DIGITAL StorageWorks HSJ50 Array Controller

HSOF 5.1 Configuration Manual

Part Number: EK–HSJ50–CG. B01

March 1997

Software Version: **HSOF Version 5.1**

Digital Equipment Corporation
Maynard, Massachusetts

March 1997

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Restrictions apply to the use of the local-connection port on this series of controllers; failure to observe these restrictions may result in harmful interference. Always disconnect this port as soon as possible after completing the setup operation. Any changes or modifications made to this equipment may void the user's authority to operate the equipment.

Warning!
This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Achtung!
Dieses ist ein Gerät der Funkstörgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.

Avertissement!
Cet appareil est un appareil de Classe A. Dans un environnement résidentiel cet appareil peut provoquer des brouillages radioélectriques. Dans ce cas, il peut être demandé à l' utilisateur de prendre les mesures appropriées.

Table of Contents

Figures

Tables

Related documents

The following table lists some of the documents related to the use of this product.

Document title	Part number
DECevent Installation Guide	AA–Q73JA–TE
StorageWorks BA350–MA Controller Shelf User's Guide	EK–350MA–UG
StorageWorks Configuration Manager for DEC OSF/1 Installation Guide	AA–QC38A–TE
StorageWorks Solutions Configuration Guide	EK–BA350–CG
StorageWorks Solutions Shelf and SBB User's Guide	EK–BA350–UG
StorageWorks Solutions SW300-Series RAID Enclosure Installation and User's Guide	EK–SW300–UG
StorageWorks SW500-Series Cabinet Installation and User's Guide	EK–SW500–UG
StorageWorks SW800-Series Data Center Cabinet Installation and User's Guide	EK–SW800–UG
The RAIDBOOK—A Source for RAID Technology	RAID Advisory Board
Polycenter Console Manager User's Guide	Computer Associates
VAXcluster Systems Guidelines for VAXcluster System Configurations	EK–VAXCS–CG
16-Bit SBB User’s Guide	EK-SBB16-UG
7-Bit SBB Shelf (BA356 Series) User’s Guide	EK-BA356-UG
SBB User’s Guide	EK-SBB35-UG

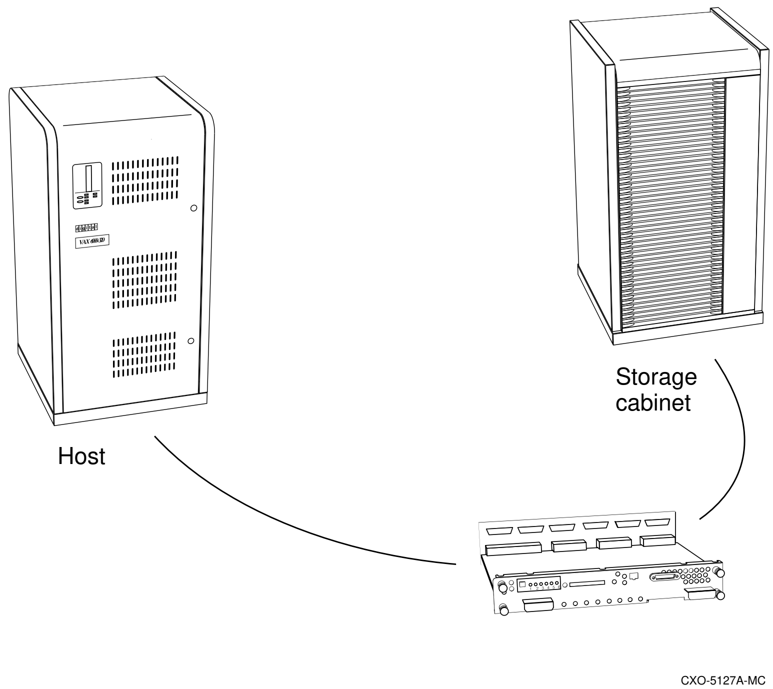
1
Introduction

Features of your controller

Your HSJ50 controller is the intelligent bridge between your host and the devices in your subsystem.

From the host's perspective, the controller is simply another DSSI device connected to one of its I/O buses. Consequently, the host sends its I/O requests to the controller just as it would to any DSSI device.

Figure 1–1 Bridging the gap between the host and its storage subsystem



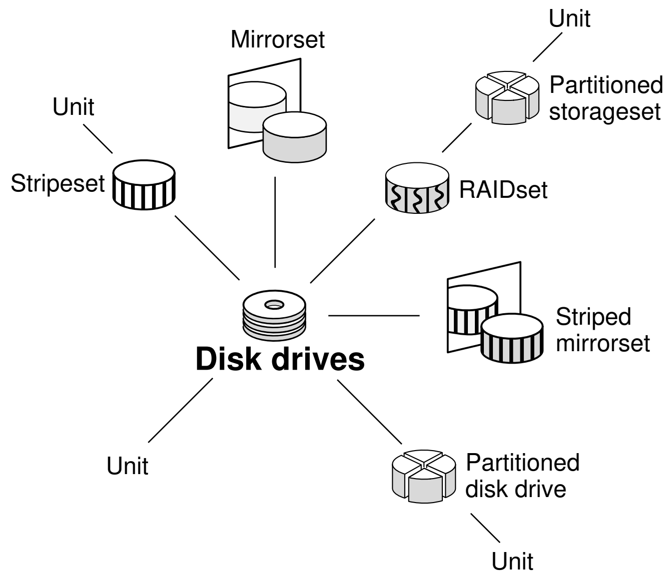
From the subsystem's perspective, the controller receives the I/O requests from the host and directs them to the devices in the subsystem. Since the controller processes all of the I/O requests, it eliminates the host-based processing that's typically associated with reading and writing data to multiple storage devices.

But the controller does much more than simply manage I/O requests: it provides the ability to combine several ordinary disk drives into a single, high-performance storage unit called a storageset.

Storagesets are implementations of RAID technology, also known as a “Redundant Array of Independent Disks.” Every storageset shares one important feature: whether it uses two disk drives or ten, each storageset looks like a single storage unit to the host.

You create storage units by combining disk drives into storagesets, such as stripesets, RAIDsets, and mirrortsets, or by presenting them to the host as single-disk units as shown in Figure 1–2.

Figure 1–2 The host recognizes units created from storagesets, partitions, and disk drives



- **Stripesets** (RAID 0) combine disk drives in serial to increase transfer or request rates.
- **Mirrorsets** (RAID 1) combine disk drives in parallel to provide a highly reliable storage unit.
- **RAIDsets** (RAID 3/5) combine disk drives in serial—just like stripesets—but also store parity data to ensure high reliability.
- **Striped mirrorsets** (RAID 0+1) combine mirrorsets in serial to provide the highest throughput and availability of any storage unit.

Of course, the controller also lets you add tape drives, CD–ROM drives, loaders, and libraries to your subsytem to meet all of your storage requirements.

Table 1-1 Summary of features

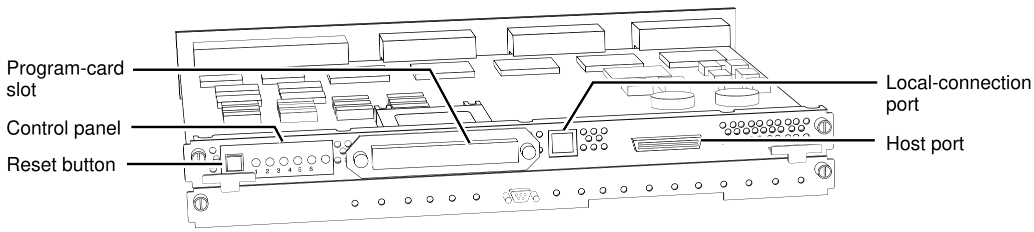
This table summarizes the features of your controller.

Feature	Supported
Host bus interconnect	DSSI
Host protocols	SCS, MSCP, TMSCP, DUP
Device protocol	SCSI–2
Number of SCSI device ports	6
Number of SCSI-2 devices in single configuration	42
Number of SCSI-2 devices in dual-redundant configuration	36
RAID levels supported	0, 1, 0+1, 3/5
Cache size	32, 64, or 128 MB
Preferred paths	✓
Device warm swap	✓
Error correction code	✓
Exercisers for testing devices	✓
Tape drives, loaders, and libraries	✓
Maximum number of configuration entities (devices + storagesets + partitions + units)	195
Maximum number of storagesets	30
Maximum number of partitions per storageset or disk drive	4
Number of RAIDsets and mirrorsets running simultaneously	20
Maximum number of units presented to host	32
Maximum number of devices per unit	32
Largest storageset	120 GB
Remote Disk Copy Data	✓

Anatomy of your controller

Your HSJ50 controller contains the key components shown in Figure 1–3.

Figure 1–3 Key Components



Under normal circumstances, you won't need to remove the controller from its cabinet. For this reason, the components that you'll use most often are conveniently located on the front panel. For example, the local-connection port provides a convenient way to connect a terminal to your controller so that you can configure it for the first time.

After you've configured your controller, you should periodically check its control panel. The reset button flashes green about once every second to indicate that the controller is operating normally. If an error occurs, one or more of the amber LEDs on the control panel will flash in a pattern that will help you to diagnose the problem.

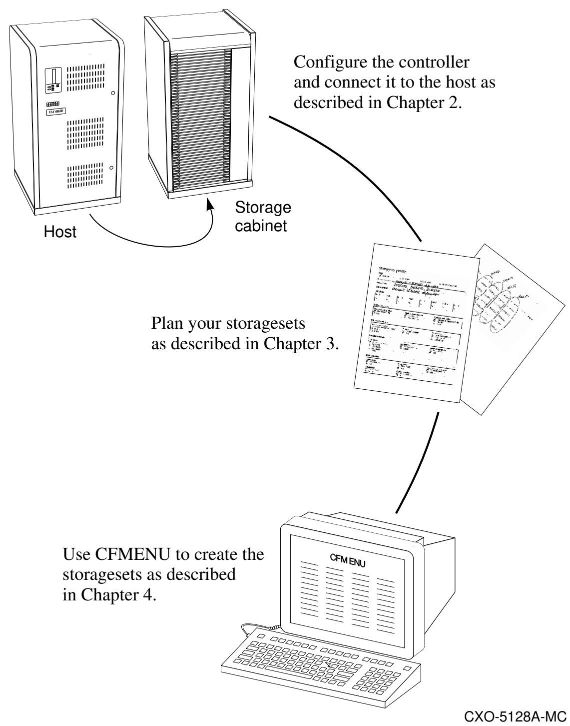
The host port and program-card slot are also located on the front panel, making it easy to update the HSOF software or to connect the controller to a different host.

The backplane enables two controllers to communicate with each other in dual-redundant configurations. It also contains device ports that enable the controller to communicate with the devices in your subsystem.

Key steps for configuring your subsystem

Figure 1–4 shows the key steps you'll follow to set up and configure your subsystem and its controller. Each of these key steps is explained later in this book.

Figure 1–4 Key steps for configuring your subsystem



2
Configuring your controller

Key steps for configuring a controller

Follow these key steps to configure a controller:

1. Establish communications with the controller. If you are configuring a controller for the first time, you MUST establish a local connection.
2. Configure the controller.
3. Connect the controller to the host.

After you have configured your controller, you can configure your subsystem by creating storagesets, single disk units, and other storage devices as described in Chapters 3, 4, and 5.

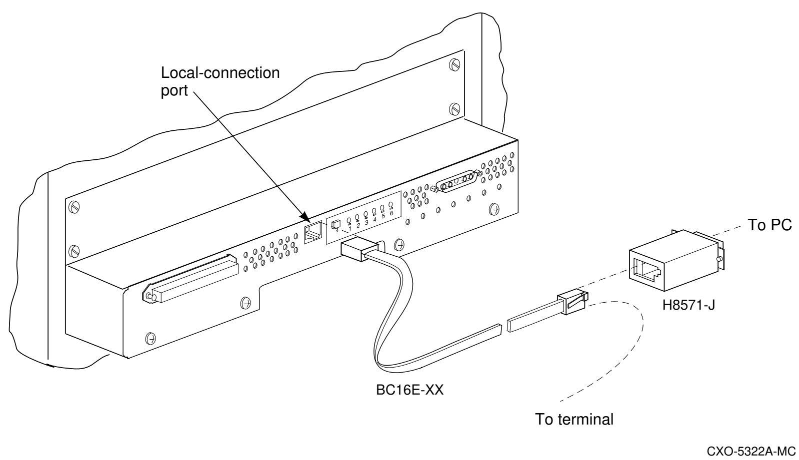
Communicating with a controller

You can communicate with a controller locally or remotely. Use a local connection to configure the controller for the first time. Use a remote connection for all subsequent configuration tasks.

Establishing a local connection

Use a terminal or a PC with terminal-emulation software to communicate with a controller locally.

Figure 2–1 Connect your terminal to the local-connection port to configure the controller for the first time



Caution

The local-connection port described in this book generates, uses, and can radiate radio-frequency energy through cables that are connected to it. This energy may interfere with radio and television reception. Do not leave any cables connected to it when you are not communicating with the controller.

To establish a local connection for configuring the controller for the first time:

1. Turn off the terminal and connect it to the controller as shown in Figure 5. Plug one end of a DECconnect Office Cable (BC16E-XX) into the terminal; plug the other end into the local-connection port.

   If you are using a PC instead of a terminal, you will need the serial-port adapter (H8571-J), also shown in Figure 5.
2. Turn on the terminal.
3. Configure the terminal for 9600 baud, 8 data bits, 1 stop bit, and no parity.
4. Press the Enter or Return key. A copyright notice and CLI prompt appear, indicating that you have established a local connection with the controller.

Establishing a remote connection

After configuring the controller for the first time, you can use a Diagnostics and Utility Protocol (DUP) terminal or a VAXcluster Console System (VCS) terminal to communicate with the controller remotely from a VMS™ host.

Installing the FYDRIVER

You will need to install the FYDRIVER before starting a DUP terminal:

Note

Use SYSMAN rather than SYSGEN for AXP systems.

---

1. Access the SYSGEN utility:

   ```
   $ MCR SYSGEN
   ```
2. Specify an FY connection that does not use an adapter:

```
SYSGEN> CONNECT FYA0 /NOADAPTER
```

3. Exit from SYSGEN:

```
SYSGEN> EXIT
```

Starting a DUP terminal

1. Obtain DIAGNOSE privileges.
2. Start the DUP connection by entering the following command at the DCL prompt:

   ```
   $ SET HOST/DUP/SERVER=MSCP$DUP/TASK=CLI nodename
   ```

   A copyright notice and CLI prompt appear, indicating that you have established a remote connection to the controller

   Use the /LOG qualifier to create a log file of your sessions:

   ```
   $ SET HOST/DUP/SERVER=MSCP$DUP/TASK=CLI/LOG=LOG.INFO
   ```

   If you want to run a local program such as DILX without going into the CLI, substitute the name of the program after the /TASK qualifier:

   ```
   $ SET
   HOST/DUP/SERVER=MSCP$DUP/TASK=DILX/LOG=LOG.INFO
   ```

Starting a VCS terminal session

To communicate with the controller through a VCS terminal session, follow the instructions provided in the *Polycenter Console User's Guide.*

Configuring a controller

You can configure a controller to operate as a single, nonredundant controller or as one controller in a pair of dual-redundant controllers:

- Use a **single** configuration if you want to use only one controller to service the same group of storagesets, single-disk units, and other storage devices. Mount the controller in its own shelf and follow the steps for configuring a single controller that begin on the next page.
- If you have two HSJ50 controllers running the same HSOF Version, you can configure them as **dual-redundant** controllers. Use this configuration if you want to use two controllers to service the same group of storagesets, single-disk units, and other storage devices. Since they are redundant, either controller can continue to service all of the storage units if the other controller fails.

  Mount both controllers in the same shelf and follow the steps for configuring dual-redundant controllers that begin on page 2–6.

Configuring a single controller

To configure a single, nonredundant controller:

1. Establish a local connection to the controller.
2. Set the maximum number of nodes in the CI cluster:

   ```
   CLI> SET THIS_CONTROLLER MAX_NODES = n
   ```

   where *n* is 8, 16, or 32. Use the smallest number that is greater than the total number of nodes in the cluster.
3. Declare a CI node number for the controller:

   ```
   CLI> SET THIS_CONTROLLER ID = n
   ```

   where *n* is a number between 0 and (MAX_NODES–1) that is not already assigned to a node in the cluster.
4. Declare the maximum number of host adapters on the CI bus segment:

   ```
   CLI> SET THIS_CONTROLLER MAXIMUM_HOSTS = n
   ```

   where *n* is the number of host adapters. Keep in mind that one CPU can have more than one adapter. If you are going to add more adapters to the cluster in the future, you should declare the anticipated amount so you can add them without having to reconfigure the controller. This number must be smaller than the MAX_NODES number.
5. Declare an SCS node name for the controller:

   ```
   CLI> SET THIS_CONTROLLER SCS_NODENAME = "node name"
   ```

   where *node name* is an alphanumeric name that identifies the controller, such as “HSJ_1”. The node name may contain up to six characters; it must begin with a letter and be enclosed in quotes.
6. Set the MSCP and TMSCP allocation classes:

   ```
   CLI> SET THIS_CONTROLLER MSCP_ALLOCATION_CLASS = n
   CLI> SET THIS_CONTROLLER TMSCP_ALLOCATION_CLASS = n
   ```

   where *n* is 0 through 255.
7. Optional: change the CLI prompt:

   ```
   CLI> SET THIS_CONTROLLER PROMPT = "new prompt"
   ```

   where *new prompt* is a 16-character (or less) string that will appear as the prompt. For example, you could use the prompt to indicate the controller’s name, such as
   “HSJ_1> ”.

8. Optional: if one or more of your host adapters support 4K packets, enable 4K packets on the controller:

   ```
   CLI> SET THIS_CONTROLLER CI_4K_PACKET_CAPABILITY
   ```

   The larger packet size can provide increased throughput to the host. The controller can use both 4K packets and smaller packets simutaneously, depending on the capabilities of each host and their adapters.

9. Disable the controller's CI ports:

   ```
   CLI> SET THIS_CONTROLLER NOPATH=A
   CLI> SET THIS_CONTROLLER NOPATH=B
   ```

10. Restart the controller:

    ```
    CLI> RESTART THIS_CONTROLLER
    ```

11. When the CLI prompt reappears, verify the configuration:

    ```
    CLI> SHOW THIS_CONTROLLER
    ```

12. Connect the controller to the host as described on page 2–9.

Configuring dual-redundant controllers

To configure a pair of dual-redundant controllers:

Note

> This procedure assumes that one controller has already been setup and installed, as described in the previous section.

1. Establish a local connection to one of the controllers. (For the steps that follow, the controller to which you are connected is "this controller.")

2. Put "this controller" into dual-redundant (failover) mode:

   ```
   CLI> SET FAILOVER COPY = THIS_CONTROLLER
   ```

   The "other controller" inherits "this controller's" configuration, then restarts. Wait for it to return to normal operation before continuing.

3. Set the maximum number of nodes in the CI cluster:

   ```
   CLI> SET THIS_CONTROLLER MAX_NODES = n
   CLI> SET OTHER_CONTROLLER MAX_NODES = n
   ```

   where *n* is 8, 16, or 32. Use the smallest number that is greater than the total number of nodes in the cluster.

4. Declare a CI node number for each controller:

   ```
   CLI> SET THIS_CONTROLLER ID = m
   CLI> SET OTHER_CONTROLLER ID = n
   ```

   where *m* and *n* are numbers between 0 and (MAX_NODES−1) that are not already assigned to a node in the cluster.

5. Declare the maximum number of host adapters on the CI cluster:

   ```
   CLI> SET THIS_CONTROLLER MAXIMUM_HOSTS = n
   ```

   where *n* is the number of host adapters. Keep in mind that one CPU can have more than one adapter. If you are going to add more adapters to the cluster in the future, you should declare the anticipated amount so that you can add them without having to reconfigure the controller. This number must be smaller than the MAX_NODES number.

6. Declare an SCS node name for each controller:

   ```
   CLI> SET THIS_CONTROLLER SCS_NODENAME = "node name"
   CLI> SET OTHER_CONTROLLER SCS_NODENAME = "node name"
   ```

   where *node name* is an alphanumeric name that identifies the controller, such as “HSJ_1” and “HSJ_2”. The node name may contain up to six characters; it must begin with a letter and be enclosed in quotes.

7. Set the MSCP and TMSCP allocation classes for “this controller”:

   ```
   CLI> SET THIS_CONTROLLER MSCP_ALLOCATION_CLASS = n
   CLI> SET THIS_CONTROLLER TMSCP_ALLOCATION_CLASS = n
   ```

   where *n* is 0 through 255. You only need to set these values for “this controller,” since the “other controller” automatically inherits the same values.

8. Optional: change the CLI prompt for each controller:

   ```
   CLI> SET THIS_CONTROLLER PROMPT = "new prompt"
   CLI> SET OTHER_CONTROLLER PROMPT = "new prompt"
   ```

   where *new prompt* is a 16-character (or less) string that will appear as the controller’s prompt. For example, you could use the prompt to indicate each controller’s name, such as “HSJ_1> ” and “HSJ_2> ”.

9. Optional: if one or more of your host adapters support 4K packets, enable 4K packets on the controllers:

   ```
   CLI> SET THIS_CONTROLLER CI_4K_PACKET_CAPABILITY
   ```

   The “other controller” inherits “this controller’s” packet size. The larger packet size can provide increased throughput to the host. The controller can use both 4K packets and smaller packets simutaneously, depending on the capabilities of each host and their adapters.

10. Disable each controller’s CI ports:

    ```
    CLI> SET THIS_CONTROLLER NOPATH=A
    CLI> SET THIS_CONTROLLER NOPATH=B
    CLI> SET OTHER_CONTROLLER NOPATH=A
    CLI> SET OTHER_CONTROLLER NOPATH=B
    ```

11. Restart the controllers:

    ```
    CLI> RESTART OTHER_CONTROLLER
    CLI> RESTART THIS_CONTROLLER
    ```

12. When the CLI prompt reappears, verify the configuration for each controller:

    ```
    CLI> SHOW THIS_CONTROLLER FULL
    CLI> SHOW OTHER_CONTROLLER FULL
    ```

13. Connect the controllers to the host as described on page 2–9.

Connecting a controller to the host

Note

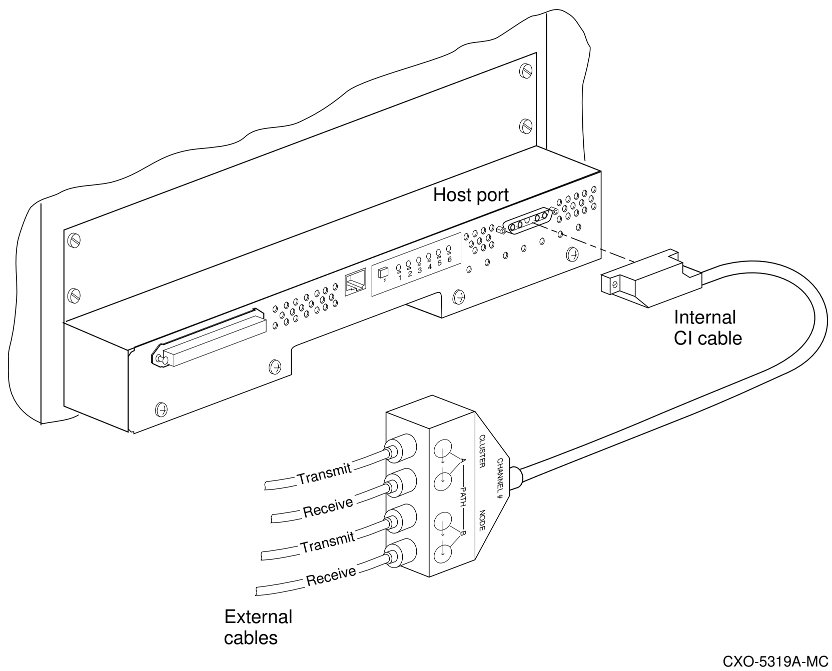
Whether you are installing a new controller or moving an old one to a new location, you must always configure the controller before connecting it to a host.

The controller's configuration determines how you will connect it to a host. Use one of the following procedures described in this section:

- connecting a single controller to the host
- connecting dual-redundant controllers to the host

Connecting a single controller to the host

Figure 2–2 Connecting a single controller to the CI cluster



To connect a single, nonredundant controller to the CI cluster:

1. Connect the internal CI cable (17-03427-01) to the host port on the front of the controller as shown in Figure 6.
2. Connect the four, blue external cables to the internal cable as shown in Figure 6. Table 2 lists the maximum cable lengths.

Table 2–1 Maximum cable lengths

Cable	Meters	Feet
Internal CI cable	1.83	6
External CI cables (blue) to star coupler	45	147.6

3. Connect the external cables to the star coupler in the following order:

   Path B Receive
   Path B Transmit
   Path A Receive
   Path A Transmit

4. Route and tie the cables as desired.
5. Establish a local connection to the controller and enable its host port paths:

```
CLI> SET THIS_CONTROLLER PATH_A
CLI> SET THIS_CONTROLLER PATH_B
```

6. Verify the connection by logging onto the cluster and entering the following commands:

```
$ SHOW CLUSTER/CONT
  CLUSTER> ADD RPORT
  CLUSTER> ADD LPORT
```

   Make sure that the controller is listed with the correct node number (RPORT) and that its path is enabled.

Connecting dual-redundant controllers to the host

To connect a pair of dual-redundant controllers to the host:

1. Connect an internal CI cable (17-03427-01) to the host port on the front of each controller as shown in Figure 6.
2. Connect the four, blue external cables to the internal cable for each controller as shown in Figure 6. Table 2 lists the maximum cable lengths.
3. Connect the external cables to the star coupler in the following order for each controller:

   Path B Receive
   Path B Transmit
   Path A Receive
   Path A Transmit
4. Route and tie the cables as desired.
5. Establish a local connection to one of the controllers and enable their host port paths:

```
CLI> SET THIS_CONTROLLER PATH_A
CLI> SET THIS_CONTROLLER PATH_B
CLI> SET OTHER_CONTROLLER PATH_A
CLI> SET OTHER_CONTROLLER PATH_B
```

6. Verify the connections by logging onto the cluster and entering the following commands:

```
$ SHOW CLUSTER/CONT
  CLUSTER> ADD RPORT
  CLUSTER> ADD LPORT
```

   Make sure that the controllers are listed with the correct node numbers (RPORT) and that the paths are enabled.