# applicationDEC 433MP
# System Overview

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This document provides an overview of the features and capabilities of the applicationDEC 433MP system.

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# Preface

## Manual Objectives

This manual describes the applicationDEC 433MP system and its optional equipment.

## Intended Audience

This manual is intended for all users of the applicationDEC 433MP.

# 1

# Introduction

The applicationDEC 433MP is a versatile, expandable computer system based on the industry standard architecture of the Intel 80486 CPU, ISA/AT expansion slots for option modules with EISA readiness, and the Santa Cruz Operation (SCO) UNIX operating system. The 433MP system hardware is optimized for use with the multiprocessing extensions to SCO Unix, SCO MPX. These extensions provide symmetrical multiprocessing capabilities allowing the increased performance of multiple i486 processors.

The system is designed to be readily expandable. The system design makes it easy to:

- Increase the number of processors and memory
- Increase the number of users
- Increase the storage capacity
- Configure the system for alternate uses

## 1.1 Features

Some of the applicationDEC 433MP system features include:

- Up to 4 Intel **80486** CPUs
- Up to 64 MB of shared memory
- Up to 1.2 gigabyte of internal disk storage
- Up to 4.8 gigabyte of additional external disk storage
- Support for SCO UNIX System V/386 3.2v2.0
- Support for SCO MPX V1.1 Symmetrical Processing Extensions
- Support for SCO Open Desktop V1.1

- Support for all industry standard SCO UNIX applications

- Up to 128 terminal users

## 1.2 Versatility

The applicationDEC 433MP system can be configured with software for a variety of system purposes. These include:

- Use as multiuser, multiprocessor timesharing system

- Use as a high performance personal workstation

- Use as a network file server

- Use as an X-windows host system

The applicationDEC 433MP system can be used as a powerful multiuser, symmetrical multiprocessing computer with as many as 128 users. In this configuration, each user accesses the operating system over a serial terminal line.

The applicationDEC can also be configured as a high-performance single user workstation. In this configuration, the user communicates with the system through a VGA monitor. The entire processing power of the system is available for high performance applications requiring intensive graphics or computation power.

As a network file server, the applicationDEC serves as a file repository for a network of connected PCs. The PCs execute programs locally and access data and programs over a network link to the applicationDEC.

As an X-windows host system, the applicationDEC 433MP system allows X-server software on remote systems to access the X-client software on the applicationDEC 433MP system.

## 1.3 Open Architecture

The applicationDEC 433MP is an open industry standard processing environment. The industry standard components in an applicationDEC system include the following:

- Intel 486 CPU

- ISA bus, EISA ready

- SCSI storage

- SCO UNIX operating system platform

### 1.3.1  The Intel Architecture

Since its introduction in the early 1980s as the Intel 8080 processing chip, the Intel architecture has been well received. With the advent of the 80386 chip, Intel announced its intention to preserve compatibility with all future versions of the Intel architecture. In other words, application developers do not have to rewrite software code as new versions of the Intel processor are developed.

Because Digital Equipment Corporation has chosen the Intel i486 architecture as the processor for the applicationDEC family of computers, your software investment is preserved. In the future, as new and faster processors are developed, applications you are currently using will continue to be available on the newer platforms.

### 1.3.2  ISA Bus

The Industry Standard Architecture, (ISA), bus was originally developed as the I/O bus for the IBM PC computer. In this computer the bus was called an AT bus. The popular success of this computer, and the subsequent development of compatible machines by numerous companies, led to the acceptance of this I/O bus as an industry standard. The specification for this bus architecture was submitted to the IEEE as the specification for the Industry Standard Architecture, or ISA bus.

Today, numerous option modules are available for the ISA bus from various vendors.

### 1.3.3  EISA Readiness

The Extended Industry Standard Architecture (EISA) bus is the next generation of the ISA bus. The transfer speed of the ISA bus is 4 MB/sec, and the transfer rate on the EISA bus is 33 MB/sec, nearly 8 times faster. The EISA bus is completely compatible with the ISA bus, so that ISA options can be installed in an EISA bus slot.

The I/O bus in the applicationDEC 433MP is an EISA bus. To upgrade the system to support EISA option modules, it is only necessary to install an EISA base processor and bridge module upgrade kit.

## 1.4  SCSI Storage Devices

The applicationDEC 433MP uses the SCSI architecture for mass storage devices and other media devices. This allows for easy expansion of the system's storage area. Many vendors manufacture SCSI based storage and media devices and connection of SCSI devices is made easy through standardized cables, connectors, address schemes and adapter designs.

## 1.5  Operating System

For timesharing multiuser configurations, the operating system for a applicationDEC 433MP is SCO UNIX System V/386, developed by the Santa Cruz Operation, Inc.  This industry standard operating system supports thousands of applications available from numerous third-parties.

SCO Open Desktop is also supported.  Open Desktop is a Motif-compliant graphical user-interface system with built-in network and DOS integration.

SCO UNIX is a multiuser System V operating system.  With the addition of the Multiprocessing Extension software, MPX, symmetrical multiprocessing is possible.  Symmetrical multiprocessing makes high performance a reality by having two or more processors share system and user tasks.

# 2
# System Components

This chapter describes some of the hardware features of the applicationDEC 433MP system.

- Processors
- System Memory
- Media Devices
- Storage Devices
- Dual Bus Design
- Industry Standard Architecture (ISA) I/O Bus

## 2.1 Processing Environment

The applicationDEC 433MP is a symmetrical multiprocessing computer. Symmetrical multiprocessing is an architecture which divides system resources evenly across all of the CPUs in the system.

All systems include one base processor module and a bridge module for communication with the ISA bus. Additional processor modules can be added.

The applicationDEC allows up to four Intel 80486 processor modules to be installed in the system. The base processor is standard in every system. Optional processor modules are the CPU/SIO processor module and the CPU/SCSI processor module. Both of these are described more fully in Chapter 5.

## 2.2 System Memory

The applicationDEC standard system comes with 8 MB of memory. System memory is upgradeable in units of 4 MB to a maximum of 64 MB of memory. Single Inline Memory Modules (SIMMs) are used for easy upgrading of system memory.

Up to four memory modules can be installed. Each memory module can contain up to 16 MB of memory. This provides a total system memory of 64 MB.

## 2.3 Storage Devices

The standard applicationDEC 433MP system comes with a single 209 MB hard disk drive. Additional mounting spaces within the system box allow up to five additional hard disk drives to be installed. This provides a total of 1.2 GB within the system. For additional storage, external storage expansion boxes are available. These storage expansion boxes can provide up to an additional 4.8 GB of storage.

All storage devices are SCSI compliant.

Storage devices are described more fully in Chapter 7.

## 2.4 Media Devices

The applicationDEC supports the following media devices.

- 3.5-inch diskettes
- 5.25-inch floppy diskettes
- CDROM
- QIC Tape

The 3.5-inch 1.44 MB diskette drive reads and writes high density and double density diskettes. The 5.25-inch 1.2 MB floppy diskette drive reads and writes high density and reads double density diskettes. The CD-ROM is a High Sierra compatible Compact Disk-Read Only Memory drive.

Each applicationDEC 433MP comes standard with a single 3.5-inch diskette drive.

## 2.5 Dual Bus Design

For increased system performance, the applicationDEC 433MP uses a dual bus design. This design provides a system bus for processor and memory interaction and a separate I/O bus for communications and option modules.

### 2.5.1  High Speed System Bus

The system bus in an applicationDEC 433MP operates at 64 MB/sec. This means that processor requests for system memory data are filled quickly, allowing processors to spend as little time idle as possible.

### 2.5.2  ISA I/O Bus

The applicationDEC 433MP uses an ISA I/O bus for complete system openness. Up to seven ISA expansion modules can be installed in an applicationDEC system.

Each applicationDEC 433MP comes standard with two ISA modules already installed. These include a SCSI adapter for control of hard disks, and a serial/parallel module for communications. Five additional ISA slots are available for system expansion.

### 2.5.3  EISA Ready

The applicationDEC 433MP is EISA ready. The EISA, or Extended Industry Standard Architecture, is an enhanced version of the ISA bus. EISA bus data transfers occur at 33 MB/second, allowing faster I/O transactions.

To install EISA I/O options in the applicationDEC 433MP, it is necessary to upgrade the standard base processor and bridge modules with EISA compliant base processor and bridge modules. The backplane slots in a standard applicationDEC 433MP are EISA slots and will accept EISA modules directly.

# 3

# Symmetrical Multiprocessing

The high performance of the applicationDEC 433MP is made possible by the combination of symmetrical multiprocessing software and optimized hardware. This chapter describes how these features are incorporated in the applicationDEC 433MP.

Some of the features that provide the applicationDEC with higher performance are:

- Symmetrical Multiprocessing Capability
- Separate System and I/O Bus
- Cache Memory
- Cache Coherency

## 3.1 What Is Symmetrical Multiprocessing?

In a single processor multiuser computer, many users make requests of the central processing unit (CPU) continually. The processor, however, can only service one request at a time. Requests from other users and tasks are put on hold until the CPU finishes whatever it is doing at the time. Software, in the operating system, manages the requests waiting in line and also attempts to share the processor's resources equally among tasks.

In the past, higher performance with single processor systems was achieved by either faster CPUs, or smarter timesharing software. However, in most cases, the need for faster response has outstripped the advances in processor speed and software optimization.

An alternative to building faster processors is simply to add more processors. With multiple processors, instead of having users and their tasks wait in line and share time on the CPU, the additional user tasks can be executed on a different processor. At any one time it appears to the user that his task is being executed faster because less time is spent waiting and sharing a single CPU.

Symmetrical multiprocessing is a software attempt to equally balance all tasks among the different processors. SCO MPX is the software that continually analyzes which processors are currently free and schedules the tasks to be assigned to each processor.

The applicationDEC system is not a true symmetrical processing system in the sense that all processors do not always have exactly the same work load. The base processor generally executes more code and is idle less than the other processors. However, the multiprocessing software does distribute tasks among the various processors as evenly as it can, in order to make all processes execute faster.

## 3.2 Why Have a System Bus and an I/O Bus?

The applicationDEC architecture uses two buses for optimal performance. The system bus is used for CPU to memory communications and for interprocessor communications. The I/O bus is used to transfer data between an option module and other processors. Since I/O operations take place at a much slower rate than system operations, use of two separate buses speeds up the entire system. If system operations had to wait for each I/O operation to complete or share the bus, system performance would be greatly reduced.

The system bus in the applicationDEC transfers data at 64 MB/sec. This fast rate of transfer has one crucial benefit for system performance: the cache of each processor can be updated as quickly as the processor requires.

## 3.3 What Is Cache Memory?

All CPUs store data and code in system memory. As each line of a software program is executed, the CPU must obtain the next line of the program. The information must be transferred from system memory to the processor chip. Although this data transfer is electronic and occurs at the speed of light, the longer the distance from the system memory to the chip, the longer it takes to transfer the data.

In addition, if the hardware has to transfer data over the system bus, it must occasionally wait for the bus to become available. In other words, your task, executing on your processor, would have to be idle if another processor were currently using the system bus. Cache memory solves this problem.

What is cache memory? When a program resides in system memory, it is represented by sequential lines of machine code. Eventually the processor will execute each line, in order, as it proceeds through the program. A *cache* of memory occurs when the system copies a certain portion of system memory into the processor's local memory. With the program data in close proximity to the processor, performance is enhanced. As the processor executes each line of

code, the next line is immediately available to it. While the data in the cache is being executed by the CPU, the hardware on the processor board can be continually transferring data from system memory to the cache. In this way, the processor rarely spends time waiting for code.

In the applicationDEC system, the cache memory is quite large. Each processor module contains 256K of memory for cache storage. The size of this cache is large enough to allow the processor to operate continually without "running out" of code.

## 3.4  What Is Cache Coherency?

Some of the data in system memory is used by more than one processor. What would happen if a processor cached a certain portion of memory at the same time that another processors cached the same portion? Additionally, what would happen if one processor altered the data, and wrote it back to the same memory location? The other processor with the cached memory would then have invalid data.

Cache coherency guarantees that no processor loses track of whether its cached data is up-to-date or not. The cache coherency hardware in the applicationDEC system prevents a processor from changing data without informing other processors. Whenever a processor caches system memory it marks the memory as taken. If it changes or knows that it will have to change the data, it marks the data so that other processors are prevented from copying the data until the current operations on the cache are complete. The cache coherency scheme implemented in the applicationDEC system ensures that when one processor caches data, the other processors are not affected.

## 3.5  How Do All These Hardware Features Benefit You?

The optimized multiprocessing hardware is designed to provide higher performance. This means faster response for you when running your application, faster execution of background programs, and faster execution of such time-consuming tasks as complete system backups.

In addition, faster performance means that your system can be more than one type of system. Although the architecture of the applicationDEC is based on the PC architecture, the hardware and software features of the applicationDEC allow it to be much more than a personal computer, with a variety of configuration options available.

# 4

## Configuration Options

This chapter describes the basic configuration options for the applicationDEC system.

## 4.1 Configurations

You can configure and applicationDEC system for use in three basic ways:

*   Multiuser Timesharing

*   X-windows Host System

*   Network File Server

A description of each of these options follows.

## 4.2 Multiuser Timesharing System

In a multiuser timesharing configuration, users communicate with the system through dumb terminals over serial communications lines. This configuration generally provides the lowest cost-per-user system. SCO UNIX is designed for multiuser systems and with MPX multiprocessor extensions, the applicationDEC system provides a very efficient timesharing system.

## 4.3 X-Windows Host System

When running SCO Open Desktop, the applicationDEC 433MP can serve as an X-host system. In this configuration, other systems running X-server software can access applications on the host system. Open Desktop provides full X-windows support. The SCO Server Upgrade provides X-server support software for other systems to be connected to the network.

## 4.4 Network File Server

In a network file server configuration, other systems connected to the network share a filesystem which resides on the applicationDEC 433MP. The software support for this configuration is industry standard SCO Network File System (NFS) on SCO UNIX and Open Desktop. Other systems on the network running NFS can access remote files on the applicationDEC 433MP as if they were local files.

# 5

# Increasing Performance

This chapter describes methods for increasing the performance of the applicationDEC 433MP.

## 5.1 Performance Options

Performance is a function of both hardware and software on your system. Performance is optimal when all parts of the system share equally in satisfying user demands. Because different user loads make different types of demands of the system, it is only possible to give generalized, simplified tips for reaching optimal system performance.

For example, performance problems are solved differently depending upon whether your user load is compute intensive or I/O intensive. A compute-intensive system is one where the processors are continually working on complex, often mathematical, instructions. Many graphics applications, such as CAD-CAM (computer-aided design and computer-aided manufacturing) are compute intensive. An I/O intensive system is one where the computer is frequently transferring data between peripheral units. Database applications are examples of I/O intensive applications.

The applicationDEC 433MP, as a general purpose system, allows changes in hardware configuration to accommodate compute intensive or I/O intensive loads. If lack of processing power is a problem, additional CPUs can be installed. This allows users to make high demands on a CPU while other CPUs service other users. If I/O access to disks needs to be improved, multiple disks can be used to spread user I/O demands across multiple units. For very high I/O demands, the applicationDEC 433MP can be configured with multiple SCSI buses, using the CPU/SCSI option. Adding multiple disks on additional SCSI buses means that programs can access disk data in parallel. In other words, one program can access data on a disk while another accesses data on a separate disk. The second program does not need to wait for the first to complete its I/O data transfer.

In general, performance can almost always be improved with the addition of more system memory. This is perhaps the most cost effective way to improve system performance. Software adjustment of system parameters, such as the size of the data transfer buffer cache, is another cost effective way to increase system performance.

To achieve optimal performance, your operating system or server software should be "tuned" to your configuration. Your software documentation can tell you how to do this in more detail than is possible here. For a more detailed discussion of SCO UNIX performance monitoring and kernel parameters that can be optimized, see discussions of "Tuning System Performance" in the *SCO UNIX System Administrator's Guide*.

One software parameter that can be adjusted to increase performance is the size of the buffer cache for ISA bus data transfers. This is a software selectable feature of SCO UNIX. By default, SCO UNIX allocates 10% of the available system memory for caching. Increasing this cache size to 30% of available system memory provides noticeable performance increases in some cases.

In regard to hardware, the two ways to increase performance of the applicationDEC 433MP are:

- Additional Memory
- Additional CPU Power

## 5.2 Additional Memory

In general, increasing memory nearly always increases performance, regardless of the specifics of your configuration. However there are certain minimum memory configuration guidelines that you can follow to ensure satisfactory system performance. These guidelines are provided in Table 5–1.

**Table 5–1  Memory Configuration Guidelines**

| Environment | Minimum Memory Required |
|---|---|
| SCO UNIX | 4.0 MB |
| For each concurrent user, or additional graphics application | 0.5 MB |

**Table 5–1 (Cont.)   Memory Configuration Guidelines**

| Environment | Minimum Memory Required |
|---|---|
| For each concurrent user, software development environment | 0.75 MB |
| For each user running DOS emulation | 1.0 MB |

Thus, for a 60-user system, where each user accesses the system at the same time, you should plan for at least 36 MB of memory. This total includes 4.0 MB for the operating system and 30 MB of memory for each user (30 x 0.5). Since memory is upgradeable in units of 4 MBs only, you should use 36 MB of memory. 36 MB is the next highest unit of memory after 32 MB, which is less than the computed 34 MB of memory.

Note that the memory guideline calls for 0.5 MB of memory of each *concurrent* user. In a system with many users connected, it is rare for all users to access the system at the same time. Many people use the following formula to estimate the number of concurrent users.

$$concurrent\ users = 1/2 * attached\ users$$

This formula recognizes the fact that most users are not active at the same time even when everyone is sitting at the terminal. However, because implementations vary widely, the above formulas should be considered as guidelines only. They provide you with a starting point for figuring the amount of memory your system should have.

## 5.2.1  How Memory Is Added

Memory is added by installing additional Single Inline Memory Modules (SIMMs) into a memory board. Each memory board is installed into a system bus slot and has twenty slots for insertion of 1.0 MB SIMMs. To install 4.0 MB of system memory, 5 1.0 MB SIMMs are installed. The extra 1.0 MB of memory is used for error correction code (ECC). Therefore, each memory module can contain up to 16 MB of memory.

## 5.3  Additional CPU Power

Additional CPU processing power can be added to an applicationDEC system at any time.  The two types of additional CPUs that can be added are:

- CPU/SIO: i486 processing module with terminal multiplexer logic (PS10K-AA)

- CPU/SCSI: i486 processing module with SCSI adapter logic (PS10K-BA)

Both CPUs add 80486 processing power capacity to your system for execution of system and user code.  In general, for each CPU you add to the system, you increase the processing power of the system by 20 million instructions per second (MIPS). Because of the symmetrical multiprocessing architecture, adding an additional CPU to a single processor system roughly doubles the performance of a multiuser system.  The additional processor services user requests in parallel with the base processor.

For each additional CPU installed in an applicationDEC system, you must have a license and install a copy of SCO MPX multiprocessing extensions. SCO MPX provides multiprocessing support for the CPU and provides an administration menu for configuring the SCSI bus or terminal devices.

The type of CPU you choose depends upon whether you want additional terminal I/O support or additional SCSI bus support.  Each of these options is described below.

### 5.3.1  Adding a CPU/SIO Module

Additional CPU processing power can be achieved by adding a CPU/SIO module.  This module provides roughly 20 MIPS of additional processing power, and additionally provides support for serial input/output (SIO) for terminals and other serial devices such as printers and modems.

The CPU/SIO module contains multiplexer logic to attach up to four terminal concentrators.  Since each terminal concentrator allows attachment of up to 8 terminals, each CPU/SIO module supports up to 32 additional terminal users.

There is only one terminal concentrator for use with the applicationDEC 433MP system.  This model, PC4XD-DB, can be attached to either the CPU/SIO module or to the ISA based terminal multiplexer, the PC4XD-DA host adapter.

Up to three additional CPU/SIO modules can be added to an applicationDEC system.  This provides serial lines for up to 96 additional users.  To obtain additional lines beyond this number, the PC4XD-DA terminal multiplexer option must be installed in the ISA bus.  See Chapter 6. CPU/SIO modules can be installed in slots 5, 6, or 7 of the backplane.

## 5.3.2  Adding a CPU/SCSI Module

Additional CPU processing power can also be achieved by adding a CPU/SCSI module. This module provides roughly 20 MIPS of additional processing power, and allows additional SCSI buses and SCSI storage and media devices to be added to the system.

The CPU/SCSI module contains complete logic to serve as an adapter for a SCSI bus. This means that a complete SCSI bus, with up to seven SCSI devices, can be connected to the CPU/SCSI module. This is in addition to the devices connected to the PS1XR-AA SCSI adapter in the ISA bus. The CPU/SCSI must be used when installing more than four hard disks in the system.

The advantage of shifting internal storage devices from the ISA based SCSI adapter to the CPU/SCSI adapter is that user requests for SCSI transactions are processed more quickly. Data flow on the SCSI bus itself is the same for both the CPU/SCSI and the ISA based SCSI adapters. But since the CPU/SCSI adapter is on the same system bus as the other CPUs, a user request from another processor can be recognized and serviced more quickly by the CPU/SCSI adapter than by the ISA SCSI adapter.

Up to two CPU/SCSI modules can be added to an applicationDEC system. In one backplane slot, the CPU/SCSI module can be used to control SCSI devices internal and external to the system box. In the other available backplane slot, the CPU/SCSI module only controls SCSI devices external to the system box. When both CPU/SCSIs are installed, the applicationDEC 433MP has three separate SCSI buses, two controlled by the CPU/SCSI modules, and one controlled by the standard ISA SCSI controller. See Chapter 7 for more details on adding storage devices.

### 5.3.2.1  CPU/SCSI for Internal and External SCSI Devices

When installed in backplane slot 5, the CPU/SCSI module can be used as the adapter for storage devices within the system chassis. The cabling scheme of the applicationDEC 433MP allows the internal storage devices to be divided between the standard SCSI bus controlled by the ISA based SCSI adapter, and the SCSI bus controlled by the system bus SCSI adapter. See Chapter 7 for details on the cabling scheme.

### 5.3.2.2  CPU/SCSI for External Devices Only

When the CPU/SCSI module is installed in backplane slot 6, only external SCSI devices may be attached to the adapter. A complete SCSI bus of up to seven devices can be attached externally. This SCSI bus is separate from the SCSI bus controlled by the ISA SCSI adapter and, if present, the CPU/SCSI adapter in backplane slot 5.

The PS1XR-xx Storage Expansion Box is recommended for attachment of SCSI devices to the CPU/SCSI in backplane slot 6.

## 5.4  Balancing CPU and Memory

Whenever you add a CPU to your system, you should examine whether you have enough system memory to take full advantage of the extra processing power.

CPU/SIO modules can be installed in slots 5, 6, or 7. CPU/SCSI modules can be installed in slots 5 or 6. Therefore, up to three additional CPUs can be installed, for a total of four additional processors.

Slots 1 through 4 are provided for memory modules. In actuality, slots 3 and 4 will accept CPU/SIO modules. However, if these slots are used for CPU modules, only slots 1 and 2 are available for memory, providing a maximum of 32 MB of memory. With six CPUs, 32 MB of memory is likely to provide unsatisfactory performance. Therefore, a maximum of four CPU processors is recommended. This allows for 64 MB of memory for a four CPU processor system.

# 6

# Increasing the Number of Users

This chapter describes configuration options for adding additional users to an applicationDEC system.

## 6.1 Serial Terminal Users

You can add additional terminal users in two ways. Serial terminal lines are available on either the CPU/SIO system bus module or the ISA bus terminal multiplexer host adapter module. Both of these modules provide ports for connection of up to four terminal concentrators. The same model (PC4XD-DB) terminal concentrator can be connected to either a CPU/SIO or ISA Terminal Multiplexer Board.

## 6.2 CPU/SIO

If you add a CPU/SIO module to your system, you bring additional processing power as well as additional serial lines to your system. The CPU/SIO module provides support for up to four terminal concentrators or 32 additional serial lines.

For each CPU/SIO module installed, you must also install a copy of SCO MPX multiprocessing extensions. SCO MPX also provides administration menus for configuring the tty devices under SCO UNIX.

## 6.3 Terminal Multiplexer Host Adapter — ISA

You can add additional users to your system by installing a terminal multiplexer host adapter (PC4XD-DA) in the ISA I/O bus. This adapter provides support for up to four terminal concentrators or as much as 32 serial terminals.

## 6.4 Terminal Concentrator

You can use the Digital Terminal Concentrator, PC4XD-DB, with either the CPU/SIO module or the ISA terminal multiplexer host adapter. The terminal concentrator serves as an intelligent I/O subsystem and processes requests to and from terminals. It communicates with the host over a single communications line. The communications cable also carries the power for the terminal concentrator, making cabling easier. The communications/power cable for the host-to-concentrator is ten feet long. For situations where the terminal concentrator must be installed more than ten feet from the applicationDEC system, use the Terminal Concentrator Expansion Kit.

### 6.4.1 Terminal Concentrator Expansion Kit

The terminal concentrator derives its power from the CPU/SIO or terminal multiplexer host adapter through the host-to-concentrator cable. This is true whether the terminal concentrator is connected to a CPU/SIO module or a Terminal Multiplexer module. This cable is ten feet long.

When the concentrator is installed more than ten feet from the application-DEC, the Terminal Concentrator Expansion Kit, PC4XD-DC, must be used. This kit provides the following:

- Wall socket power supply and cable

- Two 8-pin mini-DIN connectors for construction of a communications cable

The wall-mounted power supply provides power to the terminal concentrator. The power supply is plugged into the wall socket and a power cable is connected to the terminal concentrator.

For data communications with an applicationDEC, you must construct a cable of the appropriate length. Two 8-pin mini-DIN connectors are provided for connection of the cable to the CPU/SIO or ISA host adapter. You must provide a cable that connects to the strand ends of the mini-DIN connectors and carries data signals between the host adapter and the terminal concentrator. The cable must meet the specifications shown in Table 6–1.

**Table 6–1   Terminal Expansion Kit Cable Specification**

| | |
|---|---|
| Cable Type | RS-422 shielded, twisted pair |
| Conductors | 22 AWG stranded, 17 ohm/meter |
| Shield | 85% coverage braid |
| Impedance | 78 ohm |
| Capacitance | 68 pF/meter |

# 7

# Increasing Storage Space

This chapter describes options for adding additional mass storage space for an applicationDEC system.

## 7.1  Options

The standard applicationDEC 433MP system includes one 209 MB hard disk. You can expand the amount of storage in the system to meet your needs in several different ways, as follows:

- Additional 209 MB hard disks inside the system

- Additional 209 MB hard disks with dual SCSI bus inside the system

- Additional SCSI devices connected externally in a PS1XR-xx Storage Expansion Box

Descriptions of each of these options follow.

## 7.2  Additional Internal 209 MB Hard Disks

The base applicationDEC system is available with one 209 MB hard disk. This hard disk drive is controlled by the Adaptec SCSI adapter in the ISA I/O bus. Additional hard disk drives can be installed inside the system box, in the mounting brackets along the rear top and side of the box. Three additional hard disks can be attached to the ISA SCSI adapter.

—————————————— **NOTE:** ——————————————

Each ISA SCSI Adapter supports up to 4 hard disks only, under SCO UNIX 3.2v2.0.

## 7.3  Additional Hard Disk Drives with Dual SCSI Buses

To have more than four hard disks within the applicationDEC system, you must add a second SCSI adapter.  The CPU/SCSI module must be used for this purpose, not a second ISA based SCSI controller.

The cabling scheme used in the applicationDEC 433MP allows for easy upgrading of the system to a dual SCSI bus system.  A dual SCSI bus system has two SCSI adapters, the ISA SCSI adapter and the CPU/SCSI adapter.  The ISA controlled SCSI bus can contain up to seven SCSI devices, with a total of four hard disks on each SCSI bus.  The CPU/SCSI controlled SCSI bus can contain up to seven SCSI devices, any number of which can be hard disks.

## 7.4  External Storage Expansion up to 4.8 Gigabytes

You can connect an external storage expansion box to the CPU/SCSI module.  If the CPU/SCSI is installed in backplane slot 6, you can install up to seven external SCSI devices.

If the CPU/SCSI is installed in backplane slot 5, you can connect up to seven SCSI devices, internal and external total.  Thus, the total number of external SCSI devices which may be attached to a CPU/SCSI in slot 5 is limited by the number of internal devices on this SCSI bus.

The PS1XR-xx External Storage Expansion Box is the recommended method of connecting external hard disk storage.  Table 7–1 lists the external storage options available.

**Table 7–1  External Storage Expansion Options**

| Option | Disks Installed | Total External Storage |
|--------|-----------------|------------------------|
| PS1XR-CA, C3 | 1 665 MB RZ56 | 665 MB |
| PS1XR-BA, B3 | 2 665 MB RZ56 | 1.3 GB |
| PS1XR-FA, F3 | 1 1.2 GB RZ57 | 1.2 GB |
| PS1XR-EA, E3 | 2 1.2 MB RZ57 | 2.4 GB |

Expansion kits are also available for adding additional 665 MB or 1.2 GB hard disks to the single disk expansion storage boxes (PS1XR-C and PS1XR-F).  These are listed in Table 7–2.

**Table 7–2  Storage Expansion Box Options**

| Options | Contents | Storage Added |
| --- | --- | --- |
| PS1XR-DA | 1 665 MB RZ56 disk | 665 MB |
| PS1XR-GA | 1 1.2 GB RZ57 disk | 1.2 GB |

Up to two storage expansion boxes can be connected together in a SCSI bus.
Thus the maximum external storage capacity available is 4.8 GB of data.  This
is in addition to the maximum 1.2 GB internal storage.

# 8

# Adding Industry Standard Options

This chapter describes how to add industry standard ISA options to the applicationDEC system.

## 8.1 Industry Standard Architecture Bus

The I/O bus in applicationDEC systems is an ISA bus. The system is EISA ready, however, which means that upgrading the system to an EISA bus system will be possible without replacing the backplane.

The Industry Standard Architecture (ISA) bus was originally developed as the I/O bus for the IBM PC computer. In this computer the bus was called an AT bus. The popular success of this computer, and the subsequent development of compatible machines by numerous companies, led to the acceptance of this I/O bus as an industry standard. The specification for this bus architecture was submitted to the IEEE as the specification for the Industry Standard Architecture, or ISA bus.

## 8.2 Adding ISA Options

There are seven ISA bus slots available for installation of ISA options. Before you install any ISA option into the applicationDEC, you must examine the following items:

- Slot availability
- IRQ line availability
- Memory address availability
- Software Support

In general, any industry standard ISA option can be installed in the applicationDEC system if the following conditions are true:

- There is a free IRQ line that the option can use
- There is a free memory address, or memory range, that the option can use

- There is a free ISA slot for installation of the option

- The option is supported under SCO UNIX or under your application

Except in extremely loaded systems, it is usually easy to add an ISA option to your system.

In order to determine whether an additional ISA option can be installed in the applicationDEC, you must first know what is already installed.

The standard applicationDEC system comes with the following two ISA options:

- ISA SCSI Controller (installed backplane slot 10)

- Serial/Parallel Module (installed in backplane slot 11)

Your applicationDEC may be configured with additional factory-installed ISA options, including:

- PS1XG-AA High Resolution Graphics Adapter

- PC4XD-DA Terminal Multiplexer Host Adapter