VAXft Systems

Configuration Guide

Order Number: EK–VXFTB–PG–002

August 1991

This document describes how to configure the VAXft Systems hardware.

Revision/Update Information:	This manual supersedes the *VAXft 3000 Guide to Fault Tolerant Systems*, EK-VXFTA-PG-001.
Operating System and Version:	VMS Version 5.4
Software Version:	VAXft System Services Version 1.2
VMS Volume Shadowing:	Phase II
Hardware Version:	VAXft Systems

Digital Equipment Corporation
Maynard, Massachusetts

This document was prepared using VAX DOCUMENT, Version 1.2

Navigational Map for the VAXft Systems Documentation

Overview Information (VAXft Systems)

- Customer Letter
- Software Product Description
- VAXft Systems Configuration Guide

Hardware Information (VAXft Systems)

- Site Prep and Installation Guide
- Owner's Manual
- Mini−Reference Guide
- VAX Wide Area Network Device Drivers

Operating System (VMS)

- VMS Upgrade and Installation Manual
- VMS Upgrade and Installation Supplement: VAXft 3000
- Release Notes
- VMS Volume Shadowing Manual

Software Information (VAXft System Services)

- Using Factory−Installed Software with VAXft Systems
- Installation Guide
- Manager's Guide
- Release Notes
- Reference Manual
- Online Help
- Error Message Manual

- Master Index

Legend:

= Book

= Online

= Tape

= Bookreader

MR−5492−RA

iii

Contents

3 Networking Communications

4 System Service and Warranty

Glossary

Figures

Tables

v

Preface

Purpose of This Guide

This manual is a guide to configuring the members of the VAXft Systems family of fault tolerant systems.

Intended Audience

This guide is intended for use by Digital customers or potential customers who are interested in VAXft fault-tolerant systems configurations.

Related Documentation

The following documents contain further information on the VAXft Systems and VAXft System Services, the software used with the VAXft systems.

VAXft systems:

- *VAXft Systems Site Preparation and Installation Guide*
- *VAXft Systems Mini-Reference Guide*
- *VAXft Systems Technical Description*
- *VAXft Systems Owner's Manual*

VAXft System Services:

- *VAXft System Services Release Notes*
- *VAXft System Services Manager's Guide*
- *VAXft System Services Installation Guide*
- *VAXft System Services Reference Manual*
- *VAXft VMS: System Services Error Message Manual*
- *VMS Upgrade and Installation Supplement: VAXft 3000*[1]

---

[1] Available with VMS software kit.

- *VMS Volume Shadowing*[1]

Conventions

This document uses the following conventions:

Convention	Meaning
italics	An italicized term indicates that it is a new term described either in the text or in the glossary. Italics may also identify the title of a document.

1

Introduction

1.1 Digital's Family of Fault Tolerance Systems

In designing the VAXft fault-tolerant systems, Digital used its own hardware-intensive architecture. This architecture features fully redundant hardware and self-checking checkers for each set of hardware components. Digital also supports its fault-tolerant systems with an industry-leading service offering.

These features of the VAXft systems provide the following innovations for fault-tolerant computing:

- **Fully redundant hardware**

  One copy of each type of element in the system is always available.

- **No single point of hardware failure**

  No single hardware element is capable of bringing down the entire system.

- **No single point of repair**

  All repairs can be made without bringing down the entire system.

- **Uninterruptible Power Supply (UPS)**

  Power outages of short duration, brownouts, and power fluctuations, which are the most common environmental causes of computer failures, are eliminated.

- **Self-checking checkers**

  These checkers ensure that system integrity is not compromised if a fault occurs in the checking logic.

By combining these innovations with the highly successful VAX architecture, Digital has extended the range of its VAX family of computers into state-of-the-art fault-tolerant systems. The VAXft system family is designed to meet fault-tolerant requirements.

Digital's strategy is to provide you with a fault-tolerant VAX computer system that requires no change in your application code and is fully compatible with existing VAX systems.

The VAXft systems use the VMS operating system and a layered product, VAXft System Services, to support its hardware architecture. The VAXft systems will run any application or layered product designed to run on the VMS operating system. In this way, Digital continues to protect your investment in applications development.

Because the VAXft systems are based on the popular VAX architecture, you can mix conventional and fault-tolerant systems in your configurations. Therefore, you only have to put a fault-tolerant system where it is needed and can use conventional or high availability systems elsewhere. All the VAX systems present a common programming and operator interface.

Digital's cost-effective overall approach lets you put fault tolerance only where you need it in your system design. No other computer vendor lets you do that. For example, the VAXft systems can be used as a:

- Standalone system
- Front end system in a distributed application
- Back end system in a distributed application

Digital's VAX architecture is the most expandable in the industry. Digital offers you conventional, high-availability, and fault-tolerant systems, all within the same architecture. The VAXft systems provides a seamless upgrade for your critical applications in a networked environment that results in a high degree of system reliability and availability.

1.2 System Architecture

Each VAXft system consists of two identical sets of components configured in *dual zones*. Each zone is a complete computer system, fully capable of servicing the application by itself. Figure 1–1 illustrates the logical system design.

This dual zone design ensures there is no single point of hardware failure, and that a single fault or hardware failure in one zone does not cause system failure. Separate power supplies for each zone (including separate power cords) minimize system failure due to loss of external power in a single zone.

Each zone in a VAXft system contains identical CPU and memory modules. Both CPUs and memory in each zone execute the same instruction at the same time. This type of operation is called *lockstep*. Because the zones are peers and operate in this synchronous fashion, no delay is caused by a transfer of operations from the failed CPU to the remaining CPU. Indeed, there is no

transfer at all. With each zone running in lockstep, the remaining zone simply continues to operate while the failed zone is halted waiting for repair.

To maximize the benefits of redundancy for fault tolerance, the VAXft system interconnects are also duplicated to eliminate any connectivity losses due to cable failure. *Crosslink* cables link both system zones and provide parallel data paths between the zones. Figure 1–1 shows some of these redundant features of the VAXft systems.

Figure 1–1 VAXft System Diagram
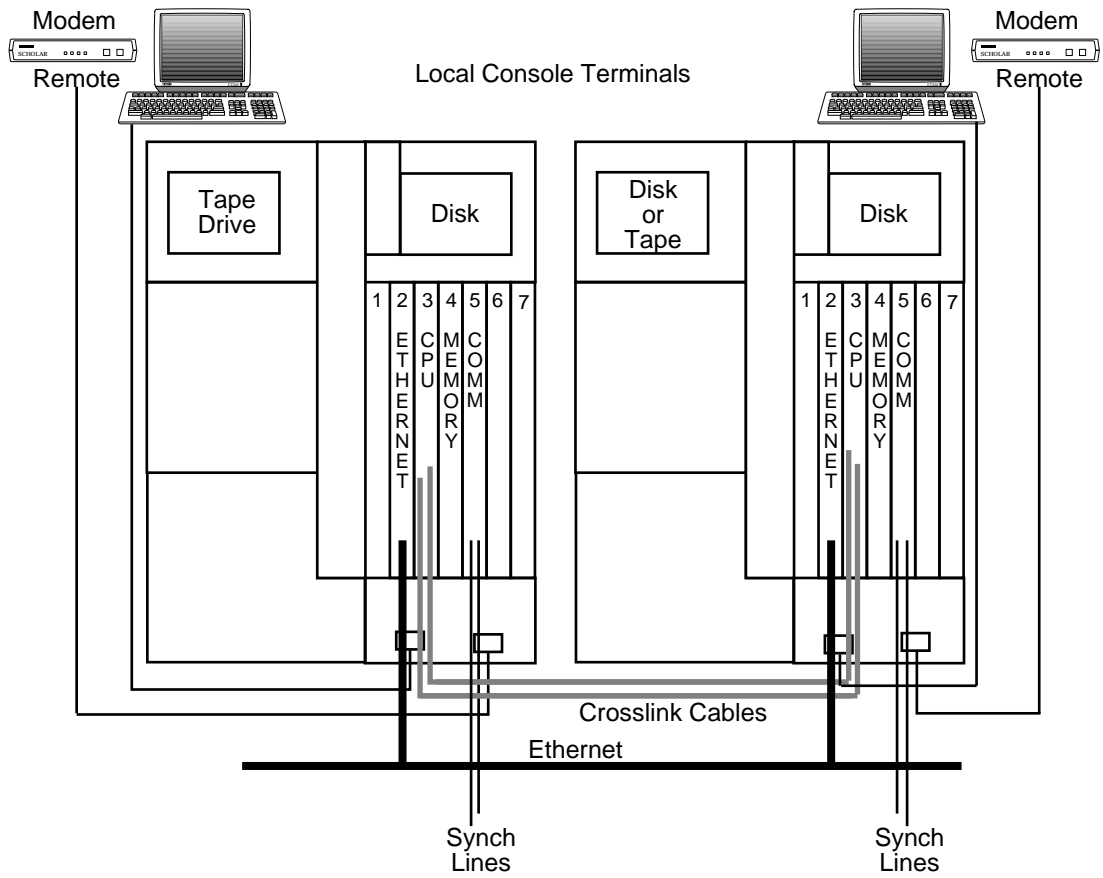
MR-5523-AD

Main memory for the VAXft systems is configured redundantly up to 128 megabytes in increments of 32 megabytes. Refer to Section 1.2.1.2, Memory, for more details.

The VAXft systems supports up to two terminals per zone, one local terminal and one remote terminal. See Section 1.2.2, System Console, for more details.

System power resources include power components and separate power cords to external power sources for each zone; and each zone has its own UPS for auxiliary power. Refer to Section 1.5, Power Subsystem, for more details.

1.2.1 System Hardware

There are seven module slots in each zone (five in the Model 110) for four types of hardware modules. The CPU, system I/O controller modules, memory modules, and communications controller modules designed for the VAXft systems reside in the module slots and connect directly to the backplane in each zone. Redundant backplanes eliminate the possibility of a single point of failure at this level. The modules are specifically designed for simple maintenance and can be inserted or removed from the front of the system cabinet. Figure 2–1 and Figure 2–2 show the arrangement of the system modules.

Figure 1–1 Seven-Slot Backplane

Crosslink Cables
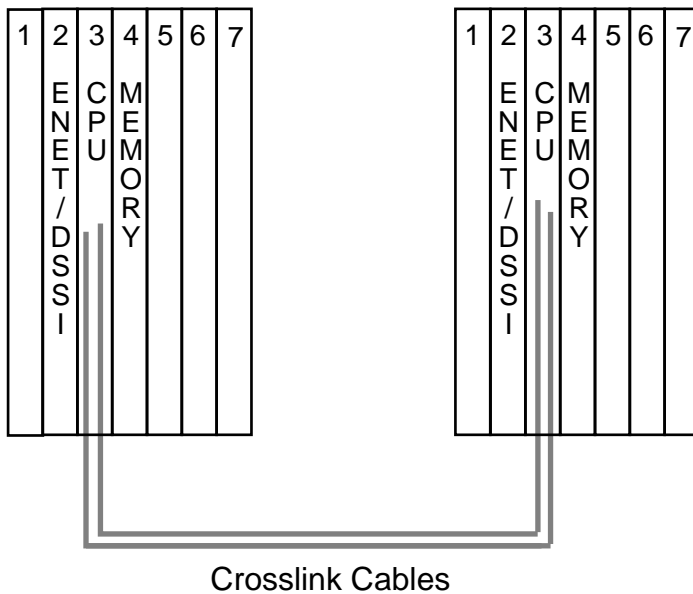
MR-5525-AD

Figure 1–2 Five-Slot Backplane

Crosslink Cables
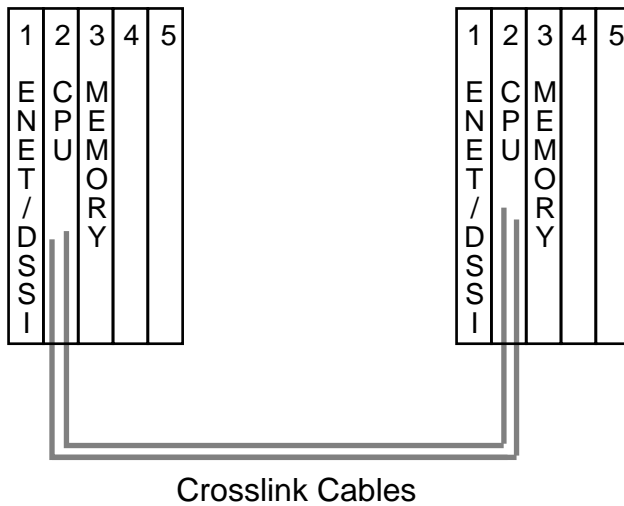
MR-5526-AD

The minimum configuration of required logic modules in each zone of the VAXft systems includes: one CPU, one memory module, and one system I/O controller.

Synchronous communication modules are not required, although some applications may require such modules. For a more detailed discussion of module configuration options for the VAXft systems, refer to Chapter 2.

1.2.1.1 Processor Modules

A VAXft system has two processor modules, one in each zone, which run in lockstep. If one processor module fails during operation, the other processor module continues to provide service to the application.

Each processor module provides the following VUPs of processing power.

- Model 110 System — 2.4 VUPs

- Model 310 System — 3.8 VUPs

- Models 410 and 610 System — 6.0 VUPs

- Model 612 VAXcluster System — 12.0 VUPs

One VUP is equal to the processing power of the VAX-11/780 processor. Each processor module also includes a 1-kilobyte internal cache memory, supplemented by an external 32-kilobyte cache memory, and a system logic clock for synchronization of the zones.

1.2.1.2 Memory

Each memory module for the VAXft systems contains 32 megabytes of fully checked memory on a single board. Each memory module features single-bit correction, double-bit detection, address and function verification, and parity checking. Up to four (three for the Model 110 system) 32-megabyte memory modules can be configured in each zone. The minimum system configuration has one memory array in each zone.

For lockstep operation, the system must be configured with equal amounts of memory in each zone.

1.2.1.3 Crosslink

Crosslink cables provide the communications paths between the CPU modules in each zone.

Between the zones, the crosslink provides two types of paths: serial and parallel. The serial path is used to establish initial communications between the zones. The parallel path operates only after the clocks in each zone have been synchronized.

1.2.2 System Console

The VAXft system console is a combination of hardware and software that enables the system to boot itself and lets you perform routine system maintenance.

The console functions enable you to:

- Issue console commands

- Boot the system either automatically or interactively

- Install the VMS operating system

- Examine control and status registers and run diagnostic tests

- View messages from the console program, diagnostics, and the VMS system

- Provide remote dialin/dialout capability

- Provide input to the operating system for the system manager or operator

System I/O controller modules containing DSSI/Ethernet/Console adapters interface the system with the DSSI, Ethernet and console. To support console operations, these modules are configured redundantly, one in each zone, to enable four console ports. The ports support one local terminal and provide access to one remote terminal in each zone by modem, as shown in Figure 1–1.

All four physical console lines operate as a single logical system console. Output appears on all four console terminals, and input can be entered from any console terminal.

Local terminals can be a combination of video display terminals, hardcopy terminals, or video display terminals with printer. A minimum of two terminals are required with the system.

During normal operation, only one terminal is required for system operations. Two terminals are normally active during system repair. One terminal can be used to manage the system, while the other is used to manage system repair. Remote console ports can be used for system access from remote locations.

1.2.3 Communications

Synchronous

Synchronous communication for the VAXft systems is provided by the DEC Wide Area Network Controller 620 (DEC WANcontroller 620), which is a two-line synchronous fault-tolerant communications controller option designed specifically for the VAXft systems.

The DEC WANcontroller 620 supports Digital-standard layered communications software for the DECnet-VAX, VAX Packetnet System Interface (PSI), VAX 2780/3780 BISYNC Protocol Emulator, and DECnet/SNA products.

The two lines are independently managed and operated so different protocols can run simultaneously. The DEC WANcontroller 620 is capable of line speeds up to 64 kilobits per second.

The maximum that can be configured is eight DEC WANcontroller 620 modules, four per zone, providing 16 synchronous non-redundant communication lines. Configuring the modules redundantly, two in each zone, enables a maximum of only eight lines.

Asynchronous

Support for asynchronous communications devices, such as user terminals, is provided through the use of Ethernet terminal servers. An Ethernet port can be connected to a thick wire or ThinWire Ethernet. See the *Networks and Communications Buyer's Guide*, for more information.

1.3 System Software

Many of the VAXft systems' fault-tolerant features are implemented in software. Therefore, the VMS operating system software and layered products are integral components of the fault-tolerant operation of the VAXft systems.

All VAXft systems require the following software for fault-tolerant operation:

- VMS operating system software

- VAXft System Services software, which supports the system's fault-tolerant hardware features

- VMS Volume Shadowing, which allows for redundancy of disk drive data

In addition to the software components that are part of the fault-tolerant operation, you can:

- Use existing VMS applications software and layered products, which run unchanged and do not need to be recompiled

- Integrate or migrate applications from other VAX systems to the VAXft systems without change

- Develop applications on conventional VAX systems or the VAXft systems

All systems include the licenses for the required software.

1.3.1 VMS Operating System

The multitude of VMS layered products and VMS applications can be run on the VAXft systems without modification or recompiling. In addition, in situations where operators are already trained in VMS operations, little additional training is needed for the VAXft systems.

1.3.2 VMS Volume Shadowing

VMS Volume Shadowing is a significant component of the VAXft systems' fault-tolerant capability. It enables all disks, including the system disk, to be shadowed within a single system or across many systems on the Ethernet.

VMS Volume Shadowing replicates data at the volume level and ensures that the loss of a disk drive does not affect the ability of an application to run. You can shadow as many drives as required by your application. Up to three members are allowed in each shadow set.

For maximum system availability, shadow set members should be accessible from different zones on different DSSI buses. For more detailed information on system configurations, refer to Section 1.3.2.1.

1.3.2.1 Guidelines for Shadowing Data

Volume shadowing is not required for all disks on the VAXft systems. However, volume shadowing enables the system to provide access to important data whenever it is needed, so disks containing critical data should be shadowed.

The best approach to shadowing disks is to identify critical needs and to protect data accessibility and availability in those areas by maintaining shadow sets of important data.

There is no restriction on the number shadow sets allowable. The maximum number of members for a shadow set is three. Members of a shadow set should reside on different DSSI buses and in separate cabinets to optimize data accessibility and availability within the VAXft system.

To determine which disks require shadowing, answer the following questions.

- **Is availability of the data on the disk critical?**

  For example, does the data on the disk need to be available at all times? If so, this disk should be included in the shadowing operation. If the system must be up all the time, the system disk is critical and needs to be shadowed. But, for example, data needed for an annual report may not require shadowing if there is a consistent procedure for backing up system data.

- **Is the data written to the disk critical?**

  Sometimes shadowing of a disk is necessary because because the data is so critical that it cannot be lost. For example, a disk that records transactions at an automatic teller machine should be shadowed because the data must be available immediately to adjust balances, and a copy must be retained for reference at all times. In this case, a simple backup procedure would be insufficient because data could be lost if the drive where it is recorded fails. Shadowing of this disk would ensure that the data is available at all times for immediate access or reference at a later date.

- **Must a disk be shadowed to adhere to legal or auditing require-ments?**

  Some businesses must adhere to corporate and government requirements to protect data. Shadowing can be used to fulfill these requirements.

1.3.3 VAXft System Services

VAXft System Services runs in conjunction with the VMS operating system to support the fault-tolerant features of the VAXft systems.

Features of the VAXft System Services software include support for the following capabilities:

- Automatic failover of hardware

- Hardware fault isolation and recovery

- Automatic dialout notification of faults

- Configuration management of I/O components

The VAXft System Services software also provides DCL-level commands to start, stop, and show zones.

1.4 System Management Utilities

Additional software for the VAXft systems provides tools and utilities you use to manage the system.

The FTSS$CONTROL Utility allows you to define the dialout telephone numbers used by the autonotification feature. See Section 4.1, Service and Repair Features, for more details on this utility.

The Failover Set Manager Utility enables you to manage members of the failover sets of Ethernet adapters. The Failover Set Manager allows the addition or removal of failover set members and displays member status. Refer to the *VAXft System Services Reference Manual* and *VAXft System Services Manager's Guide* for more details.

1.5 Power Subsystem

The VAXft systems feature a universal AC power system that supports 120 VAC requirements for the U.S. and 240 VAC requirements for the international market. The power system provides the voltages required to operate all internal components of the system, including the computer logic, memory, disks, tape, and cooling fans. The system features separate power cables for each cabinet, to enable connection to external power sources.

External power can be 120 VAC or 240 VAC, or 48 to 60 VDC on all models except the Model 110 system. See the *VAXft Systems Site Preparation and Installation Guide*, for more details.

Loss of external power is the leading cause for environmentally induced system failure. See Figure 1–4 for an illustration of typical outage causes leading to system failure. The VAXft systems are able to counteract this by switching to the Uninterruptible Power Supply (UPS). The UPS allows for a controlled shutdown of the system to eliminate loss of data. The integral UPS in each zone permits the system to tolerate brownouts, or brief or full outages due to loss of external power source, by supplying power to all internal components for up to 15 minutes in each 24-hour period. The VAXft Model 110 system does not support an integral UPS; an external UPS must be ordered if you require uninterruptible power.

If external power returns within 15 minutes, the system automatically switches back to the external power source.

For critical applications that tolerate no downtime, an external generator should be included in the installation for times when power is lost for longer than 15 minutes.

External devices such as console terminals, user terminals, modems, and terminal servers are not supported by the VAXft systems in the event of a power outage. An external UPS used to support these devices is available from Digital.

Figure 1–4 Most Common Causes of System Failure Due to Environmental Conditions
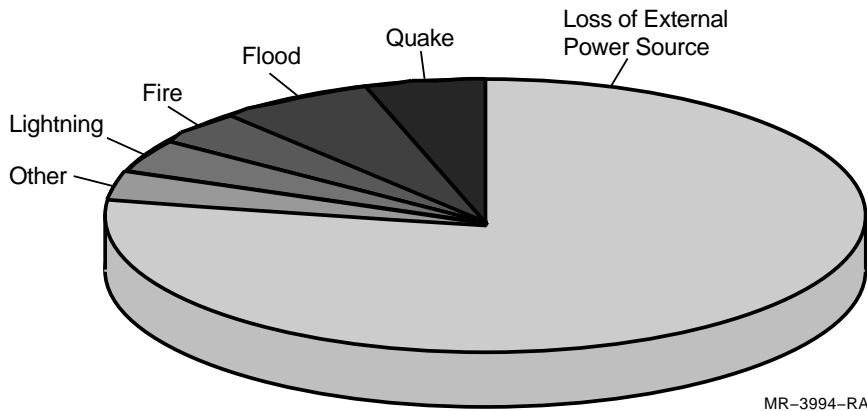
MR–3994–RA

1.6 Cooling Monitor

The VAXft systems are designed to operate in a normal temperature-controlled office space. Temperature thresholds are 10°C and 40°C, or about 50°F and 104°F. If the environment exceeds the system's thresholds, a shutdown occurs automatically.

The system has internal cooling monitors in each zone to ensure that thresholds on the high end are not exceeded. Fan speed is increased when room temperature rises above an acceptable threshold. The monitor reports harmful temperature fluctuations to the system, and the autonotification dialout procedure is initiated to notify the user or Digital Customer Services.

1.7 Summary of System Characteristics

Important characteristics of the VAXft systems include:

- Hardware-intensive, fault-tolerant VAX architecture, featuring redundant subsystem hardware and self-checking checkers within each zone

- Full VAX compatibility with the VAXft systems running the industry standard VMS operating system, and fully supporting all layered products and applications designed for VAX computers without change or recompilation

- Up to 12.0 times the processing power of the VAX-11/780

- Fault detection and isolation of all hardware faults

- Multiple Ethernet Local Area Networks

- DEC WANcontroller 620 support for multiple protocols and synchronous communications lines

- High performance Digital Storage Systems Interconnect buses for mass storage for the VAXft systems

- Online system repair while the system continues to service your application

- Separate cabinets for each zone that provide improved protection from human error and easy maintenance and repair of the system from the front of the cabinets

- Battery-backup to tolerate external power fluctuations

- Cooling monitors to maintain acceptable temperature

- Automatic dialout to notify you or Digital Customer Services of system failure.

2

VAXft Systems Configurations and Options

Digital Equipment Corporation offers a family of VAXft systems to satisfy your fault-tolerant computing requirements. The systems vary in processing power and amount of mass storage. Supported configurations are:

- VAXft Model 110 System

- VAXft Model 310 or 410 Entry System

- VAXft Model 310 or 410 Expanded System

- VAXft Model 610 Entry System

- VAXft Model 610 Expanded Systems

- VAXft Model 612 Dual-Node VAXcluster Entry System

- VAXft Model 612 Dual-Node VAXcluster Expanded System

Each configuration is described in detail in the following sections, but some features and options are available and common to all configurations. These common features and options are described in Section 2.1

2.1 Common Features and Options for Configuring VAXft Systems

Every VAXft system has two zones each of which has a backplane for logic modules. Each zone in the Model 110 backplane has five slots, while all the other systems have seven-slot backplanes. Figure 2–1 and Figure 2–2 show the placement in the backplane of the required modules: processor, memory, and system I/O controller for Ethernet/DSSI /console connections. If an additional system I/O controller is needed, the first slot is used on the seven-slot backplane and the fourth or fifth on the five-slot backplane.

Figure 2–1 Seven-Slot Backplane

Crosslink Cables
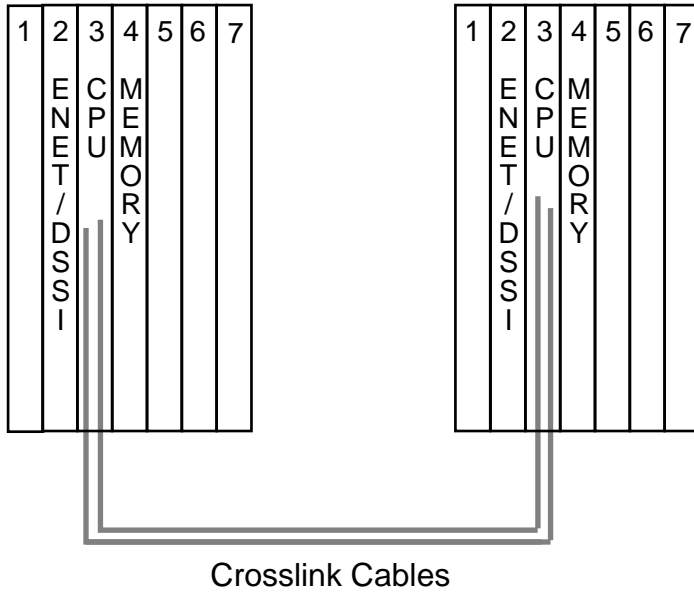
MR-5525-AD

Figure 2–2 Five-Slot Backplane

Crosslink Cables
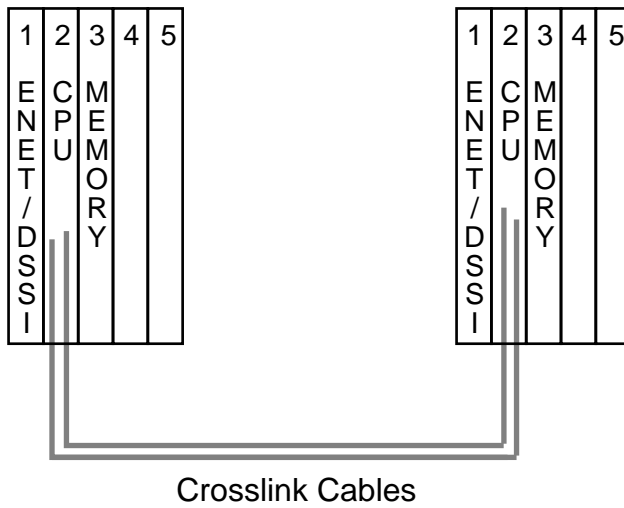
MR-5526-AD

Most of the options for memory, mass storage, and buses are common to all the systems. Table 2–1 gives each of the options, their capacities, and model numbers.

Table 2–1 Common Options for the VAXft Systems

Option	Description	Model Number
Tape Drive	TF70C 290-megabyte cartridge tape drive.	TF70C-RA, TF70C-JA, TF70C-AA
Tape Loader	TF857 18.2-gigabyte tape loader for unattended backup (available on Models 610/612 only). The TF857 can contain up to seven cartridge tapes. Normally, TK85K 2.1-gigbyte tapes are used, but TF70C and other cartridge tapes can also be used.	TF857-CA

Table 2–1 (Cont.)   Common Options for the VAXft Systems

Option	Description	Model Number
Disk Storage	RF-series Integrated Storage Elements: RF31 381-megabyte fixed disks RF31 381-megabyte shock-mounted removable disks RF72 1-gigabyte fixed disk RF72 1-gigabyte shock-mounted removable disk	RF31E-RA, RF31-KA, RF31-JA, RF72E-RA, RF72-KA, RF72-JA
Memory Module	The minimum system for each model comes with one 32-megabyte memory module per zone. Memory capacity must be identical in both zones.	MS520-BB
System I/O controller module	Connections to Ethernet and DSSI bus.	KFE52-AA
DEC WANcontroller 620	The two-line synchronous communication controller for the VAXft systems. The WAN module supports connections to X.25, DECnet, and IBM networks with appropriate Digital Equipment Corporation networking layered product software.	DSF32-AA
Console Terminal Ports	One local console and one remote console port is included in each zone for a total of four console ports per system. Order two video terminals such as VT420s unless otherwise available. A combination of video terminal and LA75 printer/terminal is recommended. You must have a minimum of two console terminals to support fault-tolerant operation.	
Uninterrruptable Power Supply (UPS)	A battery backup option (in-cabinet) for each zone is included in Models 310/410/610/612. A battery backup option (out of cabinet) for each zone must be added for the Model 110 if UPS is required for in-cabinet components or external devices such as servers, printers, and modems.	H7229-AD

Each VAXft system that has a DC power supply (see the configuration illustrations) has a Power Cooling Intelligence Module (PCIM) incorporated into the DC power supply. When such a system is expanded, a PCIM cable must connect the PCIMs in each DC pwer supply. The illustrations of the expanded systems show this cable.

Although a tape drive or tape loader is not required for any VAXft system, Digital strongly recommends that you purchase one for backup. If you have a need for large amounts of unattended tape backup on a Model 610 or 612, the TF857 tape loader is the recommended tape option. It has a capacity of up to 18.2 gigabytes of storage in up to seven tape cartridges.

In most expanded VAXft systems, the disk mass storage is located in the expansion cabinets in the form of fixed disks. However, one removable disk is allowed as long as fixed disk unit 4 is not used. In the Model 310/410, you can have a tape drive instead of the removable disk, but the tape drive would still replace fixed disk unit 4. On Models 610 and 612, the optional tape drives are separate from the optional removable disk; in this case, the tape drive replaces fixed disk unit 5 in the expansion cabinet. So, if in an expanded system, you want a removable disk and/or a tape drive (depending on model), you should order one or two fewer fixed disk drives. Figure 2–3 shows the disk units that are replaced by removable disks and/or tapes.

Figure 2–3 Disk Units
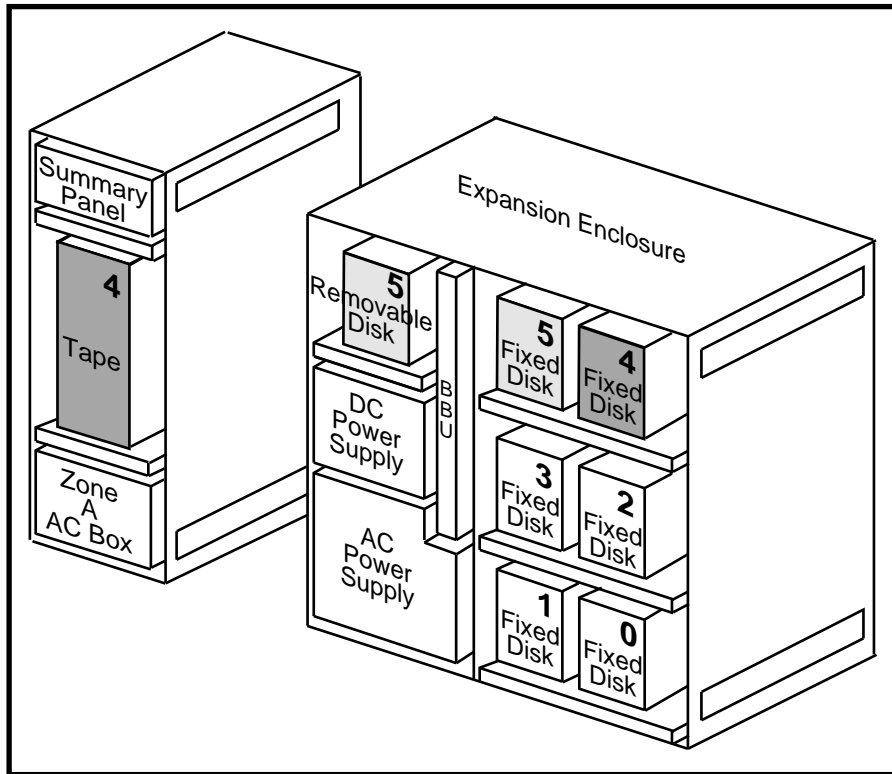
MR-5524-AD

2.2 The VAXft Model 110 System

The VAXft Model 110 system is the minimum VAX fault-tolerant system configuration available from Digital Equipment Corporation. This system features low cost with limited mass storage. It can be purchased as a rack-mounted system or a pedestal system. Both zones of the Model 110 system are contained in a single cabinet. Each zone contains a five-slot backplane, connectors, and mass storage. Figure 2–4 shows the configuration of the VAXft Model 110 system.

Figure 2–4   VAXft Model 110 Configuration

MR-5494-AD
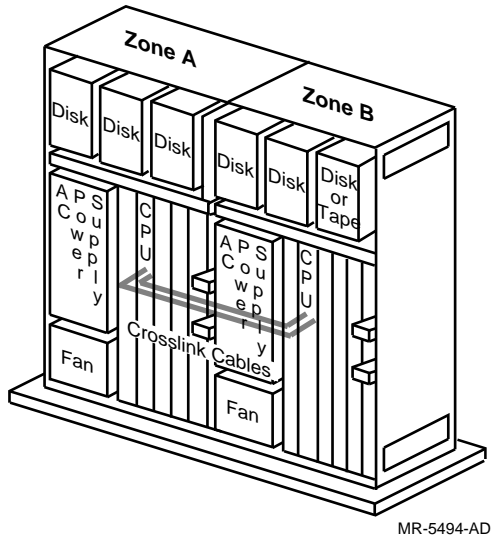
2.2.1 VAXft Model 110 Mass Storage and Module Options

The Model 110 supports a maximum of six DSSI mass storage devices, up
to three devices in each zone. All mass storage devices are contained in
the system enclosure as shown in Figure 2–4. Mass storage devices can be
configured with RF31 fixed disks, RF72 fixed disks, and TF70C cartridge tape
in the one of the following combinations:

- Three RF31 disks in each zone for a total of six RF31 disks

- Three RF31 disks in zone A and two RF31 disks plus one TF70C tape in
  zone B for a total of five RF31 disks and one TF70C tape

- Two RF72 disks in each zone for a total of four RF72 disks

- Two RF72 disks in zone A and one RF72 disk plus one TF70C tape in zone
  B for a total of three RF72 disks and one TF70C tape

Figure 2–4 shows the mass storage configuration with three RF31 disks in
each zone of the VAXft Model 110 system.

Table 2–2 gives the minimum and maximum system components for the Model
110 system.

Table 2–2 Module Options for the Model 110

Option	Description	Model Number
Tape Drive	Cartridge tape drive. One is optional for Zone B; a maximum of one tape drive can be ordered.	TF70C-RA
Disk Storage	RF31 or RF72 fixed disk drive. The minimum system comes without disks, but disks are a required option. RF31s and RF72s cannot be mixed on the Model 110.	RF31E-RA, RF72E-RA
Memory Module	A minimum of one and a maximum of two memory modules can be configured per zone. Memory capacity must be identical in both zones.	MS520-BB
System I/O controller module	The system comes with one system I/O controller module per zone to provide Ethernet lines and DSSI lines. An additional system I/O controller module can be added in each zone to provide redundant connections to dual Ethernet lines. (An additional DSSI is not available.)	KFE52-AA
DEC WANcontroller 620	A maximum of four WAN modules (two per zone) can be configured to give eight synchronous, non-redundant lines per system.	DSF32-AA
Console Terminal Ports	One local console and one remote console port is included in each zone for a total of four console ports per system.	
Uninterrruptable Power Supply (UPS)	A battery backup option (out of cabinet) for each zone must be added if UPS is required for in-cabinet components or external devices such as servers, printers, and modems.	H7229-AD

2.3 VAXft Model 310/410 Entry System

The VAXft Model 310 and the VAXft Model 410 entry systems are identical in everything but the processor. The Model 310 processor has 3.8 VUPs of processing power, while the Model 410 has 6.0 VUPs. To upgrade from a VAXft Model 310 system to a VAXft Model 410 system requires merely the replacement of the Model 310 processor with the Model 410 processor. Unlike the Model 110, the Model 310/410 is expandable (see Section 2.4). The Model 310/410 entry system is recommended if your requirements for online non-shadowed disk storage do not exceed 3 gigabytes.

A Model 310/410 entry system configuration includes two zones, each containing a seven-slot backplane, connectors, and mass storage. Refer to Figure 2–5 for an illustration of the system components.

Figure 2–5 VAXft Model 310/410 Entry System Configuration
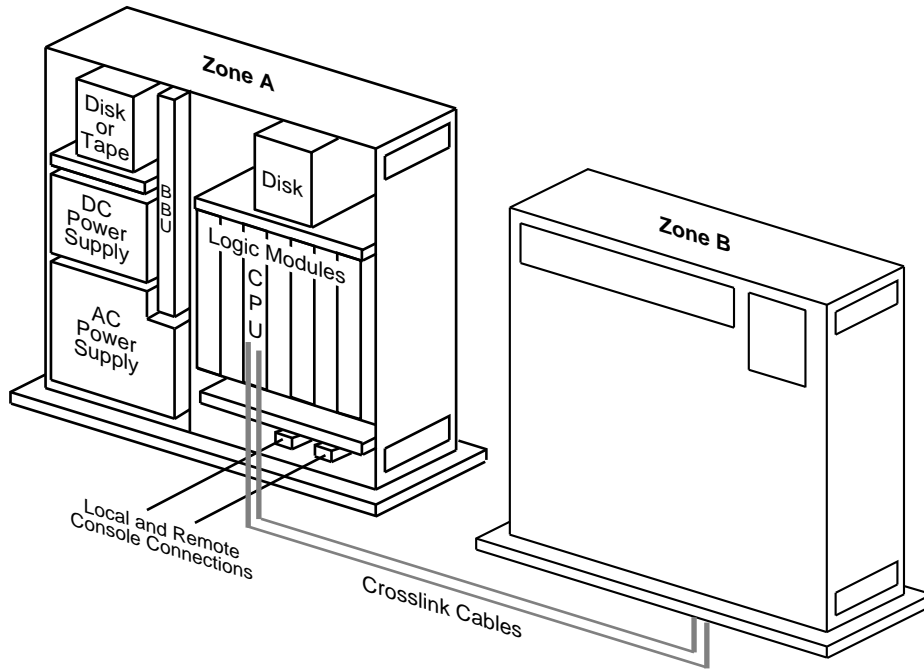
MR-5493-AD

2.3.1 VAXft Model 310/410 Entry System Mass Storage and Module Options

The Model 310/410 entry system supports a maximum of four DSSI mass storage devices, two devices in each cabinet. All mass storage devices are contained in the system cabinets. All storage devices are removable. Mass storage devices can be configured in the following combinations:

- Four RF31/RF72 disks

- three RF31/RF72 disks and one TF70C tape drive

- two RF31/RF72 disks and two TF70C tape drives

- two RF31/RF72 disks and one TF70C tape drive

Figure 2–5 shows the disk configuration for the Model 310/410 entry system, including a tape drive and three disks.

If one zone is down due to planned maintenance or repair, the mass storage devices contained in that zone are unavailable to the operational zone. Shadow set members in the downed zone must be updated when the zone is returned to operation. Refer to Section 1.3.2.1, Guidelines for Shadowing Data, for more details.

Table 2–3 gives the minimum and maximum system components available for the Model 310/410 entry system.

Table 2–3 Module Options for the Model 310/410 Entry System

Option	Description	Model Number
Tape Drive	Cartridge tape drive. a maximum of two tape drives can be ordered.	TF70C-JA
Disk Storage	RF31 or RF72 removable disk drive. The minimum system comes with two RF disks. One or two additional optional RF drives can be added to the system for a maximum of four RF disk drives.	RF31-JA, RF72-JA
Memory Module	A minimum of one and a maximum of four memory modules per zone can be configured. Memory capacity must be identical in both zones.	MS520-BB
System I/O controller module	The system comes with one system I/O controller module per zone to provide Ethernet lines and DSSI lines. An additional system I/O controller module can be added in each zone to provide redundant connections to dual Ethernet lines.	KFE52-AA
DEC WANcontroller 620	A maximum of eight WAN modules (four per zone) can be configured per system.	DSF32-AA/AB
Console Terminal Ports	One local console and one remote console port is included in each zone for a total of four console ports per system.	

2.4 VAXft Model 310/410 Expanded System

The VAXft Model 310 and the VAXft Model 410 expanded system provides up to 12 gigabytes of non-shadowed mass storage with dual-access to disks from both zones at all times. Figure 2–6 shows the Model 310/410 expanded system configuration.

Figure 2–6 Model 310/410 Expanded System Configuration
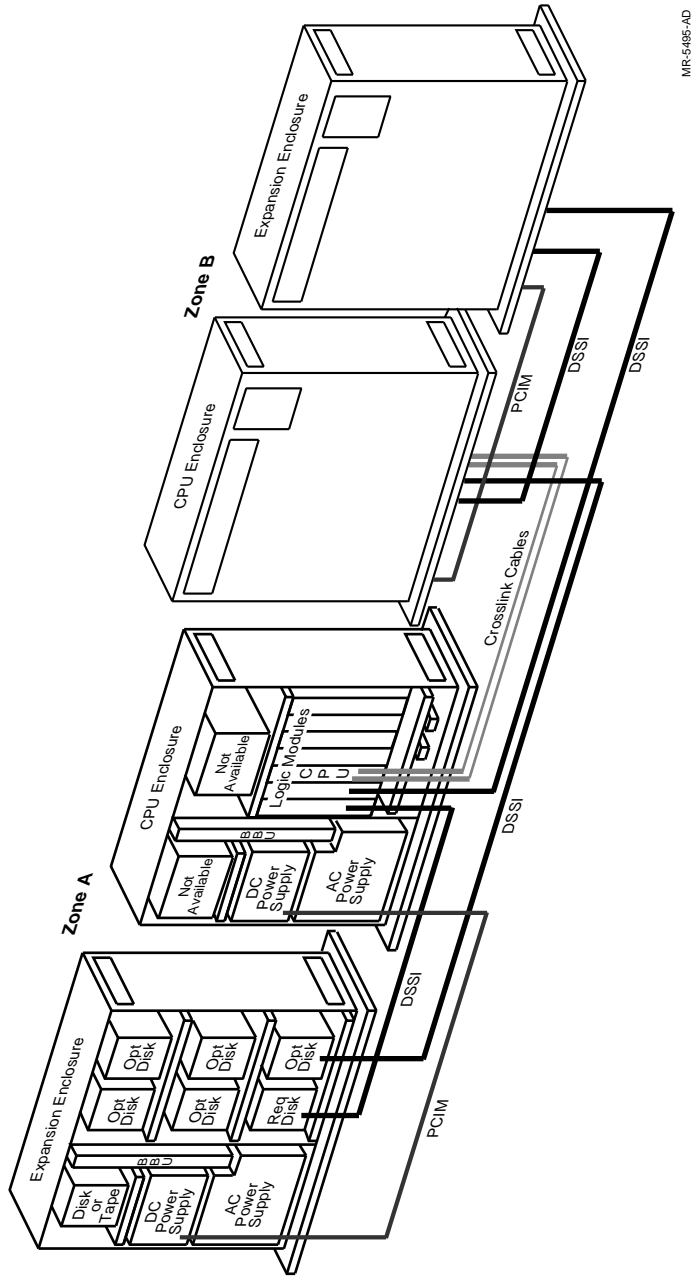
The Model 310/410 expanded system consists of two system cabinets and two expansion cabinets. The system cabinets are similar to the Model 310/410 entry system, but they contain no mass storage options. Each zone contains a seven-slot backplane and connectors. The expansion cabinets connect to the system cabinets by dual DSSI buses; this enables access to mass storage by both zones.

2.4.1 VAXft Model 310/410 Expanded System Mass Storage and Module Options

All mass storage devices for the Model 310/410 expanded system must be configured inside the expansion cabinets. Each expansion cabinet holds up to six DSSI storage devices for a total of 12 devices per system. Most disk drives are fixed, but an optional tape drive or removable disk drive can replace one of the fixed drives. See Figure 2–3 and accompanying text. Configure mass storage devices in each expansion cabinet in the following combinations:

- Up to five RF31/RF72 fixed disk drives and one TF70C tape drive

- Up to six RF31/RF72 fixed disk drives

- Up to five RF31/RF72 fixed disk drives and one RF31/RF72 removable disk

Two RF31/RF72 fixed disk drives are the minimum required mass storage for the Model 310/410 expanded system; a tape device is highly recommended for backup.

Figure 2–6 shows dual access to mass storage devices by either zone at all times, even when one zone is not operational. A pair of system I/O controller adapters in each zone interface the system with the dual DSSI buses, so even the loss of a single zone does not deny the system access to both members of a shadow set. To optimize overall system availability, the primary member of a shadow set must reside on one DSSI bus. The shadowed member should reside on the other DSSI bus.

Table 2–4 gives the minimum and maximum system components for the Model 310/410 expanded system.

Table 2–4 Options Table for Model 310/410 Expanded System

Option	Description	Model Number
Tape Drive	Cartridge tape drive. a maximum of two tape drives can be ordered.	TF70C-JA
Disk Storage	RF31 or RF72 fixed or removable disk drive. The minimum system comes with two RF fixed disks. Maximum of 12 RF fixed disk drives allowed per system. Only one RF removable disk is allowed per zone.	RF31-KA, RF31-JA, RF72-KA, RF72-JA
Memory Module	A minimum of one and a maximum of four memory modules per zone can be configured. Memory capacity must be identical in both zones.	MS520-BB
System I/O controller module	The system comes with two system I/O controller modules per zone to provide Ethernet lines and DSSI lines.	KFE52-AA
DEC WANcontroller 620	A maximum of eight WAN modules (four per zone) can be configured for a maximum of 16 synchronous lines per system.	DSF32-AA/AB
Console Terminal Ports	One local console and one remote console port is included in each zone for a total of four console ports per system.	

2.5 VAXft Model 610 Entry System

The Model 610 entry system is a fault-tolerant system available in a 60-inch cabinet with one zone on top of the other, rather than side-by-side. The Model 610 entry system is recommended if your requirements for online non-shadowed storage do not exceed 3 gigabytes. The Model 610 is expandable (see Section 2.6).

A Model 610 entry system configuration includes one system cabinet, containing two zones, each containing a seven-slot backplane, connectors, and mass storage. Refer to Figure 2–7 for an illustration of the system components.

Figure 2–7   Model 610 Entry System Configuration

MR-5504-AD
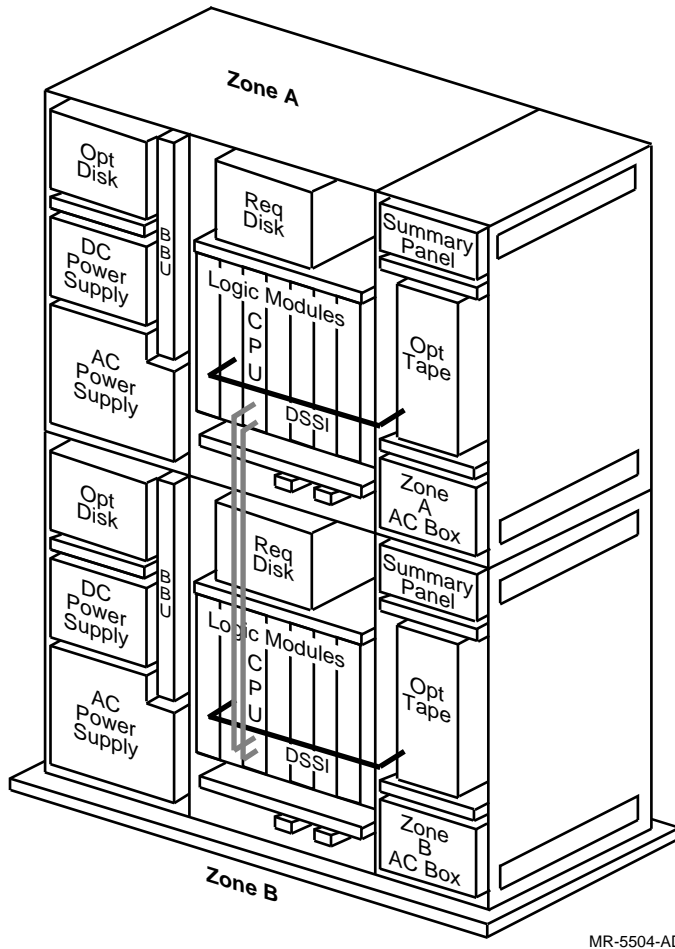
2.5.1   VAXft Model 610 Entry System Mass Storage and Module Options

The Model 610 entry system supports a maximum of six DSSI mass storage
devices, three devices in each zone. All mass storage devices are contained in
the system cabinet. All storage devices are removable. Mass storage devices
can be configured in the following combinations:

- Six RF31/RF72 disks
- Five RF31/RF72 disks and one TF70C/TF857 tape drive

- Four RF31/RF72 disks and two TF70C/TF857 tape drives

Figure 2–7 shows a full disk configuration for the Model 610 entry system, including a tape drive, a tape loader, and four disks.

If one zone is down due to planned maintenance or repair, the mass storage devices contained in that zone are unavailable to the operational zone. Shadow set members in the downed zone must be updated when the zone is returned to operation. Refer to Section 1.3.2.1, Guidelines for Shadowing Data, for more details.

Table 2–5 gives the minimum and maximum system components for the Model 610 entry system.

Table 2–5 Module Options for the Model 610 Entry System

Option	Description	Model Number
Tape Drive	Cartridge tape drive; maximum of two tape drives can be ordered.	TF70C-AA
Tape Loader	TF857 tape loader for unattended backup. A tape loader can replace one or both TF70C tape drives.	TF857-CA
Disk Storage	RF31 or RF72 shock-mounted removable disk drive. The minimum system comes with two RF disks. Two additional optional RF drives can be added to the system for a maximum of four RF disk drives.	RF31-JA, RF72-JA
Memory Module	A minimum of one and a maximum of four memory modules per zone can be configured. Memory capacity must be identical in both zones.	MS520-BB
System I/O controller module	System comes with one system I/O controller module per zone to provide Ethernet lines and DSSI lines. An additional system I/O controller module can be added in each zone to provide redundant connections to dual Ethernet lines.	KFE52-AA
DEC WANcontroller 620	The two-line synchronous communication controller for VAXft systems. A maximum of eight WAN modules (four per zone) can be configured for a total of 16 synchronous, non-redundant lines per system.	DSF32-AA/AB

Table 2–5 (Cont.)   Module Options for the Model 610 Entry System

Option	Description	Model Number
Console Terminal Ports	One local console and one remote console port is included in each zone for a total of four console ports per system.	

2.6 VAXft Model 610 Expanded Systems

The Two Model 610 expanded systems are available (as shown in Figure 2–8 and Figure 2–9) to provide up to 24 gigabytes of non-shadowed mass storage with dual-access to disks from both zones at all times.

Figure 2–8 Model 610 Expanded System Configuration with One Expansion Cabinet
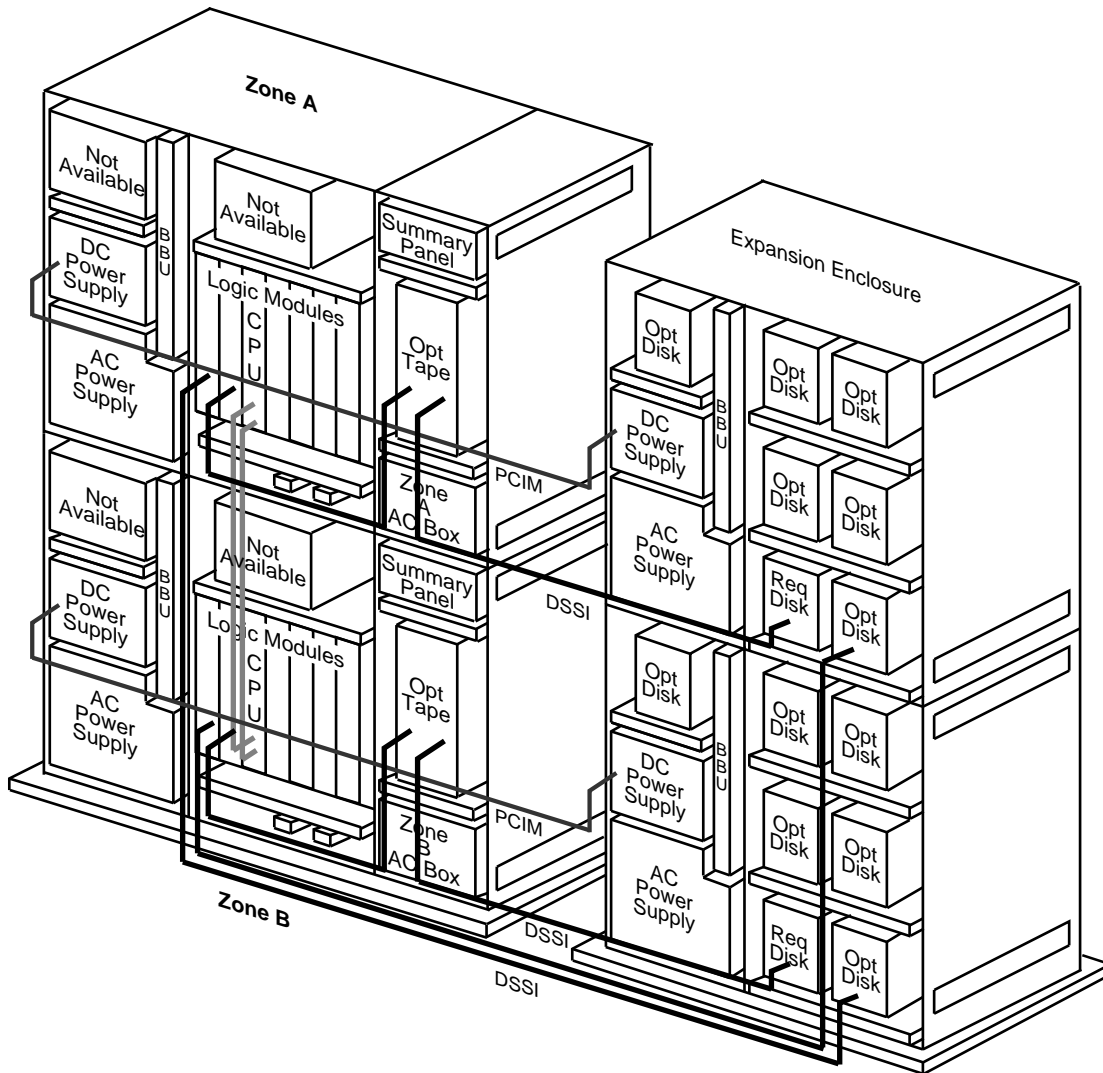
MR-5505-AD

Figure 2–9   Model 610 Expanded System Configuration with Two Expansion Cabinets
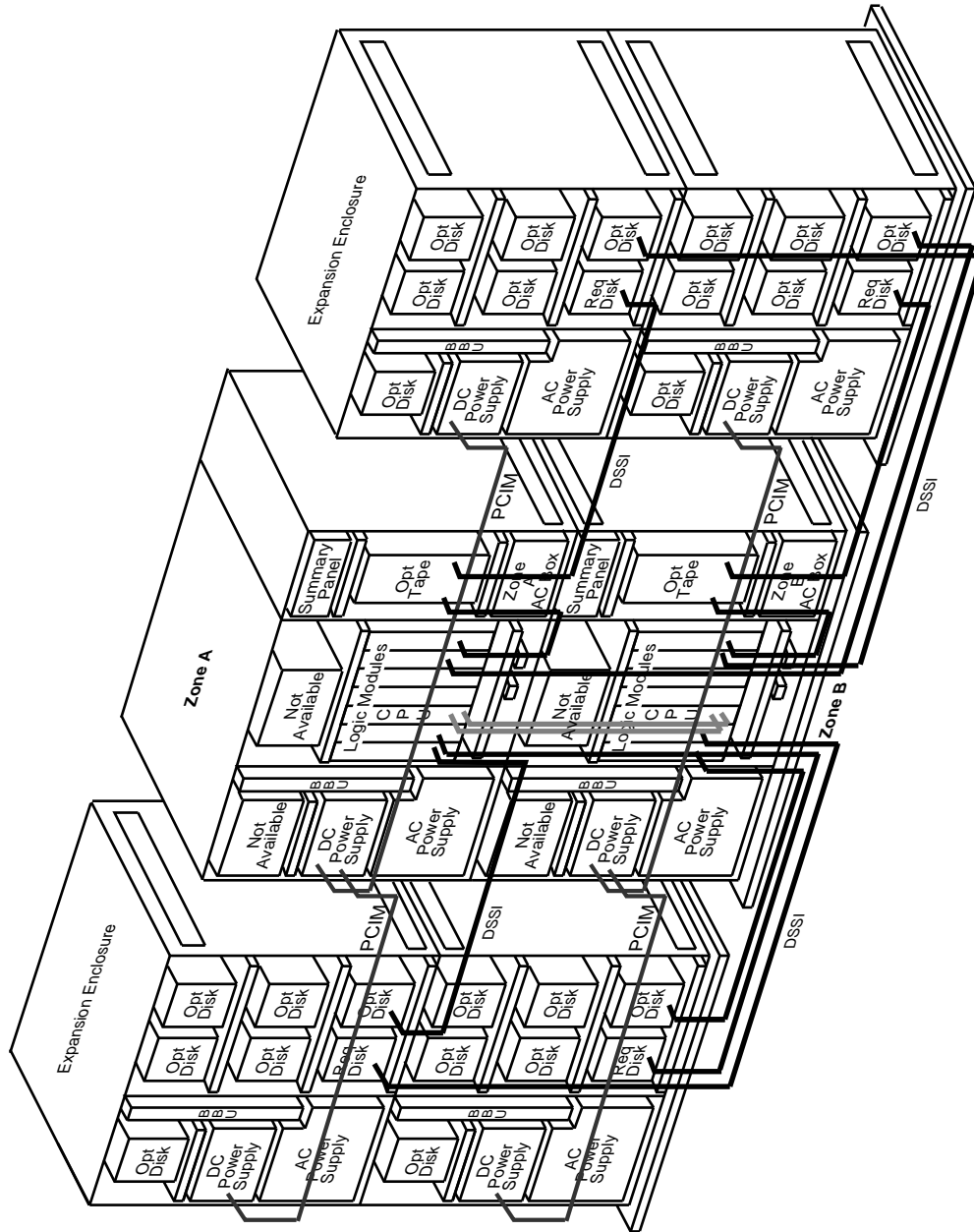
MR-5506-AD

The Model 610 expanded systems consist of the single system cabinet plus one or two expansion cabinets. The system cabinet is similar to the Model 610 entry system, but it contains no disk drives. It can contain one or two TF70C/TF857 tape drives. Each zone contains a seven-slot backplane for a processor module, a memory module, and two or four system I/O controller modules for DSSI/Ethernet interfaces. The system with the single expansion cabinet requires two system I/O controller modules (in slots 1 and 2), while the system with the two expansion cabinets requires four system I/O controller modules (in slots 1, 2, 6, and 7). Figure 2–8 and Figure 2–9 show the slots that the DSSI buses use.

Like the system cabinet, each expander cabinet contains two zones one on top of the other. Each zone contains its own power supply (AC, DC, and battery) and can contain up to six disk drives.

2.6.1 VAXft Model 610 Expanded Systems Mass Storage and Module Options

All disk storage devices for the Model 610 expanded systems must be configured inside the expansion cabinets. Each expansion cabinet holds up to 12 disk drives (six per zone) for a total of 12 disk drives for an expanded system with one enclosure cabinet and 24 disk drives for one with two expansion cabinets. The expansion cabinets connect to the system cabinet by dual DSSI buses; this enables access to mass storage by both zones. Configure mass storage devices in a system with a single expansion cabinet in the following combinations:

- Up to 12 RF31/RF72 fixed disks.

- 10 or 11 RF31/RF72 fixed disks and one or two TF70C/TF857 tape drives.

- 11 RF31/RF72 fixed disks and one RF31/RF72 removable disk.

Two RF31/RF72 fixed disks are the minimum requirement for mass storage for the Model 610 expanded system with one expansion cabinet.

Configure mass storage devices in a system with dual expansion cabinets in the following combinations:

- Up to 24 RF31/RF72 fixed disks.

- 22 or 23 RF31/RF72 fixed disks and one or two TF70C/TF857 tape drives.

- 22 or 23 RF31/RF72 fixed disks and one or two RF31/RF72 removable disks.

Four RF31/RF72 fixed disks are the minimum requirement for mass storage for the Model 610 expanded system with dual expansion cabinets.

Figure 2–8 and Figure 2–9 show dual access to mass storage devices by either zone at all times, even when one zone is not operational. A pair of system I/O controller adapters in each zone interface the system with the dual DSSI buses, so even the loss of a single zone does not deny the system access to both members of a shadow set. To optimize overall system availability, the primary member of a shadow set must reside on one DSSI bus. The shadowed member should reside on the other DSSI bus.

Table 2–6 gives the minimum and maximum system components available for the Model 610 expanded systems.

Table 2–6 Options Table for Model 610 Expanded Systems

Option	Description	Model Number
Tape Drive	Cartridge tape drive; a maximum of two tape drives can be ordered.	TF70C-AA
Tape Loader	TF857 tape loader for unattended backup. A tape loader can replace one or both TF70C tape drives.	TF857-CA
Disk Storage	RF31 or RF72 fixed and removable disk drives. A minimum of two RF fixed disk drives are required. Maximum of 12 RF disk drives allowed per expansion cabinet. Only one RF removable disk is allowed per expansion cabinet.	RF31-KA, RF31-JA, RF72-KA, RF72-JA
Memory Module	A minimum of one and a maximum of four memory modules per zone can be configured. Memory capacity must be identical in both zones.	MS520-BB
DEC WANcontroller 620	A maximum of six modules (three per zone) can be configured to give 12 synchronous lines for a system with one expansion cabinet. A maximum of two modules (one per zone) can be configured to give four synchronous lines for a system with two expansion cabinets.	DSF32-AA/AB
Console Terminal Ports	Two local console ports and two remote console ports are included per system.	

2.7 VAXft Model 612 Entry VAXcluster System

The VAXft Model 612 entry VAXcluster system is a dual-node fault-tolerant VAXcluster system consisting of two VAXft Model 610 systems sharing a single expansion cabinet that contains the DSSI disk devices. The Model 612 VAXcluster system has 12 VUPs of processing power, twice that of a Model 610 system. The Model 612 is expandable (see Section 2.8).

A Model 612 entry VAXcluster system configuration includes two Model 610 systems, each containing two zones with a seven-slot backplane in each zone and optional tape storage. Refer to Figure 2–10 for an illustration of the system components.

Figure 2–10 VAXft Model 612 Entry VAXcluster Configuration
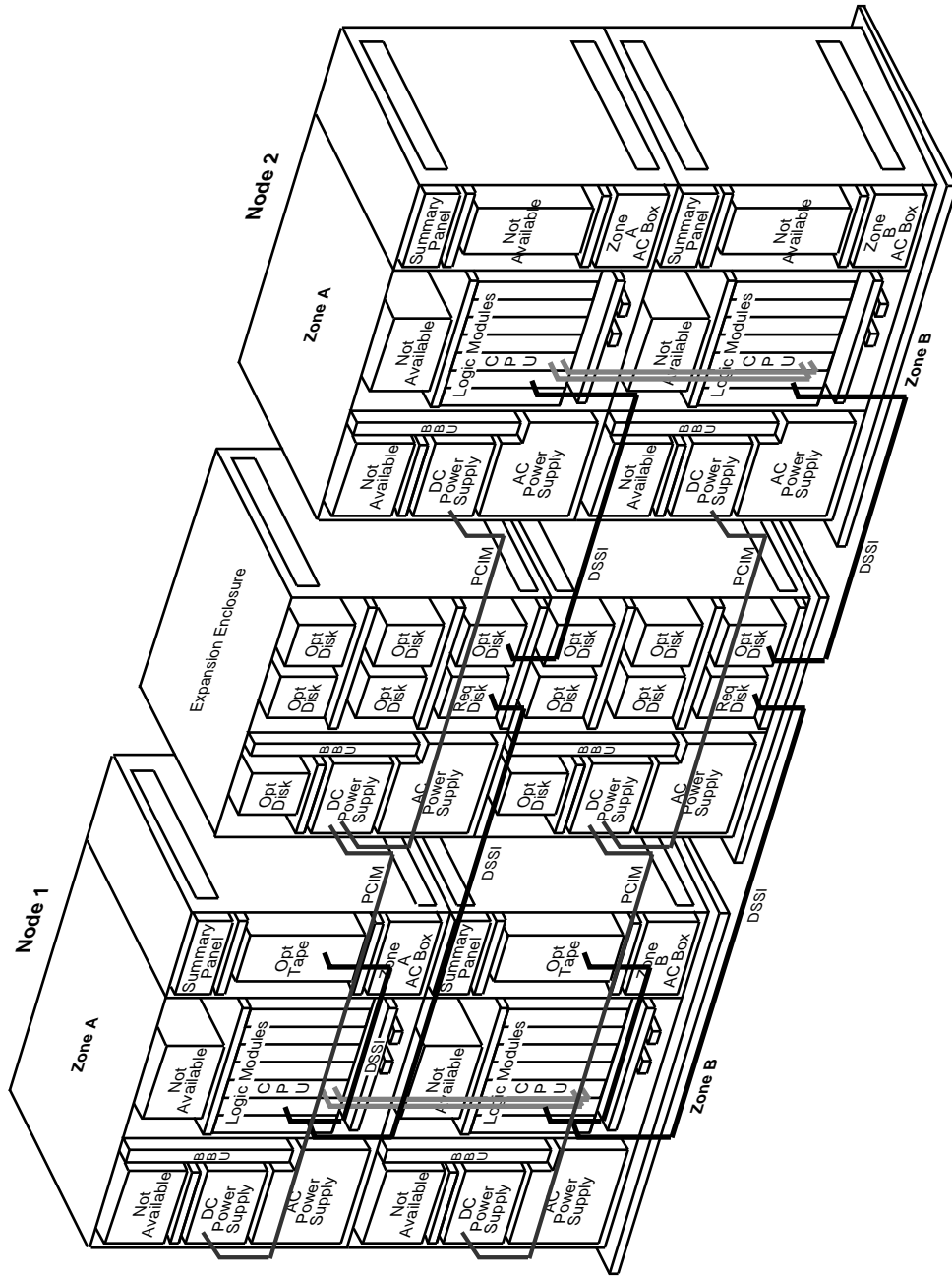
MR-5508-AD

2.7.1 VAXft Model 612 Entry VAXcluster Mass Storage and Module Options

The Model 612 entry VAXcluster system supports a maximum of 12 disk drives in the expansion cabinet and two tape drives in each zone in the Node 1 system cabinet (as shown in Figure 2–10). No storage devices are available in the Node 2 system cabinet. Mass storage devices can be configured in the following combinations:

- Twelve RF31/RF72 fixed disks

- 10 or 11 RF31/RF72 fixed disks and one or two TF70C/TF857 tape drives

- 10 or 11 RF31/RF72 fixed disks and one or two RF31/RF72 removable disks

- Eight or nine RF31/RF72 fixed disks and one or two RF31/RF72 removable disks plus one or two TF70C/TF857 tape drives

A minimum of two RF fixed disks is required for the system, and it is recommended that at least one TF tape drive be added for backup.

Figure 2–10 shows a full disk configuration for the Model 612 entry VAXcluster system, including a tape drive, a tape loader, and ten disks.

If one zone in a node is down due to planned maintenance or repair, the mass storage devices contained in that zone are unavailable to the operational zone. Shadow set members in the downed zone must be updated when the zone is returned to operation. Refer to Section 1.3.2.1, Guidelines for Shadowing Data, for more details.

Table 2–7 gives the minimum and maximum system components for the Model 612 entry VAXcluster system.

Table 2–7 Module Options for the Model 612 Entry VAXcluster System

Option	Description	Model Number
Tape Drive	Cartridge tape drive; maximum of two tape drives can be ordered.	TF70C-AA
Tape Loader	TF857 tape loader for unattended backup. A tape loader can replace one or both TF70C tape drives.	TF857-CA

**Table 2–7 (Cont.) Module Options for the Model 612 Entry VAXcluster System**

Option	Description	Model Number
Disk Storage	RF31 or RF72 fixed or removable disk drive. The minimum system comes with two RF fixed disks and can have a maximum of 12 RF fixed disk drives. A maximum of two RF removable disks can be configured, replacing two RF fixed drives.	RF31-KA, RF31-JA, RF72-KA, RF72-JA
Memory Module	A minimum of one and a maximum of four memory modules per zone per node can be configured. Memory capacity must be identical in both zones of a node.	MS520-BB
System I/O controller module	Each node comes with one system I/O controller module per zone to provide Ethernet lines and DSSI lines, and Node 1 has an additional I/O controller per zone for a tape drive. An additional system I/O controller module can be added in each zone in each node to provide redundant connections to dual Ethernet lines.	KFE52-AA
DEC WANcontroller 620	The two-line synchronous communication controller for VAXft systems. A maximum of eight WAN modules (four per zone) can be configured for each node for a total of 16 synchronous, non-redundant lines per node.	DSF32-AA/AB
Console Terminal Ports	One local console and one remote console port is included in each zone for a total of four console ports per node.	

2.8 VAXft Model 612 Expanded VAXcluster System

The VAXft Model 612 expanded VAXcluster system offers the maximum fault-tolerant system configuration currently available. It provides up to 24 gigabytes of non-shadowed mass storage with dual-access to disks from both zones at all times as well as shared access to disks from both nodes.

The Model 612 expanded VAXcluster system consists of two Model 610 systems sharing the disks in two expansion cabinets as shown in Figure 2–11.

Figure 2–11   VAXft Model 612 Expanded VAXcluster Configuration
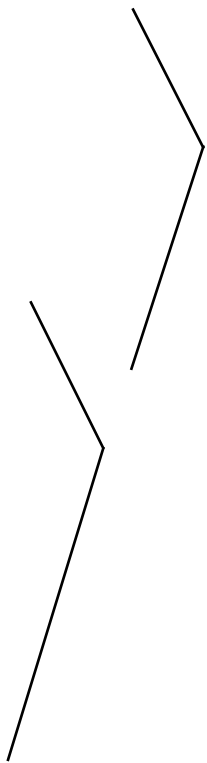
Each node is a Model 610 system without disk drives, which are contained in the expansion cabinets. Node 1 can contain one or two TF70C/TF857 tape drives. Each zone in each node contains a seven-slot backplane for a processor module, a memory module, and two system I/O controller modules for DSSI/Ethernet interfaces.

Like the system cabinets, each expander cabinet contains two zones one on top of the other. Each zone contains its own power supply (AC, DC, and battery) and can contain up to six disk drives.

2.8.1 VAXft Model 612 Expanded VAXcluster System Mass Storage and Module Options

All disk storage devices for the Model 612 expanded VAXcluster system must be configured inside the expansion cabinets. Each expansion cabinet holds up to 12 disk drives (six per zone) for a total of 24 disk drives. The expansion cabinets connect to the system cabinets by dual DSSI buses; this enables access to mass storage by both zones.

Configure mass storage devices in a Model 612 expanded VAXcluster system in the following combinations:

- Up to 24 RF31/RF72 fixed disks.

- 22 or 23 RF31/RF72 fixed disks and one or two TF70C/TF857 tape drives.

- 22 or 23 RF31/RF72 fixed disks and one or two RF31/RF72 removable disks.

Four RF31/RF72 fixed disks are the minimum requirement for mass storage for the Model 612 expanded VAXcluster system.

Figure 2–11 shows dual access to mass storage devices by either zone in each node at all times, even when one zone is not operational. A pair of system I/O controller adapters in each zone interface the system with the dual DSSI buses, so even the loss of a single zone does not deny the system access to both members of a shadow set. To optimize overall system availability, the primary member of a shadow set must reside on one DSSI bus. The shadowed member should reside on the other DSSI bus.

Table 2–8 gives the minimum and maximum system components available for the Model 612 expanded VAXcluster system.

Table 2–8   Options Table for Model 612 Expanded VAXcluster System

Option	Description	Model Number
Tape Drive	Cartridge tape drive; a maximum of two tape drives can be ordered.	TF70C-AA
Tape Loader	TF857 tape loader for unattended backup. A tape loader can replace one or both TF70C tape drives.	TF857-CA
Disk Storage	RF31 or RF72 fixed and removable disk drives. A minimum of four RF fixed disk drives are required. A maximum of 12 RF disk drives are allowed per expansion cabinet. Only one RF removable disk is allowed per expansion cabinet.	RF31-KA, RF31-JA, RF72-KA, RF72-JA
Memory Module	A minimum of one and a Maximum of four memory modules per zone per node can be configured. Memory capacity must be identical in both zones.	MS520-BB
System I/O controller module	Each node comes with two system I/O controller modules per zone to provide Ethernet lines and DSSI lines. An additional system I/O controller module can be added in each zone in each node to provide redundant connections to dual Ethernet lines.	KFE52-AA
DEC WANcontroller 620	A maximum of six modules (three per zone) can be configured to give 12 synchronous lines per node.	DSF32-AA/AB
Console Terminal Ports	Two local console ports and two remote console ports are included per node.	

2.9 Upgrading A VAXft Model 610 System to a VAXft Model 612 System

Because a VAXft Model 612 system is a VAXcluster system consisting of two VAXft Model 610 systems, it is not difficult to upgrade the Model 610 system. You will need another Model 610 system cabinet without disks plus one or two expansion cabinets to configure a Model 612 VAXcluster system. You will probably need at least one additional system I/O controller module per zone in each node and additional disk drives.

2.10 Summary of System Configuration Characteristics

Key configuration characteristics of the VAXft systems include:

- Two types of systems
- Redundancy of all system components
- Four types of system modules
- Redundant backplanes
- Up to 128 megabytes of memory (32-megabyte increments)
- Up to 16 synchronous communication lines (without redundancy)
- Up to 8 synchronous communication lines (with redundancy)
- Single or dual Ethernet fault-tolerant connections
- Up to 24 DSSI mass storage devices (expanded systems)
- VMS Volume Shadowing
- Up to four console ports (one local and one remote per zone) per system

3

Networking Communications

As the industry leader in networking, Digital Equipment Corporation is able to provide extensive communications options for the VAXft systems.

These communications options enable the VAXft systems to be configured in Local Area Networks (LANs) and Wide Area Networks (WANs).

Networking options include:

- Ethernet connections
- Synchronous communication options

3.1 Ethernet Connections

The ability to connect to the Ethernet enables the VAXft systems to use certain networking options available from Digital Equipment Corporation. Ethernet, the industry standard Local Area Network, enables VAXft systems to communicate with other computers in your enterprise.

The VAXft systems support redundant connections to a single Ethernet or to dual Ethernets. The Ethernet interface is in the DSSI/Ethernet/Console I/O module. This module supports both thick wire and ThinWire connections between the system and Ethernet.

Figure 3–1 shows two connections to a single Ethernet segment, one connection from each zone of the system.

Figure 3–1 System Configured to Single Ethernet
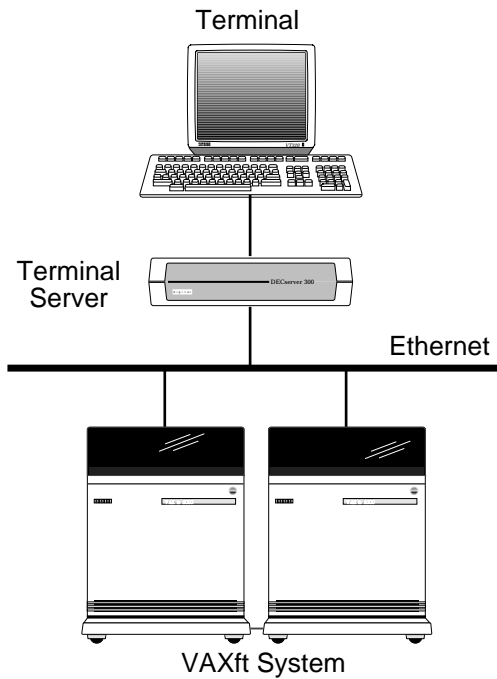
MR-5519-AD

Figure 3–2 shows redundant connections to two Ethernets. This ensures access to Ethernet even if one connection is not working.
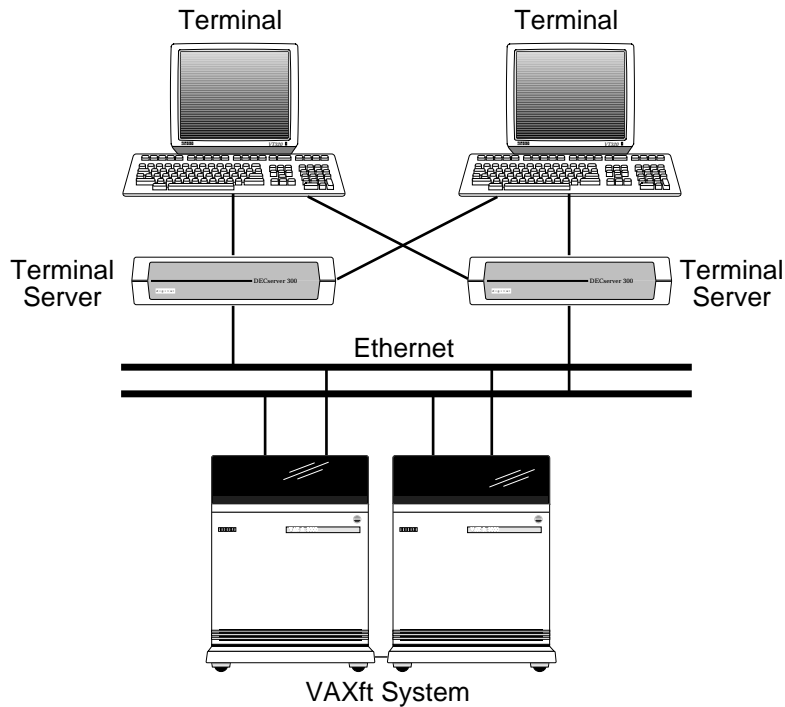
Redundant connections to dual Ethernets, as shown in Figure 3–2, require two system I/O controller modules in each zone for a total of four controllers system-wide. This means there is one I/O module in each zone connected to each Ethernet at all times.

Figure 3–2   System Configured to Dual Ethernet

MR-5520-AD

3.2 DECserver Terminal Servers

Terminal servers provided by Digital Equipment Corporation for use with the VAXft systems include a variety of DECserver systems to provide asynchronous communications.

Terminal servers provide system users with easy, transparent access to VAXft system resources. Figures 3–1 and 3–2 illustrate how terminal servers are used to connect user terminals to the system through the Ethernet. Terminal servers, connected to the system through Ethernet, enable users to establish and maintain several simultaneous sessions on system processors without delay, as long as sufficient resources are available. Figure 3–2 shows how the terminals as well as the servers can be configured redundantly so that a user can switch to another server if one goes down.

For more information on terminal servers used with the VAXft systems, see the *VAX Systems/DECsystems Systems and Options Catalog* and the *Networking and Communications Buyers Guide*.

3.3 Synchronous Communications

DEC WANcontroller 620

The DEC WANcontroller 620 is a two-line synchronous communication controller option specifically designed for VAXft systems. The WAN module can be configured to provide highly-available synchronous communication. The VAXft systems supportup to four WAN modules in each zone (eight per system). Each module contains two lines; thus, eight redundant or 16 nonredundant synchronous lines can be supported by a single VAXft system, with full modem control. Lines attached to redundant controllers are connected by Y-connectors that enable a single synchronous line to be connected to an adapter in each zone, as shown in Figure 3–3.

Ethernet Servers

Expanded synchronous communications are supported through Ethernet-based Gateways or Microservers. Refer to the *Networks and Communications Buyer's Guide* for further details on networking options.

Figure 3–3 Synchronous Communication Lines Using Y-Connectors
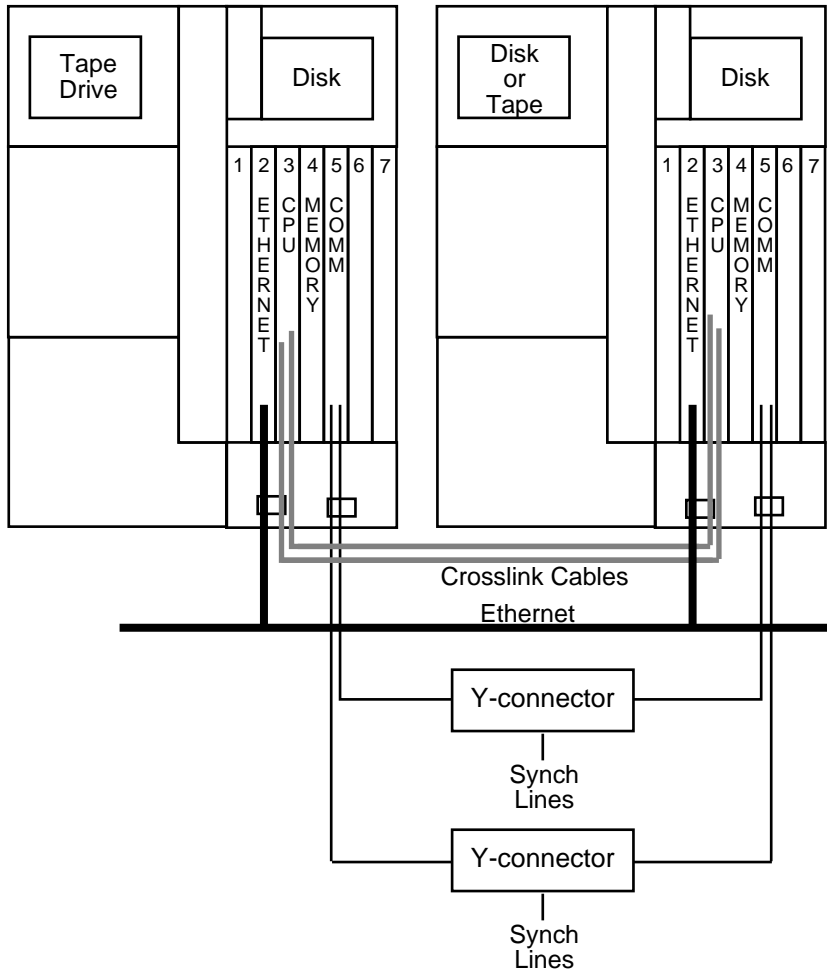
MR-5522-AD

3.4 Summary of System Communication Characteristics

Key characteristics of the VAXft system networking features include:

- Dual Ethernet connections, including redundant connections

- Up to 16 nonredundant synchronous communication lines

- Up to eight redundant synchronous communication lines

- Support of DECserver terminals to connect user terminals to the system through the Ethernet
- Support of Gateways and Microservers

4

System Service and Warranty

4.1 Service and Repair Features

The VAXft systems' design makes them easier to repair and maintain than other types of fault-tolerant computers.

The dual zone design enables repairs without interruption to a running application because the system's redundant hardware enables the operational zone to continue to service the application while repairs are made to the zone that has been shut down. Each zone displays a flashing red light to identify a failure in the zone. Logic modules have Magnetic Fault Indicators (MFI) that provide visual indication of a fault.

All the contents of each cabinet are accessible from the front. Dual doors allow easy operator access.

To expedite repairs even further, the system can automatically notify the user by automatic dialout notification. The system's modular system design makes repair as easy as manually removing the *Field Replaceable Unit* (FRU) and replacing it with a new unit.

When you combine all of these features, you can be sure that the VAXft systems provide the fastest and most accurate repair and service available for any fault-tolerant computer today.

Automatic dialout notification is Digital Equipment Corporation's proactive approach to resolving system problems before they lead to failures.

Depending on your requirements, automatic dialout notification can send a message to an operator on site or to a remote terminal using a predefined telephone number and a modem. This feature can also be utilized to automatically place a service call to Digital Customer Support when the system is experiencing a problem or the system exceeds a predictive maintenance threshold.

4.2 System Warranty

The following warranties are available for the VAXft systems:

- Standard Warranty
- List Warranty

4.2.1 Standard Warranty

The standard warranty available for the VAXft systems includes:

- Hardware installation
- One-year DECservice for hardware, 24-hour, 7-day a week coverage, including holidays, with a committed response time
- Telephone assistance for hardware, operating system software, and Digital layered products purchased with the Standard Warranty
- Critical on-site software support
- Digital Software Information Network
- Right-to-use new versions of software
- Product Foundation Warranty for kernel software

4.2.2 List Warranty

The List Warranty available for the VAXft systems includes: 1-year return to factory for all hardware and software conformance.

4.3 Digital Assisted Services Program

The Digital Assisted Services Program (DASP), which provides self-maintenance customers with selected products and services under an annuity payment schedule, is available for the VAXft systems.

The DASP is a four-part program that includes:

- Diagnostics and documentation

  This includes licensing of diagnostics, media and documentation kits for diagnostics, hardcopy manuals and print sets, maintenance documentation service (including DEC-O-Log), and rights-to-copy.

- Diagnostic and documentation updates

  This includes media and documentation kits, microfiche for hardcopy documentation, and rights-to-copy.

- DECmailer and Field Change Orders

This includes DECmailer Plus board repair for a 24-hour turnaround
time, emergency dispatch service at no extra charge, all repairable boards
accepted regardless of revision, unlimited number of boards repaired. Field
Change Orders include the same services as DECservice customer and
materials only (customer installs).

- Customer Support Centers

  Customer Support Centers provide 24-hour, 7-day a week, access to remote
  diagnostic and remote support groups. In addition, use of service delivery
  tools, such as VAXsim Plus and SPEAR, is included.

A subscriber to DASP can also purchase spare parts and kits, internal
customer services training, and backup support on a per-call basis.

4.4 Summary of System Service and Repair Features

The VAXft maintenance and repair features provide the following benefits:

- All system repairs can be performed without interrupting the application.

- Dual zone design helps avoid human error during service.

- Modular design enables easy removal and replacement of failed components
  without the use of special tools.

- All system components are easily accessible from the front of the system.

- Zones display red flashing fault indicators to identify failed zones.

- Magnetic indicators identify failed FRUs.

- Dual doors enable access only to selected system components.

- Automatic dialout to expedite notification upon the occurrence of a failure.

- VAXsimPLUS identifies, locates, and prepares diagnostic reports on
  failures. VMS error logger logs errors. VAXsimPLUS monitors the system
  error log for hard and soft errors.

Glossary

The following is a list of commonly used terms used in this guide.

automatic dialout notification

The process of sending a message to a specific remote site using a modem and a predefined telephone number to alert personnel of a system fault or failure.

autonotification

Automatic dialout notification.

Availability

The likelihood that the system will be operable when you require it to perform a task.

boot or bootstrap

The process of loading system software into a processor's main memory.

CPU

Central Processing Unit.

crosslink

The cable that connects two VAXft 3000 zones together to form a fault-tolerant system.

CVAX

A 32-bit VAX virtual memory instruction set processor implemented in CMOS.

DEC WANcontroller 620

Digital Equipment Corporation's Wide Area Network controller.

DMA

Direct Memory Access. The hardware that transfers data between VAXft main memory and the buffer memory on the I/O modules.

DSSI (Digital Storage Systems Interconnect)

A data bus that uses the System Communication Architecture (SCA) protocols for direct host-to-storage communications. The DSSI cable can extend to 6 meters and has a peak bandwidth of 4 megabytes.

error

An incorrect response from a hardware module. An error can lead to a system failure in non fault-tolerant systems. An error is a manifestation of a fault. See *fault.*

Failover

The reconfiguration process that a fault-tolerant system undergoes to remain operational after it experienced a failure or partial shutdown for planned maintenance. See *reconfiguration*.

Failover Set Manager (FSM)

A VAXft System Services utility that ensures fault-tolerant access to I/O, for example, the Ethernet. It permits users to manipulate the membership of failover sets of redundant physical Ethernet adapters by adding or removing them, or by changing their status.

Failure

Any system behavior that deviates from the system's specifications. In regard to the VAXft systems, failure often refers to a failed hardware component, such as a CPU or memory module.

fault

A condition existing in a hardware or software module that can lead to module failure. Typically, physical conditions such as worn-out modules, external or environmental problems, design flaws, or manufacturing defects can cause hardware faults. Software design flaws or implementation errors can cause software faults.

fault tolerant system

Fault tolerance is the degree to which a computer system maintains its reliability and availability. A computer system that tolerates any single point of failure and continues to provide virtually uninterrupted service to an application is a fault-tolerant system.

FRU

Field Replaceable Unit. A unit designed to be replaced in the field by appropriate personnel.

IZC

Inter-Zone Communication. A communication protocol that uses the serial crosslink to establish communication between zones that are not operating in lockstep.

lockstep

Simultaneous execution of the same instruction stream by the two CPU modules in a VAXft system running in a synchronized, dual-zone configuration.

parallel crosslink

The portion of the crosslink used to communicate between system zones when the system is running in lockstep operation.

PCM

Power and Cooling Monitor.

reconfiguration

The process of adding or removing devices from the failover set. See *synchronization.*

Reliability

The likelihood that a system or system component will continue to function over a given time period.

redundancy

Duplication of elements or components to provide alternative functional channels in case of single component failures.

shadow set

Several physical disk drives, known as *shadow set members*, that are associated with a software-created virtual unit for volume shadowing.

synchronization

The process of synchronizing the CPU and memory modules of one zone with those in the other zone of a dual-zone, fault-tolerant system. This step occurs when a second zone is added to a running zone. When synchronization is completed, the two zones of a fully configured VAXft system operate in lockstep. See *reconfiguration.*

system disk

The disk that contains the VMS operating system.

system I/O controller module

VAXft I/O module. The I/O module contains Ethernet ports, DSSI bus communications, and system console ports.

VAXft System Services

A VMS layered product required for using the VAXft 3000 system as a fault-tolerant system.

VAXcluster system

A loosely coupled, highly integrated, distributed computing environment. There are four types of VAXcluster system configurations, depending on the medium used for interprocessor communications: CI-based, local-area (Ethernet-based), DSSI-based (VAXft Model 612 system), and mixed-interconnect VAXcluster systems.

volume shadowing

An implementation of disk shadowing in which duplication of data to more than one volume is controlled through software that can reside on a central server host in a local area VAXcluster system. It provides increased data integrity and high availability to VAXft systems.

Y-connector

Hardware that joins two synchronous communication lines into into a single output line.

zone

A section of a fully-configured VAXft system that contains a minimum of a CPU module, memory module, I/O module, and associated devices. A fault-tolerant system consists of two such zones with synchronized processor operations. If one zone fails, processing continues uninterrupted through automatic failover to the other zone.