CONVEX VME SMD Disk Controller Service Guide

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CONVEX Computer Corporation
Richardson, Texas USA

CONVEX VME SMD Disk Controller
Service Guide
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Revision Sheet

CONVEX VME SMD Disk Controller
Service Guide

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1.0	081-000730-200	April 1988	First release, Version 1.0.

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 Storage Module Device (V/SMD) Disk Controller. The following areas are discussed:

- General description of VMEbus Storage Module Device Disk Controller operation
- Installation of the VMEbus Storage Module Device Disk Controller
- Integration of the V/SMD disk controller into the CONVEX Operating System (OS)

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

Hardware and Software Requirements

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

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

Organization

The content of each chapter is outlined below:

- **Chapter 1. Description** — Describes the V/SMD 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/SMD are discussed.
- **Chapter 3. Integration and Test** — Explains the integration of the V/SMD into the OS. Information is also provided on diagnostic tests for the V/SMD.
- **Appendix A. Problem Reporting** — 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:

- *CONVEX VME Reference Manual*, Order No. DHW-061
- *CONVEX VME Service Kit*, Order No. DHW-050
- *V/SMD 4200 Cheetah High-performance VMEbus Storage Module Device (SMD) Disk Controller User's Guide* (Interphase Corporation), Document No. UG-0660-000-X0F
- *CONVEX System Manager's Guide*, Order No. DSW-004
- *CONVEX PBUS I/O System Diagnostics Manual*, Order No. DHW-008
- *Interphase 4200 VME Disk Controller Configurator*, Order No. 220-000010-200
- *SMD-0-15 Interface Specification*, Magnetic Peripherals, Inc., Document No. 64712401

Ordering Documentation

To order the most current version of this or any documents, use the six-digit order number. If the order number is not known, order by the exact title. In some situations the most current version may not be desired. To receive a specific version of a manual, order the manual by it's 12-digit document, or part number, which can be obtained by contacting the local CONVEX office or by calling the Technical Assistance Center.

The order number for this manual is DHW-052.
The document number for this manual is 081-000730-200.

CONVEX documents can be ordered by mail by sending a request to:

CONVEX Computer Corporation
Customer Service
PO Box 833851
Richardson TX 75083-3851 USA

Technical Assistance

Hardware and software support can be obtained through the CONVEX Technical Assistance Center (TAC). In Texas, the TAC can be reached in Texas by calling (214) 952-0379. From other locations in the continental United States call 1(800) 952-0379. Customers outside the United States should contact their local CONVEX office.

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Chapter 1
Description

1.1 Overview

This chapter briefly discusses the major features and operating functions of the VME Storage Module Device (V/SMD) Disk Controller. The V/SMD is a disk controller and formatter, and interface between the VMEbus and SMD drives. The following topics are discussed in this chapter:

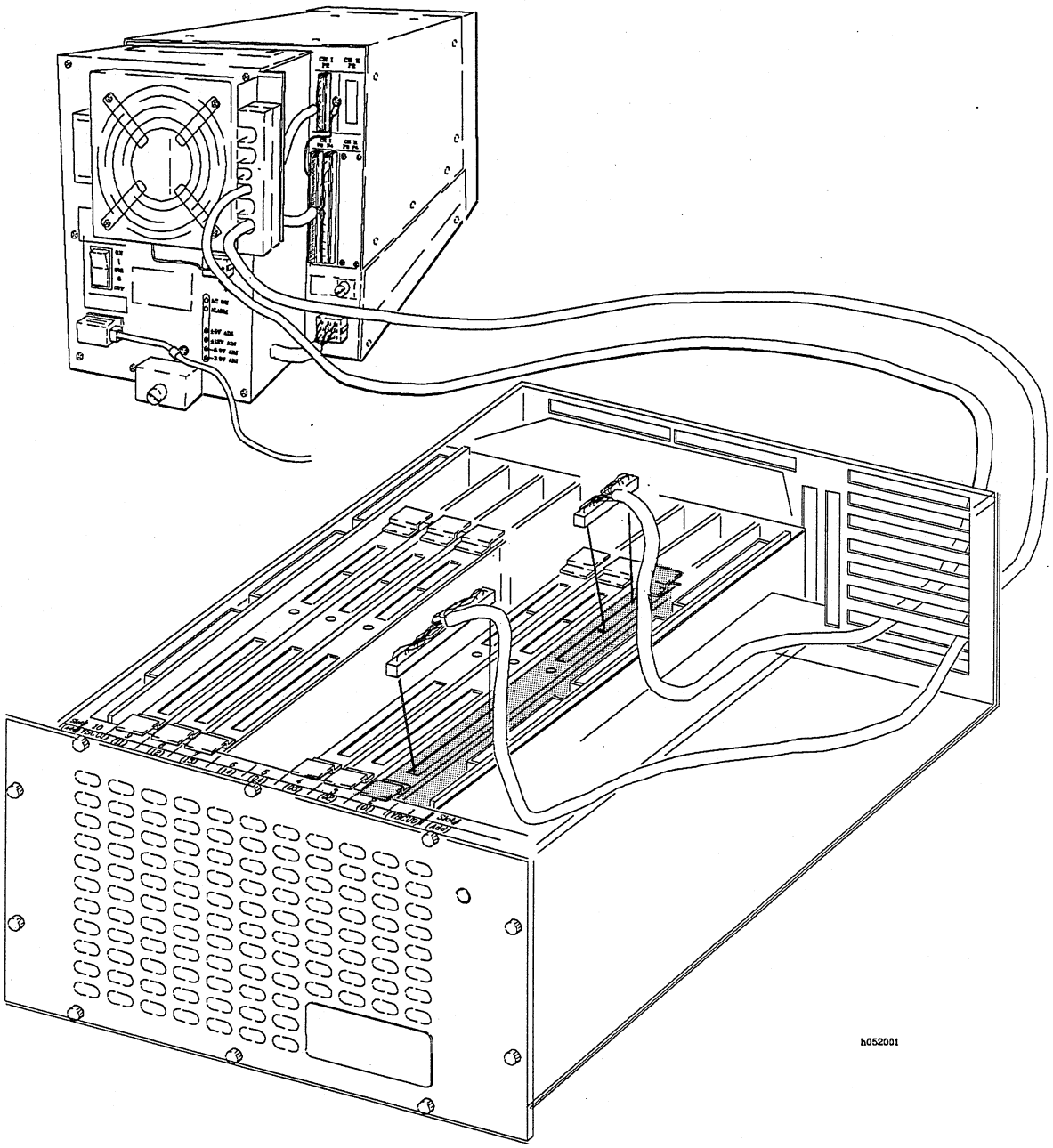
- **Hardware features** — Presents the main features of the V/SMD
- **Functional description** — Discusses initial software setup requirements, and presents a brief overview of the sequence of operation
- **Interface** — Describes the basic interface between the V/SMD, disk drive, and VMEbus
- **Diagnostics**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

NOTE

For a detail description of the V/SMD controller, refer to the Interphase Corporation's *V/SMD 4200 Cheetah High-performance VMEbus Storage Module Device (SMD) Disk Controller User's Guide.*

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

Figure 1–1, V/SMD Disk Controller Illustration



1.2 Hardware Features

The V/SMD 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 256 bytes to 4,096 bytes. CONVEX default sector size is 512 Bytes.

The main hardware features of the V/SMD 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 16/32-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 two Storage Module Device (SMD) 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 0 to 3 (CONVEX VME 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 ensure maximum throughput
- Drive status change interrupts are programmable, for such operations as overlapped seeks
- Uses multiple interrupt vectors to enable fast interrupt handling
- Pre-fetches write data during track seek time to shorten the overall write operation
- 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/SMD 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/SMD 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 and 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.

To define a UIB for a specific operation, refer to the Interphase V/SMD 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)
  - Extended addressing enable
  - Multiple spare enable
- Attributes (byte E)
  - Runt sector enable
  - 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/SMD 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/SMD's memory or main memory. However, the first IOPB must be defined in the V/SMD's memory before linked IOPBs 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 signal the controller to begin an operation defined in the IOPB by setting the *go* bit. The V/SMD will then operate as a Bus Master and perform the required functions to complete the requested command.

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

1.3.3 Command and Status Registers

The V/SMD has two registers, a read and 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/SMD 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/SMD during data transfer operations. The 68000 microprocessor manages buffer assignments composed of the V/SMD's 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/SMD puts an address signal out to the disk interface "A" cable for a specific drive. The addressed drive decodes the logical address and sends a status *unit 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 *on cylinder* signal from the drive that the head is in position on the requested track, the V/SMD 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/SMD 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/SMD's 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 and a corrected error is reported. If the error cannot be corrected, a hard error condition is reported to the V/SMD's 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/SMD's 128 Kbyte RAM buffer.

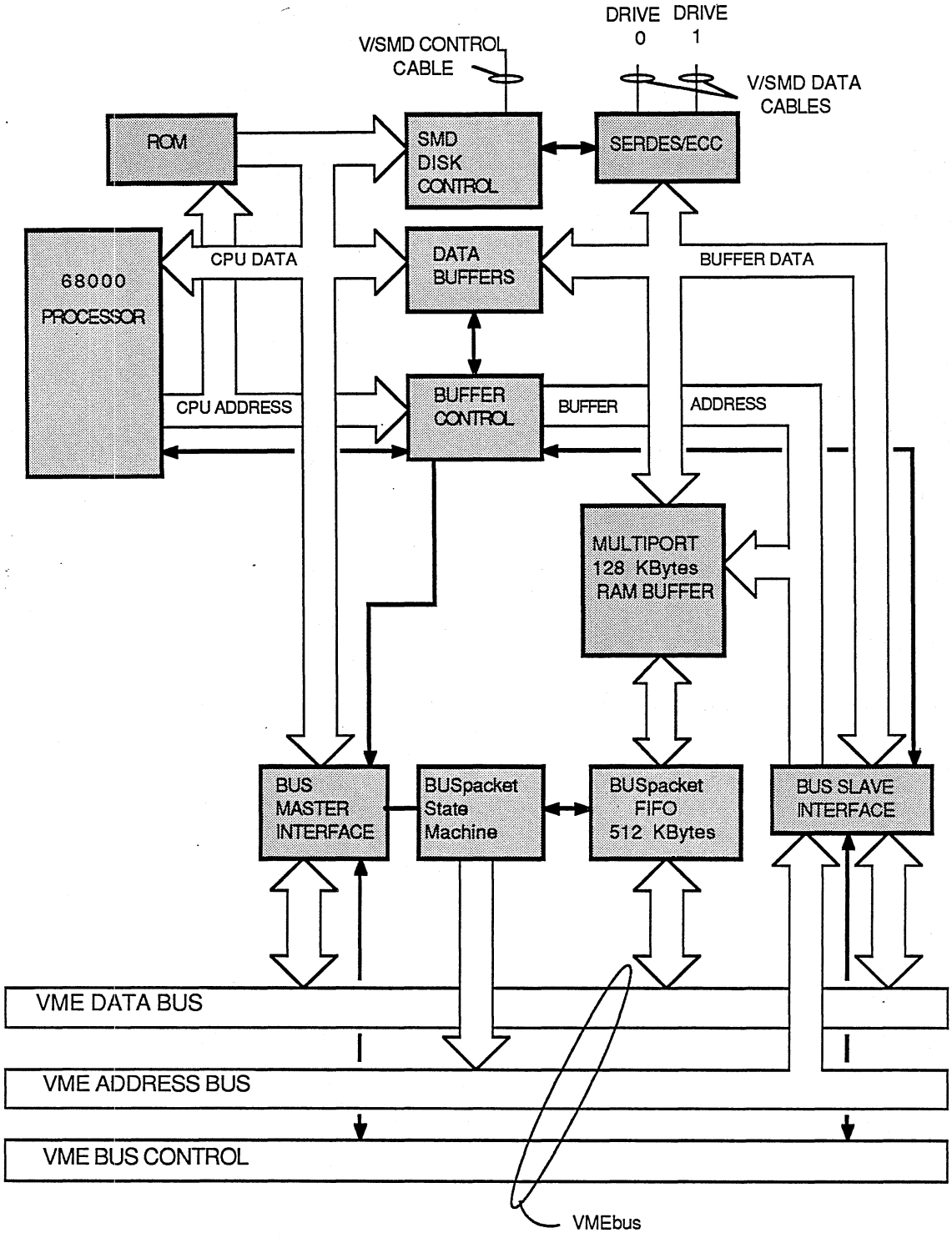
The read operation continues to fill the V/SMD's Ram buffer with data. The BUSpacket First In First Out (FIFO) 512-byte buffer enables data blocks to be sent across the VMEbus as fast as the VIOP can accept the data. During a read operation, the FIFO buffer is filled with a packet of data from the 128 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/SMD Operation 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/SMD controller signals the VIOP that it is ready to receive the data and the data is put on the VME data bus. The V/SMD contains a BUSpacket state machine that controls the data entering and leaving the FIFO buffer. The V/SMD 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/SMD 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 going to the disk, provided the buffer has not been overwritten. 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/SMD Disk Interface

The interface hardware provides a communications path between the controller and the disk drive. Communications includes all the commands, control signals, and read and write data transfers. The interface circuits use differential drivers and receivers for maximum noise immunity and distance. The receiver and driver circuits connect to the I/O cables between the V/SMD controller and the disk drive. All data and control lines are contained in the cables. The "A" cable is a 60-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 26-pin, round-shielded cable that carries the read and write data, clock, and status information between the controller and the disk drive. The maximum length of these cables is 50 feet.

1.4.1 Tags and Bus Bits

I/O signals from the V/SMD controller initiate and control the disk drive's operations. These signals are sent to receivers in the drive, then routed to the appropriate circuits in the drive. The drive sends information about the operations back to the controller. Certain I/O signals cannot be transmitted unless the drive is selected. These signals include the Tag and Bus Bit signals from the controller, and the status bits to the controller. The following table presents the Tag and Bus Bits used with the V/SMD controller:

Table 1-1, Command Tags and Bits

COMMANDS TAGS AND BITS				
	Tag 1	Tag 2		Tag 3
Bus Bit	Low Cyl Address	Head Address Select	High Cyl Address Select	Control Select
0	2^0	2^0	NA	Write Gate
1	2^1	2^1	NA	Read Gate
2	2^2	2^2	NA	None
3	2^3	2^3	NA	None
4	2^4	2^4	NA	Fault Clear
5	2^5	NA	NA	None
6	2^6	NA	NA	RTZ
7	2^7	NA	2^{10}	None
8	2^8	NA	2^{11}	None
9	2^9	NA	NA	None

1.4.2 Typical Disk Drive Interface Sequence

A typical interface sequence begins when the controller sends an address out the V/SMD "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 its *select compare* signal. The *select compare* signal enables the receivers and drivers to the controller and enables the *unit selected* signal back to the controller on the V/SMD B cable. The drive is now ready to accept further commands from the controller. All commands (except Unit Select) are sent to the drive by Tags and Bus Bits from the controller. Tags define the basic operation and the Bus Bits define or modify the basic operation.

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 by selecting Tag 2 with the High Cylinder Address, then Tag 1 with the Low Cylinder Address.

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 reached *seek end.* 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 again issues a Head Selection (Tag 2) command and a head address (Bus Bits 0 – 4). With the selected head above the desired cylinder, it is ready to begin the read or write operation.

The controller initiates a read or write function by sending a Control Select (Tag 3) with the proper Bus Bit (Bit 0 for the write gate, Bit 1 for the read gate) for the desired operation. During a read operation, the drive recovers data from the disk and transfers it to the controller. During a write operation, the drive 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/SMD 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/SMD 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/SMD to test the functionality of the board within the operation system. Detail explanations of V/SMD diagnostics are contained in the *CONVEX PBUS I/O System Diagnostics Manual.*

1.6 Specifications

The following table presents the specifications of the VME Storage Module Device Disk Controller:

Table 1-2, V/SMD 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%) @ 6.0 A max -12 VDC (± 5%) @ 0.5 A max
Temperature Range, Maximum[1]	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/SMD 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 or install the VME Storage Module Device (V/SMD) Disk Controller into the VME chassis. The cabling scheme, onboard jumper positions, and address selections are discussed.

2.2 Inspection

CAUTION

The V/SMD is extremely sensitive to Electrostatic Discharge (ESD). Use appropriate measures when handling the board. Wear a wrist ground strap or other grounding device when unpacking and inspecting the V/SMD.

The package for shipping the V/SMD 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

WARNING

The V/SMD 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/SMD.

The V/SMD 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 warning when servicing the V/SMD controller board:

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/SMD controller, it must be configured to the address setting desired for use in the system. The base address for the controller is determined by setting a series of switches on the switch block **S1**. Jumpers on the controller establish the bus request priority used during the operation of the controller. Refer to the *Interphase 4200 VME Disk Controller Configurator.*

2.5.1 Base Address Switch Selection

The switch block **S1** on the V/SMD 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/SMD short I/O space. Switches **1** through **7** on the switch block **S1** correspond to the respective address lines in the following table:

Table 2-2, 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
Switch	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). When switch **8** is 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/SMD controller installed. The base address is determined by the number of V/SMD controllers currently installed, i.e., if two V/SMD controllers are installed, the next V/SMD controller installed must contain the base address selection for the third controller.

Figure 2–1, V/SMD Base Address 0x0200, Controller One

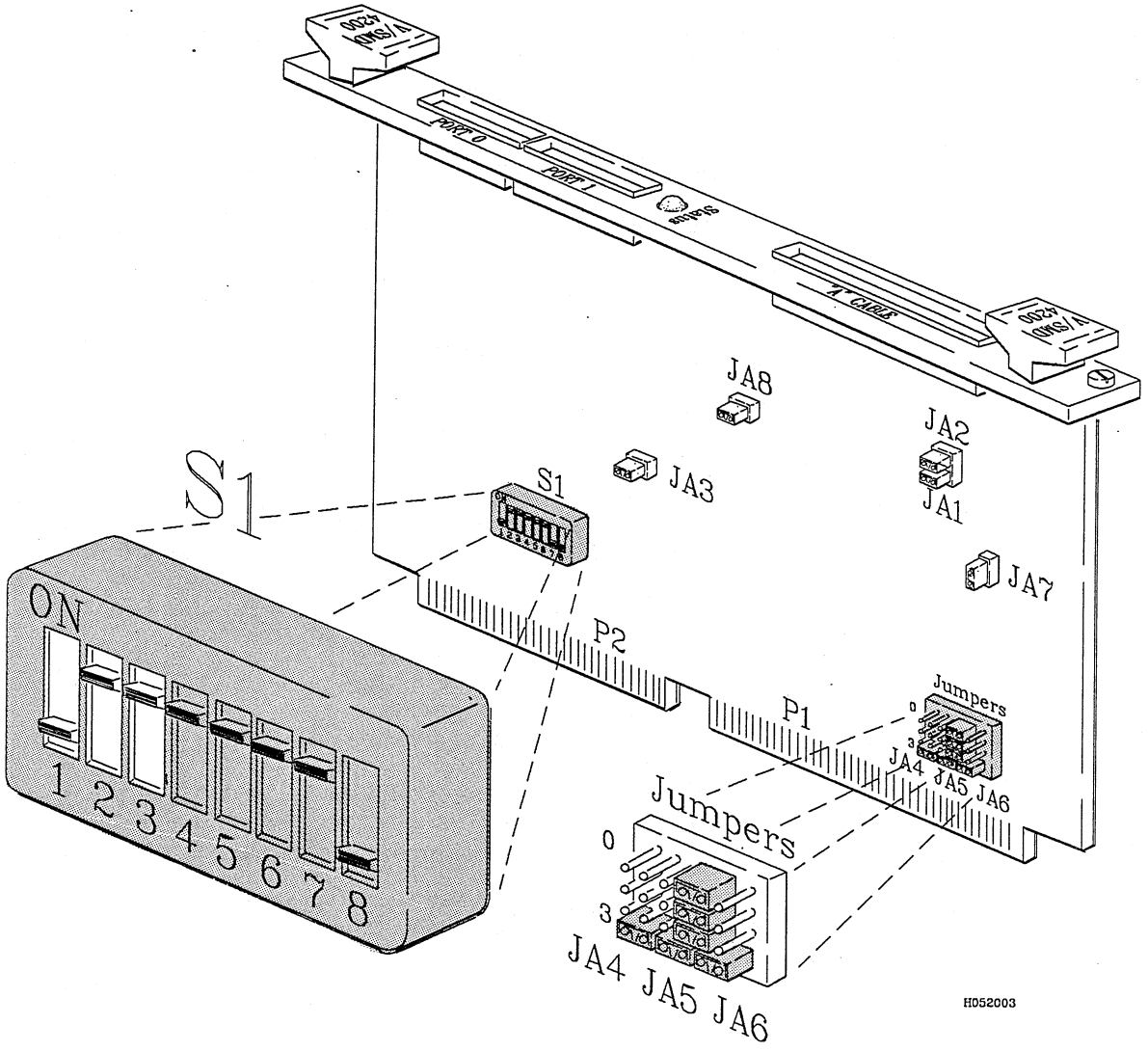


Figure 2–2, V/SMD Base Address 0x0400, Controller Two

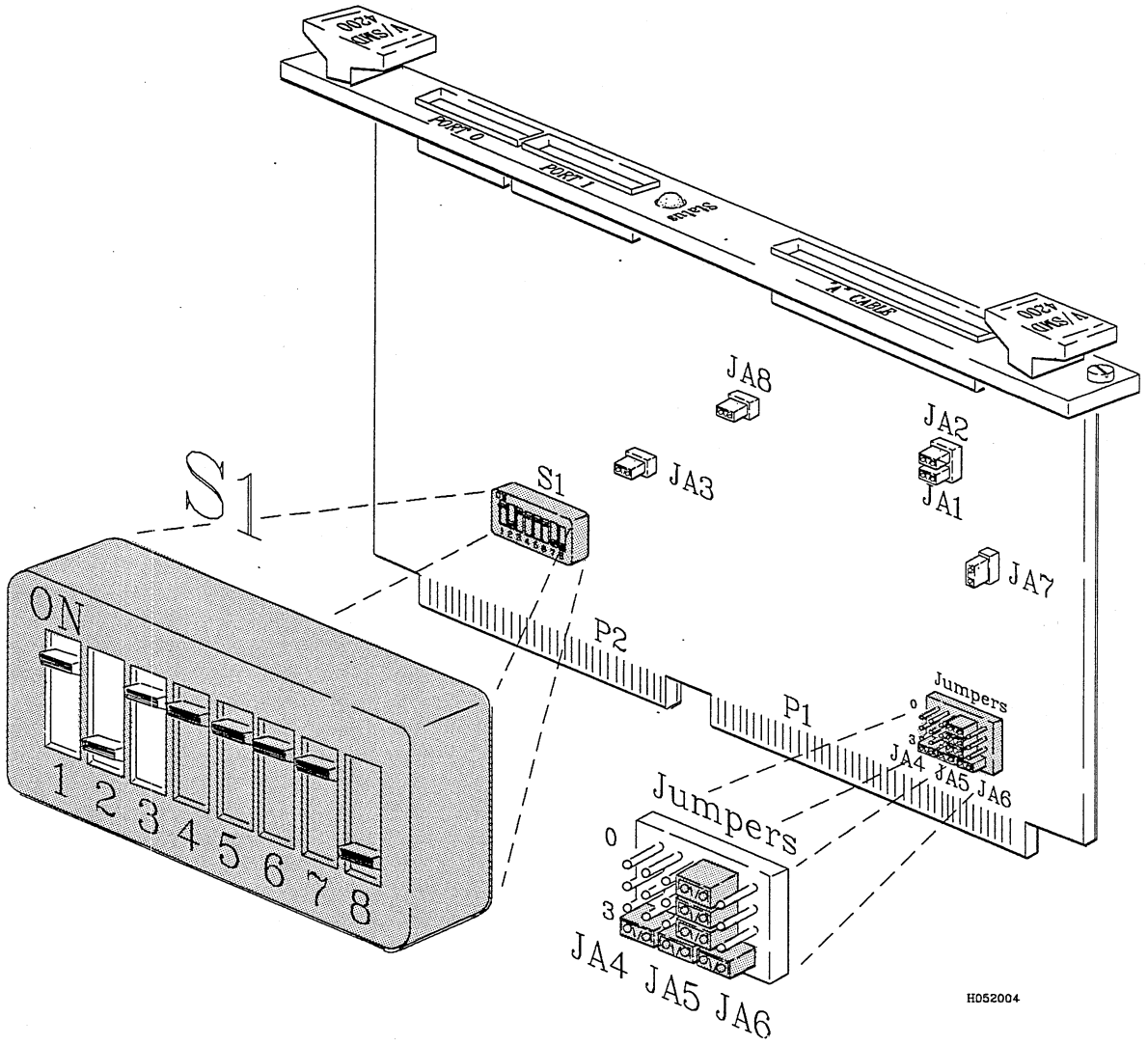
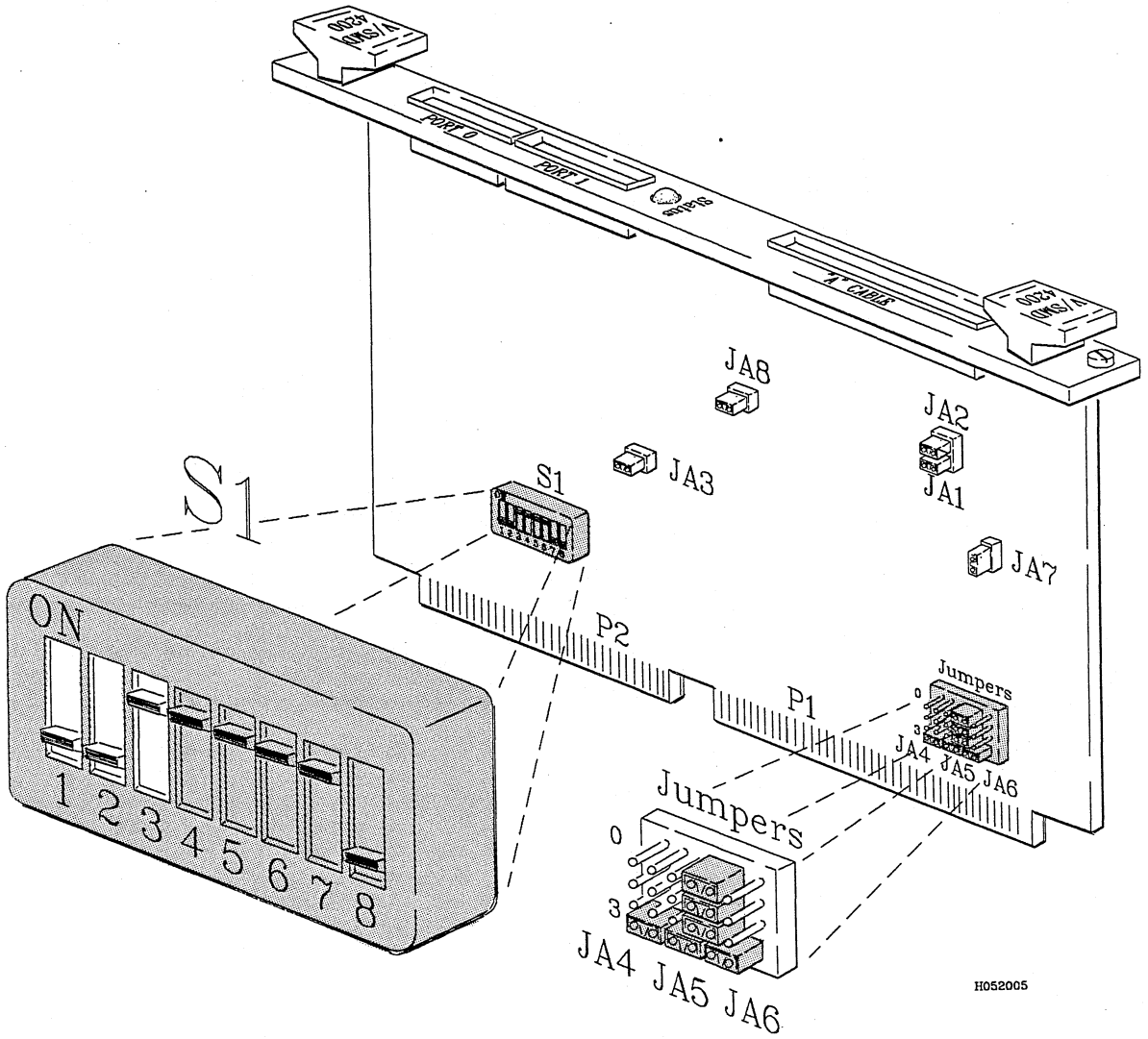


Figure 2–3, V/SMD Base Address 0x0600, Controller Three



2.5.2 Request/Grant Level Jumper Settings

CONVEX VME controllers use the bus request/grant level 3 (highest) jumper configuration. For the physical location of jumpers and the required bus request priority configuration, see the three previous figures. Unmarked jumpers in these figures are for factory use *only* and should not be changed.

2.6 Removal and Installation

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

2.6.1 Extending the VME Chassis

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

CAUTION

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

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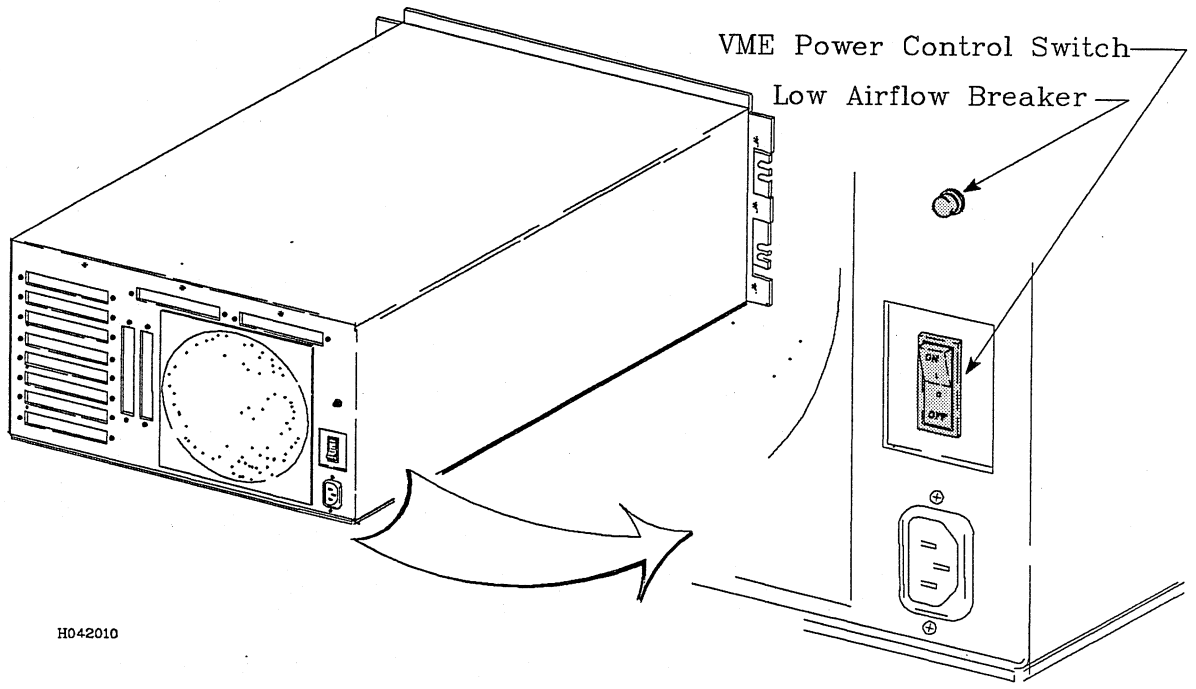
1. Shut down the operating system to the SPU prompt.
2. Set the VME chassis power switch to the **OFF** position. The following figure shows the location of the power switch on the VME chassis.

Figure 2–4, VME Cabinet Power Switch

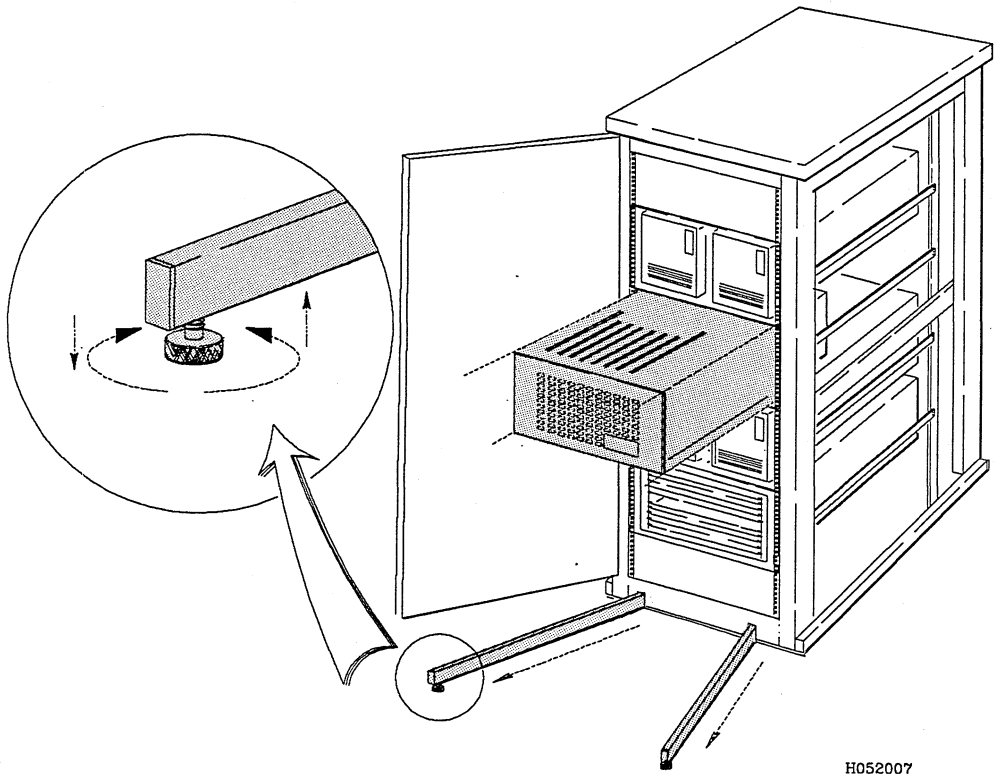


WARNING

Expansion cabinet stablizer bars must be extended before installing a VME 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 result in injury to personnel or damage to equipment.

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

Figure 2–5, Expansion Cabinet Stabilizer Bars



5. Remove the two captive-lock screws on the front of the VME chassis.
6. Carefully pull the VME chassis out on the slide guides until the slide locks click in place.
7. Unscrew the top panel captive-lock mount screws until loose from the chassis frame. Lift the top panel from the VME chassis to expose the VME controller card cage.

2.6.2 Removing the V/SMD Disk Controller

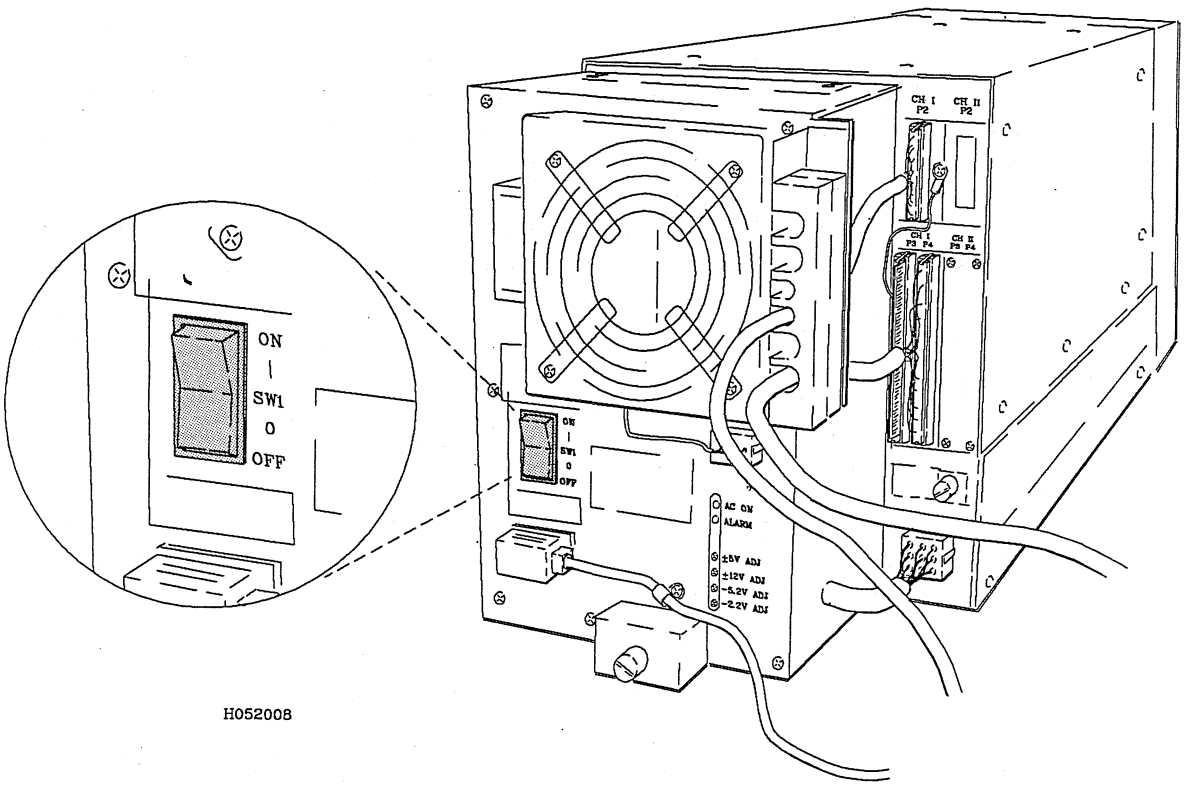
The procedures for removal are included in this manual to present the required steps for removing an already installed V/SMD controller.

CAUTION

Ensure the VME chassis power switch is in the **OFF** position. Set the disk power switch **OFF** before removing the V/SMD controller. Failure to observe this warning may result in severe damage to the board or system.

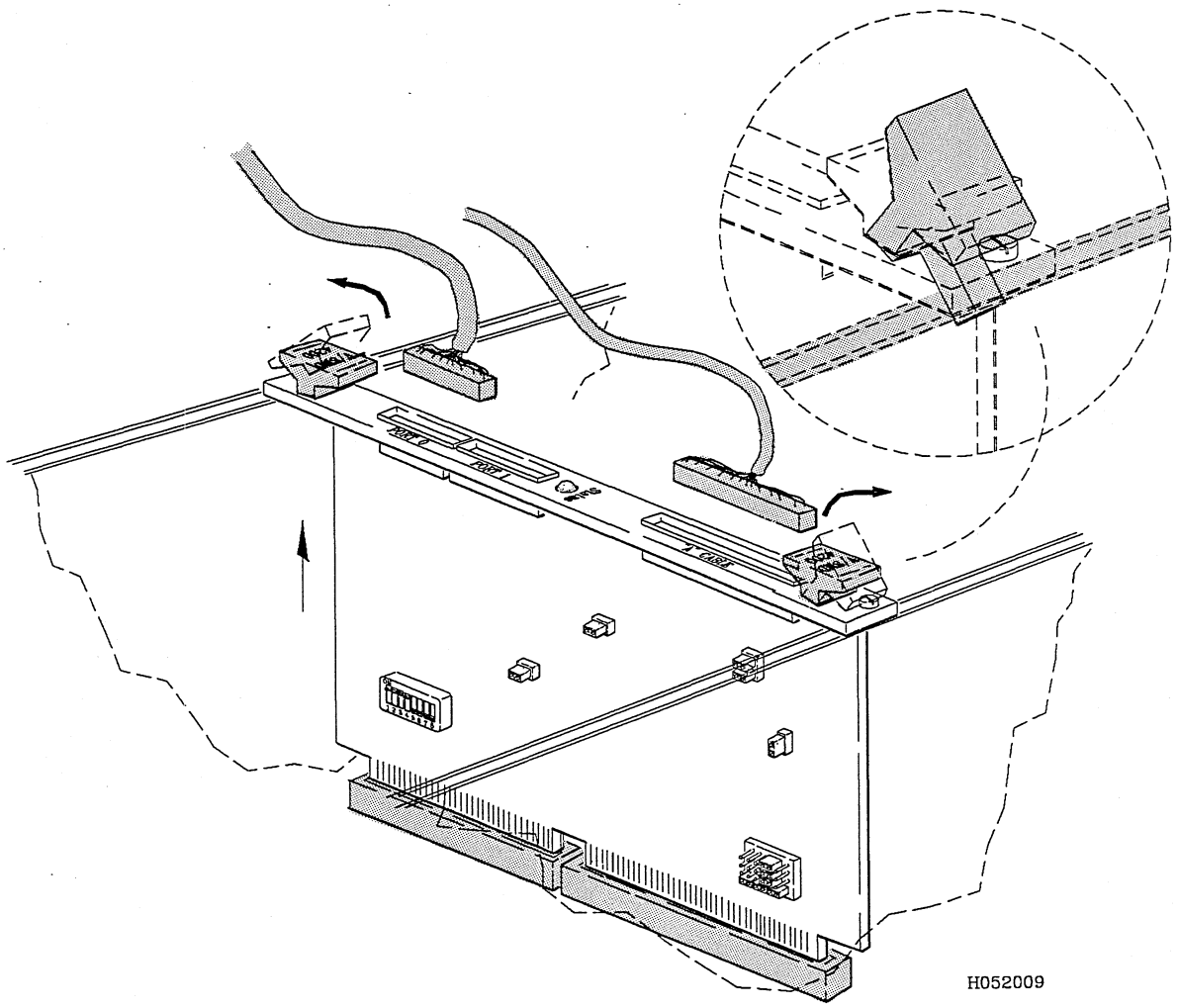
1. Set the system power and disk drive power **OFF**.

Figure 2–6, Disk Drive Power Switch



2. Disconnect B cable 604-26001-200 end connector **P1** from **PORT 0 (J2)** on the V/SMD controller by lifting straight up on the connector.
3. Disconnect B cable 604-26001-200 end connector **P1** from **PORT 1 (J3)** on the V/SMD controller by lifting straight up on the connector.
4. Disconnect A cable 604-600001-201 end connector **P1** from the **A CABLE (J1)** on the V/SMD controller by lifting straight up on the connector.
5. 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 2–7, V/SMD Board Removal



CAUTION

When the V/SMD is not installed in the VME 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.

6. 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.
7. Pull the board the rest of the way out by lifting straight up from the chassis.

2.6.3 Installing the V/SMD Disk Controller

Procedures for installing the V/SMD controller are described in detail to reflect the initial installation of the controller. Additional steps, such as the cable routing or connections to the 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/SMD 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**.

NOTES

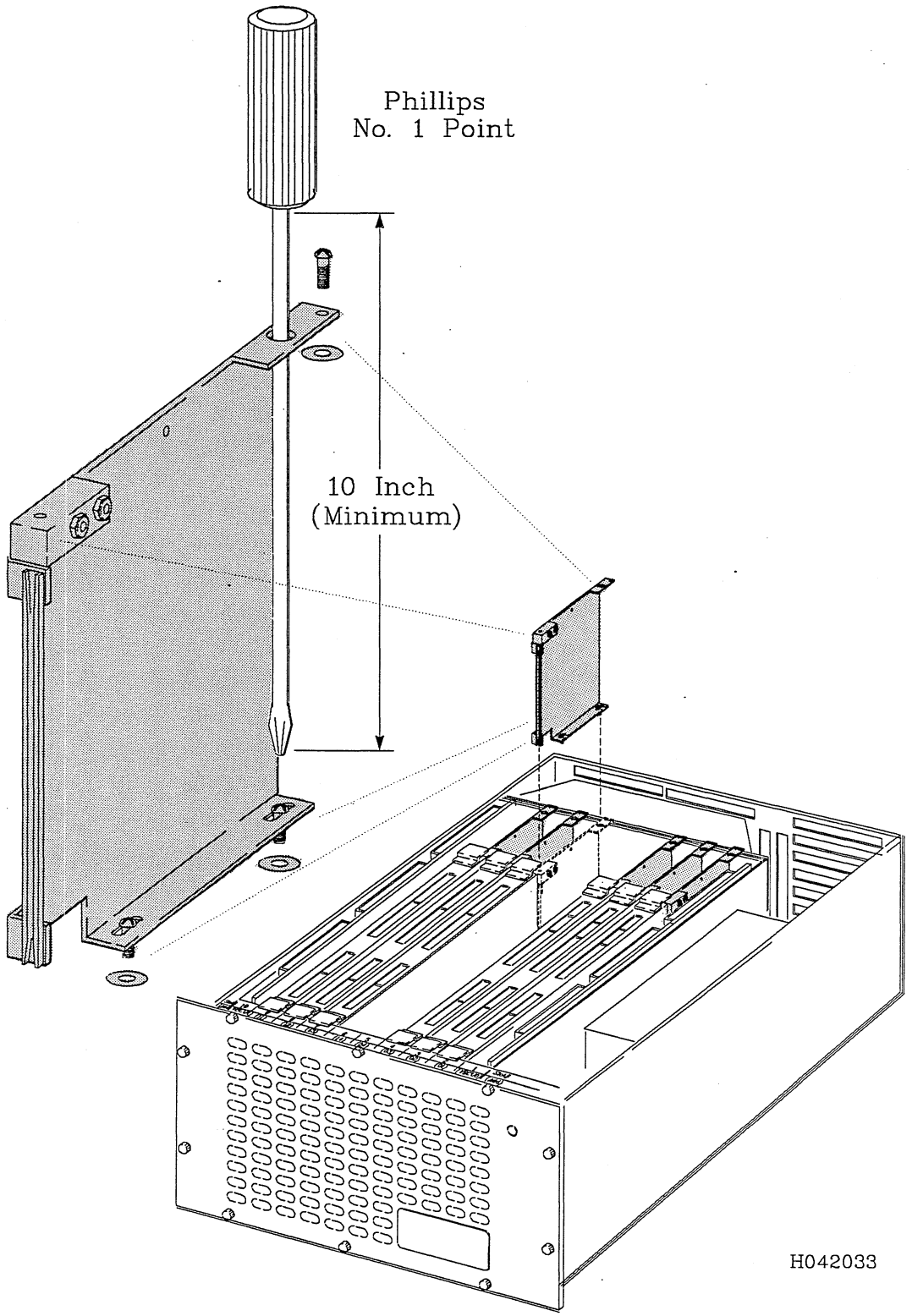
A 10-inch or longer Phillips screw driver with a No. 1 point is required to install the 2 bottom screws in the single (6U)VME circuit board adapter.

The single top screw is 2.5 mm.

---

2. Attach the single (6U)VME 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 2–8, (6U)VME Circuit Board Adapter



3. Install the V/SMD into the same slot as the 6U adapter in the VME 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-lock 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. VME 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 VME chassis. Cable routing, from the controller to the rear of the VME chassis, should always follow a prescribed sequence. Cables from a given controller backplane slot position should always exit the VME chassis at the same hole position. Cable openings and device types for each type of VME chassis are defined in the following table:

Table 2-3, Cable Opening Numbers for VME Chassis

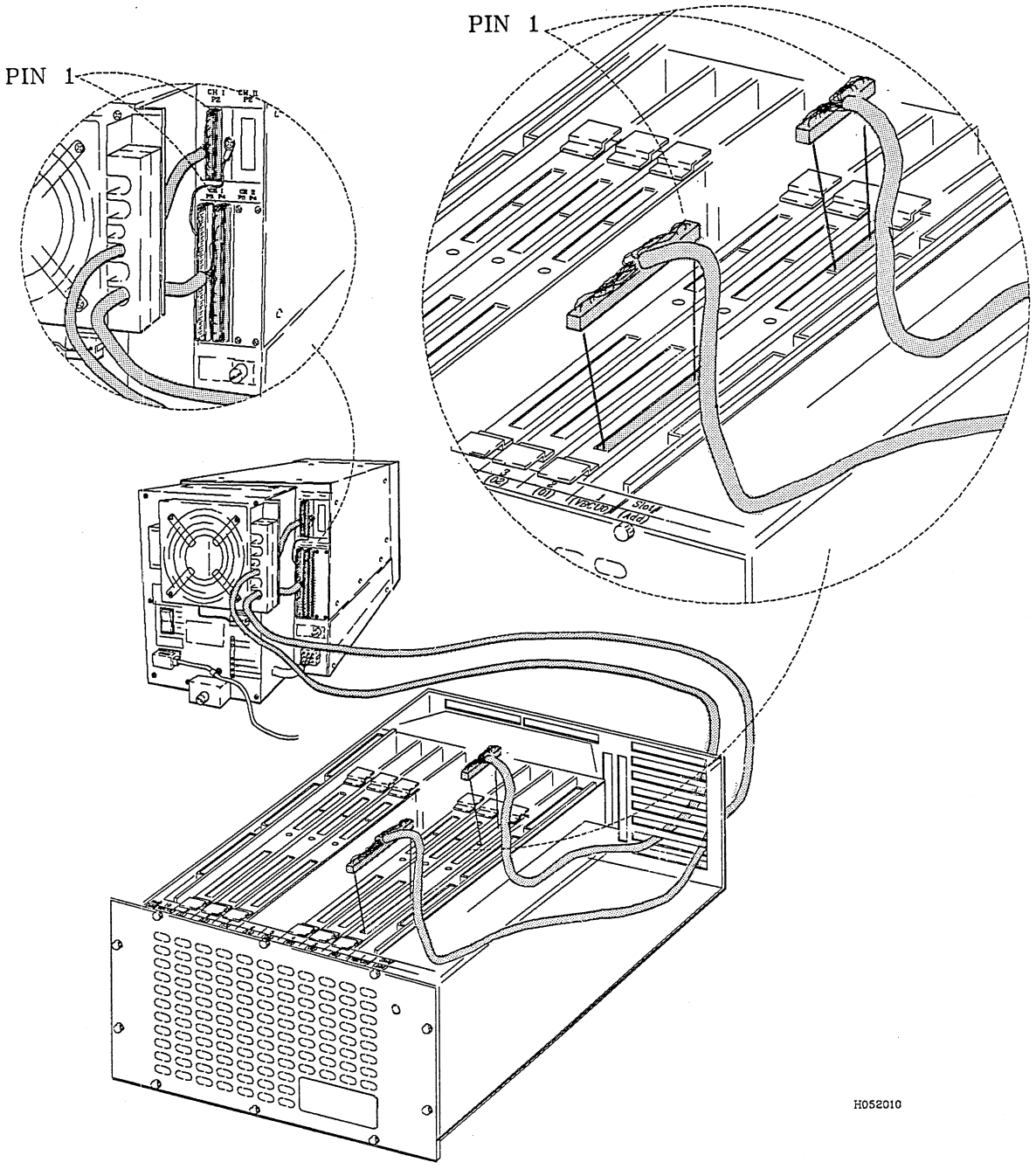
Cable Opening Number	Dual VMEbus	Single VMEbus	Combo VME/Mbus
1	VBCU-0	VBCU	VBCU
2	VME-0 Ctlr 1	Ctlr 1	VME Ctlr 1
3	VME-0 Ctlr 2	Ctlr 2	VME Ctlr 2
4	VME-0 Ctlr 3	Ctlr 3	VME Ctlr 3
5	VME-0 Ctlr 4	Ctlr 4	VME Ctlr 4
6	VME-1 Ctlr 4	Ctlr 5	VME Ctlr 5
7	VME-1 Ctlr 3	Ctlr 6	Mbus Ctlr 3
8	VME-1 Ctlr 2	Ctlr 7	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 controller set. The first board is Ctlr number 7 in slot 8.

2.6.4.1 Non-Daisy-Chain Cable Connections

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

Figure 2–9, Non-Daisy-Chain Cable Connections



1. Route end **P1** of B cable 604-260001-200 through the appropriate cable opening on the rear of the VME chassis (see Table 2-3, Cable Opening Numbers for VME Chassis) and connect to **PORT 0 (J2)** on the V/SMD, as shown in Figure 2–9.

CAUTION

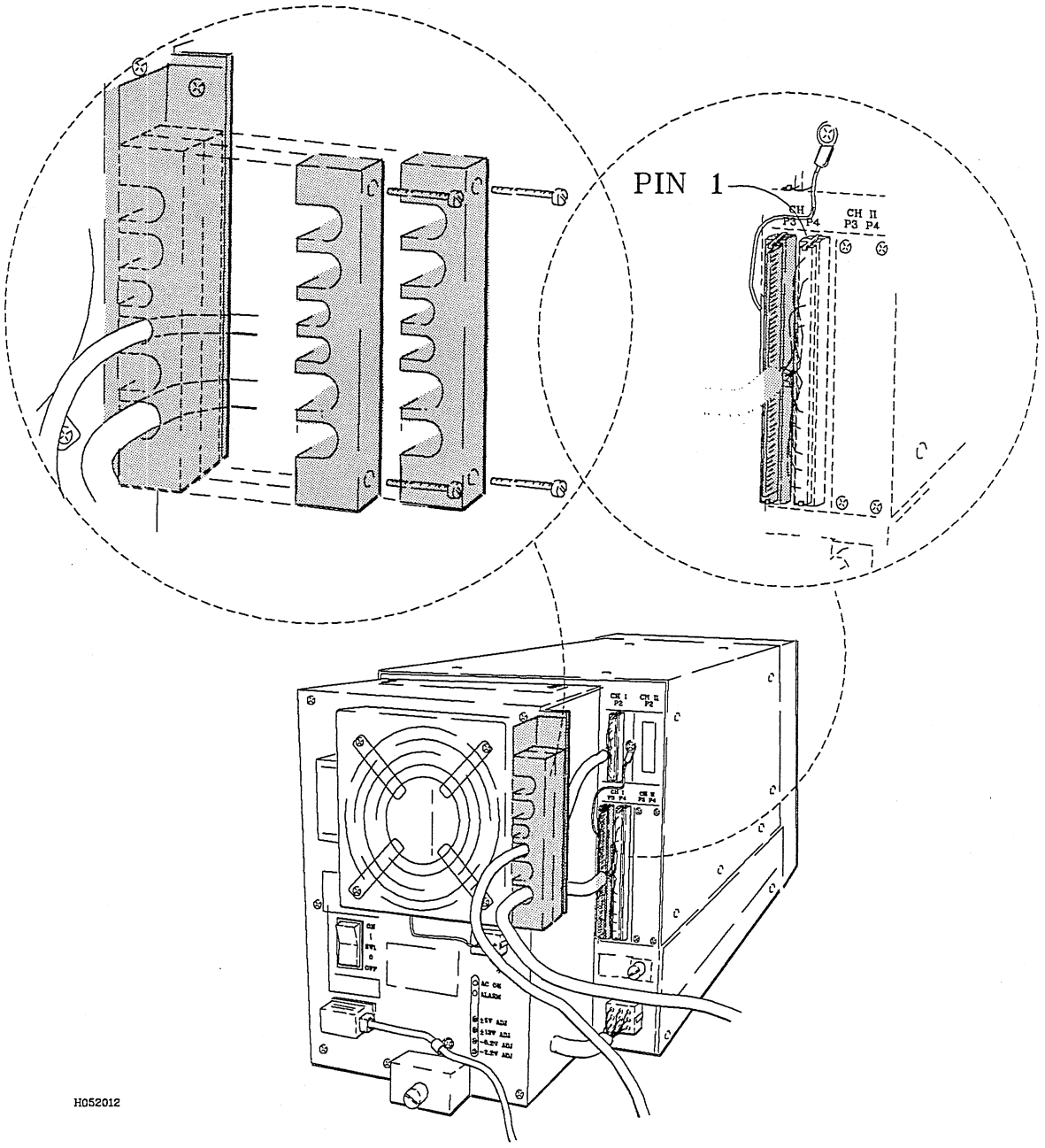
When connecting a cable to a connector, always ensure pin one on the cable matches pin one on the connector. Pin one on the cable is identified by a shallow groove on the outside corner of the end clip. Pin one for the connector is identified by a small triangle on the outside corner on the connector. Failure to connect to the appropriate port will render the controller inoperable.

NOTE

If the controller is to be attached to device drive 0, then the cable *must be* connected to **PORT 0 (J2)** on the V/SMD board. If the controller is to be attached to device drive 1, the cable *must be* connected to **PORT 1 (J3)** on the V/SMD board.

2. Connect the unconnected end (**P2**) of B cable 604-260001-200 from **PORT 0 (J2)** on the V/SMD board to the matching device port number (**CH I, P2**) on the disk device backplane connector as shown in Figure 2–9, Non-Daisy-Chain Cable Connections.
3. Route end **P1** of A cable 604-600001-201 through the cable opening on the rear of the VME chassis and connect to the **A CABLE** port on the V/SMD board.
4. Connect the unconnected end (**P2**) of A cable 604-600001-201 from the **A CABLE (J1)** port on the V/SMD to **P4** on the disk device backplane connector.
5. Install a terminator on the drive 0 (**CH I, P3**) connector as shown in Figure 2–10, Cable Terminator and Disk Clamp.
6. Secure cables to the disk drive with the cable clamp on the disk drive as shown in Figure 2–10, Cable Terminator and Disk Clamp.
7. Secure the cables in the rear of the VME chassis using the VME chassis cable clamp and mount to the back of the chassis.

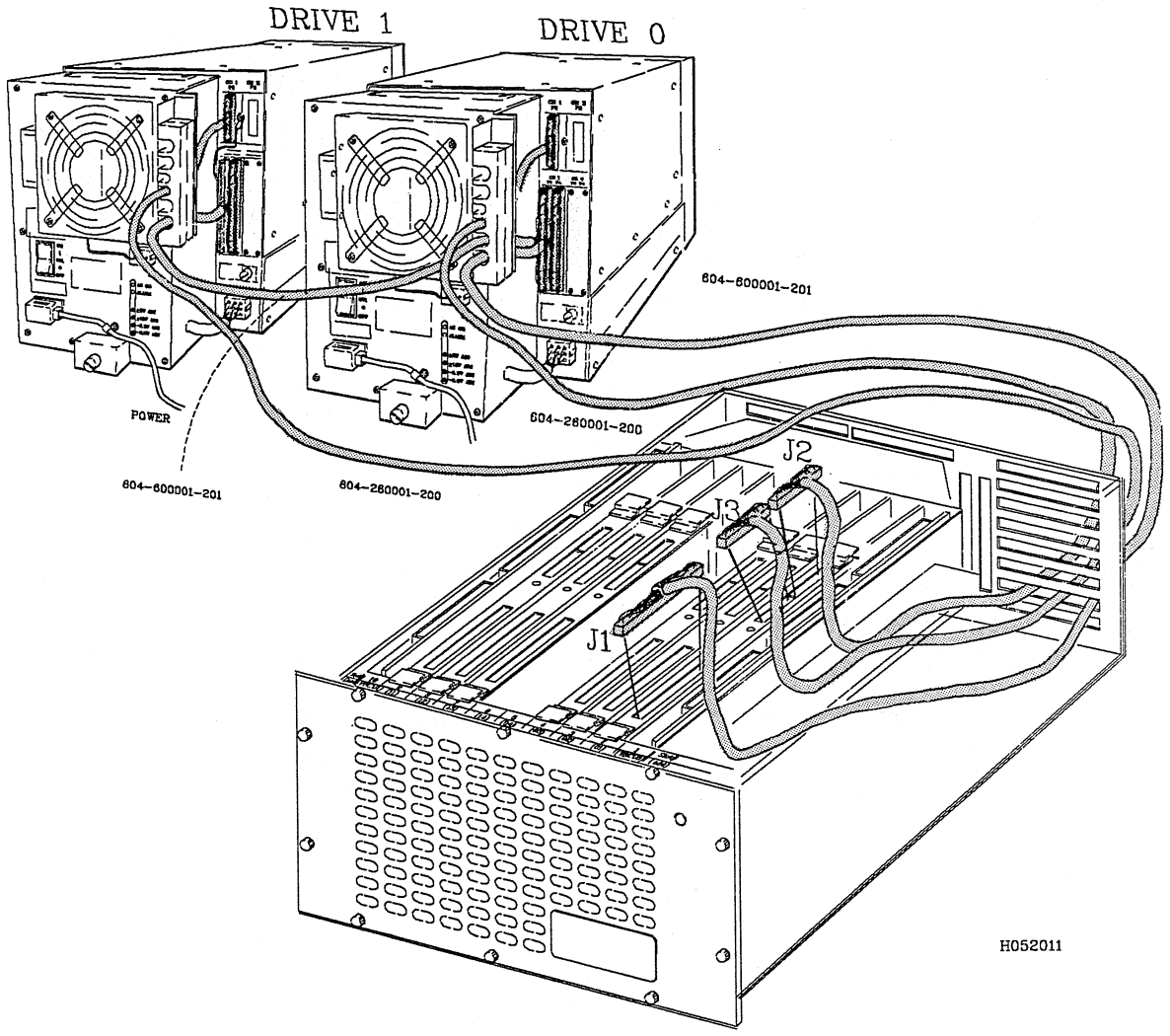
Figure 2–10, Cable Terminator and Disk Clamp



2.6.4.2 Daisy-Chain Cable Connections

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

Figure 2–11, Daisy-Chain Cable Connections



1. Route end **P1** of B cable 604-260001-200 through the appropriate cable opening on the rear of the VME chassis (see Table 2-3, Cable Opening Numbers for VME Chassis) and connect to **PORT 0 (J2)** on the V/SMD, as shown in Figure 2–11, Daisy-Chain Cable Connections.

CAUTION

When connecting a cable to a connector, always ensure pin one on the cable matches pin one on the connector. Pin one on the cable is identified by a shallow groove on the outside corner of the end clip. Pin one for the connector is identified by a small triangle on the outside corner on the connector. Failure to connect to the appropriate port will render the controller inoperable.

NOTE

If the controller is to be attached to device drive 0, then the cable *must be* connected to **PORT 0 (J2)** on the V/SMD board. If the controller is to be attached to device drive 1, the cable *must be* connected to **PORT 1 (J3)** on the V/SMD board.

---

2. Connect the unconnected end **(P2)** of B cable 604-260001-200 from **PORT 0 (J2)** on the V/SMD board to the matching device port number **(CH I, P2)** on the disk device backplane connector as shown in Figure 2–11.
3. Route end **P1** of B cable 604-260001-200 through the appropriate cable opening on the rear of the VME chassis and connect to **PORT 1 (J3)** on the V/SMD.
4. Connect the unconnected end **(P2)** of B cable 604-260001-200 from **PORT 1 (J3)** on the V/SMD board to the matching device port number **(CH I, P2)** on the disk device backplane connector.
5. Route end **P1** of A cable 604-600001-201 through the cable opening on the rear of the VME chassis and connect to the **A CABLE** port on the V/SMD board.
6. Connect the unconnected end **(P2)** of A cable 604-600001-201 from the **A CABLE (J1)** port on the V/SMD to **P4** on the disk device backplane connector.
7. To daisy chain the two supported drives, connect **P1** of a second A cable (604-600001-201) to drive 0, connector **P3**. Connect the unconnected end **(P2)** of the A cable to drive 1, connector **P4**.
8. Terminate the daisy chain by installing a terminator on the drive 1 **(CH I, P3)** connector.
9. Secure cables to the disk drives with the cable clamps on the disk drives.
10. Secure the cables in the rear of the VME chassis using the cable clamps and mount to the back of the VME chassis.

2.6.5 Installing the VME Chassis

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

1. Place the top panel on the VME chassis, and tighten panel captive-lock screws.
2. Push in on the lock buttons on each side of the VME chassis slide guides, and gently push the VME chassis back into the cabinet.
3. Tighten the captive-lock screws on the front of the VME 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/SMD controller into the I/O subsystem and the diagnostic tests available to operationally test the controller. The V/SMD must be integrated into the operating system before being used.

VME controllers, and peripheral devices must be integrated into the CONVEX computer's OS 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 VME subsystem is installed on a CONVEX computer.

System-level hardware is identified to the CONVEX OS via a configuration file (*/ioconfig*) located on the Service Processor Unit (SPU) disk. The */ioconfig* file describes, in hierarchical fashion, the connections between VIOPs, VME controllers, and peripheral devices. The OS 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 VME storage modules and the Interphase V/SMD controller are listed below:

- DKD-206 — 500–Mbyte storage module
- DKD-208 — 1–Gbyte storage module
- DKC-204 — V/SMD 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 VME I/O Processor (VIOP) number, VME chassis number, controller type, address and interrupt number, and peripheral device type. The OS uses this information during *sysgen* to assign a physical device number to a device of a given type. This enables the OS to associate a given physical device number (a storage module) with a specific base-unit sleeve. A typical */ioconfig* file that includes entries for VIOP 4 using five storage disks and three controllers in VMEbus 0 follows:

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-214
        unit 1 type DKD-214
```

Whenever a system-disk storage module or DKC-204 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/SMD controller contains internal diagnostics that are executed automatically on powerup and software reset. There are other diagnostics available that should be used after performing 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/SMD within the I/O subsystem.

Appendix A
Problem Reporting

A.1 Overview

The *contact* utility is the recommended way to report minor hardware deficiencies and technical documentation problems to the Technical Assistance Center (TAC). This utility is an interactive tool that prompts the user for the information to properly file a problem report.

NOTE

The *contact* utility is not intended for requesting customer service for hardware failures. To restore your CONVEX equipment to operational status, faster service can be obtained by directly telephoning the TAC (refer to "Technical Assistance" in the Preface).

To use the *contact* utility, there must be a phone connection to the TAC. A UNIX-to-UNIX Communication Protocol (UUCP) allows communication between UNIX systems by either dial-in or hard-wired communication lines. For more information, refer to *uucp(1)* or to the *info(1)* entry in the UNIX man pages.

The name and version number of the product involved is required. Use the *vers* command to ascertain the program or utility name and version. The syntax for the command is **vers** *filename*, where *filename* is the full pathname of the program. If the full pathname of the program is not known, enter **which** *program*. For more information, refer to the *vers(1)* and *which(1)* entries in the UNIX man pages.

A.2 Information Required to Report a Problem

The *contact* utility requires the following information:

1. The customer name, title, phone number, and corporate name
2. The hardware nomenclature, part number, and revision level, or the technical manual name, document number, and version

---

NOTE

Use *vers* and *which* to identify product name and version.

---

3. A short (one line) summary of the problem

4. The more information provided, the more quickly the problem can be isolated and solved. At a minimum, include a detailed description of the problem (including page references, if applicable), the source code, and a stack backtrace whenever possible.

NOTE

See the *adb(1)* or *csd(1)* man pages for information on obtaining stack backtraces.

---

5. The priority of the problem, selected from a list of six levels
6. Instructions on how to reproduce the problem, including the command syntax used, any flags invoked, or anything else attempted to make the program run
7. Any other comments about the problem or files to be submitted

The *contact* user has a chance to review and edit the report prior to submitting it. If the user decides to delay submitting the report, the session can be aborted. The report is automatically saved in the user's top-level directory in a file named *dead.report*.

See the following figure for a sample *contact* session. User input is in bold lettering, and the system response is in monospace type.

Figure A–1, Sample *contact* Session

```
%contact (RETURN)
Welcome to contact version 0.11 ()

Enter your name, title, phone number, and corporate name (^D to terminate)
> Margaret Atwood, systems programmer, 814-4444, University r
> of Chicago (RETURN)
> (CTRL-D)

Enter the name of the product involved
> CONVEX UNIX Programmer's Manual, Part I (RETURN)

Enter the version number (in the form X.X or X.X.X.X) of the product
> Revision 4.0 (RETURN)

Enter a short (1 line) summary of the problem
> The finger command manual page lists nonexistent bug (RETURN)

Enter a detailed description of the problem (^D to terminate)
> The finger(1) man page says, under the BUGS section, that "Only the first
line of the .project file is printed."  Happily, this is not true! (RETURN)
> (CTRL-D)

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.
> 4 (RETURN)

Enter the instructions by which the problem may be reproduced (^D to terminate)
> a) put more than one line in .project (RETURN)
> b) read the man page for finger(1) (RETURN)
> (CTRL-D)

Enter any comments that are applicable (^D to terminate) (RETURN)
> (CTRL-D)

Do you have any suggestions or comments on the documentation that you
referenced when you were trying to resolve your problem (for example,
additions, corrections organization, accessibility)? (^D to terminate)
> The man page should be updated. (RETURN)
> (CTRL-D)

Are there any files that should be included in this report (yes | no)?
> no (RETURN)

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.
> 3 (RETURN)

Problem report submitted.
%
```

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CONVEX VME SMD Disk Controller
Service Guide
Document No. 081-000730-200, V1.0

Reader's Forum

You are invited to submit comments concerning the clarity and service of this manual. Constructive critical comments are most welcome, and will help us continue in our efforts to generate quality customer documentation. Please list the document page number with your questions and comments.

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