



# SFS1600 Switch Box

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## User Guide

**Revision Information:** Revision 2.0

**Hardware Version:** SFS1600-X2

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## Preface

### 1 Features Summary

1.1	Main Features .....	1
1.2	SFS1600 Switch Box .....	1
1.3	Status LEDs .....	3

### 2 Operation and Installation

2.1	Hardware Requirements .....	4
2.2	Software Requirements .....	4
2.2.1	PCI Address Routing Mode .....	4
2.2.2	Path Routing Mode or Mixed Mode .....	4
2.3	Installation Procedure .....	4
2.4	Operation .....	5
2.5	Bundling .....	5
2.5.1	Rules for Creating a Bundled Port .....	6
2.5.2	Bundling to the SFS1600 .....	7
2.5.3	Bundling the Internal SG1010 Links of the SFS1600 .....	7
2.6	LED Mode Jumper .....	7

## Glossary

## Figures

1-1	SFS1600 Front Panel.....	1
1-2	SFS1600 Rear Panel .....	2
1-3	SFS1600 Printed Circuit Board Design .....	2
2-1	SG1010 Link Connections.....	5

## Tables

1-1	Link States.....	3
2-1	Recommended Bundling Configurations.....	6
2-2	Valid Bundled Port Configurations for the SFS1600.....	7

# Preface

This manual describes use of the SFS1600 StarFabric Switch Box for the purpose of StarFabric system design. The SFS1600 connects up to 16 StarFabric edge nodes together.

## Audience

This manual was written for users of the SFS1600 Switch box, revision SFS1600-X2. The revision can be determined by looking on the bottom of the Switch Box. For all other revisions, please obtain support from StarGen.

## Overview

This manual contains the following chapters, and a glossary:

- Chapter 1      Features Summary – High level description of the product.
- Chapter 2      Operation and Installation – Describes typical installation and configuration of the board.

## References and Additional Information

If you need additional information, please contact StarGen at [support@stargen.com](mailto:support@stargen.com) or refer to one or more of the following reference documents:

### **PCI Special Interest Group (PCISIG) Specifications**

PCI Local Bus Specification, Revision 2.2

PCI-to-PCI Bridge Architecture Specification, Rev 1.1

## PCI Industrial Computer Manufacturers Group (PICMG) Specifications

PICMG 2.17 StarFabric Specification

### StarFabric Trade Association

StarFabric Protocol Reference Manual

### StarGen Specifications

SG1010 Hardware Reference Manual

SG1010 Data Sheet

Fabric Programmer's Manual

SFS1600 Schematics ([Available on StarGen's secure website](#))

## Revision History

Revision Number	Date mm/dd/yy	Description
1.0	11/09/04	Initial Revision
1.1	01/09/05	Added section 2.5.2. This new section explains how to bundle an external node to the SFS1600
2.0	06/16/05	Updated the page #'s. Updated for the X2 revision of the board (no change to the functionality of the board).

# Features Summary

## 1.1 Main Features

The SFS1600 Switch Box has the following features:

- Four (4) SG1010 6 port StarFabric switch devices
- Sixteen (16) 2.5 Gbps full-duplex StarFabric serial links available through standard RJ45 front-panel connector
- Link status LEDs for each differential pair. By default only one LED is used per SG1010 link. Please see Section 2.6 for details on how to change to 4-LED mode
- Register configuration pre-load serial ROMs for each SG1010

## 1.2 SFS1600 Switch Box

Figure 1–1 SFS1600 Front Panel

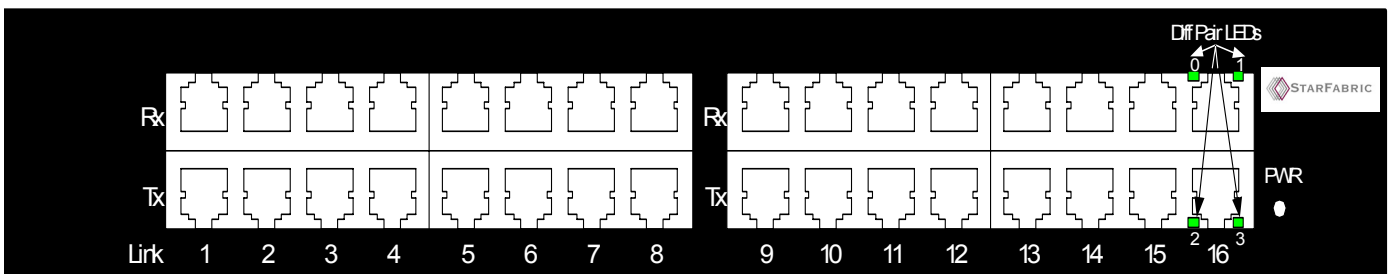




Figure 1-2 SFS1600 Rear Panel

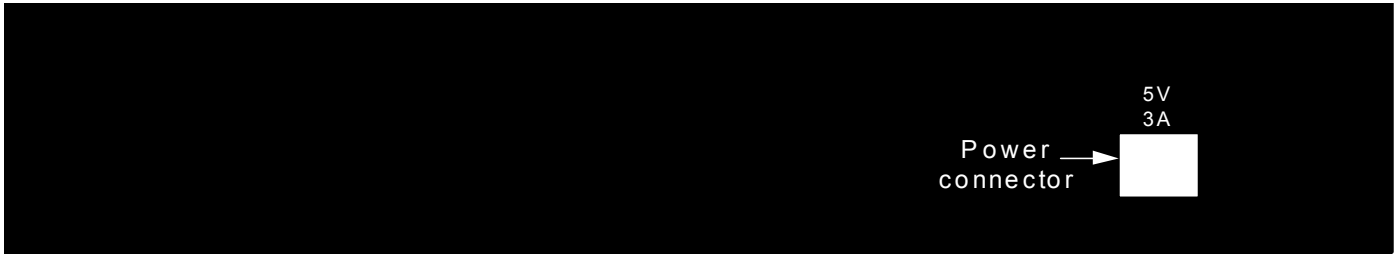
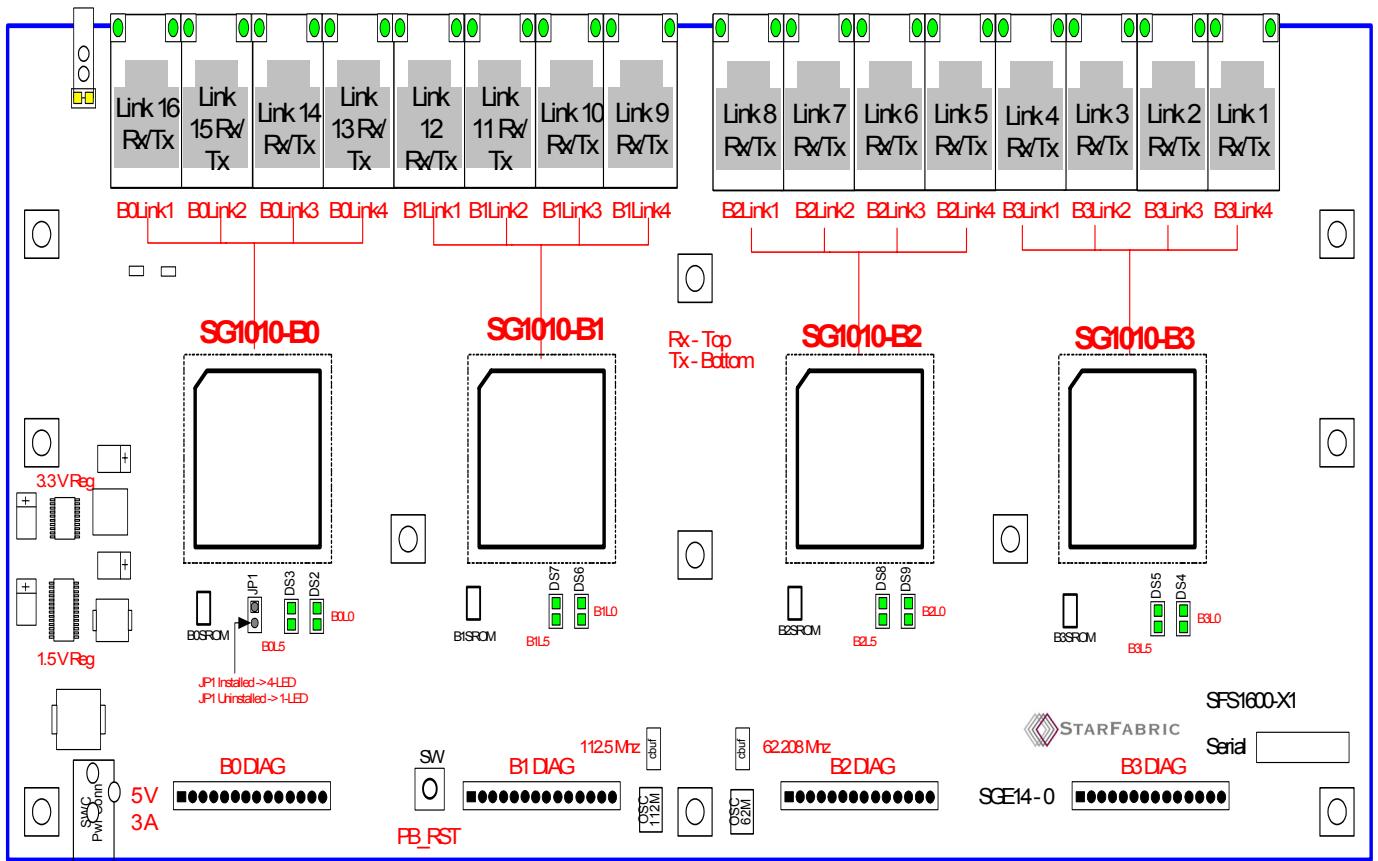


Figure 1-3 SFS1600 Printed Circuit Board Design



## 1.3 Status LEDs

The SFS1600 contains 4 status LEDs per StarFabric link, one for each receiver differential pair. Please see Figure 1–1 for details on how the LEDs correspond to the differential pairs. These LEDs are integrated into the RJ45 connector. By default the SG1010s are put into single LED mode, a single LED is used to indicate the status per StarFabric link. This mode conserves power and provides the status information required for most users. If 4-LED mode is desired, users can populate JP1 as seen in Figure 1–3.

The LED operating modes are described as follows:

1. Four status LEDs for each StarFabric link. (one LED per differential pair).
2. One status LED, the LED associated with differential pair 0, is used for each StarFabric link. If any of the differential pairs is synchronized and traffic is enabled, then the LED will be on. If none of the differential pairs are synchronized, the LED will be off. If at least one of the differential pairs is synchronized and link traffic is disabled, the LED will flash.

The link LED's indicate the state of the associated LVDS receivers as described in Table 1–1.

**Table 1–1 Link States**

LED State	Description
Off	Link is unsynchronized and traffic is disabled.
Flashing	Link is synchronized but traffic is disabled.
On	Link is synchronized and traffic is enabled.

# Operation and Installation

## 2.1 Hardware Requirements

SFS1600 Switch Box (supplied)

External 5V/3A power supply (supplied)

Mains line cord with IEC320 connector to connect to the power supply (supplied for North America)

CAT5/5E patch cables; two per StarFabric link (not supplied)

## 2.2 Software Requirements

### 2.2.1 PCI Address Routing Mode

None required. In this mode, the SG1010s act as PCI-PCI Bridges as defined in the reference documents section.

### 2.2.2 Path Routing Mode or Mixed Mode

StarGen Software Development Kit (SDK).

## 2.3 Installation Procedure

1. Connect main power (100-240VAC) to the power supply and the 5V connector to the SFS1600 power connector, located on the back of the box. When the power is turned on the LED labeled PWR should be illuminated.
2. Confirm that the jumper settings are correct. The only user-selectable jumper setting is the LED mode. By default the SG1010s are setup in single LED mode. To set 4-LED mode JP1 must be installed.
3. Insert the link cables into the RJ45 connectors taking care to insure that receive and transmit cables are properly connected. As soon as cables are connected to other powered StarFabric components, LEDs should either turn on or blink/flash. If they don't, check the cabling making sure a transmitter is connected to a receiver and vice versa. Also, confirm that the receive/transmit pair are connected to a single link.

## 2.4 Operation

If using the SFS1600 in a PCI legacy type environment, the root SG2010 should be powered on last. The root of any StarFabric will send out a Fabric reset symbol which should set links to the “LED on” state, that is, synchronized with the Traffic Enable bit set.

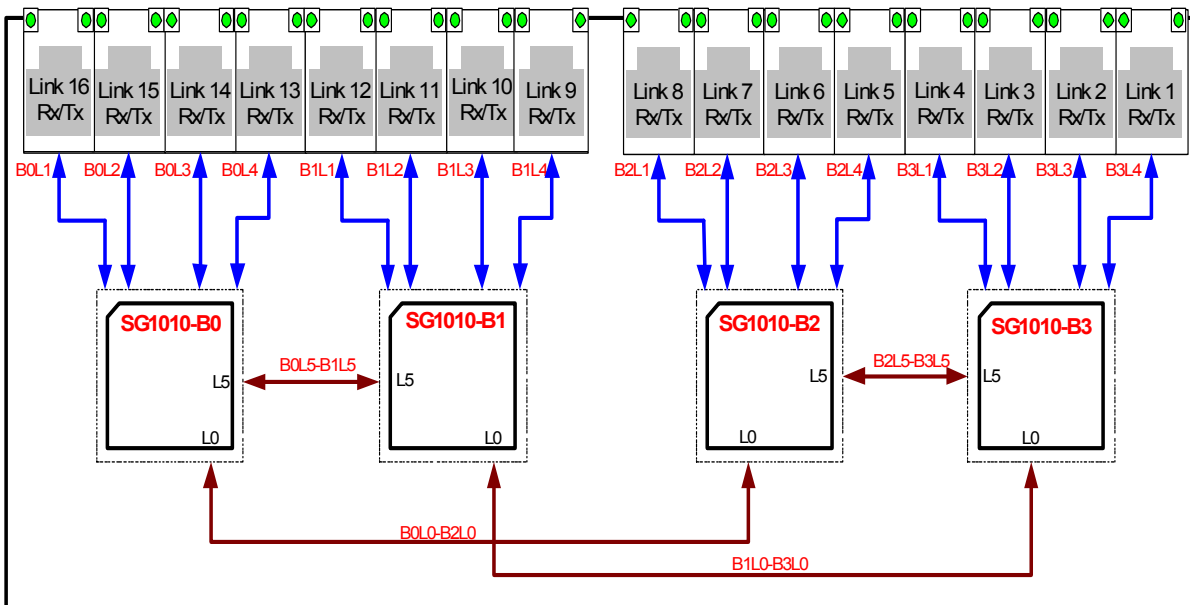
If the StarFabric topology connected to an SG1010 is changed, a reset needs to be generated to re-initialize Fabric IDs (FIDs). To generate the reset the SFS1600 module needs to be powered on and off.

Also, care should be taken when hot-plugging links in and out of SG1010’s. If the link from another StarFabric device is disconnected from an SG1010 link and then the same link is reinserted into another link of the same SG1010, the SG1010 will believe the link is bundled and the link will become unstable.

## 2.5 Bundling

High bandwidth applications may require a bundled port, which is comprised of 2 links from 1 StarFabric Device connected to 2 links of another device. If a bundle is detected, the SG1010 automatically combines the 2 links and creates a 5 Gb/s port. In StarFabric a port can consist of a single link connected to a link partner or 2 links connected to a link partner. A single link port has a bandwidth of 2.5 Gb/s. The internal link connections between the SG1010’s shown in Figure 2–1 need to be considered when creating a bundled port with an SFS1600.

**Figure 2–1 SG1010 Link Connections**



## 2.5.1 Rules for Creating a Bundled Port

There are two rules when creating a bundling port:

1. The ordering of the links has to be consistent (low link # -> low link #)

The lower link number from 1 StarFabric device has to connect to the lower link number of its link partner.

**Illegal Configuration**

SG2010 Link 0 -> SG1010 Link 5

SG2010 Link 1 -> SG1010 Link 4

**Legal Configuration**

SG2010 Link 0 -> SG1010 Link 3

SG2010 Link 1 -> SG1010 Link 4

2. Using sequential link numbers to create a bundled port

If contiguous links are not used any links in between can not be used. Therefore, using contiguous links is highly recommended.

**Illegal Configuration** (Link 3 from the SG1010 can not connect to another StarFabric device if 2 and 4 are used to create a bundled link)

SG2010 1 Link 0 -> SG1010 Link 2

SG2010 1 Link 1 -> SG1010 Link 4

SG1010 Link 3 -> SG2010 2 Link 0 or SG2010 2 Link 0 (Illegal)

**Legal Configuration**

SG2010 1 Link 0 -> SG1010 Link 0

SG2010 1 Link 1 -> SG1010 Link 1

SG1010 Link 3 -> SG2010 2 Link 0 or SG2010 2 Link 0

**Table 2-1 Recommended Bundling Configurations**

SG1010		SG2010	
Link A	Link B	Link A	Link B
0	1	0	1
1	2	0	1
2	3	0	1
3	4	0	1
4	5	0	1

If 2 SG1010's are connected, any AB to AB configuration can be used. For example:

SG1010 (1) Link 0 -> SG1010 (2) Link 2

SG1010 (1) Link 1 -> SG1010 (2) Link 3

## 2.5.2 Bundling to the SFS1600

When bundling the links of the SFS1600 switch box to external nodes, caution should be taken to meet the restrictions described in Section 2.5.1. It should be noted that since all links from the SFS1600 do not originate from a single SG1010 switch, not all links can be combined to create a bundled port. Table 2–2 provides all the valid configurations for bundling to an SFS1600. The SFS1600 links listed in the “external lower link number” column need to be connected to the lower link number of its link partner.

**Table 2–2 Valid Bundled Port Configurations for the SFS1600**

<b>External Lower Link Number</b>	<b>External Higher Link Number</b>
Link 2	Link 1
Link 3	Link 2
Link 4	Link 3
Link 6	Link 5
Link 7	Link 6
Link 8	Link 7
Link 10	Link 9
Link 11	Link 10
Link 12	Link 11
Link 14	Link 13
Link 15	Link 14
Link 16	Link 15

## 2.5.3 Bundling the Internal SG1010 Links of the SFS1600

The internal SG1010 links of the SFS1600 can also be bundled using RJ45 cables. As seen in Figure 2–1 each SG1010 has 2 internal connections. When using one of these internal links to create a bundled port, the restrictions defined in Section 2.5.1 should be followed. The following are the recommended connections if bundling the internal SG1010 links.

## 2.6 LED Mode Jumper

The factory default operating mode for the SFS1600 Switch box is single LED mode. 4-LED mode can be set by installing JP1.

<b>LVDS</b>	Low Voltage Differential Signaling
<b>PCI</b>	Peripheral Component Interconnect
<b>PLL</b>	Phase Lock Loop
<b>SROM</b>	Serial Read-Only Memory