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CMD Storage Array Controllers

User's Manual for Trident, Cobra, and Hawk Controllers

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Chapter 1

Introduction

This manual explains the installation, configuration, and use of CMD Technology's Trident, Hawk, and Cobra storage array controllers. Part I is devoted to the command line interface, error logs, and the front panel. These subjects apply to all three controllers. Part II covers the installation of the Trident controller. Part III covers the installation of the Hawk controller. And Part IV covers the installation of the Cobra controller.

1.1 Manual Conventions

Several chapters in this manual cover material common to all three storage array controllers. Occasionally, exceptions will have to be made for specific controllers. The manual will flag these exceptions with the following icons . . .

Information pertaining to the Trident CI/DSSI/FDDI storage array controller.

Information pertaining to the Hawk CI/DSSI storage array controller.

Information pertaining to the Cobra DSSI storage array controller.

Part I

Operating Instructions

This part describes the command line interface and other matters that are common to the Trident, Hawk, and Cobra controllers.

Chapter 2

Command Line Interface

This chapter describes the command line interface (CLI) and explains how to use the CLI to perform common configuration functions. See Chapter 3 for an alphabetical listing of the complete CLI command set.

2.1 Overview

The command line interface makes it possible to configure the controller and the devices connected to it from a console or terminal. Among the tasks you may perform through the command line interface are . . .

- Create a stripeset
- Partition a disk or stripeset
- Assign a (T)MSCP unit number to a disk or tape device
- Set the controller's system node name
- Set a DSSI or SCSI port's ID number

COBRA DSSI and SCSI port IDs on the Cobra must be set via hardware jumpers.

Table 2–1 lists the CLI command set organized by function.

Table 2–1: Commands by Function

Controller	
FACTORY	Resets controller parameters to factory default settings.
QUIESCE	Temporarily halts activity on one or more SCSI buses for the purpose of swapping a device.
RESTART	Restarts the controller, forcing configuration parameters stored in non-volatile memory to become current.
RESUME	Resumes activity on one or more SCSI buses after a QUIESCE.
SET CI	Sets the controller's CI parameters. Not applicable to the Cobra.
SET CONTROLLER	Sets a number of controller-specific parameters.
SET LOG	Filters error and event messages displayed on the console terminal.
SET PORT	Sets port-specific parameters.
SHOW CONTROLLER	Displays information about controller configuration.
WRITE	Writes parameter settings held in the editing buffer to the floppy diskette. Not applicable to the Cobra.
Device	
AUTOCONFIG	Scans all SCSI buses and associates a unique physical name to each device found.
CREATE DISK	Associates a unique physical name to a disk drive.
CREATE TAPE	Associates a unique physical name to a tape drive.
DELETE DISK	Deletes a physical name previously associated with a disk drive.
DELETE TAPE	Deletes a physical name previously associated with a tape drive.
RESET SCSI_BUS	Resets one or more SCSI buses. Devices will go into MOUNT VERIFY.
SET DISK	Creates up to eight partitions on a disk drive.
SHOW DEVICES	Displays a listing of disk and tape devices previously identified by the AUTOCONFIG, CREATE DISK, or CREATE TAPE commands.
SHOW DISK	Displays a listing of disk devices previously identified by the AUTOCONFIG or CREATE DISK commands.
SHOW TAPE	Displays a listing of tape devices previously identified by the AUTOCONFIG or CREATE TAPE commands.
Miscellaneous	
HELP	Displays a syntax guide for all CLI commands.
QUIT	Quits the command line interface and returns to the host when accessing through DUP.
SHOW ALL	Combination of all SHOW screens.

Table 2–1 (Cont.): Commands by Function

Statistics	
CLEAR CI_STATS	Zeros cumulative counters for the CI statistics screen.
CLEAR DSSI_STATS	Zeros cumulative counters for the DSSI statistics screen.
MONITOR CI_STATS	Dynamic display of information about CI paths.
MONITOR DSSI_STATS	Dynamic display of information about DSSI buses.
SHOW CI_STATS	Shapshot display of information about CI paths.
SHOW CLUSTER	Displays information about the cluster.
SHOW DSSI_STATS	Shapshot display of information about DSSI buses.
SHOW STATS	Displays all statistics screens.
Unit	
DELETE UNIT	Deletes a (T)MSCP unit number.
MAP UNIT	Assigns a (T)MSCP unit number to a physical device or stripeset.
RENAME UNIT	Renames a (T)MSCP unit number.
SET UNIT	Sets parameters for a device with a (T)MSCP unit number.
SHOW UNIT	Displays information about all devices with (T)MSCP unit numbers.
Utilities	
ABORT	Halts a QUALIFY, DISKTEST, or TAPETEST operation.
DESELECT	Takes a device out of maintenance mode and returns it to the pool of available devices.
DISKTEST	Initiates a disk drive test.
FORMAT	Formats a disk drive.
QUALIFY	Verifies the integrity of disk drive media.
SELECT	Puts a device into maintenance mode and removes it from the pool of available devices.
SHOW MAINTENANCE	Displays a list of devices selected for maintenance and the status of any operations underway.
TAPETEST	Initiates a tape drive test.

2.2 Accessing the Command Line Interface

There are two ways to access the command line interface: from the OpenVMS prompt and from the controller's serial port. This section will describe the steps necessary to access the command line interface from the OpenVMS prompt. See Parts II through IV for a discussion of controller serial ports.

2.2.1 OpenVMS Prompt

Follow these steps to connect to DUP from the OpenVMS prompt.

❶ If you are working on a terminal connected to a VAX system, issue the following command to connect to the DUP device:

```
$ MC SYSGEN CONNECT FYA0/NOADAPTER
```

If you are working on a terminal connected to an AXP system, issue the following command to connect to the DUP device:

```
$MC SYSMAN IO CONNECT FYA0/NOADAPTER/DRIVER=SYS$FYDRIVER
```

❷ Once you have connected the DUP device, you can access the controller's DUP programs by issuing the following command:

```
$ SET HOST/DUP/TASK=PARAMS/SERVER=MSCP$DUP n
```

Replace the variable *n* at the end of the command line with the nodename of the controller.

NOTE

Type *QUIT* at the command prompt to exit a DUP session and return to the host. The *QUIT* command has no effect when you are connected to the serial port.

2.3 Keyboard Shortcuts

When you are entering a command in the command line interface, you may use the delete key to delete a character, and the left and right arrow keys to move one character to the left or right. In addition, you may use the special keys listed in Table 2–2 to erase the entire line or recall commands from the command stack.

Table 2–2: Special Editing Keys

Key	Function
Ctrl-U	Line erase
Up Arrow	Recall previous command
Down Arrow	Recall next command

2.4 Controller Commands

Most of the controller commands are intended to be used during the installation and initial configuration of the controller. They are not limited to this purpose, however, and may be used whenever you wish to modify the configuration of the controller. Other controller commands such as *QUIESCE*, *RESTART*, and *RESUME* are intended to be used during normal operation.

2.4.1 Set Up Commands

A typical CLI session during the course of an initial controller installation might go as follows . . .

Use the *SET CONTROLLER* command to set parameters that govern the controller's relationship with the cluster and the storage devices connected to the controller.

```
NODE> SET CONTROLLER /SYSTEM_ID=180155
NODE> SET CONTROLLER /NODENAME=BIFF
```

The *SYSTEM_ID* and *NODENAME* qualifiers set the SCS system ID and node name of the controller. These parameters must be unique among all nodes in the cluster. There is no need to set the system ID if the default value of the qualifier (131072 plus the serial number of the controller) does not conflict with any other node in the cluster.

CAUTION

In a redundant controller configuration, port 0 on controller #1 must be connected to port 0 on controller #2, port 1 on controller #1 must be connected to port 1 on controller #2, and so on. Futhermore, both controllers must have the same disk and tape allocation class values (assigned with the *SET CONTROLLER* command). The */REDUNDANT* qualifier of the *SET CONTROLLER* command must be turned "ON." And the */POWER_ON_RESET* qualifier of the *SET PORT* command must be turned "OFF" for all common SCSI buses.

```
NODE> SET CONTROLLER /DISK_ALCS=4
NODE> SET CONTROLLER /TAPE_ALCS=4
NODE> SET CONTROLLER /REDUNDANT=ON
```

SET CONTROLLER also takes the following qualifiers.

```
NODE> SET CONTROLLER /MAX_HOSTS=32
NODE> SET CONTROLLER /DEVICE_TYPE=RA
NODE> SET CONTROLLER /SPINUPDELAY=5
```

The */MAX_HOSTS* qualifier may be set to any integer value between 1 and 32. The default is 32. The */DEVICE_TYPE* qualifier determines how devices connected to the controller will be reported to the host. You may select from RF, RA, HS. The */SPINUPDELAY* qualifier sets the spin up interval between disk drives on the controller's buses. See Chapter 3 for more information about these qualifiers.

Another step in the initial configuration of a controller is the *SET PORT* command. This command enables or disables a port and determines whether the controller issues a reset to the SCSI buses at power on.

TRIDENT
HAWK

On the Trident and Hawk controllers, the *SET PORT* command sets the SCSI ID or DSSI node ID of each port on the controller. It also identifies the port as SCSI, DSSI or inactive. (On the Trident, you must have a DSSI daughter card and the appropriate DSSI license to switch a SCSI port to DSSI.)

COBRA

The Cobra controller does not support the *SET PORT* qualifiers for setting the SCSI or DSSI ID, or establishing a port as SCSI or DSSI. You must set jumpers on the board to perform these functions.

The following example applies to either the Trident or Hawk. The Cobra does not support the */TYPE* and */ID* qualifiers.

```
NODE> SET PORT 5 /ENABLE/TYPE=DSSI
NODE> SET PORT 5 /ENABLE/ID=2
NODE> SET PORT 0 /ENABLE/ID=7
NODE> SET PORT 1 /ENABLE/ID=7
NODE> SET PORT 2 /ENABLE/ID=7
NODE> SET PORT 3 /ENABLE/ID=7
NODE> SET PORT 4 /ENABLE/ID=7
```

Each SCSI port on the controller must be set to SCSI ID 7, unless you have a dual controller configuration, in which case you would set one controller's SCSI ports to ID 7 and the other's ports to ID 6.

You may view your controller configuration at any time by entering the *SHOW CONTROLLER* command.

```
TRIDNT> SHOW CONTROLLER

    Controller TRIDNT
        Serial No.: 0                       Firmware Revision: BT60
        Date/Time: 27-JUL-1995 13:41:49     Uptime:  0 DAYS  00:07:11
        Processor DRAM size:  4   MB        Processor Free Pool:  235 KB
        Device Type       = HS              Spinup Delay = 5 Seconds
        Redundant Mode    = OFF             Polyport     = OFF
        Rev A Compatible  = OFF             Type         = RF72
    SCS Parameters
        Nodename:  TRIDNT      System ID: 909090
        DISK_ALCS: 2           TAPE_ALCS: 5
        MAX_HOSTS: 32          DATREQ_PR: HIGH
    Cache
         16 MB read cache
    Ports
        Port 0:   SCSI, id= 7, power_on_reset=ON
        Port 1:   SCSI, id= 7, power_on_reset=ON
        Port 2:   SCSI, id= 7, power_on_reset=ON
        Port 3:   SCSI, id= 7, power_on_reset=ON
        Port 4:   SCSI, id= 7, power_on_reset=ON
        Port 5:   DSSI, id= 2
```

NOTE

If you have a configuration with a redundant pair of controllers, be sure to set */POWER_ON_RESET* to "OFF" for those ports with shared SCSI buses. In a single controller configuration, you should set */POWER_ON_RESET* to "ON."

The */POLYPORT* qualifier permits the system administrator to achieve a degree of load balancing between two CMD controller host paths. It is intended for those users who wish to fine tune the performance of the controller and is not essential to the operation of the controller. For more information about Polyport, see Chapter 4.

COBRA Since Polyport requires two host ports, this feature does not apply to the CDI-4220 model, which has only one DSSI host port.

2.4.2 Hot Swapping SCSI Devices

The controller supports the hot swapping of SCSI devices. Since the removal of a SCSI bus can disrupt signal activity on the bus and possibly cause data corruption, you should make sure that the bus is quiet before performing the hot swap. This can be done with the *QUIESCE* command.

For example, if you need to replace a disk drive on bus 0, you would first halt activity on the bus by entering the following command.

```
NODE> QUIESCE 0
```

Once you have completed the swap, open up the bus for activity again by entering the *RESUME* command.

```
NODE> RESUME 0
```

2.4.3 Saving Parameter Changes

The Trident/Hawk and Cobra controllers differ in the way they handle the saving of parameter changes.

TRIDENT
HAWK

Parameter changes will be lost when you power down or *RESTART* the controller, unless you *WRITE* them to the floppy diskette.

COBRA

All parameter changes are saved immediately in non-volatile memory. The *WRITE* command is not available, nor is it needed, on the Cobra.

All parameter changes, except those you make with the *SET UNIT* command, require a controller *RESTART* to become effective. Changes made with the *SET UNIT* and *RENAME UNIT* commands take effect immediately, but on the Trident or Hawk controllers, you must *WRITE* the new values to the floppy diskette to make them permanent.

The following example shows the steps necessary to change a Trident or Hawk controller's node name and then make the change effective.

```
NODE> SET CONTROLLER /NODENAME=BOB
NODE> WRITE
NODE> RESTART
BOB>
```

CAUTION

TRIDENT
HAWK

Each time you power on or reset the controller, it loads its firmware and configuration data from the floppy diskette. The controller will not operate unless the boot up diskette is inserted in the floppy drive. If you make configuration changes that you wish to remain in effect after a controller *RESTART*, you must *WRITE* them to the floppy diskette. If you *RESTART* the controller without first saving any configuration changes, the changes will be lost and the last saved configuration environment will be loaded.

2.4.4 Restoring Factory Default Settings

The *FACTORY* command restores all configuration parameters to their factory default settings. This command is useful when you have made numerous parameter changes that did not produce the controller behavior that you intended. The *FACTORY* command lets you start again from a clean slate.

2.5 Device Naming Scheme

A discussion of the Device, Unit, and Stripeset commands must be predicated on an understanding of the command line interface's device naming scheme, which is based on the three-tiered hierarchy outlined in Table 2–3.

Table 2–3: Device Name Hierarchy

	Type	Format	Purpose
Level 1	Physical Name	D*pil* T*pil*	Identifies a device within the command line interpreter. Name is determined by the type of device and the device's physical installation. Disk devices start with "D." Tape devices start with "T." The remainder of the name is the port "p," SCSI ID "i," and LUN "l" of the device.
Level 2	Logical Name	S0, S1, . . . S15	A logical placeholder used to identify a stripeset within the command line interpreter.
Level 3	(T)MSCP Device Name	DUA1000, DIA4120, MUA200	The name by which a device, whether it be a disk, tape or stripeset, is known to the host.

Device commands operate on level 1. Stripeset commands operate on level 2, and unit commands operate on level 3. Every device must have a physical name. If you choose to create a stripeset, the stripeset will encompass one or more disk drives identified by their physical device names. Finally, to make any device or logical stripeset available to the host, you must map it to a (T)MSCP device name.

2.6 Device Commands

The controller does not automatically scan its SCSI buses to identify new devices. Instead, it relies on specific instructions from the operator via the command line interface to identify new devices. These instructions come in the form of the device commands *AUTOCONFIG*, *CREATE DISK*, and *CREATE TAPE*.

If you are adding many disk and tape devices to the controller at the same time, the easiest way to name the devices is to use the *AUTOCONFIG* command. This command scans all the controller's SCSI buses and creates physical names for every device it finds. The *AUTOCONFIG* command takes no parameters or qualifiers:

```
NODE> AUTOCONFIG
```

NOTE

AUTOCONFIG will ignore any ports (and the devices on them) that have not previously been enabled and defined as SCSI. When you enable a port with the *SET PORT p /ENABLE* command, you must *WRITE* the new value to the non-volatile memory and *RESTART* the controller for the change to take effect.

Alternatively, you may use the *CREATE DISK* and *CREATE TAPE* commands to create physical names for specific devices. To create names for a tape device connected to port 0, SCSI ID 3, LUN 0, and a disk device connected to port 2, SCSI ID 0, LUN 0, you would type the following commands.

```
NODE> CREATE TAPE T030
NODE> CREATE DISK D200
```

You may combine several devices of the same type on a single command line. For instance, to create names for a string of six devices on Port 3, you might enter this command.

```
NODE> CREATE DISK D300 D310 D320 D330 D340 D350
```

Once you create a physical device name, you can later delete the name with the *DELETE DISK* and *DELETE TAPE* commands. You might wish to delete a physical device name if you decide to remove a device or replace one type of device (either disk or tape) with another type.

```
NODE> DELETE DISK D310
NODE> DELETE TAPE T030
```

You may get a display of all physical device names with the *SHOW* commands. Use *SHOW DEVICES* to list disks, tapes, stripesets, and mapped units. Or narrow the output of the display with either *SHOW DISK* or *SHOW TAPE*. The "Pcnt" (Partition Count) column gives the number of partitions created on the device.

```
NODE> show disk
Name   Pcnt  Used by     Type    Inquiry Data                Device Attributes
-------------------------------------------------------------------------------
D130   1                 DISK    DEC       RZ26      392A    Sync TagQ
D160   4                 DISK    DEC       RZ28      D41C    Sync TagQ
D150   4                 DISK    DEC       RZ28      D41C    Sync TagQ
D140   1                 DISK    Quantum   XP32150   556A    Sync TagQ
D110   1                 DISK    DEC       RZ26      392A    Sync TagQ
D120   1                 DISK    Quantum   XP32150   556A    Sync TagQ
```

2.6.1 Disk Drive Partitioning

With the *SET DISK* command, you may divide a disk drive into up to eight partitions. When mapped to an MSCP device name, each of these partitions will be seen by the host as a separate disk drive. The following example divides the disk drive on port 1, SCSI ID 5, LUN 0 into three partitions.

```
NODE> SET DISK D150 /PARTITIONS=3
```

2.6.2 SCSI Bus Resets

If you believe that a SCSI bus is hung, you may reset it with the *RESET SCSI_BUS* command. The following example resets SCSI bus 4. When you issue a SCSI bus reset, all devices on that bus will go into *MOUNT VERIFY*.

```
NODE> RESET SCSI_BUS 4
```

2.7 Stripeset Commands

With the stripeset commands, you can effectively transform several disk drives into a single drive. This can produce dramatic improvements in I/O performance. For write operations, the controller splits data from the host into smaller chunks and writes each chunk in parallel to the drives in the stripeset. The opposite occurs for read operations: the controller reads the striped data in parallel from the stripeset and passes the reconstituted data to the host.

CAUTION

The controller's stripesets are based on the RAID 0 model. This means that the stripeset has no redundancy and no way of recovering from a drive failure. If a drive fails in a stripeset, all data, including the data on the surviving members of the stripeset, will be lost. RAID 0 is designed for the sole purpose of enhancing performance and offers no data security features. You should back up the data on a stripeset, just as you would back up data on a single disk drive.

The first step in the creation of a stripeset is the creation of a logical name for the stripeset. This is done with the *CREATE STRIPESET* command. For instance, to create the logical stripeset name "S1," you would enter . . .

```
NODE> CREATE STRIPESET S1
```

The next step is to assign disk drives to the stripeset. Refer to the disk drives by their physical names, as in the following example . . .

```
NODE> ADD STRIPESET S1 D120 D220 D320 D420 D520
```

Once you have assigned disk drives to the stripeset, you must initialize it. This is the process by which the controller reserves a portion of each disk, where it stores special configuration data unique to that stripeset.

The *CHUNKSIZE* qualifier specifies how much data will be written to each drive on each stripe. Each *CHUNKSIZE* unit represents 4 kilobytes of data. Thus, a *CHUNKSIZE* of 4 would mean that each drive in the stripeset would receive 16 kilobytes of data for each stripe written. By adjusting the *CHUNKSIZE* qualifier, you can optimize the efficiency of the stripeset. If the chunksize is too large, some drives in the stripeset will work harder than others, and you lose the benefit of parallel data transfers. If the chunksize is too small, the controller will have to loop through more stripes than necessary to complete the write.

```
NODE> INITIALIZE STRIPESET S1 /CHUNKSIZE=4
```

If you wish, you may partition the stripeset with the *SET STRIPESET* command. Up to eight partitions are allowed.

```
NODE> SET STRIPESET S1 /PARTITIONS=4
```

To make the stripeset available to the cluster, you must map the stripeset to an MSCP device name. This is done with the *MAP UNIT* command, which is covered in Section 2.8, Unit Commands.

2.7.1 Other Stripeset Commands

You may delete a logical stripeset name with the *DELETE STRIPESET* command. If the stripeset is mapped to an MSCP device name, the controller will not let you delete the stripeset name. First use *DELETE UNIT* to delete the MSCP device name, then use *DELETE STRIPESET*.

```
NODE> DELETE STRIPESET S0
```

The *SHOW STRIPESETS* command displays a list of all your stripesets. In the first column is the logical stripeset name. The second column contains the number of partitions associated with that stripeset name. The "Used by" column identifies the MSCP device name to which the stripeset or stripeset partition is mapped. The fourth column lists the chunksize. And the last column identifies the physical devices encompassed by the stripeset.

```
NODE> SHOW STRIPESETS

Name  Pcnt    Used by      Chunksize    Members
-------------------------------------------------------------------------
S0    1       DUA200       4            D050 D040 D030 D020 D010 D000
S1    2       DUA210 (1)   4            D150 D140 D130 D120 D110 D100
S1    2       DUA215 (2)
S2    1       DUA220       4            D240 D230 D220 D210 D200
S3    1       DUA230       4            D340 D330 D320 D310 D300
S4    1       DUA240       4            D440 D430 D420 D410 D400
S5    1       DUA250       4            D540 D530 D520 D510 D500
```

2.8 Unit Commands

The unit commands manage MSCP and TMSCP device names for your devices, stripesets, and partitions. The (T)MSCP device name is the name by which a device is known to the host. You cannot give a device a (T)MSCP device name without first giving it a physical name. This applies to stripesets and partitions as well as disk and tape devices, since they all appear as single devices to the host.

Use the *MAP UNIT* command to assign a (T)MSCP device name to a disk, tape, stripeset or partition. Device names for disk drives, stripesets, and partitions must begin with DU or DI. Tape drive device names must begin with MU. The letter "A" should be the third letter in the prefix to conform with the device naming rules of VMS Version 5.3 and above. You may append any number from 0 to 9999, as long as the resulting name is unique among all devices in the cluster.

```
NODE> MAP UNIT D220 DUA2000
NODE> MAP UNIT T140 MUA1001
NODE> MAP UNIT S0 /PARTITION=1 DUA2020
NODE> MAP UNIT S0 /PARTITION=2 DUA2021
```

Operating Instructions

You can delete a device name with the *DELETE UNIT* command, and change a device name with the *RENAME UNIT* command.

```
NODE> DELETE UNIT DUA2000
NODE> RENAME UNIT DUA2020 DUA3020
```

2.8.1 Setting Unit Parameters

With the *SET UNIT* command, you can set a number of unit parameters. The following example shows how to set a few parameters. For a full list and description of these parameters, see Chapter 3, Command Dictionary.

```
NODE> SET UNIT DUA3020 /WRPROT/NODISCONNECT/SYNC=10
NODE> SET UNIT MUA1010 /SHORT_TMARK/SYNC=5/NOTAGGED
```

2.8.2 Show Unit Command

The *SHOW UNIT* lists all device names and selected information about each one. The number in parentheses under the "Member" heading identifies which partition of the disk drive or stripeset is mapped to the unit.

```
NODE> SHOW UNIT
Name       Member   Status    Host      Set-members/Modifiers
-------------------------------------------------------------------------------
DUA200     S0  (2)  ONLINE    NODE      D050 D040 D030 D020 D010 D000
                                         online, cache, disconnect, immediate,
                                         tagging, truncate,
                                         spindown, sync_rate=10
DUA210     S1  (1)  ONLINE    NODE      D150 D140 D130 D120 D110 D100
                                         online, cache, disconnect, immediate,
                                         tagging, truncate,
                                         spindown, sync_rate=10
DUA220     S2  (2)  ONLINE    NODE      D240 D230 D220 D210 D200
                                         online, cache, disconnect, immediate,
                                         tagging, truncate,
                                         spindown, sync_rate=10
.
.
.
```

2.9 Utility Commands

The command line interface offers utilities for formatting and qualifying disk drives, and testing the ability of the controller to read and write to a particular disk or tape drive.

2.9.1 Select

To perform a utility function on a device, you must first *SELECT* the device. This removes the device from the pool of devices available to the cluster and puts the device into maintenance mode. The argument of the *SELECT* command must be a physical device number.

```
NODE> SELECT D100
```

Once you have selected a device you may *FORMAT*, *QUALIFY*, *TAPETEST*, or *DISKTEST* it. *TAPETEST* applies only to tape devices, and *DISKTEST* applies only to disk devices.

2.9.2 Format

The *FORMAT* command will overwrite any data on the disk. (Most new SCSI disk drives are formatted at the factory prior to shipment.)

```
NODE> SELECT D100
NODE> FORMAT D100
```

FORMAT will display a console message when the operation is completed. You may periodically issue the *SHOW MAINTENANCE* command to check on the status of the format. It is a good practice to run one or more *QUALIFY* passes on the drive after a format.

2.9.3 Qualify

QUALIFY verifies the integrity of the drive's media. Without the */WRITE* qualifier, *QUALIFY* will not alter any data stored on the disk. With the */WRITE* qualifier, the command will overwrite any data on the disk. The */WRITE* qualifier must be used whenever you qualify a brand new disk that contains no data. *QUALIFY* will continue indefinitely until halted with the *ABORT* command.

```
NODE> SELECT D230
NODE> QUALIFY /WRITE D230
NODE> ABORT D230
```

2.9.4 Disktest

DISKTEST exercises the selected drive and corrects any media errors encounters. During a *DISKTEST/WRITE* operation, the controller writes to randomly selected logical blocks on the device and then reads and verifies the data. If the device you want to test already contains data, omit the */WRITE* qualifier, and *DISKTEST* will read from randomly selected logical blocks. For newly formatted devices, you must must use the */WRITE* qualifier, or else *DISKTEST* will have no data to read.

```
NODE> SELECT D230
NODE> DISKTEST /WRITE D310
NODE> ABORT D310
```

2.9.5 Tapetest

TAPETEST exercises the selected tape device by writing, rewinding, and reading each section of tape, up to but not including filemarks. The block size for the initial pass is 32 kilobytes. This is halved on each successive write/rewind/read operation. The test restarts when the block size reaches 1 kilobyte.

```
NODE> SELECT D230
NODE> TAPETEST T150
NODE> ABORT T150
```

2.9.6 Deselect

When you are finished with a utility operation and wish to return a device to the pool of available devices, use the *DESELECT*. This will take the device out of maintenance mode.

```
NODE> DESELECT D230
```

2.9.7 Show Maintenance

You may view a list of devices under maintenance and the status of all utility operations by entering the *SHOW MAINTENANCE* command.

```
NODE> show maintenance

Device  Test      Flags          Status
-------------------------------------------------------------------------------
D130    QUALIFY   RO             Active LBN = 0x00004500
D160              RO             Idle
D150    FORMAT    RW             Active
D140    QUALIFY   RW             Active LBN = 0x000010c0
D110    DISKTEST  RO             Active LBN = 0x001c9816
D120    DISKTEST  RW             Active LBN = 0x00384e08
```

The Device column lists all the devices currently selected for maintenance. The devices are identified by their physical names. The Test column indicates the maintenance operation currently underway for each listed device. A blank field indicates that no operation is underway for that device.

The Flags column indicates whether the maintenance operation is Read-Only (RO) or Destructive (RW). The *FORMAT* and *TAPETEST* are always destructive, meaning that these operations write to the media. *QUALIFY* and *DISKTEST* are Read-Only, unless you specify the */WRITE* qualifier which makes each operation destructive. In addition to RO and RW, the Flags column may also indicate that a test is in the process of being aborted or that a bad block was detected and is in the process of being replaced. These indicators are transient and may rarely be visible to the user.

When a device is currently undergoing a *FORMAT* or *TAPETEST*, the Status field for the device will show "Active." For a DISKTEST or QUALIFY operation, the Status field will show the progress of the operation by displaying a snapshot of the current logical block number being processed.

If you decided to abort a maintenance operation, the "Test aborted by user" message will be displayed in the Status field. Note that *FORMAT* operations cannot be aborted and will remain active until completed.

If the controller encounters a SCSI target error during a maintenance operation, it will display the error code in the Status field. The target error display takes the following format:

```
Idle CHKCOND xxh:yyh:zzh SCSI-OP
```

"CHKCOND" refers to the SCSI check condition status. The variable "xxh" will be the SCSI sense key value (see Table 5–8). The variable "yyh" refers to the SCSI additional sense code (ASC) value, and "zzh" refers to the SCSI additional sense code qualifier (ASCQ) value. See Table 5–9 for a list of ASC and ASCQ codes. "SCSI-OP" will be replaced with the SCSI operation that was underway when the error occurred.

If the controller encounters a SCSI port error code during a maintenance operation, it will display the following information in the Status field.

```
Idle SCSI Port Error 0xXXXX
```

A complete list of SCSI port error codes may be found in Section 5.1.1.3.

2.10 Common CLI Task Examples

Many configuration tasks require CLI commands from more than one category. This section contains examples of common CLI tasks and shows how some of these tasks make use of commands from various categories.

2.10.1 Configuring the Controller

Typically when you first install the controller, you will need to assign a node name to the controller and set its allocation class. The *SET CONTROLLER* command allows you to set these parameters. In the following example, we will be changing the node name to "BLUE" and the disk and tape allocation classes to "4."

Example 2–1: Set Controller Example

```
NODE> SET CONTROLLER /NODENAME=BLUE
NODE> SET CONTROLLER /DISK_ALCS=4
NODE> SET CONTROLLER /TAPE_ALCS=4
```

You may combine two or more qualifiers in a single command.

Example 2–2: SET CONTROLLER Example

```
NODE> SET CONTROLLER /DISK_ALCS=4/TAPE_ALCS=4
```

See Chapter 3 for a complete description of the *SET CONTROLLER* syntax and qualifiers.

2.10.2 Configuring a Port

TRIDENT
HAWK

Trident and Hawk controllers have six DSSI/SCSI ports, numbered from 0 to 5. Depending on the features of your particular model, you may change a DSSI port to a SCSI port, or vice versa.

COBRA

The Cobra's DSSI and SCSI ports must be configured with the jumpers on the controller board. The only *SET PORT* qualifiers that apply to the Cobra are */ENABLE*, */DISABLE*, and */POWER_ON_RESET*.

This example shows how to enable port 5 on a Trident or Hawk controller, make it a SCSI port, and assign SCSI ID 7 to it.

Example 2–3: SET PORT Example

```
NODE> SET PORT 5 /ENABLE/TYPE=SCSI/ID=7
```

See Chapter 3 for a complete description of the *SET PORT* syntax and qualifiers.

2.10.3 Naming and Mapping Devices

Example 2–4 shows how to assign physical names to a pair of disk drives and one tape drive. The disk drives are on port 2, SCSI IDs 2 and 3. The tape drive is on port 1, SCSI ID 4.

Example 2–4: Device Naming Example

```
NODE> CREATE DISK D220, D230

Creating  Type   Inquiry Data                 Device Attributes
------------------------------------------------------------------------
D220      DISK   DEC      DSP3107     440C    Sync TagQue
D230      DISK   DEC      DSP3107     440C    Sync TagQue

NODE> CREATE TAPE T140

Creating  Type   Inquiry Data                 Device Attributes
------------------------------------------------------------------------
T140      TAPE   Archive Python 25501-XXX     NoTagQue

NODE> MAP UNIT D220 DUA1220

NODE> MAP UNIT D230 DUA1230

NODE> MAP UNIT T140 MUA1140
```

2.10.4 Creating and Mapping a Disk Partition

Example 2–5 shows how to split a disk on Port 2, SCSI ID 2, LUN 0 into three partitions and then map the partitions to MSCP device names.

Example 2–5: Creating and Mapping Disk Partitions

```
NODE> CREATE DISK D220
Creating  Type   Inquiry Data                Device Attributes
------------------------------------------------------------------
D220      DISK   DEC      DSP3107     440C    Sync TagQue
NODE> SET DISK D220 /PARTITIONS=3
NODE> MAP UNIT D220 /PARTITION=1 DUA1220
NODE> MAP UNIT D220 /PARTITION=2 DUA1221
NODE> MAP UNIT D220 /PARTITION=3 DUA1222
```

2.10.5 Configuring a Disk Device

Use the *SET UNIT* command to configure the relationship between the controller and a specific disk device. The following example shows how to turn on write protection and tagged command queuing and set the synchronous transfer rate to 10MB/sec. for device DUA2020. While each command is on a separate line in this example, you may combine all the qualifers on one command line, if you wish.

Example 2–6: SET UNIT Example

```
NODE> SET UNIT DUA2020 /WRPROT
NODE> SET UNIT DUA2020 /TAGGING
NODE> SET UNIT DUA2020 /SYNC=10
```

See Chapter 3 for more information about the *SET UNIT* command.

NOTE

The *SET UNIT* command also configures tape devices, but a different set of qualifiers apply. These qualifiers are described in Chapter 3.

2.10.6 Creating a Stripeset

This example shows how to add four disk drives, bind them into a stripeset, and give the stripeset an MSCP device name.

NOTE

For best performance, connect each member of a stripeset to a separate SCSI bus. This permits each disk drive to be accessed in parallel and the full bandwidth of each bus to be used.

Example 2–7: Stripeset Creation Example

```
NODE> CREATE DISK D010 D130 D200 D340

Creating  Type   Inquiry Data                Device Attributes
------------------------------------------------------------------------
D010      DISK   DEC      DSP3107     440C   Sync TagQue
D130      DISK   DEC      DSP3107     440C   Sync TagQue
D200      DISK   DEC      DSP3107     440C   Sync TagQue
D340      DISK   DEC      DSP3107     440C   Sync TagQue

NODE> CREATE STRIPESET S0

NODE> ADD STRIPESET S0 D010 D130 D200 D340

NODE> INITIALIZE STRIPESET S0

NODE> MAP UNIT S0 DUA1020
```

2.10.7 Creating and Partitioning a Stripeset

This example shows how to add four disk drives, bind them into a stripeset, split the stripeset into two partitions, and give each partition an MSCP device name.

Example 2–8: Stripeset Creation and Partitioning Example

```
NODE> CREATE DISK D010 D130 D200 D340

Creating  Type   Inquiry Data                Device Attributes
------------------------------------------------------------------------
D010      DISK   DEC      DSP3107     440C   Sync TagQue
D130      DISK   DEC      DSP3107     440C   Sync TagQue
D200      DISK   DEC      DSP3107     440C   Sync TagQue
D340      DISK   DEC      DSP3107     440C   Sync TagQue

NODE> CREATE STRIPESET S0

NODE> ADD STRIPESET S0 D010 D130 D200 D340

NODE> INITIALIZE STRIPESET S0

NODE> SET STRIPESET S0 /PARTITIONS=2

NODE> MAP UNIT S0 /PARTITION=1 DUA1020

NODE> MAP UNIT S0 /PARTITION=2 DUA1021
```

2.11 Event Logs

The command line interface includes an event log, which immediately posts a message on the terminal whenever a defined event occurs. Table 2–4 lists the information categories reported in the event log and each category's position in the event log line.

Table 2–4: Event Log Parsing Information

Category	Position
Date Stamp	Characters 1 to 9
Time Stamp	Characters 11 to 18
Unique Log Event Code	Characters 20 to 23
Firmware Process	Characters 25 to 31
Textual Event Description	Characters 35 to 79

The controller does not have its own clock, so the date and time stamp is based on the host's internal clock. Events logged before the controller has connected to the host will carry the default stamp of "01-JAN-1990 00:00:00."

Like VMS DCL messages, event log messages do not interfere with input on the command line.

The following example shows some sample event log entries:

Example 2–9: Event Log Example

```
30-MAY-95 12:24:45 3A05 SCSIDR5    Reset Detected on SCSI Port 5
30-MAY-95 12:24:45 5300 MSCP$DI    Unit DUA2020 Onlined by BARNEY
30-MAY-95 12:24:45 380B  RIO$31    PIL=220: Test-Unit-Ready Command Failed
30-MAY-95 12:24:45 5300 MSCP$DI    Log Buffer Full, 4 Messages Lost
30-MAY-95 12:24:45 3806  RIO$31    PIL=220: Sts=02h,Key=2h,ASC=40h,Q=83h
```

2.11.1 Event Codes

Event codes are reported as 16-bit hexadecimal numbers. Table 2–5 gives a break down (starting from the most significant bit) of the event code format.

Table 2–5: Event Code Break Down

Bits	Description
15-13	The importance or severity of the event (i.e. Fatal, Warning, Informational)
12-8	The internal firmware sub-system that reported the event log
7-0	The unique event code for the event

Chapter 3

Command Dictionary

3.1 Conventions

The following conventions are used in this command dictionary.

Table 3–1: Conventions Used in this Manual

Italic Text	A placeholder for input that can vary according to the desires of the operator or the configuration of the system.
pil	A placeholder for the port, ID and LUN of a device on one of the SCSI buses.
[ ]	Arguments contained in square brackets are optional.
. . .	A horizontal ellipsis indicates that the preceding argument may be repeated one or more times.

ABORT

Ends a utility operation.

Format

ABORT *D | Tpil*

Parameters

D | Tpil
Specifies the physical name of the device, where *D* stands for disk, *T* stands for tape, and *pil* stands for the port, SCSI ID, and LUN of the device.

Description

The *ABORT* command terminates a *QUALIFY*, *DISKTEST*, or *TAPETEST* operation. These operations normally run indefinitely until halted with the *ABORT* command or by shutting off power to the controller.

ADD STRIPESET

Groups a set of disk drives under a logical stripeset name.

Format

ADD STRIPESET *Sx Dpil [Dpil . . .]*

Parameters

Sx
Specifies the logical name of the stripeset to which the disk drives will be assigned. Refer to stripesets by their logical names, which are assigned by the *CREATE STRIPESET* command.

Dpil [Dpil . . .]
Specifies one or more disk drives to be grouped in a stripeset. The disk drives are referenced by their physical names, not their MSCP device names. Refer to disk drives by their physical names, which are created by the *AUTOCONFIG*, and *CREATE DISK* commands. (Use the *CREATE TAPE* command to assign a physical device name to a tape drive.) Separate the disk drive names with spaces.

A stripeset may contain as many as 16 disk drives. The controller will recognize a one-drive stripeset, but in practice you should include at least two drives in each stripeset.

The *ADD STRIPESET* command is cumulative. The specified disk drives will be added to any drives already assigned to the stripeset.

Description

Groups a collection of disk drives under a logical stripeset name. To complete the creation of the stripeset, you must run the *INITIALIZE STRIPESET* command and then run *MAP UNIT* to give the stripeset an MSCP device name and make it available to the operating system.

Examples

1.
```
NODE>  ADD STRIPESET S1 D100 D110 D240 D250 D310
```

   Assigns the disk drives with physical names D100, D110, D240, D250, and D310 to the logical stripeset name S1.

2.
```
NODE>  ADD STRIPESET S1 D100 D110
NODE>  ADD STRIPESET S1 D240 D250 D310
```

   Since the *ADD STRIPESET* command is cumlative, the two commands shown in this example achieve the same result as the single command in example 1.

AUTOCONFIG

Scans the SCSI bus connected to the controller and assigns physical names to the devices found.

Format

AUTOCONFIG

Parameters

None.

Qualifiers

/LOG

Displays device names as they are created. Without the */LOG* qualifier, *AUTOCONFIG* will name all devices and display no messages in the process.

Description

The controller does not automatically scan its SCSI buses for new devices. Instead it relies on the operator to identify new devices. This can be done individually with the *CREATE DISK* and *CREATE TAPE* commands, or for all connected devices with the *AUTOCONFIG* command.

NOTE

AUTOCONFIG will ignore any ports (and the devices on them) that have not previously been enabled and defined as SCSI or DSSI. When you enable a port with the *SET PORT p /ENABLE* command, you must *WRITE* the new value to the controller's non-volatile memory and *RESTART* the controller for the change to take effect.

CLEAR CI_STATS

Resets CI statistics counters to zero. These counters apply to the *MONITOR CI_STATS*, *SHOW CI_STATS* and *SHOW ALL* commands. This command does not apply to the Cobra.

Format

CLEAR CI_STATS

Parameters

None

CLEAR DSSI_STATS

Resets DSSI statistics counters to zero. These counters apply to the *MONITOR DSSI_STATS*, *SHOW DSSI_STATS* and *SHOW ALL* commands.

Format

CLEAR DSSI_STATS

Parameters

None.

CREATE DISK

Assigns a physical name to a single disk device.

Format

CREATE DISK *Dpil*

Parameters

Dpil
Indicates the physical name for the disk device located at *p* (Port), *i* (SCSI ID), and *l* (LUN).

Description

Assigns a physical name to a single disk device, addressed by its port, SCSI ID and LUN. You must assign a physical name to a device before issuing further commands to group the device in a stripeset or give it an MSCP device name. Related commands are *AUTOCONFIG*, which automatically assigns physical names to all disk and tape devices connected to the controller, and *CREATE TAPE*, which assigns a physical name to a specific tape device.

Example

```
NODE>  CREATE DISK D100
```

Assigns the physical name D100 to the disk drive on port 1, SCSI ID 0, and LUN 0.

CREATE STRIPESET

Creates a logical name for a stripeset.

Format

CREATE STRIPESET *Sx*

Parameters

Sx
Indicates the logical name for a stripeset. The variable *x* represents any integer from 0 to 15.

Description

The stripeset will be empty and unusable until you assign two or more disk drives to it with the *ADD STRIPESET* command.

Example

```
NODE>  CREATE STRIPESET S0
```

Reserves S0 as a logical name for a stripeset.

CREATE TAPE

Assigns a physical name to a single tape device.

Format

CREATE TAPE *Tpil*

Parameters

Tpil
Indicates the physical name for the tape device located at *p* (Port), *i* (SCSI ID), and *l* (LUN).

Description

Assigns a physical name to a single tape device, addressed by its port, SCSI ID and LUN. You must assign a physical name to a device before issuing further commands, such as *MAP UNIT* to give the tape device a TMSCP device name. Related commands are *AUTOCONFIG*, which automatically assigns physical names to all disk and tape devices connected to the controller, and *CREATE DISK*, which assigns a physical name to a specific disk device.

Example

```
NODE>  CREATE TAPE T340
```

Assigns the physical name T340 to the tape drive on port 3, SCSI ID 4, and LUN 0.

DELETE DISK

Deletes the physical name for a disk device.

Format

DELETE DISK *Dpil*

Parameters

Dpil
D is the required prefix for a disk device. The remaining characters *pil* represent the port, SCSI ID, and LUN of the device.

Qualifiers

/ALL
Use the */ALL* qualifier instead of the D*pil* parameter if you want to delete all physical disk drive names on all buses.

Examples

1. `NODE>  DELETE DISK D100`

   Deletes the physical device name previously created for the disk device on port 1, SCSI ID 0, and LUN 0.

2. ```
   NODE> DELETE DISK /ALL
   Delete all disk devices? (y/n) y
   ```

   Deletes the physical device names for all disk devices on all SCSI buses.
   ```

DELETE STRIPESET

Deletes a logical stripeset name.

Format

DELETE STRIPESET *Sx*

Parameters

Sx
Indicates the logical name of the stripeset, where the variable *x* can represent any integer from 0 to 15.

Description

Deletes the logical name previously assigned to a stripeset with the *CREATE STRIPESET* command.

Qualifiers

/ALL
Use the */ALL* qualifier instead of the S*x* parameter if you want to delete all logical stripeset names.

Examples

1.
```
NODE>  DELETE STRIPESET S0
```
Deletes the logical stripeset name S0.

2.
```
NODE> DELETE STRIPESET /ALL
Delete all stripesets? (y/n) y
```
Deletes all logical stripeset names.

DELETE TAPE

Deletes the physical name for a tape device.

Format

DELETE TAPE *Tpil*

Parameters

Tpil
T is the required prefix for a tape device. The remaining characters *pil* represent the port, SCSI ID and LUN of the tape device.

Qualifiers

/ALL
Use the */ALL* qualifier instead of the T*pil* parameter if you want to delete all physical tape device names.

Examples

1.
```
NODE>  DELETE TAPE T340
```
Deletes the physical name for the tape device on port 3, SCSI ID 4, LUN 0.

2.
```
NODE> DELETE TAPE /ALL
Delete all tape devices? (y/n) y
```
Deletes all physical tape device names on all SCSI buses.

DELETE UNIT

Deletes a (T)MSCP device name.

Format

DELETE UNIT *(T)MSCP_device_name*

Parameters

(T)MSCP_device_name
Indicates the MSCP device name for disk devices or TMSCP device name for tape devices.

Description

Deletes a (T)MSCP device name that was previously made known to the host with the *MAP UNIT* command.

Qualifiers

/ALL
Use the */ALL* qualifier instead of the (T)MSCP_device_name parameter if you want to delete all (T)MSCP device Names on all SCSI buses.

Examples

1.
```
NODE>  DELETE UNIT DUA1010
```
Deletes the (T)MSCP device name DUA1010.

2.
```
NODE> DELETE UNIT /ALL
Delete all units? (y/n) y
```
Deletes all (T)MSCP device names for all devices on all SCSI buses.

DESELECT

Returns a device to the pool of available devices.

Format

DESELECT *Dpil / Tpil*

Parameters

Dpil / Tpil
Specifies the physical name for the device, where *D* stands for disk, *T* stands for tape, and *pil* stands for the port, SCSI ID, and LUN of the device.

Description

Returns a device to the pool of available devices after it has been selected for a utility operation with the *SELECT* command.

DISKTEST

Initiates the disk test utility.

Format

DISKTEST *Dpil*

Parameters

Dpil
Specifies the physical name of the device, where *D* stands for disk, *T* stands for tape, and *pil* stands for the port, SCSI ID, and LUN of the device.

Description

The *DISKTEST* command exercises the selected drive and corrects any media errors. During a *DISKTEST/WRITE* operation, the controller writes to randomly selected logical blocks on the device and then reads and verifies the data. If the device you want to test already contains data, omit the */WRITE* qualifier, and *DISKTEST* will simply read from randomly selected logical blocks. For newly formatted devices, you must use the */WRITE* qualifier, or else *DISKTEST* will have no data to read.

You must *SELECT* a device before running *DISKTEST* on it.

If *DISKTEST* encounters an error that it cannot correct, it will display a message describing the error condition.

DISKTEST will run indefinitely until you issue the *ABORT* command or turn off power to the controller.

Qualifiers

/WRITE
Forces the controller to write to randomly selected blocks during the *DISKTEST*. Use this qualifier on newly formatted disks or on disks that do not contain valid data since this qualifier will cause all existing data to be overwritten.

Examples

1.
```
DILBRT> disktest d110
03-APR-1995 15:50:52 4706  RIO$15   PIL=110: DISKTEST started
```

2. DILBRT> disktest d120 /write
   DISKTEST will overwrite some or all data on this device. Are you sure? (y/n) y
   03-APR-1995 15:51:05 4706 RIO$14 PIL=120: DISKTEST started

FACTORY

Restores all controller and device configuration settings to their factory defaults.

Format

FACTORY

Parameters

None.

Description

The *FACTORY* command restores all configuration settings to their factory defaults, writes the default values to the controller's non-volatile memory, and restarts the controller.

COBRA On the Cobra controller, the *FACTORY* command disables all ports.

FORMAT

Initiates a SCSI disk format operation.

Format

FORMAT *Dpil*

Parameters

Dpil
Specifies the physical name of the device, where *D* stands for disk and *pil* stands for the port, SCSI ID, and LUN of the device.

Description

Use the *FORMAT* command to format a disk drive that has been selected with the *SELECT* command. Since the format operation will overwrite any data on the disk drive, you will be prompted to confirm that you wish to proceed. If you respond negatively, the format will be aborted with no effect on your data. Once initiated, the format operation **cannot** be aborted with the *ABORT* command.

The controller will display an event log at the start and conclusion of the format operation. You may issue the *SHOW MAINTENANCE* command to check on the status of the format while it is in progress. It is a good practice to run one or more *QUALIFY* passes on the drive after a format.

Examples

1.
```
DILBRT> format d150
FORMAT will overwrite some or all data on this device. Are you sure? (y/n) y
DILBRT>
03-APR-1995 15:51:44 4700  RIO$11   PIL=150: FORMAT started
   .
   .
   .
03-APR-1995 15:53:21 4700  RIO$11   PIL=150: FORMAT completed
```

HELP

Displays help about the specified command, or when the *HELP* command is given without an argument, displays syntax information and a table of contents.

Format

HELP *[COMMAND]*

Parameters

None.

Description

Qualifiers identified as "Dynamic" take effect immediately after being set. Other qualifiers require a controller restart before they take effect.

INITIALIZE STRIPESET

Configures the controller and prepares the drives in the specified stripeset for striping operations.

Format

INITIALIZE STRIPESET *Sx*

Parameters

Sx
Identifies the logical name of the stripeset to be initialized.

Description

During the course of the initialization, the controller reserves a portion of each stripeset member, where it stores special configuration data unique to that stripeset.

Qualifiers

/CHUNKSIZE=
The amount of data that will be written to each drive in each stripe. The chunksize qualifier is expressed in terms of 4 kilobyte multiples and may be set to any integer from 1 to 256. For example, a chunksize qualifer of 10 would result in 40KB (10 x 4KB) being written to each drive in each stripe.

If no */CHUNKSIZE* qualifier is given, the default value is 1 for newly created stripesets.

Examples

1. `NODE> INITIALIZE STRIPESET S0`

   Initializes the stripeset associated with the logical name S0.

2. `NODE> INITIALIZE STRIPESET S1 /CHUNKSIZE=4`

   Initializes the stripeset associated with the logical name S1 and sets the chunk size to 16KB (i.e. 4 x 4KB).

MAP UNIT

Assigns an MSCP device name to a disk device or stripeset, or a TMSCP device name to a tape device.

Format

MAP UNIT *logical_or_physical_name (T)MSCP_device_name*

Parameters

logical_or_physical_name
The logical_or_physical_name of the device is the name (e.g. D100, T340, S1) assigned to it by the *CREATE DISK*, *CREATE TAPE*, *CREATE STRIPESET* or *AUTOCONFIG* commands. Stripeset names are logical. Names for other devices are physical, because they refer to the device's physical location on a particular SCSI bus.

(T)MSCP_device_name
(T)MSCP_device_name is the MSCP (for disks) or TMSCP (for tapes) device name to be assigned to the specified device. The (T)MSCP_device_name must begin with DU or DI for disk devices or MU for tape devices.

Description

A host will not recognize a device until it has been assigned an MSCP or TMSCP device name.

Qualifiers

/PARTITION=
Specifies which partition of the disk drive is to be mapped to the MSCP device name. This qualifier may be inserted at any point on the command line after the *MAP UNIT* command.

Tape and CD-ROM devices may not be partitioned.

Examples

1. `NODE> MAP UNIT D100 DUA1100`

   Maps the disk drive at port 1, SCSI ID 0, LUN 0 to the MSCP device name DUA1100.

2. `NODE> MAP UNIT D230 DUA2300 /PARTITION=2`

   Maps the second partition of drive D230 to the MSCP device name DUA2300.

MONITOR CI_STATS

TRIDENT HAWK Displays a dynamic CI Statistics screen. This command does not apply to the Cobra.

Format

MONITOR CI_STATS

Parameters

None

Description

MONITOR CI_STATS is a dynamic display of activity for each CI path since the controller was last booted.

NOTE

You may also reset the controller's CI statistics counters by pressing "C" on the keyboard. Otherwise, each counter will go as high as 2 to the 32nd power (about 4.29 billion) before restarting at zero.

There are eight pages of CI Statistics screens. (Each screen displays four nodes, and 32 is the maximum number of nodes a star cluster can handle.) Use the page up and page down keys on the keyboard to move from page to page.

To exit *MONITOR CI_STATS*, press Ctrl-Z.

The statistics are from the controller's point of view. In other words, only packets transmitted or received by the controller are included in the statistics. Since the controller cannot transmit packets to or receive packets from itself, the section for the controller's node number will show all zeros.

Statistics

XMT Ok

Transmit OK. This is the number of packets successfully transmitted by the controller to a particular node on the specified path.

XMT Fail
Transmit Fail. This is the number of packets that the controller tried and failed to transmit due to a problem with the selected path. Each time the controller tries to transmit a packet and receives either a no response or a Nak, it increments either the No Response or Nak counter by one and attempts the transmission again. Once either of these counters reaches 15, the controller increments the XMT Retry counter by one, resets its No Response and Nak counters to zero, and begins another cycle of retransmissions. When the XMT Retry counter reaches eight, the controller will divert the current transmission and all subsequent transmissions to the alternate path (if it is open). The controller will continue to divert traffic to the other path until it receives a polling request from a host on the closed path. This indicates that the closed path has been repaired and can handle transmissions again.

No Response
A certain number of no responses are normal occurrence on the CI. A no response occurs when a transmission elicits no response whatsoever from the intended target. This could occur as a result of a CRC (Cyclic Redundancy Check) error due to a collision on the interconnect or a faulty cable. If the no response counter reading is very high, you probably have a defective CI cable that should be replaced.

Nak
Negative Acknowledgement. If the controller attempts to transmit a packet to a target node and the target is not ready to accept it, the target will send back a Nak signal.

XMT Under Run
This refers to internal errors in the controller and is intended as a troubleshooting tool for technical support personnel.

XMT Retry
See the XMT Fail description above for a full explanation of the controller's packet transmission cycle. The XMT Retry total gives a tally of the number instances the controller has attempted to retransmit a packet after receiving either 15 No Responses or 15 Naks.

RCV Ok
Receive OK. This is the count of packets received successfully by the controller from the particular node on the specified path.

RCV Crc
Receive Cyclic Redundancy Check. A count of packets received by the controller that contained CRC errors and were therefore rejected as unusable. A CRC error is usually due to a collision on the CI (when one node sends a packet before another node is finished sending a packet). The possibility for collisions increases as the traffic on the CI increases. A small number of CRC errors is normal, but if the number grows to be disproportionately high, you should verify that the slot count and node count values for the controller and all CI adapters in the cluster are set properly.

RCV Dest
Receive Destination. This is the count of packets received by the controller but which contained a mismatch between the destination node number and the complement of a the destination node number. (All CI packets contain the node ID of the destination node as well as a backup copy of the destination node ID, known as the destination complement. The target

node compares the destination ID and the destination complement. If there is a mismatch, it presumes the packet was corrupted in transit and rejects it.) A disproportionate number of RCV Dest occurrences is an indication that too many collisions are taking place on the CI, due to improper slot count or node count settings.

RCV Bfull

Receive Buffer Full. This is an internal error generated by the controller and is intended as a troubleshooting tool for technical support personnel.

Example

CI STATISTICS 05-AUG-1994 14:53:49

	NODE 0 A	NODE 0 B	NODE 1 A	NODE 1 B
XMT Ok	1391	1391	4420	4423
XMT Fail	0	0	0	0
No Response	3	2	119	102
Nak	0	0	125	78
XMT Under Run	0	0	0	0
XMT Retry	0	0	0	0
RCV Ok	695	696	4396	4437
RCV Crc	0	0	0	0
RCV Dest	0	0	0	0
RCV Bfull	0	0	0	0

	NODE 2 A	NODE 2 B	NODE 3 A	NODE 3 B
XMT Ok	0	0	1394	1392
XMT Fail	0	0	0	0
No Response	0	0	1	1
Nak	0	0	0	0
XMT Under Run	0	0	0	0
XMT Retry	0	0	0	0
RCV Ok	0	0	1394	1391
RCV Crc	0	0	0	0
RCV Dest	0	0	0	0
RCV Bfull	0	0	0	0

MONITOR DSSI_STATS

Displays the DSSI Statistics screen.

Format

MONITOR DSSI_STATS

Parameters

None.

Description

MONITOR DSSI_STATS is a dynamic display of activity on the controller's DSSI buses. This screen is intended as a tool for troubleshooting DSSI problems, particularly cabling and termination issues. Although the information on this screen is technical and designed primarily for service personnel, you may be able to use the screen to identify potential problems with your DSSI interface.

If you notice abnormal values on the DSSI Statistics screen, try the following steps before calling technical support . . .

- Check the DSSI cable for defects, such as a bad wire or a bad solder connection. If possible try swapping the cable with another cable that you know to be in good condition.
- Check the termination on the DSSI bus. The bus should be terminated at both ends.

Each set of DSSI statistics contains two pages. The first page shows statistics for nodes 0 through 3 and the second page shows statistics for nodes 4 through 7. Use the "N" and "P" keys on the keyboard to navigate between the screens.

NOTE

You may also reset the controller's DSSI statistics counters by pressing "C" on the keyboard. Otherwise, each counter will go as high as 2 to the 32nd power (about 4.29 billion) before restarting at zero.

Statistics

No CDRP Count

CDRP, which stands for Class Driver Request Packet, is a buffer the controller uses to store packet header information. The number displayed in this field is a tally of the instances when the DSSI driver needed a CDRP but no CDRP was available. This number will equal the total of the "RX no CDRP" fields for all nodes.

No Buffers Count
The buffers referenced in this field are used by the controller to store the data portion of a packet. This value will increment each time the DSSI driver attempted to perform a write but could not perform the operation due to lack of buffer space.

Bus Resets Detected
This field increments each time the controller detects a DSSI bus reset. Occasional resets are normal on DSSI. If you see this counter incrementing at a rapid rate, however, (e.g. once a second or more) you probably have a cabling problem.

Bus Resets Initiated
This field displays the number of times the controller initiated a bus reset on the DSSI. The controller will initiate a bus reset when it detects a parity error. A high number of bus resets initiated could indicate a cable or interface problem.

Interface Fault Count
This field counts the number of times a fault occurs in the DSSI interface chip. Such faults usually occur as a result of a physical cable break in a DSSI connnection.

TX ok
The number of packets transmitted successfully.

TX incomplete
The number of packet transmissions that were attempted but failed because the host went bus free before the entire packet could be sent. A high number of TX incompletes could indicate a cabling problem.

TX retry
A count of the number of transmissions retried after an initial failure.

Nak count
The number of negative acknowledgements (Naks) received from the host. A host will issue a Nak when it has no buffer space to receive a packet from a node.

RX ok
The number of packets received successfully from a host.

RX fail
The number of failed transmissions that hosts attempted to send to the controller. A failed transmission is usually caused by a bad cable.

RX bad source id
The number of packets rejected by the controller due to a problem with the source ID in the header.

RX bad dest id
The number of packets rejected by the controller due to a problem with the destination ID in the header.

RX bad header
The number of packets rejected by the controller due to a packet header problem other than a bad source or destination ID.

RX no CDRP
The number of packets rejected by the controller due to a lack of CDRP buffer space for the packet header. The "RX no CDRP" field reports the same type of problem as the "No CDRP Count" field at the top of the screen, except it reports the total for a single node rather than an aggregate for all nodes.

RX no SGTD
The number of packets rejected by the controller due to a lack of SGTD (Scatter-Gather Table Descriptor) buffer space for the packet data. The "RX no SGTD" field reports the same type of problem as the "No Buffers Count" field at the top of the screen, except it report the total for a single node rather than an aggregate for all nodes.

Example

```
Port:  5                          DSSI STATISTICS
                                05-AUG-1994 14:53:36

No CDRP Count          :          1
No Buffers Count       :          0
Bus resets detected    :      22253
Bus resets initiated   :          0
Interface Fault Count  :          0
```

	NODE 0	NODE 1	NODE 2	NODE 3
TX ok	0	0	0	2784
TX incomplete	0	0	0	3
TX retry	0	0	0	3
Nak count	0	0	0	0
RX ok	0	0	0	2783
RX fail	0	0	0	0
RX bad source id	0	0	0	0
RX bad dest id	0	0	0	0
RX bad header	0	0	0	0
RX no CDRP	0	0	0	1
RX no SGTD	0	0	0	0

QUALIFY

Initiates the qualify utility.

Format

QUALIFY *Dpil*

Parameters

Dpil
Specifies the physical name of the device, where *D* stands for disk and *pil* stands for the port, SCSI ID, and LUN of the device.

Description

The *QUALIFY* command will verify that the media on a disk drive can be reliably written to and read from. If you use the */WRITE* qualifier, the command also detects and replaces bad blocks on the media. Use the *QUALIFY* command by itself when you want to verify the integrity of a disk drive that already contains data, since the operation only reads from the disk drive. Use the *QUALIFY* command with the */WRITE* qualifier on newly formatted drives for a more thorough test of the drive's integrity.

QUALIFY verifies the entire disk in 32-byte chunks. When it reaches the final block it returns to the first block and repeats the process. This continues indefinitely until you halt the operation by issuing the *ABORT* command or by turning off power to the controller.

You must *SELECT* a device before performing a *QUALIFY* operation on it.

Qualifiers

/WRITE
Causes the controller to write 32 kilobyte data chunks to the drive and the read them back.

Without the */WRITE* qualifier, the *QUALIFY* command simply reads the medium.

Examples

1.
```
DOGBRT> qualify d130
03-APR-1995 15:51:18 4703  RIO$13   PIL=130: QUALIFY started
```

2.
```
DOGBRT> qualify d140 /write
QUALIFY will overwrite some or all data on this device. Are you sure? (y/n) y
DOGBRT>
03-APR-1995 15:51:32 4703  RIO$12   PIL=140: QUALIFY started
```

QUIESCE

Pauses SCSI bus activity on one or more ports.

Format

QUIESCE *p*

Parameters

p
Specifies the port (from 0 to 5) to be paused.

Qualifiers

/ALL
Use this qualifier if you wish to quiesce all ports at the same time.

Description

The *QUIESCE* command prevents the movement of data on one or more SCSI buses. This allows you to add or remove a SCSI device without causing a glitch on the bus, which can lead to data corruption. Use the *RESUME* command to restart activity on the bus.

QUIT

Exits the DUP server.

Format

QUIT

Parameters

None.

Description

This command exits the DUP server when you have accessed the command line interface by that method. If you have accessed the command line interface from the controller's serial port, this command has no effect.

RENAME UNIT

Renames a (T)MSCP device name.

Format

RENAME UNIT *old_(T)MSCP_device_name*
new_(T)MSCP_device_name

Parameters

old_(T)MSCP_device_name
Current (T)MSCP device name.

new_(T)MSCP_device_name
New (T)MSCP device name.

Description

This command allows you to change the (T)MSCP device name of a disk or tape device that you have already mapped with the *MAP UNIT* command.

Example

```
NODE>  RENAME UNIT DUA1100 DUA4320
```

RESET SCSI_BUS

Forces a reset on one or more SCSI buses.

Format

RESET SCSI_BUS *[port]*

Parameters

port
Specifies the port (from 0 to 5) to be reset.

Qualifiers

/ALL
Use the */ALL* qualifier if you wish to reset all SCSI buses.

Description

An event log will be posted on the console reporting that a SCSI bus reset was asserted on the specified port.

RESTART

Forces a reboot of the controller.

Format

RESTART

Parameters

None.

Description

Configuration changes to active units and controller and port parameters in the command line interface's editing buffer do not become part of the controller's current operating parameters until you *RESTART* the controller. This loads the values stored on the floppy diskette or nonvolatile memory into the current configuration buffer.

The exceptions to this rule are the *RENAME UNIT* command and the *SET UNIT* qualifiers *CACHE/NOCACHE*, *ONLINE/OFFLINE*, and *WRPROT/NOWRPROT*. These values become part of the controller's current operating parameters immediately upon being changed and do not require a controller *RESTART*.

The controller will ask you to confirm your choice before proceeding with the restart.

NOTE

The controller will quiesce all SCSI ports and pause for five seconds before performing the restart.

RESUME

Resumes activity on the quiesced port.

Format

RESUME *p*

Parameters

p
Specifies the port (from 0 to 5) on which you wish to resume activity.

Qualifiers

/ALL
Applies the command to all ports.

Description

The *RESUME* command restarts the movement of data on a SCSI bus after you have used the *QUIESCE* command to halt activity in order to add or remove a SCSI device.

An event log will be posted for each port when it is again ready to accept activity.

SELECT

Selects a disk or tape device for maintenance and removes it from the pool of available devices.

Format

SELECT *Dpil | Tpil*

Parameters

D | Tpil
Specifies the physical name of a disk or tape device, where *D* stands for disk, *T* stands for tape, and *pil* stands for the port, SCSI ID and LUN of the device.

Description

Before you can perform utility function on a device, you must first *SELECT* it. The act of selecting a device changes its operational status to MAINT. Devices with MAINT status may not be mapped or added.

Only devices listed as AVAILABLE by the *SHOW MAINTENANCE* command can be selected. Devices listed as OFFLINE or ONLINE cannot be selected.

SET CI

TRIDENT HAWK

Sets controller parameters relating to the CI. This command does not apply to the Cobra.

Format

SET CI

Parameters

NONE

Qualifiers

/ENABLE
/DISABLE
Enables or disables communications via the controller's CI port.

/PAMAXPORT=
This parameter specifies the maximum port number to be polled on each CI and DSSI. The CI and DSSI port drivers poll to discover newly initialized ports or the absence/failure of previously responding remote ports.

A system will not detect the existence of ports whose port numbers are higher than this parameter's value. Thus, */PAMAXPORT* should be set to a value that is equal to or greater than the highest port number being used on any CI or DSSI connected to the controller.

You can decrease this parameter to reduce polling activity if the hardware configuration has fewer than 31 nodes. For example, if the CI or DSSI with the largest configuration has a total of 5 ports assigned to port numbers 0 through 4, you could set */PAMAXPORT* to 4.

The default for this parameter is 31 (poll for all possible ports 0 through 31). The valid range of values is 0 to 31.

Description

The *SET CI* command configures the controller's CI-specific parameters. Other CI parameters (i.e. CI Node number, CI slot count, CI node count, and CI header length) are controlled by the DIP switch on the controller motherboard.

SET CONTROLLER

Sets controller-specific configuration values.

Format

SET CONTROLLER */qualifier=*

Parameters

None.

Description

The *SET CONTROLLER* command configures the controller controller's SCS parameters. The command also configures the controller's use of its onboard cache.

Qualifiers

/DATAREQ_PRIORITY=LOW / HIGH
The default setting for this parameter is "LOW." Do not change this value unless you are instructed to by technical support.

/DEVICE_TYPE=RF / RA / HS
This qualifier determines how devices connected to the controller will be reported to the host.

Device Type	Reported to Host As . . .
RF	RF72
RA	RA82
HS	MSCP served SCSI disk or tape

/DISK_ALCS=
Sets the allocation class for all disk devices connected to the controller. In a dual-controller configuration, both controllers must have the same non-zero value. The allocation class may be set to any integer from 0 to 255.

/MAX_HOSTS=
This qualifier should be set equal to the total number of VAX or Alpha hosts on all interconnects of the controller and may take any integer value from 1 to 32. The default is 32.

/NODENAME=
Sets the name used by SCS to identify the controller. May contain up to six letters and numbers. The first character must be a letter. Dollar signs ($) and underscore (_) characters are not allowed. Must be unique among the other nodes in the cluster.

/POLYPORT=ON / OFF
Causes a single CMD controller to appear to the cluster as *two* controllers. Each of these pseudo-controllers may be addressed by its own node name, which not only identifies the controller but also a specific host path to the controller. This makes it possible to use the VMS *PREFER* command to override the operating system's default path to the controller's SCSI devices and direct I/O traffic to one or more devices along a selected controller host path.

The */POLYPORT* qualifier permits the system administrator to achieve a degree of load balancing between two controller host paths. It is intended for those users who wish to fine tune the performance of the controller and is not essential to the operation of the controller. For more information about Polyport, see Chapter 4.

COBRA Polyport is not supported on the CDI-4220, which has only one DSSI host port.

/REDUNDANT=ON / OFF
Specifies whether the controller is part of a redundant pair.

/REV_A_COMPATIBLE=ON / OFF
When this parameter is turned "ON", a controller with Rev. B firmware will report disk drive geometry in the same way as a controller with Rev. A firmware. The default is "OFF." If you upgrade to Rev. B firmware and wish to connect a disk drive that was initialized on Rev. A firmware, you must set the */REV_A_COMPATIBLE* "ON."

NOTE

When */REV_A_COMPATIBLE* is turned "ON", the controller will ignore the */DEVICE_TYPE* parameter setting.

The Rev. B firmware changes the way the controller reports disk drive geometry and now uses the same method as CMD Technology's CDI-4000, BI-bus, Qbus, and Unibus controllers. This permits the migration of disk devices from these controllers without requiring a re-initialization of the drives. To move a drive from a CMD BI-bus, Qbus, or Unibus controller, set the */DEVICE_TYPE* parameter on the Trident, Cobra, or Hawk controller to "RA", and the */REV_A_COMPATIBLE* parameter to "OFF." To move a drive from a CDI-4000 controller, set the */DEVICE_TYPE* parameter so that it matches the setting on the CDI-4000, and turn the */REV_A_COMPATIBLE* parameter "OFF."

/SPINUPDELAY=
Sets the spin up interval between disk drives on the controller's buses. Use this qualifier in case you need to stagger drive spin ups to prevent the drives' power supply from being overwhelmed by multiple simultaneous spin ups. The value is measured in seconds and may range from 0 to 255.

/SYSTEM_ID=
Sets the system ID of the controller. The range of possible values is from 1 to 268435456 inclusive. The default value is 131072 plus the serial number of the controller.

/TAPE_ALCS=
Sets the allocation class for all tape devices connected to the controller. In a dual-controller configuration, both controllers must have the same non-zero value. The allocation class may be set to any integer from 0 to 255.

/TYPE=RF72 | HSC5

TRIDENT
HAWK

This parameter determines whether the controller reports itself as an HSC50 or an RF72 device. Select "HSC5," if you wish to use the Polycenter Performance Analyzer. The Polycenter Data Collector will not collect data from an RF72 device. The default value for this parameter is "RF72."

After you have changed this parameter to "HSC5," and done a *WRITE* and *RESTART* to make the change effective, you must shutdown and then restart the Polycenter Data Collector throughout the cluster. CMD Technology recommends that you restart the cluster, as well. The */DEVICE_TYPE* parameter should be set to HS since Polycenter Performance Adviser has a performance limit for RA devices.

Example

```
NODE>  SET CONTROLLER /NODENAME=DOGBRT
```

Sets the controller's node name to "DOGBRT."

SET DISK

Divides a disk drive into as many as eight partitions.

Format

SET DISK *Dpil /PARTITIONS=*

Parameters

Dpil
Specifies the physical name of the disk drive, where *D* stands for disk and *pil* stands for the port, SCSI ID, and LUN of the device.

Description

Use the *SET DISK* command to partition a disk drive. You may specify as many as eight (8) partitions.

Qualifiers

PARTITIONS=
Specifies the number of partitions to be created on the disk drive. Valid entries range from one to eight (1-8).

NOTE

The controller automatically allots equal space to each partition. Partitions of unequal size are not supported.

Example

```
NODE>  SET DISK D100 /PARTITIONS=3
```

Creates three partitions on disk D100.

SET PORT

Sets port-specific configuration values.

Format

SET PORT *p*

Parameters

p
Specifies the port number.

Description

This command configures the controller SCSI/DSSI ports. Each port may be configured individually.

Qualifiers

/DISABLE
Deactivates a port. Disabled ports will not be brought online at boot up. All controller system commands issued to a disabled port will fail (except *SET PORT x /ENABLE*). Requires a *RESTART* to take effect. (On the Trident or Hawk, be sure to do a *WRITE* first.)

/ENABLE
Activates a port, making the devices on the port accessible to other controller configuration commands and available to the host if the devices are mapped to (T)MSCP unit numbers. Requires a *RESTART* to take effect. (On the Trident or Hawk, be sure to do a *WRITE* first.)

/POWER_ON_RESET=on / off
Specifies whether the controller should initiate a SCSI bus RESET at power up. Should be set to "ON" for all SCSI buses in a single-controller configuration and "OFF" for all SCSI buses in a configuration with redundant controllers.

/TYPE=SCSI / DSSI / NONE

TRIDENT HAWK Designates whether the port will be a SCSI port, a DSSI port, or vacant.

COBRA This qualifier is not supported on the Cobra. Use the jumpers on the controller board to set a port's type.

/ID=

TRIDENT HAWK Designates the SCSI ID of the port if it is a SCSI port, or the DSSI node ID if it is a DSSI port.

COBRA This qualifier is not supported on the Cobra. Use the jumpers on the controller board to set a port's ID.

Example

```
NODE>  SET PORT 1 /ENABLE/TYPE=SCSI
NODE>  SET PORT 1 /ENABLE/ID=7
```

Specifies port 1 as a SCSI port and sets its SCSI ID to 1.

SET STRIPESET

Divides a stripeset into up to eight partitions.

Format

SET STRIPESET *Sx*

Parameters

Sx
Specifies the logical name of the stripeset, where *S* stands for stripeset and *x* stands for the logical number for the stripeset.

Description

Use the *SET STRIPESET* command to partition a stripeset. You may specify as many as eight (8) partitions.

Qualifiers

/PARTITIONS=
Specifies the number of partitions to be created on the stripeset. Valid entries range from one to eight.

Example

```
NODE>  SET STRIPESET S1 /PARTITIONS=2
```

Creates two partitions on stripeset S1.

SET UNIT

Sets various device-specific configuration values.

Format

SET UNIT *(T)MSCP_device_name*

Parameters

(T)MSCP_device_name
Specifies the MSCP device name of a disk device or the TMSCP device name of a tape device.

Description

This command configures the controller's relationship with each device connected to it. Different sets of qualifiers apply to disk and tape devices.
There are two sets of qualifiers for this command. One set applies only to disk devices, which must have DU or DI device types. The other set applies only to tape devices. The disk device qualifiers are listed first, followed by the tape device qualifiers.

DISK QUALIFIERS

/CACHE
/NOCACHE
Enables or disables the caching of data from the drive.

/DISCONNECT
/NODISCONNECT
Allows or prevents the device to disconnect itself from the SCSI bus while it processes commands. The */DISCONNECT* qualifier must be set on all devices that support tagged queuing when tagged command queuing is enabled.

/IMMEDIATE
/NOIMMEDIATE
Toggles the IMMEDIATE bit in the SCSI STOP and START commands. Specify */NOIMMEDIATE* if the device is a Sony optical disk drive. The VMS prompt will not return until the drive's media is ejected or the drive has spun down.

/JUKEBOX
/NOJUKEBOX
Enables or disables jukebox support for the device.

SET UNIT

/ONLINE
/OFFLINE
Sets a device as online or offline. An online device is available to the host for I/O activity. An offline device is not available to the host for I/O activity.

/SPINDOWN
/NOSPINDOWN
Enables or disables the controller's capability to spin down drives or eject media when the operating system issues a spin down command such as the *DISMOUNT/UNLOAD* command.

/SYNC=
Set the maximum transfer rate at which synchronous transfer negotiations will begin. Range of valid values is 0 to 10. A sync rate of 0 puts the controller in asynchronous mode.

/TAGGING
/NOTAGGING
Enables or disables tagged command queuing. The */DISCONNECT* qualifier must be set on all devices that support tagged queuing when tagged command queuing is enabled.

/TRUNCATE
/NOTRUNCATE
Enables or disables truncation. When enabled, the controller will divide the number of blocks on the disk by 126 and prevent access to any remaining blocks, thus assuring that the number of blocks on the disk is evenly divisible by 126. This improves the performance of VMS volume shadowing catch-ups and promotes compatibility with other controllers in multiple host environments. When disabled, the controller will not truncate the disk. The number of blocks may not necessarily be a multiple of 126.

/WRPROT
/NOWRPROT
Enables or disables write protection for the drive.

TAPE QUALIFIERS

/DISCONNECT
/NODISCONNECT
Allows or prevents the device to disconnect itself from the SCSI bus while it processes commands.

/FAST_SEARCH
/NOFAST_SEARCH
Enables or disables fast tapemark searching. When "on," high speed forward and reverse filemark searching is enabled. This mode can increase tape drive performance, but it should not be used when you intend to perform a VMS standalone backup, since accurate position information cannot be maintained.

/IMMEDIATE
/NOIMMEDIATE
Toggles the IMMEDIATE bit in the SCSI STOP and START commands. When the */NOIMMEDIATE* qualifier is used, the VMS prompt will not return until the drive's media is ejected or the drive has spun down.

/ONLINE
/OFFLINE
Sets a device as online or offline. An online device is available to the host for I/O activity. An offline device is not available to the host for I/O activity.

/SHORT_TMARK
/NOSHORT_TMARK
Enables or disables Exabyte short tapemark writing. When "on," the writing of short filemarks on Exabyte devices is enabled. When disabled all filemarks will be written as long filemarks. This affects the ability to append to an Exabyte tape.

/SYNC=
Set the maximum transfer rate at which synchronous transfer negotiations will begin. Range of valid values is 0 to 10. A sync rate of 0 puts the controller in asynchronous mode.

/TAGGED
/NOTAGGED
Enables or disables tagged command queuing.

SHOW ALL

Combines all the controller's *SHOW* commands into one display.

Format

SHOW ALL

Parameters

None.

SHOW CI_STATS

TRIDENT
HAWK

Displays a static snapshot of the statistics for all CI nodes.

Format

SHOW CI_STATS

Parameters

None

Description

Displays a tally of activity for each CI path since the controller was last booted. You may reset the controller's CI statistics counters by pressing issuing the *CLEAR CI_STATS* command. Each counter will go as high as 2 to the 32nd power (about 4.29 billion) before restarting at zero.

The statistics are from the controller's point of view. In other words, only packets transmitted or received by the controller are included in the statistics. Since the controller cannot transmit packets to or receive packets from itself, the rows for the controller's node number will show all zeros.

Statistics

ID
The CI node number.

PS
Path Status. There are two rows for each CI node number; one row for Path A and one row for Path B. If the path is open, a "O" will be displayed along side the path letter. If the path is closed, a "-" will be displayed.

OK
Transmit OK. This is the number of packets successfully transmitted by the controller to a particular node on the specified path.

NAK
Negative Acknowledgement. If the controller attempts to transmit a packet to a target node and the target is not ready to accept it, the target will send back a NAK signal.

NORSP
No Response. A certain number of no responses are normal occurrence on the CI. A no response occurs when a transmission elicits no response whatsoever from the intended target. This could occur as a result of a CRC (Cyclic Redundancy Check) error due to a collision on the interconnect or a faulty cable. If the no response counter reading is very high, you probably have a defective CI cable that should be replaced.

FAIL
Transmit Fail. This is the number of packets that the controller tried and failed to transmit due to a problem with the selected path. Each time the controller tries to transmit a packet and receives either a no response or a NAK, it increments either the NORSP or NAK counter by one and attempts the transmission again. Once either of these counters reaches 15, the controller increments the RETRY counter by one, resets its NORSP and NAK counters to zero, and begins another cycle of retransmissions. When the RETRY counter reaches eight, the controller will divert the current transmission and all subsequent transmissions to the alternate path (if it is open). The controller will continue to diver traffic to the other path until it receives a polling request from a host on the closed path. This indicates that the closed path has been repaired and can handle transmissions again.

UND
Transmit Under Run. This refers to internal errors in the controller and is intended as a troubleshooting tool for technical support personnel.

RETRY
Transmit Retry. See the FAIL description above for a full explanation of the controller's packet transmission cycle. The RETRY total gives a tally of the number instances the controller has attempted to retransmit a packet after receiving either 15 NORSPs or 15 NAKs.

OK
Receive OK. This is the count of packets received successfully by the controller from the particular node on the specified path.

CRC
Receive Cyclic Redundancy Check. A count of packets received by the controller that contained CRC errors and were therefore rejected as unusable. A CRC error is usually due to a collision on the CI (when one node sends a packet before another node is finished sending a packet). The possibility for collisions increases as the traffic on the CI increases. A small number of CRC errors is normal, but if the number grows to be disproportionately high, you should verify that the slot count and node count values for the controller and all CI adapters in the cluster are set properly.

DEST
Receive Destination. This is the count of packets received by the controller but which contained a mismatch between the destination node number and the complement of a the destination node number. (All CI packets contain the node ID of the destination node as well as a backup copy of the destination node ID, known as the destination complement. The target node compares the destination ID and the destination complement. If there is a mismatch, it presumes the packet was corrupted in transit and rejects it.) A disproportionate number of RCV Dest occurrences is an indication that too many collisions are taking place on the CI, due to improper slot count or node count settings.

BFL
Receive Buffer Full. This is an internal error generated by the controller and is intended as a troubleshooting tool for technical support personnel.

Example

```
NODE> SHOW CI_STATS

                        C I   S T A T I S T I C S
-------------------------------------------------------------------------------
             TRANSMIT                                              RECEIVE
ID PS          OK        NAK      NORSP FAIL UND RETRY          OK    CRC  DEST BFL
-------------------------------------------------------------------------------
00 AO         562          0          0    0   0     0         562      1     1   0
   BO         560          0          1    0   0     0         559      0     0   0
01 AO           0          0          0    0   0     0           0      0     0   0
   BO           0          0          0    0   0     0           0      0     0   0
02 AO    15921761          0       2332    0   0     0     6654409      0     0   0
   BO    15921913          0       2332    0   0     0     6657241      0     0   0
03 A-           0          0       4290    0   0   286           0      0     0   0
   B-           0          0       4305    0   0   287           0      0     0   0
04 A-           0          0       4290    0   0   286           0      0     0   0
   B-           0          0       4305    0   0   287           0      0     0   0
05 A-           0          0       4305    0   0   287           0      0     0   0
   B-           0          0       4305    0   0   287           0      0     0   0
06 A-           0          0       4305    0   0   287           0      0     0   0
   B-           0          0       4305    0   0   287           0      0     0   0
.
.
.
```

SHOW CLUSTER

Displays the status of all nodes in the DSSI cluster.

Format

SHOW CLUSTER

Parameters

None.

Description

Example

```
NODE> SHOW CLUSTER

   Local                          Remote SCS Systems
SCSPort id    SCSNOD id State  Connections     State     Credit  Activity
-------------------------------------------------------------------------------
PI0     1     HAVEN    0 OPEN
              NODE2    2 OPEN   VMS$TAPE_CL_DRV OPEN      10      0
                                 VMS$DISK_CL_DRV OPEN      12      2
              TRDNT2   7 OPEN   VMS$TAPE_CL_DRV OPEN      10      0
                                 VMS$DISK_CL_DRV OPEN      10      0
```

SHOW CONTROLLER

Displays a snapshot of information about the controller.

Format

SHOW CONTROLLER

Parameters

None.

Example

```
NODE> SHOW CONTROLLER

    Controller DILBRT
        Serial No.: 0                       Firmware Revision: BT60
        Date/Time: 27-JUL-1995 13:41:49     Uptime:  0 DAYS  00:07:11
        Processor DRAM size:  4   MB        Processor Free Pool:  235 KB
        Device Type        = HS             Spinup Delay = 5 Seconds
        Redundant Mode     = ON             Polyport     = OFF
        Rev A Compatible   = OFF            Type         = RF72
    SCS Parameters
        Nodename:  DILBRT      System ID: 909090
        DISK_ALCS: 2           TAPE_ALCS: 5
        MAX_HOSTS: 32          DATREQ_PR: HIGH
    Cache
         16 MB read cache
    Ports
        Port 0:   SCSI, id= 7, disabled, power_on_reset=OFF
        Port 1:   SCSI, id= 7, power_on_reset=OFF
        Port 2:   SCSI, id= 7, power_on_reset=OFF
        Port 3:   SCSI, id= 7, power_on_reset=OFF, differential, quiesced
        Port 4:   SCSI, id= 7, power_on_reset=OFF
        Port 5:   DSSI, id= 2
```

SHOW DEVICES

Combines the displays from the *SHOW DISK*, *SHOW STRIPESETS*, *SHOW TAPE*, and *SHOW UNIT* commands.

Format

SHOW DEVICES

Parameters

None.

SHOW DISK

Displays a listing of all physical disk device names assigned with the *CREATE DISK* or *AUTOCONFIGURE* commands.

Format

SHOW DISK *[Dpil]*

Parameters

Dpil

D specifies a disk device. *pil* specifies the port, SCSI ID and LUN of the disk device. If no parameter is given, the command returns information for all physical disk device names.

Description

Displays information about the specified disk device name or all disk device names if no parameter is given. The information includes the total number of partitions associated with the disk, the stripeset (if any) that comprises the device, the MSCP device name the device or partition is mapped to, the inquiry data returned by the device, and unit parameters assigned to the device.

Example

```
DILBRT> show disk

Name   Pcnt  Used by     Type    Inquiry Data                Device Attributes
-------------------------------------------------------------------------------
D130   1                DISK    DEC       RZ26      392A    Sync TagQ
D160   4                DISK    DEC       RZ28      D41C    Sync TagQ
D150   4                DISK    DEC       RZ28      D41C    Sync TagQ
D140   1                DISK    Quantum   XP32150   556A    Sync TagQ
D110   1                DISK    DEC       RZ26      392A    Sync TagQ
D120   1                DISK    Quantum   XP32150   556A    Sync TagQ
```

SHOW DSSI_STATS

Displays snapshot showing the DSSI statistics at the moment the command is issued.

Format

SHOW DSSI_STATS

Parameters

None.

Description

SHOW DSSI_STATS is intended as a tool for troubleshooting DSSI problems, particularly cabling and termination issues. Although the information in this report is technical and designed primarily for service personnel, you may be able to use the information to identify potential problems with your DSSI interface.

If you notice abnormal values, try the following steps before calling technical support . . .

- Check the DSSI cable for defects, such as a bad wire or a bad solder connection. If possible try swapping the cable with another cable that you believe to be in good condition.
- Check the termination on the DSSI bus. The bus should be terminated at both ends.

Use the *CLEAR DSSI_STATS* command to reset all DSSI counters to zero.

Statistics

No CDRP Count
CDRP, which stands for Class Driver Request Packet, is a buffer the controller uses to store packet information. The number displayed in this field is a tally of the instances when the DSSI driver needed a CDRP but no CDRP was available. This number will equal the total of the "RX no CDRP" fields for all nodes.

No Buffers Count
The buffers referenced in this field are used by the controller to store the data portion of a packet. This value will increment each time the DSSI driver attempted to perform a write but could not perform the operation due to lack of buffer space.

Bus Resets Detected
This field increments each time the controller detects a DSSI bus reset. Occasional resets are normal on DSSI. However, if you see this counter incrementing at a rapid rate (e.g. once a second or more) you probably have a cabling problem.

Bus Resets Initiated
This field displays the number of times the controller initiated a bus reset on the DSSI. The controller will initiate a bus reset when it detects a parity error. A high number of bus resets initiated could indicate a cable or interface problem.

Interface Fault Count
This field counts the number of times a fault occurs in the DSSI interface chip. Such faults usually occur as a result of a physical cable break in a DSSI connnection.

TX ok
The number of packets transmitted successfully.

TX incomplete
The number of packet transmissions that were attempted but failed because the host went bus free before the entire packet could be sent. A high number of TX incompletes could indicate a cabling problem.

TX retry
A count of the number of transmissions retried after an initial failure.

Nak count
The number of negative acknowledgements (Naks) received from the host. A host will issue a Nak when it has no buffer space to receive a packet from a node.

RX ok
The number of packets received successfully from a host.

RX fail
The number of failed transmissions that hosts attempted to send to the controller. A failed transmission is usually caused by a bad cable.

RX bad source id
The number of packets rejected by the controller due to a problem with the source ID in the header.

RX bad dest id
The number of packets rejected by the controller due to a problem with the destination ID in the header.

RX bad header
The number of packets rejected by the controller due to a packet header problem other than a bad source or destination ID.

RX no CDRP
The number of packets rejected by the controller due to a lack of CDRP buffer space for the packet header. The "RX no CDRP" field reports the same type of problem as the "No CDRP Count" field at the top of the screen, except it reports the total for a single node rather than an aggregate for all nodes.

RX no SGTD
The number of packets rejected by the controller due to a lack of SGTD (Scatter-Gather Table Descriptor) buffer space for the packet data. The "RX no SGTD" field reports the same type of problem as the "No Buffers Count" field at the top of the screen, except it reports the total for a single node rather than an aggregate for all nodes.

SHOW MAINTENANCE

Shows the status of all devices under maintenance.

Format

SHOW MAINTENANCE

Parameters

None.

Description

The result of the *SHOW MAINTENANCE* command is a listing of information about all devices currently under maintenance.

Example

```
DILBRT> select d110
DILBRT> select d120
DILBRT> select d130
DILBRT> select d140
DILBRT> select d150
DILBRT> select d160
DILBRT> show maintenance

Device  Test      Flags          Status
------------------------------------------------------------------------------
D130              RO             Idle
D160              RO             Idle
D150              RO             Idle
D140              RO             Idle
D110              RO             Idle
D120              RO             Idle

DILBRT> disktest d110
03-APR-1995 15:50:52 4706  RIO$15   PIL=110: DISKTEST started
DILBRT> disktest d120 /write

DISKTEST will overwrite some or all data on this device. Are you sure? (y/n) y

03-APR-1995 15:51:05 4706  RIO$14   PIL=120: DISKTEST started
DILBRT> qualify d130
03-APR-1995 15:51:18 4703  RIO$13   PIL=130: QUALIFY started
DILBRT> qualify d140 /write

QUALIFY will overwrite some or all data on this device. Are you sure? (y/n) y

DILBRT>
03-APR-1995 15:51:32 4703  RIO$12   PIL=140: QUALIFY started
DILBRT> format d150
```

```
FORMAT will overwrite some or all data on this device. Are you sure? (y/n) y

DILBRT>
03-APR-1995 15:51:44 4700  RIO$11   PIL=150: FORMAT started
DILBRT> show maintenance

Device  Test      Flags          Status
-------------------------------------------------------------------------------
D130    QUALIFY   RO             Active LBN = 0x00004500
D160              RO             Idle
D150    FORMAT    RW
D140    QUALIFY   RW             Active LBN = 0x000010c0
D110    DISKTEST  RO             Active LBN = 0x001c9816
D120    DISKTEST  RW             Active LBN = 0x00384e08

DILBRT> show maintenance

Device  Test      Flags          Status
-------------------------------------------------------------------------------
D130    QUALIFY   RO             Active LBN = 0x0001fc80
D160              RO             Idle
D150    FORMAT    RW
D140    QUALIFY   RW             Active LBN = 0x0000e480
D110    DISKTEST  RO             Active LBN = 0x0013b9c3
D120    DISKTEST  RW             Active LBN = 0x0027e078

DILBRT>
03-APR-1995 16:02:44 270F  RIO$15   PIL=110: Sts=02h,Key=5h,ASC=21h,Q=00h
03-APR-1995 16:02:44 2713  RIO$15   PIL=110: SCSI READ(10) Failed
03-APR-1995 16:02:44 2707  RIO$15   PIL=110: DISKTEST aborted
DILBRT> show maintenance

Device  Test      Flags          Status
-------------------------------------------------------------------------------
D130    QUALIFY   RO             Active LBN = 0x000a4a40
D160              RO             Idle
D150    FORMAT    RW
D140    QUALIFY   RW             Active LBN = 0x0004fb80
D110    DISKTEST  RO             Idle CHKCOND 05h:21h:00h READ(10)
D120    DISKTEST  RW             Active LBN = 0x00150e1d

DILBRT>
03-APR-1995 16:17:23 4702  RIO$11   PIL=150: FORMAT completed
DILBRT> show maintenance

Device  Test      Flags          Status
-------------------------------------------------------------------------------
D130    QUALIFY   RO             Active LBN = 0x00116680
D160              RO             Idle
D150    FORMAT    RW             Idle
D140    QUALIFY   RW             Active LBN = 0x000889c0
D110    DISKTEST  RO             Idle CHKCOND 05h:21h:00h READ(10)
D120    DISKTEST  RW             Active LBN = 0x003c450a

DILBRT> abort d120
DILBRT>
03-APR-1995 16:19:25 4708  RIO$14   PIL=120: DISKTEST completed
DILBRT> show maintenance

Device  Test      Flags          Status
-------------------------------------------------------------------------------
D130    QUALIFY   RO             Active LBN = 0x0011bc80
D160              RO             Idle
D150    FORMAT    RW             Idle
D140    QUALIFY   RW             Active LBN = 0x0008b580
D110    DISKTEST  RO             Idle CHKCOND 05h:21h:00h READ(10)
D120    DISKTEST  RW             Test aborted by user
```

```
DILBRT>
03-APR-1995 16:23:54 4705  RIO$13  PIL=130: QUALIFY completed
DILBRT> show maintenance

Device  Test      Flags          Status
-------------------------------------------------------------------------------
D130    QUALIFY   RO             Idle
D160              RO             Idle
D150    FORMAT    RW             Idle
D140    QUALIFY   RW             Active LBN = 0x00165540
D110    DISKTEST  RO             Idle CHKCOND 05h:21h:00h READ(10)
D120    DISKTEST  RW             Test aborted by user

DILBRT> show maintenance

Device  Test      Flags          Status
-------------------------------------------------------------------------------
D130    QUALIFY   RO             Idle
D160              RO             Idle
D150    FORMAT    RW             Idle
D140    QUALIFY   RW             Active LBN = 0x003a7780
D110    DISKTEST  RO             Idle CHKCOND 05h:21h:00h READ(10)
D120    DISKTEST  RW             Test aborted by user

DILBRT>
03-APR-1995 16:42:51 4705  RIO$12   PIL=140: QUALIFY completed
DILBRT> show maintenance

Device  Test      Flags          Status
-------------------------------------------------------------------------------
D130    QUALIFY   RO             Idle
D160              RO             Idle
D150    FORMAT    RW             Idle
D140    QUALIFY   RW             Idle
D110    DISKTEST  RO             Idle CHKCOND 05h:21h:00h READ(10)
D120    DISKTEST  RW             Test aborted by user

DILBRT> deselect d110
DILBRT> deselect d120
DILBRT> deselect d130
DILBRT> deselect d140
DILBRT> deselect d150
DILBRT> deselect d160
DILBRT> show maintenance
DILBRT>
```

SHOW STATS

Combines the *SHOW DSSI_STATS* and *SHOW CI_STATS* commands.

Format

SHOW STATS

Parameters

None.

SHOW STRIPESETS

Displays information about all logical stripesets.

Format

SHOW STRIPESETS

Parameters

None.

Description

This command lists all logical stripesets. The displays includes information about the total number of partitions associated with the stripeset, the MSCP mapping of the stripeset or stripeset partition, its chunk size, and the physical disk devices assigned to it.

Example

```
NODE> SHOW STRIPESETS

Name  Pcnt    Used by      Chunksize    Members
-------------------------------------------------------------------------
S0    1       DUA200       4            D050 D040 D030 D020 D010 D000
S1    2       DUA210 (1)   4            D150 D140 D130 D120 D110 D100
S1    2       DUA215 (2)
S2    1       DUA220       4            D240 D230 D220 D210 D200
S3    1       DUA230       4            D340 D330 D320 D310 D300
S4    1       DUA240       4            D440 D430 D420 D410 D400
S5    1       DUA250       4            D540 D530 D520 D510 D500
```

SHOW TAPES

Displays a listing of all physical tape devices created with the *CREATE TAPE* or *AUTOCONFIG* commands.

Format

SHOW TAPES *[Tpil]*

Parameters

Tpil
T is the required prefix for all tape device names. *pil* specifies the port, SCSI ID and LUN of the device. If no parameter is given, the command returns information about all tape devices that have been named with the *CREATE TAPE* or *AUTOCONFIG* commands.

Description

Displays a list of physical tape devices. Included in the information is the each device's TMSCP number if it has been mapped, inquiry data received from each device, and unit parameters set for each device.

Example

```
NODE> SHOW TAPES
Name      Used by     Type    Inquiry Data               Device Attributes
-------------------------------------------------------------------------
T050      MUA1050     TAPE    DEC       TK50      440C   Sync
```

SHOW UNIT

Displays information about all devices mapped to (T)MSCP device names.

Format

SHOW UNIT *[(t)mscp_device_name]*

Parameters

(t)mscp_device_name
The (T)MSCP device name for which you wish to display information.

Example

```
NODE> SHOW UNIT
Name       Member   Status    Host      Set-members/Modifiers
-------------------------------------------------------------------------------
DUA200     S0  (2)  ONLINE    NODE      D050 D040 D030 D020 D010 D000
                                         online, cache, disconnect, immediate,
                                         tagging, truncate,
                                         spindown, sync_rate=10
DUA210     S1  (1)  ONLINE    NODE      D150 D140 D130 D120 D110 D100
                                         online, cache, disconnect, immediate,
                                         tagging, truncate,
                                         spindown, sync_rate=10
DUA220     S2  (2)  ONLINE    NODE      D240 D230 D220 D210 D200
                                         online, cache, disconnect, immediate,
                                         tagging, truncate,
                                         spindown, sync_rate=10
.
.
.
```

The number in parenthesis under Member is the partition number associated with the device.

TAPETEST

Initiates the controller's tape test utility.

Format

TAPETEST *Tpil*

Parameters

Tpil
Specifies the physical name of the tape device, where *T* stands for tape and *pil* stands for the port, SCSI ID, and LUN of the tape device.

Description

TAPETEST exercises the selected tape device by writing, rewinding, and reading each section of tape, up to but not including filemarks. The block size for the initial pass is 32 kilobytes. This is halved on each successive write/rewind/read operation. The test restarts when the block size reaches 1 kilobyte.

You must *SELECT* a device before running *TAPETEST* on it. Be sure that the tape device contains enough tape for 10 megabytes of 1 kilobyte blocks, otherwise *TAPETEST* will not work.

TAPETEST will run indefinitely until you halt the operation with the *ABORT* command or by turning off power to the controller.

If *TAPETEST* encounters an error, it will display a message describing the error condition.

WRITE

Writes the configuration parameters currently held in the editing buffer to the floppy diskette.

Format

WRITE

Parameters

None.

Description

Saves all parameter values from the editing buffer to the floppy diskette. Anytime you make parameter changes that you wish to make permanent, you must *WRITE* the changes to the floppy. Otherwise, the changes will be lost, and the old values stored on the floppy will be restored when the controller restarts.

Chapter 4

Polyport

4.1 Introduction to Polyport

The */POLYPORT* qualifier to the *SET CONTROLLER* command causes a single controller to appear to the cluster as *two* controllers. Each of these pseudo-controllers may be addressed by its own node name, which identifies not only the controller but also a specific host path to the controller.

The benefit of this approach is that it permits the system administrator to use the VMS *PREFER* command to establish a preferred path to one or more devices served by the controller and balance the I/O load between two host paths. (*/POLYPORT* supports only two host paths: either two DSSI paths, or one CI and one DSSI path.) The *PREFER* command selects a preferred path through a particular SCS *node name*. When */POLYPORT* is turned "OFF", a controller will have a single node name, nullifying the *PREFER* command's ability to select one host path over another. When */POLYPORT* is turned "ON", however, each of the controller's host paths is assigned a unique node name, which makes it possible to make one host channel the preferred path to one group of SCSI drives and the other host channel the preferred path to another group of drives.

Unless you use */POLYPORT* and the *PREFER* command, VMS will automatically select the fastest path to a device. This means that VMS will send the preponderance of traffic to a Trident or Hawk controller's CI path and not take advantage of the full bandwidth of the controller. To better balance the load between two host paths, therefore, you should use */POLYPORT* and the *PREFER* command.

4.2 Using Polyport

The following restrictions apply to the use of the */POLYPORT* qualifier . . .

- */POLYPORT* is not supported in redundant controller configurations.
- You must have precisely two host connections (i.e. two DSSI or one DSSI and one CI).

COBRA Polyport is not supported on the CDI-4220, which has only one DSSI host port.

When you turn */POLYPORT* "ON," you must perform a *WRITE* and a *RESTART* to make the change effective. After the controller reboots with */POLYPORT* turned on, the controller automatically will create SCS node names for each host port by taking the controller's node name and appending C0 for the CI port, and P*x* for a DSSI port, where *x* represents the port number on the controller. If the controller's node name contains more than four characters, the */POLYPORT* suffixes will overwrite the last one or two characters, since node names may not exceed six characters in length. The host will not see the original node name set with the *SET CONTROLLER /NODENAME=* command. Table 4–1 illustrates how */POLYPORT* names are created.

Table 4–1: Polyport Naming Examples

Controller Node Name	Polyport Node Names
TOM	CI: TOMC0 DSSI Port 4: TOMP4 DSSI Port 5: TOMP5
CASPER	DSSI Port 0: CASPP0 DSSI Port 1: CASPP1

NOTE

If you turn */POLYPORT* off after operating the controller with it on, you should reboot the host as well as the controller for the host to recognize the correct node name.

4.3 Polyport Example

This section presents an example keyboard session for a Trident controller, showing how to turn */POLYPORT* "ON," and then set a preferred path to drive DIA100.

First, turn */POLYPORT* "ON," *WRITE* the change to the diskette, and *RESTART* the controller to make the change effective.

```
TRI> SET CONTROLLER /POLYPORT=ON
TRI> WRITE
TRI> RESTART
```

Then from the DCL prompt enter the following:

```
$ SHOW DEV/FULL DIA100

Disk $4$DIA100: (TRIC0), device type RF72, is online, mounted, file-oriented
    device, shareable, served to cluster via MSCP Server, error logging is
    enabled.

    Error count                    0    Operations completed          3122819
    Owner process                 ""    Owner UIC                  [OPERATOR]
    Owner process ID        00000000    Dev Prot    S:RWED,O:RWED,G:RWED,W:RWED
    Reference count               11    Default buffer size                512
    Total blocks             4197438    Sectors per track                   86
    Total cylinders             3051    Tracks per cylinder                 16
    Host name                "TRIC0"    Host type, avail              RF72, yes
    Alternate host name      "TRIP5"    Alt. type, avail              RF72, yes
    Allocation class               4

    .
    .
    .
```

This shows that */POLYPORT* effectively has transformed one controller into two controllers. Before */POLYPORT* was turned "ON," the controller's node name was "TRI." With */POLYPORT* turned "ON," the controller now has two node names: "TRIC0" for the CI port and "TRIP5" for the DSSI bus on port 5. As indicated by the "Host name" field in the above example, VMS has set the CI port as the primary path to drive DIA100. The controller's DSSI port shows up as the "Alternate host name."

Now let's make the DSSI port the preferred path to DIA100. First you must compile and link *PREFER* by doing the following:

```
$ SET DEF [sys0.syscommon.syshlp.examples]
$ MACRO PREFER
$ LINK PREFER
```

Then copy the executable to *SYS$LOGIN* and issue this command:

```
$ SET COMMAND PREFER.CLD
```

Finally, to establish the preferred path to the DSSI channel on Port 5 of the controller, type the following command:

```
$ PREFER $4$DIA100:/HOST=TRIP5/FORCE
```

The drive will go into mount verify and switch controllers when I/O is performed to the drive.

For information on the use of preferred paths, refer to the "VMS I/O User's Guide."

NOTE

PREFER does not support tape drives. As a workaround, prior to booting VMS, simply set the tape drive offline or delete the tape drive's unit name on *one* of the controllers. The other controller will then serve the tape drive to the cluster.

For example, to set a tape drive named MUA250 offline, you would enter the following command . . . .

```
TRIDNT> SET UNIT MUA250 /OFFLINE
```

Or you may accomplish the same thing by deleting the tape drive's unit name with this command . . .

```
TRIDNT> DELETE UNIT MUA250
```

Chapter 5

Troubleshooting

5.1 SCSI Error Logs

The controller reports SCSI-related error messages for the devices it controls to an error log file, which you may view with the VMS Errorlog Report Formatter, invoked by the *ANALYZE/ERROR_LOG* command.

The following is an example of a command to view an error log.

```
$ ANALYZE/ERROR_LOG/INC=DUA10/OUT=ERROR.TXT
```

The */INC=* and */OUT=* qualifiers are optional. */INC=* restricts the scope of the resulting error log report to a specific device. */OUT=* redirects the report to a file.

The controller reports three types of SCSI-related error logs.

1. SCSI port error logs (Type 1)
2. SCSI command error logs (Type 2)
3. Compare error logs (Type 3)

5.1.1 SCSI Port Error Logs

The format for SCSI port error logs differs depending on whether the device involved in the error is a disk or tape.

5.1.1.1 Disk

The following is an excerpt from a sample SCSI port error log for a disk drive, with the title of each section identified.

Figure 5–1: SCSI Port Error Log Diagram for Disk Devices

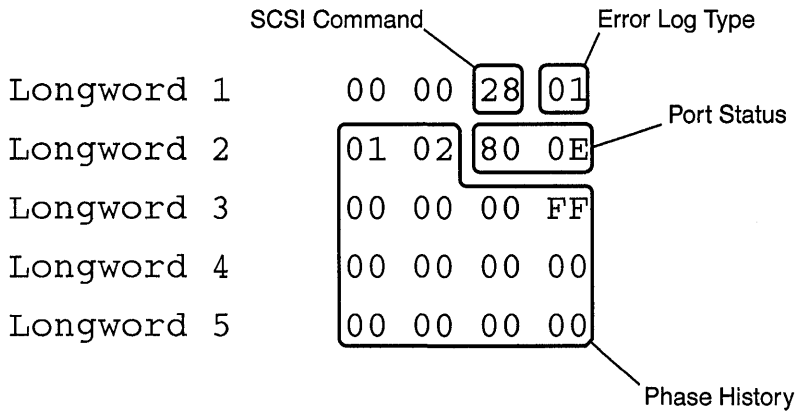


Table 5–1: SCSI Port Error Log Structure

Byte	Description
0	Indicates type of error log: "01" for a SCSI port error log, "02" for a SCSI command error log, and "03" for a compare error log.
1	SCSI command that was being executed when the error occurred. Table 5–6 lists the SCSI command hexadecimal representations for disk devices. (In this example, "28" indicates that the READ EXTENDED command was executing when the error occurred.)
4 and 5	A hex number indicating the type of port error encountered. See Table 5–2 for a complete list of port error codes. (In this example, "800E" indicates that the error was a hung bus timeout.)
6-12	The phase history leading up to the error. The bytes preceding the end marker "FF" represent the phases the SCSI bus went through before encountering the error. See Table 5–5 for a list of SCSI bus phases. (In this example, "01" in byte 7 indicates that the error occurred in the Data In phase.)

5.1.1.2 Tape

A SCSI port error log for a tape drive will report information in a format resembling the following example. Please note that an actual tape device error log will contain a third column of information. This information has been omitted in the example, because it is irrelevant in all port error logs.

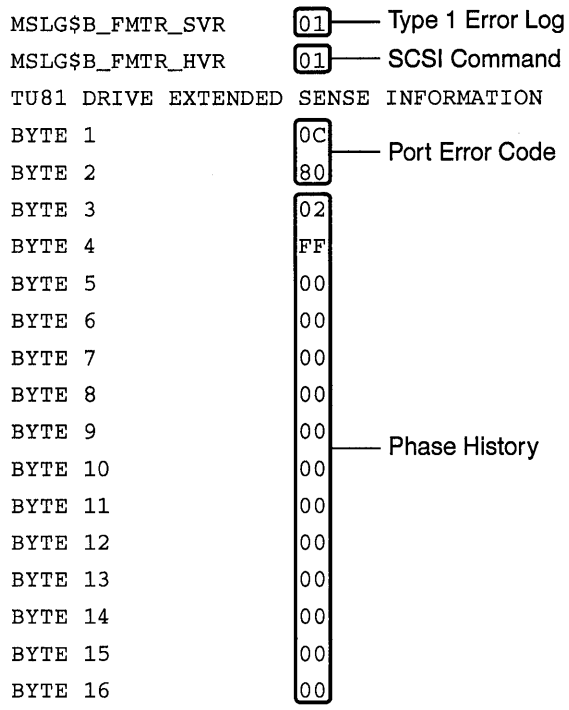
The first byte in the stack identifies the type of error log that follows. In this example of a SCSI port (Type 1) error log, the first byte is "01."

The second byte is the code for the SCSI command that was being executed when the error occurred. Table 5–7 lists the SCSI command hex representations for tape devices. (In this example, "01" is the hex representation of the SCSI REWIND command.)

Bytes 1 and 2 of the extended sense information form a hex number indicating the type of port error encountered. See Table 5–2 for a complete list of port error codes. (In this example, "800C" indicates that the device does not exist.)

Bytes 3 through 16 of the extended sense information give the phase history leading up to the error. The bytes preceding the end marker "FF" represent the phases the SCSI bus went through before encountering the error. See Table 5–5 for a list of SCSI bus phases. (In this example, "02" in byte 3 denotes that the SCSI bus was in the "Command" phase when the problem occurred.)

Figure 5–2: SCSI Port Error Log Diagram for Tape Devices



5.1.1.3 SCSI Port Error Codes

Table 5–2 lists the SCSI port error codes reported by the controller.

Table 5–2: SCSI Port Error Codes

Code	Port Status
2000	A serious problem occurred within the internal synchronization mechanism.
4002	Internal inconsistency error. Tried to send an unsupported SPORT opcode.
4007	Internal inconsistency error. Tried to send an unsupported message.
8000	Null reselect. Target issued a reselect command, which the controller had no reason to expect.
8001	A target reselected the controller for a tagged command, but the tag number did not match any stored in controller.
8003	Double check condition encountered. Check condition status returned on a Request Sense due to previous check condition status.
8004	Unsupported SCSI status returned by target.
8005	An unsupported message received.
8006	Target rejected a non-rejectable message (e.g. Identify).
8008	Phase transition timeout.
8009	Gross error bit was set in SCSI chip.
800A	Parity error bit was set in SCSI chip.
800B	Illegal command bit was set in SCSI chip.
800C	Device does not exist. 250 millisecond SCSI timeout.
800D	Illegal disconnect. Target disconnected during data-out, data-in or message-out phase.
800E	Hung bus timeout. Target connected to the bus for more than 30 seconds.
800F	Device did not go bus-free after device reset, abort, abort tag or clear queue.
8010	SCSI bus reset detected.
8011	Disconnected device timeout.
8012	Reselect tag # not outstanding.
8013	Reserved.
8014	Device transitioned to DIN phase, but firmware expected DOUT.
8015	Device transitioned to DOUT phase, but firmware expected DIN.
8016	Reselector's ID bit not set.
8017	Detected reserved status.
8018	Reselect tag # not outstanding for ID/LUN.
8019	RETDAT packet timeout.
8020	Reserved.
8021	Illegal (reserved) SCSI phase.

5.1.2 SCSI Command Error Log

SCSI command error logs are created when a SCSI command results in a check condition. The format for SCSI command error logs differs depending on whether the device involved in the error is a disk or tape.

5.1.2.1 Disk

A SCSI command error log for a disk drive will resemble the following example:

Figure 5–3: SCSI Command Error Log for Disk Example

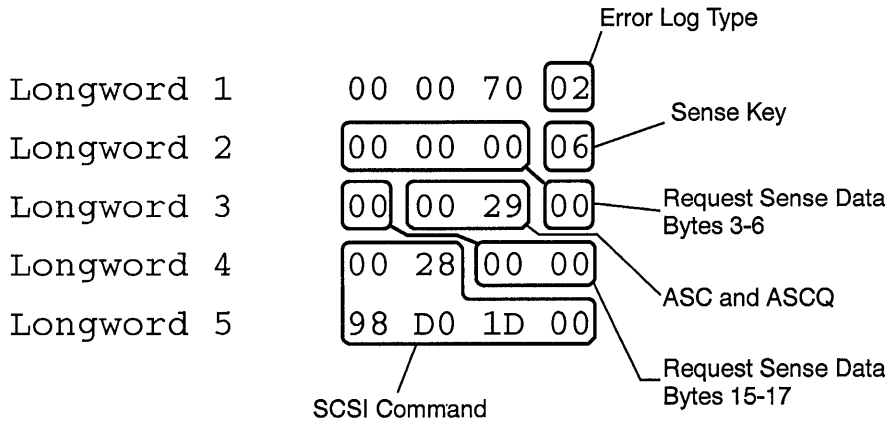


Table 5–3: SCSI Command Error Log Structure for Disk Devices

Byte	Description
0	Indicates type of error log: "01" for a SCSI port error log (Type 1), "02" for a SCSI command error log (Type 2), and "03" for a compare error log (Type 3).
4	Indicates the sense key of the extended sense data. The sense key describes the general category of the error. Refer to Table 5–8 for sense key definitions. In this example, a sense key value of "06" indicates that a UNIT ATTENTION condition has occurred.
9 and 10	Indicates the additional sense code and the additional sense code qualifier (ASC and ASCQ) in the extended sense data. This gives a more detailed description of the error. Refer to Table 5–9 for additional sense code definitions. In this example, the additional sense code value is "29," which means that the error was caused by a power-on, RESET or BUS RESET.

Table 5–3 (Cont.): SCSI Command Error Log Structure for Disk Devices

Byte	Description
14-19	The hex representation of the SCSIcommand that was being executed when the error occurred. Table 5–6 lists the SCSI command hex representations for disk devices. (In this example, "28" tells us that the READ EXTENDED command was executing when the error occurred.)

5.1.2.2 Tape

The following is an example of a Type 2 error log for a tape drive. Please note that an actual tape device error log will contain a third column of information. This information has been omitted in the example, because it is irrelevant in all SCSI command error logs.

Figure 5–4: SCSI Command Error Log Structure for Tape Devices

```
MSLG$B_FMTR_SVR              02 ---- Type 2 Error Log
MSLG$B_FMTR_HVR              01
TU81 DRIVE EXTENDED SENSE INFORMATION
BYTE 1 (SENSE KEY)           06 ---- Sense Key
BYTE 2 (BYTE 3)              00
BYTE 3 (BYTE 4)              00
BYTE 4 (BYTE 5)              00
BYTE 5 (BYTE 6)              00
BYTE 6 (BYTE 12)             29 ---- ASC
BYTE 7 (BYTE 13)             00 ---- ASCQ
BYTE 8 (BYTE 14)             00
BYTE 9 (BYTE 15)             00
BYTE 10 (BYTE 16)            00
BYTE 11 (SCSI CDB0)          01 ---- SCSI Command
BYTE 12 (SCSI CDB1)          00
BYTE 13 (SCSI CDB2)          00
BYTE 14 (SCSI CDB3)          00
BYTE 15 (SCSI CDB4)          00
BYTE 16 (SCSI CDB5)          00
```

The first byte in the stack identifies the type of error log that follows. In this example of a SCSI command (Type 2) error log, the first byte is "02."

Byte 1 of the extended sense information gives the sense key, which indicates the general category of the error. Refer to Table 5–8 for the hex representations of SCSI sense key values. (In this example, a sense key value of "06" indicates that a UNIT ATTENTION condition has occurred.)

Byte 6 of the extended sense information indicates the additional sense code in the extended sense data. This gives a more detailed description of the error. Refer to Table 5–9 for additional sense code definitions. In this example, an additional sense code of "29" indicates that a power-on, RESET, or BUS DEVICE RESET occurred.

Byte 7 of the extended sense information represents the additional sense code qualifier. When used in conjunction with the additional sense code in byte 6, the qualifer may provide additional information about the error. Refer to Table 5–9 for additional sense code qualifier definitions. In this example, a qualifier of "00" with an additional sense code of "29" provides no additional information.

Byte 11 is the first byte (in hex) of the command that wasbeing executed when the error occurred. Refer to Table 5–7 for a list of SCSI command hex representations for tape devices. In this example, a value of "01" in byte 11 indicates that the error occurred during a *REWIND* command.

5.1.3 Compare Error Logs

The controller will generate compare error log reports for disk devices, provided that you have first specified the */DATA_CHECK* option in a *MOUNT*, *INITIALIZE* or *SET VOLUME* command for the device or an application issues an MSCP command with the compare modifier bit set. Figure 5–5 shows an example of a compare error log.

Figure 5–5: Example of Compare Error Log

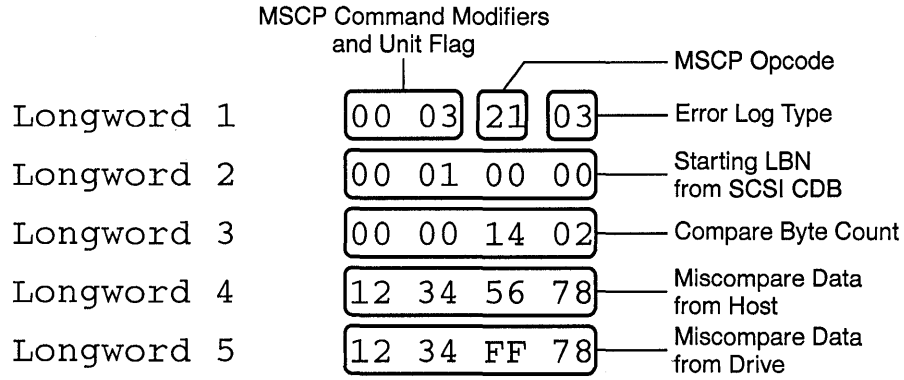


Table 5–4: Compare Error Log

Byte	Description
0	Error Log Type. Indicates type of error log: "01" for a SCSI port error log, "02" for a SCSI command error log, and "03" for a compare error log.
1	MSCP Opcode. Indicates whether the compare error occurred on a read or a write.
2 and3	MSCP Command Modifiers and Unit Flag. Indicates how the compare was invoked.
4 to 7	Starting Logical Block Number from the SCSI Command Descriptor Block.
8 to 11	Compare Byte Count. The number of bytes compared before the compare error was encountered.
12 to 15	Miscompare Data from Host. The 32 bits of host data that failed during the comparison with the drive data.
16 to 19	Miscompare Data from Drive. The 32 bits of drive data that failed during the comparison with the host data.

5.1.4 Bad Block Replacement Attempt Error Log

A media error reported by a disk device for any read or write operation will be treated either as a recoverable or a non-recoverable media error.

The controller will determine that a media error is non-recoverable when a SCSI disk device reports a media error with ASC information other than 17h, 18h or 27h.

NOTE

A non-recoverable read media error may be a block that has been flagged as a Forced Error.

The controller will determine that a media error is recoverable when the device reports back ASC information of 17h or 18h.

5.1.4.1 Blocks Replaced by Controller

The controller will replace a block only when the data on that block is determined to be non-recoverable. Here are the step for replacing non-recoverable media errors.

- Report the media error to the host by sending a Type 2 error log.
- Revector the block.
- Flag the block as a Forced Error.
- If the replacement operation is unsuccessful, the controller issues a Bad Block Replacement Attempt Error Log describing the reason for the failure. If the replacement operation successful the controller issues a Bad Block Replace Attempt Error Log with status of success. Refer to Section 5.1.4.2 for more information on this type of error log packet.
- If the operation that detected the media error was a write operation and the replacement operation is successful the controller will re-issue the command.

A block cannot be revectored with this algorithm if the device does not support SCSI Read/Write Long commands which are needed to flag and detect blocks as a Forced Error.

5.1.4.2 Bad Block Replacement Attempt Error Log Format

The controller will report a Bad Block Replacement Attempt Error Log when any of the steps used to replace a block fails. This is an error log with a format of 09h. A successful replacement operation will also send this type of error log message with an event of success. Since a Bad Block Replacement Attempt Error Log does not have controller-dependent information, fields that do not pertain to replacing a block on a SCSI device are used to report SCSI information. These fields are "Volume Serial Number," "Old RBN" and "New RBN." The information contained in these fields will depend on whether the error is a SCSI Port error or a SCSI Check Condition reporting SCSI Request Sense information. The upper byte of the New RBN field can be used to distinguish SCSI Port errors from SCSI Check Conditions. SCSI Port will have a one (01) here and SCSI Check Conditions will have a two (02).

For SCSI Port errors, the Old RBN field will contain the port's status in bytes zero and one. The physical location of the stripeset member will be in bytes two and three. The opcode of the SCSI command is in byte two of the New RBN field. All other bytes will be zero.

For SCSI Check Condition error logs, the locations of the stripeset member physical location and the SCSI command opcode will be identical to the SCSI port error log. The Request sense information is scattered about the remaining available bytes. The Sense key is in byte zero of the Old RBN field, ASC and ASCQ bytes are contained in bytes zero and one of the New RBN field and the information bytes are contained in the Volume Serial Number field.

This is an example of a SCSI Check Condition log when a SCSI Reassign command was issued to a disk drive that had internal problems.

```
V A X / V M S        SYSTEM ERROR REPORT         COMPILED 31-JUL-1995 11:05:21
                                                                  PAGE   1.

******************************* ENTRY      29. *******************************
ERROR SEQUENCE 30734.                          LOGGED ON:        SID 12000003
DATE/TIME 28-JUL-1995 18:08:06.85                              SYS_TYPE 02300101
SYSTEM UPTIME: 0 DAYS 03:53:52
SCS NODE: TUDE                                                  VAX/VMS V6.1

ERL$LOGMESSAGE ENTRY  KA65  CPU FW REV# 3.  CONSOLE FW REV# 3.0
                      XMI NODE # 7.

      I/O SUB-SYSTEM, UNIT _33300$DIA3020:, CURRENT LABEL ""

        MESSAGE TYPE        0001
                                        DISK MSCP MESSAGE
        MSLG$L_CMD_REF  CA600019
        MSLG$W_UNIT         0BCC
                                        UNIT #3020.
        MSLG$W_SEQ_NUM      0001
                                        SEQUENCE #1.
        MSLG$B_FORMAT         09
                                        BAD BLOCK REPLACEMENT ATTEMPT
        MSLG$B_FLAGS          10
                                        ERROR DURING REPLACEMENT
                                        UNRECOVERABLE ERROR
        MSLG$W_EVENT        00E8
                                        DATA ERROR
                                        UNCORRECTABLE ECC ERROR
        MSLG$Q_CNT_ID   2D494443
                        01654B34
                                        UNIQUE IDENTIFIER, 4B342D494443(X)
                                        MASS STORAGE CONTROLLER
                                        RF72
        MSLG$B_CNT_SVR        01
                                        CONTROLLER SOFTWARE VERSION #1.
        MSLG$B_CNT_HVR        01
                                        CONTROLLER HARDWARE REVISION #1.
        MSLG$W_MULT_UNT     0000
        MSLG$Q_UNIT_ID  00000000
                        02150000
                                        UNIQUE IDENTIFIER, 000000000000(X)
                                        DISK CLASS DEVICE (166)
                                        RF30
        MSLG$B_UNIT_SVR       01
                                        UNIT SOFTWARE VERSION #1.
        MSLG$B_UNIT_HVR       01
                                        UNIT HARDWARE REVISION #1.
        MSLG$W_RPL_FLGS     8000
                                        BAD LOGICAL
                                        REPLACEMENT ATTEMPTED, BLOCK
                                        _ VERIFIED BAD
        MSLG$L_VOL_SER  0000378C
                                        VOLUME SERIAL #0.
        MSLG$L_BAD_LBN  00003768
                                        BAD LOGICAL BLOCK
                                        _ NUMBER = 14184.
        MSLG$L_OLD_RBN  00000003
                                        FORMER REPLACEMENT BLOCK
                                        _ NUMBER = 3.
        MSLG$L_NEW_RBN  02070012
                                        NEW REPLACEMENT BLOCK
                                        _ NUMBER = 458770.
        MSLG$W_CAUSE        00E8
                                        DATA ERROR
                                        UNCORRECTABLE ECC ERROR
```

This is an example of a SCSI Port error log when a SCSI Reassign command was issued to disk drive when a SCSI bus reset was detected.

```
V A X / V M S        SYSTEM ERROR REPORT         COMPILED 31-JUL-1995 11:05:21
                                                                 PAGE   1.

****************************** ENTRY      29. ******************************
ERROR SEQUENCE 30734.                          LOGGED ON:        SID 12000003
DATE/TIME 28-JUL-1995 18:08:06.85                              SYS_TYPE 02300101
SYSTEM UPTIME: 0 DAYS 03:53:52
SCS NODE: TUDE                                                  VAX/VMS V6.1

ERL$LOGMESSAGE ENTRY  KA65  CPU FW REV# 3.  CONSOLE FW REV# 3.0
                      XMI NODE # 7.

  I/O SUB-SYSTEM, UNIT _33300$DIA3020:, CURRENT LABEL ""

        MESSAGE TYPE        0001
                                        DISK MSCP MESSAGE

        MSLG$L_CMD_REF  CCDE0019
        MSLG$W_UNIT         0BCC
                                        UNIT #3020.

        MSLG$W_SEQ_NUM      0003
                                        SEQUENCE #3.

        MSLG$B_FORMAT         09
                                        BAD BLOCK REPLACEMENT ATTEMPT

        MSLG$B_FLAGS          10
                                        ERROR DURING REPLACEMENT
                                        UNRECOVERABLE ERROR

        MSLG$W_EVENT        008B
                                        DRIVE ERROR
                                        LOST R/W READY, (TRANSFER)

        MSLG$Q_CNT_ID   2D494443
                        01654B34
                                        UNIQUE IDENTIFIER, 4B342D494443(X)
                                        MASS STORAGE CONTROLLER
                                        RF72

        MSLG$B_CNT_SVR        01
                                        CONTROLLER SOFTWARE VERSION #1.

        MSLG$B_CNT_HVR        01
                                        CONTROLLER HARDWARE REVISION #1.

        MSLG$W_MULT_UNT     0000
        MSLG$Q_UNIT_ID  00000000
                        02150000
                                        UNIQUE IDENTIFIER, 000000000000(X)
                                        DISK CLASS DEVICE (166)
                                        RF30

        MSLG$B_UNIT_SVR       01
                                        UNIT SOFTWARE VERSION #1.

        MSLG$B_UNIT_HVR       01
                                        UNIT HARDWARE REVISION #1.

        MSLG$W_RPL_FLGS     8000
                                        BAD LOGICAL
                                        REPLACEMENT ATTEMPTED, BLOCK
                                        _ VERIFIED BAD

        MSLG$L_VOL_SER  00000000
                                        VOLUME SERIAL #0.

        MSLG$L_BAD_LBN  00003768
                                        BAD LOGICAL BLOCK
                                        _ NUMBER = 14184.

        MSLG$L_OLD_RBN  00008010
                                        FORMER REPLACEMENT BLOCK
                                        _ NUMBER = 32784.

        MSLG$L_NEW_RBN  01070000
                                        NEW REPLACEMENT BLOCK
                                        _ NUMBER = 458752.

        MSLG$W_CAUSE        00E8
                                        DATA ERROR
                                        UNCORRECTABLE ECC ERROR
```

This is an example of a SCSI Port error log when a bad block replacement operation is successful.

```
V A X / V M S        SYSTEM ERROR REPORT         COMPILED 31-JUL-1995 11:05:21
                                                                  PAGE   1.

******************************* ENTRY      29. *******************************
ERROR SEQUENCE 30734.                          LOGGED ON:        SID 12000003
DATE/TIME 28-JUL-1995 18:08:06.85                              SYS_TYPE 02300101
SYSTEM UPTIME: 0 DAYS 03:53:52
SCS NODE: TUDE                                                  VAX/VMS V6.1

ERL$LOGMESSAGE ENTRY  KA65  CPU FW REV# 3.  CONSOLE FW REV# 3.0
                      XMI NODE # 7.

I/O SUB-SYSTEM, UNIT _33310$DIA110:, CURRENT LABEL "DIA110"

      MESSAGE TYPE        0001
                                    DISK MSCP MESSAGE
      MSLG$L_CMD_REF  B67D0021
      MSLG$W_UNIT         006E
                                    UNIT #110.
      MSLG$W_SEQ_NUM      0005
                                    SEQUENCE #5.
      MSLG$B_FORMAT         09
                                    BAD BLOCK REPLACEMENT ATTEMPT
      MSLG$B_FLAGS          80
                                    OPERATION SUCCESSFUL
      MSLG$W_EVENT        0000
                                    SUCCESS
                                    NORMAL
      MSLG$Q_CNT_ID   01653234 2D494443
                                    UNIQUE IDENTIFIER, 32342D494443(X)
                                    MASS STORAGE CONTROLLER
                                    RF72
      MSLG$B_CNT_SVR        3B
                                    CONTROLLER SOFTWARE VERSION #59.
      MSLG$B_CNT_HVR        01
                                    CONTROLLER HARDWARE REVISION #1.
      MSLG$W_MULT_UNT     0000
      MSLG$Q_UNIT_ID  02150000 00000000
                                    UNIQUE IDENTIFIER, 000000000000(X)
                                    DISK CLASS DEVICE (166)
                                    RF30
      MSLG$B_UNIT_SVR       01
                                    UNIT SOFTWARE VERSION #1.
      MSLG$B_UNIT_HVR       01
                                    UNIT HARDWARE REVISION #1.
      MSLG$W_RPL_FLGS     0000
                                    REPLACEMENT ATTEMPTED, BLOCK
                                    _ VERIFIED GOOD
      MSLG$L_VOL_SER  00000000
                                    VOLUME SERIAL #0.
      MSLG$L_BAD_LBN  000FCDDA
                                    BAD LOGICAL BLOCK
                                    _ NUMBER = 1035738.
      MSLG$L_OLD_RBN  00000000
      MSLG$L_NEW_RBN  00000000
      MSLG$W_CAUSE        00E8
                                    DATA ERROR
                                    UNCORRECTABLE ECC ERROR
```

5.1.5 SCSI Bus Phases

The following table lists the error log codes for the eight SCSI bus phases.

Table 5–5: SCSI Bus Phases

Code	Phase
00	Data Out
01	Data In
02	Command
03	Status
04	Reserved
05	Reserved
06	Message Out
07	Message In

5.1.6 Listing of SCSI Hex Codes

This section gives a complete listing and description of the SCSI hexadecimal codes that may appear in the SCSI port and SCSI command error logs.

Table 5–6: SCSI Command Hex Codes (Disk Devices)

Code	Command Name
00h	TEST UNIT READY
01h	REZERO UNIT
03h	REQUEST SENSE
04h	FORMAT UNIT
07h	REASSIGN BLOCKS
08h	READ (6)
0Ah	WRITE (6)
0Bh	SEEK (6)
12h	INQUIRY
15h	MODE SELECT (6)
16h	RESERVE
17h	RELEASE
18h	COPY
1Ah	MODE SENSE (6)
1Bh	START STOP UNIT
1Ch	RECEIVE DIAGNOSTIC RESULTS
1Dh	SEND DIAGNOSTIC
1Eh	PREVENT-ALLOW MEDIUM REMOVAL
25h	READ CAPACITY
28h	READ (10)

Table 5–6 (Cont.): SCSI Command Hex Codes (Disk Devices)

Code	Command Name
2Ah	WRITE (10)
2Bh	SEEK (10)
2Eh	WRITE AND VERIFY
2Fh	VERIFY
30h	SEARCH DATA HIGH
31h	SEARCH DATA EQUAL
32h	SEARCH DATA LOW
33h	SET LIMITS
34h	PRE-FETCH
35h	SYNCHRONIZE CACHE
36h	LOCK-UNLOCK CACHE
37h	READ DEFECT DATA
39h	COMPARE
3Ah	COPY AND VERIFY
3Bh	WRITE BUFFER
3Ch	READ BUFFER
3Eh	READ LONG
3Fh	WRITE LONG
40h	CHANGE DEFINITION
41h	WRITE SAME
4Ch	LOG SELECT
4Dh	LOG SENSE
55h	MODE SELECT (10)
5Ah	MODE SENSE (10)

Table 5–7: SCSI Command Hex Codes (Tape Devices)

Code	Command Name
00h	TEST UNIT READY
01h	REWIND
03h	REQUEST SENSE
05h	READ BLOCK LIMITS
08h	READ
0Ah	WRITE
0Fh	READ REVERSE
10h	WRITE FILEMARKS
11h	SPACE
12h	INQUIRY
13h	VERIFY
14h	RECOVER BUFFERED DATA
15h	MODE SELECT (6)
16h	RESERVE UNIT
17h	RELEASE UNIT

Table 5–7 (Cont.): SCSI Command Hex Codes (Tape Devices)

Code	Command Name
18h	COPY
19h	ERASE
1Ah	MODE SENSE (6)
1Bh	LOAD UNLOAD
1Ch	RECEIVE DIAGNOSTIC RESULTS
1Dh	SEND DIAGNOSTIC
1Eh	PREVENT ALLOW MEDIUM REMOVAL
2Bh	LOCATE
34h	READ POSITION
39h	COMPARE
3Ah	COPY AND VERIFY
3Bh	WRITE BUFFER
3Ch	READ BUFFER
40h	CHANGE DEFINITION
4Ch	LOG SELECT
4Dh	LOG SENSE
55h	MODE SELECT (10)
5Ah	MODE SENSE (10)

Table 5–8: SCSI Sense Key Hex Codes

Code	Name	Description
00h	NO SENSE	Indicates that there is no specific sense key information to be reported for the designated logical unit.
01h	RECOVERED ERROR	Indicates that the last command completed successfully with some recovery action performed by the target.
02h	NOT READY	Indicates that the logical unit addressed cannot be accessed. Operator intervention may be required to correct this condition.
03h	MEDIUM ERROR	Indicates that the command terminated with a non-recovered error condition that was probably caused by a flaw in the medium or an error in the recorded data.
04h	HARDWARE ERROR	Indicates that the target detected a non-recoverable hardware failure while performing the command or during a self-test.
05h	ILLEGAL REQUEST	Indicates that there was an illegal parameter in the command descriptor block or in the additional parameters supplied as data for some commands (e.g. FORMAT UNIT, SEARCH DATA).
06h	UNIT ATTENTION	Indicates that the removable medium may have been changed or the target has been reset.
07h	DATA PROTECT	Indicates that a command that reads or writes the medium was attempted on a block that is protected from this operation.

Table 5–8 (Cont.): SCSI Sense Key Hex Codes

Code	Name	Description
08h	BLANK CHECK	Indicates that a write-once device or a sequential-access device encountered blank medium or format-defined end-of-data indication while reading or a write-once device encountered a non-blank medium while writing.
09h	VENDOR-SPECIFIC	This sense key is available for reporting vendor-specific conditions.
0Ah	COPY ABORTED	Indicates a COPY, COMPARE or COPY AND VERIFY command was aborted due to an error condition on the source device, the destination device or both.
0Bh	ABORTED COMMAND	Indicates that the target aborted the command. The initiator may be able to recover by trying the command again.
0Ch	EQUAL	Indicates a SEARCH DATA command has satisfied an equal comparison.
0Dh	VOLUME OVERFLOW	Indicates that a buffered peripheral device has reached the end-of-partition and data may remain in the buffer that has not been written to the medium.
0Eh	MISCOMPARE	Indicates that the source data did not match the data read from the medium.
0Fh	RESERVED	

Table 5–9: SCSI ASC & ASQ Hex Codes

ASC	ASCQ	Description
00h	00h	No additional sense information
00h	01h	Filemark detected
00h	02h	End-of-partition/medium detected
00h	03h	Setmark detected
00h	04h	Beginning-of-partition/medium detected
00h	05h	End-of-data detected
00h	06h	I/O process terminated
00h	11h	Audio play operation in progress
00h	12h	Audio play operation paused
00h	13h	Audio play operation successfully completed
00h	14h	Audio play operation stopped due to error
00h	15h	No current audio status to return
01h	00h	No index/sector signal
02h	00h	No seek complete
03h	00h	Peripheral device write fault
03h	01h	No write current
03h	02h	Excessive write errors
04h	00h	Logical unit not ready, cause not reportable
04h	01h	Logical unit is in process of becoming ready

Table 5–9 (Cont.): SCSI ASC & ASQ Hex Codes

ASC	ASCQ	Description
04h	02h	Logical unit not ready, initializing command required
04h	03h	Logical unit not ready, manual intervention required
04h	04h	Logical unit not ready, format in progress
05h	00h	Logical unit does not respond to selection
06h	00h	No reference position found
07h	00h	Multiple peripheral devices selected
08h	00h	Logical unit communication failure
08h	01h	Logical unit communication time-out
08h	02h	Logical unit communication parity error
09h	00h	Track following error
09h	01h	Tracking servo failure
09h	02h	Focus servo failure
09h	03h	Spindle servo failure
0Ah	00h	Error log overflow
0Ch	00h	Write error
0Ch	01h	Write error: recovered with auto-reallocation
0Ch	02h	Write error: auto-reallocation failed
10h	00h	ID CRC or ECC error
11h	00h	Unrecovered read error
11h	01h	Read retries exhausted
11h	02h	Error too long to correct
11h	03h	Multiple read errors
11h	04h	Unrecovered read error: auto-reallocate failed
11h	05h	L-EC uncorrectable error
11h	06h	CIRC unrecovered error
11h	07h	Data resynchronization error
11h	08h	Incomplete block read
11h	09h	No gap found
11h	0Ah	Miscorrected error
11h	0Bh	Unrecovered read error: recommend reassignment
11h	0Ch	Unrecovered read error: recommend rewrite the data
12h	00h	Address mark not found for ID field
13h	00h	Address mark not found for data field
14h	00h	Recorded entity not found
14h	01h	Record not found
14h	02h	Filemark or setmark not found
14h	03h	End-of-data not found
14h	04h	Block sequence error
15h	00h	Random positioning error
15h	01h	Mechanical positioning error
15h	02h	Positioning error detected by read of medium
16h	00h	Data synchronization mark error
17h	00h	Recovered data with no error correction applied
17h	01h	Recovered data with retries

Table 5–9 (Cont.): SCSI ASC & ASQ Hex Codes

ASC	ASCQ	Description
17h	02h	Recovered data with positive head offset
17h	03h	Recovered data with negative head offset
17h	04h	Recovered data with retries and/or CIRC applied
17h	05h	Recovered data using previous sector ID
17h	06h	Recovered data without ECC: data auto-reallocated
17h	07h	Recovered data without ECC: recommend reassignment
17h	08h	Recovered data without ECC: recommend rewrite
18h	00h	Recovered data with error correction applied
18h	01h	Recovered data with error correction & retries applied
18h	02h	Recovered data: data auto-reallocated
18h	03h	Recovered data with CIRC
18h	04h	Recovered data with L-EC
18h	05h	Recovered data: recommend reassignment
18h	06h	Recovered data: recommend rewrite
19h	00h	Defect list error
19h	01h	Defect list not available
19h	02h	Defect list error in primary list
19h	03h	Defect list error in grown list
1Ah	00h	Parameter list length error
1Bh	00h	Synchronous data transfer error
1Ch	00h	Defect list not found
1Ch	01h	Primary defect list not found
1Ch	02h	Grown defect list not found
1Dh	00h	Miscompare during verify operation
1Eh	00h	Recovered ID with ECC correction
20h	00h	Invalid command operation code
21h	00h	Logical block address out of range
21h	01h	Invalid element address
22h	00h	Illegal function
24h	00h	Invalid field in CDB
25h	00h	Logical unit not supported
26h	00h	Invalid field in parameter list
26h	01h	Parameter not supported
26h	02h	Parameter value invalid
26h	03h	Threshold parameters not supported
27h	00h	Write protected
28h	00h	Not ready to ready transition, medium may have changed
28h	01h	Import or export element accessed
29h	00h	Power-on, reset or bus device reset occurred
2Ah	00h	Parameters changed
2Ah	01h	Mode parameters changed
2Ah	02h	Log parameters changed
2Bh	00h	Copy cannot execute since host cannot disconnect
2Ch	00h	Command sequence error

Table 5–9 (Cont.): SCSI ASC & ASQ Hex Codes

ASC	ASCQ	Description
2Ch	01h	Too many windows specified
2Ch	02h	Invalid combination of windows specified
2Dh	00h	Overwrite error on update in place
2Fh	00h	Commands cleared by another initiator
30h	00h	Incompatible medium installed
30h	01h	Cannot read medium: unknown format
30h	02h	Cannot read medium: incompatible format
30h	03h	Cleaning cartridge installed
31h	00h	Medium format corrupted
31h	01h	Format command failed
32h	00h	No defect spare location available
32h	01h	Defect list update failure
33h	00h	Tape length error
36h	00h	Ribbon, ink, or toner failure
37h	00h	Rounded parameter
39h	00h	Saving parameters not supported
3Ah	00h	Medium not present
3Bh	00h	Sequential positioning error
3Bh	01h	Tape position error at beginning-of-medium
3Bh	02h	Tape position error at end-of-medium
3Bh	03h	Tape or electronic vertical forms unit not ready
3Bh	04h	Slew failure
3Bh	05h	Paper jam
3Bh	06h	Failed to sense top-of-form
3Bh	07h	Failed to sense bottom-of-form
3Bh	08h	Reposition error
3Bh	09h	Read past end of medium
3Bh	0Ah	Read past beginning of medium
3Bh	0Bh	Position past end of medium
3Bh	0Ch	Position past beginning of medium
3Bh	0Dh	Medium destination element full
3Bh	0Eh	Medum source element empty
3Dh	00h	Invalid bits in identify message
3Eh	00h	Logical unit has not self-configured yet
3Fh	00h	Target operating conditions have changed
3Fh	01h	Microcode has been changed
3Fh	02h	Changed operating definition
3Fh	03h	Inquiry data has changed
40h	00h	RAM failure
40h	NNh	Diagnostic failure on component NN (80h-FFh)
41h	00h	Data path failure (should use 40 NN)
42h	00h	Power-on or self-test failure
43h	00h	Message error
44h	00h	Internal target failure

Table 5–9 (Cont.): SCSI ASC & ASQ Hex Codes

ASC	ASCQ	Description
45h	00h	Select or reselect failure
46h	00h	Unsuccessful soft reset
47h	00h	SCSI parity error
48h	00h	Initiator detected error message received
49h	00h	Invalid message error
4Ah	00h	Command phase error
4Bh	00h	Data phase error
4Ch	00h	Logical unit failed self-configuration
4Eh	00h	Overlapped commands attempted
50h	00h	Write append error
50h	01h	Write append position error
50h	02h	Position error related to timing
51h	00h	Erase failure
52h	00h	Cartridge fault
53h	00h	Media load or eject failed
53h	01h	Unload tape failure
53h	02h	Medium removal prevented
54h	00h	SCSI to host system interface failure
55h	00h	System resource failure
57h	00h	Unable to recover table-of-contents
58h	00h	Generation does not exist
59h	00h	Updated block read
5Ah	00h	Operator request or state change input
5Ah	01h	Operator medium removal request
5Ah	02h	Operator selected write protect
5Ah	03h	Operator selected write permit
5Bh	00h	Log exception
5Bh	01h	Threshold condition met
5Bh	02h	Log counter at maximum
5Bh	03h	Log list codes exhausted
5Ch	00h	RPL status change
5Ch	01h	Spindles synchronized
5Ch	02h	Spindles not synchronized
60h	00h	Lamp failure
61h	00h	Video acquisition error
61h	01h	Unable to acquire video
61h	02h	Out of focus
62h	00h	Scan head positioning error
63h	00h	End of user area encountered on this track
64h	00h	Illegal mode for this track
80h to FFh	XX	Vendor-specific
XX	80h to FFh	Vendor-specific

Chapter 6

Front Panel Display

The front panel display provides a constantly updated glimpse at the devices connected to the controller. You may use the up and down buttons to scroll the display through the devices connected to the controller. The "SEL" and "EXIT" buttons have no function at this time.

6.1 Device Display

During normal operation, the front panel display cycles through all the devices connected to the controller in a continuous loop. When information about the last device is flashed on the screen, the display returns to the first device and begins the cycle all over again.

For each device, the display shows two screens of information. The top line on both screens identifies the physical device name of the subject SCSI device and the nodename of the controller. The difference between the two screens is apparent on the second line, which identifies the SCSI ID, logical unit number (LUN), device status and write protection status on the first screen and the device manufacturer, model number and revision number on the second screen.

The first screen will look something like the following example.

```
$4$DUA1010              (BUGS)
ID=1      LUN=0     ONLNE R/W
```

The second line on this screen begins on the left with the SCSI ID of the device, followed by the LUN. Next comes the device status, and the last entry indicates whether the device is enabled for read/write access for for read-only access.

The second screen for the same device might look like this.

```
$4$DUA1010              (BUGS)
FUJITSU     M2694ES      386E
```

The left side of the top line identifies the physical device name of the particular device. On the right side of the top line is parenthesis is the nodename of the controller. The second line displays the device manufacturer's name, the device model number and the revision number of the device's firmware.

Part II

Trident Installation

This part describes various Trident controller installation issues.

Chapter 7

Trident Specifications

7.1 The Trident

All Tridents provide a means for CI-based VAX and AXP computer systems to share a common farm of SCSI devices. Individual Tridents may offer the additional feature of converting one or two from SCSI to DSSI, depending on the number of DSSI licenses purchased with the controller.

NOTE

The Trident acts as a storage server on the DSSI bus and can communicate with hosts only. It is not designed to serve DSSI devices to the CI bus.

7.1.1 Trident Features

The Trident can control up to 42 SCSI devices (36 devices if you choose to use redundant Trident controllers). These devices can be redundant arrays of independent disks (RAID), solid state disks, disk drives, tape drives, CDROMs or optical devices. For a complete list of supported devices, call CMD Technology and request the "Qualified Peripherals List" for the Trident.

The Trident is fully compliant with Digital's mass storage protocols, MSCP and TMSCP. There is no need for additional software drivers or patches to your currently running systems.

For faster read performance, you may install up to 512 megabytes of cache memory, in the form of standard 72-pin SIMMs. The Trident's firmware permits you to control which devices are to be cached.

The Trident comes with a 3.5" high-density disk drive for loading firmware code and configuration information at bootup. You may obtain firmware upgrades from CMD Technology's BBS; set your modem to 8 data bits, 1 stop bit, no parity and dial (714) 454-0795. The BBS supports up to 19200 baud. Use a DOS-based computer to transfer the file to the bootup diskette, reinsert the diskette in the Trident and reboot.

Trident Installation

The Trident's command line interface, which closely resembles the Digital Command Language (DCL) in VMS, provides a means to configure the Trident and monitor the status of various controller functions. The command line interface includes commands for creating stripesets and partitioning disk drives. You may access the command line interface through the controller's serial port or through the Diagnostics Utility Protocol (DUP).

CAUTION

The Trident's stripesets, which are based on the RAID 0 algorithm, offer enhanced I/O performance but no redundancy. If one drive in the stripeset fails, all the data in the stripeset will be lost. Consequently, you should take appropriate backup measures to protect your stripeset data.

Utilities for formatting, qualifying and testing devices are available through the Diagnostics Utility Protocol (DUP).

The Trident's chassis is a standard 5.25" rack mount with dual power supplies and dual cooling fans.

7.1.2 Specifications

Table 7–1: Technical Specifications

General	
Emulation	MSCP (DU) and TMSCP (MU)
Host Bus Interface	Digital CI, DSSI and FDDI
Peripheral Bus Interface	SCSI-1, SCSI-2, Fast SCSI-2
Maximum Cable Length	SCSI $\leq$5 MB/sec transfer rate: 6 meters (19.5 ft.) SCSI >5 MB/sec transfer rate: 3 meters (9.9 ft.) CI: 45 meters (147.65 ft.)
Maximum Hosts Supported	Up to 32
Connector Type	CI: Standard TNC CI connector DSSI: Dual row 50-pin male Honda SCSI: Dual row 50-pin female Honda
Command Queuing	Commands from host: Up to 60 with seek optimization SCSI command tag queuing: Up to 64 commands per drive
Firmware Load Media	3.5" 1.44 MB high-density diskette
User Interface	Dedicated RS232 console interface for setup, status monitoring and diagnostics
CI Host Connection Support	SC008 Star Coupler, CIXCD, CIBCA-A, CIBCA-B, CIBCI, CI750 and CI780
DSSI Host Connection Support (with DSSI license)	VAX 4000, AXP 4000, AXP 2100 Server, KFMSA and DEC 5400/5500

Table 7–1 (Cont.): Technical Specifications

General				
Operating System Support	VMS 5.4 and above OpenVMS AXP 1.5 and above OSF/1 1.5 and above			
Performance				
Maximum Sustained QIOs				
	Single server		**Dual server**	
	1 Block	TBD	1 Block	TBD
	2 Blocks	TBD	2 Blocks	TBD
	3 Blocks	TBD	3 Blocks	TBD
	4 Blocks	TBD	4 Blocks	TBD
Environmental				
Temperature	Operational: 5° C to 50° C Non-operational: -40° C to +60° C			
Relative Humidity	Operational: 10% to 85% non-condensing Non-operational: 5% to 90% non-condensing			
Power Requirements				
Input Voltage	110 VAC to 240 VAC single phase, AutoRanging			
Input Frequency	50 to 60 cycle AC			
Input Current	2A @ 115 VAC (100 watts), 1A @ 230 VAC (110 watts)			
Physical				
Unit Size Trident Controller Chassis	Standard 5.25" high rack mount 5.2" x 19" x 24.5" (HxWxD)			

Chapter 8

CI Setup

8.1 CI Cluster Configuration

The installation of a Trident server can dramatically increase the amount of traffic on the computer interconnect (CI). For this traffic to flow smoothly, it is essential that you configure your CI cluster so that all nodes have unique CI node numbers and common slot count, node count and header length settings. This chapter contains information about how to set these parameters on the Trident and Hawk. Consult the user's manuals for the host adapters and any other controllers in your cluster for information about configuring these devices.

The Trident is compatible with all CI host adapters and star couplers. However, your CI cluster environment should conform with the following guidelines recommended by Digital Equipment Corporation.

Table 8–1: Minimum Revision Levels

Device	1-16 Nodes SC008	1-32 Nodes CISCE
VMS	v. 5.4	v. 5.4
CIXCD		
T2080	Rev. E02	Rev. E02
CIXCD.BIN	v. 1.0	v. 1.0
HSC		
Link Module	L0100 Rev. E or L0118 Rev. B	L0118 Rev. B
CRONIC		
HSC50	v. 400	v. 400
HSC40/70	v. 500	v. 500

Table 8–1 (Cont.): Minimum Revision Levels

Device	1-16 Nodes SC008	1-32 Nodes CISCE
CI7x0, CIBCI		
Link Module	L0100 Rev. E or L0118 Rev. B	L0118 Rev. B
CI780.BIN/L0101	Rev. 8.7/L0101 Rev. K or Rev. 20.20/L0101- YA	Rev. 20.20/L0101-YA
CIBCA-A		
CIBCA.BIN	Rev. 7.5	Rev. 7.5
CIBCA-B		
CIBCB.BIN	Rev. 5.2	Rev. 5.2

8.2 Board Configuration

A DIP switch (located at S1 on the Trident board) controls the CI node number, CI slot count, CI node count and CI header length for the controller. Figure 8–1 shows the location of the Trident's internal CI ports and DIP switch S1. Each of these parameters must be set to a value appropriate to your cluster for the controller to operate properly.

8.2.1 Default Settings

Table 8–2 lists the controller's default CI parameter settings. While some of these defaults will be appropriate for many clusters, you should carefully evaluate them in relation to your own cluster before accepting them.

Figure 8–1: Internal CI Ports and DIP Switch S1

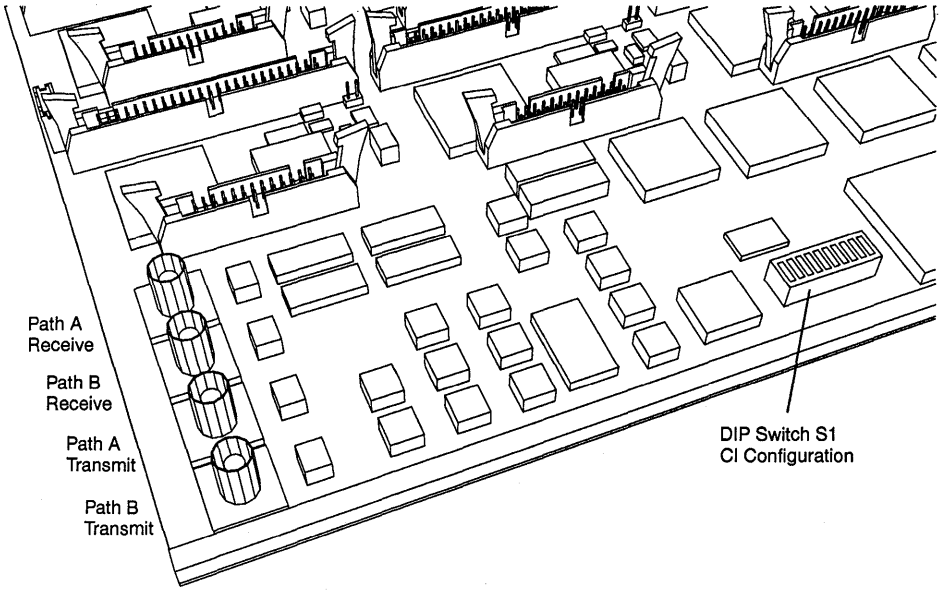


Table 8–2: Default CI Parameters

Parameter	Default Value
CI Node Number	15[1]
CI Slot Count[2]	10
CI Node Count	1 to 16 nodes
CI Header Length	5 bytes

[1]This is not a recommended value.

[2]CI Slot Count is synonymous with delta time, tick count, quiet time, or quiet slot.

8.2.2 Modifying Your Configuration

Should you find that the controller's default settings are not appropriate for your cluster, you will need to open the cabinet and manipulate the switches on DIP switch S1. The remainder of this chapter describes the four CI parameters and offers some advice for choosing an appropriate value for your cluster.

8.2.2.1 CI Node Number

The CI node number is one of the unique identifiers of the controller on the computer interconnect. You must make sure that the controller's node number does not conflict with any other node's number. Select the lowest available node number for the controller. Because of the rules governing CI arbitration and node polling, it is beneficial to "pack" the available CI node numbers, starting from the lowest available number and working up to 15 if you have a SC008 star coupler, or 31 if you have a CISCE star coupler.

Switches 1 through 5 on DIP switch S1 determine the node number of the controller. Each switch represents one bit of a five-bit binary number, which can range from 0 to 31. Switch 1 is the least significant bit and switch 5 is the most significant bit. "OFF" equals 1 and "ON" equals 0.

Table 8–3 lists the switch settings for all possible node numbers.

NOTE

The SYSGEN parameter PAMAXPORT must be set to a value that is greater than or equal to the highest CI node number in the cluster.

Table 8–3: CI Node Selection

Node	S1-1	S1-2	S1-3	S1-4	S1-5
0	ON	ON	ON	ON	ON
1	OFF	ON	ON	ON	ON
2	ON	OFF	ON	ON	ON
3	OFF	OFF	ON	ON	ON
4	ON	ON	OFF	ON	ON
5	OFF	ON	OFF	ON	ON
6	ON	OFF	OFF	ON	ON
7	OFF	OFF	OFF	ON	ON
8	ON	ON	ON	OFF	ON
9	OFF	ON	ON	OFF	ON
10	ON	OFF	ON	OFF	ON
11	OFF	OFF	ON	OFF	ON
12	ON	ON	OFF	OFF	ON
13	OFF	ON	OFF	OFF	ON
14	ON	OFF	OFF	OFF	ON
15[1]	OFF	OFF	OFF	OFF	ON
16	ON	ON	ON	ON	OFF
17	OFF	ON	ON	ON	OFF
18	ON	OFF	ON	ON	OFF
19	OFF	OFF	ON	ON	OFF
20	ON	ON	OFF	ON	OFF
21	OFF	ON	OFF	ON	OFF
22	ON	OFF	OFF	ON	OFF
23	OFF	OFF	OFF	ON	OFF
24	ON	ON	ON	OFF	OFF
25	OFF	ON	ON	OFF	OFF
26	ON	OFF	ON	OFF	OFF
27	OFF	OFF	ON	OFF	OFF
28	ON	ON	OFF	OFF	OFF
29	OFF	ON	OFF	OFF	OFF
30	ON	OFF	OFF	OFF	OFF
31	OFF	OFF	OFF	OFF	OFF

[1]The default CI Node number is 15.

8.2.2.2 CI Slot Count

The CI slot count is the number of 114-nanosecond intervals that form the "quiet slot." The quiet slot is the basic unit of measurement used when nodes are arbitrating to acquire ownership of a CI path. According to the CI path arbitration algorithm, a node seeking to transmit data on a path, must wait a certain number of quiet slots and determine that the path is inactive before beginning the transmission. The number of quiet slots a node must count down is equal to the sum of its node number, the node count (see Section 8.2.2.3) and one. If the node detects that another node has control of the path during the interval, it restarts its countdown, either from the original number of quiet slots or a lesser number, depending on whether the

other node's number is higher or lower. The purpose of the arbitration algorithm is twofold. First, it keeps two nodes from jumping on the CI path at the same time. Secondly, it prevents any single node from dominating the interconnect.

The CI slot count you select must be the same as all other CI adapters in the cluster. A slot count of 10 (the default value of the Trident controller) is used by the majority of adapters, but there are some adapters that allow other values. Consult the manuals for the CI adapters in your cluster to determine their common slot count ("delta time" for Digital Equipment Corp. adapters) and set the controller accordingly.

Switches 6 and 7 on DIP switch S1 set the slot count for the controller. Table 8–4 lists the switch settings for each slot count value.

Table 8–4: CI Slot Count Selection

CI Slot Count	S1-6	S1-7
7	ON	ON
10[1]	OFF	ON
14	ON	OFF
16	OFF	OFF

[1]Default

8.2.2.3 CI Node Count

The CI node count refers to the number of nodes on the CI. The Trident permits just two alternatives for this parameter. If your CI has been configured for 1 to 16 nodes, set switch 8 to the "OFF" position. If your system is configured for 1 to 32 nodes, set switch 8 to the "ON" position.

Table 8–5 lists the switch settings for the CI node count parameter.

Table 8–5: CI Node Count Selection

CI Node Count	S1-8
1 to 16 nodes[1]	OFF
1 to 32 nodes	ON

[1]Default

8.2.2.4 CI Header Length

Each packet transmitted on the CI contains a header that identifies the target node and characterizes the content of the packet. The controller's default header length of five bytes is used by virtually all CI adapters. Yet some adapters offer the option for a 15-byte header, so the controller offers this option as well for the sake of compatibility.

You must select a common header length for every CI node on the interconnect.

Table 8–6 lists the switch settings for CI header length.

Table 8–6: CI Header Length Selection

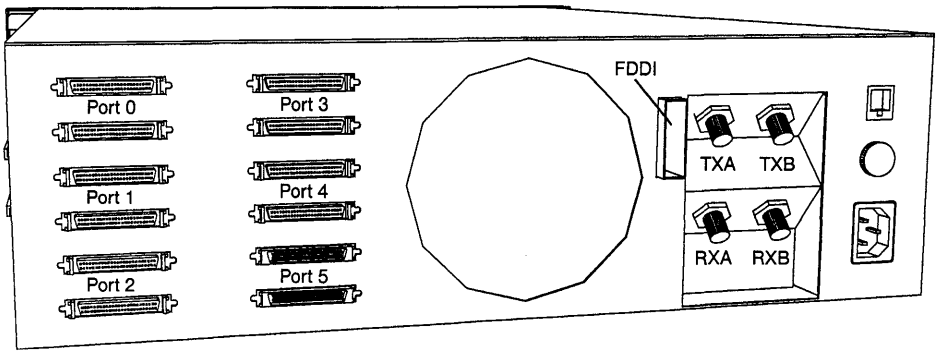
CI Header Length	S1-9
5 bytes[1]	OFF
15 bytes	ON

[1]Default

8.3 Cabling

After you have verified that all CI parameters are correct, run CI cables from your star coupler to the CI connectors on the back of the controller enclosure. Connect the transmit cable for path A to TXA, and the receive cable for path A to RXA. Likewise, connect the transmit cable for path B to TXB, and the receive cable for path B to RXB. Figure 8–2 shows the placement of the CI connectors on the back of the Trident enclosure.

Figure 8–2: Rear of Trident



WARNING

Be sure to verify that the controller's CI parameters are correct and do not conflict with other nodes on the interconnect before cabling the controller to the star coupler. Failure to take this precaution could cause other nodes connected to the star coupler to drop out of the cluster.

Chapter 9

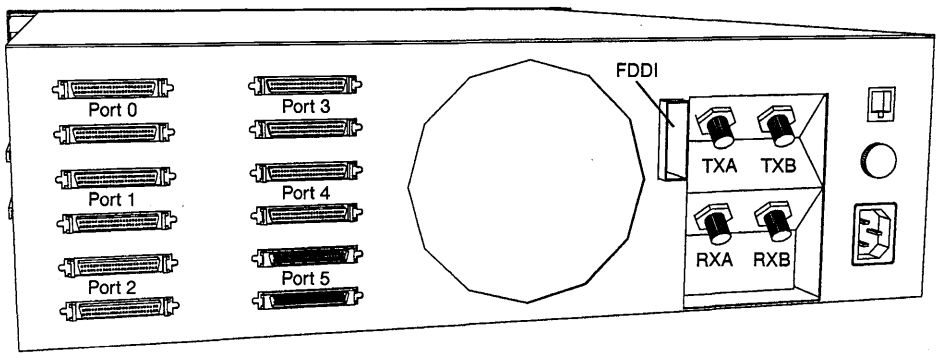
DSSI-SCSI Ports

9.1 Cabling

The base configuration of the Trident has six single-ended SCSI buses. An optional daughter card is available to convert any of these single-ended SCSI buses to differential SCSI. Another daughter card is available for converting as many as two SCSI ports to DSSI. Section 9.4 contains instructions for installing and configuring these daughter cards.

Figure 9–1 shows the external ports of a Trident with Port 5 equipped with the DSSI daughter card. SCSI ports are outfitted with high-density female connectors. DSSI ports have high-density male connectors. Each port has an "IN" and an "OUT" connector.

Figure 9–1: Rear view



9.1.1 Cable Length

For peak performance and reliability, it is essential that you use high-quality SCSI cables and keep total cable lengths on each SCSI bus within the recommendations in Table 9–1.

Table 9–1: Maximum Cable Lengths

Bus Type	Transfer Rate	Meters	Feet
Single-ended	≤5 MB/s	6	19.68
Single-ended	>5 MB/s	3	9.84
Differential	10 MB/s	25	82.02

9.2 Termination

The Trident's internal cabling daisy-chains SCSI and DSSI buses from the backplane's IN connector to the SCSI or DSSI header on the controller motherboard and back out to the OUT connector on the backplane. This arrangement requires the use of external terminators, if the Trident is the first or last device on a SCSI or DSSI bus. The Trident comes with six external terminators. They should be inserted into either the IN or OUT connector of each port connector pair on the back of the enclosure.

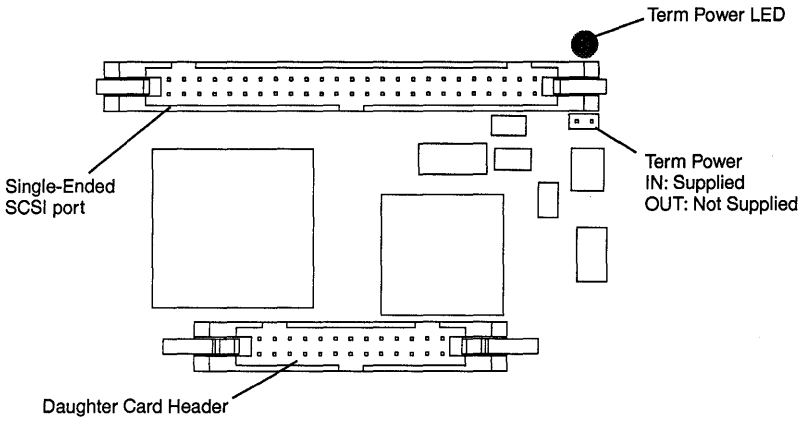
The Trident uses active termination for its SCSI buses. DSSI buses on the Trident use passive termination. For SCSI buses, you should terminate the other end of the bus with either an active terminator or some other form of high-quality terminator (such as FPT). For DSSI buses, terminate the other end of the bus with a passive DSSI terminator.

9.2.1 Term Power

By default, the Trident supplies term power on all ports. At least one device on any DSSI or SCSI interconnect must supply term power to the terminators. There is no harm in having more than one device supply term power. In fact, the ideal situation is to have the devices at each end of the interconnect supply term power.

If you wish to prevent the Trident from supplying term power, you will have to open the enclosure and configure the term power jumper for each port. The term power jumper may be found in the same relative position for each port, as Figure 9–2 shows. These jumpers are labeled W7, W15, W23, W8, W16, and W24 for ports 0 through 5 respectively. To have the Trident supply term power on any particular bus, insert the shunt on the jumper for that port. Remove the shunt to cut off term power to a bus. The term power LED will be illuminated when the Trident is supplying term power for that port.

Figure 9–2: Term Power Jumper Location

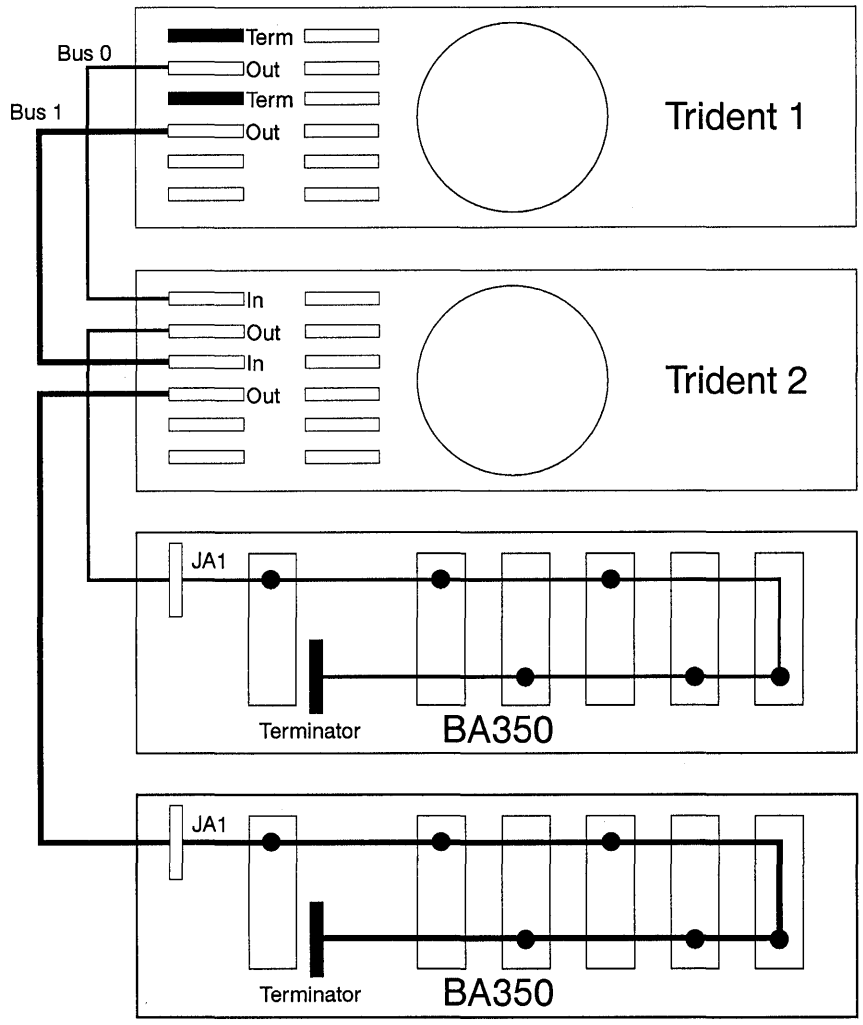


9.3 Cabling Example

Figure 9–3 depicts a typical cabling scheme for a redundant Trident configuration and two Digital Equipment Corporation BA350 storage shelves. SCSI bus 0 begins at Port 0 on the first Trident. The bus is terminated at one end with an external terminator at the IN connector on the port and at the other end with a terminator installed on the backplane (behind the blowers) of the BA350. The bus comes out of the first Trident through the OUT connector of Port 0. It enters the second Trident through the IN connector of Port 0 and comes back out through the OUT connector. Then it enters the BA350 at JA1, accessible through the front of the shelf. The bus continues through the BA350's backplane, which features hardwired connectors for devices. In a redundant configuration, you may connect up to six devices to the BA350. If you eliminate the second Trident in the example show below, you could install up to seven devices.

Bus 1 follows the same pattern as Bus 0, except it runs from each Trident's Port 1 connectors to a second BA350 shelf.

Figure 9–3: Cabling Example



CAUTION

In a redundant Trident configuration, port 0 on Trident 1 must be connected to port 0 to Trident 2, and port 1 on Trident 1 must be connected to port 1 on Trident 2. Futhermore, both controllers must have the same disk and tape allocation class values (assigned with the *SET CONTROLLER* command). The */REDUNDANT* qualifier of the *SET CONTROLLER* command must be turned "ON." And the */POWER_ON_RESET* qualifier of the *SET PORT* command must be turned "OFF" for all common SCSI buses. See Chapter 2 and Chapter 3 for a full discussion of the Trident's command line interface.

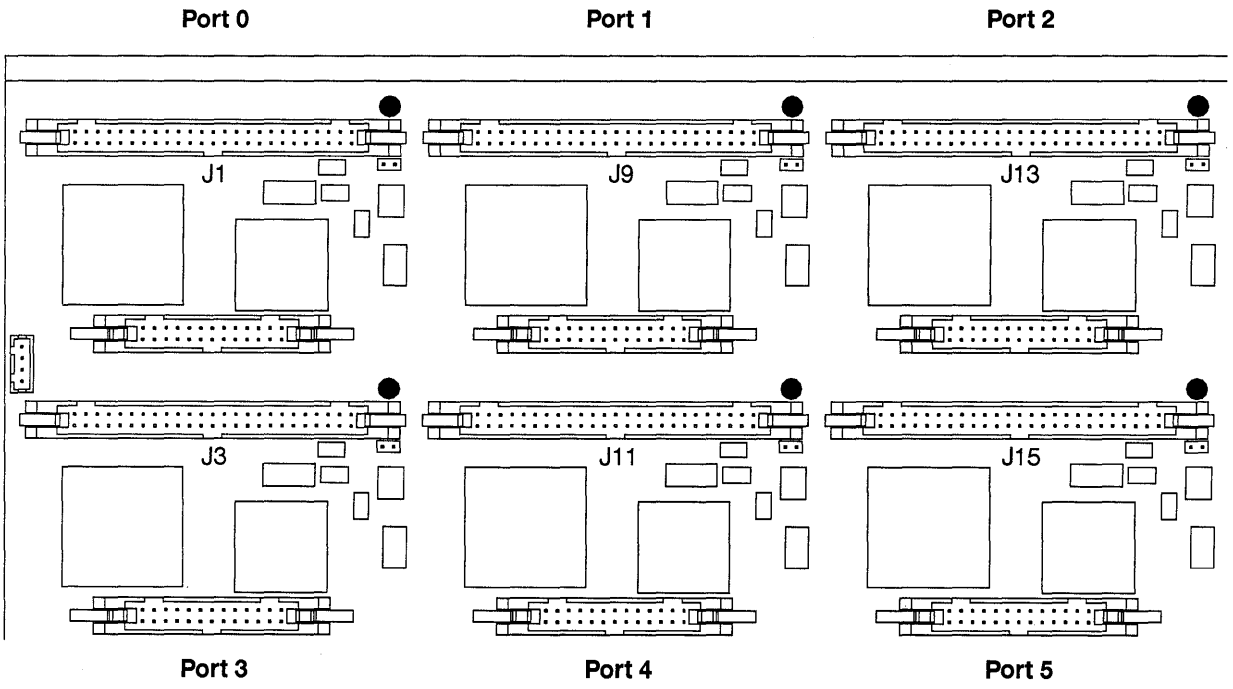
9.4 Port Configuration

The following sections explain how to change the default configuration of the Trident's six SCSI/DSSI ports. The steps needed to configure each port depend on whether the port is set up for single-ended SCSI, differential SCSI, or DSSI.

9.4.1 Single-Ended SCSI

A port without a daughter card is configured for single-ended SCSI operation. You may connect a single-ended SCSI cable directly into headers J1, J9, J13, J3, J11, and J15. Figure 9–4 shows the location of each port header.

Figure 9–4: SCSI Ports



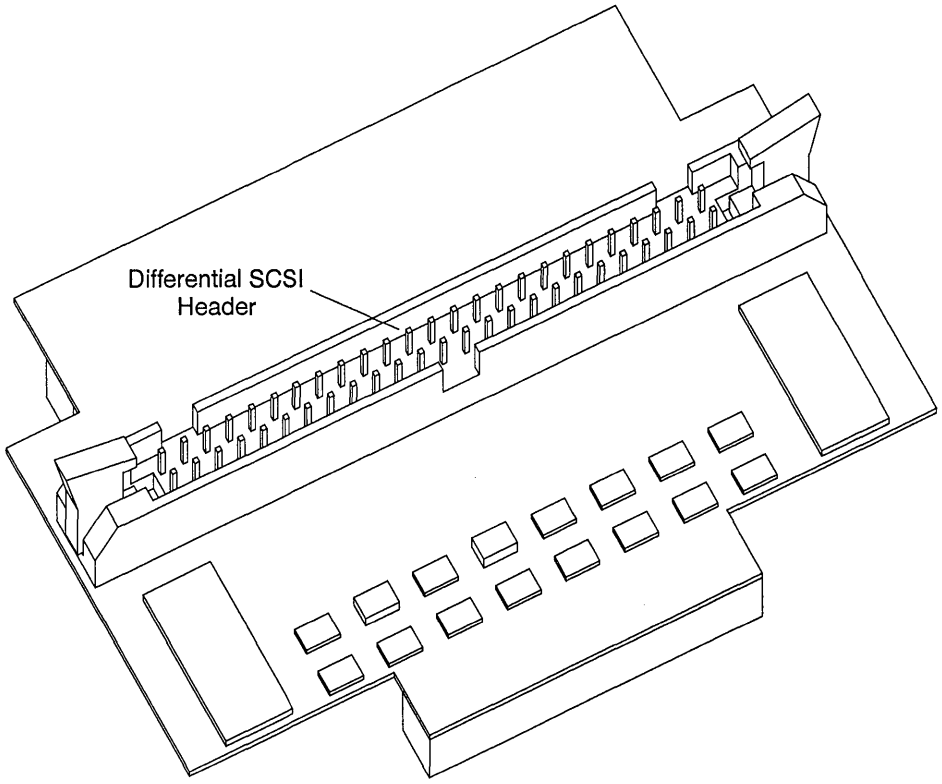
NOTE

To complete the configuration of a single-ended SCSI port, you must enter the Trident's command line interface and set the port's type to SCSI, as opposed to DSSI. SCSI is the default setting for a port, unless the port was configured for DSSI prior to shipment. The command line interface also makes it possible to configure other port parameters. See Chapter 2 for a discussion of the command line interface.

9.4.2 Differential SCSI Daughter Card

You may convert any of the Trident's single-ended SCSI ports to differential SCSI by installing a differential SCSI daughter card in that port. Figure 9–5 shows a differential SCSI daughter card.

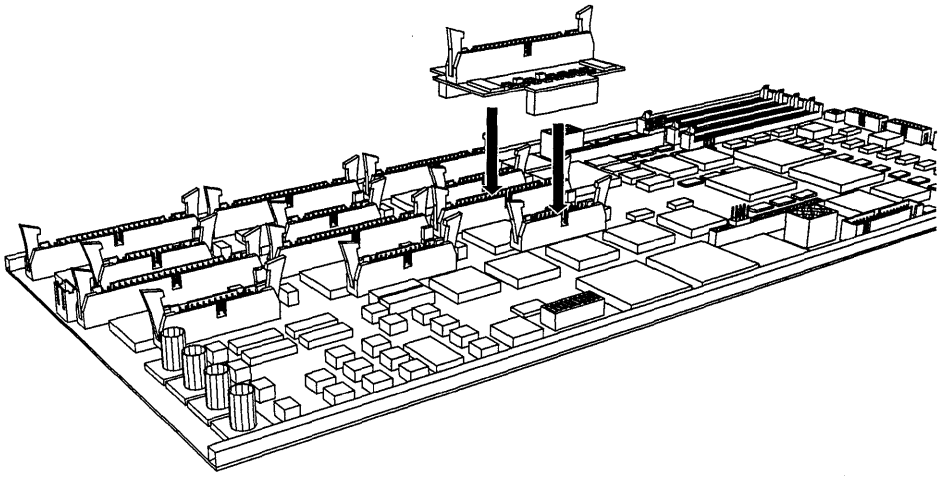
Figure 9–5: Differential Daughter Card



To install the differential daughter card, follow these steps:

❶ Insert the daughter card in the port. The daughter card has two connectors, the larger one goes in the single-ended SCSI connector and the smaller one goes in the daughter card header. Figure 9–6 shows a differential SCSI daughter card being installed in port 5.

Figure 9–6: Daughter Card Installation



❷ Once the daughter card is installed, connect a SCSI cable to the header on the daughter card. Be sure to terminate the bus with an external terminator designed for differential SCSI.

❸ If the port was previously configured for DSSI, use the command line interface to change the port's type to SCSI. See Chapter 2 and Chapter 3 for instructions on the command line interface. To set port 5 to SCSI, you would type . . .

```
SET PORT 5 /TYPE=SCSI
```

9.4.3 DSSI Daughter Card

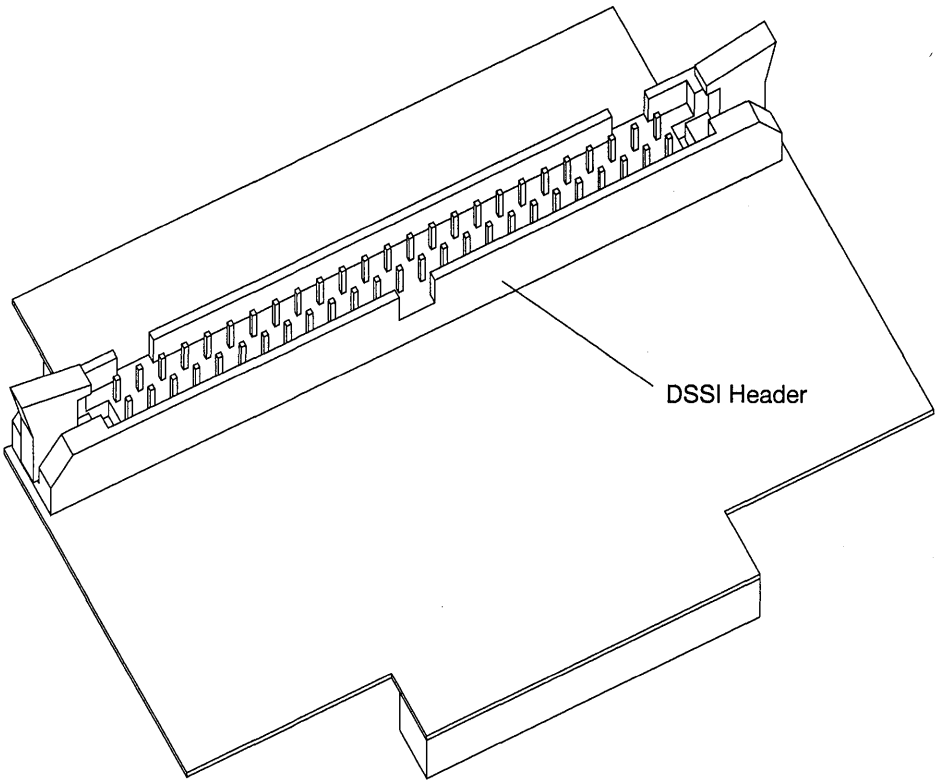
By installing a DSSI daughter card, you may convert port five or ports four and five from SCSI to DSSI, provided your Trident has been programmed with the appropriate DSSI license information. Figure 9–7 shows a DSSI daughter card.

To install the DSSI daughter card, take the following steps:

❶ Insert the DSSI daughter card as shown in Figure 9–6. The large connector on the daughter card plugs directly into the single-ended SCSI header on the Trident motherboard. The smaller connector on the daughter card plugs into the daughter card header on the motherboard.

❷ Connect a DSSI cable to the header on the DSSI daughter card. Replace the external SCSI terminator with an external DSSI terminator.

Figure 9–7: DSSI Daughter Card



NOTE

The Trident acts as a storage server on the DSSI bus and can communicate with hosts only. It is not designed to serve DSSI devices to the CI bus.

❸ Enter the command line interface and change the port's type from SCSI to DSSI. You may also use the command line interface to change the port's DSSI node ID, if necessary. See Chapter 2 and Chapter 3 for a discussion of the command line interface.

Chapter 10

Trident Service Information

10.1 Serial Port

The serial cable that comes with the Trident has a Modified Modular Jack (MMJ) plug at one end for connecting to the Trident enclosure and a DB-25 connector at the other end for connecting to any standard monitor. There are two serial ports on the Trident enclosure, one on the front and one on the back. Either may be used to gain access to the monitor utility.

Figure 10–1: Front Serial Port

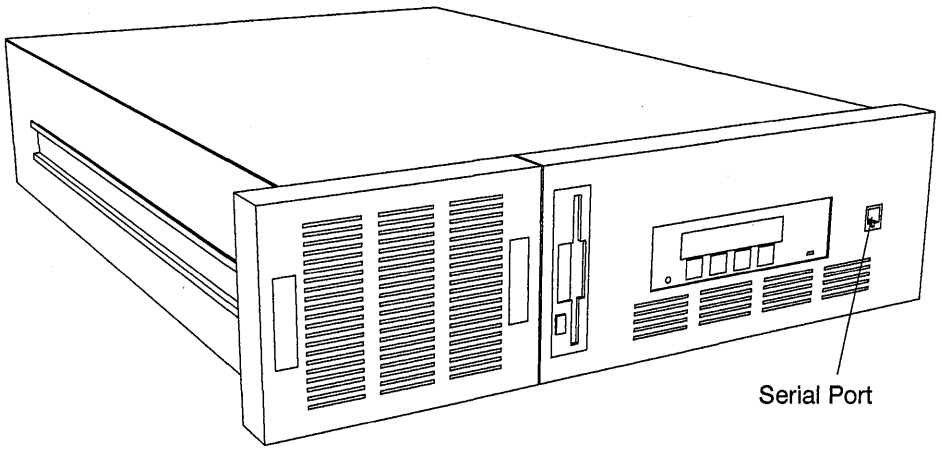
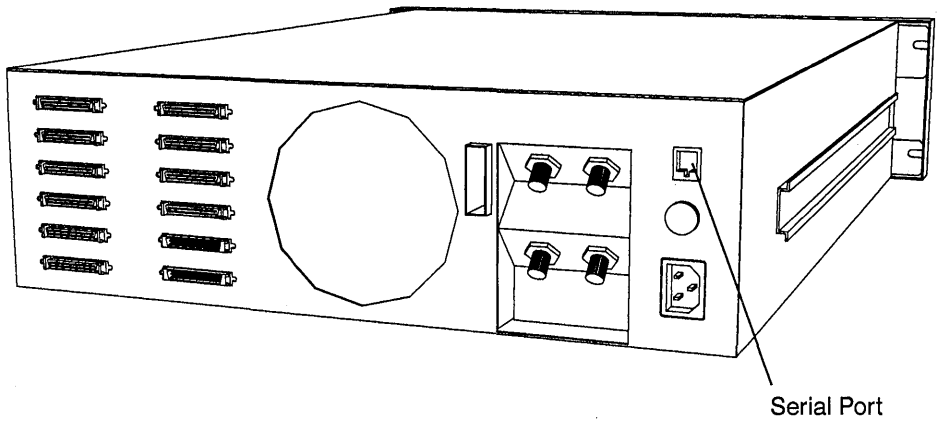


Figure 10–2: Rear Serial Port

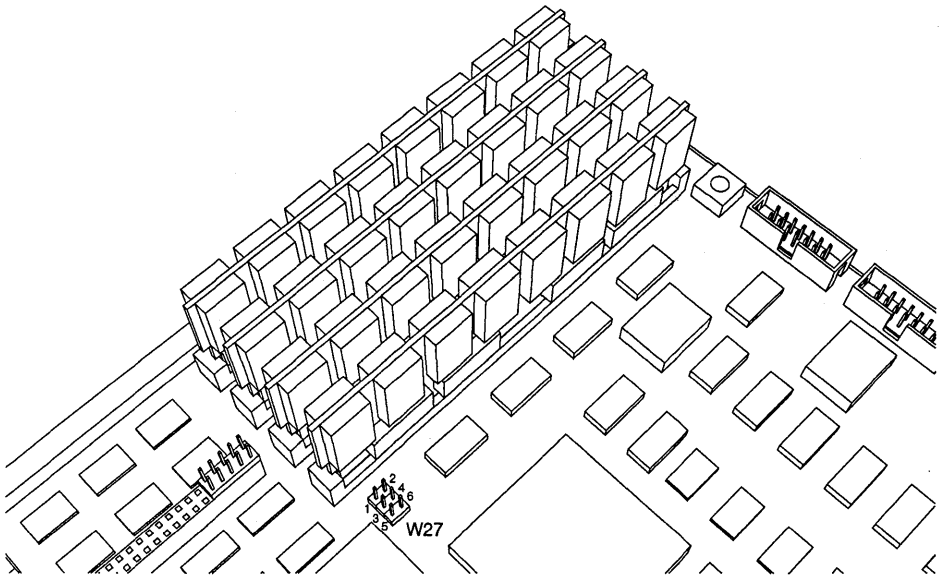


Set your terminal's communications parameters to 9600 baud, 8-bit data, 1-stop bit, no parity, jump scroll.

10.2 Cache Size

The Trident's cache accepts standard 36-bit, 72-pin, 70-nanosecond SIMMs. The connectors for the modules are located at J20 through J23. You may install four-, eight-, 16-, 32-, or 64-megabyte modules, as long as all modules are identical. Begin installing modules in J20 and work your way up to J23. There is no need to fill all four sockets. You may install one module, two modules, three modules or four modules. The Trident will accept 128-megabyte modules when they become available.

Figure 10–3: Cache Module Installation



Jumper W27 specifies the size of the individual modules installed in the cache. This should not be confused with the total size of the cache.

Table 10–1: Cache Module Size

Module Size	W27 (1-2)	W27 (3-4)	W27 (5-6)
4 MB	IN	IN	IN
8 MB	OUT	OUT	IN
16 MB	IN	OUT	OUT
32 MB	OUT	IN	OUT
64 MB	IN	IN	OUT
128 MB	OUT	OUT	OUT

10.3 EPROM Size

Jumpers W28 and W29 tell the Trident what size EPROM to look for in position U124. The "EPROM Size Selection" table shows the possible settings.

Figure 10–4: EPROM Size Jumpers

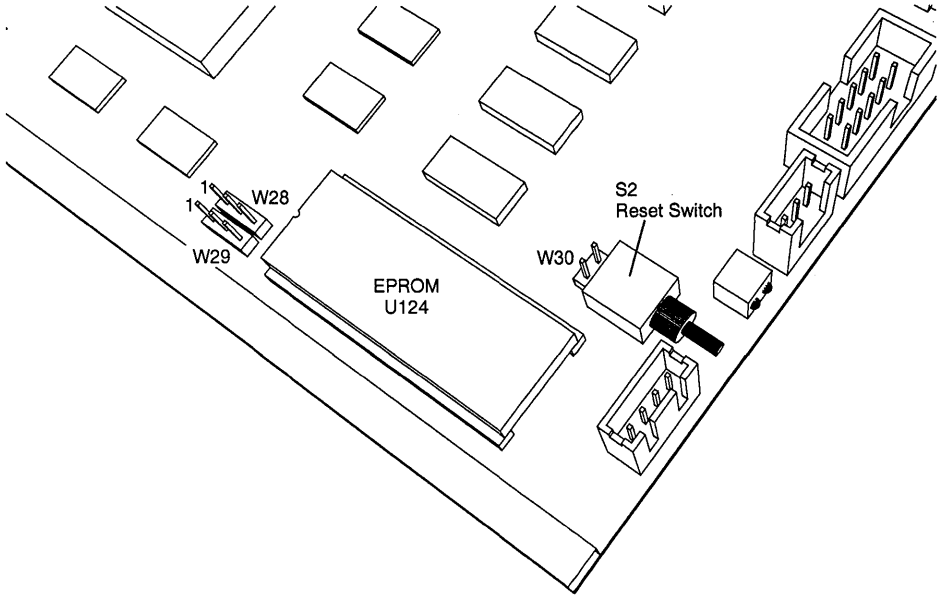


Table 10–2: EPROM Size Selection

EPROM Size	W28 (1-2)	W28 (2-3)	W29 (1-2)	W29 (2-3)
1 or 2 megabit[1]	OUT	IN	OUT	IN
4 megabit	IN	OUT	OUT	IN
8 megabit	IN	OUT	IN	OUT

[1]Default

10.3.1 Manual Reset

Pressing the button on the switch at S2, causes the board to reset without going through a power cycle. You may also force a reset by shorting the two pins at jumper W30.

10.3.2 Reserved Jumpers

The following jumpers are reserved and have no function at this time.

Table 10–3: Reserved Jumpers

Jumper (Pins)	Status	Jumper (Pins)	Status
W3 (1-2)	Reserved	W14 (1-2)	Reserved
W3 (3-4)	Reserved	W14 (3-4)	Reserved
W6 (1-2)	Reserved	W19 (1-2)	Reserved
W6 (3-4)	Reserved	W19 (3-4)	Reserved
W11 (1-2)	Reserved	W22 (1-2)	Reserved
W11 (3-4)	Reserved	W22 (3-4)	Reserved

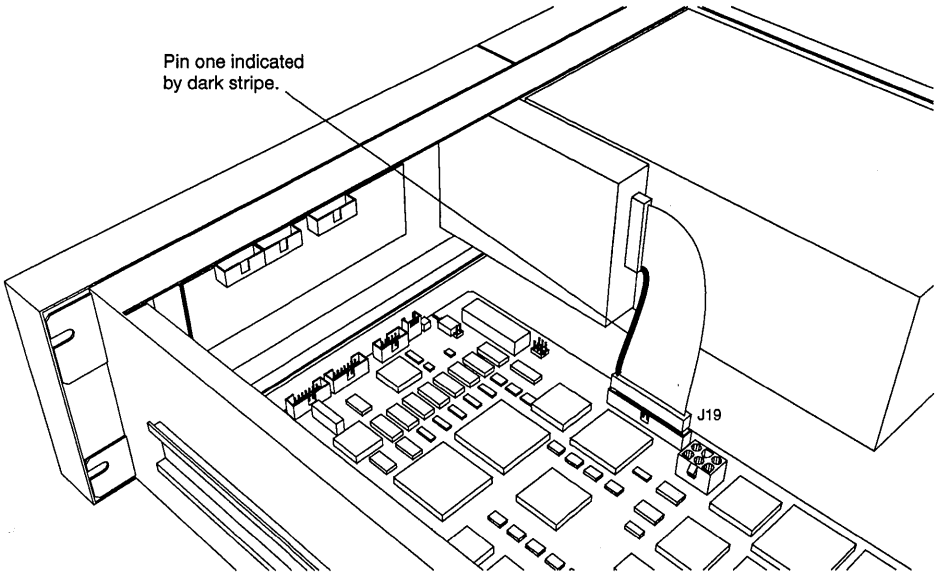
10.4 Connecting the Floppy Drive

The Trident uses a standard PC-compatible floppy disk drive to load firmware code and configuration information from a 3.5-inch, high-density diskette formatted by DOS . When your Trident is shipped, its floppy drive will be properly connected and ready for operation. If you later need to disconnect the floppy drive, please take the following steps.

❶ With power turned off, connect the floppy disk drive to the power supply.

❷ Connect the data cable to connector J19 on the Trident board. Be sure to properly align pin 1, as Figure 10–5 shows.

Figure 10–5: Floppy Installation

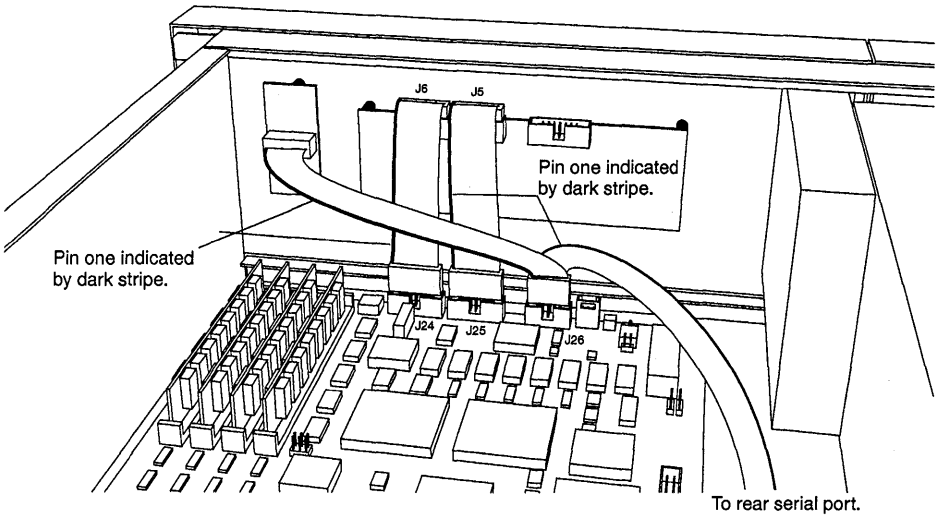


10.5 Internal Cabling

10.5.1 Front Panel

The front-panel display is connected to the Trident board by two cables. One cable runs from connector J5 on the back of the front panel to connector J24 on the Trident board. The other runs from connector J6 on the back of the front panel to connector J25 on the Trident. The pin-1 alignment of both cables is shown in Figure 10–6.

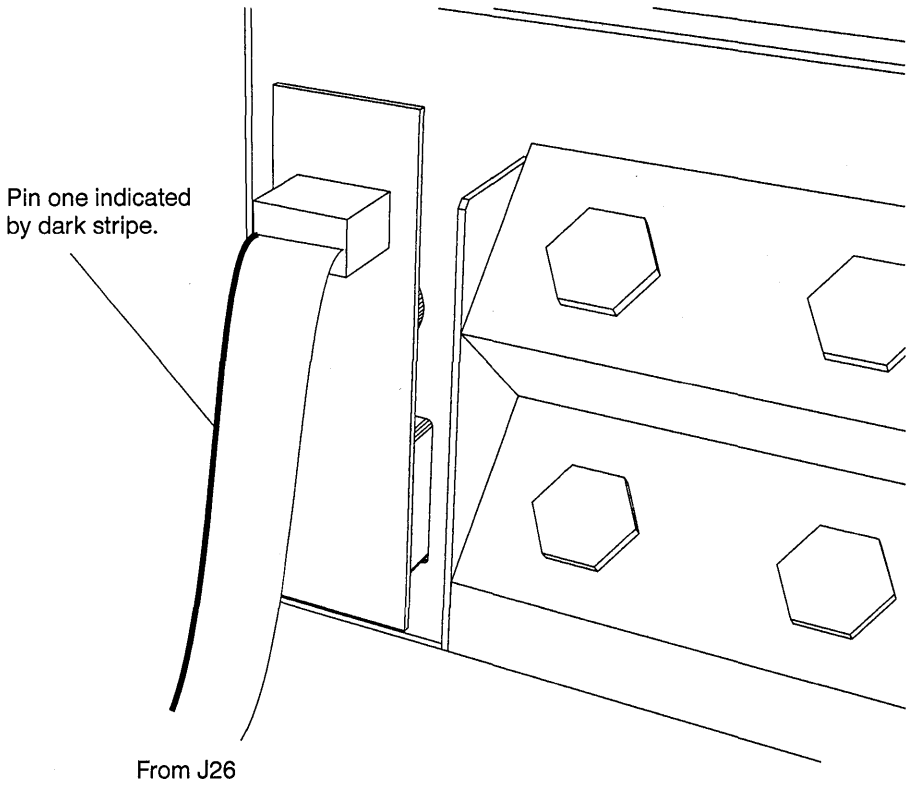
Figure 10–6: Connecting the Front Panel



10.5.2 Serial Port Connections

The Trident has two serial ports (one on the front and one on the back of the enclosure) for communicating with an external terminal. Figure 10–6 shows how to run a cable from the front port to connector J26 on the Trident board. This same cable branches at J26 and runs to the rear of the enclosure, where it attaches to the other serial port as shown in Figure 10–7.

Figure 10–7: Rear Serial Port Internal Connection



Part III

Hawk Installation

This part describes various Hawk controller installation issues.

Chapter 11

Hawk Specifications

The Hawk series comprises two products: the CSV-8000 and the CSV-8100. Both provide a means for CI-based VAX and AXP computer systems to share a common farm of SCSI devices. But while the CSV-8000 can transmit and receive over the CI only, the CSV-8100 can communicate over DSSI as well, enabling CI- and DSSI-based systems to share storage devices. This manual uses the name Hawk to refer to both the CSV-8000 and the CSV-8100, unless otherwise noted.

11.1 Hawk Features

The Hawk can control up to 42 SCSI devices·36 devices if you choose to use redundant Hawk servers. These devices can be redundant arrays of independent disks (RAID), solid state disks, disk drives, tape drives, CDROMs or optical devices. For a complete list of supported devices, call CMD Technology and request the "Qualified Peripherals List" for the Hawk.

The Hawk is fully compliant with Digital's mass storage protocols, MSCP and TMSCP . There is no need for additional software drivers or patches to your currently running systems.

For faster read performance, you may install up to 512 megabytes of cache memory, in the form of standard 72-pin SIMMs. The Hawk's firmware permits you to control which devices are to be cached.

The Hawk comes with a 3.5-inch high-density disk drive for loading firmware code and configuration information at bootup. You may obtain firmware upgrades from CMD Technology's BBS: set your modem to 8 data bits, 1 stop bit, no parity and dial (714) 454-1134 or (714) 454-0795 . The BBS supports up to 19200 baud. Use a DOS-based computer to transfer the file to the bootup diskette, reinsert the diskette in the Hawk and reboot. You may also use any ASCII editor to modify the Hawk's configuration file, which contains instructions for setting system and device parameters.

Utilities for formatting, qualifying and testing devices are available through the Diagnostics Utilty Protocol (DUP).

By connecting a monitor to the Hawk's dedicated RS232 port, you may view various displays designed to help you determine the controller's current status and configuration options at any given moment.

The Hawk's chassis is a standard 5.25" rack mount with dual power supplies and dual cooling fans for added reliability.

11.2 Specifications

Table 11–1: Hawk Technical Specifications

General	
Emulation	MSCP (DU) and TMSCP (MU)
Host Bus Interface	Digital CI (CSV-8000) Digital CI and DSSI (CSV-8100)
Peripheral Bus Interface	SCSI-1, SCSI-2, "Fast" SCSI-2
Maximum Cable Length	SCSI $\leq$5 MB/sec transfer rate: 6 meters (19.5 ft.) SCSI >5 MB/sec transfer rate: 3 meters (9.9 ft.) CI: 45 meters (147.65 ft.)
Maximum Hosts Supported	Up to 32
Connector Type	CI: Standard TNC CI connector DSSI (CSV-8100): Dual row 50-pin male Honda SCSI: Dual row 50-pin female Honda
Command Queuing	Commands from host: Up to 60 with seek optimization SCSI command tag queuing: Up to 64 commands per drive
Firmware Load Media	3.5" 1.44 MB high density diskette
User Interface	Dedicated RS232 console interface for setup, status monitoring and diagnostics
CI Host Connection Support	SC008 Star Coupler, CIXCD, CIBCA, CIBCI, CI750 and CI780
DSSI Host Connection Support (CSV-8100 only)	VAX 3300/3400, VAX 4000, AXP 4000, KFMSA and DEC 5400/5500
Operating System Support	VMS 5.4 and above OpenVMS AXP 1.5 and above OSF/1 1.5 and above

Table 11–1 (Cont.): Hawk Technical Specifications

Performance		
Maximum Sustained QIOs		
	Single Server	
	1 Block	2400 QIOs
	2 Blocks	2100 QIOs
	3 Blocks	1700 QIOs
	4 Blocks	1100 QIOs
	Dual server	
	1 Block	4800 QIOs
	2 Blocks	4350 QIOs
	3 Blocks	3500 QIOs
	4 Blocks	2200 QIOs
Environmental		
Temperature	Operational: 5° C to 50° C Non-operational: -40° C to +60° C	
Relative Humidity	Operational: 10% to 85% non-condensing Non-operational: 5% to 90% non-condensing	
Power Requirements		
Input Voltage	110 VAC to 240 VAC single phase, AutoRanging	
Input Frequency	50 to 60 cycle AC	
Input Current	2A @ 115 VAC (100 watts), 1A @ 230 VAC (110 watts)	
Physical		
Unit Size Hawk Controller Chassis	Standard 5.25" high rack mount 5.2" x 19" x 24.5" (HxWxD)	

Chapter 12

Hawk CI Setup

The procedure for configuring the Hawk's CI interface is identical to the procedure in Chapter 8, CI Setup.

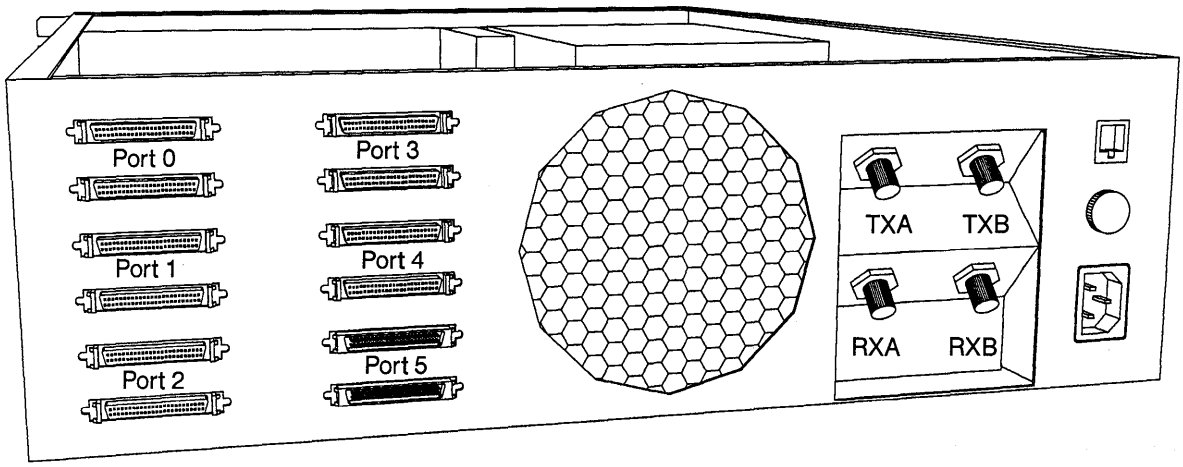
Chapter 13

Hawk DSSI-SCSI Ports

13.1 Cabling

The CSV-8000 comes with all ports configured for SCSI. The CSV-8100 comes with ports 0 through 4 configured for SCSI and port 5 configured for DSSI . The following illustration shows the placement of the port connectors on the back of the CSV-8100 enclosure (the CSV-8000 enclosure would have all SCSI ports). SCSI ports are always equipped with high-density female connectors, and the DSSI port is always equipped with high-density male connectors. Each port has an "IN" and an "OUT" connector.

Figure 13–1: Rear View of Hawk Enclosure



Hawk

For peak performance and reliability, it is essential that you use high-quality SCSI cables and keep total cable lengths on each SCSI bus within the recommendations in Table 13–1.

Table 13–1: Maximum Cable Lengths

Bus Type	Transfer Rate	Meters	Feet
Single-ended	≤5 MB/s	6	19.68
Single-ended	>5 MB/s	3	9.84
Differential	10 MB/s	25	82.02

13.2 Termination

CMD Technology recommends that you use external termination on all SCSI and DSSI buses connected to the Hawk. The Hawk comes with six external SCSI terminators. These should be plugged in to one end of each interconnect. Typically, this will mean that you should plug a terminator into either the "IN" or "OUT" connector of each port connector pair on the back of the enclosure.

The Hawk uses active termination for its SCSI buses. DSSI buses on the CSV-8100 use passive termination. For SCSI buses, you should terminate the other end of the bus with either an active terminator or some other form of high-quality terminator (such as FPT). For DSSI buses, terminate the other end of the bus with a passive DSSI terminator.

If you wish to use the Hawk's on-board termination, you will have to open the enclosure and configure the appropriate resistors and jumpers for each port. See Chapter 14 for detailed instructions.

13.2.1 Term Power

By default, the Hawk supplies term power on all ports. At least one device on any DSSI or SCSI interconnect must supply term power to the terminators. There is no harm in having more than one device supply term power. In fact, the ideal situation is to have the devices at each end of the interconnect supply term power.

If you wish to prevent the Hawk from supplying term power, you will have to open the enclosure and configure the appropriate jumpers for each port. See Chapter 14 for detailed instructions.

13.3 Cabling Example

See Figure 9–3, Cabling Example for an example of cabling a redundant pair of Trident controllers. The principles in this example also apply to the Hawk.

13.4 Modifying CSV-8100 Default Cabling

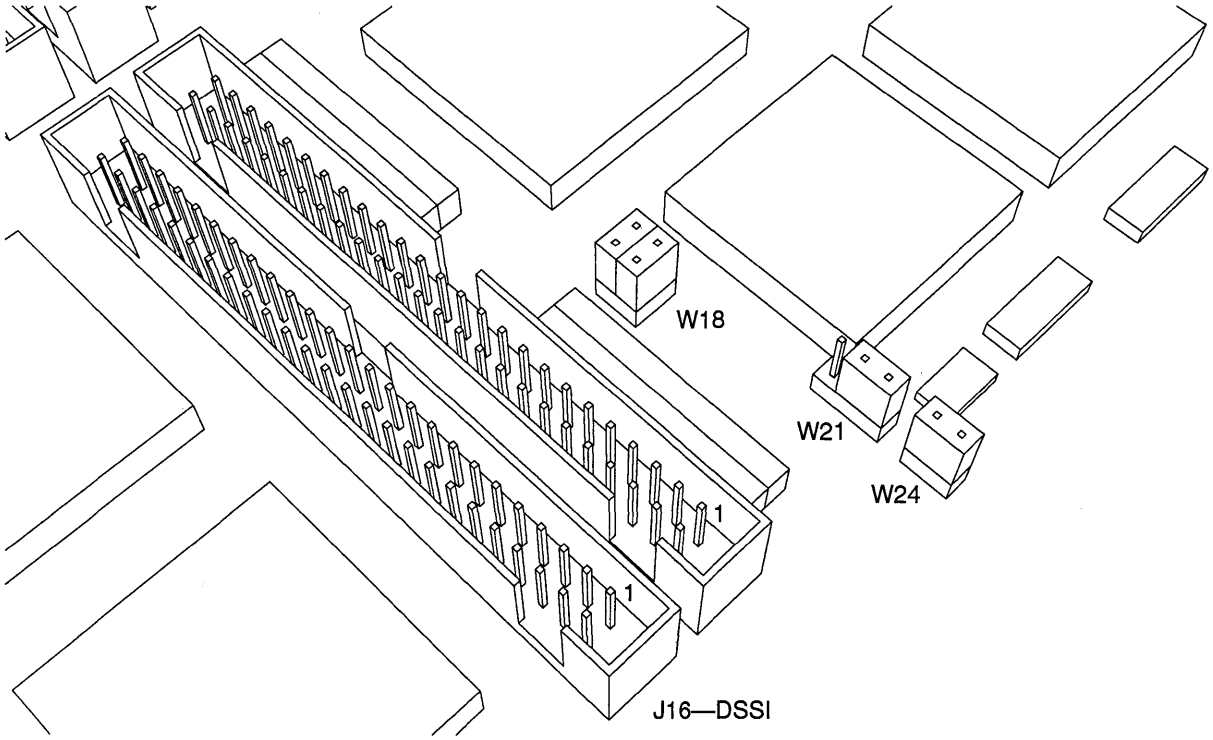
If you have no need for a DSSI port on the CSV-8100 and wish to have all SCSI ports, you may change port 5 from DSSI to SCSI. Likewise, if you need two DSSI ports, you may change port 4 from SCSI to DSSI. The next two sections explain how to make these changes.

13.4.1 Changing Port 5 from DSSI to SCSI

To change port 5 from DSSI to SCSI, remove the DSSI cable from connector J16 on the circuit board and unscrew the connectors for the cable from the back of the enclosure. Take the extra SCSI cable supplied with the CSV-8100 and attach the two high density connectors to the back of the enclosure. Plug the internal connector to J15 on the circuit board. Be sure to align pin one on the cable with pin one at J15.

If you have not changed the default jumper settings, the jumpers for port 5 should look like the following illustration. See Section 14.1.6 for a full description of the configuration options for Port 5.

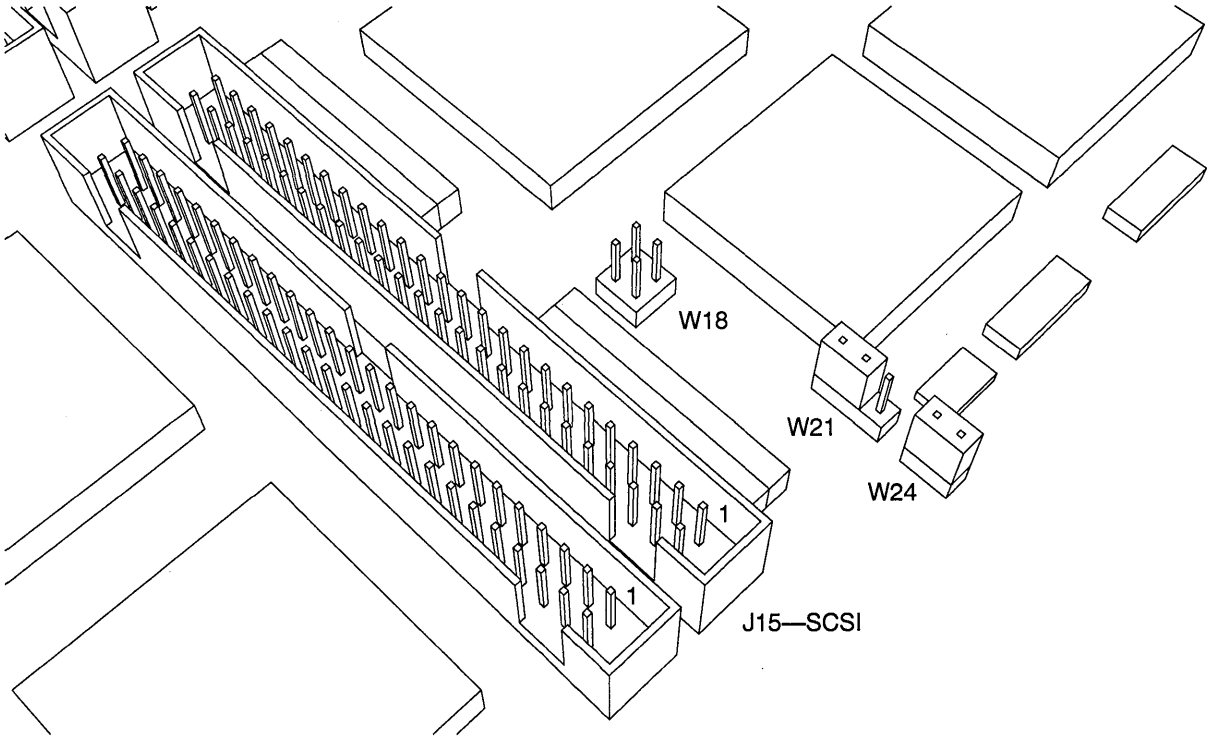
Figure 13–2: Port 5 Configured for DSSI



Hawk

You will need to change the shunt on jumper W21 from pins 2-3 to pins 1-2. This will direct term power to the SCSI connector J15. The two shunts on jumper W18 apply only to the DSSI connector J16. They have no effect on connector J15. You may leave them in or remove them at your option. After you have changed the jumpers, they should look like the following illustration.

Figure 13–3: Port 5 Configured for SCSI



Finally, you must configure the controller's firmware. Issue the following command through the command line interface.

```
NODE> SET PORT 5 /ENABLE/TYPE=SCSI/ID=7
```

NOTE

If you are configuring redundant Hawks, then you must set one of the Hawk's SCSI ID to 6. You would also need to set */POWER_ON_RESET* to "OFF."

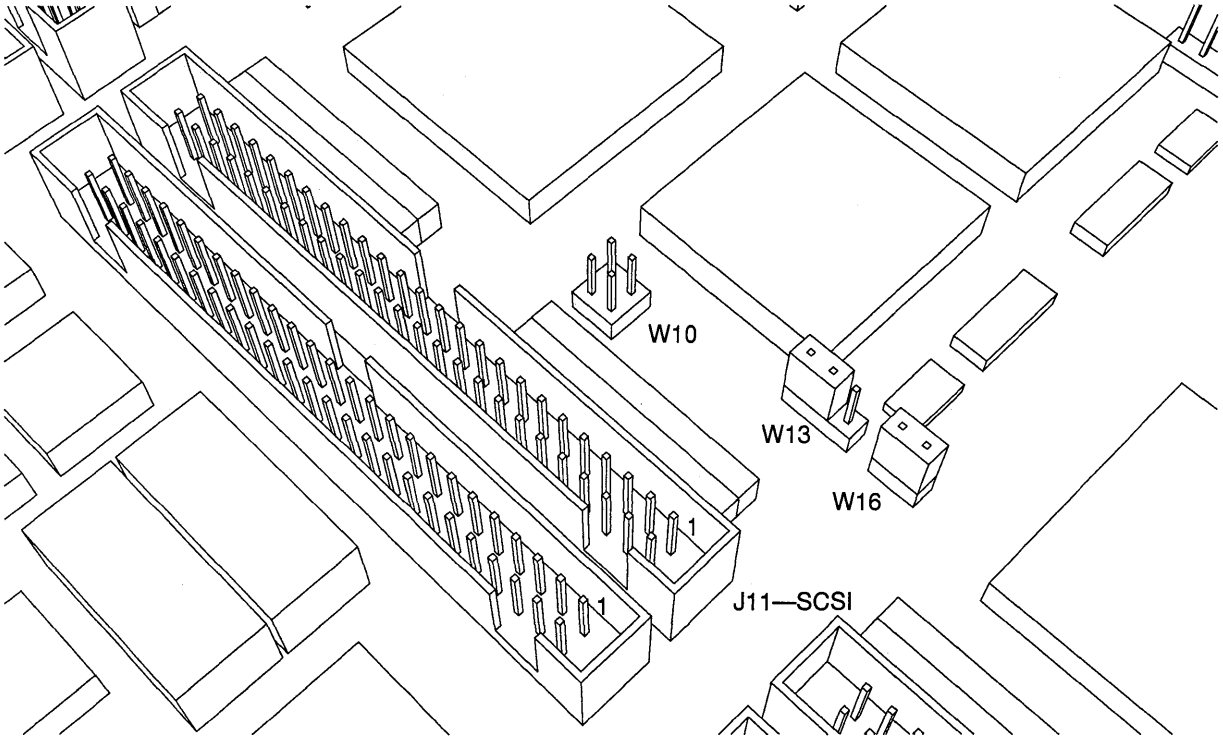
13.4.2 Changing Port 4 from SCSI to DSSI

Changing port 4 from SCSI to DSSI entails reversing the steps of the previous section-'except the jumper label numbers are different. In addition, CMD Technology does not provide an extra DSSI cable with the CSV-8100. If you need to add another DSSI port, you must purchase a set of internal DSSI cables from CMD.

Replace the SCSI cable with the DSSI cable you have obtained from CMD Technology. Insert the internal connector into the socket at J12 and secure the high-density connectors to the back of the enclosure.

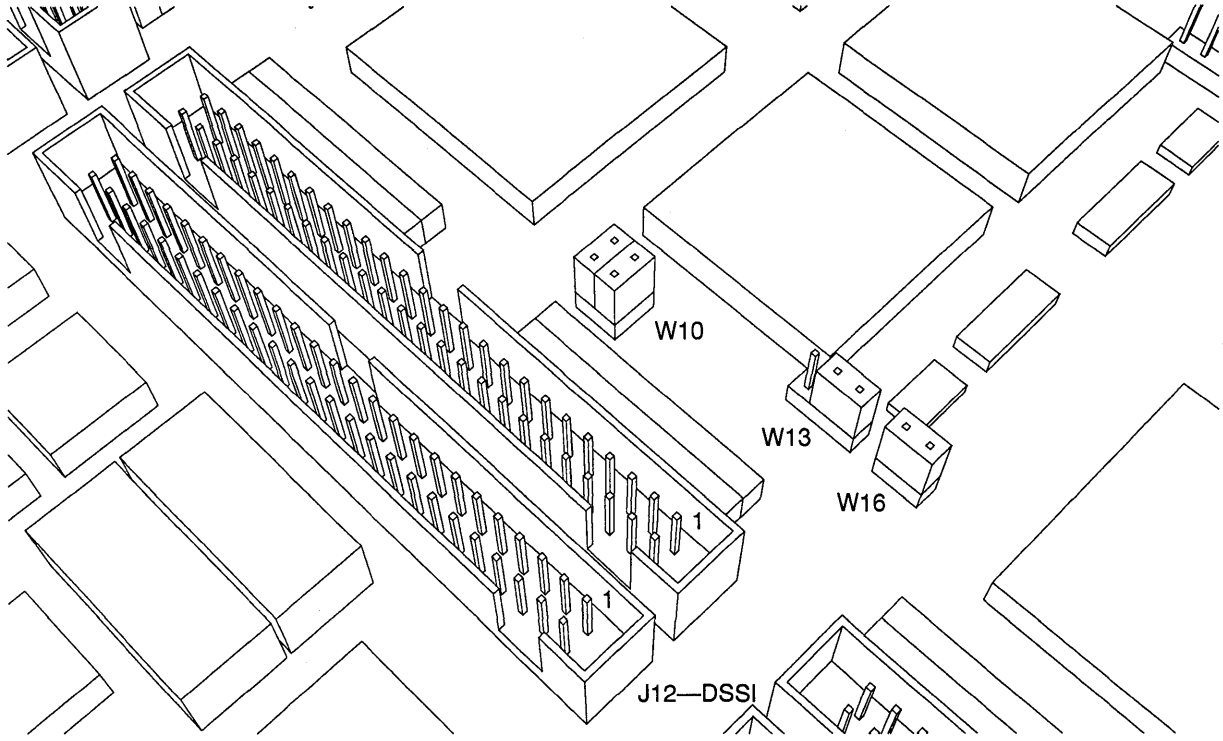
The following illustration shows the default jumper positioning for port 4 configured as a SCSI port. See Section 14.1.5, Port 4 for a full description of configuration options for Port 4.

Figure 13–4: Hawk Port 4 Configured for SCSI



To configure the port for DSSI, you must move the shunt at jumper W13 from pins 1-2 to 2-3. Additionally, install shunts on pins 1-2 and 3-4 of jumper W10. The following illustration shows what the jumpers should look like for a DSSI configuration.

Figure 13–5: Hawk Port 4 Configured for DSSI



Finally, you must configure the controller's firmware. Issue the following command through the command line interface.

```
NODE> SET PORT 4 /ENABLE/TYPE=DSSI/ID=7
```

NOTE

If you are configuring redundant Hawks, then you must set the DSSI Node ID of one of the Hawks to 6.

13.5 Bootup Floppy Diskette

Each time you power on or reset the Hawk, the board downloads its firmware and configuration data from the 3.5" DSHD boot up floppy diskette. The Hawk will not operate unless you have the boot up diskette inserted in the floppy drive integrated into the enclosure.

Chapter 14

Hawk Service Information

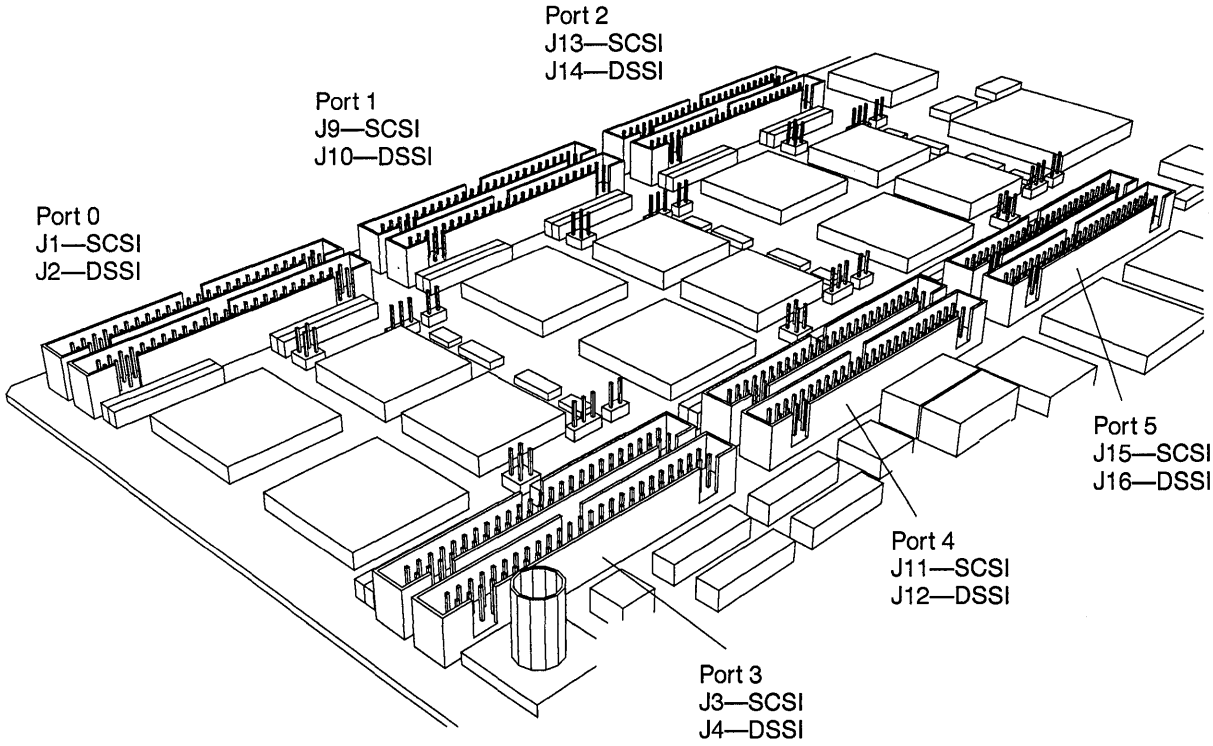
14.1 DSSI-SCSI Port Configuration

The Hawk has six SCSI ports. (On the CSV-8100 you may convert one or more of the SCSI ports to DSSI. The conversion instructions in this section apply only to the CSV-8100.) Additionally, you may configure each port for on-board or external termination.

NOTE

The *SET PORT* command governs other aspects of the Hawk's SCSI and DSSI ports, in addition to the parameters set by the jumpers described in this chapter.

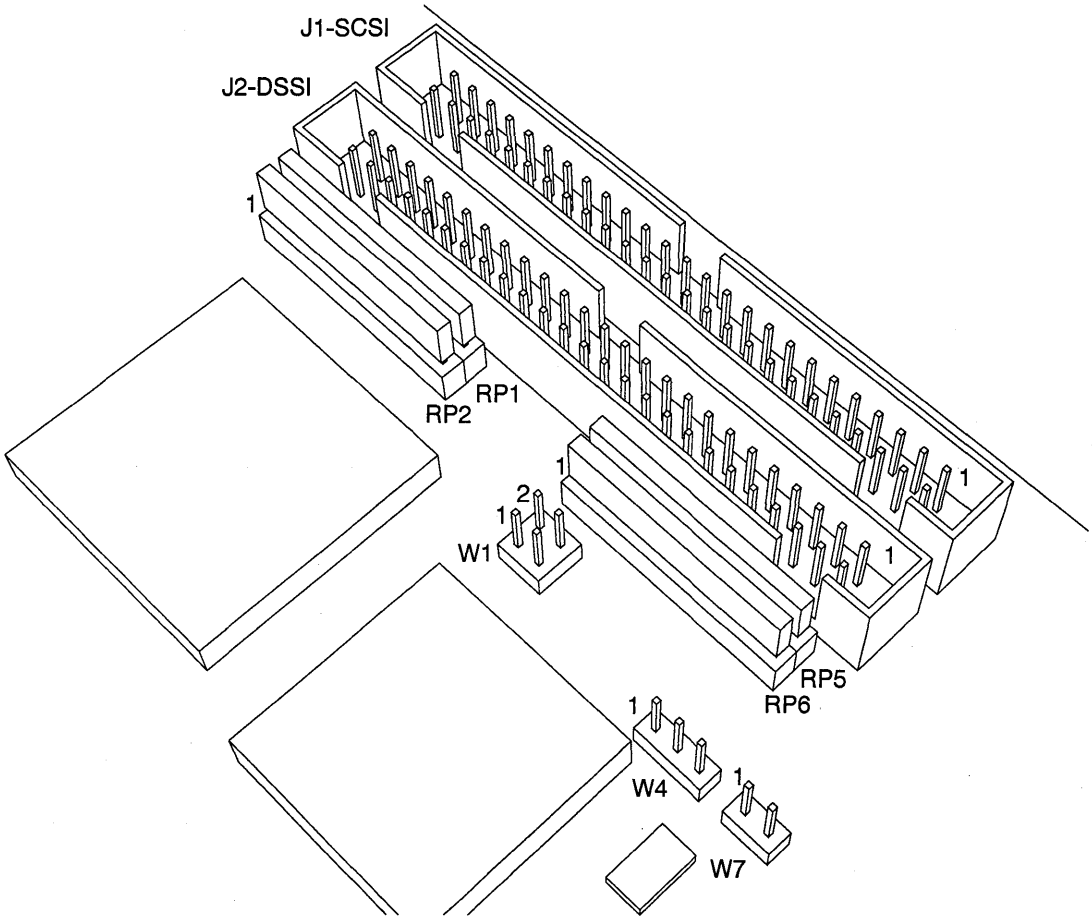
Figure 14–1: Hawk DSSI and SCSI Ports



14.1.1 Port 0

If you select DSSI as the interconnect for Port 0, you must use connector J2. If you select SCSI, use connector J1. If you wish to use on-board termination or disable term power from the Hawk, you must change the board's default settings (see below for instructions).

Figure 14–2: Hawk Port 0



14.1.1.1 Port 0 Termination

The Hawk's termination options vary according to whether you have selected DSSI or SCSI and whether you opt for on-board or external termination. The following tables will guide you through the various options.

Table 14–1: Hawk Port 0 SCSI Termination

On-Board Termination		External Termination	
Socket	**Status**	**Socket**	**Status**
RP1	110 ohm resistor installed	RP1	Empty
RP2	Empty	RP2	Empty
RP5	110 ohm resistor installed	RP5	Empty
RP6	Empty	RP6	Empty

If you use the Hawk's on-board termination, be sure to use active termination on the other end of the SCSI bus. Do not use passive termination. (You may use an alternative form of high-quality termination, such as force perfect termination, if you prefer.)

Table 14–2: Hawk Port 0 DSSI Termination

On-Board Termination			External Termination		
Part		**Status**	**Part**		**Status**
RP1	IN	120 ohm resistor installed	RP1	OUT	Empty
RP2	IN	270 ohm resistor installed	RP2	OUT	Empty
RP5	IN	120 ohm resistor installed	RP5	OUT	Empty
RP6	IN	270 ohm resistor installed	RP6	OUT	Empty
W1 (1-2)	OUT	On-board termination used	W1 (1-2)	IN	External termination used
W1 (3-4)	OUT	On-board termination used	W1 (3-4)	IN	External termination used

The CSV-8100 uses passive termination for DSSI.

14.1.1.2 Hawk Port 0 Term Power

At least one node on a SCSI or DSSI interconnect must supply term power. Ideally, the nodes at each end of the interconnect should supply term power. You may configure the Hawk to supply term power or not to supply term power. The following tables show how.

Table 14–3: Hawk Port 0 SCSI Term Power

Term Power Supplied			Term Power Not Supplied		
Jumper		**Status**	**Jumper**		**Status**
W4 (1-2)	IN	Term power directed to J1	W4 (1-2)		Not applicable
W7 (1-2)	IN	Term power supplied	W7 (1-2)	OUT	Term power not supplied

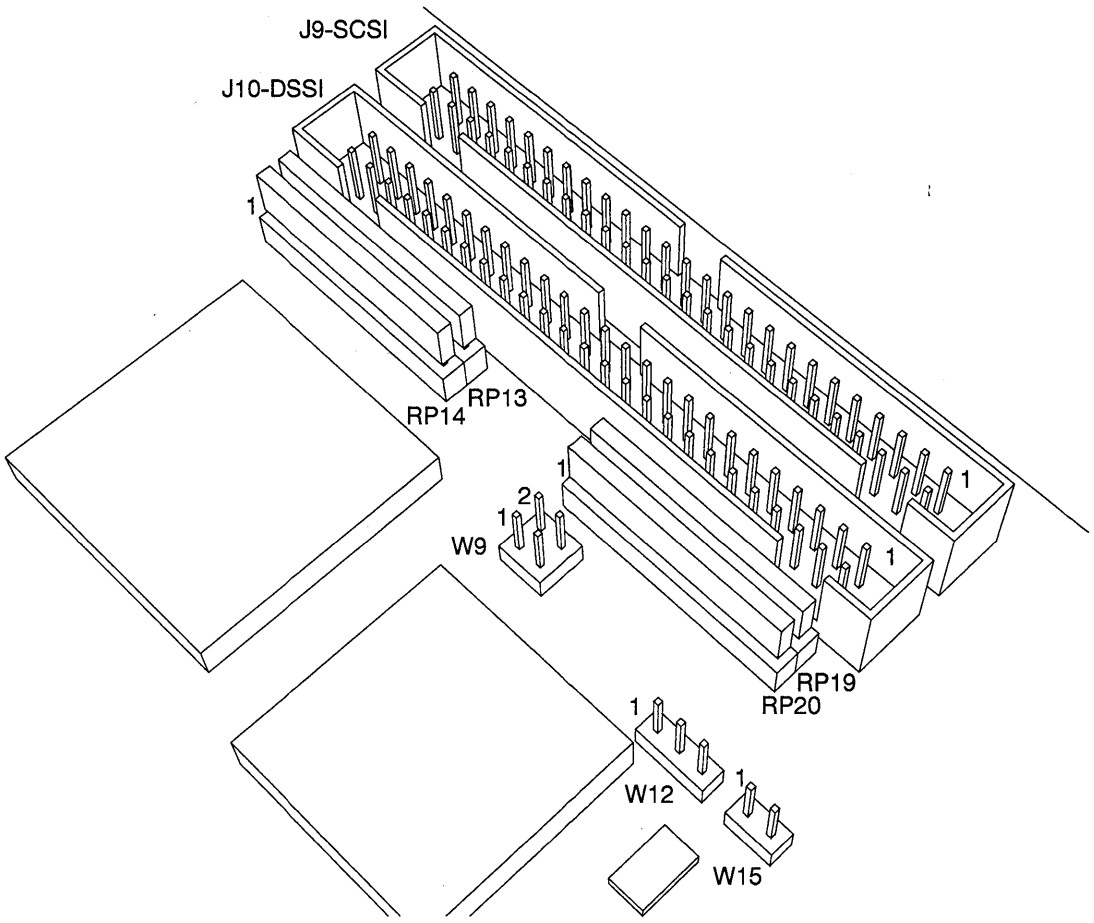
Table 14–4: Hawk Port 0 DSSI Term Power

Term Power Supplied			Term Power Not Supplied		
Jumper		**Status**	**Jumper**		**Status**
W4 (2-3)	IN	Term power directed to J2	W4 (2-3)		Not applicable
W7 (1-2)	IN	Term power supplied	W7 (1-2)	OUT	Term power not supplied

14.1.2 Port 1

If you select DSSI as the interconnect, you must use connector J10. If you select SCSI, use connector J9. If you wish to use on-board termination or disable term power from the Hawk, you must change the board's default settings.

Figure 14–3: Hawk Port 1



14.1.2.1 Port 1 Termination

The Hawk's termination options vary according to whether you have selected DSSI or SCSI and whether you opt for on-board or external termination. The following tables will guide you through the various options.

Table 14–5: Port 1 SCSI Termination

On-Board Termination		External Termination	
Socket	**Status**	**Socket**	**Status**
RP13	110 ohm resistor installed	RP13	Empty
RP14	Empty	RP14	Empty
RP19	110 ohm resistor installed	RP19	Empty
RP20	Empty	RP20	Empty

If you use the Hawk's on-board termination, be sure to use active termination on the other end of the SCSI bus. Do not use passive termination. (You may use an alternative form of high-quality termination, such as force perfect termination, if you prefer.)

Table 14–6: Port 1 DSSI Termination

On-Board Termination			External Termination		
Part		**Status**	**Part**		**Status**
RP13	IN	120 ohm resistor installed	RP13	OUT	Empty
RP14	IN	270 ohm resistor installed	RP14	OUT	Empty
RP19	IN	120 ohm resistor installed	RP19	OUT	Empty
RP20	IN	270 ohm resistor installed	RP20	OUT	Empty
W9 (1-2)	OUT	On-board termination used	W9 (1-2)	IN	External termination used
W9 (3-4)	OUT	On-board termination used	W9 (3-4)	IN	External termination used

The CSV-8100 uses passive termination for DSSI.

14.1.2.2 Port 1 Term Power

At least one node on a SCSI or DSSI interconnect must supply term power. Ideally, the nodes at each end of the interconnect should supply term power. You may configure the Hawk to supply term power or not to supply term power. The following tables show how.

Table 14–7: Hawk Port 1 SCSI Term Power

Term Power Supplied			Term Power Not Supplied		
Jumper		**Status**	**Jumper**		**Status**
W12 (1-2)	IN	Term power directed to J9	W12 (1-2)		Not applicable
W15 (1-2)	IN	Term power supplied	W15 (1-2)	OUT	Term power not supplied

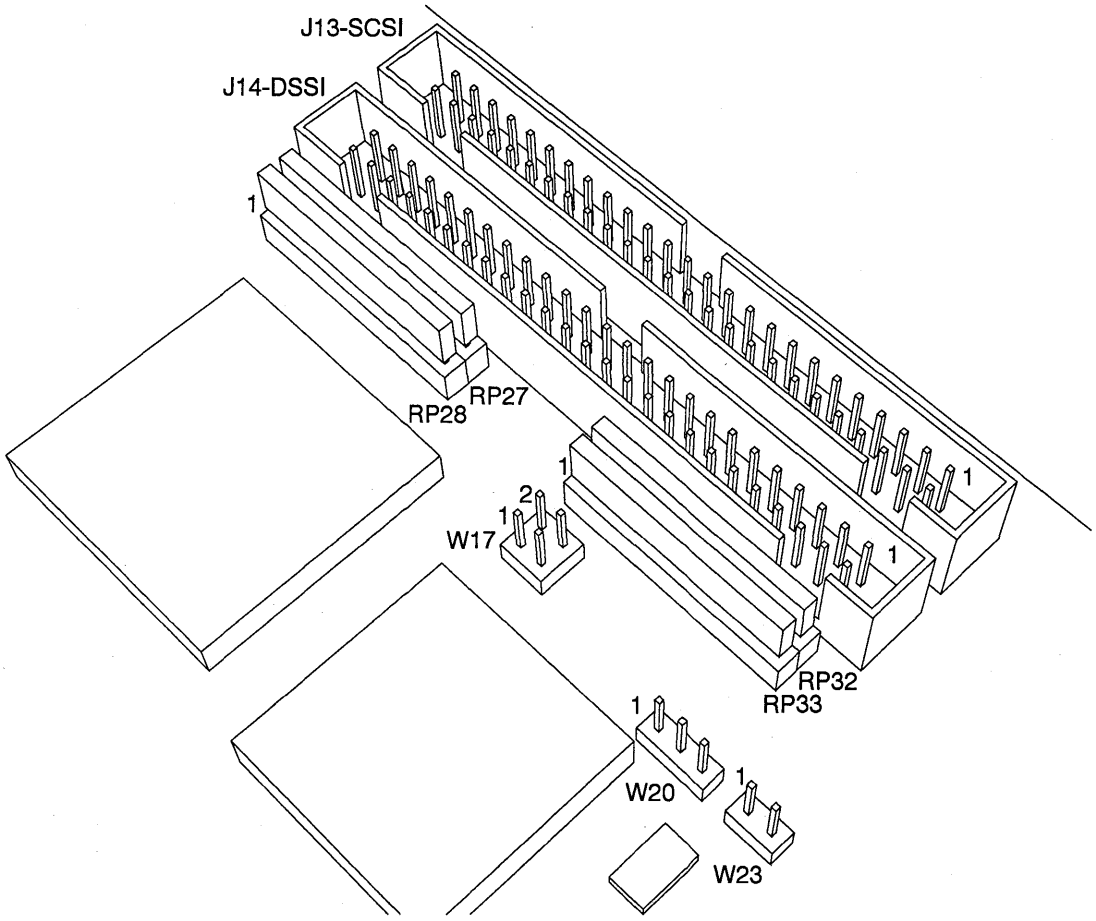
Table 14–8: Hawk Port 1 DSSI Term Power

Term Power Supplied			Term Power Not Supplied		
Jumper		**Status**	**Jumper**		**Status**
W12 (2-3)	IN	Term power directed to J10	W12 (2-3)		Not applicable
W15 (1-2)	IN	Term power supplied	W15 (1-2)	OUT	Term power not supplied

14.1.3 Port 2

If you select DSSI as the interconnect, you must use connector J14. If you select SCSI, use connector J13. If you wish to use on-board termination or disable term power from the Hawk, you must change the board's default settings.

Figure 14–4: Hawk Port 2



14.1.3.1 Port 2 Termination

The Hawk's termination options vary according to whether you have selected DSSI or SCSI and whether you opt for on-board or external termination. The following tables will guide you through the various options.

Table 14–9: Hawk Port 2 SCSI Termination

On-Board Termination		External Termination	
Socket	**Status**	**Socket**	**Status**
RP27	110 ohm resistor installed	RP27	Empty
RP28	Empty	RP28	Empty
RP32	110 ohm resistor installed	RP32	Empty
RP33	Empty	RP33	Empty

If you use the Hawk's on-board termination, be sure to use active termination on the other end of the SCSI bus. Do not use passive termination. (You may use an alternative form of high-quality termination, such as force perfect termination, if you prefer.)

Table 14–10: Hawk Port 2 DSSI Termination

On-Board Termination			External Termination		
Part		**Status**	**Part**		**Status**
RP27	IN	120 ohm resistor installed	RP27	OUT	Empty
RP28	IN	270 ohm resistor installed	RP28	OUT	Empty
RP32	IN	120 ohm resistor installed	RP32	OUT	Empty
RP33	IN	270 ohm resistor installed	RP33	OUT	Empty
W17 (1-2)	OUT	On-board termination used	W17 (1-2)	IN	External termination used
W17 (3-4)	OUT	On-board termination used	W17 (3-4)	IN	External termination used

The CSV-8100 uses passive termination for DSSI.

14.1.3.2 Port 2 Term Power

At least one node on a SCSI or DSSI interconnect must supply term power. Ideally, the nodes at each end of the interconnect should supply term power. You may configure the Hawk to supply term power or not to supply term power. The following tables show how.

Table 14–11: Hawk Port 2 SCSI Term Power

Term Power Supplied			Term Power Not Supplied		
Jumper		**Status**	**Jumper**		**Status**
W20 (1-2)	IN	Term power directed to J13	W20 (1-2)		Not applicable
W23 (1-2)	IN	Term power supplied	W23 (1-2)	OUT	Term power not supplied

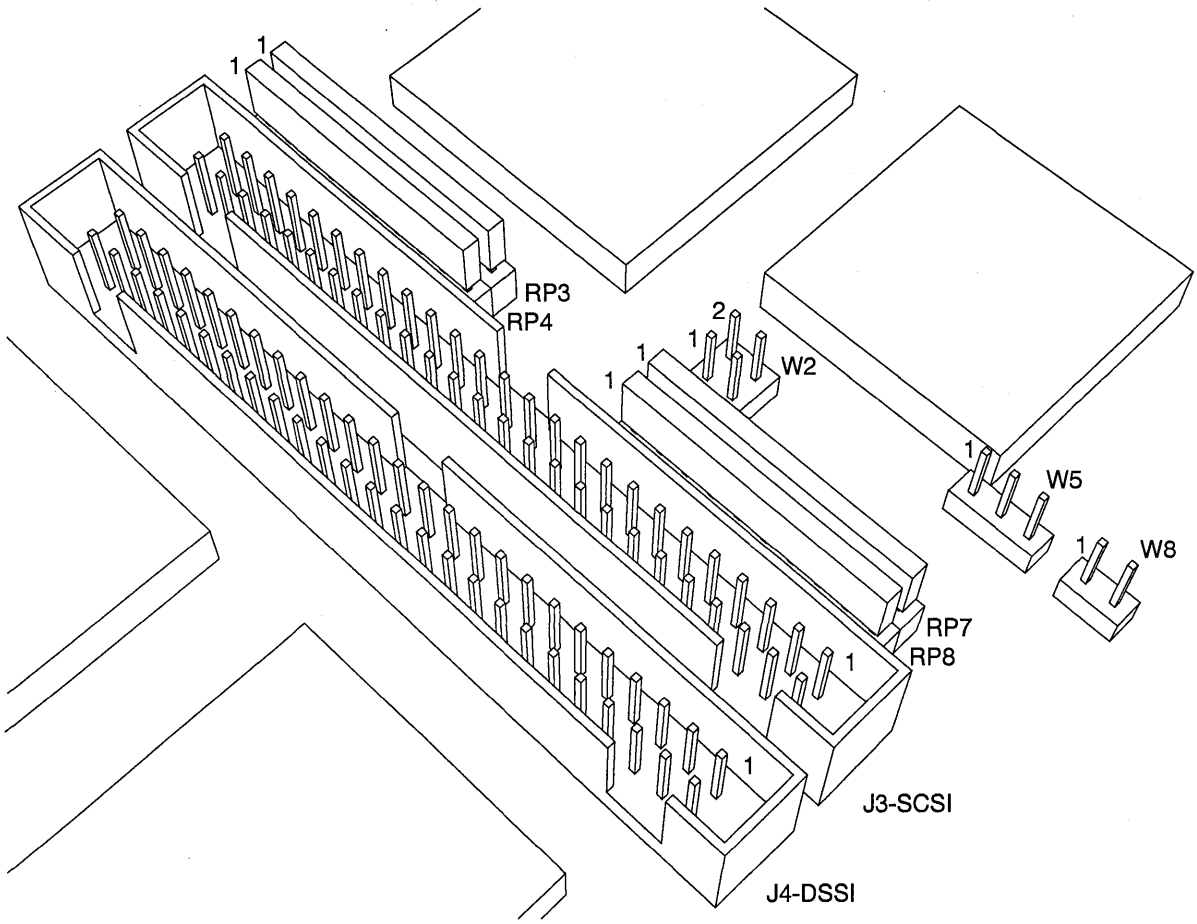
Table 14–12: Hawk Port 2 DSSI Term Power

Term Power Supplied			Term Power Not Supplied		
Jumper		**Status**	**Jumper**		**Status**
W20 (2-3)	IN	Term power directed to J14	W20 (2-3)		Not applicable
W23 (1-2)	IN	Term power supplied	W23 (1-2)	OUT	Term power not supplied

14.1.4 Port 3

If you select DSSI as the interconnect, you must use connector J4. If you select SCSI, use connector J3. If you wish to use on-board termination or disable term power from the Hawk, you must change the board's default settings.

Figure 14–5: Hawk Port 3



14.1.4.1 Port 3 Termination

The Hawk's termination options vary according to whether you have selected DSSI or SCSI and whether you opt for on-board or external termination. The following tables will guide you through the various options.

Table 14–13: Hawk Port 3 SCSI Termination

On-Board Termination		External Termination	
Socket	**Status**	**Socket**	**Status**
RP3	Empty	RP3	Empty
RP4	110 ohm resistor installed	RP4	Empty
RP7	Empty	RP7	Empty
RP8	110 ohm resistor installed	RP8	Empty

If you use the Hawk's on-board termination, be sure to use active termination on the other end of the SCSI bus. Do not use passive termination. (You may use an alternative form of high-quality termination, such as force perfect termination, if you prefer.)

Table 14–14: Hawk Port 3 DSSI Termination

On-Board Termination			External Termination		
Part		**Status**	**Part**		**Status**
RP3	IN	270 ohm resistor installed	RP3	OUT	Empty
RP4	IN	120 ohm resistor installed	RP4	OUT	Empty
RP7	IN	270 ohm resistor installed	RP7	OUT	Empty
RP8	IN	120 ohm resistor installed	RP8	OUT	Empty
W2 (1-2)	OUT	On-board termination used	W2 (1-2)	IN	External termination used
W2 (3-4)	OUT	On-board termination used	W2 (3-4)	IN	External termination used

The CSV-8100 uses passive termination for DSSI.

14.1.4.2 Port 3 Term Power

At least one node on a SCSI or DSSI interconnect must supply term power. Ideally, the nodes at each end of the interconnect should supply term power. You may configure the Hawk to supply term power or not to supply term power. The following tables show how.

Table 14–15: Hawk Port 3 SCSI Term Power

Term Power Supplied			Term Power Not Supplied		
Jumper		**Status**	**Jumper**		**Status**
W5 (1-2)	IN	Term power directed to J3	W5 (1-2)		Not applicable
W8 (1-2)	IN	Term power supplied	W8 (1-2)	OUT	Term power not supplied

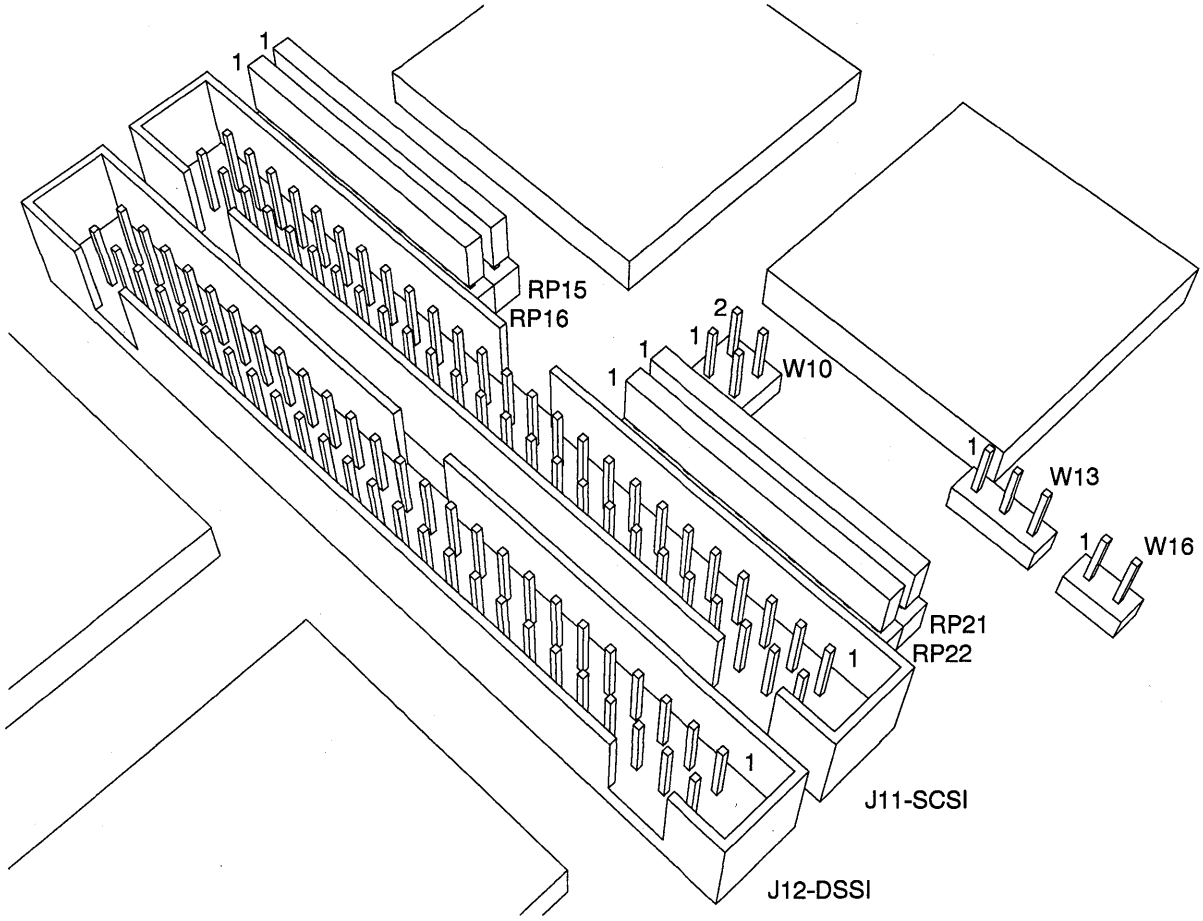
Table 14–16: Hawk Port 3 DSSI Term Power

Term Power Supplied			Term Power Not Supplied		
Jumper		**Status**	**Jumper**		**Status**
W5 (2-3)	IN	Term power directed to J4	W5 (2-3)		Not applicable
W8 (1-2)	IN	Term power supplied	W8 (1-2)	OUT	Term power not supplied

14.1.5 Port 4

If you select DSSI as the interconnect, you must use connector J12. If you select SCSI, use connector J11. If you wish to use on-board termination or disable term power from the Hawk, you must change the board's default settings.

Figure 14–6: Hawk Port 4



14.1.5.1 Port 4 Termination

The Hawk's termination options vary according to whether you have selected DSSI or SCSI and whether you opt for on-board or external termination. The following tables will guide you through the various options.

Table 14–17: Hawk Port 4 SCSI Termination

On-Board Termination		External Termination	
Socket	**Status**	**Socket**	**Status**
RP15	Empty	RP15	Empty
RP16	110 ohm resistor installed	RP16	Empty
RP21	Empty	RP21	Empty
RP22	110 ohm resistor installed	RP22	Empty

If you use the Hawk's on-board termination, be sure to use active termination on the other end of the SCSI bus. Do not use passive termination. (You may use an alternative form of high-quality termination, such as force perfect termination, if you prefer.)

Table 14–18: Hawk Port 4 DSSI Termination

On-Board Termination			External Termination		
Part		**Status**	**Part**		**Status**
RP15	IN	270 ohm resistor installed	RP15	OUT	Empty
RP16	IN	120 ohm resistor installed	RP16	OUT	Empty
RP21	IN	270 ohm resistor installed	RP21	OUT	Empty
RP22	IN	120 ohm resistor installed	RP22	OUT	Empty
W10 (1-2)	OUT	On-board termination used	W10 (1-2)	IN	External termination used
W10 (3-4)	OUT	On-board termination used	W10 (3-4)	IN	External termination used

The CSV-8100 uses passive termination for DSSI.

14.1.5.2 Port 4 Term Power

At least one node on a SCSI or DSSI interconnect must supply term power. Ideally, the nodes at each end of the interconnect should supply term power. You may configure the Hawk to supply term power or not to supply term power. The following tables show how.

Table 14–19: Hawk Port 4 SCSI Term Power

Term Power Supplied			Term Power Not Supplied		
Jumper		**Status**	**Jumper**		**Status**
W13 (1-2)	IN	Term power directed to J11	W13 (1-2)		Not applicable
W16 (1-2)	IN	Term power supplied	W16 (1-2)	OUT	Term power not supplied

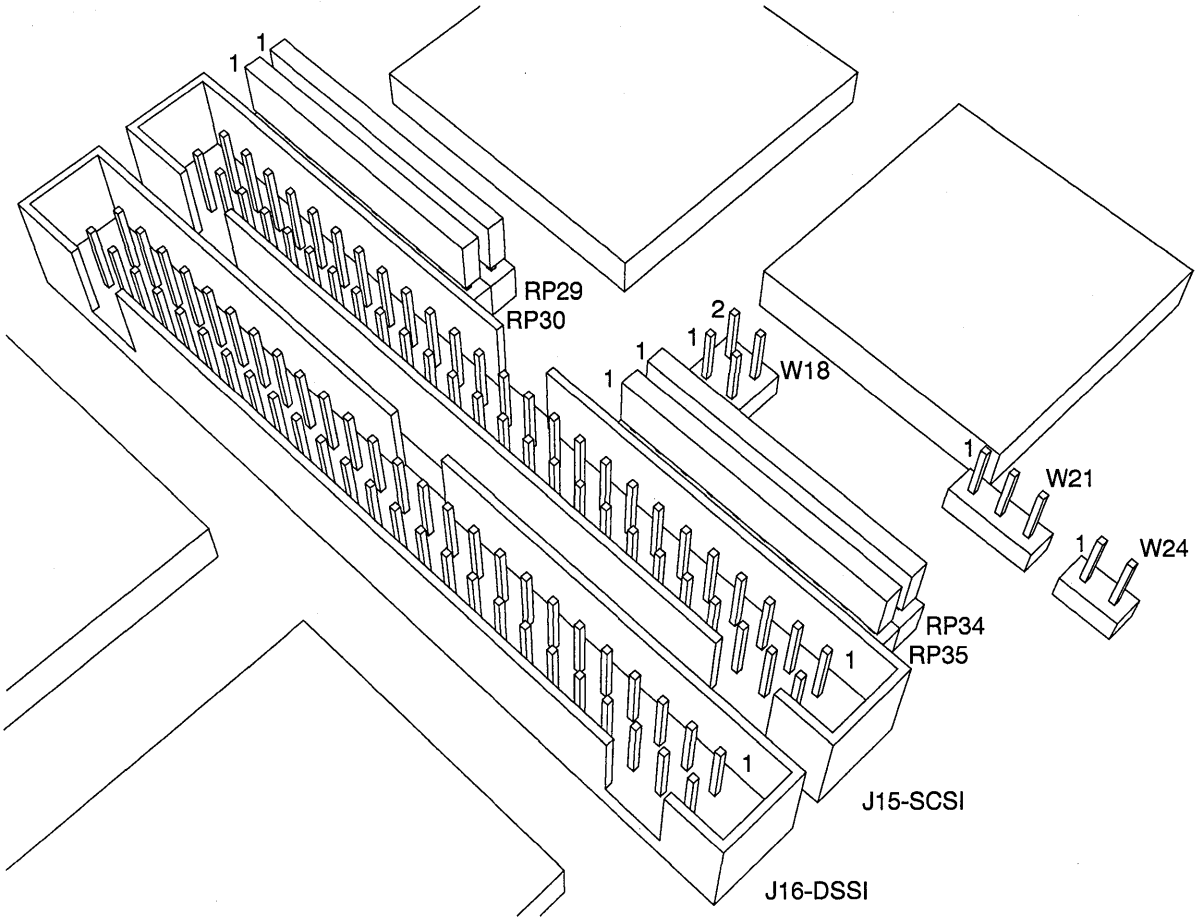
Table 14–20: Hawk Port 4 DSSI Term Power

Term Power Supplied			Term Power Not Supplied		
Jumper		**Status**	**Jumper**		**Status**
W13 (2-3)	IN	Term power directed to J12	W13 (2-3)		Not applicable
W16 (1-2)	IN	Term power supplied	W16 (1-2)	OUT	Term power not supplied

14.1.6 Port 5

If you select DSSI as the interconnect, you must use connector J16. If you select SCSI, use connector J15. If you wish to use on-board termination or disable term power from the Hawk, you must change the board's default settings.

Figure 14–7: Hawk Port 5



14.1.6.1 Port 5 Termination

The Hawk's termination options vary according to whether you have selected DSSI or SCSI and whether you opt for on-board or external termination. The following tables will guide you through the various options.

Table 14–21: Hawk Port 5 SCSI Termination

On-Board Termination		External Termination	
Socket	**Status**	**Socket**	**Status**
RP29	Empty	RP29	Empty
RP30	110 ohm resistor installed	RP30	Empty
RP34	Empty	RP34	Empty
RP35	110 ohm resistor installed	RP35	Empty

If you use the Hawk's on-board termination, be sure to use active termination on the other end of the SCSI bus. Do not use passive termination. (You may use an alternative form of high-quality termination, such as force perfect termination, if you prefer.)

Table 14–22: Hawk Port 5 DSSI Termination

On-Board Termination			External Termination		
Part		**Status**	**Part**		**Status**
RP29	IN	270 ohm resistor installed	RP29	OUT	Empty
RP30	IN	120 ohm resistor installed	RP30	OUT	Empty
RP34	IN	270 ohm resistor installed	RP34	OUT	Empty
RP35	IN	120 ohm resistor installed	RP35	OUT	Empty
W18 (1-2)	OUT	On-board termination used	W18 (1-2)	IN	External termination used
W18 (3-4)	OUT	On-board termination used	W18 (3-4)	IN	External termination used

The CSV-8100 uses passive termination for DSSI.

14.1.6.2 Port 5 Term Power

At least one node on a SCSI or DSSI interconnect must supply term power. Ideally, the nodes at each end of the interconnect should supply term power. You may configure the Hawk to supply term power or not to supply term power. The following tables show how.

Table 14–23: Hawk Port 5 SCSI Term Power

Term Power Supplied			Term Power Not Supplied		
Jumper		**Status**	**Jumper**		**Status**
W21 (1-2)	IN	Term power directed to J15	W21 (1-2)		Not applicable
W24 (1-2)	IN	Term power supplied	W24 (1-2)	OUT	Term power not supplied

Table 14–24: Hawk Port 5 DSSI Term Power

Term Power Supplied			Term Power Not Supplied		
Jumper		**Status**	**Jumper**		**Status**
W21 (2-3)	IN	Term power directed to J16	W21 (2-3)		Not applicable
W24 (1-2)	IN	Term power supplied	W24 (1-2)	OUT	Term power not supplied

14.2 Other Jumper Settings

This section describes the remaining jumpers on the Hawk.

14.2.1 Cache Size

The discussion of cache size in Section 10.2 also applies to the Hawk.

14.2.2 EPROM Size

The discussion of cache size in Section 10.3 also applies to the Hawk.

14.2.3 Manual Reset

The discussion of the manual reset switch in Section 10.3.1 also applies to the Hawk.

14.2.4 Reserved Jumpers

The discussion of reserved jumpers in Section 10.3.2 also applies to the Hawk.

14.3 Connecting the Floppy Drive

The instructions for connecting the floppy drive in Section 10.4 also applies to the Hawk.

14.4 Internal Cabling

The discussion of internal cabling to the front panel and serial ports in Section 10.5 also applies to the Hawk.

Part IV

Cobra Installation

This part describes various Cobra controller installation issues.

Chapter 15

Cobra Specifications

15.1 The Cobra

The Cobra series comprises three products: the CDI-4220 and CDI-4240 DSSI to SCSI adapters and the CDI-4204 cache module. Both the CDI-4220 and CDI-4240 provide a means for DSSI-based VAX and AXP computer systems to share a common farm of SCSI devices. The CDI-4204 cache module makes it possible to install up to 128 megabytes of cache on either Cobra series adapter.

This manual uses the name Cobra to refer to both the CDI-4220 and the CDI-4240, unless otherwise noted.

15.1.1 Cobra Features

The Cobra can control up to 21 SCSI devices (18 devices if you choose to use redundant Cobra adapters). These devices can be redundant arrays of independent disks (RAID), solid state disks, disk drives, tape drives, CDROMs or optical devices. For a complete list of supported devices, call CMD Technology and request the "Qualified Peripherals List" for the Cobra.

The Cobra is fully compliant with Digital's mass storage protocols, MSCP and TMSCP . There is no need for additional software drivers or patches to your currently running systems.

For faster read performance, the Cobra can be equipped with the CDI-4204 cache module. The CDI-4204 will accept one standard 72-pin SIMM, which can be from 4 to 128 megabytes in size. The Cobra's firmware permits you to control which devices are to be cached.

The Cobra's command line interface, which closely resembles the Digital Command Language (DCL) in VMS, provides a means to configure the Cobra and monitor the status of various controller functions. The command line interface includes commands for creating stripesets and partitioning disk drives. You may access the command line interface through the controller's serial port or through the Diagnostics Utility Protocol (DUP).

CAUTION

The Cobra's stripesets, which are based on the RAID 0 algorithm, offer enhanced I/O performance but no redundancy. If one drive in the stripeset fails, all the data in the stripeset will be lost. Consequently, you should take appropriate backup measures to protect your stripeset data.

Cobra Installation

Utilities for formatting, qualifying and testing devices are available through the Diagnostics Utilty Protocol (DUP).

15.1.2 Cobra Specifications

Table 15–1: Cobra Technical Specifications

General	
Emulation	MSCP (DU) and TMSCP (MU)
Host Bus Interface	Digital DSSI
Peripheral Bus Interface	SCSI-1, SCSI-2, "Fast" SCSI-2
Maximum Cable Length	SCSI $\leq$5 MB/sec transfer rate: 6 meters (19.5 ft.) SCSI >5 MB/sec transfer rate: 3 meters (9.9 ft.) DSSI: 25 meters (82 ft.)
Number of SCSI Devices Supported	CDI-4220: Up to 7 CDI-4240: Up to 21
Maximum Hosts Supported	CDI-4220: Up to 7 CDI-4240: Up to 14
Connector Type	DSSI: Dual row 50-pin male Honda SCSI: Dual row 50-pin BERG
Command Queuing	Commands from host: Up to 60 with seek optimization SCSI command tag queuing: Up to 64 commands per drive
User Interface	Dedicated RS232 console interface for setup, status monitoring and diagnostics
Host Connection Support	VAX 3300/3400, VAX 4000, AXP 4000, KFMSA and DEC 5400/5500
Operating System Support	VMS 5.4 and above OpenVMS AXP 1.5 and above OSF/1 1.5 and above
Environmental	
Temperature	Operational: 5° C to 50° C Non-operational: -40° C to 60° C
Relative Humidity	Operational: 10% to 85% non-condensing Non-operational: 5% to 90% non-condensing
Power Requirements	
Input Voltage	Without cache module: 5 VDC @ 1.5 amps peak With cache module: 5 VDC @ 2.5 amps peak
Physical Board Size	5.75" x 8.125" (W x D)

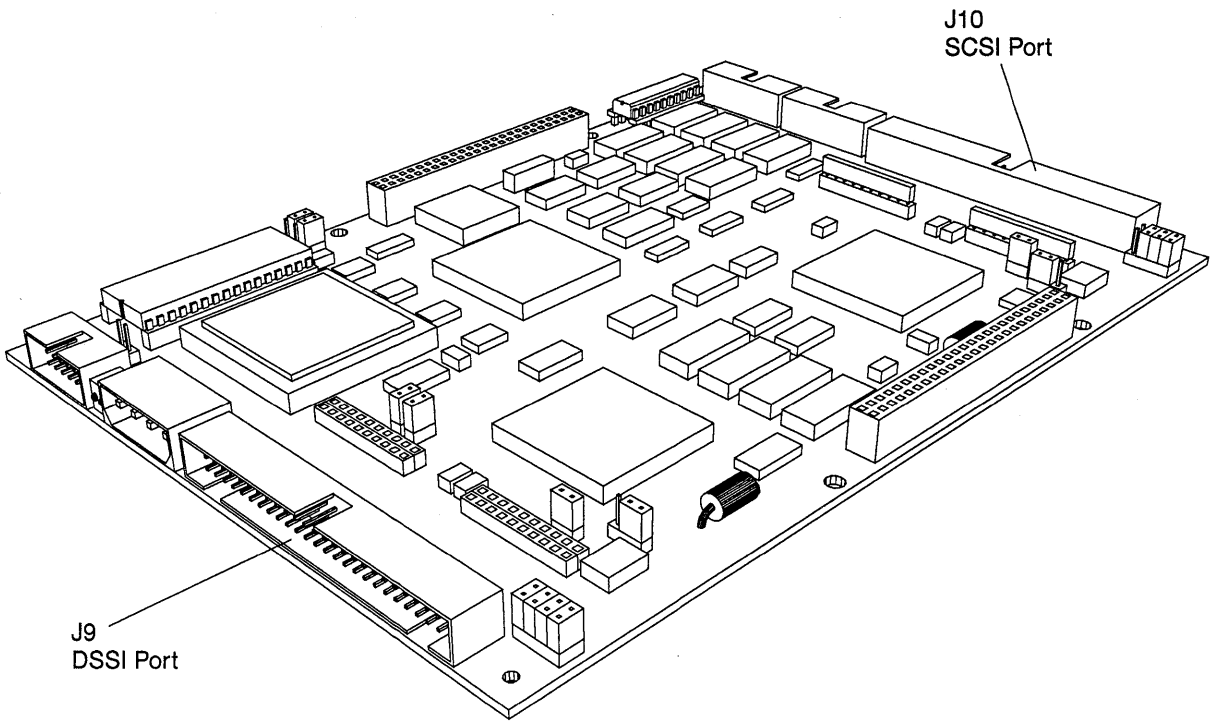
Chapter 16

CDI-4220 Installation

16.1 CDI-4220 Components

Figure 16–1 shows the location of the CDI-4220's DSSI and SCSI ports.

Figure 16–1: CDI-4220 Ports



Cobra Installation

Table 16–1 outlines the default configuration of the CDI-4220 adapter:

Table 16–1: CDI-4220 Default Configuration

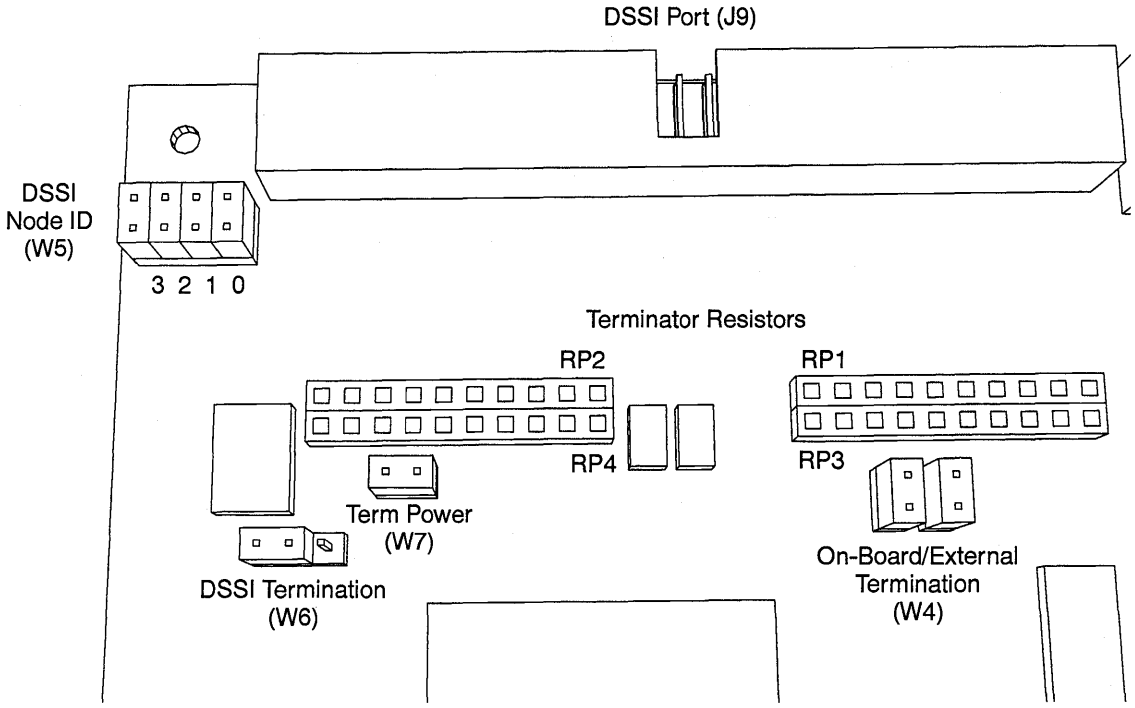
Parameter	Default Value
DSSI Node ID	7
SCSI ID	7
On-board DSSI termination	No
DSSI term power supplied	Yes
On-board active SCSI termination	Yes
SCSI term power supplied	Yes

The remainder of this chapter describes how to change the default configuration of the CDI-4220's DSSI and SCSI ports.

16.2 DSSI Port (J9)

Figure 16–2 shows the components that determine the configuration of the DSSI port.

Figure 16–2: CDI-4220 DSSI Port (J9)



16.2.1 DSSI Node ID

Jumper W5 determines the DSSI Node ID of the adapter. There are four positions on the jumper, labeled 0, 1, 2 and 3. Position 0 sets the least significant bit of the node ID, position 1 sets the next significant bit, and position 2 sets the most significant bit. Position 3 is reserved and must have a jumper installed.

Table 16–2: CDI-4220 DSSI Node ID

	DSSI Node ID							
W5 Position	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2 (MSB)	OUT	OUT	OUT	OUT	IN	IN	IN	IN
1 (NSB)	OUT	OUT	IN	IN	OUT	OUT	IN	IN
0 (LSB)	OUT	IN	OUT	IN	OUT	IN	OUT	IN

16.2.2 DSSI Termination

While the CDI-4220 is equipped to provide on-board DSSI termination, CMD Technology recommends that you use external DSSI terminators supplied by Digital Equipment Corporation. If your system configuration requires on-board termination, put 120-ohm terminator resistors in RP1 and RP2, 270-ohm resistors in RP3 and RP4 and remove the shunts from jumper W4.

Table 16–3: CDI-4220 DSSI Termination Settings

Component	On-Board Termination	External Termination
RP1 & RP2	110-ohm resistors IN	Empty
RP3 & RP4	270-ohm resistors IN	Empty
W4	OUT	IN

16.2.3 DSSI Term Power

Jumper W7 determines whether the CDI-4220 supplies term power to the DSSI bus. When the jumper shunt is installed, term power is supplied. Remove the jumper shunt to disable term power.

Table 16–4: CDI-4220 DSSI Term Power

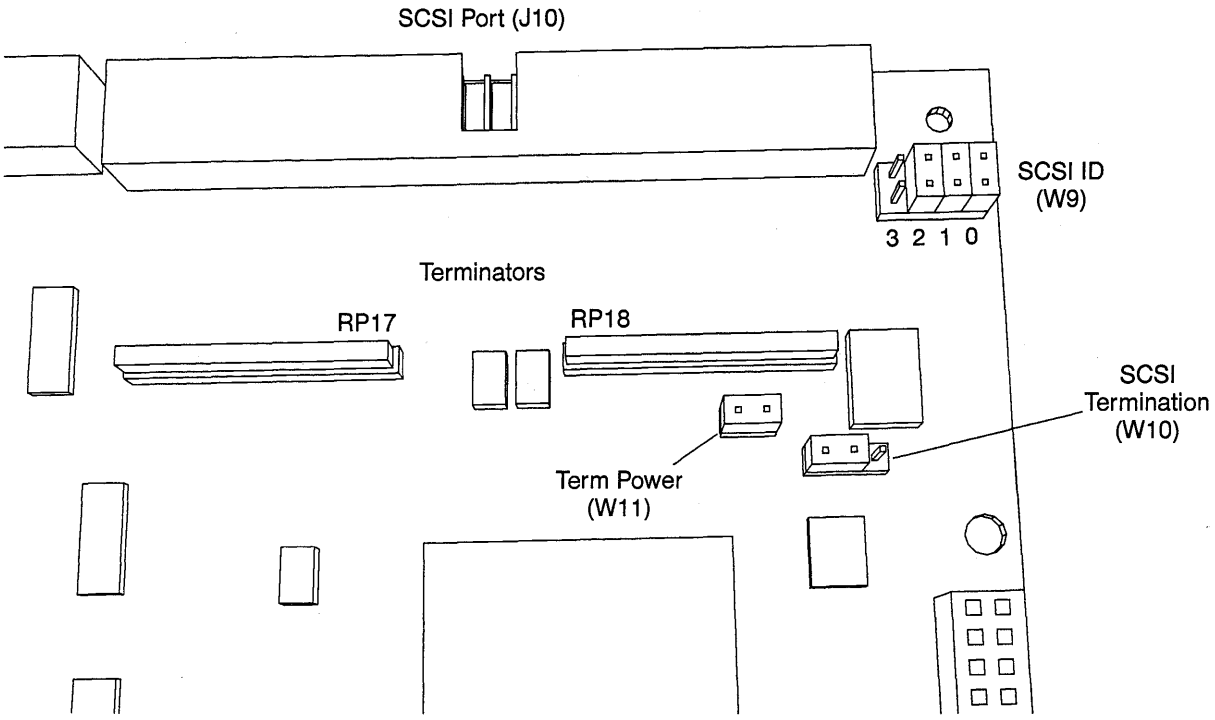
Jumper W7	DSSI Term Power
IN	Supplied
OUT	Not supplied

Jumper W6 must be in its default position (with the shunt joining pins 2 and 3) when you want the CDI-4220 to supply term power on the DSSI bus.

16.3 SCSI Port (J10)

Figure 16–3 shows the components that determine the configuration of the SCSI port.

Figure 16–3: CDI-4220 SCSI Port



16.3.1 SCSI ID

Jumper W9 determines the SCSI ID of the adapter. There are four positions on the jumper, labeled 0, 1, 2 and 3. Position 0 sets the least significant bit of the ID, position 1 sets the next significant bit, and position 2 sets the most significant bit. Position 3 is reserved and must *not* have a jumper installed.

Table 16–5: CDI-4220 SCSI ID

	SCSI ID							
W9 Position	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2 (MSB)	OUT	OUT	OUT	OUT	IN	IN	IN	IN
1 (NSB)	OUT	OUT	IN	IN	OUT	OUT	IN	IN
0 (LSB)	OUT	IN	OUT	IN	OUT	IN	OUT	IN

16.3.2 SCSI Termination

Like the DSSI bus, both ends of the SCSI bus must be terminated. By default, the CDI-4220's on-board SCSI terminators are installed. The adapter employs active termination on the SCSI bus. If you use on-board termination, you should use either active or FPT termination on the other end of the SCSI bus. Do not use passive termination.

The CDI-4220's SCSI termination consists of two 110-ohm resistors at RP17 and RP18. To install termination, insert the resistors. To remove termination, remove the resistors. If you remove the resistors, be sure to save them, in case you need to reinstall on-board termination.

16.3.3 SCSI Term Power

The CDI-4220 supplies term power to the SCSI bus by default. To prevent the adapter from supplying term power, remove the jumper shunt from W11.

Table 16–6: CDI-4220 SCSI Term Power

Jumper W11	SCSI Term Power
IN	Supplied
OUT	Not supplied

The shunt on jumper W10 always should be in its default position: joining pins 1 and 2. Changing the position of this jumper will prevent the adapter from properly directing term power to the SCSI bus.

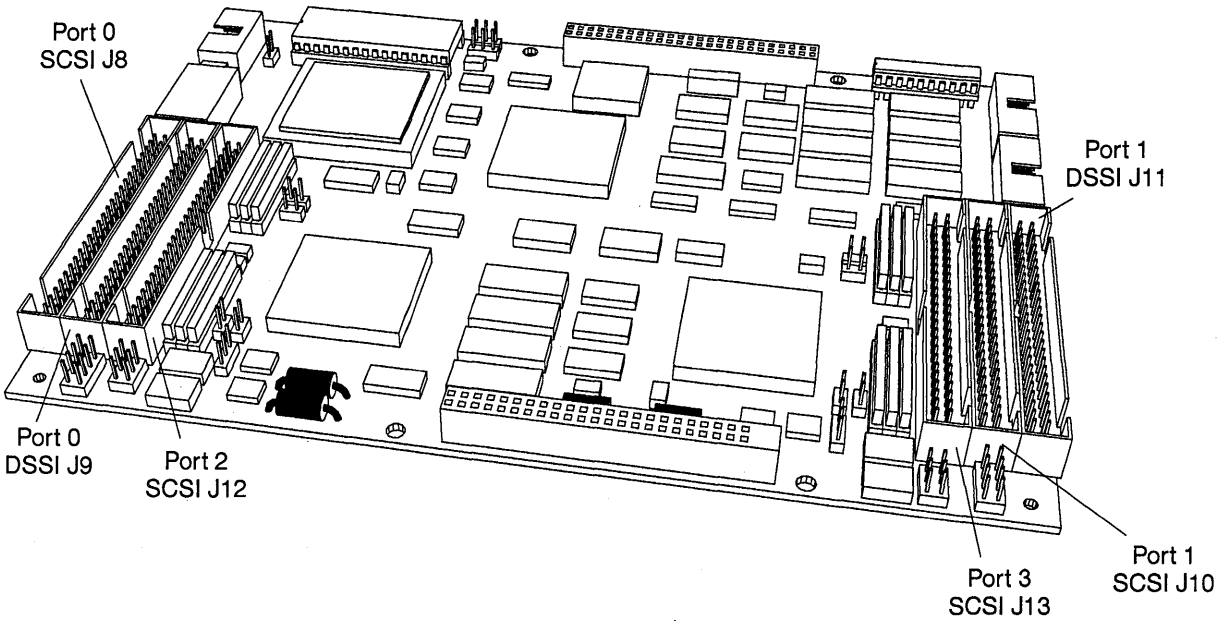
Chapter 17

CDI-4240 Installation

17.1 CDI-4240 Components

Figure 17–1 shows the location of the CDI-4240's six DSSI/SCSI ports, as well as the most important configuration jumpers.

Figure 17–1: CDI-4240 Components



Cobra Installation

Table 17–1 outlines the default configuration of the CDI-4240 adapter:

Table 17–1: CDI-4240 Default Configuration

Port 0 (J9)	Default
DSSI or SCSI	DSSI
DSSI Node ID or SCSI ID	7
On-board DSSI termination	No
Term power supplied	Yes

Port 1 (J11)	Default
DSSI or SCSI	DSSI
DSSI Node ID or SCSI ID	7
On-board DSSI termination	No
Term power supplied	Yes

Port 2 (J12)	Default
SCSI ID	7
On-board SCSI termination	Yes
SCSI term power supplied	Yes

Port 3 (J13)	Default
SCSI ID	7
On-board SCSI termination	Yes
SCSI term power supplied	Yes

You may change these default settings by manipulating the adapter's jumpers, as described in succeeding sections. The instructions for each port are contained in the sections listed in Table 17–2.

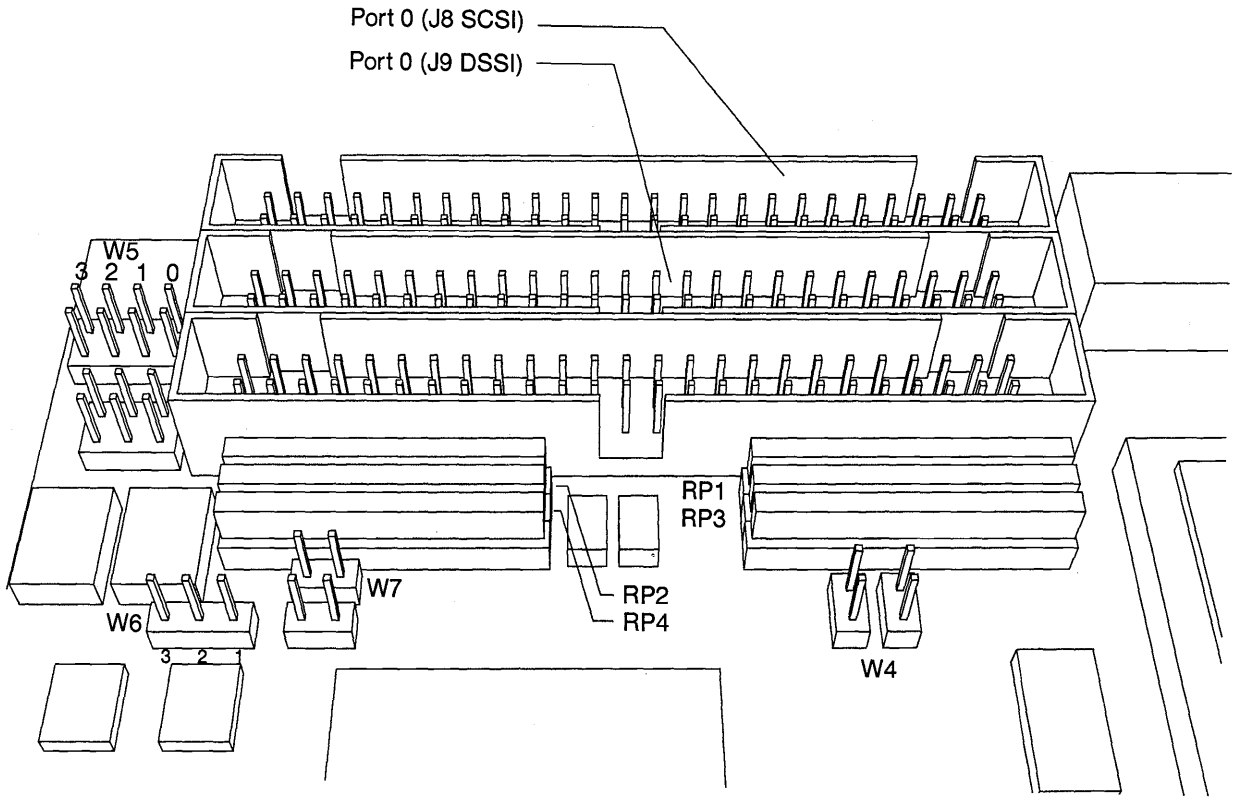
Table 17–2: CDI-4240 Port Configuration Page Reference

Port	Section
Port 0 (J8/J9)	Section 17.2
Port 1 (J10/J11)	Section 17.3
Port 2 (J12)	Section 17.4
Port 3 (J13)	Section 17.5

17.2 Port 0

This section describes the configuration options for port 0.

Figure 17–2: CDI-4240 Port 0



17.2.1 DSSI/SCSI Selection

Port 0 may be configured for DSSI or SCSI. The selector jumper is W5, position 3. If you configure port 0 for DSSI, use connector J9. If you configure port 0 for SCSI, use connector J8.

Table 17–3: CDI-4240 Port 0 DSSI/SCSI Selection

W5 Position 3	Port 0 Selection
IN	DSSI (J9)
OUT	SCSI (J8)

17.2.2 DSSI Node ID/SCSI ID

Depending on how you set position 3 on jumper W5, the remaining positions determine either the DSSI Node ID or the SCSI ID for port 0. Position 0 sets the least significant bit of the node ID, position 1 sets the next significant bit, and position 2 sets the most significant bit.

Table 17–4: CDI-4240 Port 0 DSSI Node ID/SCSI ID

	DSSI Node ID/SCSI ID							
W5 Position	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2 (MSB)	OUT	OUT	OUT	OUT	IN	IN	IN	IN
1 (NSB)	OUT	OUT	IN	IN	OUT	OUT	IN	IN
0 (LSB)	OUT	IN	OUT	IN	OUT	IN	OUT	IN

17.2.3 Termination

All DSSI and SCSI buses must be terminated at each end. If the CDI-4240 is at one end of a bus, you may use the adapter's on-board termination or extend the bus beyond the adapter and terminate with an external terminator. If the CDI-4240 is not at one end of a bus, be sure to remove on-board termination.

By default, port 0 is configured for DSSI without on-board termination. If you wish to install on-board termination for DSSI, follow these steps.

1. Install 120-ohm terminator resistors at RP1 and RP2. Install 270-ohm resistors at RP3 and RP4.
2. Remove the two shunts from jumper W4.

To remove on-board DSSI termination, simply reverse these steps. That is, you should:

1. Remove terminator resistors from RP1, RP2, RP3 and RP4.
2. Install two shunts on jumper W4.

If you configure port 0 for SCSI and decide to use on-board termination, follow these steps:

1. Remove any DSSI resistors from RP1, RP2, RP3 and RP4.
2. Insert 110-ohm resistors in RP1 and RP2.

   If you wish to use external SCSI terminators or if the CDI-4240 is not at either end of the SCSI bus, simply make sure that RP1, RP2, RP3 and RP4 are depopulated.

The following table outlines the various termination choices you have for port 0.

Table 17–5: CDI-4240 Port 0 Termination Settings

	DSSI	SCSI
Component	**On-Board Termination**	**On-Board Termination**
RP1 & RP2	120 ohm	110 ohm
RP3 and RP4	270 ohm	Empty
W4	OUT/OUT	Irrelevant
Component	**External Termination**	**External Termination**
RP1 & RP2	Empty	Empty
RP3 and RP4	Empty	Empty
W4	IN/IN	Irrelevant

17.2.4 Termination Power

At least one host or device on a DSSI or SCSI bus must supply current to the terminators. The most desireable configuration is to have the two devices at the ends of the bus supply termination power, although no harm will come if more than two devices supply termination power.

Port 0 termination power options are determined by jumpers W6 and W7. Table 17–6 outlines the available options.

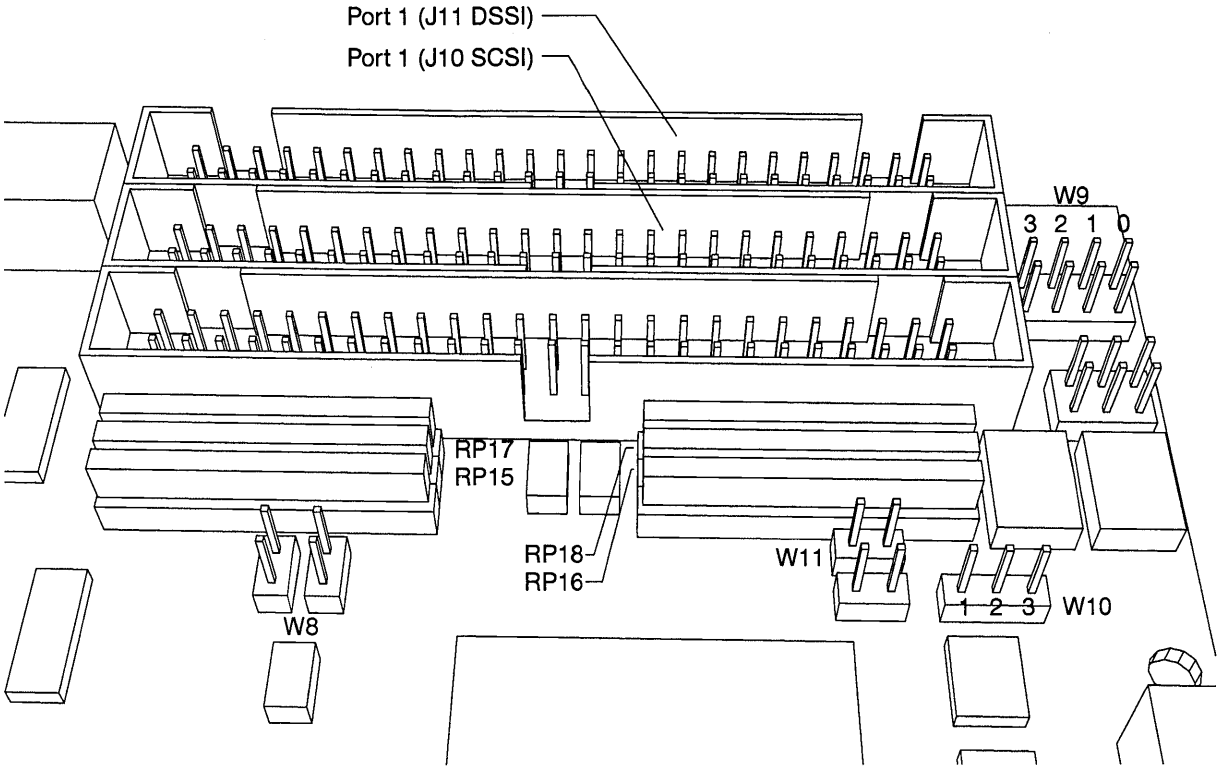
Table 17–6: CDI-4240 Port 0 Term Power Settings

	DSSI	SCSI
Component	**Term Power Supplied**	**Term Power Supplied**
W6	2-3 IN	1-2 IN
W7	IN	IN
Component	**Term Power Not Supplied**	**Term Power Not Supplied**
W6	2-3 OUT	1-2 OUT
W7	Irrelevant	Irrelevant

17.3 Port 1

This section describes the configuration options for port 1.

Figure 17–3: CDI-4240 Port 1



17.3.1 DSSI/SCSI Selection

Port 1 may be configured for DSSI or SCSI. The selector jumper is W9, position 3. If you configure Port 1 for DSSI, use connector J11. If you configure Port 1 for SCSI, use connector J10.

Table 17–7: CDI-4240 Port 1 DSSI/SCSI Selection

W9 Position 3	Port 1 Selection
IN	DSSI (J11)
OUT	SCSI (J10)

17.3.2 DSSI Node ID/SCSI ID

Depending on how you set position 3 on jumper W9, the remaining positions determine either the DSSI Node ID or the SCSI ID for Port 1. Position 0 sets the least significant bit of the node ID, position 1 sets the next significant bit, and position 2 sets the most significant bit.

Table 17–8: CDI-4240 Port 1 DSSI Node ID/SCSI ID

	DSSI Node ID/SCSI ID							
W9 Position	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2 (MSB)	OUT	OUT	OUT	OUT	IN	IN	IN	IN
1 (NSB)	OUT	OUT	IN	IN	OUT	OUT	IN	IN
0 (LSB)	OUT	IN	OUT	IN	OUT	IN	OUT	IN

17.3.3 Termination

By default, Port 1 is configured for DSSI without on-board termination. If you wish to install on-board termination for DSSI, follow these steps.

1. Install 120-ohm terminator resistors at RP17 and RP18. Install 270-ohm resistors at RP15 and RP16.
2. Remove the two shunts from jumper W8.

To remove on-board DSSI termination, simply reverse these steps. That is, you should:

1. Remove terminator resistors from RP17, RP18, RP15 and RP16.
2. Install two shunts on jumper W8.

If you configure Port 1 for SCSI and decide to use on-board termination, follow these steps:

1. Remove any DSSI resistors from RP17, RP18, RP15 and RP16.
2. Insert 110-ohm resistors in RP17 and RP18.

   If you wish to use external SCSI terminators or if the CDI-4240 is not at either end of the SCSI bus, simply make sure that RP17, RP18, RP15 and RP16 are depopulated.

Table 17–9 outlines the various termination choices you have for Port 1.

Table 17–9: CDI-4240 Port 1 Termination Settings

	DSSI	SCSI
Component	**On-Board Termination**	**On-Board Termination**
RP17 & RP18	120 ohm	110 ohm
RP15 and RP16	270 ohm	Empty
W8	OUT/OUT	Irrelevant
Component	**External Termination**	**External Termination**
RP17 & RP18	Empty	Empty
RP15 and RP16	Empty	Empty
W8	IN/IN	Irrelevant

17.3.4 Termination Power

Port 1 termination power options are determined by jumpers W10 and W11. Table 17–10 outlines the available options.

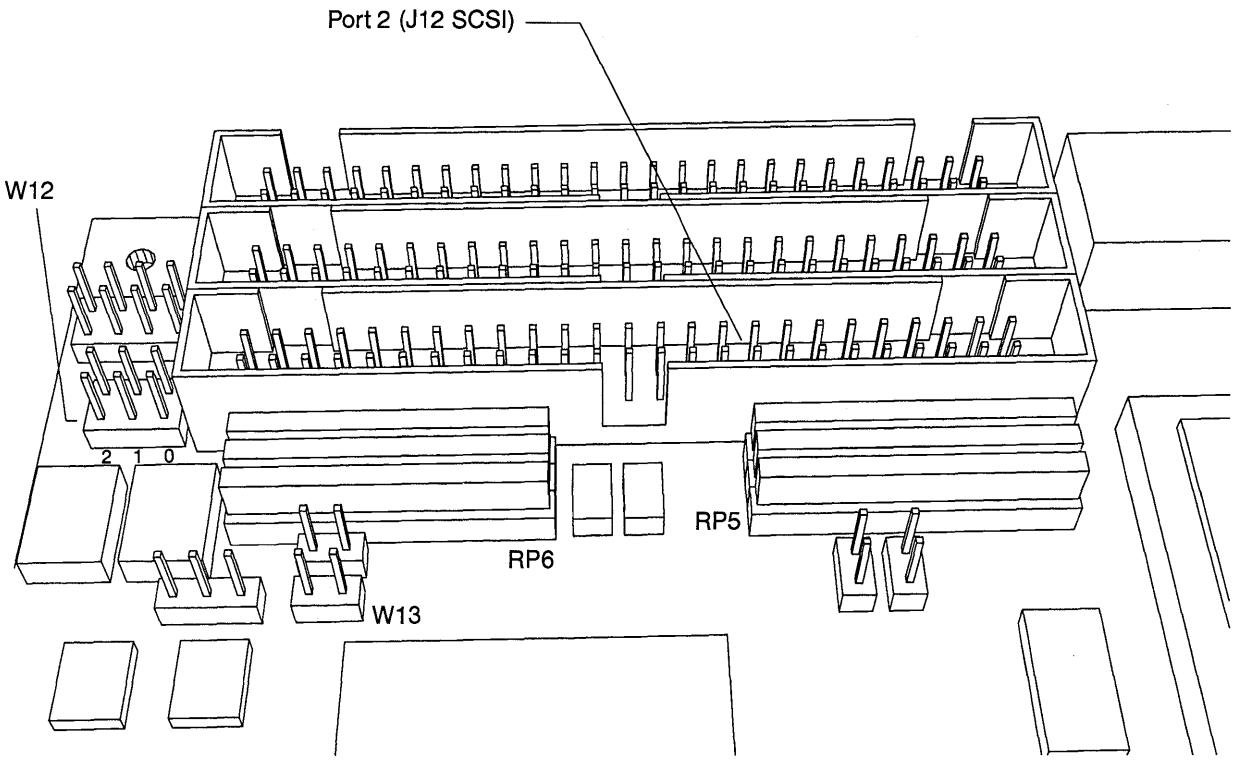
Table 17–10: CDI-4240 Port 1 Term Power Settings

	DSSI	SCSI
Component	**Term Power Supplied**	**Term Power Supplied**
W10	2-3 IN	1-2 IN
W11	IN	IN
Component	**Term Power Not Supplied**	**Term Power Not Supplied**
W10	2-3 OUT	1-2 OUT
W11	Irrelevant	Irrelevant

17.4 Port 2

This section describes the configuration options for port 2, which is always configured for SCSI.

Figure 17–4: CDI-4240 Port 2



17.4.1 SCSI ID

Jumper W12 determines the SCSI ID for Port 2. Position 0 sets the least significant bit of the node ID, position 1 sets the next significant bit, and position 2 sets the most significant bit.

Table 17–11: CDI-4240 Port 2 SCSI ID

	SCSI ID							
W12 Position	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2 (MSB)	OUT	OUT	OUT	OUT	IN	IN	IN	IN
1 (NSB)	OUT	OUT	IN	IN	OUT	OUT	IN	IN
0 (LSB)	OUT	IN	OUT	IN	OUT	IN	OUT	IN

17.4.2 Termination

By default, on-board active SCSI termination is installed for Port 2. If you wish to use external termination or if the CDI-4240 is not at the end of the bus, you may prevent termination by removing the 110-ohm resistors at RP5 and RP6. Conversely, if you wish to use on-board termination, install 110-ohm resistors at RP5 and RP6.

Table 17–12: CDI-4240 Port 2 Termination Settings

Component	On-Board Termination	No Termination
RP5	110-ohm resistor IN	OUT
RP6	110-ohm resistor IN	OUT

17.4.3 Termination Power

Port 2 termination power is turned on and off by jumper W13.

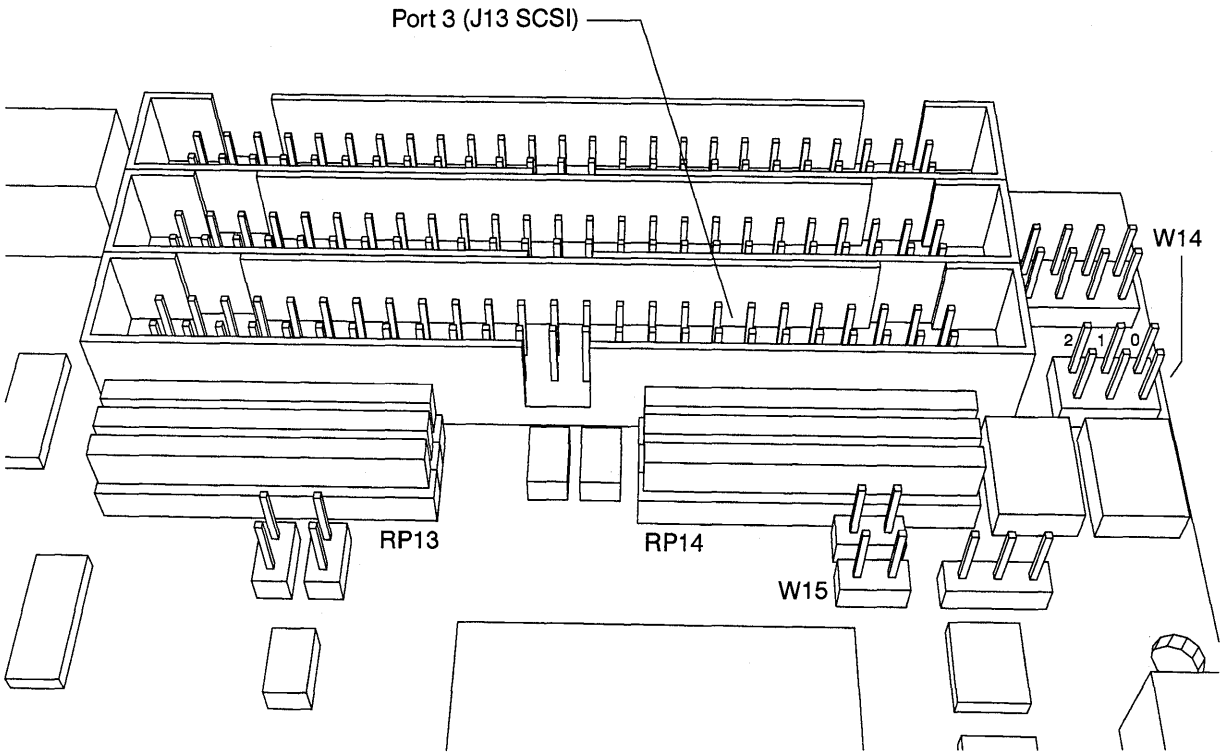
Table 17–13: CDI-4240 Port 2 Termination Power Settings

Component	Term Power Supplied	Term Power Not Supplied
W13	IN	OUT

17.5 Port 3

This section describes the configuration options for port 3, which is always configured for SCSI.

Figure 17–5: CDI-4240 Port 3



17.5.1 SCSI ID

Jumper W14 determines the SCSI ID for Port 3. Position 0 sets the least significant bit of the node ID, position 1 sets the next significant bit, and position 2 sets the most significant bit.

Table 17–14: CDI-4240 Port 3 SCSI ID

	SCSI ID							
W14 Position	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2 (MSB)	OUT	OUT	OUT	OUT	IN	IN	IN	IN
1 (NSB)	OUT	OUT	IN	IN	OUT	OUT	IN	IN
0 (LSB)	OUT	IN	OUT	IN	OUT	IN	OUT	IN

17.5.2 Termination

By default, on-board active SCSI termination is installed for Port 3. If you wish to use external termination or if the CDI-4240 is not at the end of the bus, you may prevent termination by removing the 110-ohm resistors at RP13 and RP14. Conversely, if you wish to use on-board termination, install 110-ohm resistors at RP13 and RP14.

Table 17–15: CDI-4240 Port 3 Termination Settings

Component	On-Board Termination	No Termination
RP13	110-ohm resistor IN	OUT
RP14	110-ohm resistor IN	OUT

17.5.3 Termination Power

Port 3 termination power is turned on and off by jumper W15.

Table 17–16: CDI-4240 Port 3 Termination Power Settings

Component	Term Power Supplied	Term Power Not Supplied
W15	IN	OUT

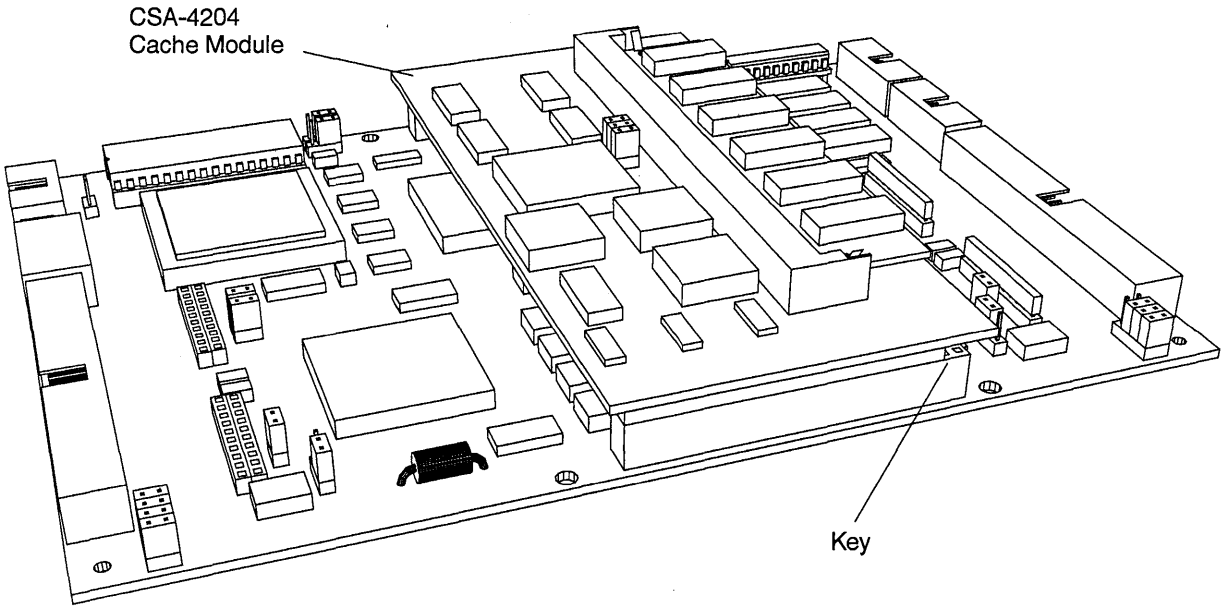
Chapter 18

Cache Module

18.1 Installation

The optional cache module (the CDI-4204) is designed to plug into connectors J2 and J3 on the Cobra. The module and the connectors are "keyed" to guarantee proper installation. Figure 18–1 shows the cache module properly installed on the CDI-4220.

Figure 18–1: Cache Installation



18.2 SIMM Specifications

The CDI-4204 will accept 4, 8, 16 and 32 megabyte SIMMs. It will also accept 64 and 128 megabyte SIMMs when they become available. When you purchase a SIMM for the cache module, be sure it adheres to the specifications in Table 18–1.

Table 18–1: CDI-4204 SIMM Specifications

Attribute	Specification
Pins	72
Bits	36
Speed	70 nanosecond

18.3 SIMM Size Selector

For the cache module to operate properly, you must specify the size of the SIMM you have installed. This is done by setting jumper W1 on the cache module.

Figure 18–2: SIMM Size Selector

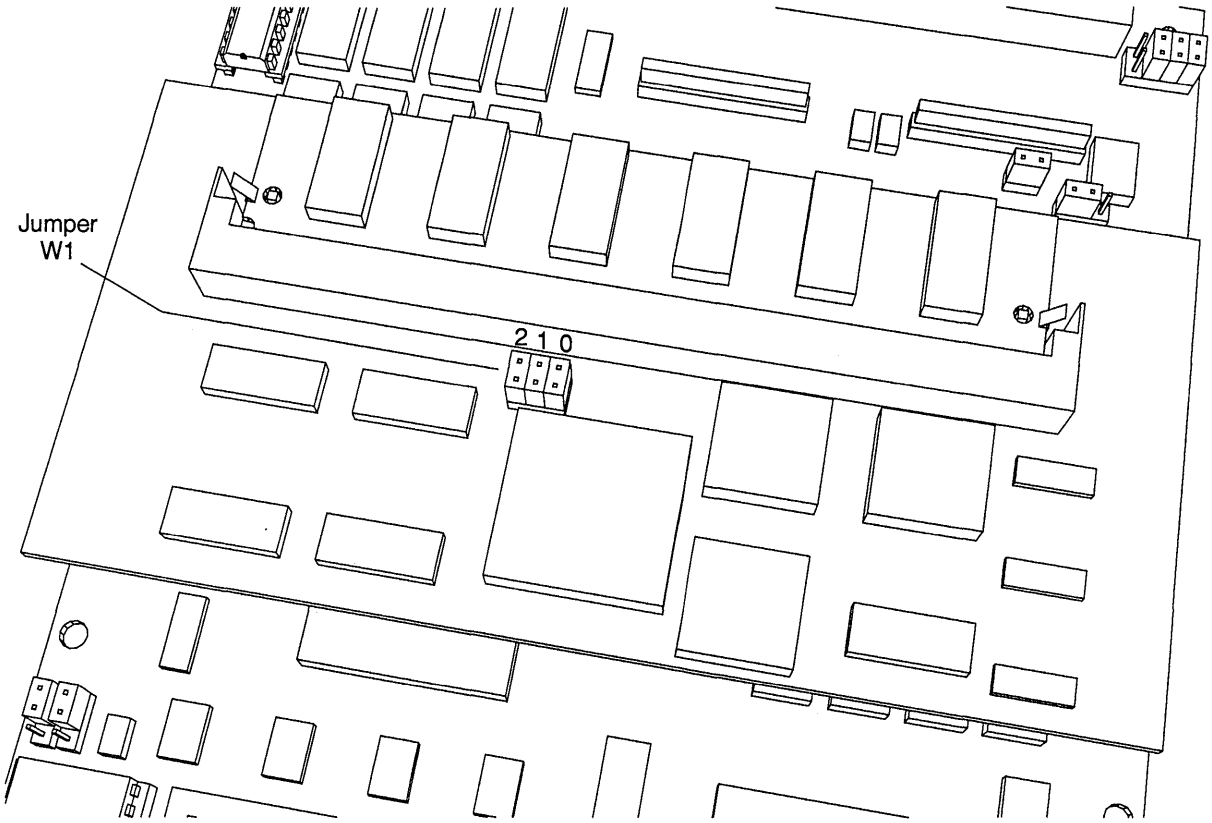


Table 18–2: CDI-4204 Jumper W1 (SIMM Size)

SIMM Size	W1(2)	W1(1)	W1(0)
4MB	IN	IN	IN
8MB	IN	OUT	OUT
16MB	IN	IN	IN
32MB	OUT	IN	OUT
64MB	IN	IN	IN
128MB	OUT	OUT	OUT

Chapter 19

Cobra Installation Kits

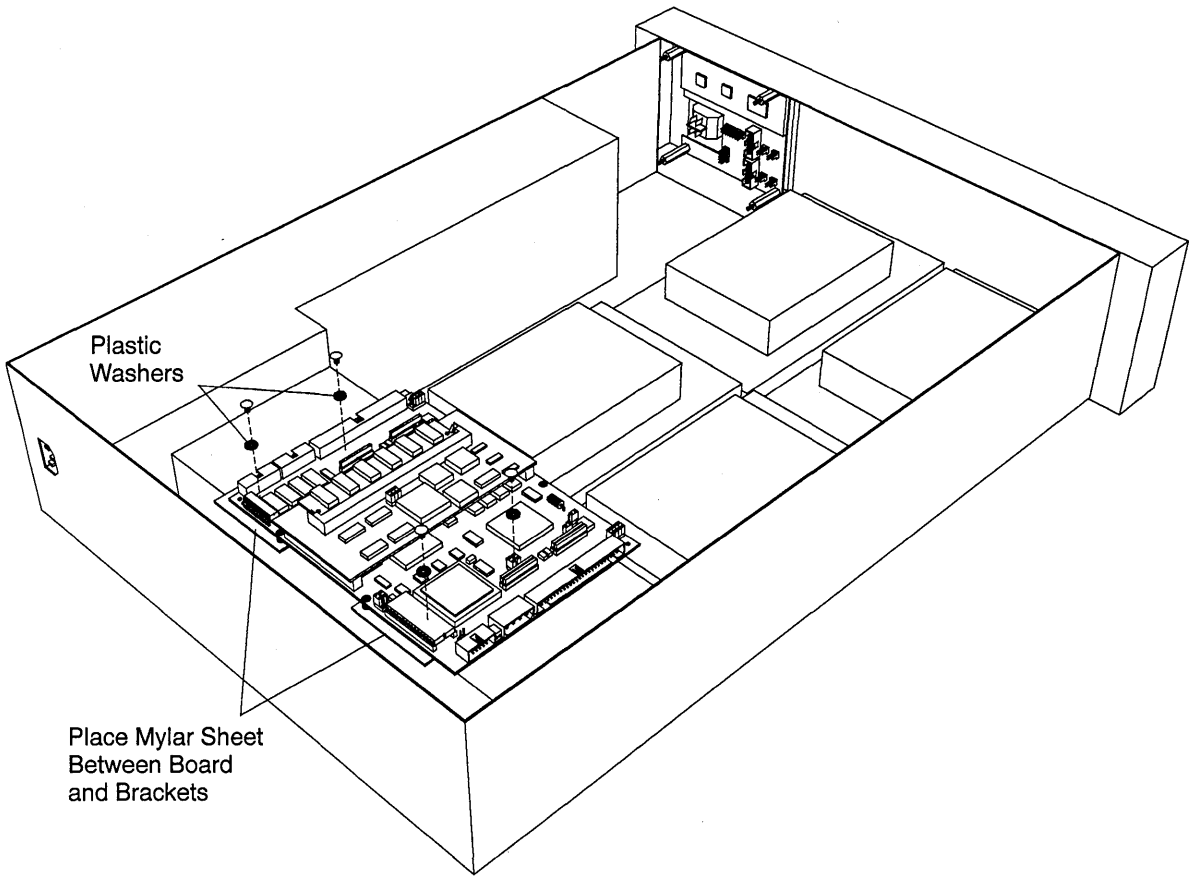
This chapter describes the Cobra SC kit for installing the Cobra in a TRIMM Industries DA40 or DA60 chassis and the SD kit for mating the Cobra with a half-height chassis.

19.1 SC Kit

1. Attach the supplied brackets to the top of the power supply frame. You may need to reroute some cables to make room for the brackets and the controller.
2. Attached the controller to the bracket standoffs with the supplied screws. Insert the mylar sheet between the bracket and the controller. Be sure to place the plastic washers between the controller board and the screw heads.

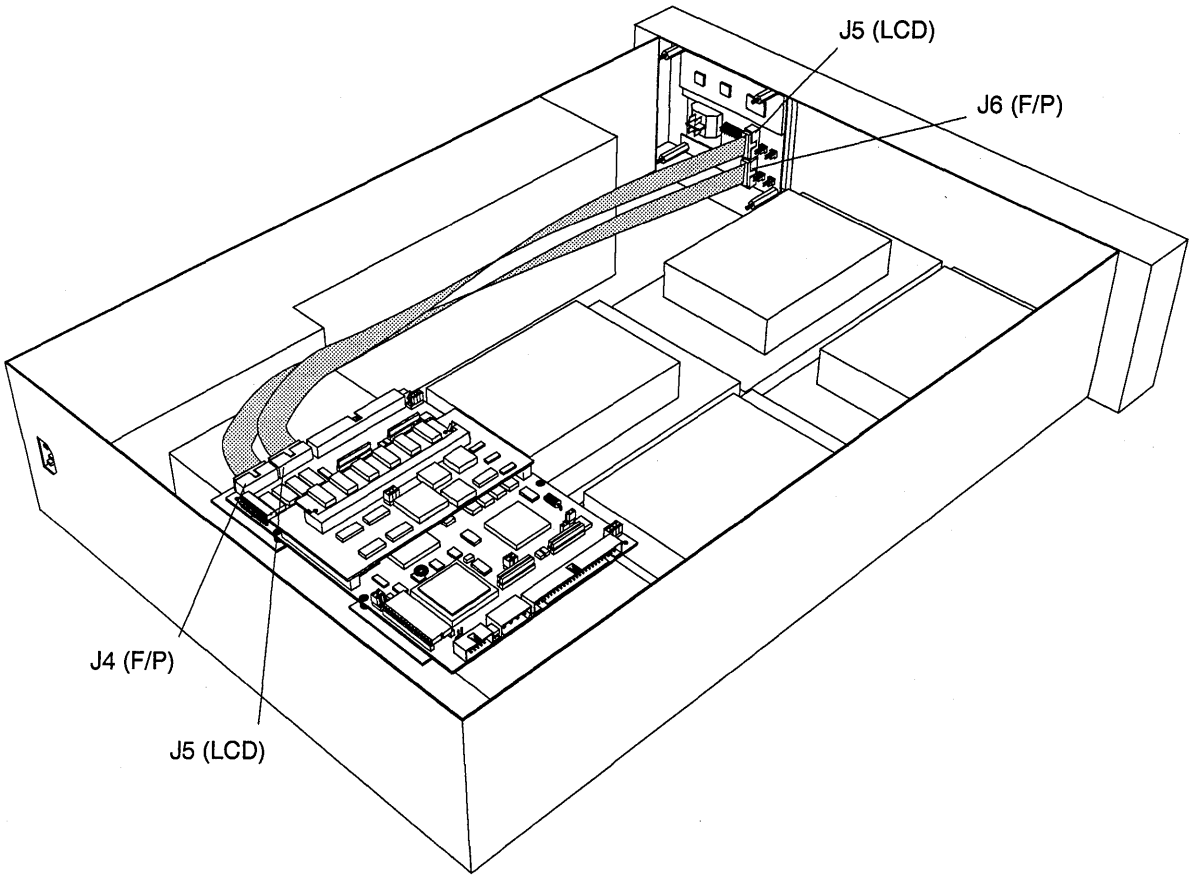
Cobra Installation

Figure 19–1: SC Kit Installation



❸ Replace the switch panel on the front of the chassis with the panel supplied with the kit. Run cables from J4 on the Cobra to J6 on the front panel, and from J5 on the Cobra to J5 on the front panel.

Figure 19–2: SC Kit Cables

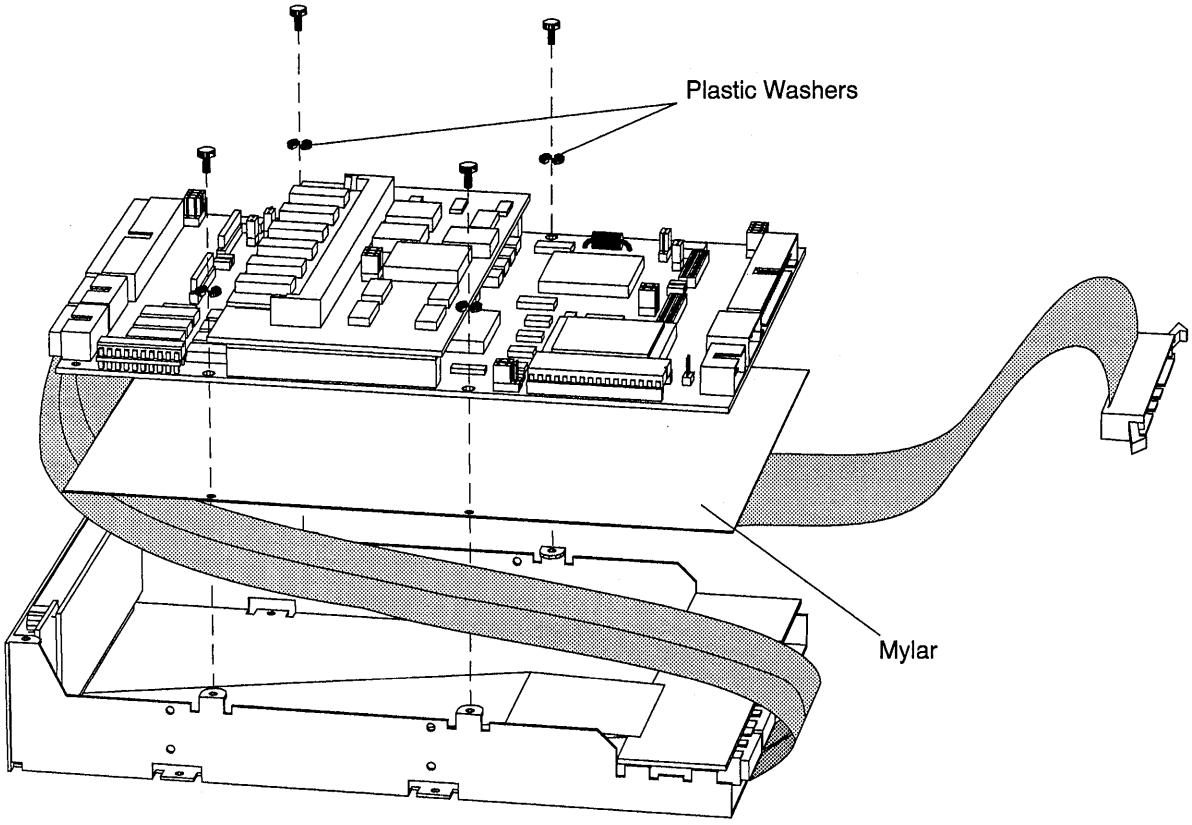


19.2 SD Kit

The Cobra mates with the SD kit half-height chassis as shown in Figure 19–3. Place the mylar sheet directly underneath the controller and run the cables under the mylar sheet. Use plastic washers with all the screws. Connect J4 on the Cobra to J6 on the chassis, and J5 on the Cobra to J5 on the chassis.

Cobra Installation

Figure 19–3: SD Kit Installation

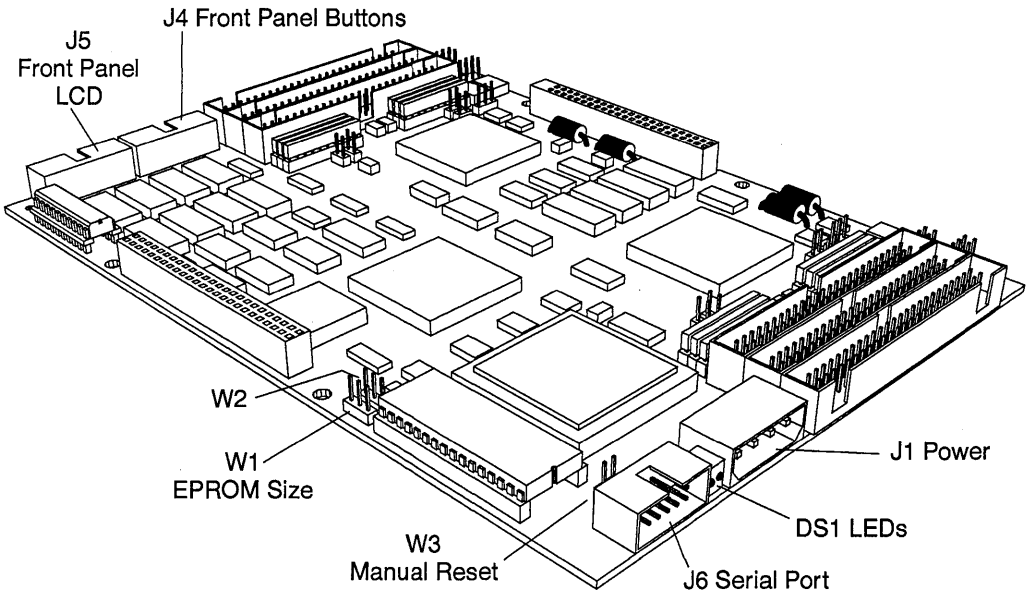


Chapter 20

Cobra Service

This appendix describes the servicing and maintenance of the CDI-4220 and CDI-4240 controllers.

Figure 20–1: Component Map



20.1 EPROM Size

Jumpers W1 and W2 specify the size of the EPROM on the CDI-4220 and the CDI-4240. These jumpers will be set properly when you receive your adapter, and you may never need to touch them. The only occasion that may call for you to change these jumpers is a firmware upgrade. If the EPROM containing the new firmware has a different capacity than your old EPROM, you must change jumpers W1 and W2 accordingly.

Figure 20–2: EPROM Jumpers

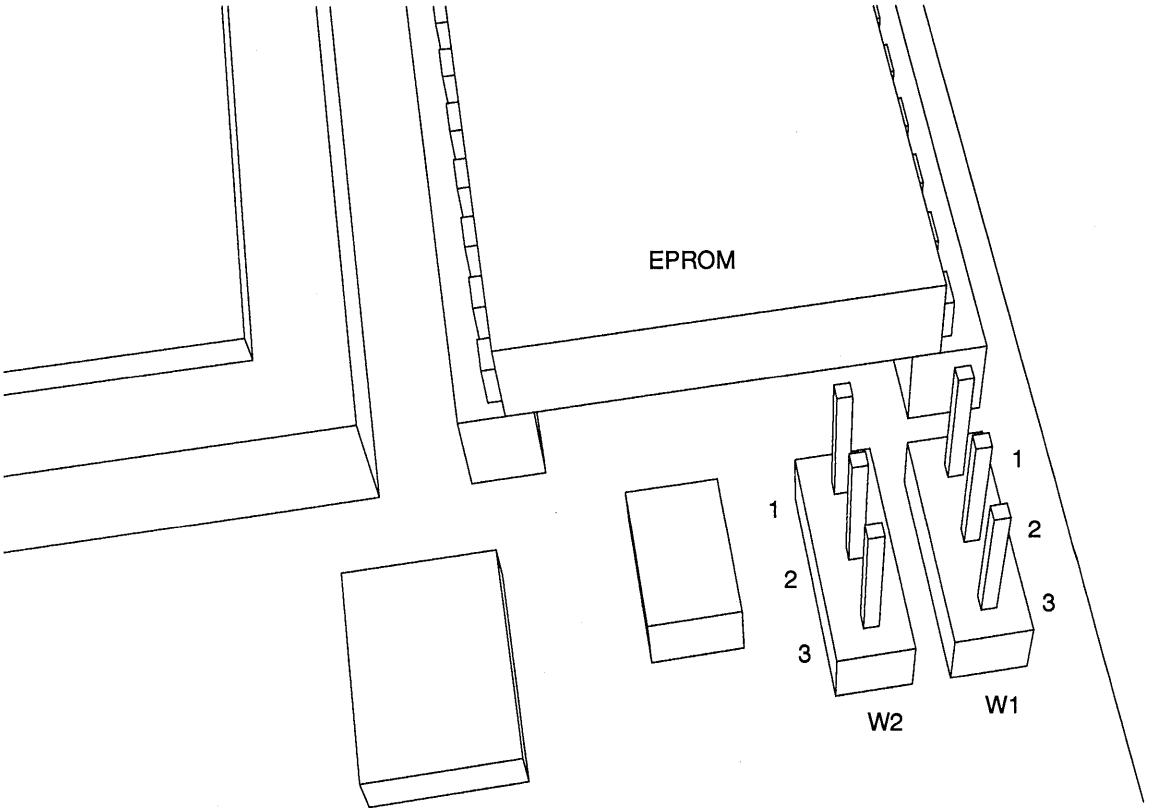


Table 20–1: Jumpers W1 and W2 (EPROM Size)

EPROM Size	W1 (1-2)	W1 (2-3)	W2 (1-2)	W2 (2-3)
128Kb		IN		IN
256Kb		IN		IN
512Kb	IN			IN
1024Kb	IN		IN	

20.2 Power Supply

The CDI-4220 and CDI-4240 receive power (5 volts, 1.5 amps) through connector J1.

20.3 Manual Reset

Jumper W3 provides a means other than recycling power to manually reset the adapter. To reset the adapter, short the two pins with a jumper shunt. The adapter will immediately reset.

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