



August, 2002

LB9002A-ST-R2

Express

Ethernet Switches



CUSTOMER
SUPPORT
INFORMATION

Order toll-free in the U.S. 24 hours, 7 A.M. Monday to midnight Friday: **877-877-BBOX**
FREE technical support, 24 hours a day, 7 days a week: Call **724-746-5500** or fax **724-746-0746**
Mail order: **Black Box Corporation**, 1000 Park Drive, Lawrence, PA 15055-1018
Web site: **www.blackbox.com** • E-mail: **info@blackbox.com**

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 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 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 objetos 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: 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 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 the compact size of Express Ethernet Switch, LB9002A-SC/ST, which has 1 port TX and 1 port FX.

Table of Contents	
About This Manual	4
Product Features	4
Installation	4
Trouble-shooting	4
Glossary	4
Product Features	7
Key Features	7
Physical Features	8
Illustrated Compact-Size Switches	9
LB9002A-SC-R2/LB9002A-ST-R2	9
Fiber Module Installation	10
Product Specifications	10
Installation	12
Quick Tip	12
Connecting to Power	12
Connecting to Your Network	12
Copper-based cabling	12
Fiber-optic cabling	13
Uplink or MDI Function	13
No Power to the Switch	14
No Connectivity to the Data Terminal Equipment	14
No Connectivity to Certain Nodes on the Network	14
Transmission Problems	15
Trademarks	16
Glossary	16

Product Features

This section addresses:

- ?? Key Features
- ?? Physical Features (including LEDs)
- ?? 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:** 100-250VAC, 47-63Hz internal universal power supply
- ?? **Input Fuse:** 2A
- ?? **Power Consumption:** 7W
- ?? **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 B, CE Mark, VCCI Class B
- ?? **Safety:** UL
- ?? **Dimensions:** W254mm x D135mm x H36mm (10" x 5.3" x 1.4")
- ?? **Net weight:** 0.9kg (2.1lb)

Illustrated Compact-Size Switches

The front panel of the compact switch has two or eight ports and LED indicators to provide instant feedback on the status of the switch. This group includes LB9002A-SC/ST, and LB9108A.

LB9002A-SC-R2/LB9002A-ST-R2

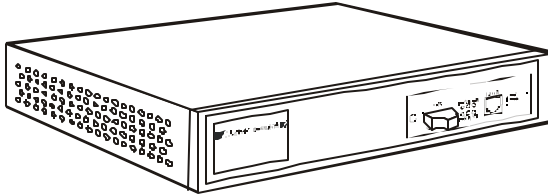


Figure 1: Compact-size, 2-port with fiber LB9002A-SC-R2 (also available in ST)

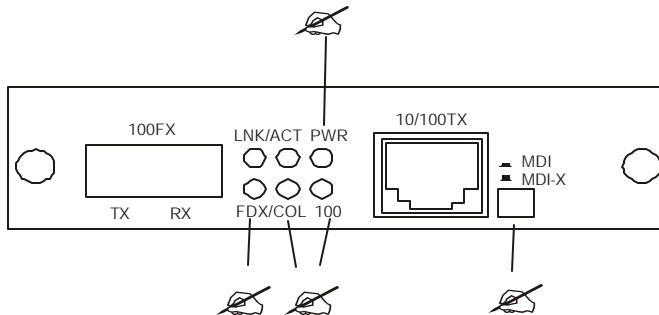


Figure 2: LED and functions of the two-port switch (LB9002A-SC-R2 & LB9002A-ST-R2)

✍ Port Status for the FX port

Two LEDs, LNK/ACT and FDX/COL, convey the status of the port as detailed on the following table

✍ Port Status for the TX port

Three LEDs, LNK/ACT, FDX/COL, and 100, convey the status of the port as detailed on the following table.

Table 1: Port status display LEDs for compact-size, 1 port TX, 1 port FX (part# LB9002A-ST/SC-R2)

LED	State	Indication
LNK/ACT (link/activity)	Steady	The port has established a valid network connection
	Flashing	The port is receiving or transmitting data
100	Steady	The port has established a valid 100 Mbps connection
	Off	The port has established a valid 10 Mbps network connection
FDX/COL (full-duplex/collision)	Steady	The connection is in full-duplex mode
	Flashing	Collision occurred in the 10/100 domain
	Off	The connection is in half-duplex mode

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

⚡ Power

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

⚡ MDI Button

Also referred to as the uplink button.

The following chart details the LED status displays.

Table 2: Port Status Display

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

⚡ Uplink button

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
LB9002A-SC/ST	10 x 5.3 x 1.4 25.4 x 13.5 x 3.6 cm	2.1 lb. 0.9 kg	100-250VAC 47-63 Hz	7W

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	<ol style="list-style-type: none"> 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. 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	<ol style="list-style-type: none"> 1. Check cables for a secure connection. 2. Verify that the correct type of cable is in use. <ul style="list-style-type: none"> ?? For connection to a PC or a network interface card (NIC), use a straight-through cable. ?? 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. ?? Refer to Table 9 for cable specifications. 1. Verify proper cable preparation. 2. Use a time domain reflectometer (TDR) or other cable-checking device to verify that the cable has no opens, shorts, or other problems. 3. Swap the cable with another of the same kind to see if the cable is bad. ?? 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	<p>Express Ethernet Switches are all equipped with auto-negotiation to communicate with other DTEs on the network for the best available performance.</p> <ol style="list-style-type: none"> 1. Verify if the connected NIC is equipped with auto-negotiation (this is not the same as auto-sensing). 2. Change the DIP switch setting if available.
Exceeded cabling distance or misused cable	<ol style="list-style-type: none"> 1. Ensure that the proper cable is in use and that the recommended distance is not exceeded. For information, refer to Table 9. 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. 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 runs 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.