



Broadband Wireless Transmission System

User Manual

Version 2.1

Netronics

User Manual and Installation Guide

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Information to User

Any changes or modifications of equipment not expressly approved by the manufacturer could void the user's authority to operate the equipment and the warranty for such equipment.

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Contacts

Regulatory Compliance

General Note

This system has achieved Type Approval in various countries around the world. This means that the system has been tested against various local technical regulations and found to comply. The frequency bands in which the system operates may be "unlicensed" and in these bands, the system can be used provided it does not cause interference.

FCC - Compliance

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.



Warning

It is the responsibility of the installer to ensure that when using the outdoor antenna kits in the United States (or where FCC rules apply), only those antennas certified with the product are used. The use of any antenna other than those certified with the product is expressly forbidden in accordance to FCC rules CFR47 part 15.204.



Caution

Outdoor units and antennas should be installed ONLY by experienced installation professionals who are familiar with local building and safety codes and, wherever applicable, are licensed by the appropriate government regulatory authorities. Failure to do so may void the product warranty and may expose the end user or the service provider to legal and financial liabilities. Resellers or distributors of this equipment are not liable for injury, damage or violation of regulations associated with the installation of outdoor units or antennas.

Indoor Units comply with part 15 of the FCC rules. Operation is subject to the following two conditions:

- (1) These devices may not cause harmful interference.
- (2) These devices must accept any interference received, including interference that may cause undesired operation.

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Any changes or modifications to this device not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

RF Radiation Exposure statement.

This equipment complies with FCC RF radiation exposure limits. This equipment should be installed and operated with a minimum distance of 281.8 cm between the radiator and your body for 5 GHz operations.

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Chapter 1

Introduction

Welcome!

Welcome to the NetStream 5x100 radio series, designed for the IP and WiMAX Backhaul, Private Networks and Broadband Access global markets. The NetStream 5x100 series is an innovation in high-capacity carrier-grade sub-6GHz radios, and designed to meet the requirements of current and next-generation markets and applications.

The NetStream 5x100 radio series offers unmatched performance and carrier-class quality with the following features:

- Superior spectral efficiency at 20MHz channel
- High Ethernet capacity (50Mbps full duplex net throughput)
- Combo frequency products for maximum flexibility
- Advanced air-interface based on MIMO, built-in diversity and OFDM technologies
- Superior range performance
- Simple installation and management
- High Tx power of 25dBm

The NetStream radio series supports the 4.9 - 5.8 GHz spectrum bands, and complies with international standards and regulations (FCC, IC Canada, WPC India and MI China).

Key Applications

WiMAX and IP Backhaul

The NetStream radio series offers WiMAX operators and ISPs a unique, highly scalable and cost-effective backhaul solution. Designed to suit a wide range of topologies, NetStream 5x100 is easy to install and maintain, enabling operators to quickly and efficiently expand their networks and introduce new services to a growing subscriber base.

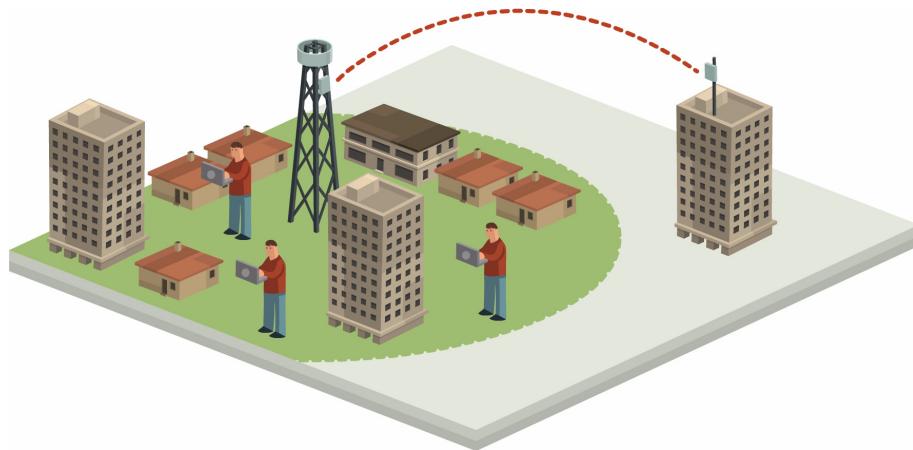


Figure 1-1: Typical Wimax and IP Backhaul application

Broadband Access

With NetStream, service providers can quickly and efficiently expand their networks, and provide high-capacity services that meet the increasing demand for high-quality, high-speed broadband.

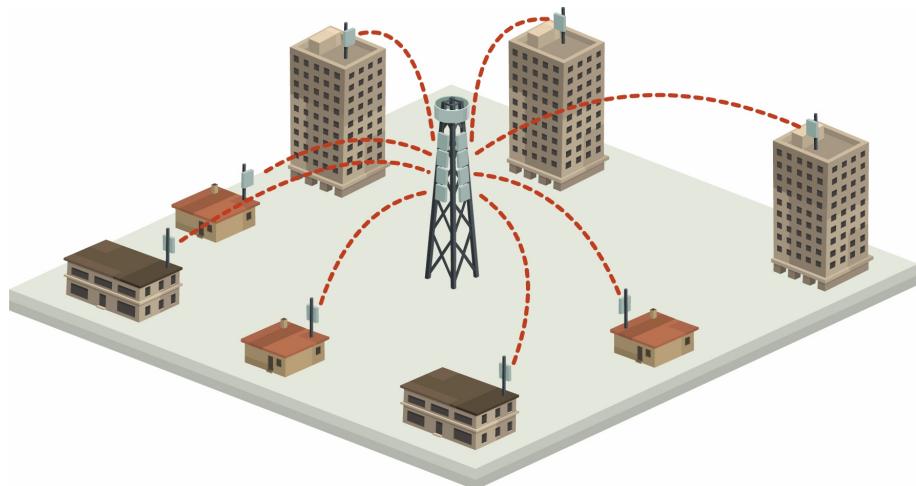


Figure 1-2: Typical Broadband Access application

Private Networks

NetStream is the ultimate solution for private networks such as enterprises, education, government and utility organizations that wish to own and manage their own networks and eliminate the costly recurring charges from service providers.

NetStream cost-effective solution enables a variety of organizations to connect geographically dispersed sites at ranges of up to 120km (75 miles).

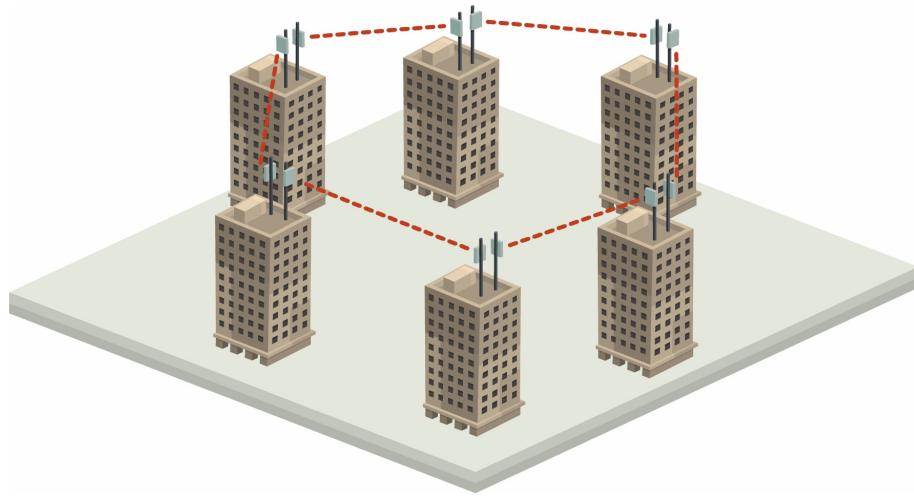


Figure 1-3: Private Network

Key Features of NetStream

Some of the outstanding features of the NetStream radio series are as follows:

- **High Capacity**

The NetStream system provides a high-capacity link of 50Mbps net throughput in full duplex.

- **Superior Spectral Efficiency**

Built on advanced MIMO and OFDM technologies, the NetStream system provides a high-capacity link at channel bandwidth of 20MHz. This channel bandwidth supports high robustness of the air interface under interference and harsh conditions. In countries where applicable, narrow channel bandwidth reduces the cost of the spectrum license.

- **Combo Frequency Products**

Every Netronics Combo Frequency radio supports multiple frequency bands. For example the NetStream 5x100 radios support the four bands: 5.725 - 5.850 GHz, 5.150 - 5.350 GHz, 5.470 - 5.725 GHz and 4.940 - 4.990 GHz. The Netronics Combo Frequency products support the regulations of FCC, IC Canada, WPC India and MII China.

- **Advanced Air Interface**

The Netronics system provides an advanced air-interface based on MIMO, built-in diversity and OFDM technologies, resulting in an exceptionally robust air interface.

Using the following technologies, the Netronics air interface is designed to ensure nonstop, high quality transmission, even under interference and harsh conditions:

- Automatic Adaptive Rate (AAR) is a mechanism that dynamically adapts the air interface rate by changing both the signal modulation and coding.

- Automatic Channel Selection (ACS) chooses the best channel by monitoring the available radio channels and dynamically selecting a channel which is best suited for transmission at any given time.
 - Automatic Repeat Request (ARQ) is a mechanism for error control during data transmission. When the receiver detects an error in the received information, it automatically requests the transmitter to resend the information. This process is repeated until the transmission is error free or the error continues beyond a predetermined number of maximum transmissions. Wireless Link's ARQ mechanism is optimized for time-critical traffic.
 - Forward Error Correction (FEC) with very low overhead and algorithms specifically designed for the varying conditions of license-exempt frequency bands, ensuring fast, robust and error-free communications.
- **High transmission (Tx) power of 25dBm**
- The NetStream system supports high Tx power, compliant with radio regulations. High Tx power increases the system's availability and range, and enables the high performance with smaller antennas, thus reducing the total cost of the solution (lower CAPEX), installation and tower rent costs (lower OPEX).
- **Superior range performance**
- The NetStream system supports high capacity at superior ranges. The Link Budget Calculator (appendix D) is used to determine the capacity and range according to the choice of product, antenna, type of service and environmental conditions.
- **Simple installation and management**
- NetStream systems are extremely simple to install and maintain. They are typically up and running in less than an hour.
- The Link Manager application has full local and remote management capabilities. The user-friendly SNMP based management tool provides full end-to-end configuration, event logging, and performance monitoring capabilities.
- **Enhanced Security**

The security features of NetStream include:

- NetStream 5x100 AES 128-bit integrated advanced encryption support provides enhanced air interface security for carriers and private networks. It ensures user data protection with one of the most sophisticated commercially available combined encryption and authentication techniques, CCM/AES. This technique combines message authentication (preventing anti-spoofing and replay protection) with commercial encryption, and complies with the IEEE 802.11i (phase iii) security recommendations.

CCM/AES uses a symmetric 128-bit encryption key (EK), and a nonce, and provides both message encryption and authenticat-

ing signature. The nonce mechanism enables the receiver to remember already received genuine messages and reject all replayed messages.

- Initial encryption and authentication is based on a user-defined master key (Link Password). While standard Wireless LAN encrypts only the Ethernet Payload, the AES encrypts both the source and destination MAC addresses.
- In addition to normal login access, Read or Write Community access is available at login

NetStream Link

The NetStream point-to-point solution is a wireless communication link. Typically each side of the link is comprised of an Outdoor Unit (ODU) and antenna and an Indoor Unit (IDU) or PoE device as shown in [figure 1-4](#) below.

The link is managed by the SNMP-based Link Manager application.

The IDU and the ODU are connected by a CAT5e cable that carries the service traffic and power.

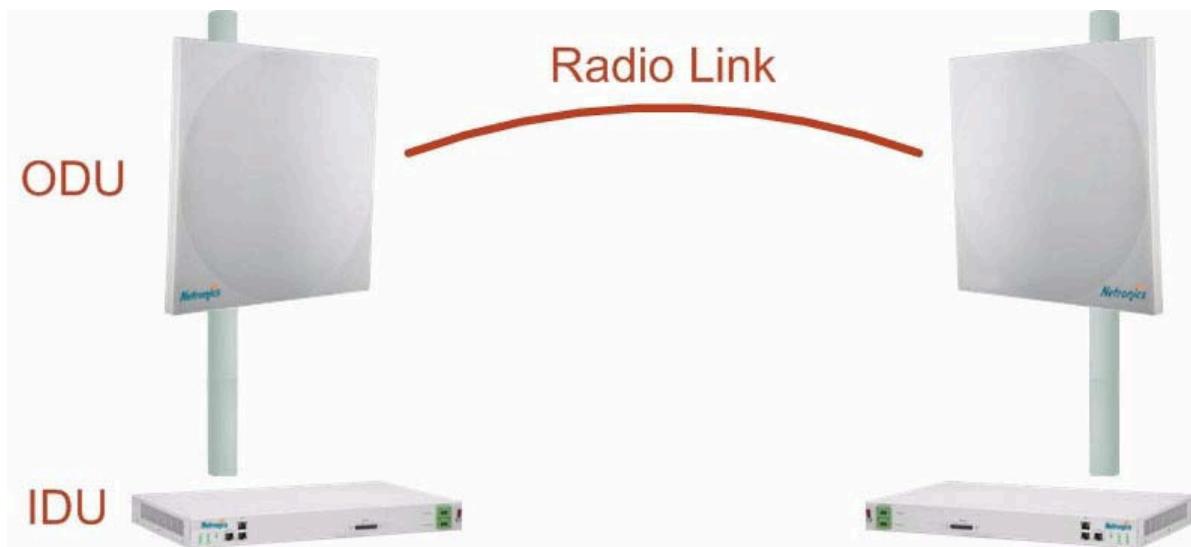


Figure 1-4: Example of Link Architecture - System Components

The Radio Outdoor Unit (ODU)

The ODU is the radio transceiver of the NetStream 5x100 system. It supports two radios for MIMO operation. It is available with an integrated antenna (**Integrated Antenna ODU**) or with connectors for an external antenna (**Connectorized ODU**).

The ODU may be mounted on a pole or a wall, and connects to the IDU or PoE device using a CAT5e cable.

The ODU comes in two form factors as shown in [figure 1-5](#) below:

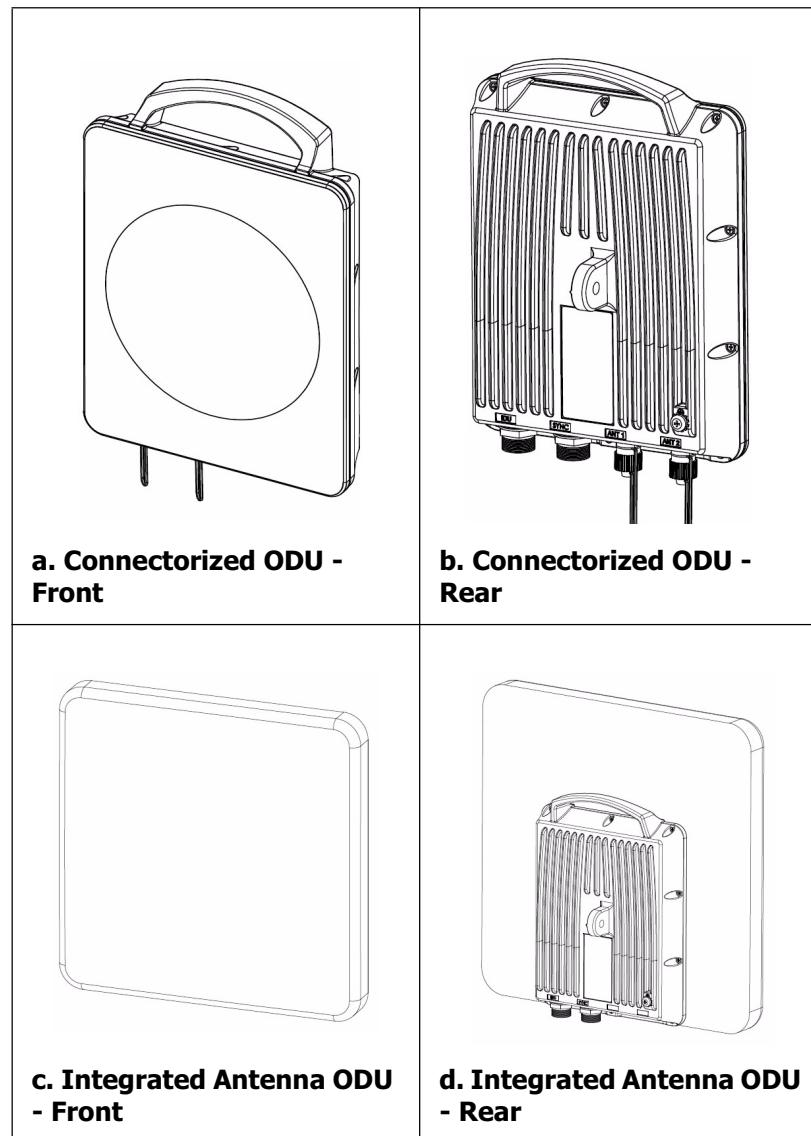


Figure 1-5: ODU Form Factors

- Integrated Antenna ODU
This ODU has an integrated 370mm (1.2ft) flat panel antenna, with a gain of 23dBi. The ODU contains both the radio and the antenna as a single unit housed in a weatherproof case.
- Connectorized ODU
This ODU has 2x N-type connectors for connecting an external antenna.

The ODU products available in release 2.1 are shown below:

Table 1-1: Available ODU Products - Release 2.1

Part Number	Description		
	Form Factor	Frequency Bands and Regulations	
B/FC/50-0I50	Integrated antenna	FCC/IC	5.725 – 5.850 GHz (default)
		Universal	5.470 – 5.725 GHz
		Universal	5.150 – 5.350 GHz
		Universal	4.940 – 4.990 GHz
		China MII	5.725 – 5.850 GHz
		India WPC	5.825 – 5.875 GHz
B/IN/50-0I50	Integrated antenna	India WPC 5.825 – 5.875 GHz	
B/IN/50-0E50	Connectorized for external antenna (2x N-type)		

The external antenna choices are:

- Single bipolar antenna
- Two monopolar antennas
- Single monopolar antenna

For further information, see [page 4-19, Installing the Link: Step 4, Tx Power and Antenna Settings](#).

The Indoor Unit (IDU)

The IDU has the service ports and provides aggregation of these services towards the ODU that transports them over the air. The IDU also provides power to the ODU.

The IDU-C is a carrier-class 19 inch, 1U unit, providing two Ethernet ports, dry contact alarms and indication leds. It has two DC power feed connectors. An AC to DC converter is available for powering the IDU-C from an AC source. The IDU-C is designed to be rack mounted.

One IDU-C product are available in release 2.1:

Table 1-2: Release 2.1 IDU-C Products

Part Number	Ethernet ports	Power	Form factor
7/C/00-B000	2	Dual DC feed, -20 to -60VDC	19" 1U



Figure 1-6: IDU-C Front Panel

Power Over Ethernet (PoE) Devices

The PoE device provides Ethernet service only, with power for the ODU. The PoE device is extremely compact, having only two Ethernet ports and a standard 3 pin male AC power socket.



Figure 1-7: PoE device - showing the radio Ethernet port

Antennas

An antenna is the radiating and receiving element from which the radio signal, in the form of RF power, is radiated to its surroundings and vice versa. The antenna gain and transmitting power may be limited by country regulations.

The NetStream may be operated with an integrated antenna that is part of the ODU unit, or with external antennas connected to the ODU via N-type connectors. All cables and connections must be connected correctly to reduce RF losses. The required antenna impedance is 50Ω .

The Integrated Antenna ODU is provided with 370 mm (1.2ft) flat panel antenna, with a gain of 23dBi. The radio and the antenna are housed in a weatherproof case as a single unit.



Figure 1-8: ODU with integrated Flat Panel antenna

External antennas are available for the NetStream radios, varying in operating frequencies, form factor, size and gain, dual or single polarization.

Flat Panel Antennas

The Flat Panel antenna shown in [figure 1-9](#) below can be used either as an integrated or external antenna:

	Integrated	1.2ft Flat Panel Dual Polarization
	Frequency	4.940 - 5.875 GHz
	Gain	23 dBi at 5.0 GHz 21 dBi at 4.9 GHz
	Size	1.2 x 1.2 ft / 371x371 mm
	Beam Width	H,V: 9°

Figure 1-9: Flat Panel Antenna

Parabolic Dish Antennas

	External	2ft Dish Dual Polarization
	Frequency	5.150 - 5.875 GHz
	Gain	28 dBi
	Diameter	2 ft / 620 mm
	Beam Width	H,V: 5.6°

Figure 1-10: External Antennas - Parabolic Dish

See the NetStream5x100 products catalog for Netronics offering of external antennas are also available from authorized antenna vendors.

Link Manager

The Link Manager is an SNMP-based management application which manages a complete link over a single IP address. It can also manage each side of the link separately.

The Link Manager application facilitates installation and configuration of the link between the ODU units. The intuitive, easy-to-use Link Manager has a graphical Microsoft Windows interface, and can be run locally and remotely.

The Link Manager provides:

- Installation Wizard
- On-line monitoring of air interface quality allowing the administrator to monitor the service and status of each link
- On-line monitoring of equipment alarms and QoS
- Local and remote loopback testing
- Configuration settings
- On-line user manual and help files
- Link Budget Calculator for calculating the expected performance of the NetStream and the possible service configurations for a specific link range.

The Link Manager can easily be integrated with any NMS system.

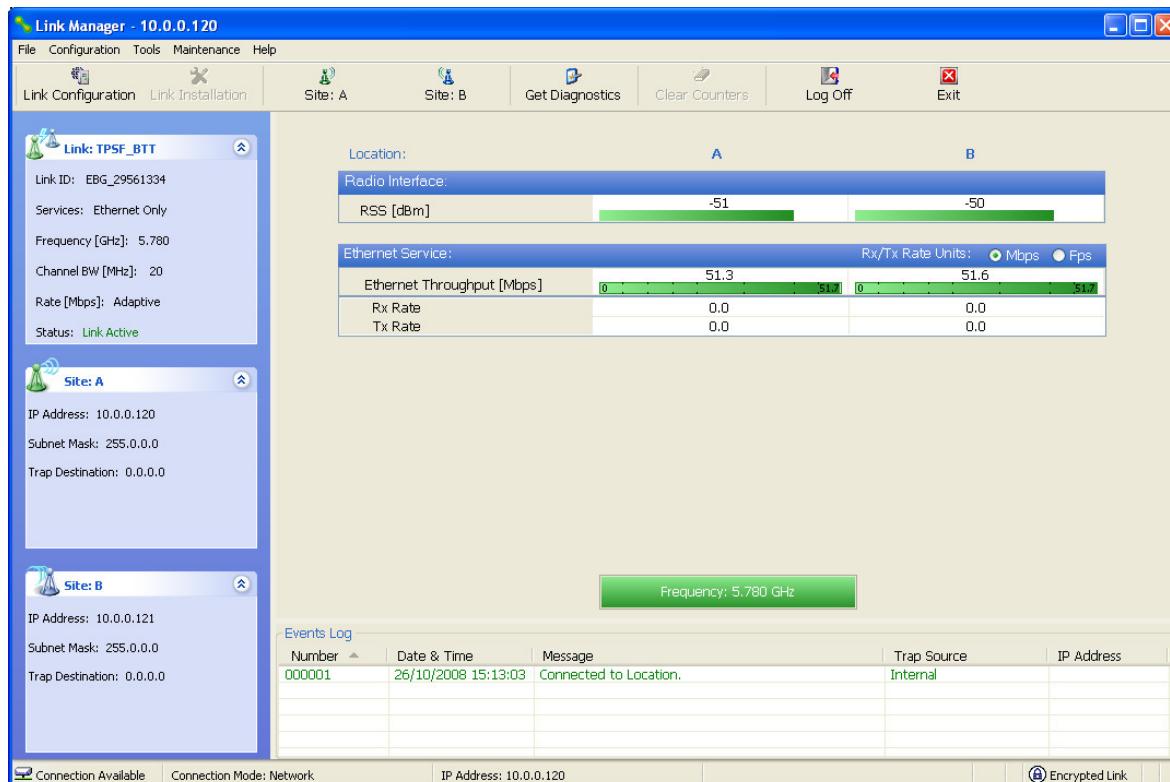


Figure 1-11: Link Manager screen

Accessories

Netronics provides a variety of accessories to support the NetStream 5x100 system:

- PoE devices
- AC Power Adaptor
- External Lightning Protection Unit
- Cables to connect the various system elements

Documentation set supplied with Netronics

The technical documentation supplied with a Netronics includes the following items:

- A Quick Start Guide for experienced installers
- A full User Manual - the document which you are reading

How to Use this Manual

This User Manual is divided into functionally distinct chapters reflecting the activities required to set up a NetStream. The division is shown in the following table:

Chapter/ Appendix	Subject	Audience
2	Site Preparation	Site survey team
3	Hardware Installation	Field technician
4	Link Installation: The Link Manager	Installation technician
5	Configuring the Link	Installation technician, System manager
6	Site Configuration	Installation technician, System manager
7	Monitoring and Diagnostics	Installation technician, System manager
A	Technical Specifications	Installation technician, System manager
B	Wiring Specifications	Installation technician
C	Pole and Wall Installation	Installation technician
D	Link Budget Calculator	Installation technician
E	Lightning Protection and Grounding Guidelines	Field technician
F	MIB Reference	System manager
G	External Alarms Specification	Installation technician, System manager, Field technician
H	Combo Configuration Tool	Installation technician

A Little Terminology

In the field, a link typically has a local or headquarters site as for example in [figure 1-2](#) above. Here the service provider is the local or headquarters site. The service recipient is the remote site.

Where the link is completely internal to a corporation, the choice of the local and remote is just a matter of convenience.

A **link** then, consists of two **sites**.

In Broadband Wireless terminology, the local and remote sites are sometimes referred to as “near” and “far”, “HQ” and “remote” and so on.

The site which is closer to the network core (often the local site) will be referred to as **site A**, and the opposite side of the link, usually closer to the end user, as **site B**.

This choice is application-neutral and will be used throughout the manual both to describe the sites and their names as in the examples.

The link is configured and managed using a PC, the **managing computer** connected to site A. (The precise requirements for the managing computer are set out in [chapter 3, Hardware Installation](#)).

NetStream supports three connection methods for the managing computer:

- **Local** - a direct peer to peer connection between the Ethernet ports on the managing computer and the IDU or PoE device. Local connection is always read-write.
- **Network** - the managing computer and the site A IDU or PoE device belong to a LAN and communicate through a router or hub
- **Over-the-air** - the managing computer connects to site B via the air interface

The managing computer may be connected to the link through an IDU or a PoE device. In what follows, where ever we refer to an IDU it includes PoE devices unless stated otherwise. Typically, if we need to refer to an IDU as such, we will use a model name such as IDU-C.

Conventions Used in this Manual

Notifications

Notifications consist of Notes, Cautions and Warnings.



The purpose of a **Note** is to

- Draw your attention to something that may not be obvious or counter-intuitive
- Emphasize a special feature or peculiarity of the Netronics
- Offer an external reference for additional information
- Add a caveat that would not qualify as a full Caution or Warning (see below)
- Provide additional background to what follows
- Offer a recommendation
- Highlight an indication of something to watch out for
- Advise you if an action has “side effects” i.e. it may disturb something else that would be best left undisturbed
- Remind you of something that should be kept in mind



A **Caution** is a notification of risk of damage to equipment or of service degradation



A **Warning** is a notification of risk of danger to persons operating near the equipment

Typographical conventions

General

Where a term is defined or introduced for the first time, it is shown in Bold-face. You will have noticed this usage in the Terminology section above.

Software

The Link Manager is a Microsoft Windows application following the user interface conventions of familiar Microsoft Windows programs.

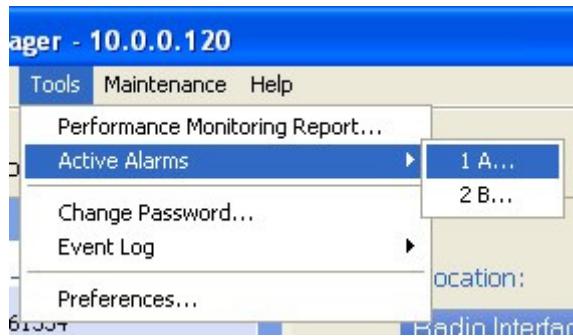
We would describe the chain of menu commands indicated in the following screen shot, like this:

Tools | Active Alarms | 1 A

using Boldface for the menu labels and vertical bars to separate them.

Similarly, mouse click items will be referred to like this:

"Click **Next** to continue."



(A mouse click always uses the left mouse button unless stated otherwise.)

Windows Terminology

Look at **figure 1-11** above. The main application display which you see consists of a frame-window with a menu bar, system icons and content. It will be referred to as a **window**, the **main window** or the Manager window depending on context.

The top line of icons is the **tool bar**, and provides part of the menu bar functionality with a mouse click.

At the bottom of the window is the **status bar**, a line of icons and text boxes.

The central part of the main window consists of several **panes**: On the right, there are Radio Interference, Ethernet Service and the Frequency panes. The left hand pane (with the blue background) is split into three sub-panes.

If you click Site A or Site B in the tool bar, you will be offered another window, which in turn displays one of several **panels** depending on which function you choose.

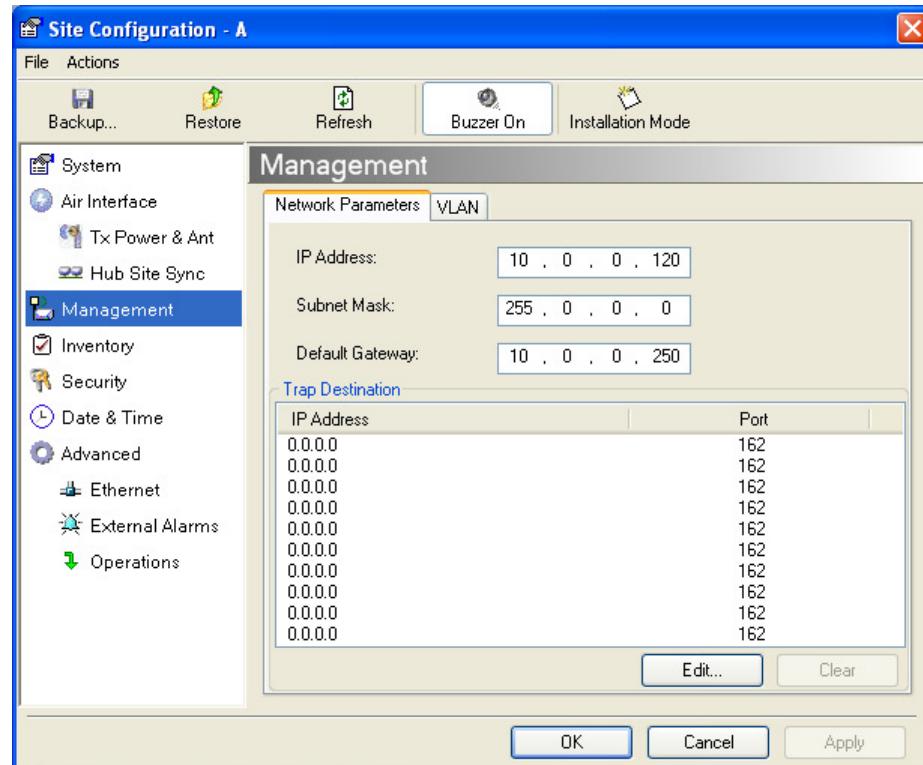


Figure 1-12: Site Configuration window with open Management panel

Chapter 2

Site Preparation

Planning the Link Site

Overview

Link site planning consists of a set of surveys, which must be carried out before any equipment is brought to the site. If for some reason, the outcome of any of these surveys is negative, site re-location will need to be considered.

A Site Survey consists of three stages:

1. Preliminary survey - The proposed link is analyzed **in the office** using a topographic map.
2. Physical survey - The locations of the Netronics indoor and outdoor equipment are determined **on-site**.
3. Radio Frequency (RF) survey - It is recommended that the installation area be scanned with a spectrum analyzer, to identify RF interference so as to determine a clear channel for Netronics installation (**on-site**).

The Site Survey

Introduction

Netronics must be planned before installation. The designated installation site must be appraised to determine that the wireless system is able to operate efficiently and provide connectivity without signal degradation.

Netronics offers a wide operating frequency range. A free frequency channel must be determined within the operating range, for optimum performance.

Recommended Equipment

Stage 1: Preliminary Survey

- Topological map of the area
- Urban map of the area

- Compass

Stage 2: Physical Survey

- 100 meter tape measure
- Ohmmeter, to check ground connection
- Binoculars
- Map
- Digital camera
- Paper, pencil, and a clipboard
- GPS device (optional)
- Compass (optional)

Stage 3: RF Survey

- Spectrum Analyzer with Max Hold function and screen capture facility that can store multiple images, for documentation purposes
- RF accessories (connectors and cables)
- Communication devices (for example, cellular phones, or a set of walkie-talkies)

Stage 1: Preliminary Survey

A preliminary survey is necessary before visiting potential installation sites. As much detail as possible should be obtained about the two designated ODU installation sites and the area between them.

➤ **To perform a preliminary survey:**

1. Mark the two designated installation sites on a topographic map of the area.
2. Measure the distance between the sites; check that it is within the specified range of the Netronics.
3. On the urban map, check for developed areas situated between the two installation sites. Pay attention to these areas when performing the physical site survey; there may be tall buildings, RF towers, or transmitters, which could cause interference to the link.
4. Check the area between the two sites for obstructions such as:
 - High ground - hills or mountains
 - Lakes or large bodies of water. Water has a reflection effect on RF signals like a building. This type of reflection causes the received amplitude to be reduced. As a rule of thumb, the presence of a large body of water between the link sites may double the required antenna height.
5. Determine and record the compass bearings between both ODUs, relative to north.
6. If there are obstructions between the two sites, calculate the Fresnel Zone (see appendix D for details).
7. If the site chosen does not meet requirements, consider alternative sites.

8. Use the Link Budget Calculator (on the CD supplied with the Netronics or using the Link Manager) to determine the expected performance.

Stage 2: Physical Survey

The physical site survey reviews the environment of the proposed Netronics installation location, to ensure that the link sites are suitable for the wireless network. The results of the physical site survey should be recorded.



Note

It is advisable to go on a clear day, so you can more easily see any obstructions between the two sites.

➤ To perform a physical survey:

1. From the compass readings taken in the preliminary survey, find the azimuth (horizontal position) that the ODU should face towards the second ODU.
2. Using binoculars, locate any obstructions such as tall trees, high buildings, hills or mountains. Look for other RF towers between the two sites. Mark the locations of the obstructions on the map.
3. Determine the location for the ODU (having regard for existing rooftop installations and tower space). It should be above any obstructions, considering the Fresnel zone (see appendix D).
4. If you need to install the ODU on a tower, make sure that the tower is far away from overhead electric power lines.
5. Determine a location for the indoor equipment; it should be as close as possible to the ODU. At an existing site, there is probably an equipment room with cable-routing channels.



Note

The IDU - ODU cable length limit is 100m, in accordance with IEEE 10/100BaseT standards.

6. Measure and record the path length of the cable from the ODU position to the indoor equipment room.
7. Determine the ground and lightning connection points of the installation. The Netronics ODU and IDU must both be grounded.
8. Using the Ohmmeter, measure and record the resistance of the required installation to the grounding point. The resistance must be less than 10 ohm.
9. Review the results of the physical site survey. Decide if the site is suitable for the Netronics wireless network installation.
 - If the site is suitable, continue with stage 3, the RF survey
 - If the site is not suitable, survey another site

Additional Outdoor Site Requirements

The ambient outdoor operating temperature should be -35 to 60°C (-31 to 140°F).

Additional Indoor Site Requirements

The following requirements guarantee proper operation of the system:

- For IDU-C units, allow at least 90 cm (36 ") of front clearance for operating and maintenance accessibility. Allow at least 10 cm (4 ") clearance at the rear of the unit for signal lines and interface cables
- The ambient operating temperature should be 0 to 50°C (32 to 122 °F) at a humidity of up to 90%, non condensing

Stage 3: RF Survey

The RF survey examines the wireless environment of the Netronics installation site, to determine whether there are available channels within the Netronics operating frequency band. An RF survey is performed using a spectrum analyzer.

It is advisable to familiarize yourself with the spectrum analyzer before going out on site, specifically the Max Hold and Marker functions.

You should perform the RF survey at both proposed link sites.

The survey should be carried out during a busy time of day, to best judge the worst-case radio interference. Allow 2-4 hours duration for a good RF survey.



Note

It is possible to install the NetStream link and use the Link Manager to find a clear channel. Each frequency channel can be evaluated in turn. Achievement of a clear channel is indicated by the Quality bar on the Channel Setting window (see [figure 4-13](#)) becoming green.

Chapter 3

Hardware Installation

This chapter sets out the requirements and procedures for the hardware installation and alignment of a NetStream link in accordance with the prior planning as set out in chapter 2. It is intended to guide qualified field technicians.



Outdoor units and antennas should be installed ONLY by experienced installation professionals who are familiar with local building and safety codes and, wherever applicable, are licensed by the appropriate government regulatory authorities. Failure to do so may expose the end user or the service provider to legal and financial liabilities. Netronics and its resellers or distributors are not liable for injury, damage or violation of regulations associated with the installation of outdoor units or antennas.

Safety Practices

Preventing overexposure to RF energy

To protect against overexposure to RF energy, install the ODUs so as to provide and maintain minimal separation distances from all persons.

When the system is operational, avoid standing directly in front of the antenna. Strong RF fields are present when the transmitter is on. The ODU must not be deployed in a location where it is possible for people to stand or walk inadvertently in front of the antenna.

Grounding

All NetStream 5x100 products should be grounded during operation. In addition:

- The **ODU** should be earthed by a wire with diameter of at least **12AWG**.

The NetStream5x100 ODU must be properly grounded to protect against lightning. It is the user's responsibility to install the equipment in accordance with Section 810 of the National Electric Code, ANSI/NFPA No.70-1984 or Section 54 of the Canadian Electrical Code. These codes describe correct installation procedures for grounding the outdoor unit, mast, lead-in wire and discharge unit. It

also lays down the size of grounding conductors and connection requirements for grounding electrodes.

The NetStream ODU must be grounded to a Protective Earth as described in appendix [E](#) and in accordance with the Local Electrical Regulations.

- The earth lug on the **IDU-C** should be connected to the protective earth at all times, by a wire with a diameter of **18 AWG** or wider. Rack-mounted equipment should be mounted only in earthed racks and cabinets.

Further, you should -

- Always make the ground connection first and disconnect it last
- Never connect telecommunication cables to ungrounded equipment
- Ensure that all other cables are disconnected before disconnecting the ground

More detailed guidelines are supplied in appendix [E](#).

Protection against Lightning

The use of lightning protection is dependent on regulatory and end user requirements. All of NetStream 5x100 outdoor units are designed with surge limiting circuits to minimize the risk of damage due to lightning strikes. NetStream 5x100 recommends the use of additional surge arrestor devices to protect the equipment from nearby lightning strikes.

See appendix [E](#) for detailed installation instructions of lightning protection devices.

General

- It is recommended that installation of the outdoor unit be contracted to a professional installer.
- Before working on equipment connected to power lines or telecommunication lines, you should remove jewelry or any other metallic object that may come into contact with energized parts.
- Use extreme care when installing antennas near power lines.
- Use extreme care when working at heights.
- When using an AC power source for NetStream always use the AC power adapter supplied by Netronics.
- Use the right tools. In addition to standard tools required for any kind of ODU or antenna installation, Netronics requires additional specific tools detailed on [page 3-5](#) below.

Package Contents

The NetStream packages include the following items:

ODU Package Contents

The ODU package contains:

- One ODU - see [figure 3-2](#) below for front and rear view
- An ODU mounting kit - see [figure 3-1](#) below
- A CD containing -
 - the Link Manager
 - Quick Start Guide
 - User Manual
 - Link Budget Calculator
- Label showing the MAC address and the alternative Community string. The label is self-adhesive. You should keep this label safe
- Cable glands (to be used with the ODU-IDU cable)



Figure 3-1: ODU Mounting kit

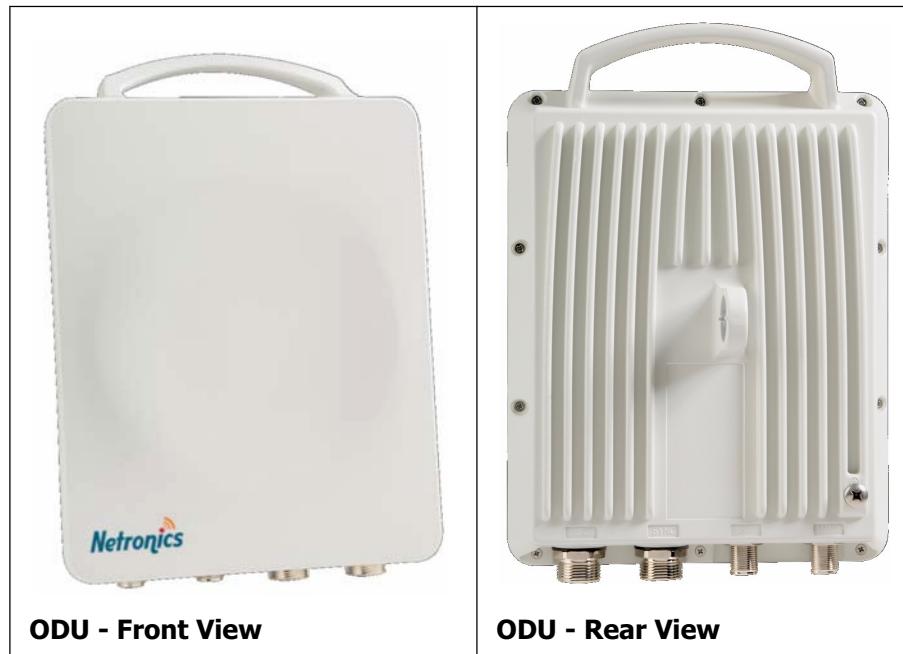


Figure 3-2: Connectorized ODU - Front and rear views

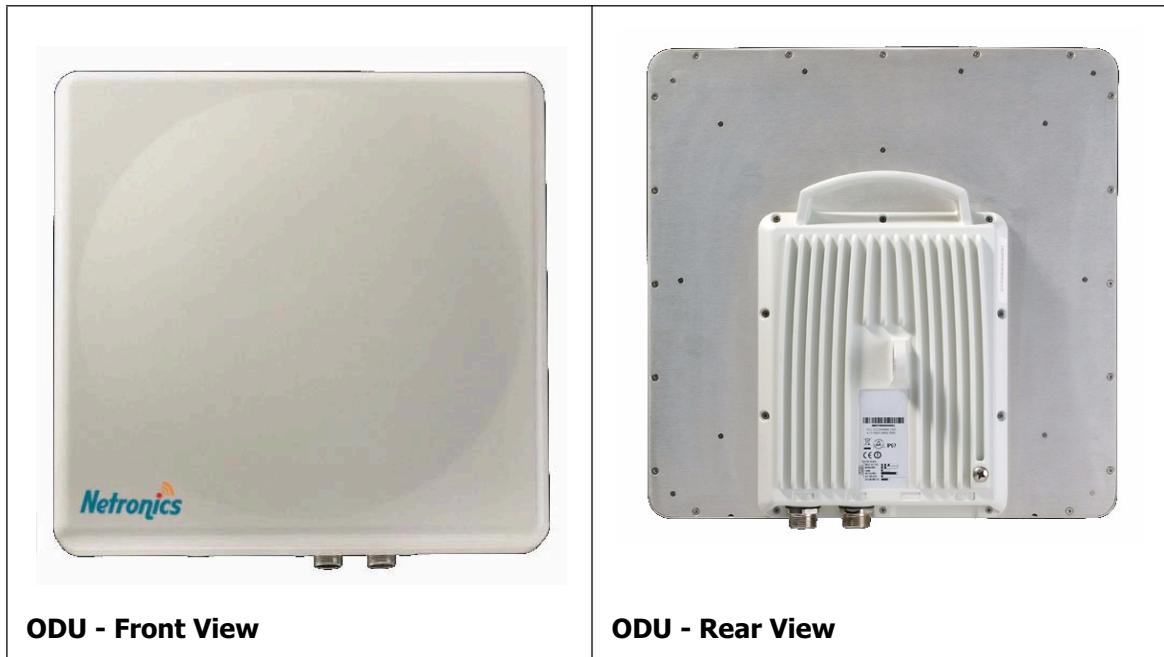


Figure 3-3: Integrated ODU - Front and rear views

IDU Package Contents

The IDU package contains:

- IDU-C - see [figure 3-4](#) below.
- 19" rack mounting kit - see [figure 3-5](#) below
- Two DC power plugs for power cables - see [figure 3-5](#) below



Figure 3-4: IDU-C Package contents - the IDU-C



Figure 3-5: IDU-C Package contents - the mounting kit and DC power plugs

External Antenna Package Contents

- Antenna
- RF cable 1m (3') long; two cables supplied with bipolar antennas, single cable supplied with monopolar antennas
- Mounting kit

Additional Tools and Materials Required

The following is a list of the equipment and materials required to install NetStream hardware.

Tools and Materials

- Crimping tool for RJ-45 (if the ODU-IDU cable is without connectors)
- Spanner/wrench 13 mm (½")
- Drill (for wall mounting only)
- Cable ties
- Sealing material

Cables and connectors

- ODU grounding cable 12AWG
- IDU grounding cable 18AWG
- ODU-IDU cable (outdoor class, CAT-5e, 4 twisted pairs, 24AWG)

Hardware Installation Sequence

The following steps are required to install the NetStream system:

1. Mounting the ODUs, page [page 3-6](#).
2. Mounting the external antennas (if used), page [page 3-7](#).
3. Mounting the Lightning Protection devices (if used), page [page 3-7](#).
4. Outdoor connections, page [page 3-8](#).
5. Mounting the IDUs, page [page 3-8](#).
6. Indoor connections, page [page 3-11](#).
7. Aligning the ODUs/antennas, page [page 3-12](#).

See [figure 3-6](#) below, which illustrates a typical installation of NetStream with an external antenna.

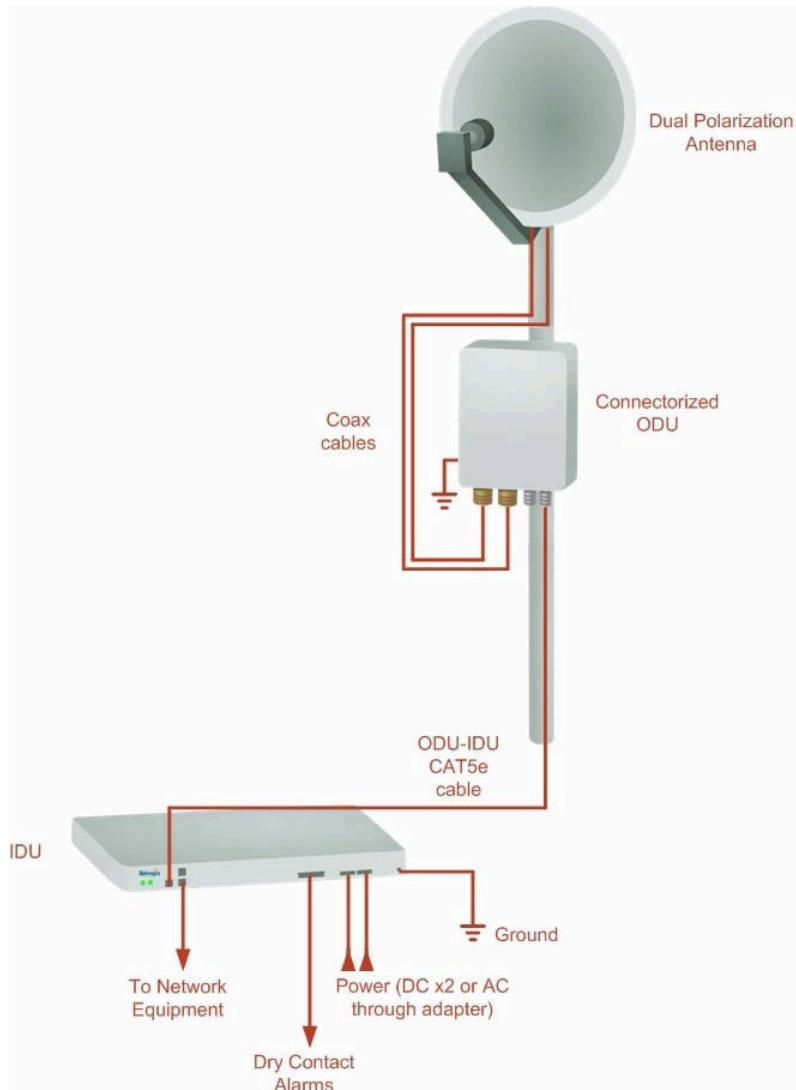


Figure 3-6: Typical Installation Diagram (with external antenna)

The installation steps are detailed in the following sections.

Outdoor installation

Mounting the ODU

The ODU can be mounted on a pole or a wall. In both installations, the supplied mounting kit is used to secure the ODU.



Note

A mast-sited ODU typically uses a pole attached to the mast.

A NetStream link operates in pairs of two ODUs with the same configuration. Both ODUs must be installed, and the antennas aligned for maximum throughput.

**Warning**

Prior to connecting cables to the ODU, the protective earth terminal (screw) of the ODU must be connected to an external protective ground conductor or to a grounded pole.

- Only a qualified person using the proper safety equipment should climb the antenna mast
- Only qualified professional personnel should install or dismantle ODUs and masts

➤ To mount the ODU on a pole or a wall:

1. Ensure that the ODU is properly grounded.
2. Mount the ODU onto the pole or wall. Ensure that the unit is oriented so that the cable connectors are at the bottom. (**If they are on top, water may penetrate into the unit causing damage.**)
3. Refer to [Appendix C, Pole and Wall Installation](#) for detailed ODU mounting kit contents and schematics.

**Note**

Do not tighten the ODU to its mounting brackets until the alignment process of the antenna is complete.

Ensure that there are no direct obstructions in front of the ODU or interference from man-made obstacles.

Mounting external antennas

If you are using ODU with an integrated antenna, skip to [Mounting the Lightning Protection Devices](#) below.

The supplied mounting kit is used to mount the antenna onto a pole. The antennas must be aligned for maximum throughput.

**Warning**

Do not stand in front of a live antenna.

➤ To mount an external antenna:

1. To mount an external antenna ensure that the antenna is properly grounded and then mount the antenna onto the pole. Refer to [Appendix C, Pole and Wall Installation](#) for detailed antenna mounting instructions.
2. Follow the mounting instructions supplied with the antenna.

Mounting the Lightning Protection Devices

The use of lightning protection is dependent on regulatory and end user requirements. The NetStream ODU is designed with surge limiting circuits to minimize the risk of damage due to lightning strikes. NetStream 5x100 recommends

the use of additional surge arrestor devices to protect the equipment from nearby lightning strikes.

Refer to appendix [E](#) for detailed installation instructions of lightning protection devices.

Outdoor Connections

➤ To complete the outdoor connections:

1. Connect the ground cable to the ODU chassis as marked on the ODU.
2. Connect the antenna cable(s) to the ODU.
3. Connect the lightning protection device to the ODU (see appendix [E](#)).
4. Attach the ODU-IDU cable to the ODU RJ-45 connector (see appendix [B](#) for the connector pin-out)
5. Screw in the cable glands to ensure hermetic sealing of the ODU.
6. Secure the cables to the pole, mast or brackets using UV-rated cable ties.

Indoor Installation

Mounting the IDUs

The NetStream IDUs are all rack mounted, as shown in [figure 1-6](#). A front panel keyed schematic of a rack mounted IDU-C is shown in [figure 3-7](#) below.

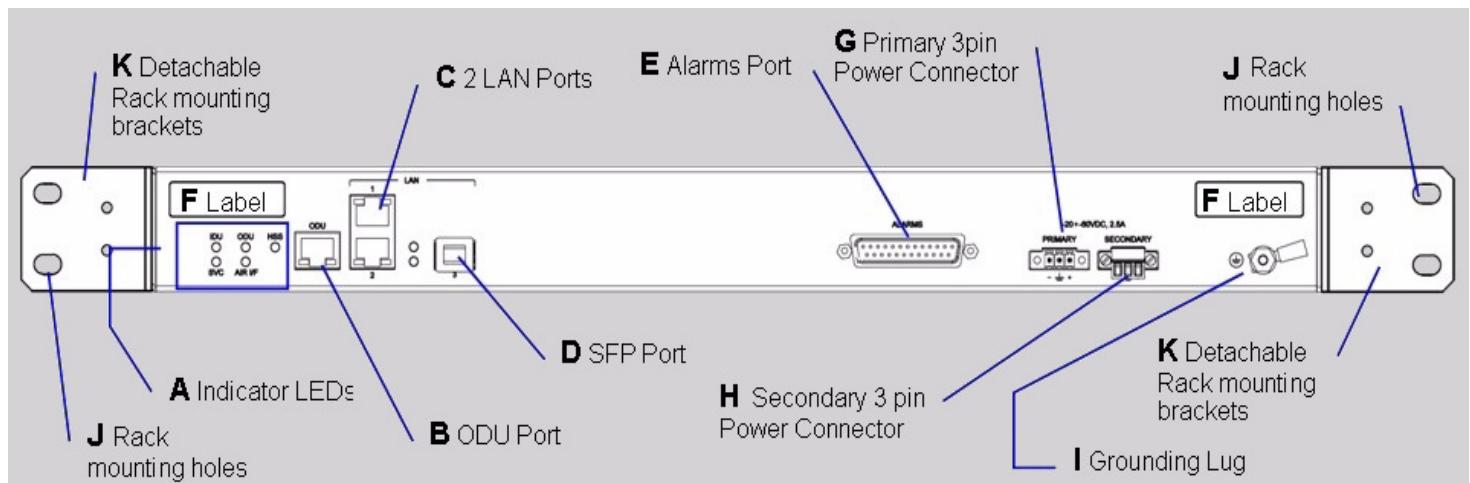


Figure 3-7: IDU-C front panel

In [figure 3-8](#) we display a perspective view of the IDU-C:

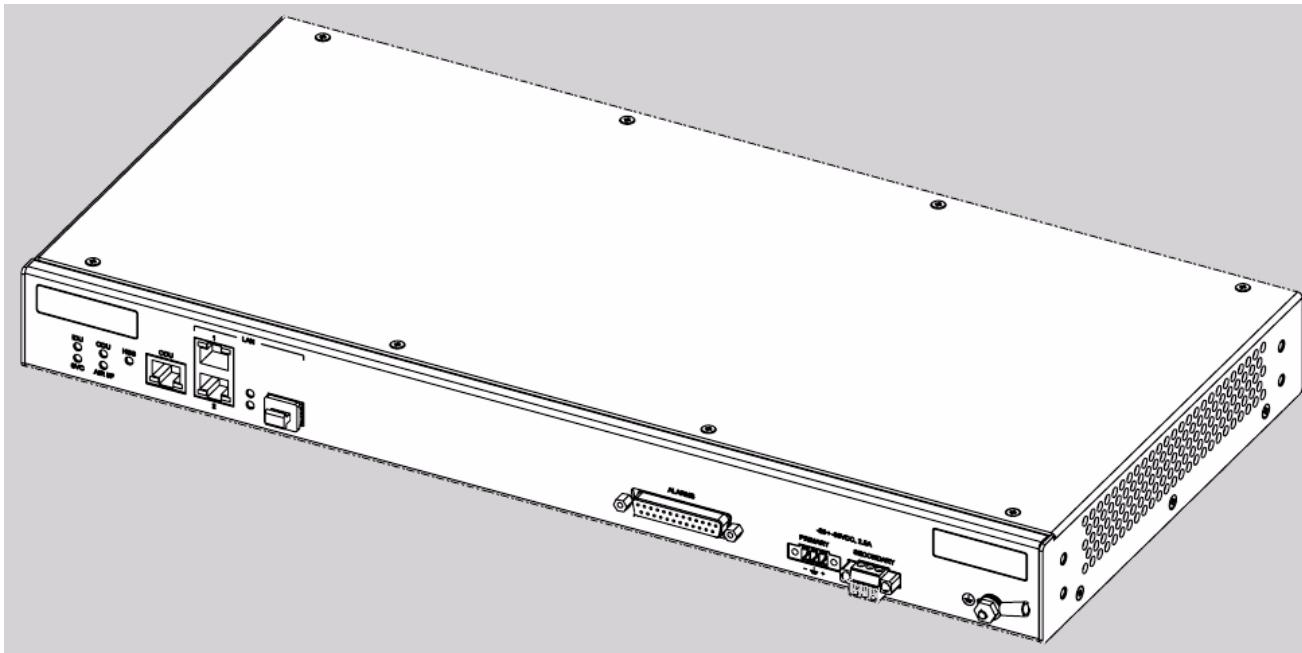


Figure 3-8: IDU-C - A perspective view

Further description of the keyed items in [figure 3-7](#) is shown in [table 3-1](#) below:

Table 3-1: Components of an IDU-C front panel

Key	Label	Remarks
A	Indicator LEDs	See figure 3-9 .
B	ODU Port	RJ-45 connector, see table B-1 .
C	2 LAN Ports	Ethernet, RJ-45 connector, see table B-2
D	SFP Port	The IDU-C is SFP ready.
E	Alarm Ports	Standard DB25 female connector, see table B-3 .
F	Label indent	Place for adhesive identification labels
G	Primary 3 pin Power Connector	Standard 3 pins in line power connector, see table B-4 .
H	Secondary 3 pin Power Connector	Standard 3 pins in line power connector, see table B-4 .
I	Grounding Lug	Use the lug supplied
J	Rack mounting holes	
K	Detachable Rack mounting brackets	

The Indicator LEDs (Item A in [table 3-1](#) above) are shown in more detail in [figure 3-9](#) below:



Figure 3-9: IDU-C LEDs

The purpose of the LEDs is shown in [table 3-2](#) below:

Table 3-2: IDU-C Front Panel LEDs

Name	Color	Function
IDU	Green	IDU operational
	Green	During power-up only
	Red	Failure
ODU	Green	ODU-to-IDU communication link is operating
	Red	ODU-to-IDU communication link is disrupted
AIR I/F	Green	Wireless link is synchronized
	Orange	During installation mode only
	Red	Wireless link lost synchronization
SVC		Off
HSS		Off

➤ **To mount an IDU (using [figure 3-7](#) above):**

1. If the rack already holds other equipment, ensure that it is properly grounded.



Warning

Do not proceed with installation into a “live” rack unless it is properly grounded.

2. Attach the rack mounting brackets (K) to the IDU.
3. Bolt the IDU into an empty slot in the rack, ensuring that it sits securely.
4. Ground the IDU to the rack using grounding lug I. The IDU should be left permanently grounded.



Note

Instead of using the rack mounting brackets, the IDU may be rail mounted using the four screw holes on each of its sides.

Connecting power to the IDU

The IDU-C has redundant power connection circuits (items G and H in [figure 3-7](#) above). An enlarged schematic of the power connectors is shown in below:

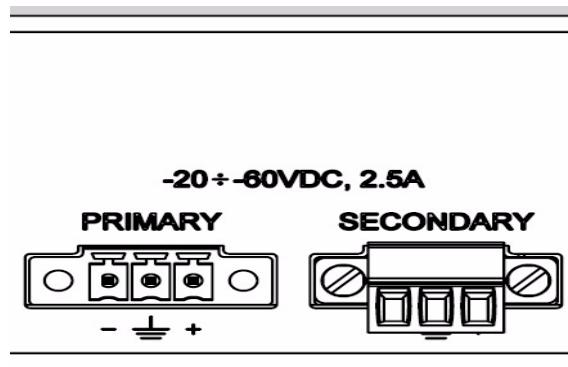


Figure 3-10: DU-C power connectors

The connectors are 3 pin in line female, with polarities (left to right) minus, ground, plus. To avoid damage to the IDU, always use an AC/DC adapter supplied by NetStream 5x100.

Ensure that the IDUs at both sites are powered up.

Connecting the ODU to the IDU

The ODU-IDU cable conducts all the user traffic between the IDU and the ODU, and also provides power to the ODU. The maximum length of the ODU-IDU cable is 100m (328') in accordance with 10/100BaseT standards.

The ODU-IDU cable is supplied pre-assembled with RJ-45 connectors, at the length specified when ordering, or as a cable drum with spare connectors. If the ODU-IDU cable was not ordered, use an outdoor class, CAT-5e 24AWG shielded cable. See appendix [B](#) for Wiring Specifications.

To connect the ODU to the IDU, route the cable from the ODU to the IDU, secure the cable along its path and connect the cable to the ODU RJ-45 connector on the IDU (see item B in [figure 3-7](#) above).

Installing a Link using PoE Devices

The PoE device is a very simple unit having a power input connector and two Ethernet ports. It is AC powered, and has a power LED.

➤ To prepare a link using PoE devices:

1. To connect the ODU to the PoE device, route the cable from the ODU to the PoE device, secure the cable along its path and connect the cable to the P-LAN-OUT RJ-45 connector on the PoE device.
2. Connect it to AC power.
3. Repeat steps 1 to 2 for the second link.

Connecting User Equipment

➤ To connect user equipment to the IDU:

- Connect user switch/router or any other compatible device to the IDU panel RJ-45 ports designated LAN (see item C in [figure 3-7](#) above).

Refer to appendix [B, Wiring Specifications](#), for connector pinouts.



Note

Do not connect two LAN ports to the same network, or flooding may occur.

➤ To connect user equipment to the PoE device:

- Connect a user switch, router or any other compatible device to the PoE device RJ-45 port designated LAN-IN. Refer to appendix [B, Wiring Specifications](#), for connector pinouts.

Connecting and Aligning ODUs / Antennas

You perform antenna alignment using the ODU's audible tone.

To speed up the installation time, alignment of a NetStream system should be performed by two teams simultaneously, at site A and at site B.

➤ To align ODUs with integrated antennas or external bipolar antennas:

1. For external bipolar antennas: Using a coax cable with N-Type connectors, connect the vertical polarization connector of the antenna to the ANT 1 connector of the ODU.
2. For external bipolar antennas: Using a coax cable with N-Type connectors, connect the horizontal polarization connector of the antenna to the ANT 2 connector of the ODU.
3. Ensure that power is connected to the IDUs at both sites.
4. Ensure normal operation of the IDUs by the LED indications on the front panel.

Provided that site A detects the signal from site B, the ODU starts beeping 20 seconds after power up, and continues beeping until the ODUs are aligned, and the installation is complete.

In the following steps, "antenna" refers both to an external antenna and an integrated antenna.

5. Direct the antenna of site B in the direction of site A. This is simplified if a previous site survey has been completed and azimuths are known.



Warning

When aligning the antennas, do not stand in front of a live antenna.

6. Make a horizontal sweep of 180 degrees with the site A antenna so that the strongest signal from site B can be detected.
7. Slowly turn the site A antenna back towards the position of site B, listening to the tone until the best signal is reached. See the following figure for audible signal variations.

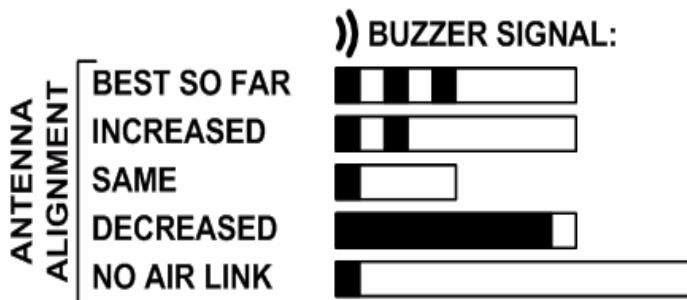


Figure 3-11: Beep Sequence for antenna alignment



Note

- Three beeps and a pause is 'best signal so far'
- Two beeps and a pause is 'signal quality increased'
- One beep and pause is 'no change in signal'
- Long beep and short pause is 'signal quality decreased'
- One beep and a long pause is 'no air link'
- Any other signal does not relate to antenna alignment

8. Secure the site A antenna to the pole/wall.
9. Repeat steps 4 to 8 for site B.

➤ To align two external monopolar antennas:



Note

The ODU buzzer only works on the radio connected to the ANT 1 connector marked . You will therefore need to use ANT 1 to align both antennas in turn. Upon completion of the alignment procedure, you may connect the two antennas to ANT 1 and ANT 2 connectors.

1. Using a coax cable with N-Type connectors, connect one antenna to the ANT 1 connector of the ODU.
2. Follow the steps 3 to 7 above to align the antenna connected to the ODU connector ANT 1 on both sides of the link.
3. On both sides of the link, disconnect the antenna connected to the ODU connector ANT 1. Connect the other antenna to connector ANT 1 and follow the steps 3 to 7 above to align the second antenna.
4. Secure the antennas to the pole/wall.
5. Restore one of the antennas to ANT 2 on both sides of the link.

Chapter 4

Link Installation: The Link Manager

This chapter explains how to use the Link Manager to install a radio link.

Installing the Link Manager Application

Minimum System Requirements

The Link Manager application is distributed on a CD. Operating system specific PC resources required by the application are set out in **table 4-1** below:

Table 4-1: PC Requirements for the Link Manager Application

	Windows 2000	Windows XP Pro	Windows Vista
Memory	128 MB	512 MB	1 GB
Processor	P III	P IV	P IV Dual Core

Requirements common to all systems are:

- Hard disk: 1 GB free space
- Network: 10/100BaseT NIC
- Graphics: 1024x768 screen resolution with 16 bit color
- Microsoft Explorer version 5.01 or later

Installing the Software

➤ To install the Link Manager program:

1. Insert the CD-ROM into your CD-ROM drive.
The installation starts automatically.
2. Follow the on-screen instructions of the installation wizard to complete setup of the Link Manager program in the desired location.

Starting the Link Manager

► To start the Link Manager:

1. Connect the managing computer to one of the two LAN ports as shown in **figure 4-1** below:



Figure 4-1: LAN ports on the front panel of the IDU-C

If you are not using a direct connection as above, ensure that you have IDU to managing computer connectivity (e.g. through a LAN).

2. Check that you have connectivity to the ODU. You can do this by opening up a command line session (**Start | Run** and then type, **cmd**). At the command prompt, type

```
ping 10.0.0.120
```

You should see something like this:

```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\vera>ping 10.0.0.120

Pinging 10.0.0.120 with 32 bytes of data:
Reply from 10.0.0.120: bytes=32 time=6ms TTL=63
Reply from 10.0.0.120: bytes=32 time=3ms TTL=63
Reply from 10.0.0.120: bytes=32 time=3ms TTL=63
Reply from 10.0.0.120: bytes=32 time=3ms TTL=63

Ping statistics for 10.0.0.120:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 3ms, Maximum = 6ms, Average = 3ms

C:\Documents and Settings\vera>
```

Figure 4-2: Pinging an uninstalled and unconfigured link

Any other response from ping means that the ODU is not responding. Check your Ethernet connection and that both the the IDU and ODU are switched on and then try again. If you do not succeed, seek assistance from NetStream 5x100 Customer Support.

3. Dismiss the command line session.
4. Double-click the Link Manager icon on the desktop, or click **Start | Programs | Link Manager | Link Manager**.

The Login dialog box appears.

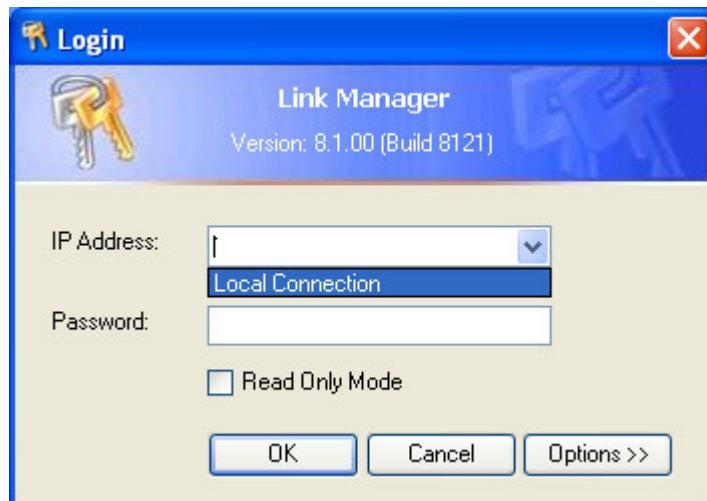


Figure 4-3: Login Screen

5. Type an IP address for the ODU (if you connect through a network), or click Local Connection (if you are connected directly to the IDU port).



1. If you log in on Local Connection, but your physical connection is **not** local (i.e. anything other than a direct connection between the managing computer and the IDU), then any configuration you carry out may affect other links in the network.
2. If you log in via an over-the-air IP address, you will receive a warning. If you reset the site to which you are connected to factory settings, you can lock yourself out of the Link.
3. Network login (IP address to the ODU) is recommended.



Note

The default IP address for the ODU is 10.0.0.120. The subnet mask is 255.0.0.0.

The actual IP address is defined during link configuration (see [Site Management: IP Address and VLAN](#) on page [6-4](#)).

6. Enter the password



Note

The default password is **admin** (see [Changing the Log On Password](#) on page [4-6](#)).

7. If you are a user with Read-Write permission, click Options to enter the Community options.



NetStream is protected with Community passwords. A user may be defined with read-only permission or with read-write permission (see [page 6-14](#) for more details).



Figure 4-4: Login Screen with Community options visible

- If you are using the system for the first time, leave the default Community passwords, **netman** for read-write, and **public** for read-only.
- If Community values were previously defined, enter them under Community in the Read-Only or Read-Write boxes.
- If you are a user with read-only permission, click the Read Only Mode check box.

The Link Manager main window is displayed (see [figure 4-7](#)).

Login Errors

Unsupported Device

Attempting to connect to an unsupported device will result in the following error message:



Figure 4-5: Unsupported device message

Incorrect IP Address

If the IP address chosen is invalid or the link is unreachable, the following error message will be displayed:

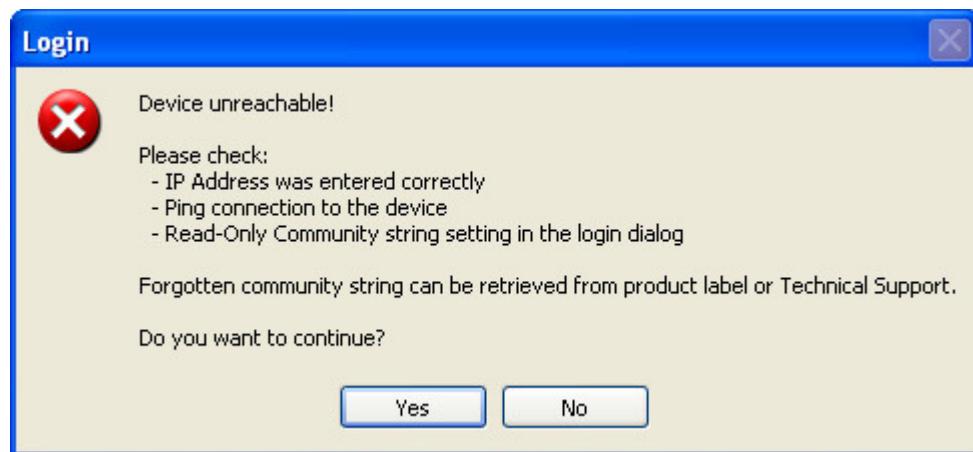


Figure 4-6: Unreachable device message

In both of the above situations, you will see a warning graphic  alongside the IP Address field.

Incorrect Password

If you type an incorrect password in the Login screen, you will see a warning graphic  alongside the password field.

Continuing without an IP Address

The Link Manager provides limited “offline” functionality when there is no accessible IDU/ODU. It is primarily for setting managing computer related parameters and running the Link Budget Calculator. The offline functionality is shown in [table 4-2](#) below. The table does not show menu items grayed out.

Table 4-2: Link Manager: Offline Functionality

Menu level			Function	Reference
Top	+1	+2		
File				
	Log Off		Return to Log On dialog. Same as Log Off button	
	Exit		Exit the Link Manager. Same as Exit button	
Tools				
	Change Password		Change the Log On password dialog	page 4-6
	Events Log			page 7-10
		Clear Events	Clear local events log	
		Save to File	Save events log data to a file	
Help				
	Link Manager Help		View online help version of the User Manual	
	Link Budget Calculator		Calculator opened in default browser	Appendix D
	Get Diagnostics Information		Obtain system information	page 7-1
	About Link Manager		Link Manager build information	

Changing the Log On Password

➤ To change the log on password:

1. From the Tools menu, select **Change Password**.
The Change Password dialog box appears.
2. Enter the current password, and the new password.
3. Click **OK** to confirm.

Installing the Link: First steps

At this point the main window of the Link Manager should be displayed:

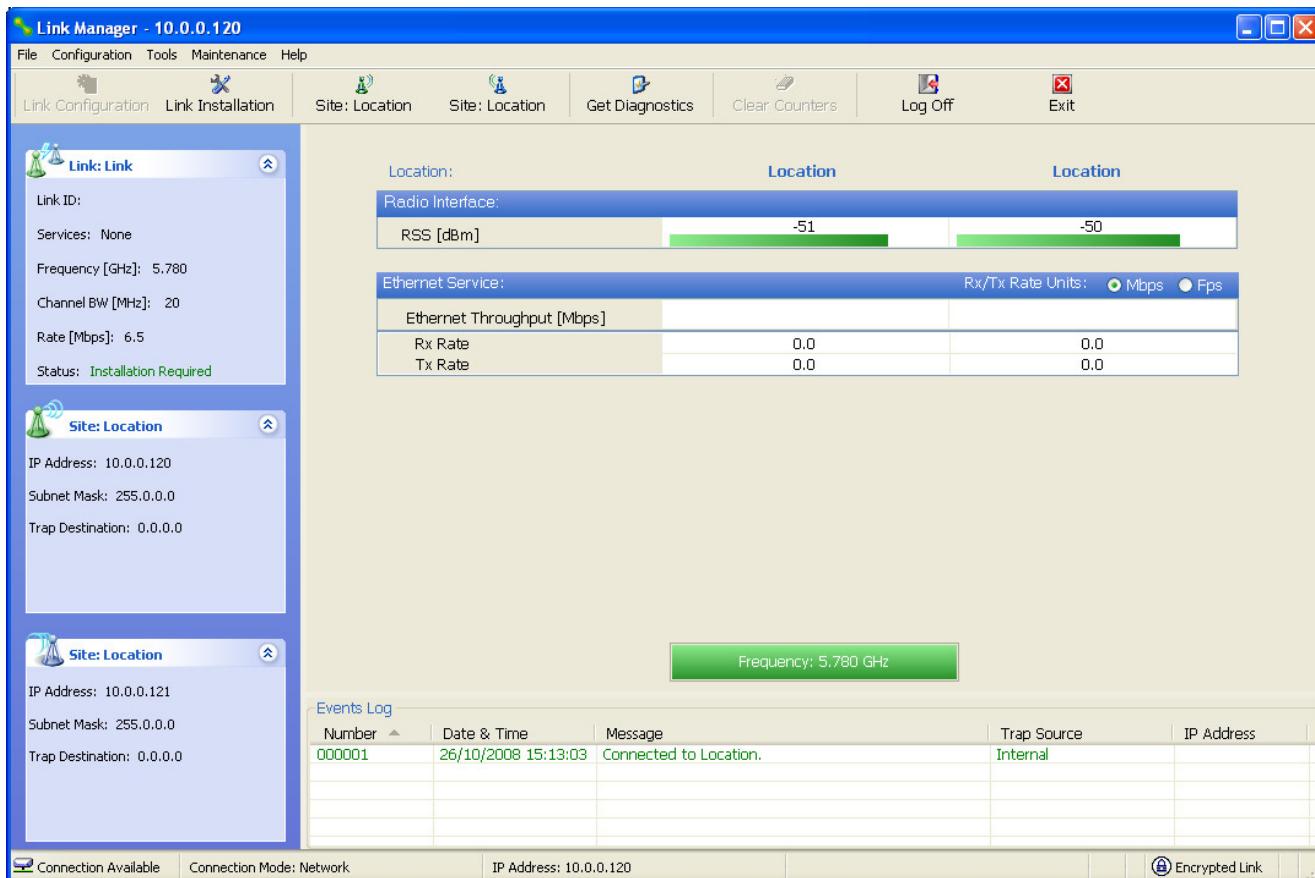


Figure 4-7: Opening Link Manager window prior to installation

A detailed field by field description of the contents of the Link Manager main window may be found in chapter 5.

The procedure required to make the link functional has three phases:

1. Link Installation - which we will detail below.

Installation actually gets the link operational by setting the link parameters. It uses a fixed channel at the lowest possible modulation, BPSK at 6.5Mbps and will work under the harsh interference condition.



Note

During the installation procedure, the definition of all parameters is automatically applied to both sides of the link.

2. Link Configuration - described in chapter 5.

Configuration provides much the same functionality as Installation, but for a running link. A fallback to Installation mode is provided for situations which cannot be handled without resetting the link, such as antenna realignment and IDU or ODU replacement.

The Link Installation and Configuration phases are both carried out with Wizards, which “walk you through” the processes. The Wizards are visually quite similar and will be described in detail below.

3. Site Configuration - described in chapter 6.

Site specific configuration for each side of the link is available at any time
- under a running link or under the restricted Installation mode.

Site Configuration consists of a set of panels, which may be invoked individually in any order, as needed.


Note

An installed and configured link can be returned to installation mode for re-installation and configuration from last settings or from factory settings.

- Reversion to installation mode requires a complete break in the link service
- Configuration mode may vary the service throughput and quality, but without a service break

Default Settings

The default settings of the NetStream configuration parameters are listed in **table 4-3** below:

Table 4-3: Default Settings

Parameter	Default Value
ODU IP Address	10.0.0.120
Subnet Mask	255.0.0.0
Trap destination	0.0.0.0
Manager Login password	admin
Link ID	Link
Site 1	Site
Site 2	Site
Link Password	wireless-bridge
Rate	Adaptive
Ethernet Configuration	Auto Detect
Radio Link Failure Actions	No action
Bridge or Hub mode	Hub Mode, Aging time = 300 sec
Community values	Read-write – netman Read-only – public

Front Panel LEDs on the IDU-C

The front panel LEDs on the IDU provide basic information about link status.

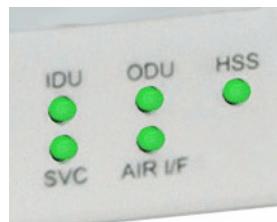


Figure 4-8: IDU-C Front Panel LEDs

The following table describes the indicators:

Table 4-4: Front Panel LEDs

Name	Color	Function
IDU With Ethernet only	Green	During power-up only
	Green	IDU operational
	Red	Failure
ODU	Green	ODU-to-IDU communication link is operating
	Red	ODU-to-IDU communication link is disrupted
AIR I/F	Green	Wireless link is synchronized
	Orange	During installation mode only
	Red	Wireless link lost synchronization
SVC		Off
HSS		Off

Installation Menu and Toolbar Functionality

The Link Manager menu functionality is displayed in [table 4-5](#). The Toolbar buttons are detailed in [table 4-6](#).

Table 4-5: Link Manager main menu functionality

Menu level			Function	Reference
Top	+1	+2		
File				
	Log Off		Return to Log On dialog. Same as Log Off button	
	Exit		Exit the Link Manager. Same as Exit button	
Configuration				
	Link Configuration		Run the Configuration Wizard. Not available in installation mode	
	1 Configure <Site 1 name>		Provides limited configuration for site. Has a path to return to installation mode	
	2 Configure <Site 2 name>		Provides limited configuration for site. Has a path to return to installation mode	
	Link Installation		Runs the Installation Wizard. Not available in configuration mode	
Tools				
	Performance Monitoring Report			
	Active Alarms			
		1 <Site 1 name>	Shows active alarms for <Site 1 name>	
		2 <Site 2 name>	Shows active alarms for <Site 1 name>	
	Change Password		Change the Log On password dialog	page 4-6
	Events Log	Clear Events	Clear local events log	page 7-10
		Save to File	Save events log file	
	Preferences		Local preferences dialog	

Table 4-5: Link Manager main menu functionality (Continued)

Menu level			Function	Reference
Top	+1	+2		
Maintenance				
	Clear counters		Disabled	
	Loopbacks		Disabled	
	Reset			
		1 <Site 1 name>	Reset <Site 1 name> ODU	
		2 <Site 2 name>	Reset <Site 2 name> ODU	
Help				
	Link Manager Help		View online version of the User Manual	
	Link Budget Calculator		Calculator opened in default browser	Appendix D
	Get Diagnostics Information		Obtain system information	page 7-1
	About Link Manager		Manager build and system information	

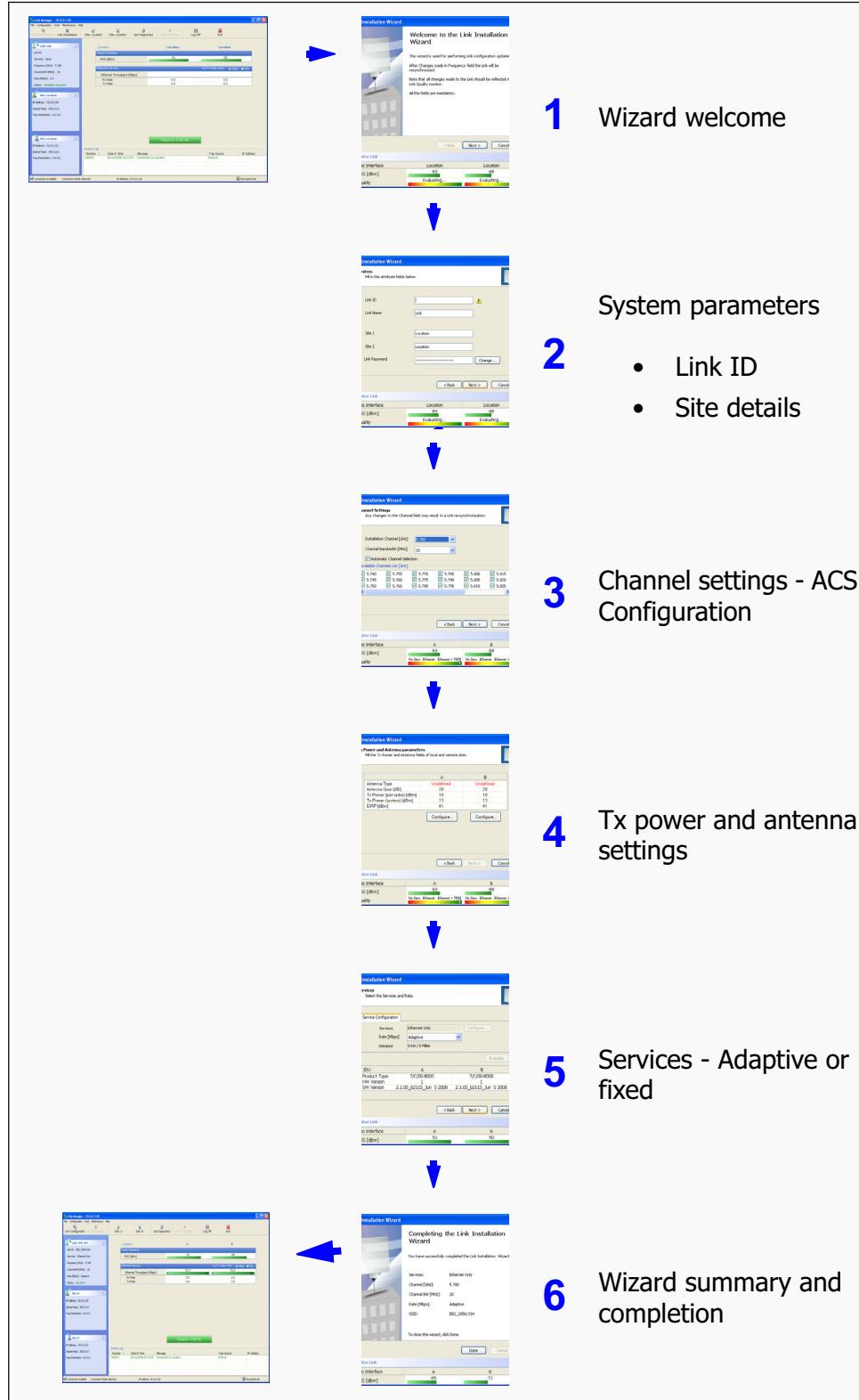
Table 4-6: Link Manager Toolbar

Item	Description
Link Configuration	Changes configuration parameters of an operating wireless link; assigns text files for storing alarms, statistics and configuration data. This button is disabled until a link installation has been completed
Link Installation	Performs preliminary configuration of the system. This button is disabled after the link is installed
Site: <Site 1 name>	Opens the Site configuration dialog for Site A. Same as Configuration 1 Configure <Site 1 name>
Site: <Site 2 name>	Opens the Site configuration dialog for Site B. Same as Configuration 2 Configure <Site 2 name>
Get Diagnostics	Obtain system information
Clear Counters	Disabled
Log off	Closes the current session and logs off Link Manager
Exit	Exits Link Manager

Installing the Link: Overview

The Installation wizard has seven steps as shown in **table 4-7** below.

Table 4-7: Link Installation Wizard



Installing the Link: Step 1, Start the Wizard

In the tool bar of the Link Manager main window, click the **Link Installation** button. The Link Installation button is only accessible if antennas are properly aligned. If this box is “grayed out”, you should align the antennas as set out in [Connecting and Aligning ODUs / Antennas on page 3-12](#).

The Installation Wizard opens:

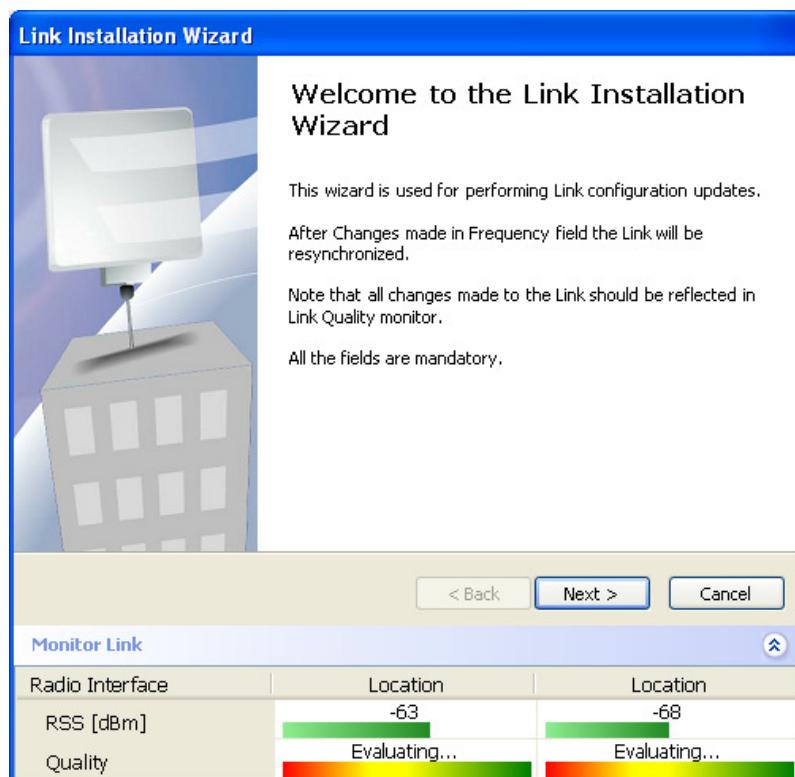


Figure 4-9: Link Installation Wizard

The bottom data area reproduces the corresponding data from the main window - which the above panel obscures. See [page 5-7](#) for a field by field description of this data area.

Click **Next** to proceed with the installation procedure.

Installing the Link: Step 2, System Parameters

The system dialog box opens:

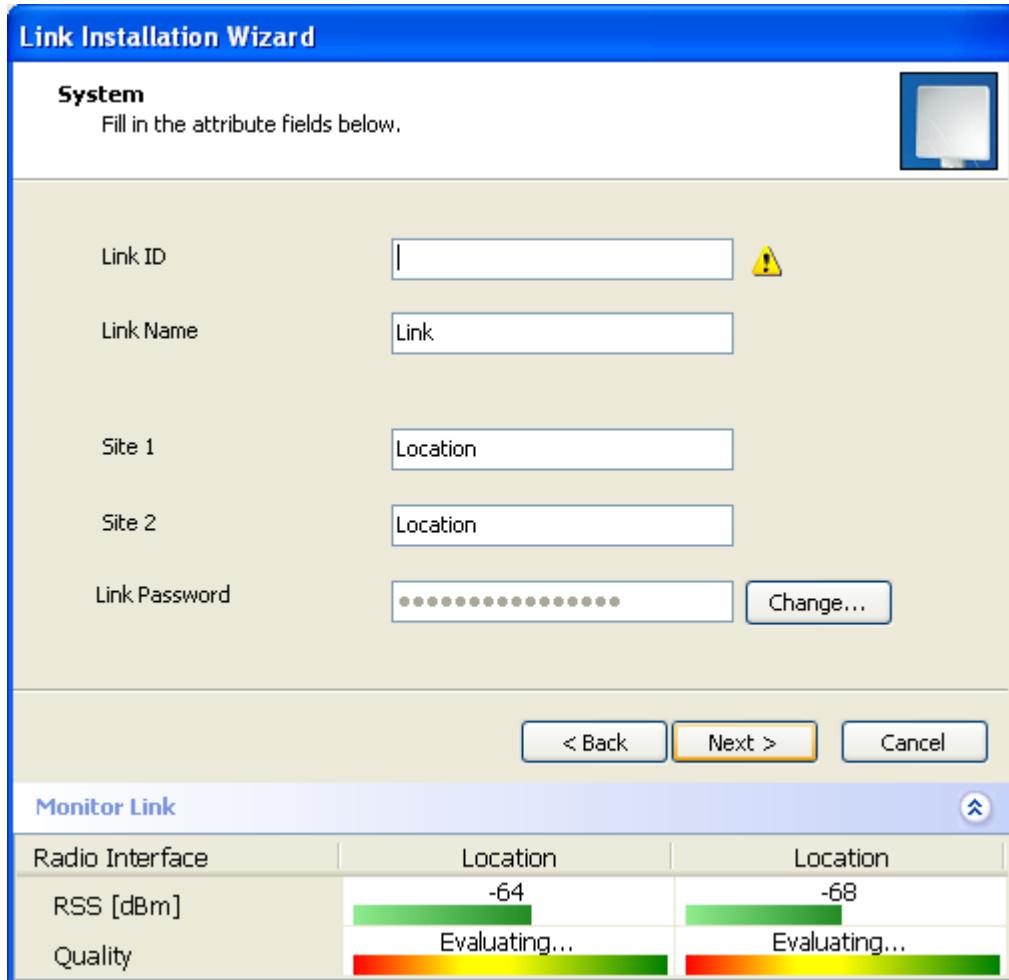


Figure 4-10: : Installation Wizard, System dialog box

➤ To complete Installation Step 2:

1. Enter a Link ID. (Link ID - must be unique for each link in the area). The Link ID must include at least eight alphanumeric characters. Up to 24 characters are allowed. You should use a Link ID composed of both alphabetic and numeric characters.



Note

Both sides of a link must have the same Link ID.

2. Enter a Link Name for the link identification. The default name is "Link". You should change it.
3. Enter names for Site 1 and Site 2. The default names are both "Location". You should change them. Throughout this manual, we use A for Site 1 and B for Site 2.

4. Optionally enter a new Link Password.



Note

If the Link Password is incorrect a link is established but configuration cannot be performed and no services are available. A new link password may be obtained from NetStream 5x100 Customer Support or use the alternative password supplied with the product. (see [for more details](#)).

The link password is peculiar to the link itself and should not be confused with the Link Managerlog on password.

5. Click **Next**.

The default link with a rate of 6.5 Mbps is evaluated.

The Channel Setting dialog box appears. Proceed to [Installing the Link: Step 3, Channel Settings](#), below.

Changing the Link Password

The default password is **wireless-bridge**. Optionally, you can change the link password as explained here.

► To change the link password:

1. Click the Change button in the System dialog box.

The Change Link Password dialog box opens.



Note

Use the Hide characters check box for maximum security



Figure 4-11: Change Link Password dialog box

2. Enter the current link password (The default link password for a new ODU is wireless-bridge).

If you have forgotten the Link Password, click the Forgotten Link Password button. The following window is displayed:

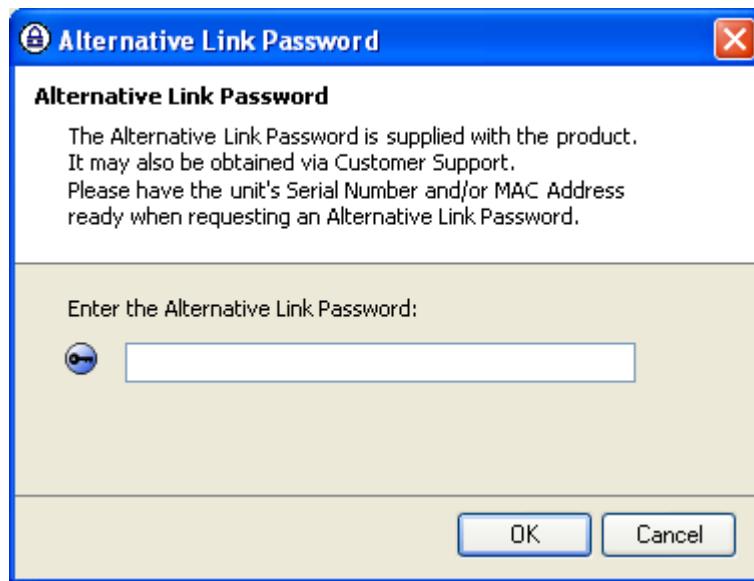


Figure 4-12: Lost or forgotten Link Password recovery

Follow the instructions to use the Alternative Link Password, and click **OK** to finish. You are returned to the window in [figure 4-11](#) above. Continue with the next step.

3. Enter a new password.
4. Retype the new password in the Confirm field.
5. Click **OK**.
6. Click **Yes** when asked if you want to change the link password.
7. Click OK at the Password changed success message.



Note

- Restoring Factory Defaults returns the Link Password to **wireless-bridge**.
- If the link is inactive, then the link password may also be changed from the Site Configuration dialogs. See [page 6-14](#).

Installing the Link: Step 3, Channel Settings

NetStream systems have a feature called Automatic Channel Selection (ACS). In the event of sync loss, ACS chooses the first available channel in a list of monitored channels nominated in the Channel settings window of [figure 4-13](#) below. A channel switch takes place sufficiently fast as to ensure no loss of service.

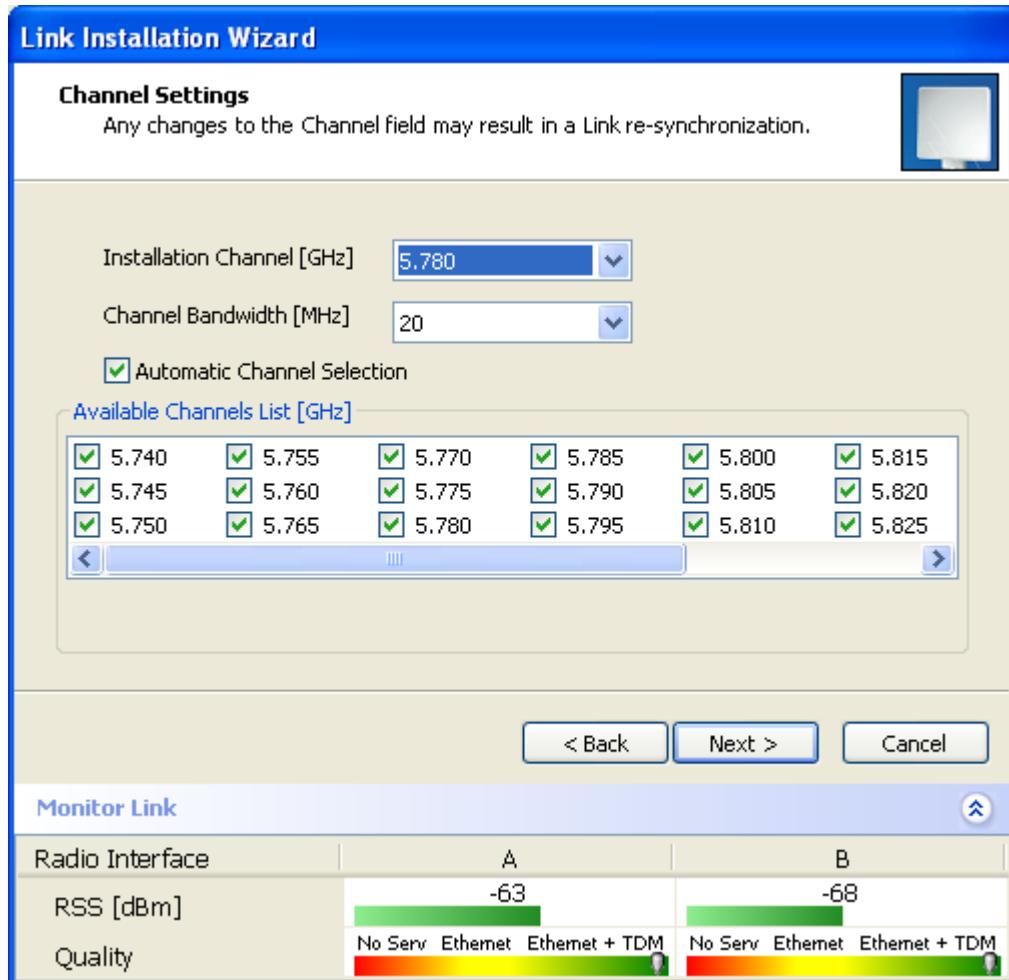


Figure 4-13: Channel Settings - Automatic Channel Selection

The default frequency for the product is shown.

➤ **To select channels to be used by the link:**

1. Select the main frequency from the Installation Channel box.

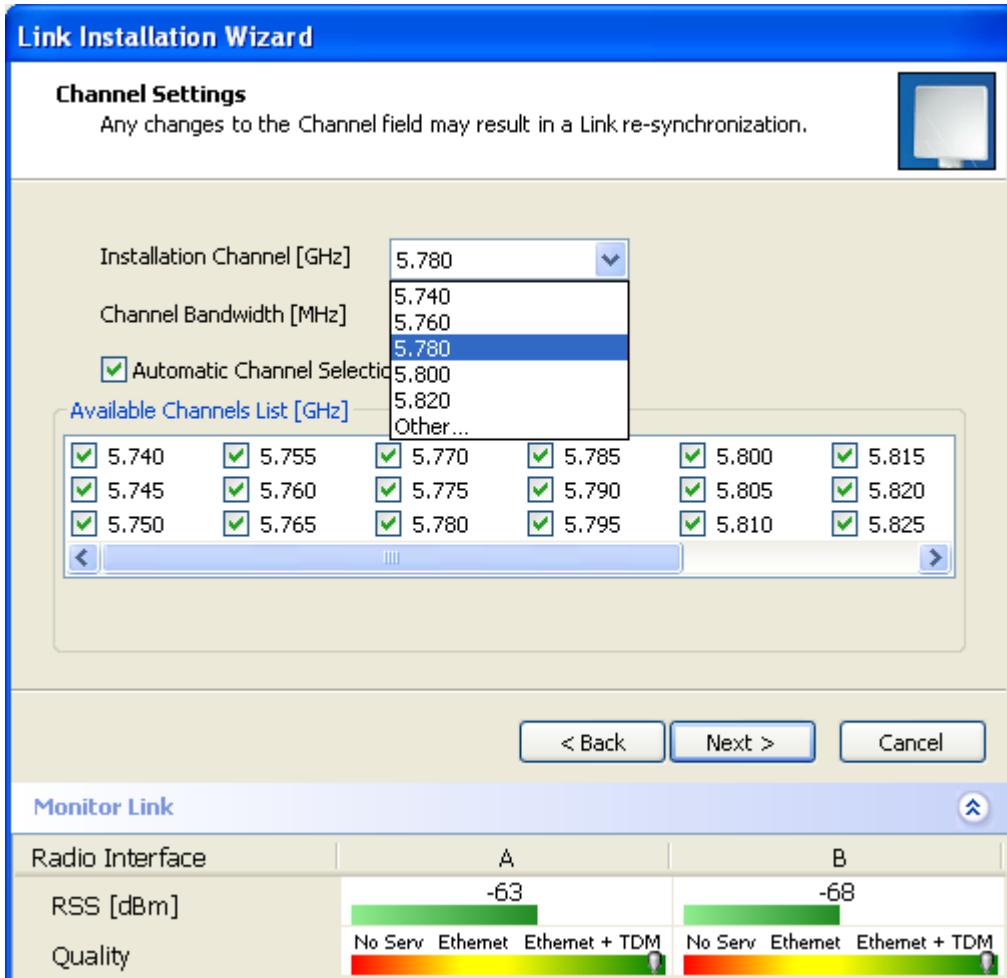


Figure 4-14: Channel Settings - Showing available installation rates



Note

For version 2.1, channel bandwidth is set to 20 MHz and cannot be changed.

2. Click the check box if Automatic Channel Selection is required.
 3. The Available Channels List contains all of the allowable channels for the link. Check the channels that can be automatically selected.
- Selecting a new channel causes the system quality to change. The Quality bar provides an indication of the link quality from poor (red) to good (green) as shown in the bottom of [figure 4-13](#) above.
4. Click **Next**.

Installing the Link: Step 4, Tx Power and Antenna Settings

The Tx Power and Antenna Parameters dialog appears.

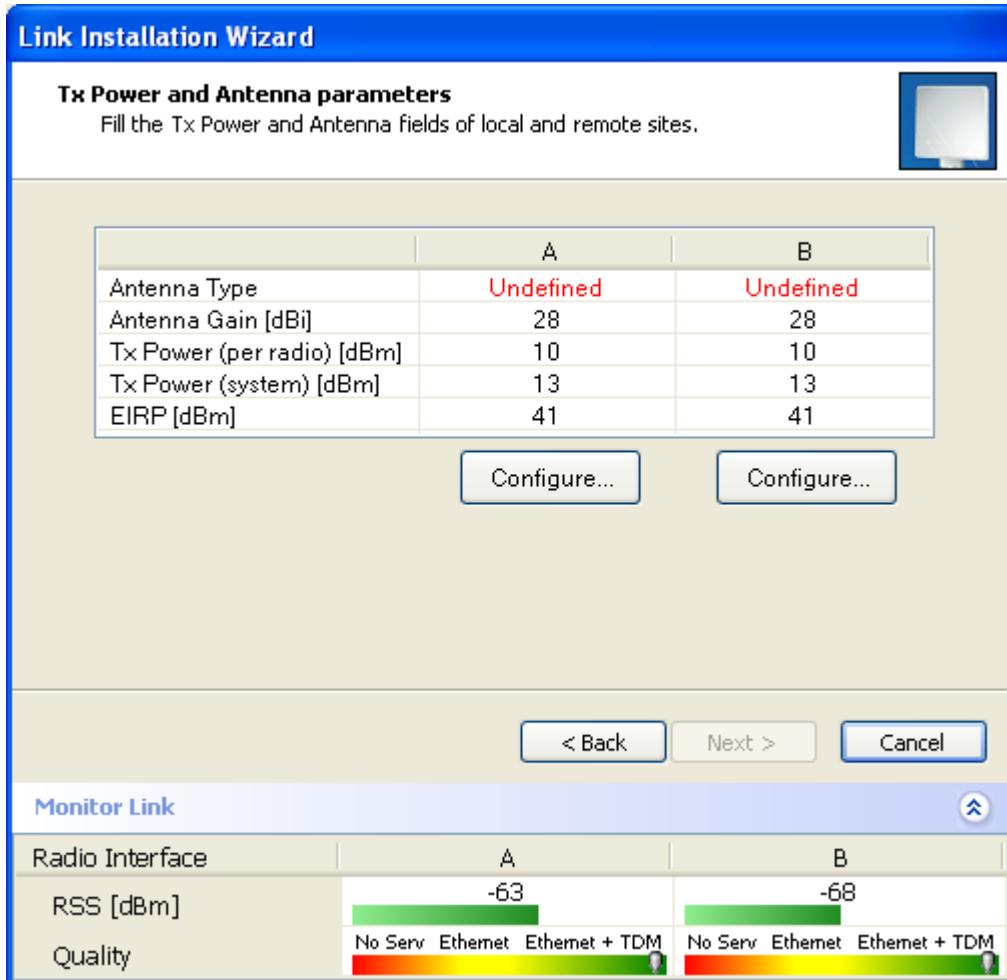


Figure 4-15: Transmission Power and Antenna Parameters

The choice of Tx power, antenna gain and cable loss determines the EIRP and is affected by such considerations as radio limitations and regulatory restrictions.

Before proceeding to antenna installation details, the following background information should be considered:

General

Each NetStream ODU is made of two radio transceivers (radios). The radios make use of algorithms that utilize both polarization and space diversity resulting in enhanced capacity, range and link availability. The number of antennas (i.e. radios) used is determined by user configuration and by automatic system decisions, explained below.

Dual Antennas at Both Sites

Using dual antennas at both sites (single bipolar antenna or two monopolar antennas) enables the use of MIMO technology. With MIMO the system doubles the link capacity. At the same time, it keeps the same rate and modulation per radio as was used with single antenna, thus increasing capacity, range and availability.

For example with a dual antenna NetStream can transmit at modulation of 64QAM and FEC of 0.83 and get an air rate of 130 Mbps, compared to 65 Mbps with single antenna.

To work in this mode, each antenna port must be connected to an antenna, the RSS level in both receivers should be balanced and a minimal separation between the antennas must be maintained. (For example, by using dual polarization antennas a cross polarization separation is attained).

Upon selecting Antenna Type as Dual, NetStream automatically doubles the air rates.

Link Manager indicates a case of unbalanced RSS between the two antennas.

Single Antennas at Both Sites

By selecting a single antenna at both sites the ODUs operate with a single radio that is connected to the ANT 1 connector. The second radio is automatically shut down.

Single and Dual Antennas

In this mode one of the sites uses the ODU with a single antenna while the other site uses the ODU with a dual antenna.

The advantages in this mode in comparison to using a single antenna in both sites are doubled total Tx power and additional polarization and/or space diversity.

NetStream automatically switches to this mode if one of the ODUs is connected to a dual antenna or if the RSS at one of the ODU receivers is below minimal level.

The air rates used in this mode are same as when using single antennas in both sites.

The rates used by NetStream are shown in Table 4-5 below:

Table 4-8: NetStream5x100 Transmission rates

Radio	Modulation	FEC	Air-Rate [Mbps]
Single	BPSK	1/2	6.5
Single	QPSK	1/2	13
Single	QPSK	3/4	19.5
Single	16QAM	1/2	26
Single	16QAM	3/4	39
Single	64QAM	2/3	52
Single	64QAM	3/4	58.5
Single	64QAM	5/6	65
Dual	BPSK	1/2	13
Dual	QPSK	1/2	26
Dual	QPSK	3/4	39
Dual	16QAM	1/2	52
Dual	16QAM	3/4	78
Dual	64QAM	2/3	104
Dual	64QAM	3/4	117
Dual	64QAM	5/6	130

Considerations for Changing Antenna Parameters

Let:

maxAllowedTx Power denote the maximum Tx Power practically available from an ODU. It appears as **Tx Power per Radio** in [figure 4-16](#) below.

maxRegEIRP denote the maximum EIRP available by regulation. It will be determined by three factors:

- per band/regulation
- per channel bandwidth
- antenna gain

It appears in [figure 4-16](#) as **Max EIRP**.

maxRegTxPower denote the maximum regulatory Tx Power for the equipment, also having regard the above three points

maxODUTxPower denote the maximum Tx Power of the ODU, itself depending on the air rate used.

Then, the following relationship must be satisfied:

$$\text{maxAllowedTxPower} \leq \min(\text{maxRegEIRP} - \text{AntennaGain} + \text{CableLoss}, \text{maxRegTxPower}) \quad \dots (*)$$

These parameters are controlled as follows:

➤ To set Tx power and configure antennas:

1. Click the Configure buttons in turn to configure the antennas on both sides of the link. Each one offers a dialog like this:



Figure 4-16: Antenna configuration dialog with opened type selection

2. Choose the antenna type and required transmission (Tx) power for the first site and click **OK**. Repeat the process for the second site.

The Tx power (per radio) indicates the power of each radio inside the ODU and is used for Link Budget Calculations. The Tx power (System) shows the total transmission power of the ODU and is used to calculate the EIRP according to regulations.



Note

To see the relationship between Tx Power (radio) and TX Power (system), note that $\text{dBm} = 10 \times \log_{10} \text{milliWatt}$ so that if you double the power in milliWatts (for two radios) then dBm will increase by $10 \times \log_{10} 2 \approx 3$.

3. Set the Antenna Gain and Cable Loss. If do this you will receive a warning message:

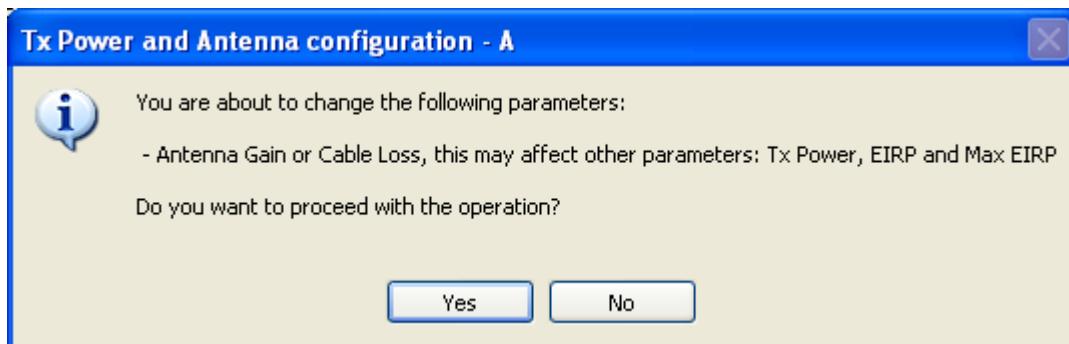


Figure 4-17: Antenna parameters change warning



- The Max EIRP level will be automatically set according to the selected band and regulation.
- The EIRP level is the sum of the System Tx power and the Antenna Gain minus the Cable Loss.

If inequality (*) above is violated, then the following warning window is displayed:

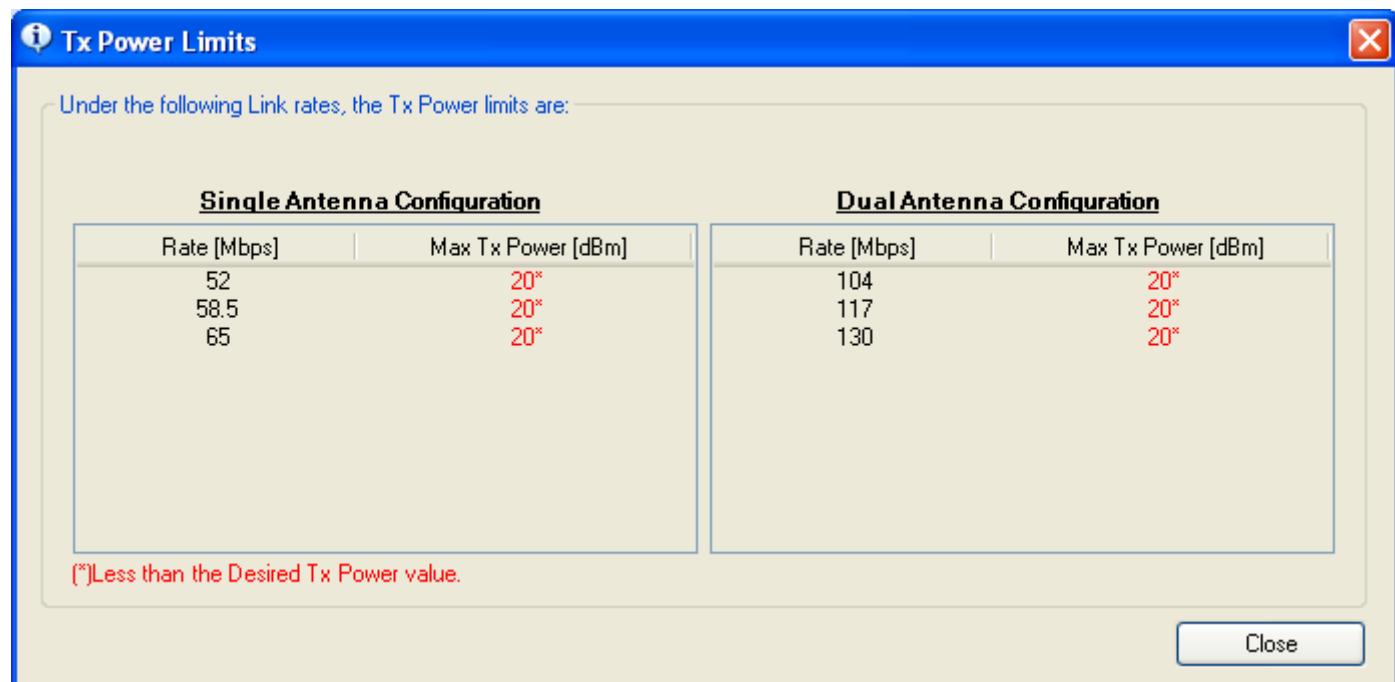


Figure 4-18: Tx Power Limits

The precise relationship between the items in inequality (*) and the window of **figure 4-16** is follows:

- Required Tx Power (per radio) will be adjusted down to the lesser of the value entered and **maxAllowedTxPower**
- TxPower (system) is **maxAllowedTxPower + 3** (for 2 radios)
- Max EIRP is **maxRegEIRP**.
- EIRP is **maxAllowedTx Power + Antenna Gain - Cable Loss**

The table in [figure 4-18](#) only shows rates where the maximum Tx Power is the limitation, rather than regulations.



Note

Recall that **maxAllowedPower** and **maxEIRP** are regulatory. In an unregulated environment, the only limit is **maxODUTxPower**.

When you close the window of [figure 4-18](#), the change you requested will **not** be honored, and you will need to try again.

4. When you are finished with Tx Power configuration, Click **Next**.

Installing the Link: Step 5, Services

The Services dialog appears:

IDU	A	B
Product Type	7/C/00-B000	7/C/00-B000
HW Version	1	1
SW Version	2.1.05_b2115_Jun 5 2008	2.1.05_b2115_Jun 5 2008

Radio Interface	A	B
RSS [dBm]	-51	-50

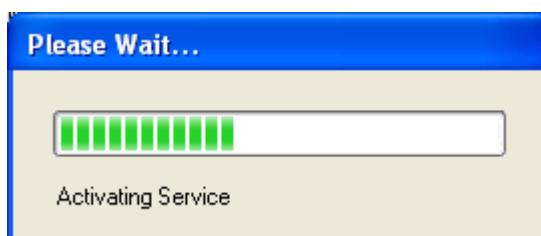
Figure 4-19: Services and Rates dialog

For version 2.1, Ethernet Only is the only available service. You may choose a specific modulation rate or use Adaptive.

➤ To choose a modulation rate:

1. Choose Adaptive or one of the available rate (see [page 1-3](#) for information about Automatic Adaptive Rate).
2. Click **Next** to continue.

The service is activated as shown below:



Installing the Link: Step 6, Installation Summary and Exit

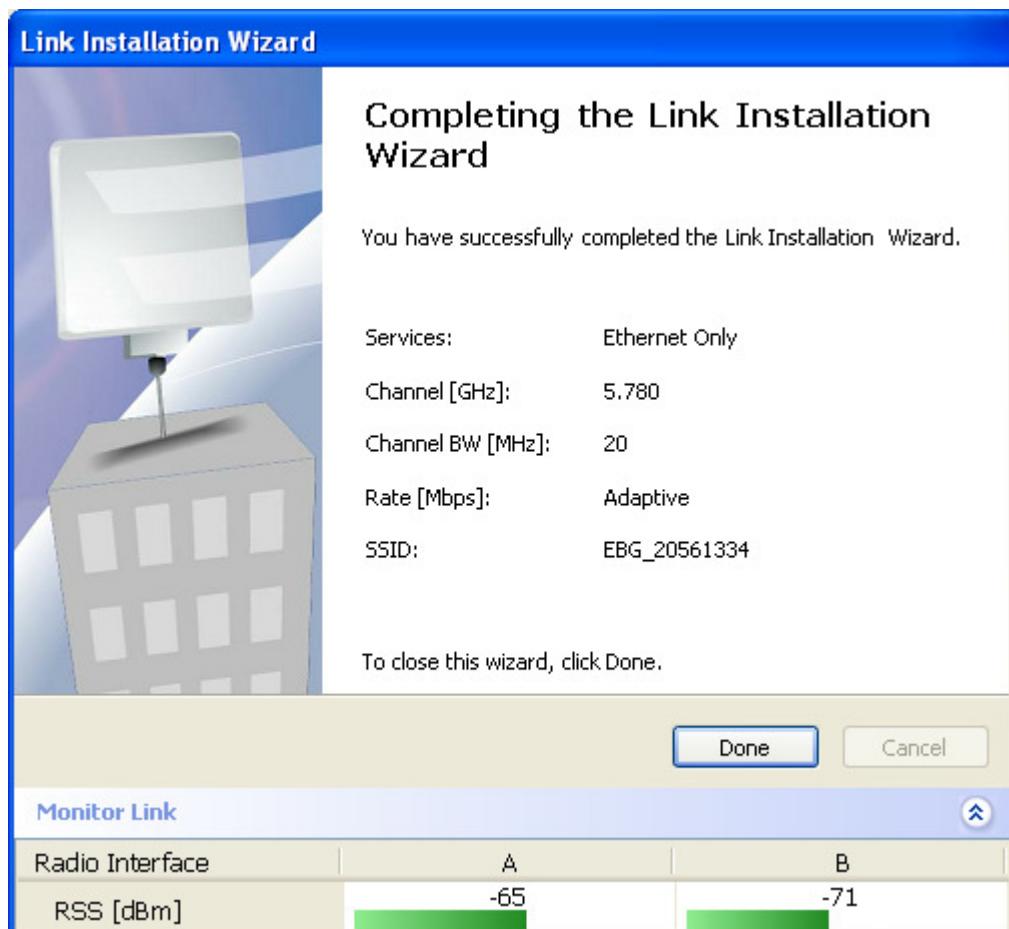


Figure 4-20: Installation Wizard Exit Summary

Click **Done** to return to the main window.

The main window now reflects the installation:

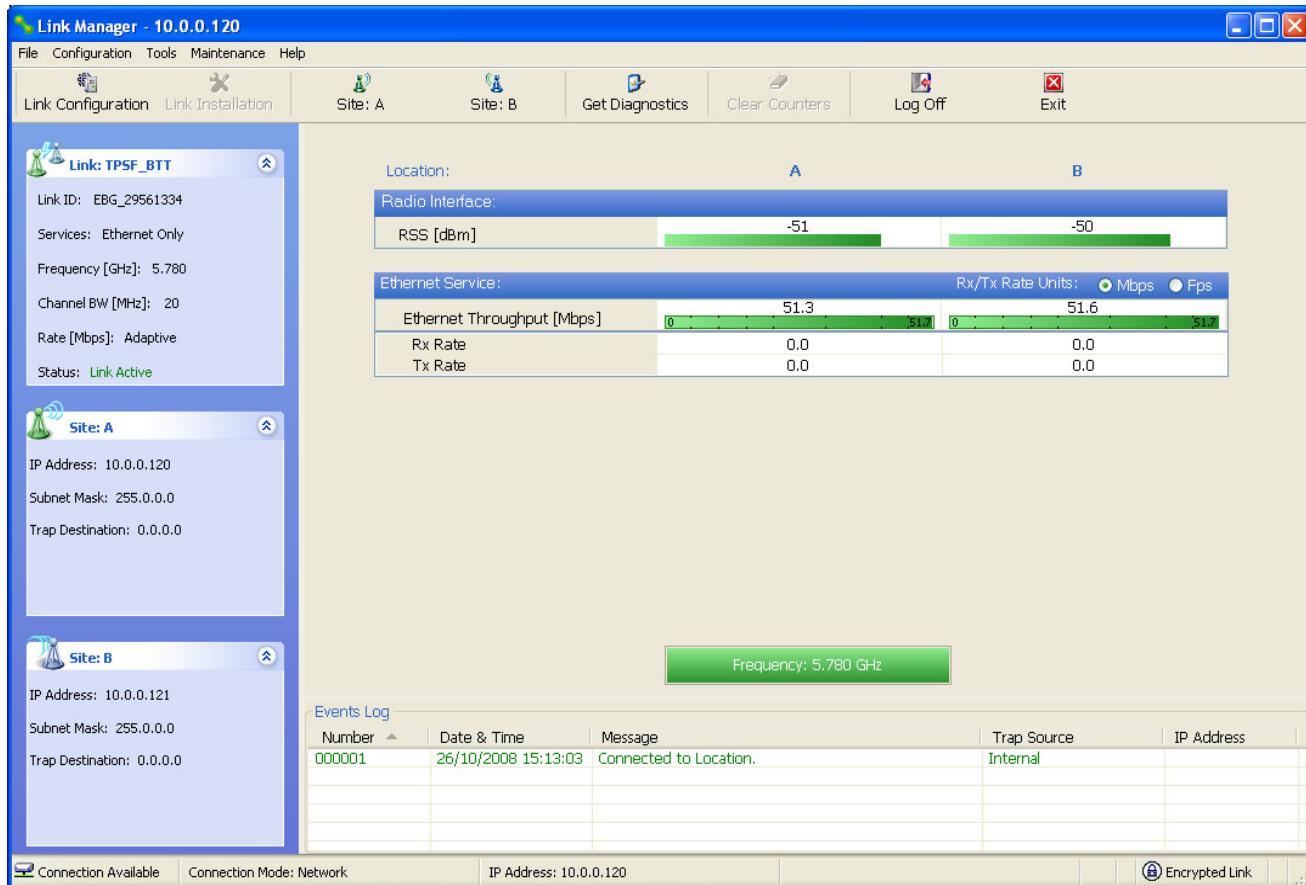


Figure 4-21: Main window of the manager after installation

➤ To verify the installation:

- Verify that the Radio Signal Strength (RSS) is according to expected results as determined by the Link Budget Calculator.



Caution

Installation mode, as described above, may be re-entered using **Configuration | 1 Configure Site A and Installation Mode** the Site Configuration dialog. Some Installation mode functionality may cause a break in link service.

If you can accomplish link changes without breaking the service, always prefer to use Configuration mode, described in chapter [5](#).

Chapter 5

Configuring the Link

This chapter describes the link configuration procedure, which is performed after the installation of both sides of the NetStream link, as set out in chapters [3](#) and [4](#).

Link configuration uses a Link Configuration Wizard to redefine the configuration parameters and fine-tune an operational link. Both sides of the link are configured simultaneously.

The following parameters are configured using the Link Configuration Wizard:

- System parameters
- Channel settings
- Transmission power and antenna settings
- Service parameters

Link Configuration: Getting Started

The Main Window of the Link Manager

Ensure that the Link Manager is running.

The main window should look similar to that in [figure 5-1](#):

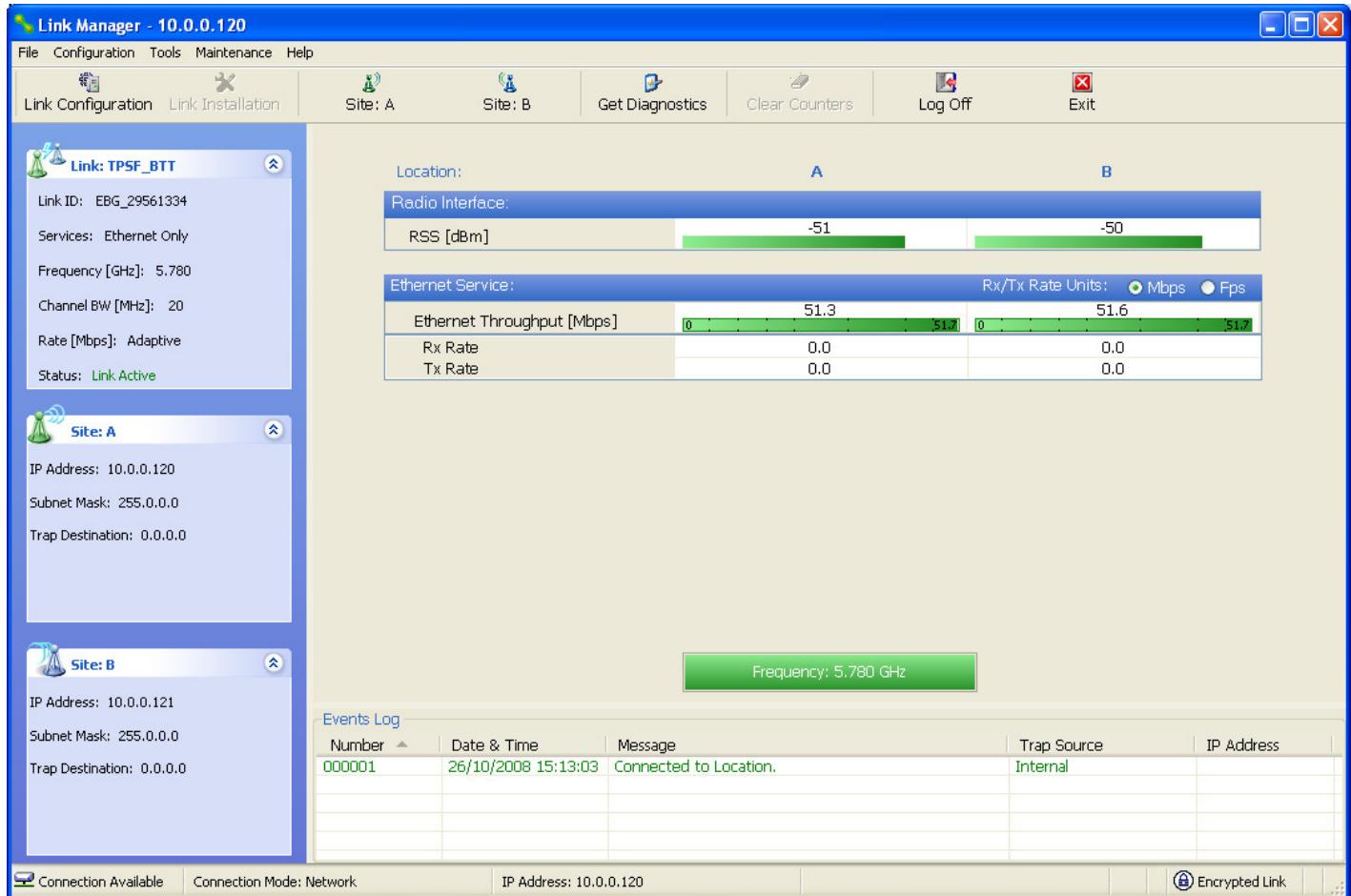


Figure 5-1: Main Window, NetStream is Active

Before starting a configuration session, make sure that a communication link exists between the two sides of the link.

The Link Status indication bar must be green. In the Link Status panel, the Status field should show Link Active in green.

The main window of the Link Manager contains a large amount of information about the link. Before proceeding to details of link configuration we set out the meaning of each item in the main window.

The Link Manager Toolbar

In configuration mode, the Link Manager toolbar contains the following buttons:

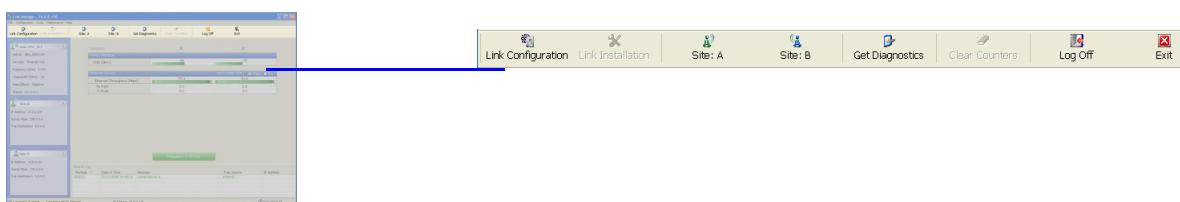


Table 5-1: Link Manager Toolbar

Item	Description
Link Configuration	Changes configuration parameters of an operating wireless link; assigns text files for storing alarms, statistics and configuration data. This button is disabled until a link installation has been completed
Link Installation	Performs preliminary configuration of the system. This button is disabled after the link is installed
Site: <Site 1 name>	Opens the Site configuration dialog for Site A. Same as Configuration 1 Configure <Site 1 name>
Site: <Site 2 name>	Opens the Site configuration dialog for Site B. Same as Configuration 2 Configure <Site 2 name>
Get Diagnostics	Obtain system information
Clear Counters	Disabled
Log off	Closes the current session and logs off Link Manager
Exit	Exits Link Manager

The Link Manager Main Menu

The Link Manager menu, is shown in [table 5-2](#) below:

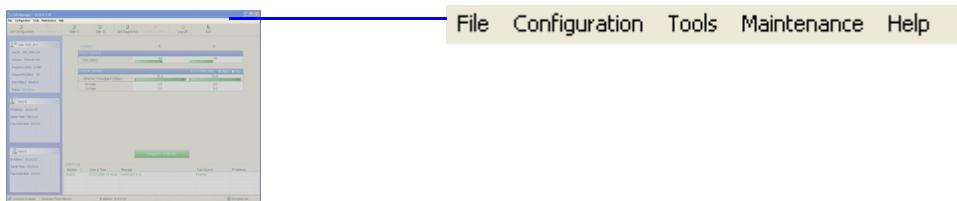


Table 5-2: Link Manager main menu functionality

Menu level			Function	Reference
Top	+1	+2		
File				
	Log Off		Return to Log On dialog. Same as Log Off button	
	Exit		Exit the manager. Same as Exit button	
Configuration				
	Link Configuration		Run the Configuration Wizard. Not available in installation mode	
	1 Configure <Site 1 name>		Provides limited configuration for site. Has a path to return to installation mode	
	2 Configure <Site 2 name>		Provides limited configuration for site. Has a path to return to installation mode	
	Installation		Runs the Installation Wizard. Not available in configuration mode	
Tools				
	Performance Monitoring Report			
	Active Alarms			
		1 <Site 1 name>	Shows active alarms for <Site 1 name>	
		2 <Site 2 name>	Shows active alarms for <Site 1 name>	
	Change Password		Change the Log On password dialog	page 4-6
	Events Log			page 7-10
		Clear Events	Clear local events log	
		Save to File	Save events log file	
	Preferences		Local preferences dialog	

Table 5-2: Link Manager main menu functionality (Continued)

Menu level			Function	Reference
Top	+1	+2		
Maintenance				
	Clear counters		Disabled	
	Loopbacks		Disabled	
	Reset			
		1 <Site 1 name>	Reset <Site 1 name> ODU	
		2 <Site 2 name>	Reset <Site 2 name> ODU	
Help				
	Link Manager Help		View online version of the User Manual	
	Link Budget Calculator		Calculator opened in default browser	Appendix D
	Get Diagnostics Information		Obtain system information	page 7-1
	About Link Manager		Manager build and system information	

Elements of the Link Manager Main Window

Link details pane

The Link details pane on the left is split into three sections. The top section summarizes information about the link:

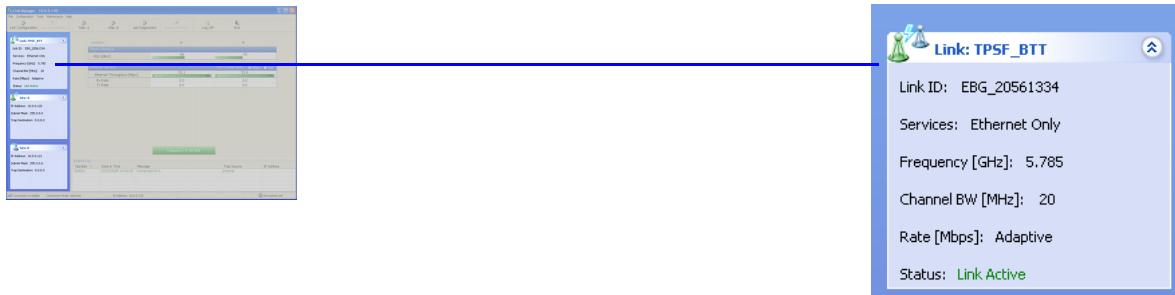


Table 5-3: Link Details

Item
Link ID
Services selected
Frequency
Channel bandwidth
Rate
Link status

The two lower panels show basic link site details:

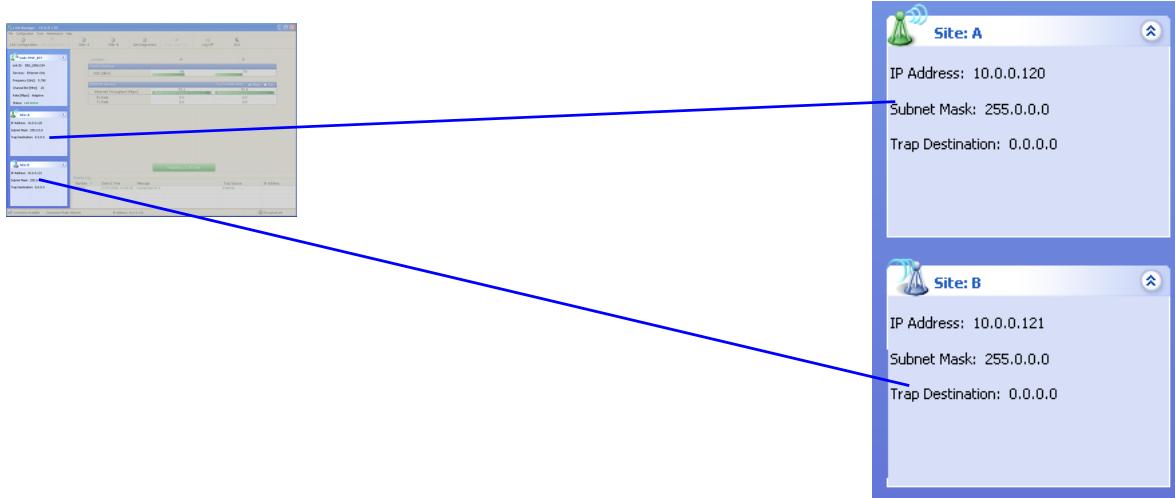


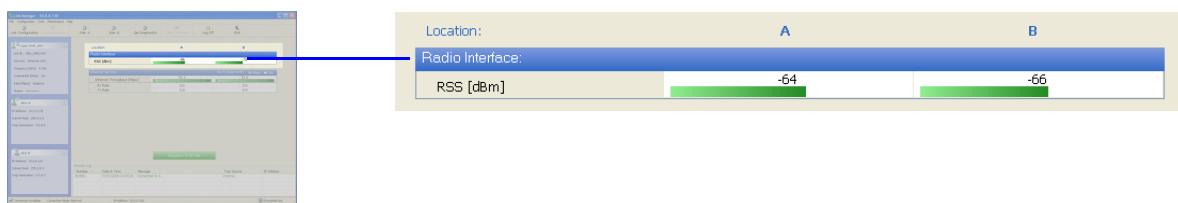
Table 5-4: Link site details, Site A and Site B

Item
IP Address
Subnet Mask
Trap Desalination

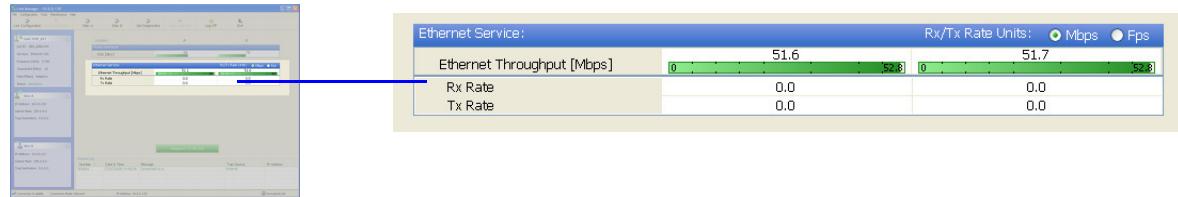
Monitor pane

The monitor pane, is the main source of real time information about link performance at both link sites. It includes the following panes (top to bottom):

- Radio Interface, Received Signal Strength (RSS) in dBm



- Ethernet Service:



- Ethernet Throughput: The numbers are the current calculated throughputs at each site. The colored bars (with numbers) indicate the maximum possible throughput having regard for air conditions.
- Rx and Tx Rates: Actual Ethernet traffic received and transmitted rates per site, in Mbps or Fbps.

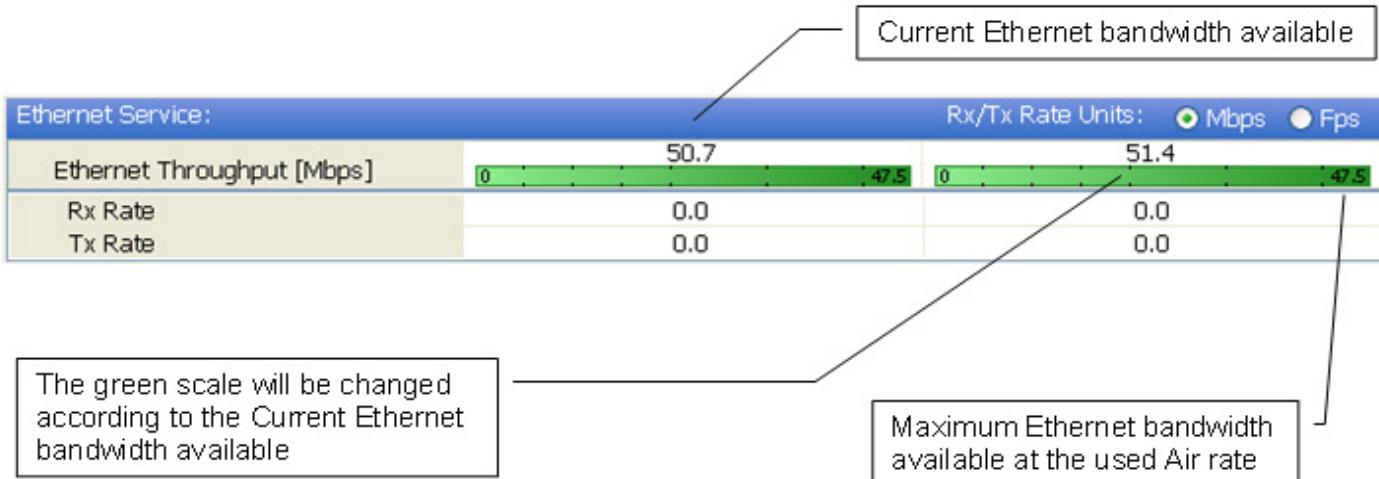
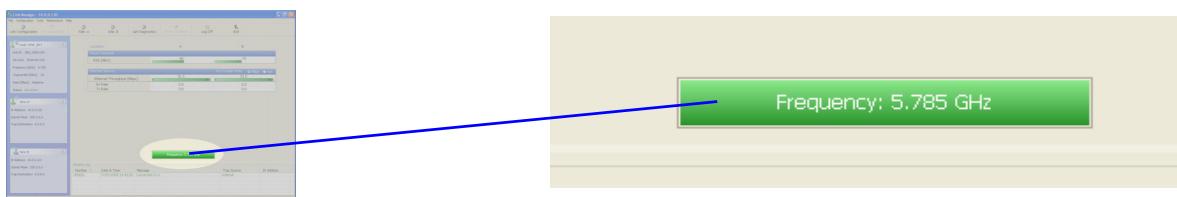


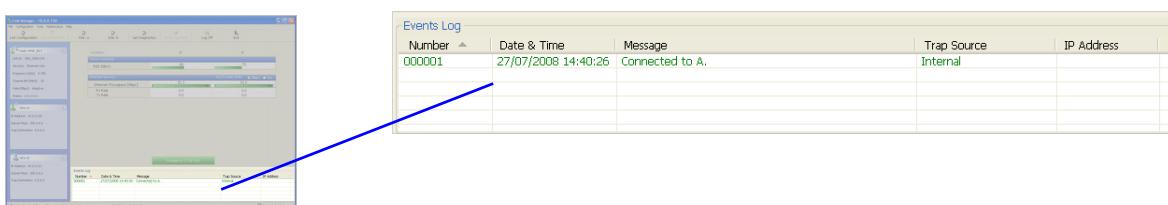
Figure 5-2: Ethernet Bandwidth Indication



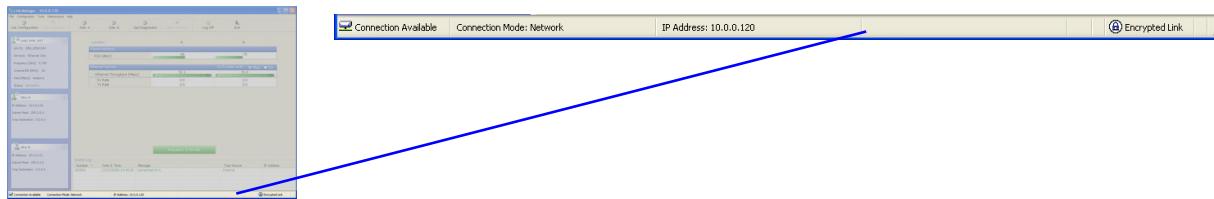
- Frequency box: It shows the link frequency. The color of the box indicates the status
 - **Green** is an active link
 - **Red** is an inactive link
 - **Magenta** shows an authentication or compatibility problem
 - **Brown** shows severe compatibility problem

Events Log

The Events Log, stores alarms generated from both sides of the link and is detailed in chapter [7, The Events Log](#).



Status Bar



The Status bar, displays the following icons:

Table 5-5: Status bar indicators

Icon or Label	Purpose
Connectivity	Shows if Link Manager is communicating with the ODU.
Connection available	Connection mode to the ODU <ul style="list-style-type: none"> Over-the-Air connection - using the IP address of the remote unit. Local connection - direct connection to the IDU without using an IP address. Network connection - through a LAN
IP Address	Login IP address
Encryption indicator	Normally encrypted link Link password validation failed. The link is encrypted with default keys. Service and configuration are unavailable. Change the link password.



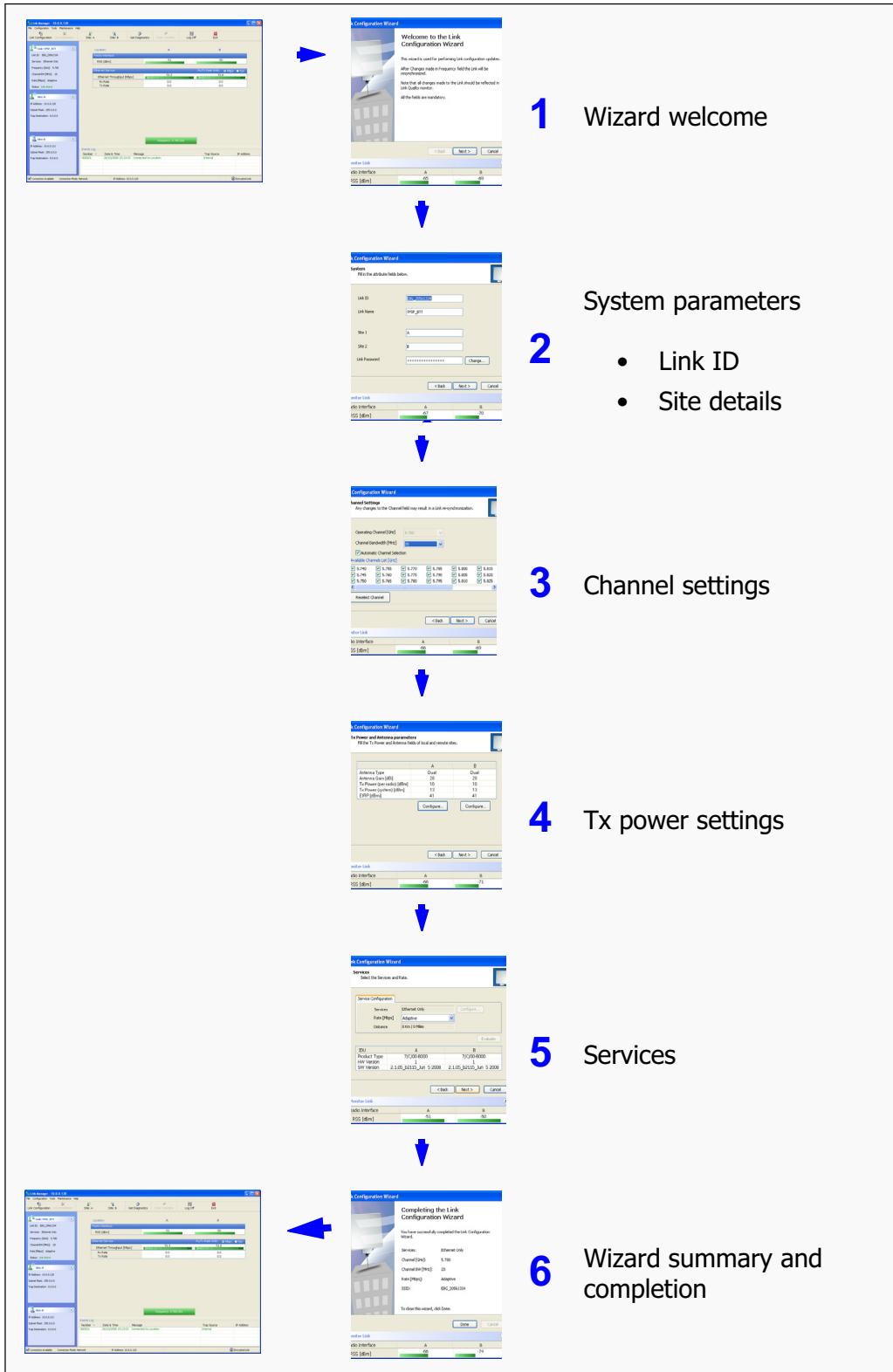
Note

There are several "floating" icons, which appear under specific conditions

Configuring the Link: Overview

The Configuration Wizard has seven steps as shown in **table 5-6** below.

Table 5-6: Link Configuration Wizard



Since configuration functionality is included in the installation, we will briefly review the main steps and for most part offer references to the corresponding installation step.

Configuring the Link: Step 1, Start the Wizard

In the tool bar of the Link Manager main window, click the **Link Configuration** button. The Link Configuration button is only accessible on a fully installed link as set out in chapter 4.

The Configuration Wizard opens:

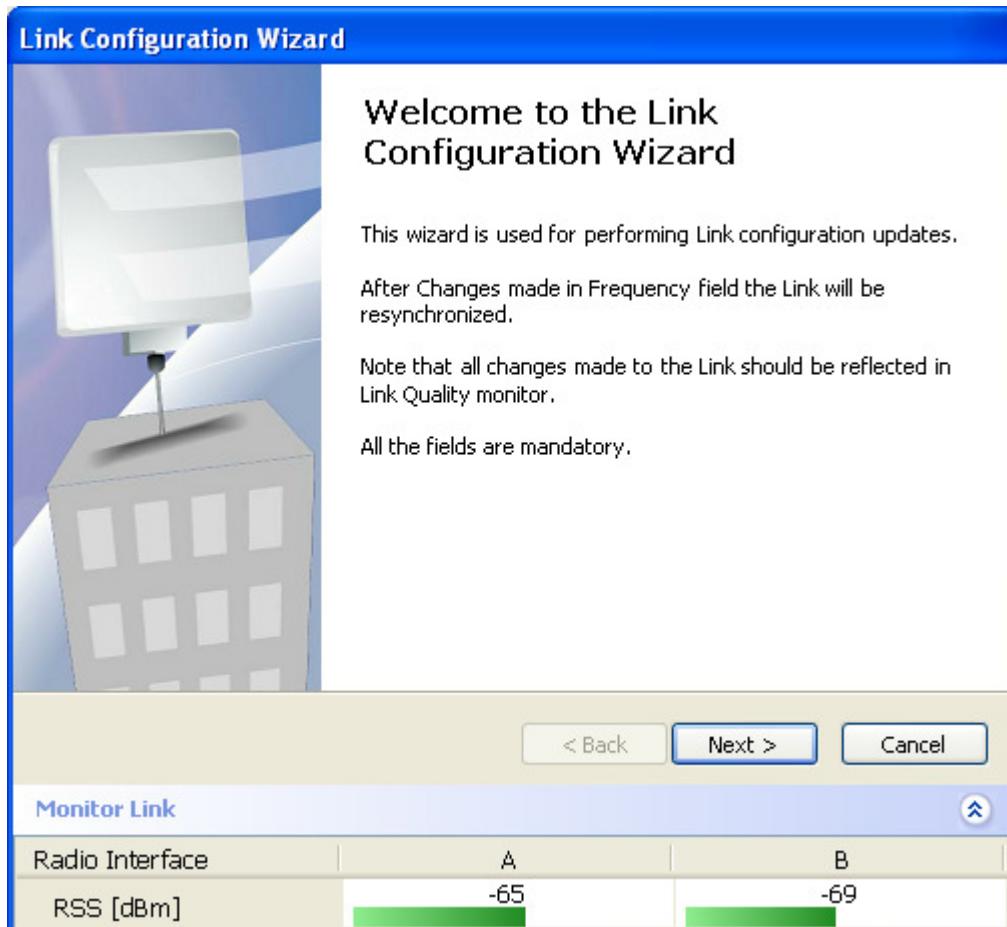


Figure 5-3: Link Configuration Wizard

Click **Next** to proceed with the configuration procedure.

Configuring the Link: Step 2, System Parameters

The System dialog box opens:

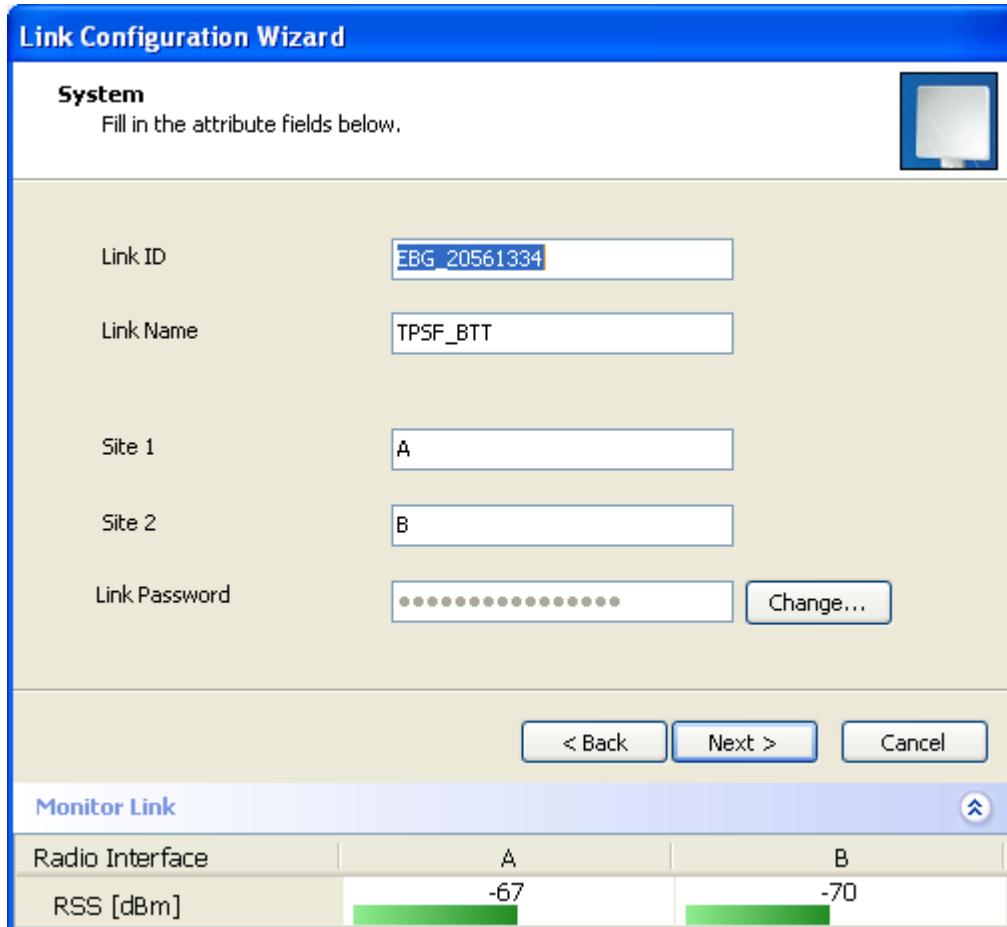


Figure 5-4: Configuration Wizard, System dialog box

The System attributes may be edited and the Link Password may be changed exactly as in the corresponding Link Installation step on [page 4-13](#).

Click **Next** to continue.

Configuring the Link: Step 3, Channel Settings

Configuring the Channel Settings follows the same pattern as the Installation procedure:

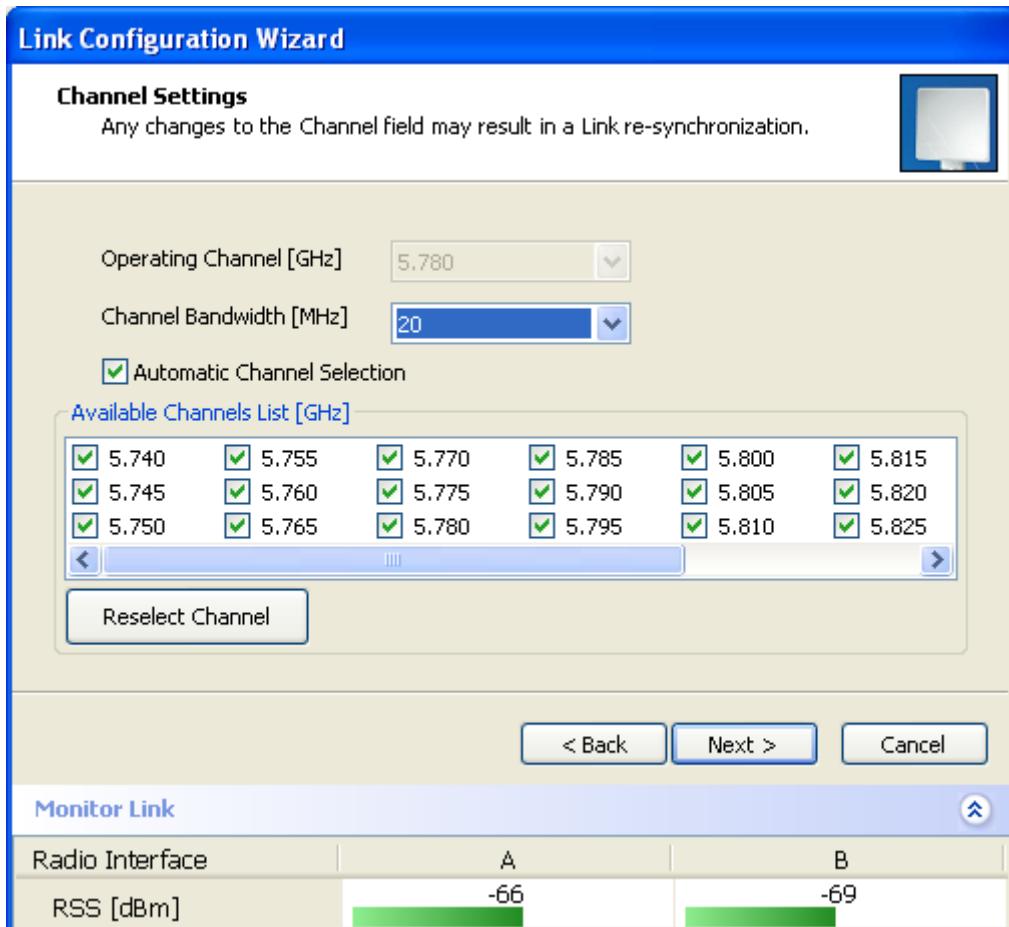
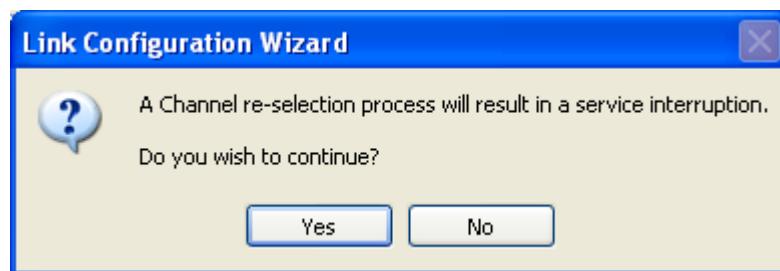


Figure 5-5: Channel Settings dialog box - Automatic Channel Selection

Notice that the operating channel is grayed out. If you use the **Reselect Channel** button, to change it, you will be asked for confirmation:



If you accept, then the system will search for the best operating channel:

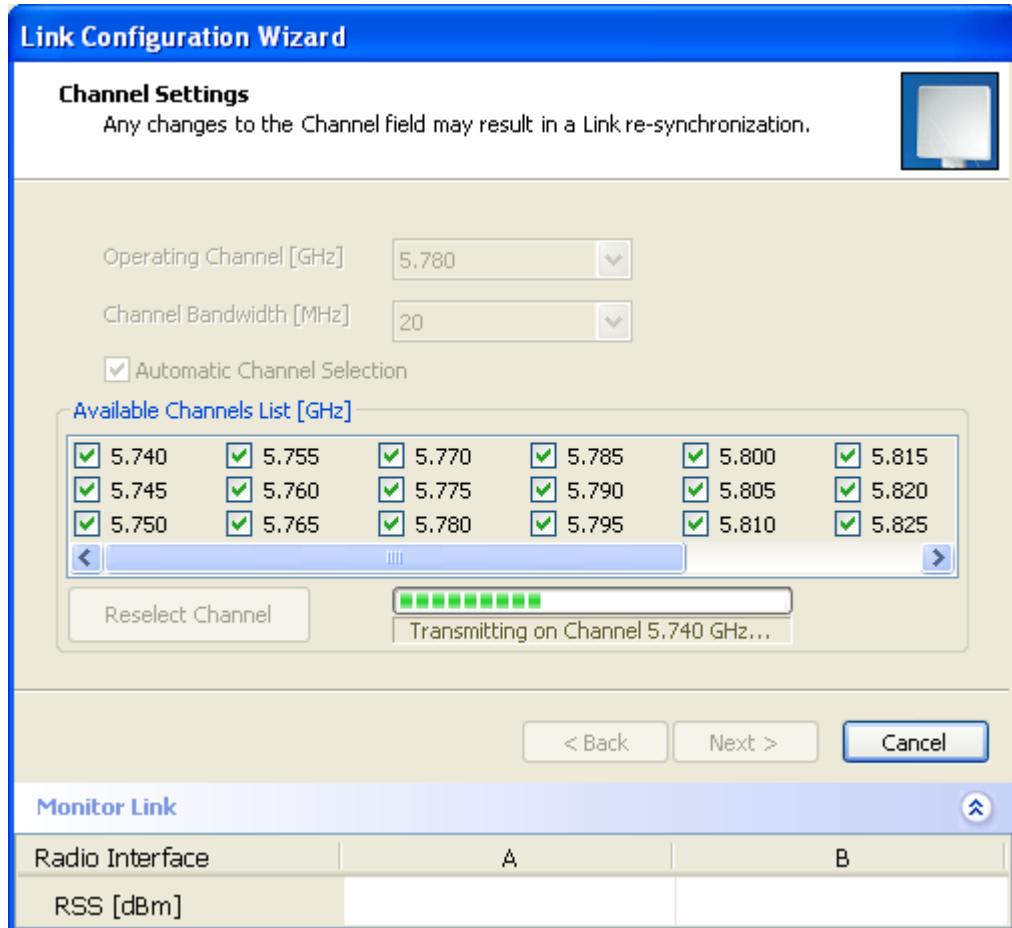


Figure 5-6: Searching for the best operating channel

The link will return to the status of [figure 5-5](#) above with a possible change to the operating channel.

If you work without automatic channel selection, the Channel Settings window looks like this:

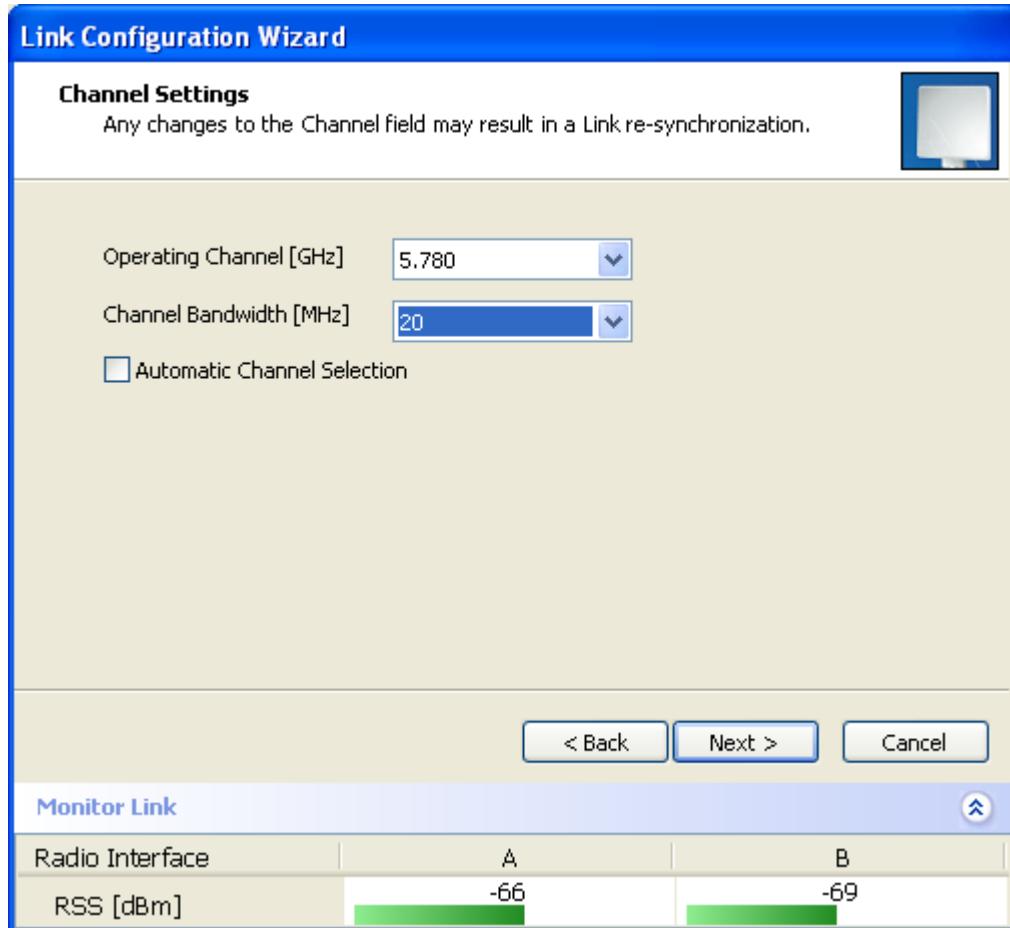


Figure 5-7: Channel Settings without automatic channel selection

If you click the Operating Channel drop-down list, the following window appears:

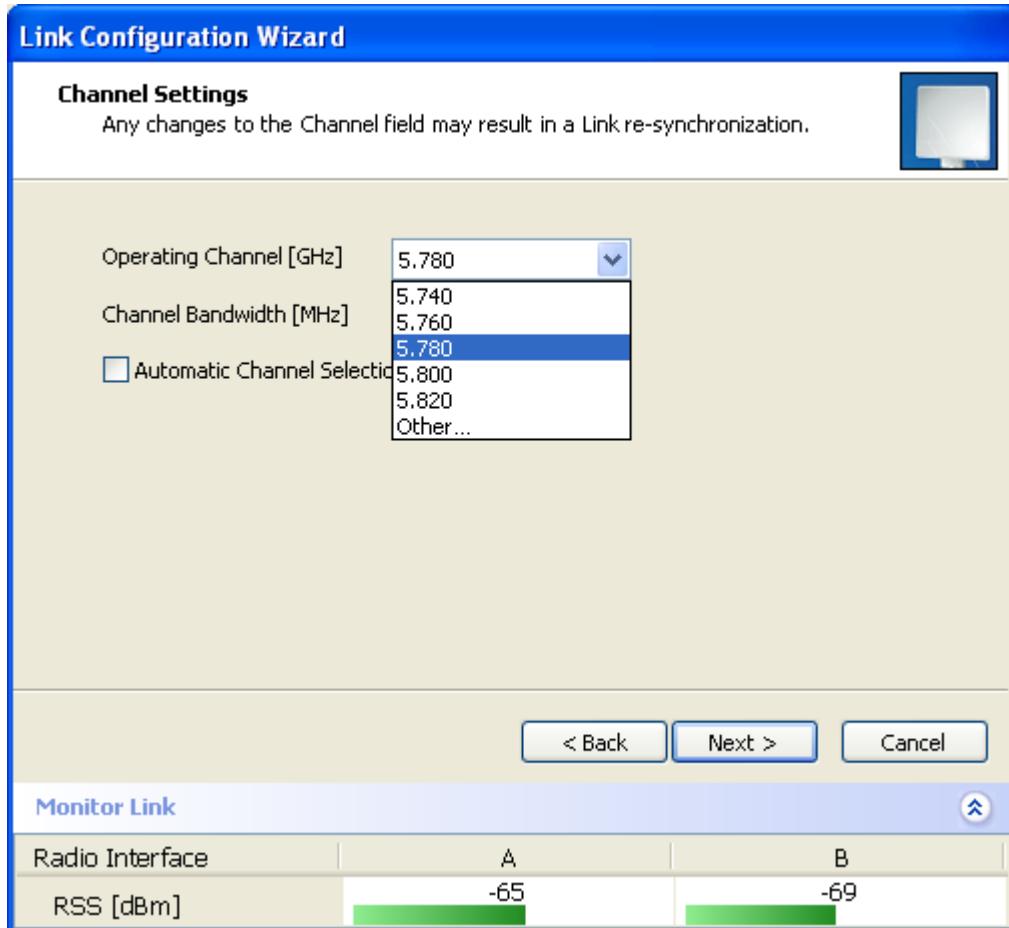


Figure 5-8: Channel frequency options

Selecting one of the frequencies presented returns you to the status of [figure 5-7](#) with the appropriate change. If you choose **Other...**, the following window opens:

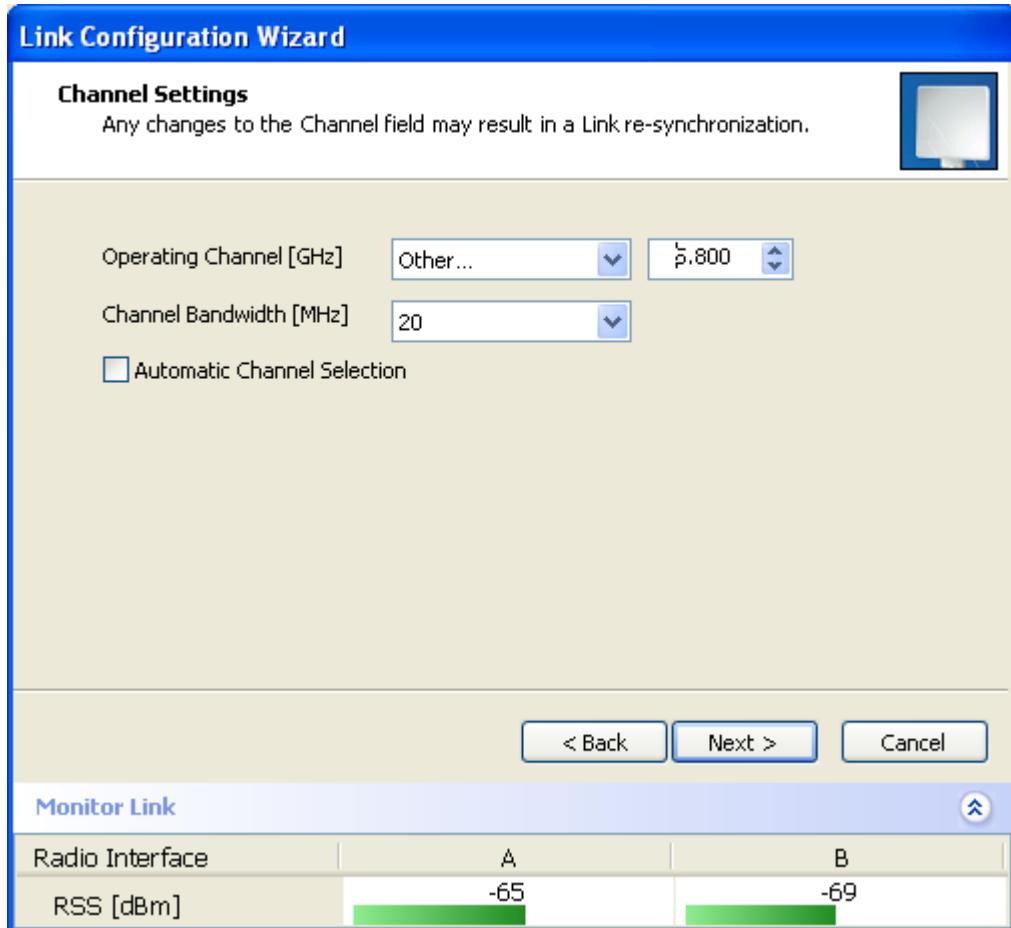


Figure 5-9: Choosing an "Other" Operating Channel frequency

The right hand drop-down list (showing 5.800) allows you to fine-tune the frequency in increments of ±5MHz within a range of 5.740 - 5.835 GHz.

When you have completed making your choice, click **Next** to continue.

Configuring the Link: Step 4, Tx Power and Antenna Settings

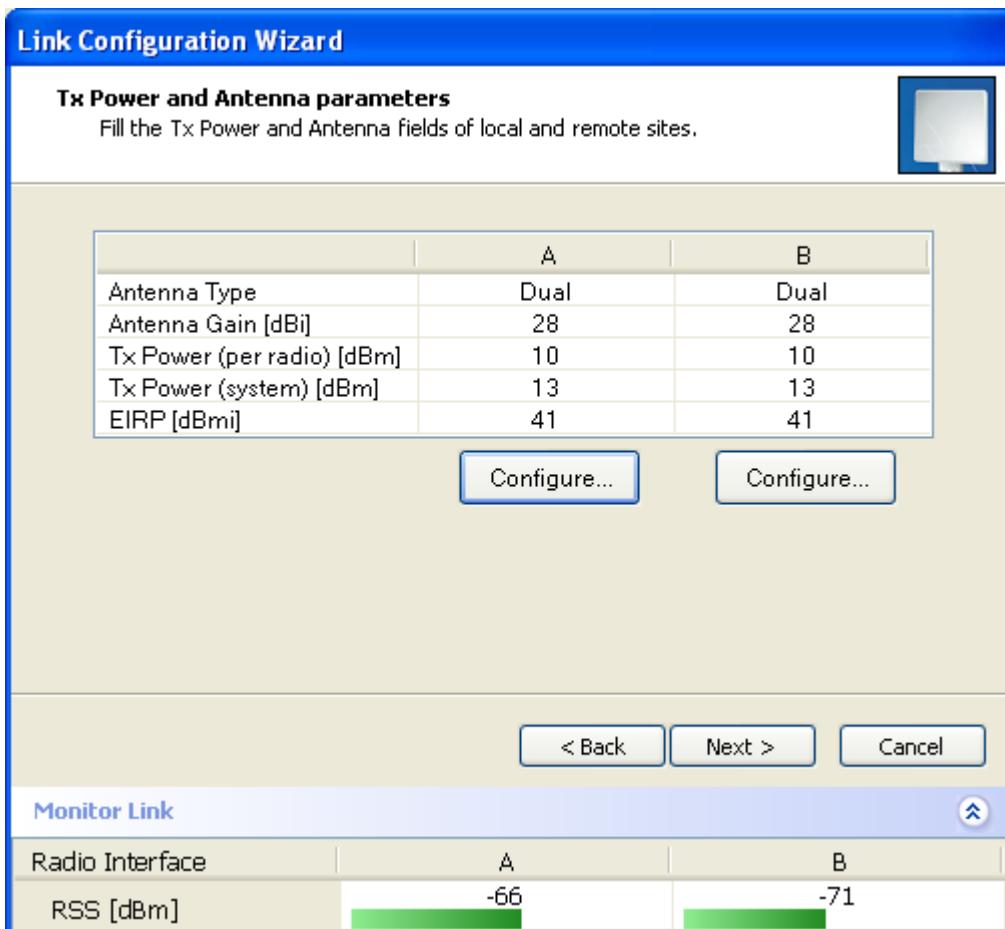


Figure 5-10: Transmission Power and Antenna Parameters

If you chose to configure either antenna, you are presented with the following window:

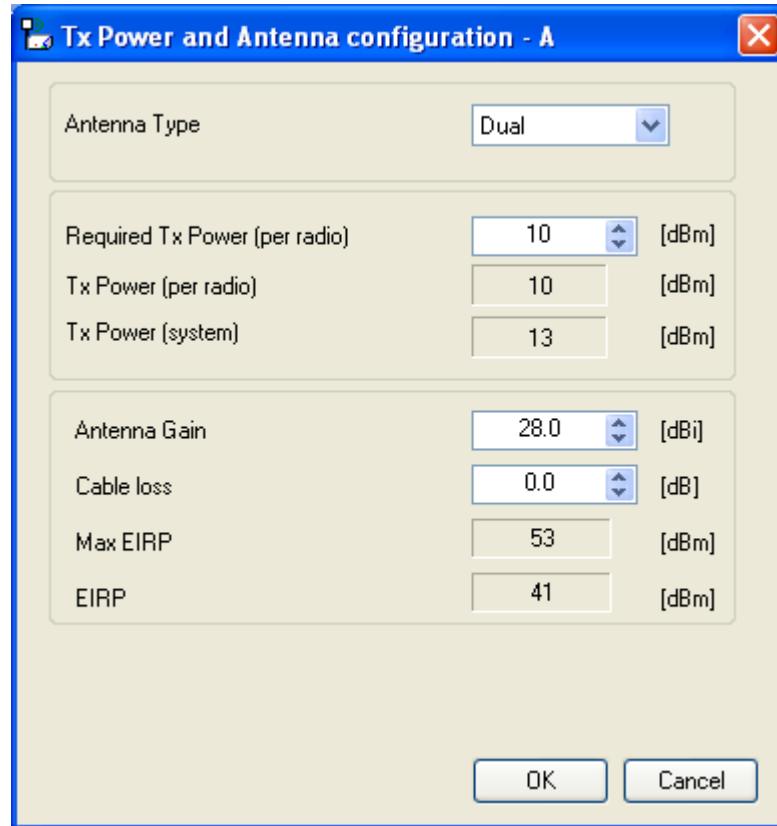
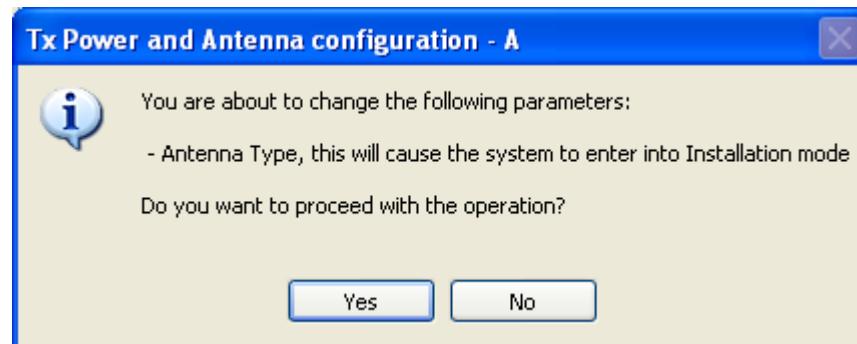


Figure 5-11: Antenna configuration dialog with opened type selection

So far, the procedure duplicates the corresponding Installation process on. If you choose a different antenna type and click **OK**, you will receive the following cautionary message:



Caution

In this context, entering Installation mode causes a service break until it is restored by running the Installation wizard.

If you are uncertain, do not do this without expert technical assistance.

You may also change the Required Tx Power, Antenna Gain and Cable Loss. The procedure is the same as that set out in the Installation procedure on [page 4-22](#).

When you have completed making your choice, proceed to the Services window.

Configuring the Link: Step 5, Services

Here is the services dialog:

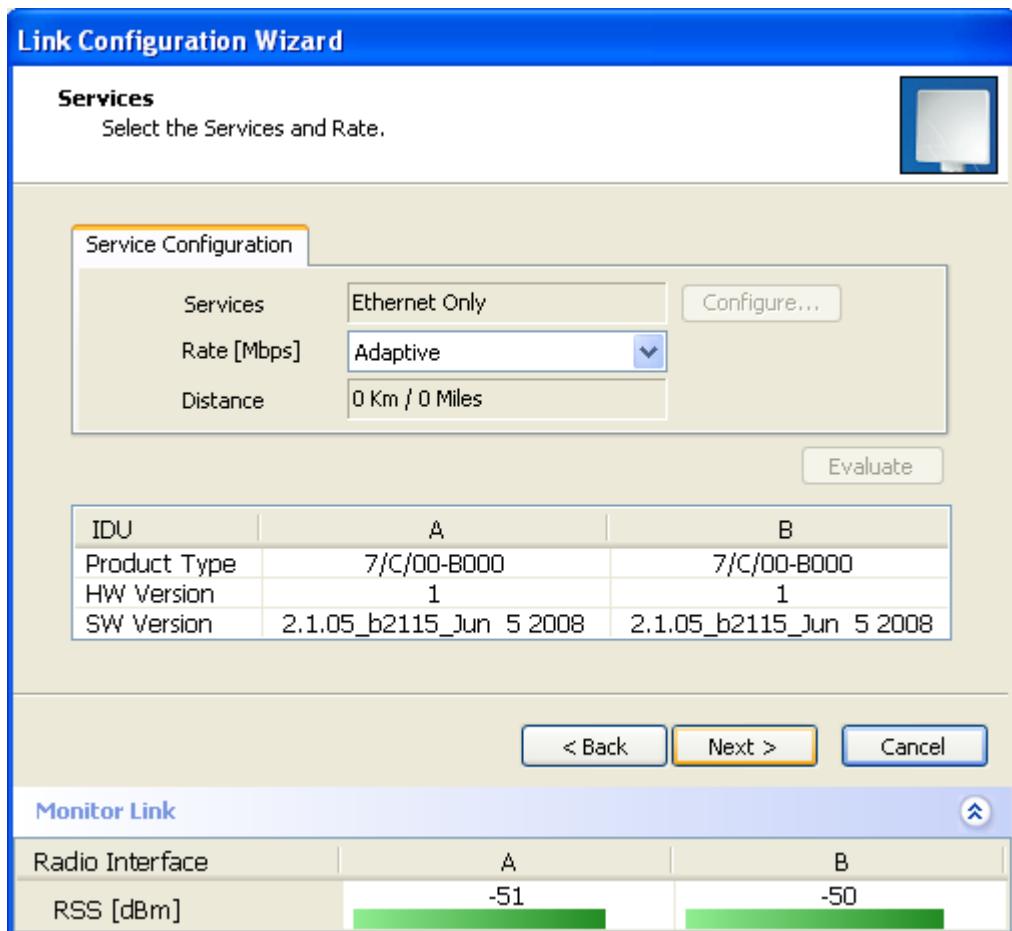


Figure 5-12: Services and Rates dialog

To choose Services, see the corresponding Installation procedure on [page 5-20](#).

Click **Next** to continue.

Configuring the Link: Step 6, Configuration Summary and Exit

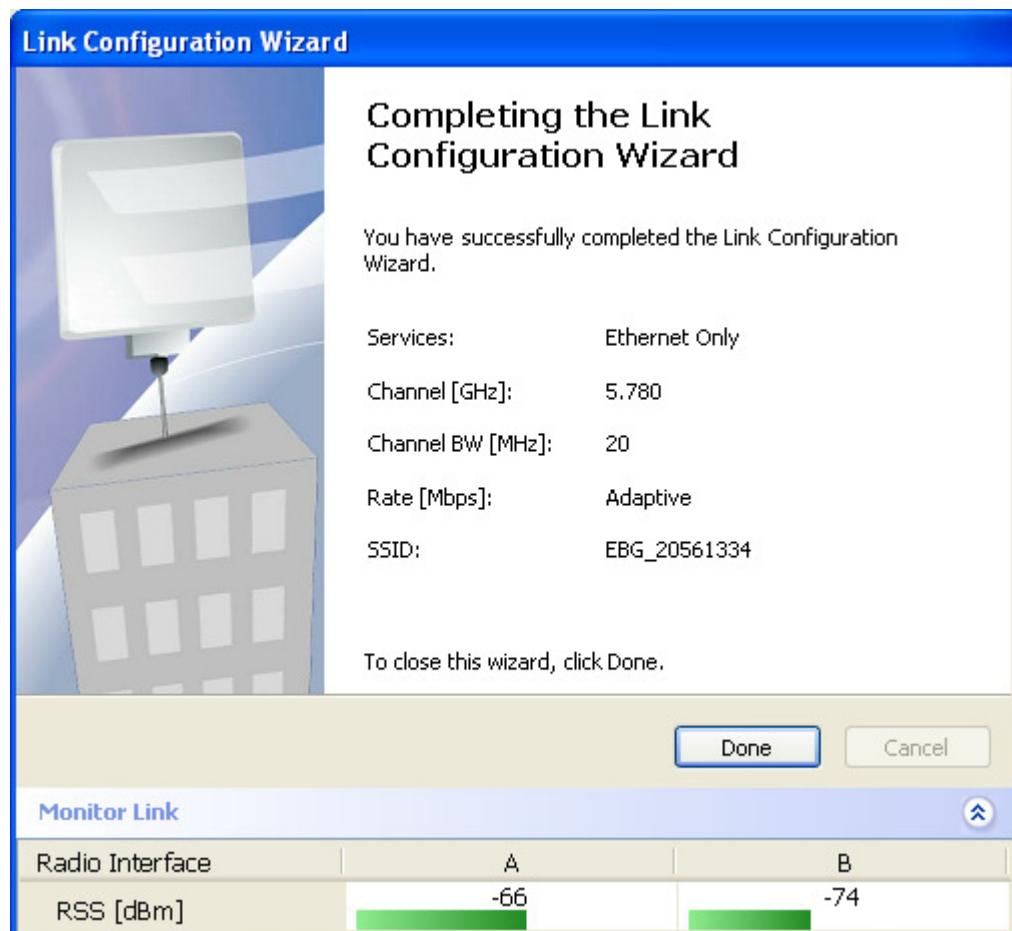


Figure 5-13: Configuration Wizard Exit Summary

Click **Done** to return to the main window.

The main window now reflects the configuration:

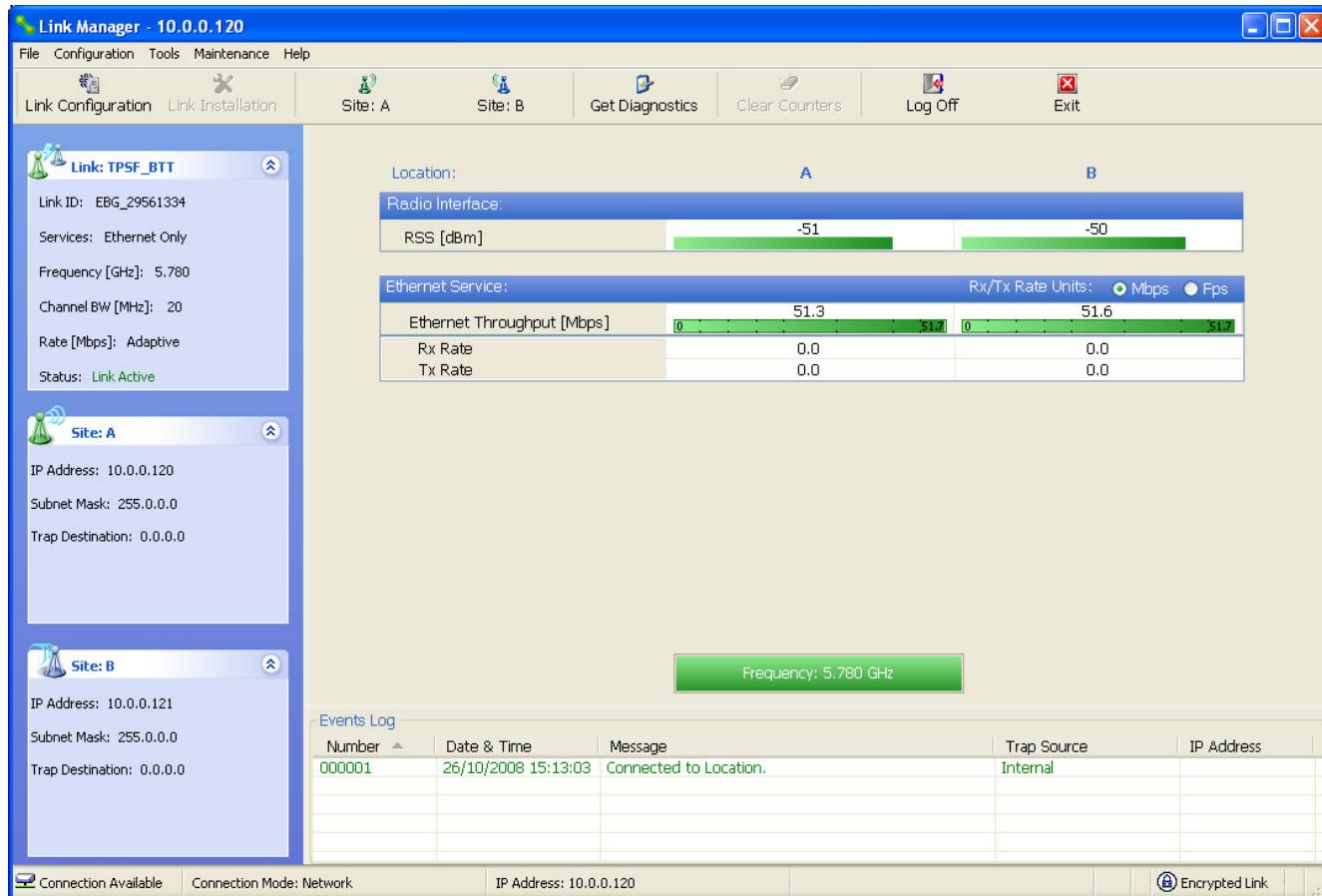


Figure 5-14: Main window of the manager after configuration

Chapter 6

Site Configuration

The Site Configuration dialog panels are used to configure parameters, which may differ between both sides of the link.

The parameters configured using the Site Configuration dialog panels include (among others):

- System settings
- Air interface - Transmit (Tx) power and antenna
- Network management including VLAN
- Security settings
- Date and time
- Hub or Bridge mode

In addition, the Link Site Configuration panels include several information windows:

- Inventory - link hardware and software model details
- External alarms indicators

The Operations dialog offers a “doorway” to jump into installation mode reverting to factory settings.

The Site Configuration dialog has its own main menu with the following extra functionality:

- Backup configuration parameters to a text file
- Restore configuration from a previously backed up configuration file
- Enable/disable the site ODU buzzer
- Jump back into installation mode keeping current configuration settings

Configuring the Site

Editing the Configuration Parameters by Site

You can edit the configuration parameters for each site individually. The following functions are available from the left side of the dialog box.

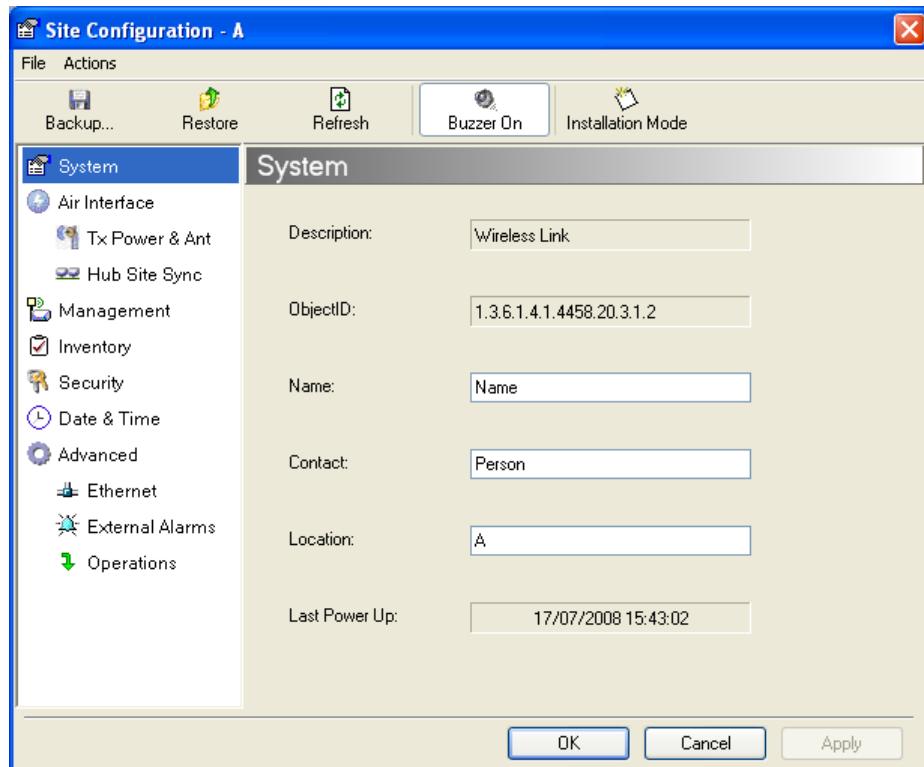


Figure 6-1: Configuration Dialog Box

Functions on the left of the dialog box:

System	Edit the contact person and location details. View the system details
Air Interface	Change the transmit power, cable loss, antenna type and settings
Inventory	View the hardware and software inventory (release numbers, model identification, MAC address)
Management	Configure the IP address, Subnet Mask, Default Gateway, the Trap Destination and VLAN
Security	Change the Community Values and the Link Password
Date and Time	Set the date and time of the link from an NTP servers otherwise
Advanced	Choose Hub or Bridge ODU mode, set the Ethernet ports configuration, set the external alarm inputs, restore factory settings

Functions at the top of the dialog box:

Backup	Save the current configuration to an .ini file
Restore	Restore the link configuration from the .ini file created by the backup

Installation Mode	Return to Installation Mode for the entire link.
Mute	Selecting the Mute check box before clicking the Install Mode button mutes the Beeper.
Mute	Mutes the alignment tone in installation mode. Reactivate the beeper during alignment.

➤ To edit the Configuration Parameters:

1. Click the required site button on the main tool bar of the Link Manager

OR

Click **Configuration** from the main menu and choose a site to configure.

The Configuration dialog box opens (see **figure 6-1** above).

2. Choose the appropriate item in the left hand list to open a dialog box.

3. Click **Apply** to save changes.

In subsequent instructions, we will simply say "Choose a site to configure" on the understanding that the foregoing procedure is implied.

Viewing Air Interface Details

Click the Air Interface item in the left hand list. A window similar to the following appears:

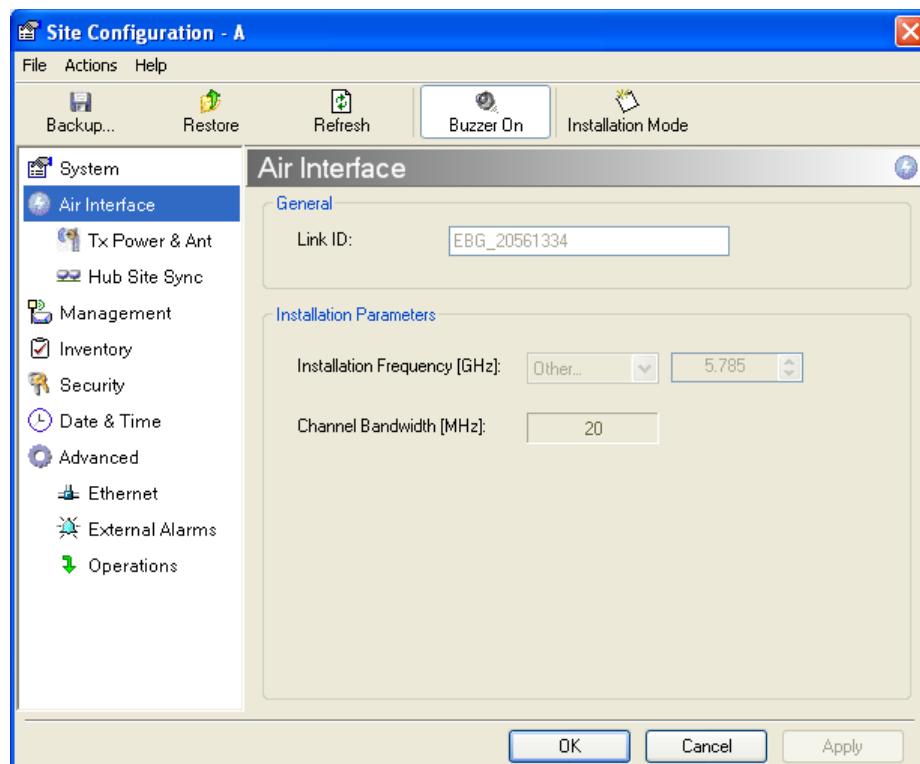


Figure 6-2: Air interface details

Changing the Transmit Power

Each site can have a different transmit power level.

➤ To change the Transmit Power:

1. Choose a site to configure.
The Configuration dialog box opens.
2. Choose Air Interface (see [figure 6-3](#)).
3. Choose the required Transmit (Tx) Power Level.
4. Click **Apply** to save the changes.

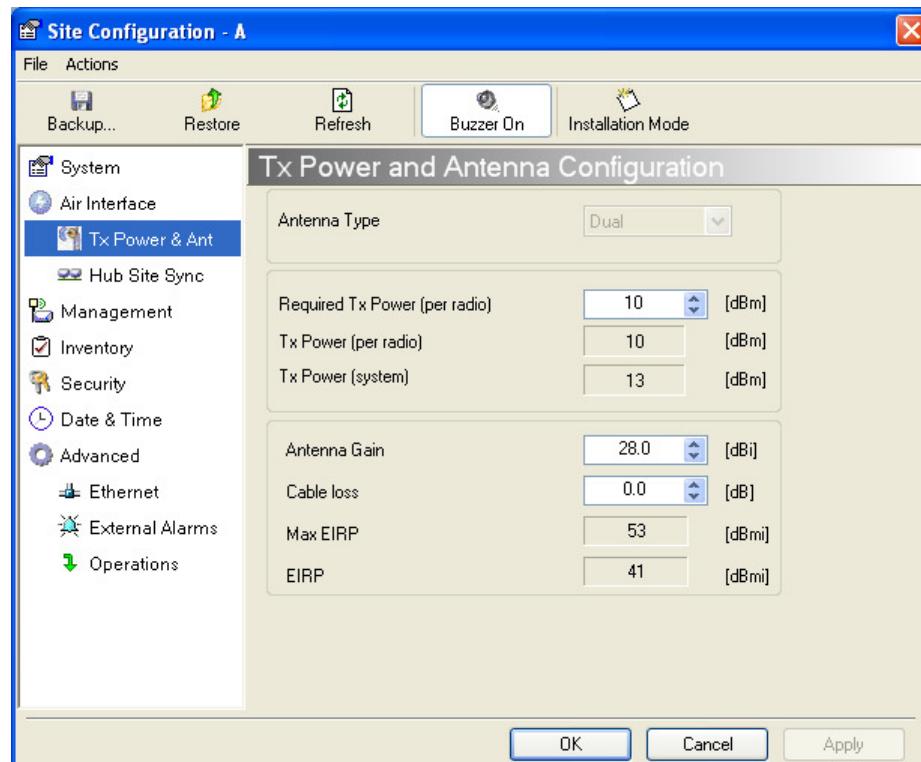


Figure 6-3: Changing the Transmit Power



Note

The same considerations apply here as were noted in the Installation procedure on [page 4-22](#).

Site Management: IP Address and VLAN

Configuring the ODU Address

Each site must be configured separately, first site A then site B.

➤ To define the Management Addresses:

1. Choose a site to configure.

The Configuration dialog box opens:

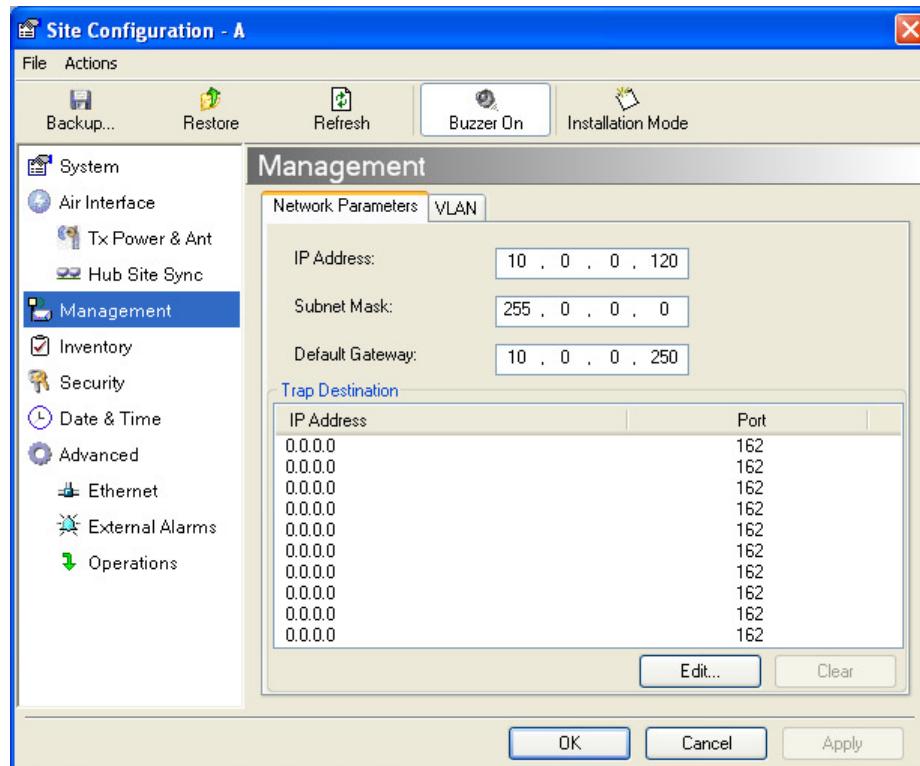


Figure 6-4: Management Addresses - Site Configuration dialog box

5. Choose **Management**.

6. Enter the IP address of the ODU in the IP Address field.



Note

If performing configuration from the Link Manager, the IP address is that entered from the login screen.

7. Enter the Subnet Mask.

8. Enter the Default Gateway.

9. Enter the Trap Destination. This could be the IP address of the managing computer. The events log will be stored at this address.

10. Click **Apply** to save the changes.

Configuring VLAN Settings

VLAN Management enables separation of user traffic from management traffic whenever such separation is required. It is recommended that both sides of the link be configured with different VLAN IDs for management traffic.

➤ To enable VLAN management:

1. Click **Configuration** from the main menu.

2. Choose a site to configure. If you are configuring both sites, choose site B first.
3. Choose **Management**.
4. Open the **VLAN** tab.
5. Check the **Enabled** box.
6. Enter a VLAN ID. Its value should be between 1 and 4094.

After entering the VLAN ID, only packets with the specified VLAN ID are processed for management purposes by the ODU. This includes all the protocols supported by the ODU (ICMP, SNMP, TELNET and NTP). The VLAN priority is used for the traffic sent from the ODU to the managing computer. Using VLAN for management traffic affects all types of management connections (local, network and over the air).

7. Enter a Priority number between 0 and 7.
8. Change the VLAN ID and Priority of the managing computer NIC to be the same as those of steps 6 and 7 respectively.
9. Click **Apply** or **OK**.

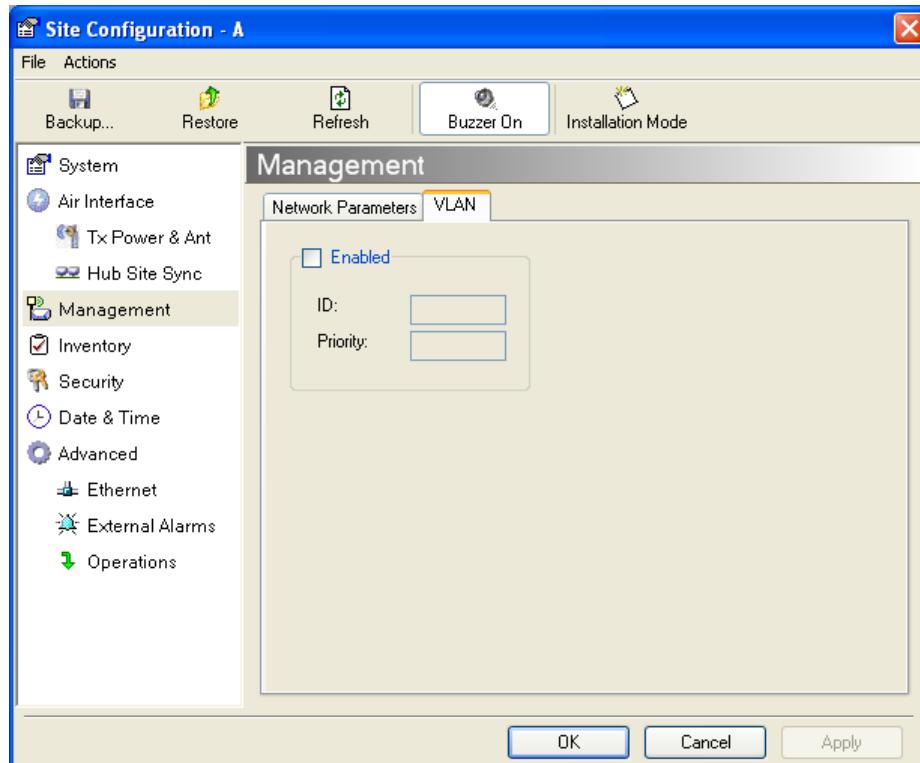


Figure 6-5: Configuring management traffic VLAN Settings



Changing this parameter causes the Link Manager to immediately disconnect. To avoid inconvenience, you should verify the change by setting the VLAN only to one ODU, and only after verifying proper management operation, change the other ODU VLAN setting.