**BLACK BOX®**
NETWORK SERVICES

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LB9006A-SC-R2
LB9006A-ST-R2

# Express
# Ethernet Switches

FEDERAL COMMUNICATIONS COMMISSION AND
CANADIAN DEPARTMENT OF COMMUNICATIONS
RADIO FREQUENCY INTERFERENCE STATEMENT

**Class B** Digital Device. This equipment has been tested and found to comply with the limits for a Class B computing device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. If this equipment does cause harmful interference to radio or telephone reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one 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 an experienced radio/TV technician for help.

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

To meet FCC requirements, shielded cables and power cords are required to connect this device to a personal computer or other Class B certified device.

This digital apparatus does not exceed the Class B 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 B 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 connectado 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 fisica 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 lineas de energia.

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 objectos liquidos 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: Objectos 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 leads with a Quick Tip, and continues with a detailed description of Connecting to Power and Connecting to Your Network with the two types of cable: copper-based and fiber-optic. The section concludes with instructions on using the Uplink Function.

**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.

This manual services rack mount size of Express Ethernet Switch, LB9006A-SC/ST-R2 that
has 2-port TX and 6-port FX.

**Table of Contents**

# Product Features

This section addresses:
- Key Features
- Physical Features
- Product Specification

## Key Features

- Auto-negotiation for speed and duplex on every TX port

- Plug & play

- True non-blocking architecture

- Full wire-speed forwarding

- Store-and-forward switching mechanism

- Runt and CRC filtering eliminate erroneous packets to optimize network bandwidth

- Back pressure for half-duplex

- IEEE 802.3x flow control for full-duplex

- MAC address filtering and relearning that automatically adjusts to the network configuration

- Comprehensive array of LED indicators that communicate the status of the switch and trouble-shooting information

- Designed in compliance with 10BASE-T, IEEE802.3u, 100BASE-TX, and 100BASE-FX standards

- Full compatibility with standard Ethernet applications, internetworking systems, and client-side adapters to minimize migration cost

**Physical Features**

- **AC Input:** 100-240VAC, 47-63Hz internal universal power supply
- **Input Fuse:** 2A
- **Power Consumption:** 11W
- **Operating Temperature:** 0 C- 40 C (32 F- 104 F)
- **Storage Temperature:** -25 C- 70 C (-13 F-158 F)
- **Humidity:** 10%-90% non-condensing
- **Emission Compliance:** FCC part 15 class A, CE Mark, VCCI Class A
- **Safety:** UL
- **Dimensions:** W440mm x D205mm x H45mm (17.3" x 8" x 1.8") Standard 19" Rack Mount Size
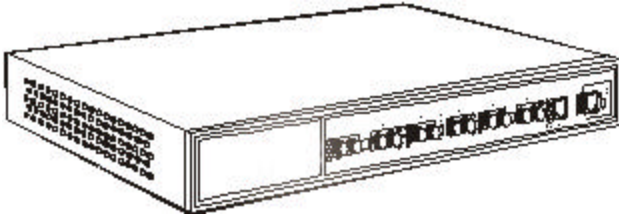- **Net weight**: 2.5kg(5.5lb)

*LB9006A-ST-R2 or LB9006A-SC-R2*



**Figure 1: Rackmount-size, 6 ports fiber, 2 ports TX, shown in ST; LB9006A-ST-R2 or LB9006A-SC-R2**

**Figure 2: Port status display LEDs of LB9006A-ST-R2**

❶ **Power**

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

❷ **Uplink Status**

This LED illuminates when the uplink button is pressed down.  There is no need for uplink function on 8-port fiber switch.

❸ **Port Utilization**
The Port Utilization LEDs indicates how much traffic each port is handling, measured as a percentage of the port's bandwidth. Column 1 corresponds to Port 1, Column 2 to Port 2, Column 3 to Port 3, etc. As traffic on a port increases, the LEDs for its column will light progressively from bottom to top.

❹ **Fiber Port Status**
Three LEDs convey the status of each fiber port as detailed on the following chart.

**Table 1: FX port status display LEDs of LB9006A-ST-R2, LB9006A-SC-R2.**

| LED | State | Indication |
|---|---|---|
| LNK (link) | Steady | The port has established a valid network connection |
| ACT (activity) | Flashing | The port is transmitting or receiving data |
| FDX (full-duplex) | Steady | The connection is in full-duplex mode |
| | Off | The connection is in half-duplex mode |

❺ **TX Port Status**
An array of six LEDs conveys the status of each TX port as detailed on the following chart.

Table 2: TX port status display LEDs for **of LB9006A-ST-R2, LB9006A-SC-R2.**

| LED | State | Indication |
|---|---|---|
| LNK (link) | Steady | The port has established a valid network connection |
| 100 | Steady | The port has established a valid 100 Mbps connection |
| TX (transmit) | Flashing | The port is transmitting data |
| FDX (full-duplex) | Steady | The port is operating in full-duplex mode |
| | Off | The port is operating in half-duplex mode |
| RX (receive) | Flashing | The port is receiving data |
| COL (collision) | Flashing | Collision occurred in the 10/100 domain* |

*Collision will only occur on the half duplex mode of transmission between two devices.

❻ **Uplink Button**
There is no need for an uplink button on the switch with 8 ports of fiber.

❼ **DIP Switch**
DIP switches between every two sets of fiber ports allow a choice between full-duplex or
half-duplex transmission. Moving the DIP switch down allows half-duplex transmission.
When in the up position, the unit operates in full-duplex transmission.

**Fiber Module Installation**

- Turn off the power. The module is not hot- swappable.
- Remove the cover plate, retaining screws and plate    for later replacement
- Slide in the module, following the guides
- Snap in the module to attain a firm connection

## Product Specifications

All Black Box Express Ethernet Switches auto-negotiate 10/100 Mbps, use store-and-forward and non-blocking architectures and use back pressure for half-duplex and IEEE 802.3x compliant flow-control for full-duplex. The Express Ethernet Switches support substantial MAC entries with address filtering and relearning capabilities.

**ETHERNET STANDARDS**
IEEE 802.3 10BASE-T; IEEE 802.3u 100BASE-TX/FX

**CABLE**
10BASE-T: 2-pair UTP Cat. 3, 4, or 5;
100BASE-TX: 2-pair UTP Cat. 5;
100BASE-FX: 62.5/125 multi-mode fiber-optic cable

**SWITCHING METHOD**
Store-and-Forward

**FORWARDING RATE**
14,800 pps for 10 Mbps;
148,800 pps for 100 Mbps

**TEMPERATURE**
Operating: 32 to 104°F (0 to 40°C)
Storage: -13 to +158°F (-25 to +70°C)

**HUMIDITY**
10 to 90% non-condensing

**EMISSION COMPLIANCE AND SAFETY STANDARDS**
FCC part 15 Class B, CE Mark, VCCI, cUL

**Table 8: Specifications per model**

| Model | Dimension "W x "D x "H | Weight | Output | Pwr |
|---|---|---|---|---|
| LB9006A-SC-R2<br>LB9006A-ST-R2 | 17.3 x 8.0 x 1.8<br>43.9 x 20.3 x 4.6 cm | 5.5 lb.<br>2.5 kg | 100-250VAC<br>47-63 Hz | 20W |

# Installation

## Quick Tip

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

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 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

If you are making a connection to a server or workstation, be sure that it has a properly installed 100BASE-TX (or 100BASE-FX if the switch does not contain 100BASE-TX ports) network interface card. Connect the RX/TX jacks on the target device to the TX/RX jacks on the switch and the RJ-45 jacks on the target device to the RJ-45 jacks on the switch.

Use the uplink port for connecting to a regular (i.e. non-uplink) port of a hub or another switch. If connecting to an uplink port of a hub or another switch, use any port. There is no uplink issue with fiber ports.

### Copper-based cabling

Connect cables to computers or network segments into the RJ-45 ports on the front of the switch.

The cable must be a Category 5 shielded twisted-pair or unshielded twisted-pair (STP/UTP) cable for 100BASE-TX, or Category 3, 4, or 5 STP/UTP cable for 10BASE-T. Consult Table 9 for further details.

### Fiber-optic cabling

Prepare a pair of fiber optic cables with SC or ST type connectors at both ends. The cable for fiber ports must be a 62.5/125 micron fiber-optic cable for 100BASE-FX. Consult Table 9 for further details.

**Table 9: Cable Specifications**

| Speed | Connector | Port Speed 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 |

## Uplink or MDI Function

A network of switches connected (or cascaded) together via uplink ports is termed a "collapsed backbone." The uplink function transforms the adjacent or indicated port into an uplink port with a push of the button or by sliding the switch. This allows connection to another switch or hub without preparing crossover cable. However, this is unnecessary when either connecting directly to the uplink port of another switch or hub or when connecting fiber ports between switches or hubs.

# Trouble-shooting Guide

This trouble-shooting guide describes problems that could occur with the Express Ethernet Switch. The guide states possible reasons for the problems, and possible 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 | 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.<br>2. Verify that the power outlet has power. |

**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 | 1. Check cables for a secure connection.<br>2. Verify that the correct type of cable is in use.<br>• For connection to a PC or a network interface card (NIC), use a straight-through cable.<br>• 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.<br>• Refer to Table 9 for cable specifications.<br>1. Verify proper cable preparation.<br>2. Use a time domain reflectometer (TDR) or other cable-checking device to verify that the cable has no opens, shorts, or other problems.<br>3. Swap the cable with another of the same kind to see if the cable is bad.<br>• Replace or fix the faulty cable as necessary. |
| 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><br>1. Verify if the connected NIC is equipped with auto-negotiation (this is not the same as auto-sensing).<br><br>2. Change the DIP switch setting if available. |
| Exceeded cabling distance or misused cable | 1. Ensure that the proper cable is in use and that the recommended distance is not exceeded. For information, refer to Table 9.<br><br>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.<br>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. |
| 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

| | |
|---|---|
| **10BASE-T** | Networking standard for twisted-pair cabling capable of carrying data at 10 Mbps. |
| **100BASE-TX** | Networking standard for two pairs of high-quality twisted-pair wires carrying data at 100 Mbps. |
| **100BASE-FX** | Networking standard for fiber-optic cabling capable of carrying data at 100 Mbps. |
| **auto-negotiation** | Two-part process by which a network device automatically senses the speed and duplex capability of another device. |
| **Category 5** | Networking standard certifying that a copper wire cable can carry data at up to 100 Mbps. |
| **collision** | Concurrent Ethernet transmissions from two or more devices on the same segment. |
| **Ethernet** | Networking standard for transmitting data at 10 Mbps. |
| **Fast Ethernet** | Networking standard for transmitting data at 100 Mbps. |
| **fiber-optic cable** | Cable made of thin glass threads that carry data in the form of light pulses. |
| **full-duplex** | A communications technique that allows bi-directional, simultaneous transmission between two devices on a single segment. |
| **half-duplex** | A communications technique in which one device on a segment transmits while the other receives, then the process is reversed. |
| **IEEE 802** | Set of Institute of Electrical and Electronic Engineers standards for defining methods of access and control on LANs. |
| **LAN** | 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). |
| **MAC address** | Media access control address. A hardware address that uniquely identifies each node of a network. |
| **Mbps** | Millions of bits per second. |
| **segment** | 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. |
| **store-and-forward** | 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. |
| **switch** | Device that filters and forwards packets between LAN segments. |
| **UTP** | Unshielded twisted pair; cabling with wires that are twisted around each other. The individual wires are not insulated. |
| **wire speed** | 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. |