CONVEX VME ESDI Disk Controller Service Guide

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CONVEX Computer Corporation
Richardson, Texas USA

CONVEX VME ESDI Disk Controller
Service Guide
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Revision Sheet

CONVEX VME ESDI Disk Controller
Service Guide

Second	Document No.	Date	Description
Second	081-000130-201	February 1990	Added information on DKD-284 780-Mbyte disk drive.
First	081-000130-200	April 1988	First release.

FCC NOTICE

Warning: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in strict accordance with the instructions 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 FCC Rules, which are designed to provide reasonable protection against such interference when operated 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.

Do not connect external equipment to the utility outlets in CONVEX equipment cabinets. Unauthorized connection voids all agencies' emissions certifications.

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Preface

Purpose and Intended Audience

This manual provides a general description of the VMEbus Enhanced Small Device Interface (V/ESDI) Disk Controller. The following areas are discussed:

- General description of VMEbus Enhanced Small Device Interface Disk Controller operation
- Installation of the VMEbus Enhanced Small Device Interface Disk Controller
- Integration of the V/ESDI disk controller into the CONVEX Operating System (ConvexOS)

This manual is for CONVEX field engineers, manufacturing personnel, and customers installing and maintaining this equipment. This manual is a subset of the VMEbus Service Kit.

Hardware and Software Requirements

The V/ESDI can be used with all CONVEX computers that have a VMEbus chassis installed.

Diagnostic program *dev5130* is used to verify the proper operation of the V/ESDI

Organization

The content of each chapter is outlined below:

- **Chapter 1. Description**—Describes the V/ESDI and lists the electromechanical and environmental specifications.
- **Chapter 2. Configuration and Installation**—Describes inspection and reporting of damage. Instructions on how to configure and install the V/ESDI are discussed.
- **Chapter 3. Integration and Test**—Explains the integration of the V/ESDI into ConvexOS. Information is also provided on diagnostic tests for the V/ESDI.
- **Appendix A. Reporting Problems**—Contains information concerning how to use the *contact* facility to report problems.

Notational Conventions

The following are examples of warnings, cautions, and notes and their typical content and locations as used in CONVEX documents:

WARNING

Warnings highlight procedures or information necessary to avoid injury to personnel. Warnings immediately precede the critical information and include a description of the hazard.

CAUTION

Cautions highlight procedures or information necessary to avoid damage to equipment, damage to software, or loss of data, or invalid test results. Cautions immediately precede the critical information and include a description of the possible damage.

NOTE

Notes highlight information of a supplemental nature. They immediately precede or follow the highlighted information.

Associated Documentation

The following partial list of manuals may provide more detailed information on the VMEbus I/O Processor system:

- *VME Reference Manual*, Order No. DHW-061
- *CONVEX VMEbus Service Documentation*, Order No. DHW-050
- *V/ESDI 4201 Panther High-performance VMEbus Enhanced Small Device Interface (ESDI) Disk Controller User's Guide* (Interphase Corporation), Document No. UG-0660-000-X0F
- *CONVEX System Manager's Guide*, Order No. DSW-004
- *Enhanced Small Disk Interface Specification*, Magnetic Peripherals, Inc., specification no. 77715898
- *DK514 Winchester Disk Drive Product Specification*, Hitachi, specification no. K2500186
- *DK515 Winchester Disk Drive Product Specification*, Hitachi, specification no. K2500279
- *CONVEX Removable Disk System Operation Guide*, Order No. DHW-043

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Chapter 1
Description

1.1 Overview

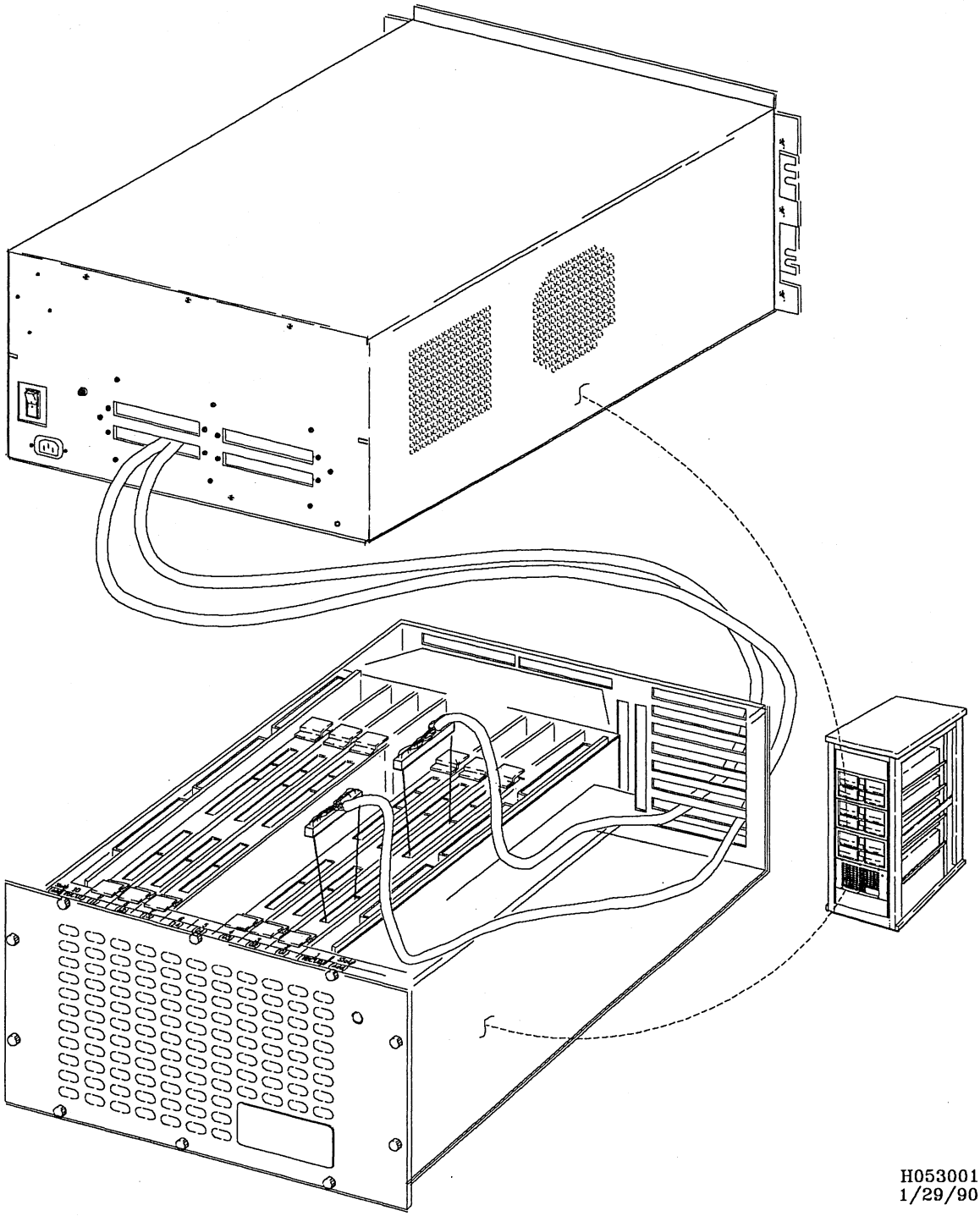
This chapter briefly discusses the major features and operating functions of the VMEbus Enhanced Small Device Interface (V/ESDI) Disk Controller. The V/ESDI is a disk controller and formatter, and interfaces between the VMEbus and RDS drives. The following topics are discussed in this chapter:

- **Hardware features**—Presents the main features of the V/ESDI
- **Functional description**—Discusses initial software setup requirements, and presents a brief overview of the sequence of operation
- **Interface**—Describes the basic interface between the V/ESDI, disk drive, and VMEbus
- **Diagnostics**—Describes the V/ESDI controller's onboard diagnostics
- **Specifications**—A tabular presentation of the electromechanical and environmental specifications for the V/ESDI

> **NOTE**
>
> For a detail description of the V/ESDI controller, refer to the Interphase Corporation's *V/ESDI 4201 Panther High-performance VMEbus Enhanced Small Device Interface (ESDI) Disk Controller User's Guide.*

The V/ESDI is a 6U VMEbus form factor board that can be installed in all CONVEX VMEbus chassis. The following figure illustrates the V/ESDI installed in a CONVEX VMEbus chassis and shows the cable connections to a typical disk drive:

Figure 1–1, V/ESDI Disk Controller Illustration



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1.2 Hardware Features

The V/ESDI controller contains many software or switch selectable features that enable it to operate with a variety of disk drives. For example, sector sizes are programmable from 128 bytes to 2,048 bytes. CONVEX default sector size is 512 Bytes.

The main hardware features of the V/ESDI disk controller are outlined in the following list:

- Uses a BUSpacket interface that boosts DMA throughput to more than 10 Mbytes/sec
- Operations are controlled by a simple macro-level software interface
- Uses an M68000 16-bit microprocessor that relieves the VIOP of disk handling tasks
- Supports 8-, 16-, or 32-bit wide data transfers, and provides 16-, 24-, or 32-bit addressing capability. CONVEX uses 24-bit addressing and 32-bit data transfers
- Has 128 Kbytes of memory, used as a group of virtual buffers, that reduce or eliminate data transfer delays caused by disk rotational latency and data overrun or underrun conditions
- Uses a pre-fetch cache scheme with dynamic buffer allocation and deallocation
- Built-in 32-bit automatic Error Correction Code (ECC) is used on both read and write operations. This code provides 32-bit detection and 11-bit correction
- Can control four Enhanced Small Device Interface drives
- Has extensive on-board diagnostics that are performed after each hardware or software reset
- Supports overlapped and implied seeks
- Contains seven programmable interrupts
- Uses jumper selectable bus request/grant levels, from zero to three (CONVEX VMEbus controllers use bus request/grant level 3 ONLY)
- Defective media detection and replacement, on a sector or track basis, is provided when formatting the disk
- Disk drives can be addressed by either their physical or logical sector address
- Uses zero latency reads and writes to insure maximum throughput
- Drive status change interrupts are programmable, for such operations as overlapped seeks
- Uses scatter and gather commands that enable the user to place contiguous disk data in noncontiguous areas of system memory or visa versa

1.3 Functional Description

The following sections present a brief overview of the characteristics and operations of the V/ESDI such as:

- Unit Initialization Block
- Input/Output Parameter Block
- Command and status registers
- Dynamic buffer allocation
- Read operations
- Write operations

1.3.1 Unit Initialization Block

The V/ESDI controller operates with a variety of disk drive formats, sizes, and speeds. The Unit Initialization Block (UIB) is a key element in this flexibility. Drive characteristics, such as number of heads, cylinders, sectors, skew, format, interleave, and others are defined in the UIB. The UIB *must* be defined before operations can begin. Therefore, the first operation *must* issue the *Initialize* command to the controller.

The V/ESDI automatically initializes the UIB to a set of default conditions during a hardware or software reset. The user can, however, create a customized UIB and overwrite these default conditions. To define a UIB for a specific operation, refer to the Interphase V/ESDI user guide. The following parameters are contained in a typical UIB:

- Status change interrupt level, register and vector (bytes 11 and 10)
- Second attributes set (byte F)
  - Unit select
  - ESDI drive type select
  - Multiple spare enable
- Attributes (byte E)
  - Spare sector enable
  - Caching enable
  - Status change
  - Increment by head
  - Move bad data
  - Reseek
- Number of cylinders (bytes D and C)
- Retry count (byte B)
- Sector interleave (byte A)
- Gap two words (byte 9)
- Gap one words (byte 8)

- Bytes per sector (bytes 7 and 6)
- Spiral skew (byte 5)
- Sectors/Track (byte 4)
- Volume specification (bytes 3--0)

1.3.2 Input/Output Parameter Block

The Input/Output Parameter Block (IOPB) instructs the V/ESDI to do specific functions, such as write or read data from the disk. Specific parameters *must* be defined before executing these operations. These parameters are defined by software and are stored in either the V/ESDIs memory or main memory. However, the IOPB must be defined in the V/ESDIs memory before it can reside in main memory.

Prior to a read or write operation, the VIOP builds an IOPB for the applicable command. When the command features are built, the VIOP will write a command to the *go* bit for the IOPB. The V/ESDI will then operate as a Bus Master and perform the required functions to complete the requested command.

The address of one IOPB may be programmed into a second IOPBs file to link it to the first IOPB. This enables a second operation to be performed as soon as the first one is completed. Refer to the Interphase V/ESDI user guide for the format and command requirements for the IOPB.

1.3.3 Command and Status Registers

The V/ESDI has two registers, a read and a write register, for command and status information. These registers are:

- Command Status Register
- Drive Status Register

The Command Status Register (CSR) contains command and status information. The host CPU uses the CSR to start an operation or to determine the status of an operation. The Drive Status Register (DSR) contains drive status information for both drives. The DSR is updated during the various drive operations, and is available for use by the host CPU.

The Interphase V/ESDI user guide contains a detailed description on the format of these registers.

1.3.4 Dynamic Buffer Allocation

Although not in the data path, the 68000 microprocessor manages the setup and sequence of the commands being executed by V/ESDI during data transfer operations. The 68000 microprocessor manages buffer assignments composed of the V/ESDIs onboard RAM. At any point in a data transfer operation, individual buffers may be dynamically allocated or deallocated by the 68000. The processor allocates or deallocates buffers as requested by the VMEbus or a disk drive.

1.3.5 Read Operations

Read operations begin when the V/ESDI puts an address signal out to the V/ESDI "A" cable for a specific drive. The addressed drive decodes the logical address and sends a status *drive selected* signal back to the controller. This establishes the communications link between the controller and the drive. The controller then sends signals to the drive to position a specific head over a track within a cylinder.

After receiving a signal from the drive that the head is in position on the requested track, the V/ESDI enables the head to start the read operation. Data is read as soon as the head is above the track, thus reducing latency time. The V/ESDI controller assumes the VIOP will request the next sequential track during a read operation. Therefore, when the end of a track is reached, the controller automatically switches the head to the next sequential track and starts reading.

Data is transferred to the VMEbus by first reading in serial data from the disk drive. Refer to figure 1–2 for the block diagram of the V/ESDI operation. The serial data then goes to the serial and de-serializer (serdes) chip. Data is checked for an ECC error then de-serialized in the serdes. If an ECC error ≤ 11 bits is detected (soft error), the data is corrected before it is sent to the RAM buffer. If the error cannot be corrected, a hard error condition is reported to the V/ESDIs microprocessor. This status may cause the 68000 to retry the operation. If no ECC errors are detected, the data is put into a parallel 16-bit format, then transferred to the V/ESDIs 128 Kbyte RAM buffer.

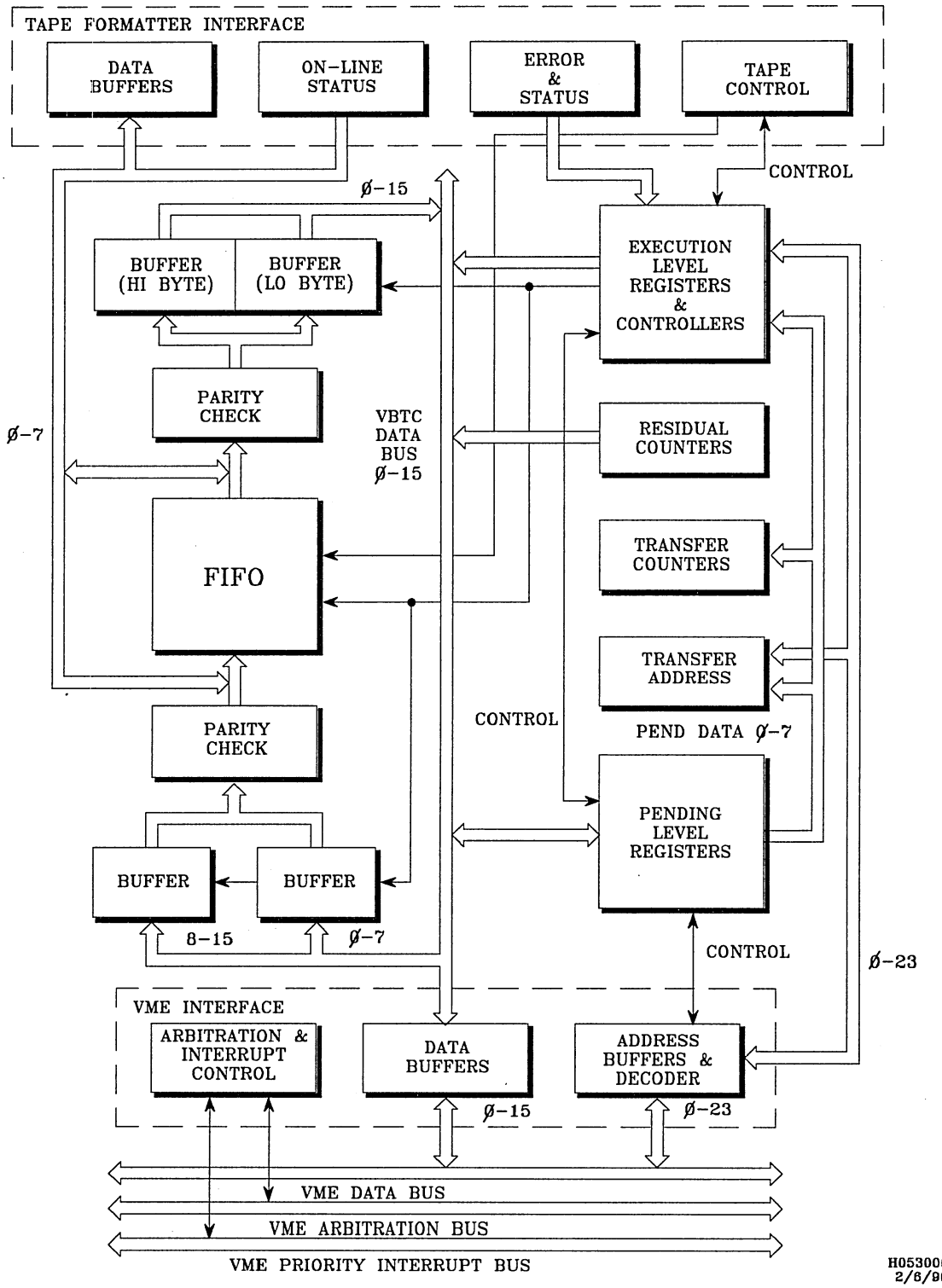
The read operation continues to fill the V/ESDIs Ram buffer with data. The BUSpacket First In First Out (FIFO) 512-byte buffer enables data blocks to be sent across the VMEbus as fast as the VIOP can accept the data. During a read operation, the FIFO buffer is filled with a packet of data from the 128 Kbyte buffer prior to the controller requesting the bus. Once the controller requests and is granted the bus, the packets of data are burst across the bus. When this transfer is complete the bus is released and the FIFO begins filling with more data. This continues until all the data has been read to system memory.

A read-ahead (pre-fetch) feature enables contiguous data read operations to be performed. For example, the initial read request will position the head to the desired track and immediately start reading data from the track. The head will read the entire track and transfer all data to a controller memory location. The requested data will then be transferred to the VMEbus, while the remaining data is stored in the buffer. If a follow-on request coincides with the data in the buffer, a check is made in a lookup table to verify that:

- The data is still valid
- Data has not been corrupted since the last request

If the data in the buffer has not been corrupted, the data is retrieved from the buffer. Because no access to the disk is required, latency time is reduced.

Figure 1–2, V/ESDI Operations Block Diagram



1.3.6 Write Operations

Most of the functions of the write operation are the same as the read operation, as far as requesting the cylinder and head on the disk. The V/ESDI controller signals the VIOP that it is ready to receive the data and the data is put on the VMEbus data bus. The V/ESDI contains a BUSpacket state machine that controls the data entering and leaving the FIFO buffer. The V/ESDI requests the bus, and on receipt of a bus grant, asserts *bus busy* and moves the data into the FIFO buffer.

When the FIFO buffer is filled, the data packet is sent to the 128 Kbyte RAM buffer. When the buffer is filled the data is then sent to the serdes chip for serialization and to the ECC circuit for ECC code generation. When the data passes through the serdes chip, the ECC code is appended to the end of the data bock as it is transferred to the disk.

The V/ESDI uses a cache buffer that functions much like the read-ahead feature in the read operation. Data previously written to a drive is retained in the cache buffer. Should a request follow for the same data as that written, the data may be retrieved directly from the buffer without accessing the disk. If a request for the data is received, the data will be taken from the buffer after verifying that it has not been changed. This caching scheme reduces the latency time that would normally be required to go out to the disk to retrieve the data.

1.4 V/ESDI Disk Interface

The interface hardware provides a communications path between the controller and the disk drive. Refer to the cable diagrams in the Interphase V/ESDI user guide. The interface circuits use TTL and differential signals. The receiver and driver circuits connect to the I/O cables between the V/ESDI controller and the disk drive. All data and control lines are contained in two cables, "A" and "B". The "A" cable is a 34-pin, round-shielded cable that carries commands and control information to the disk drive and status information to the controller. The "B" cable is a 20-pin, round-shielded cable. It carries the read and write data and clock information between the controller and the disk drive. The maximum length of the "A" cable or "B" cable is 3 meters (9.8 ft).

1.4.1 Interface Signals

Signals from the V/ESDI initiate and control the disk drive operation. These signals are transmitted in a series of bits to indicate the functions of operation. Each signal uses a separate sequence of bits. Signals are sent to the drive receivers, then routed to the appropriate circuits in the drive. The drive sends information about the operation back to the controller. The following table presents the signals output from the controller and returned to the controller with the supporting interface cable:

Table 1–1, V/ESDI Controller Signals

V/ESDI I/O Signals		
Ctlr Cable	**Controller Output**	**Controller Input**
J1	Head Select	Config Status
J1	Write Gate	Transfer ACK
J1	Trans Req	Attention
J1	Drive Select	Sector
J1	Read Gate	Index
J1	Cmd Data	Ready
J2/J3	+/– Write Clock	+/– Read/Ref Clock
J2/J3	+/– Write Data	+/– Read Data
J2/J3		Drive Selected
J2/J3		Cmd Completed

1.4.2 Typical Disk Drive Interface

A typical interface begins when the controller sends an address out to the A cable to select the drive for operations. On receipt, the drive compares its own logical address to the address sent by the controller. If the address sent by the controller is the same as that of the drive, the drive enables the receivers and drivers and signals the controller the drive is now ready to accept further commands. All commands from the controller are sent to the drive by a series of bits defining the basic operation desired by the controller. Refer to Magnetic Peripherals, Inc. *Enhanced Small Disk Interface Specification,* the Hitachi *DK514 Winchester Disk Drive Product Specification,* or the Hitachi *DK515 Winchester Disk Drive Product Specification* for the command and status bits definition.

After the controller has selected the drive that it wishes to perform an operation, it must then direct the drive to the specific location on the data recording surface where the operation is to be performed. The positioning of the heads over the desired track is called a Seek operation. The controller initiates the seek operation and places the desired cylinder address out to the drive. The drive receives and decodes the commands, and starts the seek operation by positioning the heads above the surface of the disk at a particular cylinder. When the heads are in the desired position, a status signal is sent to the controller to notify it that the heads are on cylinder and has completed the command. The drive is ready to respond to further controller instructions.

The head must be selected before a read or write operation can be performed. Head selection begins when the controller issues Head Selection bits and a head address. With the selected head above the desired cylinder, it is ready to begin the read or write operation.

Controller response will then direct the read or write operations. During the read operation, the drive recovers data from the disk and transfers it to the controller. During the write operation, the drives receives data from the controller and writes it to the disk.

1.5 Diagnostics

There are four onboard diagnostic tests that are executed on the V/ESDI disk controller. Onboard diagnostics are executed after each hardware powerup, or software reset. Error codes are reported to the computer operator if any test fails. For a list of the error codes refer to the Interphase V/ESDI user guide.

The onboard diagnostics executed during powerup and software reset are:

- Checksum on the EPROM
- Memory test on RAM buffer
- Handshaking with the disk interface hardware
- Operation of the buffer control hardware

System diagnostics should be executed after doing maintenance on the V/ESDI to test the functionality of the board within the operation system. Detail explanations of each diagnostics is contained in the *CONVEX PBUS I/O System Diagnostics Manual.*

1.6 Specifications

The following table presents the specifications of the VMEbus Enhanced Small Device Interface disk controller:

Table 1–2, V/ESDI Disk Controller Specifications

Parameter	Value
Width	6.30 in (160 mm)
Length	9.20 in (233 mm)
Thickness	0.77 in (*approx*) (19.6 mm)
Weight	1.01 lb (*approx*) (0.45 kg)
DC Voltage Requirements	+5 VDC (± 5%) @ 4.5 A max -12 VDC (± 5%) @ 0.5 A max
Temperature Range, Maximum	32 °F to 131 °F (0 °C to 55 °C)
Temperature Range, Recommended[1]	70 °F to 80 °F (21 °C to 26.6 °C)
Rate of Temperature Change, Maximum[2]	18 °F/hr (10 °C/hr)
Humidity Range, Maximum	10% to 90% with no condensation
Humidity Range, Recommended	40% to 60% with no condensation

[1] At altitudes above 3,280 ft (1,000 m), lower air densities affect air conditioning. If the unit is located above this altitude, lower the recommended temperature range by 1 °F per 1,000 ft (2 °C per 1,000 m).

[2] This is the maximum rate of change for the V/ESDI controller, however, the maximum rate of change for the system containing the controller may be less.

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Chapter 2
Configuration and Installation

2.1 Overview

This chapter describes the procedures to remove and install the VMEbus Enhanced Small Device Interface (V/ESDI) Disk Controller into the VMEbus chassis. The cabling scheme, onboard jumper positions, and address selections are discussed.

2.2 Inspection

> **WARNING**
>
> The V/ESDI is extremely sensitive to Electrostatic Discharge (ESD). Use appropriate measures when handling the board. Wear a wrist ground strap or other grounding device when installing or performing maintenance on or around electronic devices.

The package for shipping the V/ESDI controller is specially designed to protect the board against electrostatic damage. Inspect the package on receipt for signs of damage during shipment. Remove the board from the package and carefully examine the board for damaged components. Document any damage and refer to the following section.

> **NOTE**
>
> Save all packaging material until after operational checkout of the board. This enables the board to be returned should problems exist.

2.3 Damage Claims

If the board is damaged in shipment, a damage claim must be completed. Damage claims should be prepared by the customer and given to the shipping representative. Claims forms may be obtained from the shipping representative.

2.4 Electrostatic Discharge

Static charge takes place when various objects are separated or rubbed together, often creating high voltage levels. The main factors that determine a voltage charge are:

- Types of materials
- Relative humidity
- Rate of change or separation

The V/ESDI is sensitive to static electricity, due to the electrostatically sensitive devices used within the circuitry. The controller can be damaged by an Electrostatic Discharge (ESD) caused during maintenance procedures, such as installation. Use proper care when handling or performing maintenance on or around the controller board. To avoid damage to electronic devices, service personnel must observe the following when servicing the V/ESDI controller board:

WARNING

The V/ESDI is extremely sensitive to Electrostatic Discharge (ESD). Use appropriate measures when handling the board. Wear a wrist ground strap or other grounding device when installing or performing maintenance on the V/ESDI.

The following table presents examples of charge levels based on various activities and humidity levels:

Table 2–1, Static Charge Levels and Relative Humidity

Personnel Activity	Humidity & Charge Levels (Volts)			
	26%	32%	40%	50%
Person walking across linoleum floor	6,150V	5,750V	4,625V	3,700V
Person walking across carpet	18,450V	17,250V	13,875V	11,100V
Person getting up from a plastic chair	24,600V	23,000V	18,500V	14,800V

2.5 Configuration

Before installing the V/ESDI controller, it must be configured to the address setting desired for use in the system. Base addresses are dependent on the disk drive being supported by the V/ESDI controller. For the possible configurations of the RDS chassis and RDS unit locations, refer to the *CONVEX Removable Disk System Operation Guide.* The standard CONVEX base address controller configuration for the supporting disk drive is identified in the following table:

Table 2–2, Controller Base Address

CONTROLLER ADDRESS			
RDS Disk Drive	**Individual Address Configuration**	**RDS-001 Daisy-Chain Configuration**	**RDS-002 Daisy-Chain Configuration**
A	**0x800**	—[1]	**0x800**
B	**0xa00**	**0xa00**	—[2]
C	**0xc00**	**0xc00**	**0xc00**
D	**0xe00**	—[3]	—[3]

[1] The RDS-001 configuration uses the SPU disk in place of drive A.

[2] This drive daisy chains to the above drive A; and the address of the board supporting that drive is used when daisy chaining.

[3] This drive daisy chains to the above drive C; and the address of the board supporting that drive is used when daisy chaining.

2.5.1 Base Address Switch Selection

The switch block **S1** on the V/ESDI controller contains eight switches that may be positioned **ON** or **OFF**. The combination of the switch positions determines the base address for the controller. Switch **8** on the switch block selects the address modifier for the V/ESDI short I/O space. Switches **1** through **7** on the switch block **S1** correspond to the respective address lines in the following table:

Table 2–3, Switch Block/Address Bit Relationship

SWITCHES/ADDRESS BITS								
		Upper Nibble Lower Word				**Lower Nibble Lower Word**		
Address	Mod	A15	A14	A13	A12	A11	A10	A9
Switches	8	7	6	5	4	3	2	1

Set the base address selection using the switch block **S1**. When switch **8** is **ON**, only supervisory addresses are permitted (address modifier 2D). With switch **8** in the **OFF** position, both address modifiers 2D and 29, supervisory and user addresses, are permitted.

The switch block settings in the following figures present possible base address settings for each V/ESDI controller installed. The base address is determined by the disk drive the V/ESDI controller is currently supporting, i.e., if one V/ESDI controller is supporting drive A, the address is 0x800 and the switch block is set to the example for the base address of 0x800. If a second controller is supporting drive B, then the switch block is set to the example for address 0xa00, and so on.

Figure 2–1, V/ESDI Base Address 0x800

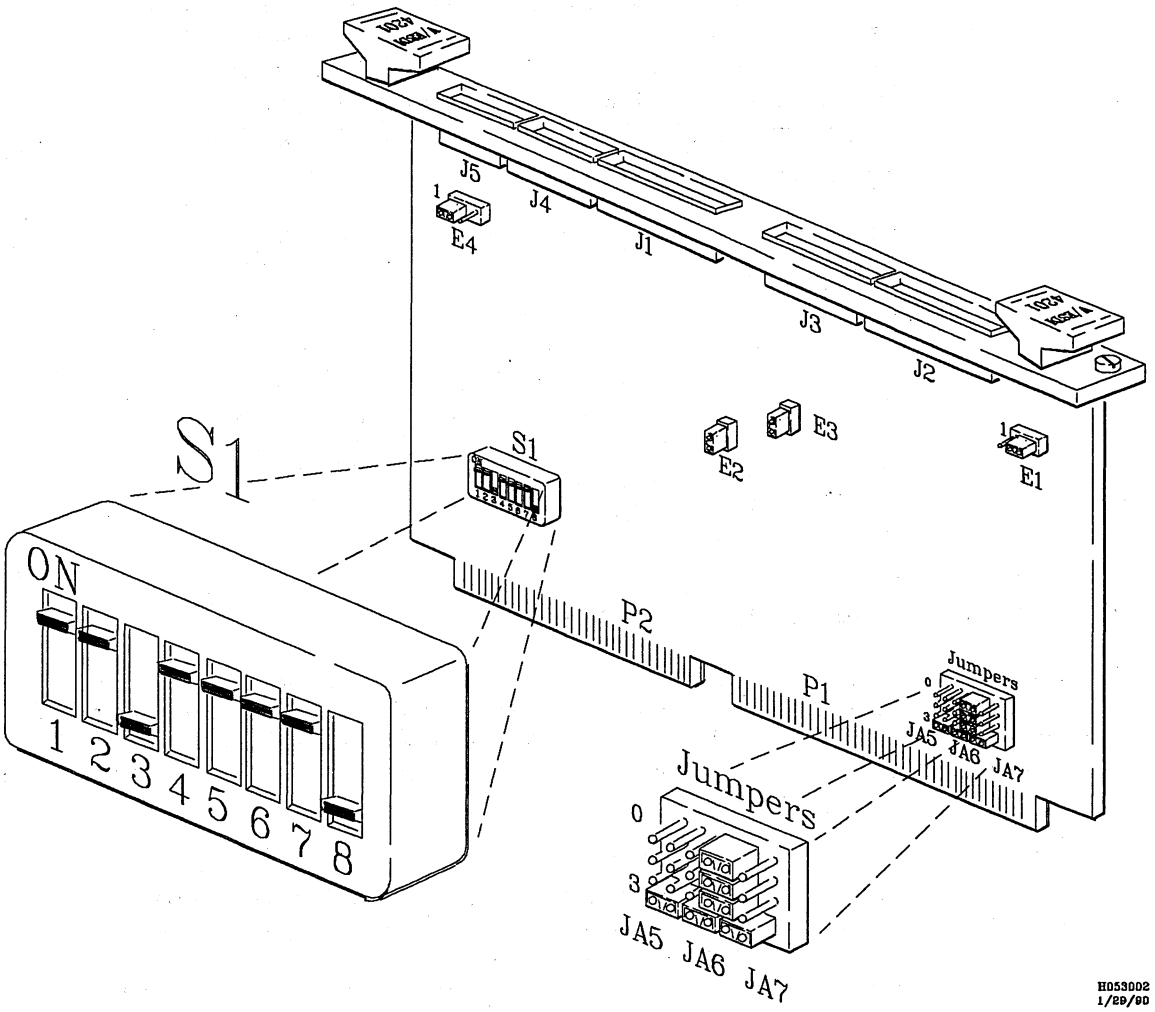


Figure 2–2, V/ESDI Base Address 0xa00

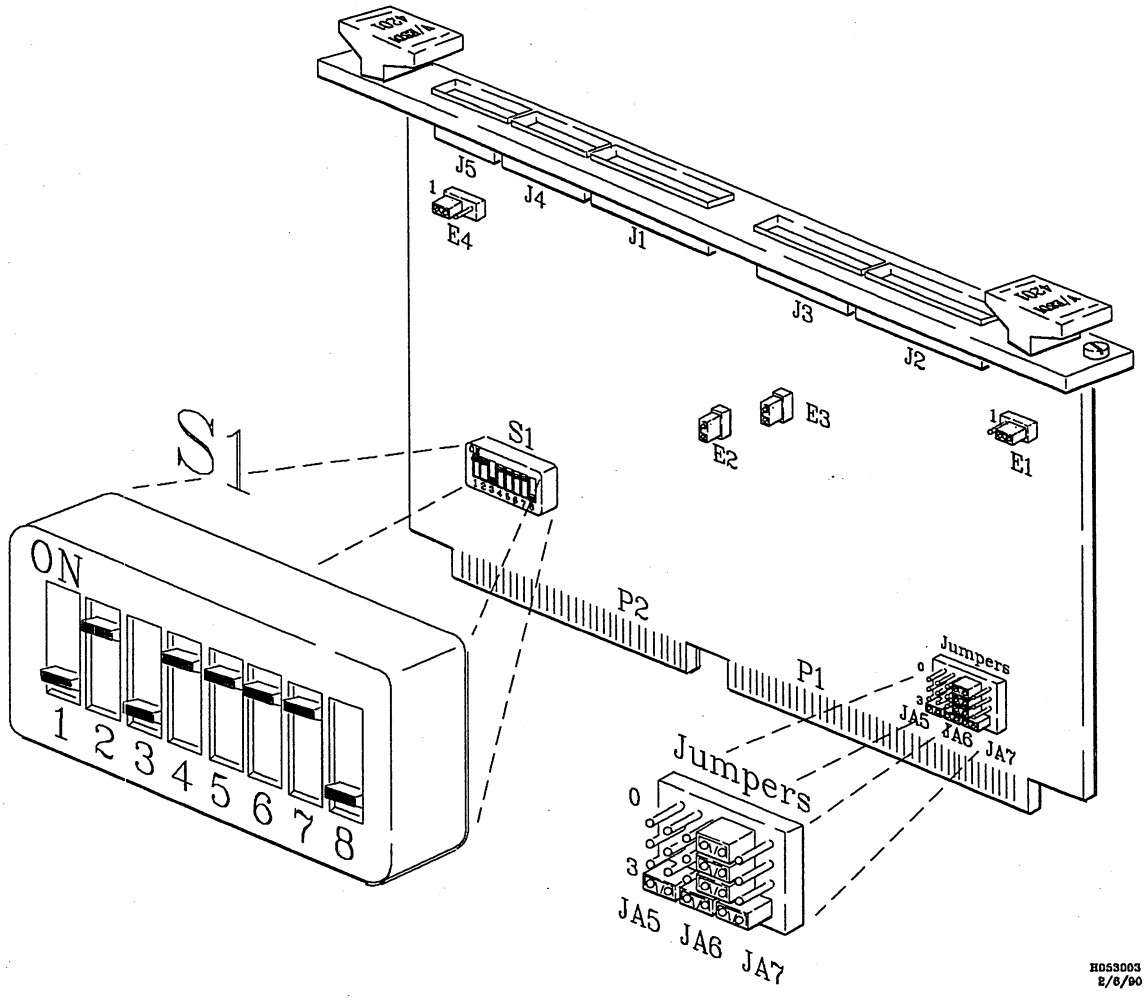


Figure 2–3, V/ESDI Base Address 0xc00

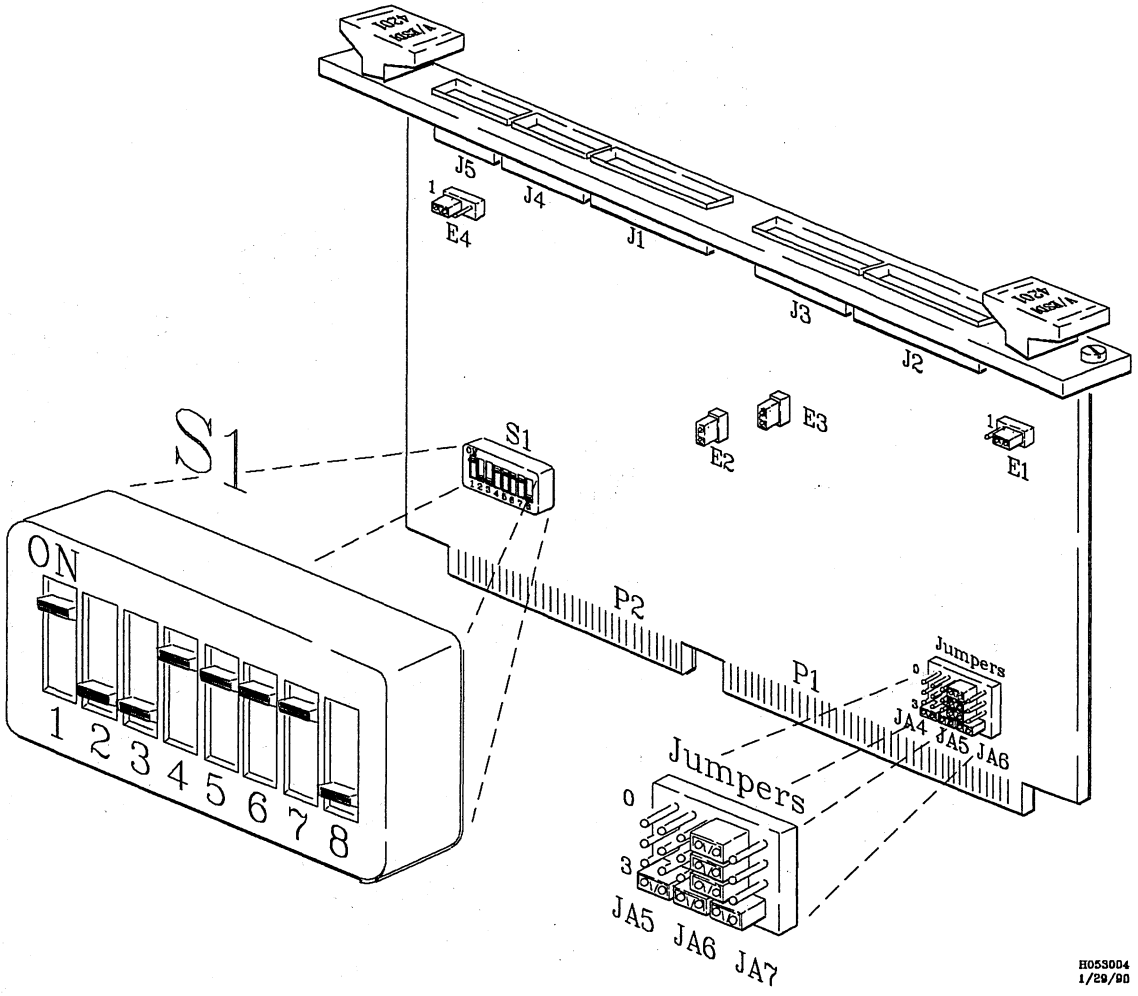
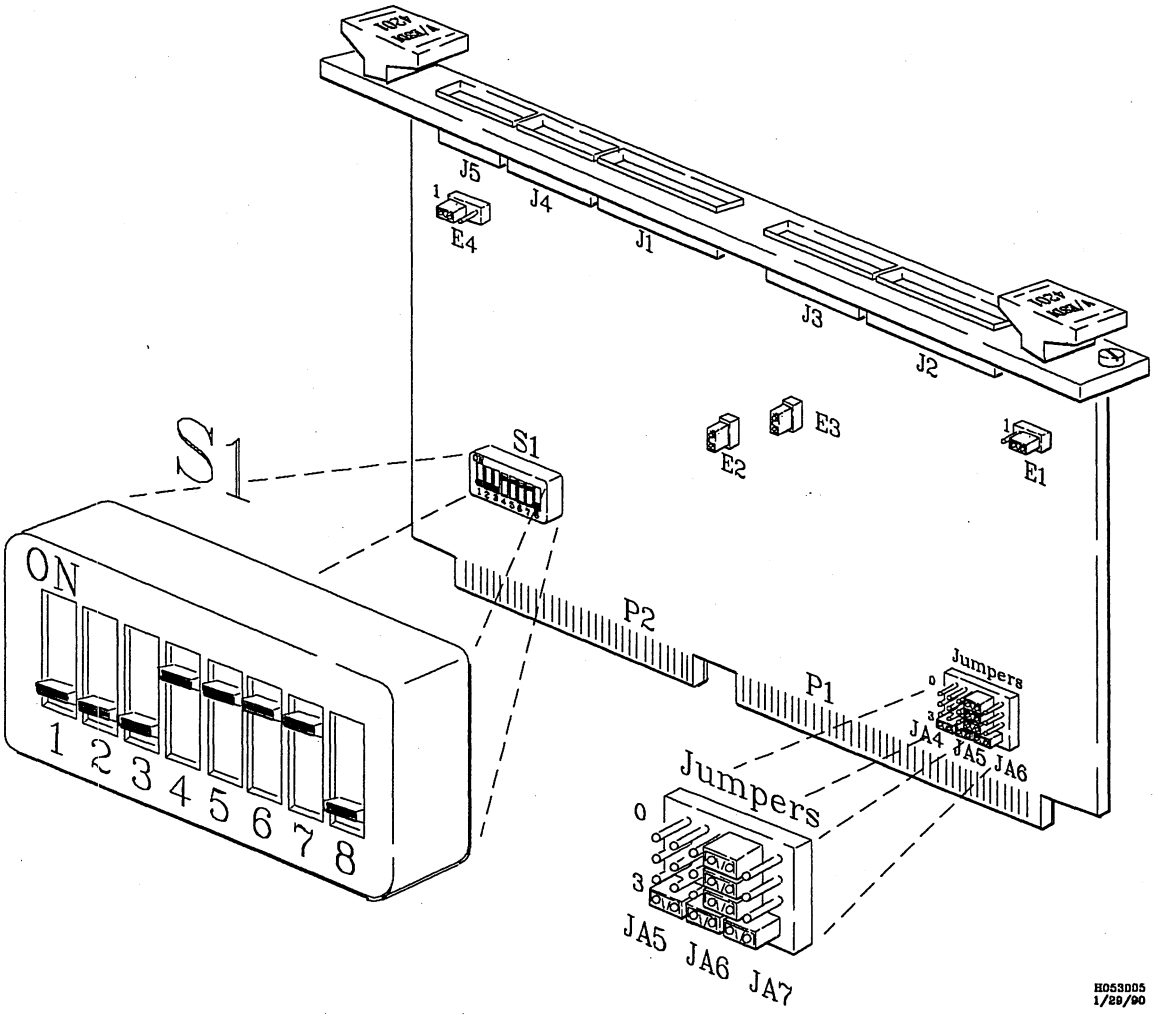


Figure 2–4, V/ESDI Base Address 0xe00



2.5.2 Request/Grant Level Jumper Settings

CONVEX VMEbus controllers use the bus request 3 (highest) jumper configuration. Jumpers **JA5, JA6**, and **JA7** are used to select the VMEbus request priority. These jumpers are configured as shown in the four previous figures.

2.6 Removal and Installation

The V/ESDI disk controller is located in the VMEbus chassis, therefore, the VMEbus chassis must be extended before replacing the controller. The following procedures detail the steps to extend the VMEbus chassis and install the V/ESDI controller.

2.6.1 Extending the VMEbus Chassis

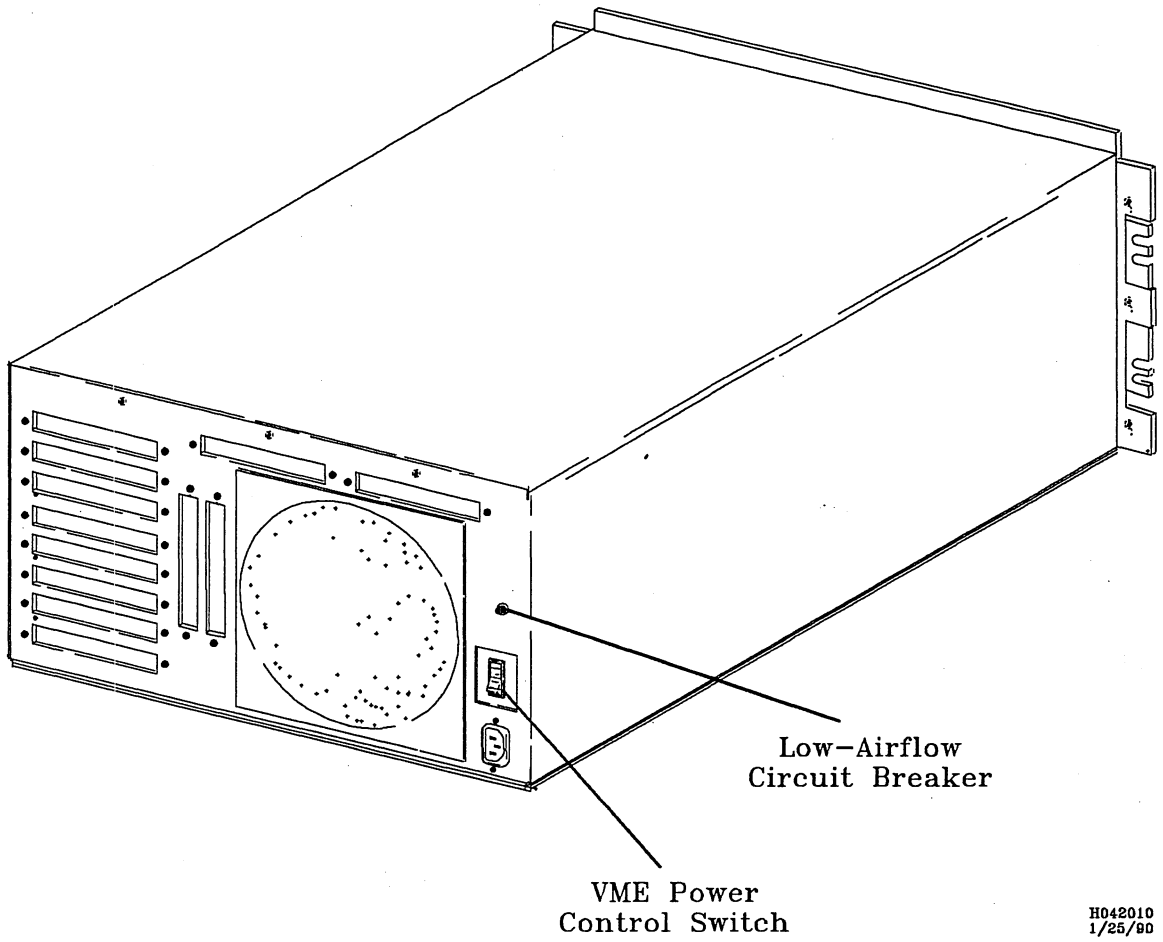
The following procedures describe the steps necessary to safely extend the VMEbus chassis from the expansion cabinet.

> **WARNING**
>
> System power must be **OFF** before performing any type of maintenance on the VMEbus chassis. Failure to do so may cause injury to personnel.

> **CAUTION**
>
> System must be shut down to the SPU prompt prior to performing maintenance. Failure to shutdown system prior to removing power will cause the loss of system data. Refer to the *CONVEX Processor Operation Guide* for the shutdown procedures for the CONVEX computer.

1. Remove all power to the VMEbus chassis by setting the power switch to the **OFF** position. The location of the power switch on the VMEbus chassis is shown in the following figure:

Figure 2–5, VMEbus Chassis Power Switch

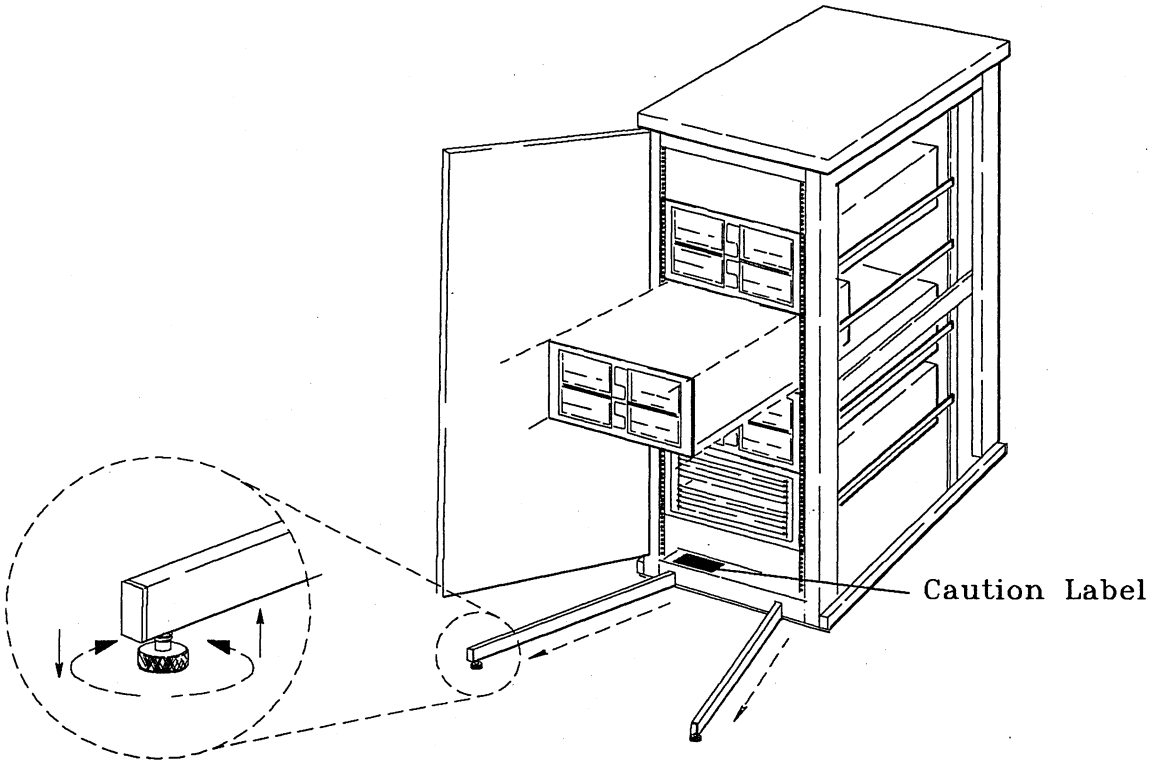


WARNING

Expansion cabinet stabilizer bars must be extended before installing a VMEbus chassis, or extending it forward on its slide guides for service. Failure to do so will make the expansion cabinet unstable, increasing the possibility of it falling forward. This may cause injury to personnel and will cause damage to equipment.

2. Extend the expansion cabinet stabilizer bars to the full length of the bars.
3. Adjust the legs on the expansion cabinet stabilizer bars until they are in firm contact with the floor, as shown in the following figure:

Figure 2–6, Expansion Cabinet Stabilizer Bars and Caution Labels



CAUTION LABEL

ENGLISH/FRENCH

CAUTION

TO REDUCE RISK OF POSSIBLE INJURY DUE TO UNSTABLE UNIT, ACTUATE STABILIZER BEFORE ANY PERIPHERAL IS EXTENDED.

1. TO ACTUATE STABILIZER, FULLY EXTEND ANTITILT CHANNELS AND LOWER CHANNEL SUPPORT FEET FIRMLY TO THE FLOOR.
2. INSURE THAT LOCKING MECHANISMS ARE INSTALLED IN ALL OTHER EXTENDABLE UNITS.
3. NEVER EXTEND MORE THAN ONE UNIT AT A TIME.

ATTENTION

POUR REDUIRE LE RISQUE D'ACCIDENT ATTRIBUABLE A L'INSTABILITE DE L'UNITE, DEPLOYER LES STABILISATEURS AVANT DE SORTIR LES PERIPHERIQUES.

1. POUR DEPLOYER LES STABILISATEURS, TIRER COMPLETEMENT LES BRAS ANTI-BASCULEMENT ET ABAISSER LES PATTES DE FACON QU'ELLES REPOSENT SOLIDEMENT SUR LE SOL.
2. S'ASSURER QUE TOUS LES PERIPHERIQUES SON MUNIS DE VIS DE BLOCAGE.
3. NE JAMAIS SORTIR PLUS D'UN PERIPHERIQUE A UN MOMMENT DONNE.

ENGLISH/GERMAN

CAUTION

TO REDUCE RISK OF POSSIBLE INJURY DUE TO UNSTABLE UNIT, ACTUATE STABILIZER BEFORE ANY PERIPHERAL IS EXTENDED.

1. TO ACTUATE STABILIZER, FULLY EXTEND ANTITILT CHANNELS AND LOWER CHANNEL SUPPORT FEET FIRMLY TO THE FLOOR.
2. INSURE THAT LOCKING MECHANISMS ARE INSTALLED IN ALL OTHER EXTENDABLE UNITS.
3. NEVER EXTEND MORE THAN ONE UNIT AT A TIME.

ACHTUNG

ZUR VERMEIDUNG VON GEFAHRDUNG DURCH EIN INSTABILES GERAT SIND VOR DER HERAUSNAHME VON PERIPHERALS DER STABILISIERUNGSMECHANISMUS BETATIGT WERDEN.

1. UM DIE STABILISIERUNGSEINRICHTUNG ZU BETATIGEN, SIND DER "ANTITILT KANAL" GANZ HERAUS ZU ZIEHEN UND DER UNTERE STUTZFUSS AUF DEN BODEN ZU FUHREN.
2. OBERPRUFEN SIE, OB IN ALLEN ANDEREN VERSCHIEBBAREN GERATEN DER SICHERUNGSMECHANISMUS BETATIGT IST.
3. ZIEHEN SIE NIE MEHR ALS EIN GERAT HERAUS.

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4. Unlock the two chassis lock screws on the front of the VMEbus chassis.
5. Pull the VMEbus chassis out on the slide guides until the guide locks click in place.
6. Unscrew the top panel captive mount screws until loose from the chassis frame. Lift the top panel from the VMEbus chassis to expose the VMEbus controller card cage.

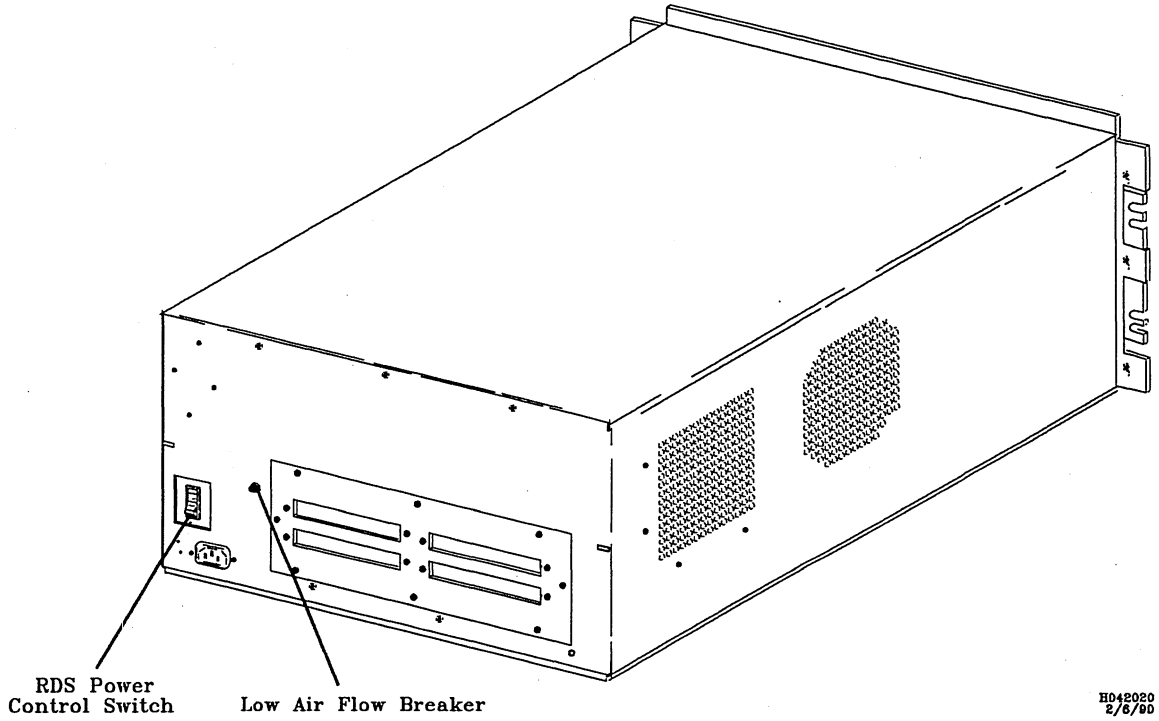
2.6.2 Removing the V/ESDI Disk Controller

The procedures for removal are included in this manual to present the required steps for removing an already installed V/ESDI controller.

> **CAUTION**
>
> Remove power to the VMEbus chassis and disk drive chassis prior to performing maintenance on the controller. Failure to observe this **CAUTION** may result in the loss of data or damage to equipment components.

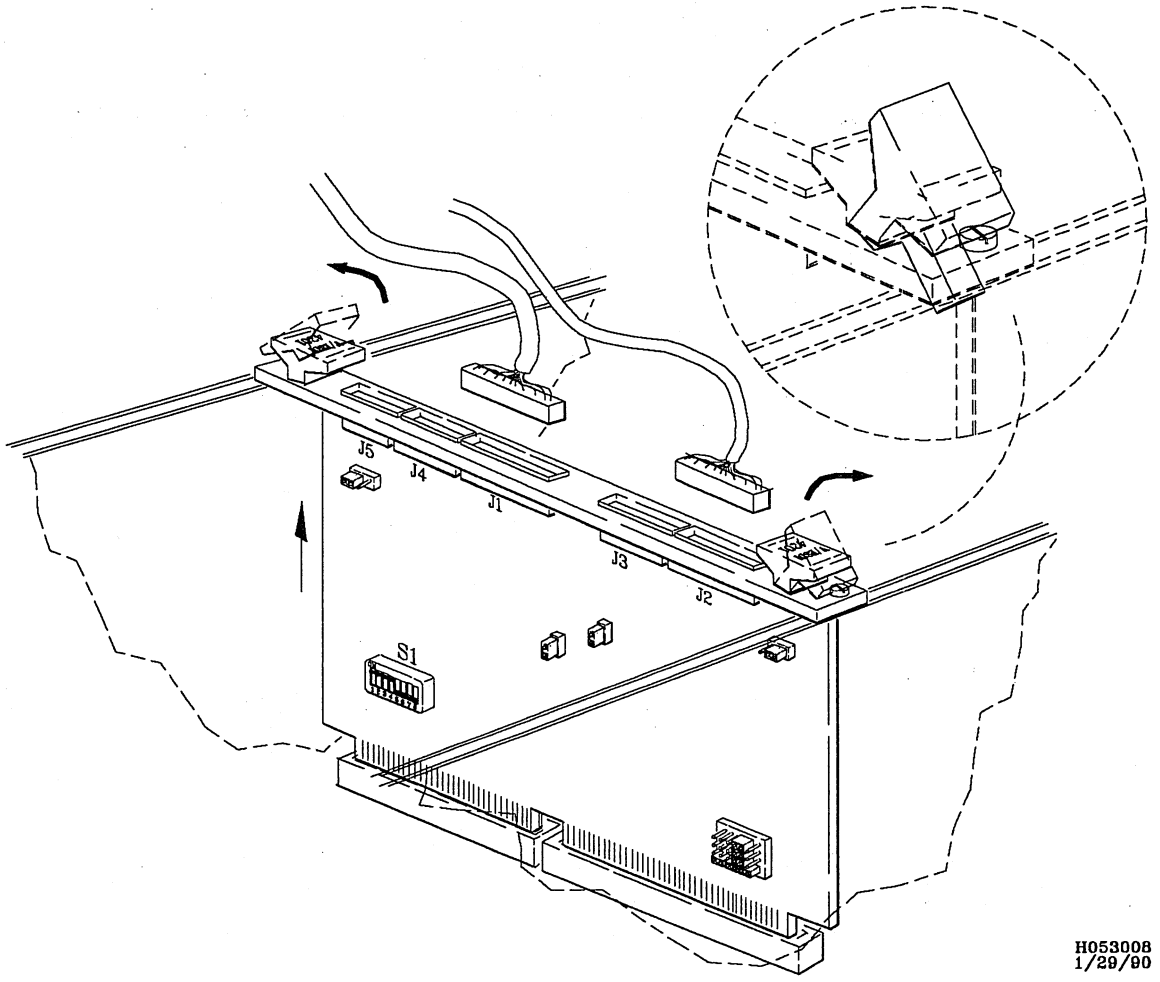
1. Unmount the supported disk drive from the system.
2. Push the power switches for the disk drives **OFF**.
3. Set the disk drive chassis power switch to the **OFF** position, as shown in the following figure:

Figure 2–7, Disk Drive Power Switch



4. Disconnect the cable 604-260003-200 end connector **P1** from the **J2** on the V/ESDI controller by lifting straight up on the connector.
5. If controller supports two drives (daisy chain), disconnect the cable 604-260003-200 end connector **P1** from the **J3** on the V/ESDI controller by lifting straight up on the connector.
6. Disconnect the cable (604-600002-200) end connector **P1** from **J1** on the V/ESDI controller by lifting straight up on the connector.
7. Two captive mount screws are attached to holders on the board to prevent dropping of screws into the chassis. Unscrew these screws until loose from the chassis frame.

Figure 2–8, V/ESDI Board Removal



CAUTION

When the V/ESDI is not installed in the VMEbus chassis, keep it in a conductive static shielding bag. Static bags provide protection from direct static discharge and from static fields surrounding charged objects. These bags are conductive and should not be placed where they may cause an electrical short circuit.

8. Lift the board from the chassis by pushing the handle on the top front of the board forward while at the same time pushing the top back handle toward the back of the chassis. This will gently lift the board from the connector on the VMEbus.
9. Pull the board the rest of the way out by lifting straight up from the chassis.

2.6.3 Installing the V/ESDI Disk Controller

Procedures for installing the V/ESDI controller are described in detail to reflect the initial installation of the controller. Additional steps, such as the cable routing or connections to a disk device, may not be necessary when replacing a controller. However, each step should be read when installing a controller to assure proper installation.

CAUTION

System power and disk power must be **OFF** before the V/ESDI can be installed. Failure to observe this warning may result in severe damage to the board or system.

1. Once the board is configured, ensure that both the system power and the disk drive power are **OFF**. See Figures 2-4 and 2-6.

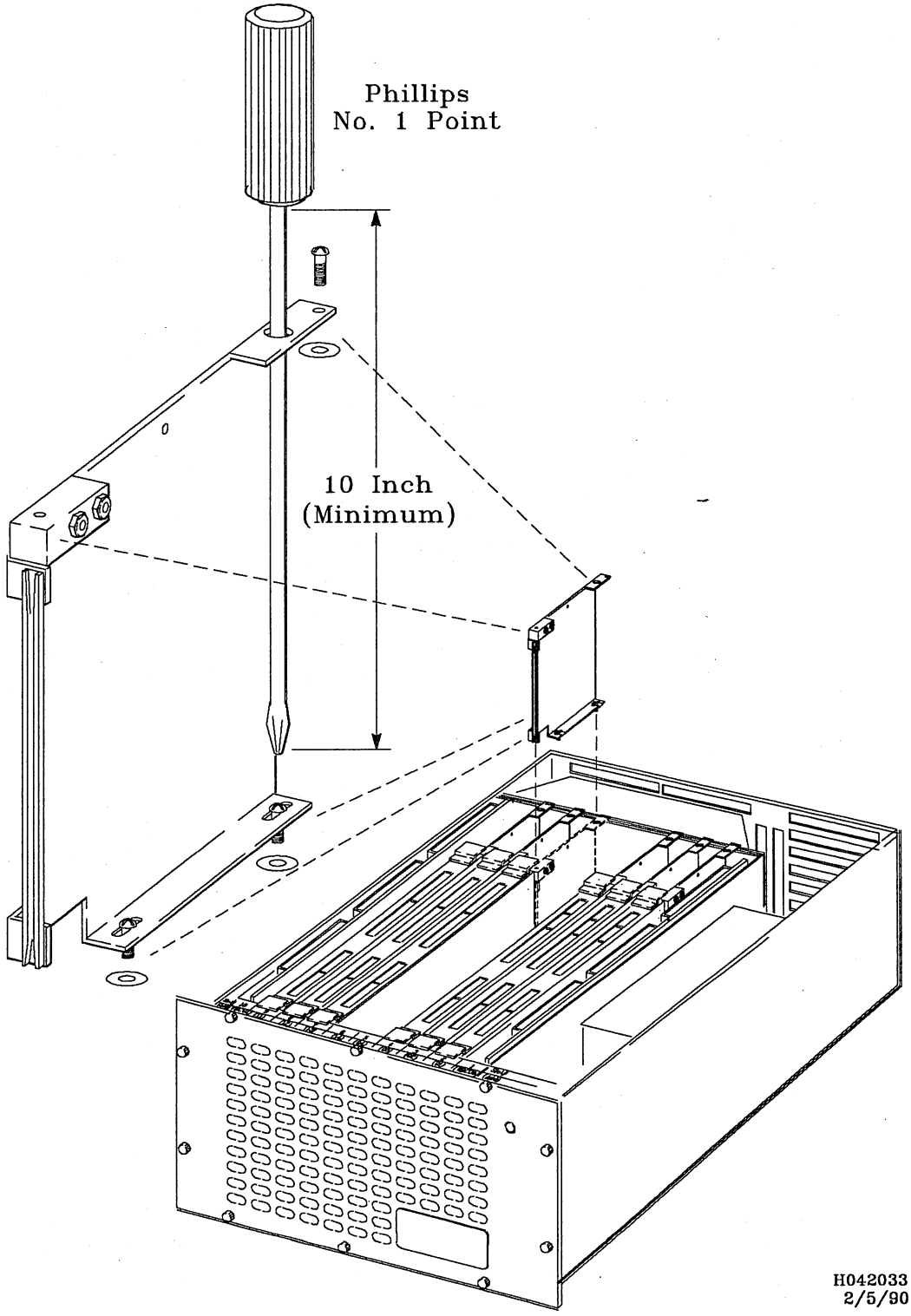
NOTES

A 10-inch or longer Phillips screw driver with a No. 1 point is required to install the 2 bottom screws in the single (6U)VMEbus circuit board adapter.

The single top screw is 2.5 mm.

2. Attach the single (6U)VMEbus circuit board adapter (with 2 screws) to the bottom of the chassis and (with 1 screw) to the top rear support rail, where the controller is to be installed, as shown in the following figure:

Figure 2–9, (6U)VMEbus Circuit Board Adapter



3. Install the V/ESDI into the same slot as the 6U adapter in the VMEbus chassis, gently pushing down evenly on both ends of the board to prevent damage to the board pins.
4. Secure the board into position by tightening the two captive mount screws on the top front and back of the board.

2.6.4 Cable Connections

The VMEbus backplane slot positions are labeled on the front of each chassis. VMEbus controller cables exit the chassis at the rear of the chassis through cable openings. Cable opening numbers are stamped on the rear panel of each VMEbus chassis. Cable routing, from the controller to the rear of the VMEbus chassis, should always follow a prescribed sequence. Cables from a given controller backplane slot position should always exit the VMEbus chassis at the same hole position. The following table defines the cable openings and device types for each VMEbus chassis:

Table 2–4, Cable Opening Numbers for VMEbus Chassis

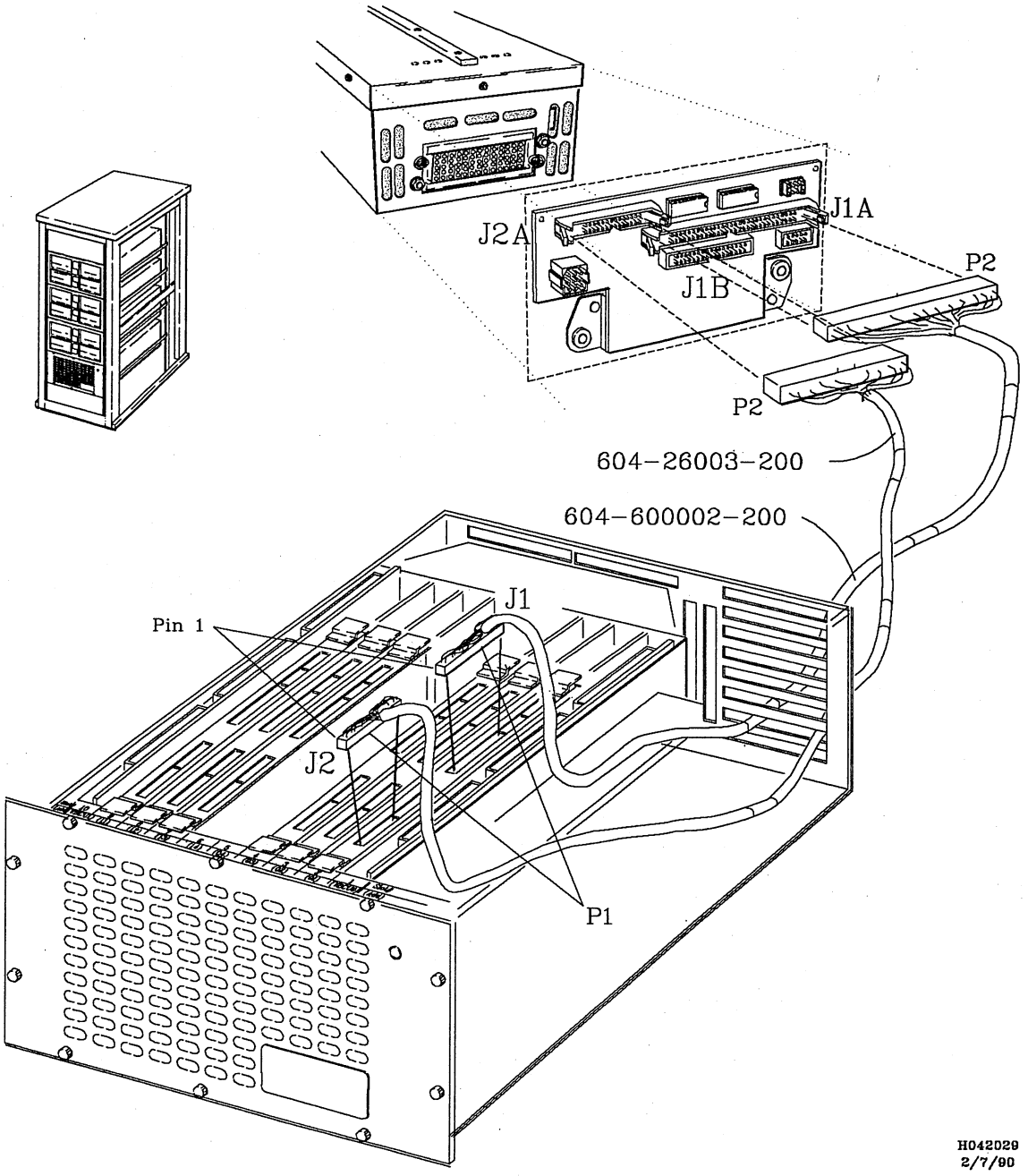
Cable Opening Number	Dual VMEbus	Single VMEbus	Combo VMEbus/Mbus
1	VBCU-0	VBCU	VBCU
2	VME-0 Ctlr 1	Ctlr 1	VME Ctlr 1
3	VME-0 Ctlr 2	Ctlr 2	VME Ctlr 2
4	VME-0 Ctlr 3	Ctlr 3	VME Ctlr 3
5	VME-0 Ctlr 4	Ctlr 4	VME Ctlr 4
6	VME-1 Ctlr 4	Ctlr 5	VME Ctlr 5
7	VME-1 Ctlr 3	Ctlr 6	MBUS Ctlr 3
8	VME-1 Ctlr 2	Ctlr 7	MBUS Ctlr 2
9	VME-1 Ctlr 1	Ctlr 7[1]	MBUS Ctlr 1
10	—	—	MBUS Ctlr 0
11	—	—	—
12	VBCU-1	—	MBCU

[1] This controller is the second board of a two board set. The first board is Ctlr 7 in slot 8.

2.6.4.1 Non-Daisy-Chain Cable Connections

The following procedures are used to install cables on the V/ESDI controller and attach the cables to the disk device using a non-daisy-chain configuration as shown in the following figure:

Figure 2–10, Non-Daisy-Chain Cable Connections

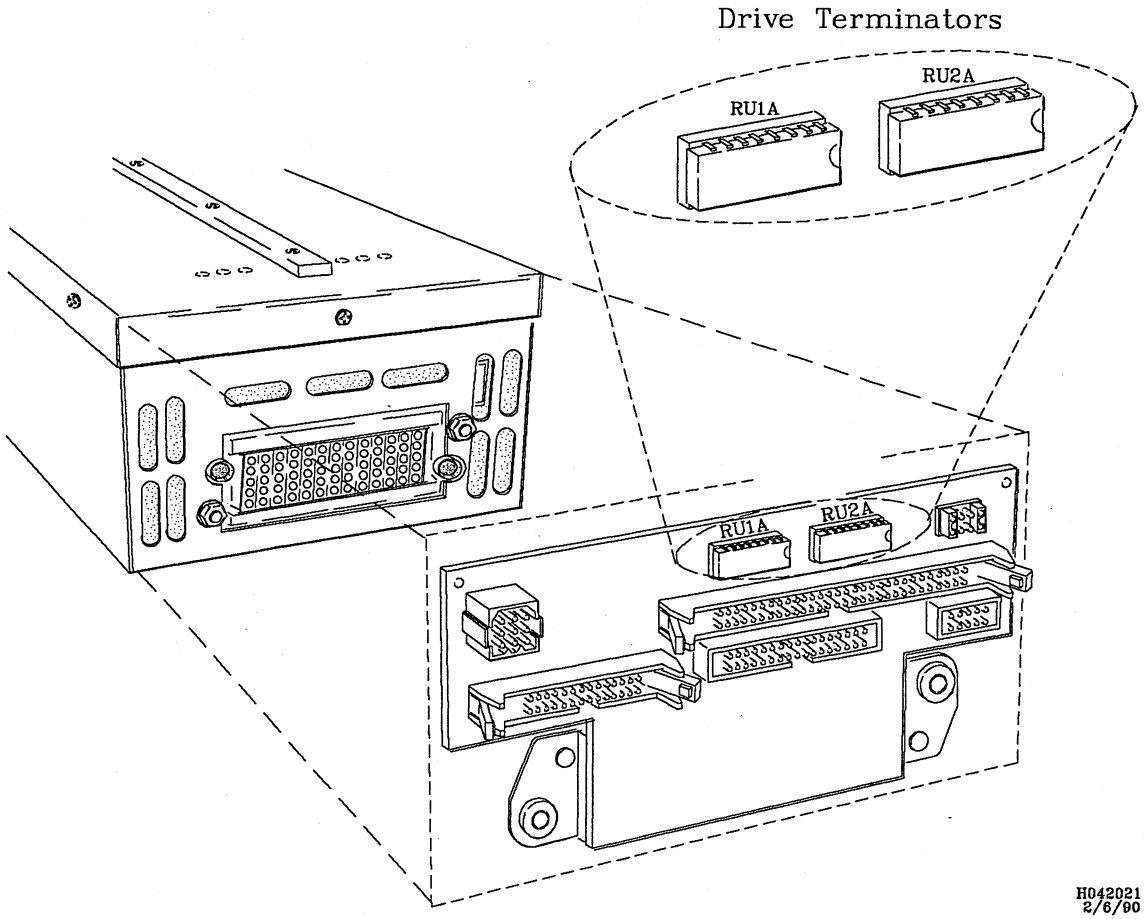


CAUTION

When connecting a cable to a connector, always insure pin one on the cable matches to pin **1** on the connector. Pin one on the cable is identified by a shallow groove on the outside corner of the end clip. Pin **1** for the connector is identified by a small triangle on the outside corner on the connector. Failure to properly connect cables may result in an inoperable system and controller.

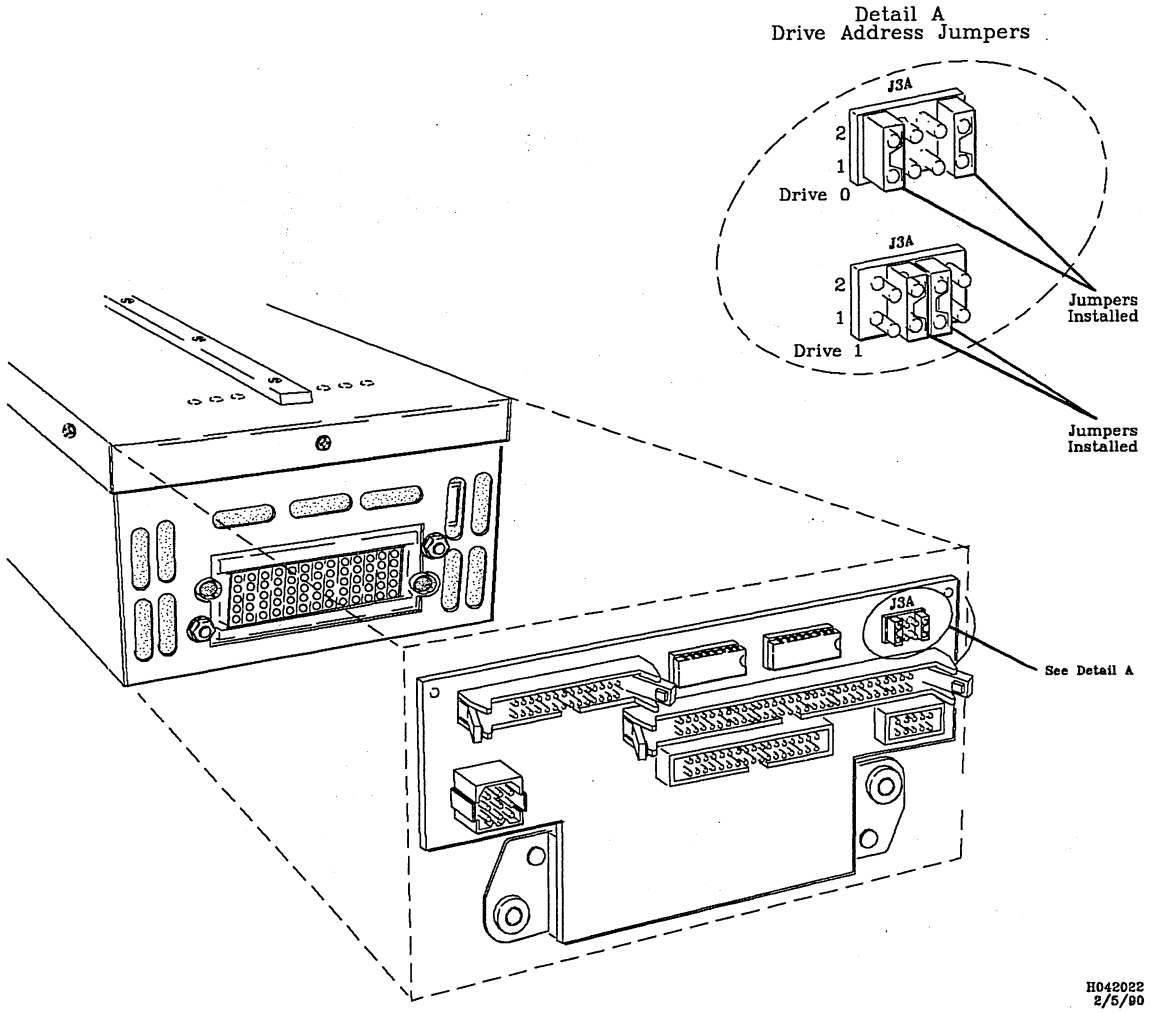
1. Route one end (**P1**) of cable 604-260003-200 through the appropriate cable opening on the rear of the VME chassis (see Table 2-3) and connect to **J2** on the V/ESDI.
2. Connect the unconnected end (**P2**) of cable 604-260003-200 from **J2** on the V/ESDI board to **J2A** on the disk device backplane connector.
3. Route one end (**P1**) of cable 604-600002-200 through the cable opening on the rear of the VMEbus chassis (see Table 2-3) and connect to **J1** on the V/ESDI board.
4. Connect the unconnected end (**P2**) of cable 604-600002-200 from the **J1** connector on the V/ESDI controller to **J1A** on the disk device backplane connector.
5. Secure the two cables in the cable clamp and mount to the rear of the VMEbus chassis.
6. Inspect the PCB on the rear of the disk drive and ensure that the terminators are installed in **RU1A** and **RU2A** as shown in the following figure:

Figure 2–11, Cable Terminators



7. Set the drive address jumpers on **J3A** to the "Drive 0" position as shown in the following figure:

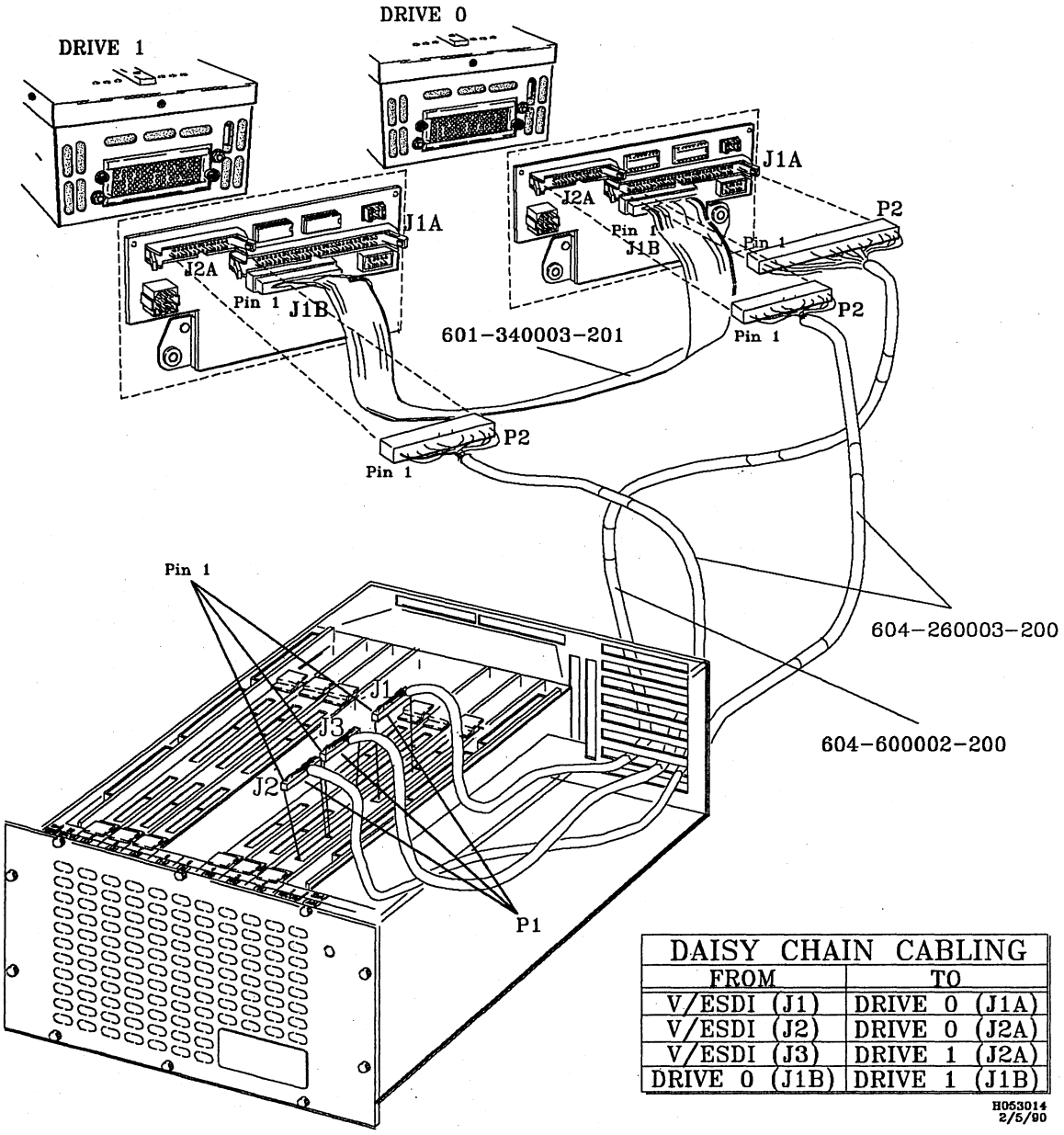
Figure 2–12, Drive Address Jumper Settings



2.6.4.2 Daisy-Chain Cable Connections

The following procedures are used to install cables on the V/ESDI controller attaching two disk devices using a daisy-chain configuration as shown in the following figure:

Figure 2–13, Daisy-Chain Cable Connections



DAISY CHAIN CABLING	
FROM	TO
V/ESDI (J1)	DRIVE 0 (J1A)
V/ESDI (J2)	DRIVE 0 (J2A)
V/ESDI (J3)	DRIVE 1 (J2A)
DRIVE 0 (J1B)	DRIVE 1 (J1B)

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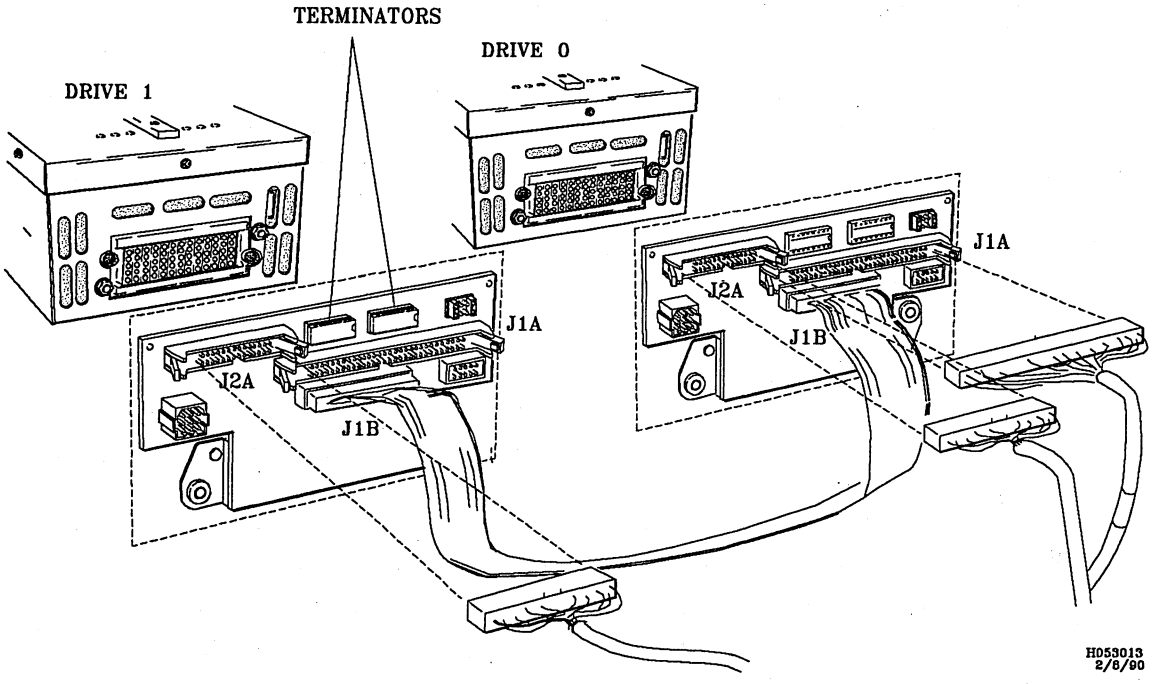
CAUTION

When connecting a cable to a connector, always insure pin one on the cable matches to pin **1** on the connector. Pin one on the cable is identified by a shallow groove on the outside corner of the end clip. Pin **1** for the connector is identified by a small triangle on the outside corner on the connector. Failure to properly connect cables may result in an inoperable system and controller.

1. Route one end (**P1**) of cable 604-260003-200 through the appropriate cable opening on the rear of the VMEbus chassis (see Table 2-3) and connect to **J2** on the V/ESDI.
2. Connect the unconnected end (**P2**) of cable 604-260003-200 from **J2** on the V/ESDI board to **J2A** on the disk device (drive 0) backplane connector.
3. Route one end (**P1**) of a second cable 604-260003-200 through the appropriate cable opening on the rear of the VMEbus chassis (see Table 2-3) and connect to **J3** on the V/ESDI.
4. Connect the unconnected end (**P2**) of the second cable 604-260003-200 from **J3** on the V/ESDI board to **J2A** on the disk device (drive 1) backplane connector.
5. Connect ribbon cable 601-340003-201 from **J1B** on drive 0 to **J1B** on the drive 1.
6. Route one end (**P1**) of cable 604-600002-200 through the cable opening on the rear of the VMEbus chassis (see Table 2-3) and connect to **J1** on the V/ESDI.
7. Connect the unconnected end (**P2**) of cable 604-600002-200 from the **J1** connector on the V/ESDI controller to **J1A** on the disk device (drive 0) backplane connector.
8. Inspect the PCB on the rear of drive 0 and ensure that the terminators are removed from **RU1A** and **RU2A** as shown in the following figure:
9. Inspect the PCB on the rear of drive 1 and ensure that terminators are installed in **RU1A** and **RU2A** as shown in the following figure:

Figure 2–14, Daisy-Chain Terminator Configuration



10. Set the address jumpers on **J3A** to drive 0 and drive 1 as shown in figure 2–12.
11. Secure the three cables in the cable clamp and mount to the rear of the VMEbus chassis.

2.6.5 Installing the VMEbus Chassis

After the V/ESDI controller is installed, the VMEbus chassis is ready to be placed back into the cabinet. The following steps are required to properly replace the VMEbus chassis in the cabinet.

1. Place the top panel on the VMEbus chassis and tighten panel screws.
2. Push in on the lock buttons on each side of the VMEbus chassis slide guides and gently push the VMEbus chassis back into the cabinet.
3. Tighten the captive support screws on the front of the VMEbus chassis.
4. Push expansion cabinet stabilizer bars back into the cabinet.

Chapter 3
Integration and Test

3.1 Overview

This chapter discusses the guidelines for integrating the V/ESDI controller into the I/O subsystem and the diagnostic tests available to operationally test the controller. The V/ESDI must be integrated into the operating system before being used.

VMEbus controllers, and peripheral devices must be integrated into the ConvexOS before they can be used. How they are integrated depends on the type of performance or features required.

3.2 Software Integration

The CONVEX operating systems contains all software drivers for the hardware supported by CONVEX. This means that a system generation is not required when the VMEbus subsystem is installed on a CONVEX computer.

System-level hardware is identified to the ConvexOS via a configuration file (*/ioconfig*) located on the Service Processor Unit (SPU) disk. The */ioconfig* file describes, in hierarchical fashion, the connections between VIOPs, VMEbus controllers, and peripheral devices. ConvexOS uses this information to assign a physical device number to a device of a given type.

Each type of device controller is identified to the operating system by a mnemonic device code. The device codes for the VMEbus storage modules and the Interphase V/ESDI controller are listed below:

- DKD-214—320-Mbyte RDS system disk
- DKD-284—780-Mbyte RDS system disk
- DKC-203—V/ESDI disk controller

3.3 Example */ioconfig* File

These codes, and other information, are entered into the */ioconfig* file that is contained on the SPU disk. The I/O configuration file contains entries, such as VMEbus I/O Processor (VIOP) number, VMEbus number, controller type, address and interrupt number, and peripheral device type. ConvexOS uses this information during *sysgen* to assign a physical device number to a device of a given type. This enables ConvexOS to associate a given physical device number (a storage module) with a specific base-unit sleeve. A typical */ioconfig* file that includes 2 V/ESDI controllers and 4 RDS system disks in VMEbus 1:

Figure 3–1, Example *ioconfig* File

```
viop 4
    vme 0
     ctlr DKC-204 csr 0x200 int 1
        unit 0 type DKD-206
        unit 1 type DKD-208
     ctlr DKC-204 csr 0x400 int 2
        unit 0 type DKD-206
        unit 1 type DKD-208
     ctlr DKC-204 csr 0x600 int 3
        unit 0 type DKD-206
    vme 1
     ctlr DKC-203 csr 0x800 int 1
        unit 0 type DKD-214
        unit 1 type DKD-214
     ctlr DKC-203 csr 0xa00 int 2
        unit 0 type DKD-284
        unit 1 type DKD-284
```

Whenever a system-disk storage module or DKC-203 controller is added or removed, the information in the hardware section of the configuration file (*/ioconfig)* must be changed, otherwise system operation problems will occur. The *CONVEX System Manager's Guide* should be consulted when making these changes.

3.4 Diagnostics

The V/ESDI controller contains internal diagnostics that are executed automatically on powerup and software reset. There are other diagnostics available that should be used after performing any maintenance on the controller. These diagnostics are discussed in depth in the *CONVEX PBUS I/O System Diagnostics Manual.* Refer to this manual when attempting to functionally test the operation of the V/ESDI within the I/O subsystem.

Appendix A
Reporting Problems

A.1 Overview

This appendix introduces the CONVEX Technical Assistance Center (TAC) and the *contact* utility. The *contact* utility is an online system for reporting problems to the TAC. To learn *contact* by using it, enter **contact** at the system prompt and then answer the questions as they appear on the screen. To find out more about using *contact*, read through this appendix. It describes prerequisites and tips for using *contact* and the step-by-step process *contact* takes you through.

A.2 Technical Assistance Center

The CONVEX Technical Assistance Center (TAC) is staffed by technical specialists who can address the diverse questions and problems that arise in a supercomputing environment. If you have a hardware, software, or documentation problem, contact the TAC. This group stands ready to solve such problems.

A.3 The *contact* Utility

The TAC recommends using the *contact* utility to report a hardware, software, or documentation problem. The *contact* utility is an interactive utility that helps the TAC track reports and route them to the the CONVEX personnel most qualified to fix them.

After invoking *contact*, it prompts for information about the problem. When you finish your report, *contact* electronically mails it to the TAC. You are notified within 48 hours that the TAC has received your report.

A.4 Prerequisites

To use *contact* requires

- a UNIX-to-UNIX Communication Protocol (UUCP) connection to the TAC
- the full path name of the program or utility in question
- the version number of the program or utility in question

A.4.1 UUCP Connection

Before using *contact*, check with your system administrator to be sure there is a UUCP connection to the TAC. A UUCP connection allows files to be copied from one UNIX system to another. The *uucp* (UNIX-to-UNIX copy) command relies on either a dial-up or hard-wired UUCP communication line.

A.4.2 Finding the Program Path Name

To determine the full path name of the program or utility in question, use the *which* command. The following screen illustrates using the *which* command to find the full path name of the loader (*ld*) utility:

```
>which ld
/bin/ld
>
```

In this example, the full path name of the loader is */bin/ld*.

For more information on the *which* command, refer to the *which*(1) man page. You can also use the *info* online information system. Enter **info which** at the system prompt. If you use the C shell (*csh*), you can also use the *whence* command to find the program path name. The *whence* command works like *which*, only faster.

A.4.3 Finding the Program Version Number

To determine the version number of the program or utility in question, use the *vers* command. The following screen illustrates using the *vers* command (enter **vers**, then the path name of the program or utility) to find the version number of the loader (*ld*) utility.

```
>vers /bin/ld
/bin/ld: 7.0
>
```

In this example, the loader utility version number is 7.0.

For more information on the *vers* command, refer to the *vers*(1) man page. You can also use the *info* online information system. To do so, enter **info vers** at the system prompt.

A.5 Tips on Using the *contact* Utility

The *contact* utility is interactive and easy to use. This section lists tips to help use it efficiently. In particular, this section tells how to

- use a *.contact* file
- abort a contact session
- resubmit an aborted report
- suspend a contact session
- move from one prompt to another
- use tilde-escape sequences in the *contact* utility

A.5.1 Using a *.contact* File

When invoked, *contact* prompts for information regarding the problem. The first prompt is for your name, title, phone number, and company name. You can, however, create a *.contact* file to skip this first prompt. Follow these steps:

1. Create a *.contact* file in your home directory.
2. Enter your name, job title, phone number, and company name, each on a new line.

When you invoke *contact*, it automatically includes the *.contact* file as input for the first prompt and proceeds to the next prompt.

A.5.2 Aborting the Report

To abort a contact report, either enter the interrupt key (usually CTRL-C) or choose the abort option when prompted by the *contact* utility. Using CTRL-C to abort does not save the contents of the report. Using the abort option saves the contents of the report in a file named *dead.report* in your home directory.

A.5.3 Submitting the *dead.report* File

When aborting a contact session, the *contact* utility saves the report in a file named *dead.report* in your home directory. Using the *contact* command with the *-r* option automatically merges the contents of the *dead.report* file into the new contact session. Enter

contact -r

and *contact* finds the *dead.report* file in your home directory and merges it into the contact report. You can then edit the report. When you end the editing session, *contact* returns to the final prompt, which asks you to review, edit, submit, or abort the report.

A.5.4 Suspending a Report

Sometimes it is necessary to stop in the middle of a contact report and return to the shell (for instance, to suspend the contact session to find the program path name or version number). To suspend the contact session, press CTRL-Z. To return to the contact session, enter **fg**. Using CTRL-Z and the *fg* (foreground) command lets you switch back and forth between the *contact* utility and the shell. You cannot, however, use CTRL-Z and *fg* to switch back and forth if you are using a Bourne shell (*sh*).

A.5.5 Ending a Response

The *contact* utility prompts for information pertinent to your hardware, software, or documentation question. Some prompts require one-line responses; to move to the next prompt, press RETURN. Other prompts require more than a one-line response; to move to the next prompt, press CTRL-D.

A.5.6 Tilde-Escape Sequences

The *contact* utility treats input beginning with a tilde (~) as a special sequence. The character following the tilde is considered a request for a special function. The following tilde sequences are recognized by *contact*:

~e	Start the text editor (defined in your EDITOR environment variable).
~h	Display a list of available tilde-escape sequences.
~p	Print the contact report to the terminal screen.
~r *filename*	Read the contents of *filename* as a response to the current prompt. Some prompts require only a one-line response. This tilde-escape sequence only works for prompts that allow more a than one-line response.
~~	Insert a single tilde as the first character in the line.

A.6 Using the *contact* Utility

The *contact* utility prompts for the following information:

- your name, title, phone number, and corporate name
- the name and version of the product involved
- a one-line summary of the problem
- a detailed description of the problem
- the priority of the problem
- instructions on how to reproduce the problem
- comments about the problem
- comments about the documentation supporting the problem
- files to include in the contact report

The following is a step-by-step discussion of these prompts:

1a. To invoke the *contact* utility, enter **contact** at the system prompt. The system responds with a welcome message and a series of questions regarding your hardware, software, or documentation question. The following screen illustrates the *contact* command and the system response:

```
>contact
Welcome to contact version 0.11 ()

Enter your name, title, phone number, and corporate name (^D to terminate)
>
```

1b. If there is a *.contact* file in your home directory, *contact* skips the first prompt. The following screen illustrates the *contact* command and the system response when a *.contact* file is in your home directory:

```
>contact
Welcome to contact version 0.11 ()

Enter the name of the product involved
>
```

2. The *contact* utility prompts for the version number of the product. If you do not know the version number, use CTRL-Z to suspend the session. Use the *which* (or *whence* if using *csh*) and *vers* commands to find the version number of the product. Use the *fg* command to return to the session and enter the version number in the form X.X or X.X.X.X.
3. The *contact* utility prompts for a one-line summary of the problem. This summary is the subject header in any further correspondence regarding the problem. Make this summary as descriptive as possible in one line.
4. The *contact* utility prompts for a detailed description of the problem. Make this description as complete as possible. Include source code and a stack backtrace whenever possible. (Refer to the *adb*(1) or *csd*(1) man page for information on obtaining a stack backtrace.) The more information provided, the quicker the TAC can isolate and solve the problem.
5. The *contact* utility prompts for the priority of the problem. The following screen illustrates this prompt and the priority levels from which to choose; you must enter a priority number.

```
Enter a problem priority, based on the following:
1) Critical    - work cannot proceed until the problem is resolved.
2) Serious     - work can proceed around the problem, with difficulty.
3) Necessary   - problem has to be fixed.
4) Annoying    - problem is bothersome.
5) Enhancement - requested enhancement.
6) Informative - for informational purposes only.
>
```

6. The *contact* utility prompts for an explanation of how to reproduce the problem. Include the command syntax and options you used and anything else you did to make your program run.
7. The *contact* utility prompts for any other pertinent comments. Include any relevant information.
8. The *contact* utility prompts for suggestions regarding the documentation supporting the product. Indicate if the documentation could be revised to address the question.
9. The *contact* utility asks for the names of files necessary to reproduce the problem. The following screen illustrates the *contact* prompt and sample user response:

```
Are there any files that should be included in this report (yes | no)?
>yes
Please enter the names of the files, one to a line (^D to terminate)
>test.f
>~/subroutines/sub.f
>
```

NOTE

Tilde-escape sequences are not recognized in responses to this prompt. Instead, *contact* treats a tilde in this section to mean your home directory. This convention is based on use of the tilde for expanding file names in *csh*.

If the files specified are small text files, they are automatically included in the contact report. If the files are too big to be included in this report, *contact* gives further instructions on how to submit these files.

To specify a directory, combine the directory files into a single file using the *tar* command (refer to the *tar*(1) man page for further information) or enter each file name in the directory on a single line in the contact report.

10. The *contact* utility prompts you to review, edit, submit, or abort the contact report. The following screen illustrates this prompt:

```
Please select one of the following options:
1) Review the problem report.
2) Edit the problem report.
3) Submit the problem report.
4) Abort the problem report.
>
```

Choose the number of the option you want to select. These options let you do the following:

Review — Review the text of your contact report. You are then prompted again to select an option.

Edit — Edit the text of the contact report. If you choose to edit the report, *contact* puts you in your default text editor.

Submit — Send the report to the CONVEX TAC. You are notified within 48 hours that the TAC has received the report. This option exits the *contact* utility and returns you to the shell environment.

Abort — Save the text of your report in a file named *dead.report* in your home directory. This option exits the *contact* utility and returns you to the shell environment.

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Electronic Mail

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```
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- The chapter and page number in question
- The comment

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