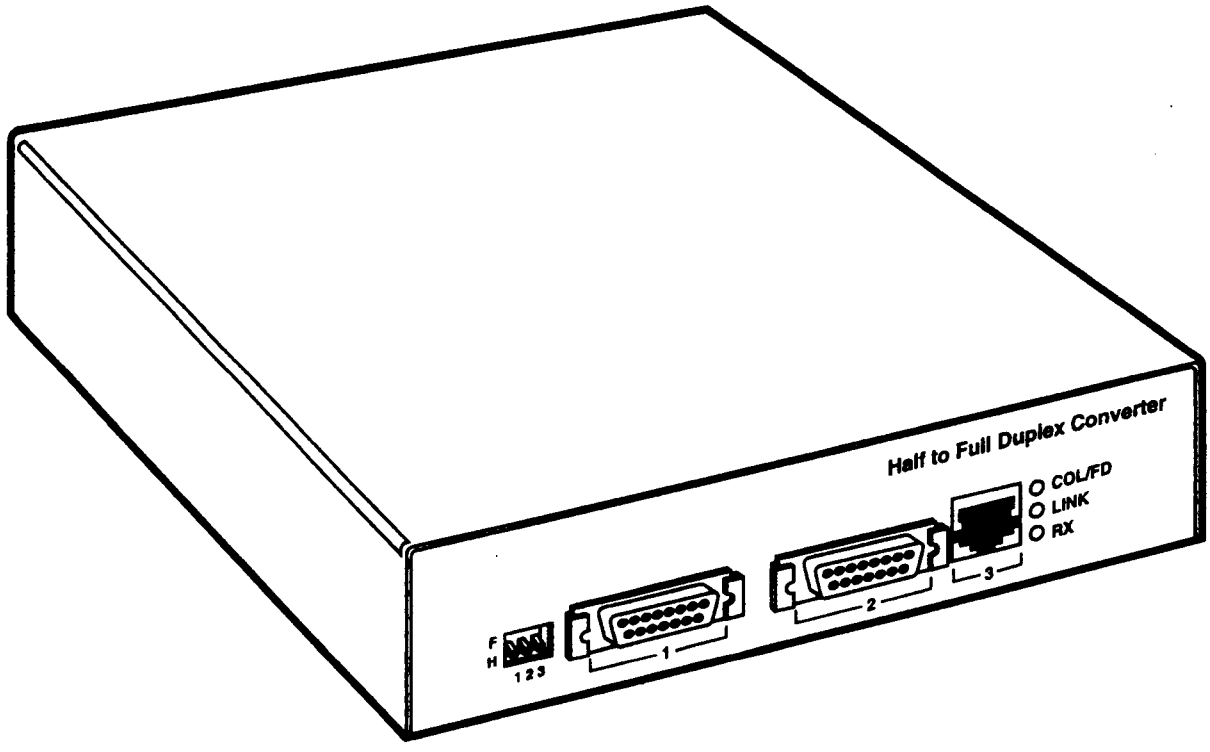
Black Box Corporation
The World's Source for Cabling and Network Connectivity™

DECEMBER 1998
LE1070A-R2

Half-to-Full-Duplex Converter



CUSTOMER SUPPORT INFORMATION

To order or for technical support: Call **724-746-5500** or fax **724-746-0746**
Technical support and fax orders 24 hours a day, 7 days a week
Phone orders 24 hours, 7 A.M. Monday to midnight Friday; Saturday 8 to 4 (Eastern)
Mail order: **Black Box Corporation**, 1000 Park Drive, Lawrence, PA 15055-1018
Web site: **http://www.blackbox.com** • E-mail: **info@blackbox.com**

TRADEMARKS USED IN THIS MANUAL

UL is a registered trademark of Underwriters Laboratories Incorporated.

Any trademarks mentioned in this manual are acknowledged to be the property of the trademark owners.

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

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 J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this 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.

CE Mark

The CE mark symbolizes compliance with the EMC directive of the European Community. The CE mark indicates that the specified equipment meets or exceeds these technical standards:

- EN 55022 — "Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment."
- EN 50082-1 — "Electromagnetic compatibility — Generic immunity standard Part 1: Residential, commercial, and light industry."
    - IEC 1000-4-2 — "Electromagnetic compatibility for industrial-process measurement and control equipment Part 2: Electrostatic discharge requirements" — Severity level 3.
    - IEC 1000-4-3 — "Electromagnetic compatibility for industrial-process measurement and control equipment Part 3: Radiated electromagnetic field requirements" — Severity level 2.
    - IEC 1000-4-4 — "Electromagnetic compatibility for industrial-process measurement and control equipment Part 4: Electrical fast transient/ burst requirements" — Severity level 2.
- CISPR 22 — Radiated and Line-conducted Class A.
- EN 60950 — ITE Safety.

VCCI

This equipment is in the 2nd Class category (information equipment to be used in a residential area or an adjacent area thereto) and conforms to the standards set by the Voluntary Control Council for Interference by Information Technology Equipment aimed at preventing radio interference in such residential areas.

When used near a radio or TV receiver, it may cause radio interference. Read the instructions for correct handling.

1. Specifications

Compatibility —	IEEE 802.3
Learning Table —	8K MAC address entries
Connectors —	AUI: DB15; STP: RJ-45
Diagnostic LEDs —	COL/FD, LINK, RX
DIP Switches —	Switch DOWN indicates half-duplex mode
Standards Compliance —	UL® 1950; CSA 22.2 No 950; VCCI; FCC Part 15 Class A; CE 89/336/EEC, 73/23/EEC
Operating Temperature —	32 to 104°F (0 to 40°C)
Storage Temperature —	14 to 122°F (-10 to +50°C)
Humidity Tolerance —	85% maximum, noncondensing
Power —	90–260 VAC, 47–63 Hz, 20 watts
Size —	1.8"H x 7.8"W x 8.5"D (4.6 x 19.8 x 21.6 cm)
Weight —	2 lb. (0.9 kg)

2. Introduction

2.1 Description

The Half-to-Full-Duplex Converter is a compact, standalone three-port switch operating in the Ethernet environment. Consisting of two AUI and one copper port, this device can convert each port's half-duplex connection into a full-duplex one, as well as performing all switching functions. DIP switches determine the duplex mode for each port.

The Converter can extend the range of an Ethernet network far beyond the conventional CSMA/CD-imposed limits. Capable of connecting to any media through a transceiver, the Converter can reach distances up to 100 km link distance over fiberoptic cable.

The Converter incorporates extensive buffering. It also isolates a network's collision domain, reducing contention and eliminating fragments created by the collision process on the half-duplex segment.

The Converter complies with IEEE 802.3 standard, guaranteeing compatibility with all NIC, repeater, and switch vendors.

2.2 Features

- Copper 10BASE-T connections up to 100 m; AUI connections up to 50 m over standard AUI cable (copper over transceiver).
- Data rate of 10/20 Mbps half-/full duplex.
- Can be connected between a hub/switch and a workstation, or between two hubs/switches. Can be connected to any media through a transceiver.

2.3 Application

The configuration below displays two Half-to-Full-Duplex Converters whose 10BASE-T connections achieve 100-km link distance through fiberoptic AUI transceivers.

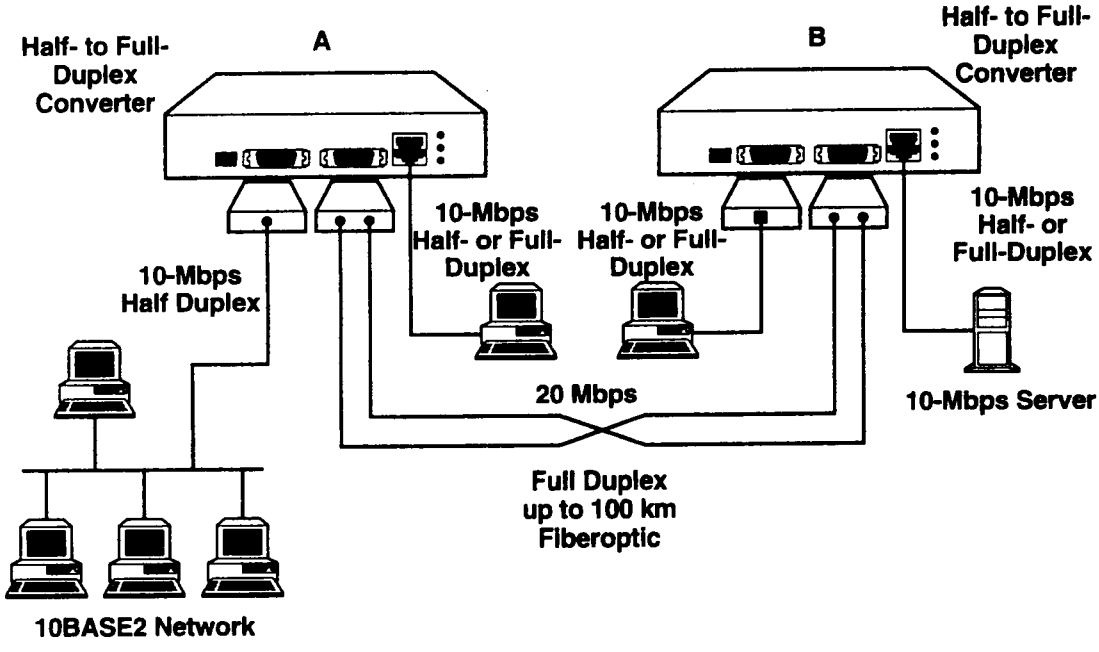
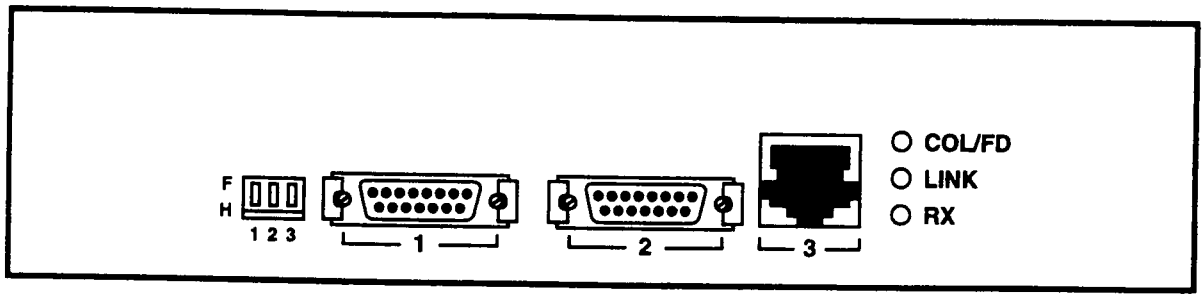


Figure 2-1. Typical configuration of the Converters.

3. Installation and Setup

3.1 Front Panel

The Converter's front panel is shown below, followed by descriptions of its various components and their functions.



DIP Switches	(Shown on the left side of the front panel.) Determine half-/full duplex mode for each port.
AUI Ports	Two, each with DB15 connector (labeled 1 and 2 in the illustration).
Copper Port	With RJ-45 connector (labeled 3 in the illustration).
Port LEDs	Group of three LEDs displaying the status of the copper port; the status of the AUI ports is displayed in the connecting transceiver.

3.2 Rear Panel

The power connection is on the rear.

3.3 Connecting the Converter

3.3.1 Power Connection

The power cord is the main disconnect device. It should be plugged into an easily accessible outlet. The Converter does not use an on/off power switch; when you plug the unit into an active AC outlet, it is automatically turned on. The internal power supply is a wide-range device operating between 90 and 264 VAC at 50/60 Hz.

For a 115-volt configuration, use a power cord with minimum type SJT (SVT) 18/3, rated 250 VAC, 10 amps, with a maximum length of 15 feet (4.6 m). One end is terminated in an IEC 320 attachment plug, the other in a NEMA 5-15P plug.

For a 230-volt configuration, use a power cord with minimum type SJT (SVT) 18/3, rated 250 VAC, 10 amps, with a maximum length of 15 feet (4.6 m). One end is terminated in an IEC 320 attachment plug. The other end is terminated as required by the country where it will be installed.

Le cable de transport d'energie que doit être utilisé la configuration 230 volts est le type minumum SJT (SVT) 18/3, nominal 250 VAC, 10 amps, 4.5 m long maximum. Un bout est raccordé comme éxigé par le pays ou il sera utilisé.

Das Netzkable ist das hauptsachliche Diskonnektionsmittel, es sollte in eine leicht erreichbare steckdos gesteckt werden. Das Netzkabel kann mit einer 230 volts Konfiguration verwonder werden vom typ: Minimum VDE or HAR, 3 X 1.00 mm 2, 250 VAC, 10 amps, maximal 4.5 m long. Ein Ende ontspriche dem Stecker IEC 320. Das andere Ende entspricht den Anfoderungen des entsprechen Landes.

3.3.2 Input Supply

Check nameplate ratings to make sure there is no overloading of supply circuits that could have an effect on overcurrent protection and supply wiring.

3.3.3 Grounding

Reliable earthing of this equipment must be maintained. Pay close attention to supply connections when connecting to power strips, rather than direct connections to the branch circuit.

3.4 Network Connections

The cable connections to the copper port can be UTP or STP Category 3 and above, and cable length is limited to 328 feet (100 meters) for 10BASE-T, 164 feet (50 meters) for AUI. STP cable carries a higher quality of signal and is less sensitive to environmental noise.

Most UTP RJ-45 installations are straight cable connections (that is, a PC NIC card is connected to an Ethernet hub with a straight cable and the hub is connected to the switch with a straight cable.)

When a PC or a server NIC card is connected directly to the switch, use a crossed cable.

3.4.1 Connecting An Ethernet Device to a 10BASE-T Port

The 10BASE-T port on the Converter is MDI-wired and designed to be connected directly to a hub, using a standard straight-through patch cable. In order to cascade switches or connect a workstation to the switch, either there must be a hub between them, or a crossover cable must be used.

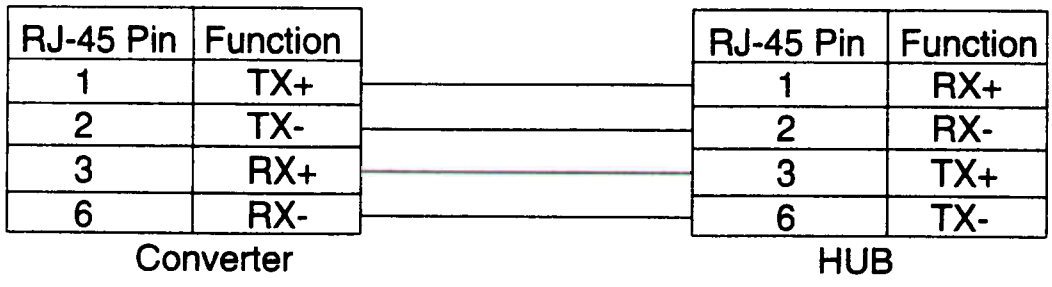


Figure 3-1. Straight cable connection between a Converter and a hub.

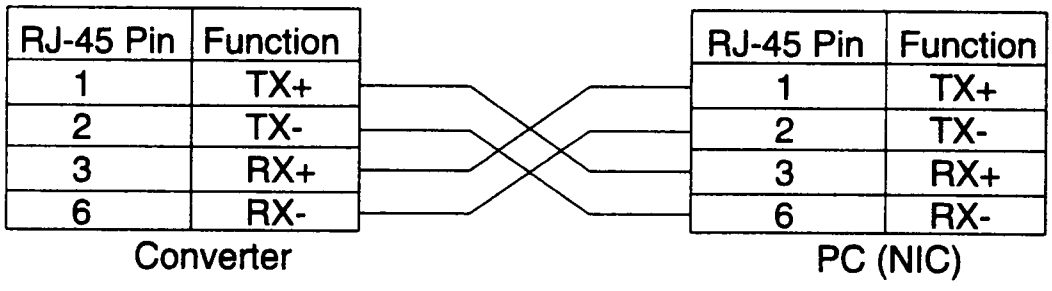


Figure 3-2. Crossover cable connection between a Converter and a server/PC.

3.4.2 Half-/Full-Duplex Operation

Each port of the Converter is capable of supporting half- or full-duplex operation. The copper port's FD LED indicates when the full-duplex option has been set.

4. Troubleshooting

If you have any problems with your Converter, follow the troubleshooting steps below. If the problem persists, contact Black Box.

1. Make sure that the Converter is plugged into a grounded, functioning AC outlet providing between 90 and 264 VAC at 50/60 Hz. Check the power fuse and replace it if it's blown. Make sure you replace the fuse with one that's the same type and rating.

2. Make sure the Link LED is blinking to indicate power ON.

3. Verify that your cables are wired correctly. Use a UTP crossover cable to directly connect another switch or any other DTE type-device (such as a workstation) directly to a port. (See *Network Connections* in **Chapter 3.**)

4. Once you have attached the cable, make sure the LINK LED is ON.

Copper Port:

Problem:	**LINK LED is ON, but data is not being forwarded through the switch.**
Cause:	Cables are too long.
Solution:	Make sure that cables are as defined in **Chapter 3.** Check that cables meet the 10BASE-T standards and that they do not exceed 100 m.

AUI Port:

Problem:	**LINK LED is ON but data is not being forwarded through the switch.**
Cause:	Cables are too long.
Solution:	Any type of cable (coax, fiber, copper) can be used between the two AUI transceivers; however, make sure that cable length is according to defined standards.

4.1 Calling Black Box

If you determine that your Converter is malfunctioning, do not attempt to alter or repair the unit. It contains no user-serviceable parts. Contact Black Box at 724-746-5500.

Before you do, make a record of the history of the problem. We will be able to provide more efficient and accurate assistance if you have a complete description, including:

- the nature and duration of the problem.
- when the problem occurs.
- the components involved in the problem.
- any particular application that, when used, appears to create the problem or make it worse.

4.2 Shipping and Packaging

If you need to transport or ship your Converter:

- Package it carefully. We recommend that you use the original container.
- If you are shipping the Converter for repair, make sure you include everything that came in the original package. Before you ship, contact Black Box to get a Return Materials Authorization (RMA) number.

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