Boca's Family of Ethernet Products

10Base-T ETHERNET Concentrator By BOCA™

Installation Guide

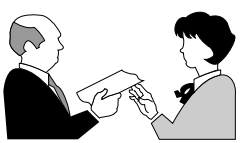
PRODUCT CODE:
BEN210

Before You Begin your Installation

The product you have purchased is designed to be easily installed into most IBM PC or compatible systems. Many products have large, easy-to-read legends to allow for the easy configuring of the product. This installation manual contains detailed instructions. Most included software has automatic installation programs to place the software correctly onto your computer. However, as all computers are configured differently, you may be required to perform some basic DOS or Windows tasks. If you are not familiar with basic DOS commands such as DIR, CD, or EDIT, you should check your DOS manual, or seek assistance from you local computer dealer to install the product.

How to get Technical Assistance

The dealer that you purchased this product or your computer from is the first place you should go for technical assistance. The dealer is usually the most qualified source of help, and is most familiar with your system and how this product should be installed. Many dealers have customer service and technical support programs, with varying levels of support offered, depending on your needs and computer knowledge. ***Please contact the dealer first whenever a problem occurs.***



If your Dealer Can't Assist you

If you can't get assistance from your dealer, the manufacturer provides varying levels of technical assistance as summarized on the following page.

Boca BBS
407-241-1601

Standard Free Technical Support
407-241-8088

Automated *Fax Retrieval System*
407-995-9456

Priority Service
900-555-4900
($2 per minute)

Technical Support Fax
407-997-0918

On-Line Support!
***CompuServe*: GO BOCA**
***Internet*:**
***email*: support@boca.org**
***on the World Wide WEB*:**
http://www.boca.org

The Standard Free Technical Support number is for quick answers to specific inquiries on product features and technical questions (call **407-241-8088**; M-F, 8 am to 6:30 pm EST). Direct access to technical support representatives is provided on a limited basis. If you require immediate attention or in-depth help with the installation of the product, please call our 900-priority support number for service. This number gives you immediate access to senior-level technicians. The number is **900-555-4900**. You will be charged $2.00 per minute. The charges will appear on your next phone bill.

Damaged or Missing Items

We use many world-class quality assurance programs to ensure the product you purchased is of the highest caliber. Sometimes, however, a component may be missing from the box, or is damaged or corrupt in some way. If this happens, immediately return the entire package to your place of purchase so you may exchange it for a new one. Your dealer should be able to provide you with an exchange far more quickly than by contacting us directly. If for some reason you are unable to return the product directly to its place of purchase, refer to the “Servicing Your Product” and “Warranty” sections in this manual for instructions.

Contents

Section One: Introduction

Congratulations on purchasing the 10Base-T Concentrator by Boca (BEN210). This low-cost compact concentrator is fully compliant with IEEE 802.3 standards. Its highly integrated single-chip solution constantly monitors signal quality ensuring increased network reliability. The BEN210's compact case fits conveniently on the corner of a desk, and multiple concentrators for cascading may be stacked on one another.

Feature Highlights:

- High-performance, highly integrated one-chip solution from Advanced Micro Devices.
- The 8-port concentrator allows you to connect up to eight nodes using unshielded twisted-pair cabling.
- An uplink, or crossover switch for "cascading" multiple units to support flexible growth.
- Status LEDs monitor status and operation at all times.
- Automatic partitioning disables ports that experience collisions and automatically reconnects those ports when the error condition is cleared.

Functional Description

The BEN210 is an implementation of an IEEE 802.3/Ethernet repeater or hub. It provides eight 10Base-T ports in a compact package. The BEN210 complies with the full set of repeater basic functions as defined in section 9 of ISO 8802.3 (ANSI/IEEE 802.3c). These functions are defined below:

Repeater Function

If any single network port senses the start of a valid packet on its receive lines, then the BEN210 will re-transmit the received data to all other enabled network ports.

Signal Regeneration

When re-transmitting a packet, the BEN210 ensures that the outgoing packet complies with the 802.3 specification in terms of preamble structure, voltage amplitude, and timing characteristics.

Jabber Lockup Protection

The BEN210 implements a built-in jabber protection scheme to ensure that the network is not disabled due to the transmission of excessively long data packets.

Collision Handling

The BEN210 will detect and respond to collision conditions as specified in 802.3. It will also protect the network from an excessive duration of, or frequent collisions by “partitioning” the offending port from the rest of the network. Once a port is partitioned, the data received from that port will not be repeated. However, any other data on the network will be re-transmitted on that port.

If the collisions that cause the partitioning cease, the port will be re-connected to the rest of the network.

The status of the partitioning scheme can be checked at any time by moving the LNK/PRT switch on the front of the BEN210 to the PRT position. If any ports are currently partitioned, the corresponding LED will come ON.

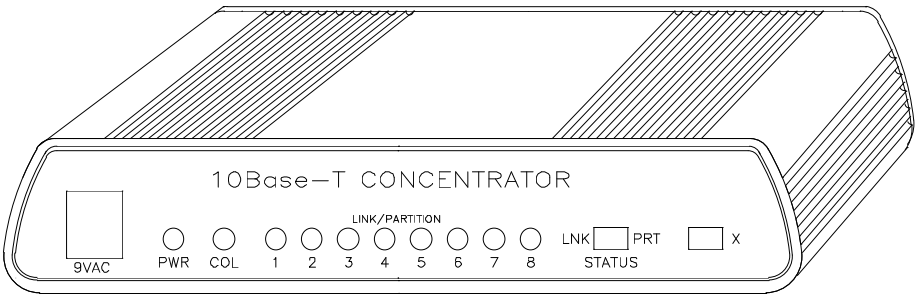
Link Test

The BEN210 implements the Link test function as specified in the 802.3 10Base-T standard. It transmits Link test pulses to any port after that port's transmitter has been inactive for a short period of time. The device connected to the port will respond in the same manner.

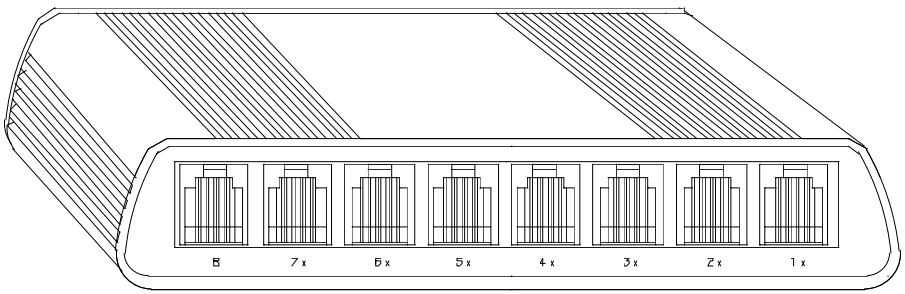
The Link Status can be viewed on the LEDs of the BEN210 when the LNK/PRT switch is in the LNK position. If a successful link has been established, the corresponding LED will be ON.

Polarity Reversal

The BEN210 automatically detects and adjusts to reversed polarity of received data.



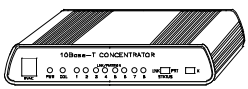
FRONT VIEW OF BEN210

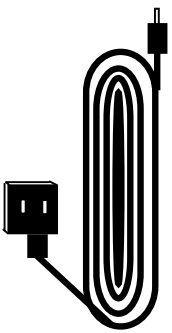


REAR VIEW OF BEN210

Section Two: Installation

The Contents of Your Package





Connecting the Power Supply

1. Connect the appropriate end of the power cord to the front of the BEN210 (marked 9VAC) and insert the remaining end to any conveniently accessible wall outlet.

2. Check the front panel LEDs. If the power (PWR) LED is not ON, turn to Section Five: Troubleshooting.

Section Three: Network Configuration

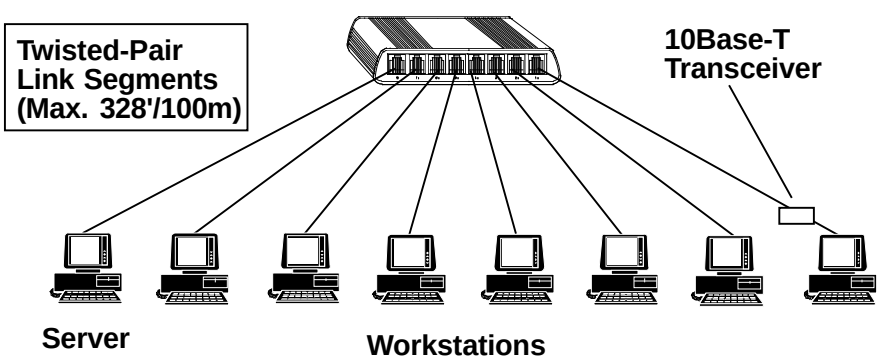
The BEN210 is intended to connect multiple personal computers (stand-alone) and/or other concentrators to an Ethernet star topology network.

3.1 Small Stand-Alone Network

A single BEN210 can support a maximum of eight nodes, one per port. Each device is connected directly to the twisted-pair port (RJ-45 connector) via a twisted pair link segment (RJ-45 cable).

If the Ethernet adapter in any given machine in the stand-alone network does not have an RJ-45 connector, a transceiver may be connected to interface the adapter to an RJ-45 connector. The other end of the transceiver is then connected to an RJ-45 port on the concentrator with a twisted-pair link segment (RJ-45 cable). In the example below, work station number 8, with an Ethernet adapter without an RJ-45 connector, requires a transceiver.

NOTE: Maximum RJ-45 cabling distance is 100 meters (328 feet).

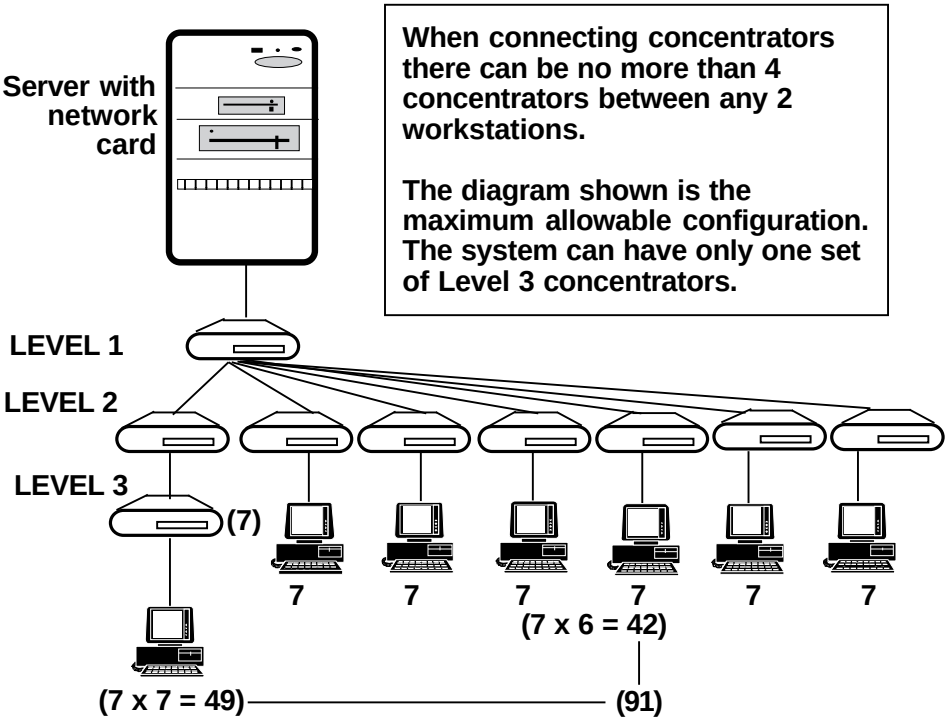


3.2 Cascaded Network

The star network may be expanded to a maximum of 91 stations through “cascading”. This amounts to 3 levels of concentrators as shown on the next page. The **first** is the main concentrator. One of its eight ports is connected to a network card in the server. The remaining 7 ports are connected to 7 concentrators. This makes up the **second** level. Six of the 7 concentrators have 7 ports available which are connected to 7 workstations for a total of **42 stations on Level 2**.

Seven ports on the remaining concentrator are connected to 7 additional concentrators. This makes up the **third** level. Seven workstations may be connected to each of these concentrators for a total of **49 stations on Level 3**. 49 on Level 3 and 42 on Level 2 yield a total of 91 stations. See diagram on following page.

When cascading from one BEN210 to a second BEN210, set port 8 on the first BEN210 to the non-X position Use a straight-through cable from port 8 on the first BEN210 to any one port (1-7) on the second BEN210.



NOTE: Maximum RJ-45 cabling distance is 100 meters (328 feet).

This is only a sample configuration. Other configurations are possible.

Section Four: Cabling Characteristics

4.1 Cable Type

Cable:	UTP (Unshielded Twisted Pair)
Type:	100 Ohm UTP
	22-26 AWG (0.4-0.6 mm)
	2 pairs minimum; category 3 or higher
Male Connector:	8-pin RJ-45
Distance:	Maximum: 100m (328'); Minimum: .6m (2')

4.2 10Base-T Pin Assignments

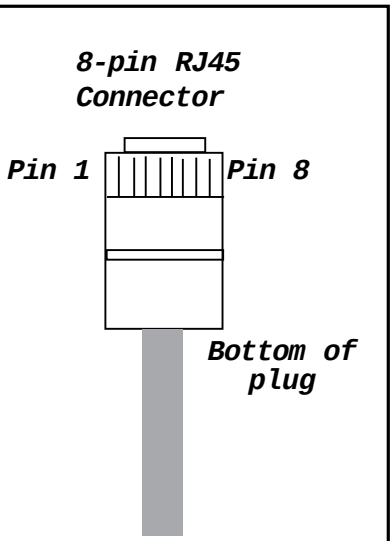
An Ethernet twisted pair link segment calls for two pairs of wires, with each pair differentiated by color. Each twisted pair link segment must have an RJ-45 male connector attached to both ends. Pins 1 and 2 on the RJ-45 connector are for transmitting data while pins 3 and 6 are for receiving data. See chart below:

Looking into the RJ-45 connector on the network card

RJ-45	Assignment	
1	Tx+	**This is standard for Ethernet devices (e.g., BEN100). The BEN210 is crossed over (except for port 8)**
2	Tx-	
3	Rx+	
6	Rx-	

Looking into the RJ-45 connector on the BEN210

RJ-45	Assignment	
1	Rx+	**This is the concentrator scheme for Ports 1-7.**
2	Rx-	
3	Tx+	
6	Tx-	



* The “+” and “-” signs are used to represent the polarity of the two wires that make up each wire pair.

NOTE: Each wire pair must be connected to the RJ-45 connectors in a specific orientation. Refer to 4.3 Crossover Function for details.

4.3 Crossover Function

Two Ethernet 10Base-T devices can communicate only if the transmitter on one device is connected to the receiver of the other device. The 10Base-T specification suggests that the crossover function be implemented in the concentrator itself. On the BEN210, this crossover function is implemented in all ports. However, the last port can be switched to straight-through to simplify installation when cascading concentrators. This switch is labelled “X” and located on the front of the BEN210.

The BEN210 features internal cross-over for each port. So, when a BEN210 port labelled with an “X” is connected to a network card that does not feature internal crossover, then straight-through wiring must be used.

When connecting two identical twisted-pair ports (that is, ports that either BOTH support or NOT support the crossover function), a crossover must be implemented in the wiring (see 4.5).

4.4 Straight-Through Wiring

If the twisted pair link segment is to connect two devices and only one of the devices features an internal crossover, the two pairs of wires must be straight-through:

STRAIGHT-THROUGH RJ-45 PIN ASSIGNMENTS

Device 1	Device 2
1 (Rx+)	1 (Tx+)
2 (Rx-)	2 (Tx-)
3 (Tx+)	3 (Rx+)
6 (Tx-)	6 (Rx-)

The assignments will vary if both are "X", or both are NOT "X".

4.5 Crossover Wiring

If you are connecting two devices directly that do not implement internal crossover, then the crossover must be implemented in the wiring.

CROSSOVER RJ-45 PIN ASSIGNMENTS

Device 1	Device 2
1 (+)	1 (+)
2 (-)	2 (-)
3 (+)	3 (+)
6 (-)	6 (-)

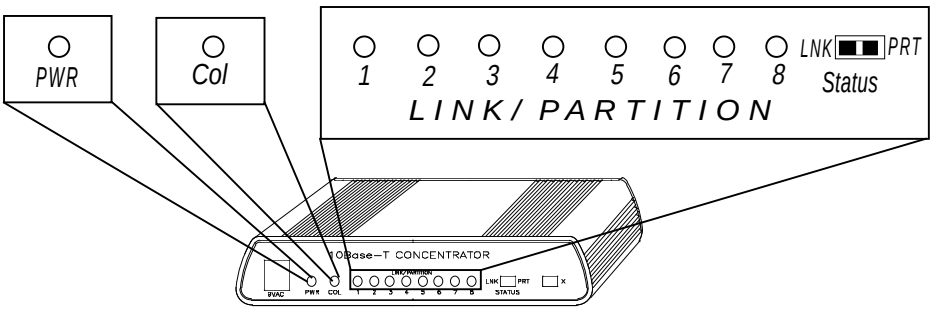
NOTE ON SIGNAL POLARITY

If a receive data pair has the "+" and "-" signals unintentionally reversed, the BEN210 automatically detects and adjusts this reversal so the data path will function properly.

Section Five: Troubleshooting

5.1 Status/Diagnostic LEDs

The BEN210 features a total of ten front panel LEDs to aid in testing the installation and the diagnosing of problems. There are eight LINK/PARTITION LEDs, one Power LED, and one Collision LED.



Ports one through eight feature an associated Link/Partition LED. A switch is used to toggle between the **LINK** and **PARTITION** display status.

When set to **LINK**, the status LED will be **ON** continuously for a given port IF a device is physically attached and functioning normally. If the LED is **OFF** or **FLASHING**, there is a problem with the corresponding device.

When set to **PARTITION**, the LED will be **OFF** continuously for a given port IF a device is physically attached and functioning normally. If the LED is **ON**, the associated device has been isolated from the network because of a **COLLISION** (concentrator receiving data from two or more nodes at the same time).

Each BEN210 concentrator also has:

- A GREEN power LED to indicate that the BEN210 has power.

- One RED collision LED to signal a network collision. If this light goes ON, toggle the LNK/PRT switch to PRT (for PARTITION), to isolate which device is causing the collision.

LED functionality is summarized as follows:

LED	COLOR	#	STATUS	MEANING
POWER	GREEN	1	ON	BEN210 has power.
COLLISION	RED	1	ON	A network collision has been detected. BEN210 is receiving data from two or more nodes at the same time.
PORT LINK STATUS (1-8)	GREEN	8	ON	The port is receiving a valid link test signal.
PORT PARTITION STATUS (1-8)	GREEN	8	OFF	Associated device is attached and functioning normally.
			ON	Device has been isolated because of COLLISION

5.2 Installation Test

1. POWER UP THE BEN210 AND CHECK THE LEDs

The Power LED should be ON. If the ports are connected to active devices, their LINK LEDs will remain on after power-on.

2. IF THE POWER LED IS NOT ON AND THE BEN210 SHOWS NO ACTIVITY

Check the connections between the concentrator, the power cord, and the wall outlet.

Try another AC power adapter that you know works. If the Power LED still fails to come ON, the BEN210 may be faulty. Call Technical Support.

3. IF THE LINK LEDs DO NOT RESPOND

Check that the LNK/PRT switch is set to LNK.

Check the connections between each network device and the concentrator port, including wiring. Make certain all devices have power and are working normally.

Appendix A: Specifications

Operating Temperature:	20-50 Centigrade
Relative Humidity: (non-condensing)	70%
Power:	9vac @ 750mA
Twisted-Pair Cable Interface:	Unshielded Twisted Pair
Crossover Ports:	7 preset / 1 switch-selectable
Connector:	RJ-45

Appendix B: FCC Compliance

This equipment has been tested and found to comply with the limits for a **Class A** digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

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. Operation of this equipment in a residential area is likely to cause harmful interference in which case users will be required to correct the interference at their own expense."

CHANGES OR MODIFICATIONS TO THIS EQUIPMENT NOT EXPRESSLY APPROVED BY THE MANUFACTURER COULD VOID YOUR AUTHORITY TO OPERATE THE EQUIPMENT.

Appendix C: Servicing Your Boca Product

If your Boca product requires service, first contact the authorized dealer from whom you purchased the product. If the dealer is unable to assist you, and you must contact Boca Research, Inc., please follow the instructions below.

Our electronic BBS is available 24 hours a day at (407) 241-1601 and will support data transmission speeds up to 28.8Kbps with settings of N, 8, 1. If you have a modem, the BBS may be helpful (especially during off hours) if you have a question about product settings or compatibility, or if you wish to download driver software or utilities.

If the Troubleshooting section did not resolve your problem, you may call our technical support staff for assistance. If you haven't referred to the Troubleshooting section, there's a good chance the solution to your problem is there.

NOTE: CALLING TECHNICAL SUPPORT WITHOUT COMPLETE AND ACCURATE INFORMATION CONCERNING YOUR PROBLEM MAY BE BOTH TIME-CONSUMING AND FRUSTRATING FOR YOU.

1. When calling Boca Research Technical Support, have the following information available:

Board name and part #
(located on the board)
Computer manufacturer
Computer model
Peripherals in system
Operating system and version

If you suspect a problem with a specific program or software package, make note of the name, version or release number, and manufacturer of the software.

2. Call Boca Research Technical Support Department between the hours of 8:00 a.m. and 6:30 p.m. Monday through Friday EST at (407) 241-8088. A technical support specialist will be available to discuss the problem(s) you are experiencing. If factory service is required, you will be given a Return Merchandise Authorization (RMA) number. **Please place this number on the outside of the package** when you return the item(s) for service and reference it on any correspondence included in the package. Boca Research, Inc. will return any product which is not accompanied by an RMA number.

3. Refer to the Warranty Statement if the product is covered under the five-year Boca Research Limited Warranty.

4. Certain parts will not be covered under the Boca Research, Inc. Limited Warranty. Dealer installed parts are warranted by the dealer. Parts which you have installed yourself are covered only by the suppliers warranties. In these cases, Boca Research, Inc. can identify which parts are defective, but will not replace such parts until we receive written authorization from you. Cost of parts and labor involved in making such repairs will be billed to you C.O.D.

5. When returning the product to Boca Research, Inc. for repairs, please be sure to include:

   - **the BEN210 concentrator only and a copy of the original invoice**
   - **your return street address (for UPS purposes)**
   - **your phone number**
   - **the RMA number mentioned above.**

   Package the product securely in a container equivalent to the original packaging, and insure the package to protect against loss or damage during transit. Shipping charges must be prepaid; C.O.D. shipments will not be accepted. Please use the address below for all correspondence:

Boca Research, Inc.
RMA Department - RMA # _____
1601 Clint Moore Road
Boca Raton, FL 33487-2841

6. If the repairs performed on your product were covered by the warranty, Boca Research, Inc. will return it prepaid via UPS.

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Limited Warranty

Boca Research, Inc. (BRI) warrants to the original buyer of this BRI product that the hardware is free of defects in materials and workmanship for a period of five (5) years from the date of purchase from BRI or an authorized dealer ("the Warranty Period"). Should the product fail to be in working order at any time during the five-year period, BRI, will at its option, repair or replace this product as described below, provided that in BRI's sole determination the part or product has not been abused, misused, repaired, or modified.

All products will be serviced and returned via ground at no charge to customers DURING the first year of service.

All returns for limited warranty service require a Return Merchandise Authorization (RMA). All customers are required to demonstrate proof of purchase when requesting an RMA. The period of warranty commences on the date of purchase. A dated copy of the sales slip must be included with the returned merchandise.

Products which require Limited Warranty service during the warranty period should be delivered to BRI at the address in the Appendix (Servicing Your Boca Product) with proof of purchase, copy of canceled check (if any), and the Return Merchandise Authorization (RMA) number provided by BRI Technical Support. Refer to the Appendix in this manual. Replacement parts or complete products will be furnished on an exchange basis only. Replaced parts and / or products become the property of BRI.

If the returned product is sent by mail, the purchaser agrees to prepay shipping charges, insure the product or assume the risk of loss or damage which may occur in transit, and to use a shipping container equivalent to the original packaging. BRI does not make any warranties in respect to the product, either expressed or implied, including no implied warranties of merchantability or fitness for a particular purpose, except as expressly provided in this agreement. If any labor, repair, or parts replacement is required because of accident, negligence, misuse, theft, vandalism, fire, water or other peril; or because of conditions outside of specifications, including, but not limited to, electrical power, temperature, humidity or dust; or by moving, repair relocation, or alteration not performed by BRI, or by any other cause other than normal use, the warranty and maintenance obligations provided herein shall not apply.

BRI SHALL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES OR FOR LOSS, DAMAGE, OR EXPENSE DIRECTLY OR INDIRECTLY ARISING FROM CUSTOMER'S USE OF OR INABILITY TO USE THE EQUIPMENT EITHER SEPARATELY OR IN COMBINATION WITH OTHER EQUIPMENT, OR FOR PERSONAL INJURY OR LOSS OR DESTRUCTION OF OTHER PROPERTY, OR FROM ANY OTHER CAUSE.

This warranty shall not be applicable to the extent that any provision of this warranty is prohibited by any Federal, state, or municipal law which cannot be preempted. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Manual Part No. 9183
Rev. 3.1