CARLSON WIRELESS TECHNOLOGIES, INC.

Leading the Charge Across the Digital Divide

Trailblazer-Ethernet Bridge

Wireless Ethernet Bridge

User Manual

August 5, 2002

Rev. 4

CARLSON WIRELESS TECHNOLOGIES, INC.
CARLSON WIRELESS USA
USA Headquarters:
1180-B Evergreen Road
P.O. Box 2400
Redway, CA 95560 USA

Tel: +1-707-923-3000
Fax: +1-707-923-1913
Email: sales@carlsonwireless.com
URL: http://www.carlsonwireless.com

Logo and Copyright Statement

i-WLL, the *i*-WLL logo, Trailblazer, the Trailblazer logo, Carlson Wireless USA, and the Carlson Wireless logo are registered trademarks of Carlson Wireless Telephone Inc. Any trademarks, trade names, service marks, or service names owned or registered by any other company and used in this manual are the property of their respective companies. Copyright 1999, 2000, 2001 Carlson Wireless Technologies, Inc. All rights reserved.

Carlson Wireless USA Limited Warranty

Carlson Wireless Technologies (CWT) or Carlson Wireless USA, Collectively referred to as "Carlson“ will repair this product with new or rebuilt parts, free of charge, in the USA or Puerto Rico for two (2) years from the date of original purchase in the event of a defect in material or workmanship. Mail-in service in the USA can be obtained during the warranty period from a Carlson Factory Service Center by calling +1-707-923-3000 for a RMA (Return Materials Authorization) number. Mail your product adequately packed, postage paid and insured to the address provided. This warranty is extended only to the original purchaser. A purchase receipt or other proof of date of original purchase will be required before warranty performance is rendered. This warranty only covers failures due to defects in materials or workmanship which occur during normal use. It does not cover damage which occurs in shipment or failures which are caused by products not supplied by Carlson or failures which result from accident, misuse, abuse, neglect, mishandling, misapplication, alteration, modification, lightning, line power surge, introduction of sand, dust, humidity and liquids or commercial use of the product, or service by anyone other than a Carlson Factory Service Center or authorized Carlson Service Center, or damage that is attributable to acts of God.

Limits and Exclusions

There are no express warranties except as listed above.
CARLSON SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF THIS PRODUCT, OR ARISING OUT OF ANY BREACH OF THIS WARRANTY. ALL EXPRESS AND IMPLIED WARRANTIES, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO THE APPLICABLE WARRANTY PERIOD SET FORTH ABOVE.
Some states do not allow the exclusion or limitation of incidental or consequential damages, or limitations on how long an implied warranty lasts, so the above exclusions or limitations may not apply to you. This warranty gives you specific legal rights and you may also have other rights, which vary, from state to state. If a problem with this product develops during or after the warranty period you may contact your dealer or Service Center. If the problem is not handled to your satisfaction, fax, phone, or write the company at the address indicated in the service section of this manual.

Table of Contents

Features and Benefits 1
Applications 1
Installation 2
Point-to-Point Mode 3
Point-to-Multipoint Mode 7
Access Point Models 8
T-EB Standard Product 8
T-EB60 9
T-EB360 10
Accessing the Diagnostic Tools 12
Site Survey Tool 13
Changing Channels 14
Loop-Back Test Tool 15
Repeater Applications 16
Repeater Configuration 18
Troubleshooting Hints 19
T-EB Kit Contents 21
Ordering Information 21
Specifications 22

Table of Figures

Point-to-Point Mode 3
Workstation-to-Workstation Connection Point-to-Point Mode 4
Network-to-Workstation Connection 5
Point-to-Multipoint Mode 7
T-EB Coverage 8
T-EB60 Coverage 9
T-EB360 Coverage 10
Configuration Utility Browser Window 11
Client Station Programming Window 12
Site Survey Tool 13
Access Point Programming Window 14
Loop-Back Test Tool 15
Repeater Connection 17
Repeater Configuration Utility Browser Window 18
Ping Test 19
Status LEDs 20

Trailblazer-Ethernet Bridge User Manual

Features and Benefits

The Trailblazer-Ethernet Bridge (T-EB) implements a wireless Ethernet Bridge with a range of up to 14 miles (23km). Carlson Wireless Technology's patented antenna and advanced microelectronic assemblies are fully encased in weatherproof NEMA-4X enclosures. Rugged and compact, Trailblazers come with stout stainless-steel mounting hardware, ready for easy installation and many years of service in tough field conditions. Electrical connections couldn't be easier: screw terminals are used for DC power. Data connections are made with readily available Cat-5 UTP cables. T-EB uses the internationally license-free 2.4GHz ISM band as the physical layer for IEEE 802.11 wireless networking. Two assemblies are included in a system: the Access Point, and the Client Station. The system can be used in various modes: Point-to-Point, Point-to-Multipoint and Repeater. File throughput rates are 10 times faster than DSL, and over 25 times faster than dial-up modems. Trailblazer digital wireless connections are safe and very secure. Trailblazers emit less than half the RF energy of common cell phones. Data security is "as good as on-line Banking". Direct Sequence Spread Spectrum techniques provide sophisticated encoding on the air. Data Layer password configuration provides a second level of control at the user level. Carlson Wireless is a leader in low power field applications. The T-EB uses approximately 2 watts from a wide range of DC voltage input sources. Internationally certified DC power supplies and Solar Power Kits are available from the factory.

Applications

Networking in Remote Areas

E-mail, file transfer, networking, VOIP, telemetry and monitoring for remote sites. Wireless LAN Networking (WLAN) in areas with poor telephone service. Extended range for DSL and Cable Modem users.

Difficult-to-Wire Environments

Historical or old buildings, asbestos sites, areas where wiring is difficult and costly to deploy. Network in rural areas, over highways, railroads, waterways, right-of-ways, and dangerous terrain.

Temporary LANs for Special Projects or Peak Seasons

Trade shows, exhibitions, and construction sites that need temporary portable networking. Secure site to site connections. Emergency backup for hardwired networks and leased lines.

Wireless ISP Networks

Trailblazer-EB is not recommended for wireless ISPs with independent clients. To arbitrate RF access in multi-point applications, Client Stations within the same network, are cognizant of their peers on Data Link layer. Because of this, complete security between Client Stations on the same network cannot be guaranteed. For full security, use multiple Trailblazer-EB networks or Rural Connect for drop-in ISP network solutions.

Installation

See the *i-WLL Trailblazer Installation and User Manual* for complete details on system planning and site set-up.

The Trailblazer-EB requires DC power from +12 to +48 Volts. The power connection is made using simple and reliable screw terminals. A versatile DC power supply is available for sites with AC power. This supply is certified for use in many countries and accepts input voltages from 100 to 240VAC at 50 or 60Hz. Users outside North America may have to supply a power cord for this supply.

For electrical safety and correct RF performance Trailblazers must be grounded to Earth Ground. Do not connect Trailblazers to –48 Volt DC telephone (or Central Office) batteries. Using –48V batteries can create hazardous conditions and damage your Trailblazer. Isolation Kits are available from the factory for use with –48V telephone batteries.

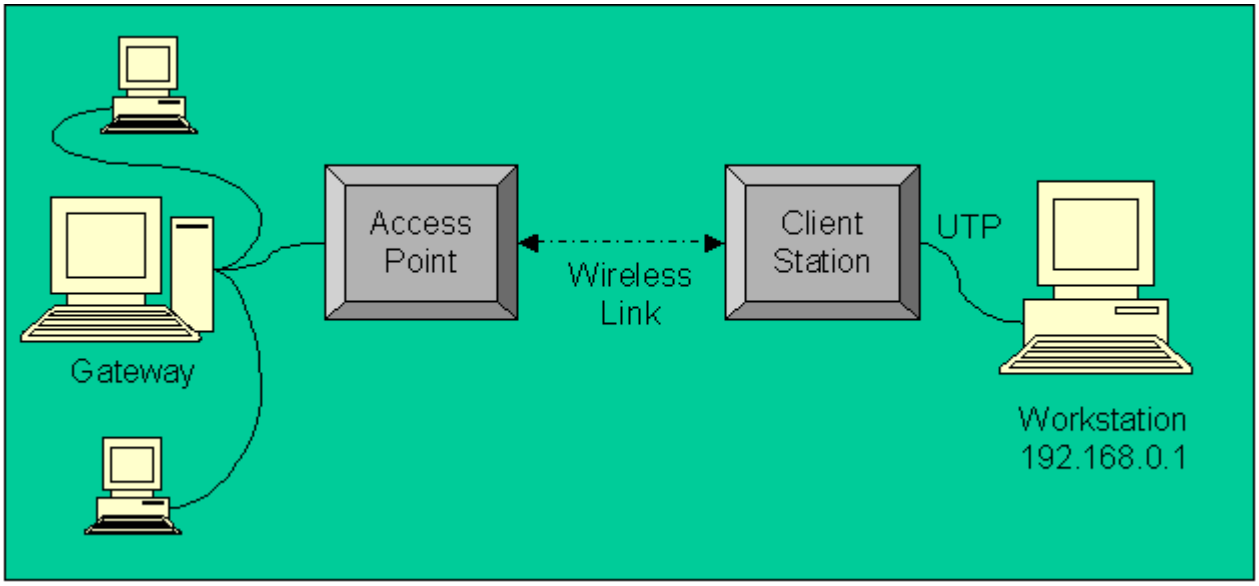
The network connection is made using standard CAT5 UTP cables with RJ-45 connectors. These are readily available from several sources. High quality pre-manufactured cables are recommended. Field terminated UTP cables can be unreliable and should be avoided. Also, cable length can effect Ethernet performance. Use shorter cables for better performance.

The Trailblazer-EB System has two distinct assemblies; the Access Point and the Client Station. Generally, the Access Point is connected to the Gateway end of the network. For Network-to-Workstation applications a crossover cable is required, as shown in the following figures. One crossover cable is supplied with the system. The provided crossover cable should be connected with the male plug toward the Access Point and female jack mated to a straight UTP cable from an Ethernet Hub.

Bench testing your system before field deployment is highly recommended. Verify your network TCP/IP settings by using a hardwired connection first. For MS Windows users; verify other computers are available in Network Neighborhood. Verify access to networked machines by opening a shared folder or transferring a file. If Network Neighborhood is problematic, try the Find Computer utility to find another computer known to be on the network. Also, the PING utility, available for many operating systems, can be used to evaluate connection to a known IP address, like an in-house gateway or server. See the Troubleshooting section for more suggestions.

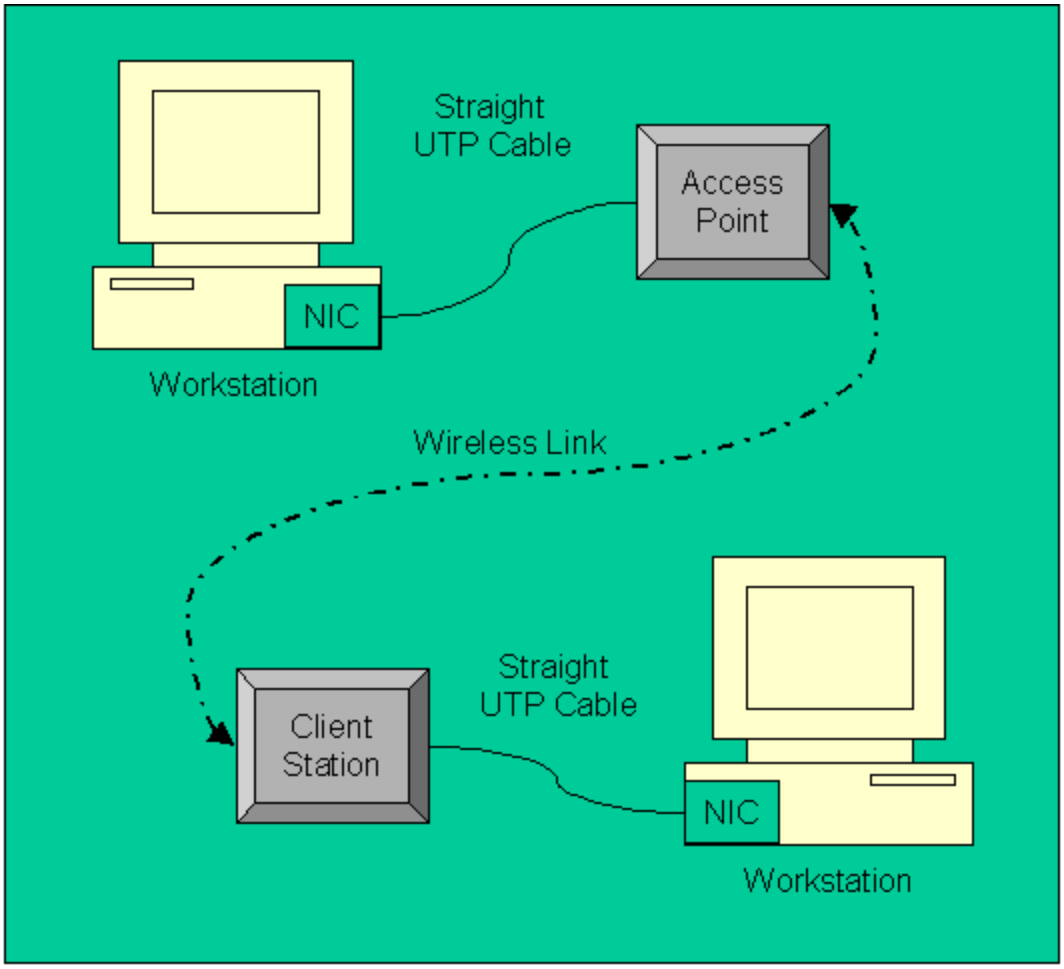
Point-to-Point Mode

This is the simplest of connections. The T-EB supports one IP address per Client Station. The IP address shown below is only an example and users are not restricted to this particular address.



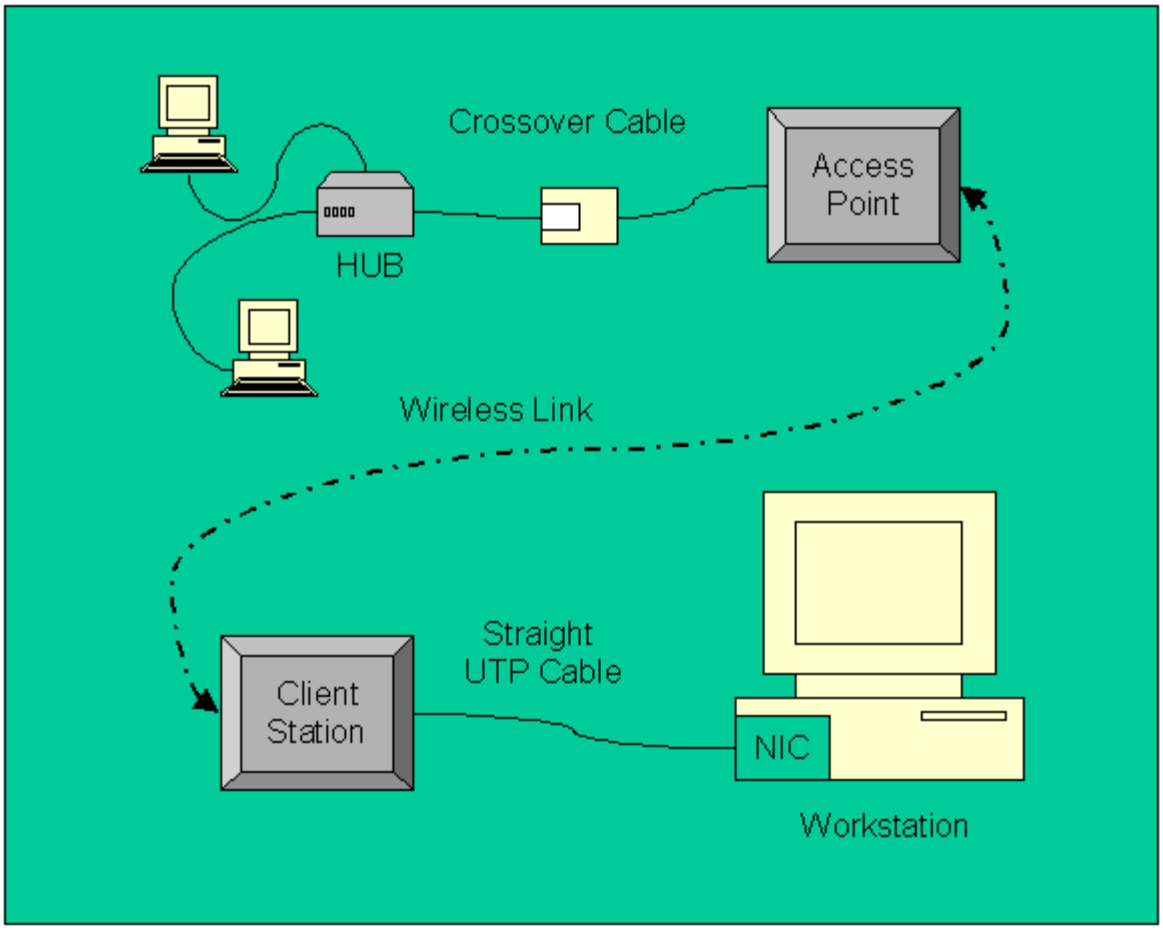
POINT-TO-POINT MODE

To make a Workstation-to-Workstation connection, connect the T-EB as shown in the diagram below. Straight cables are used throughout the system– no crossover cables are needed. We recommend attaching the Access Point to the Gateway end of the bridge.



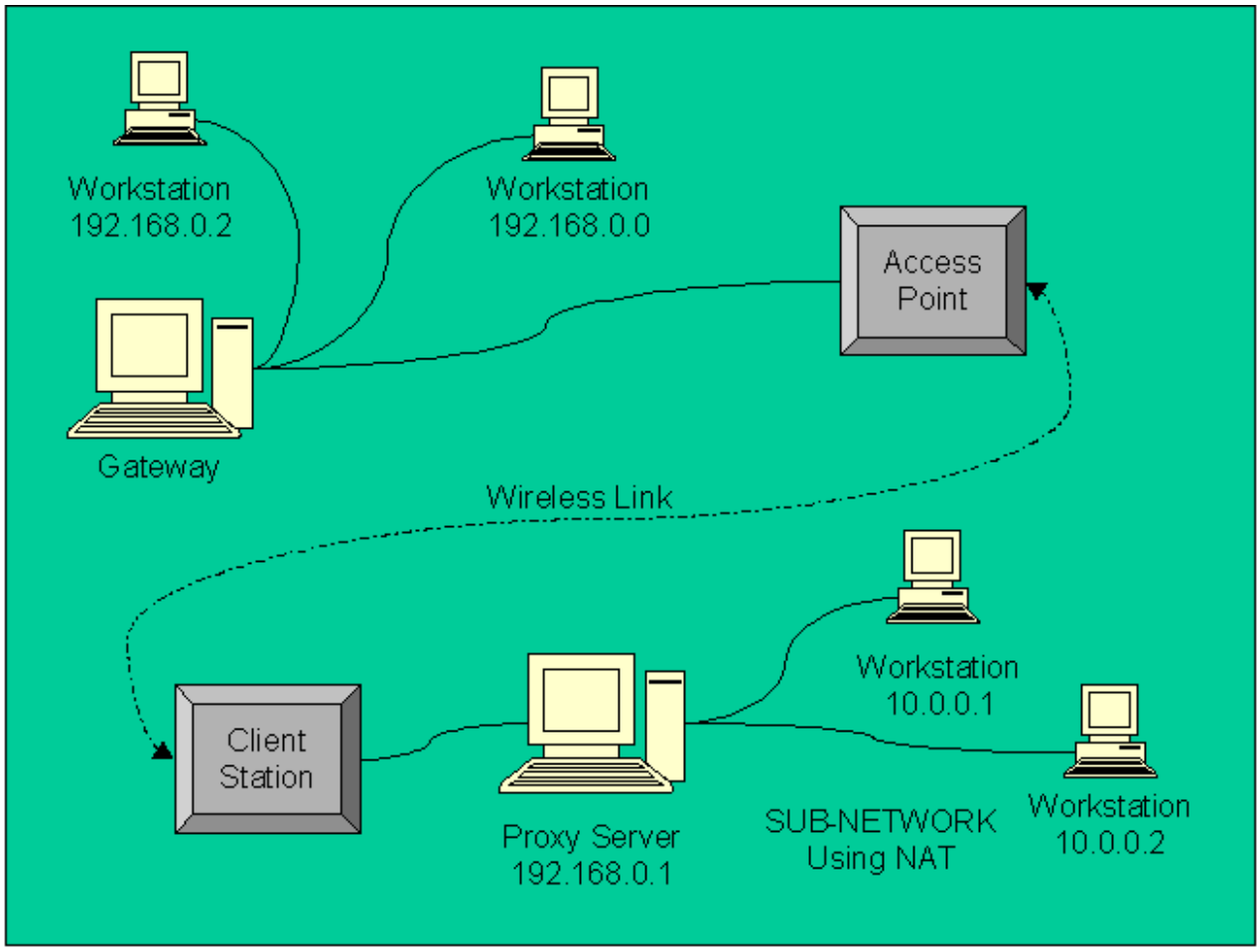
WORKSTATION-TO-WORKSTATION CONNECTION
POINT-TO-POINT MODE

Frequently users want to connect their remote Workstation to an existing LAN. In this case, connect the Access Point to the LAN Hub and use the supplied crossover cable. The diagram below shows the correct connections for Network-to-Workstation applications.



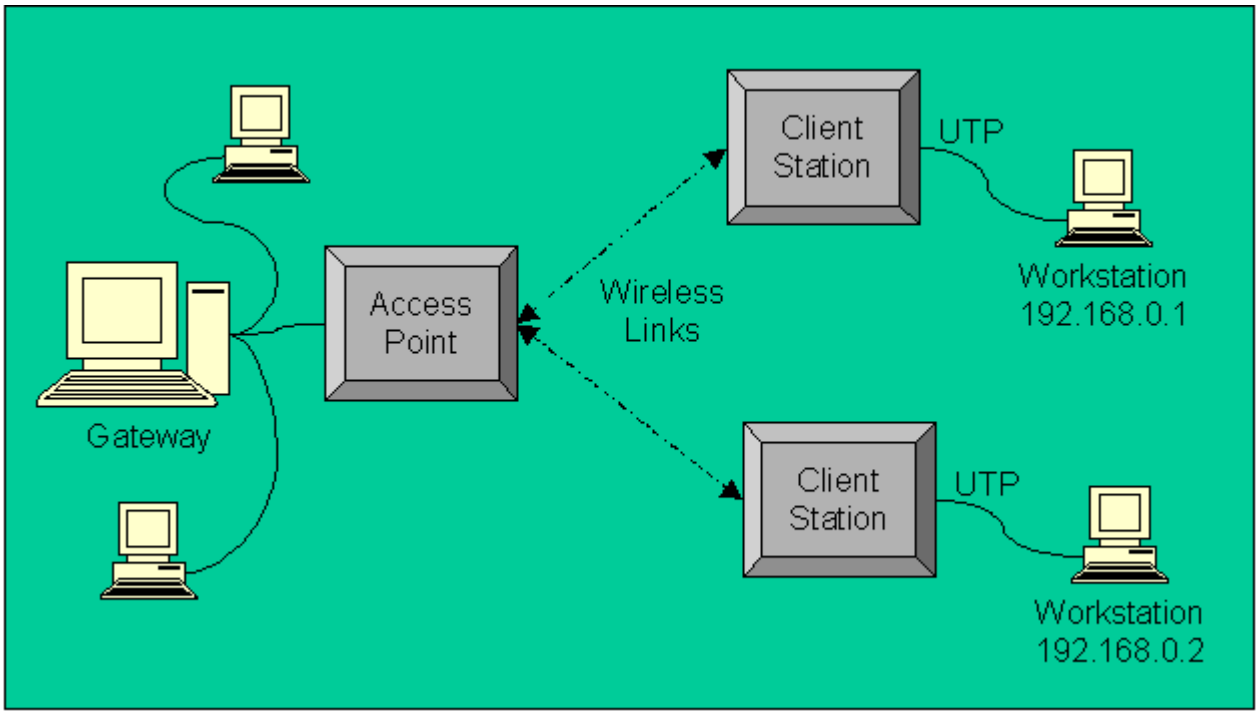
NETWORK-TO-WORKSTATION CONNECTION
POINT-TO-POINT

The T-EB can support Network-to-Sub-Network connections. There are two methods. The *preferred* method is to use the Point-to-Multipoint capability because it is simple and straightforward. See the Point-to-Multipoint section below. The second method is to use a proxy server running NAT (Network Address Translation), or a router on the Sub-Network. The proxy server or router is required because T-EB can only support one IP Address per Client Station. Customers have had success with both proxy servers and routers, however these techniques are complicated and require sophisticated network administration and third party products.



Point-to-Multipoint Mode

The T-EB can be used to support many Client Stations from a single Access Point. This is the Point-to-Multipoint Mode. Users may want to select this topography to include multiple buildings on a WLAN. The Trailblazer-EB supports one IP Address per Client Station. In the diagram below, each Client Station has a different IP Address. The Access Point and all Client Stations used in a Point-to-Multipoint application must have the same ESSID. See the Configuration Utility section below to configure the ESSID.



POINT-TO-MULTIPOINT MODE

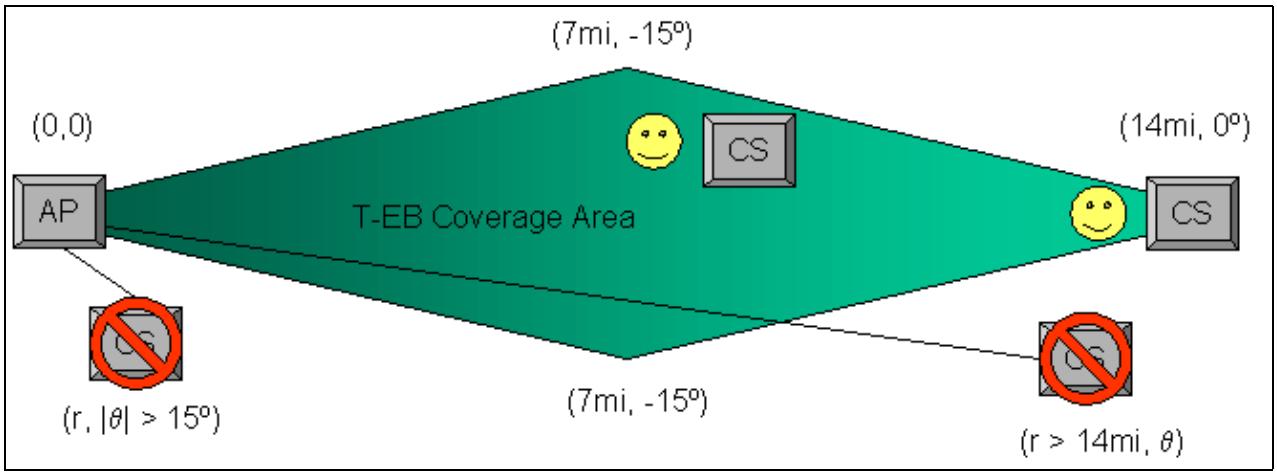
NOTE: Client Stations are available separately for Point-to-Multipoint networks.

Access Point Models

The Access Point is offered in three models with different antenna radiation patterns: T-EB (narrow beam), T-EB60 (medium beam), and T-EB360 (omni-directional).

T-EB Standard Product

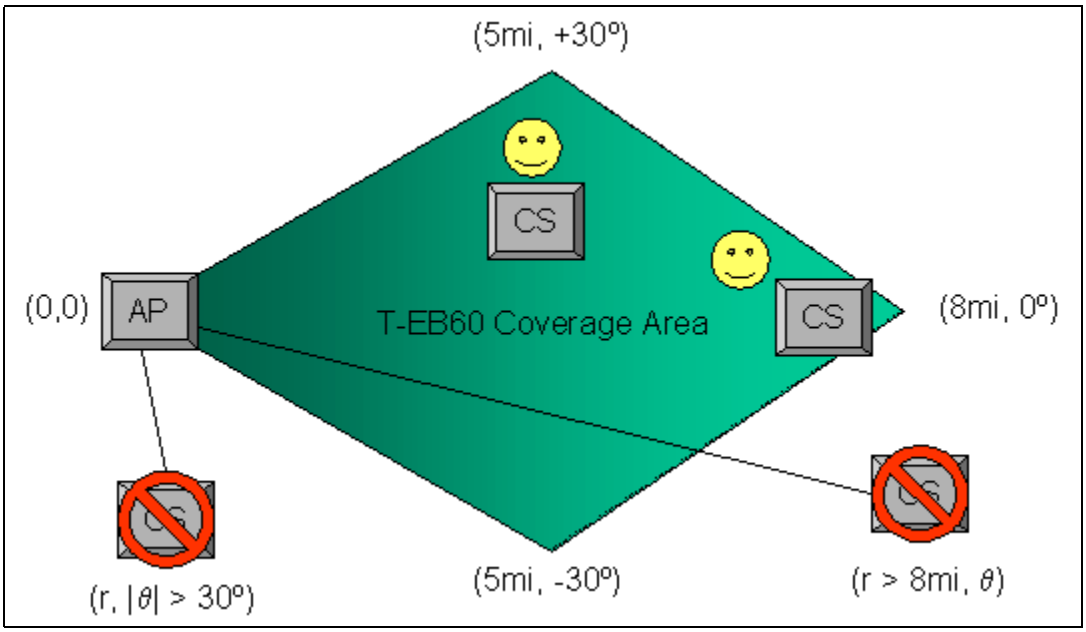
The T-EB is our standard product. This model has the narrowest radiation pattern, or coverage area. This model is best for Point-to-Point applications and long distance links. Users with one Client Station should select this option, too. The dimensions shown in the diagram below are calculated from test-lab data. Real-world results may vary.



T-EB COVERAGE
SINGLE POINT AND LONG DISTANCE

T-EB60

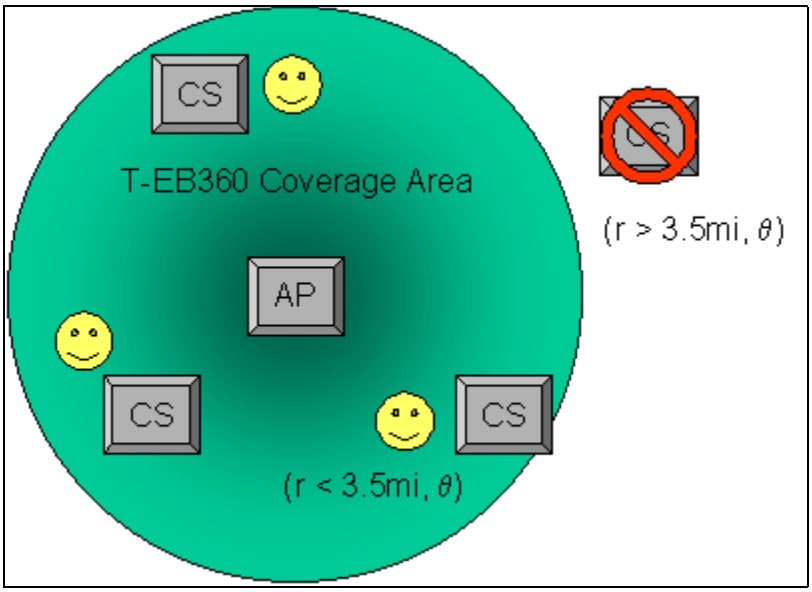
The T-EB60 is our medium beam option. This has a wider coverage area than the standard product. This model is best for coverage of multi-point sites within a 60º arc. The dimensions shown in the diagram below are calculated from test-lab data. Real-world results may vary.



T-EB60 COVERAGE
WIDE AREA AND MEDIUM DISTANCE

T-EB360

The T-EB360 is our omni-directional option. This is best for a centralized Access Point with Multi-Point sites encompassing the coverage area at all angles. The T-EB360 requires an external antenna. The dimensions shown in the diagram below are calculated from test-lab data. Real-world results may vary.



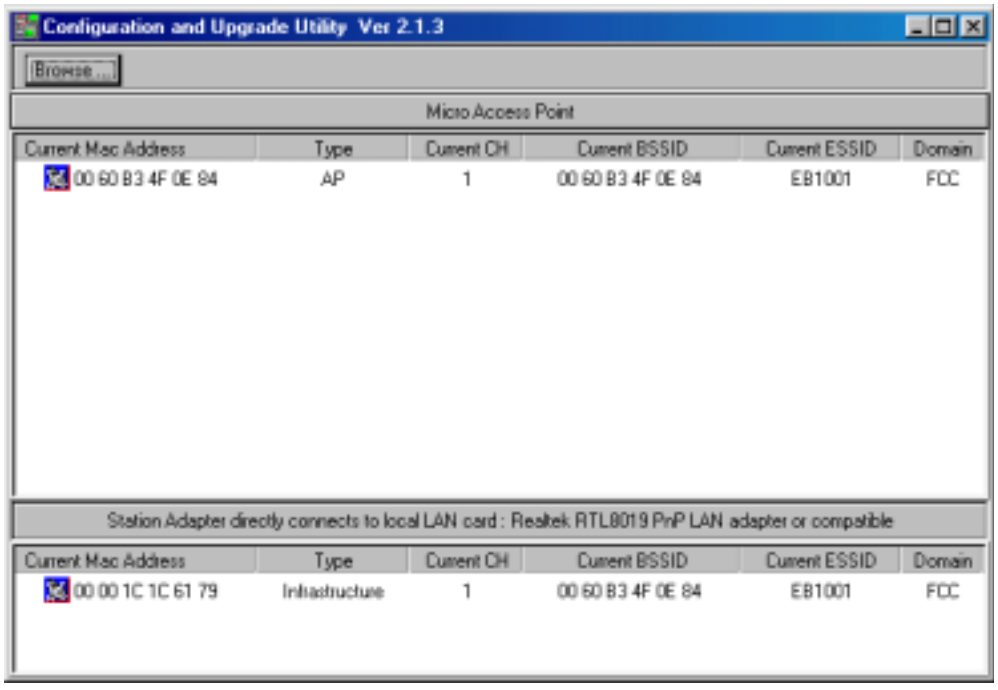
T-EB360 COVERAGE
360º OMNI-DIRECTIONAL

XWL450 Configuration Utility

The T-EB is supplied with a third-party Configuration Utility for signal quality diagnostics. The Configuration Utility can be used to re-configure the chipset for different topologies of the IEEE 802.11 standard. The Trailblazer-EB is pre-configured at the factory for optimal performance in local-loop applications and typical users will not need to change any settings. In cases of poor signal path or interference, the Configuration Utility offers two useful tools: the Sight Survey Tool allows users to select the clearest channel available, and the Loop-Back Test allows users to measure signal strength and packet errors.

The Configuration Utility can be installed by launching the SETUP.EXE program on the floppy disk and using the Installation Wizard. Install the Configuration Utility on the Client Station end of the Bridge. The Access Point can be configured remotely from the Client Station. If need be, the Access Point can be configured locally if communication is lost.

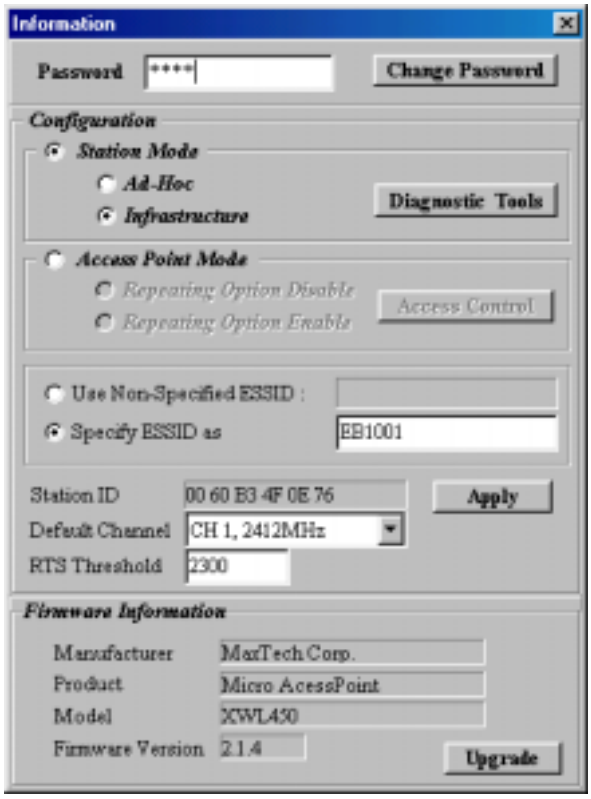
Once the utility is installed, power-up the T-EB and re-start your PC.
NOTE: The Configuration Utility is NOT hot-swappable and may “hang” the PC if it is improperly used.
Launch the XWL450 Configuration Utility and you should see the Browser Window shown below. Use the Browse button to update the window after making changes.



XWL450 CONFIGURATION UTILITY BROWSER WINDOW

Accessing the Diagnostic Tools

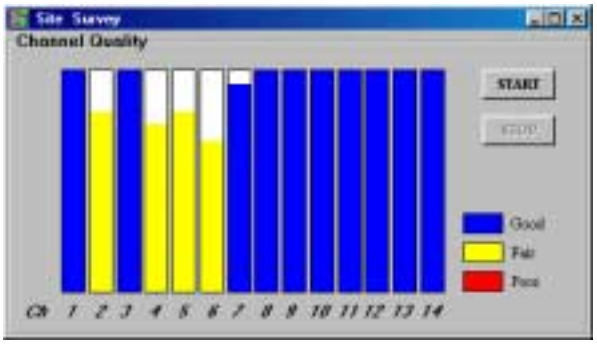
The Diagnostic Tools are only available on the Client Station end of the Bridge. In the Browser Window, double-click on the Client Station icon in the lower area to open the Programming Window. The example below shows the Programming Window and the correct default values for optimal local-loop applications. Note your ESSID and keep it in a safe place. The ESSID is unique for each Trailblazer-EB System. The ESSID must match on the Client Station and Access Point or the system will not work. Use the default password "1234" and select the Diagnostic Tools button. You will then be able to select either the Site Survey Tool or the Loop-Back Tool.



CLIENT STATION PROGRAMMING WINDOW
DEFAULT PARAMETERS
PASSWORD = 1234

Site Survey Tool

The Sight Survey Tool allows users to find the clearest channels available. Press the Start button and monitor the bar-graphs for a few cycles. Note if poor performance correlates to interference sources like microwave ovens or other 2.4GHz RF sources. A typical session is shown below.



SITE SURVEY TOOL
CHANNELS 1, 3, 7, 8, 9 & 10 LOOK GOOD
(CHANNELS 11-14 ARE NOT USED)

The T-EB has access to channels 1 through 10. Channels 11 through 14 are not supported. After monitoring the Site Survey Tool for a few minutes note the best channels and close the tool. The Diagnostic Tools are only available on the Client Station end of the Bridge, however the Access Point assigns the channel used by the RF link. Re-configure the Access Point for a new channel and the Client Station will automatically adapt to the new frequency.

Changing Channels

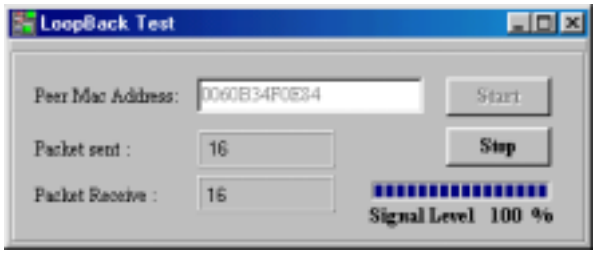
In the Browser Window, double-click on the Access Point icon in the upper area to open the Programming Window. The example below shows the Programming Window and the correct default values for optimal local-loop applications.

ACCESS POINT PROGRAMMING WINDOW
DEFAULT PARAMETERS
PASSWORD = 1234

To change to a new channel, use the pull-down box to change the Default Channel, then click the Apply button to re-program the Access Point. Next, close the Programming Utility, and re-browse in the Configuration Window to verify both the Access Point and Client Station are on the new channel.

Loop-Back Test Tool

The Loop-Back Tool allows users to quantify signal quality. This is useful for antenna alignment and path evaluation. The Loop-Back Tool shows a Signal Level bar-graph and packet throughput.



LOOP-BACK TEST TOOL

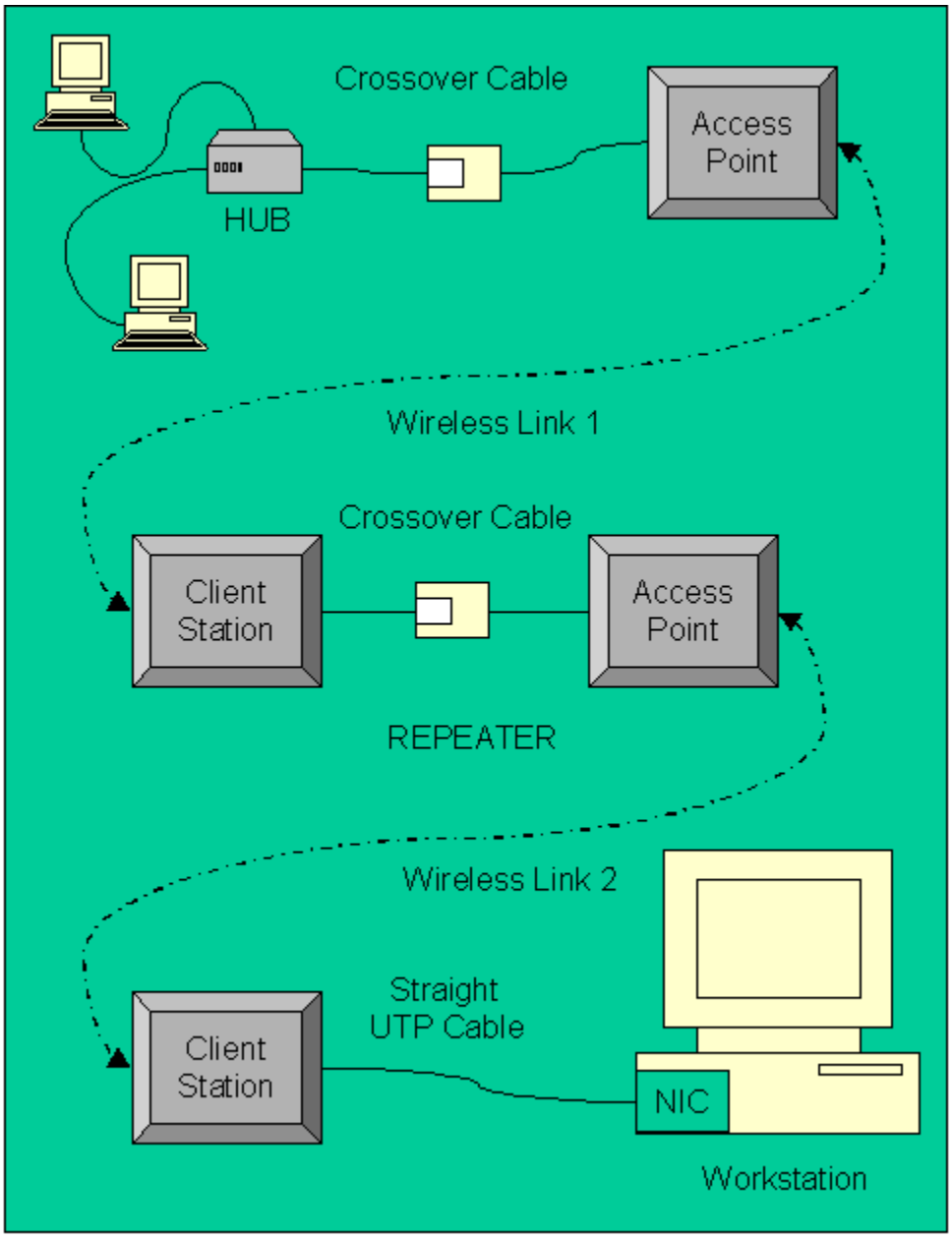
Repeater Applications

Two Trailblazer-EB Systems can be configured for repeater applications using the cabling and Configuration Utility supplied. No extra equipment is needed except a PC, to run the Configuration Utility. In a repeater configuration, ping and file-transfer times are increased by a factor of roughly 1.5x. The good news is the Ethernet Bridge can be extended around obstacles and the range is effectively doubled.

Each Trailblazer-EB System consists of an Access Point (AP) and a Client Station (CS). The overall Ethernet Bridge connects a Gateway to a Client. In the repeater scheme, one link is established from the Gateway to the repeater using an arbitrary ESSID and Channel. In this example we use “Link1” as the ESSID and CH.1 as the RF channel. A second link is established from the repeater to the Client. In this example we use “Link2” as ESSID and CH.9 as the RF channel. Use of widely separated channels, different ESSIDs, and no-repeating options reduce contention at the repeater location.

Use the Site Survey Tool to choose the best channels available for each link. As explained above, the Sight Survey Tool only works from the CS end of the link, the APs assign the channels used, and the CS side should seek the new channel automatically (though it may be helpful to force the CS default channel to reduce variables). Furthermore, channels 11 through 14 are not available; use channels 1 through 10 only.

The figure that follows shows the necessary connections for a Repeater System. An AP and a CS, with different channels and ESSIDs, are co-located at the repeater site. The AP and CS at the repeater are connected using a UTP crossover cable. Because repeaters are often in hard-to-reach locations, using the crossover at the repeater site is preferred. This allows for both Workstation-to-Workstation and Network-to-Workstation without modification of the repeater setup.

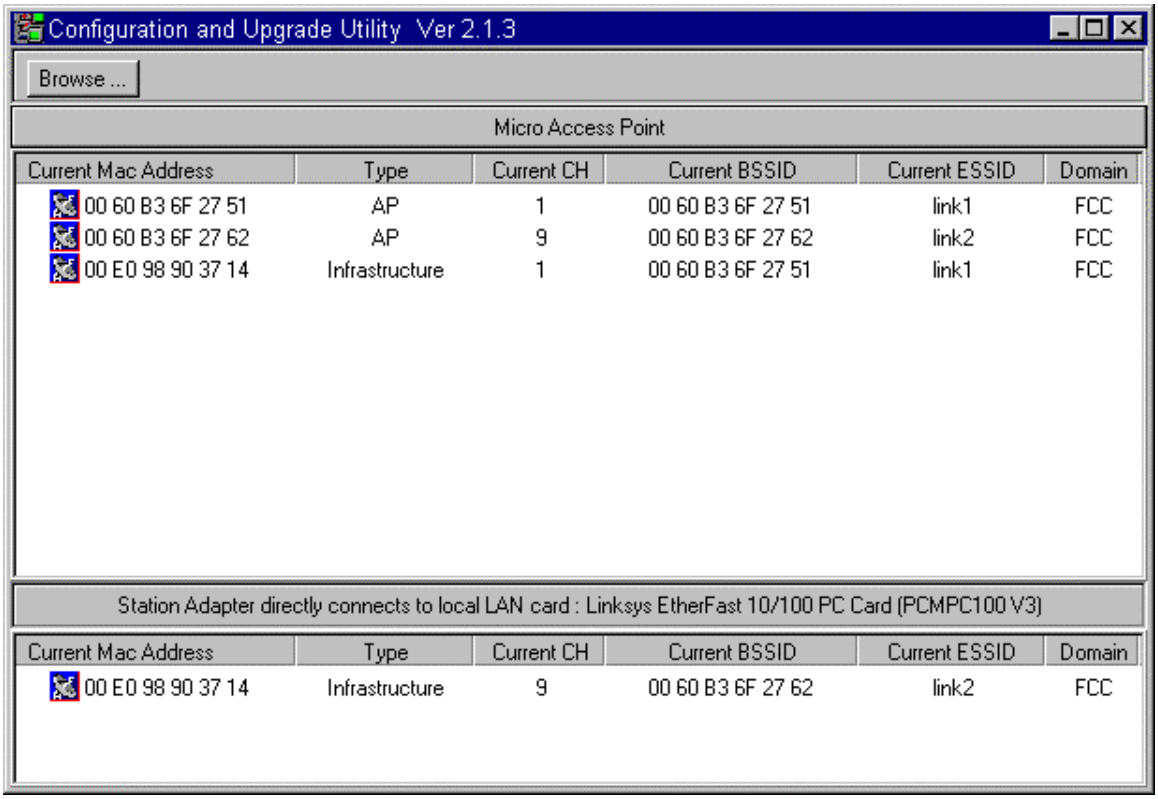


REPEATER CONNECTIONS

Repeater Configuration

Once you have the Trailblazer-EBs connected, run the Configuration Utility from the Client end. If everything is connected you should see all the T-EBs in the Browser Window. It should look like the example shown below. T-EB nodes can be configured remotely, however this is like cutting the tree branch you're sitting on, start from the far end and work towards yourself. Re-configuring a link in the middle can bisect the Bridge. Local re-configuration may have to be performed to recover lost sections.

The overall Bridge connects a Gateway to a Client. In the repeater scheme one link is established from the Gateway to the repeater using an arbitrary ESSID and Channel. In this example we use "Link1" as the ESSID and CH.1 as the RF channel. A second link is established from the repeater to the Client. In this example we use "Link2" as the ESSID and CH.9 as the RF channel.



REPEATER CONFIGURATION UTILITY BROWSER WINDOW
ALL THE NODES CAN BE SEEN FROM THE CLIENT END

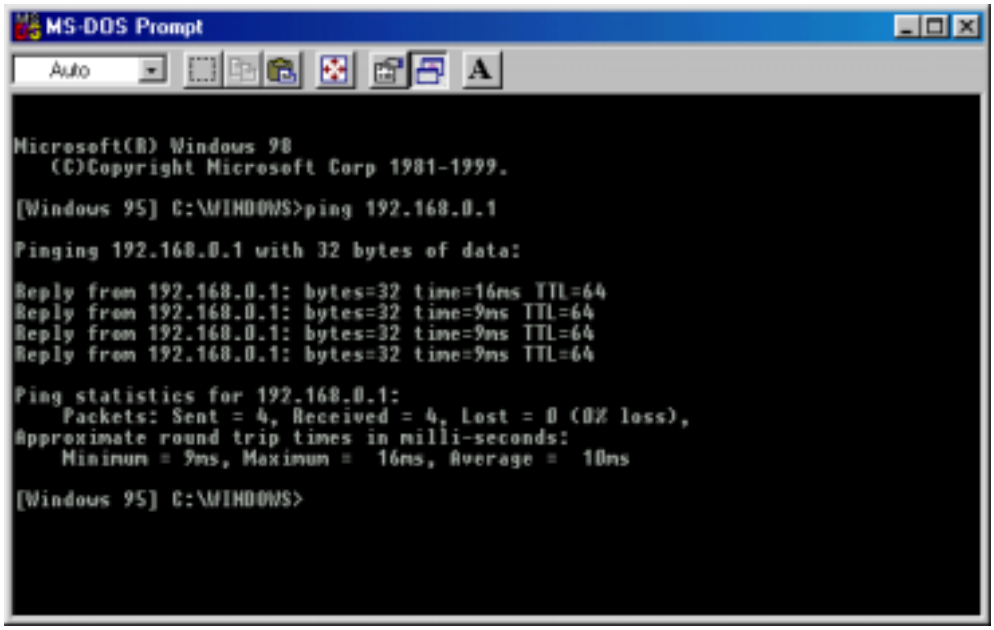
Troubleshooting Hints

- Bench testing your system before field deployment is highly recommended.

- Verify your network TCP/IP settings by using a hardwired connection.

- For MS Windows users;
  Verify other computers are available in Network Neighborhood.
  Verify access to networked machines by opening a shared folder or transferring a file.
  If Network Neighborhood is problematic try using the Find Computer utility to find another computer known to be on the network.
  Use PING.EXE.

- The PING utility, available for many operating systems, can be used to evaluate connection to a known IP Address, like an in-house gateway or server. See example below. Try C:\WINDOWS\ping /? for more details on PING.EXE.
  NOTE: PING.EXE only works with specified IP Addresses. Networks with automatically assigned addresses will vary, in this case, use IPCONFIG.EXE to determine dynamically assigned IP Addresses.



PING TEST
GATEWAY IP ADDRESS = 192.168.0.1

- Check the Status LEDs:

LED	MONITOR	STATUS
D1	Power	Green = OK
D2	Wired Network Traffic	Flashing = OK
D3	Wireless Network Traffic	Flashing = OK
D4	Serial Port	Not Used
D5	Link	Green = OK

STATUS LEDS

- Look for flashing lights on your Hub to indicate power and a hardwired connection.
- Verify crossover cable is connected to the Access Point.
- Check UTP cables with cable tester.
- Use high quality pre-manufactured cables. Field terminated UTP cables can be unreliable and should be avoided.
- Try the Sight Survey Tool to find a better channel.
- Try the Loop-Back Tool to optimize antenna alignment.

Kit Contents T-EB

- One Trailblazer-EB Access Point
- One Trailblazer-EB Client Station
- One crossover UTP cable
- One Configuration Utility on floppy disk
- Trailblazer-Ethernet Bridge User Manual
- Trailblazer Installation Manual

Order Information

Product:	Order Number:
Standard Product	T-EB
Wide Area 60º Access Point	T-EB60
Omni-directional Access Point	T-EB360
Separate Access Point	T-EA
Separate Client Station	T-EC

Contact:

Carlson Wireless Technologies, Inc.
1180-B Evergreen Road
Redway, CA. 95560 USA
Voice: (707) 923-3000
Fax: (707) 923-1913
Email: sales@carlsonwireless.com
www.carlsonwireless.com

Specifications

Parameter	Spec
Wired Interface	10BaseT Ethernet
Ethernet Connector	RJ-45
Wireless Interface	Wireless LAN IEEE 802.11
Frequency Band	2.412 to 2.462GHz FCC Canada 2.422 to 2.462GHz ETSI 2.484GHz Japan
Channels	10
RF Technology	DSSS
RF Power	50mW
System Power	2 Watts, Typical
System Voltage	12 to 48VDC
System Range	up to 14 miles (23 km)
Operating Temperature	-30° to +60°C
Data Rate Data Link Layer	2 Megabit/second
Typical File Throughput	1.5 Megabit/sec using Win98 TCP/IP
Size Each, Without Bracket	10 ½ x 8 ½ x 5 inches (27 x 22 x 13 mm)
Weight Each, With Bracket	8.5 LBS (3.8kg)
Shipping Weight, Complete System	18 LBS (8kg)
Shipping ContainerSize	19 x 15 x 13 inches (47 x 37 x 32 mm)