Sun™ StorEdge™ FC-100 Long Wave Gigabit Interface Converter Guide

Caution – LW GBIC performance depends upon the correct implementation of a 10 km Single Mode Optical Fiber Cable Plant which complies with the specifications provided in Section A.3 “Single Mode Cable Plant”.

A Sun sales representative must complete and submit a pre-sales agreement which certifies that your installation meets the above specifications before the sales order will be approved.

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Contents

Preface v

1. LW GBIC Installation and Removal 1-1

1.1 Planning the Configuration 1-1

1.2 Installing the LW GBIC 1-4

1.3 Removing the LW GBIC 1-6

1.4 Maintaining Fiber Optic Cables 1-7

A. Specifications A-1

A.1 LW GBIC A-2

A.1.1 Laser Safety A-2

A.1.2 Optical Characteristics A-3

A.1.3 Mechanical Specifications A-4

A.1.4 Center Wavelength Versus Spectral Width A-4

A.2 Single Mode Cable With Duplex SC Connectors A-5

A.2.1 Environmental and Safety Specifications A-5

A.2.2 Optical and Mechanical Characteristics A-6

A.2.3 Single Mode Optical Fiber Specifications A-6

A.3 Single Mode Cable Plant A-7

A.3.1 Connector Specification A-7

A.3.2 Single Mode Optical Fiber Specifications A-7

Preface

The *Sun StorEdge FC-100 Long Wave Gigabit Interface Converter Guide* explains how to install Sun™ StorEdge™ FC-100 Long Wave Gigabit Interface Converters (LW GBICs) into Sun disk arrays and hubs.

Using UNIX Commands

This document does not contain information on basic UNIX® commands and procedures such as shutting down the system, booting the system, and configuring devices.

See one or more of the following for this information:

- *Solaris Handbook for Sun Peripherals*
- AnswerBook™ online documentation for the Solaris™ software environment
- Other software documentation that you received with your system

Typographic Conventions

TABLE P-1 Typographic Conventions

Typeface	Meaning	Examples
`AaBbCc123`	The names of commands, files, and directories; on-screen computer output	Edit your `.login` file. Use `ls -a` to list all files. `% You have mail.`
`AaBbCc123`	What you type, when contrasted with on-screen computer output	`% su` `Password:`
AaBbCc123	Book titles, new words or terms, words to be emphasized	Read Chapter 6 in the *User's Guide.* These are called *class* options. You *must* be superuser to do this.
	Command-line variable; replace with a real name or value	To delete a file, type `rm` *filename.*

Shell Prompts

TABLE P-2 Shell Prompts

Shell	Prompt
C shell	*machine_name*%
C shell superuser	*machine_name*#
Bourne shell and Korn shell	$
Bourne shell and Korn shell superuser	#

Related Documentation

See the *Sun StorEdge A5000 Installation Tasks and Documentation Guide*, part number 805-1903-xx, for the list of related documentation.

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CHAPTER 1

LW GBIC Installation and Removal

This chapter explains how to plan LW GBIC configurations and how to install and remove LW GBICs.

1.1 Planning the Configuration

This section shows the supported LW GBIC cabling guidelines in Sun StorEdge device configurations.

FIGURE 1-1 and FIGURE 1-2 show the supported configurations between initiators and the Sun StorEdge A5000 Disk Array and StorEdge FC-100 Hubs. Use these illustrations in conjunction with the information in the *Sun StorEdge A5000 Disk Array Hardware Configuration Guide*, part number 805-0264-xx, to plan your configuration.

The LW GBIC can be inserted into host adapter cards or Sun™ Enterprise™ SBus+ I/O Boards.

Note – LW GBICs must be connected in pairs.

Additional configurations may become available in the future. For an updated list of supported configurations, go to the “Storage & Peripherals” section of the `docs.sun.com` web site and read the *Sun StorEdge A5000 Installation Supplement:*

```
http://docs.sun.com
```

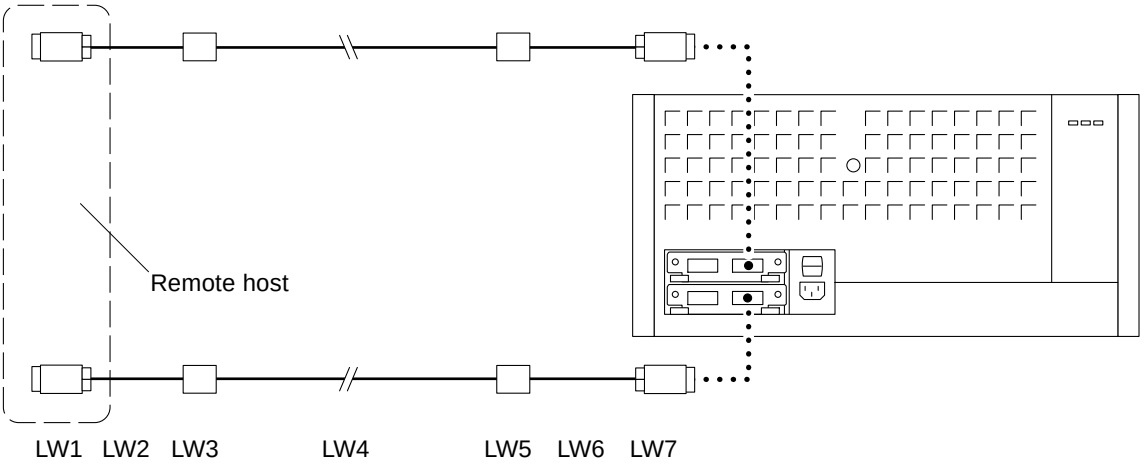

FIGURE 1-1 LW GBIC Configuration Between Initiators and a Single Disk Array

TABLE 1-1 Index to FIGURE 1-1

Number	Component
LW1	LW GBIC
LW2	15m single-mode fiber optic cable
LW3	Wall or socket connection
LW4	Up to 10K single-mode fiber optic cable
LW5	Wall or socket connection
LW6	15m single-mode fiber optic cable
LW7	LW GBIC

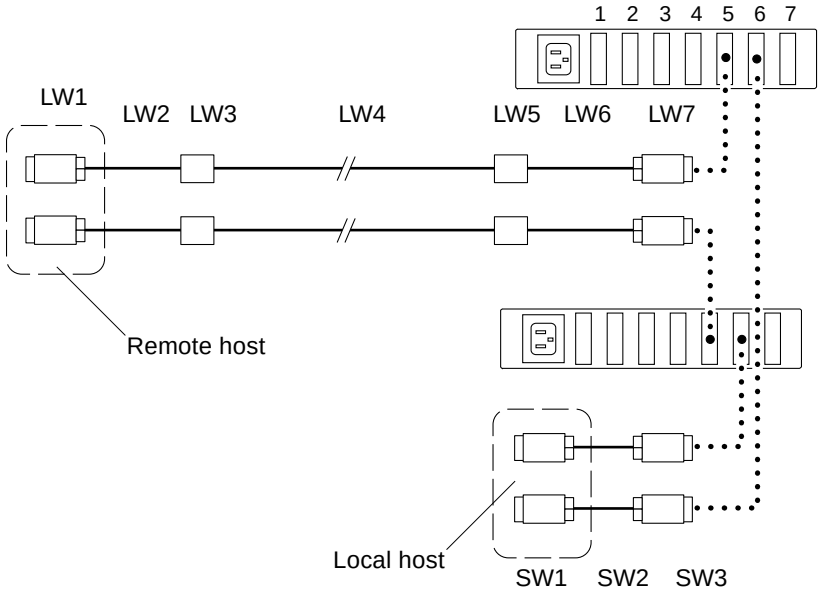

FIGURE 1-2 LW GBIC Configuration Between Initiators and StorEdge FC-100 Hub

TABLE 1-2 Index to FIGURE 1-2

Number	Component
LW1	LW GBIC
LW2	15m single-mode fiber optic cable
LW3	Wall or socket connection
LW4	Up to 10K single-mode fiber optic cable
LW5	Wall or socket connection
LW6	15m single-mode fiber optic cable
LW7	LW GBIC
SW1	SW GBIC[1]
SW2	Fiber optic cable
SW3	SW GBIC

1. SW GBIC refers to the multi mode 500m default GBIC used in Sun StorEdge A5000 Disk Array factory configurations.

1.2 Installing the LW GBIC

Caution – Forcing a LW GBIC into a port can damage the LW GBIC and/or the port. Use minimal pressure when inserting the LW GBIC.

1. **Unwrap the LW GBIC and pull out the dust covers.**
2. **With the bail in the unlock position, insert the LW GBIC into the port. The unlock position is with the bail near the top of the LW GBIC (**FIGURE 1-3**).**

   LW GBICs are keyed to prevent improper insertion; they can be installed only as shown below.

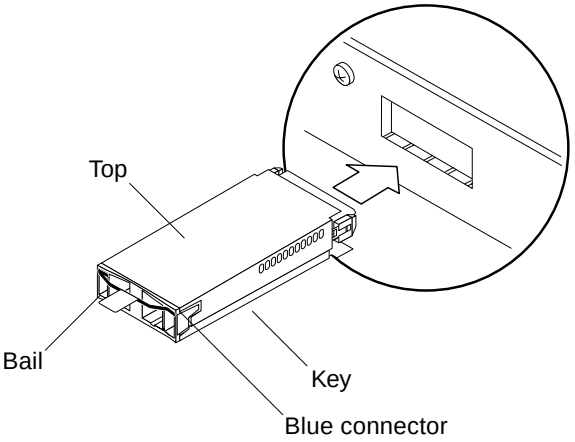

FIGURE 1-3 Installing the LW GBIC

3. **Move the bail down into the locked position (**FIGURE 1-4**).**

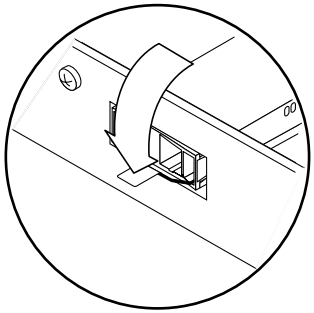

FIGURE 1-4 Moving the Tab Into the Locked Position

4. **Pull lightly on the bail to ensure that it is properly locked into place.**

5. **Connect a fiber optic cable to the LW GBIC (**FIGURE 1-5**).**

   Fiber optic cables are keyed to prevent improper insertion; they can be installed only as shown below.

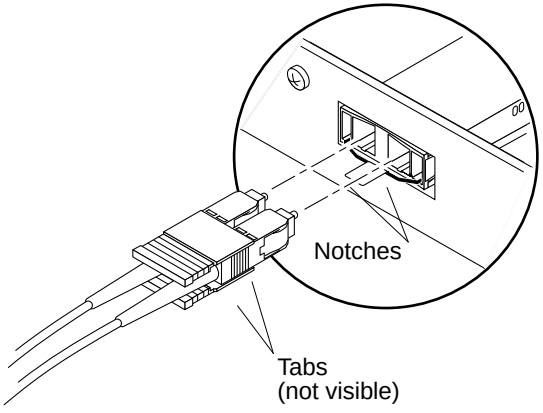

FIGURE 1-5 Connecting the Fiber Optic Cable

1.3 Removing the LW GBIC

1. **Disconnect the fiber optic cable connector from the LW GBIC.**

Caution – You must remove the fiber optic cable from the LW GBIC before removing the LW GBIC.

2. **Move the bail to the unlocked position (**FIGURE 1-6**).**

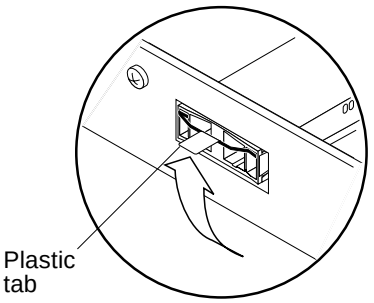

FIGURE 1-6 Moving the Bail to the Unlocked Position

3. **Pull on the bail's plastic tab to remove the LW GBIC.**

1.4 Maintaining Fiber Optic Cables

Caution – Follow these guidelines to avoid causing damage to fiber optic cables.

The minimum bend radius for fiber optic cables is 1.2 inches (3 cm).

Make sure to grasp the connector when disconnecting a fiber optic cable. Never disconnect a fiber optic cable by pulling on the cable.

To avoid damage due to contamination or abrasion, always put dust covers on the fiber optic cable connectors when the cable is disconnected.

Dirty fiber optic cable connectors can impeded data transfer.

Before replacing a fiber optic cable, make sure that the connectors on the cable and LW GBIC are clean.

1. **Disconnect the fiber optic cable.**
2. **Lightly dip a cotton swab in a solution of pharmaceutical-grade isopropyl alcohol.**
3. **Use the swab and clean the inside of both connectors, as well as the insides of the LW GBICs and other connectors.**
4. **Reconnect the connectors.**

If the fiber optic cable still registers as being faulty, replace the fiber optic cable.

APPENDIX **A**

Specifications

This appendix contains specifications for the following components:

- LW GBIC—page A-2
- Single Mode Cable With Duplex SC Connectors—page A-5
- Single Mode Cable Plant—page A-7

A.1 LW GBIC

This section contains specifications for the LW GBIC. The LW GBIC meets or exceeds the Fibre Channel Standard 100-SM-LC-L specification.

A.1.1 Laser Safety

The LW GBIC is Class I Laser safe under single fault conditions for the when used with Sun-approved power sources at the operating temperatures specified in Section A.1.2 “Optical Characteristics” on page A-3.

TABLE A-1 Laser Safety Standards

Parameter	References
International Standards	IEC825-1 and IEC 825-2
FDA Standard	CDRH 21 CFR Ch1. Sub J Part 1040.10

FIGURE A-1 Laser Compliance Label

A.1.2 Optical Characteristics

TABLE A-2 Link

Parameter	Min	Max
Nominal bit rate (B)	1062.5±200 PPM Mb/s	
Operating range (L)	2m	10 Km
Loss budget	10.5 dB	
Typical fiber core diameter (MFD)	8.5	9.8

TABLE A-3 Transmitter

Parameter	Min	Max
Spectral center frequency (l)	1285 nm RMS	1345 nm RMS
Spectral width (Δl)	0.5 nm RMS	3 nm RMS
Launched power (P)	-8 dBm	-3 dBm
Relative intensity noise (RIN)		-120 dB/Hz
Extinction ratio (Ex)	9 dB	
Deterministic jitter (DJ)		0.20 UI[1] (pk-pk)
Total jitter (TJ)		0.43 UI (pk-pk))
Optical rise and fall time[2]		320 ps

1. 1 UI=941 pico-seconds

2. The optical rise and fall time is 20%-80% unfiltered. If a 4th order Bessel Thompson filter is used, the unfiltered rise and fall time would be:
TRise/Fall = √ ((Trise/fall measured)^2 - (Trise/fall filter)^2)

TABLE A-4 Receiver

Parameter	Min	Max
Received power	-20 dBm	-3 dBm
Operating wavelength	1270 nm	1350 nm
Optical power penalty		4.2 dB
Return loss of receiver (RL)	12 dB	
OE deterministic jitter added (DJ)[1]	0.17 UI (pk-pk)	
OE total jitter added (TJ)[1]	0.15 UI (pk-pk)	

1. Amount of jitter added by the converter only.

A.1.3 Mechanical Specifications

TABLE 1-3 Mechanical Specifications

Parameter	Specification
Optical Connector Insertion	250 times[1]
LW GBIC Insertion	100 times[2]

1. The number of times SC Duplex connector can be inserted / removed into the LW GBIC.
2. The number of times a LW GBIC unit can be inserted / removed in to the mating assembly.

A.1.4 Center Wavelength Versus Spectral Width

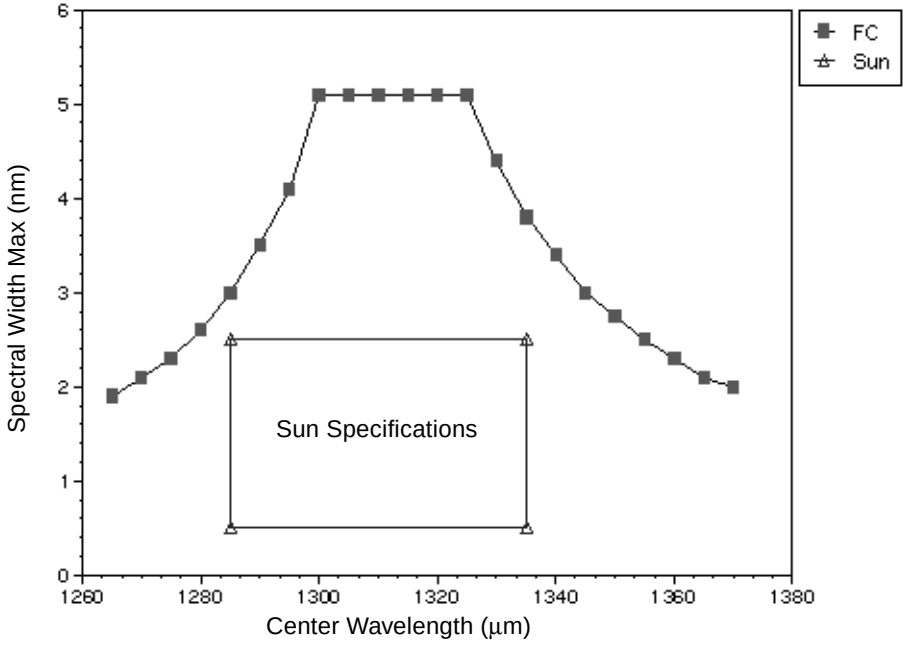

FIGURE A-2 Wavelength Versus Spectral Width

FC = FC Specification for 9.5 dB Power Budget

A.2 Single Mode Cable With Duplex SC Connectors

Cable assemblies comply with the EIA/TIA 492BAAA specification. The cable color is be yellow, and the connectors are be blue in compliance with Fibre Channel adapted color coding.

A.2.1 Environmental and Safety Specifications

TABLE A-5 Environmental and Safety Specifications

Parameter	Min	Max
Storage temperature (at 5% to 95% RH)	-40 ˚ C	80 ˚ C
Operating temperature (at 10% to 90% RH)	-10 ˚ C	70 ˚ C
Flame retardance (OFNR)[1]	1666	
Cable material minimum rating (UL-94)	V-1	

1. UL specification for cable flame retardation.

A.2.2 Optical and Mechanical Characteristics

TABLE A-6 Optical and Mechanical Characteristics

Parameter	Min	Max
Mean optical connector loss[1]		0.25 dB
Optical connector loss + 3s[1]		0.5 dB
Connector optical return loss (RL)[2]		-30 dB
Fiber tensile proof test	100 Kpsi	
Cable bend radius[3]	30 mm	
Ferrule end radius	10 mm	25 mm
Connector apex offset		50 mm
Connector axial retention[4]	90 N	
Insertion / withdrawal force		80 N
Off axial rotational pull[4]	20 N	
Cable / connector pull strength	90 N	
Mating durability / insertion	500	

.1 Verified with OFSTP-7 method.

2. Verified with FOTP-107 method.

3. Excess loss is less than 0.5 dB if the fiber is wrapped around a 30-mm radius Mandrel once.

4. Maximum optical loss variation is less than 0.5 dB.

A.2.3 Single Mode Optical Fiber Specifications

TABLE A-7 Single Mode Optical Fiber Specifications

Parameter	Min	Max
Fiber attenuation at 1310 nm[1]		0.4 dB / Km
Excess attenuation[1]		0.05 dB / Km
Zero dispersion wavelength ($\lambda 0$)	1301.5 dB / Km	1321 dB / Km
Zero dispersion slope (S0)		0.092 ps / ($nm^2 \bullet Km$)

1. For a temperature range of -10˚ C to 85˚ C and 4% to 98% RH.

A.3 Single Mode Cable Plant

All cable plants must meet or exceed the requirements of EIA/TIA 492BAAA and use approved single mode optical fibers such as Corning SMF-28 or Lucent equivalent.

A.3.1 Connector Specification

TABLE A-8 Connector Specification

Parameter	Max
Mean optical connector loss[1]	0.25 dB
Optical connector loss + 3s[1]	0.5 dB
Connector optical return loss (RL)[2]	-30 dB

1. Verified with OFSTP-7 method.
2. Verified with FOTP-107 method.

A.3.2 Single Mode Optical Fiber Specifications

TABLE A-9 Single Mode Optical Fiber Specifications

Parameter	Min	Max
Mode field diameter (MFD)	8.8 µm	9.8 µm
Cladding diameter	124 µm	126 µm
Cladding non-circularity		1%
Cable cutoff wavelength		1260 nm
Fiber attenuation at 1310 nm[1]		0.4 dB/Km
Excess attenuation[1]		0.05 dB/Km
Zero dispersion wavelength (λ0)	1301.5 dB/Km	1321.5 dB/Km
Zero dispersion slope (S0)		0.092 ps/(nm^2•Km)

1. For temperature range of -10˚ C to 85˚ C and 4% to 98% RH.