Fibre Channel Arbitrated Loop Hub (DS-DHGGA-CA)

User's Guide

EK-DHGGA-UG. A01

Digital Equipment Corporation
Maynard, Massachusetts

First Edition, October 1997

Contents

Appendix A Notices

Appendix B Specifications

Figures

Revision Record

This Revision Record provides a concise publication history of this manual. It lists the manual revision levels, release dates, and reasons for the revisions. It also describes how the changes to affected pages are marked in the manual.

The following revision history lists all revisions of this publication and their effective dates. The publication part number is included in the Revision Level column, with the last entry denoting the latest revision.

Revision Level	Date	Summary of Changes
EK–DHGGA–UG. A01	October 1997	Original release.

About This Guide

This section identifies the audience of this guide and describes the contents (chapter by chapter) and structure. In addition, this section includes a list of associated documents and the conventions used in this guide.

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This guide provides the following:

- An overview of fibre channel technology
- A functional description of fibre channel technology
- Configuration information
- Installation and cabling information

Intended Audience

This guide is intended for administrators of StorageWorks fibre channel technology. It requires an overall understanding of fibre channel concepts.

Document Structure

This guide contains the following major sections:

Chapter 1: Introduction

This chapter contains information on fibre channel technology.

Chapter 2: Functional Description

This chapter describes the functionality of the Fibre Channel Arbitrated Loop hub.

Chapter 3: Configuration

This chapter describes how to configure the Fibre Channel Arbitrated Loop hub.

Chapter 4: Installation and Cabling

This chapter contains instructions for installing and cabling the Fibre Channel Arbitrated Loop hub.

Appendix A: Notices

This appendix contains notices that are pertinent to the operation of the Fibre Channel Arbitrated Loop hub.

Appendix B: Specifications

This appendix provides hardware specifications for the hub.

Associated Documents

For further information on the fibre channel technology, please refer to the documents you received at the initial purchase of your system.

Conventions

This guide uses the following documentation conventions:

Table 2 Style Conventions

Style	Meaning
`boldface monospace type`	To be input by the user.
italic type	For emphasis, manual titles, utilities, menus, screens, filenames, variable values, placeholders, and function argument names.
`plain monospace type`	Screen text.
#	Represents the DIGITAL UNIX system superuser prompt.
{name}	Braces represent items that are required.

Support and Services

Who to contact in the Americas

Information and Product Questions:	Local Sales Office / StorageWorks Hotline 1-800-786-7967
Installation Support:	Contact the DIGITAL Distributor where the Storage Solution was Purchased / Local Digital Sales Office.
DIGITAL Multivendor Customer Service (MCS)	
Installation	Contact the DIGITAL Customer Support Center (CSC).
Warranty	Contact the DIGITAL Customer Support Center (CSC) for warranty service after solution is installed and operating.
Remedial	Contact the DIGITAL Customer Support Center (CSC) **Note**: A Service Contract is recommended when the equipment is out of warranty. Contact the local DIGITAL Sales Office.
Customer Support Center (CSC)	1 800-354-9000

Who to contact in Europe

Information and Product Questions, **Installation Support, and Installation:**	Contact the DIGITAL Distributor or reseller from whom the Storage Solution was purchased.
For Warranty Service	See the Warranty Card packaged with the product.
For Remedial Service	Contact the DIGITAL Distributor or reseller from whom the Storage Solution was purchased. **Note**: A Service Contract is recommended when the equipment is out of warranty.

Who to contact in Asia Pacific

For all services, contact the DIGITAL Distributor or reseller from whom the equipment was purchased.

1

Introduction

This chapter contains descriptive information on fibre channel technology.

1.1 Fibre Channel Technology

Fibre Channel is a serial, medium-to-high performance external interface that is unaware of the content or meaning of transferred information. Fibre Channel increases both the potential connectivity of devices and the usable distance between devices.

The Fibre Channel Arbitrated Loop hub operates by collapsing the physical loop into a logical star. Intelligent port by-pass functions manage movement of nodes on and off the fibre channel arbitrated loop. Data availability is then preserved by preventing the downtime associated with node failures, cable disconnections, and network reconfigurations.

The Fibre Channel hub operates within an area address of 126 devices which handle initialization, discovery, and addressing. Its gigabit infrastructure, coupled with native storage (SCSI) attachment, makes the fibre channel arbitrated loop hub the ideal solution for data intensive applications.

2

Functional Description

This chapter describes the functionality of the Fibre Channel Arbitrated Loop active hub.

2.1 General Description

The Fibre Channel Arbitrated Loop is an active hub. It has intelligent, per-port data detection check capabilities for automatic port bypass control. The hub is configured to have nine default copper ports, each of which is supplied with power to support the Fibre Channel Media Interface Adapters (MIA) for electrical to optical conversion.

2.2 Operation

The hub operates without any user intervention. It continually monitors the serial data and automatically configures a fibre channel arbitrated loop (FC-AL) based on its intelligent bypass control logic. To operate in plug-and-play mode, valid FC-AL nodes with ANSI-compliant cables are added.

The hub is transparent to the protocol. It does not consume any fibre channel arbitrated loop addresses and so is not addressable by a FC-AL port. Because of the intelligent signal detection tests, only valid fibre channel devices can be connected to a loop when using the hub. If a fibre channel arbitrated node transmits invalid fibre channel data, the node is taken off the loop. Examples of node behaviors, which result in a bypass state are invalid characters, absence of frames, and invalid signal amplitude.

2.3 Hub Port Functionality

2.3.1 Active Repeaters

The hub is "active" in that it re-drives the input signal to full amplitude and re-times the input signal with its recovered clock to attenuate jitter. Every port implements active repeaters at each incoming node. Re-timed serial data simplifies physical cabling management by allowing users to use any kind of fibre channel compliant cables. Without re-driving and re-timing, the serial data is degraded by the cable. For copper cables, the principal cause of signal degradation is attenuation and intersymbol interference.

For fiber optic cables, the electrical-to-optical and optical-to-electrical conversion induces jitter as well as model noise of the optical cable itself. Without repeaters, users must keep track of total end-to-end cable distances. As an active hub, it contains repeater PLLs (Phase Lock Loops) at every hub port. These PLLs work only at the 1.0625 Gbit/sec fibre channel data rate. The fibre channel arbitrated loop does not operate with multiple data speeds. Only active ports re-time the serial data. Unused ports are not re-timed. Only in cascading hubs would there be more than one repeater between two NL_Ports.

2.4 Data Detection Tests

The hub employs intelligent data detection checks to provide high availability for an operating FC-AL loop. These checks minimize loop disruption due to catastrophic node failures, node expansion, and incorrect node insertion.

The hub deploys look-aside data detection check circuits. The look-aside scheme minimizes data latency through the hub. Three different data detection checks (DDC) are used as listed below:

- DDC 1: Checks for the absence of valid characters
- DDC 2: Checks for the presence of oscillation.
- DDC 3: Checks for crosstalk

DDC1 tests for the presence of invalid 8B/10B characters. 8B/10B code's run length is limited to no more than five consecutive runs of "1's" or "0's." Any data that exceeds the 8B/10B maximum run length of five is considered to be an invalid 8B/10B character. This test will prevent the insertion of test sequences, invalid bit rates (quarter or half speed), or any other non-fibre channel data sequences onto an operating loop.

DDC2 checks for the presence of oscillation above 100 MHZ. Oscillation at such a frequency can often cause an invalid DDC1 because 8B/10B is the only valid data at this level. High frequency devices can often break into oscillation when not properly driven. This can occur on open cables or when the host transmitter's outputs are shut off. DDC2 also ensures the reception of valid fibre channel frames as it is checking for the presence of control characters that must occur within a valid time window.

DDC3 checks for crosstalk in order not to falsely insert an unconnected node. Fibre channel receivers use sensitive input receivers to provide design margins resulting in low bit error rates even in the presence of large eye closure. High sensitivity receivers can mistake crosstalk for valid fibre channel data. DDC3 tests for a valid input level to ensure proper bit error rate link performance. The crosstalk test is a look-aside test, so it does not actually degrade input receiver sensitivity. The link bit error rate is not affected.

All three data detection checks are performed continuously and simultaneously. From field testing, it is found that only the simultaneous performance of all three data detection tests can reliably prevent false loop operation.

2.5 Time_In and Time_Out Periods

One of the key design parameters for a hub design is in setting the hub's "port bypass sensitivity." Port bypass sensitivity is the amount of time that passes before a hub port removes a failed port or adds a new port. High port bypass sensitivity results in bouncy performance and too low port bypass sensitivity causes loop re-initialization.

The hub implements asymmetric port bypass sensitivity. It uses different Time_In periods from its Time_Out periods. The Time_Out period is the period of time used by the hub to decide whether a node is non-operational. The Time_In period is the amount of time used by the hub to decide whether to add a node onto a loop.

The goal for setting the test periods is to make it easier for a port to be taken off the loop than for a port to be allowed onto a loop. This built-in hysteresis prevents any peculiar modes that can cause fault propagation.

The hub must sense an error in four consecutive 50msec periods prior to bypassing a port. Requiring four consecutive errors in 50msec periods ensures that a port is not bypassed due merely to normal link noise. Maximum loop frame disruption is 200msec.

The Time_In period is 100msec. This means that the hub must sense error-free transmission for 100msec prior to allowing a port onto an operating loop. During this interval, the hub PLL repeater locks onto the new port and then onto incoming serial data within 2msec. This provides for overall error-free operation.

2.6 Fault Indicators

All LED indicators are on the front panel.

Amber LED's per port are provided for link status indicators. If the amber LED is off, the port is active and participating on an active fibre channel loop. If the amber LED indicator is on, the port is bypassed and not participating on a fibre channel loop.

A single green LED indicator is provided to indicate that the power is on.

3

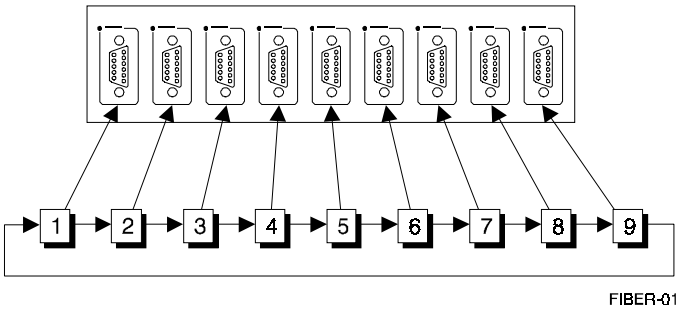
Configuration

This Chapter describes how to configure the fibre channel arbitrated loop hub.

3.1 Port Order

A hub collapses the physical loop within itself. In the hub, the loop operates from left to right. Figure 3-1 shows the internal port order of a fibre channel arbitrated loop hub.

Figure 3-1: DS-DHGGA-CA Internal Port Order



4

Installation and Cabling

This chapter contains instructions for installing and cabling the fibre channel arbitrated loop hub.

4.1 Mounting

The hub is designed for desktop usage.

4.2 Cabling

The hub accepts cabling options for distances up to 10 m.

NOTE

For further cabling and routing information, refer to your solution-specific *Getting Started* manual.

4.3 Connector Definition

The hub uses the ANSI FC-PH standard DB-9 pinout connector with an additional power pin to support an external module for electrical to optical conversion. The DS-DHGGA-CA uses female DB-9 receptacles with Pin 4 keyed to prevent misplugging. The DB-9 type connector is the same as the standard RS232 serial port connector on a computer.

4.4 Twinax Cables

Twinax cables are shielded twisted-pair cables that are electrically enhanced for optimal gigabit data transmission. Electrical enhancement refers to the low skew control required by ANSI on the differential pair conductors to minimize eye closure and RFI emissions. The cables are ANSI-compliant and include four (4) conductor cable assemblies. These assemblies are terminated with DB-9 male plugs to provide for differential, duplex-data communication.

NOTE

For further cabling and routing information, refer to your solution-specific *Getting Started* manual.

4.5 Power

The power cord must be connected to a nearby electrical outlet that is easily accessible. Ensure that the appropriate power plug is available for the installation area. The hub has an IEC 320 power connector on the back. A power cable with the IEC 320 plug on one end and a suitable local power plug on the other end must be used. If the power cable has the wrong connection for your area, contact your sales or service representative.

There is no power switch on the hub. The hub should be the first operating component in bringing up a fibre channel arbitrated loop system. Once the hub is up and indicates it is ready (i.e., the green power LED is on), users can power up the FC-AL nodes on the loop.

A

Notices

This appendix contains notices that are pertinent to operation of the fibre channel arbitrated loop hub.

A.1 FCC STATEMENT

NOTE: 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 in a residential installation. This equipment generates, uses, and radiates radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, (which can be determined by turning the equipment off and on), the user is encouraged to try to correct the interference by implementing one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that
- to which the receiver is connected.
- Consult the dealer or an experienced radio TV technician for help. Shielded cables must be used with this unit to ensure compliance with the Class A FCC limits.

A.2 INDUSTRY CANADA COMPLIANCE STATEMENT

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'emet pas de bruits radioéléctriques dépassant les limites applicables aux appareils numériques de la class A préscrites dans le Règlement sur le brouillage radioéléctrique édicté par le ministère des Communications du Canada.

A.3 SAFETY INFORMATION

For PLUGGABLE EQUIPMENT, the socket-outlet shall be installed near the equipment and shall be easily accessible. There are no field serviceable components to this product. All service must be performed by the factory. Opening the product voids the warranty.

A.4 CE MARK

This product was tested and found to be in compliance with the applicable requirements of the following standards, enabling attachment of the CE mark to the product label:

- EN60950: Product Safety
- EN50082-1:1992, Immunity Testing
- EN55022:1994 (Class A), Emissions Testing

B

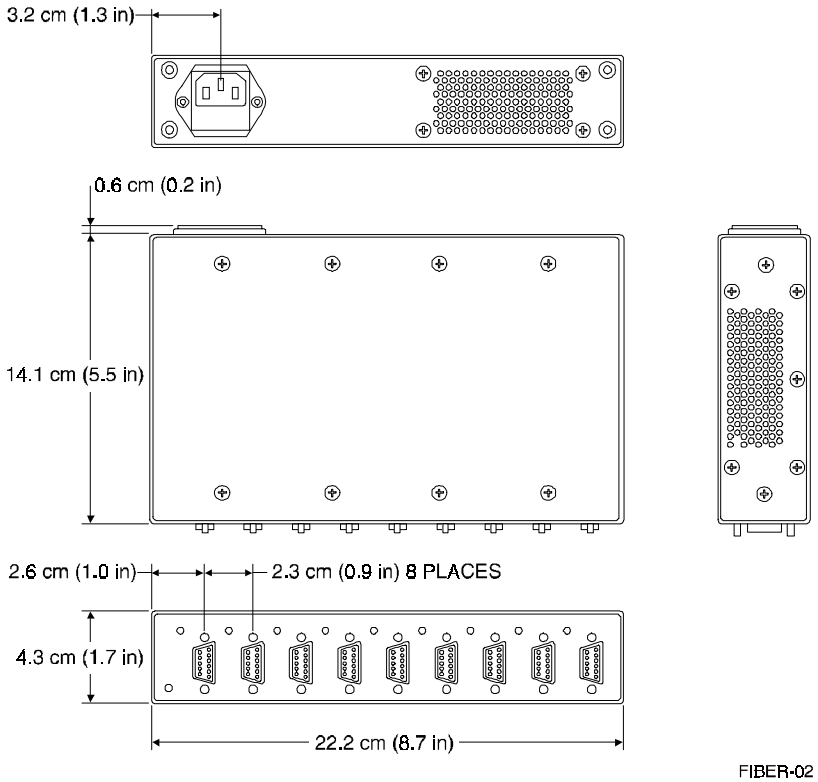
Specifications

This appendix provides hardware specifications for the fibre channel arbitrated loop hub.

B.1 Mechanical

Chassis Height ..... 43 mm (1.7 in)
Chassis Width ..... 221 mm (8.7 in)
Chassis Depth ..... 145 mm (5.7 in)
Chassis Weight..... 3 lbs Net 93.3 lbs Shipping0

Figure B–1 Mechanical Dimensions



B.2 Electrical

Bit rate ..... 1.0625 Gigabit per second
Standards/Profiles ..... ANSI X3T11 PH
Connector DB-9
Port LED..... 1 Amber LED per port
Power LED ..... 1 Green LED
Bypass Control ..... Automatic, Intelligent

B.3 Power

AC Voltage..... 100 - 240 VAC autosensing
Power ..... 2A, 50 - 60Hz
Power Consumption 100VA

B.4 Environmental

Operating Temperature ..... 0 o C to +40 o C
Storage Temperature..... -40 o C to +70 o C
Operating Humidity ..... 95% max relative humidity

B.5 Agency Approvals

EMI ..... FCC Part 15 Class A (EN55022B), (EN50082-1)
Safety ..... UL 1950, CSA 950, EN60950 (IEC950), CE Mark

Reader's Comments

Manual Order Number:
EK–DHGGA–UG. A01

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Manual Rating	Excellent	Good	Fair	Poor
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Organization (logical sequence of information)	[ ]	[ ]	[ ]	[ ]
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