



Installation Guide for Optical Bypass Switch with Heartbeat™



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Introduction

Thank you for choosing the most versatile Optical Bypass Switch available today. Whether you are a novice or an expert, this installation guide is designed to help answer any questions and to provide a quick set-up reference.

Net Optics Optical Bypass Switches with Heartbeat provide a permanent and trouble-free access port for in-line network security and monitoring devices. The Optical Bypass Switch automatically switches network traffic through added in-line devices or bypasses devices that are about to be removed. With a heartbeat, the Optical Bypass Switch protects network traffic against both signal and power loss on the attached in-line device.

Link Fault Protection

The Optical Bypass Switch with Heartbeat monitors the attached in-line device by sending a heartbeat packet to the device. If the Optical Bypass Switch does not receive the heartbeat back, it automatically switches network traffic to bypass the unresponsive device—even if the device is still receiving power. The Optical Bypass continues to send the heartbeat and restores the traffic through the in-line device as soon as the link is restored.

Uninterrupted Traffic

The Optical Bypass Switch supports fail-open monitoring with any GigaBit in-line device when it shares the same power source as the in-line appliance. For as long as the Optical Bypass Switch is receiving power, it diverts network traffic to attached in-line devices. In this state, all in-line traffic is routed directly to the device connected to the Optical Bypass Switch.

When the Optical Bypass Switch loses power, in-line traffic continues to flow through the network link, but is no longer routed through the device. This allows the network devices to be removed and replaced without network downtime. Once power is restored to the Optical Bypass Switch, network traffic is seamlessly diverted to the in-line device, allowing it to resume its critical functions.

Simply Plug It In

Each Bypass Switch includes all the cables and power supplies you need to quickly connect to an IPS. Three quick steps is all it takes to establish a secure connection point for inline devices. For special applications, customize the bypass trigger and Heartbeat rate from an RS232 command line interface.

Key Features

Passive, Secure Technology

- Fail-open monitoring with any GigaBit fiber in-line appliance at speeds of 1000 Mbps
- Protects against power, link, and application failure
- Increased reliability on critical network links
- High-speed optical switching with minimal insertion loss
- Configurable timeout (heartbeat) and retry
- Custom Heartbeat packet option
- Fully RoHS Compliant

Ease of Use

- LED indicators show power, speed, link, and activity status
- Front-mounted connectors support easy installation and operation
- Silk-screened application diagram illustrates all connections for easy deployment
- Optional 19-inch rack frames holds two Bypass Switches
- Tested and compatible with all major manufacturers' monitoring devices, including protocol analyzers, probes, and intrusion detection/prevention systems

Support

- Net Optics offers free technical support throughout the lifetime of your purchase. Our technical support team is available from 8 am to 5 pm Pacific Time, Monday through Friday at +1 (408) 737-7777 and via email at ts-support@netoptics.com. FAQs are also available on Net Optics website at www.netoptics.com

About this Guide

This guide covers the installation and use of the following models:

Part Number	Description
BPO-HBSX-LC	GigaBit SX Bypass Switch with Heartbeat
BPO-HBSX-SC/LC	GigaBit SX Bypass Switch with Heartbeat, SC to LC cables
BPO-HB-LX/SX	GigaBit LX to SX Bypass Switch with Heartbeat
BPO-HBLX-SC/LC	GigaBit LX Bypass Switch with Heartbeat, SC to LC cables
BPO-HBLX-LC	GigaBit SX Bypass Switch with Heartbeat
BPO-HB50SX-LC	GigaBit SX Bypass Switch with Heartbeat, 50µm

Product Diagrams

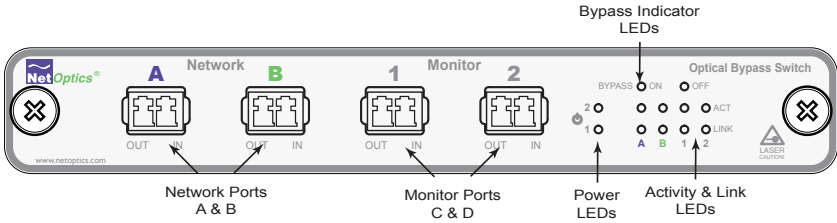


Figure 1: Front View Panel

Figure 2: Rear View Panel

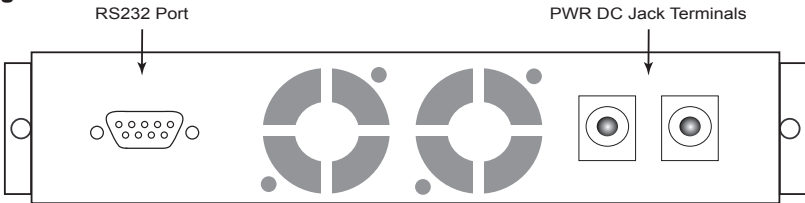
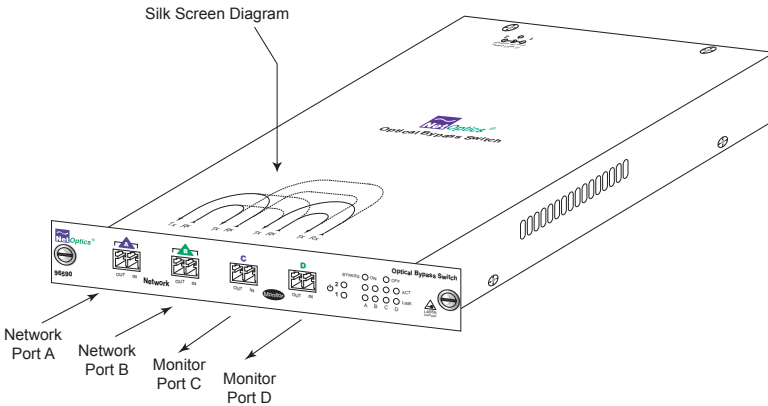


Figure 3: Application Diagram



Bypass Modes

The Optical Bypass Switch with Heartbeat bypasses attached in-line device when one of three events occurs:

- Power loss to the switch
- Link failure
- Application failure

Two LEDs on the front of the Optical Bypass Switch indicate whether the switch is bypassing the connected appliance or not. When the Bypass ON indicator is illuminated, the bypass switch has not received the heartbeat packet as expected and is in Bypass Enabled mode. When the Bypass OFF indicator is illuminated, the bypass switch is in Bypass Disabled mode and is sending traffic through the attached in-line device.

When the switch is in Bypass Enabled (ON) mode, the switch circuitry re-directs network traffic around the in-line appliance. In Bypass Enabled mode Network Ports A and B are connected (see Figure 4).

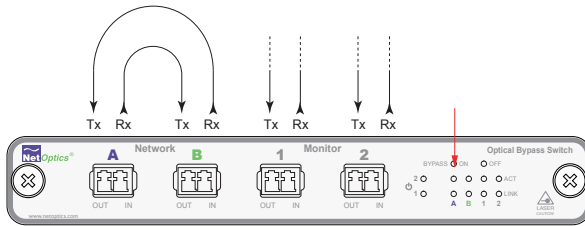


Figure 4: Bypass Enabled

When the switch is in Bypass Disabled (OFF) mode, the switch circuitry sends network traffic through the in-line appliance. In Bypass Disabled mode, Network Port A is connected to Monitor Port C and Network Port B is connected to Monitor Port D (see Figure 5).

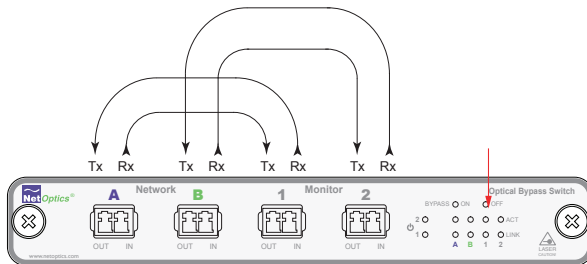


Figure 5: Bypass Disabled

Power Loss Bypass

The Optical Bypass Switch protects link integrity when the attached in-line device loses power. To install the Optical Bypass Switch for this type of protection, the switch should share the same power source as the in-line appliance. If you are using redundant power supplies for the switch, make sure that both are connected to the same power source as the in-line device.

Heartbeat Bypass

The Optical Bypass Switch with Heartbeat protects against both physical link failure and application failure on the in-line appliance. The switch checks the path through the in-line appliance by sending a packet every second from Monitor Port C. The switch validates the path when it receives the packet on the Monitor Port D. If the switch does not receive the packet as expected three times in a row, the switch automatically enters Bypass Enabled (ON) mode. You can change the number of the heartbeat packets required before the bypass switch enters Bypass Enabled mode from the bypass switch CLI (see *Configuring the Bypass Switch* on page 6).

Below is the default IPX heartbeat packet sent once every second from the Monitor Port C. You can change the default timing of the heartbeat packet and the heartbeat packet from the bypass switch CLI (see *Configuring the Bypass Switch* on page 6).

The switch continues to send the bypass packet and will return to Bypass Disabled mode when it receives three consecutive packets on Monitor Port D.

The default IPX and IP packets are shown on the following page. Units are shipped from the factory with the IPX packet. When the factory defaults are restored using the "z" CLI command (see "To restore the bypass switch to factory defaults" on page 11), you will be able to select either the IPX or IP packet.

IPX Packet

Packet Contents (Hex) -----	Description -----
00 50 C2 3C 60 00	MAC DA Net Optics
00 50 C2 3C 60 01	MAC SA Net Optics
81 37	Packet Type IPX
FF FF 00 30 00 00 00 00	
40 04 EC A2 C6 13 01 02	
C6 13 01 01 00 00 00 00	
00 00 00 00 00 00 00 00	
00 00 00 00 00 00 00 00	
00 00 00 00 00 00 00 00	
82 A2 BA 71	CRC

IP Packet

Packet Contents (Hex) -----	Description -----
00 50 C2 3C 60 00	MAC DA Net Optics
00 50 C2 3C 60 01	MAC SA Net Optics
08 00	Packet Type IP
45 00 00 3C 18 D2 00 00	
80 01 0A FF 0A 02 01 DC	
0A 01 01 12 08 00 37 5C	
02 00 14 00 61 62 63 64	
65 66 67 68 69 6A 6B 6C	
6D 6E 6F 70 71 72 73 74	
75 76 77 61 62 63 64 65	
66 67 68 69	
B8 8E 1C A9	CRC

Unpacking and Inspection

Unpack the Optical Bypass Switch, power supplies, and cables provided.

Each Optical Bypass Switch is delivered with the following:

- 2 Power supplies
- 2 LC fiber cables (models BPO-HBSX-LC0, BPO-HB-LX/SX, and BPO-HBLX-SC/LC) or 2 LC-to-SC cables (model BPO-HBSX-SC/LC)
- 1 DB-9 RS232 cable
- 1 Manual

You may have also purchased a panel for rack mounting the bypass switch and an extended warranty. If any component is missing or damaged, contact Net Optics Customer Service immediately.

Configuring the Bypass Switch

The Optical Bypass Switch allows you to set several configuration options and to display configuration information. You can set:

The frequency of the heartbeat.

This defines the period of time that passes before the switch considers the packet to have timed out. The default is 1 second.

The number of timeouts allowed.

This is the number of packets missed before the switch bypasses the IPS (retry count). The default is 3 missed packets.

Port communication parameters.

You can turn Link Fault Detect and Bypass Detect on or off. The default is LFD and Bypass Detect on.

A custom heartbeat packet.

You can input a custom heartbeat packet to suit special needs. The default is the IPX packet shown on page 5.

Reset to factory defaults.

Use this option to quickly restore the original configuration.

For quick reference, you can display the configuration settings and heartbeat packet.

Link Fault Detect

You can set the bypass switch to drop the remaining full-duplex link when one side fails. The Link Fault Detect feature ensures that connected devices are aware of a failure on both sides of the link.

Bypass Detect

You can set the Monitor Ports to cycle on and off while the bypass switch is in Bypass Enabled mode. In Bypass Detect mode, the Monitor Ports cycle through five seconds off followed by fifteen seconds on. The alternating link status can be used to trigger attached devices to send an alarm to a management system every time the bypass switch turns off the Monitor Ports. When the bypass switch returns to Bypass Disabled mode, the Monitor Ports remain on and the on/off cycle is discontinued.

Note:

Before starting, make sure power to the bypass switch is disconnected.

To access the bypass switch CLI:

1. Using the RS232 DB-9 cable provided, connect a PC running terminal emulation software, such as HyperTerminal to the RS232 port on the rear panel of the bypass switch.

2. Set the terminal emulation software to the following communication parameters:

- 9600 baud
- 8 data bit
- No parity
- 1 stop bit
- No flow control

3. Connect power to the bypass switch. The software compile date and time is displayed in the terminal emulation software as shown in the example below.

```
Compiled on 16-Jan-06 15:35:00
Type ? for a list of commands
```

4. Type ? and press ENTER for a list of commands.

The following commands are listed:

- a = Input Timeouts
- b = Input Configuration
- c = Input Heartbeat Packet
- d = Display Configuration
- e = Display Heartbeat Packet
- z = Reset to Factory Defaults

To set the timeout values:

1. Type a and press Enter to set the timeout values.
2. At the input time out period prompt, enter the number of seconds between each heartbeat (1-254 seconds). Press Enter.
3. At the input retry count prompt, enter the number of missed heartbeats allowed before the switch enters Bypass ON mode (1-254). The input retry count must be greater than or equal to the input timeout. Press Enter.

Note:

Manufacturing default for Input Timeout Period and Input Retry Count are set to 1 and 3 respectively.

To set the LFD and Bypass Detect options:

1. Type b and press Enter.
2. At the Bypass Detect on/off prompt, type **1** to turn on or **0** to turn off Bypass Detect.
3. At the LFD on/off prompt, type **1** to turn on or **0** to turn off Link Fault Detect.

To input a custom heartbeat packet:

1. Type c and press Enter. You are prompted for the length of the packet including header bytes and CRC bytes.
2. Enter the length of your custom packet in decimal format and press Enter. You are prompted for each packet byte.

3. Enter packet bytes in Hex format in the following order:

MAC DA Net Optics (6 bytes)
 MAC SA Net Optics (6 bytes)
 Packet Type (2 bytes)
 Packet Bytes
 CRC (4 bytes)

Alternately you can load the packet as a pre-formatted text file. The text file should be one byte per line, beginning with a decimal value for the number of packets followed by hex values for the remaining bytes. Load the text file at the packet length prompt.

To load a custom packet from byte-by-byte or from a file, you must set the Line Delay to 1000 milliseconds and the Character Delay to 100 milliseconds in your terminal emulation software. If you are using HyperTerminal, these settings are located in the ASCII Setup dialog box found in File>Properties>Settings>ASCII Setup.

To display the current values:

1. Type d and press Enter. A list similar to the following appears.

```
input timeout period 1
input retry count 3
LFD on
Bypass Detect on
Bypass Disabled
```

To display the current packet:

1. Type e and press Enter. The packet is displayed as shown in the example below.

```
packet length = 78
MAC DA 00 50 c2 3c 60 00
MAC SA 00 50 c2 3c 60 01
Packet Type 08 00
45 00 00 3c 18 d2 00 00
80 01 0a ff 0a 02 01 dc
0a 01 01 12 08 00 37 5c
02 00 14 00 61 62 63 64
65 66 67 68 69 6a 6b 6c
6d 6e 6f 70 71 72 73 74
75 76 77 61 62 63 64 65
66 67 68 69
CRC bb 8e 1c a9
```

To restore the bypass switch to factory defaults:

1. Type z and press Enter. You are prompted to select which type of packet you want to restore, IP or IPX.
2. Select 1 to restore defaults with an IP packet or 0 to restore defaults with an IPX packet.

The bypass switch will be reset to the following defaults:

Input Timeout Period: 1
Input Retry Count: 3
LFD: On
Bypass Detect: On
Heartbeat Packet: IPX

Connecting to the Network**To connect the bypass switch to the network:**

1. Connect Network Port A to the appropriate switch, server or router device. This acts as your DCE interface.
2. Connect Network Port B to the appropriate switch, server or router device. This acts as your DTE interface.

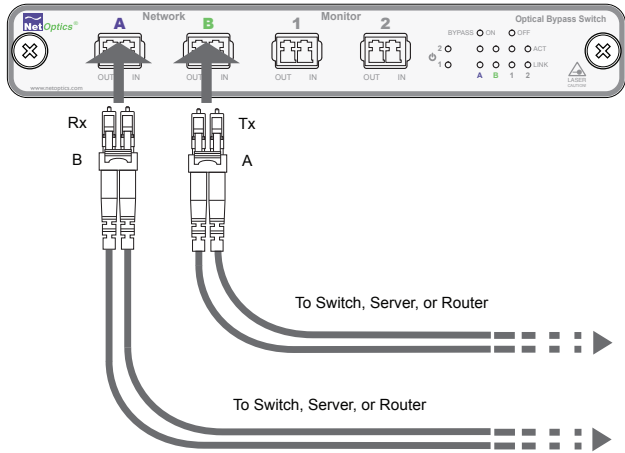


Figure 6: Connecting to the Network

3. Verify that the bypass switch Network Ports are cabled in-line between two devices.

Note

Model BPO-HB-LX/SX has a built-in LX-to-SX media converter. Connect your LX network devices to the Network Ports and your SX in-line device to the Monitor Ports.

Connecting to the In-line Device

To connect the bypass switch to the in-line device:

1. Connect Monitoring Port C to the in-line appliance using a duplex LC fiber cable. This acts as your DCE interface.
2. Connect Monitoring Port D to the in-line appliance using a duplex LC fiber cable. This acts as your DTE interface.

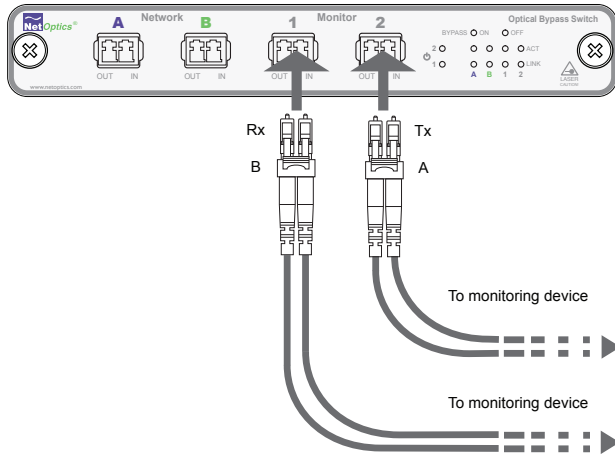


Figure 7: Connecting to the In-Line Device

3. Verify that the bypass switch Monitoring Ports are cabled in-line to the attached device.
4. Connect power to the switch. If you are implementing power fault failover, make sure you connect the switches' power supplies to the same power sources that the IPS is using.

Specifications

Splitter Specifications

Fiber Type: Multimode: Corning 50 or 62.5/125 μ m, wavelength, 850nm

Insertion Loss: Network Port: \leq 1.25 dB

Monitor Port: \leq 1.25 dB

Fiber Type: Singlemode: Corning 8.5/125 μ m, wavelength, 1310nm

Insertion Loss: Network Port: \leq 1.25 dB

Monitor Port: \leq 1.25 dB

Note:

There is no insertion loss when the bypass switch is not receiving power.

Environmental

Operating Temperature: 0°C to 40°C

Storage Temperature: -10°C to 70°C

Relative Humidity: 10% min, 95% max, non-condensing

Power

Power Supply: Input Power: 100-240V, 0.5A, 47-63Hz

Output Power: 12V, 1.5A

Mechanical

Dimensions: 1.125" high x 11.5" deep x 6.5" wide

Connectors

(2) Duplex LC connectors (monitoring ports)

(2) Duplex LC connectors (network ports)

Cables

BPO-HBSX-LC model: (2) LC cables, 3 meter

BPO-HB-LX/SX model: (2) LC cables, 3 meter

Certifications

Fully RoHS Compliant

Limitations on Warranty and Liability

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Net Optics, Inc. warrants this Optical Bypass Switch to be in good working order for a period of ONE YEAR from the date of purchase from Net Optics or an authorized Net Optics reseller.

Should the unit fail anytime during the said ONE YEAR period, Net Optics will, at its discretion, repair or replace the product. This warranty is limited to defects in workmanship and materials and does not cover damage from accident, disaster, misuse, abuse or unauthorized modifications.

If you have a problem and require service, please call the number listed at the end of this section and speak with our technical service personnel. They may provide you with an RMA number, which must accompany any returned product. Return the product in its original shipping container (or equivalent) insured and with proof of purchase.

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Net Optics is always open to any comments or suggestions you may have about its products and/or this manual.

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