PRELIMINARY

UC03/M1 INTELLIGENT

HOST ADAPTER

USER'S MANUAL

EMULEX®

WARNING

This equipment generates, uses and can
radiate radio-frequency energy, and if
not installed and used in accordance with
this manual, may cause interference to
radio communications. It has been tested
and found to comply with the limits for a
Class A computing device pursuant to
Subpart J of Part 15 of Federal
Communications Commission (FCC) Rules,
which are designed to provide reasonable
protection against such interference when
operating in a commercial environment.
Operation of this equipment in a
residential area is likely to cause
interference in which case the user at
his own expense will be required to take
whatever measures may be required to
correct the interference.

CONTENTS

SECTION 3   **INSTALLING YOUR UC03**

FIGURES

TABLES

EMULEX PRODUCT WARRANTY

PACKAGED SUBSYSTEM WARRANTY: Emulex warrants all packaged subsystems and their major elements to be free of defects in material and workmanship for a period of six (6) months following shipment to the customer. In the event of difficulty, the customer should return the questionable assembly to Emulex, freight prepaid. Emulex, at its option, will either repair or replace the unit following confirmation that it is covered by our warranty. Major assemblies are defined as power supply, disk drive, tape drive, and all associated controller circuit boards which make up the packaged subsystem.

CONTROLLER AND HOST ADAPTER WARRANTY: Emulex warrants for a period of twelve (12) months from the date of shipment that each Emulex controller product supplied shall be free from defects in material and workmanship.

During this period, if the customer experiences difficulties with an Emulex controller and is unable to resolve the problem via the phone with Emulex Technical support, a Return Authorization will be issued. Following receipt of a Return Authorization, the customer is responsible for returning the product to Emulex, freight prepaid. Emulex, upon verification of warranty, will, at its option, repair or replace the controller in question, and return to the customer freight prepaid.

CABLE WARRANTY: (Return to Factory) All Emulex provided cables are warranted for ninety (90) days from the time of shipment.

SOFTWARE WARRANTY: Emulex warrants for a period of ninety (90) days, either from the date of installation or thirty (30) days after shipment, which ever comes first, that each software package supplied shall be free from defects and shall operate according to Emulex specifications under those Digital Equipment Corporation ("DEC"), IBM, Intel, and Unix, operating system versions supported by Emulex. Emulex does not warrant its software products under any operating system which has not been specifically identified. Any software revisions required hereunder will cover supply of distribution media only and will not cover on-site installation of integration.

MEDIA WARRANTY: (Return to Factory) - Media not covered by on-site warranty is warranted for thirty (30) days from date of shipment. The customer is responsible for return of media to Emulex and Emulex for freight associated with replacement media being returned to the customer.

INSTALLATION/ON-SITE SERVICE WARRANTY: For the customer who prefers repair of his equipment on-site, Emulex offers installation with an included ninety (90) days on-site maintenance service. Under this plan, the Emulex subsystem is installed and fully checked out by Emulex authorized representatives. Following installation, all reported problems are corrected at the customer facility. All elements of the system, including cables, Emulex supplied media, etc., are covered by this service. This provides the customer with maximum availability of the equipment in the event of a problem and precludes the necessity of returning defective parts to the factory for repair under the standard return to factory warranty.

GENERAL TERMS: The above warranties shall not apply to expendable components such as fuses, bulbs, and the like, nor to connectors and other items not a part of the basic product. Emulex shall have no obligation to make repairs or to cause replacement required through normal wear and tear or necessitated in whole or in part by catastrophe, fault or negligence of the user, improper or unauthorized use of the Product, or use of the Product in such a manner for which it was not designed, or by causes external to the Product, such as, but not limited to, power failure or air conditioning, Emulex's sole obligation hereunder shall be to repair or replace items covered in the above warranties. Purchaser shall provide for removal of the defective Product, shipping charges for return to Emulex, and installation of its replacement.

RETURNED MATERIAL: Warranty claims must be received by Emulex within the applicable warranty period. A replaced product, or part thereof, shall become the property of Emulex and shall be returned to Emulex at Purchaser's expense. All returned material must be accompanied by a RETURN AUTHORIZATION number assigned by Emulex.

THE EXPRESSED WARRANTIES SET FORTH IN THIS AGREEMENT ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND ALL OTHER WARRANTIES ARE HEREBY DISCLAIMED AND EXCLUDED BY EMULEX. THE STATED EXPRESS WARRANTIES ARE IN LIEU OF ALL OBLIGATIONS OR LIABILITIES ON THE PART OF EMULEX FOR DAMAGES, INCLUDING BUT NOT LIMITED TO SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THE PRODUCT.

INTRODUCTION

As an owner of a UC03/M1 Intelligent Host Adapter, you have purchased a state-of-the-art host adapter that should provide thousands of hours of trouble-free operation. The UC03 is manufactured and distributed by Emulex Corporation, a leader in the technology of microcomputer and minicomputer controllers, host adapters, communication devices, and subsystems. This manual is designed to help you setup and operate your UC03. To obtain peak operating efficiency, you should read the various sections of this manual carefully.

The manual is divided into six sections and two appendices:

Section 1   **GETTING TO KNOW YOUR UC03:** An overview of the UC03 Host Adapter, compatible subsystems, and related software programs.

Section 2   **PLANNING YOUR UC03 INSTALLATION:** A descriptive and tutorial guide designed to save you time during the physical installation of the UC03. Includes procedures to integrate the UC03 into your host operating system.

Section 3   **INSTALLING YOUR UC03:** A step-by-step procedure describing unpacking and inspection, switch settings, system preparation, physical installation, cable connections, power-up, and verification.

Section 4   **OPERATING YOUR UC03:** Describes the two activity indicator LEDs and the use of the run vs. reset/halt switch on the UC03.

Section 5   **USING YOUR UC03 SOFTWARE:** Instructions to run the related software programs with the UC03 Host Adapter.

Section 6   **TROUBLESHOOTING:** Basic guidelines to identify any performance difficulties with the UC03 Host Adapter and subsystem. Describes self-test and software error messages.

Appendix A   **SPECIFICATIONS:** General, environmental, physical, electrical, and port specifications for the UC03 Host Adapter.

Appendix B   **ADDITIONAL SOFTWARE INFORMATION:** Specifies the sixteen data patterns used in the Emulex MSCP/SCSI Disk Formatter Program, some software error messages, and instructions for use of the DEC XXDP+ Diagnostic Supervisor with the Emulex UDA50 Subsystem Reliability Program.

1

OVERVIEW

The Emulex UC03 Host Adapter implements DEC Mass Storage Control Protocol (MSCP) on LSI-11 bus-based systems. The UC03 communicates with the CPU through the LSI-11 bus and communicates with a mass storage device through the Small Computer System Interface (SCSI). By using SCSI as the peripheral interface, the UC03 allows a wide variety of storage devices to operate in a MSCP subsystem.

The UC03 Host Adapter

The UC03 is a microprocessor-based intelligent host adapter. The microprocessor on the UC03 relieves the host CPU of many file maintenance tasks, and ensures excellent reliability and compactness.

The UC03 is contained on a single quad-wide printed circuit board assembly (PCBA) and connects directly to the LSI-11 bus backplane in the host system.

MSCP Subsystems

The UC03 implements the DEC MSCP for high performance and flexibility in mass-storage subsystems. MSCP supports virtually any drive capacity, providing limitless possibilities for storage expansion for your LSI-11 bus system. MSCP treats the drives as a class of devices rather than separate units, allowing you to combine a various drives of different speeds and sizes without patches or modifications to the operating system software.

The UC03 performs some of the functions of a DEC RQDX1 Controller in DEC MSCP subsystems. In a UC03 MSCP subsystem, the UC03 provides the CPU with the specific characteristic of the attached drives and through MSCP the operating system adjusts accordingly, eliminating the need for changes to software.

The UC03 Host Adapter and Your Subsystem

The UC03 supports up to four logical storage devices. All of these storage devices may be supported by the same controller, or each may be attached to its own individual controller.

The UC03 supports several Emulex mass-storage subsystems. The Decathlon, Javelin, Medley, and Sabre subsystems feature SCSI-compatible peripheral controllers, disk drives, and tape drives in various combinations. Each Emulex subsystem offers expanded storage and backup capabilities for your LSI-11 bus system.

Emulex software programs are available to format the subsystem disk drives, to run data reliability tests, and to backup and restore data files.

Figure 1-1 shows a typical UC03 MSCP subsystem.
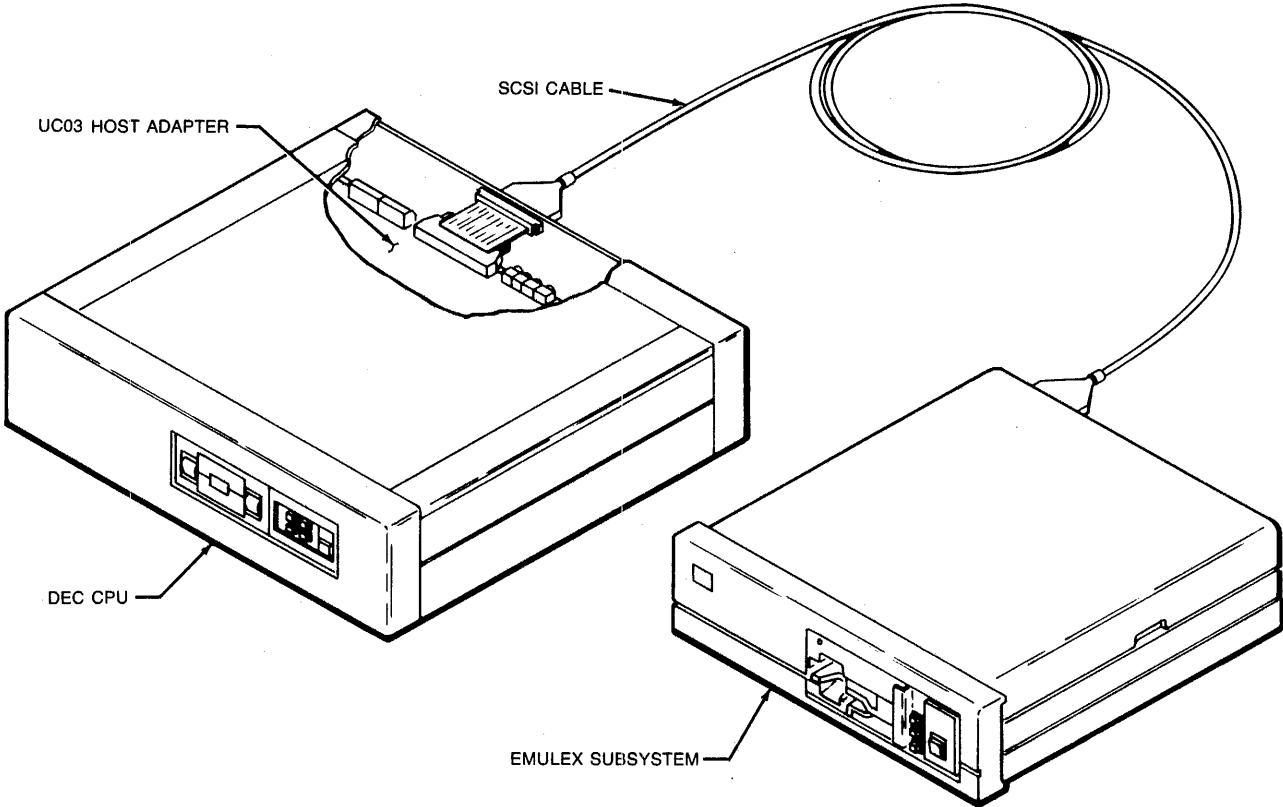
Figure 1-1. The UC03 Host Adapter and Your Subsystem

MODELS AND OPTIONS

Emulex offers one model of the UC03 Host Adapter - the UC03/M1, pictured in Figure 1-2.

	Model	Description
●	UC03/M1	Intelligent Host Adapter interfacing DEC MSCP with SCSI bus peripheral devices. 22-bit addressing kit is standard.

Table 1-1 lists the basic product contents of the UC03/M1 Host Adapter.

Table 1-1.   Basic Product Contents

Description	Part Number	Comment
UC03/M1 Host Adapter 22-Bit Addressing Kit	UC0310201-M1X UC0313001	X is Firmware Rev Standard
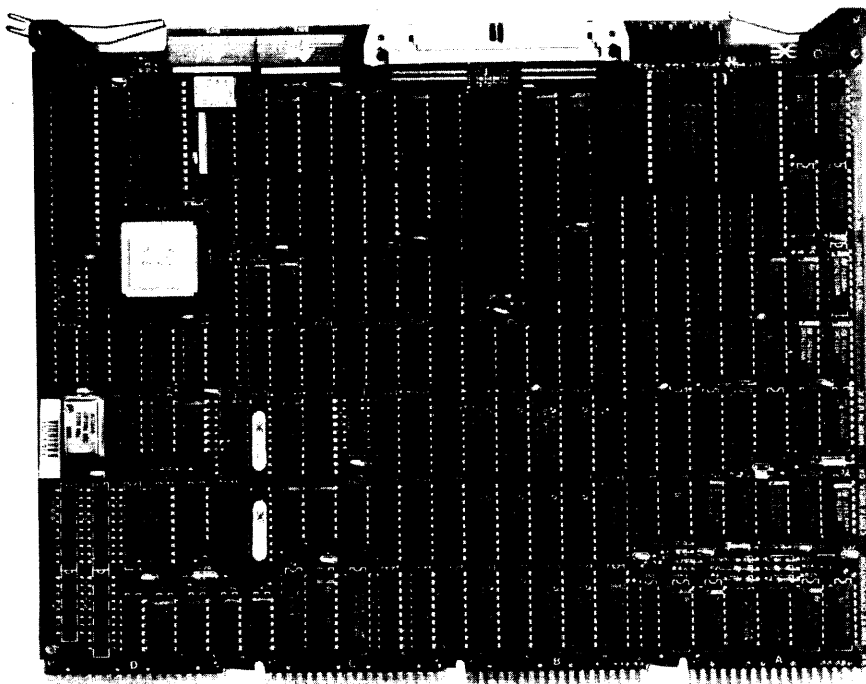
Figure 1-2.   UC03/M1 Intelligent Host Adapter

Software for Your Host Adapter

Emulex offers three software programs for use with your UC03 MSCP subsystem:

- Emulex MSCP/SCSI Disk Formatter Program
- Emulex UDA50 Subsystem Reliability Program
- Emulex MS/SCSI Stand-Alone (Disk Image) Backup/Restore Program

The formatter and subsystem reliability programs are distributed on Emulex Diagnostic Media as described in Table 1-2. The Backup/Restore Program is distributed on various media, also described in Table 1-2.

Table 1-2. Software for the UC03

Software	Model Number	Part Number
Diagnostic Media		
Sentinel 1/4" tape with MS bootstrap	MTC-06D	PX9960419
Cipher 1/4" tape with SCSI bootstrap	MTC-06C	
Iomega Cartridge Disk with DU bootstrap	RDC-01U	PX9960420
Backup/Restore Program		
1/2" tape, 800 bpi with MT bootstrap		
1/2" tape, 1600 bpi with MT bootstrap		
1/2" tape, 1600 bpi with MS bootstrap		

Table 1-2.   Software for the UC03 (continued)

Software	Model Number	Part Number

Backup/Restore Program
 	
   1/2" tape with MS and
SCSI bootstrap
 	
   1/4" DC600A tape cartridge
with TKQ25 format and
MS bootstrap
 	
   1/4" DC450A tape cartridge
with Emulex format for use
with Emulex Titleist tape
subsystem
	MTC-06B	PD9960303

Documentation for Your Host Adapter

Emulex offers two manuals for the UC03. This User's Manual
describes how to install and operate the UC03 Host Adapter with
an Emulex subsystem. More detailed information regarding
programming, the LSI-11 bus and SCSI bus interfaces, and
operating instructions can be found in the **UC03/M1 Intelligent
Host Adapter Technical Manual.** Table 1-3 lists these manuals by
part number.

Table 1-3.   Documentation for the UC03

Documentation	Part Number
UC03 User's Manual	UC0350901
UC03/M1 Technical Manual	UC0351001

6

Subsystems for Your Host Adapter

Emulex offers several subsystems that operate with the UC03 Host Adapter. Table 1-4 describes these subsystems.

Table 1-4. Subsystems for the UC03

Subsystem	Model Number	Description
Decathlon	ER3/XXX	Offers 1-3 Winchester disk drives, and/or 1 tape drive.
Javelin	ED2/XXX	Offers 1-2 Winchester disk drives, and/or 1 tape drive.
Medley	ES2/XXX	Offers 1 Winchester disk drive, and one tape drive.
Sabre	ER2/XXX	Offers 1 Winchester disk drive, and one cartridge disk drive.
XXX = Specific model designator. All Winchester drives are offered in various storage capacities, ranging from 36 megabytes to 110 megabytes.		

Cabling Kits for Your Host Adapter

The cabling kits that connect your UC03 Host Adapter with your subsystem are ordered and supplied with your Emulex subsystem. Each kit includes a flat-ribbon cable, a SCSI shielded cable, a transadapter plate, and all the hardware necessary to complete an installation.

Emulex offers three cabling kits for the UC03 Host Adapter:

* MICRO/PDP-11   PU0213001-XX

* Universal RETMA Rack-Mount   PU0113003-XX

* Chassis Mount   PU0113004-XX

The MICRO/PDP-11 Cabling Kit is designed to use the DEC patch panel at the rear of the MICRO/PDP-11 chassis. This kit cannot be used with the Emulex CP24 or CP24B Distribution Panels. If you wish to install both the cabling kit and the Distribution Panel, Emulex manufactures a replacement for the DEC patch panel. Order the Emulex patch panel in addition to the MICRO/PDP-11 Cabling Kit.

Table 1-5 lists the MICRO/PDP-11 Cabling Kit part numbers and cable lengths. The last two digits in the kit part number specify the lengths of the SCSI and flat-ribbon cables.

Table 1-5. MICRO/PDP-11 Cabling Kit

Kit Part Number	SCSI Cable Length (ft.)	Flat-Ribbon Cable Length (ft.)
PU0213001-01	5	1
PU0213001-02	10	1
PU0213001-03	15	1
PU0213001-04	20	1
Option		
PU0120105	Emulex Patch Panel	

The Universal RETMA Rack-Mount Cabling Kit can be used in any CPU cabinet that is based on the standard 19-inch RETMA rack. It is particularly useful in rack-mounted LSI-11/23 and LSI-11/23-PLUS CPUs.

Table 1-6 lists the Universal RETMA Rack-Mount Cabling Kit part numbers and cable lengths. The last two digits in the kit part number specify the lengths of the SCSI and flat-ribbon cables.

Table 1-6.   Universal RETMA Rack-Mount Cabling Kit

Kit Part Number	SCSI Cable Length (ft.)	Flat-Ribbon Cable Length (ft.)
PU0113003-01	5	1
PU0113003-02	10	1
PU0113003-03	15	1
PU0113003-04	20	1
PU0113003-05	5	3
PU0113003-06	10	3
PU0113003-07	15	3
PU0113003-08	20	3
PU0113003-09	5	6
PU0113003-10	10	6
PU0113003-11	15	6
PU0113003-12	20	6
PU0113003-13	5	9
PU0113003-14	10	9
PU0113003-15	15	9
PU0113003-16	20	9

The Chassis Mount Cabling Kit is designed for use with LSI-11/23 BC chassis. Table 1-7 lists the Chassis Mount Cabling Kit part numbers and cable lengths. The last two digits in the part number specify the lengths of the SCSI and flat-ribbon cables.

Table 1-7.   Chassis Mount Cabling Kit

Kit Part Number	SCSI Cable Length (ft.)	Flat-Ribbon Cable Length (ft.)
PU0113004-01	5	1
PU0113004-02	10	1
PU0113004-03	15	1
PU0113004-04	20	1

Sample Sales Order Form

If you wish to order software or additional documentation for your UC03 Host Adapter, simply contact your Emulex Sales Representative, or contact Emulex directly at the following address:

Emulex Corporation
In-House Sales
3545 Harbor Boulevard
Costa Mesa, CA 92626

Figure 1-3 shows a sample sales order. Software or additional documentation is entered as a separate line item.

Item	Model Number	Comment/Description
1.	UC03/M1	Intelligent Host Adapter implementing DEC MSCP. Includes 22-bit memory addressing kit.

Figure 1-3. Sales Order Example

FEATURES

The UC03 Host Adapter exemplifies traditional Emulex advanced technology and reliability. In addition, these significant features make the UC03 the best MSCP device for your application.

- **Microprocessor:** The UC03 design incorporates an eight-bit, high-performance microprocessor to perform all controller functions. The microprocessor approach provides a reduced component count, high reliability, easy maintainability, and - most importantly - the ability to use MSCP.

- **Buffer Controller:** Our custom designed buffer chip makes optimum use of the controller hardware to achieve high throughput rates.

- **Peripherals:** The UC03 provides complete flexibility. It is capable of supporting as many as four SCSI-compatible controllers with disk or tape drives of varying capacities.

- **Software Transparency:** The UC03 emulates DEC MSCP and functions with all DEC standard operating systems.

- **22-Bit Memory Addressing:** The UC03 supports full 22-bit memory addressing to use the full four megabyte capacity of the LSI-11 bus.

- **Self-test:** The UC03 incorporates an internal self-test routine that is executed upon power-up. This test exercises all parts of the microprocessor, the on-board memory, the LSI-11 bus interface, and the SCSI bus interface. Although this test does not completely test all circuitry, successful execution indicates a very high probability that the UC03 is operational. If the UC03 fails to pass the self-test, it illuminates four light-emitting diode (LED) indicators and reports its failure to the host operating system.

- **Error Control:** The host adapter presents an error-free media to the operating system by correcting soft errors transparently and reporting only uncorrectable errors to the host.

- **Seek Optimization:** The UC03 is able to pool the various seek operations that need to be performed and determine the most efficient order in which to do them. This is an especially important feature in heavily loaded systems. The host adapter's ability to arrange seeks in the optimum order can save a great deal of time and makes the entire system more efficient.

- **Command Buffer:** The UC03 contains a buffer that is able to store 13 MSCP commands. This large buffer allows the subsystem to achieve a faster throughput rate and to operate at a very efficient level.

- **Disconnect/Reconnect:** The UC03 fully supports standard SCSI arbitration, including the disconnect/reconnect option. Using this option, drives that are performing time-consuming tasks, such as seek operations, release the SCSI bus temporarily and reconnect when the seek is complete. Support of this feature permits the UC03 to initiate four command simultaneously on four controllers; thus, several operations can be performed at once. The option ensures efficient use of the SCSI bus and provides maximum overall subsystem throughput.

- **Block Mode DMA:** The UC03 supports block mode commands for accessing memory. In this mode, the initial address of the data is transmitted, followed by a burst of up to 16 words of data. The memory address is automatically incremented to accommodate this burst. Block mode transfers considerably reduce the overhead associated with DMA transfers.

- **Adaptive DMA:** During each DMA data transfer burst, the UC03 monitors the LSI-11 bus for other pending DMA requests and suspends its own DMA activity to permit other transfers to occur. In addition, burst length and burst delay are programmable, to ensure that CPU functions, including interrupt servicing, are not locked out for excessive periods of time by high-speed disk transfers.

- **Automatic Bootstrap:** The UC03 features an automatic bootstrap option which causes the system to bootstrap automatically from logical unit zero or one on power-up or reset.

- **Compact Packaging:** A single quad-height PCBA plugs into any LSI-11 bus slot to minimize mounting space.

COMPATIBILITY

Software Programs

Emulex offers two Emulex diagnostic programs to support the UC03: a disk formatter and a data reliability program. In addition, the UC03 is compatible with the DEC MSCP Performance Exerciser. Emulex also offers a stand-alone backup and restore program.

Operating Systems

The UC03 completely implements MSCP. MSCP is supported by the RT-11, RSX-11, RSX-11M PLUS, and RSTS/E operating systems.

Hardware Compatibility

The UC03 Host Adapter complies with DEC LSI-11 bus protocol, and it directly supports 22-bit memory addressing. The disk drives supported by the UC03 are not media compatible with comparable DEC MSCP products. The fixed nature of DEC's disk media, however, makes this an unimportant consideration.

SCSI Bus

The UC03 Host Adapter is compatible with the ANSI standard SCSI with single-ended driver option. The SCSI commands implemented with the UC03 are specified in Appendix A.

PERFORMANCE

The UC03 MSCP subsystem performance is superior to that of DEC
MSCP mass storage subsystems. The buffer controller chip used in
the UC03 design increases the usual MSCP data transfer rate. In
addition, the UC03 allows you to build your subsystem from a wide
variety of low-cost peripheral devices that, when combined with
the UC03, provide cost-effective solutions to mass storage on
LSI-11 bus-based systems.

RELATED DOCUMENTATION

If you want more information about:

UC03 Host Adapter

Title: UC03/M1 Intelligent Host Adapter Technical Manual
Publication Number: UC0351001
Publisher: Emulex Corporation
          In-House Sales
          3545 Harbor Boulevard
          Costa Mesa, CA 92626

Emulex Subsystems User's Manuals

Emulex offers User Manuals for each of the subsystems that
support the UC03 Host Adapter.

Title: Decathlon User's Manual
Publication Number: PE3150901
Publisher: Emulex Corporation
          In-House Sales
          3545 Harbor Boulevard
          Costa Mesa, CA 92626

Title: Javelin User's Manual
Publication Number: PE2150901
Publisher: Emulex Corporation
          In-House Sales
          3545 Harbor Boulevard
          Costa Mesa, CA 92626

Title: Medley User's Manual
Publication Number: PE0250901
Publisher: Emulex Corporation
          In-House Sales
          3545 Harbor Boulevard
          Costa Mesa, CA 92626

Title: <u>Sabre User's Manual</u>
Publication Number: PE0150901
Publisher: Emulex Corporation
          In-House Sales
          3545 Harbor Boulevard
          Costa Mesa, CA 92626

Emulex Subsystems Technical Information

In addition, Emulex offers Technical Manuals for each of the Emulex controllers used in our subsystems.

Title: MD01 (Medalist) Disk Controller Technical Manual
Publication Number: MD0151001
Publisher: Emulex Corporation
          In-House Sales
          3545 Harbor Boulevard
          Costa Mesa, CA 92626

Title: MD21 (Champion) Disk Controller Technical Manual
Publication Number: MD2151001
Publisher: Emulex Corporation
          In-House Sales
          3545 Harbor Boulevard
          Costa Mesa, CA 92626

Title: MT01 (Titleist) Tape Controller Technical Manual
Publication Number: MT0151001
Publisher: Emulex Corporation
          In-House Sales
          3545 Harbor Boulevard
          Costa Mesa, CA 92626

Title: MT02 (Titleist) Tape Controller Technical Manual
Publication Number: MT0251001
Publisher: Emulex Corporation
          In-House Sales
          3545 Harbor Boulevard
          Costa Mesa, CA 92626

Small Computer System Interface

Title: <u>Small Computer System Interface</u> (SCSI)
Publisher: American National Standard Task Group X3T9.2/82-2
          Computer and Business Equipment Manufacturers Assoc.
          311 First Street, N.W., Suite 500
          Washington, D.C. 20001

OVERVIEW

This section is designed to help you integrate the UC03 into your host computer and host operating systems. By planning the installation process in this way, you should be able to install the UC03 more efficiently.

After a general introduction to MSCP, we discuss its implementation in UC03 and DEC mass storage subsystems. Next, a planning guide helps you determine how to set up your UC03 to operate with your system. Finally, we describe procedures to supplement your resources on integrating the UC03 Host Adapter into your operating system.

At the end of this planning section, you should feel confident about installing the UC03 Host Adapter into your system.

MSCP Architecture

MSCP is a protocol designed by DEC for mass storage subsystems using Digital Storage Architecture (DSA). In a MSCP mass storage subsystem, DSA comprises three functional and physical layers:

- **Host Layer:** An MSCP class-driver receives requests from the host operating system and then relays data and commands to the controller in MSCP message packets.

- **Controller Layer:** The MSCP controller communicates with both the host layer and the mass storage layer. The controller transmits MSCP message packets to and from the host MSCP class-driver and performs data-handling functions for the mass storage devices.

- **Mass Storage Layer:** The mass storage devices communicate with the MSCP controller and send or receive data as specified by the MSCP controller.

MSCP defines the form of the message packets that are exchanged by the host and the MSCP controller. The UC03 implements MSCP in mass storage subsystems using the Small Computer Systems Interface (SCSI) as the peripheral interface.

UC03 MSCP Subsystems

The UC03 functions as an MSCP controller. In a UC03 MSCP subsystem, as shown in Figure 2-1, the UC03 communicates with the host CPU through the LSI-11 bus and communicates with a mass storage subsystem through the SCSI bus. Both the UC03 and the CPU module reside in the backplane of the host computer system.
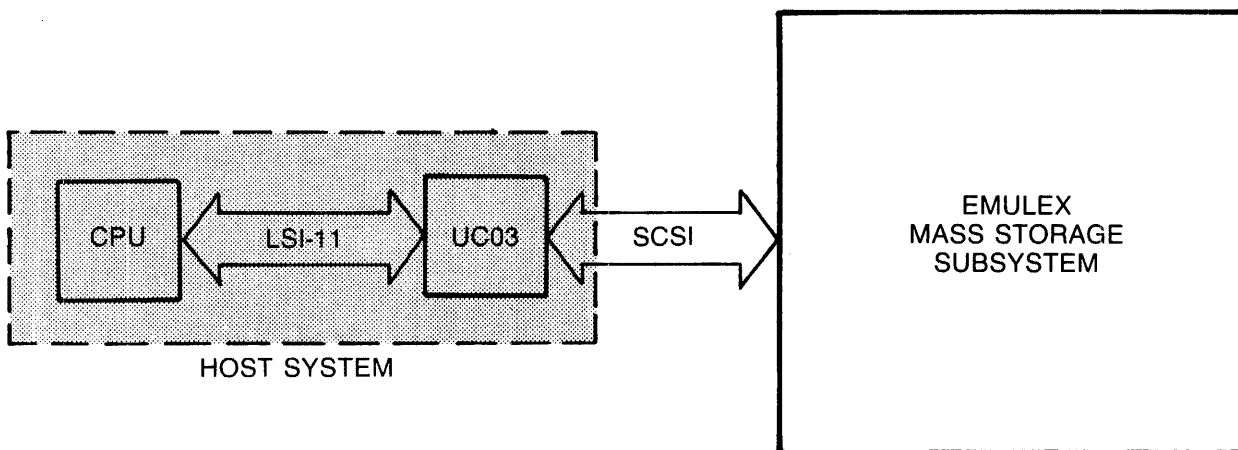
Figure 2-1. UC03 MSCP Subsystem

The UC03 communicates with the storage devices in an Emulex mass storage subsystem through the SCSI bus and the SCSI-compatible controllers. The UC03 supports numerous combinations of disk drives and tape drives. The combination of peripheral devices in a particular Emulex mass storage subsystem is described to the UC03 through switch settings.

In Figure 2-2, the UC03 supports an Emulex subsystem which comprises two disk drives (and disk controller) and one tape drive (and tape controller). Switch SW1, positions 6-10 are set to reflect the particular disk and tape combination in the subsystem. The tape drive is an offline to MSCP.

```
 ┌───────┐           ┌──────────┐                    ┌──────────────────────────────────────┐
 │       │    LSI-11 │   UC03   │                    │  ┌──────────────┐     ┌───────────┐  │
 │  CPU  │◄═════════►│┌────────┐│◄═══════ SCSI ═════►│  │     DISK     │─────│  DRIVE    │  │
 │       │           ││678910  ││                    │  │  CONTROLLER  │     │   DU0     │  │
 └───────┘           │└────────┘│                    │  └──────────────┘     └───────────┘  │
                     └──────────┘                    │         │             ┌───────────┐  │
                        SW1                          │         │             │  DRIVE    │  │
                                                     │         │             │   DU1     │  │
                                                     │  ┌──────────────┐     └───────────┘  │
                                                     │  │     TAPE     │     ┌───────────┐  │
                                                     │  │  CONTROLLER  │─────│  TAPE  *  │  │
                                                     │  └──────────────┘     │  DRIVE    │  │
                                                     │                       └───────────┘  │
                                                     └──────────────────────────────────────┘
```

*TAPE DRIVE IS OFFLINE TO MSCP
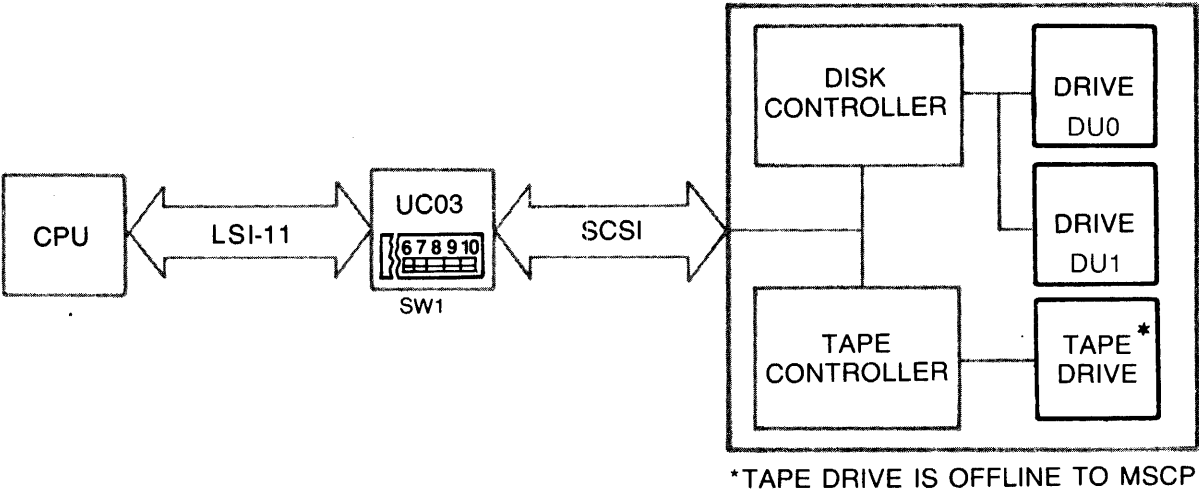
Figure 2-2. Mass Storage Devices in a UC03 MSCP Subsystem

DEC MSCP Subsystems

In a DEC MSCP subsystem, the RQDX1 is the MSCP controller. As shown in Figure 2-3, the RQDX1 communicates with the host CPU through the LSI-11 bus and with each mass storage device using that device's native interface. Notice that the peripheral interface in a DEC MSCP subsystem differs from that in a UC03 MSCP subsystem.
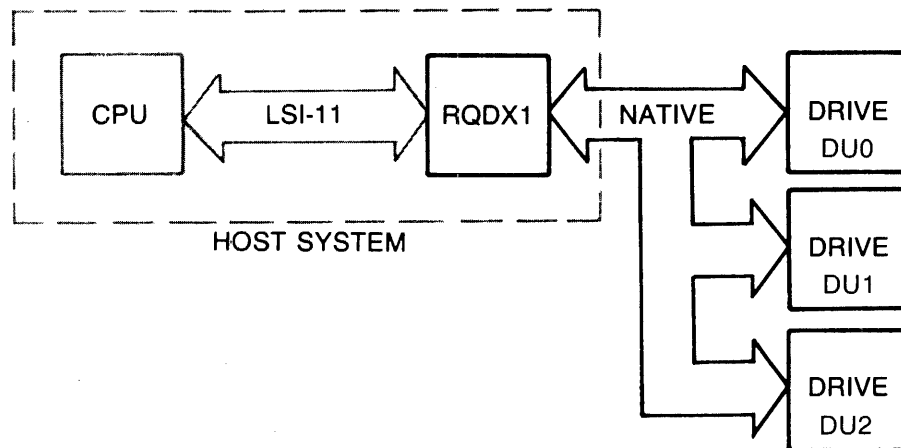
Figure 2-3.   DEC MSCP Subsystem

A PLANNING GUIDE

This planning guide is designed to help you determine how you should set up the UC03 to operate with your system. These subsections examine how the components in your system affect the installation of the UC03.

Which LSI-11 Bus Address Do I Select for My UC03?

The UC03 must be assigned a unique address on the LSI-11 bus, known as a device address, base address, or Control and Status Register (CSR) address. This LSI-11 bus address identifies the UC03 as an MSCP controller and its location on the LSI-11 bus.

LSI-11 bus address selection is based on primary or alternate device status. If your system uses one UC03 Host Adapter and one RQDX1 Controller, as illustrated in Figure 2-4, then the RQDX1 is considered the "primary" device, and the UC03 is considered an "alternate" device. Similarly, if your system uses two UC03 Host Adapters, one is the primary UC03 and the other is the alternate UC03.

The primary device uses the standard LSI-11 bus address and the alternate device uses the alternate address. The LSI-11 bus address for primary MSCP controllers is 772150_8, and the LSI-11 bus address for alternate MSCP controllers is 772154_8.

In Figure 2-4, the RQDX1 is the primary MSCP controller and uses the standard LSI-11 bus address of 772150_8. The UC03 in this illustration is the alternate MSCP controller and uses the alternate address of 772154_8.

NOTE

In most systems that include an RQDX1, the RQDX1 is considered the primary device and the UC03 is considered the alternate device. To use the RQDX1 as the alternate device, refer to the DEC **RQDX1 Controller User's Guide.**
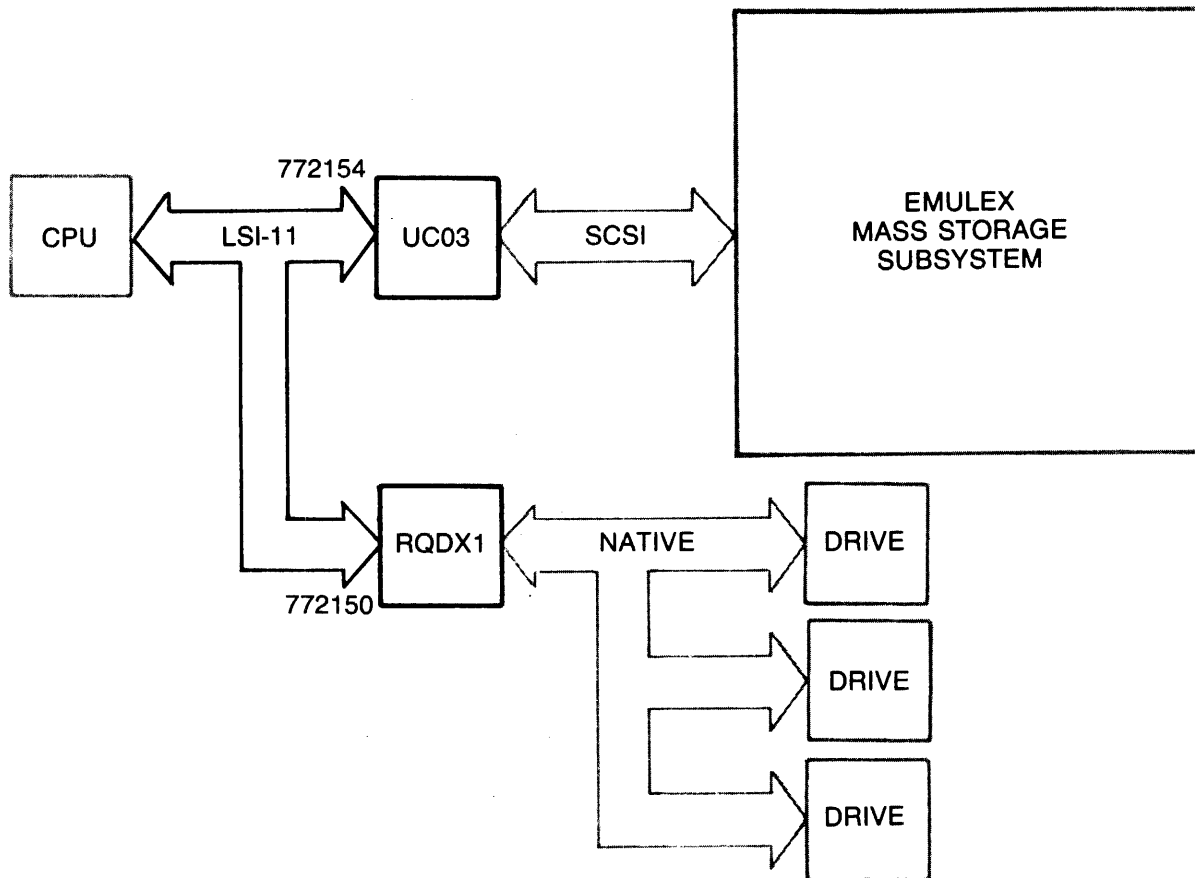
Figure 2-4. Primary RQDX1 and Alternate UC03 on LSI-11 bus

Which Interrupt Vector Do I Select for My UC03?

The interrupt vector address for the UC03 is programmed into the UC03 by the host operating system. For more information, refer to **INTEGRATING THE UC03 INTO YOUR OPERATING SYSTEM SOFTWARE.**

Which SCSI Bus Address Do I Select for My UC03?

The UC03 must also be assigned a unique SCSI bus address to identify
its location on the SCSI bus.

Emulex has defined standard addresses on the SCSI Bus for primary
and alternate UC03 Host Adapters. A primary UC03 is assigned a SCSI
bus address of seven. In Figure 2-5, there is only one UC03 on the
SCSI bus, so the UC03 uses the primary address of seven.

If your system has two UC03 Host Adapters and each UC03 resides on a
separate SCSI bus, each UC03 is assigned the primary address of
seven on its respective SCSI bus.

NOTE

> If two UC03 Host Adapters reside on the
> same SCSI bus, one UC03 is assigned an
> address of seven and the other UC03 is
> assigned an address of six. Placing a
> second UC03 on the same SCSI bus requires
> software modifications.
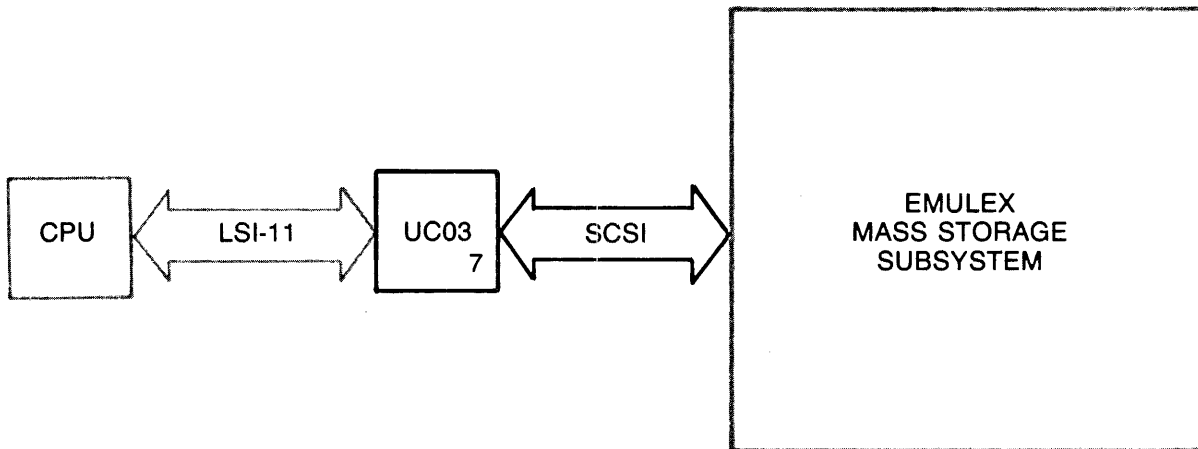
Figure 2-5. Primary UC03 on SCSI Bus

Using Logical Drive Mapping to Emulate File-Structured Backup and Restore Operations

You must backup all the data stored on a disk drive when using streaming cartridge tape drives because these tape drives are not capable of backing up data file-by-file. The UC03 increases your backup-and-storage options for Emulex Javelin subsystems containing one disk drive and a streaming cartridge tape drive.

The subsystem shown in Figure 2-6 has one disk drive and one tape drive. In order to backup any data stored on the disk drive, you must backup the entire disk drive. You may not always want to backup all the data stored on that disk drive. The UC03 allows you to split that physical disk drive into two logical drives. You can then use one logical drive as your system disk and the other logical drive to perform backup operations.

For example, if you map two logical drives onto one physical disk drive, as shown in Figure 2-7, you now have two logical disk drives and one tape drive in your system. You may use logical drive zero as your system disk and transfer those files you want to backup to logical drive one. Then, you can backup those files stored on drive one to the tape drive. In the same way, you can restore those files from the tape drive to logical drive one and then transfer the files you want to the system disk.

Logical Drive Mapping

Dividing a single, physical drive into two, logical units is referred to as "splitting" one physical drive into two logical drives, or mapping two logical drives onto one physical drive.

In Figure 2-6, the Emulex subsystem contains one physical disk drive and one physical tape drive. The UC03 allocates the entire storage capacity of the disk drive to a single, unit number. The configuration of the drives in a subsystem is switch-dependent. In Figure 2-6, the unit number zero identifies the total capacity of that disk drive. The physical disk drive is identified by the UC03 as one logical drive.

Figure 2-7 shows the same physical subsystem as Figure 2-6. The subsystem contains one physical disk drive and one physical tape drive. The UC03 allocates the first part of the disk drive to unit number zero and the second part of the disk disk to unit number one. If you notice in Figure 2-7, the disk drive is partitioned into two sections by a dashed-line; each section is considered a logical drive. That single, physical disk drive contains two logical drives that are identified by the UC03 as logical drive zero and logical drive one. The logical drive zero is always used as the system disk and logical drive one is always used to perform backup.

The combined storage capacities of each logical drive is about
equal to the storage capacity of the physical drive. If the
physical disk drive in Figure 2-7 has a capacity of 110 megabytes
and logical drive zero has a capacity of approximately 55
megabytes, then logical drive one must have a capacity of
approximately 55 megabytes.
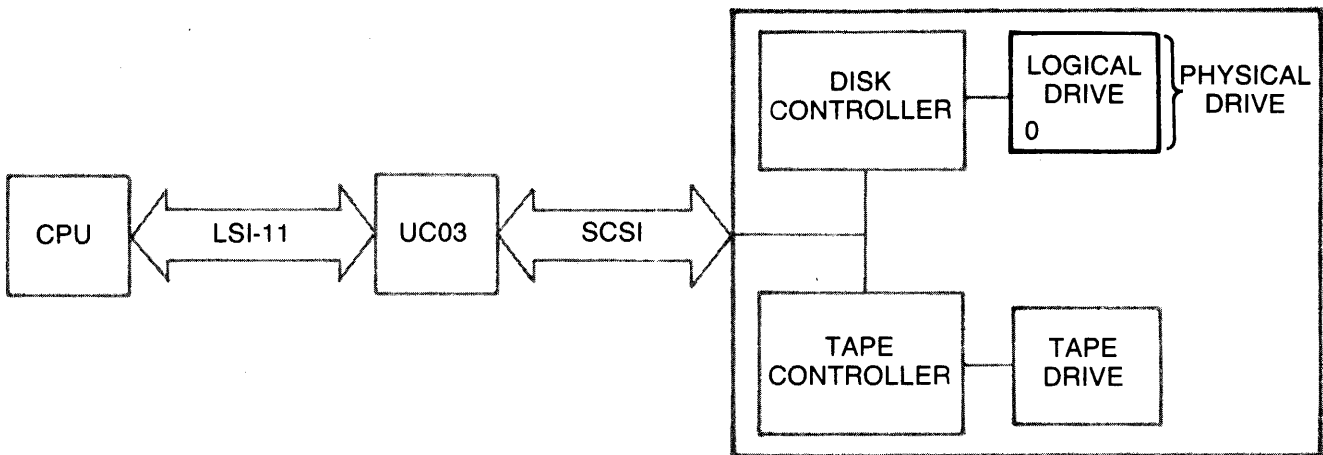
Figure 2-6. One-to-One, Physical-to-Logical Drive Correlation
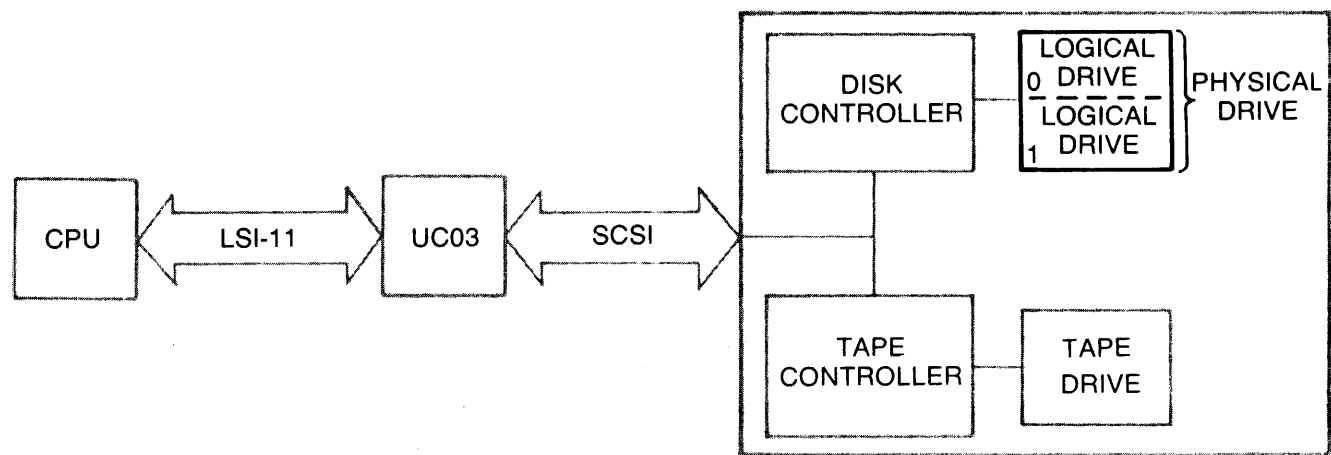
Figure 2-7. One Physical Drive "Split" into Two Logical Drives

Selecting Logical Drive Mapping Ratios

In a Javelin subsystem, you can select logical drive mapping to emulate file-structured backup and restore operations. The UC03 offers you two choices for logical drive mapping in your one-disk/one-tape Javelin subsystem:

- Two logical disk drives, split in a 1:1 ratio to emulate full-disk, file-structured backup and restore operations

- Two logical disk drives, split in a 7:1 ratio to emulate partial-disk, file-structured backup and restore operations

Advantages of 1:1 Split

If you map two logical disk drives in a 1:1 ratio, the storage capacity of your system disk is equal to the storage capacity on the disk that you use for backup and restore operations. For example, if you split a 110-megabyte disk drive in a 1:1 ratio, your system disk drive is approximately 55 megabytes and your backup disk drive is approximately 55 megabytes.

Using a 1:1 split ratio, you can backup or restore all the data stored on your system disk. First, you backup from your system disk drive directly to the tape drive. If you need a particular file in the backup data, you restore the data from the tape drive to disk drive one and then copy that particular file from drive one to the system drive zero.

By using a 1:1 split ratio, you are able to backup or restore all the data on your system disk in one operation. You gain the flexibility and precision of transferring a single file from logical drive one to the system disk, but you also reduce the storage capacity of that system disk drive.

Advantages of 7:1 Split

If you map two logical disk drives in a 7:1 ratio, the amount of storage capacity on your system disk is seven times the amount of storage capacity on the disk that you use for backup and restore operations. For example, if you split a 110-megabyte disk drive in a 7:1 ratio, your system disk is approximately 96 megabytes and your backup disk is approximately 14 megabytes.

In a 7:1 split ratio, logical drive zero is your larger, system disk and logical drive one is your smaller, backup disk. You would use a 7:1 split ratio to perform partial backup or restore operations.

First, you copy the files you want to backup from the larger
system disk drive zero to the smaller disk drive one. Then, you
backup from the smaller disk drive to the tape drive. To recover
a file from the backup tape, you restore to the smaller disk
drive one and transfer that file from logical drive one to the
system disk drive zero.

By using a 7:1 split ratio, you retain a sizable storage capacity
on your system disk drive, but in order to backup or restore the
complete system disk, you must backup or restore that data in
segments using several operations.

You need to evaluate your system application to decide if a 7:1
or 1:1 split is better for your Javelin subsystem. You may
decide not to use the logical drive mapping at all. The UC03
switch settings for logical drive mapping with the Javelin
subsystem are presented in **Defining Your Subsystem, in Section 3.**

Understanding MSCP Device Numbering

After the UC03 associates a unit number with the storage capacity
of a drive, it reports this unit number and a media type
identifier to the host operating system. The operating system
then couples a MSCP device code with that unit number. The MSCP
device code plus the that unit number is referred to as the MSCP
device number. For most operating systems, the MSCP device code
is "DU". An example of a MSCP device number is DU0, where "DU"
is the MSCP device code and "0" is the unit number.

The host operating system assigns MSCP device numbers to each
storage device that an MSCP controller supports. For example, in
Figure 2-8, the UC03 supports two disk drives and one tape drive.
The UC03 assigns DU0 to the first disk drive, DU1 to the second
disk drive. MSCP conventions require that the device numbers be
in sequence, starting with DU0.

NOTE

> Because the tape drive is offline to
> MSCP, the host operating system does not
> assign a MSCP device number to the tape
> drive. However, to perform backup and
> restore operations using the Emulex
> Backup/Restore Program, it is convenient
> to refer to the tape drive with a MSCP
> device number. If you query the
> operating system, the tape drive is
> reported as an offline device.
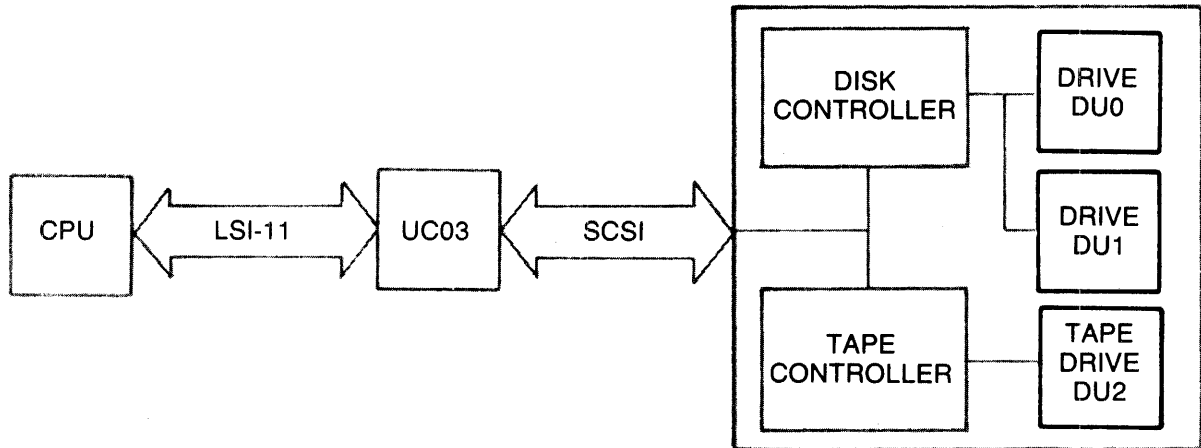
Figure 2-8.   MSCP Device Numbering for a Primary UC03

MSCP requires that the host operating system observe these conventions in assigning MSCP device numbers to storage devices:

● The first storage device supported by a primary MSCP controller is assigned a MSCP device number of DU0.

● The MSCP device numbers of the storage devices be in sequence such that the number of the last device supported by a primary controller is contiguous with the number of the first device supported by an alternate controller.

In accordance with MSCP, the host operating system assigns a MSCP device number of DU0 to the first storage device supported by the primary MSCP controller. In Figure 2-8, the UC03 is the primary MSCP controller and the first drive it supports is DU0.

In Figure 2-9, the RQDX1 is the primary MSCP controller and supports three drives. The RQDX1 assigns DU0 to the first drive, DU1 to the second drive, and DU2 to the third drive.

The UC03 is the alternate MSCP controller in Figure 2-9 and also supports three drives. Following the MSCP convention that device numbers be in sequence, the first drive supported by the UC03 is assigned a number of DU3. The MSCP device number of the last drive supported by the primary MSCP controller, DU2, must be contiguous with the MSCP device number of the first drive supported by the alternate MSCP controller, DU3.

The UC03 controls MSCP device numbering for alternate host adapters by switch SW2, positions SW1 and SW2. If you have an alternate UC03 in your system, you must reset this switch during the installation process in **Section 3, SETTING UP YOUR UC03.**
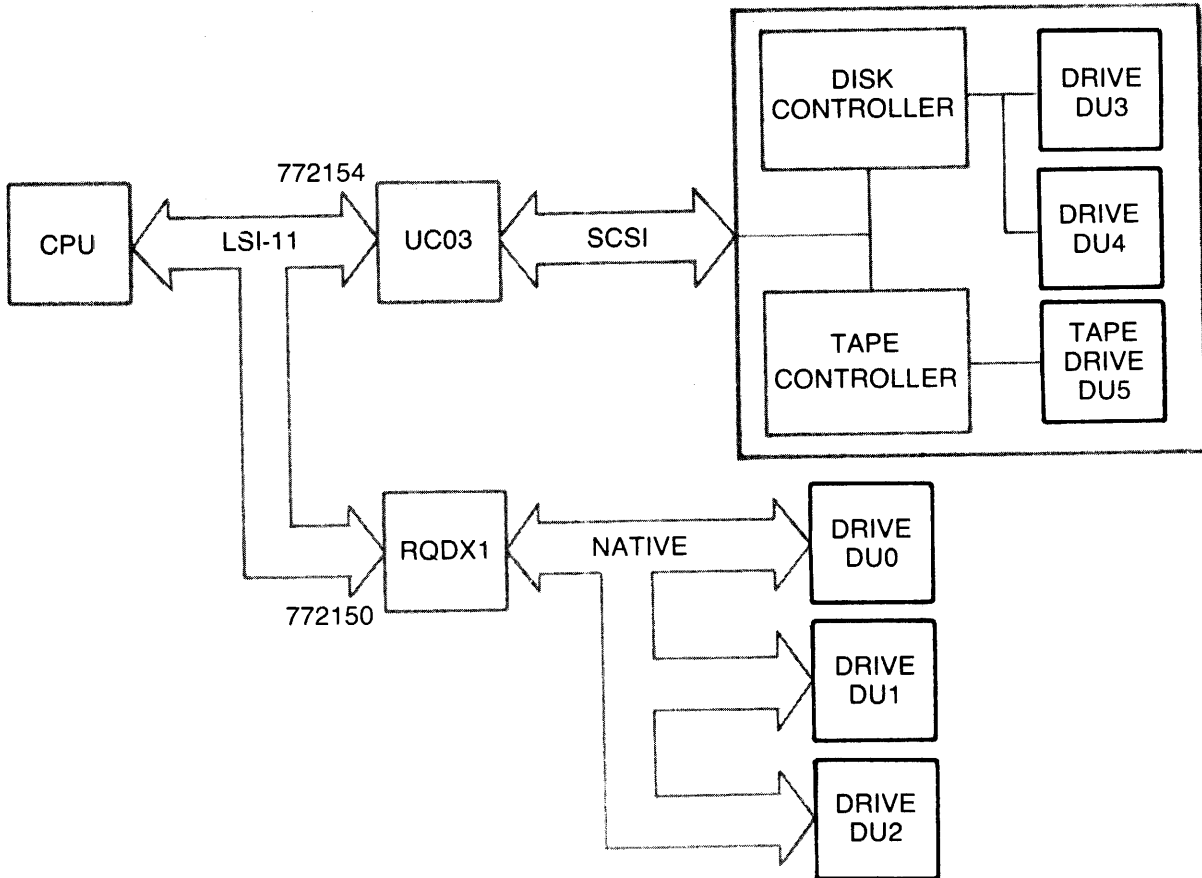
Figure 2-9. MSCP Device Numbering with an Alternate UC03

INTEGRATING THE UC03 INTO YOUR HOST OPERATING SYSTEM

Before the installation of the UC03 can be considered complete, the host operating system must be made aware of the new device. The procedures described in this section should be used to supplement your resources on DEC operating systems.

A DEC host operating system can be made aware of a new device in three ways:

- The first technique, autoconfigure, is essentially automatic. As the operating system polls the computer's I/O device address space, it locates the UC03.

- The second technique requires that CONNECT statements be placed in a special command file that is executed each time the computer is powered up. The UC03 is manually connected using CONNECT or CONFIGURE statements.

- The third technique, interactive SYSGEN, creates a configuration file that the operating system references when the system is powered up. The user tells the operating system about the UC03 during this interactive SYSGEN procedure.

All three techniques associate a specific device-type with a LSI-11 bus address and interrupt vector address. All recent versions of DEC operating systems use autoconfigure, to some extent, and all try to follow the same rules. There are some differences between operating systems, however, especially with regard to a MSCP controller located at an alternate LSI-11 bus address. The following subsections address these differences on a operating-system-by-operating-system basis.

LSI-11 Bus Address and Vector Address

This section discusses selecting the appropriate LSI-11 bus address and interrupt vector for your MSCP subsystem. In this section, the LSI-11 bus address is also referred to as the CSR address. The operating system discussions below give procedures for choosing CSR addresses for both a primary and alternate MSCP controller in the host system configuration. Instructions for programming the selected CSR address into the UC03 are presented in **Section 3, SETTING UP YOUR UC03.**

Vector addresses for MSCP controllers are not selected by using switches on the controller module, but are programmed into the controller during the SYSGEN process. Many operating system select the vector address automatically. If manual input of the vector is required by an operating system, that fact is noted in the procedure.

MSCP Device Names

Although DEC attempts to standardize treatment of peripherals by operating systems, some differences do exist. Table 2-1 lists and describes the names assigned to MSCP devices under four operating systems. Two controller names and drive names are listed to infer the numbering scheme.

Table 2-1. MSCP Device Names

Operating System	Controller	Drive
RSTS/E	DUA, DUB	DU0, DU1
RT-11	Port1, Port2	DU0, DU1
RSX-11M	DUA, DUB	DU0, DU1
RSX-11M-PLUS	DUA, DUB	DU0, DU1

Assumptions

The procedures in these subsections are based on the following assumptions:

● This is the first pass that is being made through SYSGEN, therefore, no saved answer file exists. Answer NO to question such as "Use as input saved answer file?"

● Your host system configuration conforms to the standard LSI-11 device configuration algorithm (otherwise autoconfigure results are not reliable). All of the operating systems discussed here use some type of autoconfigure algorithm to identify devices in the host system. The procedures which follow use autoconfigure as much as possible.

● You are generating a mapped version of the operating system on the appropriate hardware.

RSTS/E OPERATING SYSTEMS (V8.0)

The RSTS/E operating system scans the system's hardware to determine its configuration each time the system is bootstrapped. The scanning program is called INIT.SYS and it relies on the same hardware configuration conventions as other DEC operating systems.

RSTS/E supports two MSCP controllers. The primary MSCP controller must be located at the standard CSR address, 772150_8. According to DEC documentation, the alternate MSCP controller should be located in floating address space. However, tests have shown that if the CSR address of the alternate MSCP controller (772154_8) is contiguous with the CSR address of the primary MSCP controller (772154), then RSTS/E locates and properly identifies the second MSCP controller. We suggest using a CSR address of 772154_8 for an alternate UC03.

Interrupt vector addresses are assigned to MSCP controllers by INIT.SYS and programmed into the MSCP controller during initialization.

RSX-11M OPERATING SYSTEMS

RSX-11M SYSGEN is an interrogative program that allows a complete, running RSX-11M system to be configured for a particular hardware environment. SYSGEN is well documented in the **RSX-11M System Generation and Installation Guide,** and you are expected to rely primarily on that manual. This explanation is provided only to remove some ambiguities that the installation of the UC03 may invoke.

SYSGEN supports autoconfigure. However, autoconfigure only detects the MSCP controller that is located at the standard CSR address. The CSR address for an alternate MSCP controller must be attached to the host operating system manually.

Installing a Single MSCP Controller

If you have only one UC03, install it at the standard CSR address (772150_8) and use autoconfigure to connect your peripherals. The procedure given in the **RSX-11M-PLUS System Generation and Configuration Guide** is adequate.

Installing a Second MSCP Controller

If you have two MSCP controllers in your system, such as an RQDX1 and a UC03, we recommend that you use autoconfigure to connect the first MSCP controller at the standard CSR address (772150_8). We recommend that you install the RQDX1 at the standard address and the UC03 at the alternate address. Locating the UC03 at the alternate CSR address does not prevent it being used as the system device.

The alternate MSCP controller is connected to the operating system after the initial SYSGEN is complete and system is running. To connect the alternate controller, use the "Add a Device" option of SYSGEN. The following procedure describes the process:

1. Invoke SYSGEN.

   > **SET /UIC=[200,200]<cr>**
   > **@SYSGEN<cr>**

2. To indicate that you want to use autoconfigure, answer YES the to the following question:

   * 1. Autoconfigure the host system hardware?
     [Y/N]: **Y<cr>**

3. To indicate that you do not want to override autoconfigure results, answer NO to this question:

   * 2. Do you want to override Autoconfigure
     results? [Y/N]: **N<cr>**

   Answer the rest of the questions in the SETUP section appropriately, and continue to the next section, TARGET CONFIGURATION. In TARGET CONFIGURATION, answer questions 1 through 14 appropriately (since autoconfigure was requested, the defaults presented for these questions should be accurate for your system).

4. In response to question 15, Devices, indicate that you have two MSCP-type controllers:

   *15. Devices: **DU=2<cr>**
        Devices: **.<cr>**

   This will supersede the value of 1 that autoconfigure has determined. Typing a period (.) terminates device input.

   Continue through the next four sections, HOST CONFIGURATION, EXECUTIVE OPTIONS, TERMINAL DRIVER OPTIONS, and SYSTEM OPTIONS, answering questions appropriately.

When you reach the PERIPHERAL OPTIONS section, SYSGEN will ask you questions that pertain only to the MSCP devices on your system. (Unless you indicated that you wished to override other autoconfigure results when you responded to the Devices question (15), then SYSGEN asks questions on those devices.)

The first question requests information about the controller's interrupt vector address, CSR address, the number of DU-type disk drives (there is no default value for this parameter), the number of command rings, and the number of response rings. The question is asked twice, once for contr 0 and once for contr 1, since we have specified two DU-type controllers.

    * DU contr 0 [D:154,172150,,4,4]
    154,172150,3,4,4<cr>

The standard vector address for MSCP controllers is 154_8. The vector for an alternate controller should be allocated from floating vector address space. Any unused vector between 300_8 and 774_8 can be allocated.

The standard CSR address for MSCP controllers is 772150_8. An alternate controller can be located at 772154_8, or in floating CSR address space.

The number of DU-type disk drives depends on the configuration that you have selected for the UC03, or on the number of drives that are attached to a DEC MSCP controller.

When you select a configuration for the UC03, you are taking into account the number of physical disk drives that you are attaching to the UC03's SCSI interface. When you select a configuration, you are also specifying a logical arrangement for the UC03 MSCP subsystem. Some configurations split one physical drive into two logical drives to make file management easier. To determine the number of MSCP units in your subsystem, refer to Tables 2-2 through 2-5 and to the subsection **Understanding MSCP Device Numbering.**

The following types of disk drives can be attached to DEC
MSCP controllers:

   RX50
   RD51
   RC25
   RA60
   RA80
   RA81

The RX50 contains two 5.25-inch floppy diskette drives; count
each RX50 as two drives. The RC25 has both fixed and
removable hard media; count each RC25 as two drives.

Four command rings are reasonable and adequate for most
applications.

Four response rings are reasonable and adequate for most
applications.

6. SYSGEN then asks you to specify the type of disk drive(s) on
each controller:

   * DU contr 0 unit 0. is an RA60/80/81/RC25/RD51/RX50
   [D:RA81] **RD51<cr>**

For the RQDX1, indicate that you have an RD51 and two RX50
(in that order).

For the UC03, indicate that you have one RD51 for each
logical disk (the tape drive is excluded).

RSX-11M does not tolerate gaps in sequence; the unit numbers
must be contiguous. In addition, the unit numbers specified
for each controller must be the same as those reported by the
controller during initialization.

Table 2-2.   MSCP Unit Numbers and Capacities
for Decathlon Subsystems

Subsystem Part Number	MSCP Unit	MSCP Unit Number Capacity
PE3120005	0	71747
PE3120015	0	131939
PE3120006	0	219283
PE3120003	0 1	71747 71747
PE3120014	0 1	131939 131939
PE3120004	0 1	219283 219283
PE3120009	0 1	71747 Varies
PE3120017	0 1	131939 Varies
PE3120010	0 1	219283 Varies
PE3120001	0 1 2	71747 71747 71747
PE3120013	0 1 2	131939 131939 131939

Table 2-2.   MSCP Unit Numbers and Capacities
for Decathlon Subsystems (continued)

Subsystem Part Number	MSCP Unit	MSCP Unit Number Capacity
PE3120002	0	219283
	1	219283
	2	219283
PE3120007	0	71747
	1	71747
	2	Varies
PE3120016	0	131939
	1	131939
	2	Varies
PE3120008	0	219283
	1	219283
	2	Varies

Table 2-3.   MSCP Unit Numbers and Capacities
for Javelin Subsystems

Subsystem Part Number	MSCP Unit	MSCP Unit Capacity
PE2120003	0	71747
PE2120010	0	131939
PE2120004	0	219283
PE2120001	0	71747
	1	71747
PE2120009	0	131939
	1	131939
PE2120002	0	219283
	1	219283

Table 2-3.   MSCP Unit Numbers and Capacities
for Javelin Subsystems (continued)

Subsystem Part Number	MSCP Unit	MSCP Unit Capacity
PE2120005		
No Split	0	71747
	1	Varies
1:1 Split	0	35746
	1	35746
	2	Varies
7:1 Split	0	62556
	1	8936
	2	Varies
PE2120011		
No Split	0	131939
	1	Varies
1:1 Split	0	65774
	1	65774
	2	Varies
8:1 Split	0	115105
	1	16443
	2	Varies
PE2120006		
No Split	0	219283
	1	Varies
1:1 Split	0	109378
	1	109378
	2	Varies
7:1 Split	0	191412
	1	27334
	2	Varies

Table 2-4. MSCP Unit Numbers and Capacities
for Sabre Subsystems

Subsystem Part Number	MSCP Unit	MSCP Unit Capacity
PE0120003-XX	0	71747
PE0120008-XX	0	131939
PE0120006-XX	0	219283
PE0120002-XX	0	20002
PE0120001-XX	0 1	71747 20002
PE0120007-XX	0 1	131939 20002
PE0120005-XX	0 1	219238 20002

Table 2-5. MSCP Unit Numbers and Capacities
for Medley Subsystems

Subsystem Part Number	MSCP Unit	MSCP Unit Capacity
PE0220006-XX	0	71747
PE0220008-XX	0	131939
PE0220003-XX	0	219283
PE0220005-XX	0 1	71747 Varies
PE0220007-XX	0 1	131939 Varies
PE0220001-XX	0 1	219283 Varies

RSX-11M-PLUS OPERATING SYSTEMS (V2.1)

RSX-11M-PLUS SYSGEN is an interrogative program that allows a complete, running RSX-11M-PLUS system to be configured for a particular hardware environment. SYSGEN is well documented in the **RSX-11M-PLUS System Generation and Installation Guide,** and you are expected to rely primarily on that manual. This explanation is provided only to remove some ambiguities that the installation of the UC03 may invoke.

SYSGEN supports autoconfigure. However, autoconfigure only detects the MSCP controller that is located at the standard CSR address. The CSR address for an alternate MSCP controller must be attached to the host operating system manually.

Installing a Single MSCP Controller

If you have only one UC03, install it at the standard CSR address (772150_8) and use autoconfigure to connect your peripherals. The procedure given in the **RSX-11M-PLUS System Generation and Configuration Guide** is adequate.

Installing an Alternate MSCP Controller

If you have two MSCP controllers, such as an RQDX1 and a UC03, we recommend that you use autoconfigure to connect the first controller at the standard CSR address (772150_8). We recommend that the RQDX1 be installed at the standard CSR address and the UC03 at the alternate address. Locating the UC03 at the alternate CSR address does not prevent it being used as the system device.

The alternate MSCP controller is connected to the operating system after the initial SYSGEN is complete and system is running. To connect the second Server, use the "Add a Device" option of SYSGEN. The following procedure describes the process:

1. Invoke SYSGEN.

> **SET /UIC=[200,200]<cr>**
> **@SYSGEN<cr>**

2. To indicate that you want to do a subset of the SYSGEN
   procedure, answer NO the to the following questions:

   * SU120   Do you want to do a complete SYSGEN?
                  [Y/N D:Y]: **N<cr>**

   * SU130   Do you want to continue a previous SYSGEN
                  from some point? [Y/N D:Y]: **N<cr>**

3. To indicate that you want to execute a specific module of the
   SYSGEN procedure, answer YES to this question:

   * SU150   Do you want to do any individual sections
                  of SYSGEN? [Y/N D:Y]: **Y<cr>**

4. Select the Add a Device section of SYSGEN:

   * SU160   Which sections would you like to do?
                  [S R:0.-15.]: **H<cr>**

   Type the letter 'H' to select the Add a Device section.
   SYSGEN will now ask you all of the questions in the Choosing
   Peripheral Configuration section.
   The questions that SYSGEN asks pertain the type and number of
   controllers that are installed on your system. There is one
   question for each type of controller that RSX-11M-PLUS can
   support. Answer zero (0) for all types of controllers until
   you are prompted for the number of UDA-type devices.

   There is an exception: if your system has MASSBUS controllers
   (RH-type), specify the proper number when asked. Answer
   zero, however, to all the questions that follow about MASSBUS
   devices that are attached to the MASSBUS controller (DB, DR,
   DS, EM, and MM types).

5. When you are asked to specify the number of MSCP-type
   devices, answer appropriately:

   * CP3004   How many MSCP disk controllers do you
                  have? [D R:0.-63. D:0.] **2<cr>**

6. Give the total number of MSCP disk drive (on all controllers)
   installed on the system.

   * CP3008   How many MSCP disk drives do you have?
                  [D R:0.-n. D:1.] **5<cr>**

   The answer to this question will depend on the configuration
   that you have selected for the UC03 and on the number of
   drives that are attached to any DEC MSCP controllers.

When you select a configuration for the UC03, you are taking into account the number of physical disk drives that you are attaching to the UC03's SCSI interface. When you select a configuration, you are also specifying a logical arrangement for the UC03 MSCP subsystem. Some configurations split one physical drive into two logical drives to make file management easier. To determine the number of MSCP units in your subsystem, refer to Tables 2-2 through 2-5 and **Understanding MSCP Device Numbering.**

The following types of disk drives can be attached to DEC MSCP controllers:

    RX50
    RD51
    RC25
    RA60
    RA80
    RA81

The RX50 contains two 5.25-inch floppy diskette drives; count each RX50 as two drives. The RC25 has both fixed and removable hard media; count each RC25 as two drives.

6. SYSGEN then asks you to specify controllers per disk drives.

    * CP3044   To which DU controller is DU0: connected?
                [S R:1-1]: **A<cr>**

This question is asked as many times as you have indicated that there are MSCP drives on the system. RSX-11M-PLUS does not tolerate gaps in sequence; the unit numbers must be contiguous. In addition, the unit numbers specified for each controller must be the same as those reported by the controller during initialization.

7. Enter the vector address for each MSCP controller:

    * CP3068   Enter the vector address of DUA
                [O R:60-774 D:154]

The standard vector address for MSCP controllers is 154_8. The vector for an alternate controller should be allocated from floating vector address space. Any unused vector between 300_8 and 774_8 can be allocated.

8. Enter the CSR address for each MSCP controller:

> * CP3072   What is its CSR address?
> [O R:160000-177700 D:172150]

The standard CSR address for MSCP controllers is 772150_8. An alternate controller can be located at 772154_8, or in floating CSR address space.

9. Specify the number of command rings for each MSCP controller:

> * CP3076   Enter the number of command rings for DUA
> [D R:1.-8. D:4.] **4<cr>**

Four command rings are reasonable and adequate for most applications.

10. Specify the number of response rings for each MSCP controller:

> * CP3076   Enter the number of response rings for DUA
> [D R:1.-8. D:4.] **4<cr>**

Four response rings are reasonable and adequate for most applications.

RT-11 OPERATING SYSTEMS (V5.0)

The RT-11 Operating System supports up to four MSCP controllers with up to 256 devices (total) on the four controllers. The following paragraphs discuss the CSR and vector addresses for MSCP controllers under RT-11 in host systems where there is one or more MSCP controllers. Disk partitioning, a unique feature of RT-11 that is applicable regardless of the number of controllers, is also discussed.

Installing a Single MSCP Controller

If you host system includes only one MSCP controller, install it with a CSR address of 772150_8. The RT-11 version of autoconfigure finds and installs the handler (driver) for that controller. In single MSCP controller configurations, it is not necessary to run SYSGEN. You may use one of the pregenerated monitors that are provided with the RT-11 Distribution. To get the most out of your MSCP subsystem, however, you must modify the system start up command file, STARTx.COM, to properly partition the disk drives. Refer to **Disk Partitioning.**

Installing an Alternate MSCP Controller

If your host system includes more than one MSCP controller, you may modify the MSCP handler as described in the **RT-11 Software Support Manual,** or perform a SYSGEN. The following procedure describes the SYSGEN technique:

1. Initiate SYSGEN:

   R SYSGEN.COM<cr>

   Answer questions 1 through 25 appropriately.

2. Indicate that you want the system to use the start-up command file when booting:

   26. Do you want the start-up indirect
       file (Y)? **Y<cr>**

   The start-up command file is required to allow additional MSCP controller CSR addresses to be specified and to partition the disks consistently when the system is bootstrapped. Answer questions 27 through 32 appropriately.

3. Indicate that you want MSCP support when the Disk Options dquestion appears:

   Enter the device name you want support for
   [dd]: **DU<cr>**

   Specify support for all other devices in your host system configuration, as well. Indicate that there are no more devices by entering a period.

   Enter the device name you want support for
   [dd]: **.<cr>**

   SYSGEN does not prompt for the number of DU devices here. Answer questions 33 through 66 appropriately.

4. Indicate the number of MSCP controllers on your system in response to this question:

   67. How many ports are to be
       supported (1)? **2<cr>**

   RT-11 refers to individual MSCP controllers as ports. Each port has its own CSR and vector addresses.

5. You must specify the addresses of all MSCP controllers
   (ports) using the SET CSR keyboard command. To ensure that
   this is done consistently and automatically on power up, you
   must add the commands to the system start-up command file,
   STARTx.COM. The "x" stands for the monitor that is being
   used where "x" is S, F, or X for single-job, foreground/
   background, or extended memory. Edit the command file to
   include the following statements:

   ```
   SET DU CSR=772150
   SET DU CSR2=772154
   SET DU VECTOR=154
   SET DU VEC2=300
   ```

   The CSR and vector address for the second device can be any
   unused address in the I/O page or vector page.

Disk Partitioning

RT-11 is unable to handle DU-type drives with a capacity of more
than 65,535 blocks (33.5 megabytes). To allow drives with larger
capacities to be used, RT-11 allows individual physical drives to
be partitioned into multiple logical drives. This is done by
assigning as many logical drive names (DU0, DU1, etc) to a
physical drive as that drive can support. The statements that
make that assignment should be placed in the system start-up
command file. This ensures that the drives are automatically
partitioned every time the system is bootstrapped, and that the
partitions are always the same. Use the following procedure to
determine the total number of logical drives to assigned to each
physical drive.

1. Consult Tables 2-2 through 2-5. Find your subsystem part
   number. Note down the capacity given in the MSCP Unit
   Capacity Number column for each MSCP Unit (except tape units,
   ignore those). If the UC03 is at an alternate CSR address
   (not 772150_8), then you must specify an MSCP Unit number
   offset by using switches SW2-1 and SW2-2 (see **Section 3**).
   Add the selected offset to the MSCP Unit number from Table
   2-2, 2-3, 2-4, or 2-5 to determine the proper Unit number to
   use in the SET statements.

2. Divide the capacity for each MSCP Unit by 65,535. If the
   result is a number greater than one, then that MSCP Unit
   should be partitioned into multiple logical units. (The last
   partition on a disk may be smaller that 65,535 blocks.)
   Round the result up to the nearest whole number. That whole
   number equals the number of logical disks into which that
   MSCP unit should be partitioned.

3. You must then include a series of statements in the system start-up command file, STARTx.COM, that assign logical names to each partition. The statements have the following format:

        SET DUn UNIT=y PART=x

   where "n" is the logical device name, "y" is physical MSCP unit number (taken from Table 2-2), and "x" is the partition number. You must do this for each partition on each drive, including drives that can hold only one partition.

For example:

You have a Sabre subsystem P/N PE0120005-XX. You have located your subsystem part number in Table 2-5. MSCP Unit 0 has a capacity of 219,283 blocks; unit 1 has a capacity of 20,002 blocks.

$$\frac{219,283}{65,535} = 3.35 \text{ (4 logical units)}$$

$$\frac{20,002}{65,535} = 0.31 \text{ (1 logical unit)}$$

Dividing the Unit Capacities by 65,535 and rounding the result up to the nearest whole number gives the number of logical units into which each should be partitioned.

You begin assigning logical names to the partitions beginning with DU0. Assign logical names to the partitions on MSCP Unit 0 first. The assignments are made as follows:

        SET DU0 UNIT=0 PART=1
        SET DU1 UNIT=0 PART=2
        SET DU2 UNIT=0 PART=3
        SET DU3 UNIT=0 PART=4

        SET DU4 UNIT=1 PART=1

OVERVIEW

If you follow the step-by-step instructions in this section, you should be able to install your UC03 Host Adapter without any problems. If you are not familiar with the installation procedure for host adapters, Emulex recommends reading this entire installation section before beginning to install your UC03.

To install the UC03, follow the instructions in these subsections:

- Unpacking and Inspecting Your UC03
- Setting Up Your UC03
- Preparing the System
- Installing Your UC03 in the Backplane
- Cabling the UC03
- Powering Up the System
- Bootstrapping the System
- Re-assembling the System

Preparing for Installation

Table 3-1 outlines the steps required to install the UC03 and lists the section and page number where each procedure is described.

Table 3-1. Installation Checklist

Action	Section
Select tools	Overview, page 46
Unpack and inspect the UC03	Unpacking Your UC03, page 48
Set switches on the UC03	Setting Up the UC03, page 49
Prepare the system	Preparing Your System, page 66
Plug the UC03 in backplane	Installing in the Backplane, page 70
Cable the UC03	Cabling, page 71
Power-up the system	Powering Up the System, page 76
Bootstrap the system	Bootstrapping the System, page 77
Re-assemble the system	Re-assembling the System, page 82

Tools You Need to Install the UC03

To install the UC03, Emulex recommends that you use these tools:

- Standard screwdriver

- Phillips-head screwdrivers, numbers 1 and 0.

Figure 3-1 shows a standard and a Phillips-head screwdriver.

STANDARD

PHILLIPS-HEAD
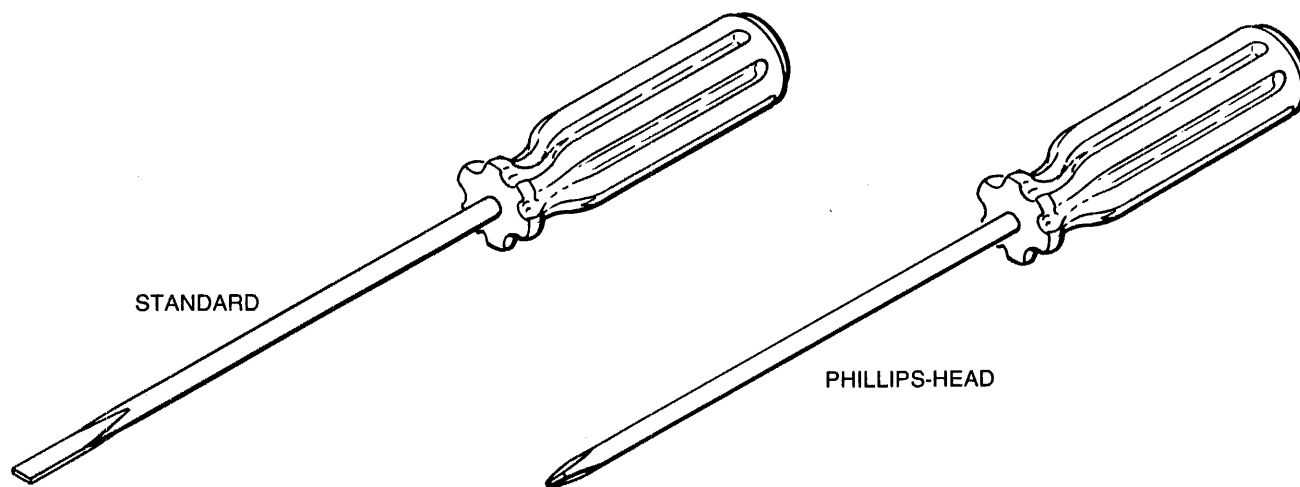
Figure 3-1. Tools

How to Set Switches

The UC03 uses two types of Dual In-line Package (DIP) switches which are shown in Figure 3-2.

Switch-setting tables in this manual describe the proper switch positions by using the numeral one (1) to indicate the ON (closed) position, and the numeral zero (0) to indicate the OFF (open) position. In the switch-setting example, both types of switch packs are set to the same code in the sample switch-setting table.
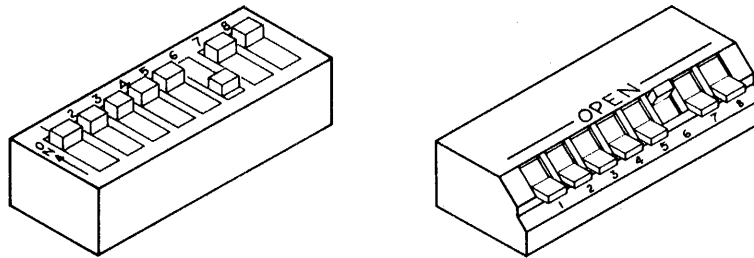

```
------------ SW1 ------------
```

1	2	3	4	5	6	7	8
1	1	1	1	1	0	1	1

Figure 3-2.   Switch Setting Example

Changing Switch Positions

If you change a switch position on the UC03, you must also reset the UC03 so that an initialization program reads the codes established by the switch settings. To reset the UC03, either toggle switch SW1-1 (ON then OFF), or power-down and power-up the the system.

Maintaining FCC Class A Compliance

Emulex has tested the UC03 with DEC computers that comply with FCC Class A limits for radiated and conducted interference. When properly installed, the UC03 does not cause compliant computers to exceed Class A limits.

To limit radiated interference, DEC completely encloses the components of their computers that generate or could conduct radio frequency interference (RFI) with a grounded metal shield (earth ground). When installing the UC03, nothing must be done that would reduce this shield's effectiveness. That is, when the UC03 installation is complete, no gap in the shield that would allow RFI to escape can be allowed.

The steps which must be taken to maintain the integrity of the shield and to limit conducted interference are explained fully in the following subsections:

- PREPARING YOUR SYSTEM
- CABLING

UNPACKING AND INSPECTING YOUR UC03

Emulex products are shipped in special containers that are designed to provide full protection under normal transit conditions. Immediately upon receipt, the shipping container should be inspected for evidence of possible damage incurred in transit. Any obvious damage to the container, or indications of actual or probable equipment damage, should be reported to the carrier company in accordance with instructions on the form included in the container.

The UC03 is shipped in a small cardboard box. Remove the UC03 printed circuit board assembly (PCBA) from the shipping carton and from the anti-static plastic bag. Save these packing materials for future use.

Refer to the shipping invoice and verify that all listed equipment is present. Verify also that model or part numbers (P/N), revision levels, and serial numbers agree with those on the shipping invoice. These verifications are important to confirm warranty. If evidence of physical damage or identity mismatch is found, notify an Emulex representative immediately. If the equipment must be returned to Emulex, it should be shipped in the original container.

Visually inspect the UC03 after unpacking. Check for such items as bent or broken connector pins, damaged components, or any other evidence of physical damage.

Examine all socketed components carefully to ensure they are properly seated.

SETTING UP YOUR UC03

We recommend that you read **Section 2, PLANNING YOUR UC03 INSTALLATION,** before you set up your UC03 Host Adapter.

When you receive your UC03, the switches are set at the factory standard positions. These factory standard switch positions enable the UC03 to work with most user applications. Table 3-2 lists and defines functions and factory settings of the switches on the UC03.

Factory standard positions are not assigned to switches SW1-6 through SW1-10 because the settings vary with the subsystem supported by the UC03. However, if you order an Emulex packaged subsystem, your UC03 is set up at the factory to operate with your subsystem. The UC03 switch settings for Emulex subsystems are described in the subsection entitled **Defining Your Subsystem.**

Figure 3-3 shows the component locations on the UC03 PCBA.

To set up the UC03, see Figure 3-3 and use the following procedure:

1. For most applications, simply check the switch positions on your UC03 and ensure that they match the factory standard settings listed in Table 3-2 and the settings listed for your subsystem in Table 3-3.

2. If you have a DEC RQDX1 or more than one UC03 in your system, follow the instructions in these subsections:

   ● **Selecting Your LSI-11 Bus Address**
   ● **Selecting Your SCSI Bus Address**
   ● **Defining the MSCP Device Number for the First Logical Drive Supported by an Alternate UC03**

3. If you want to use the 22-bit memory addressing capability of the UC03, follow the instructions in the subsection **Installing the 22-Bit Memory Addressing Option.**

4. If you want to use automatic bootstrapping, read **Enabling the Automatic Bootstrap Feature.**

5. If your UC03 supports a subsystem with more than one SCSI-compatible controller, read **Using the Disconnect/Reconnect Feature.**

6. Record your UC03 switch settings on the form provided in the subsection **Making a Setup Record.**

Table 3-2.   Functions of Switches on UC03

Switch	Factory Setting	Function
SW1-1	0 (OFF/OPEN)	UC03 Run (OFF) vs. Reset/Halt (ON)
SW1-2	0 (OFF/OPEN)	Automatic Bootstrapping (OFF=Disable, ON=Enable)
SW1-3	0 (OFF/OPEN)	Unit to Bootstrap from (OFF=LUN0, ON=LUN1)
SW1-4	0 (OFF/OPEN)	LSI-11 Bus Address - Table 3-3*
SW1-5	0 (OFF/OPEN)	LSI-11 Bus Address - Table 3-3*
SW1-6	NS	Subsystem Defined - Table 3-4
SW1-7	NS	Subsystem Defined - Table 3-4
SW1-8	NS	Subsystem Defined - Table 3-4
SW1-9	NS	Subsystem Defined - Table 3-4
SW1-10	NS	Subsystem Defined - Table 3-4
SW2-1	0 (OFF/OPEN)	MSCP Device Number of First Logical Drive on Alternate UC03
SW2-2	0 (OFF/OPEN)	MSCP Device Number of First Logical Drive on Alternate UC03
SW2-3	0 (OFF/OPEN)	Disconnect/Reconnect (OFF=Disable, ON=Enable)
SW2-4	0 (OFF/OPEN)	LSI-11 Bus Address - Table 3-3*
SW2-5	0 (OFF/OPEN)	Self-Test Error Reporting (OFF=Disable, ON=Enable)
SW2-6	0 (OFF/OPEN)	22-Bit Memory Addressing (OFF=18-Bit, ON=22-Bit)
SW2-7	1 (ON/CLOSED)	SCSI Bus Address - Table 3-5**
SW2-8	1 (ON/CLOSED)	SCSI Bus Address - Table 3-5**
SW2-9	1 (ON/CLOSED)	SCSI Bus Address - Table 3-5**
SW2-10	0 (OFF/OPEN)	Reserved
SW3-1	0 (OFF/OPEN)	Reserved
SW3-2	0 (OFF/OPEN)	Reserved
SW3-3	0 (OFF/OPEN)	Reserved
SW3-4	0 (OFF/OPEN)	Reserved

*   = Standard factory setting is $(17)772150_8$.   Table 3-3 defines
      alternate switch settings.
** = Standard factory setting is 7.   Table 3-5 defines alternate
      switch setting.
NS = No standard factory setting.
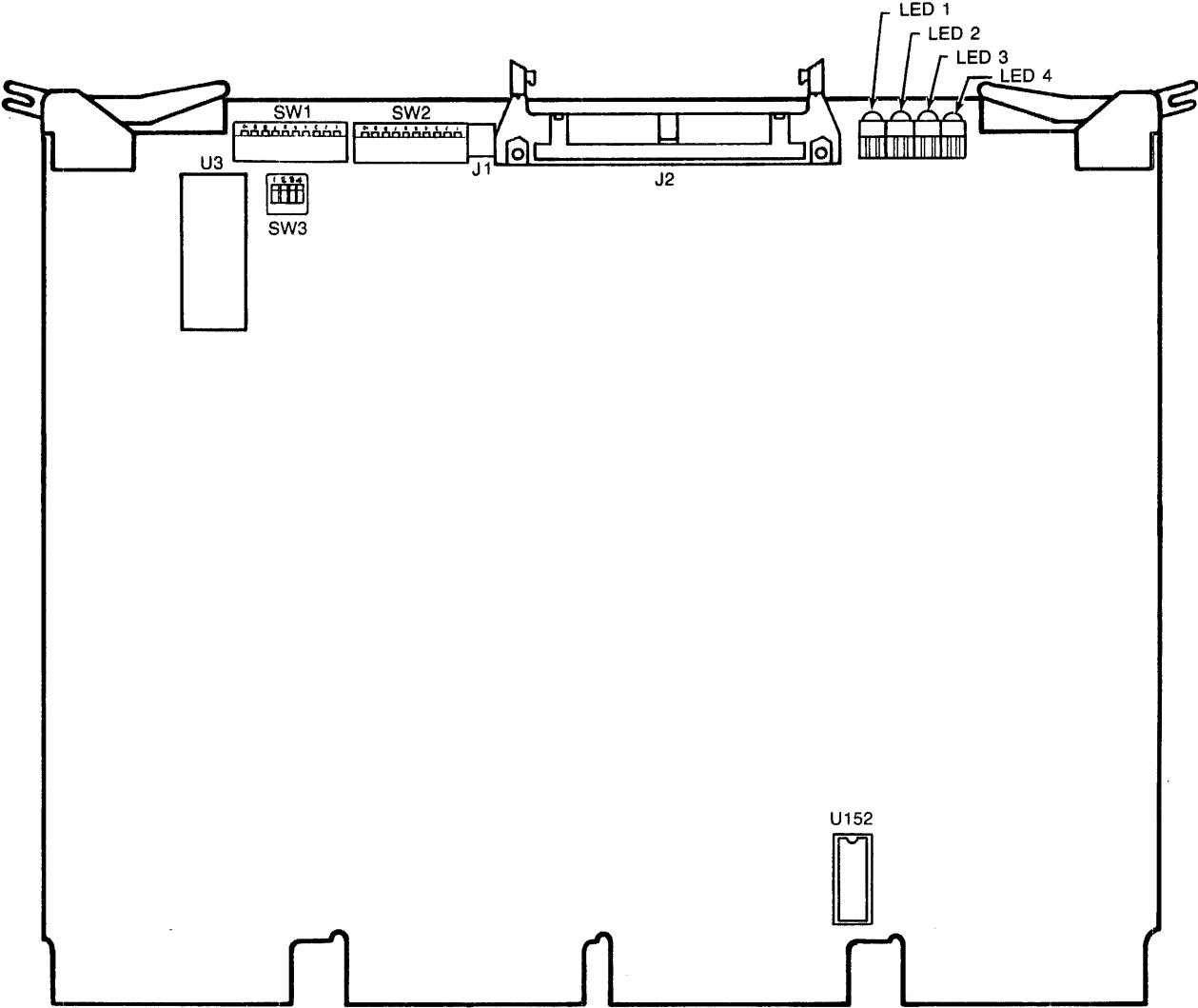
Figure 3-3.   UC03 Component Locations

Defining Your Subsystem

Switches SW1-6 through SW1-10 describe your subsystem to the UC03 Host Adapter. The UC03 supports single subsystems and daisy-chained subsystems. Tables 3-3A through 3-3C list and define the UC03 switch settings for Emulex subsystems.

To determine the correct switch settings for your application, see Tables 3-3A through 3-3C and use the following procedure:

1. Determine your subsystem configuration:

   a. Do you have a single subsystem that uses one disk controller? If so, refer to Table 3-3A during this procedure.

   b. Do you have a Decathlon subsystem that uses two disk controllers? If so, refer to Table 3-3B during this procedure.

   c. Do you have daisy-chained subsystems? If so, refer to Table 3-3C during this procedure.

   For more information regarding the components in your subsystem, refer to your Emulex subsystem User's Manual.

2. Find your subsystem's model and part number in the table you selected in step 1. The first column lists the subsystem model and the second column lists the part number. Your subsystem's part number is located on the product identification (ID) plate on the rear panel of the subsystem.

3. Choose and set the appropriate positions for UC03 switches SW1-6 through SW1-10 to match your subsystem model and part number found in step 2.

4. If you have selected a subsystem configuration from Tables 3-3B or 3-3C, ensure that the disk controllers in your subsystem(s) are set at the correct SCSI bus address. For more information, refer to the **NOTE** that follows Table 3-3B in this manual or to your Emulex subsystem User's Manual.

For more detailed information about the subsystem configurations supported by the UC03 Host Adapter, see Appendix C in this manual.

Javelin Subsystems

If you have a Javelin subsystem with one disk drive and one tape drive, your storage and backup capabilities can be arranged in three ways:

- One logical disk drive
  One logical tape drive

- Two logical disk drives, divided in a 1:1 ratio
  One logical tape drive

- Two logical disk drives, divided in a 7:1 ratio
  One logical tape drive.

If you have a Javelin subsystem, Model ED2/30-T, ED2/70-T, or ED2/110-T, you may select any of these options. For more information, refer to **Using Logical Drive Mapping to Emulate File-Structured Backup and Restore Operations** in Section 2.

<div align="center">

NOTE

</div>

The switch settings specified in Table 3-3A for Javelin subsystems using one disk drive split into two logical drives may also be used for other Emulex single disk drive subsystems. For more information, refer to Appendix C in this manual.

Table 3-3A. UC03 Switch Settings for Single Subsystems
that Use One Disk Controller

Subsystem Model	Subsystem Part Number	UC03 SW1				
		6	7	8	9	10
Decathlon						
ER3/30	PE3120005	1	0	0	0	1
ER3/70	PE3120015	1	0	0	1	1
ER3/110	PE3120006	1	0	0	1	0
ER3/30-30	PE3120003	0	0	1	0	1
ER3/70-70	PE3120014	0	0	1	1	1
ER3/110-110	PE3120004	0	0	1	1	0
ER3/30-T	PE3120009	1	0	0	0	1
ER3/70-T	PE3120017	1	0	0	1	1
ER3/110-T	PE3120010	1	0	0	1	0
ER3/30-30-30	PE3120001	1	0	1	0	1
ER3/70-70-70	PE3120013	1	0	1	1	1
ER3/110-110-110	PE3120002	1	0	1	1	0
ER3/30-30-T	PE3120007	0	0	1	0	1
ER3/70-70-T	PE3120016	0	0	1	1	1
ER3/110-110-T	PE3120008	0	0	1	1	0

0 = OFF, open
1 = ON, closed
ER = Rack-Mounted Versions
ET = Tower (free-standing) Versions (not listed but same as ER
     except for mounting)
ED = Desk-Top Versions (not listed but same as ER except
     for mounting)
XX = 01=Rack-Mounted
XX = 02=Table-top

Table 3-3A.   UC03 Switch Settings for Single Subsystems
that Use One Disk Controller (continued)

Subsystem Model	Subsystem Part Number	UC03 SW1				
		6	7	8	9	10
Javelin						
ED2/30	PE2120003	1	0	0	0	1
ED2/70	PE2120010	1	0	0	1	1
ED2/110	PE2120004	1	0	0	1	0
ED2/30-30	PE2120001	0	0	1	0	1
ED2/70-70	PE2120009	0	0	1	1	1
ED2/110-110	PE2120002	0	0	1	1	0
ED2/30-T	PE2120005					
No Split		1	0	0	0	1
1:1 Split		0	1	0	0	1
7:1 Split		0	1	1	0	1
ED2/70-T	PE2120011					
No Split		1	0	0	1	1
1:1 Split		0	1	0	1	1
7:1 Split		0	1	1	1	1
ED2/110-T	PE2120006					
No Split		1	0	0	1	0
1:1 Split		0	1	0	1	0
7:1 Split		0	1	1	1	0

0 = OFF, open 1 = ON, closed ER = Rack-Mounted Versions ET = Tower (free-standing) Versions (not listed but same as ER except for mounting) ED = Desk-Top Versions (not listed but same as ER except for mounting) XX = 01=Rack-Mounted XX = 02=Table-top
continued next page

Table 3-3A.   UC03 Switch Settings for Single Subsystems
               that Use One Disk Controller (continued)

Subsystem Model	Subsystem Part Number	UC03 SW1				
		6	7	8	9	10
SABRE						
ER2/30	PE0120003-XX	1	0	0	0	1
ER2/70	PE0120008-XX	1	0	0	1	1
ER2/110	PE0120006-XX	1	0	0	1	0
ER2/I	PE0120002-XX	1	0	0	0	0
ER2/30-I	PE0120001-XX	0	0	0	0	1
ER2/70-I	PE0120007-XX	0	0	0	1	1
ER2/110-I	PE0120005-XX	0	0	0	1	0
Medley						
ES2/30	PE0220006-XX	1	0	0	0	1
ES2/70	PE0220008-XX	1	0	0	1	1
ES2/110	PE0220003-XX	1	0	0	1	0
ES2/30-S	PE0220005-XX	1	0	0	0	1
ES2/70-S	PE0220007-XX	1	0	0	1	1
ES2/110-S	PE0220001-XX	1	0	0	1	0

```
0  = OFF, open
1  = ON, closed
ER = Rack-Mounted Versions
ET = Tower (free-standing) Versions (not listed but same as ER
     except for mounting)
ED = Desk-Top Versions (not listed but same as ER except
     for mounting)
XX = 01=Rack-Mounted
XX = 02=Table-top
```

5(,A

Table 3-3B. UC03 Switch Settings for Single Subsystems
that Use Two Disk Controllers

Subsystem Model	Subsystem Part Number	UC03 SW1				
		6	7	8	9	10
Decathlon						
ER3/30-30-T*	PE31200nn	1	1	0	0	1
ER3/70-70-T*	PE31200nn	1	1	0	1	1
ER3/110-110-T*	PE31200nn	1	1	0	1	0

```
0  = OFF, open
1  = ON, closed
*  = Model uses two disk controllers
ER = Rack-Mounted Versions
ET = Tower (free-standing) Versions (not listed but same as ER
     except for mounting)
ED = Desk-Top Versions (not listed but same as ER except
     for mounting)
XX = 01=Rack-Mounted
XX = 02=Table-top
```

NOTE

If your UC03 application uses a subsystem
that has more than one disk controller or
daisy-chained subsystems, then you must
ensure that each disk controller is set
for the correct address on the SCSI bus.
Emulex has defined standard SCSI bus
address assignments for disk controllers
used in packaged subsystems:

Disk Controllers	First Subsystem	Second Subsystem
Iomgega	1	3
First (other)	0	2
Second (other)	5	5

Table 3-3C. UC03 Switch Settings for Daisy-Chained Subsystems

Subsystem Models	Subsystem Part Numbers	UC03 SW1				
		6	7	8	9	10
Javelin and Javelin						
ED2/30-30,ED2/30-T	PE2120001,PE2120005	1	1	1	0	1
ED2/40-40,ED2/40-T	PE21200nn,PE21200nn	1	0	1	0	0
ED2/40-40*,ED2/40-T	PE21200nn,PE21200nn	1	1	1	0	0
ED2/70-70,ED2/70-T	PE2120009,PE2120011	1	1	1	1	1
ED2/110-110,ED2/110-T	PE2120002,PE2120006	1	1	1	1	0
Javelin and Medley						
ED2/30-30,ES2/30-S	PE2120001,PE0220005	1	1	1	0	1
ED2/40-40,ES2/40-S	PE21200nn,PE02200nn	1	0	1	0	0
ED2/40-40*,ES2/40-S	PE21200nn,PE02200nn	1	1	1	0	0
ED2/70-70,ES2/70-S	PE2120009,PE0220007	1	1	1	1	1
ED2/110-110,ES2/110-S	PE2120002,PE0220001	1	1	1	1	0

```
0  = OFF, open
1  = ON, closed
*  = Model uses two disk controllers
ER = Rack-Mounted Versions
ET = Tower (free-standing) Versions (not listed but same as ER
     except for mounting)
ED = Desk-Top Versions (not listed but same as ER except
     for mounting)
XX = 01=Rack-Mounted
XX = 02=Table-top
```

Selecting Your LSI-11 Bus Address

The UC03 must be assigned a unique address on the LSI-11 bus, known as a device address, base address, or Control and Status Register (CSR) address. The UC03 is set up at the factory to the standard LSI-11 bus base address for MSCP-type devices, $(17)772150_8$.

If the UC03 is the primary MSCP-type device in your system, use the standard base address; if your UC03 is a secondary MSCP-type device, use the alternate base address.

Set switches SW1-4, SW1-5 and SW2-4 in the OFF position for the standard base address of $(17)772150_8$. For an alternate address of $(17)772154_8$, set switches SW1-4 and SW1-5 in the OFF position, and set SW2-4 in the ON position. Table 3-4 lists the switch settings for the UC03 standard and alternate LSI-11 bus base addresses.

If your have more than one UC03 in your system, set one UC03 at the standard base address and set the other at the alternate base address. If you have a DEC RQDX1 in your system, keep the RQDX1 at the standard base address and set your UC03 at the alternate base address.

Table 3-4. UC03 LSI-11 Bus Address Switch Settings

LSI-11 Bus Address	SW1-4	SW1-5	SW2-4	Factory
Standard $(17)772150_8$	0(OFF)	0(OFF)	0(OFF)	✓
Alternate $(17)772154_8$	0(OFF)	0(OFF)	1(ON)	

Your Vector Address

The interrupt vector address for the UC03 is programmed into the UC03 by the host operating system during the power-up sequence. Refer to **INTEGRATING THE UC03 INTO YOUR OPERATING SYSTEM**, Section 2.

Selecting Your SCSI Bus Address

The UC03 must also be assigned a unique address on the SCSI bus. This address is programmed into the UC03 by using switches SW2-7 through SW2-9. Emulex has defined factory standard addresses on the SCSI bus for a primary and alternate UC03 Host Adapter.

A primary UC03 is assigned the address of seven. If your system has two UC03 Host Adapters and each UC03 resides on a separate SCSI bus, each UC03 is assigned the primary address of seven on its respective SCSI bus.

NOTE

If two UC03 Host Adapters reside on the same SCSI bus, the first UC03 is assigned an address of seven, and the second UC03 is assigned an address of six. Placing a second UC03 on the same SCSI bus requires software modifications.

Table 3-5 lists the switch settings for UC03 SCSI bus address.

Table 3-5. UC03 SCSI Bus Address Selection

UC03	SCSI Bus Address	- SW2 - 7	8	9	Factory
First	7	1 (ON)	1 (ON)	1 (ON)	V
Second	6	1 (ON)	1 (ON)	0 (OFF)	

Defining the MSCP Device Number for the First Logical Drive Supported by an Alternate UC03

If you are installing your UC03 at an alternate LSI-11 bus address, you must define the MSCP device number of the first logical drive supported by that alternate UC03 using switches SW2-1 and SW2-2.

The UC03 factory setting assigns the number "4" to the first logical drive supported by an alternate UC03. Table 3-6 lists and defines the UC03 switch settings for the first MSCP device number on an alternate UC03.

For example:

Your system has two UC03 Host Adapters.

The primary UC03 is set to the standard LSI-11 bus address and supports two logical drives, whose MSCP device numbers are DU0 and DU1.

The alternate UC03 is set to the alternate LSI-11 bus address and supports three logical drives. In accordance with MSCP, these drives must have MSCP device numbers of DU2, DU3, and DU4.

In this example, DU2 is the MSCP device number of the first logical drive supported by the alternate UC03. On the alternate UC03, switch SW2-1 is in the OFF position and switch SW2-2 is in the ON position.

For further information, refer to **Section 2, PLANNING YOUR UC03 INSTALLATION.**

Table 3-6.   MSCP Device Number of the First Logical Drive
              Supported by an Alternate UC03

MSCP Device Number	SW2-1	SW2-2	Factory
1	1 (ON)	0 (OFF)	
2	0 (OFF)	1 (ON)	
3	1 (ON)	1 (ON)	
4	0 (OFF)	0 (OFF)	$\checkmark$

Installing the 22-Bit Memory Addressing Option

When you receive your UC03, it is set up to support 18-bit memory addressing. To expand the UC03 memory addressing capability, simply install the 22-bit memory addressing option. The 22-Bit Memory Addressing Kit (Emulex P/N UC0313001) is shipped in the same container as the UC03 Host Adapter.

Before installing the 22-bit memory addressing Integrated Circuit (IC), ensure that your system supports extended addressing. MICRO/PDP-11, LSI-11/23+ and LSI-11/73 systems support 22-bit memory addressing.

CAUTION

If you install a UC03 with the 22-bit memory addressing IC in a system with a backplane that does not support extended memory addressing, the 22-bit memory IC **WILL** be damaged.

To enable 22-bit memory addressing, see Figure 3-4 and use the following procedure:

1. Unpack IC AMD8641 from the 22-Bit Memory Addressing Kit.

2. Grasp the IC between your thumbs and index fingers. Squeeze the pins so that they are flush with the edge of the IC chip body.

3. Find IC socket U152 on the UC03 (see Figure 3-4).

4. Align the notch on the IC with the notch that is outlined on the UC03 at socket U152. (Some IC manufacturers denote chip orientation by using bar or circle markings instead of notches.)

5. Position the IC so that the pins can be inserted in the empty IC socket as shown in the top of Figure 3-4.

6. Place your thumbs on the IC as shown in the bottom of Figure 3-4. Press down on top of the IC until the IC is secured in the socket.

7. Place switch SW2-6 in the ON position.

IC AMD8641

U152

IC AMD8641

U152
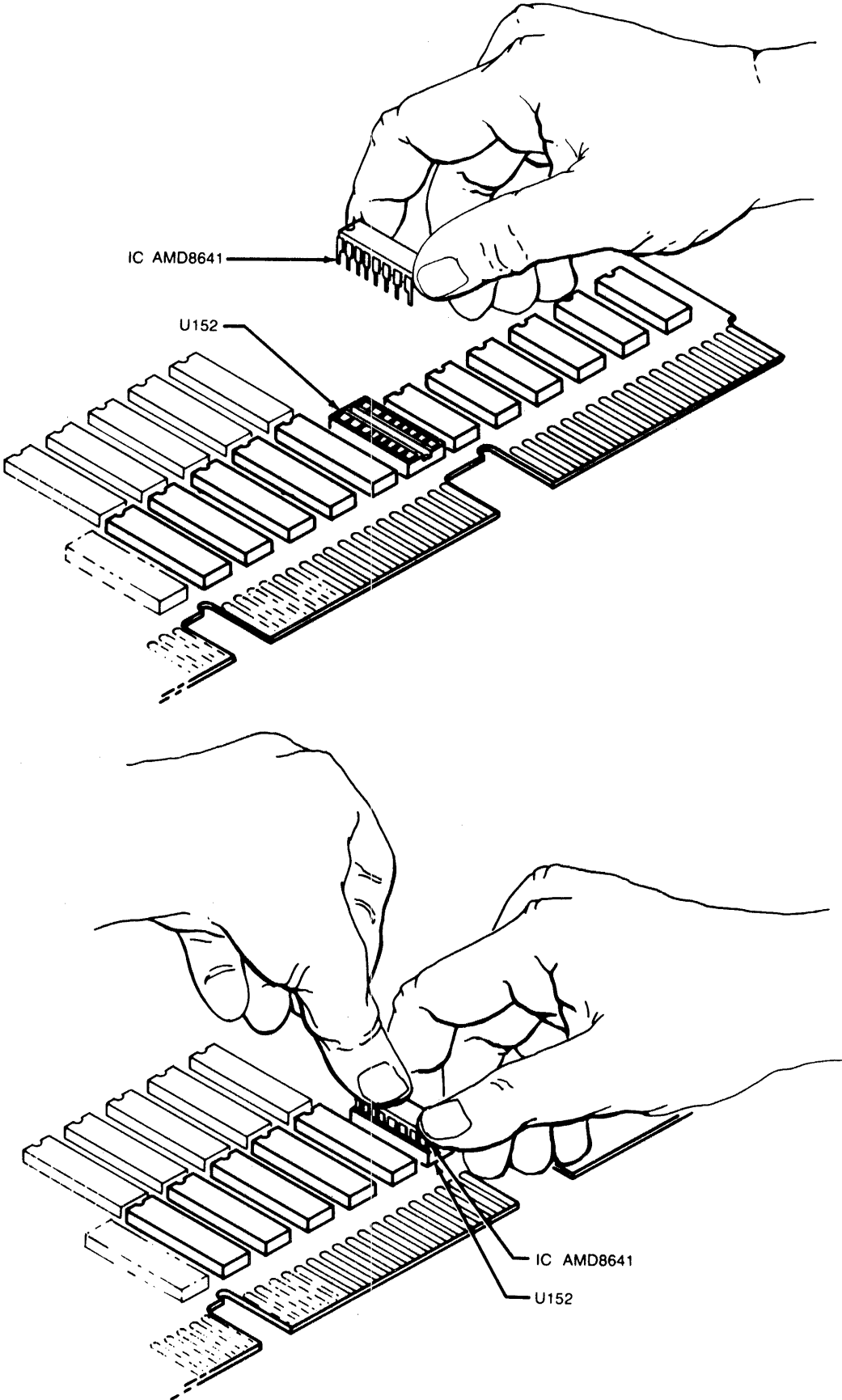
Figure 3-4.   Installing 22-Bit Addressing IC

61

Enabling the Automatic Bootstrap

The UC03 has a built-in bootstrap loader program that causes the UC03 to bootstrap automatically on power-up. The factory standard setting disables this automatic bootstrap feature (switch SW1-2 in the OFF position).

If you select the automatic bootstrap feature on the UC03, you must identify that drive from which the UC03 loads the bootstrap block. The drive is identified by its MSCP device number. Switch SW1-3 selects either MSCP device number zero or one.

NOTE

If you are using an alternate UC03 to bootstrap the system, the UC03 automatically offsets the MSCP device number you select with switch SW1-3.

Table 3-7 lists and defines the switch settings for the automatic bootstrap feature, and Table 3-8 lists and defines the switch settings for the MSCP device number of the unit the UC03 bootstraps from.

To enable automatic bootstrapping on the UC03:

1. If you have an 11/02, 11/23, 11/23+, or 11/73, ensure that the CPU module is set up for powerup mode zero (see Table 3-9).

2. Set switch SW1-2 in the ON position.

3. Set switch SW1-3 to select the MSCP device number of the unit to bootstrap from (see Table 3-8).

Table 3-7. Automatic Bootstrap Switch Settings

Automatic Bootstrap	SW1-2	Factory
Disabled Enabled	0 (OFF) 1 (ON)	$\sqrt{}$

Table 3-8. MSCP Device Number to Bootstrap From

MSCP Device Number	SW1-3	Factory
0 1	0 (OFF) 1 (ON)	V

Table 3-9.   LSI-11 Series CPU Modules
Power-up Mode Zero Setup

CPU Module	Setup
11/73 11/23+ 11/23 11/02	Install W3 and W7 Remove J18-J19 and J18-J17 Remove W5 and W6 Remove W5 and W5

NOTE

By setting up the CPU module to power-up
mode zero, you disable the automatic
bootstrap feature on the DEC RQDX1
controller.

Using the Disconnect/Reconnect Option

If your UC03 supports a mass-storage subsystem with more than one
Emulex SCSI-compatible controller, you should enable the SCSI bus
Disconnect/Reconnect option. When enabled, Disconnect/Reconnect
allows the UC03 to start four commands simultaneously on four
controllers; thus, several operations can be performed at once.
Disconnect/Reconnect ensures efficient use of the SCSI bus and
provides the maximum data throughput rate for the subsystem.

Table 3-10 lists the UC03 switch settings for the
Disconnect/Reconnect option.

Table 3-10. Disconnect/Reconnect Switch Setting

Disconnect/Reconnect	SW2-3	Factory
Enabled Disabled	1 (ON) 0 (OFF)	$\checkmark$

NOTE

If your subsystem has an Adaptec 4000
controller, you may enable the
Disconnect/Reconnect feature on the UC03
even though the Adaptec controller will
not support Disconnect/Reconnect.

If you have an Iomega Cartridge Disk
Drive, you cannot enable the
Disconnect/Reconnect feature on the UC03.

MAKING A SETUP RECORD

After you set up the UC03, take a few minutes to fill out the
UC03 Setup Record provided in Figure 3-5. This information can
help your Emulex service representative if your UC03 or subsystem
requires service.

The UC03 top assembly and serial number are printed on the label
affixed to the top surface of IC U1. The firmware revision
number is printed on the label affixed to the top surface of
IC U3 (see Figure 3-5).

UC03 SETUP RECORD

GENERAL INFORMATION

1. Host computer type _____
2. Host computer operating system _____
   Version_____
3. Subsystem Model _____
   Controller(s)   _____
                    _____
                    _____
                    _____
   Disk drive(s)   _____
                    _____
                    _____
   Tape drive(s)   _____

UC03/M1 INTELLIGENT HOST ADAPTER

1. Firmware revision number _____
2. Warranty expiration date _____
3. Top assembly number _____
   Serial number_____
4. LSI-11 Bus address _____
5. Interrupt vector address _____
6. 22-bit addressing IC (AMD 8641) installed (Y or N) _____
7. Switch settings (□ = OFF   ■ = ON)
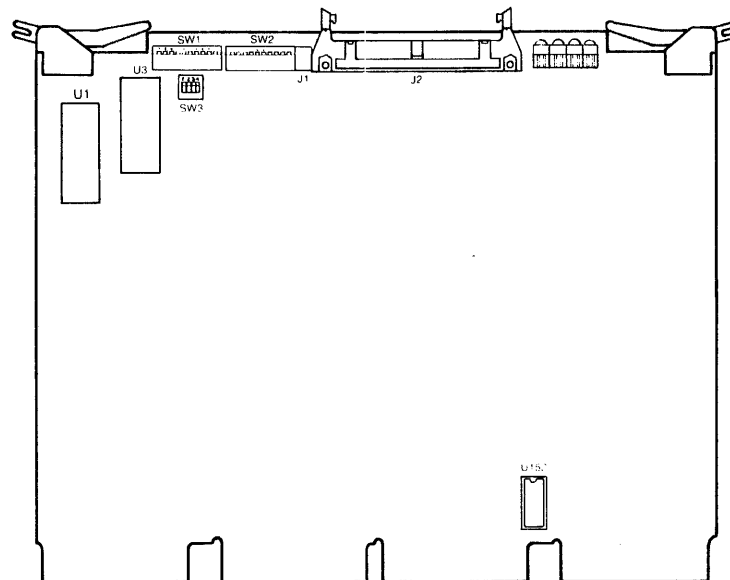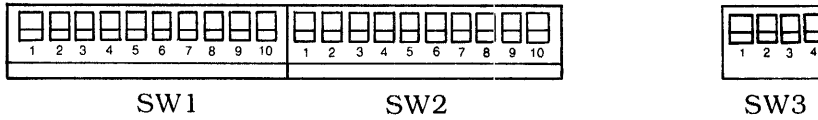
U1 label identifies top assembly and serial numbers.
U3 label identifies firmware revision.

Use Pencil

Figure 3-5.   UC03 Setup Record

PREPARING YOUR SYSTEM

After you have set up the UC03, prepare your system for UC03 installation.

Preparing Your Emulex Subsystem

1. Unpack and install your subsystem according to the instructions in your Emulex subsystem User's Manual.

2. Position the subsystem in its final place before you begin to install the UC03. By positioning the subsystem, you can determine the routing and length of the SCSI bus cable which connects the UC03 to your subsystem.

3. If the UC03 supports more than one subsystem, place the subsystems side by side to simplify daisy chaining. Remember, the recommended maximum length of the SCSI bus cable is 20 feet (6 meters).

Your Emulex subsystem is set up at the factory to operate with the UC03 Host Adapter. Setup items include controller SCSI bus address and SCSI bus termination. Refer to the appropriate Emulex subsystem manual for further information.

Preparing Your DEC System

The UC03 installs in the LSI-11 bus-based systems of the DEC PDP-11 family. In this section, we describe preparing the MICRO/PDP-11 and the PDP-11/23 rack-mount systems. For additional information regarding your DEC system, consult your DEC manual.

To prepare your MICRO/PDP-11:

1. Power-down the system by turning OFF the main AC switch.

2. Remove the rear cover from the chassis so that patch panel is exposed.

3. Remove the screws from the patch panel using a standard screwdriver. Save the screws for re-assembling the system.

4. Remove the patch panel.

5. Find the flat-ribbon cable that connects the CPU module to the patch panel. (The CPU module is always in the first backplane slot.)

6. Disconnect the CPU flat-ribbon cable from the patch panel.

To prepare your rack-mount PDP-11/23:

1. Power down the system by turning OFF the main AC switch.

2. Open the door at the rear of the chassis so that the back cover is exposed.

3. Remove the cover so that the backplane is exposed.

Preparing the Emulex Patch Panel

If you are using an Emulex patch panel with your MICRO/PDP-11, the patch panel is shipped with your Emulex subsystem.

To prepare the Emulex patch panel, use a Phillips-head #1 screwdriver, see Figure 3-6 and follow these steps:

1. Remove the console distribution panel insert from section A of the DEC patch panel. Save the screws.

NOTE

You should have already removed the DEC patch panel in Step 4 of the previous section, **Preparing Your DEC System.**

2. Install this console distribution panel insert in section A of the Emulex patch panel. Use the screws saved in Step 1.

3. Remove the panel insert from section B of the DEC patch panel. Save the screws.

4. Install this panel insert in section B of the Emulex I/O panel. Use the screws saved in Step 3.

5. Remove the panel inserts from sections C and D in the DEC patch panel. Save the screws.

6. Install these panel inserts in sections C and D of the Emulex patch panel. Use the screws saved in Step 5.

PANEL INSERTS

DEC PATCH PANEL
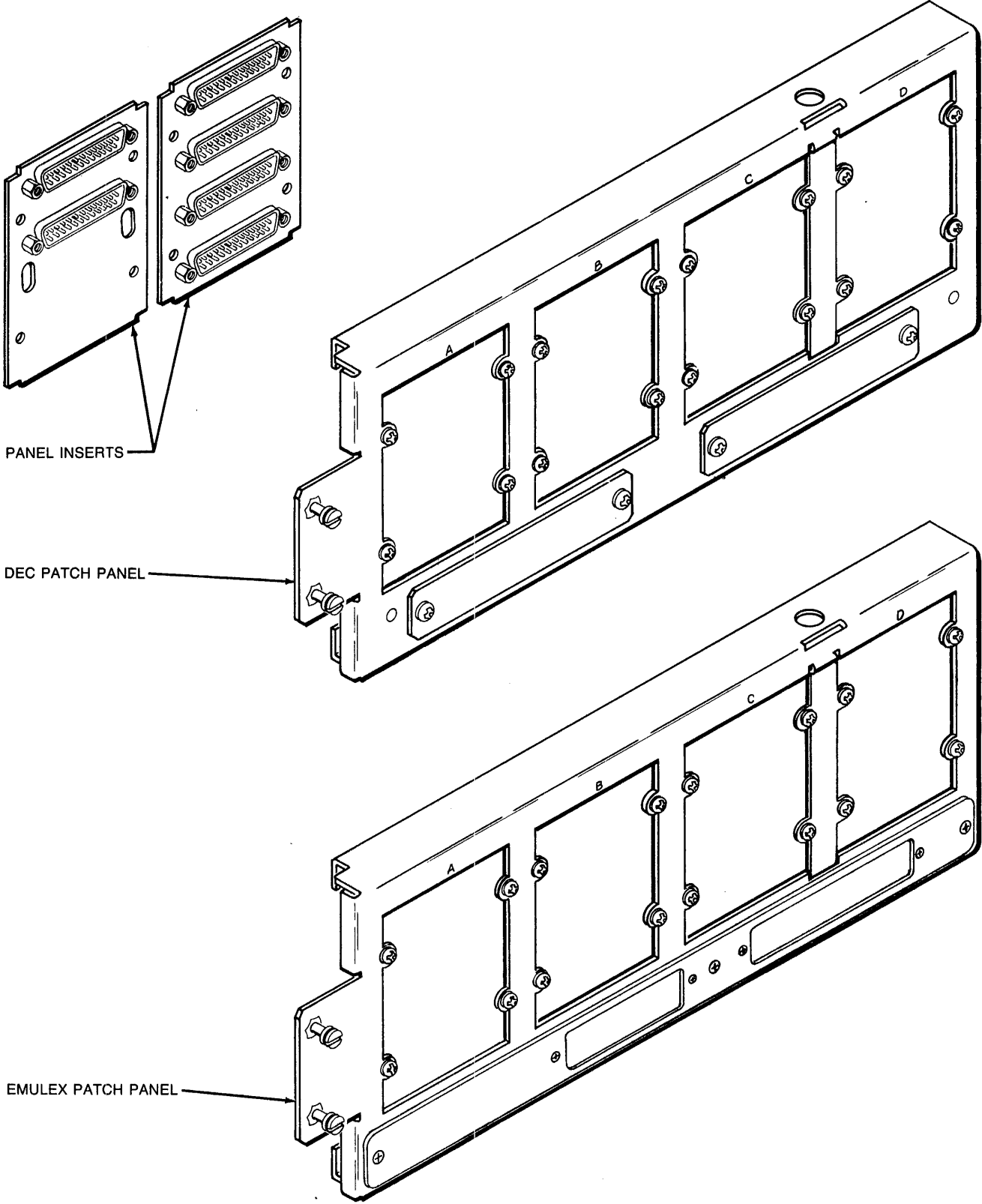
EMULEX PATCH PANEL

Figure 3-6. Preparing the Emulex Patch Panel

INSTALLING IN THE BACKPLANE

To install the UC03 in the backplane:

1. Ensure that the system power is OFF.

2. Select a slot in the backplane for the UC03. Your UC03 may
   be assigned to any desired slot because it uses the
   four-level interrupt scheme to perform distributed
   arbitration.

   a. If you have an RQDX1 Controller in your system, it must
      be in last slot used in the backplane. The UC03 should
      reside in the slot presently occupied by the RQDX1.
      Remove the RQDX1 from its backplane slot and re-install
      the RXQD1 in the next slot.

   b. If you have a DEC BDV11 Multi-Function Board in your
      system, the UC03 should reside in the slot presently
      occupied by the BDV11. Remove the BDV11 from its
      backplane slot and re-install the BDV11 in the next slot.

3. Plug the UC03 edge connectors into the selected backplane
   slot with components oriented in the same direction as the
   CPU PCBA and other modules. Be sure that the UC03 PCBA is
   properly positioned in the throat of the backplane connector
   before attempting to seat the PCBA by means of the extractor
   handles. Once the UC03 is properly positioned, you will need
   to apply some force to seat the board in the backplane
   properly.

4. Arrange any remaining PCBAs in the backplane so that no empty
   slots exist between boards.

CABLING

After you install the UC03 module in the backplane, connect the UC03 to your subsystem using the cabling kit supplied with your Emulex subsystem. The cabling kit comprises a flat-ribbon cable attached to a transadapter plate, and a separate 50-wire round shielded cable. For more information on the types of cabling kits, refer to **Cabling Kits for Your Host Adapter** in **Section 1.**

Figures 3-7 and 3-8 show four views of cabling the UC03. The main illustration in Figure 3-7 represents typical cabling for the UC03 with a DEC system, in this case a MICRO/PDP-11.

- Figure 3-7, View A shows the MICRO/PDP-11 Cabling Kit used with a MICRO/PDP-11 and a DEC patch panel.

- Figure 3-8, View B shows the MICRO/PDP-11 Cabling Kit used with a MICRO/PDP-11 and an Emulex patch panel.

- Figure 3-8, View C shows the Universal RETMA Rack-Mount Cabling Kit used with a rack-mount PDP-11/23 or PDP-11/23 PLUS and mounting frame.

- Figure 3-8, View D shows the Chassis Mount Cabling Kit used with an LSI-11/231BC chassis.
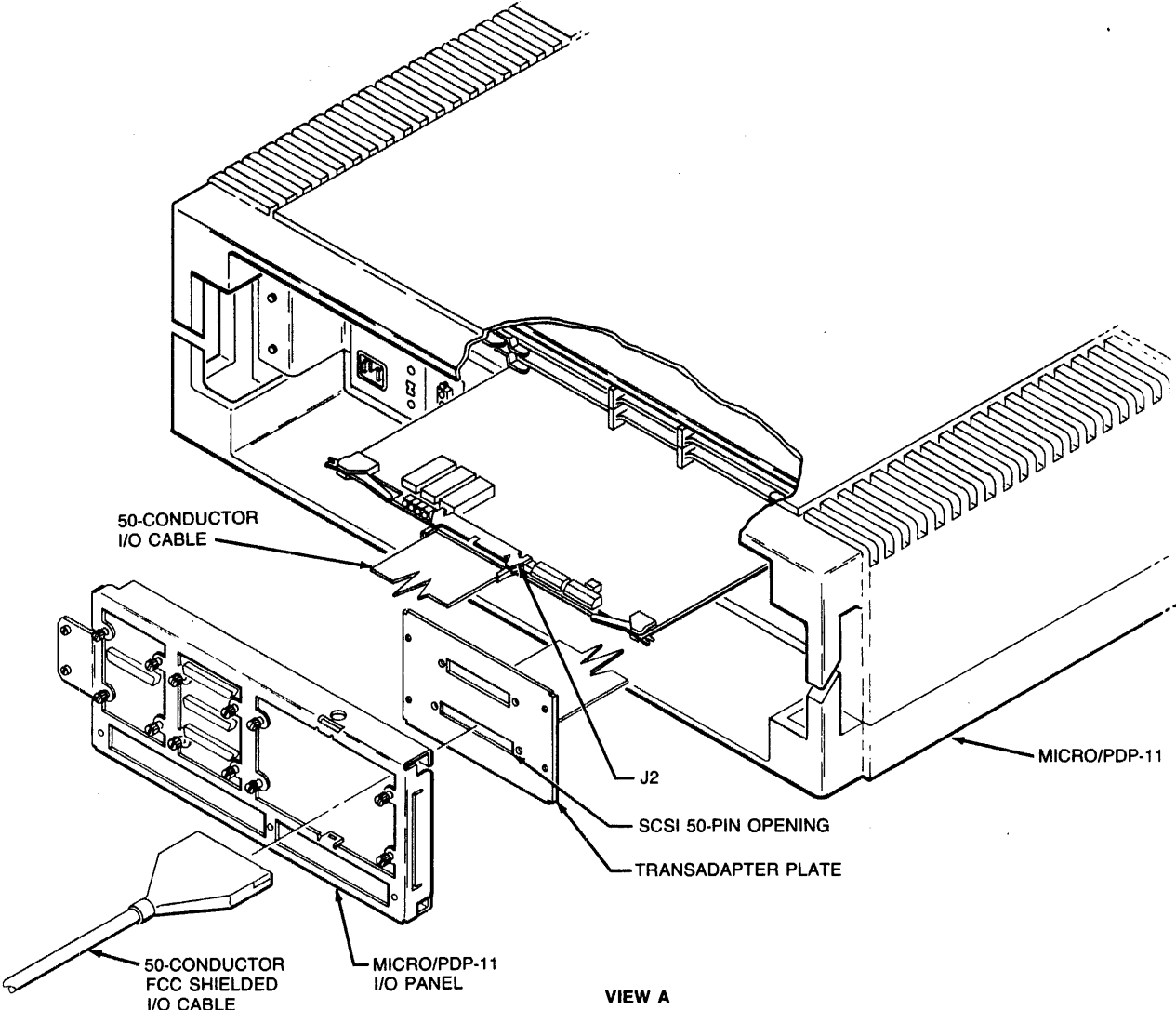
Figure 3-7. Cabling the UC03, View A

VIEW B

VIEW C

VIEW D
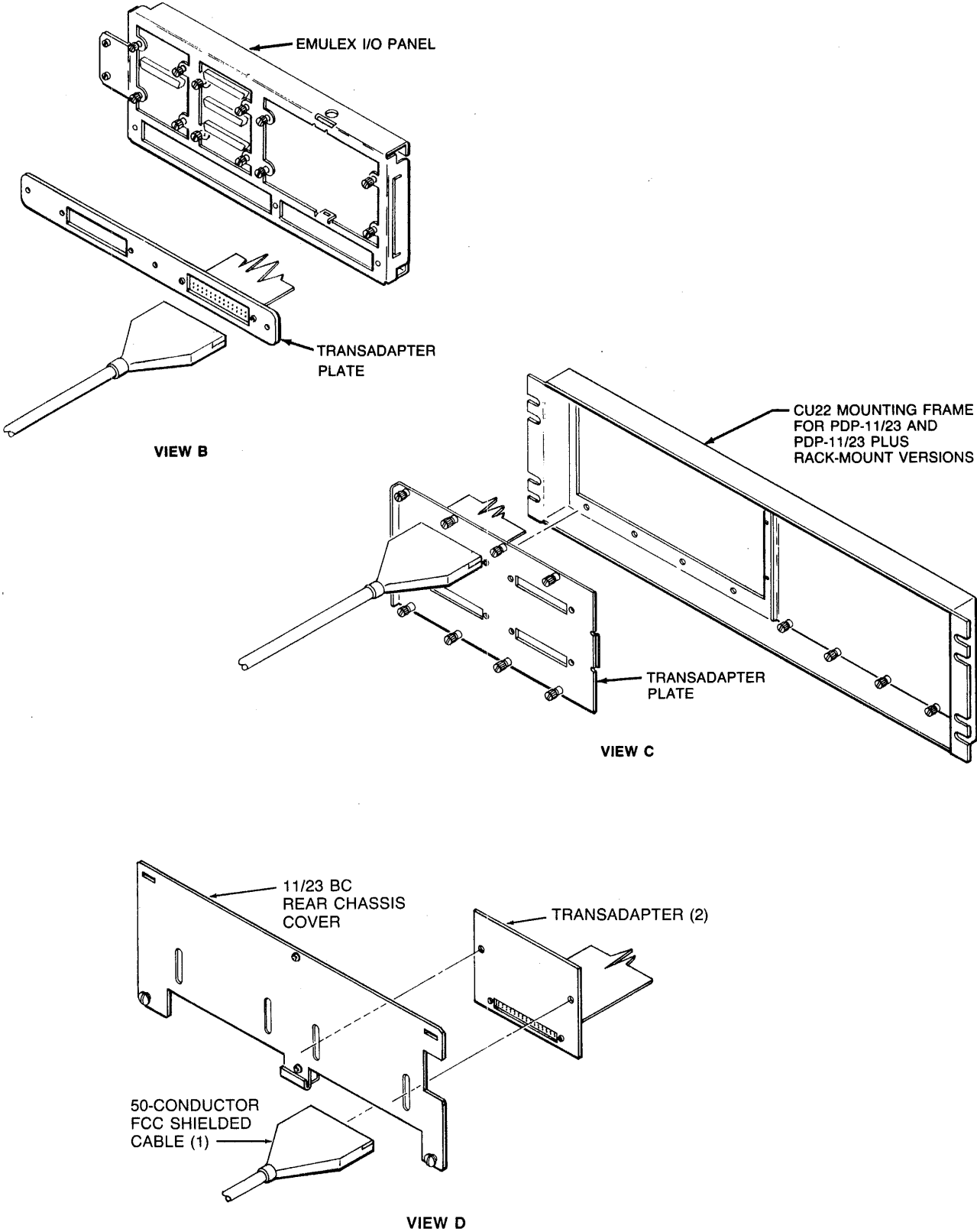
Figure 3-8. Cabling the UC03, Views B, C, and D

To cable the UC03:

1. Align the header of the connector on the flat-ribbon cable
   with connector J2 on the UC03. Match the triangle marking
   on the header with the triangle marking on the J2 connector,
   as shown in the top of Figure 3-9.

2. Seat the header in the J2 connector using the latches as
   shown in the bottom of Figure 3-9.

NOTE

The connector is not keyed and can be
physically reversed in the header. No
damage should result, but the system will
not operate.

3. Attach the transadapter plate to the patch panel or mounting
   frame with the supplied screws and a Phillips-head #0
   screwdriver. See Figures 3-7 and 3-8.

4. Connect one end of the SCSI round shielded cable to the
   50-pin opening in the transadapter plate. See Figures 3-7
   and 3-8.

5. If you have a MICRO/PDP-11, thread the round shielded cable
   through the opening in the bottom of the chassis. If you
   have an LSI-11/23, dress the round shielded cable toward the
   bottom of the chassis.

6. If you have a MICRO/PDP-11, re-connect the flat-ribbon cable
   from the CPU module to the patch panel. Align the stripe on
   the flat-ribbon cable with Pin 1 on the connector.

7. Connect the other end of the SCSI round shielded cable to the
   50-pin opening in the rear panel of the subsystem. For
   additional cabling instructions, refer to your subsystem
   manual.
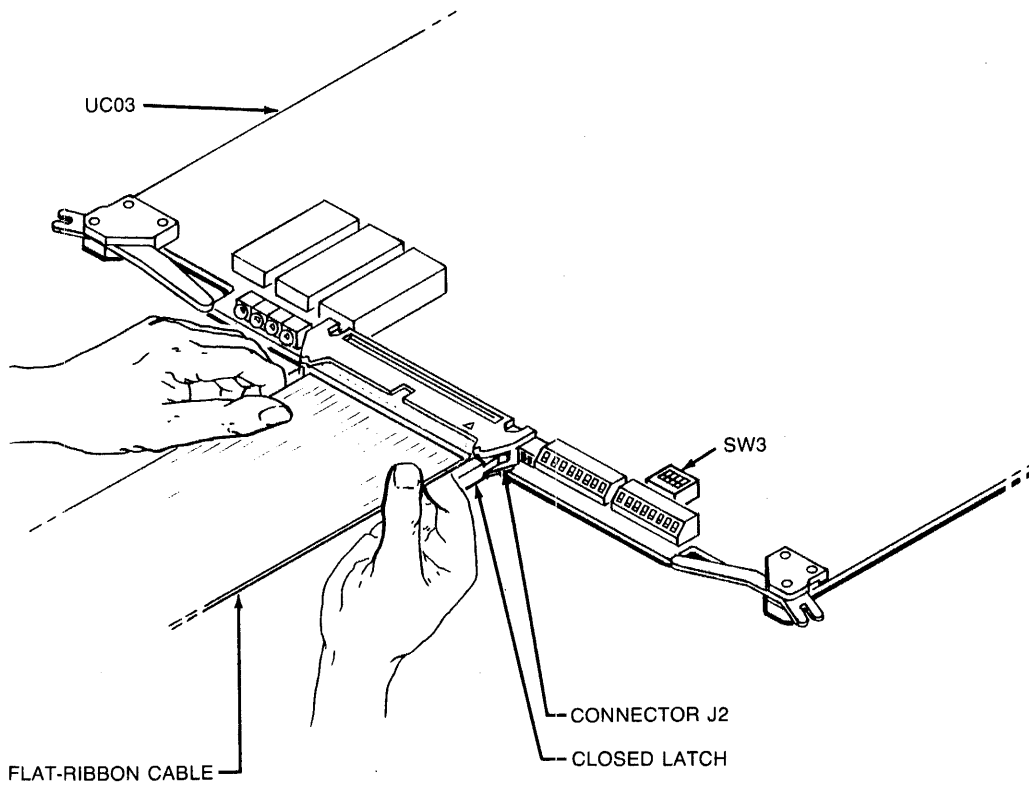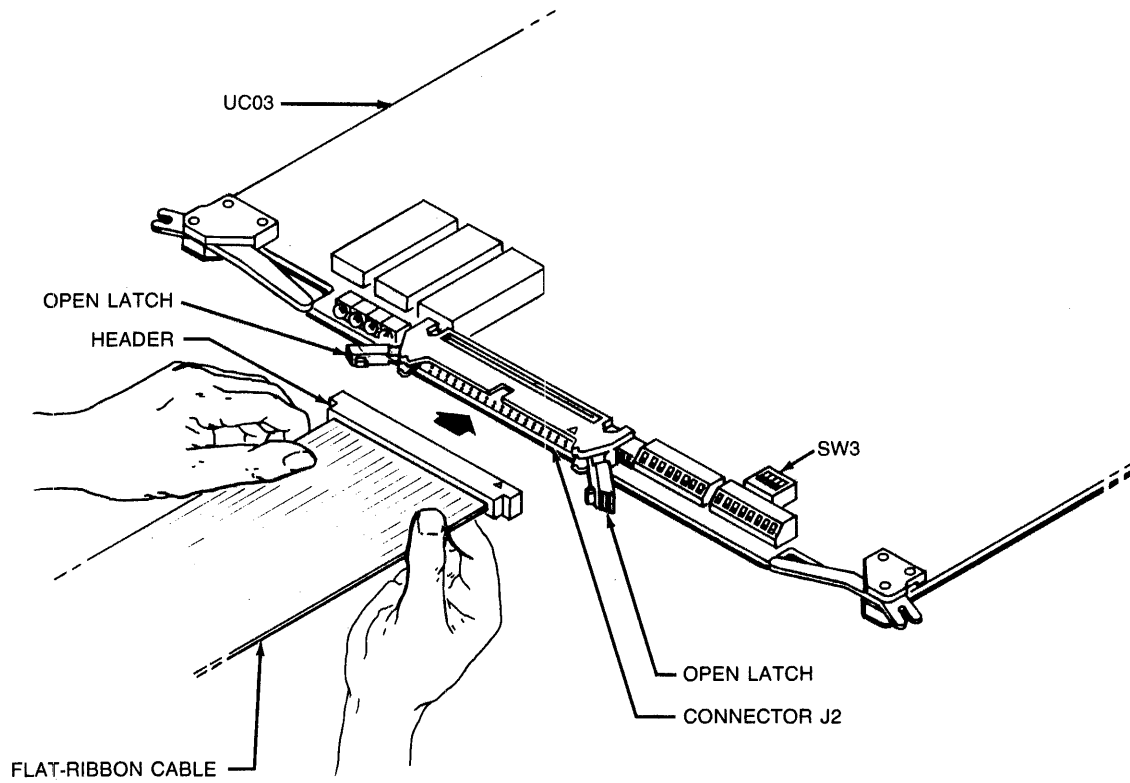
Figure 3-9. Connecting the Flat-Ribbon Cable

POWERING UP THE SYSTEM

After cabling the UC03 to your subsystem, power-up the system. To power-up, place the power switch in the ON position. When power is applied to the system, the UC03 automatically executes a built-in self-test.

Self-Test

If switch SW2-5 is OFF, the UC03 executes a self-test at the following times:

● on power-up
● after a reset condition
● after a bus initialization
● after a write operation to the IP register

The self-test routine consists of two test sequences, preliminary and self-test. The preliminary test sequence exercises the 8031 microprocessor chip and the NCR5385 SCSI chip. When the UC03 completes the preliminary test, the indicators LED1 and LED4 illuminate. After the host CPU initializes the UC03's MSCP file server, the UC03 executes the second sequence in the self-test routine. This self-test sequence exercises the buffer controller chip, the HAC chip and its associated circuitry, the on-board RAM and the control memory PROM.

If the UC03 passes both sequences of its self-tests successfully, all the LED indicators on the edge of the UC03 are OFF. If a fatal error is detected, all four of the edge-mounted LED indicators are ON (illuminated).

If the UC03 fails to pass its power-up self-tests, you can select a special diagnostic mode which causes the LED indicators to display an error code. See **Self-Test Error Reporting**, in **Section 6, TROUBLESHOOTING**.

NOTE

During normal operation, LED1 flashes to indicate LSI-11 bus activity and LED2 flashes to indicate SCSI bus activity.

BOOTSTRAPPING THE SYSTEM

You can bootstrap the system using the UC03 in four ways:

- UC03 automatic bootstrap feature enabled
- UC03 manual bootstrap procedure
- DEC automatic bootstrap
- DEC manual bootstrap

NOTE

The RQDX1 controller also has an an
automatic bootstrap feature which is not
discussed here.

UC03 Automatic Bootstrap

If you enabled the automatic bootstrap feature when you set up
the UC03, the UC03 bootstraps on power-up.

If the UC03 fails to bootstrap automatically, then the system
enters the console Online Debugging Technique (ODT) mode. At
this point, you can bootstrap manually.

UC03 Manual Bootstrap

To bootstrap manually using the UC03 Host Adapter, follow the
instructions on the next pages.

DEC.Automatic Bootstrap and Manual Bootstrap

If your system includes an LSI-11/23+ CPU module, or an LSI-11/73
CPU module and an MXV11BE multifunction module, and the automatic
bootstrap feature on the UC03 (or RQDX1) is disabled, then the
host system initiates either an automatic bootstrap or manual
bootstrap procedure.

In either case, the host system bootstraps using the MSCP
controller, either the UC03 or the RQDX1, located at the standard
LSI-11 bus address, 772150_8. To use the DEC manual bootstrap
procedure, simply enter DU and the unit number of the drive from
which to bootstrap.

Manual Bootstrap

In response to the Online Debugging Technique (ODT) prompt "@", type the UC03 LSI-11 bus address plus two. If you are bootstrapping from a primary UC03, type 772152; if you are bootstrapping from an alternate UC03, type 772156.

Press the "/" key.

At the system response 005400 or 004400, type 30003 and enter a carriage return <cr>.

NOTE

> If the system does not display 005400 or 004400 as described, the bootstrap procedure will not work.

At the next @ prompt, press the "/" key.

At the system response 000400, type 40000 and enter a carriage return <cr>.

NOTE

> The last zero in 40000 represents the storage device that contains the bootstrap program. If the bootstrap program is stored at a device number other than 0, enter 4000n, where n is the MSCP unit number of the device storing the bootstrap program.

@772152/005400 **30003<cr>**

@/000400 **40000<cr>**

At the @ prompt, type R0 and press the "/" key.

In response to the six-digit number, type 0 and press the "line feed" key <lf>.

NOTE

> If you entered a storage device number
> other than 0 in the previous step, you
> must type that device number in response
> to the six-digit number.

At the @ prompt, type R1 and press the "/" key.

In response to the six-digit number, type the UC03 LSI-11 bus address (primary - 172150; alternate - 172154), and enter a carriage return <cr>.

Include this next step only if your system uses the RSTS/E operating system:

At the next prompt type 777776 and press the "/" key.

In response to the six-digit number, type 340 and enter a carriage return <cr>.

At the next @ prompt, type 0G. This command starts the bootstrap program. Wait a few minutes for the disk to bootstrap.

```
@R0/XXXXXX 0<lf>
@R1/XXXXXX 772150<cr>
```

For RSTS/E only:

```
777776/XXXXXX 340<cr>
```

```
@0G
```

RE-ASSEMBLING THE SYSTEM

After the UC03 successfully passes its self-tests, re-assemble the system.

In this section, we describe re-assembling the MICRO/PDP-11 and the PDP-11/23 rack-mount systems. For additional information regarding your DEC system, consult your DEC manual.

To re-assemble a MICRO/PDP-11:

1. Replace the patch panel, fitting the notch on the patch panel to the slot in the rear of the chassis.

2. Secure the patch panel by tightening the screws with a standard screwdriver.

3. Replace the chassis cover at the rear of the unit.

To re-assemble a rack-mount PDP-11/23:

1. Replace the mounting frame.

2. Secure the mounting frame by tightening the screws with a standard screwdriver.

3. Close the door at the rear of the chassis.

OVERVIEW

For your convenience, the UC03 features LED indicators and a run
vs. reset/halt switch. This section describes these features and
how to use them. Figure 4-1 shows an edge-on view of the LED
indicators and switches as they appear on an installed UC03 PCBA.
Switch SW3 is located behind switch SW1.

LSI-11 BUS ACTIVITY INDICATOR

During normal operation, LED1 flashes to indicate LSI-11 bus
activity (see Figure 4-1).

SCSI BUS ACTIVITY INDICATOR

During normal operation, LED2 flashes to indicate SCSI bus
activity (see Figure 4-1).
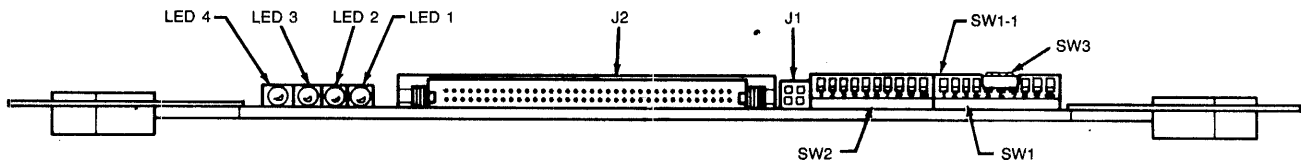
Figure 4-1. Edge-On View of UC03 PCBA

UC03 RUN VS. RESET/HALT SWITCH

Switch SW1-1 on the UC03 is defined as a run vs. reset/halt
switch. In the run position (switch SW1-1 OFF), this switch
allows the UC03 Host Adapter to operate normally. In the
reset/halt position (switch SW1-1 ON), the UC03 is in the reset
state, and it will not respond to commands from the host
computer.

You may use this run vs. reset/halt switch:

- to reset the UC03

- after you change a switch position on the UC03

- to take the UC03 offline without removing the PBCA from the backplane

To use the run vs. reset/halt switch:

1. Place switch SW1-1 in the ON position (reset).

2. Place switch SW1-1 in the OFF position (run).

OVERVIEW

Emulex offers three software programs for the UC03 Host Adapter:

- Emulex MSCP/SCSI Disk Formatter Program
- Emulex UDA50 Subsystem Reliability Program
- Emulex MS/SCSI Stand-Alone (Disk Image) Backup/Restore Program

The Emulex MSCP/SCSI Disk Formatter Program formats disk drives to operate with the UC03. This software program also performs a media verification routine. If you ordered your UC03 with an Emulex subsystem, you do not need to use the Formatter software because the disk drive(s) in your subsystem have been formatted at the factory. However, you must format each Iomega Cartridge Disk before it can be used.

The Emulex UDA50 Subsystem Reliability Program verifies subsystem operation by an addressing test and a data reliability test. The addressing test verifies that the disk drive is formatted properly and that implied seek operations are functional. The data reliability test performs data storage and retrieval testing using the UC03 and a user-selected disk drive. Because the UC03 is DEC MSCP-compatible, it also works with the DEC MSCP Performance Exerciser.

The Emulex MS/SCSI Stand-Alone (Disk Image) Backup/Restore Program (BRP) is a stand-alone software program which allows you to backup data from a disk drive to a tape drive, and restore data from a tape drive to a disk drive.

How to Use Our Software Instructions

In this section, we use both text and facsimiles of terminal screen displays to describe how to use the UC03 software. The text shown at the top of a left-hand page describes the screen display shown at the top of the facing right-hand page; the text at the bottom of a left-hand page describes the screen display shown at the bottom of the facing right-hand page. This page format is used throughout this section.

In the sample dialogues between the software program and the user, your responses are highlighted in **boldface** print.

If an error message is displayed on your terminal screen while you are using any of these programs, consult **Software Error Messages**, in **Section 6, TROUBLESHOOTING**.

Additional Software Information

The Emulex MSCP/SCSI Disk Formatter software includes a series of prompts that appear only if the program does not recognize the drive and disk controller combination in your subsystem. These prompts are described in **Appendix B, ADDITIONAL SOFTWARE INFORMATION.**

Also included in **Appendix B** are instructions for the Diagnostic Supervisor commands with the Emulex UDA50 Subsystem Reliability Program.

HOW TO INSTALL YOUR SOFTWARE

The Emulex MSCP/SCSI Disk Formatter Program and Emulex UDA50 Subsystem Reliability Program are distributed on the same diagnostic media. The Emulex MS/SCSI Stand-Alone (Disk Image) Backup/Restore Program is distributed separately.

To install the software, consult the **OPERATION** section of the User's Manual supplied with your subsystem.

Loading the MSCP/SCSI Disk Formatter Program

The Emulex MSCP/SCSI Disk Formatter program operates under the
DEC XXDP+ Diagnostic Supervisor. To access on-line "help"
information, type the letter "h" or "h/l" in response to the
XXDP+ prompt ".". The help information lists those diagnostic
programs supplied on the diagnostic media.

NOTE

The XXDP+ restart address is displayed at
this time. Entering this restart address
offers you an alternate method to access
the XXDP+ Diagnostic Supervisor.

Starting the Program

To run the Formatter program, enter the letter "r" and the title
of the program, U1MX8?. By entering the question mark instead of
a specific letter, you ensure calling up the most recent revision
of the program.

The Emulex MSCP/SCSI Disk Formatter program announces itself as
shown in the screen at the right.

```
BOOTING FROM DUX
CHMDQA0 XXDP+ DQ MONITOR
BOOTED VIA UNIT X
XX K
RESTART ADDRESS: XXXXXXXX
DOES THIS SYSTEM HAVE A UNIBUS (Y/N CR=Y) N<cr>
NON-UNIBUS SYSTEM
ENTER DATE (DD-MMM-YY):01-OCT-84
THIS IS XXDP+. TYPE "H" OR "H/L" FOR HELP.
.
```

```
.R U1MX8?
U1MX8?.BIN

EMULEX CORPORATION
MSCP/SCSI DISK FORMATTER PROGRAM
VERSION V2.7    COPYRIGHT AUGUST 1984
```

CSR Address

You must verify that the UC03 CSR address given in default by the Formatter, matches the CSR address set by UC03 switches SW1-4, SW1-5 and SW2-4.

To accept the CSR address displayed on the screen, enter a carriage return <cr>. To change the displayed CSR address, type the new CSR address and enter a carriage return.

NOTE

The standard CSR address for the UC03 is 172150_8; the alternate CSR address is 172154_8.

Program Options

The main menu lists the eleven program options. You may change the CSR address (option C), list all the drives and their unit numbers (option L), format a specific drive, or quit the program (option Q).

If you want to format a drive, type the menu option number which selects the unit number of that drive. No carriage return is necessary.

THE PROGRAM IS CURRENTLY SET TO USE A CSR ADDRESS OF
172150 OCTAL. TYPE A CARRIAGE RETURN TO KEEP THIS
VALUE, OR ENTER A NEW CSR ADDRESS IN OCTAL, FOLLOWED
BY A CARRIAGE RETURN. **<cr>**

```
YOUR CHOICES ARE:
    0 - FORMAT UNIT NUMBER 0
    1 - FORMAT UNIT NUMBER 1
    2 - FORMAT UNIT NUMBER 2
    3 - FORMAT UNIT NUMBER 3
    4 - FORMAT UNIT NUMBER 4
    5 - FORMAT UNIT NUMBER 5
    6 - FORMAT UNIT NUMBER 6
    7 - FORMAT UNIT NUMBER 7
    C - CHANGE CSR ADDRESS
    L - LIST KNOWN UNITS
    Q - QUIT
        NO CARRIAGE RETURN IS NECESSARY.
PLEASE ENTER THE SINGLE CHARACTER TO THE LEFT OF YOUR
SELECTION:0
```

Warning

The program then displays a warning message which reminds you
that during formatting, you erase all data stored on the drive.
To confirm that you want to format the drive, type the letter
"y".

Formatting an Iomega Cartridge Disk

If you are formatting an Iomega Cartridge Disk Drive, the program
asks if you want to enable Error Checking and Correcting (ECC) or
Cyclic Redundancy Check (CRC). The ECC and CRC features can be
enabled separately or simultaneously.

If you use the ECC feature, the controller recovers the data if a
read operation fails; additional transfer time is required for
any ensuing write operations. The post write CRC feature
verifies the data after a write operation while the host still
has the data and retries if that data is incorrect. Overhead
for CRC is 40 msec. Enabling both features simultaneously
reduces transfer speed, but increases data integrity.

*** FORMATTING THIS UNIT WILL DESTROY
ALL USER DATA ON THE MEDIA. ***
ARE YOU SURE THAT YOU WANT TO FORMAT THIS UNIT?
[Y OR N] **Y**

DO YOU WANT THIS CARTRIDGE TO USE
THE ECC FEATURE? TYPE "N" TO INHIBIT
ECC USAGE. ANY OTHER INPUT WILL ENABLE
THE ECC. [Y OR N] **Y**

DO YOU WANT THIS CARTRIDGE TO USE THE POST WRITE
CRC CHECK FEATURE? TYPE "N" IF NOT. ANY OTHER
INPUT WILL ENABLE THE POST WRITE CRC CHECK.
ENABLE IT? [Y OR N] **Y**

Interleave Factor for Iomega Drive

If you are formatting an Iomega drive, the program presents a menu and prompts you to select an interleave factor for the drive that is being formatted.

The interleave factor has a large effect on overall system performance. For optimum subsystem performance with an Iomega drive, Emulex recommends using an interleave factor of two.

NOTE

If the program does not recognize the drive/controller combination, you will not be prompted for interleave factors here. To continue program instructions, see **Drive/Controller Combination Dialogue**, in **Appendix B**, **ADDITIONAL SOFTWARE INFORMATION**.

Interleave Factor for Winchester Drive

If you are formatting a Winchester drive, the program displays the current interleave factor for the drive that is being formatted. For optimum system performance, Emulex recommends an interleave factor of one for MSCP subsystems using a UC03 Host Adapter.

To accept the current interleave factor, enter a carriage return. To change the interleave factor, type the new value in octal and enter a carriage return.

NOTE

If the program does not recognize the drive/controller combination, you will not be prompted for interleave factors here. To continue program instructions, see **Drive/Controller Combination Dialogue**, in **Appendix B**, **ADDITIONAL SOFTWARE INFORMATION**.

SELECT THE VALUE FOR THE SECTOR INTERLEAVE FACTOR
TO BE USED ON THIS CARTRIDGE.

    1 - INTERLEAVE FACTOR OF 1
    2 - INTERLEAVE FACTOR OF 2 (DEFAULT)
    3 - INTERLEAVE FACTOR OF 4
    4 - INTERLEAVE FACTOR OF 17
    5 - INTERLEAVE FACTOR OF 34
YOUR SELECTION: **2**

THE PROGRAM IS CURRENTLY SET TO USE AN INTERLEAVE OF
000001 OCTAL FOR THIS DRIVE. TYPE A CARRIAGE RETURN
TO KEEP THIS VALUE, OR ENTER A NEW INTERLEAVE IN
OCTAL, FOLLOWED BY A CARRIAGE RETURN: **<cr>**

Formatting Operation

Once the program has the necessary information about the subsystem, it begins formatting the drive. The program displays a message which indicates that formatting is in process.

Media Verification Routine

When the formatting operation has been completed, the program enters a media verification routine. In this routine, the program writes one of several test patterns on the media, then reads that pattern to ensure that no flaws are on the media. When a flaw is detected, the bad sector or block is de-activated (flagged as un-usable) and replaced with a spare sector.

The media verification menu lists the data patterns you may select. Type the letter that corresponds to the data pattern you wish to verify. No carriage return is necessary.

The default data pattern is menu option A, which uses the worst-case pair of data patterns. When used with an 11/23 CPU module, the default pattern takes about three minutes for every megabyte on the drive. All of the verification data patterns are specified in **Appendix B, ADDITIONAL SOFTWARE INFORMATION.**

THE DRIVE IS NOW BEING FORMATTED.

PLEASE SELECT THE VERIFICATION ACTION.   YOUR CHOICES
ARE:
    A - VERIFY WITH WORST CASE PAIR OF PATTERNS
        (DEFAULT)
    B - VERIFY WITH PATTERN 0
    C - VERIFY WITH PATTERN 1
    D - VERIFY WITH PATTERN 2
    E - VERIFY WITH PATTERN 3
    F - VERIFY WITH PATTERN 4
    G - VERIFY WITH PATTERN 5
    H - VERIFY WITH PATTERN 6
    I - VERIFY WITH PATTERN 7
    J - VERIFY WITH PATTERN 8
    K - VERIFY WITH PATTERN 9
    L - VERIFY WITH PATTERN 10
    M - VERIFY WITH PATTERN 11
    N - VERIFY WITH PATTERN 12
    O - VERIFY WITH PATTERN 13
    P - VERIFY WITH PATTERN 14
    Q - VERIFY WITH PATTERN 15
    X - EXIT VERIFICATION
        NO CARRIAGE RETURN IS NECESSARY.
PLEASE ENTER THE SINGLE CHARACTER TO THE LEFT OF YOUR
SELECTION: **A**

Verification Pass Complete

The program announces the completion of a verification pass, then displays the media verification menu. You may have the program perform additional verification passes by typing the letter that corresponds to the data pattern you wish to verify.

To exit the media verification routine, type the letter "x". Any other method of exit, such as <CONTRL>C, will not properly reformat the disk or produce a valid bad block map.

Number of Bad Blocks Dectected; Re-formatting if Applicable

After you exit the media verification routine, the program displays two possible messages:

1. If no defects were found, the program displays a message indicating that no bad blocks were detected.

2. If defects were found, the program displays the number of bad blocks found and a message telling you that the disk is being re-formatted to eliminate the bad blocks. The re-formatting rate is approximately 15 megabytes per minute.

PASS COMPLETE.

PLEASE SELECT THE VERIFICATION ACTION.   YOUR CHOICES
ARE:
    A - VERIFY WITH WORST CASE PAIR OF PATTERNS
        (DEFAULT)
    B - VERIFY WITH PATTERN 0
    C - VERIFY WITH PATTERN 1
    D - VERIFY WITH PATTERN 2
    E - VERIFY WITH PATTERN 3
    F - VERIFY WITH PATTERN 4
    G - VERIFY WITH PATTERN 5
    H - VERIFY WITH PATTERN 6
    I - VERIFY WITH PATTERN 7
    J - VERIFY WITH PATTERN 8
    K - VERIFY WITH PATTERN 9
    L - VERIFY WITH PATTERN 10
    M - VERIFY WITH PATTERN 11
    N - VERIFY WITH PATTERN 12
    O - VERIFY WITH PATTERN 13
    P - VERIFY WITH PATTERN 14
    Q - VERIFY WITH PATTERN 15
    X - EXIT VERIFICATION
        NO CARRIAGE RETURN IS NECESSARY.
PLEASE ENTER THE SINGLE CHARACTER TO THE LEFT OF YOUR
SELECTION: X

NO BAD BLOCKS WERE DETECTED.

XXX BAD BLOCKS WERE DETECTED DURING VERIFICATION.
NOW RE-FORMATTING THE DRIVE TO ELIMINATE THOSE
BLOCKS.

Media Verification Routine Complete

Next, the program displays a message telling you that the media has been verified and that the program is writing a DEC file-structure that maps the replacement blocks on the disk.

Drive Ready

The program displays a message to indicate that the disk is ready for use, then displays the main menu. You may select any of the program options, such as formatting additional drives, or quit the program.

If you select a formatting option, the program repeats the dialogue described earlier. If you quit the program (option Q), the program displays a message telling you that the program is finished and the CPU is halted.

VERIFICATION COMPLETE, WRITING RCTS

*** THE DRIVE IS NOW READY FOR USE. ***

MAIN MENU - YOUR CHOICES ARE:
    0 - FORMAT UNIT NUMBER 0
    1 - FORMAT UNIT NUMBER 1
    2 - FORMAT UNIT NUMBER 2
    3 - FORMAT UNIT NUMBER 3
    4 - FORMAT UNIT NUMBER 4
    5 - FORMAT UNIT NUMBER 5
    6 - FORMAT UNIT NUMBER 6
    7 - FORMAT UNIT NUMBER 7
    C - CHANGE CSR ADDRESS
    L - LIST KNOWN UNITS
    Q - QUIT
        NO CARRIAGE RETURN IS NECESSARY.
PLEASE ENTER THE SINGLE CHARACTER TO THE LEFT OF YOUR
SELECTION:Q

END OF PROGRAM, CPU HALTED....

Starting the Emulex UDA50 Subsystem Reliability Program

The Emulex UDA50 Subsystem Reliability Program operates under the
DEC XXDP+ Diagnostic Supervisor. To access online "help"
information, type the letter "h" or "h/l" in response to the
XXDP+ prompt ".". The help information lists the diagnostic
programs supplied on the diagnostic media.

To start the Emulex UDA50 Subsystem Reliability Program after you
have completed the Emulex MSCP/SCSI Disk Formatter Program, enter
the restart address which was displayed when you first accessed
the XXDP+ Diagnostic Supervisor.

In response to the XXDP+ prompt ".", type the letter "r" followed
by a space and the title of the program U1MX9?. By entering the
question mark instead of a specific letter, you ensure calling up
the most recent revision of the program.

The Emulex UDA50 Subsystem Reliability Program announces itself
as shown in the screen at the right.

—

The Emulex UDA50 Subsystem Reliability Program asks a series of
questions to determine what type of test you want to run on which
units.

In response to the "change hw" (change hardware) prompt, you
should enter the letter "n" and a carriage return.

If you have installed the twenty two-bit IC, enter the letter "y"
and a carriage return.

Next, type the MSCP device number of the drive that you want to
test, and enter a carriage return.

The program asks you to select the mode of operation for the
addressing test. If you enter the number "0" for the
non-destructive mode, the diagnostic section of the disk will be
tested. If you enter the number "1" for the destructive mode, the
the entire disk, including the user area, will be tested. Emulex
recommends that you select the non-destructive mode.

.R U1MX9?
U1MX9X.BIN

EMULEX CORPORATION
UDA50 SUBSYSTEM RELIABILITY PROGRAM (UDAREL)
VERSION 1.0   MARCH 16, 1983

CHANGE HW (L) ? **N<cr>**
USING 22-BIT ADDRESSING (Y OR N)? **Y<cr>**
ENTER THE UNIT NUMBER(S) (0): **0<cr>**
ENTER MODE OF OPERATION (0 = NON-DESTRUCTIVE,
1 = DESTRUCTIVE): **0<cr>**

Automatic Test Program

You may either run the tests of the Emulex UDA50 Subsystem
Reliability Program using an Automatic Test Program (ATP) or
using the Diagnostic Supervisor XXDP+. Emulex suggest that you
use the Automatic Test Program in most cases. The commands used
under the Diagnostic Supervisor are for troubleshooting or for
instances other than initial testing. If you want to use the
Diagnostic Supervisor commands, see **Appendix B, ADDITIONAL
SOFTWARE INFORMATION.**

The program asks if you want to use the Automatic Test Program.
Type the letter "y" and enter a carriage return. In the
non-destructive mode, the ATP usually takes about thirty seconds
to complete.

At the end of the ATP, the system displays the number of units
tested, the testing sequence, a comment when the testing has been
completed, the number of passes made and the number of errors
found.

If an error occurs which the program cannot correct, an error
message and command information appears on the screen. The error
messages are described in **SOFTWARE ERROR MESSAGES, Section 6,
TROUBLESHOOTING.**

ATP   Y OR N ? Y<cr>

TESTING UNIT 0
01, 02

END OF PASS   X   ERROR TOTAL   X

Loading the Backup/Restore Program

To load the Emulex Backup/Restore Program using a MS device such as a TC02, TC05, or TC15 tape controller, type "MS" and enter a carriage return in response to the bootstrap prompt symbol "$".

Program Starts

The program announces itself as shown in the screen at the right.

NOTE

During the initialize dialogue, you can type <CTRL>C in response to any question to restart or end the program.

BRP>Restart the program (Y or N)?

$MS<cr>

EMULEX CORPORATION
MS/SCSI STAND-ALONE (DISK IMAGE) BACKUP/RESTORE
PROGRAM
REVISION D   OCTOBER 1, 1984

To Backup a Disk

The program prompts you to select either backup or restore functions. If you want to backup data from a disk to tape, type the letter "b" and enter a carriage return.

Enter the MSCP device code and then follow by unit number (e.g., DU1).

To Restore a Tape to a Disk

If you want to restore the data from tape to disk, type the letter "r" and enter a carriage return.

Enter the MSCP device code for the tape and then follow with the unit number (e.g., DU1).

```
BRP>BACKUP/RESTORE (B OR R)?B
BRP>BACKUP FROM DEVICE:DU1
```

```
BRP>BACKUP/RESTORE (B OR R)?R
BRP>RESTORE TO DEVICE:DU1
```

Tape Type and Total Memory

The first statement on this screen asks you to select the type of tape device you are using. If you are using a Sentinel tape drive, type the letter "a" to select an MS device. If you are using the cartridge tape drive in an Emulex subsystem, type the letter "b". If you select a SCSI device, enter the tape MSCP unit number.

The next statement displays the total memory in the system.

Disk Controller CSR and Interrupt Vector Address

This statement displays the default CSR address for the disk controller that is being backed up from or restored to. Press the carriage return if the number is correct, otherwise type the new CSR address.

This statement displays the default interrupt vector for the disk that is being backed up or restored. Press the carriage return if the number is correct, otherwise type in the new interrupt vector address.

BRP>ENTER TAPE TYPE: A = MS DEVICE, B = SCSI DEVICE

BRP>SYSTEM MEMORY = XXXXXXX BYTES

BRP>CSR ADDRESS = XXXXXX ?<cr>

BRP>INTERRUPT VECTOR = XXX ?<cr>

Storage Capacity for MSCP Devices

The next two statements define the number of logical blocks being backed-up or restored. The logical blocks are defined by the combination of the high and low words. Enter a carriage return if the parameters are correct.

Storage Capacity

This statement displays the number of sectors per track for the selected drive. Press the carriage return if the number is correct, otherwise type in the new number of sectors per track.

This statement displays the number of tracks per cylinder for the selected drive. Press the carriage return if the number is correct, otherwise type in the new number of tracks per cylinder.

This statement displays the maximum cylinder address for the selected drive. Press the carriage return if the number is correct, otherwise type in the new maximum cylinder address.

BRP>MAX # OF LOGICAL BLOCKS IN OCTAL <HIGH WORD> =

BRP>MAX # OF LOGICAL BLOCKS IN OCTAL <LOW WORD> =

BRP># OF SECTORS PER TRACK = XX ?<cr>

BRP># OF TRACKS PER CYLINDER = XX ?<cr>

BRP># OF CYLINDERS ON DISK = XXXX ?<cr>

Register Dump

To have the Backup/Restore program dump the processor registers in case of an error type Y, otherwise type N.

Next, the program prompts you to select the operating system you wish to backup/restore under, or if you want a image backup/restore. Type the letter that corresponds with your selection.

Destination Device CSR and Vector Address

This statement displays the selected tape controller device base address. Press the carriage return if the number is correct, otherwise type in the new base address.

This statement displays the selected tape controller device interrupt vector address. Press the carriage return if the number is correct, otherwise type in the new interrupt vector address followed by a carriage return.

In either case, the program will begin executing automatically after this value has been entered. The program begins executing automatically after the initialization dialogue is complete.

BRP>DUMP REGISTER WHEN ERROR OCCURRED (Y OR N) ?Y

ENTER: A=RSTS/E, B=RSX11M, C=RT11, D=DISK IMAGE?

BRP>MS DEVICE BASE ADDRESS = XXXXXX ?
BRP>MS DEVICE INTERRUPT VECTOR = XXX

BRP>SCSI DEVICE BASE ADDRESS = XXXXXX ?
BRP>SCSI DEVICE INTERRUPT VECTOR = XXX

Operation

Backup operations

A message will be displayed on the terminal to indicate that the backup operation is in progress.

Restore operations

A message will be displayed on the terminal to indicate that the restore operation is in progress.

During either the backup or restore process, a <CTRL>C will abort the program.

Tape Operation

At the end of each tape, a message will be displayed on the terminal to inform the user that there is end of tape, and instructing the user to mount next tape to continue operation.

BRP>*****START BACKUP PROCESS*****

BRP>*****START RESTORE PROCESS****

BRP>END OF TAPE # X
BRP>MOUNT TAPE # X, ENTER RETURN WHEN READY

End of Operation

Backup operations

At the end of the backup operation, a message appears to indicate that the backup is complete, and then the program stops.

Restore operations

At the end of the restore operation, a message appears to indicate that the restore process is complete, and then the program stops.

Tape Operation

At the end of each tape, a message will be displayed on the terminal to inform the user that there is end of tape, and instructing the user to mount next tape to continue operation.

BRP>BACKUP COMPLETED

BRP>RESTORE COMPLETED

BRP>END OF TAPE # X
BRP>MOUNT TAPE # X, ENTER RETURN WHEN READY

OVERVIEW

If you have trouble using your UC03 Host Adapter, the guidelines in this section can help you solve your problems. This section explains the Emulex service policies, some troubleshooting guidelines, the UC03 self-test error codes, and the software error messages. This information is presented in the following order:

- Service
- Troubleshooting Guide
- Self-Test Error Reporting
- Software Error Messages

SERVICE

Your Emulex UC03 Host Adapter has been designed to give years of trouble-free service, and it was thoroughly tested before leaving the factory.

If a fault-isolation procedure indicates that the UC03 is not working properly, you must return the UC03 to the factory or to an Emulex authorized repair center to be serviced. Emulex products are not designed to be repaired in the field.

Before returning the product to Emulex, whether it is under warranty or not, you **must** contact the factory or the factory representative for return-shipment instructions and for a Return Materials Authorization (RMA) number.

DO NOT RETURN A PRODUCT TO EMULEX WITHOUT AUTHORIZATION. A product returned for service without an authorization will be returned to the owner at the owner's expense.

In the continental United States, Alaska, and Hawaii contact:

Emulex Technical Support
3545 Harbor Boulevard
Costa Mesa, CA 92626
(714)662-5600   TWX 910-595-2521

Outside the United States, contact the distributor from whom the product was initially purchased.

To help you efficiently, Emulex or its representative requires certain information about the product and the environment in which it is installed. During installation, a record of the switch settings should have been made on the UC03 Setup Record. After you have received an RMA, package the product (preferably using the original packing material) and send the product **POSTAGE PAID** to the address provided by the Emulex representative. The sender must also insure the package.

TROUBLESHOOTING GUIDE

If your UC03 Host Adapter appears to be not working properly, you should check the troubleshooting guide in Table 6-1 which lists possible problem symptoms, possible explanations, and helpful aids.

Table 6-1.   UC03   Troubleshooting Guide

Symptom	Possible Cause	For More Help
All four LEDs are illuminated.	The powerup self-test has detected an error.	Self-Test Error Reporting, Section 6.
22-bit memory addressing does not work.	Verify 22-bit memory addressing IC is installed.	Installing 22-Bit 22-Bit Memory Addressing Option, Section 3.
	Verify that your CPU supports extended memory addressing.	
A message displays on the screen while you are using UC03 software.	The software program has detected an error.	Software Error Messages, Section 6.
Automatic bootstrap does not work.	Verify automatic bootstrap is enabled.	Enabling Automatic Bootstrap Feature, Section 3.
	Your LSI-11 Series CPU module is not setup for power-up mode zero.	
	Drive specified is not powered-up or operational.	Manual Bootstrap, Section 3.

SELF-TEST ERROR REPORTING

If the UC03 detects a fatal error during its power-up self-test (all LED indicators ON) you can isolate the problem by using the diagnostic mode of the UC03 self-test. In the diagnostic mode, the self-test performs a sequence of tests and causes the LED indicators on the UC03 to display an error code.

To enable this Self-Test Error Reporting:

1. Set set SW2-5 ON (1).

2. Power-down and power-up the CPU, or toggle switch SW1-1 on the UC03 (ON and then OFF) to cause the UC03 to perform its self-test in the diagnostic mode.

3. Observe the four LED indicators on the edge of the UC03. If this test detects an error, the CPU halts and the LED indicators display an error code. The error codes are listed and explained in Table 6-2.

Table 6-2. Error Codes

LED 4 3 2 1		Error Description
○ ○ ○ ●	0 0 0 1	Addressing/Data Test on internal RAM failed.
○ ○ ● ○	0 0 1 0	Push and Pop Stack Test failed.
○ ○ ● ●	0 0 1 1	Logic Function Test failed.
○ ● ○ ○	0 1 0 0	Addition and Subtraction Test failed.
○ ● ○ ●	0 1 0 1	Multiplication and Division Test failed.
○ ● ● ○	0 1 1 0	RAM Bank Selection via Processor Status Word (PSW) Test failed.
○ ● ● ●	0 1 1 1	Boolean Instruction Test failed.
● ○ ○ ○	1 0 0 0	Untested 8031 Instruction Test failed.
● ○ ○ ●	1 0 0 1	SCSI Chip Test failed.
● ○ ● ○	1 0 1 0	External RAM and Addressing Data Test failed.
● ○ ● ●	1 0 1 1	Buffer Controller Chip failed.
● ● ○ ○	1 1 0 0	Host Adapter Controller (HAC) Test failed.
● ● ○ ●	1 1 0 1	External RAM Refresh Test failed.
● ● ● ○	1 1 1 0	Checksum Test failed.
○ ○ ○ ○	0 0 0 0	Self-Diagnostic complete without errors. Entering main program.

○,0 = LED OFF
●,1 = LED ON, illuminated

SOFTWARE ERROR MESSAGES

Both the Emulex MS/SCSI Disk Formatter Program and the UDA50 Subsystem Reliability Program display error messages if an error cannot be corrected by the software program. This section describes the error messages that may be displayed by these programs.

Emulex MS/SCSI Disk Formatter Error Message Definitions

Table 6-3 lists and defines possible error messages that the Emulex MS/SCSI Disk Formatter displays if it detects an uncorrectable or hard error.

Table 6-3. Emulex MS/SCSI Disk Formatter
Error Message Definitions

Error Message	Definition
Bad instruction error	The program has probably been corrupted in memory, or the distribution media is faulty. Reload program and retry.
Bad-block-type error without valid address.	A bad block error was reported to the program with an invalid block address. Indicates that the disk controller may be bad, or that a media defect obscures the bad block identification locations.
CPU timeout occurred.	CPU timeout occurred as a result of a bus protocol error such as failure to receive slave sync after presenting an address on the bus (non-existent memory); or the CSR address of the UC03 was specified incorrectly. Check the switches on the UC03.
Defect list overflowed. Too many errors.	Indicates that the number of bad blocks or tracks has exceeded the number of available replacement blocks or tracks. This indicates that the drive or media is bad.
Continued next page	

125

Table 6-3. Emulex MS/SCSI Disk Formatter
Error Message Definitions (continued)

Error Message	Definition
Error code indicates a drive error.	The error reported to the program indicates that a drive failure has occurred.
Error is not a SCSI class 1 type. Error code (octal) is xx.	The error reported to the program was not a SCSI class 1 error (target error). The program cannot recover from other classes of errors. See Appendix B.
Error on Send Diagnostic command.	The UC03 is unable to configure the disk controller.
Error on Format command.	The UC03 is unable to configure the disk controller. You may have specified an invalid configuration parameter during the drive-parameter prompt sequence or the drive controller may be faulty.
Error on Set Controller Characteristics command.	The UC03 may be bad.
Failed to flag bad sector or track on IOMEGA drive.	The UC03 has reported a SCSI error as a result of failure of a command to flag a bad sector or track on an IOMEGA drive. Indicates that the IOMEGA cartridge may have excessive faults.
Failure on initialization step x.	The UC03 failed to respond as expected during the indicated initialization step. The UC03 may be bad.
Continued next page	

Table 6-3. Emulex MS/SCSI Disk Formatter
Error Message Definitions (continued)

Error Message	Definition
Host Adapter is not ready.	The UC03 is returning "not ready" status in response to program inquiries.
Missed response message interrupt.	The program has failed to receive a response interrupt within the time allowed. The UC03 may be bad.
MSCP error on SCSI read command. Fatal error condition. Abandoning verification.	The program has detected an MSCP error while issuing a read command to the UC03. Indicates possible UC03 failure.
MSCP error on SCSI write command. Fatal error condition. Abandoning verification.	The program has detected an MSCP error while issuing a write command to the UC03. Indicates possible UC03 failure.
MSCP error while trying to flag a bad sector on an IOMEGA drive.	The UC03 has reported an error as a result of a failed command to flag a bad sector on an IOMEGA drive. Indicates that the UC03 may be bad.
MSCP error while trying to flag a bad track on an IOMEGA drive.	The UC03 has reported an error as a result of a failed command to flag a bad track on an IOMEGA drive. Indicates that the UC03 may be bad.
Continued on next page	

127

Table 6-3.   Emulex MS/SCSI Disk Formatter
Error Message Definitions (continued)

Error Message	Definition
MSCP status (octal) = xxxxxx	Refer to DIGITAL's UDA50 Programmer's Documentation Kit (QP905-GZ); MSCP Basic Disk Function Manual (AA-L619A-TK).
No free command descriptor.	The UC03 failed to return ownership of a command descriptor block to the program. The UC03 may be bad.
Response message command reference number didn't match with command packet	The UC03 may be bad.
Retries exhausted on mode select command.	The UC03 is unable to configure the disk controller. You may have specified an invalid configuration parameter during the drive parameter prompt sequence or the drive controller may be faulty.
SCSI error on SCSI read command.	A drive controller has reported (via the SCSI bus) an unrecoverable error to the UC03 during a read operation. Indicates that there is a defect on the drive media.
SCSI error on SCSI write command.	A drive controller has reported (via the SCSI bus) an unrecoverable error to the UC03 during a write operation. Indicates that there is a defect on the drive media.
Continued on next page	

Table 6-3. Emulex MS/SCSI Disk Formatter
Error Message Definitions (continued)

Error Message	Definition
SCSI status (octal) = 2	The SCSI status byte reported a CHECK CONDITION. An error, exception, or abnormal condition occurred.
SCSI error on final Format Command.	A drive controller has reported (via the SCSI bus) an unrecoverable error to the UC03 during the final phase of the formatting process. Indicates a controller or UC03 problem.
MSCP error on final Format Command.	The program has detected an MSCP error during the final phase of the formatting process. Indicates possible UC03 failure.
Warning: The controller failed the final format operation, so the drive is unusable.	This message occurs only when either the MSCP or SCSI error on final Format Command message displays.
The drive failed to come online.	Initial status indicated that the drive was present, but it is now failing to respond as expected.
UDASA = xxxxxx	XXXXXX is the content of the UC03 SA register. See the Registers and Programming Section of the UC03 Technical Manual for a description of the register.
UDASA does not contain expected data on step x	The UC03 failed to respond as expected during the indicated initialization step. The UC03 may be bad.
Continued on next page	

129

Table 6-3.   Emulex MS/SCSI Disk Formatter
Error Message Definitions (continued)

Error Message	Definition
UDASA not as expected for step 1 of initialization.	The UC03 SA register did not contain the expected status. Indicates that the UC03 is not at the CSR address given to the program or that the UC03 is bad.
UDASA not clear after hard initialization	The UC03 is configured with the wrong CSR address or it may be bad.
Unexpected interrupt occurred.	The program has received an unexpected interrupt. Another device on the bus may be configured with the same interrupt address as the UC03, or the UC03 may be bad.

Emulex UDA50 Subsystem Reliability Error Messages

Table 6-4 lists and defines possible error messages that the
Emulex UDA50 Subsystem Reliability Program displays if it detects
an uncorrectable or hard error.

Table 6-4. Emulex UDA50 Subsystem Reliability Program
Error Message Definitions

Error Message	Definition
Step 1 Didn't Appear Within 100 uSec After Hard Initialize	MSCP requires that the controller supplies the Step 1 data of the initialize sequence to the SA Register within 100 uSec of a Bus initialization. This error indicates that step was not accomplished.
Initialization Step Didn't Complete Within 10 Seconds	During the four steps of initialization, the controller is allowed 10 secs to complete the entire sequence. This error indicates one or more of those steps was not completed within that time.
Bit(s) Error In UDASA Register During Initialization	The Host System sends and receives certain bit patterns to the controller through the SA Register during initialization. This message indicates the Host received unexpected bit(s).
Response Packet Command Reference Number Didn't Match with Command Packet	Every command packet sent by MSCP contains a unique command reference number. When the controller returns, the end packet to the Host, the Host checks this number to see if it is the same. This message means it wasn't.
Error On Set Controller Characteristics Command	Controller could not successfully execute the set controller characteristics command.
continued on next page	

131

Table 6-4. Emulex UDA50 Subsystem Reliability Program
Error Message Definitions (continued)

Error Message	Definition
Missed Response Packet Interrupt	The controller has a certain amount of time to respond to the command issued by the host. This message states that the controller did not respond in time.
Error On Writing Test Block(s)	The controller did not complete the write command with error free status.
Error On Reading Test Block(s)	Same as above, except that it applies to the read command.
Error On Comparing Host Data With Test Block(s)	When the data that was written was compared with the data in memory an error was found.
Controller Not Ready	The host has read the SA register prior to issuing a command and found it to be non-zero. This means the controller is no longer ready.
No Free Command Descriptor	The host attempted to issue a command to the controller, but found that the controller still owned the command ring slot it wanted to use.
UDA SA Register Not Zeros On Next Bus Cycle	Zeros must be present in the SA Register on the first bus cycle after a bus initialization. This means that it wasn't.
Not Able To Bring Drive Online Please Attempt Re-Initialization	An error occurred during a read or write command, and the drive was taken offline, and the diagnostic could not bring it online again.
Bad Instruction Trap	Fatal Diagnostic Error that usually requires reload of the diagnostic.
continued on next page	

Table 6-4. Emulex UDA50 Subsystem Reliability Program
Error Message Definitions (continued)

Error Message	Definition
Bad Interrupt Error Trap	A device did not interrupt to the proper vector.
Bad Timeout Error Trap	A timeout occurred somewhere in the diagnostic, usually requires reload of the diagnostic.
Data Compare Error At Block #	There was a miscompare between the data written and the data read.

Backup/Restore Program Error Messages

Table 6-5 lists and defines possible error messages which may display while you are using the MS/SCSI Stand-Alone (Disk Image) Backup/Restore Program.

Table 6-5. Backup/Restore Program Error Messages

Message	Definition
BRP>aborted - Unexpected interrupt occurred, old PC:	The program will abort if an unexpected interrupt occurs.
BRP>aborted - Operator entered control-C	The program will abort if the user enters a <Control> C from the terminal.
BRP>aborted - Bus timeout error, old PC:	The program will abort if the CPU times out.
BRP>aborted - MSCP initialization error	
BRP>aborted - MSCP initialization timeout error	
BRP>aborted - MSCP command reference number mismatch	
BRP>aborted - MSCP controller error	
BRP>aborted - Illegal instruction error, old PC:	The program will abort if the CPU executes a bad instruction
BRP>aborted - Memory less than 28K words.	The program will abort if there is less than 28K words of memory in the system.
BRP>Tape to tape not supported.	This message is displayed if the user enters device code "M" in response to question 4 of the initialization dialogue.
continued next page	

134

Table 6-5. Backup/Restore Program Error Messages
(continued)

Message	Definition
BRP>No such device	This message is displayed if the user specifies an unsupported device for backup device or restore operations.
BRP>aborted - RK drive not ready	The program will abort if the RK drive is not ready when initialization is attempted.
BRP>aborted - Tape unit not ready	The program will abort if the tape subsystem is not ready when initialization is attempted.
BRP>tape drive is off line. BRP>set drive to on line and press return when ready	The program notes that the tape drive is off line. The program will wait for the user to set the tape drive on line and enter carriage return to notify the program the drive is ready.
BRP>aborted - Tape failed in write characteristics	The program will abort if there is an error when writing characteristics to the tape drive.
BRP>aborted - Tape drive is write protected. BRP>Please enable write on tape and press RETURN.	During the backup operations, the program will abort if the tape drive is write protected.
BRP>aborted - Incorrect length from tape.	
BRP>aborted - Residual block number too large	
BRP>aborted - RK06/07 controller timeout.	The program will abort if there is a controller timeout after RK06 or RK07 disk operation.
continued next page	

Table 6-5.   Backup/Restore Program Error Messages
(continued)

Message	Definition
BRP>aborted - read error on home block.	This message is displayed if the program detects an error while reading the home block under the RSX-11M operating system.
BRP>aborted - Read error on bad-block file header.	This message is displayed if the program detects an error while reading the bad-block file header under the RSX-11M operating system.
BRP>aborted - Can't find bad-block file.	This message is displayed if the program cannot find the bad-block file under the RSX-11M operating system.
BRP>aborted - Non-existent tape	
BRP>Data error	
BRP>aborted - MSCP media format error.	
BRP>aborted - MSCP fatal error.	
BRP>Read error from CYL : XXXXX ; TRK : XX ; SEC : XX ; WITH WC ; XXX	This message is displayed if the program detects an error while reading the disk. The specific cylinder, track, sector and word count are reported.
BRP>do you want to continue (Y or N) ?	After detection of a read or write error, the program will display this message. If Y is entered, the program will continue. If N is entered, the program will halt.
continued next page.	

Table 6-5.   Backup/Restore Program Error Messages
(continued)

Message	Definition
BRP>tape error after 16 retry	This message indicates that the seventeenth retry of a tape read or write operation has produced an error.
BRP>write error at CYL : XXXX ; TRK : XX ; SEC : XX ; WITH WC ; XXX	This message is displayed if the program detects an error while writing the disk. The specific cylinder, track, sector and word count are reported.
BRP>aborted - Restore media is different from backup media	The program will abort if the restore media parameters (drive type, cylinder, track, and sector) are different from that the backup media.
BRP>aborted - RP drive not ready	The program will abort if the RP02/03/04/05/06 drive is not ready when initialization is attempted.
BRP>aborted - RP02/03 controller timeout	The program will abort if the RP02/03 controller times out after a disk operation.
BRP>aborted - RP04/05/06 controller timeout	The program will abort if the RP04/05/06 controller times out after a disk operation.
BRP>aborted - RM drive not ready	The program will abort if the RM02/03/05 drive is not ready when initialization is attempted.
BRP>aborted - RM02/03/05 controller timeout	The program will abort if the controller times out after RM02/03/05 disk operation.
BRP>aborted - read error on GFD label block	
continued next page	

Table 6-5. Backup/Restore Program Error Messages
(continued)

Message	Definition
BRP>aborted - read error on MFD label block	The program will abort if an error is detected while reading the MFD label block under the RSTS/E operating system.
BRP>aborted - MFD label block not found	The program will abort if it can not find MFD label block under the RSTS/E operating system.
BRP>aborted - GFD label block not found	
BRP>aborted - read error on UFD label block	The program will abort if an error is detected while reading the UFD label block under the RSTS/E operating system.
BRP>aborted - UFD label block not found	The program will abort if it can not find the UFD label block under the RSTS/E operating system.
BRP>aborted - block number too large	The program will abort if, when calculating the bad sector block number, it determines that the block number is larger than the disk's total block count.
BRP>aborted - RL01/02 controller timeout	The program will abort if the RL01/02 controller times out after a disk operation.
BRP>aborted - RL drive not ready	The program will abort if the RL01/02 drive is found not ready when initialization is attempted.
BRP>aborted - DU unit - offline	

OVERVIEW

This appendix describes the general, environmental, physical, and electrical specifications for the UC03 Host Adapter.

GENERAL SPECIFICATIONS

Table A-1. UC03 General Specifications

Parameter	Description
FUNCTION	Provide mass data storage for DEC LSI-11 bus-based systems
Logical CPU Interface	Complete implementation of DEC Mass Storage Control Protocol (MSCP)
Diagnostic Software	Emulex MS/SCSI Disk Formatter, Emulex UDA50 Subsystem Reliabiity
Operating System Compatibility	RT-11, RSX-11M, RSX-11M PLUS, RSTS/E
CPU I/O Technique	Direct Memory Access, including Block Mode and Adaptive Techniques and 22-Bit Memory Addressing
INTERFACE	
CPU Interface	Standard LSI-11 bus interface.
Device CSR Address	
Standard Alternate	$(17)\,772150_8$ $(17)\,772154_8$
Vector Address	Programmable
Priority Level	BR5, BR4
Load	One LSI-11 bus
Continued on next page	

SPECIFICATIONS

Table A-1.   UC03 General Specifications (continued)

Parameter	Description
Peripheral Interface	Small Compter System Interface (SCSI) ANSI X3T9.2/82-2 compatible
Driver Option	Single-Ended
Maximum Cable Length	18 ft (6 m)
SCSI Commands used with MSCP Implementation	00 Test Unit Ready 03 Request Sense 08 Read 0A Write

ENVIRONMENTAL SPECIFICATION

Table A-2. UC03 Environmental Specifications

Parameter	Description
OPERATING TEMPERATURE	5° to 50° Celsius (C) 41° to 122° Fahrenheit (F) Where maximum temperature is reduced $1.8^{\circ}C$ per 1000 meters ($1^{\circ}F$ per 1000 feet) altitude
RELATIVE HUMIDITY	10% to 90% with a maximum wet bulb of $28^{\circ}C$ ($82^{\circ}F$) and a minimum dewpoint of $2^{\circ}C$ ($3.6^{\circ}F$)
COOLING RATE	6 cubic feet per minute
HEAT DISSIPATION RATE	82 BTU per hour

PHYSICAL SPECIFICATION

Table A-3. UC03 Physical Specifications

Parameter	Description
PACKAGING	Single, quad-size, six-layer PCBA
Dimensions	10.436 x 8.70 inches (in) 26.507 x 22.098 centimeters (cm)
Shipping Weight	4 pounds

ELECTRICAL SPECIFICATION

Table A-4. UC03 Electrical Specifications

Parameter	Description
POWER	5 Vdc ± 5%, 4.6 A
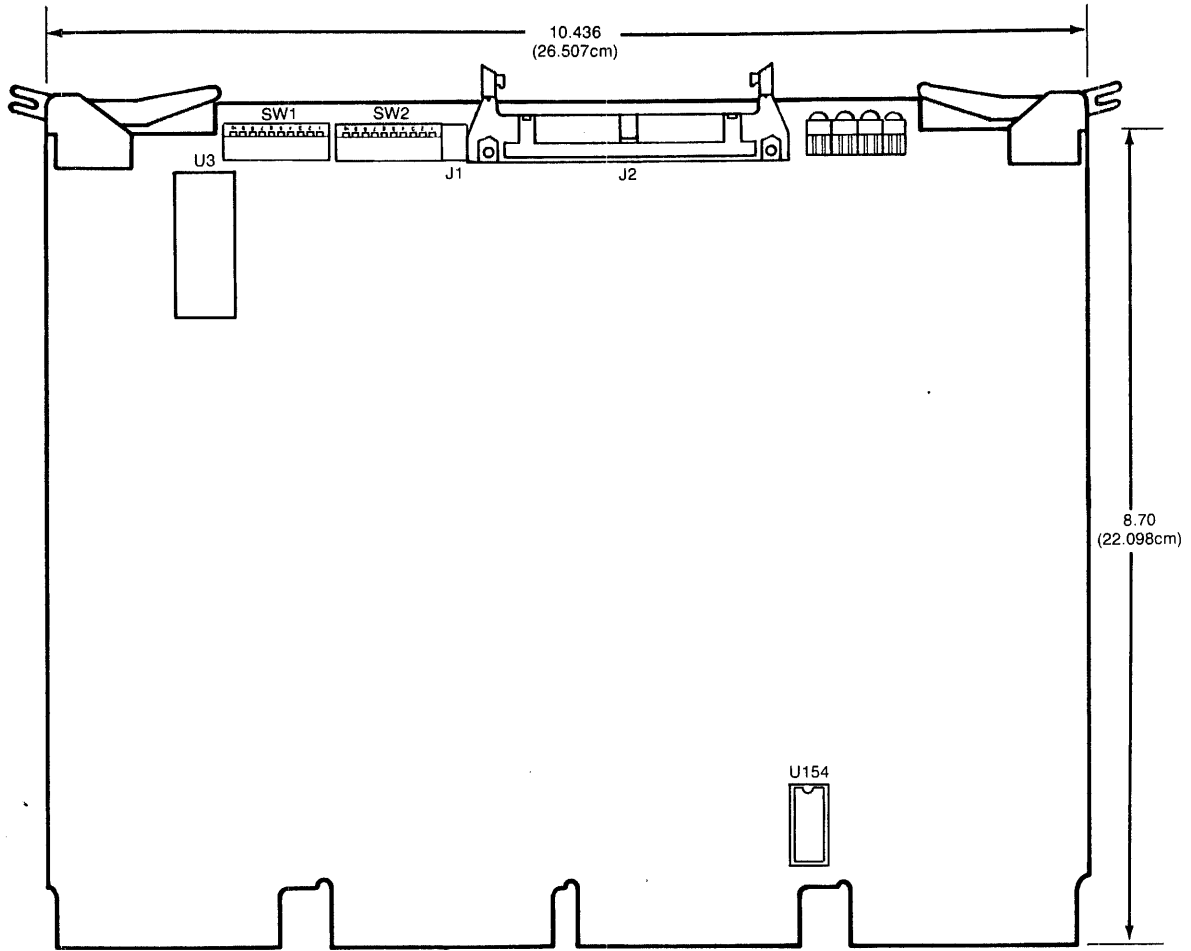
Figure A-1.   UC03 PCBA Dimensions

OVERVIEW

This appendix supplements **Section 5, USING YOUR UC03 SOFTWARE** by describing some applications of the software which not all users may require, such as:

- Drive/Controller Dialogue from the Emulex MSCP/SCSI Disk Formatter

- Diagnostic Supervisor commands from the Emulex UDA50 Subsystem Reliablity Program

- SCSI Standard Sense Byte Error Codes

- Verification Data Patterns used by the Emulex MSCP/SCSI Disk Formatter Program

DRIVE/CONTROLLER COMBINATION DIALOGUE

If the Emulex MSCP/SCSI Disk Formatter program does not recognize
the combination of drive and controller in your subsystem, the
program prompts for characteristics of your particular drive and
controller. The next five screens detail these prompts.

The program asks for the total number of cylinders and the number
of data heads on the drive. The program then asks for the
cylinder number from which reduced write current should be used.

Drive Landing Zone

The program then asks whether or not the drive has a designated
landing zone.

If the answer is yes, type the letter "y" and the program will
ask two questions that allow the exact location of the zone to be
computed.

If the answer is no, type the letter "n" and the program will
skip to the **Step Pulse Rate** questions.

HOW MANY CYLINDERS (DECIMAL) DOES THIS DRIVE HAVE?

HOW MANY DATA HEADS (DECIMAL) DOES THIS DRIVE HAVE?

WHAT VALUE (DECIMAL) SHOULD THE REDUCED WRITE CURRENT
CYLINDER TAKE?

DOES THIS DRIVE HAVE A DESIGNATED LANDING ZONE?

IS IT NEAR THE HUB (BEYOND THE HIGHEST TRACK)?
[Y OR N]

HOW MANY CYLINDERS (DECIMAL) AWAY FROM THE NEAREST
DATA TRACK IS THE LANDING ZONE? [0->127]

Step Pulse Rate

The program then prompts for the maximum Step Pulse rate that the drive can handle. Type the number that corresponds to the rate specified on the menu screen shown at the right. The default rate is 12 microseconds for Winchester drives.

Interleave Factor for Winchester Drives

For Winchester disk drives, the program prompts for an interleave factor. For optimum system performance, Emulex recommends that you use an interleave factor of one for Winchester disk drives in a MSCP subsystem using a UC03.

PLEASE SELECT THE STEP PULSE OUTPUT RATE:
    1 - 3.0 MILLISECOND RATE FOR NON-BUFFERED SEEK
    2 - 28 MICROSECOND RATE FOR BUFFERED SEEK
    3 - 12 MICROSECOND RATE FOR BUFFERED
TYPE THE SINGLE DIGIT TO THE LEFT OF YOUR CHOICE: **3**

WHAT INTERLEAVE FACTOR (DECIMAL) DO YOU WISH TO USE ?
[1->127] **1<cr>**

Bytes per Sector

The program then requests the number of bytes per sector on the drive being formatted. Type the number to select the appropriate menu option and enter a carriage return.

Interleave Factor for Winchester Drives

For Winchester disk drives, the program prompts for an interleave factor. For optimum system performance, Emulex recommends that you use an interleave factor of one for Winchester disk drives in a MSCP subsystem using a UC03.

PLEASE SELECT THE NUMBER OF BYTES PER SECTOR USED ON
THIS DRIVE
   1 - 256 BYTES PER SECTOR
   2 - 512 BYTES PER SECTOR
TYPE THE SINGLE DIGIT TO THE LEFT OF YOUR CHOICE: 1

WHAT INTERLEAVE FACTOR (DECIMAL) DO YOU WISH TO USE ?
[1->127] 1<cr>

DIAGNOSTIC SUPERVISOR COMMANDS

IP - Initialize Program: This routine will restart the diagnostic program and initialize all the common test variables.

SS - Select Switch Options: This routine is used in conjunction with the Display Switch Option to enable various switches within the switch table. The routine is used whenever there is an absence of front panel switches. When the command is entered, the switch option table will be printed on the CRT or LP, after which it will ask for the following.

Drive/Controller Combination Dialogue for Medalist

This section describes the Emulex MSCP/SCSI Disk Formatter Program, Revision 2.10, and the drive and controller dialogue that appears when you use this program with a subsystem that includes an Emulex Medalist (MD01) Disk Controller.

Table B describes this drive and controller dialogue. The program prompts and user responses are listed in sequence. The responses are in **boldface** type. The first column lists the program prompts. The second column lists the appropriate responses for formatting Atasi disk drives. The third column lists the appropriate responses for formatting Maxtor disk drives.

Table B. Emulex MSCP/SCSI Disk Formatter
Drive and Controller Dialogue for
Medalist Controller and Atasi or
Maxtor Disk Drives

Prompt	Response for Atasi	Response for Maxtor
How many alternate cylinders (decimal) do you want to configure?	**2**	**2**
How many data heads (decimal) does this drive have?	**7**	**15**

Please select the number of bytes per sector used on this drive
   1 - 256 bytes per sector
   2 - 512 bytes per sector
Type the single digit to the left of your choice:_
	Option 2 **(512)**	**Option 2** **(512)**

Specify the number of spare sectors per track [0, 1, 2, or 3]	**1**	**1**
Does this drive support step pulse buffering? [Y or N]	**Y**	**Y**
continued next page		

Table B. Emulex MSCP/SCSI Disk Formatter
Drive/Controller Dialogue for
Medalist Controller and Atasi or
Maxtor Disk Drives (continued)

Prompt	Response for Atasi	Response for Maxtor
How many sectors (not including those entered as spares above) does this drive have on each track?	16	16
How many cylinders (in decimal, not including those entered as alternates above) does this drive have?	643	916
What value (decimal) should the Write Precompensation Cylinder take?	320	919
What value (decimal) should the Reduced Write Current Cylinder take?	320	919

IP
CHANGE HW (L) ? **N<cr>**
USING 22-BIT ADDRESSING (Y OR N) ? **Y<cr>**
UNITS STATUS
ATP Y or N? **N<cr>**

EXC>SS<cr>

SS	Description	SS	Description
15	Halt On Error	14	Loop On Test
13	Inhibit Error Typeout	12	Not Used
11	Not Used	10	Ring Bell On Error
09	Loop On Error	08	Not Used
07	Not Used	06	Inhibit Data Compare
05	No Data Compare Typeout	04	Not Used
03	Not Used	02	Not Used
01	Not Used	00	Not Used

OPTIONS: **13,9,5<cr>**

DS - Display Switch Options: This routine displays the switch table, which describes the use for each switch currently being implemented. A sample switch table is shown in the screen at the right.

Changing Switch Options

To change a selected switch option, use the Select Switch Option command (SS). Type the number of the option selected to de-select that option. Type the Display Switch Option (DS) command to verify your switch option selections.

EXC>**DS**<cr>

SS	Description	SS	Description
15	Halt On Error	14	Loop On Test
13	Inhibit Error Typeout	12	Not Used
11	Not Used	10	Ring Bell On Error
09	Loop On Error	08	Not Used
07	Not Used	06	Inhibit Data Compare
05	No Data Compare Typeout	04	Not Used
03	Not Used	02	Not Used
01	Not Used	00	Not Used

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0

EXC>**SS 13,5**<cr>

EXC>**DS**<cr>

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0

SD – Select Test Drives: This routine allows the user to specify the drives to be tested. Where 0,1,2,3 are the drives to be tested (must be separated by commas).

SP – Start Program: This routine will start to execute the diagnostic test sequence. This is the normal procedure to start the test program.

AT – Select All Tests: This routine will initialize the test sequence table to include all the tests when execution of the diagnostic program starts.

—   —

EXC>SD 0,1<cr>

—   —

EXC>AT<cr>

EXC>SP<cr>

LP – Enable Line Printer: This routine will enable the line
printer as the output device

KB – Enable CRT/TTY: This routine will enable the CRT/TTY as the
output device and disable the LP. Usually used only
when the LP has been previously selected as the
output device.

ST – Select Sequence Tests: This routine will let the user enter
the tests to be run in any order of his choosing. Where 1,3,5
are test numbers (must be separated by commas). Because this
diagnostic only contains two tests, there should not be much need
for this command.

NT – Select No Tests: This routine will let the user enter any
tests which he does not want to execute while the test program is
running. Where 1,3,5 are test numbers (must be separated by
commas).

B-14

EXC>**LP<cr>**

EXC>**KB<cr>**

EXC>**ST 1,2**

EXC>**NT 2**

SB – Set BREAKPOINT: This routine provides the user with the ability to stop execution of the test program at any specified memory location. When the address that is breakpointed is reached, the test program halts and returns to the executive prompt. XXXXXX is the specific address you wish to stop at.

CB – Clear Breakpoint: This routine will clear the previous breakpoint trap and restore the program code at the trap location. If you have SET BREAKPOINT and never reached it and wish to set another breakpoint, you must first clear the previous one.

LB – Loop Address On Breakpoint: This routine gets the breakpoint address and also turns switch 8 ON. XXXXXX is the breakpoint address.

The following commands normally are used only after the test program has been halted and only when examination and modification of specific parts of the memory are required.

DM – Dump Memory: This command will display the contents of the specified memory locations. SSSSSS is the starting memory location and EEEEE is the ending memory location.

EXC>SB XXXXXX<cr>

EXC>CB<cr>

EXC>LB XXXXXX<cr>

EXC>DM SSSSSS,EEEEEE<cr>

PM - Patch Memory: This routine will examine and/or modify specified memory location contents. If it is desired to modify the data at that location, the operator simply types in the new data in octal followed by a terminator. If there is no new input then the original data will remain unchanged. XXXXXX is the memory location to be patched.

Valid input terminators are as follows:

CR - End patching, return to command monitor
LF - Examine next sequential location of memory
^ - Examine previous memory location
@ - Examine memory address that equals data examined

GT - Go to Specific Address: This routine will cause the test program to go to the specified memory location. XXXXXX is the specific address.

DR - Dump Registers: This routine will display all the PDP-11 general register contents at the trap or halt condition.

EXC>PM XXXXXX<cr>

EXC>GT XXXXXX<cr>

EXC>DR<cr>

SCSI STANDARD SENSE BYTE ERROR CODES

If the Emulex MSCP/SCSI Disk Formatter detects a SCSI Class 1
Error, the program displays the error code in octal. Table B-1
lists and defines the possible error codes for SCSI Class 1 disk
drive errors. The table lists the error codes in octal as they
appear on your display screen during the program, and in
hexadecimal as the error messages are defined in the SCSI
specification.

Table B-1. SCSI Standard Sense Byte Error Codes

Disk Drive Error Codes			
Octal Code	Error	Description	Hex Code
0	No Sense	The drive controller detected no error during execution of the previous command.	00
2	No Seek Complete	The drive controller could not seek to the specified address within an allotted time.	02
4	Drive Not Ready	The disk drive is not ready.	04
5	Drive Not Selected	The drive associated with the specified LUN could not be addressed.	05
6	No Track Zero	The drive controller could not rezero the disk drive.	06
13	Drive Timeout	A timeout occured during an operation being performed by the disk drive.	0B

MEDIA VERIFICATION DATA PATTERNS

Table B-2 lists and describes the 16-word verification data patterns used by the Emulex MSCP/SCSI Disk Formatter Program to verify the media.

Table B-2.   Verification Data Patterns

Number	Pattern	Description
0	0	Sixteen words of all zeros.
1	165555 133333	First half of worst case. Repeat each word pair eight times.
2	133333 165555	Second half of worst case. Repeat each word pair eight times.
3	-1	Sixteen words with all bits asserted.
4	1 3 7 17 37 77 177 377 777 1777 3777 7777 17777 37777 77777 177777	Sixteen words as specified.
Continued next page		

Table B-2. Verification Data Patterns (continued)

Number	Pattern	Description
5	177776 177774 177770 177760 177740 177700 177600 177400 177000 176000 174000 170000 160000 140000 100000 0	Sixteen words as specified.
6	000000 000000 000000 177777 177777 177777 000000 000000 177777 177777 000000 177777 000000 177777 177777 000000	Sixteen words as specified.
Continued next page		

Table B-2. Verification Data Patterns (continued)

Number	Pattern	Description
7	0 010421 021042 031463 042104 052525 063146 073567 104210 114631 125252 135673 146314 156735 167356 177777	Sixteen words as specified.
8	052525 052525 052525 125252 125252 125252 052525 052525 125252 125252 052525 125252 052525 125252 125252 052525	Sixteen words as specified.

Continued next page

Table B-2. Verification Data Patterns (continued)

Number	Pattern	Description
9	007417 007417 007417 170360 170360 170360 007417 007417 170360 170360 007417 170360 007417 170360 170360 007417	Sixteen words as specified.
10	026455 026455 026455 151322 151322 151322 026455 026455 151322 151322 026455 151322 026455 151322 151322 026455	Sixteen words as specified.
Continued next page		

Table B-2.   Verification Data Patterns (continued)

Number	Pattern	Description
11	077577	Sixteen words of the same value.
12	1 2 4 10 20 40 100 200 400 1000 2000 4000 10000 20000 40000 100000	Sixteen words – moving ones.
13	177776 177775 177773 177767 177757 177737 177677 177577 177377 176777 175777 173777 167777 157777 137777 077777	Sixteen words – moving zeros.
Continued next page		

Table B-2. Verification Data Patterns (continued)

Number	Pattern	Description
14	172666 155555	Repeat each word pair eight times.
15	077777 137777 157777 167777 173777 175777 176777 177377 177577 177677 177737 177757 177767 177773 177775 177776	Sixteen words as specified.

OVERVIEW

This appendix supplements the subsystem information presented in Section 3. Use this section if you want more detailed information about the subsystem configurations supported by the UC03 Host Adapter.

1. Find the type of disk drive you wish to use in Table C-1. The UC03 supports two physical drives/four logical drives. Note the configuration numbers associated with the selected drive type. Table C-2 lists the SCSI controller device types. Both the Adaptec ACB-4000 and the Emulex Medalist disk controllers can support two drives per controller, but each drive must be the same device type. In a UC03 subsystem, the Adaptec 5000 is limited to support two physical drives instead of four physical drives.

2. If you want to include a tape drive in your subsystem, consult Table C-3 for the types of tape drives that are supported by the UC03. The UC03 supports only the Emulex Titleist family of SCSI tape drive controllers. Table C-2 lists the SCSI controller device types. Note the configuration numbers associated with the selected tape drive.

3. If you have selected both disk and tape devices, compare the configuration numbers that you have noted for each device type, selecting only those that appear on both lists.

4. If you want to map two logical drives onto one physical drive in any single disk drive subsystem, compare your list with configuration numbers 9, 10, 11, 13, 14, or 15. Select only those numbers that appear on both lists. If you select one of these configurations for a subsystem that does not include a SCSI tape controller, such as a Medley which uses a TC05 tape controller and Sentinel tape drive, note that the host operating system will identify the tape drive as an EUUT device which is supported by a SCSI tape controller. This device information may be considered superfluous in this instance because subsystem operation or performance is not affected.

Table C-1.   Disk Drive Type

Manufacturer	Model	Drive Key	Formatted Capacity	Configuration
Atasi	3046	100	36.7	01, 05, 09, 13, 17, 21, 25, 29
Fujitsu	M2243AS	101	67.5	03, 07, 11, 15, 19, 23, 27, 31
Maxtor	XT1140	102	110	02, 06, 10, 14, 18, 22, 26, 30
IOMEGA	Alpha-10.5	103	10.5	01, 02, 03, 16
Rodime	208	105	41.8	20, 28

Table C-2.   SCSI Controller Type

Manufacturer	Model	Units Supported
Emulex	Medalist MD01	100, 101, 102, 105
Adaptec	4000, 5000	100, 101, 102, 105
IOMEGA	Alpha-10.5	103
Emulex	Titleist MT01, MT02	104

Table C-3.   Tape Drive Type

Manufacturer	Model	Drive Key	Formatted Capacity	Configuration
Cipher	540	104	Varies	05, 06, 07, 09, 10, 11, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31

5. Look up the configurations that you have listed in step 4 in Table C-4. Table C-4 fully describes the subsystem that the UC03 supports when that configuration is selected. Select the configuration that best suits your application. Table C-4 has eight columns described as follows:

Column 1 (Config Number), is used to make cross referencing between the configuration and device type tables easier.

Column 2 (Drive Key), indicates the type of drive supported by this configuration.

Columns 3 (SCSI Address), 4 (Drive LUN), and 5 (MSCP Unit), relate to the number of drives supported by the UC03. The SCSI address in column three must be programmed into the disk or tape controller. Each address corresponds to one controller and each controller can support one or two physical drives (LUNs--Logical Unit Numbers). In addition, each LUN may be partitioned into two logical drives (MSCP Units). Two examples will make this clear:

EXAMPLE 1: Refer to configuration 21. This configuration supports two disk controllers at SCSI addresses 0 and 5. Both controllers support drive type 100 (Atasi 3046), so both controllers must therefore be either Emulex Medalists or Adaptec 4000s or 5000s (see Table C-3). The controller at SCSI Address 0 supports two physical drives (LUN 0 and 1) and the controller at SCSI Address 5 supports one physical drive (LUN 0). The MSCP unit numbering counts all storage devices, regardless of which SCSI Address they are at, so the two drives on the first controller are MSCP units 0 and 1, and the drive on the second controller is MSCP unit 2. The tape drive at SCSI Address 4 is type 104 (Cipher 540), which requires an Emulex Titleist controller. It is designated MSCP unit number 3.

EXAMPLE 2: Refer to configuration 9. This configuration supports only one controller, at SCSI Address 0. It is drive; type 100 (Atasi 3046), so the controller must be either an Emulex Medalist or an Adaptec 4000 or 5000 (see Table C-3). There is only one physical drive, LUN 0, but it is split into two logically separate drives. These logical drives have MSCP unit numbers 0 and 1. The tape drive at SCSI Address 4 is type 104 (Cipher 540), which requires an Emulex Titleist controller. It is designated MSCP unit number 2.

There are no configurations with just one winchester disk drive. All configurations with a single winchester are paired with either tape drives or IOMEGA cartridge drives. If you plan to use only a winchester drive, select the configuration that contains the tape drive, since the UC03 does not report the presence of tape drive to the operating system.

If the UC03 is located at a non-standard CSR address (not 772150), then you must specify an MSCP Unit number offset (see Section 3, INSTALLATION). To obtain the correct MSCP Unit number for a given configuration, add the offset to the unit number given in column 5.

Column 6 (MSCP Unit Capacity), is the capacity of the logical MSCP unit. A Physical drive with a capacity of 70000 could be split into two logical drives (as in example two), each with an MSCP Unit Capacity of 35000.

Column 8 (Rev Level), is the revision level of the firmware which is required to support the indicated configuration. To use a configuration, your firmware must be equal to or higher than the level shown in column eight.

6. When you have decided on a configuration, set UC03 switches SW1-6 through SW1-10 as indicated for that configuration.

Table C-4. Drive Configuration

Config Number	Drive Key	SCSI Addr	Drive LUN	MSCP Unit	MSCP Unit Capacity	SW 6	7	8	9	10	Rev
01	100	0	0	0	71747	0	0	0	0	1	A
	103	1	0	1	20301						
02	102	0	0	0	219283	0	0	0	1	0	A
	103	1	0	1	20301						
03	101	0	0	0	131939	0	0	0	1	1	A
	103	1	0	1	20301						
05	100	0	0	0	71747	0	0	1	0	1	A
	100		1	1	71747						
	104	4	0	2	Varies						
06	102	0	0	0	219283	0	0	1	1	0	A
	102		1	1	219283						
	104	4	0	2	Varies						
07	101	0	0	0	131939	0	0	1	1	1	A
	101		1	1	131939						
	104	4	0	2	Varies						
09*	100	0	0	0	35746	0	1	0	0	1	A
				1	35746						
	104	4	0	2	Varies						
10*	102	0	0	0	109378	0	1	0	1	0	A
				1	109378						
	104	4	0	2	Varies						
11*	101	0	0	0	65774	0	1	0	1	1	A
				1	65774						
	104	4	0	2	Varies						

continued next page

0 = OFF, open
1 = ON, closed
Config = Configuration
Cntrl = Controller
Addr = Address
LUN = Logical Unit Number
* = This configuration may be used to map two logical drives onto one physical drive in any single disk drive subsystem. See step 4 of procedure for further information.

Table C-4. Drive Configuration (continued)

Config Number	Drive Key	SCSI Addr	Drive LUN	MSCP Unit	MSCP Unit Capacity	SW 6	7	8	9	10	Rev
13*	100	0	0	0	62569	0	1	1	0	1	A
				1	8923						
	104	4	0	2	Varies						
14*	102	0	0	0	191425	0	1	1	1	0	A
				1	27331						
	104	4	0	2	Varies						
15*	101	0	0	0	115118	1	1	1	1	1	A
				1	16430						
	104	4	0	2	Varies						
16	103	1	0	0	20301	1	0	0	0	0	A
	104	4	0	1	Varies						
17	100	0	0	0	71747	1	0	0	0	1	A
	104	4	0	1	Varies						
18	102	0	0	0	219283	1	0	0	1	0	A
	104	4	0	1	Varies						
19	101	0	0	0	131939	1	0	0	1	1	A
	104	4	0	1	Varies						
20	105	0	0	0	81665	1	0	1	0	0	A
	105		1	1	81665						
	105	5	0	2	81665						
	104	4	0	3	Varies						
21	100	0	0	0	71747	1	0	1	0	1	A
	100		1	1	71747						
	100	5	0	2	71747						
	104	4	0	3	Varies						
continued next page											

0 = OFF, open
1 = ON, closed
Config = Configuration
Cntrl = Controller
Addr = Address
LUN = Logical Unit Number
* = This configuration may be used to map two logical drives onto one
    physical drive in any single disk drive subsystem. See step 4 of
    procedure for further information.

Table C-4. Drive Configuration (continued)

Config Number	Drive Key	SCSI Addr	Drive LUN	MSCP Unit	MSCP Unit Capacity	SW 6	7	8	9	10	Rev
22	102 102 102 104	0 5 4	0 1 0 0	0 1 2 3	219283 219283 219283 Varies	1	0	1	1	0	A
23	101 101 101 104	0 5 4	0 1 0 0	0 1 2 3	131939 131939 131939 Varies	1	0	1	1	1	A
25	100 100 104	0 5 4	0 0 0	0 1 2	71747 71747 Varies	1	1	0	0	1	A
26	102 102 104	0 5 4	0 0 0	0 1 2	219283 219283 Varies	1	1	0	1	0	A
27	101 101 104	0 5 4	0 0 0	0 1 2	131939 131939 Varies	1	1	0	1	1	A
28	105 105 105 104	0 5 2 4	0 0 0 0	0 1 2 3	81665 81665 81665 Varies	1	1	1	0	0	A
29	100 100 100 104	0 5 2 4	0 0 0 0	0 1 2 3	71747 71747 71747 Varies	1	1	1	0	1	A
30	102 102 102 104	0 5 2 4	0 0 0 0	0 1 2 3	219283 219283 219283 Varies	1	1	1	1	0	A
31	101 101 101 104	0 5 2 4	0 0 0 0	0 1 2 3	131939 131939 131939 Varies	1	1	1	1	1	A

0 = OFF, open
1 = ON, closed
Config = Configuration
Cntrl = Controller
Addr = Address
LUN = Logical Unit Number