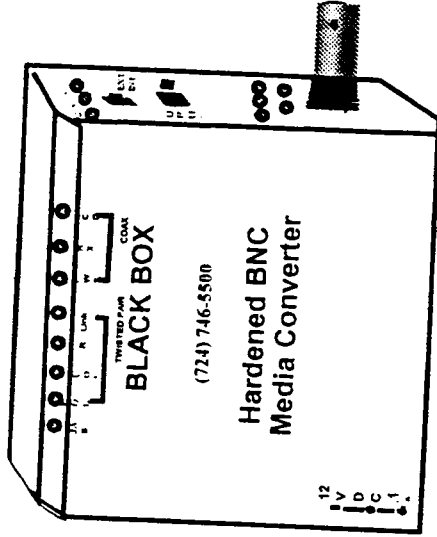
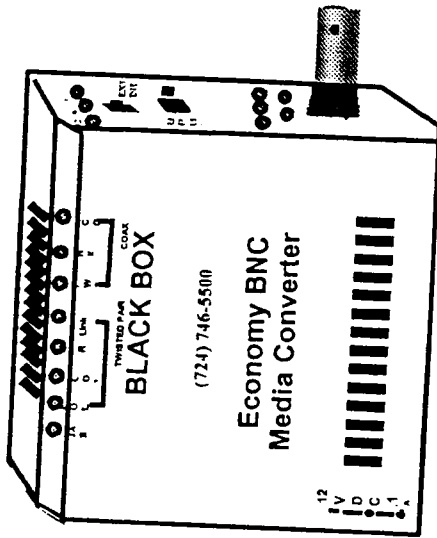




## 10 Mbps Economy Media Converters

March 2003  
LE1502A-R3  
LE1502AE-R3  
LE1508A  
LE1508AE



### 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](http://www.blackbox.com) • E-mail: [info@blackbox.com](mailto:info@blackbox.com)

## **BLACK BOX®**

# **Economy “Crossover” 10 Mbps Media Converters Installation and User Guide**

### **Trademarks**

UL is a registered trademark of Underwriters Laboratories

Ethernet is a trademark of Xerox Corporation

Velcro is a trademark of Velcro U.S.A.

**Important:** BLACK BOX® 10 Mbps Economy or Hardened Media Converters contain no user serviceable parts. Attempted service by unauthorized personnel shall render any and all warranties null and void. If problems are experienced with a 10 Mbps Economy or Hardened Media Converter, consult Section 5, Troubleshooting, of this User Guide.

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**Contacting Black Box Corporation**

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*1000 Park Drive*

*Pittsburgh, PA 15055*

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*Fax: (724) 746-0746*

**E-mail: [info@blackbox.co](mailto:info@blackbox.co)**

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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 B 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.



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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) ELECTRICAL SAFETY STATEMENT 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.

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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 du fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser conectado una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

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12. Precaución debe ser tomada de mal 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.

# **BLACK BOX® 10Mbps Economy BNC Media Converters Installation & User Guide**

## **Certification Notice for Equipment Used in Canada**

The Canadian Department of Communications label identifies certified equipment. This certification means that the equipment meets certain telecommunications-network protective, operation, and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single-line individual service may be extended by means of a certified connector assembly (extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility—in this case, your supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.



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Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

### **CAUTION:**

Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

The **LOAD NUMBER (LN)** assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices, subject only to the requirement that the total of the load numbers of all the devices does not exceed 100.

**TABLE OF CONTENTS**

**Page**

<b>1.1</b>	<b>TECHNICAL SPECIFICATIONS</b> .....	<b>1</b>
1.2	Summary of models and descriptions: .....	8
<b>2.</b>	<b>INTRODUCTION</b> .....	<b>9</b>
2.1	Inspecting the Package and the Product.....	9
2.2	Product Description .....	10
2.3	Features and Benefits .....	16
2.4	Applications .....	18
<b>3.0</b>	<b>INSTALLATION</b> .....	<b>20</b>
3.1	Locating the Media Conv. Unit .....	20
3.2	Rack Mount of LE1502A-R3 and LE1508 hardened M.C's .....	21
3.3	Rack Mount Tray, Model with Power Supply included .....	23
3.4	Calculating Overall Cable Segment Distance .....	25
3.5	Connecting Ethernet Media .....	28
3.5.1	Connecting Twisted Pair (RJ-45 ports).....	28
3.5.2	Connecting ThinNet (10BASE2) .....	30

# BLACK BOX<sup>®</sup> 10Mbps Economy BNC Media Converters Installation & User Guide

<b>4.0</b>	<b>OPERATION</b> .....	<b>31</b>
4.1	Power Supply Types for LE1502A-R3 and LE1508 models .....	31
4.2	Powering the LE1508Dxx (DC internal) with 12V, 24V or -48V DC34 .....	31
4.3	LE1508Dxx, DC-powered, -48VDC, 24VDC and 12VDC Instal .....	36
4.4	LEDs, dual for front-panel and side-panel (regular and hardened) ..	38
4.5	BNC port, Internal Termination Switch (for regular and hardened).	39
4.6	Up-Link (Cross-over) Switch .....	40
<b>5.0</b>	<b>TROUBLESHOOTING</b> .....	<b>41</b>
5.1	Before Calling for Assistance .....	41
5.2	When Calling for Assistance .....	41
5.3	Shipping and Packaging Information .....	43
		44

Black Box reserves the right to change specifications, performance and models without notice.

## **1.1 TECHNICAL SPECIFICATIONS**

Models LE1502A-R3 and hardened LE1508A, standard TP and BNC media

### **Performance:**

Data Rate: 10 Mbps (IEEE 802.3), half duplex mode

### **Network Standards:**

Ethernet: IEEE 802.3, 10BASE2, 10BASE-T

(Black Box Media Converters are physical layer standard Ethernet products, and operate independently of all software.)

### **Number of Media Converters in series:**

*Experience shows that up to two BNC units can be used in series between repeaters. For 3 or more in series, noise build-up will typically preclude proper operation. See also Section 3.4, Calculating Segment Distances.*

## **BLACK BOX<sup>®</sup> 10Mb Economy BNC Media Converters Installation & User Guide**

### **Maximum Standard Ethernet Segment Lengths:**

10BASE-T (twisted pair):	100 m (328 ft)
10BASE2 ThinNet (BNC):	185 m (607 ft)

Note: *Black Box Media Converters **DO NOT** support full length Ethernet segments. See Section 3.2 of this manual for media lengths and segment distance calculations.*

### **Operating Environment:**

#### **Ambient Temperature:**

(0 °C to 40 °C) **LE1502A-R3, LE1502AE-R3**  
(0 °C to 50 °C) **LE1502A, LE1502AE** with “H” power supply  
(-40 °C to 55 °C) **LE1508A, LE1508AE**(incl “H” pwr suppl.)  
(-40 °C to 75 °C) **LE1508D12 (12VDC),**

**LE1508D24 (24VDC), LE1508D48 (-48VDC)**

Note: *0 °C=32 °F, 40 °C=104 °F, 50 °C=122 °F, 55 °C=131 °F, 75 °C=167 °F, -40 °C=-40 °F.*

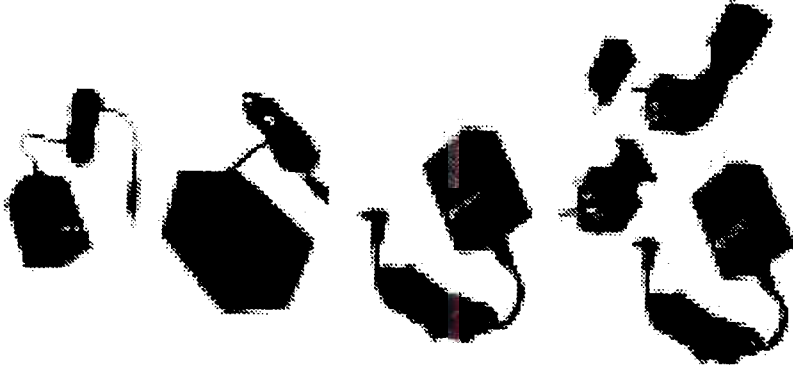
**Storage Temperature:** -40 °C to 85 °C

**Ambient Relative Humidity:** 5% to 95% (non-condensing)

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### **Power Supply ( AC External):**

Power input 12V DC jack is 2.5mm center +ve jack, with 6ft. cord



**120V AC at 60 Hz, for "A" North American models**

**230V AC at 50 Hz, IEC built-in, for "AE" int'l**

**100-240V AC at 50-60Hz, for "H" high temp.**

**100-240V AC at 50-60Hz, for "-Hi" w/ adapter kit  
DC to unit: 12V DC, 2.5mm jack, center +ve, 6ft.  
cord**

## **BLACK BOX<sup>®</sup> 10Mb Economy BNC Media Converters Installation & User Guide**

**Power Supply ( DC Internal):**

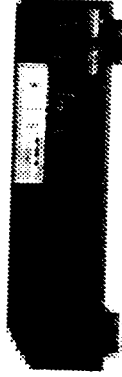
**Model LE1508D12**

**12V DC** internal (range of 8 to 15V DC), built-in terminal block for +, -, ground. The 12V DC jack is also present.



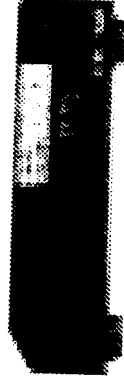
**Model LE1508D24**

**24V DC** internal (range of 18 to 36V DC), built-in terminal block for +, -, ground. The 12V DC jack is also present



**Model LE1508D48**

**-48V DC** internal (range of 36 to 70V DC), built-in terminal block for +, -, ground. The 12V DC jack is also present.



## **BLACK BOX® 10Mb Economy BNC Media Converters Installation & User Guide**

**Power Consumption:** 3 watts typical and 5 watts max. for all models

### **Connectors, for Media:**

RJ-45 Port: Modular 8-Pin female, with “cross-over” up-link switch

BNC Port: Standard BNC connector, RG-58 ThinNet with internal term sw.

### **Packaging:**

Enclosure: Rugged sheet metal (Steel).

Dimensions, Media Converter unit: Height x Width x Depth

**LE1502-all and hardened LE1508-all:** 3.5 in H x 3.0 in W x 1.0 in D (8.9 cm x 7.6 cm x 2.5 cm)

**Weight: LE1502-all and hardened LE1508-all:** 7.9 oz. (225g);

power supply, regular office temp : 5.8 oz (165g)

power supply, hardened AC models: 3.8 oz 110g)



# **BLACK BOX<sup>®</sup> 10Mb Economy BNC Media Converters Installation & User Guide**

**Cooling Method:** Convection, plus case is used as a heat sink on hardened models

## **Media Converter LED Indicators:**

<u>LED</u>	<u>LE1502A-R3</u>	<u>LE1508</u>	<u>Description</u>
<b>PWR</b>	unit	unit	Steady ON when power is applied
<b>Link</b>	TP	TP	Steady ON when proper link is established at both ends of the segment.*
<b>RX/A</b>	TP, BNC	TP, BNC	Blinking indicates activity, port is receiving packets. (Steady ON or OFF=no RX activity)
<b>POL</b>	TP	TP.	Indicates the unit has detected a TP receive wire-pair signal inversion (polarity).
<b>COL*</b>	TP, BNC.	TP, BNC	Indicates unit is simultaneously transmitting and receiving data from the cables.
<b>JAB*</b>	unit	unit	Indicates jabber (illegal packet length fault) condition. when lit, Segment is partitioned.

**NOTE:**\*COL and JAB LEDs are indicators applicable to standard Ethernet collision domains with half-duplex operation.

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**Metal Mounting clips :** included

## **Agency Approvals:**

UL Listed (UL 1950 and cUL) and CE Certified.  
Emissions: Meets FCC Part 15 Class A, CE

**Warranty:** Three years, return to factory

Made in USA

# **BLACK BOX<sup>®</sup> 10Mb Economy BNC Media Converters Installation & User Guide**

## **1.2 Summary of models and descriptions:**

LE1502A-R3 = TP to BNC, half-duplex, 115V 60Hz AC power supply

LE1502AE-R3 = TP to BNC, half-duplex, 230V 50Hz AC power supply

LE1508A = Hardened unit, TP to BNC, half-duplex, hardened (to 55°C) ext'l AC power supply

LE1508AE = Hardened unit, TP to BNC, half-duplex, hardened (to 55°C) ext'l AC power supply with adapter kit for international AC 230V50Hz power outlets.

LE1508D12 = Hardened unit (-40 to 75°C), TP to BNC, half-duplex, built-in 12VDC power supply

LE1508D24 = Hardened unit (-40 to 75°C), TP to BNC, half-duplex, built-in 24VDC power supply

LE1508D48 = Hardened unit (-40 to 75°C), TP to BNC, half-duplex, built-in -48VDC power supply

LE1505-RACK = 19" Rack-mount tray for Economy Media Converters, up to 16 units  
See Section 3.2

LE1505P-RACK = 19" Rack-mount tray for Economy Media Converters, with power supply  
See Section 3.3

## **2.0 INTRODUCTION**

This section describes the, LE1502A-R3 regular and LE1508A hardened media converter models, including appearance, features and typical applications.

### **2.1 Inspecting the Package and the Product**

Examine the shipping container for obvious damage prior to installing this product; notify the carrier of any damage which you believe occurred during shipment or delivery. Inspect the contents of this package for any signs of damage and ensure that the items listed below are included.

This package should contain:

- |       |  |
|-------|--|
| 1     | 10 Mbps BNC Media Converter Unit                                   |
| 1     | External Power Supply (except for internal DC power supply models) |
| 1 set | Metal mounting clips and screws, 2 each unit                       |
| 1     | Velcro® Tape section, approximately 3 inches in length             |
| 1     | User Guide, i.e., this manual                                      |
- (continued next page)

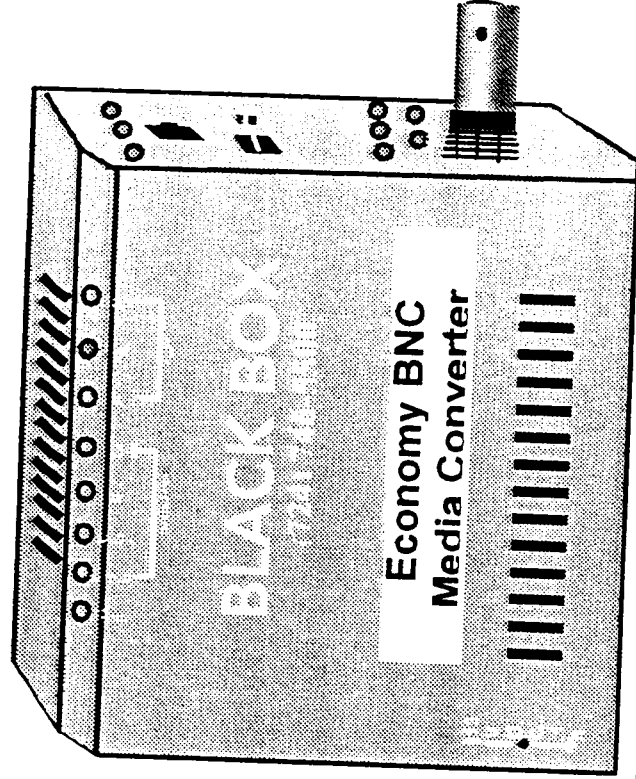
## **BLACK BOX<sup>®</sup> 10Mb Economy BNC Media Converters Installation & User Guide**

Remove the Black Box 10Mb BNC Media Converter from the shipping container. Be sure to keep the shipping container should you need to ship the unit at a later date.

In the event there are items missing or damaged contact your supplier. If you need to return the unit use the original shipping container. Refer to Section 5, Troubleshooting, for specific return procedures.

### **2.2 Product Description**

The BLACK BOX,<sup>®</sup> 10Mb LE1502A-R3 regular and LE1508A hardened Media Converters have rugged metal packaging, a selection of extended temperature models, choice of AC and DC power types, ease-of-use features, and are energy-efficient. All models offer a

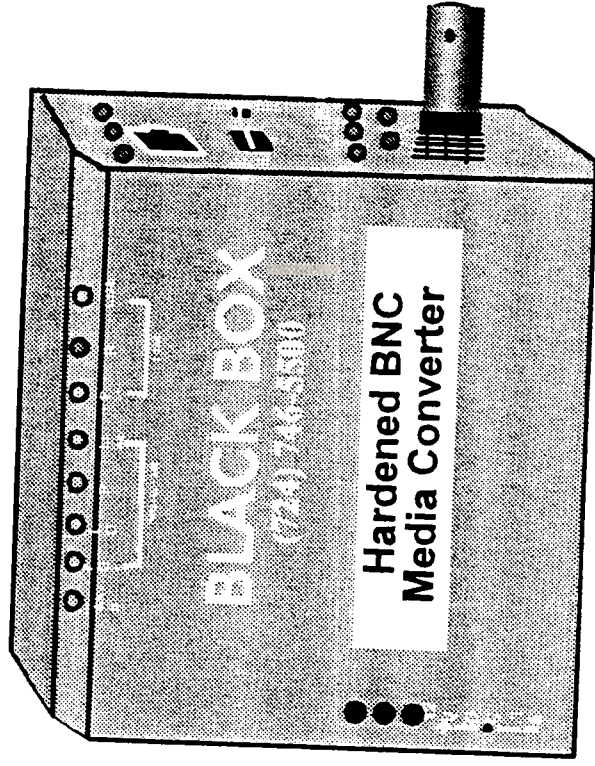


## **BLACK BOX® 10Mb Economy BNC Media Converters Installation & User Guide**

graceful way to convert and transmit data between twisted pair (RJ-45) and thin coaxial (BNC) network cables for media flexibility in new or expanded 10Mb Ethernet networks. They provide standard collision detection and indication, and comply with the Ethernet V1.0 / 2.0 specifications and the IEEE 802.3 standards. Power consumed in use is only 3 watts.

### **Black Box LE1508 shown ->**

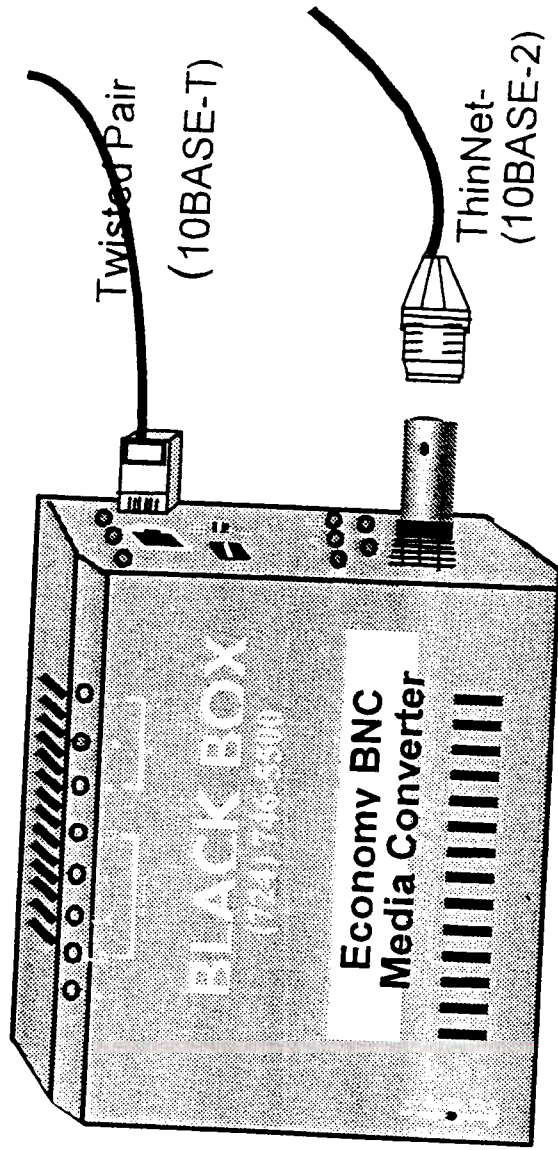
The LE1502A-R3 regular-package units are for office and wiring closet environments and use an external AC power supply for either 0° to 40°C or the more stressful industrial 0° to 50°C



## **BLACK BOX<sup>®</sup> 10Mb Economy BNC Media Converters Installation & User Guide**

ambient temperature. A rugged metal case with convection cooling is featured. The units can be mounted securely on a closet wall or the side of cabinet, or by using the metal mounting clips included.

The LE1508 hardened unit features a sealed metal case which is also used as a heat sink. No air flow is required for cooling, so the LE1508's resist



dust, dirt, moisture, smoke and insects, and are plenum rated. Choices of models for

## **BLACK BOX® 10Mb Economy BNC Media Converters Installation & User Guide**

external AC or internal DC power are available. Ambient temperature rating is up to – 40°C to +75°C depending on the power source used. The LE1508's are suitable for temperature un-controlled outdoor applications. Mounting options include panel-mounting or rack-mount tray.

The LE1502A-R3 office series offer a graceful way to convert and transmit data among twisted pair, and thin coaxial network cabling environments. LE1502A-R3 Media Converters cost significantly less than full repeaters and can be used whenever media distance limitations will not be exceeded in the segment. All units are compatible with Ethernet V 1.0 / 2.0 specifications and comply with IEEE 802.3 standards.

Black Box LE1502A-R3s 10Mb BNC Media Converters are designed for quick and easy installation even in very tight spaces. Media cables are easily attached to the corresponding Media Converter. Because of their compact size, Black Box Media



## **BLACK BOX<sup>®</sup> 10Mb Economy BNC Media Converters Installation & User Guide**

Converters can be Velcro®-mounted on an office wall or the side of a desk or cabinet.

Mounting options include panel-mounting, and rack-mount tray ( LH1505/LH1505P-RACK, see Section 3.3) that neatly holds the units and power supplies is available.

The standard “1-per-unit” external power supply plugs into a nearby AC wall socket or power strip. The LE1508 hardened media converter is also available with extended temperature power supply AC/DC (External/Internal) to qualify for temperature un-controlled and industrial applications. Each converter features two full sets of LEDs that convey essential diagnostic and status information at any angle. See Section 4.1 and 4.4, for power supply and LED function specifications.

All of the Black Box LE1502's and LE1508's Media Converters comply with the IEEE 802.3 10BASE-T specification for 10 Mb/sec traffic via shielded (STP) or unshielded twisted pair (UTP) segments. They feature an up-link or cross-over switch to

## **BLACK BOX® 10Mb Economy BNC Media Converters Installation & User Guide**

eliminate the need for a special cross-over cable when connecting to a hub or concentrator and also an ( $\infty - 50\Omega$ ) internal termination switch to control the BNC port by eliminating the TEE – Connector otherwise required at BNC taps. The BNC port connector complies with IEEE 802.3 10BASE2 specifications.

### **2.3 Features and Benefits**

- **Reduces Network Costs**

Black Box Media Converters offer the ideal solution to efficiently and inexpensively connect Twisted Pair with ThinNet media within an expanding Ethernet network where full repeaters are not required.

- **No added Repeater Hop Count**

Media Converters do not add signal timing delays associated with full repeaters, and can be installed without increasing the repeater hop count of an existing network.

- **Two sets of LEDs for viewing status from any angle.**

Each of the LE1502's and LE1508's Media Converter is equipped with two sets (front and side) of LEDs to provide status information when viewed at any angle or mounting arrangement, rack-mount (LE1505-RACK) or wall-mount.

## **BLACK BOX® 10Mb Economy BNC Media Converters Installation**

- **Rugged metal case, industrial grade**  
The LE1502's and LE1508's Media Converters have a robust design and are packaged in a rugged metal enclosure to ensure durability even when placed in extended temperature; e.g. industrial or outdoor applications.
- **AC and DC Power Supplies with extended temperature ratings**  
LE1508 Hardened Media Converters are designed for use in temperature-controlled applications, and are available with a variety of ratings for external AC and internal DC power supplies. See Specs, Section 4.1 for details.
- **Compact design, mount anywhere**  
Featuring a compact steel case with an external AC power supply, the Black Box LE1502A-R3 and LE1508 Hardened Media Converters can be installed in minimal space in rack mount cabinets like LE1505-RAC, on table-tops or wall-mounted.

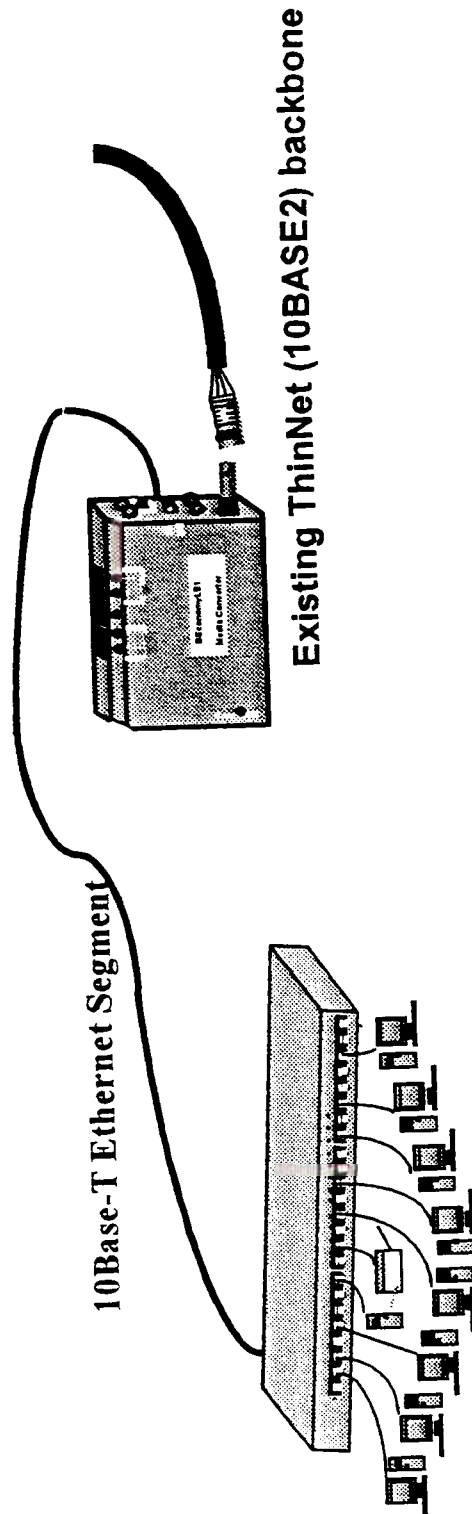
## **2.4 Applications**

The primary function of a 10Mb Ethernet Media Converter is to permit two different 10Mb media types to coexist inexpensively within the same network by allowing data to be transmitted and received between different media types.

Black Box LE1502A-R3 Economy Media Converters are typically used where new 10BASE-T networking equipment is being installed and connected to existing BNC Ethernet cabling. Black Box LE1502A-R3 Economy Media Converters have an external AC power supply and internal DC Power supply, enabling them to be used to convert signals among media that does not have a power source as part of the cabling system, such as twisted pair and BNC. The wide variety of options of AC and DC power supply qualify the LE1502A-R3 regular and LE1508 hardened series for use in office locations as well as industrial and even outdoor applications.

## **BLACK BOX® 10Mb Economy BNC Media Converters Installation & User Guide**

In this application, in a Industrial environment where extended temp. supported units is a requirement, the existing BNC network needs to connect with RJ-45 ports in a hub / switch to expand the existing application. The rugged Black Box LE1508's with various extended temperature features easily qualifies to be deployed in this requirement and smoothly serve the needs by changing BNC media to RJ-45.



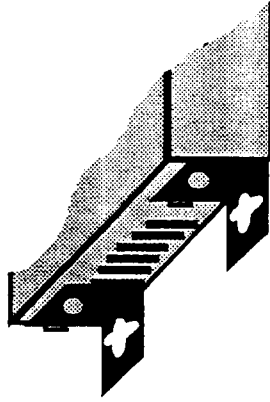
The LE1502A-R3's and LE1508's 10Mb Economy Media Converter connect twisted-pair cabling to existing BNC cabling. Their operation is half-duplex in all situations. See Section 3.5 for calculations of cable distance limits.

### **3.0 INSTALLATION**

This section describes the installation of the Black Box LE1502A-R3's and LE1508's Economy Media Converters, including location, segment distance calculation and media connection.

#### **3.1 Locating the Media Conv. Unit**

The compact and lightweight design of the Black Box Media Converter allows it to be easily installed in almost any location. A Velcro strip is included for mounting the unit on a



**Secure attachment of mounting clips for wall mounting**

## **BLACK BOX<sup>®</sup> 10Mb Economy BNC Media Converters Installation & User Guide**

vertical surface such as a wall or cabinet, or for securing the unit on a table-top or shelf. Alternatively, metal mounting clips and screws are included for a rugged and secure mounting in any orientation.

Installation of Black Box BNC Media Converters is a simple procedure. The installation location is dependent upon the physical layout of the Ethernet network and associated cabling. Make sure the unit is installed in a location that is easily accessible to an AC power outlet or power strip, and where convection cooling is not inhibited. The green Power (PWR) LED must turn ON, when power is applied through the internal DC input 12V, 24V or -48V DC (hardened models) or external AC through the 12V DC jack.

### **3.2 Rack Mount of LE1502A-R3 and LE1508 M.C's**

For 19" rack-mounting of Black Box BNC Media Converters, a rack-mount tray is available, LE1505-RACK. The Media Converter units are mounted with their RJ-45 port



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and DC power jack in the back, with either fiber or BNC cable in the front. Any mix of the Economy BNC or fiber-type Media Converters may be placed on a tray, up to a maximum of 16 units. (The mounting spaces of the LH1505-RACK are specific to the Economy M.C. series, and do not permit other models).

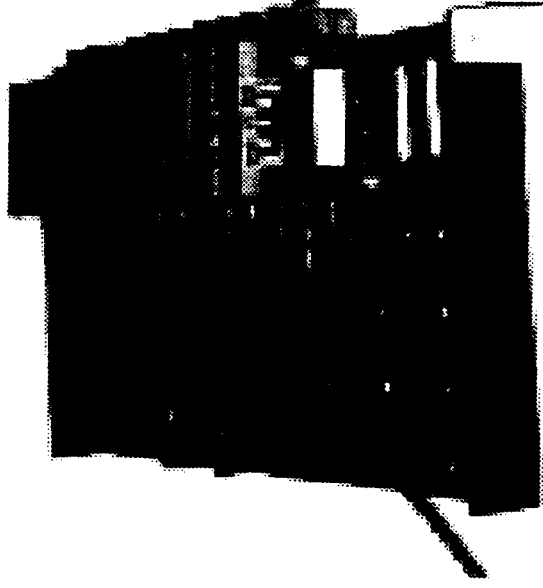
A typical installation of the model LH1505-RACK, 19" rack-mount tray will hold a few (often three to eight) economy 10Mb BNC Media Converters, with their power supplies plugged into power strips (not included) in the rear area of the tray. Metal mounting screws in the bottom-front hold the regular and hardened Media Converters firmly in place. The beveled-top edge of the units permits the LEDs of each unit to be viewed for operational status, even when the units are very close together.

### **3.3 Rack Mount Tray, Model with Power Supply included**

The LH1505P -RACK is another option available for Rack Mounting the mix-match of 10Mbps and 100Mbps Economy & Crossover Media Converters together in 19" rack-mount tray. The LH1505P-RACK model comes with built-in common universal AC power supply rated at 40 watts at 50C ambient, 9VDC output, and supporting up to 10 MC units. (Six tray positions for MC's are not wired for power). Typically, 3 to 8 MC units are in use with a LH1505P-RACK, with expansion space left available.

The LH1505P-RACK holds up to 10 mix-match of 10Mbps and 100Mbps Black Box Economy & Crossover Media Converters. (The MC mounting spaces of the LH1505P-RACK are specific to the 10Mb "Economy"- series and the 100Mbps "Crossover" series, and do not permit other models or other sizes to be put in the tray).

The side-view picture shown here is an example of an installation of the model LH1505P-RACK, 19" rack-mount tray, holding a few 10Mbps Economy Media Converters, each with their power input plugged into the built-in common AC power supply in the rear area of the tray. (PS units that come with the MC's are not used)..



Metal mounting screws in the bottom-front hold each of the media converters secure in the tray, separately removable for service. The dual LEDs permit viewing operating status of the Media Converters from any angle.

### **3.4 Calculating Overall Cable Segment Distance**

***Important Note:*** Special consideration must be given to maximum cable segment lengths on each side of a 10 Mbps Economy Media Converter. It is recommended that IEEE 802.3 specifications for overall maximum segment distances be adhered to in order to maintain optimum network performance. (See also Technical Specs, Maximum Standard Ethernet Segment Distances, Section 1.1 of this manual.)

When installing the 10 Mbps Economy Media Converter, it is important to consider the combined overall segment length of both of the attached media types. The overall segment length is calculated by adding together the segment lengths on both sides of the 10 Mbps Economy Media Converters. Cable segment length on each side of the Media Converter is measured as a percentage of the maximum allowable standard media distance for the given media type. The percentages, when added together, must not exceed 100%.

# **BLACK BOX<sup>®</sup> 10Mb Economy BNC Media Converters Installation & User Guide**

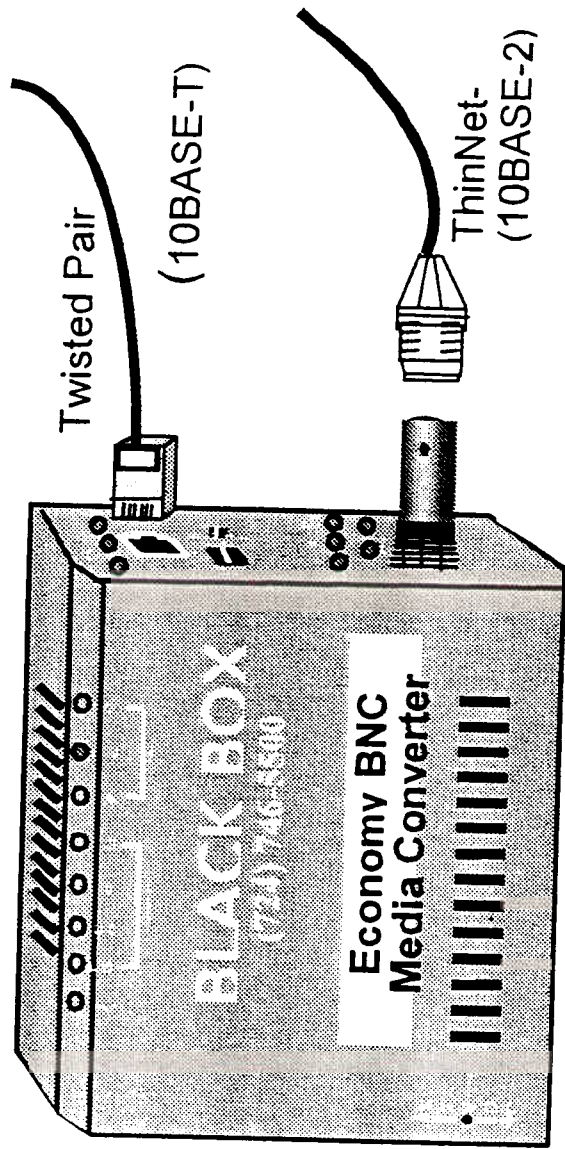
## **Media Distance Formula for 10 Mbps Economy Media Converters:**

$$X\% + Y\% \leq 100\%$$

Where X = The segment distance on one side of the Media Converter divided by the Standard Maximum Media Distance for that media type, x 100%.

Where Y = The segment length on the other side of the Media Converter divided by the Standard Maximum Media Distance for that media cabling type, x 100%

**Notes:** 1) Media distance calculation is the same for both half and full duplex media converters. 2) Single-mode fiber distances more than about 4Km will exceed the 10 Mbps collision domain limits, and should be operated at either full-duplex or with light traffic.



**A Distance Calculation Example:**

**Connectivity between ThinNet and TP Ethernet Media.**

In the figure shown above, the length of Segment X is 72m (216 ft). This is 39% of the maximum allowable distance for 10BASE2 media (185 m) [ $72/185 \times 100\% = 39\%$ ]. The length of Segment Y is 55m (165 ft). This is 55% of the maximum allowable distance for UTP 10BASE-T media (100 m) [ $55/100 \times 100\% = 55\%$ ]. The total of the two percentages (39% + 55%) is 94%, which is allowable.

Note 1: Where more than one media converter is used in one segment run, the percentages for all of the cabling lengths in the run must be added together and must not exceed 100%.

Note 2: If the total segment distance calculation result is greater than 100%, consider using a Repeater so that each cable type can be 100% of its maximum allowed length.

Note 3: The maximum number of 10 Mbps Media Converters that can be used in series is two. The cumulative noise from three or more units together causes packet alignment errors, dropped packets.

### **3.5 Connecting Ethernet Media**

It is recommended that both of the media (TP and BNC) be connected with power off so that both ports are connected when power is applied to the logic in the electronics. If power is on, connect the Twisted Pair media before the BNC media. If BNC is connected before TP with power on, it can create a Jabber condition, in which case the JAB LED will come on and no packets will be processed.

See Sections 4.4 for details of the LEDs on the media converter models.

#### **3.5.1 Connecting Twisted Pair (RJ-45 ports)**

The following procedure describes how to connect a 10BASE-T twisted pair segment to the RJ-45 port on the Black Box Media Converters. The procedure is the same for both unshielded and shielded twisted pair segments.

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1. Using standard 10BASE-T media, insert either end of the cable with an RJ-45 plug into the RJ-45 connector of the Black Box Media Converter.
2. Connect the other end of the cable to the corresponding device.

Use the LINK LED to ensure proper connectivity by noting that the LED will be illuminated when the units are powered and proper connections established. If the LINK LED is not illuminated, change the setting of the up-link switch (See Section 4.6 for up-link switch information.) If this does not help, ensure that the cable is connected properly at both ends and is not defective.



### **3.5.2 Connecting ThinNet (10BASE2)**

Note: connect TP media before connecting BNC media if power is on in the Media Converter unit. See Section **3.5 Connecting Media** above.

Connect the ThinNet coax cable to the BNC connector on the Media Converter in the same manner as is done for any standard BNC connection. Be sure that the BNC segment is properly terminated using a standard “T” connector.





The LE1502A-R3 regular and LE1508A hardened BNC media converters are also equipped with “Terminator Switch” ( $\infty$ -50 $\Omega$ ), which can be used to eliminate the standard “T” connector by moving the “Terminator Switch” to the 50 $\Omega$  position. See Section **4.5 BNC port, Internal Termination Switch** for details.

# **BLACK BOX® 10Mb Economy BNC Media Converters Installation & User Guide**

## **4.0 OPERATION**

This section describes the operation of the Black Box LE1502A-R3 regular and LE1508 hardened 10Mb BNC Media Converters , including power supply requirements, up-link switch functionality, and a description of all LEDs.

### **4.1 Power Supply Types for LE1502A-R3 and LE1508 models**

<b>LE1502A</b>	<b>LE1502AE</b>	<b>LE1508A</b>	<b>LE1508-AE</b>
			
<b>OFFICE</b>		<b>INDUSTRIAL</b>	

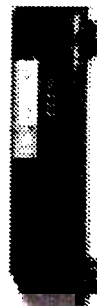
## **BLACK BOX<sup>®</sup> 10Mb Economy BNC Media Converters Installation & User Guide**

Black Box BNC Media Converters are power-efficient and can work with an external AC power supply. Black Box BNC Media Converters require a nominal 12VDC input. The "A" regular PS version is used for light duty offices, whereas the extended temperature LE1508 version (-40° to 55°C with AC power) is used for more heavy duty and industrial applications.

The 12V DC power input jack has a plug of 2.5mm, center +ve, with 6 ft. cord. All the AC power supply information details are provided in Technical Specifications Sec. 1.1.

The LE1508 Hardened media converters are specially designed to provide reliable operation, withstand higher temperature environment and provide the various choice to the user to deploy in uncontrolled temperature environment. The extended temp. AC version of LE1508 uses the external power supply with (100-240v) AC range at 50-60 Hz.

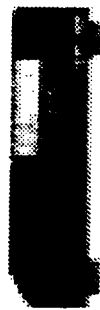
**12VDC**



**24VDC**



**-48VDC**

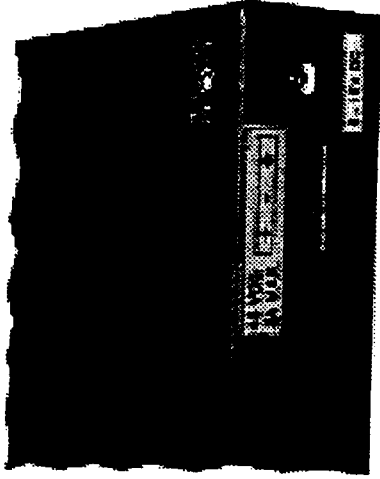


The Internal 12V DC (8 – 15V DC) has a built-in terminal block for +, -, ground. The 12V DC jack is also present. Detail information about the 12 VDC, the 24V DC and the -48V DC is provided in the Technical Specifications Section 1.1.

The various models of power type and extended ambient temperature AC power supplies are optional for use as spares and in special situations.

**4.2 Powering the LE1508Dxx (DC internal) with 12V, 24V or -48V DC**  
(LE1508D12 for 12VDC, LE1508D24 for 24VDC, LE1508D48 for 48VDC)

Each Black Box LE15Dxx is equipped with an internal DC power supply, and has built-in screw terminals for secure attachment of the power leads. The three models support a range of power input types. The three model choices are for use with 12VDC, 24VDC or -48VDC power. DC power input is often chosen for high-availability in heavy duty applications.



The extended temperature capability of the DC-powered LE1508Dxx's can go outdoors, rated at -40°C to +75°C. The DC jack is also present and can optionally be used with an external AC power supply.

## **BLACK BOX<sup>®</sup> 10Mb Economy BNC Media Converters Installation & User Guide**

**DC Power Terminals:** “+”, “-”, floating

**GND:** Terminal for “earth” or ground wire connection to the LE15XX chassis

**Input Voltage:** 8 - 15V DC (12V DC)

18 – 26V DC (24V DC)

30 – 60V DC (-48V DC)

**Input current:** 0.8 amp max.(9V DC)

0.4 amp max.(24V DC)

0.2 amp max.(-48V DC)

**Power Consumption:** 3 watts typical, 3.5 watts max.

### **4.3 LE1508Dxx, DC-powered, -48VDC, 24VDC and 12VDC Install**

This section describes the proper connection of the -48VDC leads (or 24VDC, 12VDC leads) to the DC power terminal block on the Black Box LE15Dxx hardened media converter (as shown in Figure 4.2 above). The DC terminal block on the Black Box LE1508Dxx models is located on the left side of the unit and is equipped with three (3) screw-down lead posts. The power terminals are identified as positive (+) and negative (-), and they are floating inside the unit so that either of the terminals may be grounded by the user if desired. The chassis is “earth” or ground (GND).

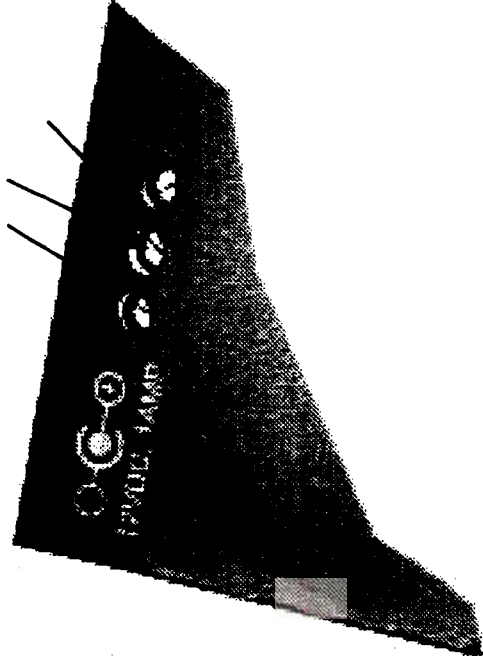
The connection procedure is straightforward. Simply insert the DC leads to the LE1508’s power terminals, positive (+) and negative (-) screws. The use of Ground (GND) is optional; it connects to the LE1508 chassis. Ensure that each lead is securely tightened from the top, as shown here.

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***NOTE:** Always use a voltmeter to measure the voltage of the incoming power supply and figure out the +ve potential lead or -ve potential lead. The more +ve potential lead will connect to the post labeled "+ve" and the rest to the "-ve".*

*The GND can be hooked up first.*

When power is applied, the green PWR LED will illuminate.





#### **4.4 LEDs, dual for front-panel and side-panel**

**LED**      **Description**

**PWR**      Illuminates GREEN to indicate power applied.

**LINK/L (TP)** Illuminates GREEN, to indicate proper connectivity on the 10BASE-T network segment. LINK will turn off in the event connectivity is lost between the ends of the twisted pair segment or a loss of power occurs in the unit or remote device.

**RX/A**      Blinking GREEN indicates data is being received, receive activity.  
                 (Steady ON or steady OFF indicates no receive activity).

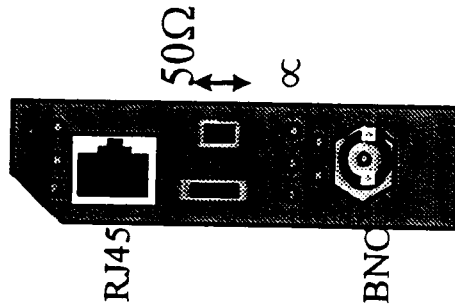
**POL/PO (TP)** Illuminates AMBER to indicate inverse polarity detected.

**JAB**      Illuminates AMBER to indicate jabber (illegal packet length). See also  
                 Section 3.5 Connecting Media instructions on attaching TP before BNC.

**COL/C**      (per port) Illuminates AMBER to indicate a collision on the segment.

## **4.5 BNC port, Internal Termination Switch**

An internal termination switch ( $\infty - 50\Omega$ ) is provided on the end near the BNC port. The BNC port is specially equipped with an internal termination switch that eliminates the need to use a "tee" connector when the BNC cable is ending at the LE1502A-R3. When the switch is in the "50 $\Omega$ " position, the connection is internally terminated. When switched to the " $\infty$ " position, external termination (using a "tee" connector, not supplied) is required. Some applications may require a "tee" connector, used as a tap, to allow the 10BASE2 coax segment to continue on past the LE1502A-R3 and LE1508's port connection.

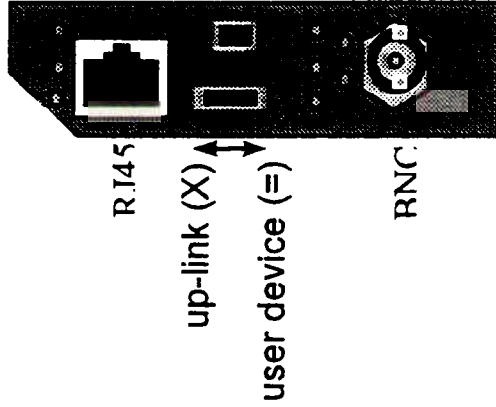


**End view of BNC M.C.**

#### **4.6 Up-Link (Cross-over) Switch**

The LE1502A-R3 and LE1508's Media Converters are equipped with an Up-Link slide switch. When set to the UP position (X), the Media Converter is wired with cross-over functionality for direct up-link to a network hub, switch or concentrator.

When set to the DOWN position (=), the 10Mb BNC Media Converter is wired for normal twisted-pair connection to a user node device. Some Ethernet Switch ports may be of either polarity, and this feature is most convenient with such switches.



**End view. BNC M.C.**

## **5.0 TROUBLESHOOTING**

All Black Box Ethernet products are designed to provide reliability and consistently high performance in all network environments. The installation of 10 Mbps Economy Media Converters is a simple procedure (see Section 3.0, INSTALLATION); their operation is described in Section 4.0, OPERATION.

Should problems develop during installation or operation, this section should help to locate, identify and correct such problems. Please follow the suggestions listed below prior to contacting your supplier. However, if you are unsure of any procedure described in this section, or if the Economy BNC Media Converter is not operating as expected, do not attempt to repair or alter the unit. Contact Black Box for assistance.

### **5.1 Before Calling for Assistance**

1. If difficulty is encountered when installing or operating the Economy Media Converter, refer back to Section 3.0, Installation and Section 4.0, Operation. Check to make sure that the various other components of the network are operable.
2. Check the cables and connectors to ensure that they have been properly connected, and the cables/wires have not been crimped or in some way impaired during installation. (About 90% of network downtime can be attributed to wiring and connector problems.)

3. Make sure that the external DC power supply is properly attached to the unit, that it is of the proper type, and that it is plugged into a functioning electrical outlet. Use the PWR LEDs to verify the unit is receiving proper power.
4. If the problem is isolated to a network device other than the Economy Media Converter, it is recommended that the problem device be replaced with a known good device. Verify whether or not the problem is corrected. If not, go to Step 5 below. If the problem is corrected, the Media Converter and its associated cables are functioning properly.
5. If the problem continues after completing Step 4 above, contact Black Box.

## **5.2 When Calling for Assistance**

If you determine that your Hardened Ethernet Switch is malfunctioning, do not attempt to alter or repair the unit. It contains no user-serviceable parts. Contact Black Box by phone at (724) 746-5500 or by other appropriate method .

Before you do, make a record of the history of the problem. Black Box 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.

## **BLACK BOX™ 10Mb Economy BNC Media Converters Installation & User Guide**

### **5.3**

#### **Shipping and Packaging Information**

Should you need to ship the unit back to Black Box Corporation, please follow these instructions:

1. Package the unit carefully. It is recommended that you use the original container if available. Units should be wrapped in a "bubble-wrap" plastic sheet or bag for shipping protection. (You may retain all connectors and this Installation Guide.)

**CAUTION** : Do not pack the unit in Styrofoam "popcorn" type packing material. This material may cause electro-static shock damage to the unit.

2. Clearly mark the Return Material Authorization (RMA) number on the outside of the shipping container.
3. Black Box Corporation is not responsible for your return shipping charges.
4. Ship the package to:

**Black Box Corporation  
1000 Park Drive  
Lawrence, PA 15055  
Phone: (724) 746-5500  
Fax: (724) 746-0746**



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