



October, 2003

**Express Entry  
Ethernet Switch  
LB9008A-FO-R2**



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RADIO FREQUENCY INTERFERENCE STATEMENT**

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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

*Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par le ministère des Communications du Canada.*

**Normas Oficiales Mexicanas (NOM)  
INSTRUCCIONES DE SEGURIDAD**

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc.
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.

10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.
12. Precaución debe ser tomada de tal manera que la tierra física y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objetos líquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
  - A: El cable de poder o el contacto ha sido dañado; u
  - B: Objetos han caído o líquido ha sido derramado dentro del aparato; o
  - C: El aparato ha sido expuesto a la lluvia; o
  - D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
  - E: El aparato ha sido tirado o su cubierta ha sido dañada.

### **About This Manual**

This manual describes the Black Box Express Ethernet Switch in these basic sections:

- Product Features
- Installation
- Trouble-shooting
- Glossary of Terms

### **Product Features**

This section examines the key features, the physical features, and the product specifications of each model.

### **Installation**

This section presents step-by-step installation instructions on how to select a site for the switch, connecting to power & connecting to your network.

### **Trouble-shooting**

This guide leads you through trouble-shooting the most common networking problems.

### **Glossary**

A brief glossary defines the terms used in this manual.

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## **Product Features**

This section addresses:

- Key Features
- Physical Features (including LEDs)
- Product Specification

### **Key Features**

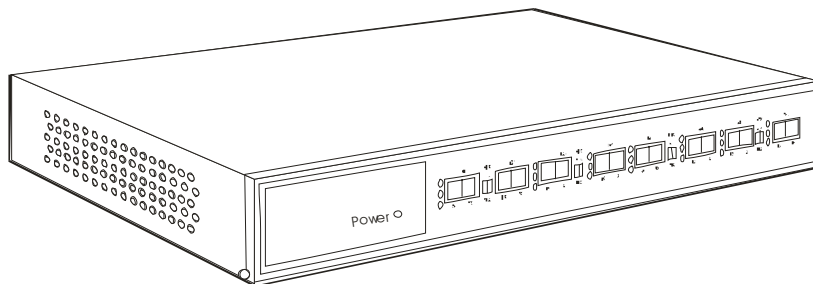
- Eight 100BASE-FX switching ports.
- Dip Switch for Full- and Half-Duplex setting on Fiber ports.
- Designed in compliance with IEEE802.3, 100BASE-FX standards.
- Supports 802.3x Flow Control pause packet for Full-Duplex in case buffer is full.
- Supports Back Pressure function for Half-Duplex operation in case buffer is full.
- Supports Store & Forward architecture and performs forwarding and filtering at non-blocking full wire speed.
- Broadcast Storming Filter function.
- Comprehensive array of LED indicators that communicate the status of the switch and troubleshooting information.

## Physical Features

### Front Panel

The front panel of the rackmount switch has eight fiber ports and an array of LED indicators to provide instant feedback on status of the switch.

### LB9008A-FO-R2



**Figure 1: Rackmount-size, 8 ports fiber Ethernet switch**

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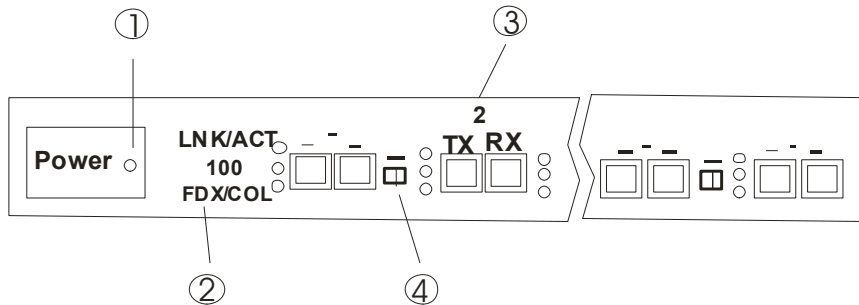
### Ports

The fiber ports accept 100BASE-FX connections only. They operate at 100Mbps in half-duplex mode and 200Mbps in full-duplex mode. The distance between this switch and a Data Terminal Equipment is 2 Kilometers using 62.5/125 micron fiber-optic cable with SC connector. If longer distance is desired, please consult Black Box Tech Support for special order at Tel: 724-746-5500. Fiber switch with multi-mode ST connectors is also available with model number LB9009A-FO.

## LEDs

The array of LED indicators on the front panel conveys status and configuration information to help you monitor and troubleshoot the switch.

The following figures illustrate the LED and functions of LB9008A-FO-R2.



**Figure 2: Port status display LEDs of LB9008A-FO-R2.**

### ① Port Status

#### 100BASE-FX Ports

Each port has three LEDs to show status information. The LEDs are identified by a corresponding captions located beside the LEDs on the port one.

#### LNK/ACT:

The link indicator is the top LED. It is illuminated whenever the port is connected to another working networked device.

The LED flashes when the port is transmitting or receiving data.

#### 100:

The middle LED shines whenever the switch detects that the corresponding port is connected to a 100BASE-TX segment.

#### FDX/COL:

The lower LED is illuminated when the port is operating in full-duplex mode. When this LED is off, the port is operating in half-duplex mode.

The LED flashes when the switch detects packet collisions on the port.

### ② Power

This LED comes on when the switch is connected to a power supply and turned on.

### ③ TX/RX

**TX:** Transmit Data

**RX:** Receive Data

### ④ Dip Switch

**Full-Duplex:** Toggle on to enable Full-Duplex mode for 100BASE-FX ports (Default setting).

**Half-Duplex:** Toggle down to enable Half-Duplex mode for 100BASE-FX ports.



**Product Specifications**

|                       |   |
|-----------------------|---|
| Applicable Standards  | 10BASE-T, IEEE 802.3<br>100BASE-TX/FX, IEEE 802.3u  |
| Ports                 | 10/100BASE-TX or 100BASE-FX   |
| Speed                 | 100BASE-TX: 200Mbps full-duplex, 100Mbps half-duplex<br>10BASE-TX: 20Mbps full-duplex, 10Mbps half-duplex<br>100BASE-FX: 200Mbps full-duplex, 100Mbps half-duplex |
| Performance           | 14,880/148,800pps forwarding rate per port.   |
| LED Indicators        | POWER, LNK/ACT, 100, FDX/COL  |
| Dimensions            | 440 X 205 X 45mm Rack-mount size  |
| Weight                | 2.8kg (6.2lb)   |
| Power Input           | 100 ~ 250 VAC, 47/63 Hz, 2A   |
| Power Consumption     | 12 W  |
| Operating Temperature | 32 ~ 104 degrees F (0 ~ 40 degrees C)   |
| Humidity              | 10 ~ 90%, non-condensing  |
| Altitude              | 10,000 ft (3048 m)  |
| Emissions             | FCC part 15 Class A, CISPR Class A,<br>VCCI-I CE Mark   |
| Safety                | UL  |

## Installation

Install a Black Box Express Ethernet Switch as a plug-and-play device. No special configuration is required. Details below are consistent with the installation of any electronic device

### Selecting a Site for the Switch

Place the Black Box Express Ethernet Switch where it will not be subjected to extreme temperatures, humidity, or electromagnetic interference. Specifically, the site you select should meet the following requirements:

- The room temperature should be between 32 and 104 degrees Fahrenheit (0 to 40 degrees Celsius).
- The relative humidity should be less than 90 percent, non-condensing.
- Surrounding electrical devices should not exceed the electromagnetic field (RFC) standards for IEC 801-3, Level 2 (3V/M) field strength.
- Make sure that the switch receives adequate ventilation. Do not block the ventilation holes on the side of the switch or the fan exhaust port on the rear of the switch.
- The power outlet should be within 1.8 meters (6 feet) of the switch.

### Connecting to Power

Connect the supplied AC power cord to the receptacle on the back of the switch, and then plug the cord into a standard AC outlet with a voltage range from 100 to 120 VAC. For external power supply units, plug the jack into the DC receptacle on the front of the unit, and plug the power supply unit into a 110~220 AC outlet.

Turn the switch on by flipping the ON/OFF switch on the rear of the unit to the I (ON) position. The O position is OFF.

### Connecting to Your Network

**Copper Port:** If you are making a connection to a server or workstation, be sure that it has a properly installed 100BASE-TX network interface card. All the TX ports on Express Ethernet Switch series are quipped with auto MDIX and can use either straight or crossed over cable when uplink to another switch or hub. The cable must be a Category 5 shielded or unshielded twisted-pair (STP/UTP) cable for 100BASE-TX, or Category 3, 4, or 5 STP/UTP cable for 10BASE-T.

**Fiber Optic Port:** When connecting to a server or workstation, be sure that it has a properly installed 100BASE-FX network interface card. A fiber optic port consists of two holes, one for transmitting data (TX) and the other for receiving data (RX). Make sure the TX jack on the target device is connected to the RX jack on the switch, and the RX jack on the target device is connected to the TX jack on the switch. The cable for fiber ports must be a 62.5/125 micron fiber-optic cable for 100BASE-FX.

Consult the Table below for further details.

**Table 1: Cable Specifications**

| Speed      | Connector | Port Speed<br>Half/Full Duplex | Cable                             | Range         |
|------------|-----------|--------------------------------|-----------------------------------|---------------|
| 100BASE-TX | RJ-45     | 100/200 Mbps                   | Category 5 UTP                    | 100 meters    |
| 10BASE-T   | RJ-45     | 10/20 Mbps                     | Category 3, 4, or 5 UTP           | 100 meters    |
| 100BASE-FX | ST or SC  | 200 Mbps                       | 62.5/125 micron fiber-optic cable | 2 kilo-meters |

## Trouble-shooting Guide

This trouble-shooting guide describes problems that could occur with the Express Ethernet Switch. The guide states possible reasons for the symptoms, and proper steps to take to solve the problems.

### No Power to the Switch.

**Symptom:** Power cord is connected to the switch, but all LEDs, including the Power LED, are off.

| Possible Problem                              | Solution   |
|---|--|
| Loose power connection or faulty power supply | <ol style="list-style-type: none"> <li>1. Check both ends of the power cord to make certain that they are securely connected to the power receptacle on the switch and to the power outlet.</li> <li>2. Verify that the power outlet has power.</li> </ol> |

### No Connectivity to the Data Terminal Equipment.

**Symptom:** An Ethernet switch cannot communicate to the directly connected computers or network segments.

| Possible Problem                         | Solution  |
|--|---|
| Incorrect or faulty cabling              | <ol style="list-style-type: none"> <li>1. Check cables for a secure connection.</li> <li>2. Verify that the correct type of cable is in use. <ul style="list-style-type: none"> <li>• For connection to a PC or a network interface card (NIC), use a straight-through cable.</li> <li>• For uplink to another switch or hub, use a cross-wire cable, or use a regular straight-through cable connected to the uplink port with the uplink button activated.</li> <li>• Refer to Table 1 for cable specifications.</li> </ul> </li> <li>1. Verify proper cable preparation.</li> <li>2. Use a time domain reflectometer (TDR) or other cable-checking device to verify that the cable has no opens, shorts, or other problems.</li> <li>3. Swap the cable with another of the same kind to see if the cable is bad. <ul style="list-style-type: none"> <li>• Replace or fix the faulty cable as necessary.</li> </ul> </li> </ol> |
| Dysfunctional NIC on a PC or workstation | Run the diagnostic supplied by the vendor on the NIC to determine if it is functioning properly. If it is not, replace it.  |
| Packet Overflow or Hardware problem      | Reset the switch by pressing the reset button or turn the switch off, then on again.  |

**No Connectivity to Certain Nodes on the Network**

**Symptom:** Data terminal equipment (DTE) connected to the switch can not send or receive information from certain segments on the same network or across to another LAN or WAN.

| Possible Problem | Solution  |
|------------------|---|
| Hardware problem | Check for a damaged RJ-45 jack, or fiber SC or ST type connector. |

**Transmission Problems**

**Symptom:** Connections across a LAN switch are slow or unreliable.

| Possible Problem                           | Solution  |
|--|---|
| Incorrect full- or half-duplex settings    | Express Ethernet Switches are all equipped with auto-negotiation to communicate with other DTEs on the network for the best available performance.<br><ol style="list-style-type: none"> <li>1. Verify if the connected NIC is equipped with auto-negotiation (this is not the same as auto-sensing).</li> <li>2. Change the DIP switch setting if available.</li> </ol>  |
| Exceeded cabling distance or misused cable | <ol style="list-style-type: none"> <li>1. Ensure that the proper cable is in use and that the recommended distance is not exceeded. For information, refer to Table 9.</li> <li>2. Check the cable distance using a cable tester or TDR. Verify that the cable lengths attached to the switch meet Ethernet/IEEE 802.3 specifications.</li> <li>3. If the distance is out of specification, reduce the length of the cable or add a repeater, ensuring no more than four repeaters are attached.</li> </ol> |
| Bad adapter in attached device             | Check the switch port statistics. If excessive errors are found, run the adapter card diagnostic utility to determine the problem.  |

**Trademarks**

Any trademarks are acknowledged to be the property of the trademark owners.

**Glossary**

|                          |   |
|--------------------------|---|
| <b>10BASE-T</b>          | Networking standard for twisted-pair cabling capable of carrying data at 10 Mbps.   |
| <b>100BASE-TX</b>        | Networking standard for two pairs of high-quality twisted-pair wires carrying data at 100 Mbps.   |
| <b>100BASE-FX</b>        | Networking standard for fiber-optic cabling capable of carrying data at 100 Mbps.   |
| <b>auto-negotiation</b>  | Two-part process by which a network device automatically senses the speed and duplex capability of another device.  |
| <b>Category 5</b>        | Networking standard certifying that a copper wire cable can carry data at up to 100 Mbps.   |
| <b>collision</b>         | Concurrent Ethernet transmissions from two or more devices on the same segment.   |
| <b>Ethernet</b>          | Networking standard for transmitting data at 10 Mbps.   |
| <b>Fast Ethernet</b>     | Networking standard for transmitting data at 100 Mbps.  |
| <b>fiber-optic cable</b> | Cable made of thin glass threads that carry data in the form of light pulses.   |
| <b>full-duplex</b>       | A communications technique that allows bi-directional, simultaneous transmission between two devices on a single segment.   |
| <b>half-duplex</b>       | A communications technique in which one device on a segment transmits while the other receives, then the process is reversed.   |
| <b>IEEE 802</b>          | Set of Institute of Electrical and Electronic Engineers standards for defining methods of access and control on LANs.   |
| <b>LAN</b>               | Local area network. A network where computers are connected in close proximity, such as in the same building or office park. A system of LANs connected at a distance is called a wide-area network (WAN).  |
| <b>MAC address</b>       | Media access control address. A hardware address that uniquely identifies each node of a network.   |
| <b>Mbps</b>              | Millions of bits per second.  |
| <b>segment</b>           | Section of a network bounded by bridges, routers, hubs, or switches. Dividing an Ethernet into multiple segments is a common way to increase bandwidth on a LAN.  |
| <b>store-and-forward</b> | Switching feature where the port receives the entire incoming frame and stores it in the buffers while checking for runts and error frames before forwarding it to the destination port.  |
| <b>switch</b>            | Device that filters and forwards packets between LAN segments.  |
| <b>UTP</b>               | Unshielded twisted pair; cabling with wires that are twisted around each other. The individual wires are not insulated.   |
| <b>wire speed</b>        | The ability to handle the fastest rate of traffic that a generator can deliver without dropping packets. On a 100 Mbps connection, wire-speed traffic is 148,809 packets per second using 64-byte frames or 8,127 packets per second using 1,518-byte frames. |