RADWIN 2000

Broadband Wireless Transmission

User Manual

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RADWIN 2000

User Manual

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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.

Warning

This product was tested with special accessories - indoor unit (IDU or PoE), FTP Cat 5e shielded cable with sealing gasket, 12 AWG grounding cable - which must be used with the unit to insure compliance.

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.

Canadian Emission Requirements for Indoor Units

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numẻrique de la classe B est conforme ả la norme NMB-003 du Canada.

China MII

Operation of the equipment is only allowed under China MII 5.8GHz band regulation configuration with EIRP limited to 33 dBm (2 Watt).

India WPC

Operation of the equipment is only allowed under India WPC GSR-38 for 5.8GHz band regulation configuration.

Unregulated

In countries where the radio is not regulated the equipment can be operated in any regulation configuration, best results will be obtained using Universal regulation configuration.

Safety Practices

Applicable requirements of National Electrical Code (NEC), NFPA 70; and the National Electrical Safety Code, ANSI/IEEE C2, must be considered during installation.

NOTES:

1. A Primary Protector is not required to protect the exposed wiring as long as the exposed wiring length is limited to less than or equal to 140 feet, and instructions are provided to avoid exposure of wiring to accidental contact with lightning and power conductors in accordance with NEC Sections 725-54 (c) and 800-30.

In all other cases, an appropriate Listed Primary Protector must be provided. Refer to Articles 800 and 810 of the NEC for details.

2. For protection of ODU against direct lightning strikes, appropriate requirements of NFPA 780 should be considered in addition to NEC.

3. For Canada, appropriate requirements of the CEC 22.1 including Section 60 and additional requirements of CAN/CSA-B72 must be considered as applicable.

Brief

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RADWIN 2000

Part 1: Basic Installation

Broadband Wireless Transmission

User Manual

Release 2.2

UM 2000-22/03.09

Chapter 1

Introduction

Welcome to RADWIN 2000!

Welcome to the RADWIN 2000 radio series, designed for the Cellular Backhaul, IP and WiMAX Backhaul, Private Networks and Broadband Access markets. The RADWIN 2000 series is an innovation in high-capacity carrier-grade sub-6GHz radios, meeting the requirements of current and next-generation networks and applications.

The RADWIN 2000 radio series offers unmatched performance and carrier-class quality with the following features:

- Superior performance at the spectral-efficient 20MHz channel
- High Ethernet capacity (50Mbps full duplex net throughput)
- Up to 16 E1/T1 ports
- Muti-band 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 RADWIN 2000 radio series supports the 4.9 - 5.9 GHz and 2.4 GHz spectrum bands, and complies with international standards and regulations (FCC, IC Canada, ETSI, WPC India and MII China). DFS is supported where required by regulation.

About Release 2.2

Release 2.2 brings important new features to RADWIN 2000:

- **Support for up to 16 E1/T1 ports**

  The RADWIN 2000 native TDM interface supports E1 or T1 traffic, which includes:

  - 16, 8 or 4 E1/T1 interfaces in the indoor unit, E1/T1 configurable
  - Unframed (transparent)

  - Independent timing per port for both Tx and Rx
  - Compliant with ITU-T standards G.703 and G.826
  - Line codes E1: HDB3, T1: AMI and B8ZS
- **Support for new bands 2.3 – 2.4 GHz**

  RADWIN 2000 radios support multi-frequency bands including 2.4 GHz and 4.9 – 5.9 GHz according to FCC, IC Canadian, ETSI, WPC Indian and MII Chinese regulations
- **Frequency Band Selection built into the RADWIN Manager**
- **Software upgrade in RADWIN Manager**
- **The IDU-C supports SFP**

  Standard SFP FE modules are supported
- **Link Lock security feature**

  Link Lock enables you to mutually lock both sides of a link to each other so as to exclude outside listening or intrusion

Key Applications

Cellular Backhaul

RADWIN 2000 products enable cellular carriers to expand their networks in both rural and urban areas quickly and cost-effectively.

RADWIN 2000 systems are ideally suited for a broad range of cellular backhaul deployment scenarios. They empower carriers to expand their presence into remote and low ARPU areas, provide enhanced overlay coverage in urban spots, and can serve as an intermediate temporary or backup backhaul solution.

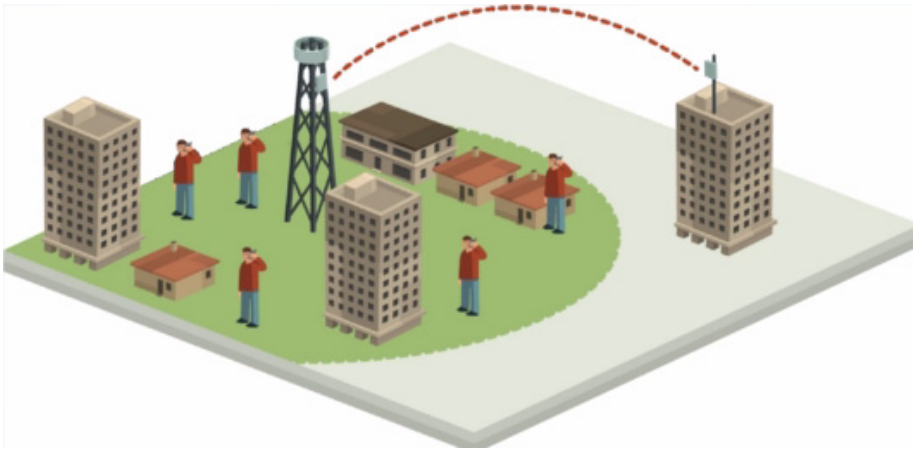


Figure 1-1: Typical Cellular Backhaul application

WiMAX and IP Backhaul

The RADWIN 2000 radio series offers WiMAX operators and ISPs a unique, highly scalable and cost-effective backhaul solution. Designed to suit a wide range of topologies, RADWIN 2000 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 1-2: Typical Wimax and IP Backhaul application

Broadband Access

With RADWIN 2000, 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.

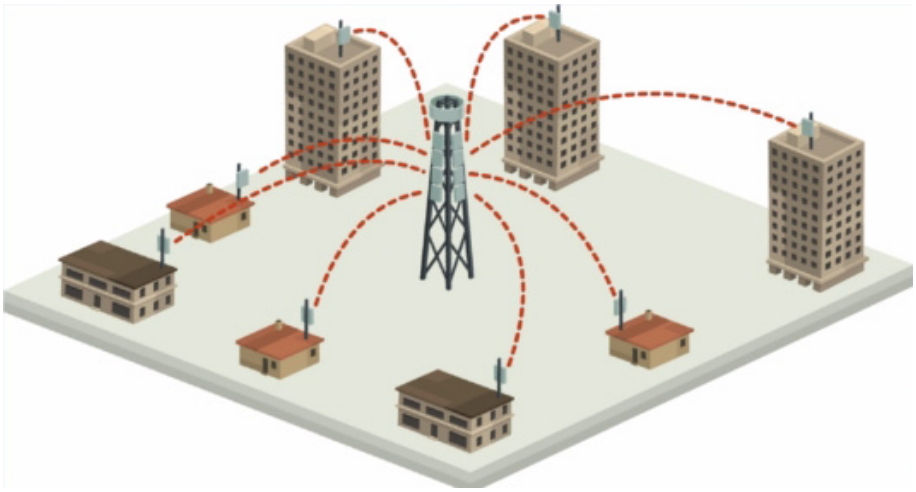


Figure 1-3: Typical Broadband Access application

Private Networks

RADWIN 2000 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.

RADWIN 2000's cost-effective solution enables a variety of organizations to connect geographically dispersed sites at ranges of up to 80km (50 miles).

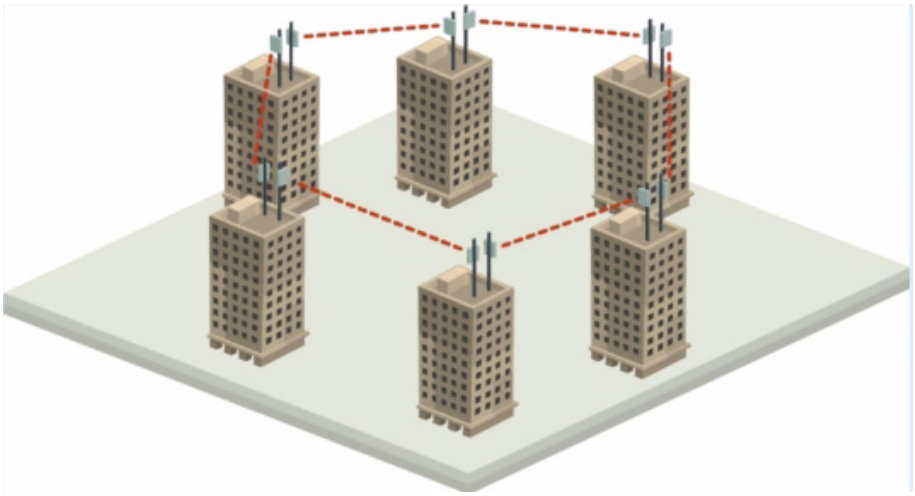


Figure 1-4: Private Network

Key Features of RADWIN 2000

Some of the outstanding features of the RADWIN 2000 radio series are as follows:

» **E1/T1 + Ethernet in one Solution**

RADWIN 2000 systems deliver carrier-class native E1/T1 + Ethernet in a single platform, making them ideal for a range of backhaul and access applications. Up to 16 E1/T1 services are supported.

» **High Capacity**

The RADWIN 2000 system provides a high-capacity link of 50Mbps net throughput in full duplex.

» **Superior Spectral Efficiency**

Built on advanced MIMO and OFDM technologies, the RADWIN 2000 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.

» **Muti-band Products**

Every RADWIN 2000 Multi-band radio supports multiple frequency bands. For example the RW-2050-0250 connectorized radio support the bands: 5.9 GHz, 5.8 GHz, 5.4 GHz, 5.3 GHz, 4.9 GHz and 2.4 GHz. The RADWIN 2000 Multi-band products support the regulations of FCC, IC Canada, ETSI, WPC India and MII China. DFS is supported where required by regulation.

» **Advanced Air Interface**

The RADWIN 2000 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 RADWIN 2000 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. RADWIN 2000'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 RADWIN 2000 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 RADWIN 2000 system supports high capacity at superior ranges. The Link Budget Calculator (appendix **B**) 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**

RADWIN 2000 systems are extremely simple to install and maintain. They are typically up and running in less than an hour.

The RADWIN 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 RADWIN 2000 include:

- RADWIN 2000's 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 authenticating 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 log on access, Read or Write Community access is available at log on
- Link Lock is a part of the RADWIN 2000 security concept. It is designed to discourage physical theft of units and "piggybacking" using an otherwise identical ODU to steal bandwidth or information. It locks a pair of synchronized ODUs for mutually exclusive communication.

» **SFP support in the IDU-C**

Standard SFP modules are used, enabling any type of Ethernet physical connectivity including various fiber connections. E3/T3 or E1/T1 over Ethernet SFPs can be used as well.

RADWIN 2000 Link

The RADWIN 2000 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 **1-5** below.

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

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

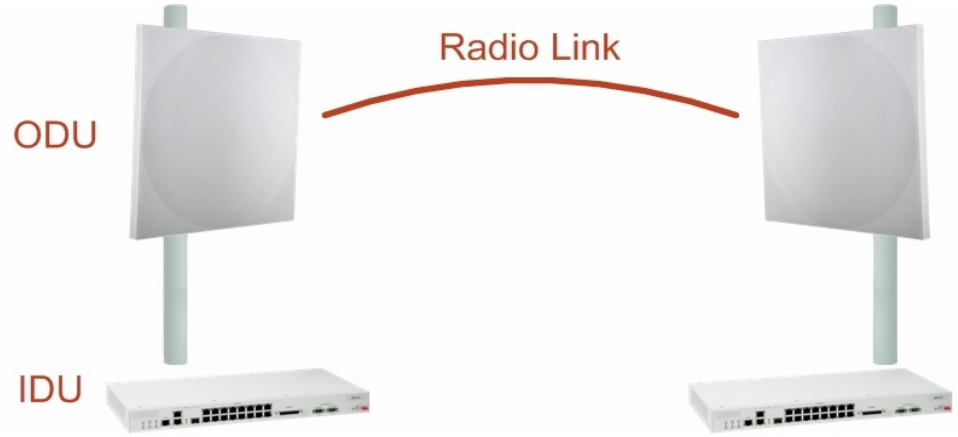


Figure 1-5: Example of Link Architecture - System Components

The ODU is the radio transceiver of the RADWIN 2000 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 **1-6** below:

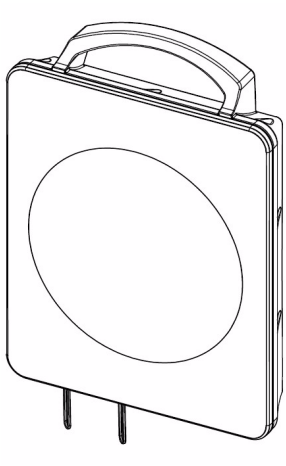
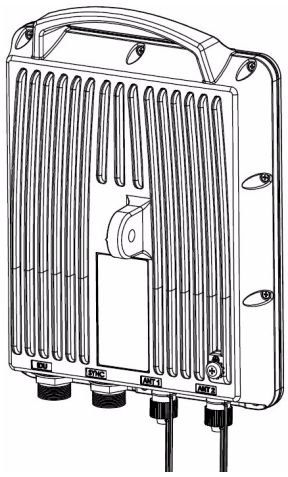
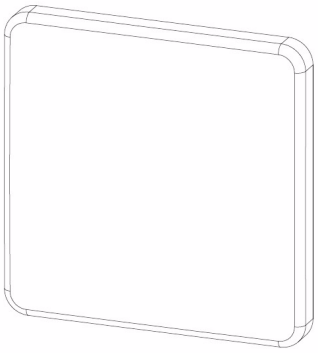
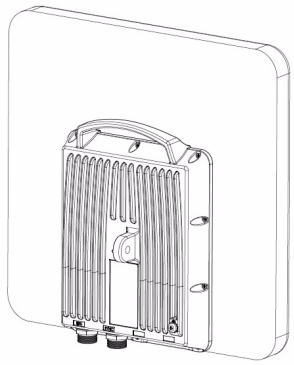
	Front	Rear
Connectorized		
Integrated		

Figure 1-6: ODU Form Factors

- **Integrated Antenna ODU**

  This ODU has an integrated 370mm (1.2ft) flat panel antenna. The ODU contains both the radio and the antenna as a single unit housed in a weatherproof case.

- **Connectorized ODU**

  This ODU has 2xN-type connectors for connecting an external antenna.

The ODU products available in release 2.2 are shown below:

Table 1-1: Available C onnectorized ODU Products - Release 2.2

	DFS	RW-2050-0250	RW-2049-0250	RW-2450-0250	RW-2250-0250
5.9 GHz Universal	X	√	√	X	X
5.8 GHz FCC/IC	X	**Factory default**	√	X	X
5.8 GHz MII China	X	√	√	X	X
5.8 GHz WPC India	X	√	√	**Factory default**	X
5.4 GHz FCC	√	√	√	X	X
5.4 GHz IC	√	√	√	X	X
5.4 GHz Universal	X	√	√	X	X
5.3 GHz FCC/IC	√	√	√	X	X
5.3 GHz Universal	X	√	√	X	X
4.9 GHz FCC	X	X	**Factory default**	X	X
4.9 GHz Universal	X	X	√	X	X
5.8 GHz ETSI	√	X	X	X	√
5.4 GHz ETSI	√	X	X	X	**Factory default**
5.3 GHz ETSI	√	X	X	X	√
2.4 GHz FCC/IC	X	√	√	√	X

Table 1-2: Available Integrated Antenna ODU Products - Release 2.2

	DFS	RW-2050-0150	RW-2020-0150	RW-2049-0150	RW-2450-0150	RW-2250-0150
5.9 GHz Universal	X	√	X	√	X	X
5.8 GHz FCC/IC	X	**Factory default**	X	√	X	X
5.8 GHz MII China	X	√	X	√	X	X
5.8 GHz WPC India	X	√	X	√	**Factory default**	X
5.4 GHz FCC	√	√	X	√	X	X
5.4 GHz IC	√	√	X	√	X	X
5.4 GHz Universal	X	√	X	√	X	X
5.3 GHz FCC/IC	√	√	X	√	X	X
5.3 GHz Universal	X	√	X	√	X	X
4.9 GHz FCC	X	X	X	**Factory default**	X	X
4.9 GHz Universal	X	X		√	X	X
5.8 GHz ETSI	√	X	X	X	X	√
5.4 GHz ETSI	√	X	X	X	X	**Factory default**
5.3 GHz ETSI	√	X	X	X	X	√
2.4 GHz FCC/IC	X	X	**Factory default**	X	X	X

The external antenna choices are:

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

For further information, see page 4-21.

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 E1/T1 ports, 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.

Four IDU-C products are available in release 2.2:

Table 1-3: Release 2.2 IDU-C Products

Part Number	E1/T1 ports	Ethernet ports	Power	Form factor
RW-7216-2000	**16**	**2**	Dual DC feed -20 to -60VDC	19" 1U
RW-7208-2000	**8**	**2**		
RW-7204-2000	**4**	**2**		
RW-7200-2000	**0**	**2**		

Figure 1-7: IDU-C, Ethernet only, front panel

Figure 1-8: IDU-C, 16 E1/T1 ports, 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 1-9: 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 RADWIN 2000 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 5.x GHz Integrated Antenna ODU is provided with 370 mm (1.2ft) flat panel antenna, with a gain of 23dBi (5.x GHz) / 19dBi (4.9 GHz) and 8° beam width. The 2.x GHz Integrated Antenna ODU is provided with 370 mm (1.2ft) flat panel antenna, with a gain of 16dBi and 16° beam width. The radio and the antenna are housed in a weatherproof case as a single unit.

Figure 1-10: ODU with integrated Flat Panel antenna

External antennas are available for the RADWIN 2000 radios, varying in operating frequencies, form factor, size and gain, dual or single polarization.

Flat Panel Antennas

The Flat Panel antenna shown in figure **1-11** below can be used either as an integrated or external antenna:

Integrated **1.2ft Flat Panel Dual Polarization**				
Frequency	4.940 - 5.800 GHz	5.150 - 5.875 GHz	4.940 – 4.990 GHz	2.300 – 2.485 GHz
Gain	23 dBi		19 dBi	16 dBi
Beam Width	H,V: 8°			H,V: 16°
Size	1.2 x 1.2 ft / 371x371 mm			

Figure 1-11: Flat Panel Antenna

Parabolic Dish Antennas

External **2ft Dish Dual Polarization**	
Frequency	5.250 - 6.000 GHz
Gain	28 dBi
Diameter	2 ft / 620 mm
Beam Width	H,V: 5.6°

Figure 1-12: External Antennas - Parabolic Dish

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

RADWIN Manager

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

The RADWIN Manager provides:

- Installation Wizard
- Frequency band selection
- 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 Wizard and site settings
- Integrated software upgrade utility
- On-line user manual and help files
- Link Budget Calculator for calculating the expected performance of the RADWIN 2000 wireless link and the possible service configurations for a specific link range.

The RADWIN Manager can easily be integrated with any NMS system.[1]

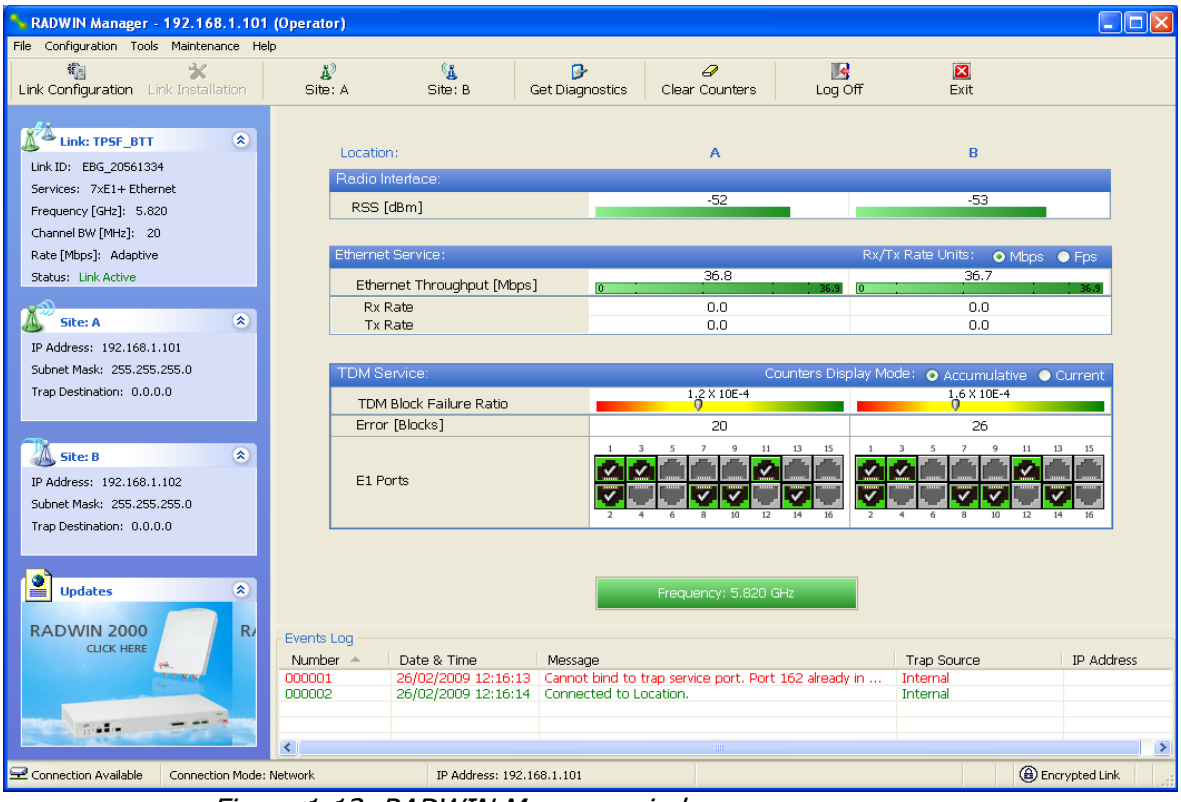


Figure 1-13: RADWIN Manager window

Accessories

RADWIN provides a variety of accessories to support the RADWIN 2000 system:

- PoE devices
- AC Power Adaptor
- External Lightning Protection Unit

1. RADWIN also supplies a complete SNMP NMS solution. Contact RADWIN Customer Support for details.

- Cables to connect the various system elements
- Grounding cable

Documentation set supplied with RADWIN 2000

The technical documentation supplied with a RADWIN 2000, is located on the distribution CD. It includes the following items:

- A Quick Installation Guide for experienced installers (also hardcopy)
- A full User Manual - the document which you are reading
- A Help file accessible from the RADWIN Manager

How to Use this Manual

This User Manual is divided into functionally distinct chapters reflecting the activities required to set up a RADWIN 2000. The division is shown in the following table:

Table 1-4: User Manual layout

Chapter/ Appendix	Subject	Audience
2	Site Preparation	Site survey team
3	Hardware Installation	Field technician
4	Link Installation: The RADWIN 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	Pole and Wall Installation	Installation technician
B	Link Budget Calculator	Installation technician
C	Lightning Protection and Grounding Guidelines	Field technician
D	Preloading an ODU with an IP Address	Field technician
E	Changing the FactoryDefault Band	Installation technician, System manage

Table 1-4: User Manual layout (Continued)

Chapter/ Appendix	Subject	Audience
F	Software Upgrade	Installation technician, System manager
G	Technical Specifications	Installation technician, System manager
H	Wiring Specifications	Installation technician
I	Small Form-factor Pluggable Transceiver	User
J	MIB Reference	Network System Manager
K	External Alarms Specification	Installation technician, System manager, Field technician
L	Regional Notice: French Canadian	Canadian-French Field technician

A Little Terminology

In the field, a link typically has a local or headquarters site as for example in figure1-3 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 on page 4-1).

We will occaissionally need to distinguish between the site to which the managing computer is connected, and the second site, when they are not necessarily A or B. The former will be called the ***managing site*** and the latter, the ***over-the-air site***. Which is which is always determined by the location of the managing computer.

RADWIN 2000 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.

Note

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 RADWIN 2000
- 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

Caution

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

Warning

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 Boldface. You will have noticed this usage in the Terminology section above.

Software

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

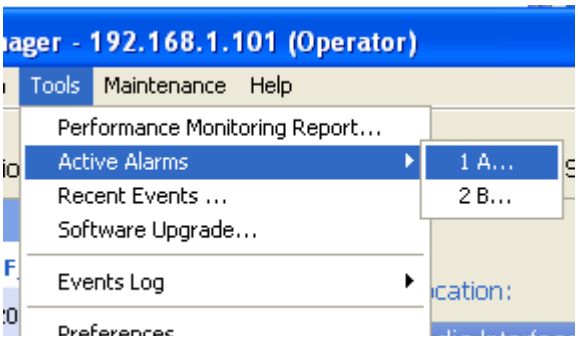
We would describe the chain of menu commands indicated in the following screen shot, like this:

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 **1-13** 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 on of several **panels** depending on which function you choose.

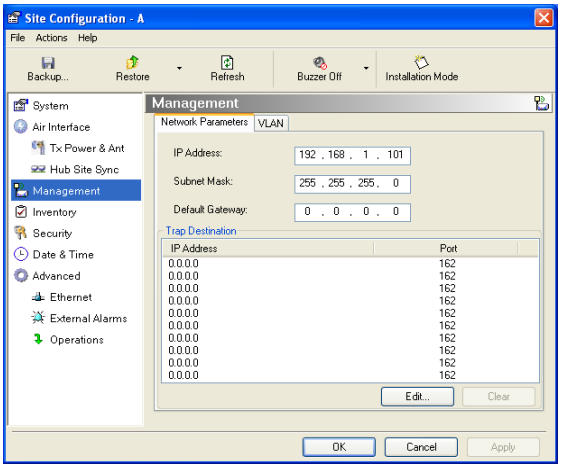


Figure 1-14: Site Configuration window with open Management panel

Viewing and Printing

This manual is optimized for viewing online as a PDF file. To this end it uses an 11 point Tahoma typeface for main text. Here are a few pointers for hard-copy printing:

- The 11 point Tahoma typeface is large enough to print the manual at two pages per sheet.
- For good legibility, use a commercial grade laser printer. A color printer is of course best, however a monochrome printer set to use gray-scale gives acceptable results.
- Better quality inkjet printers also give good output.

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 RADWIN 2000 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 RADWIN 2000 installation (**on-site**).

The Site Survey

Introduction

RADWIN 2000 wireless links 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.

RADWIN 2000 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 RADWIN 2000.
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 **B** 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 RADWIN 2000 or using the RADWIN Manager) to determine the expected performance.

Stage 2: Physical Survey

The physical site survey reviews the environment of the proposed RADWIN 2000 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 **B**).
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 RADWIN 2000 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 1O ohm.
9. Review the results of the physical site survey. Decide if the site is suitable for the RADWIN 2000 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 RADWIN 2000 installation site, to determine whether there are available channels within the RADWIN 2000 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 RADWIN 2000 link and use the RADWIN 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 **4-14**) becoming green.

Chapter 3

Hardware Installation

This chapter sets out the requirements and procedures for the hardware installation and alignment of a RADWIN 2000 link in accordance with the prior planning as set out in chapter 2. It is intended to guide qualified field technicians.

Warning

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. RADWIN 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 RADWIN products should be grounded during operation. In addition:

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

  The RADWIN 2000 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 RADWIN 2000 ODU must be grounded to a Protective Earth as described in appendix **C** 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 **C**.

Protection against Lightning

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

See appendix **C** 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 RADWIN 2000 always use the AC power adapter supplied by RADWIN.
- Use the right tools. In addition to standard tools required for any kind of ODU or antenna installation, RADWIN 2000 requires additional specific tools detailed on **page 3-5** below.

Package Contents

The RADWIN 2000 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 RADWIN 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)

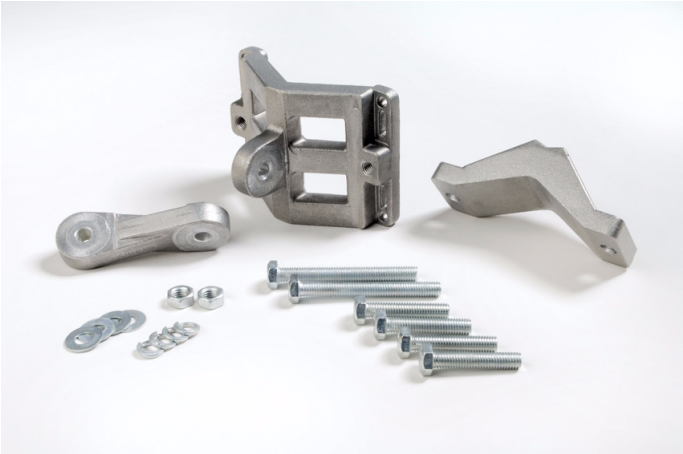


Figure 3-1: ODU Mounting kit

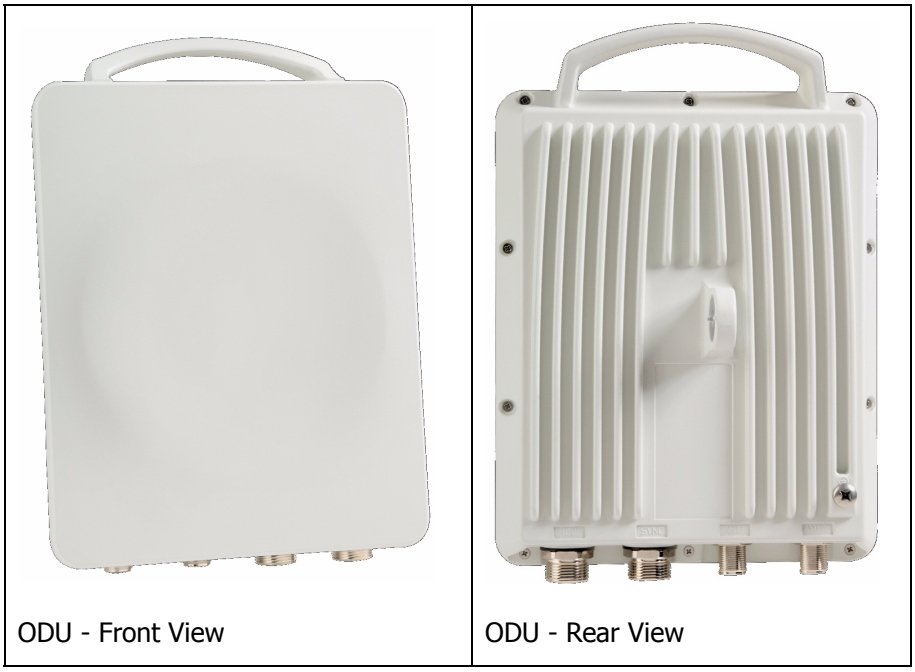


Figure 3-2: Connectorized ODU - Front and rear views

ODU - Front View

ODU - Rear View

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 **3-6** below
- Two DC power plugs for power cables - see figure **3-6** below

Figure 3-4: IDU-C Package contents - the IDU-C, ethernet only

Figure 3-5: IDU-C Package contents - the IDU-C, 16 E1/T1 ports

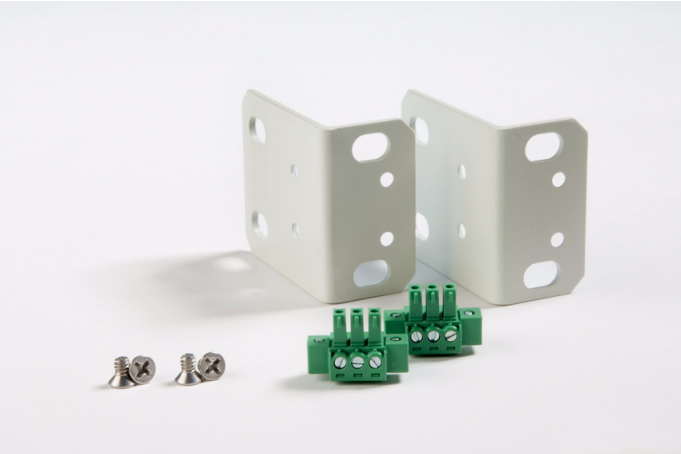


Figure 3-6: IDU-C Package contents - the mounting kit and DC power plugs

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 RADWIN 2000 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)
- For PoE based links: A crossed Ethernet LAN cable

Hardware Installation Sequence

The following steps are required to install the RADWIN 2000 system:

1. Mounting the ODUs, page **page 3-7**.
2. Mounting the external antennas (if used), page **page 3-7**.
3. Mounting the Lightning Protection devices (if used), page **page 3-8**.

4. Outdoor connections, page page 3-8.
5. Mounting the IDUs, page page 3-8.
6. Indoor connections, page page 3-12.
7. Aligning the ODUs/antennas, page page 3-13.

See figure 3-7 below, which illustrates a typical installation of RADWIN 2000 with an external antenna.

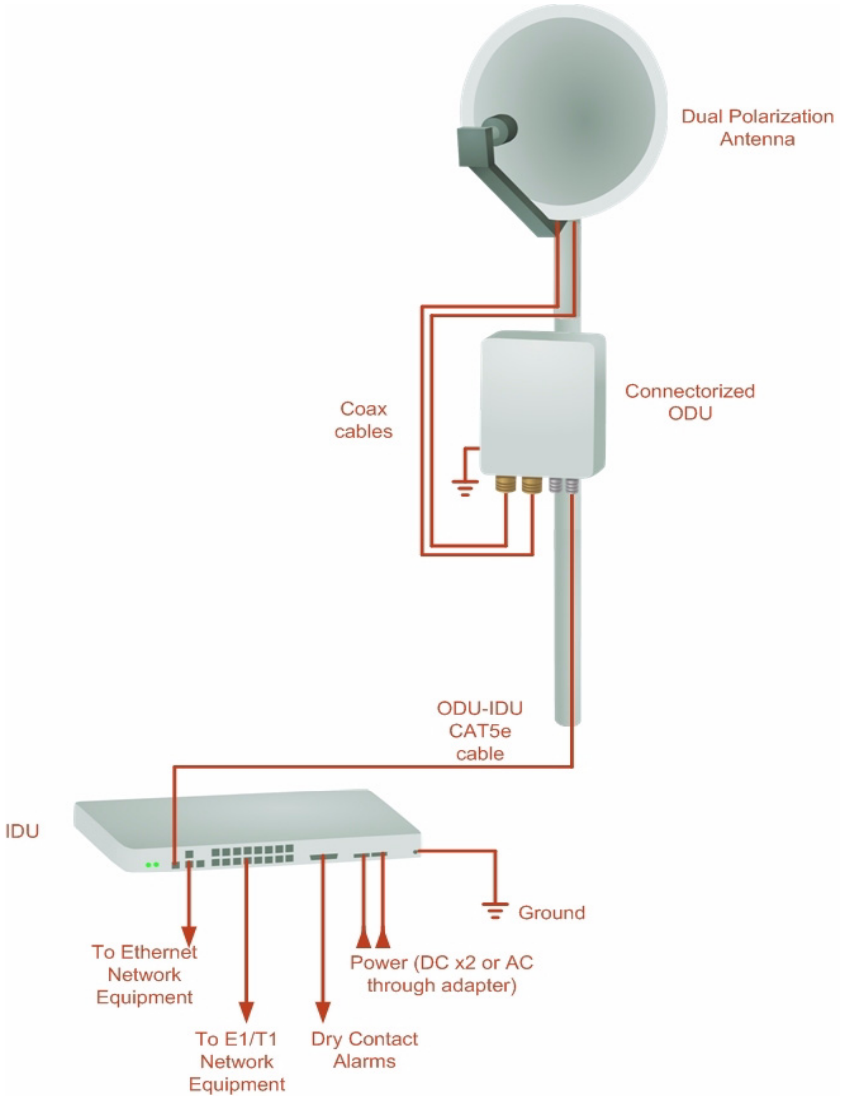


Figure 3-7: Typical Installation Diagram (with external antenna)

The installation steps are detailed in the following sections.

Outdoor installation

Preparing the ODU before Deployment

Each ODU must be pre-loaded with an IP address. This may be done prior to deployment in the field, or on-site using a Laptop computer. The process is quite straight-forward and described in appendix D.

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 RADWIN 2000 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 **A** 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 **A** 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 RADWIN 2000 ODU is designed with surge limiting circuits to minimize the risk of damage due to lightning strikes. RADWIN recommends the use of additional surge arrestor devices to protect the equipment from nearby lightning strikes.

Refer to appendix **C** 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 **C**).
4. Attach the ODU-IDU cable to the ODU RJ-45 connector (see appendix **H** for the connector pinout)
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 RADWIN 2000 IDUs are all rack mountable, as shown in figure **1-7**. A front panel keyed schematic of a rack mounted IDU-C is shown in figure **3-8** below.

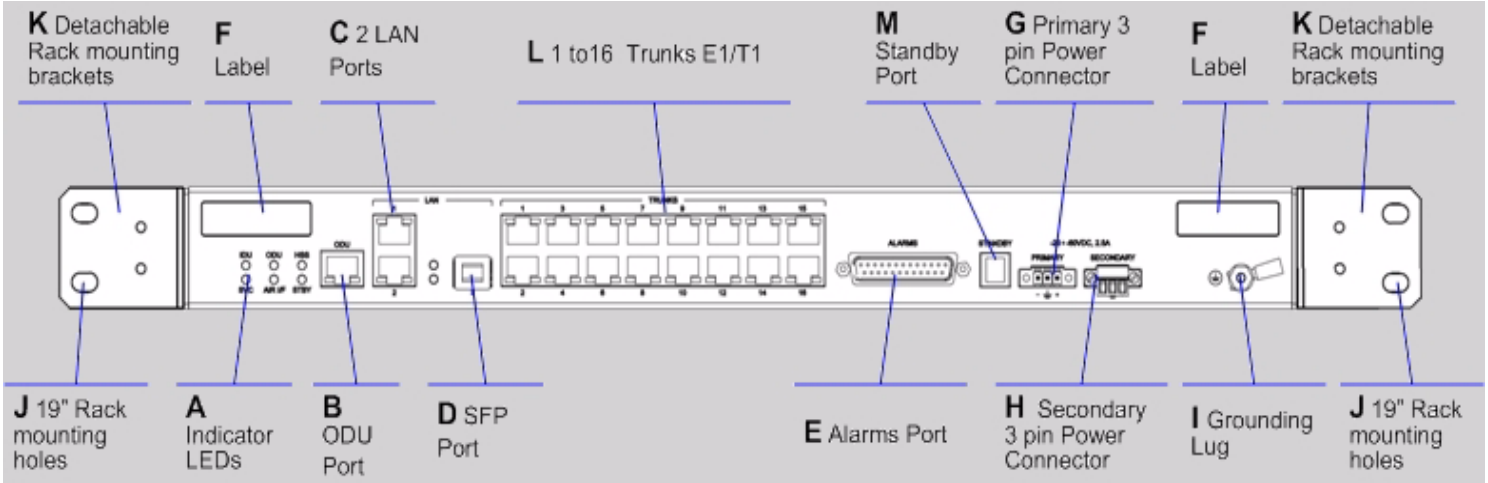


Figure 3-8: IDU-C front panel

In figure **3-9** we display a perspective view of the IDU-C:

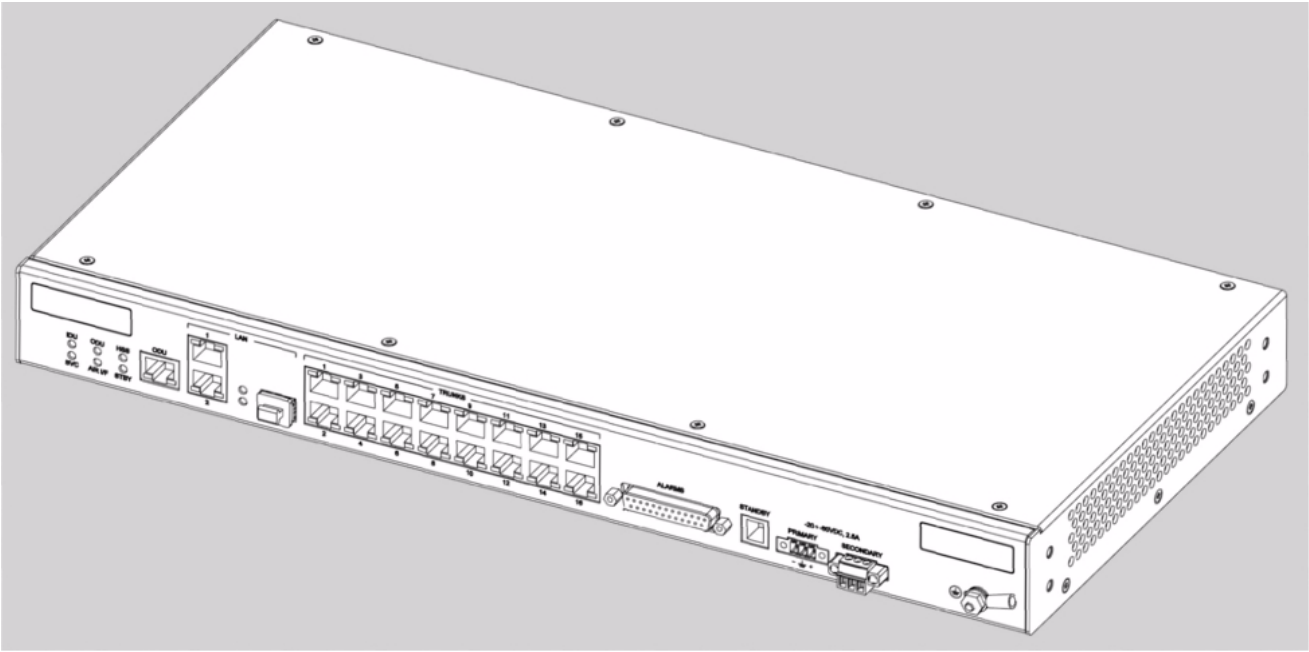


Figure 3-9: IDU-C - A perspective view

Further description of the keyed items in figure **3-8** 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 **3-10**.
B	ODU Port	RJ-45 connector, see table **H-1**.
C	LAN RJ45Ports	Ethernet, RJ-45 connector, see table **H-2**.
D	LAN SFP Port	See appendix **I**.

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

Key	Label	Remarks
E	Alarm Ports	Standard DB25 female connector, see table **H-5**.
F	Label indent	Place for adhesive identification labels.
G	Primary 3 pin Power Connector	Standard 3 pins in line power connector, see table **H-6**.
H	Secondary 3 pin Power Connector	
I	Grounding Lug	Use the lug supplied.
J	Rack mounting holes	
K	Detachable Rack mounting brackets	
L	0, 4, 8 or 16 E1/T1 Ports	See table **H-3**.
M	Standby Port	Hot Standby ready: HSB cable socket, see table **H-4**.

The Indicator LEDs (Item A in table **3-1** above) are shown in more detail in figure **3-10** below:

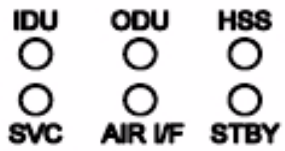


Figure 3-10: IDU-C LEDs

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

Table 3-2: IDU-C Front Panel LEDs (Continued)

Name	Color	Function
SVC	Green	E1 or T1 line is synchronized
	Orange	Alarm detected at the Site Binterface
	Orange	Local or Remote loopback
	Red	Alarm detected at the Site A interface
		Off - Ethernet only IDU or E1/T1 not configured
HSS		**Off**
STBY		**Off**

3-8

1. Attach the rack mounting brackets (K) to the IDU.
2. Bolt the IDU into an empty slot in the rack, ensuring that it sits securely.
3. 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 **3-8** above). An enlarged schematic of the power connectors is shown in below:

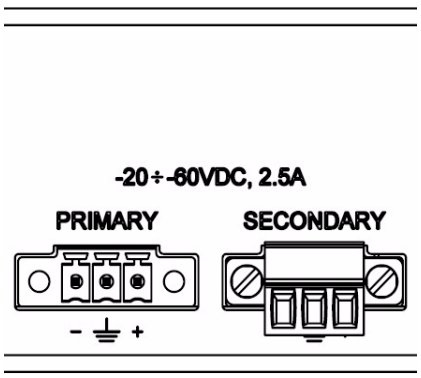


Figure 3-11: DU-C Power connectors

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 RADWIN.

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 **H** 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 **3-8** 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:

1. Connect user switch/router or any other compatible device to the IDU panel RJ-45 ports designated LAN (see item C in figure **3-8** above).
2. Connect user E1/T1 traffic to the IDU panel RJ-45 ports designated TRUNKS (labeled item L in figure **3-8** above).
3. To use the SFP Port (labeled item D in figure **3-8** above), insert an SFP plug-in module into the port and connect the user switch/router or any other compatible device to the SFP plug-in module.

Refer to appendix **H** 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 **H** 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 RADWIN 2000 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.

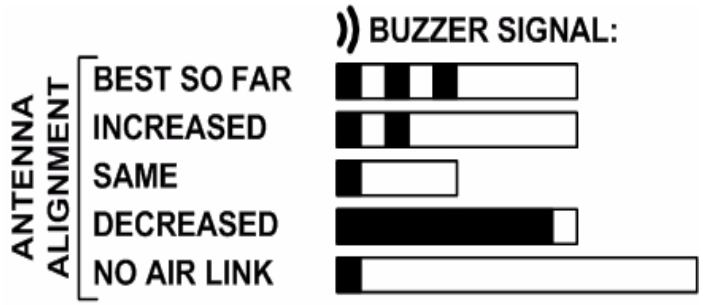


Figure 3-12: Beep Sequence for antenna alignment

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 RADWIN Manager

This chapter explains how to use the RADWIN Manager to install a RADWIN 2000 radio link.

Installing theRADWIN Manager Application

Minimum System Requirements

The RADWIN 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 RADWIN 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:

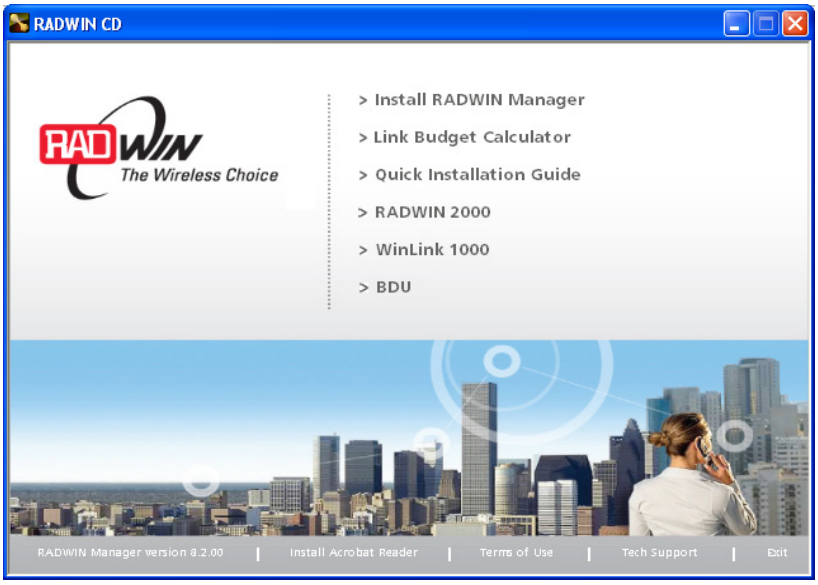
- Hard disk: 1 GB free space
- Network: 10/100BaseT NIC
- Graphics: 1024x768 screen resolution with 16 bit color
- Microsoft Explorer version 5.01 or later

Installing the Software

To install the RADWIN Manager application:

1. Insert the CD into the CD/DVD drive of your computer.

   The CD opening window appears:



2. Choose **Install** RADWIN Manager and follow the on-screen instructions of the installation wizard to complete the setup of the RADWIN Manager application.

   If the installation program fails to start, browse to your CD/DVD drive, chose the setup.exe program and run it.

Any PC running the RADWIN Manager application can be used to configure a RADWIN 2000 link.

Getting Started with the RADWIN Manager

If your links are within easy reach, you can configure them using the procedure described below. If however, your links are to be geographically scattered, it may be convenient to pre-load each ODU with its network address prior to physical installation. The procedure is quite straight forward, and set out in appendix **D**.

Note

Each ODU requires a static IP address, since part of the link definition is the IP address pair of both ODUs. Network Managers should ensure that these addresses are outside of the automatic allocation ranges used by their network DHCP server.

➢ To start the RADWIN Manager:

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

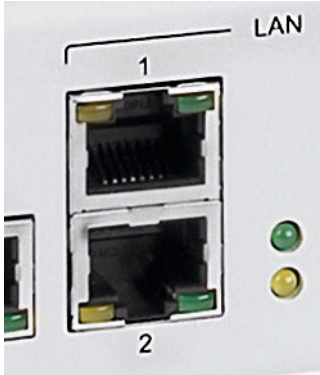


Figure 4-1: LAN ports on the front panel of the IDU-C

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:

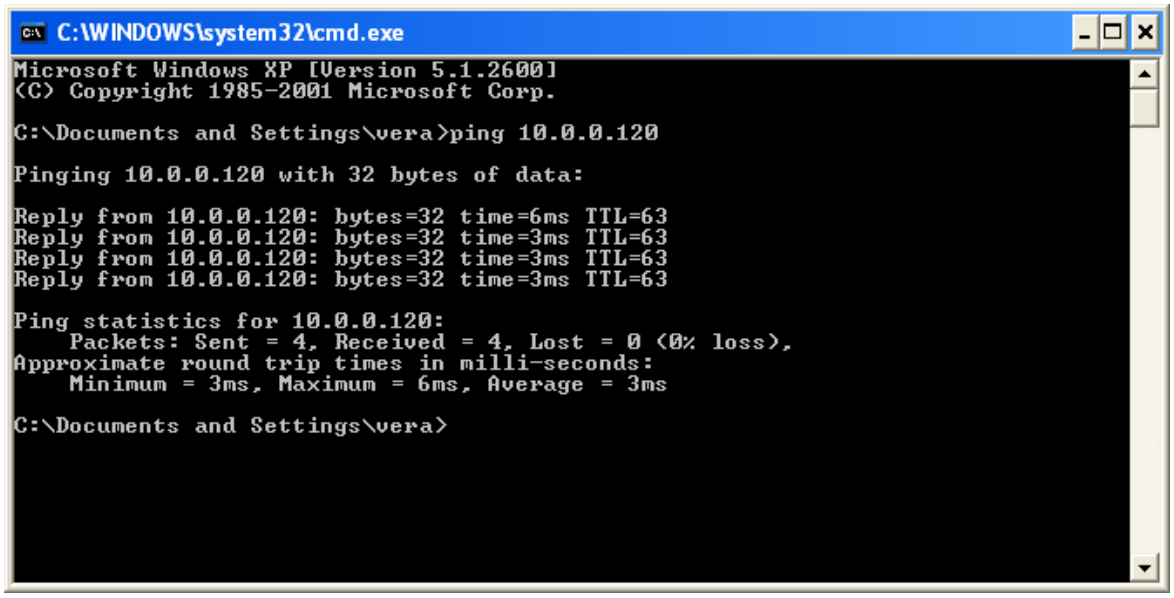


Figure 4-2: Pinging an uninstalled and unconfigured link

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

3. Dismiss the command line session.

4. Double-click the RADWIN Manager icon on the desktop, or click **Start | Programs |** RADWIN Manager **|** RADWIN Manager**.**

   The Login dialog box appears.

Figure 4-3: Log on Window

The RADWIN Manager log-on Concept

The RADWIN Manager provides three levels of access. To see them, click **Options** at any time in the Log on window (figure **4-3** above). You are offered an *extended* log-on window:

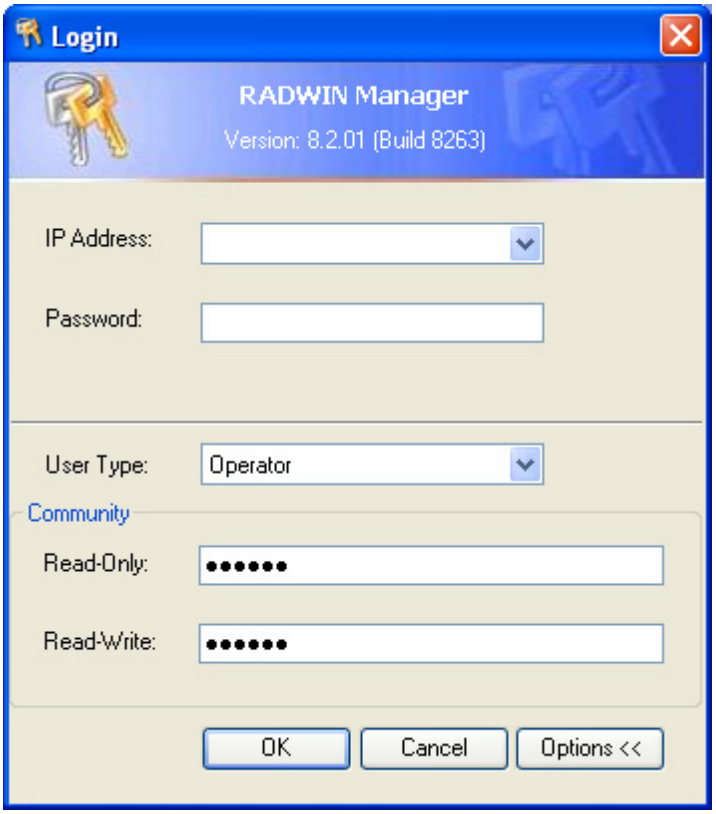


Figure 4-4: Log on window with User Type and Community options visible

At the User Type field, click the list button:

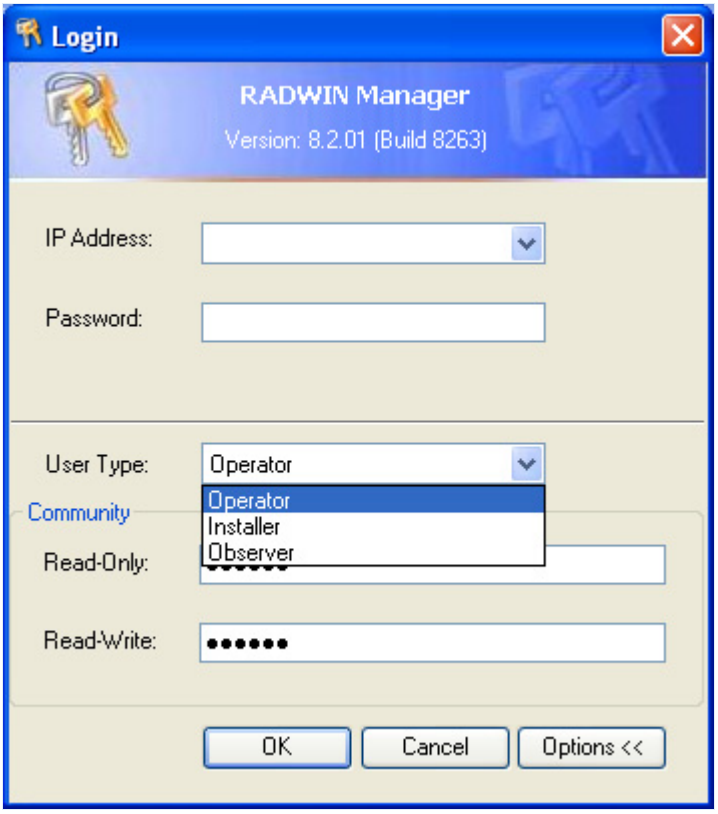


Figure 4-5: Log on window exposing the user types.

There are three user types:

- An ***Observer*** has read-only access to the link. An Observer can monitor the link, generate reports, but may not change any link parameters.
- An ***Operator*** can install and configure the link.
- An ***Installer*** can, in addition to functioning as an Operator, also change the operating band. The latter function has legal ramifications, requiring familiarity with local regulations.

The following table summarizes these options:

Table 4-2: User types, default passwords and function

User Type	Default Password	Function	Community	Community String	Reference
Observer	***admin***	Monitoring	Read-Only	***public***	
Operator	***admin***	Installation, configuration	Read-Write	***netman***	Chapters **4** - **6**, **page 6-14**
Installer	***wireless***	Operator plus set band	Read-Write	***netman***	Appendixe **E**, **page 6-14**

The network manager should change the default passwords as soon as possible.

Continuing the log-on procedure:

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).

Warning

- If you log on using 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. **Do not do this!**
- Network log on (IP address to the ODU) is recommended.
- If you log on 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.

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**. See also, appendix **D**).

6. If your User Type is not Operator, then choose it now.
7. Enter the password.
8. If you are a user with Read-Write permission, click **Options** to enter the Community options if required
9. For initial log on:
   - 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 RADWIN Manager main window is displayed (see figure **4-8**).

Log-on Errors

Unsupported Device

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

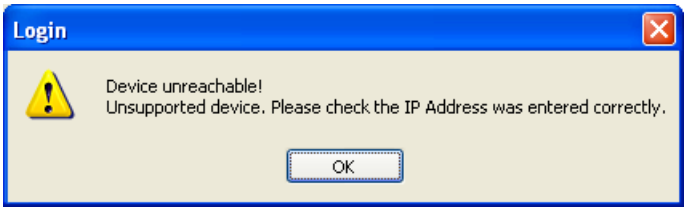


Figure 4-6: Unsupported device message

Incorrect IP Address

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

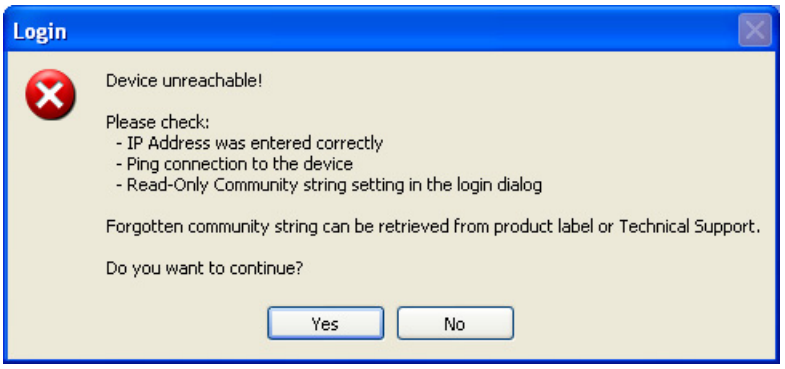


Figure 4-7: Unreachable device message

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

Incorrect Password

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

Continuing without an IP Address

The RADWIN Manager provides limited "offline" functionality when there is no accessible IDU/ODU. It is primarily for setting managing computer related parameters, running the Link Budget Calculator or viewing online Help. The offline functionality is shown in table **4-3** below. The table does not show menu items grayed out.

Table 4-3: RADWIN 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 RADWIN Manager. Same as Exit button	
Tools	**Software Upgrade**		Upgrades the ODU firmware in selected links	appendix **F**
	Change Password		Change the log-on password	**page 4-8**
	Events Log	**Clear Events**	Clear local events log	**page 7-13**
		Save to File	Save events log data to a file	
	Preferences		Set managing computer preferences	
Help	**RADWIN Manager Help**		View online help version of the User Manual	
	Link Budget Calculator		Calculator opened in default browser	appendix **B**
	Get Diagnostics Information		Obtain system information	**page 7-1**
	About RADWIN Manager		RADWIN 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

For what follows, it is assumed that you have set the IP addresses of both ODUs. For the purposes of illustration, we will use the following IP addresses:

Note

Our managing computer has its NIC set to IP address 192.168.1.100. The log-on ODU is set to IP address 192.168.1.101 and the over-the-air ODU is set to 192.168.1.102. The Subnet Mask for both sites is 255.255.255.0 and the Default Gateway is left unset. We will maintain this arrangement throughout the remainder of this manual.

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

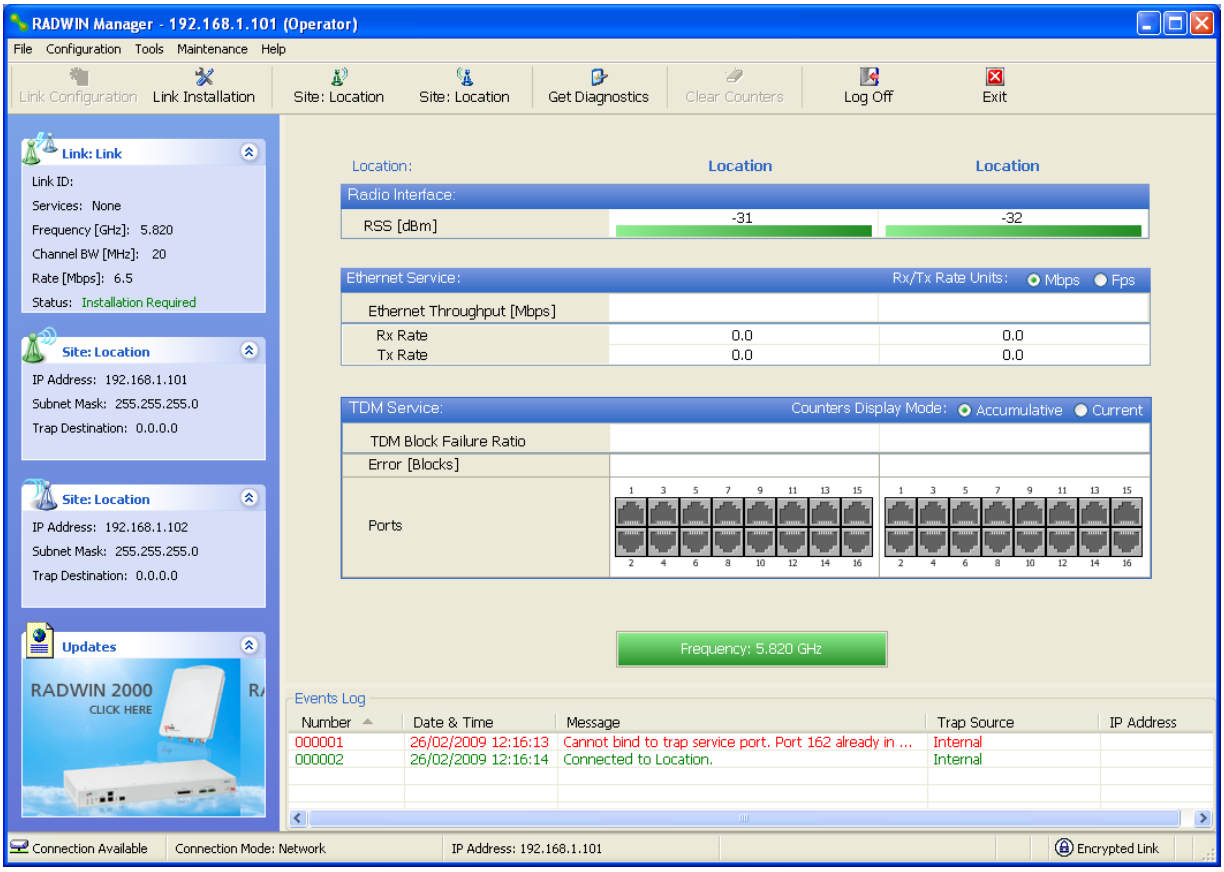


Figure 4-8: Opening RADWIN Manager window prior to installation

A detailed field by field description of the contents of the RADWIN 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.

Caution

- The ODUs as supplied by RADWIN are set up with a factory default band. If for some reason the default band needs to be changed, it should be done before link Installation. The procedure is set out in appendix **E**.
- Use of an incorrect band may be in violation of local regulations.

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.

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

Note

- 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 RADWIN 2000 configuration parameters are listed in the second column of **table 4-4** below. The third column shows the values we use in this manual for illustrative purposes.

Table 4-4: Default Settings

Parameter	Default Value	Illustrative Value	
Factory default band	Product dependent	5.820GHz	
ODU IP Address	10.0.0.120	192.168.1.101 and 102	
Subnet Mask	255.0.0.0	255.255.255.0	
Trap destination	0.0.0.0	0.0.0.0	
RADWIN Manager log-on passwords			
Observer	admin		
Operator	admin		
Installer	wireless		
Link ID	Link	EBG_20561334	
Link Name	Name	TPSF_BTT	
Site 1	Site	A	
Site 2	Site	B	
Location (per site)	Location	A	B
Name (per site)	Name	John	Mary
Contact (per site)	Person	Local	Remote
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 4-9: IDU-C Front Panel LEDs

The following table describes the indicators:

Table 4-5: IDU-C Front Panel LEDs

Name	Color	Function
IDU	**Green** **Green** **Red**	IDU operational During power-up only Failure
ODU	**Green** **Red**	ODU-to-IDU communication link is operating ODU-to-IDU communication link is disrupted
AIR I/F	**Green** **Orange** **Red**	Wireless link is synchronized During installation mode only Wireless link lost synchronization
SVC	**Green** **Orange** **Orange** **Red**	E1 or T1 line is synchronized Alarm detected at the Site Binterface Local or Remote loopback Alarm detected at the Site A interface **Off** - Ethernet only IDU or E1/T1 not configured
HSS		**Off**
STBY		**Off**

Installation Menu and Toolbar Functionality

The RADWIN Manager menu functionality is displayed in table **4-6**. The Toolbar buttons are detailed in table **4-7**.

Table 4-6: RADWIN 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 RADWIN Manager. Same as Exit button	
Configura-tion	**Link Configuration**		Run the Configuration Wizard. Not available in installation mode	chapter **5**
	1 Configure <Site 1 name>		Provides limited configuration for site. Has a path to return to installation mode	chapter **6**
	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	chapter **4**
Tools	**Performance Monitoring Report**		On screen and printable	chapter **7**
	Active Alarms	**1 <Site 1 name>**	Shows active alarms for <Site 1 name>	
		2 <Site 2 name>	Shows active alarms for <Site 1 name>	
	Recent Events		Displays recent events by site	
	Software Upgrade		Upgrade ODU firmware for current site or others	appendix **F**
	Change Band (Installer only)		Change the link band	appendix **E**
	Change Password		Change the log-on password dialog	**page 4-8**
	Events Log	**Clear Events**	Clear local events log	**page 7-13**
		Save to File	Save events log file	
	Preferences		Local preferences dialog	

Table 4-6: RADWIN Manager main menu functionality (Continued)

Menu level			Function	Reference
Top	**+1**	**+2**		
Mainte-nance	**Clear counters**		Clear TDM counters	
	Loopbacks		Set loopbacks - TDM only	**page 7-3**
	Reset	**1 <Site 1 name>**	Reset <Site 1 name> ODU	
		2 <Site 2 name>	Reset <Site 2 name> ODU	
Help	**RADWIN Manager Help**		View online version of the User Manual	
	Link Budget Calculator		Calculator opened in default browser	appendix **B**
	Get Diagnostics Information		Obtain system information	**page 7-1**
	About RADWIN Manager		Manager build and system information	

Table 4-7: RADWIN 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 1 name**. Same as **Configuration | 1 Configure <Site 1 name>**
Site: <Site 2 name>	Opens the Site configuration dialog for **Site 2 name**. 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 RADWIN Manager
Exit	Exits RADWIN Manager

Installing the Link: Overview

The installation is carried out using the Installation wizard. Its operation is detailed in the following pages in a tutorial style.

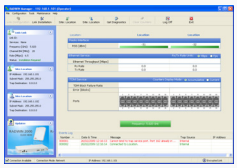
For the purpose of explanation, we will set up a laboratory link with the following characteristics:

- **Channel selection:** Automatic

- **Antennas:** Dual at both sites
- **Services:** Ethernet + 7xE1 on ports 1, 2, 3, 8, 10, 11, 14. It is unlikely that you would use a non-contiguous set of ports - but this shows that if required, it can be done.

The Installation wizard has seven steps as shown in table **4-8** below.

Table 4-8: Link Installation Wizard

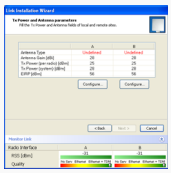


1 Wizard welcome

2 System parameters

- Link ID
- Site details

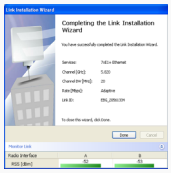
3 Channel settings - ACS Configuration



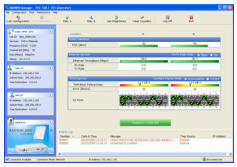
4 Tx Power and antenna settings

5 Services - Types, Adaptive or fixed, Jitter Buffer

6 Set TDM Clock Parameters



7 Wizard summary and completion



Installing the Link: Step 1, Start the Wizard

In the tool bar of the RADWIN Manager main window, click the **Link Installation** button. The Link Installation button is only accessible if the 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 3-13**.

The Installation Wizard opens:

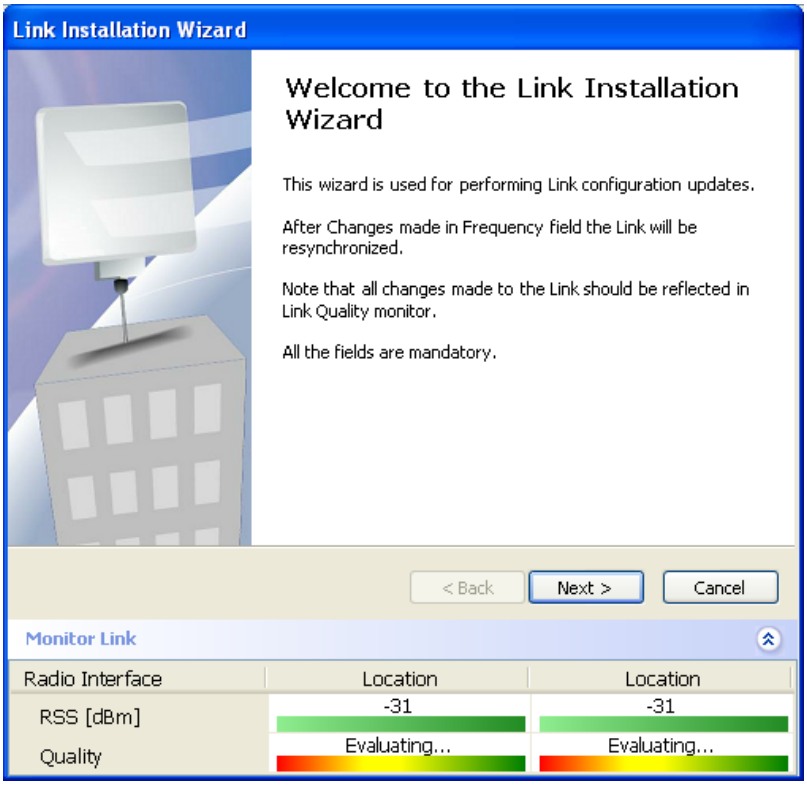


Figure 4-10: Link Installation Wizard

The bottom data area reproduces the corresponding data from the main window - which the above panel obscures. See **page 5-6** 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:

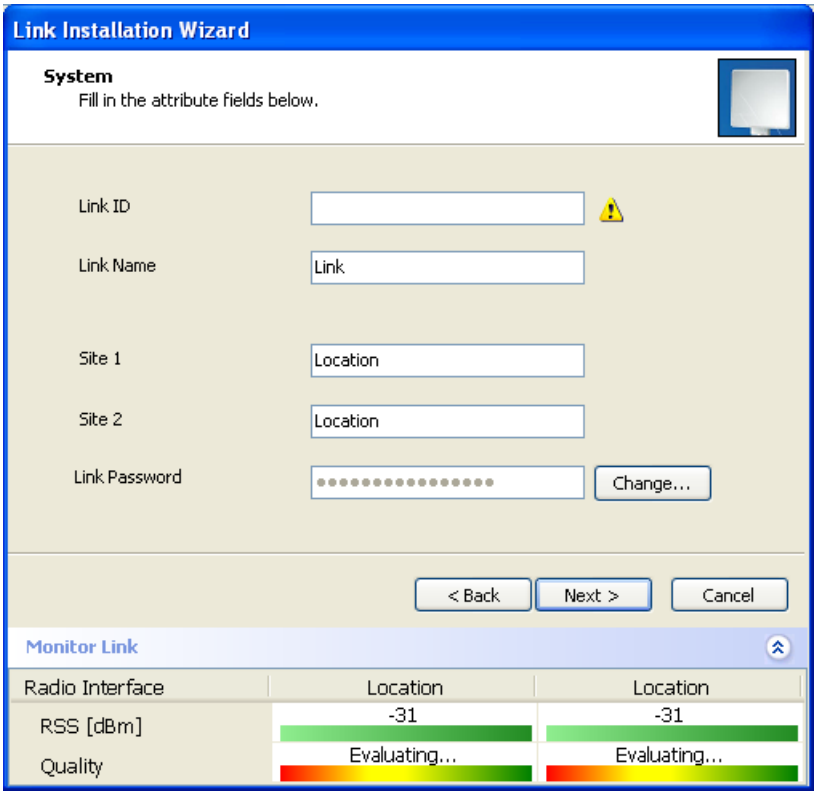


Figure 4-11: Installation Wizard, System dialog box

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 RADWIN Customer Support or use the alternative password supplied with the product.

The link password is peculiar to the link itself and should not be confused with the RADWIN Manager log 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

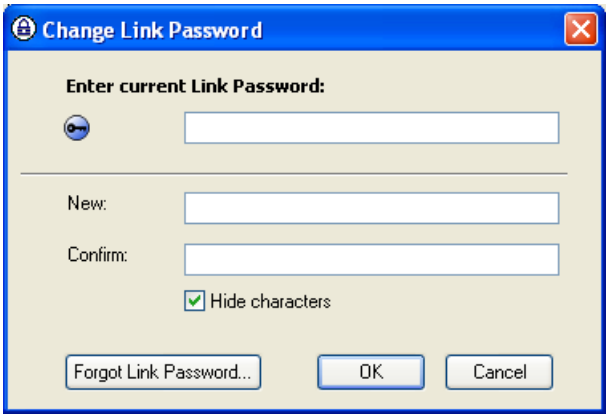


Figure 4-12: Change Link Password dialog box

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:

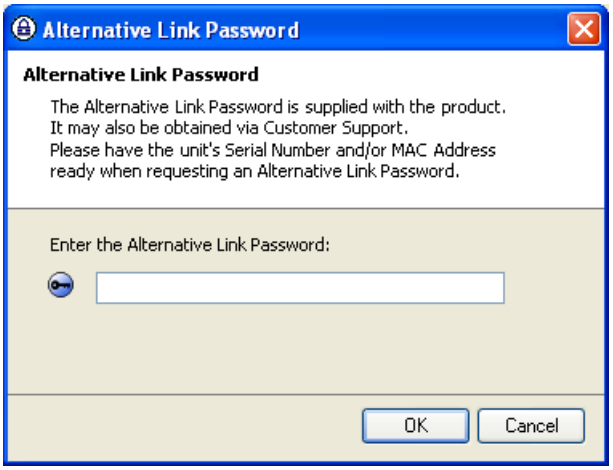


Figure 4-13: Lost or forgotten Link Password recovery

Follow the instructions to use the Alternative Link Password, and click **OK** to finish. You are returned to the window in **Figure 4-12** 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

RADWIN 2000 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 4-14** below. A channel switch takes place sufficiently fast as to ensure no loss of service.

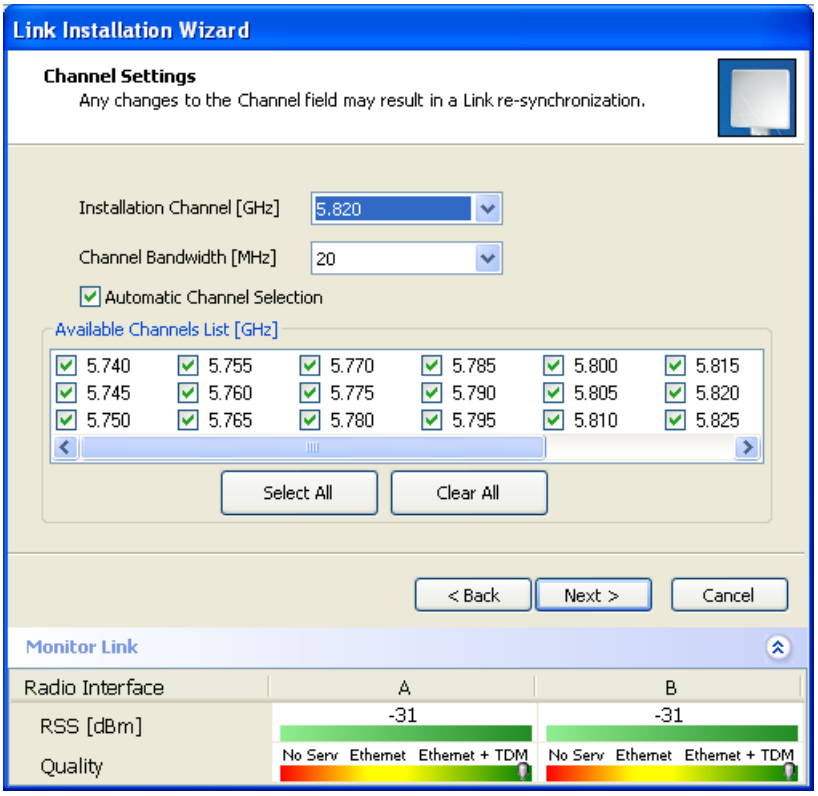


Figure 4-14: Channel Settings - Automatic Channel Selection

The default frequency for the product is shown.

To select channels to be used by the link:

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

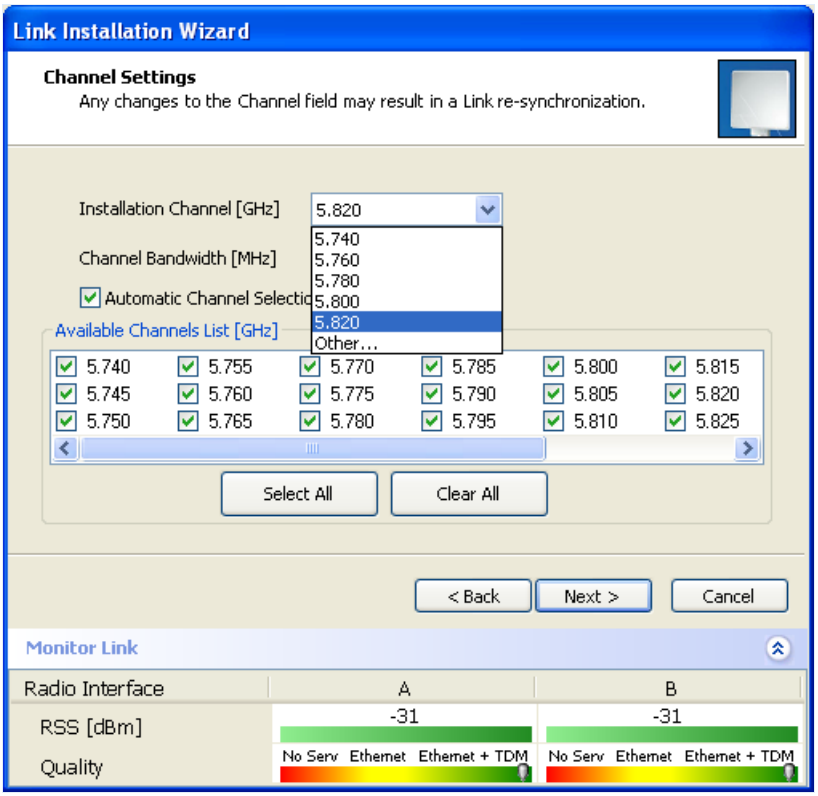


Figure 4-15: Channel Settings - Showing available installation rates

Note

For version 2.2 or earlier, 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 **No serv**(ice) (red) to **Ethernet + TDM** (green) as shown in the bottom of **Figure 4-14** above.
4. Click **Next**.

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

The Tx Power and Antenna Parameters dialog appears.

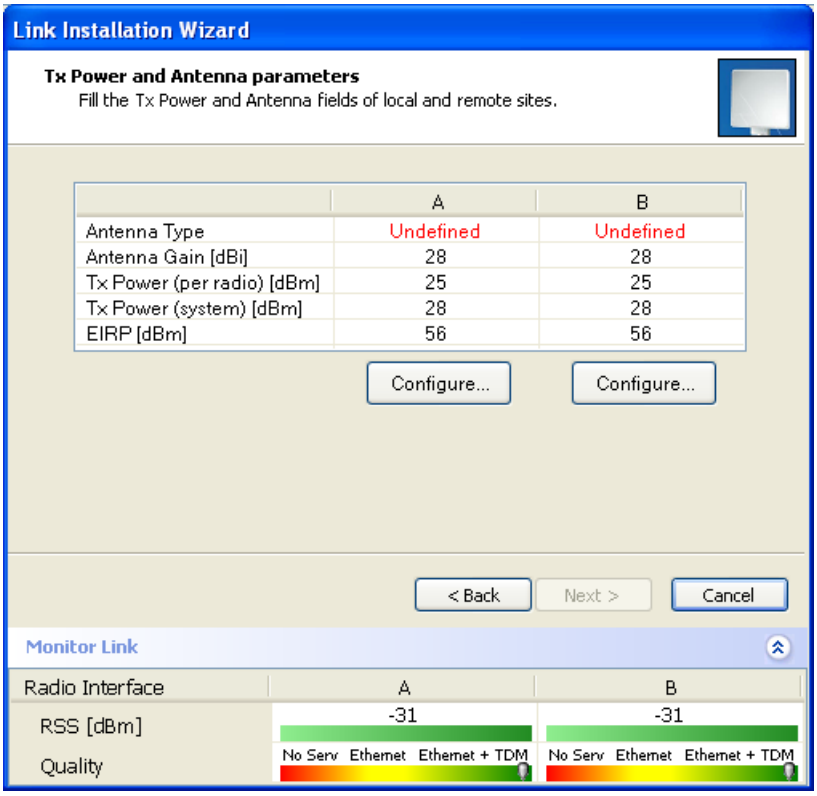


Figure 4-16: Transmission Power and Antenna Parameters

The choice of Tx Power, antenna gain and cable loss (between the radio and the antenna) 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 RADWIN 2000 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 RADWIN 2000 can transmit at modulation of 64QAM and FEC of 5/6 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, RADWIN 2000 automatically doubles the air rates.

RADWIN 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.

RADWIN 2000 automatically switches to this mode from dual mode if one of the ODUs is connected to a single antenna or if the RSS at one of the ODU receivers is below minimal level.

Table **4-9** summarizes the situation:

Table 4-9: MIMO, Air rate and Tx Power availabilit y

Site A - Site B	MIMO	Max Applicable Air Rate	Max Applicable System Tx Power
dual-dual	yes	dual	dual
dual-single	no	single	dual at Site A
single-single	no	single	single

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

The rates used by RADWIN 2000 are shown in table **4-10** below:

Table 4-10: RADWIN 2000 Air rates

Antenna	Modulation	FEC	Air-Rate [Mbps]
Single	BPSK	1/2	6.5
Single	QPSK	1/2	13
Single	QPSK	3/4	19.5

Table 4-10: RADWIN 2000 Air rates (Continued)

Antenna	Modulation	FEC	Air-Rate [Mbps]
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:

maxAvailableTx Power denote the maximum Tx Power practically available from an ODU. It appears as **Tx Power per Radio** in figure **4-17** 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 **4-17** as **Max EIRP**.

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

Then, the following relationship must be satisfied:

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

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:

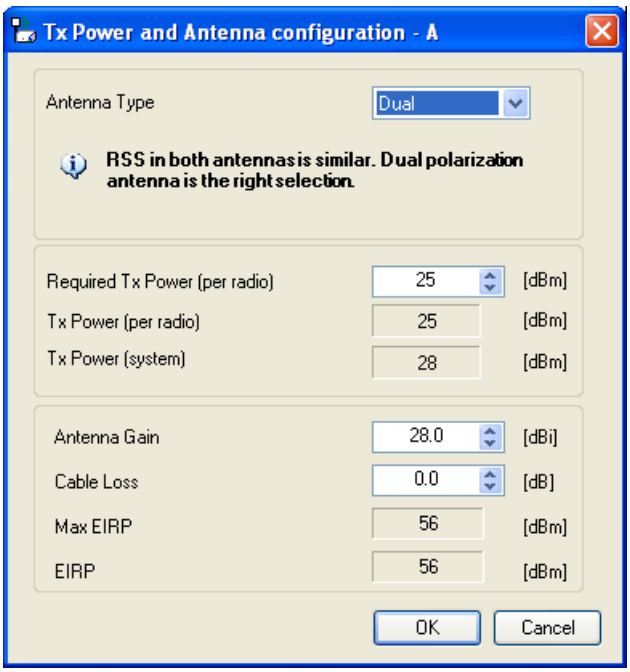


Figure 4-17: Antenna configuration dialog

2. Choose the antenna type and required transmission (Tx) power for the first site and click **OK**. You will receive the following warning:

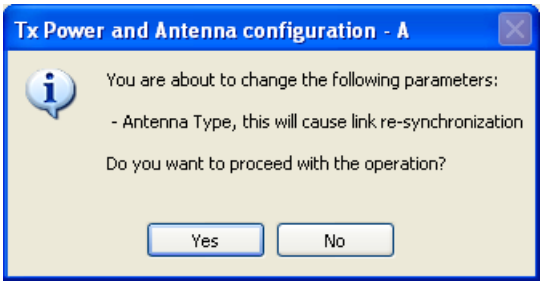


Figure 4-18: Antenna type change warning

3. Repeat the process for the second site.
4. At the same time you can set the Antenna Gain and Cable Loss.

   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 $dBm = 10 \times \log_{10} milliWatt$ so that if you double the power in milliWatts (for two radios) then dBm will increase by $10 \times \log_{10} 2 \approx 3$.

If you choose to set the Antenna Gain and Cable Loss, you will receive the following warning message:

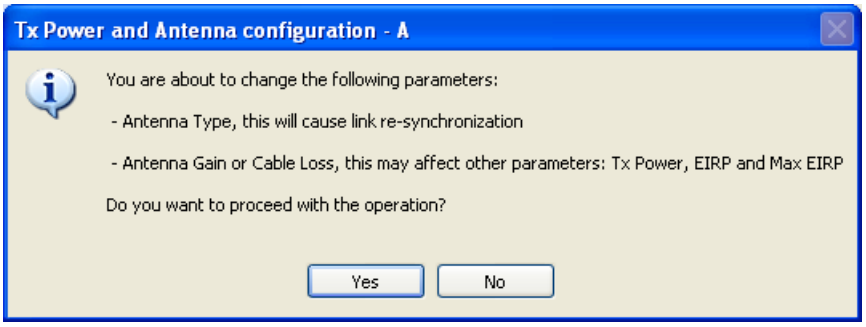
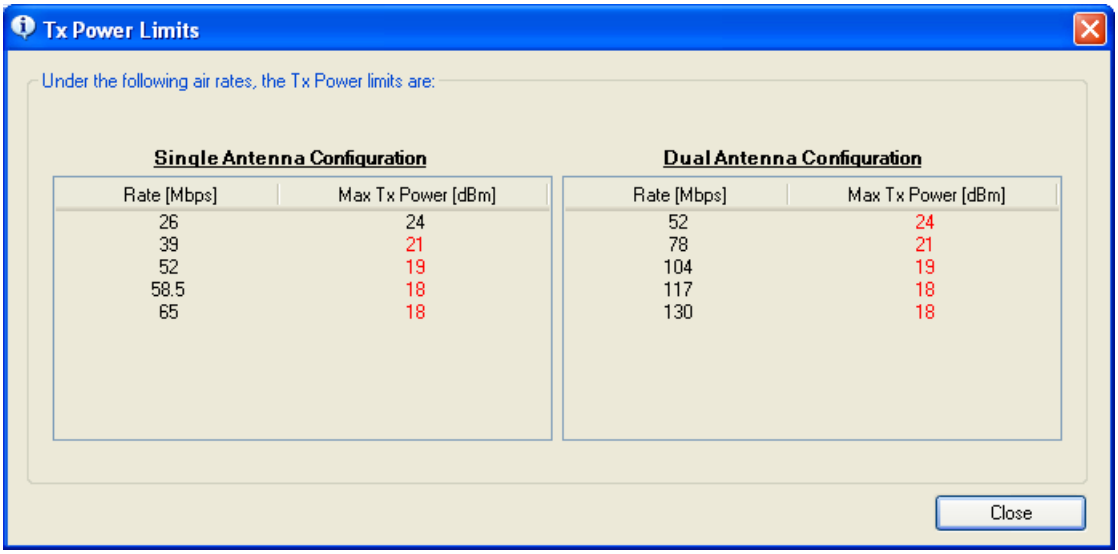


Figure 4-19: Antenna parameters change warning

Note

- 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:



Single Antenna Configuration

Rate [Mbps]	Max Tx Power [dBm]
26	24
39	21
52	19
58.5	18
65	18

Dual Antenna Configuration

Rate [Mbps]	Max Tx Power [dBm]
52	24
78	21
104	19
117	18
130	18

Figure 4-20: Tx Power Limits

The precise relationship between the items in inequality **(*)** and the window o figure **4-17** is as follows:

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

The table in figure **4-20** only shows rates where the maximum Tx Power is the limitation, rather than regulations.When you close the window of figure **4-20**, the change you requested will **not** be honored, and you will need to try again.

Since our demonstration link is entirely indoors, we have reduced Tx Power to 5 dBm to obtain a realistic RSS. Although this is much too low for field use, the method is general.

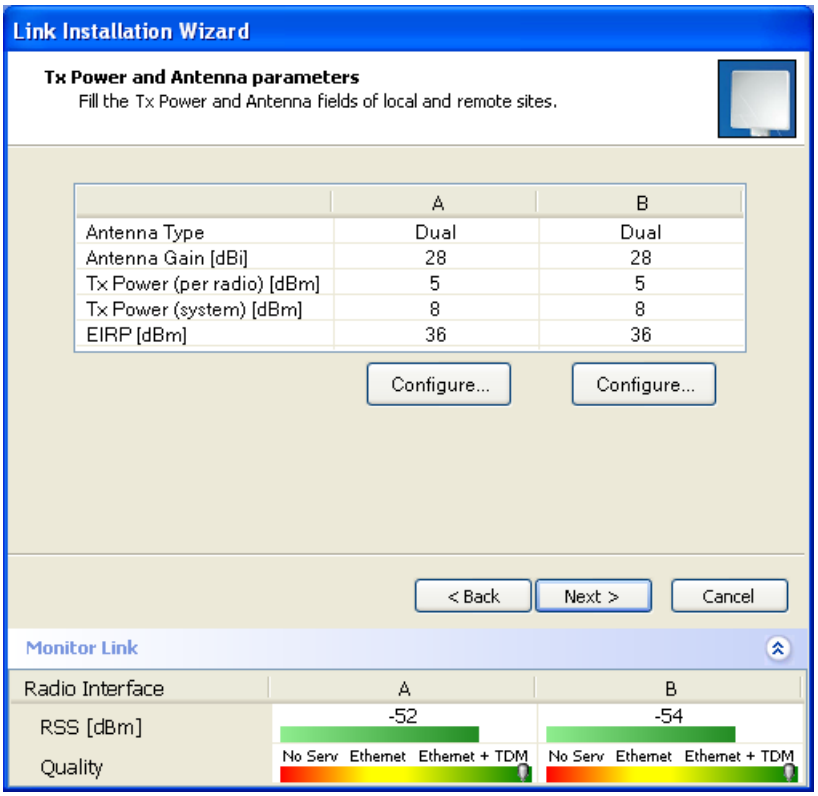


Figure 4-21: Antennas configured for two dual and Tx power 5dBm

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

Installing the Link: Step 5, Services

The Services dialog appears:

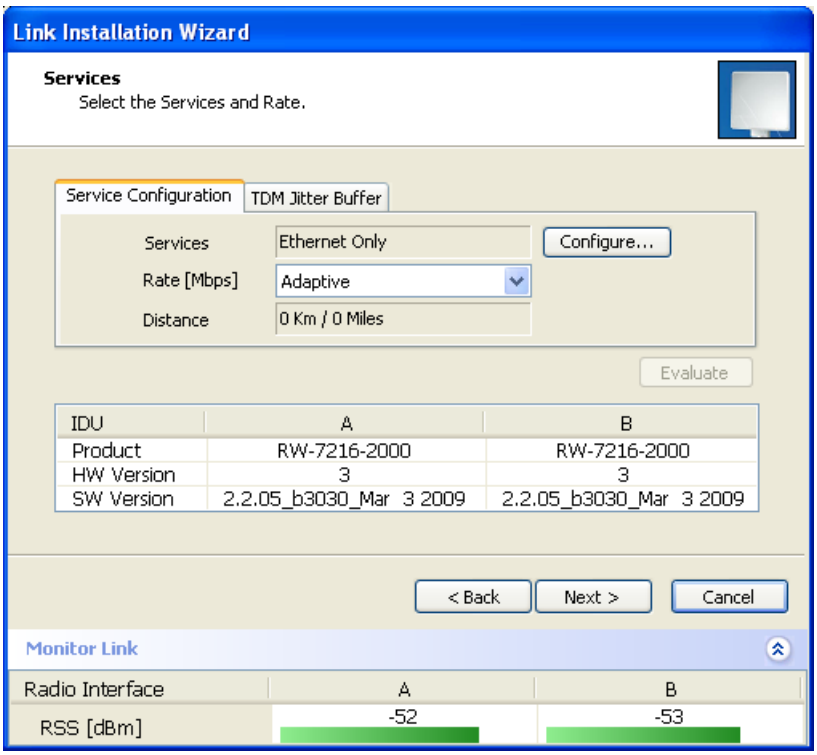


Figure 4-22: Services and Rates dialog

TDM Services selection

To select services:

1. Click the **Configure** button. The TDM services dialog is displayed:

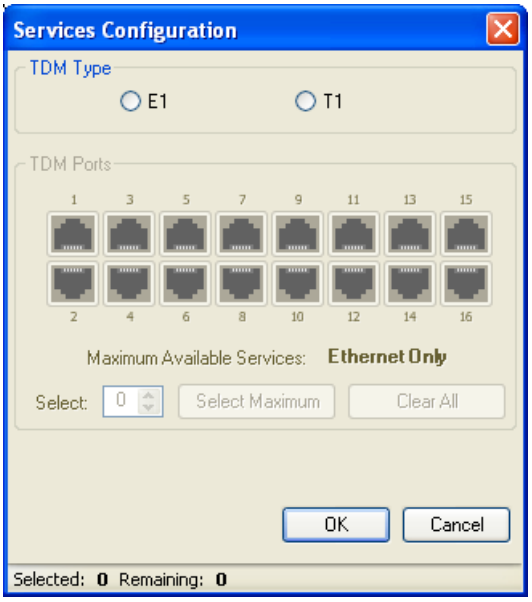


Figure 4-23: TDM Type selection

2. Using the TDM Type radio buttons, choose E1 or T1. You are now able to select the required service ports:

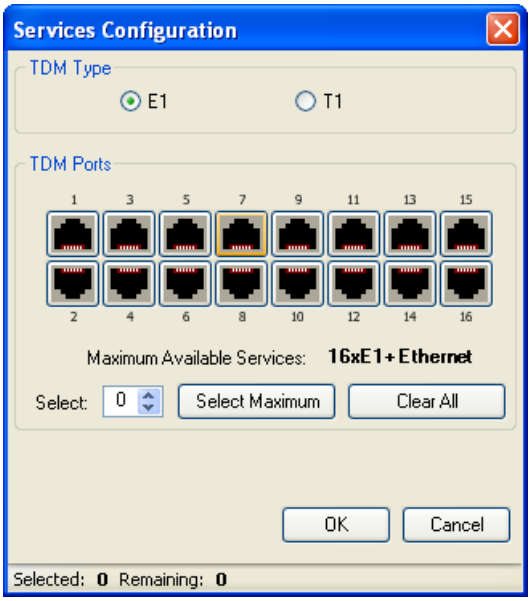


Figure 4-24: TDM service port selection

3. Use the spin button to choose consecutive service ports, the **Select Maximum** button to choose all available ports or click on individual ports to choose them.

Note

- Ethernet is always selected.
- The maximum available services will be reduced in accordance with actual air interface capacity.

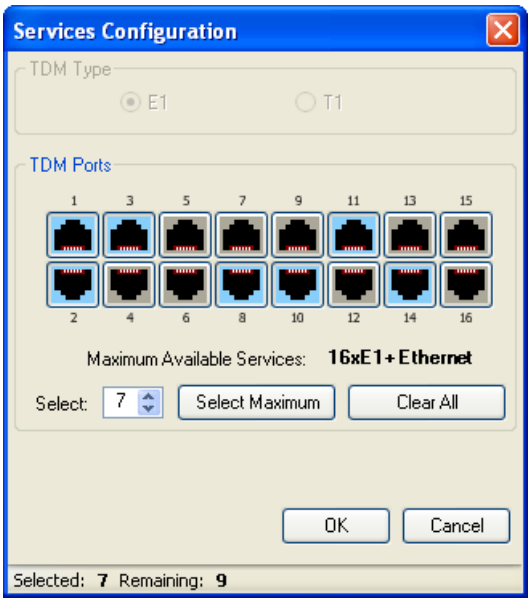


Figure 4-25: TDM Service port selection - seven services selected

4. Click **OK**. You are returned to the Services and rates dialog of figure **4-22**. It is updated to reflect your choice.

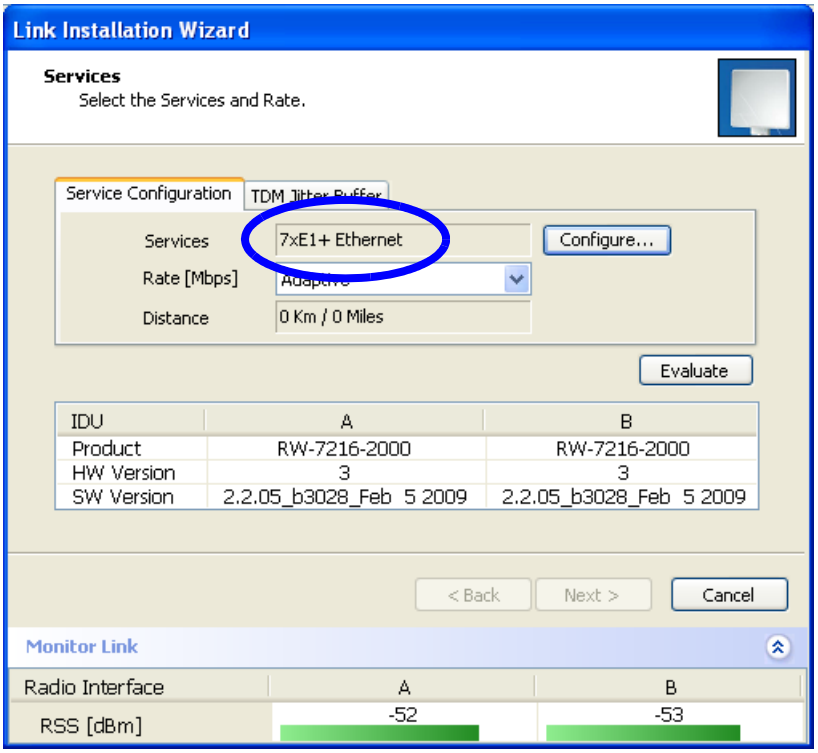


Figure 4-26: Services and Rates - Services chosen

Note

The selected ports will be enabled for both sides of the link. You cannot for example, use ports 1, 3, 5, 7 on one side and 2, 4, 6, 8 on the other.

Modulation Rate Selection

You may choose a specific modulation rate or use Adaptive.

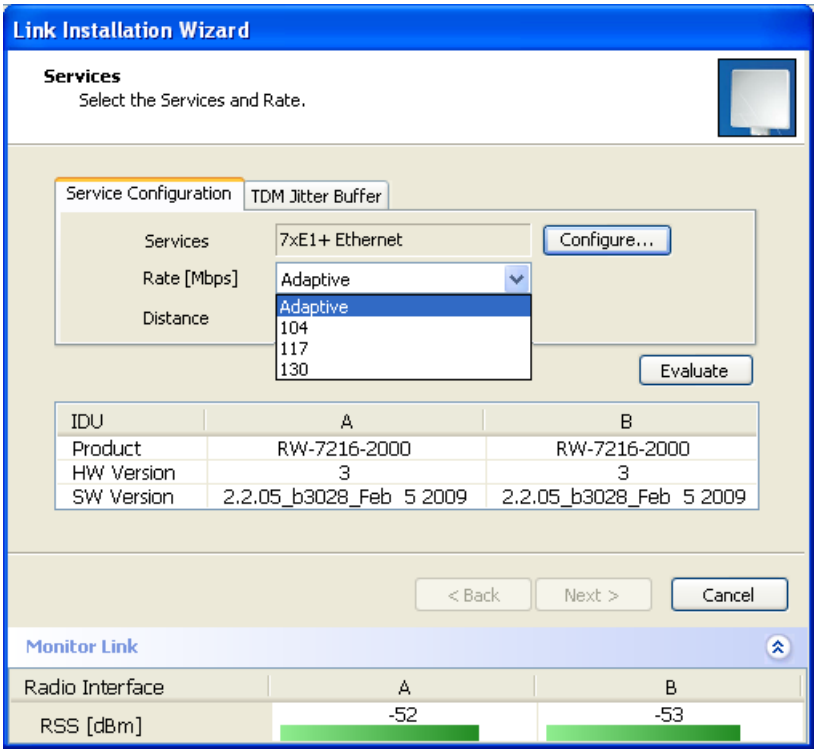
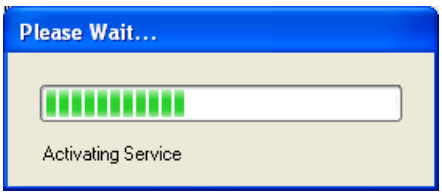


Figure 4-27: Services and Rates dialog: Available rates

To choose a modulation rate:

1. Choose Adaptive or one of the available rates (see **page 1-5** for information about Automatic Adaptive Rate).
2. Click **Evaluate** to continue or click the TDM Jitter Buffer tab to set the TDM Jitter Buffer (see next section).

   The service is activated as show below:



You are returned to the Services and rates dialog of figure **4-22**.

Setting the TDM Jitter Buffer

To set the TDM Jitter Buffer size:

1. Click the TDM Jitter Buffer tab. The following dialog appears:

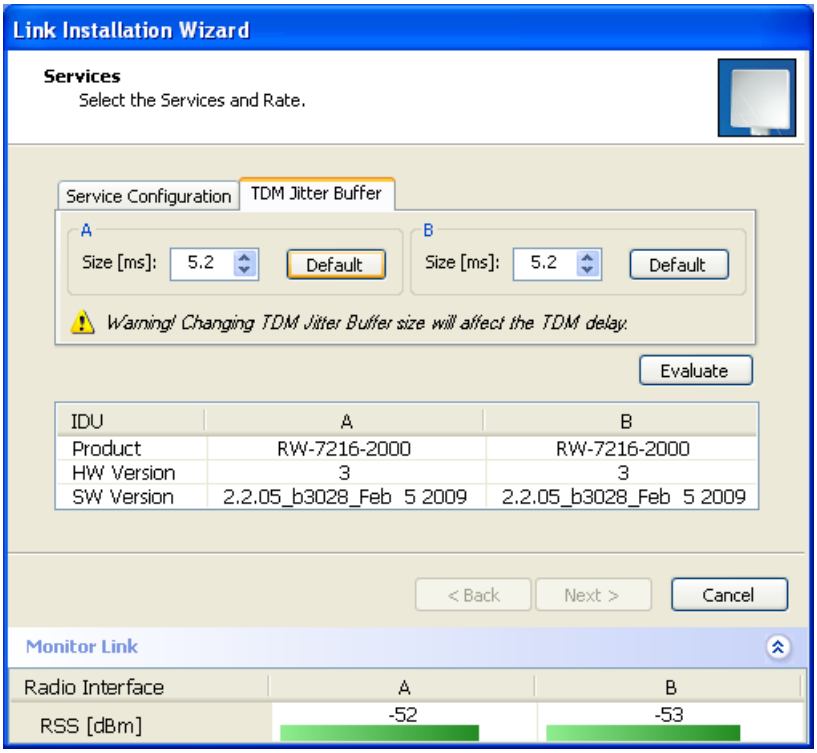


Figure 4-28: TDM Jitter Buffer Configuration

Note

- The receiver jitter buffer for each site can be enlarged, thereby increasing system resistance to interference (the larger the jitter buffer, the longer the interference period that the system will overcome without TDM errors).
- You can also decrease the jitter buffer to decrease the system delay.
- The jitter buffer can be configured between 2.0 and 16.0 ms.
- After setting the new value you must evaluate the expected quality. During the evaluation the TBFR (TDM Block Failure Ratio) bar is displayed. You select either **Next**, which performs the change or **Back** to cancel the change. Notice that the Jitter Buffer is configured per site.

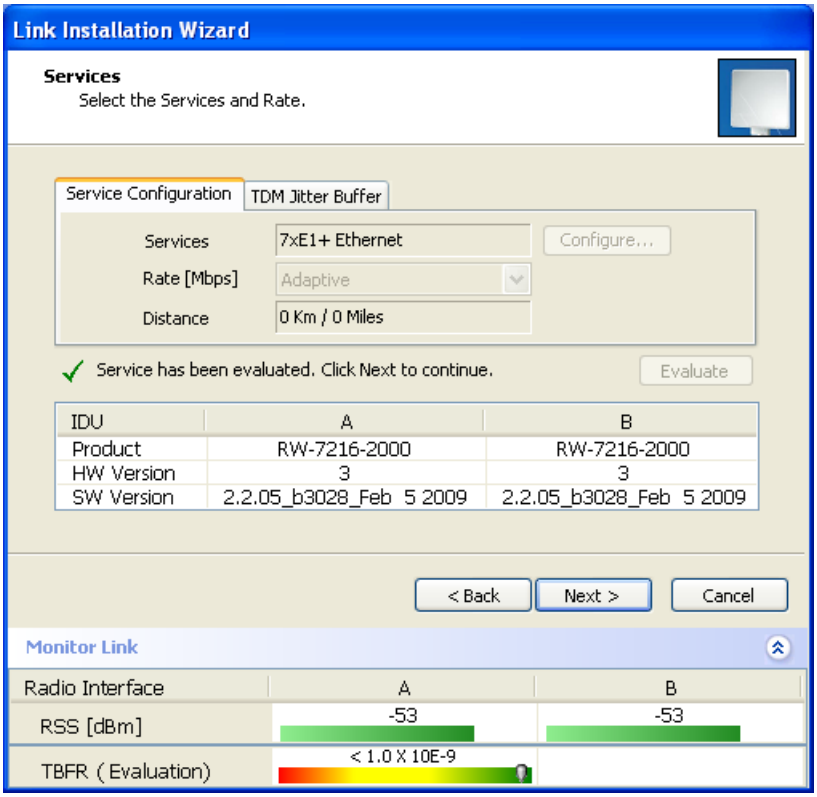


Figure 4-29: TDM Jitter Buffer Configuration - TBFR evaluation bar

2. After setting the jitter buffer size, if grayed out, the **Evaluate** button is enabled while both **Back** and **Next** are disabled as shown in the next figure:

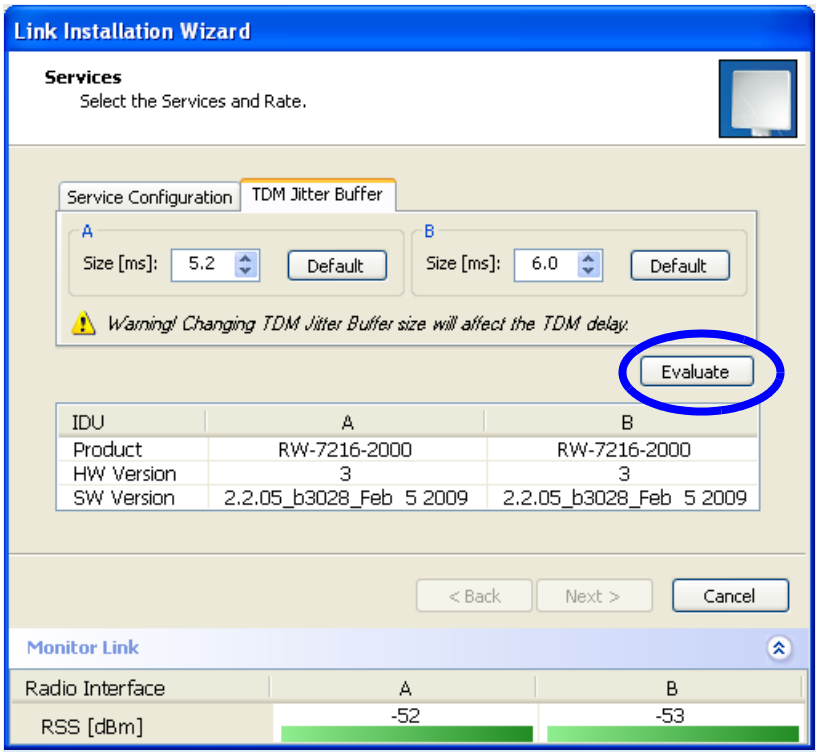


Figure 4-30: Services and TDM delay set - link ready for evaluation

3. You may make any further changes to the Service Configuration or the Jitter buffer. When you are satisfied, click the **Evaluate**.

   The optimum transmission rate for the selected services is evaluated.

   Following a short delay for processing, **Back** and **Next** are enabled.

4. Click **Next** to continue.

Note

The transmission rates used by RADWIN 2000 are shown in table **4-10** above.

Installing the Link: Step 6, TDM Clock Configuration

The following dialog is displayed:

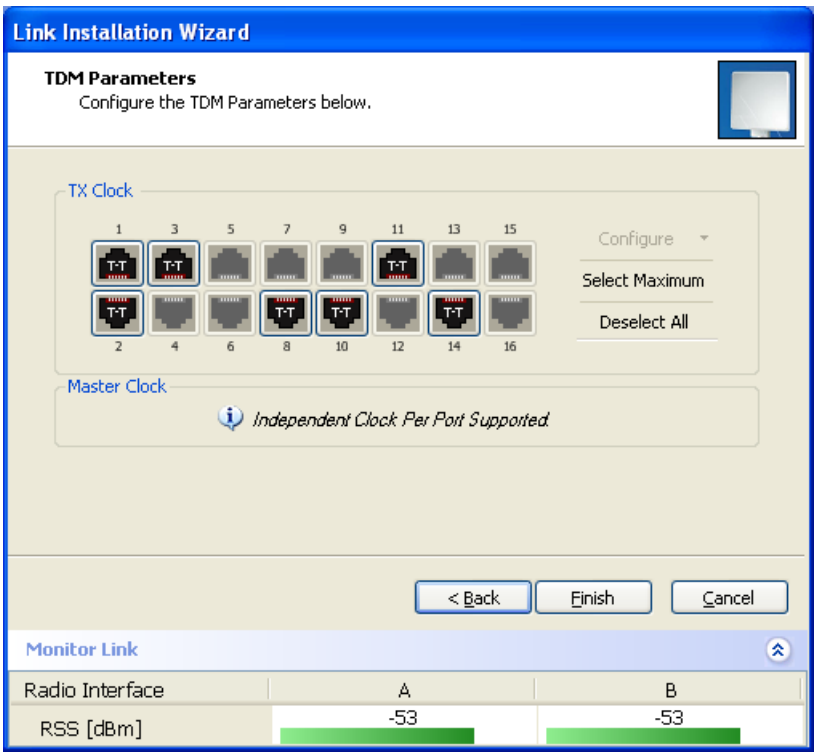


Figure 4-31: TDM Parameters Configuration (1)

To configure TDM clock parameters:

1. For any individual port, click it. For the same parameters for all ports, click the **Select All** tag.

Note

- **Select Maximum** will select the maximum number of services that can be carried by the air interface
- **Select All** unconditionally selects all of the services

2. Click **Configure**. The following drop down list is displayed:

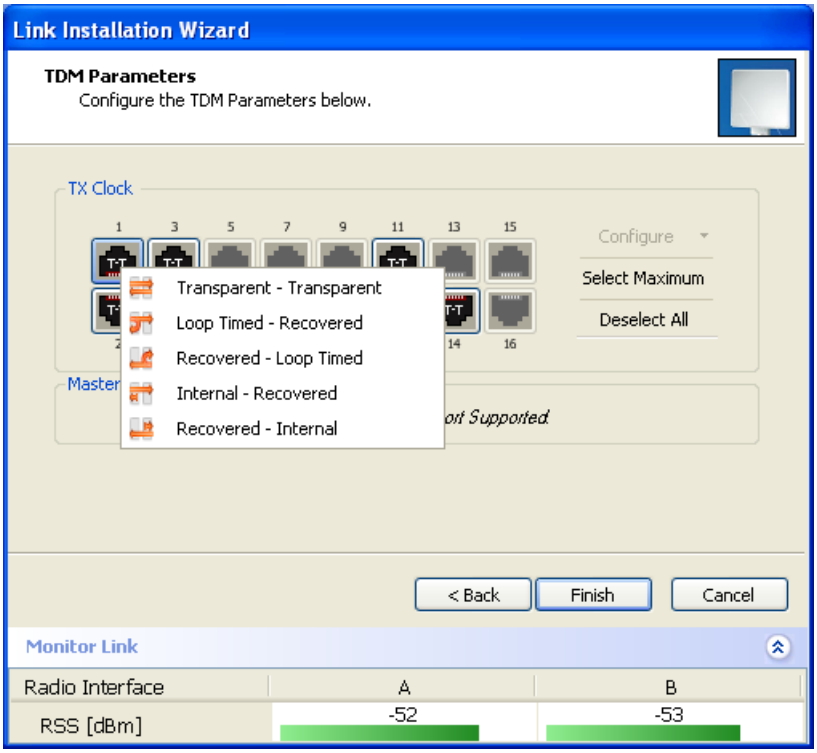


Figure 4-32: TDM Parameters Configuration (2)

3. Click the required parameter. Their meanings are as follows:

Note

Please keep in mind that what follows is ***per port***.

Transparent/Transparent

The clock at Site A regenerates the clock from Site B and vice versa.

Loop time/Recover

The Site A port receive-clock is used as the transmit-clock for that port on both sides of the link.

Recover/Loop time

The Site B port receive-clock is used as the transmit-clock for that port on both sides of the link.

Internal/Recover

The Site A port uses its internal oscillator to generate its transmit clock while the Site B port regenerates the clock received at the Site A port.

Recover/Internal

The Site B port uses its internal oscillator to generate its transmit clock while the Site A port regenerates the clock received at the Site B port.

4. Click **Finish** to complete the wizard.

Installing the Link: Step 7, Installation Summary and Exit

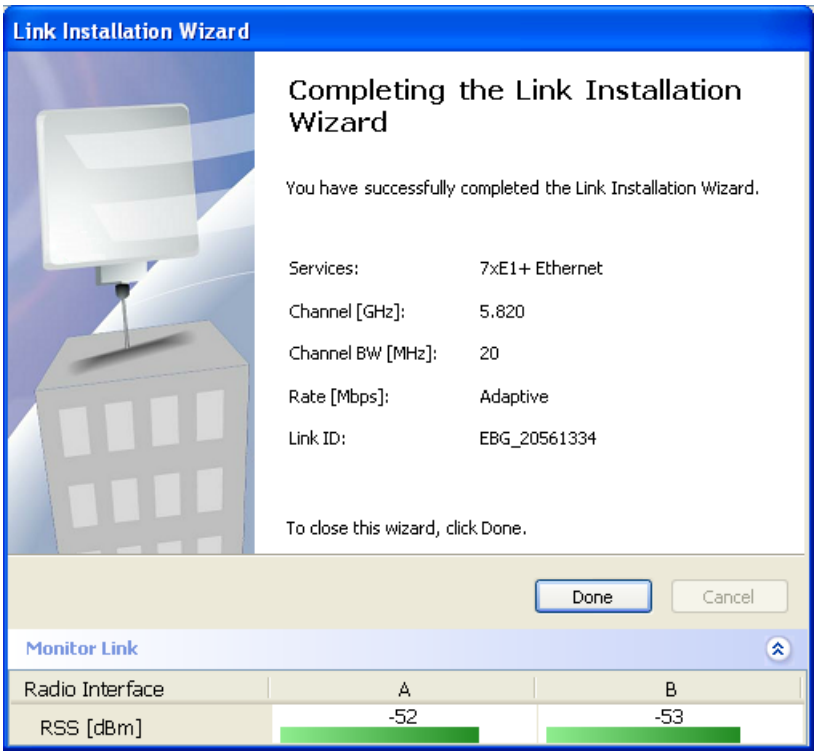


Figure 4-33: Installation Wizard Exit Summary

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

The main window now reflects the installation:

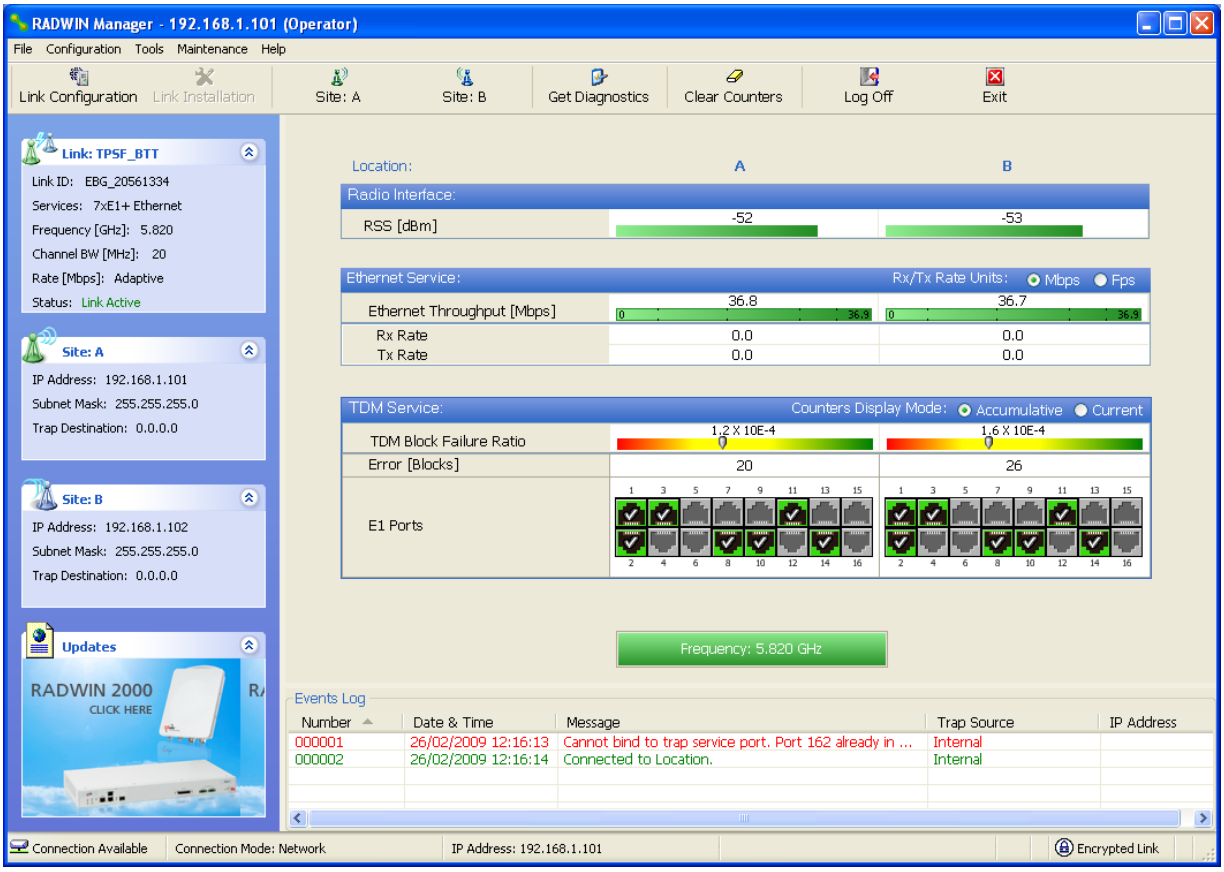


Figure 4-34: Main window of the manager after installation

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 **Site: A** or **Site:B** and **Installation Mode** in the Site Configuration dialog. Some Installation mode functionality may cause a break in, or degrade link service.

If you can accomplish link changes without affecting 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 RADWIN 2000 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.

Link configuration allows you to configure link parameters, which do not lead to sync loss or require a reset. Some may change service performance, in respect of which, warnings are displayed.

For ease of use, the Link Configuration wizard follows the same pattern as Link Installation. You should therefore be familiar with the content of chapter 4.

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 RADWIN Manager

Ensure that the RADWIN Manager is running.

The main window should look similar to that in figure 5-1:

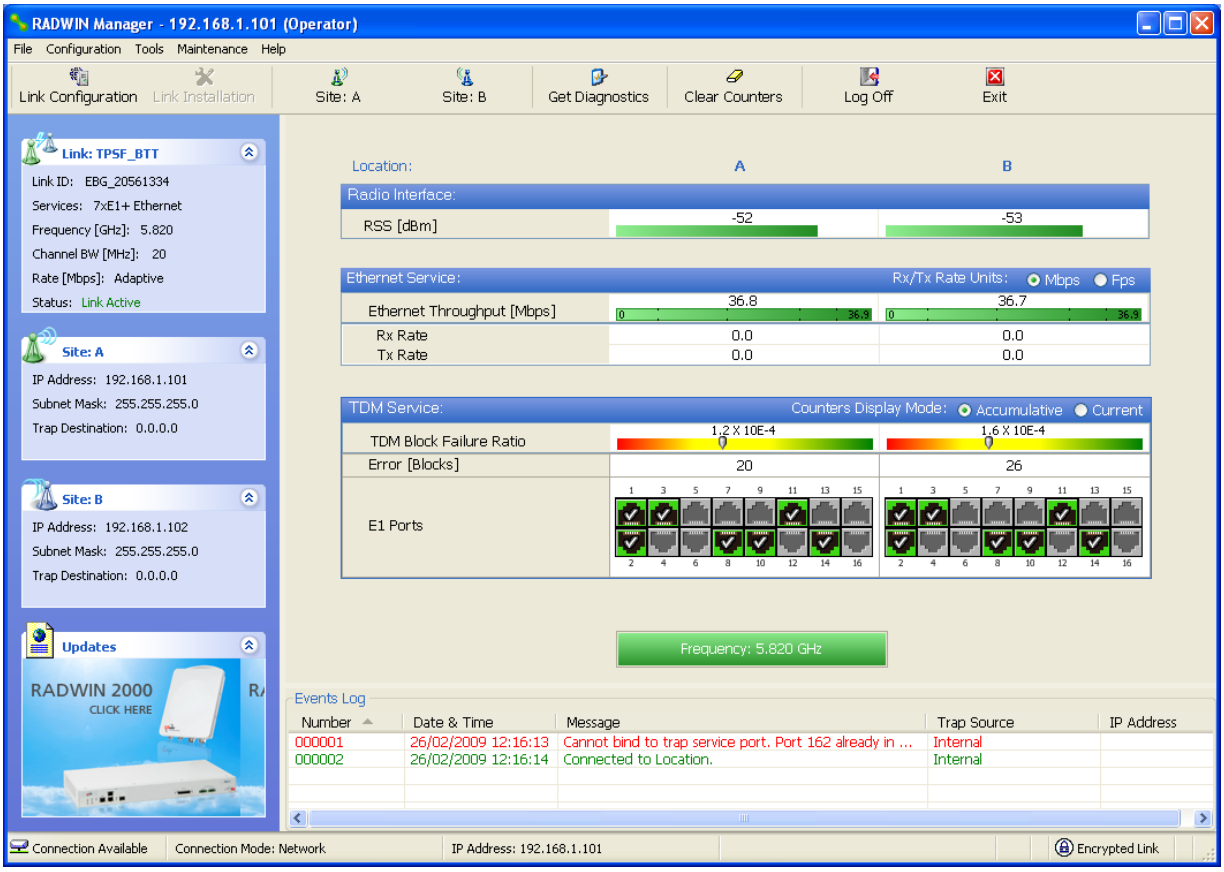


Figure 5-1: Main window, Wireless Link is Active

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 RADWIN 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 RADWIN Manager Toolbar

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

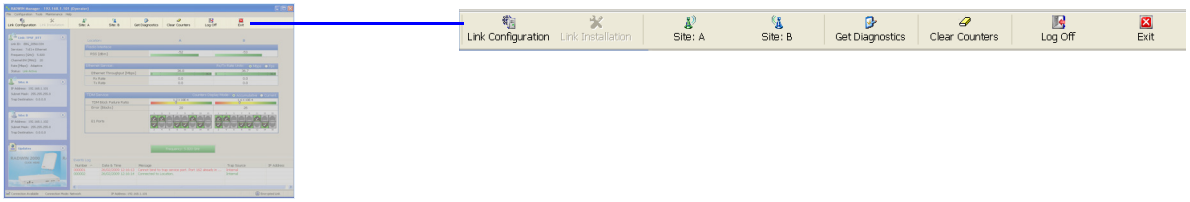


Table 5-1: RADWIN Manager Toolbar

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 1 name**. Same as **Configuration | 1 Configure <Site 1 name>**
Site: <Site 2 name>	Opens the Site configuration dialog for **Site 2 name**. 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 RADWIN Manager
Exit	Exits RADWIN Manager

The RADWIN Manager Main Menu

The RADWIN Manager menu, is shown in table **5-2** below:

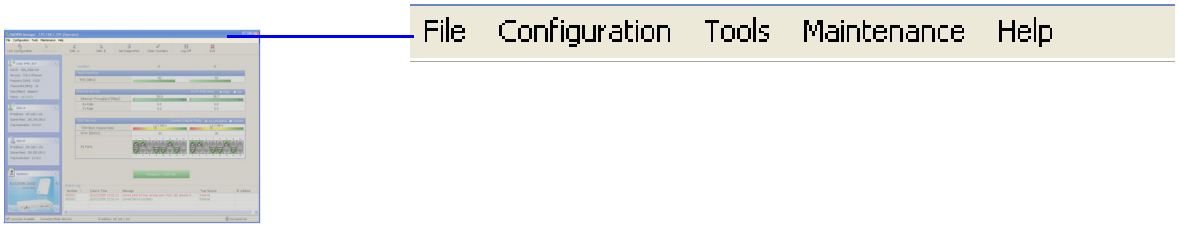


Table 5-2: RADWIN Manager main menu functionality

Menu level			Function	Reference
Top	**+1**	**+2**		
File	**Log Off**		Return to log-on dialog. Same as Log Off button	
	Exit		Exit the RADWIN Manager. Same as Exit button	

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

Menu level			Function	Reference
Top	**+1**	**+2**		
Configura-tion	**Link Configuration**		Run the Configuration Wizard. Not available in installation mode	chapter **5**
	1 Configure <Site 1 name>		Provides limited configuration for site. Has a path to return to installation mode	chapter **6**
	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	chapter **4**
Tools	**Performance Monitoring Report**		On screen and printable	chapter **7**
	Active Alarms	**1 <Site 1 name>**	Shows active alarms for <Site 1 name>	
		2 <Site 2 name>	Shows active alarms for <Site 1 name>	
	Recent Events		Displays recent events by site	
	Software Upgrade		Upgrade ODU firmware for current site or others	appendix **F**
	Change Band (Installer only)		Change the link band	appendix **E**
	Change Password		Change the log-on password dialog	**page 4-8**
	Events Log	**Clear Events**	Clear local events log	**page 7-13**
		Save to File	Save events log file	
	Preferences		Local preferences dialog	
Mainte-nance	**Clear counters**		Clear TDM counters	
	Loopbacks		Set loopbacks - TDM only	**page 7-3**
	Reset	**1 <Site 1 name>**	Reset <Site 1 name> ODU	
		2 <Site 2 name>	Reset <Site 2 name> ODU	

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

Menu level			Function	Reference
Top	**+1**	**+2**		
Help	**RADWIN Manager Help**		View online version of the User Manual	
	Link Budget Calculator		Calculator opened in default browser	appendix **B**
	Get Diagnostics Information		Obtain system information	**page 7-1**
	About RADWIN Manager		Manager build and system information	

Link details pane

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

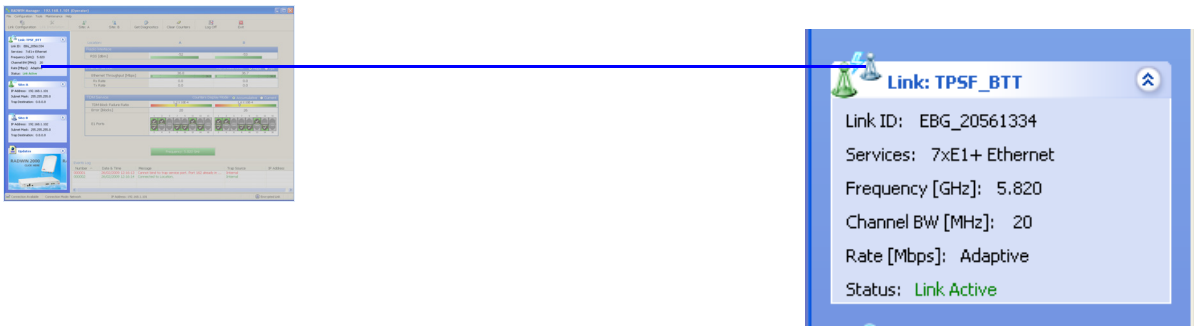


Table 5-3: Link Details

Item
Link ID
Services selected
Frequency
Channel bandwidth
Rate
Link status

The two lower panels show basic link site details:

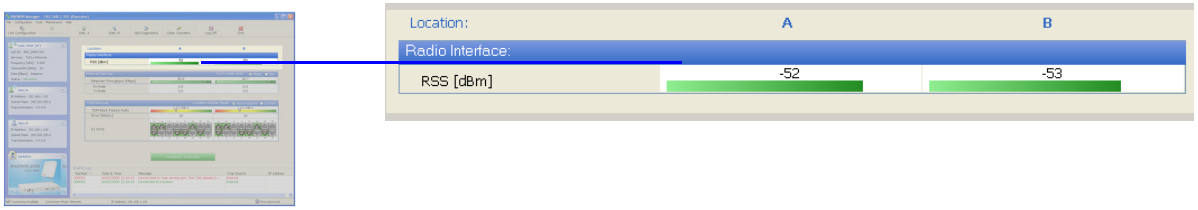
Table 5-4: Link site details, Site A and Site B

Item
IP Address
Subnet Mask
Trap Desalination

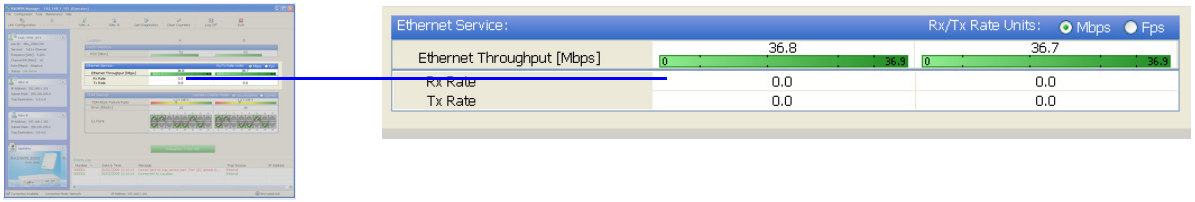
Monitor pane

he 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 of Fbps, selectable in the panel tile bar.

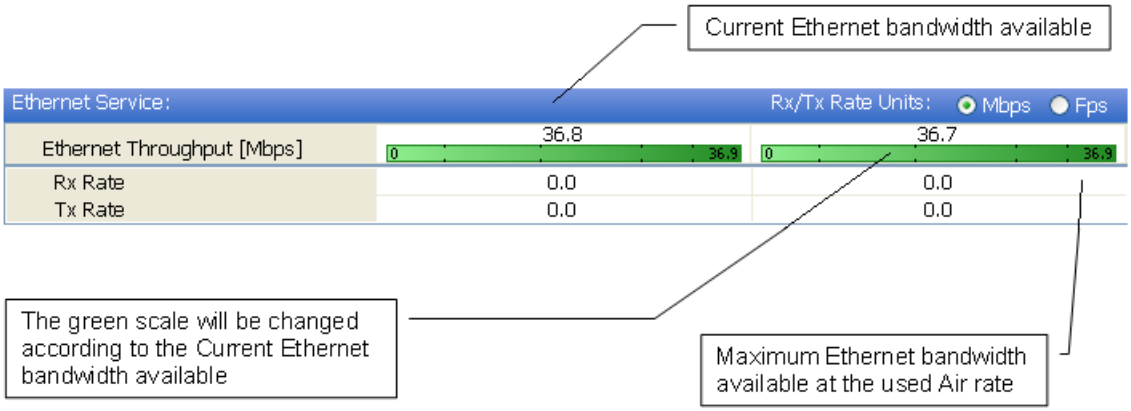
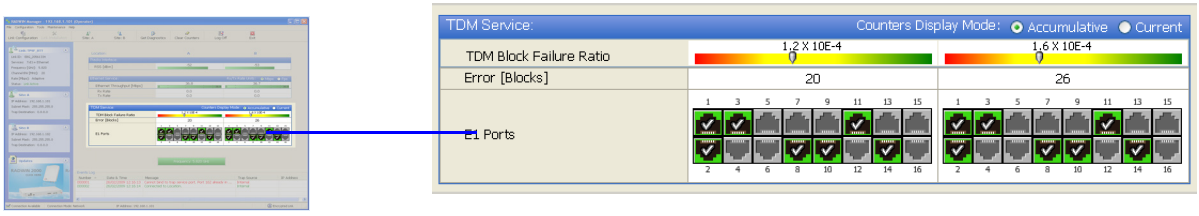
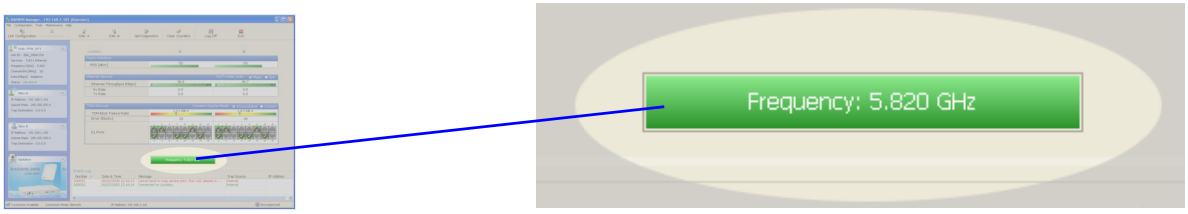


Figure 5-2: Ethernet Throughput Indication

- TDM Services:



- The title bar enables you to switch betweenAccumulative and Current view.
- Immediately below the title bar is displayed the TDM Block Failure Ratio. It is zerod by the **Clear Counters** button in the tool bar.
- Error block count is shown immediately above the active TDM channels display.
- The color of the TDM ports reflects their current status:
  - Green - Operational
  - Red - Error: LOS for loss of signal and AIS for Alarm Indication Signal
  - Yellow - loopback
- Frequency box: It shows the link frequency. The color of the box indicates the status

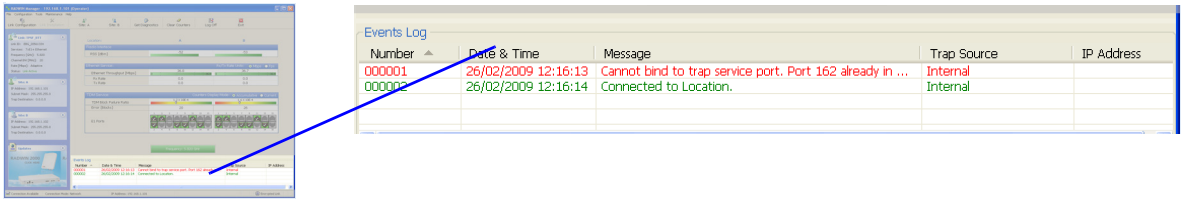


- Green is an active link
- Red is an inactive link
- Magenta shows an authentication or compatibility problem

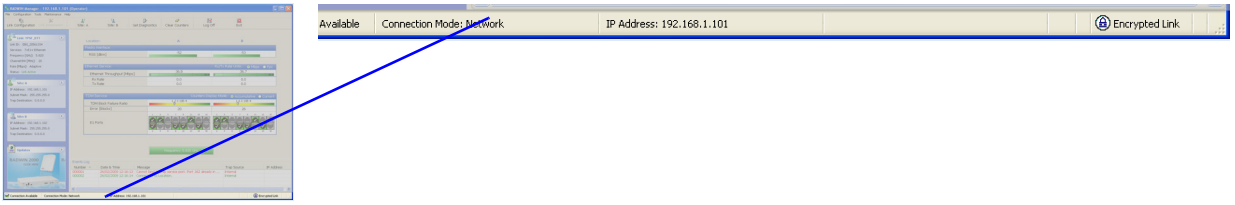
- Brown shows severe compatibility problem

Events Log

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



Status Bar



The Status bar, displays the following icons:

Table 5-5: Status bar indicators

Icon or Label	Purpose
Connectivity	Shows if RADWIN Manager is communicating with the ODU.
Connection available	Connection mode to the ODU • 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	Log on 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.

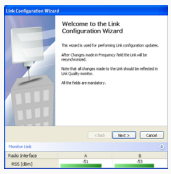
Note

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



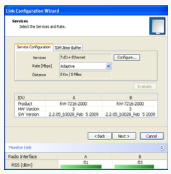
1 Wizard welcome

2 System parameters

- Link ID
- Site details

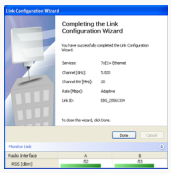
3 Channel settings

4 Tx power settings

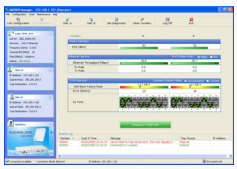


5 Services

6 Set TDM Clock Parameters



7 Wizard summary and completion



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 RADWIN 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:

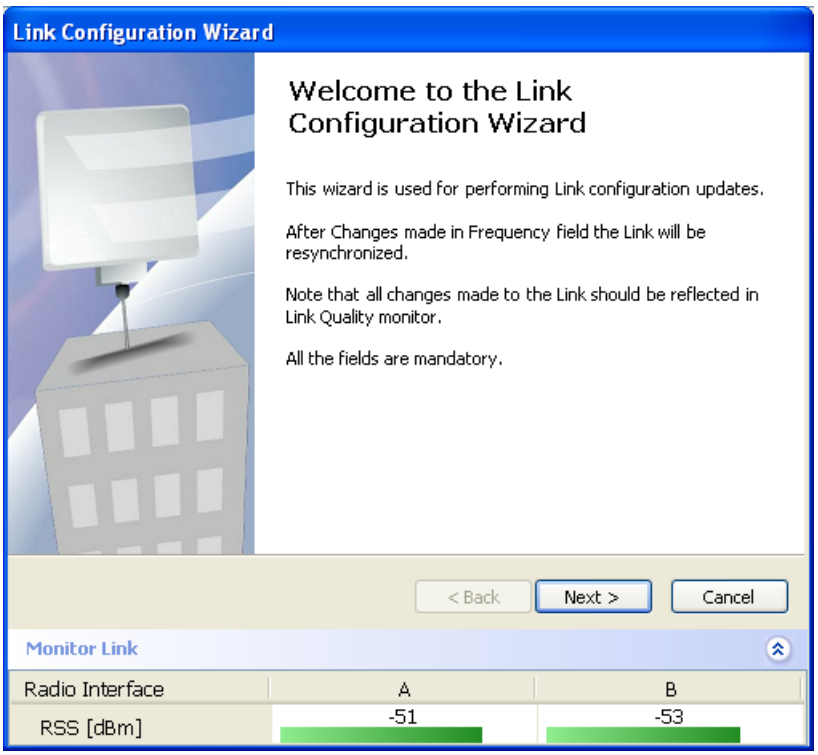


Figure 5-3: Link Configuration Wizard

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

Configuring the Link: Step 2, System Parameters

The System dialog box opens:

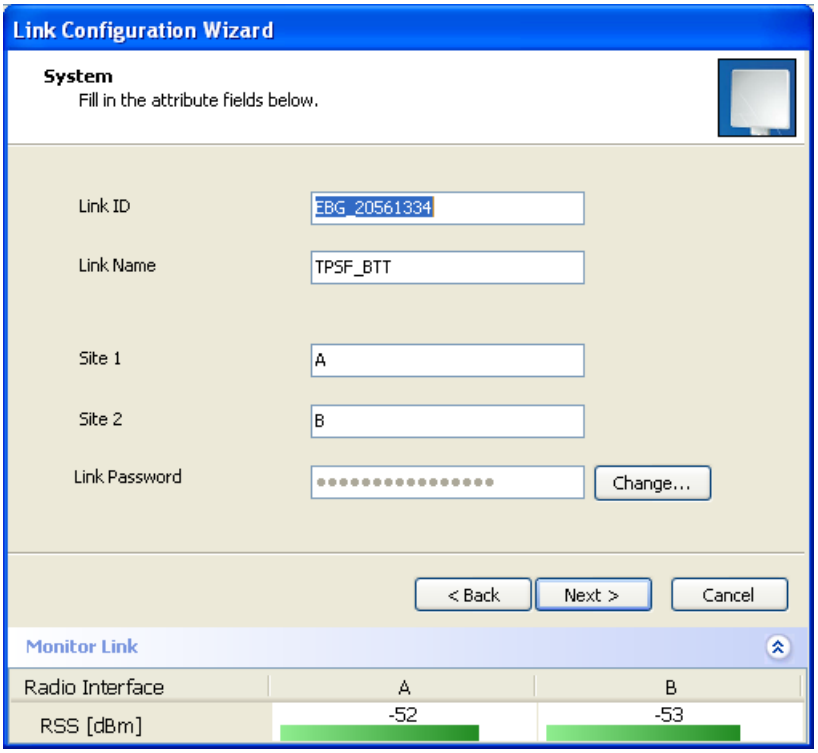


Figure 5-4: Configuration Wizard, System dialog box

The System attributes may be edited and the Link Password may be changed exactly as in the corresponding Link Installation step on **page 4-17**.

Click **Next** to continue.

Configuring the Link: Step 3, Channel Settings

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

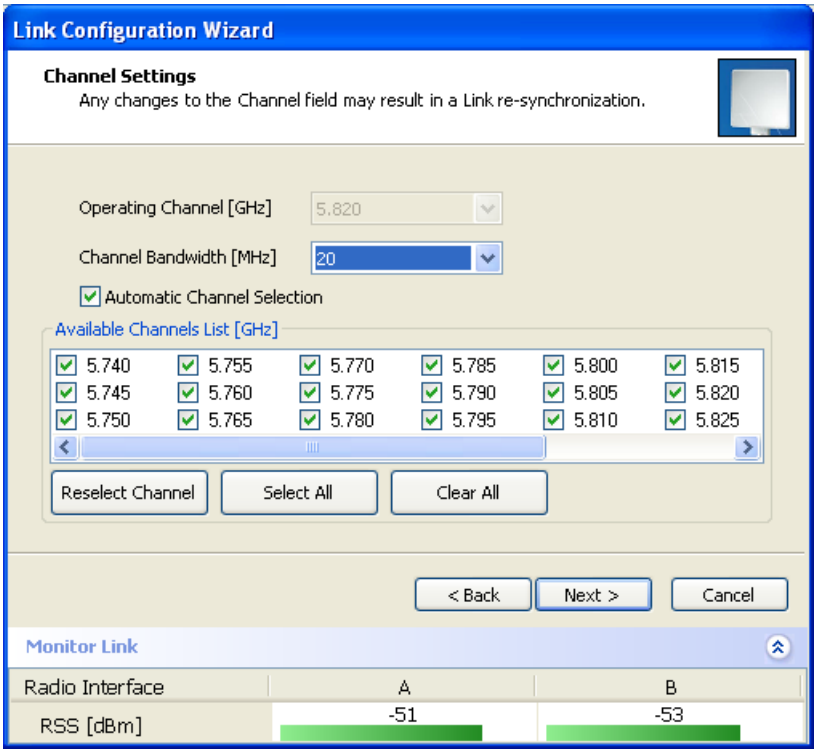
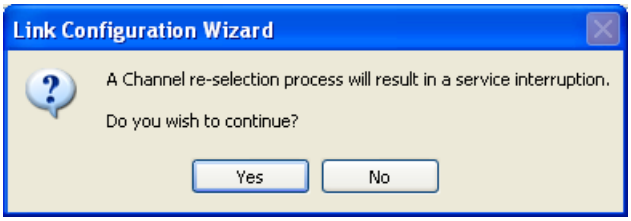


Figure 5-5: Channel Settings dialog box - Automatic Channel Selection

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:

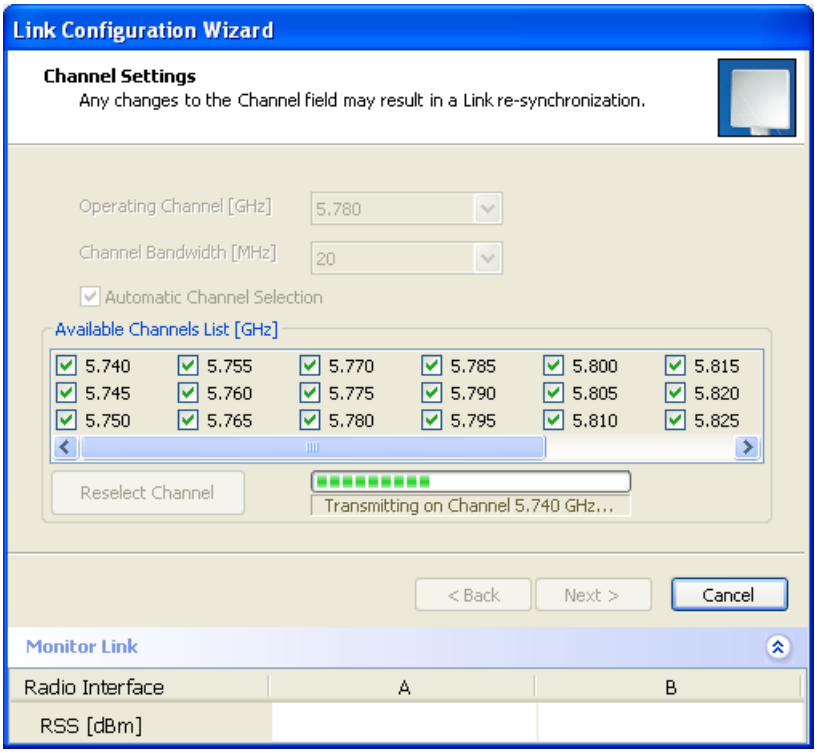


Figure 5-6: Searching for the best operating channel

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:

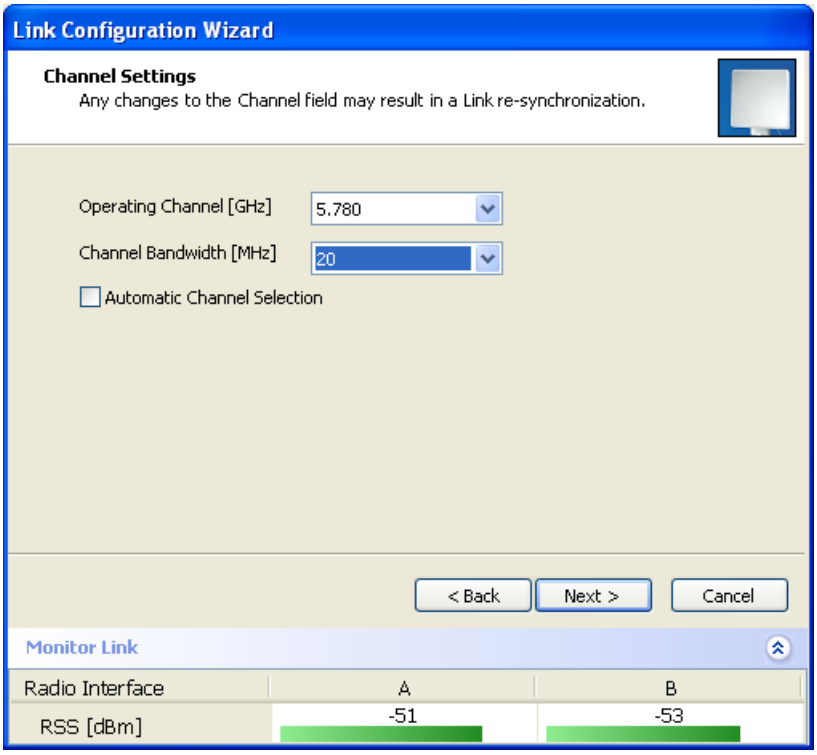


Figure 5-7: Channel Settings without automatic channel selection

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

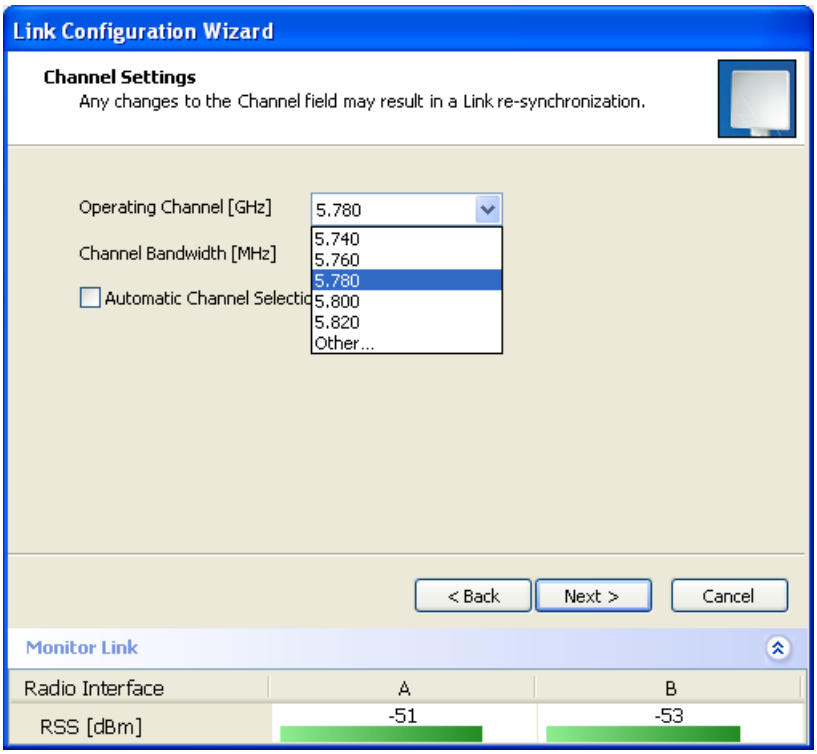


Figure 5-8: Channel frequency options

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:

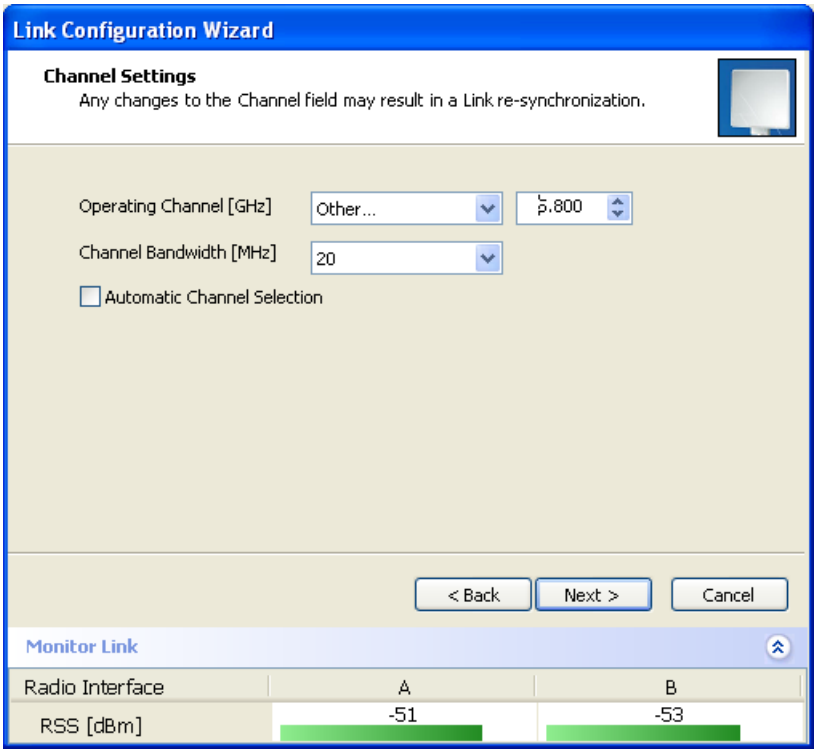


Figure 5-9: Choosing an "Other" Operating Channel frequency

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

For RADWIN 2000 radios, the Channel Bandwidth is fixed at 20 MHz.

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

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

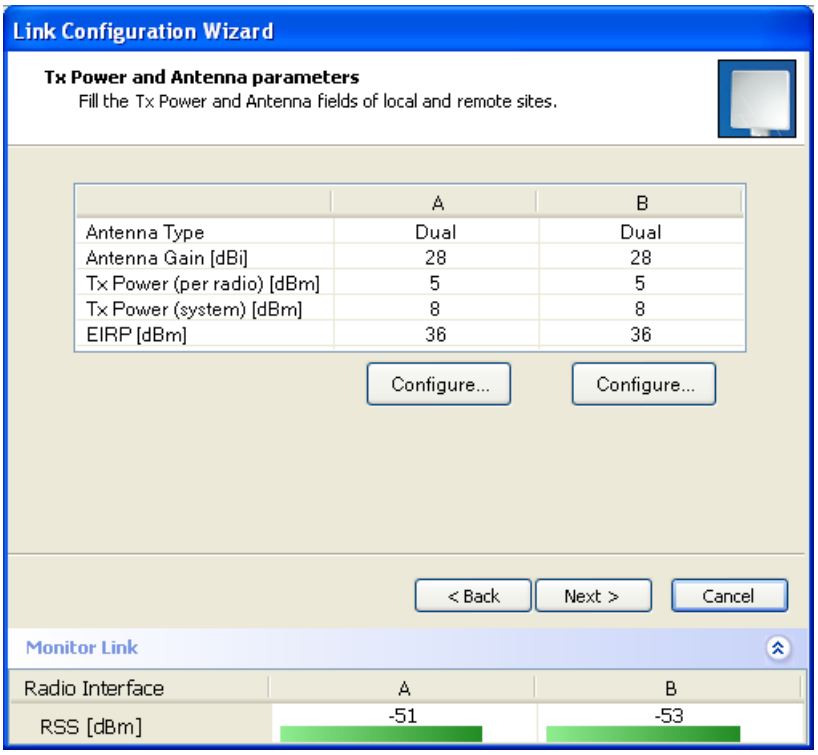


Figure 5-10: Transmission Power and Antenna Parameters

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

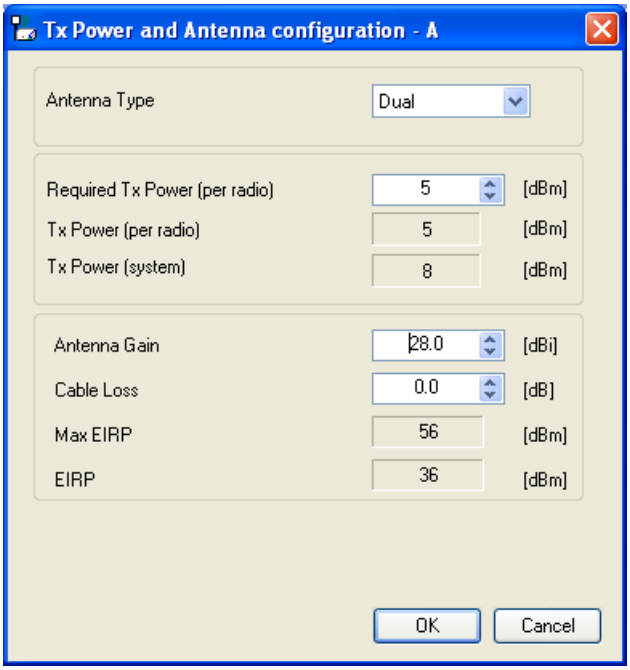
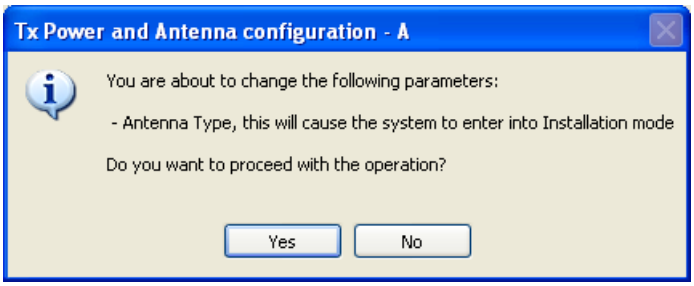


Figure 5-11: Antenna configuration dialog with opened type selection

(Recall that we are using an unrealistically low Tx power here because our link in a laboratory.)

So far, the procedure duplicates the corresponding Installation process. 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 4-21**.

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

Configuring the Link: Step 5, Services

Here is the services dialog:

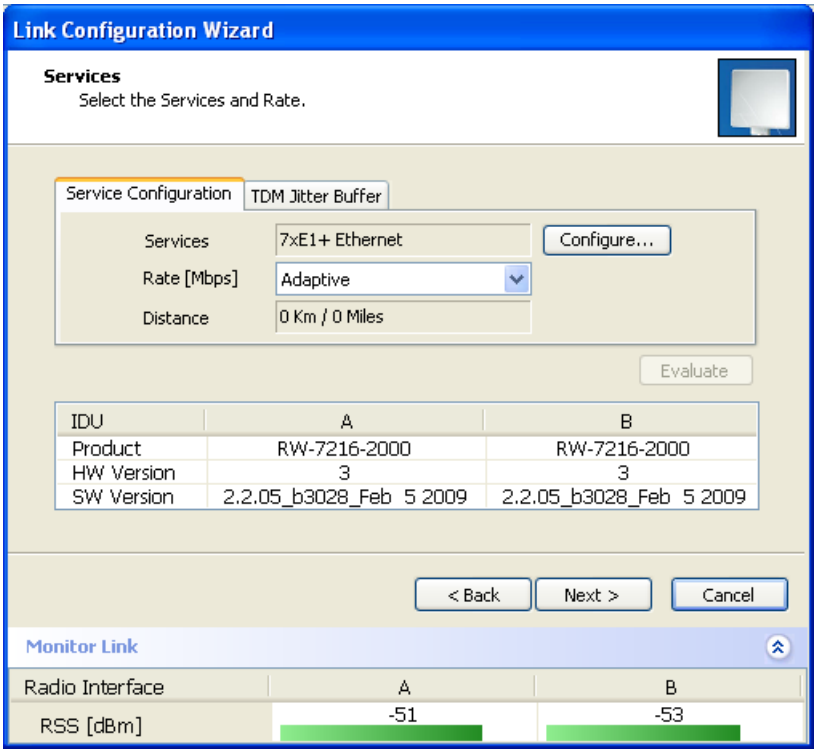


Figure 5-12: Services and Rates dialog

To choose Services, see the corresponding Installation procedure on **page 5-16**.

Click **Next** to continue.

Configuring the Link: Step 6, TDM Clock Configuration

The following dialog is displayed:

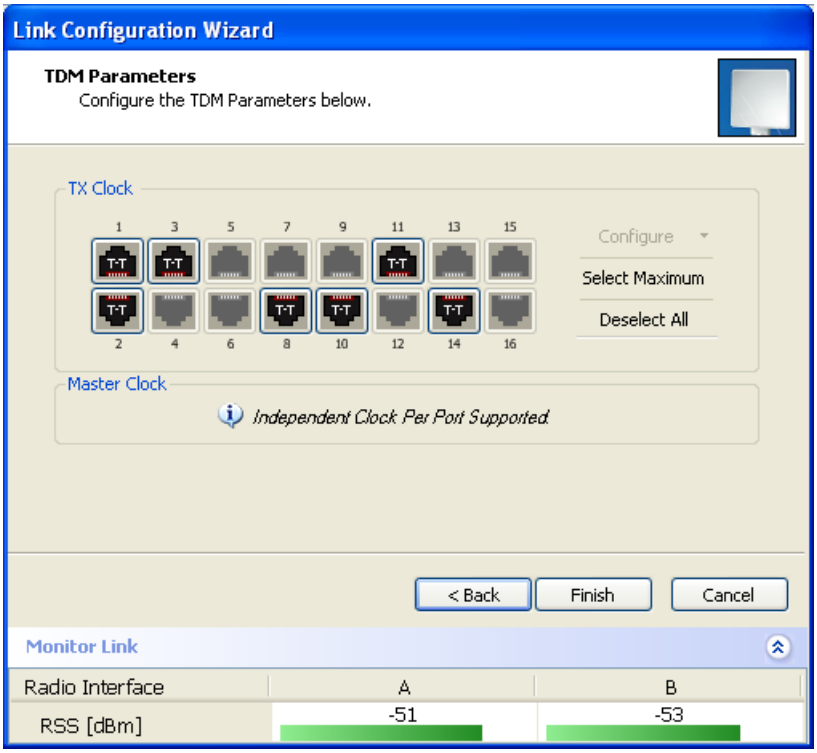


Figure 5-13: TDM Parameters Configuration

To configure the TDM Parameters, see the corresponding procedure on **page 4-34**.

Configuring the Link: Step 7, Configuration Summary and Exit

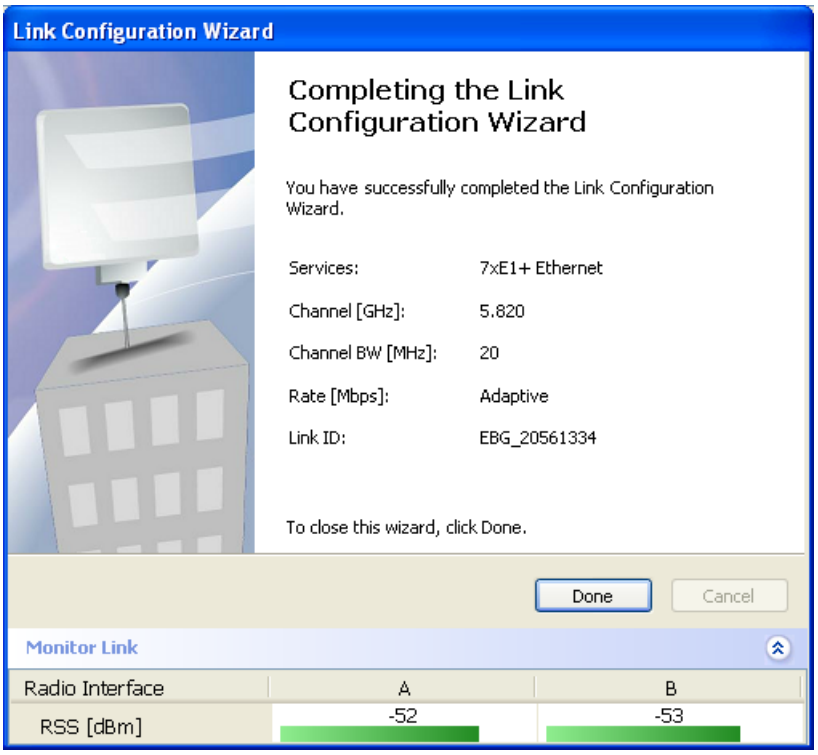


Figure 5-14: Configuration Wizard Exit Summary

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

The main window now reflects the configuration:

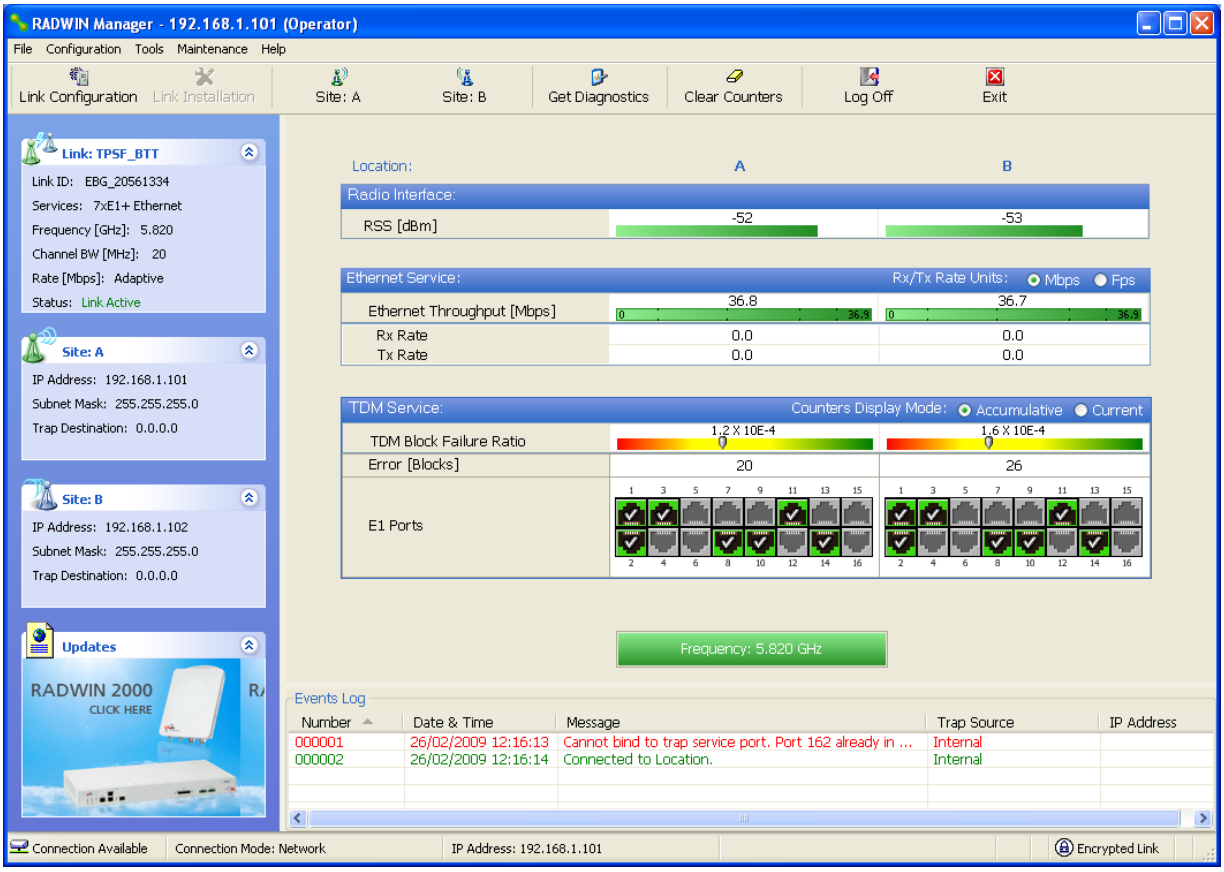


Figure 5-15: Main window of the manager after configuration

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.

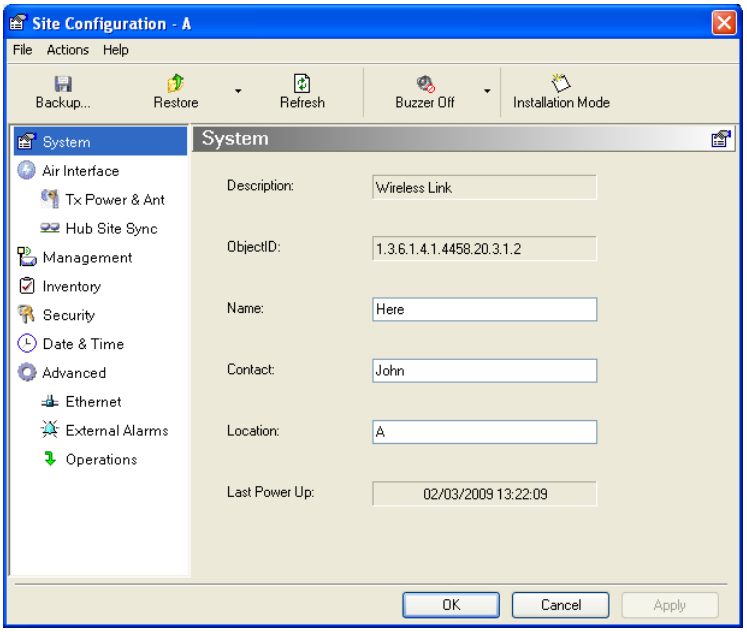


Figure 6-1: Configuration Dialog Box

Functions on the left of the dialog box:

System	Edit the contact person and location details. View the system details
Air Interface	Change the Tx 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 or from the managing computer
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. Selecting the Mute check box before clicking the Install Mode button mutes the Beeper.

Buzzer 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 RADWIN 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:

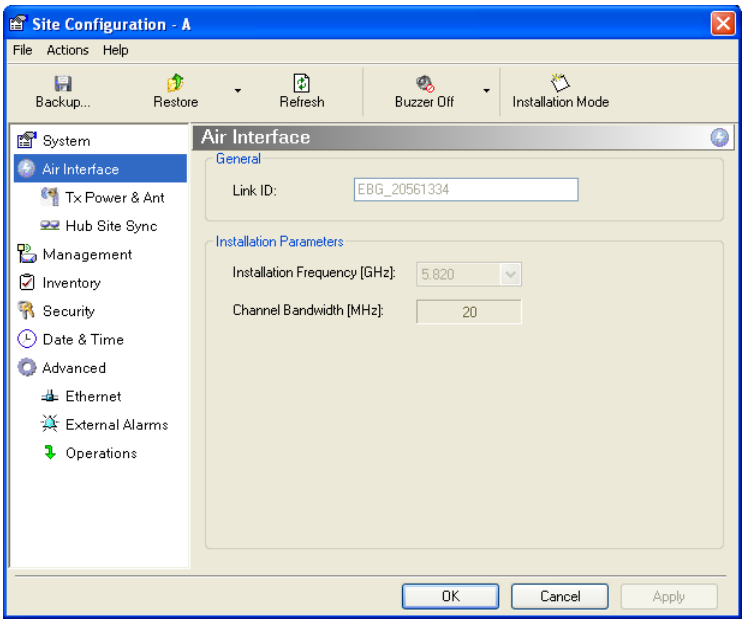


Figure 6-2: Air interface details

Changing the Transmit Power

Each site can have a different Tx 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.

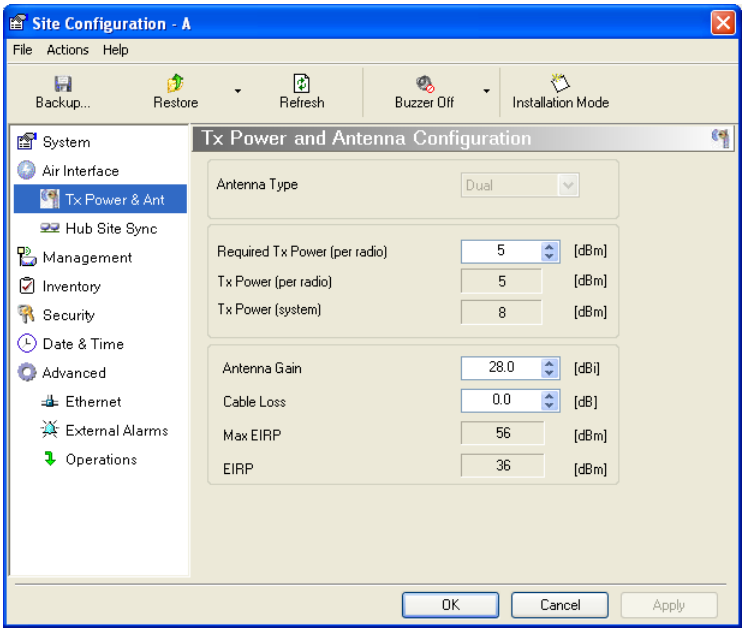


Figure 6-3: Changing the Transmit Power

For detailed explanation about the relationship between these parameters, see page 4-21 to 4-27.

Caution

This action will affect service quality. The same considerations apply here as were noted in the Installation procedure on page 4-24.

Site Management: IP Address and VLAN

Configuring the ODU Address

Each site must be configured separately. For an over-the air configuration, first configure site B then site A so as to avoid lockout. See appendix D for detailed instructions about the best way to do this on-site.

To define the Management Addresses:

1. Choose a site to configure.

   The Configuration dialog box opens:

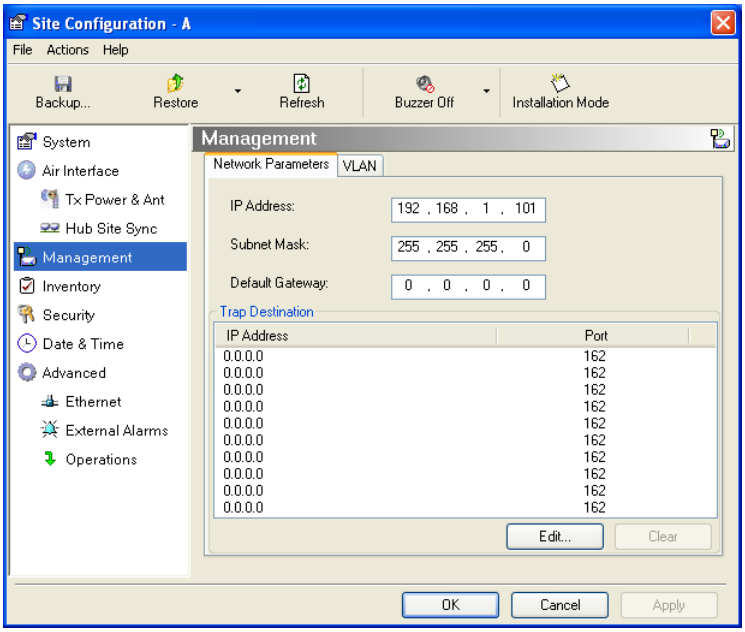


Figure 6-4: Management Addresses - Site Configuration dialog box

5. Choose **Management**.
6. Enter the IP address of the ODU in the IP Address field.

Note

If performing configuration from the RADWIN Manager, the IP address is that entered from the Login window.

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. (This reduces your chances of accidentally locking yourself out of the link.)

➢ 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 to avoid locking yourself out.
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.

Caution

Changing this parameter causes the RADWIN 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.

9. Click **Apply** or **OK**.

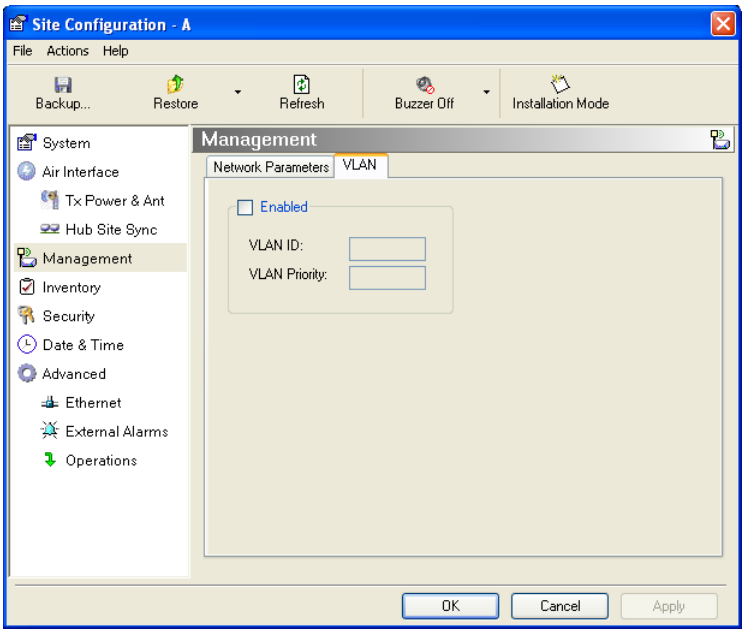


Figure 6-5: Configuring management traffic VLAN Settings

Lost or forgotten VLAN ID

If the VLAN ID is forgotten or there is no VLAN traffic connected to the ODU, then reset the relevant ODU.

During the first two minutes of connection, the ODU uses management packets both with and without VLAN. You may use this period to reconfigure the VLAN ID and priority.

Setting the Date and Time

The ODU maintains a date and time. The date and time should be synchronized with any Network Time Protocol (NTP) version 3 compatible server.

During power-up the ODU attempts to configure the initial date and time using an NTP Server. If the server IP address is not configured or is not reachable, a default time is set.

When configuring the NTP Server IP address, you should also configure the offset from the Universal Coordinated Time (UTC). If there is no server available, you can either set the date and time, or you can set it to use the date and time from the managing computer. Note that manual setting is not recommended since it will be overridden by a reset, power up, or synchronization with an NTP Server.

Note

The NTP uses UDP port 123. If a firewall is configured between the ODU and the NTP Server this port must be opened.

It can take up to 8 minutes for the NTP to synchronize the ODU date and time.

To set the date and time

1. Determine the IP address of the NTP server to be used.
2. Test it for connectivity using the command (Windows XP), for example:

   w32tm /stripchart /computer:216.218.192.202

   You should get a continuous response of times, each a few seconds apart.
3. Choose a site to configure.

   The Configuration dialog box opens.
4. Choose Date & Time:

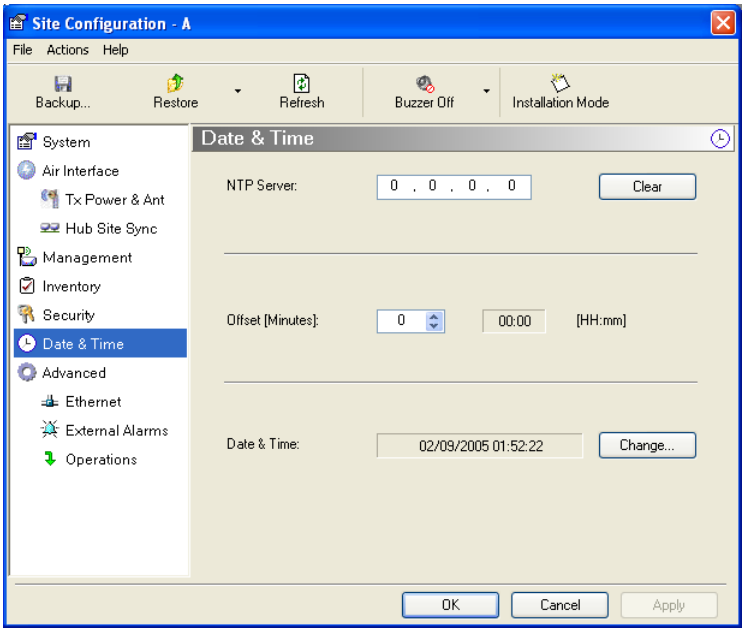


Figure 6-6: Date and Time Configuration

5. If entering an IP address for the NTP Server, click **Clear**, and then enter the new address.
6. Set your site Offset value in minutes ahead or behind GMT[1].
7. To manually set the date and time, click Change and edit the new values.

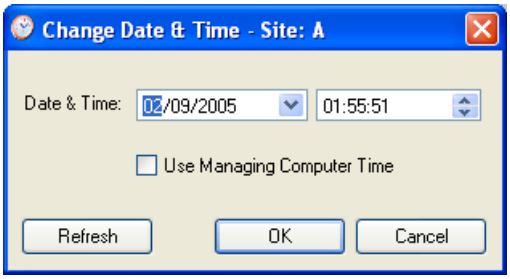


Figure 6-7: Change Date and Time

If you used an NTP Server, you will see a window like this:

1. Greenwich Mean Time

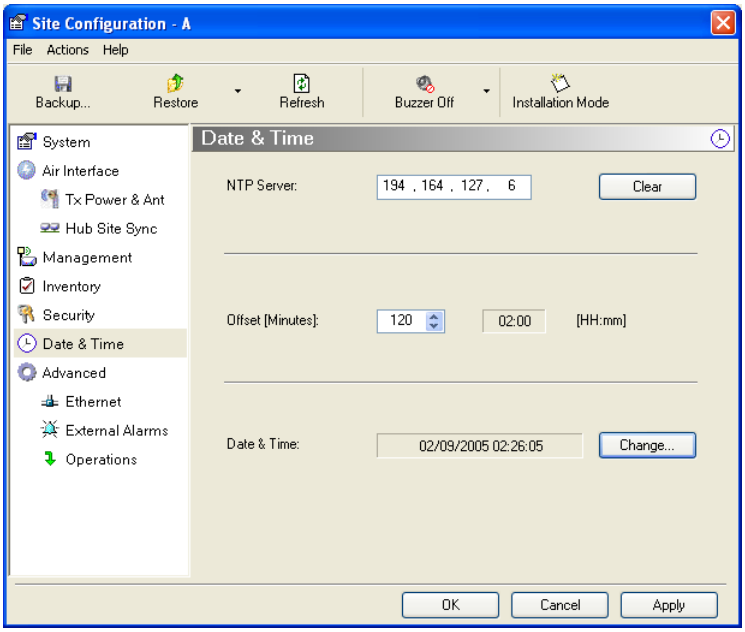


Figure 6-8: Date and Time configured from an NTP Server

8. Click **OK** to return to the Configuration dialog.

Ethernet Properties

Configuring the Bridge

Bridge configuration is required in various network topologies, such as protection (1+1) and ring applications. The bridge configuration parameters are located under the Advanced tab of the Site Configuration dialog box:

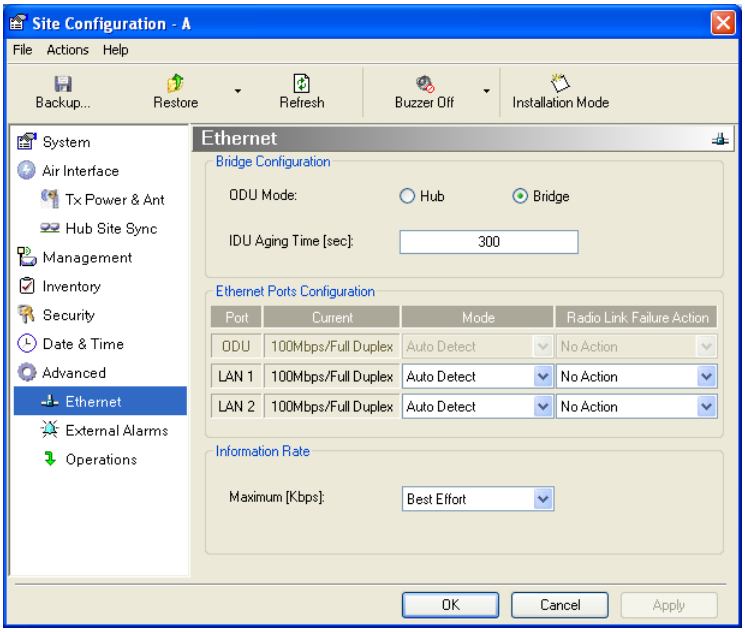


Figure 6-9: Bridge Configuration - Site Configuration dialog box

ODU Mode

This parameter controls the ODU mode with two optional values,

- Hub Mode - in Hub mode the ODU transparently forwards all packets over the wireless link.
- Bridge Mode - In Bridge mode the ODU performs both learning and aging, forwarding only relevant packets over the wireless link. The aging time of the ODU is fixed at 300 seconds.

Note

Changing these modes requires system reset.

IDU Aging time

This parameter controls the IDU aging time.

The aging time parameter controls the time after which each MAC address is dropped from the MAC address learning table.

The default value is 300 seconds.

Note

- Any change to these parameters is effective immediately.
- Each side of the link can be configured separately, with different aging times.

The following table shows the appropriate configuration for several common scenarios. Both link sites must be configured with the same parameter:

Table 6-1: ODU mode configuration for common scenarios

Scenario	ODU Mode	IDU Aging Time
Standard (default) Configuration for Ethernet Applications	Bridge	300 sec
Rapid network topology changes where fast aging is required	Hub	1 sec
Ethernet Hub	Hub	N/A
Ethernet Bridge	Bridge	N/A

Configuring Ethernet Ports Mode

The ODU Ethernet port is configured to auto-detect by default and may not be changed.

The ODU Ethernet port mode is configurable for line speed (10/100BaseT) and duplex mode (half or full duplex).

An Auto Detect feature is provided, whereby the line speed and duplex mode are detected automatically using auto-negotiation. Use manual configuration when attached external equipment does not support auto-negotiation. The default setting is Auto Detect.

Caution

You should not reconfigure the port that is used for the managing computer connection, since a wrong configuration can cause a management disconnection or Ethernet services interruption.

To configure the Ethernet Mode:

1. From the **Configuration** menu, choose the site to configure.

   The Site Configuration dialog box opens.

2. Click **Advanced | Ethernet**.
3. In the Ethernet Ports Configuration pane, use the drop-down menu to choose the configuration.
4. Click **Apply** to save the changes.

Note

It is possible to close the Ethernet service by disconnecting the Ethernet port.

If you close the port, you may subsequently be unable to access the device. If this should occur, a workaround is as follows:

- Connect the system from the remote site
- Connect via other Ethernet port (of the IDU)
- Power down the equipment and connect immediately after power up (the fastest way is to enter install mode)

Setting the Maximum Information Rate

The maximum Ethernet throughput of the link can be limited. The default setting is Not Limited (see figure **6-9** above), where the highest information rate available for the link conditions and settings is used.

To limit the Ethernet information rate:

1. From the **Configuration** menu, choose the site to reconfigure.
2. Click **Advanced | Ethernet**

   The Configuration dialog box opens.

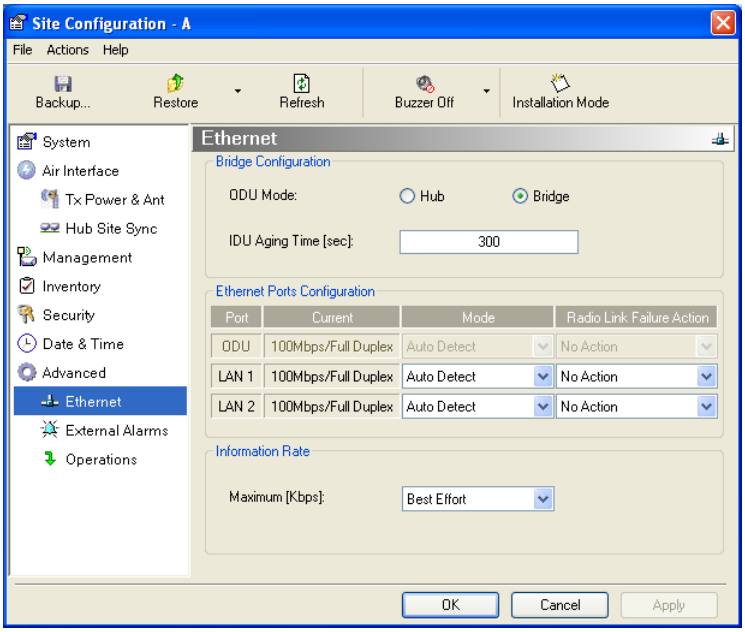


Figure 6-10: Ethernet Information Rate - Site Configuration dialog box

3. In the Information Rate pane, use the drop-down menu to choose the maximum Information Rate.

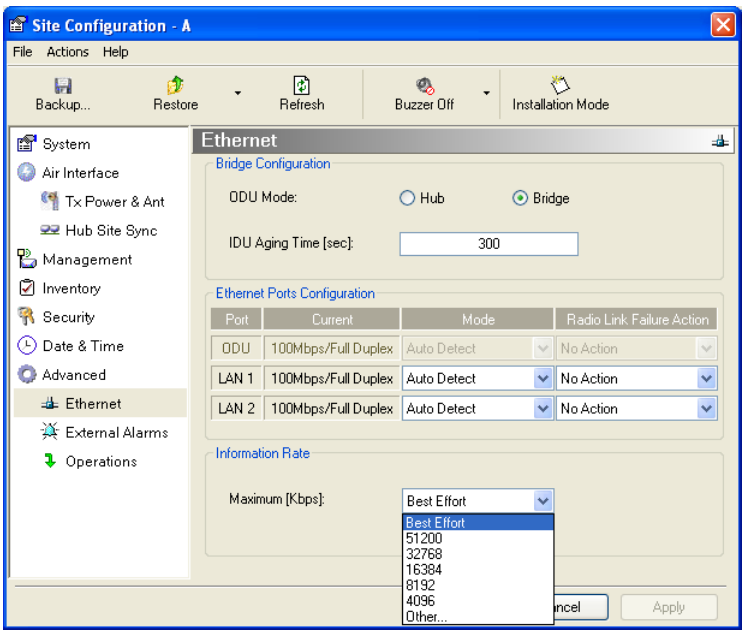


Figure 6-11: Ethernet Information Rate - Throughput selection

4. Choose **Other** to define the throughput with 1 Kbps resolution
5. Choose **Best Effort** for the highest information rate possible for the link conditions and settings
6. Click **Apply** to save the changes.

Displaying the Inventory

To view the inventory data

1. Choose a site from the main menu.

   The Configuration dialog box opens.

2. Choose Inventory (figure **6-12**).

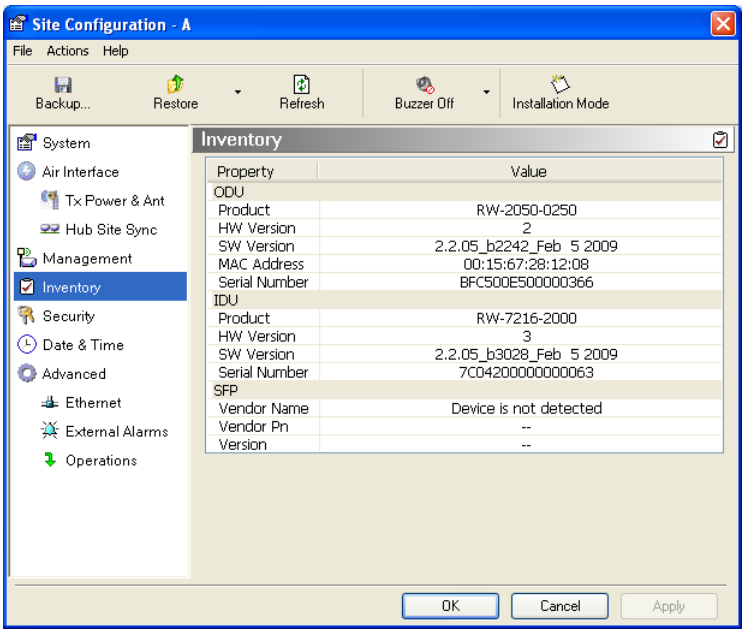


Figure 6-12: Inventory window

Security Features

The Security dialog enables you to change the Link Password and the SNMP Community strings and use the Link Lock feature:

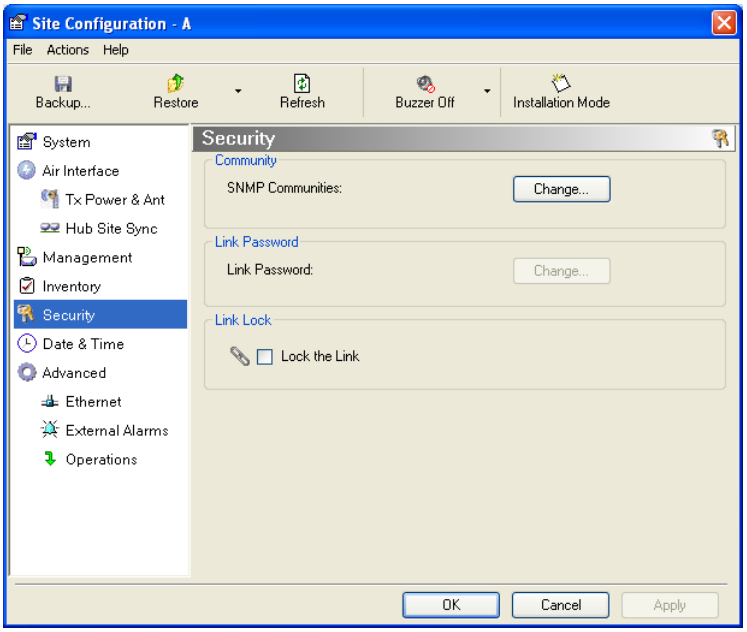


Figure 6-13: Available security features

Changing the Link Password

This item is only available when the link is down. Otherwise, it works the same way as the corresponding item on **page 4-19**.

RADWIN Manager Community Strings

The ODU communicates with the application using SNMPv1 protocol. The protocol defines three types of communities:

- **Read-Only** for retrieving information from the ODU
- **Read-Write** to configure and control the ODU
- **Trap** used by the ODU to issue traps.

The Community string must be entered at log on. The user must know the password and the correct Community string to gain access to the system. A user may have read-only privileges.

It is not possible to manage the ODU if the read-write or the read Community values are forgotten. A new Community value may be obtained from RADWIN Customer Support for the purpose of setting new Community; the serial number or the MAC address of the ODU must be supplied.

The read-write Community strings and read-only Community strings have a minimum of five alphanumeric characters. (**bru1** and **bru4097** are not permitted). Changing the trap Community is optional and is done by clicking the check box.

Editing Community Strings

The Community change dialog box is available from the **Configuration | Security** tab. Both read-write and read-only communities must be defined.

On logging on for the first time, use the following as the current Community:

- For Read-Write Community, use ***netman***.
- For Read-Only Community, use ***public***.
- For Trap Community, use ***public***

To change a Community string:

1. From the Configuration dialog box, choose the Security tab.
2. Type the current read-write Community (default is ***netman***).
3. Choose the communities to be changed by clicking the check box.
4. Type the new Community string and re-type to confirm.
5. Click **OK** to save.

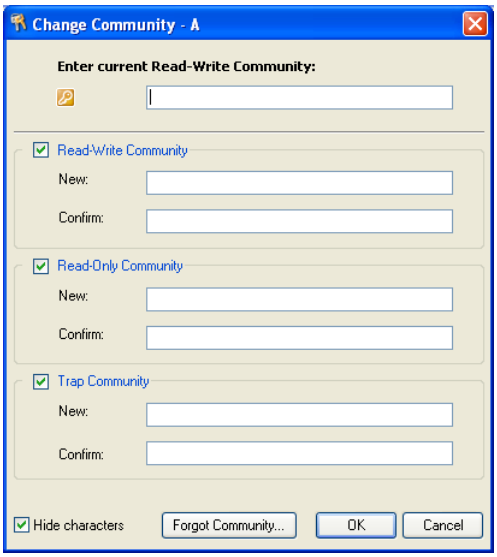


Figure 6-14: Changing the Community String

Forgotten Community string

If the read-write Community string is unknown, an alternative Community key can be used. The alternative Community key is unique per ODU and can be used only to change the Community strings. The alternative Community key is supplied with the product, and should be kept in a safe place.

If both the read-write Community and the alternative Community key are unavailable, then an alternative Community key can be obtained from RADWIN Customer Support using the ODU serial number or MAC address. The serial number is located on the product label. The serial number and the MAC address are displayed in the Site Configuration inventory tab.

When you have the alternative Community key, click the **Forgot Community** button and enter the Alternative Community key (**Figure 6-15**). Then change the read-write Community string.

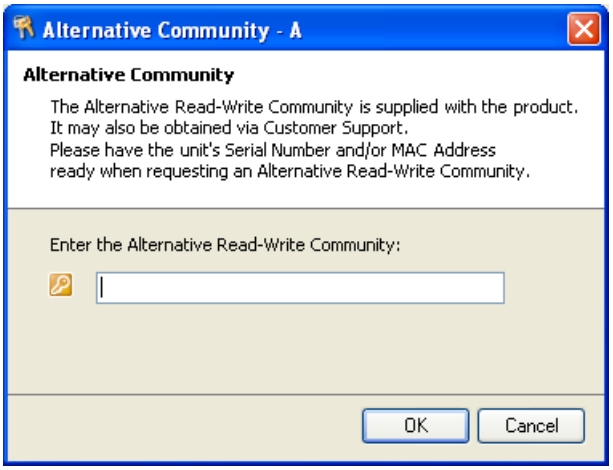


Figure 6-15: Alternative Community Dialog box

Link Lock Security Feature

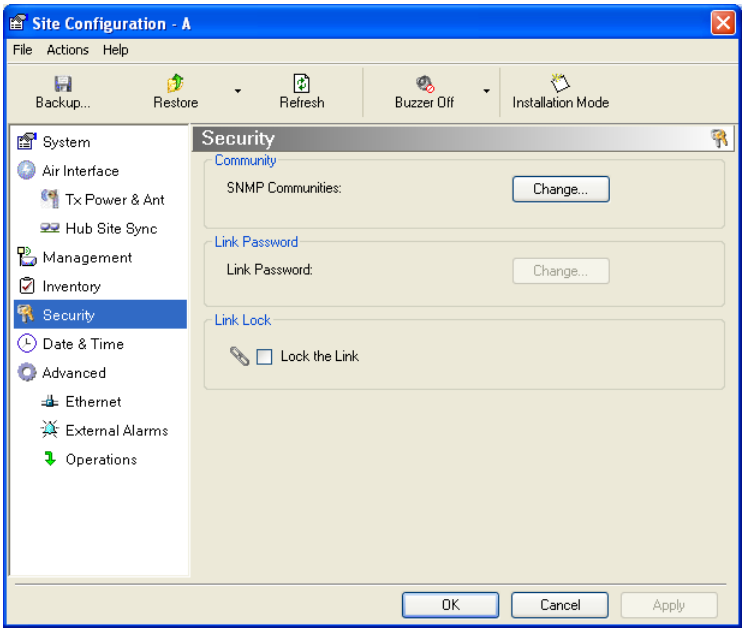
Link Lock is a part of the RADWIN 2000 security concept intended to meet a form of abuse encountered in the field. It is designed to prevent the situation where a remote ODU can be stolen and used as a "pirate" link to steal services or information. The Link Lock feature actually locks the local ODU to be synchronized ONLY to specific remote ODU. It is a ***site oriented*** feature.

The lock can only be set from a live link. It is based on MAC authentication and is site oriented and activated on a per ODU basis. For example, if you lock the Site B ODU to the Site A ODU, you must still lock the Site A ODU to the Site B ODU to ensure complete two way locking.

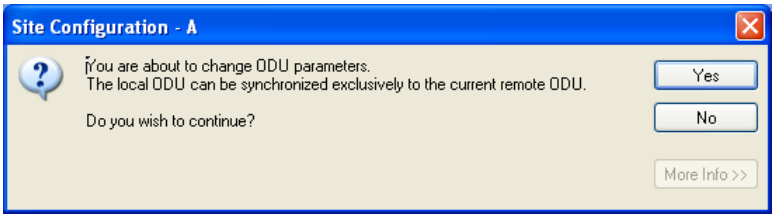
Link Lock can only be removed when the link is unsynchronized. In such a case, an alarm is raised by the RADWIN Manager.

➢ To enable Link Lock:

1. Click **Site A** on the main tool bar.
2. Choose the Security tab. The following window is displayed:



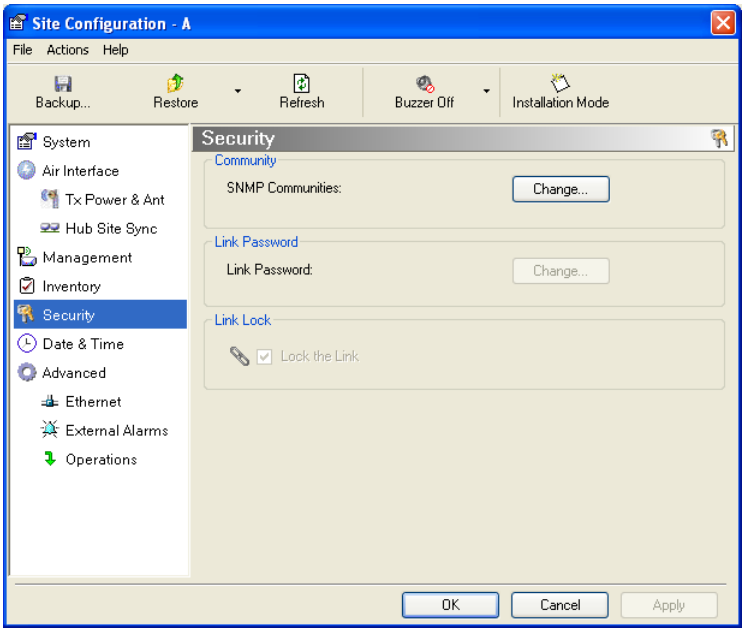
3. Click the Link Lock checkbox and then **OK**. You are asked to confirm the lock:



4. Click the **Yes** button and you are returned to the main window of the RADWIN Manager.

   Observe that a link icon is now displayed in the status bar on the bottom right of the RADWIN Manager window.

   The link to the remote unit is now locked. If you repeat steps 1 and 2 above, the Security screen will look like this:



The Link Lock checkbox is now unavailable.

5. Repeat the procedure for Site B.

Note

To revert the Link Lock status to unlocked, power down each ODU in turn. Use the above procedure to uncheck the Link Lock status box for the live ODU.

A simple ODU reset at either end will restore the link to its previous locked or unlocked state.

Muting the alignment tone buzzer

The ODU alignment tone becomes audible as soon as power is supplied, and continues until the ODUs are aligned and the link established.

It is possible to mute the tone during regular operation of the link. It must be enabled when performing the alignment procedure.

To mute the alignment tone buzzer:

1. Choose a site. The Configuration dialog box opens.
2. In the Configuration dialog box, click the **Buzzer** button.

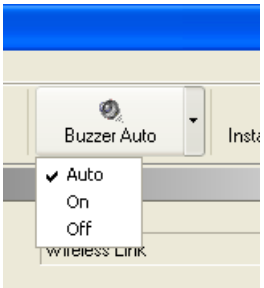


Figure 6-16: Alignment tone buzzer states

3. Click **Off**. The tone is disabled.

To restore the alignment tone buzzer:

1. Choose a site. The Configuration dialog box opens.
2. Click **On** to have the buzzer beep continuously or **Auto** to have the buzzer beep only in install mode.

Setting External Alarm Inputs

The IDU-C has four external alarm inputs and four external alarm outputs in the form of dry-contact relays. The Alarm interface is located on the front panel of the IDU-C and is a 25-pin D-type female connector. See appendix **H**, for wiring specifications and pinout. You may enable or disable each of the alarms and configure the alarm description text appearing in the alarm trap message. The ODU sends the alarm within less than a second from actual alarm trigger.

To set the external alarm inputs:

1. Choose **External Alarms** from the Site Configuration window.

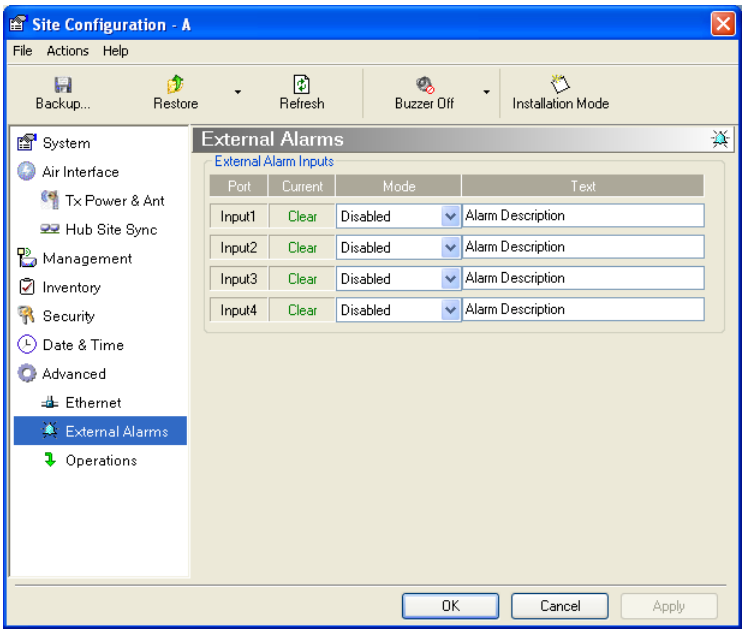


Figure 6-17: External Alarms Configuration

2. Choose an alarm and set its mode to Enabled or Disabled
3. Enter a description of the alarms in the text field.
4. Click **Apply** to save.
5. Click **OK** to exit from the dialog.

Managing Configuration Files

Backup Configuration to a File

RADWIN Manager allows you to backup configuration parameters of the local and remote units to the managing computer as **.ini** files. Each site is backed up in a separate **.ini** file.

To save the configuration in a file:

1. Choose a site to back up. The Configuration dialog box opens.
2. Click **Backup**.
3. In the Save As dialog box, indicate in which folder and under what name configuration file is to be saved, and click **Save**.

Restoring a Configuration File

Configuration files (*.**ini**) can be uploaded from the managing computer. To restore a configuration file:

1. Choose a site to restore (from a previous backup).

   The Configuration dialog box opens.
2. Click **Restore**.
3. From the Open dialog box choose *.**ini** file to upload and click **OK**.

Caution

Backup files are specific to a site (IDU / ODU pair and Link ID).

Do not restore a backup configuration file to a site other than that from which it was originally taken.

Resetting

You may reset the link, preserving the current configuration, or reset to factory defaults.

Caution

Resetting the link causes service disconnection.

To maintain the connection between the managing computer and the link, first reset Site B.

To reset the link preserving current configuration:

1. From **Maintenance** on the main window, reset the remote unit.
2. From **Maintenance** on the main window, reset the local unit.

To reset to Factory Defaults

1. Choose either of the sites to be reset. The Configuration dialog box opens.

2. Choose **Operations** in the Configuration dialog box.

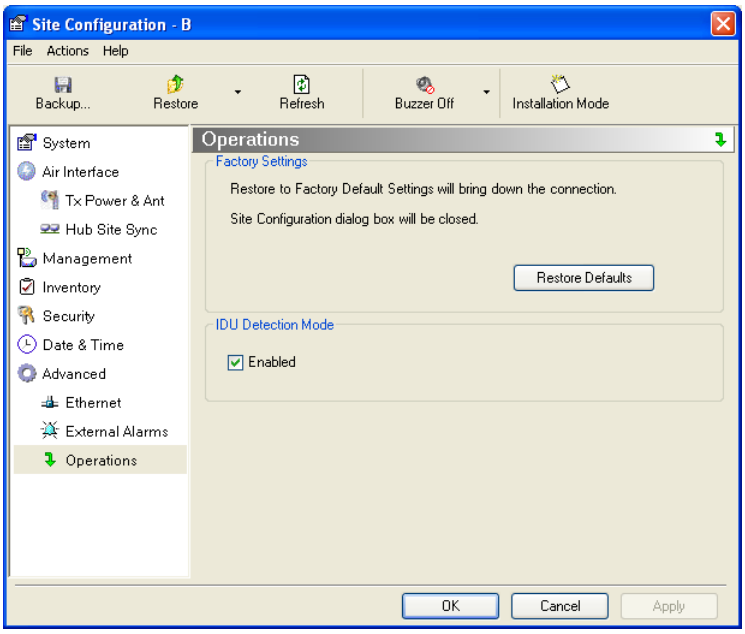
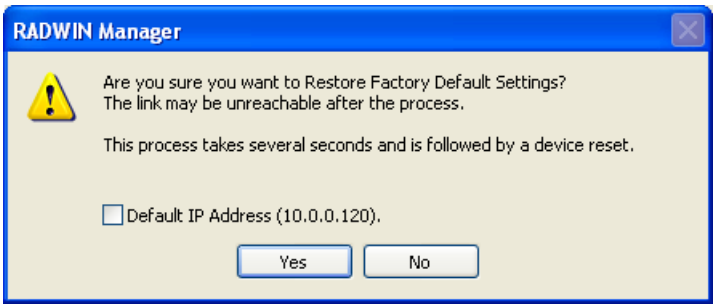


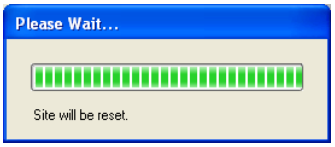
Figure 6-18: Site Configuration - Reset to factory defaults

3. Click the **Restore Defaults** button.

   A message box asking if you want to restore factory default settings appears.



4. Click the check box if you want to keep the current IP address settings.
5. Click **Yes** to continue.



   After a few moments the site will be reset and you will need to log on to it to re-install the link.

IDU Detection

An ODU always tries to detect the IDU to which it is connected. IDU Detection is effected by an IDU responding to special ODU packets.

If a PoE device is in use, the detection packets spread to the containing network and may cause flooding. In such a case, the IDU Detection feature, (figure **6-18**), should be disabled.

To disable IDU Detection Mode, just toggle the check box in figure **6-18**.

Configuration with Telnet

A Telnet terminal can be used to configure and monitor the RADWIN 2000.

To start a Telnet session, use **telnet <ODU_IP>.**

For example, if you run Telnet as follows,

telnet 192.168.1.101

you will be asked for a user name and password.

The Telnet log on user name is the password that you used to enter the RADWIN Manager (for example, the default: ***admin***). The Telnet password is the corresponding Community string (default: ***netman***).

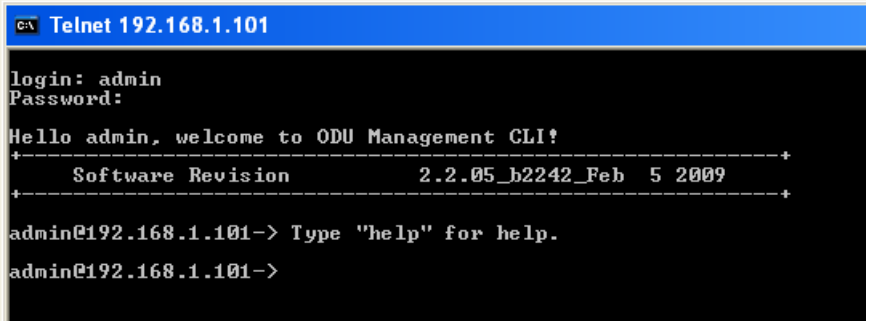


Figure 6-19: Telnet session log on

A Read-Only Community string allows display only whereas a Read-Write Community string allows display and set commands.

Supported Telnet commands are shown in table **6-2**. Note that some of the commands are model-specific. For example, TDM commands will not apply to Ethernet only and PoE based links.

Table 6-2: Telnet Commands

Command	Explanation
display inventory	Displays ODU product name, Name, Location, hardware and software revisions, uptime, MAC address, IDU product name, IDU software and hardware revisions
display management	Displays IP, Subnet, Gateway, Traps table
display link	Displays State, Link ID, Channel BW, RSS, TSL, Frequency/ACS, DFS, Rate/ARA, Distance
display ethernet	Displays Bridge Mode, Aging time, Port table (State, Status and action)
display tdm	Displays Clock Mode, Master Clock Mode, Current Clock, Quality, TDM table (Line status, Error Blocks)

Table 6-2: Telnet Commands (Continued)

Command	Explanation
display ntp	Displays Time, Server and Offset
display PM <interface:AIR,LAN1,LAN2,TDM1, TDM2,...,TDM16> <interval:current,day,month>	Shows the performance monitor tables for each interface according to user defined monitoring intervals
set ip <ipaddr> <subnetMask> <gateway>	Set the ODU IP address, subnet mask and gateway. The user must reset the ODU after the command completion
set trap <index:1-10> <ipaddr> <port:0-65535>	Set a specific trap from the traps table (e.g. set trap 3 192.168.1.101 162)
set readpw <oldpasswd> <passwd>	Set the read access password (Read Community)
set writepw <oldpasswd> <passwd>	Set the read-write access password (Read-Write Community)
set trappw <oldpasswd> <passwd>	Set the trap Community string
set buzzer <mode:0=OFF,1 =ON>	Toggle the buzzer mode (0 – off, 1 – on)
set tpc<power:Value between minimal Tx power, and maximal Tx power>	Set the ODU Tx Power. If a wrong value is entered, both min and max values shall be displayed in the error reply
set bridge <mode:0=Bridging OFF,1= Bridging ON >	Set the ODU bridge mode (0 – off, 1 – on)
set name <new name>	Set the name of the link
set location <new location>	Set the name of the location
Set contact <new contact>	Set the name of the site manager
set Ethernet <>port:MNG,LAN1,LAN2> <mode:AUTO,10H,10F,100H,100F,DISABLE>	Set the mode and speed of each Ethernet port
reboot	Resets both the IDU and the ODU. The user is warned that the command will reset the ODU. A new Telnet session to the ODUmay be opened after the reset is complete. (Watch the IDU LEDs.)
help	Displays the available commands

Figure 6-20, below, shows the available Telnet commands using the **help** command.

```
admin@192.168.1.101-> Type "help" for help.

admin@192.168.1.101-> help
   display inventory
   display management
   display link
   display ethernet
   display tdm
   display ntp
   display PM <interface:AIR,LAN1,LAN2,TDM1,TDM2,TDM3,...,TDM15,TDM16>
            <interval:current,day,month>
   set ip <ipaddr> <subnetMask> <gateway>
   set trap <index:1-10> <ipaddr> <port:1-65535>
   set readpw <writePasswd> <newPasswd>
   set writepw <writePasswd> <newPasswd>
   set trappw <writePasswd> <newPasswd>
   set buzzer <mode:0=OFF,1=ON>
   set tpc <power:Value between minimal TX power, and maximal TX power>
   set bridge <mode:0=Bridging OFF,1=Bridging ON>
   set name <new name>
   set location <new location>
   set contact <new contact>
   set ethernet <port:MNG,LAN1,LAN2> <mode:AUTO,10H,10F,100H,100F,DISABLE>
   reboot
   help

Command "help" finished OK.
```

Figure 6-20: Telnet Management window

Chapter 7

Monitoring and Diagnostics

The RADWIN Manager application enables you to monitor the link, as well as perform diagnostic operations such as loopback tests.

This chapter covers:

- Retrieving link information
- Link compatibility issues
- Reinstalling and realigning a link
- Performance monitoring
- Troubleshooting
- Replacing an ODU
- Restoring to factory setup
- TDM port loopbacks

Retrieving Link Information (Get Diagnostics)

The Get Diagnostics feature collects and writes all link and Manager information (from both sites) into a text file. The file information can be used for diagnostics and should be sent to RADWIN Customer Support to speed up assistance.

The following table lists link and system information that can be monitored.

Table 7-1: Get Diagnostics Data and Description

Data	Description
System Data	General information about the system
Events Log	• List of main windon system events including those from other sites if this one is defined as a trap address • Last 256 events from both sites
Link Information	Information about the link properties

Table 7-1: Get Diagnostics Data and Description (Continued)

Data	Description
Site Configuration	Data about the site parameters
Active Alarms	List of active alarms
Performance Monitor	Network performance data over defined time periods
Monitor	Detailed event data record

To get diagnostics

1. On the Help menu, choose **Get Diagnostic Information**.

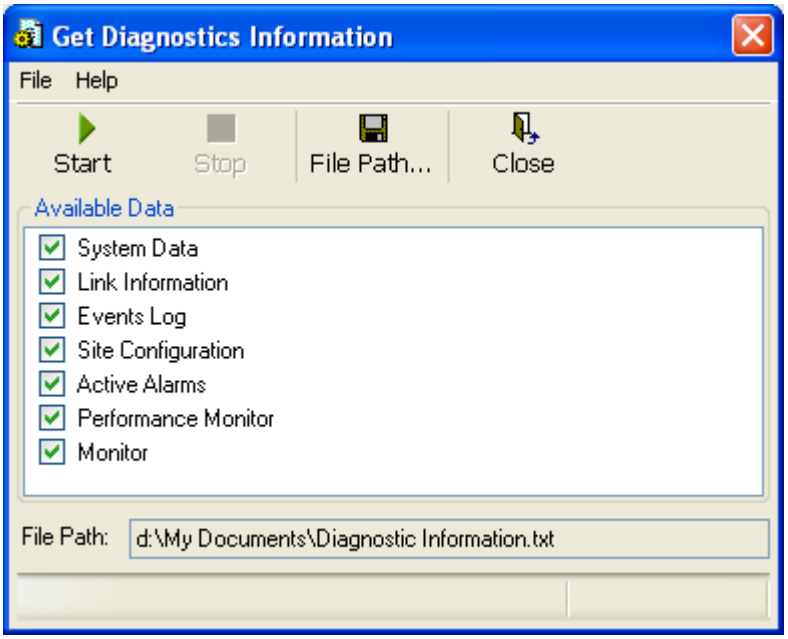


Figure 7-1: Get Diagnostics Dialog Box

2. Select or deselect the data options. If the file is to be sent to RADWIN Customer Support leave all options checked.
3. Click **File Path** to specify the folder in which you want to save the file and then click **Start** to save the information.

   The file is saved in the specified folder as **Diagnostics Information.txt**

Link Compatibility

Link Compatibility indicates the version compatibility using software traps. As new hardware or software is added to existing networks compatibility issues may arise. An incompatibility issue is indicated to the user by a change of color of the Link Status box on the Main Menu window. Trap messages (can be viewed in the Events Log) indicate the problems or limitations and suggest upgrades when appropriate.

The following Link Status messages are given:

fullCompatibility - different software versions were detected that are fully compatible. The message indicates that an upgrade is available.

restrictedCompatibility - different software versions were detected that operate correctly. However, new features are not supported.

softwareUpgradeRequired - different software versions were detected allowing limited operation. The message is, that a software upgrade is required.

versionsIncompatibility - different software versions were detected that are incompatible. You need to perform local upgrades.

Table 7-2: Link Compatibility Trap Messages

Link State	Link State text	Link Status Color	Site Description	Site Description Color	Link Status Color
fullCompatibility	Active	Green	Software Upgrade Available	Yellow	Green
restrictedCompatibility	Active - Software Version mismatch	Magenta (Same as authentication error)	Software Upgrade Recommended	Yellow	Magenta (Same as authentication error)
softwareUpgradeRequired	Active – Software Upgrade Required	Brown (Major)	Software Upgrade Required	Yellow	Brown (Major)
versionsIncompatibility	Not Active - Software Upgrade Required	Red	Local Software Upgrade Required	Yellow	Red

TDM Loopbacks

Internal and external loopbacks on both sites of a link are used to test the TDM connections

To activate a loopback:

1. From the Maintenance menu, choose **Loopbacks...** or right-click the TDM display in the main window.

   The Loopbacks dialog box appears:

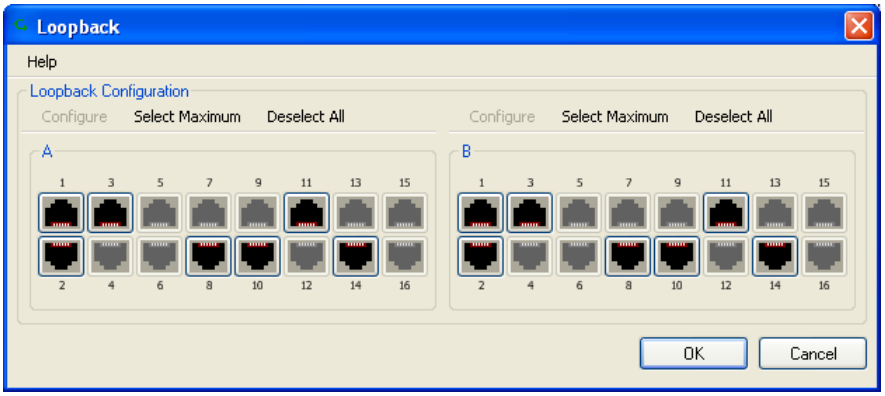


Figure 7-2: Loopback configuration box

2. From the active ports, click those required for loopback activation. The selected port icons change color to light blue as in the following example:

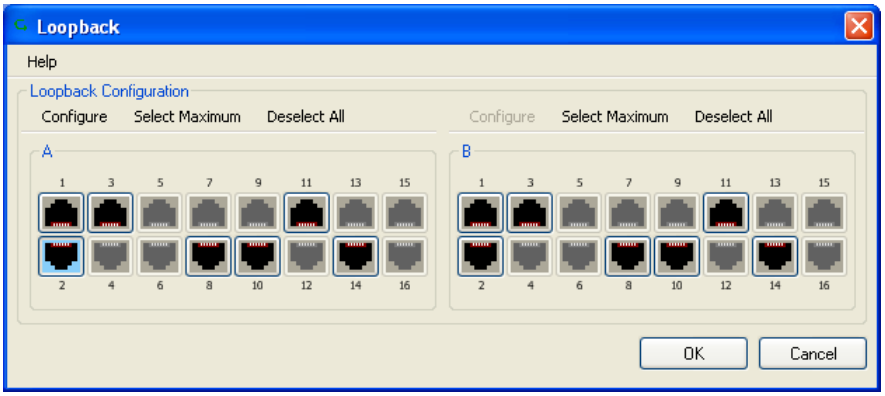


Figure 7-3: Loopback configuration box with one Site A port selected

3. Click configure to choose a loopback mode:

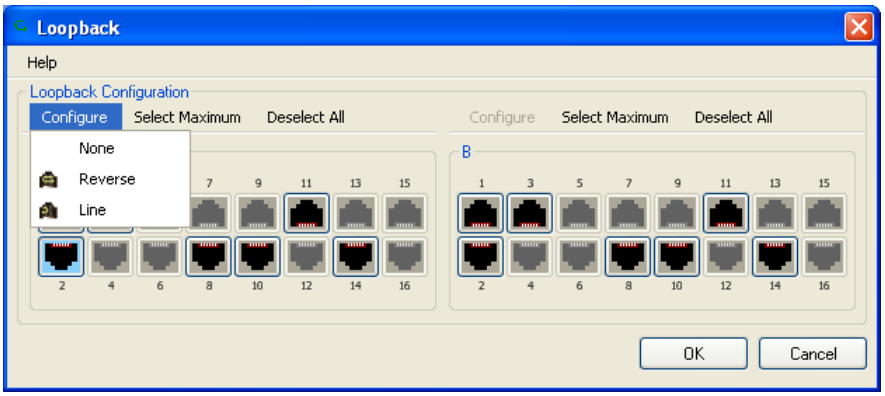
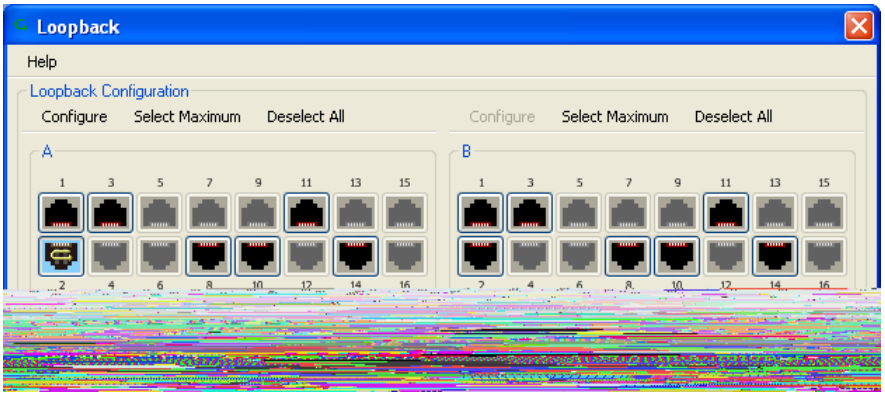


Figure 7-4: Loopback options

4. Click the required loopback mode.



5. Click **OK** to activate the sected loopback(s).

   This activates selected loopback(s). The corresponding service port icon in the main menu changes color and appearance to indicate an active loopback.

Figure 7-5: Site A port 2 set to loopback

To deactivate a loopback:

- Return to the situation of figure **7-4** and click **None**.

  When a loopback is deactivated, the corresponding icon in figure **7-5** reverts to its previous state (like the right side of the figure).

Local External Loopback

A Local external loopback can be set to test the local E1/T1 port and its connection to local side user equipment.

data coming from the remote user equipment is looped back to it locally. This loopback is initiated by the managing computer connected to the local unit.

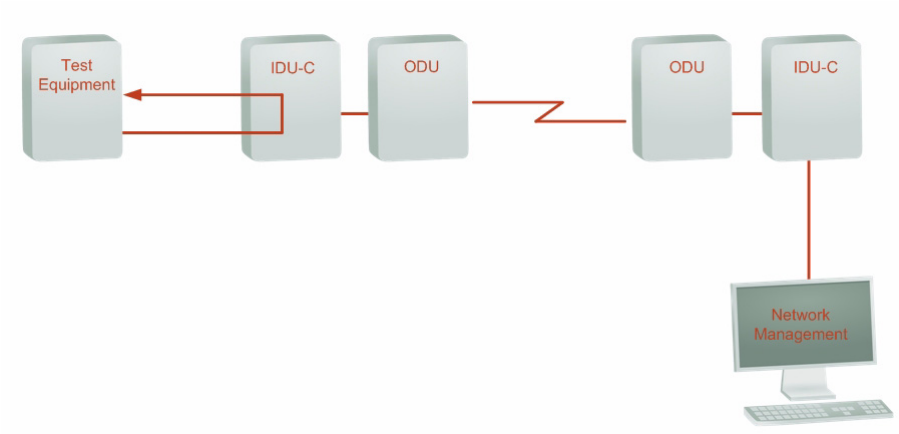


Figure 7-8: Remote External Loopback

Local Internal Loopback

The local unit can be set to close an internal loopback to test connection between the local and remote units and between the remote E1/T1 port and its connection to the remote user equipment. In this mode, data coming from the remote user equipment is looped back to it locally. This loopback is initiated by the managing computer connected to the local unit.

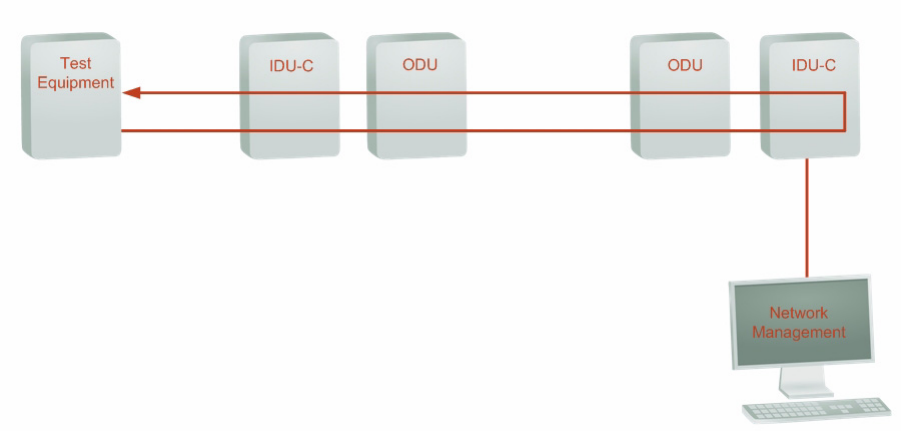


Figure 7-9: Local Internal Loopback

Reinstalling and Realigning a Link

It may be necessary to reinstall the link if the ODUs need to be realigned.

Note

Activating Install Mode causes both sites to go into install mode, causing disruption in service for approximately fifteen seconds.

To reinstall the link:

1. Choose a site.

The Configuration dialog box opens.

2. In the Configuration dialog box, click the **Install Mode** button.

   A message box asking if you want to enter install mode appears.

3. Click **Yes** to continue.

   The system enters Install mode and the alignment tone becomes audible.

4. Realign the ODUs and start the Installation wizard (see chapter **4**).

The Link Budget Calculator

The Link Budget Calculator is part of the RADWIN Manager software and is found in the Help menu. This useful utility enables you to calculate the expected performance of the wireless link and the possible configurations for a specific link range including antenna size, cable loss and climate conditions. For full details, see appendix **B**.

Performance Monitoring

RADWIN 2000 Performance Monitoring constantly monitors traffic over the radio link and collects statistics data for the air interface, TDM and Ethernet ports. It does so continuously, even when the RADWIN Manager is not connected.

Two types of logs are recorded:

- **Monitor Log** that records statistics on traffic rate and radio signal strength.
- **Events Log** that records when the rates fall above or below a predefined threshold.

Both the statistics Monitor log and events log can be saved as text files.

The Monitor Log

The Monitor Log records performance statistics for predefined intervals. You can save the monitor log to a text file, as well as display the information in an on-screen report.

Saving the Monitor Log

You can save the recorded Monitor Log statistics to a text file.

➢ To save the monitor log:

1. From the **Tools** menu, choose **Preferences**.

   The Preferences dialog box appears:

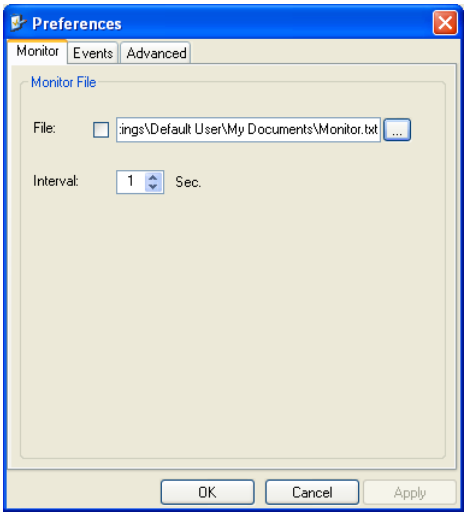


Figure 7-10: Preferences dialog box

2. Click the **Monitor** Tab.
3. Select the file to save.
4. Click the check box to open the file for saving.
5. Click the ... button and in the Select File dialog box indicate in which folder and under what name the monitor log file is to be saved.
6. Set the time interval for adding data to the file.
7. Click **OK** to save the file.

Viewing Performance Reports

The Performance Monitor Report displays performance views of each of the interfaces[1].

To obtain performance monitoring reports:

1. From the main menu, choose **Tools | Performance Monitoring Report ...**

   You are presented with the following window:

1. Ethernet performance is not collected from PoE devices.

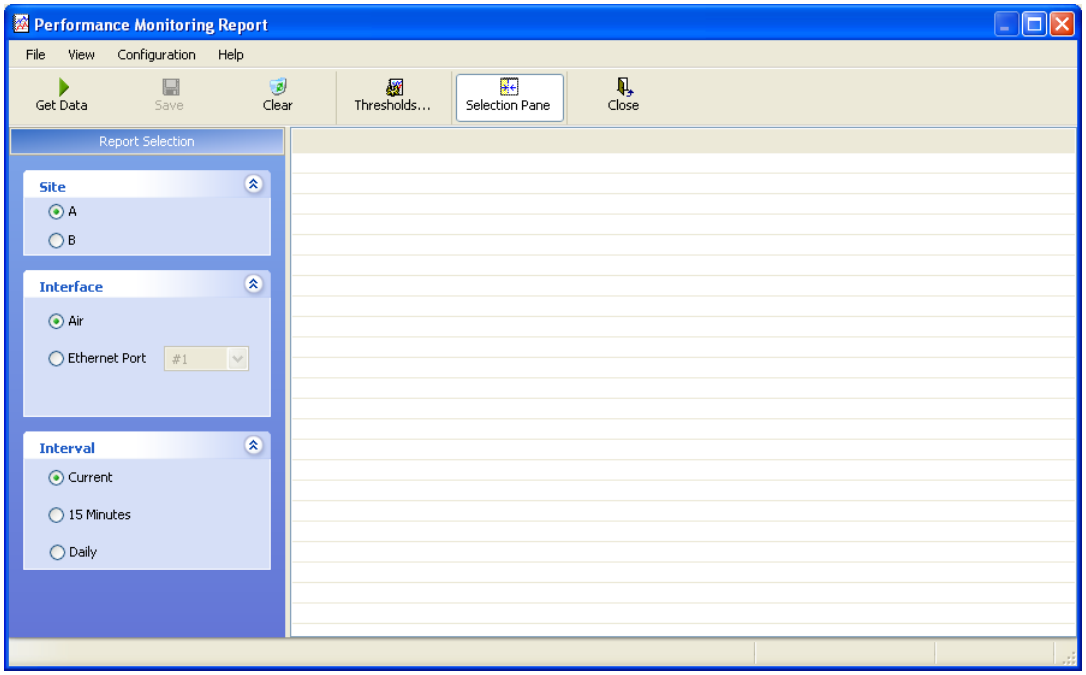


Figure 7-11: Basic Performance Monitoring Report

2. Choose a report type from the left panel and click the **Get Data** toolbar button. For example, if you choose Site A, Air and Current, you will be offered a report looking like this:

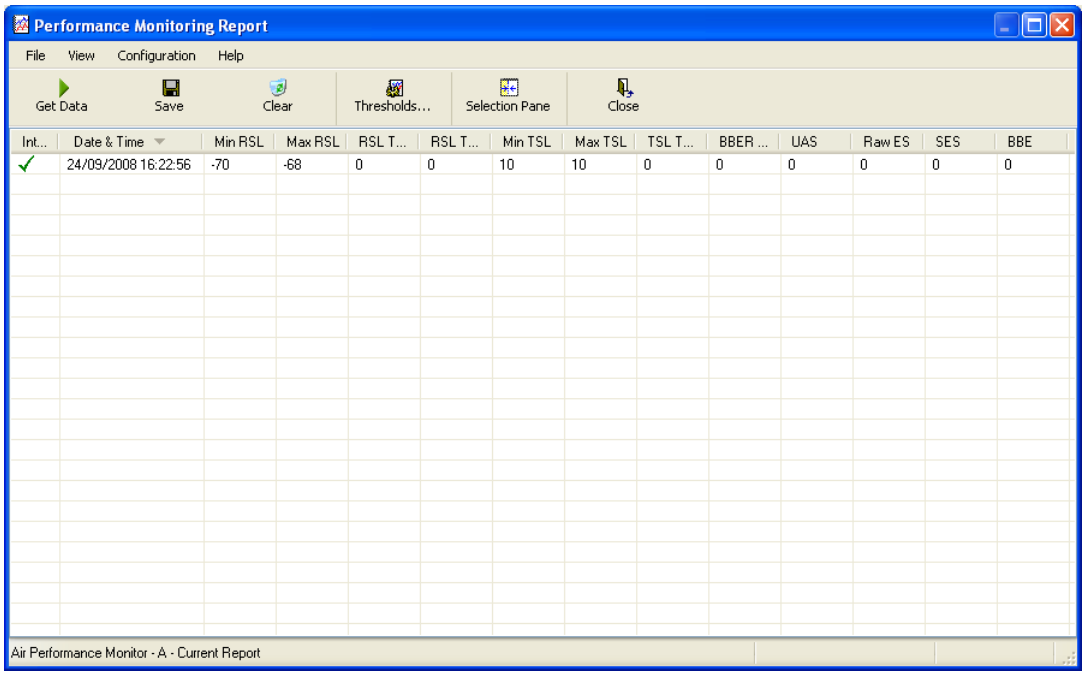


Figure 7-12: A typical Performance Monitoring Report

You can click the **Selection Pane** icon to toggle the side panel on or off.

The other reports look similar. Here is a detailed description of the reports and their fields:

Several performance data occurrences are collected for each of the interfaces (ES, SES, and UAS), as well as Specific data per Interface type (e.g.,

Tx and Rx bytes for Ethernet). For the Air Interface, user defined thresholds data are collected. Refer to tables 7-3 and 7-4 below.

Data is collected and selectively displayed based on three time intervals as selected by the **Interval** radio buttons:

- Current (t=0)
- 15 minutes Intervals
- Daily

Table 7-3: Explanation of performance data

Data type	Reported Value	Explanation
Generic PM Data	UAS – Unavailable Seconds	Seconds in which the interface was out of service.
	ES – Errored Seconds	The number of seconds in which there was at least one error block. Note that the notation of an error block is different per interface.
	SES – Severe Errored Seconds	The number of seconds in which the service quality was low (the quality is different per type of interface and determined by the BBER threshold per interface).
	BBE – Background Block Error	The number of errored blocks in an interval.
	Integrity	A flag indicating that the data was valid. Note that the Performance Monitoring data is not valid if not all the values were stored (e.g., due to clock changes within the interval or power up reset).
Additional Air Interface PM Data	Max RSL	The maximum of the receive signal level (measured in dBm).
	Min RSL	The minimum of the receive signal level (measured in dBm).
	Max TSL	The maximum of the transmit signal level (measured in dBm).
	Min TSL	The minimum of the transmit signal level (measured in dBm).
	RSL Threshold 1	The number of seconds in which the RSL was below the specified threshold.
	RSL Threshold 2	The number of seconds in which the RSL was below the specified threshold.
	TSL Threshold	The number of seconds in which the RSL was above the specified threshold.
	BBER Threshold	The number of seconds in which the Background Block Error Ratio (BBER) exceeded the specified threshold.

Table 7-3: Explanation of performance data

Data type	Reported Value	Explanation
Additional Ethernet Interface PM Data	Received Bytes	The number of Megabytes received at the specified port within the interval
	Transmitted Bytes	The number of Megabytes transmitted at the specified port within the interval.
TDM interface	No additional PM data	

Performance Monitoring Report Toolbar

You can use the toolbar to perform the actions described in the following table:

Table 7-4: Action of the toolbar buttons

Command Button	Action
Get Data	Gather current performance monitoring data.
Save	Save current performance monitoring data to a file
Clear	Clear current performance monitoring data
Thresholds	Set Thresholds
Close	Closes the Performance Monitoring window

Setting Air Interface Thresholds

Use the **Thresholds** button on the Monitoring Performance Report toolbar to set the Air Interface Thresholds:

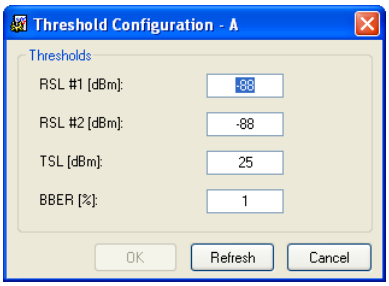


Figure 7-13: Threshold configuration dialog box

BBER Threshold

The Background Block Error Ratio is measured as a percentage. The threshold can be set from 0.1% up to 50%.

For links with Ethernet only service, 8% threshold is recommended. If there are no problems during the interval, then for that threshold, the recommended BBER value should be 0. Since the system provides a lossless Ethernet service, there is throughput degradation in case of interference. The degradation is proportional to the BBER.

RSL Threshold

RSL Threshold can also be used as an indicator of problems in the radio channel. You can check the RSS by from the Link Budget Calculator results during installation. A value of -5dB from the current RSS is recommended as a threshold.

Events, Alarms and Traps

The Events Log

The Events Log records system failures, loss of synchronization, loss of signal, compatibility problems and other fault conditions and events.

Note

The foregoing event types include events from all links for which this managing computer has been defined as the traps address. Only events from RADWIN equipment will be shown.

Alarms (traps) are displayed in the Events Log in the lower panel of the main window. The Events Log may be saved as a text file.

The Events Log includes the following fields:

- Sequential number (ID)
- Date and time stamp
- Message
- Trap source
- IP address of the ODU that initiated alarm.

For complete information about traps and alarms see appendix **J**, table **J-3**.

The events are displayed in the Events Log in the lower part of the RADWIN Manager main window:

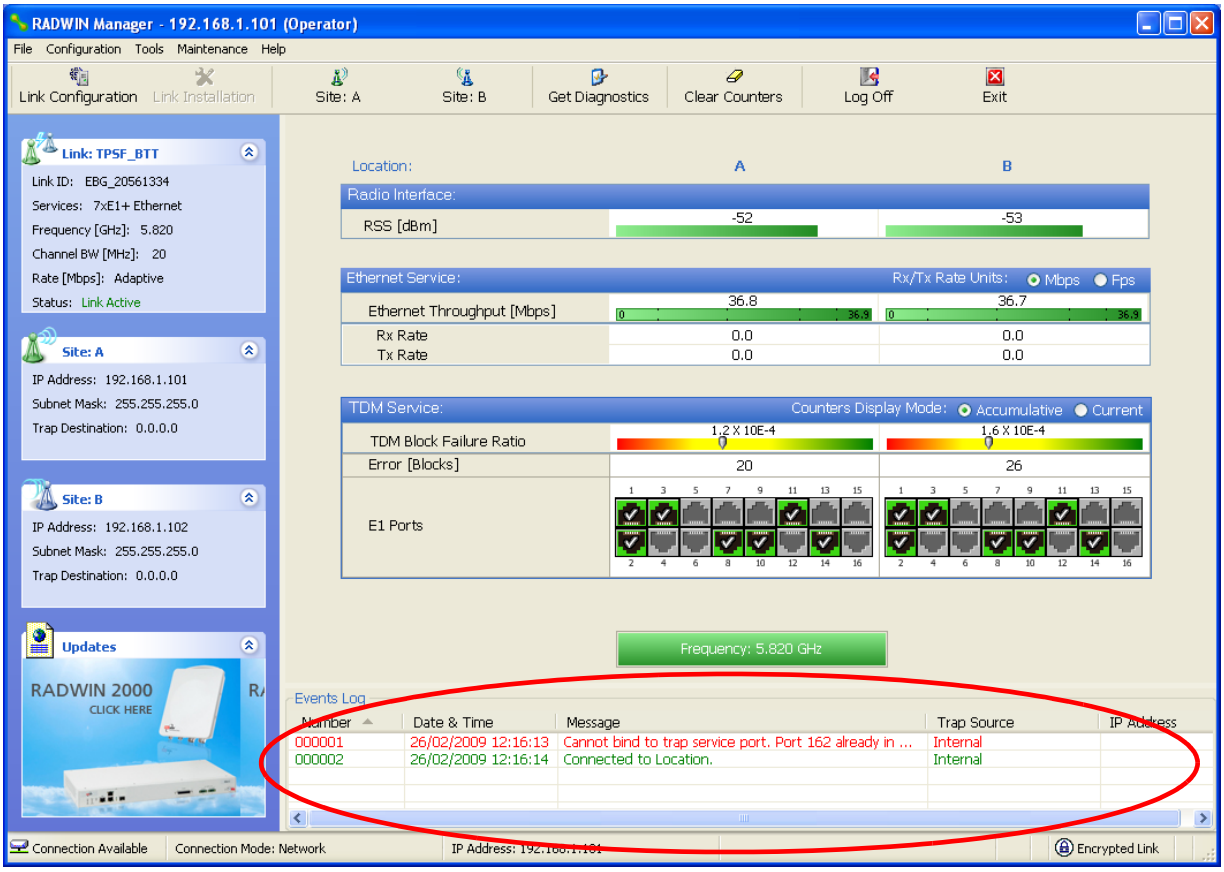


Figure 7-14: Events Log Display

To save the Events Log:

1. From the Tools menu, choose **Preferences**.

   The Preferences dialog box appears

2. Click the **Events** Tab.
3. Select the file to save.
4. Click the check box to open the file for saving.

Click the button and in the Select File dialog box indicate in which folder and under what name the Events Log file is to be saved, and click OK.

Note

To store the Events Log, first define the IP address, subnet mask, default gateway and trap address of the managing computer (see **page 6-4** for details).

RADWIN Manager Traps

The RADWIN Manager application issues traps to indicate various events, displayed in the Events Log.

Table 7-5: RADWIN Manager Trap Messages

Trap Message	Severity	Remarks
Cannot bind to trap service port. Port 162 already in use by ProcessName (pid: ProcessId)	Warning	RADWIN Manager will not catch any traps from the ODU, some other application has grabbed this port. For further detail see **this web site**.
Device unreachable!	Error	Check connectivity to ODU
Connected to <site_name>	Information	
<site_name> Site will be reset.	Information	
Restore Factory Default Settings in process on Site <site_name>	Information	
Factory Settings: The process was not finished due to connection issues.	Warning	Factory setting failed due to connectivity problem to ODU
Reset: The process was not finished due to connection issues.	Warning	Factory setting failed due to connectivity problem to target - ODU will not be reset
Cannot Write to Monitor file. There is not enough space on the disk.	Warning	Free some space on disk on the managing computer and retry
Windows Error: <error_ID>. Cannot Write to Monitor file.	Warning	Operating System error on the managing computer
TDM Counters were cleared for both sides	Information	
Identical IP addresses at <local_site_name> and <remote_site_name>	Warning	Set up a different IP to each site
The Product is not identified at the <local_site_name> site.	Warning	RADWIN Manager is incompatible with the ODU software version
The Product is not identified at the <remote_site_name> site.	Warning	
The Product is not identified at both sites.	Warning	
Product Not Identified!	Warning	
The Manager identified a newer ODU release at the <remote_site_name> site.	Warning	ODU release is newer than RADWIN Manager release. Wizards are not available. RADWIN Manager will be used just for monitoring. Upgrade the RADWIN Manager. (You will get this message as a pop up)
The Manager identified a newer ODU release at both sites.	Warning	
The Manager identified a newer ODU release at the <local_site_name> site.	Warning	

Table 7-5: RADWIN Manager Trap Messages

Trap Message	Severity	Remarks
Newer Version identified at the <local_site_name> site.	Warning	ODU release is newer than RADWIN Manager release. Wizards are not available. RADWIN Manager will be used just for monitoring. Upgrade the RADWIN Manager.
Newer Version identified at the <remote_site_name> site.	Warning	
Newer Version Identified!	Warning	

Setting the Events Preferences

You can define a color for the messages to be displayed in the Event Log window, according to the severity of the event. The severity is predefined.

➢ To set the Message color:

1. From the **Tools** menu, choose **Preferences**.

   The Preferences dialog box appears.

2. Click the **Events** Tab:

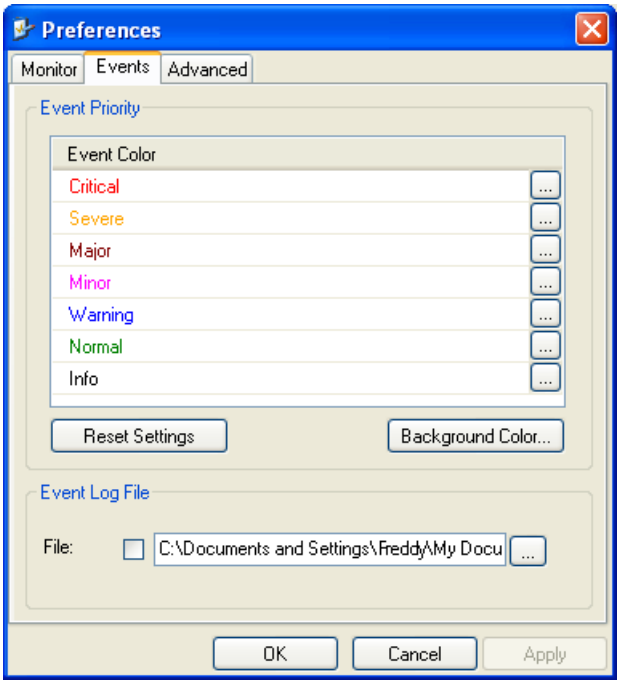


Figure 7-15: Preferences dialog box - Event tab

3. Select the event type and click on the button.

   A color chart opens.

4. Select the required color.
5. Repeat for each of the event types.

To set the message background color:

- Click **Background Color** to change the text background.

To reset the message colors:

- Click **Reset Settings** to return to the default color settings.

Saving the Events Log

You can save recorded events in an Events Log text file. New alarms are automatically added to the text file, as they enter the Events Log.

Active Alarms

Upon setting a trap destination, applicable events are reported as active alarms to the user. The active alarms are saved and can be viewed in the Active Alarms window.

To view summary of saved alarms:

- From the Tools menu, choose Active Alarm Summary.

  The Active Alarms Summary window opens:

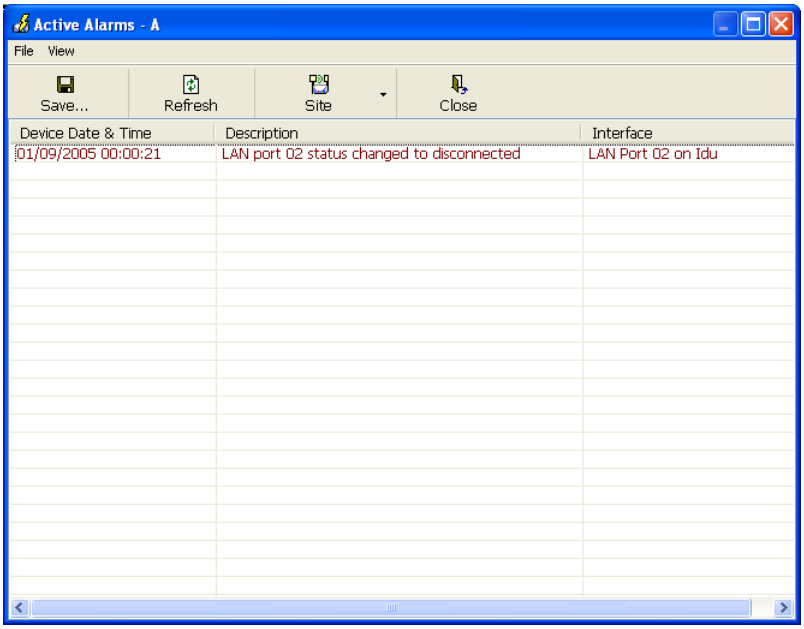


Figure 7-16: Active Alarms Summary

The following table provides an explanation of the command buttons

Table 7-6: Active Alarms command buttons

Command	Action
Save	Saves the alarms in CSV or text format for further analysis
Refresh	Reads the alarms from the ODU
Site	Selects site for the active alarms
Close	Closes the active alarm window

Viewing Recent Events

Each ODU stores the last 256 events:

To view the last 256 events:

1. Click **Tools | Recent Events ...** A window like the following is displayed:

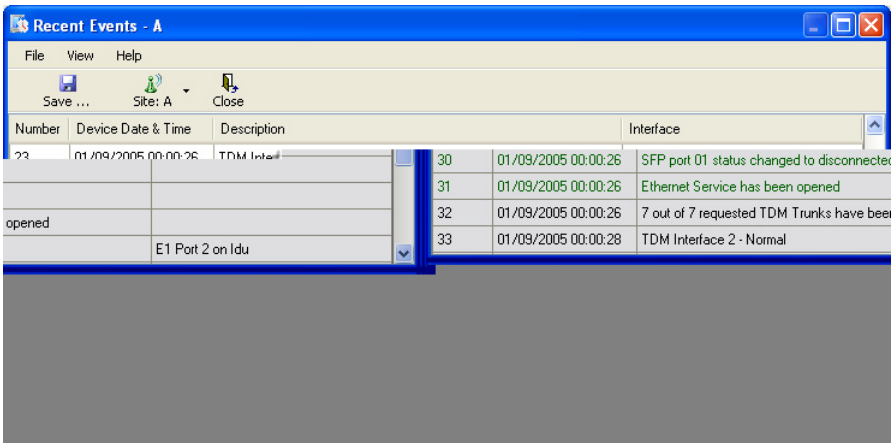


Figure 7-17: Recent Events - Upto last 256 events at Site A

2. Use the Site button to choose Site B
3. Use the Save button to store the events in a tab-delimited list.

Reverting Aalert Messages

Many alert messages in the RADWIN Manager have an option of the form "Do not show this message again". These alert messages can be reverted to their default state (shown) by choosing the **Advanced** tab from the Preferences dialog:

RADWIN 2000

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Appendix A

Pole and Wall Installation

ODU Mounting Kit Contents

Table A-1: Bill of Materials: ODU mounting kit

Item	Qty
Large Clamp (see figure **A-1**)	1
Small Clamp (see figure **A-2**)	1
Arm (see figure **A-3**)	1
Screw hex head M8x40	4
Screw hex head M8x70	2
Washer flat M8	4
Washer spring M8	3
M8 Nuts	2

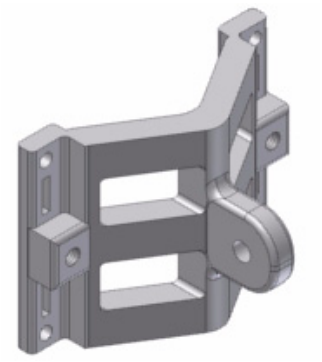


Figure A-1: Large Clamp

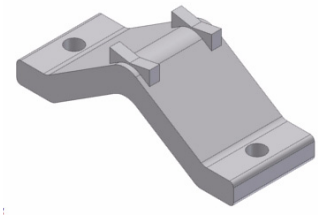


Figure A-2: Small Clamp

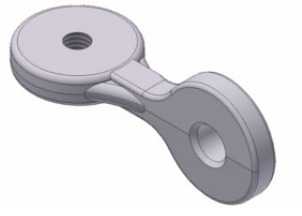


Figure A-3: Arm

Mounting RADWIN 2000 on a pole

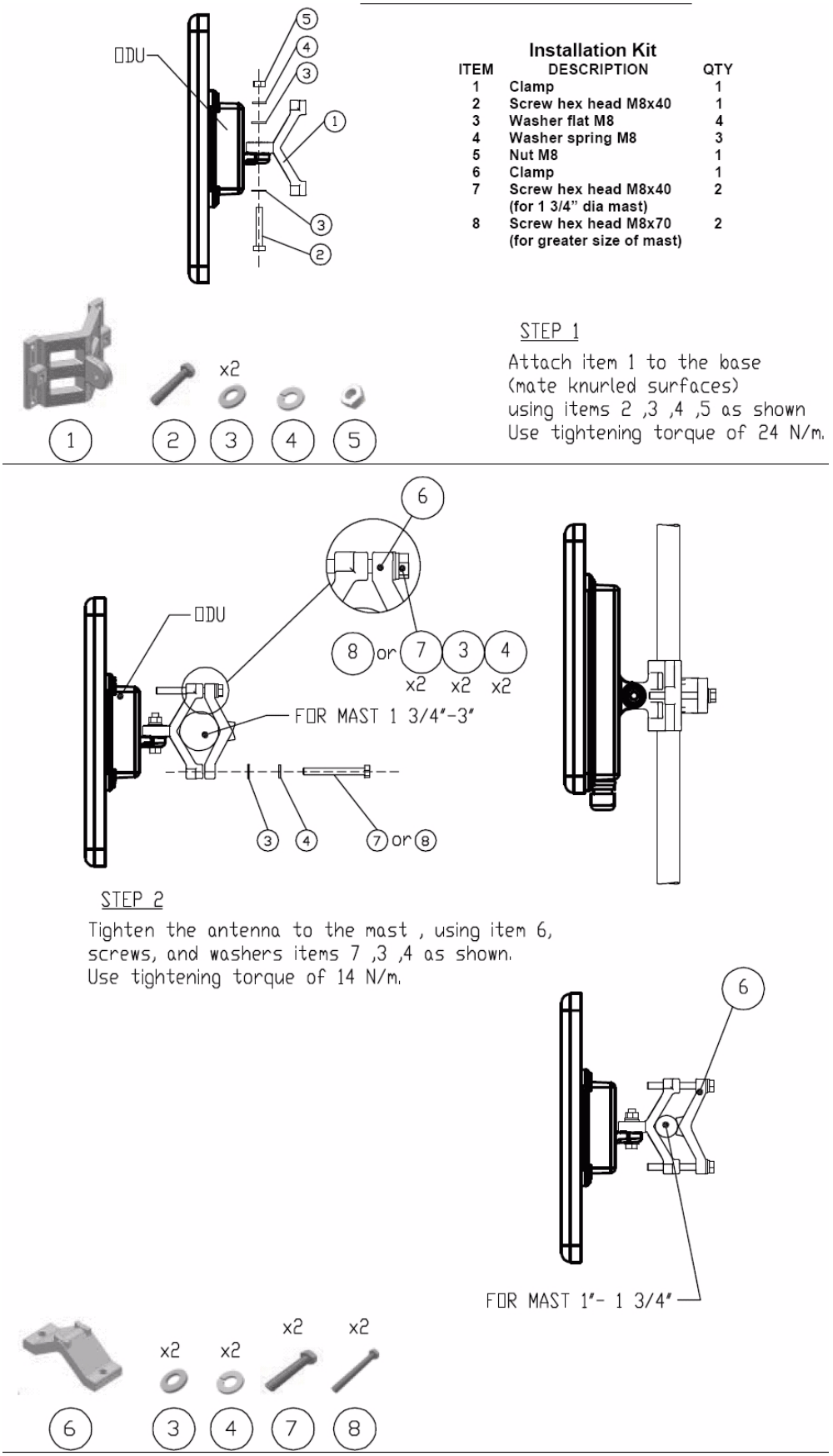


Figure A-4: Mounting on a pole

Mounting RADWIN 2000 on a Wall

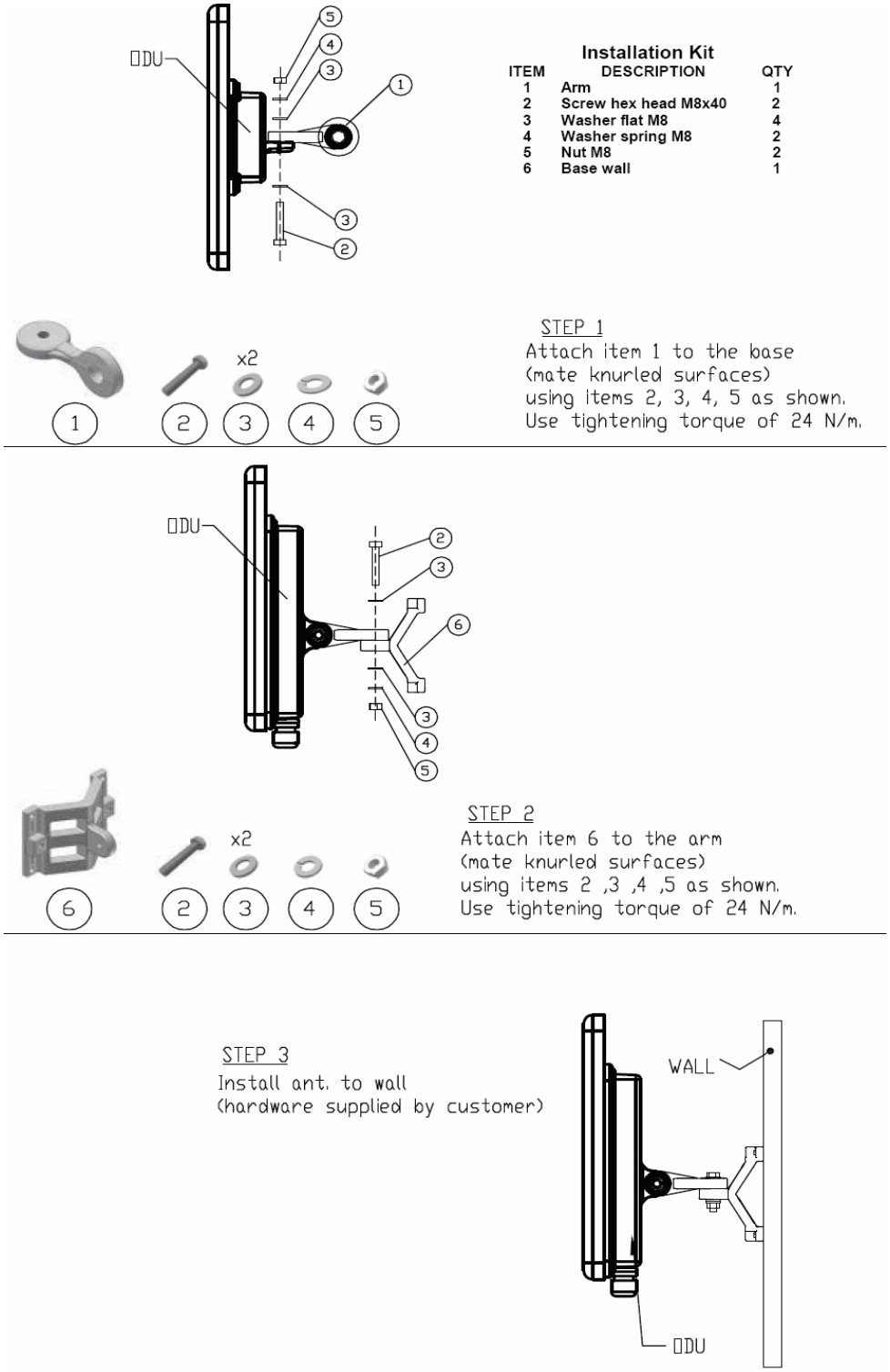


Figure A-5: Mounting on a Wall

Mounting an External Antenna

Optional external antennas can be mounted on a pole. The external mounting kit varies according to the specific antenna.

Appendix B

Link Budget Calculator

Overview

The Link Budget Calculator is a utility for calculating the expected performance of the RADWIN 2000 wireless link and the possible configurations for a specific link range.

The utility allows you to calculate the expected RSS of the link, and find the type of services and their effective throughput as a function of the link range and deployment conditions.

User Input

You are required to enter or choose the following parameters. Depending on the product, some of the parameters have a default value that cannot be changed.

- Band, which determines frequency and regulation
- Channel Bandwidth (fixed to 20 MHz for RADWIN 2000)
- Tx Power (maximum Tx power per modulation is validated)
- Antenna Type (cannot be changed for ODU with integrated antenna)
- Antenna Gain per site (cannot be changed for integrated antenna)
- Cable Loss per site (cannot be changed for integrated antenna)
- Required Fade Margin
- Rate (and Adaptive check box)
- Service Type
- Required Range

Link Budget Calculator Internal Data

For each product (or Regulation and Band) the calculator stores the following data required for link budget calculations:

- Maximum Transmit power (per modulation)
- Receiver Sensitivity (per modulation) for Ethernet service and for TDM services at various BER
- Maximum linear input power (used to calculate minimum distance)

- Antenna gain and cable loss for ODU with integrated antenna
- Available Channel Bandwidths

Calculations

EIRP

$$EIRP = TxPower + AntennaGain_{SiteA} - CableLoss_{SiteA}$$

Expected RSS and Fade Margin

$$ExpectedRSS = EIRP - PathLoss + AntennaGain_{SiteB} - CableLoss_{SiteB}$$

where:

Site A is the transmitting site

Site B is the receiving site

PathLoss is calculated according to the free space model,

$$PathLoss = 32.45 + 20 \times \log_{10}(frequency_{MHz}) + 20 \times \log_{10}(RequiredRange_{Km})$$

$$ExpectedFadeMargin = Sensitivity - ExpectedRSS$$

where Sensitivity is dependent on air-rate.

Min and Max Range

MinRange is the shortest range for which $ExpectedRSS \leq MaxInputPower$ per air-rate.

MaxRange (with Adaptive checked) is the largest range for which $ExpectedRSS \geq Sensitivity$, at the highest air-rate for which this relationship is true. In a link with adaptive rate this will be the actual behavior.

MaxRange (for a given air-rate) is the largest range for which $ExpectedRSS \geq Sensitivity + RequiredFadeMargin$.

Service

The Ethernet and configured TDM trunks throughput is calculated according to internal product algorithms.

Availability

The Service Availability calculation is based on the Vigants Barnett method which predicts the downtime probability based on a climate factor (C factor).

$$Availability = 6 \times 10^{-7} \times Cfactor \times frequency_{GHz} \times (RequiredRange_{KM})^3 \times 10^{\frac{-ExpectedFadeMargin}{10}}$$

Antenna Height

The recommended antenna height required for line of sight is calculated as the sum the Fresnel zone height and the boresight height. See **About the Fresnel Zone** below. Using the notation of figure **B-9** below, splitting *ExpectedRange* into $d_1 + d_2$, the ***Fresnel zone height*** at distance d_1 from the left hand antenna, is given by

$$0.6 \times \sqrt{\frac{\frac{300}{frequency_{GHz}} \times d_1 \times d_2}{d_1 + d_2}}$$

For the most conservative setting, we take the mid-point between the antennas, setting $d_1 = d_2 = \frac{ExpectedRange}{2}$

which gives $0.6 \times \sqrt{\frac{\frac{300}{frequency_{GHz}} \times \left[\frac{ExpectedRange}{2}\right]^2}{\frac{ExpectedRange}{2} + \frac{ExpectedRange}{2}}}$

simplifying to $0.52 \times \sqrt{\frac{ExpectedRange}{frequency_{GHz}}}$.

The ***boresight clearance height*** is calculated as:

$$\sqrt{R^2_{Maean} + \left[\frac{ExpectedRange}{2}\right]^2} - R_{Maean}$$

where $R_{Mean} = 6367.4425Km$.

Running the Link Budget Calculator

The Link Budget Calculator is supplied on the RADWIN Manager CD. It may be run stand-alone from the CD or from the RADWIN Manager application.

To run the Link Budget Calculator from the CD:

1. Insert the RADWIN Manager CD into the drive on the managing computer. In the window which opens, click the Link Budget Calculator option.
2. If the CD autorun application does not start by itself, then point your browser to

   Z:\RADWIN\Setup\DATA\Link Budget Calculator.htm

where Z should be replaced with your own CD drive name.

To run the Link Budget Calculator from the RADWIN Manager:

- Choose **Help | Link Budget Calculator** from the main menu of the RADWIN Manager as in the following figure:

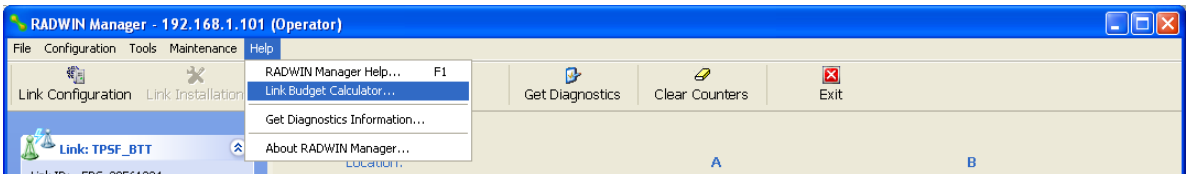


Figure B-1: Accessing the Link Budget Calculator

However invoked, your browser displays the following page:

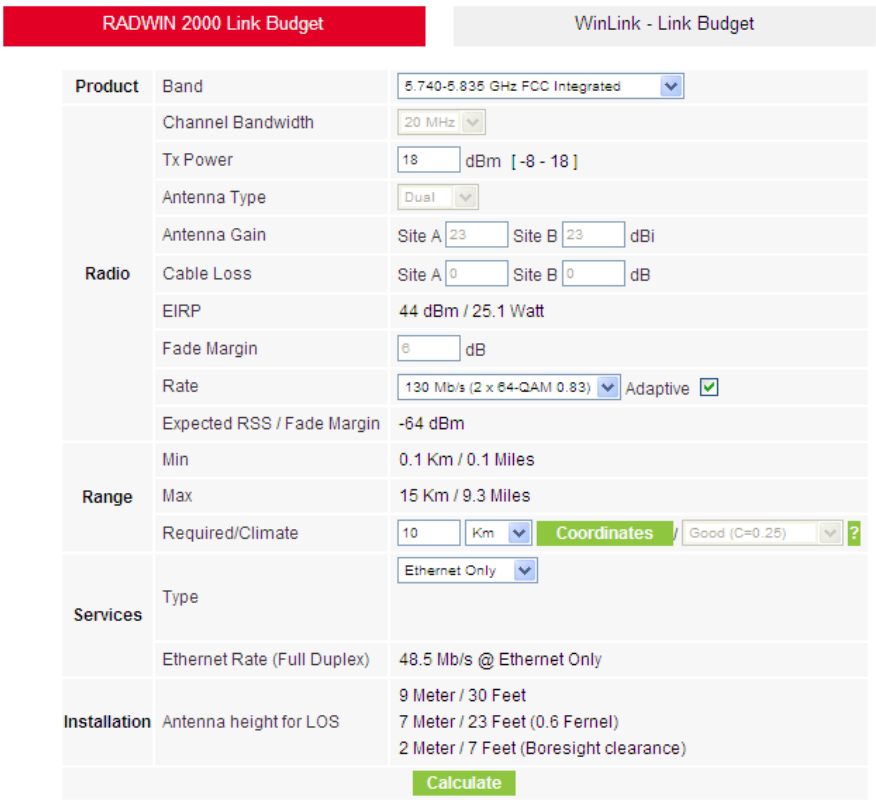
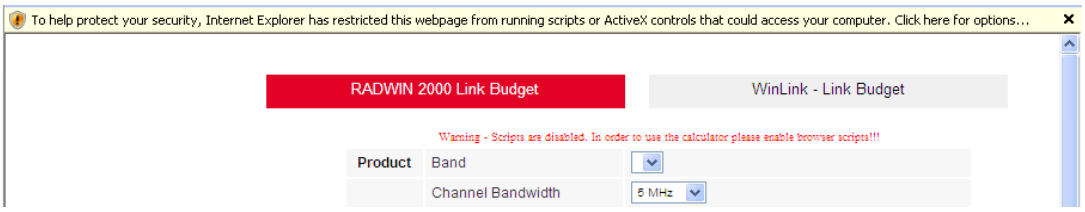


Figure B-2: Link Budget window

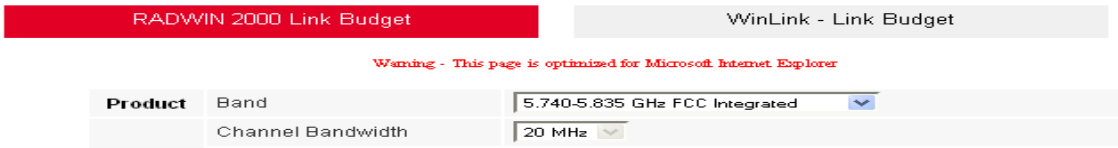
- Microsoft Internet Explorer users may see a warning message like this:



Note

Click the yellow bar and follow the instructions to allow blocked content.

- Mozilla FireFox and Google Chrome users may see a warning message like this:



You may ignore it and continue.

To use the Link Budget Calculator for RADWIN 2000:

1. Choose a band from the drop-down list.

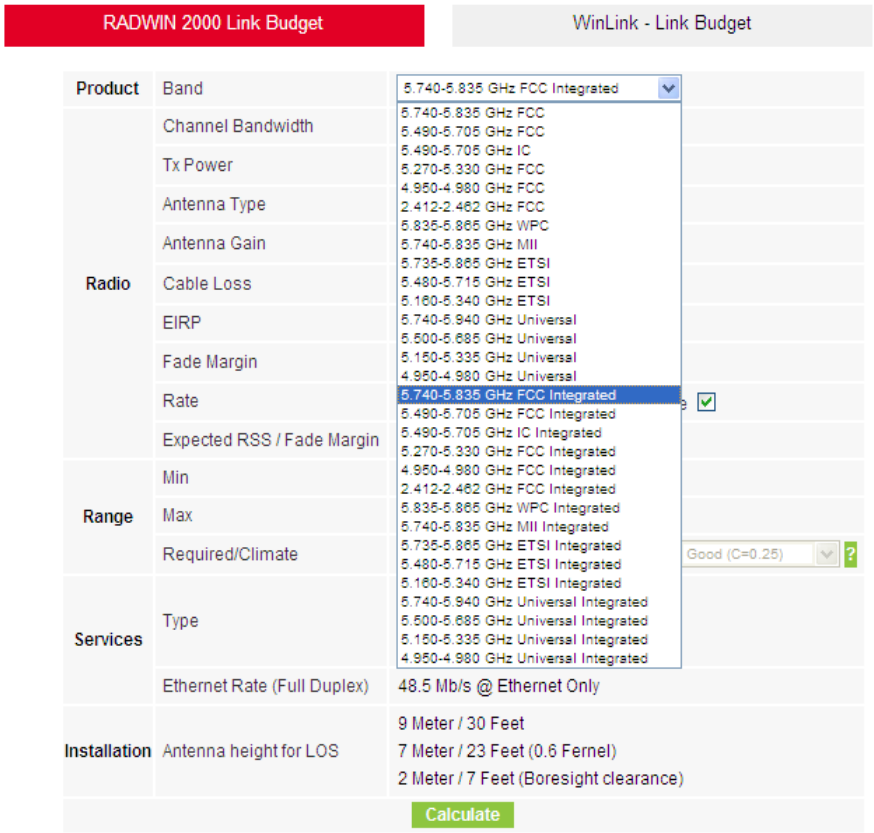


Figure B-3: Product selector

2. Enter the radio details. Note that Rate is chosen from a drop-down list:

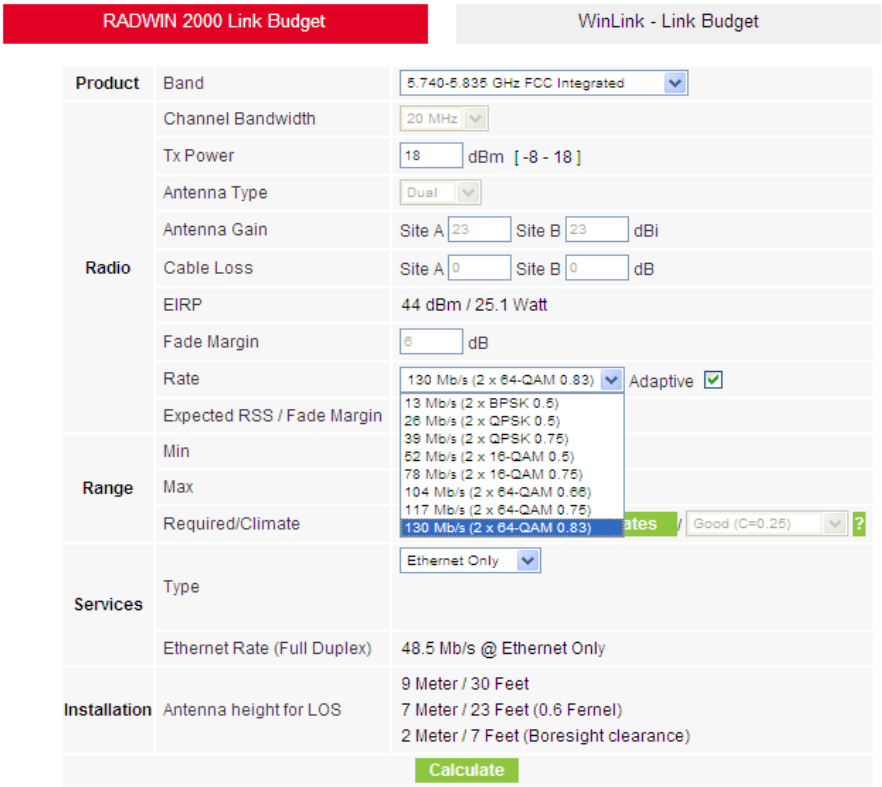


Figure B-4: Rate selector

Note

If you choose Adaptive Rate, then the Rate list is unavailable as is the Climate factor list. Both of these quantities are calculated.

The **Rate** shown, defines the air-interface rate in Mbps. The system operates in TDD mode and has the overhead of the air-interface protoco.l Thus, the Ethernet actual throughput is provided by the **Ethernet Rate**.

Note

For a given air-rate, Ethernet throughput will decrease with increasing range due to propagation delay.

The Fade margin is the minimum required for LOS conditions. For degraded link conditions, a larger Fade margin should be used.

The EIRP is given in dBm and Watts.

3. If the required range between the two link sites is known, you may enter it directly. Alternatively, you may enter the latitude and longitude of each site in the link, in which case the distance between them will be calculated and displayed.

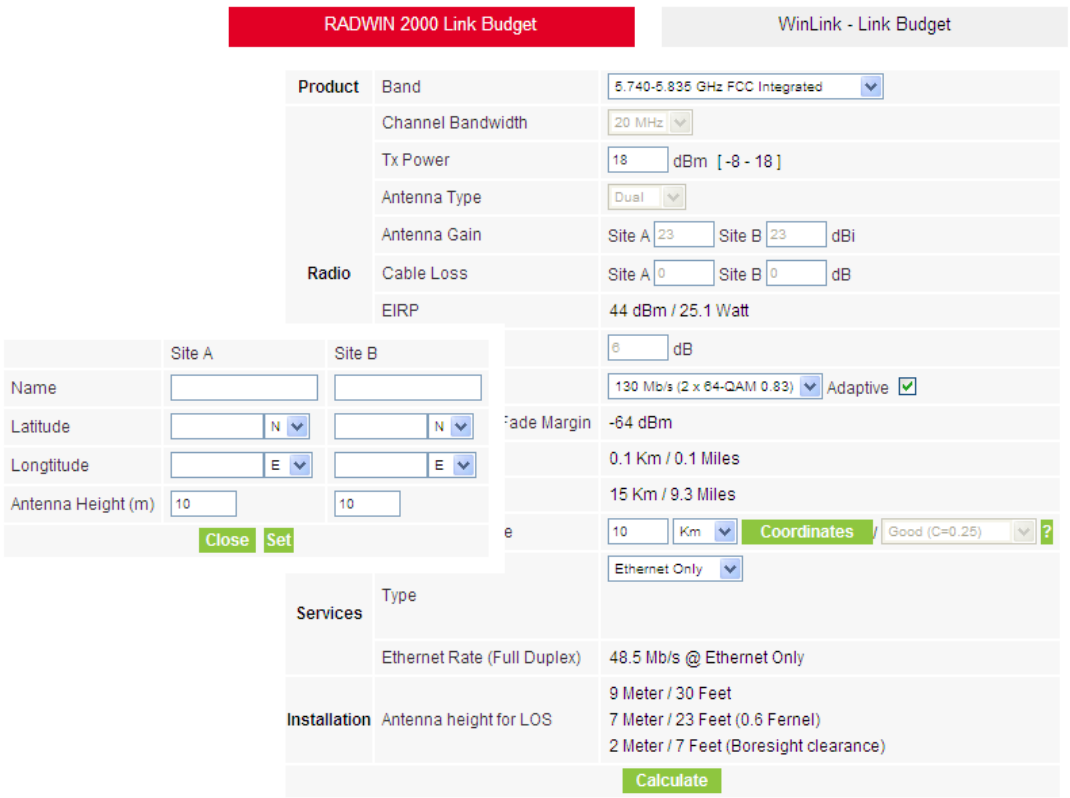


Figure B-5: Calculation of distance from site coordinates

4. Located to the right of the green Coordinates button is a drop-down list of Climactic C Factor values. It is only available if you choose a non-adaptive rate.

Figure B-6: Climactic C Factors

For help about what these mean, click the **?** button to the right of the list in **Figure B-6**.

RADWIN 2000 Link Budget | WinLink - Link Budget

Product	Band	5.740-5.835 GHz FCC Integrated
Radio	Channel Bandwidth	20 MHz
	Tx Power	18 dBm [-8 - 18]
	Antenna Type	Dual
	Antenna Gain	Site A 23 Site B 23 dBi
	Cable Loss	Site A 0 Site B 0 dB
	EIRP	44 dBm / 25.1 Watt
	Fade Margin	6 dB
	Rate	130 Mb/s (2 x 64-QAM 0.83) Adaptive ☐
	Expected RSS / Fade Margin	-64 dBm / 3 dB
Range	Min	0.1 Km / 0.1 Miles
	Max	7 Km / 4.3 Miles
	Required/Climate	10 Km Coordinates / Good (C=0.25) ?
Services	Type	Ethernet Only @ 99.9742% availability (downtime 136 min/year)
	Ethernet Rate (Full Duplex)	48.5 Mb/s @ Ethernet Only
Installation	Antenna height for LOS	9 Meter / 30 Feet 7 Meter / 23 Feet (0.6 Fernel) 2 Meter / 7 Feet (Boresight clearance)

Calculate

Climate/Terrain Factor

Value	Description
Good (C=0.25)	Mountains and dry climate
Average (C=1)	Average terrain and climate
Moderate (C=2)	Moderate terrain and climate
Difficult (C=4)	Over water or humid climate
Very Difficult (C=6)	Exterme humid climate

Close

Figure B-7: Climactic C Factor description

In **Figure B-8** we display a map of the world showing C Factor contours:

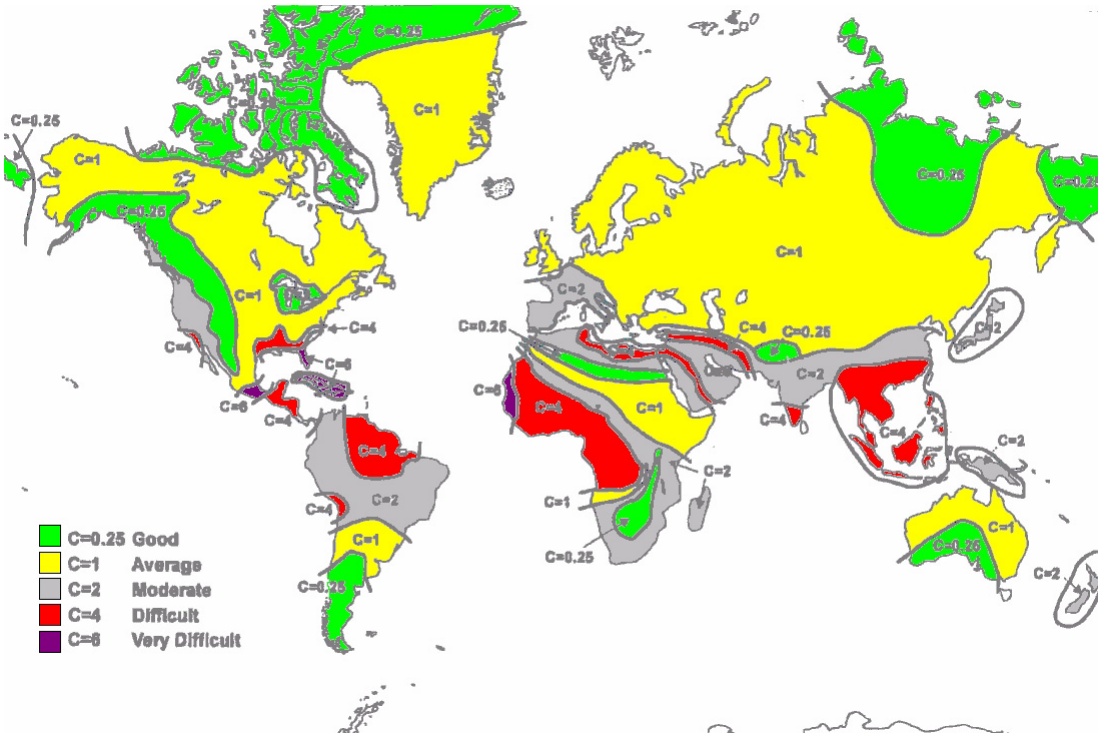


Figure B-8: World map showing C Factor contours

5. Click **Calculate** to obtain the required performance estimate.

> **Note**
> Placing the cursor in any other calculated field will also update the calculated results.

The Expected Performance parameters are calculated and displayed:

- **Expected RSS** - the expected RSS that the RADWIN Manager shows when the RADWIN 2000 ODUs are optimally aligned
- **Services Type** - max number of T1 or E1 trunks if "Max Trunks" is selected
- **Ethernet Rate** - maximum throughput available for the chosen parameter combination
- **Antenna height for LOS** – the minimum antenna height required for line-of-sight operation. It is the sum of the height required for boresight clearance due to the earth's curvature plus the height required to clear the Fresnel zone

If the expected performance is not suitable for your application, try different parameters and repeat the calculation.

About the Fresnel Zone

The Fresnel zone (pronounced "frA-nel", with a silent "s") is an elliptically shaped conical zone of electromagnetic energy that propagates from the transmitting antenna to the receiving antenna. It is always widest in the middle of the path between the two antennas.

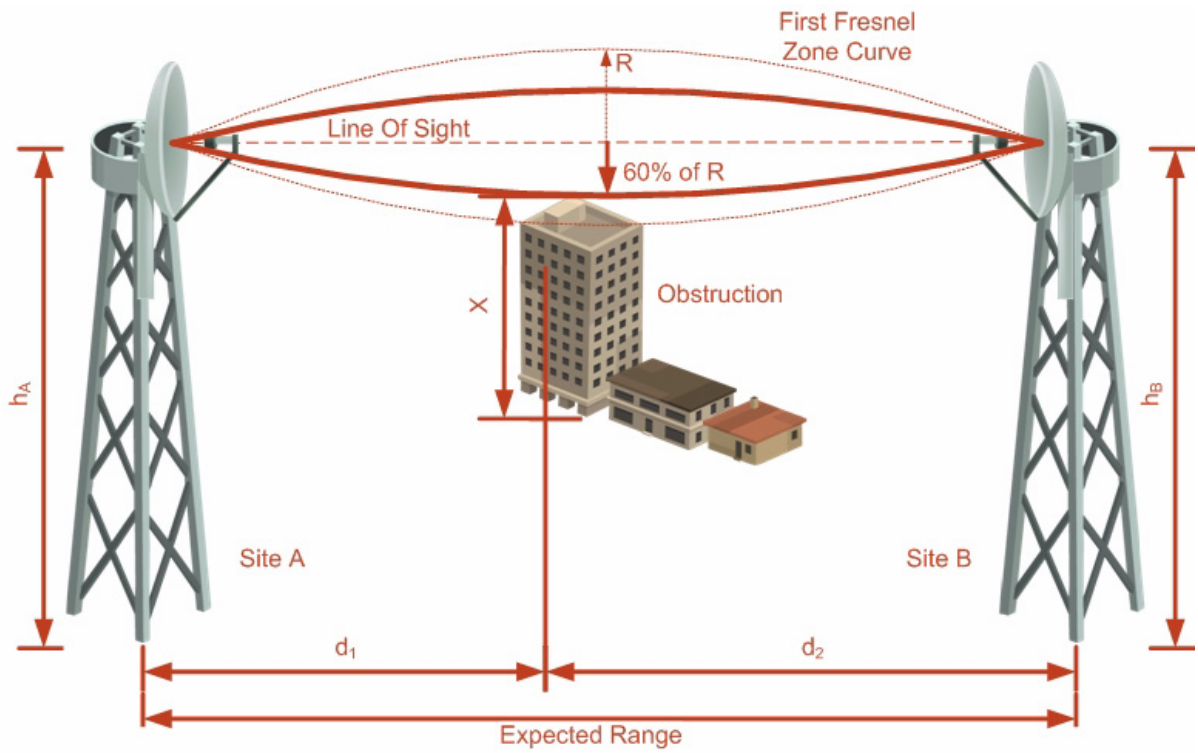


Figure B-9: Fresnel zone

Fresnel loss is the path loss occurring from multi-path reflections from reflective surfaces such as water, and intervening obstacles such as buildings or mountain peaks within the Fresnel zone.

Radio links should be designed to accommodate obstructions and atmospheric conditions, weather conditions, large bodies of water, and other reflectors and absorbers of electromagnetic energy.

The Fresnel zone provides us with a way to calculate the amount of clearance that a wireless wave needs from an obstacle to ensure that the obstacle does not attenuate the signal.

There are infinitely many Fresnel zones located coaxially around the center of the direct wave. The outer boundary of the first Fresnel zone is defined as the combined path length of all paths, which are half wavelength (1/2 λ) of the frequency transmitted longer than the direct path. If the total path distance is one wavelength (1 λ) longer than the direct path, then the outer boundary is said to be two Fresnel zones. Odd number Fresnel zones reinforce the direct wave path signal; even number Fresnel zones cancel the direct wave path signal.

The amount of the Fresnel zone clearance is determined by the wavelength of the signal, the path length, and the distance to the obstacle. For reliability, point-to-point links are designed to have at least 60% of the first Fresnel zone clear to avoid significant attenuation.

The concept of the Fresnel zone is shown in **Figure B-9** above. The top of the obstruction does not extend far into the Fresnel zone, leaving 60% of the Fresnel zone clear; therefore, the signal is not significantly attenuated.

For more about Fresnel zone, see **http://en.wikipedia.org/wiki/Fresnel_zone**.

Appendix C

Lightning Protection and Grounding Guidelines

Meticulous implementation of the guidelines in this appendix will provide best protection against electric shock and lightning.

Warning

100% protection is neither implied nor possible.

Note

This appendix is at best a guide. The actual degree of lightning protection required depends on local conditions and regulations.

The RADWIN 2000™ Lightning protection system consists of the following components:

- Grounding for the antenna coax cable
- Grounding for each IDU and ODU
- External Primary Surge Suppressor units and grounding for the outdoor cable
- Internal ESD protection circuits over the Power/Telecom lines

Grounding for Antenna Cable

A Grounding Kit must be connected to the coax antenna cable and reliably grounded as shown in Figure X. The grounding kit is an Andrew Type 223158-2 (**www.andrew.com**). See figure **C-1** below.

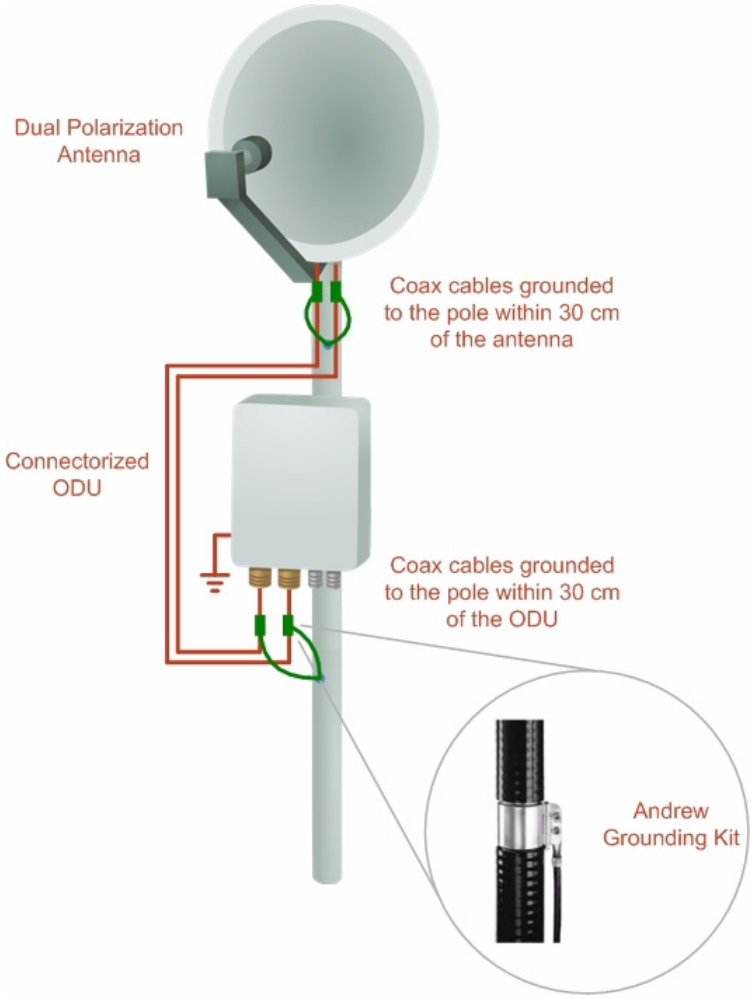


Figure C-1: Grounding antenna cables

Grounding for Indoor/Outdoor Units

ODU Grounding

RADWIN 2000™ uses a Shielded CAT-5e cable to interconnect the Outdoor (ODU) and Indoor (IDU) units.

However, this shielding does not provide a good Lightning Discharge path, since it can not tolerate the high Lightning Current surges.

To provide an alternate Lightning Discharge path, the ODU and antenna grounding posts should be connected to ground point by a 10 AWG short copper wire.

The device should be permanently connected to ground.

IDU Grounding

The IDUs grounding post should be connected to the internal ground point, using a grounding wire of at least 10 AWG. The grounding wire should be connected to a grounding rod or the building grounding system.

The device should be permanently connected to ground.

External Lightning Surge Suppressors and Grounding

A Grounding Kit and Surge Arrestor Unit must be located near the ODU and properly grounded as illustrated in figures **C-2** and **C-3** below:

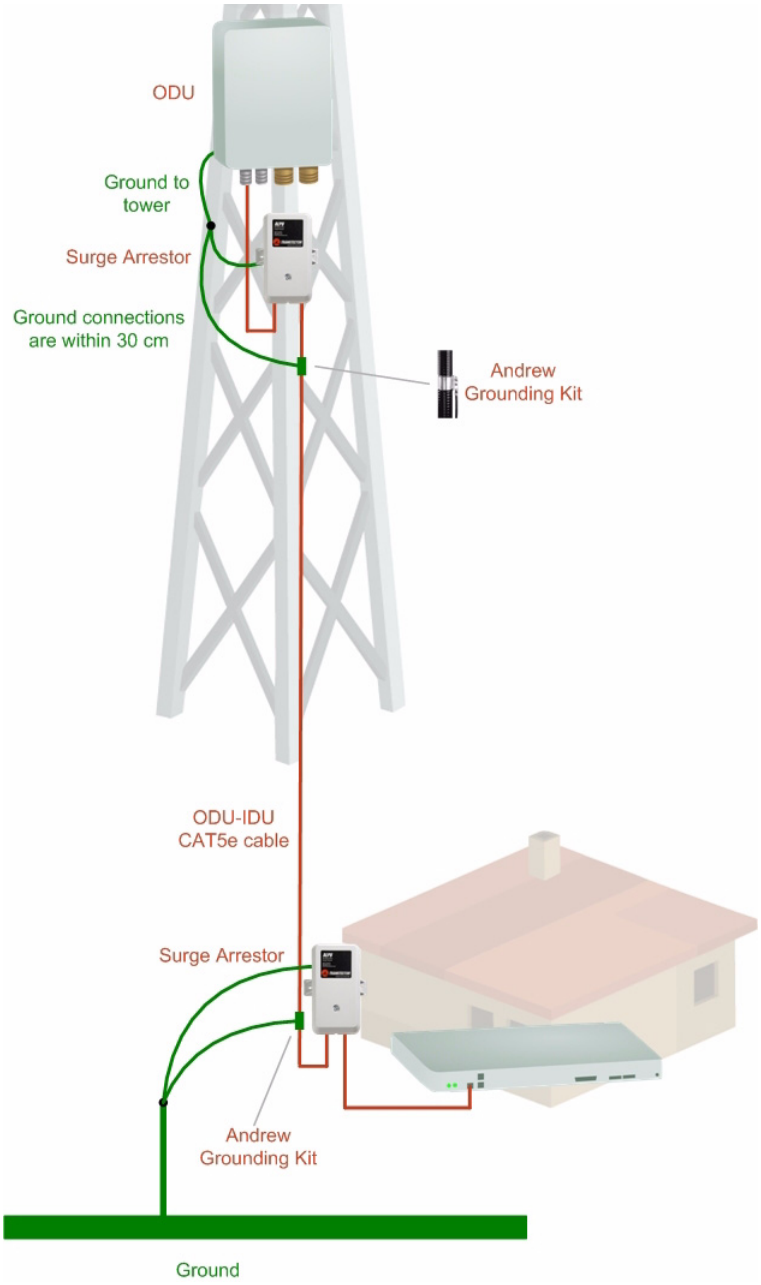


Figure C-2: Grounding a typical pole installation

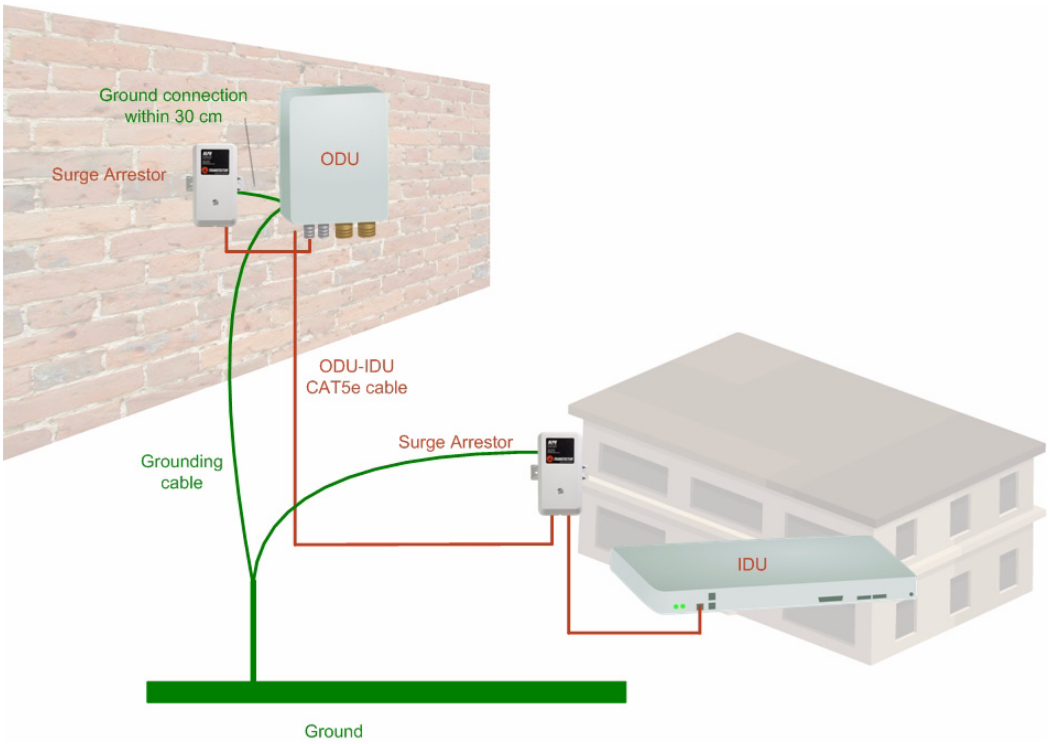


Figure C-3: Grounding a typical wall installation

The next figure shows a close-up of the rear of grounded ODU:

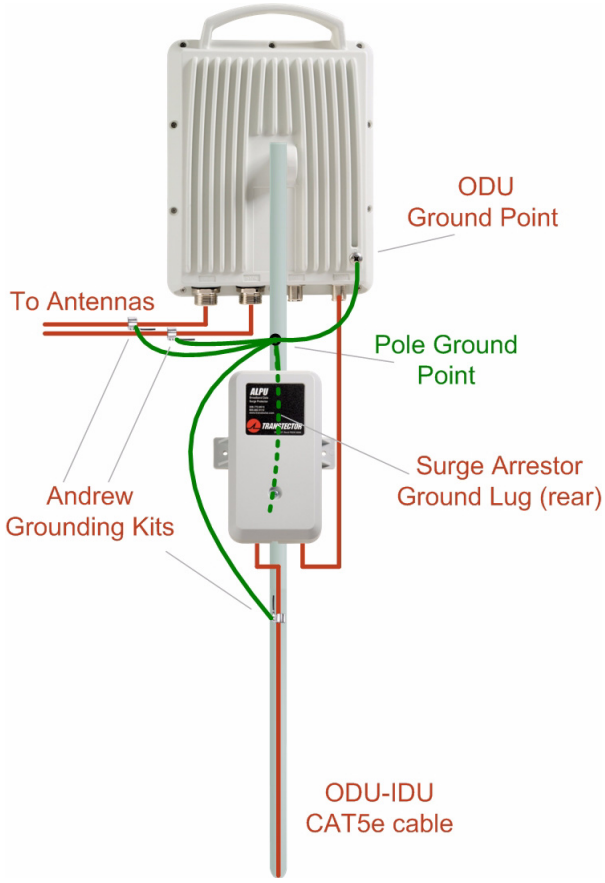


Figure C-4: ODU Surge Suppressor and grounding

The Transtector protection circuits shown in figure **C-5** below, utilize silicon avalanche diode technology. The unit consists of an outdoor rated NEMA 3R type enclosure with easy mounting flanges, ground stud attachment and easy wiring.

The ALPU-POE features RJ-45 protection circuits for the ODU-IDU data pairs (pins 1,2 & 3,6) and DC power (pins 4,5 & 6,7 with the pairs bonded).

The unit is designed to be wall mounted. An optional set of bracket is available to allow a wide range of pole mount applications. A dedicated ground stud is provided inside the unit that must be bonded to the nearest grounding system (or Master Ground bar) for proper surge protection.

The system wiring is installed with RJ-45 type connectors that can feed directly into the chassis without having to cut, splice or route through awkward strain relief holes.

Figure C-5: Transtector's Surge Suppressor

To mount the lightning protection devices:

1. Mount the device as close to the ODU as possible. Mount the unit so that the cable connectors are at the bottom (to prevent water from penetrating), with the strain reliefs facing the ground.
2. Remove the cover by unscrewing the front of the unit.
3. Mount the unit to an outside surface using the two mounting holes.
4. Connect the ODU-IDU cable using the RJ-45 jack.
5. Connect one cable between the ODU and the suppressor using an RJ-45 jack.
6. Connect the suppressor's ground stud to a grounding point. Use the appropriate wire gauge and type, keeping the wire as short as possible, less than 1m (3'), between the stud and the site grounding point.

7. Replace the cover.

Note

There may also be regulatory requirements to cross bond the ODU-IDU CAT-5e cable at regular intervals up the mast. This may be as frequent as every 10 meters (33 feet).

A second Surge Arrestor Unit should be mounted at the building entry point and must be grounded, as shown in figure **C-3** above.

To mount the lightning protection at the building entry point:

1. Mount the device outside the building, located as near as possible to the entrance of the CAT-5e ODU-IDU cable. Mount the unit so that the cable connectors are at the bottom (to prevent water from penetrating), with the strain reliefs facing the ground.
2. Remove the cover by unscrewing the front of the unit.
3. Mount the unit to an outside surface using the two mounting holes.
4. Connect the ODU-IDU cable using the RJ-45 jack.
5. Connect one cable between the IDU and the suppressor using an RJ-45 jack.
6. Connect the suppressor's ground stud to a grounding point. Use the appropriate wire gauge and type, keeping the wire as short as possible, less than 1m (3'), between the stud and the site grounding point.
7. Replace the cover

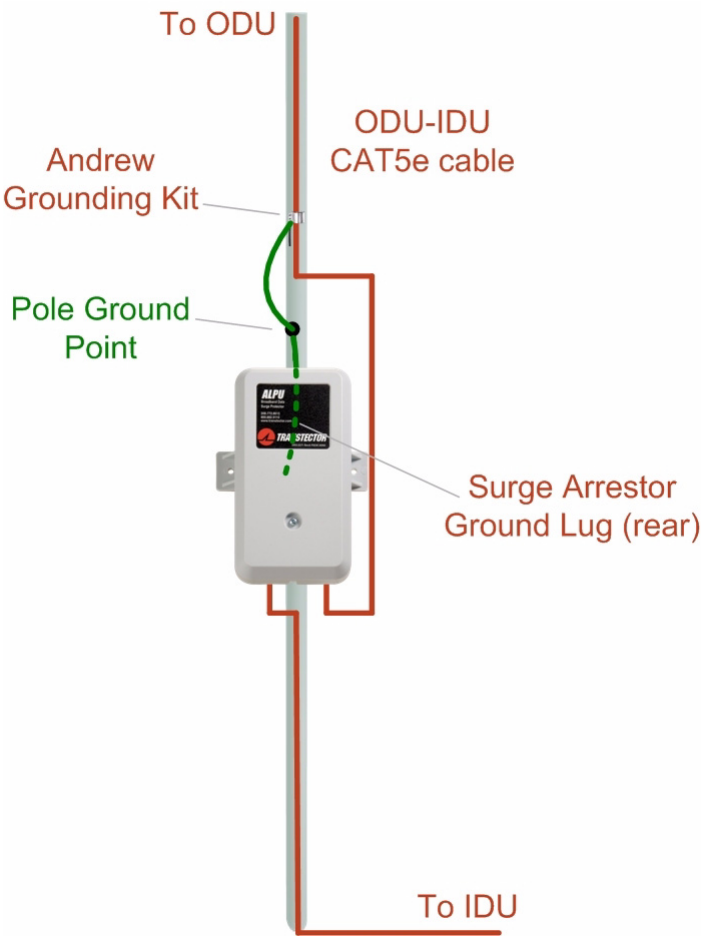


Figure C-6: Surge Suppressor and grounding at building entry point

Internal ESD Protection circuits

RADWIN 2000™ is designed to meet the ETSI/FCC/Aus/NZ/CSA EMC and Safety requirements. To fulfill these requirements, the system's Telecom lines at the ODU/IDU are Transformer-isolated and include internal ESD (Electro-Static-Discharge) Protection circuits.

Appendix D

Preloading an ODU with an IP Address

Why this is Needed?

All ODUs supplied by RADWIN come pre-configured with an IP address of 10.0.0.120. For use in a network, the ODUs must be configured with suitable static IP addresses. The method for doing this under office conditions is set out in chapter 4.

This appendix explains how do achieve the same thing in the field.

Required Equipment

The minimal equipment required to pre-load an ODU with an IP address is:

- Laptop computer (managing computer) satisfying the requirements of table 4-1
- An installed copy of the RADWIN Manager
- A PoE device
- A crossed Ethernet LAN cable
- An IDU-ODU cable
- If you have connectorized ODUs, two N-type RF terminators

The procedure

To Preolad an ODU with an IP address:

1. Using the IDU-ODU cable, connect the PoE device to the ODU, ensuring that the cable is plugged into the PoE port marked P-LAN-OUT.

2. For connectorized ODUs, screw the RF terminators into the two antenna ports.

Warning

A powered up ODU emits RF radiation from the antenna port (or connected antenna). When working with a powered up connectorized ODU, always use RF terminators.

For an ODU with an integrated antenna, ensure that the antenna is always directed away from other people.

3. Connect the Poe device to AC power.
4. Using a crossed LAN cable, connect the LAN-IN port of the PoE device to the Ethernet port of the managing computer. The ODU will commence beeping at about once per second, indicating correct operation.
5. Launch the RADWIN Manager.
6. At the log on window, choose Local Connection.

Figure D-1: Log on Window for Local Connection

7. Enter the default password, ***admin***. After a few moments, the RADWIN Manager main window appears:

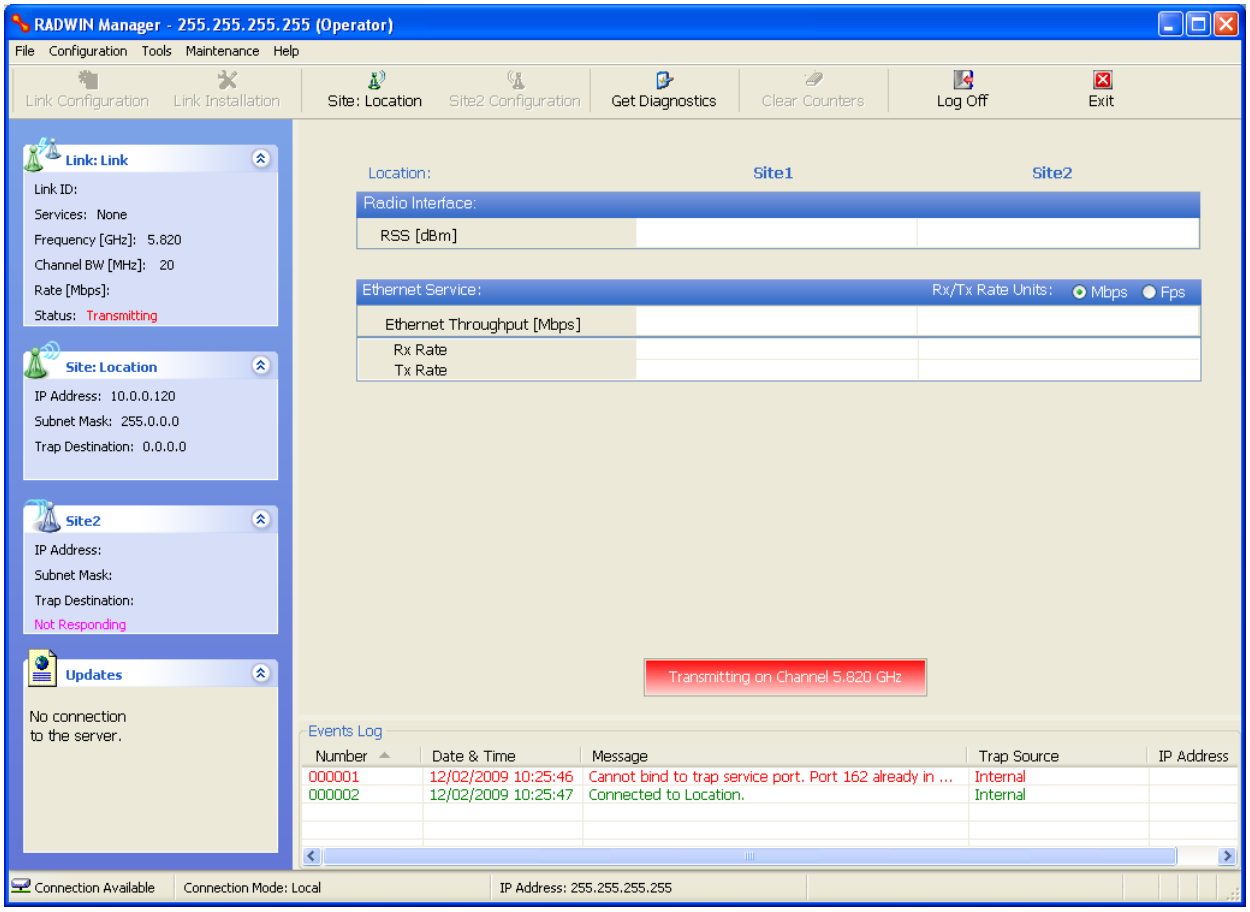


Figure D-2: Opening RADWIN Manager window prior to installation

8. Click the un-grayed **Site:Location** button. The following dialog window appears:

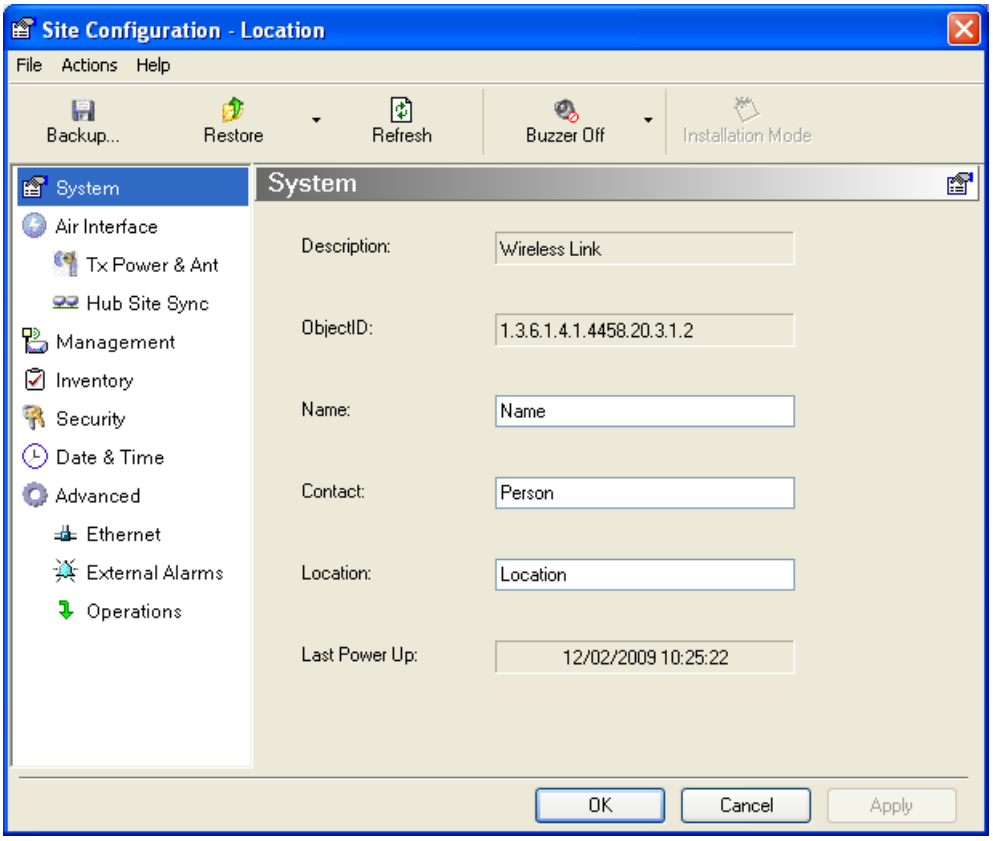


Figure D-3: Configuration Dialog Box

9. Click the **Management** item in the left hand panel. The following window is presented:

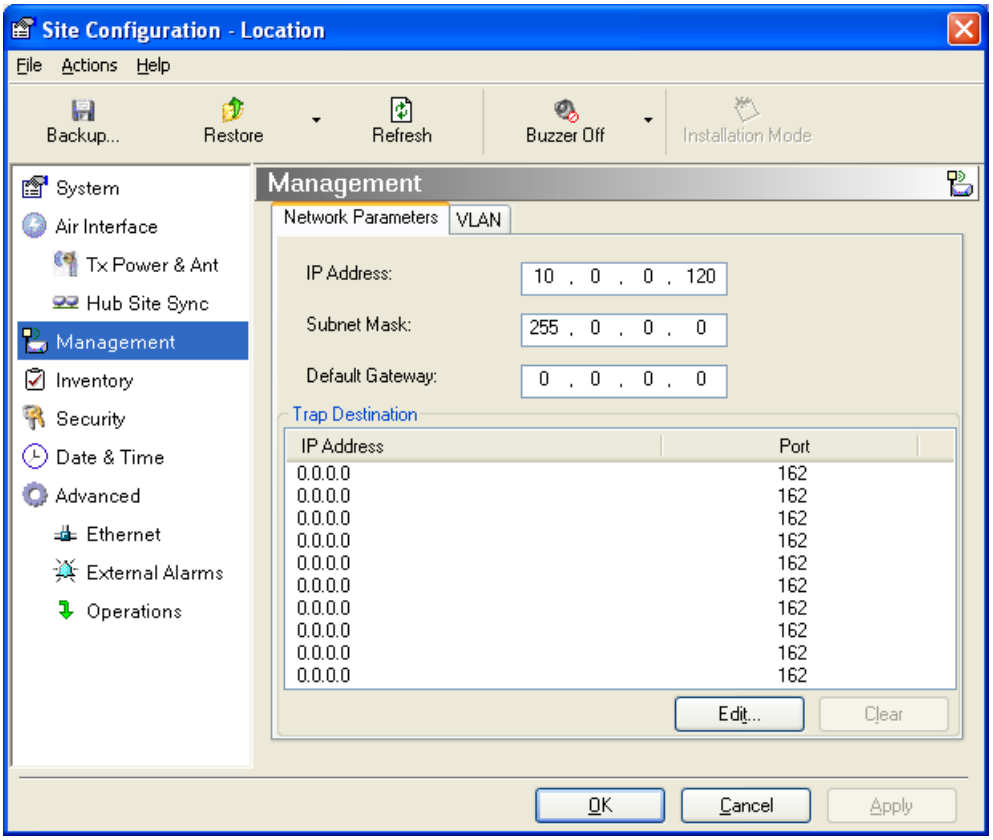


Figure D-4: Management Addresses - Site Configuration dialog box

10. Enter the IP Address, Subnet Mask and Default Gateway as requested. For example, the ODU used here is to be configured as follows:

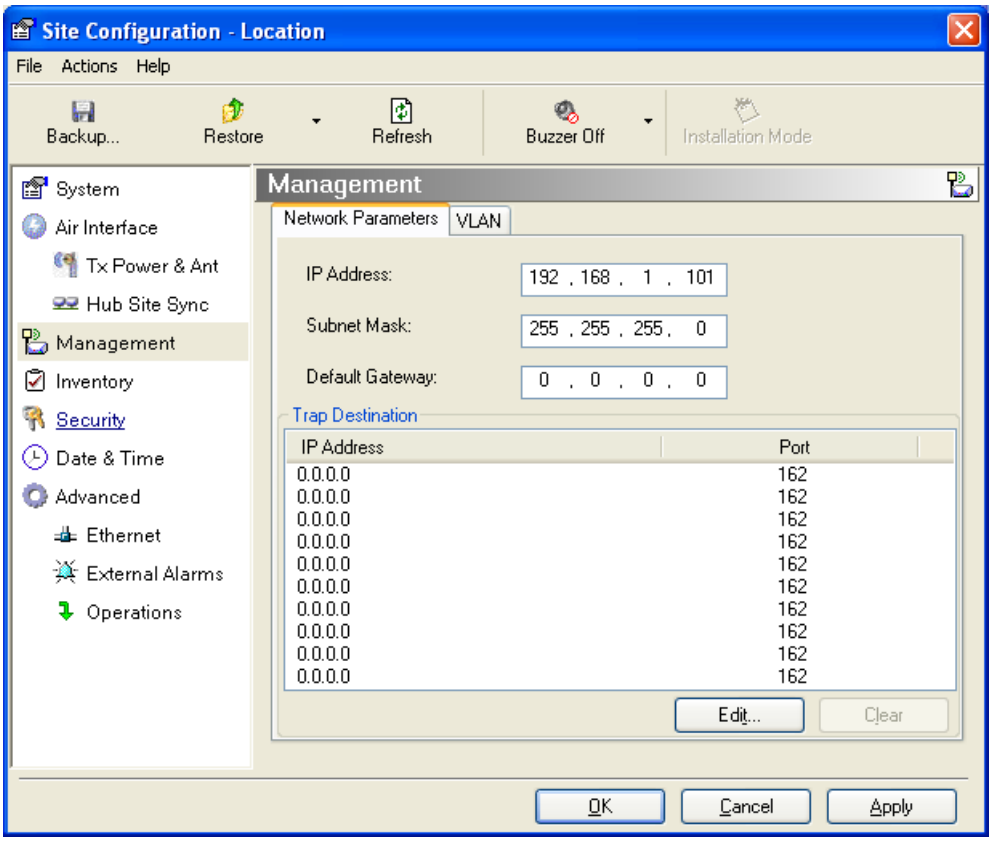


Figure D-5: ODU with IP Addressing configured

11. Click **OK.** You are asked to confirm the change:

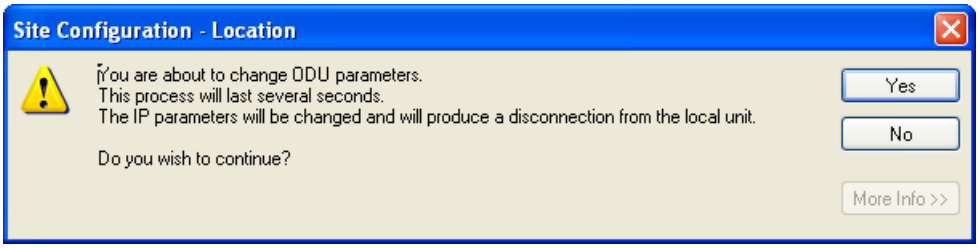


Figure D-6: Confirmation of IP Address change

12. Click **Yes** to accept the change. After about half a minute the changes will be registered in the ODU. On the left hand panel of the main window, you will see the new IP configuration for the ODU.

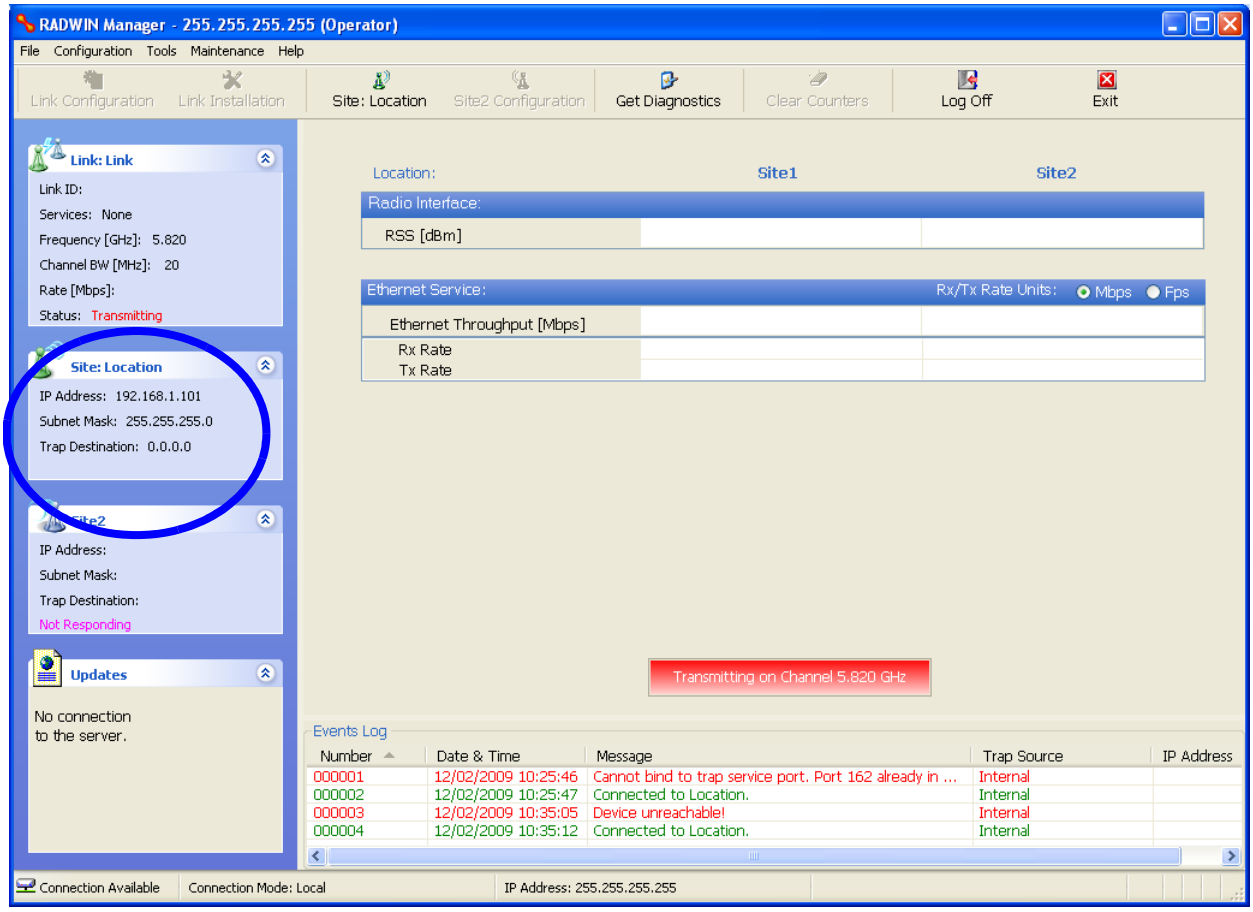


Figure D-7: Main Window after IP Address change

13. Click **Cancel** to leave the open Management dialog. You may now exit the RADWIN Manager, or connect to another ODU. If you choose to connect to another ODU, after about a minute, the main window of the RADWIN Managerwill revert to that shown in figure **D-2** above. In any event, power down the changed ODU; the IP address change will take effect when you power it up again.

Note

Don't forget to remove the RF terminators from a connectorized ODU after powering it down.

Appendix E

Changing the FactoryDefault Band

Why this is Needed?

All ODUs supplied by RADWIN come pre-configured with a factory set up product (part number) dependent band. It may be changed using the procedure in this appendix.

Caution

- The ODUs as supplied by RADWIN are typically set up with a factory default band for your product.
- If for some reason the default band needs to be changed, it should be done before link Installation.
- Use of an incorrect band may be in violation of local regulations.

Required Equipment

The minimal equipment required to change an ODU default band is:

- Laptop computer (managing computer) satisfying the requirements of table **4-1**.
- An installed copy of the RADWIN Manager
- A PoE device
- A crossed Ethernet LAN cable
- An IDU-ODU cable

The procedure

To change the factory default band:

1. Using the IDU-ODU cable, connect the PoE device to the ODU, ensuring that the cable is plugged into the PoE port marked P-LAN-OUT.
2. Connect the Poe device to AC power.

3. Using a crossed LAN cable, connect the LAN-IN port of the PoE device to the Ethernet port of the managing computer. The ODU will commence beeping at about once per second, indicating correct operation.
4. Launch the RADWIN Manager.
5. Log on as Installer.

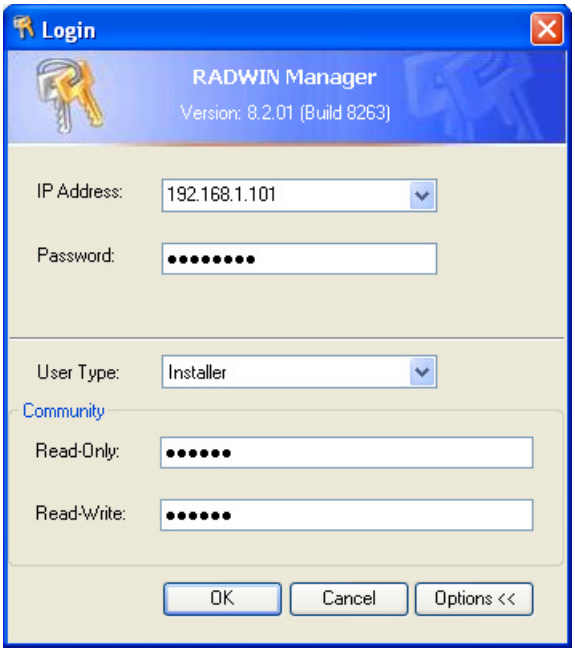


Figure E-1: Becoming Installer

6. Enter the default password, ***wireless***. After a few moments, the RADWIN Manager main window appears:

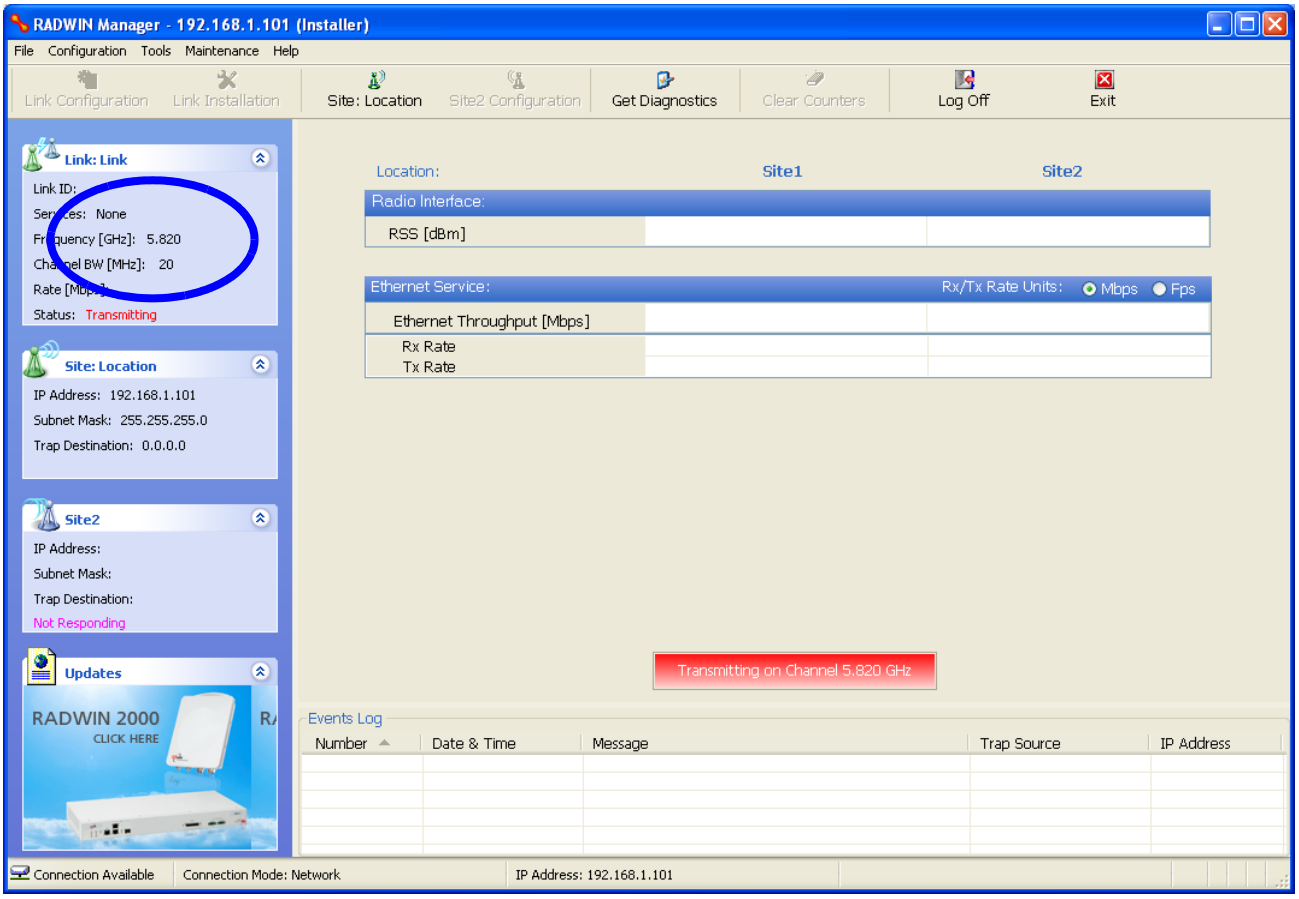


Figure E-2: Opening RADWIN Manager window prior to band change

7. Click **Tools | Change Band**. The following window appears:

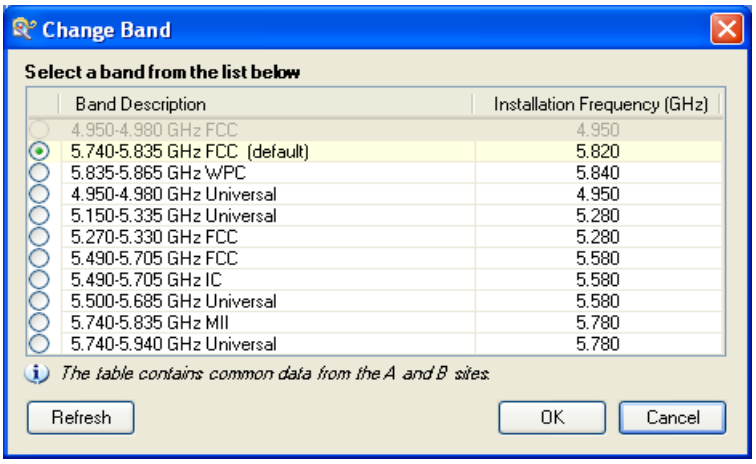


Figure E-3: Change Band dialog

Note

The bands appearing in figure **E-3** are product dependent. To see which bands are available for your product, check your product Inventory (see figure **6-12**) and then consult tables **1-1** and **1-2**. Observe that disabled bands are grayed out.

8. Click the band required:

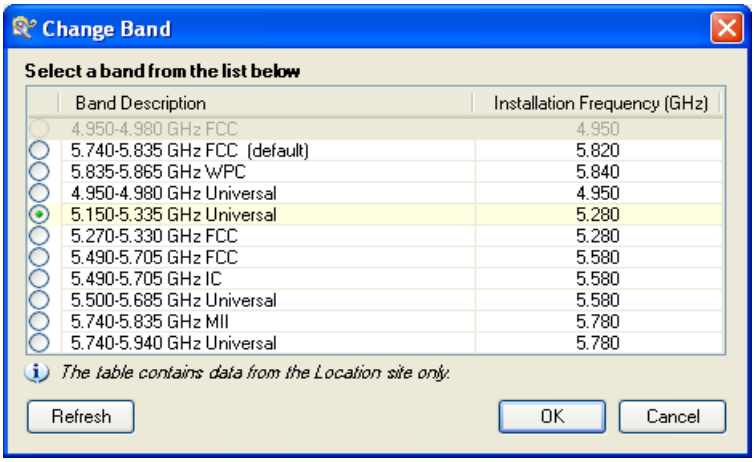


Figure E-4: A different band selected

9. The Change Band warning is displayed. Click **Yes** to continue.

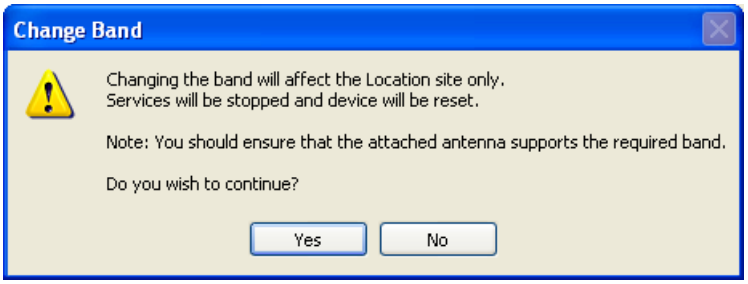
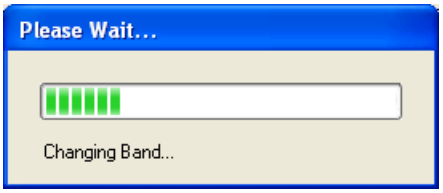


Figure E-5: Change Band confirmation

Caution

If you are changing the band on an installed link, change the "over the air" site (site B) first., otherwise you will lock yourself out of the link.

The change, which may take some time, is carried out:



The result is reflected in the RADWIN Manager main window:

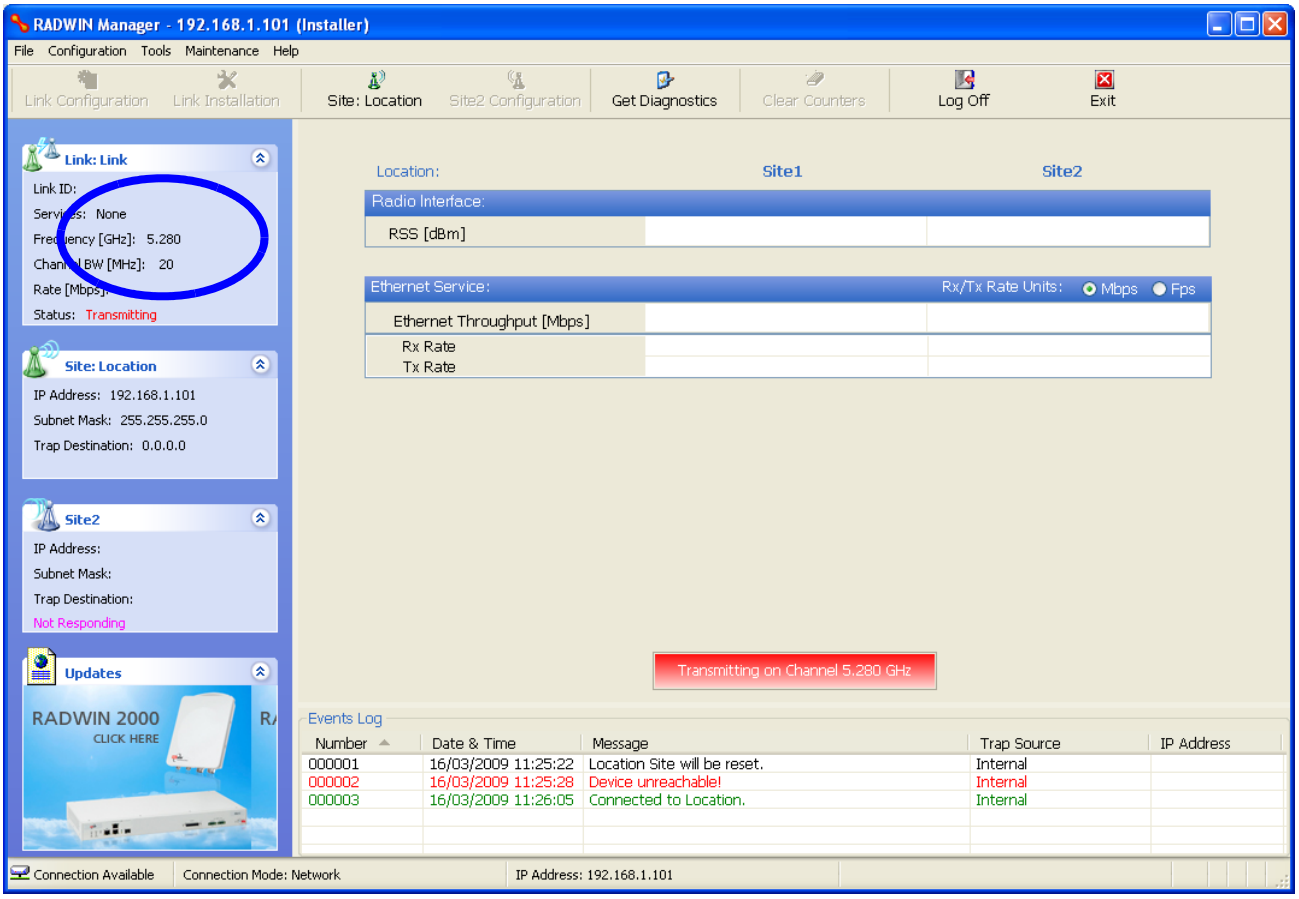


Figure E-6: Main Window after band change

Note

If you carry ou this operation on a link, the band is effective on both sites and you are placed in installation mode. DFS is different and desctibed below.

Changing Band for DFS

Changing to a DFS band is similar to the foregoing procedure. The DFS bands are listed in tables **1-1** and **1-2**.

As soon as you establish a link using a DFS band, you are offered Configuration only in the man menu. Installation mode is disabled.

Special Products or Features: Entering a License Key

If you go to the Operations window as Installer (figure **E-7**), you will see a provision for entering a license key. Should you ever require such a key, the procedure is as follows:

To enter a License key:

1. Log on as Installer (as for the previous procedure).
2. Click the **Site:Location** tool bar button. From the main tool bar.

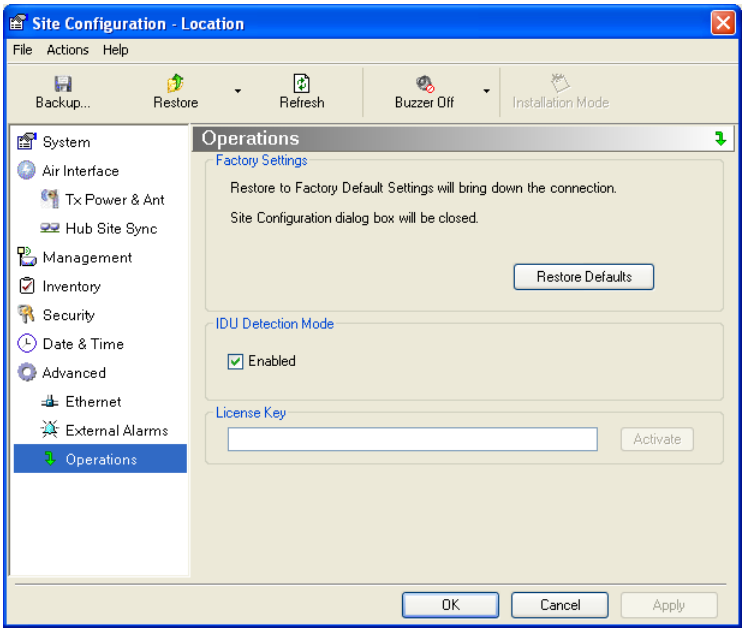


Figure E-7: Using the Operations window to enter a license key

3. Enter your license key and click **Activate**.
4. When it is accepted, click **Cancel**.

Note

License keys, where appropriate, are obtainable from RADWIN Customer Support.

Appendix F

Software Upgrade

What is the Software Upgrade Utility?

The RADWIN Manager provides a Software Upgrade Utility (SWU) to upgrade the software (firmware) of installed ODUs in a network. The update files may be located anywhere accessible by the operator.

The SWU provides for prior backup of the current files prior to upgrade.

The default location of the software files is in the installation area, and can be used to restore factory defaults.

Upgrading an Installed Link

➢ **To upgrade software for a link:**

1. In the RADWIN Manager main menu, click **Tools | Software Upgrade ...** The following detached window appears

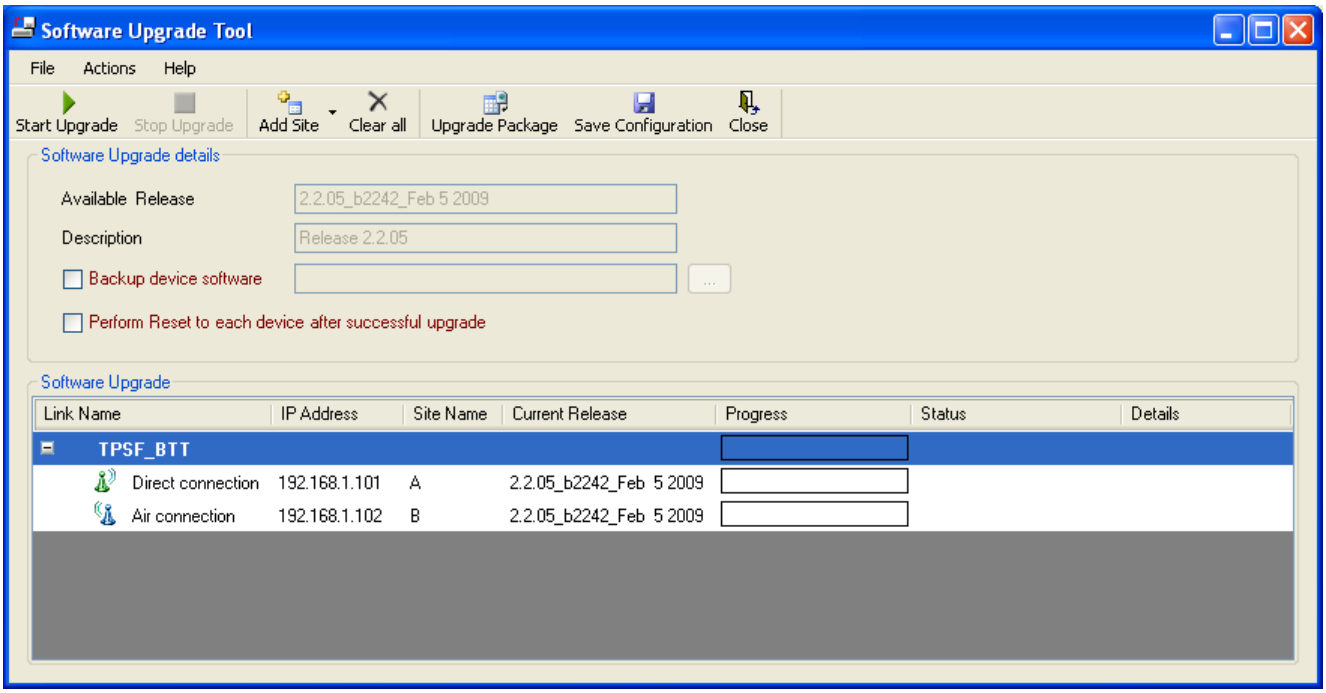


Figure F-1: Software Upgrade Utility - Main window

The default sites shown in the Software Upgrade list panel belong to the currently link. The list may be empty if you are running the RADWIN Manager "offline".

2. Click **Add Site** to add additional sites for upgrade.

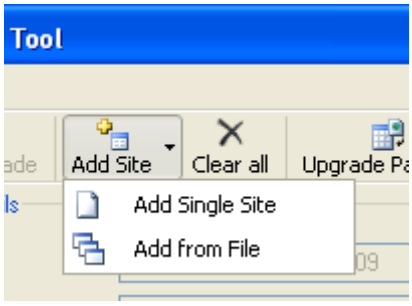


Figure F-2: Add site options

Click **Add Single Site** for one site only:

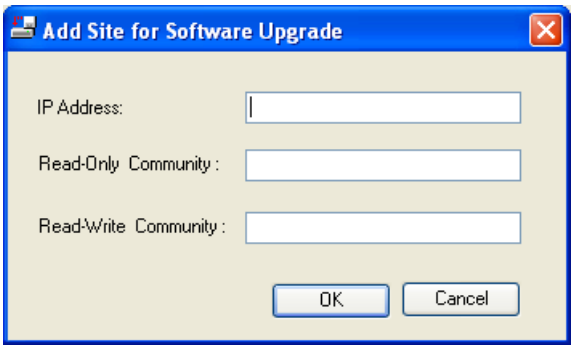


Figure F-3: Adding a single site for upgrade

Enter the IP address of the site, the Community strings (Default: ***public*** and ***netman***, respectively) and then click OK. The site will appear in the Software Upgrade list box. For example if we add the site at IP address 192.168.2.101, the SWU main window of figure **F-1** looks like this:

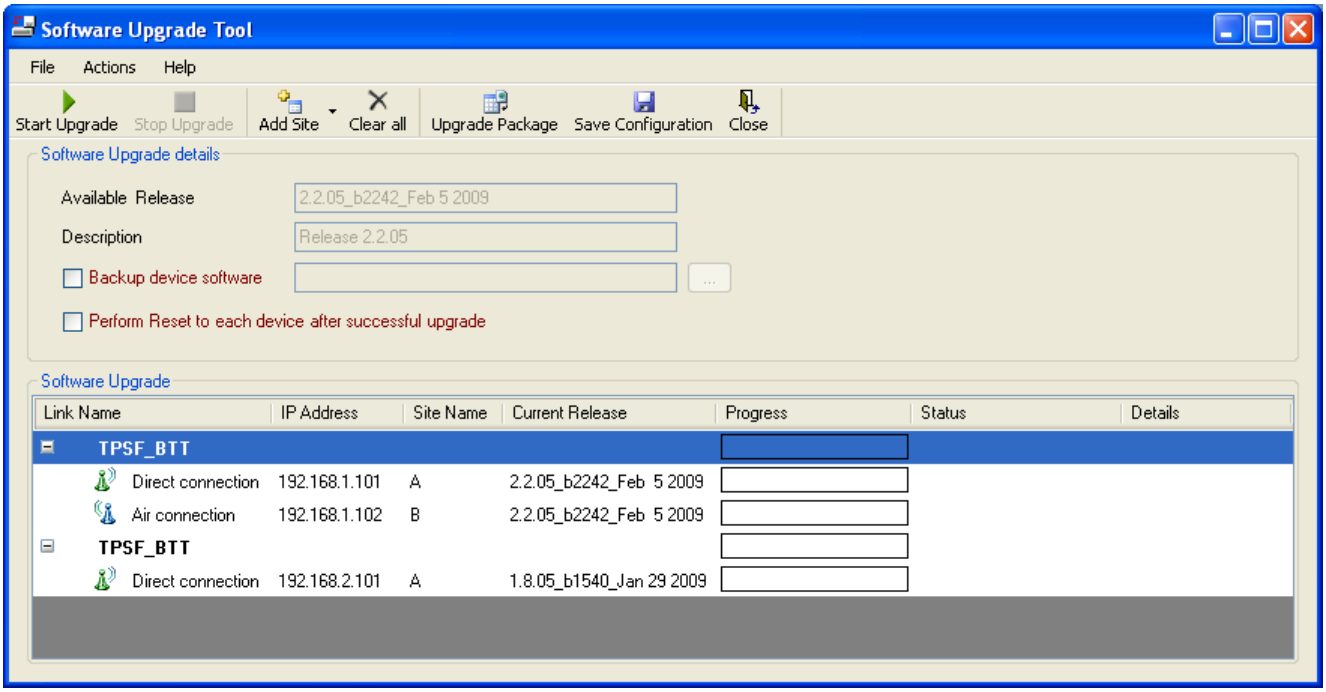


Figure F-4: Single site added for upgrade

The list can be cleared using the **Clear All** button.

As an alternative to adding sites one at a time, you can add sites from a prepared list using the **Add from File** option in figure **F-2**. The list has the following format:

<IP address>,<Read-Only community>,<Read-Write community>

Here is an example:

192.168.1.101,public,netman

192.168.1.102,public,netman

192.168.2.101,public,netman

192.168.2.102,public,netman

3. Having created an update list, click **Upgrade Package** to chose the relevant files. The default files are located in the **SWU** subdirectory in the RADWIN Manager installation area. They are currently named **SWU_1k.swu** and **SWU_2k.swu**. You may have to find them elsewhere, depending on your system.
4. To back up your existing system, check **Backup device software**. Then click the ... button for a standard file dialog. The default location is the My Documents directory on the managing computer.

Note

The backup here is the same as that in **page 6-20**, and serves the same purpose. It provides a fallback if the upgrade proves problematic.

5. The next check box determines whether or not the sites should be reset immediately after the upgrade. Bear in mind that on the one hand, a

reset involves a service interruption, but on the other hand, the software upgrade will not become effective until after the reset is carried out.

6. Click **Start Upgrade** to commence the process.

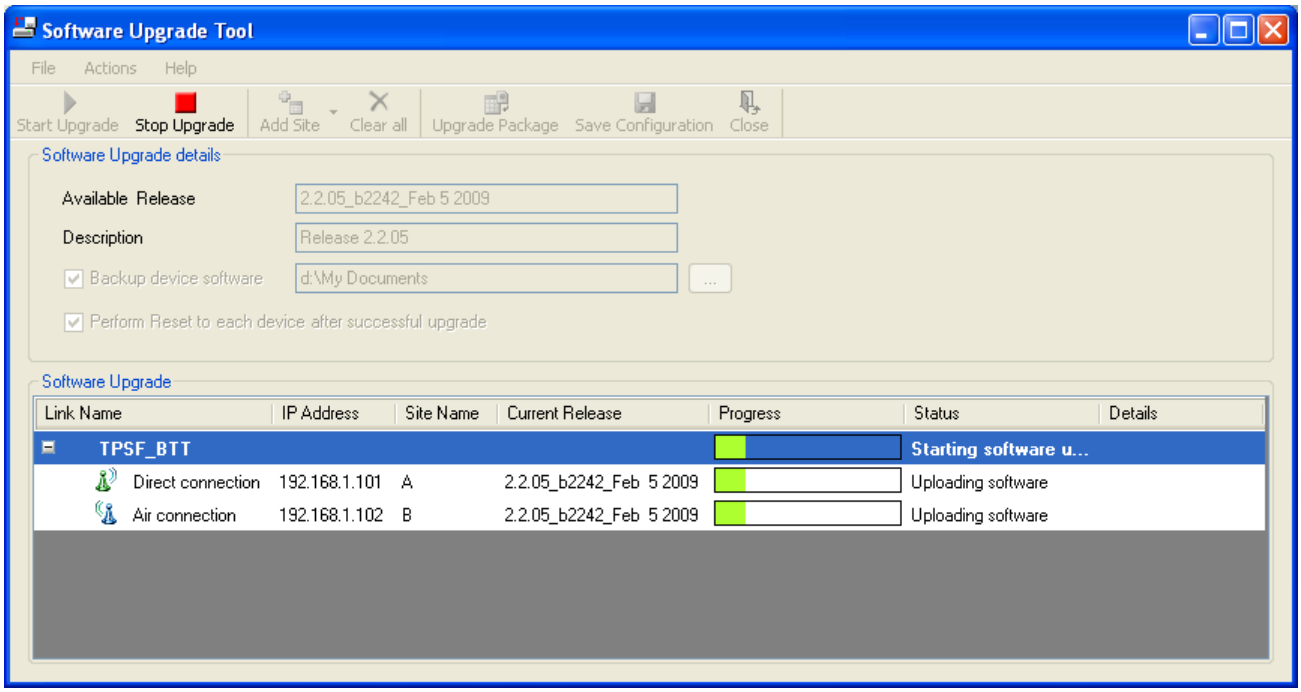


Figure F-5: Software upgrade in progress - Note the stop button

7. Click **Close** to exit.

If one or both sites fail to update, a warning notice will be displayed.

Caution

If one site of a link updates but the other fails, you should correct the problem and update the second site as soon as possible. If you do not, following the next reset of the updated site, you could experience a link software mismatch which may affect service. See **page 7-2** for details.

RADWIN 2000

Part 3: Technical Information

Broadband Wireless Transmission

User Manual

Release 2.2

UM 2000-22/03.09

Appendix G

Technical Specifications

Radio

Capacity	50 Mbps capacity (net throughput, full duplex)		
Range	Up to 120 km / 75 miles		
Frequency Bands and Regulatory Compliance	**Band**	**Spectrum range [GHz]**	**Compliance**
	FCC/IC 5.8	5.735 – 5.840	FCC 47CFR, Part 15, Subpart C and IC RSS-210
	FCC 5.4	5.490 – 5.705	FCC 47CFR, Part 15, Subpart E
	IC 5.4	5.490 – 5.580 5.670 – 5.705	IC RSS-210
	FCC/IC 5.3	5.270 – 5.330	FCC 47CFR, Part 15, Subpart E and IC RSS-210
	FCC/IC 4.9	4.950 – 4.980	FCC 47CFR, Part 90, Subpart Y and IC RSS-111
	FCC/IC 2.4	2.412 – 2.462	FCC 47CFR, Part 15, Subpart C and IC RSS-210
	WPC India 5.8	5.825 – 5.875	GSR-38
	MII China 5.8	5.730 – 5.845	MII China
	ETSI 5.8	5.735 – 5.865	ETSI EN 302 502
	ETSI 5.4	5.480 – 5.715	ETSI EN 301 893
	ETSI 5.3	5.160 – 5.340	ETSI EN 301 893
	ETSI 2.4	2.412 – 2.472	ETSI EN 300 328
	Universal 5.9	5.730 – 5.950	N/A
	Universal 5.4	5.490 – 5.710	
	Universal 5.3	5.140 – 5.345	
	Universal 2.3-2.4	2.302 – 2.397	
Channel Bandwidth	20 MHz		
Radio Modulation	2x2 MIMO-OFDM (BPSK/QPSK/16QAM/64QAM)		
Adaptive Modulation & Coding	Supported		
Automatic Channel Selection	Supported		

Radio Regulation	FCC 47 CFR Part 15 Subpart C IC (Canada) RSS-210 and RSS-111 WPC (India) MII (China)							
Duplex Technology	TDD							
Error Correction	FEC k = 1/2, 2/3, 3/4, 5/6							
Rate – Dual Antenna [Mbps]	13	26	39	52	78	104	117	130
Rate – Single Antenna [Mbps]	6.5	13	19.5	26	39	52	58.5	65
Modulation	BPSK	QPSK		16QAM		64QAM		
FEC [k=]	1/2	1/2	3/4	1/2	3/4	2/3	3/4	5/6
Max Tx Power [dBm]	25			24	21	19	18	
Sensitivity (dBm) @BER <10e-11 (20MHz)	-88	-86	-83	-81	-80	-72	-70	-67
Encryption	AES 128							

Configuration

Architecture	ODU: Outdoor Unit with Integrated Antenna or Connectorized for External Antenna IDU: Indoor Unit for service interfaces or PoE device for Ethernet only
IDU to ODU Interface	Outdoor CAT-5e cable; Maximum cable length: 100 m

TDM Interface

Number of Ports	16, 8, 4 or 0
Type	E1/T1 configurable
Framing	Unframed (transparent)
Timing	Independent timing per port, Tx and Rx
Connector	RJ-45
Standards Compliance	ITU-T G.703, G.826
Line Code	E1: HDB3 @ 2.048 Mbps, T1: B8ZS/AMI @ 1.544 Mbps
Latency	Configurable 5-20 ms
Impedance	E1: 120Ω, balanced, T1: 100Ω, balanced
Jitter & Wander	According to ITU-T G.823, G.824

Ethernet Interface

Net Throughput	Up to 50Mbps, full duplex
Ethernet ports	IDU-C: 2; PoE Device: 1 10/100BaseT with Auto-Negotiation (IEEE 802.3u) Framing/Coding: IEEE 802.3 Connector: RJ-45 Line Impedance: 100 Ω
SFP port	IDU-C: 1 Type: Fast Ethernet
VLAN Support	Transparent
Maximum Frame Size	2048 Bytes
Bridge	Layer 2, self-learning of up to 2047 MAC addresses (IEEE 802.1Q), hub/ Bridge selectable mode
Latency	3 ms (typical)

Management

Management Application	RADWIN Manager
Protocol	SNMP and Telnet

Mechanical

Dimensions	ODU with Integrated Antenna: 37.1/14.84(W) x 37.1/14.84(H) x 9.00/ 3.6(D) cm/in; 3.5 kg / 7 lbs ODU Connectorized: 18.0/7.2(W) x 27.0/10.8(H) x 5.5/2.2(D) cm/in; 1.5 kg / 3.0 lbs IDU: 43.6/17.2(W) x 4.5/1.7(H) x 21/8.3(D) cm; 1.5 kg / 3.3 lbs

Power

Power Feeding	Dual feeding, -20 to -60 VDC (AC/DC converter is available)
Power Consumption	< 35 W (IDU+ODU)

Environmental

Operating Temperatures	ODU: -35°C to +60°C / -31°F to +140°F IDU: 0°C to +50°C / 32°F to +122°F
Humidity	ODU: Up to 100% non-condensing, IP67 IDU: 90% non-condensing

Safety

FCC/IC (cTUVus)	UL 60950-1, CAN/CSA 60950-1 C22.2
ETSI	EN/IEC 60950-1

EMC

FCC	CFR47 Class B, Part15, Subpart B (2007)
ETSI	EN 300 386 (2005), EN 301 489-1 (2003), EN 301 489-4 (2002)
CAN/CSA-CEI/IEC	CISPR 22-04
AS/NZS	CISPR 22:2004

Appendix H

Wiring Specifications

ODU-IDU Cable

The ODU-IDU cable is shielded/outdoor class CAT-5e, 4 twisted-pair 24 AWG terminated with RJ-45 connectors on both ends. A cable gland on the ODU side provides hermetic sealing.

The following table shows the connector pinout:

Table H-1: ODU-IDU Connector Pinout

Function	Color	IDU RJ-45		ODU RJ-45
Ethernet (RxN)	White/Green	1	twisted	1
Ethernet (RxT)	Green	2	pair	2
Ethernet (TxT)	White/Orange	3	twisted	3
Ethernet (TxN)	Orange	6	pair	6
Power (+)	Blue	4	twisted	4
Power (+)	White/Blue	5	pair	5
Power (–)	White/Brown	7	twisted	7
Power (–)	Brown	8	pair	8

User Port Connectors

LAN Port

The LAN 10/100BaseT interface terminates in an 8-pin RJ-45 connector, wired in accordance to table **H-2**.

Table H-2: Fast Ethernet Connector Pinout

Pin	Signal	Function
1	TD (+)	Transmit Data (positive)
2	TD (–)	Transmit Data (negative)
3	RD (+)	Receive Data (positive)
6	RD (–)	Receive Data (negative)

Trunk Ports - E1/T1 RJ45 Connector

The E1/T1 interfaces terminate in 8-pin RJ-45 connectors, as shown in table **H-3** below:

Table H-3: Trunk Ports - E1/T1 RJ45Pinout

Pin	Signal	Function
1	TxTip	Transmit Data Tip
2	TxRing	Transmit Data Ring
4	RxTip	Receive Data Tip
5	RxRing	Receive Data Ring

Hot Standby Port RJ11

Table H-4: Hot Standby RJ11 Port Pinout

Pin	Signal
1	Alarm out
2	Alarm in
3	Ground
4	Ground

IDU-C Alarm Connector

The IDU-C Alarm interface is a 25 pin D type female connector. Its pinout is listed in table **H-5**.

Table H-5: IDU-C Alarm Connector (Dry-Contact)

I/O	Description	Pin
Input 1	Positive	14
Input 1	Negative	15
Input 2	Positive	16
Input 2	Negative	17

Table H-5: IDU-C Alarm Connector (Dry-Contact) (Continued)

I/O	Description	Pin
Input 3	Positive	18
Input 3	Negative	19
Input 4	Positive	20
Input 4	Negative	21
Output 1	Normally Open	1
Output 1	Common	2
Output 1	Normally Closed	3
Output 2	Normally Open	4
Output 2	Common	5
Output 2	Normally Closed	6
Output 3	Normally Open	7
Output 3	Common	8
Output 3	Normally Closed	9
Output 4	Normally Open	10
Output 4	Common	11
Output 4	Normally Closed	12

The following diagram describes how to connect external input and output alarms.

Note

- Use an external current limit resistor to limit the current at the output relays to 1 Ampere. Such resistor is not required if the equipment connected to the IDU supports current limiting to 1 Amp.
- The voltage of the input alarm must be within the range of -10 to -50 VDC.

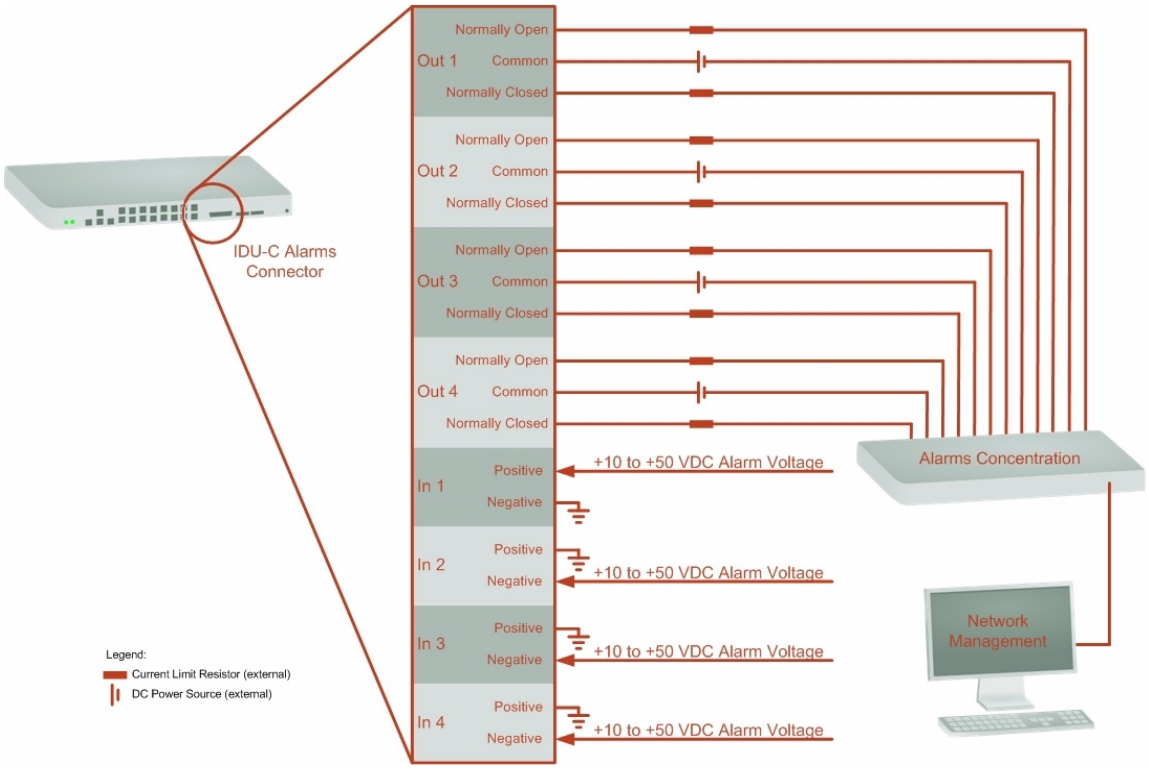


Figure H-1: Example for connecting the alarm connector

Uplink Ethernet RJ-45 Port Connectors

The Uplink Ethernet RJ-45 10/100/1000BaseT interface terminates in an 8-pin RJ-45 connector, wired in accordance to table **H-6**.

Table H-6: Uplink Ethernet Connector Pinout

Pin	Signal	Function
1	BI_DA+	Transmit Data
2	BI_DA-	Receive Data
3	BI_DB+	Transmit Data
4	BI_DC+	Transmit Data
5	BI_DC-	Receive Data
6	BI_DB-	Receive Data
7	BI_DD+	Transmit Data
8	BI_DD-	Receive Data

Note

10/100/1000baseT ports support 1000bps using four pairs hence cannot support power. This is applies to the Uplink Ethernet RJ-45 port as shown in table **H-6**.

DC Power Terminal

Table H-7: Terminal Block 3-pin -48VDC

Function	Pin
+	Right
Chassis	Center
–	Left

Appendix I

Small Form-factor Pluggable Transceiver

RADWIN 2000 IDU-C SFP Support

The Small Form-factor Pluggable (SFP) transceiver, is a compact, hot-pluggable transceiver used in communications applications.

The SFP transceiver technology allows almost any protocol converter implementation with seamless integration to a standard Ethernet switch.

The RADWIN 2000 IDU-C supports SFP transceivers to provide and support several network applications.

Any standard Fast Ethernet (FE) SFP transceiver can be plugged into the IDU-C. These SFPs support various Ethernet interfaces. For example a fibre optic interface can be used to support long fibre distances.

In addition, System on SFP transceivers can be used, supporting a ***protocol converter*** concept. The main application for such SFP transceivers is ***TDM over Ethernet*** providing E1/T1 or E3/T3 over full duplex Ethernet Remote Bridge

The following table provides a few SFP types that can be used with the RADWIN 2000 IDU-C:

Table I-1: SFP Type and Interface description

SFP Type	Interface Description
100baseT	100BaseT, IEEE 802.3, UTP CAT5
100baseFX	Multimode fiber-optic (MMF) link spans up to 2km long
100baseLX	Single-mode fiber optic (SMF) links pans up to 10km
100baseBX	SMF single-strand link spans up to 10 km or 40 km
MiRICi-E3T3/FE (manufactured by RAD data communications)	E3/T3

Appendix J

MIB Reference

Introduction

About the MIB

The RADWIN MIB is a set of APIs that enables external applications to control RADWIN equipment.

The MIB is divided into public and a private API groups:

- **Public**: RFC-1213 (MIB II) variables, RFC-1214 (MIB II) System and Interfaces sections
- **Private**: Controlled by RADWIN and supplements the public group.

This appendix describes the public and private MIB used by RADWIN.

Terminology

The following terms are used in this appendix.

Term	Meaning
MIB	Management Information Base
API	Application Programming Interface
SNMP	Simple Network Management Protocol

In addition, the MIB uses internally, the older notions of **Local site** and **Remote site** where this manual would use site A and site B.

To avoid burdening the reader, this appendix will follow the MIB usage.

Interface API

Control Method

The RADWIN Manager application provides all the means to configure and monitor a RADWIN 2000 link, communicating with the SNMP agent in each ODU. Each SNMP agent contains data on each of the IDUs and ODUs in the

link. Both agents communicate with each other over the air using a proprietary protocol.

Note

Each ODU has a single MAC address and a single IP address.

To control and configure the device using the MIB, you should adhere to the following rules:

- The connection for control and configuration is to the local site, over any SNMP/UDP/IP network.
- All Parameters should be consistent between both of the ODUs. Note that inconsistency of air parameters can break the air connection. To correct air parameters inconsistency you must reconfigure each of the ODUs.
- Common practice is to configure the remote site first and then to configure the local site.
- For some of the configuration parameters additional action must be taken before the new value is loaded. Please refer to the operation in the parameters description.
- Some of the MIB parameters values are product dependent. It is strongly recommend using the RADWIN Manager Application for changing these values. Setting wrong values may cause indeterminate results.

Community String

To control a link, all SNMP requests should go to the local site IP address.

See table **4-4** for default Community strings.

Private MIB Structure

The sections in the private RADWIN MIB and its location in the MIB tree are shown in figure **J-1** below:

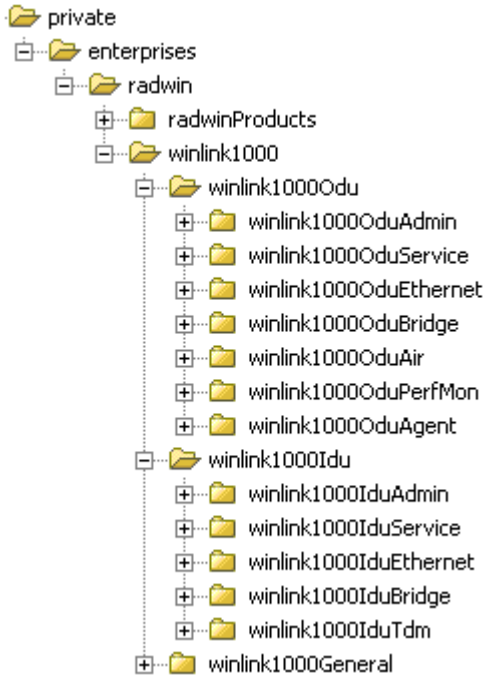
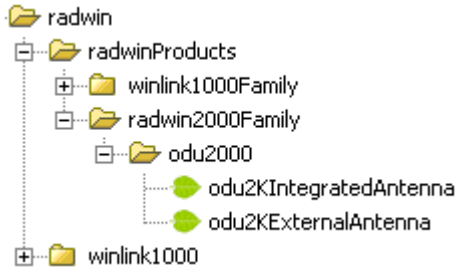


Figure J-1: Top Level Sections of the private MIB

The products MIB section contains the definition of the Object IDs for the two form factors of the ODU, Integrated Antenna and Connectorized (referred in the MIB as **external antenna**):



The ODU MIB contains the sections: Admin, Service, Ethernet, Bridge, Air, PerfMon and Agent.

The IDU MIB contains the sections: Admin, Service, Ethernet, Bridge and TDM.

The general MIB include a single generic parameter that is used by all traps as a trap description parameter.

MIB Parameters

The following section describes all of the MIB parameters. The MIB parameters follow the following naming convention:

<winlink1000><Section 1>…<Section n><Parameter Name>

For each of the configuration and control parameters (parameters with read-write access), the "Description" column describes when the new value is effective. It is recommended that you perform the appropriate action to make the values affective immediately after any change. Where a change is required on both sides of the link, it is recommended that you change both sides of the link first and then perform the action.

Supported Variables from the RFC 1213 MIB

Table J-1: Supported RFC 1213 Variables (Sheet 1 of 2)

Name	OID	Type	Access	Description
ifIndex	.1.3.6.1.2.1.2.2.1.1.x[a]	Integer	RO	A unique value for each interface.Its value ranges between 1 and the value of ifNumber.The value for each interface must remain constant at least from one re-initialization of the entity's network management system to the next re-initialization.
ifDescr	.1.3.6.1.2.1.2.2.1.2	DisplayString	RO	A textual string containing information about the interface.This string should include the name of the manufacturer, the product name and the version of the hardware interface.
ifType	.1.3.6.1.2.1.2.2.1.3	Integer	RO	The type of interface, distinguished according to the physical/link protocol(s) immediately `below' the network layer in the protocol stack.
ifSpeed	.1.3.6.1.2.1.2.2.1.5	Gauge	RO	An estimate of the interface's current bandwidth in bits per second.For interfaces which do not vary in bandwidth or for those where no accurate estimation can be made, this object should ontain the nominal bandwidth.
ifPhysAddress	.1.3.6.1.2.1.2.2.1.6	Phys-Address	RO	The interface's address at the protocol layer immediately `below' the network layer in the protocol stack. For interfaces which do not have such an address (e.g., a serial line), this object should contain an octet string of zero length.
ifAdminStatus	.1.3.6.1.2.1.2.2.1.7	Integer	RW	The desired state of the interface. The testing(3) state indicates that no operational packets can be passed.
ifOperStatus	.1.3.6.1.2.1.2.2.1.8	Integer	RO	The current operational state of the interface. The testing(3) state indicates that no operational packets can be passed.
ifInOctets	.1.3.6.1.2.1.2.2.1.10.x	Counter	RO	The total number of octets received on the interface, including framing characters.
ifInUcastPkts	.1.3.6.1.2.1.2.2.1.11.x	Counter	RO	The number of subnetwork-unicast packets delivered to a higher-layer protocol.
ifInNUcastPkts	.1.3.6.1.2.1.2.2.1.12.x	Counter	RO	The number of non-unicast (i.e., subnetwork-broadcast or subnetwork-multicast) packets delivered to a higher-layer protocol.
ifInErrors	.1.3.6.1.2.1.2.2.1.14.x	Counter	RO	The number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.
ifOutOctets	.1.3.6.1.2.1.2.2.1.16.x	Counter	RO	The total number of octets transmitted out of the interface, including framing characters.
ifOutUcastPkts	.1.3.6.1.2.1.2.2.1.17.x	Counter	RO	The total number of packets that higher-level protocols requested be transmitted to a subnetwork-unicast address, including those that were discarded or not sent.

Table J-1: Supported RFC 1213 Variables (Sheet 2 of 2)

Name	OID	Type	Access	Description
ifOutNUcastPkts	.1.3.6.1.2.1.2.2.1.18.x	Counter	RO	The total number of packets that higher-level protocols requested be transmitted to a non-unicast (i.e., a subnetwork-broadcast or subnetwork-multicast) address, including those that were discarded or not sent.

a. x is the interface ID

MIB Parameters

Table J-2: Private MIB Parameters (Sheet 1 of 15)

Name	OID	Type	Access	Description
winlink1000OduAdmProductType	1.3.6.1.4.1.4458.1000.1.1.1	DisplayString	RO	ODU configuration description.
winlink1000OduAdmHwRev	1.3.6.1.4.1.4458.1000.1.1.2	DisplayString	RO	ODU Hardware Version.
winlink1000OduAdmSwRev	1.3.6.1.4.1.4458.1000.1.1.3	DisplayString	RO	ODU Software Version.
winlink1000OduAdmLinkName	1.3.6.1.4.1.4458.1000.1.1.4	DisplayString	RW	Link Name. A change is effective immediately.
winlink1000OduAdmResetCmd	1.3.6.1.4.1.4458.1000.1.1.5	Integer	RW	Reset Command. A set command with a value of 3 will cause a device reset. The read value is always 0.
winlink1000OduAdmAddres	1.3.6.1.4.1.4458.1000.1.1.6	IpAddress	RW	ODU IP address. A change is effective after reset. The parameter is kept for backward compatibility. Using the alternative parameter: winlink1000OduAdmIpParamsCnfg is recommended.
winlink1000OduAdmMask	1.3.6.1.4.1.4458.1000.1.1.7	IpAddress	RW	ODU Subnet Mask. A change is effective after reset. The parameter is kept for backward compatibility. Using the alternative parameter: winlink1000OduAdmIpParamsCnfg is recommended.
winlink1000OduAdmGateway	1.3.6.1.4.1.4458.1000.1.1.8	IpAddress	RW	ODU default gateway. A change is effective after reset. The parameter is kept for backward compatibility. Using the alternative parameter: winlink1000OduAdmIpParamsCnfg is recommended.
winlink1000OduAdmBroadcast	1.3.6.1.4.1.4458.1000.1.1.10	Integer	RW	This parameter is reserved for the Manager application provided with the product.
winlink1000OduAdmHostsTable			N/A	Trap destinations table. Each trap destination is defined by an IP address and a UDP port. Up to 10 addresses can be configured.
winlink1000OduAdmHostsEntry			N/A	Trap destinations table entry. INDEX { winlink1000OduAdmHostsIndex }
winlink1000OduAdmHostsIndex			RO	Trap destinations table index.
winlink1000OduAdmHostsIp	1.3.6.1.4.1.4458.1000.1.1.12.1.2	IpAddress	RW	Trap destination IP address. A change is effective immediately.
winlink1000OduAdmHostsPort	1.3.6.1.4.1.4458.1000.1.1.12.1.3	Integer	RW	UDP port of the trap destination. A change is effective immediately.
winlink1000OduBuzzerAdminState	1.3.6.1.4.1.4458.1000.1.1.13	Integer	RW	This parameter controls the activation of the buzzer while the unit is in install mode. A change is effective immediately. The valid values are: disabled (0) enabledAuto (1) enabledConstantly(2).
winlink1000OduProductId	1.3.6.1.4.1.4458.1000.1.1.14	DisplayString	RO	This parameter is reserved for the Manager application provided with the product.

Table J-2: Private MIB Parameters (Sheet 2 of 15)

Name	OID	Type	Access	Description
winlink1000OduReadCommunity	1.3.6.1.4.1.4458.1000.1.1.15	DisplayString	RW	Read Community String. This parameter always returns ***** when retrieving its value. It is used by the Manager application to change the Read Community String. The SNMP agent accepts only encrypted values.
winlink1000OduReadWriteCommunity	1.3.6.1.4.1.4458.1000.1.1.16	DisplayString	RW	Read/Write Community String. This parameter always returns ***** when retrieving its value. It is used by the Manager application to change the Read/Write Community String. The SNMP agent accepts only encrypted values.
winlink1000OduTrapCommunity	1.3.6.1.4.1.4458.1000.1.1.17	DisplayString	RW	Trap Community String. This parameter is used by the Manager application to change the Trap Community String. The SNMP agent accepts only encrypted values.
winlink1000OduAdmSnmpAgentVersion	1.3.6.1.4.1.4458.1000.1.1.18	Integer	RO	Major version of the SNMP agent.
winlink1000OduAdmRemoteSiteName	1.3.6.1.4.1.4458.1000.1.1.19	DisplayString	RO	Remote site name. Returns the same value as sysLocation parameter of the remote site.
winlink1000OduAdmSnmpAgentMinorVersion	1.3.6.1.4.1.4458.1000.1.1.20	Integer	RO	Minor version of the SNMP agent.
winlink1000OduAdmLinkPassword	1.3.6.1.4.1.4458.1000.1.1.21	DisplayString	RW	Link Password. This parameter always returns ***** when retrieving its value. It is used by the Manager application to change the Link Password. The SNMP agent accepts only encrypted values.
winlink1000OduAdmSiteLinkPassword	1.3.6.1.4.1.4458.1000.1.1.22	DisplayString	RW	Site Link Password. This parameter always returns ***** when retrieving its value. It is used by the Manager application to change the Link Password of the site. The SNMP agent accepts only encrypted values.
winlink1000OduAdmDefaultPassword	1.3.6.1.4.1.4458.1000.1.1.23	Integer	RO	This parameter indicates if the current Link Password is the default password.
winlink1000OduAdmConnectionType	1.3.6.1.4.1.4458.1000.1.1.24	Integer	RO	This parameter indicates if the Manager application is connected to the local ODU or to the remote ODU over the air. A value of 'unknown' indicates community string mismatch.
winlink1000OduAdmBackToFactorySettingsCmd	1.3.6.1.4.1.4458.1000.1.1.25	Integer	RW	Back to factory settings Command. A change is effective after reset. The read value is always 0.
winlink1000OduAdmIpParamsCnfg	1.3.6.1.4.1.4458.1000.1.1.26	DisplayString	RW	ODU IP address Configuration. The format is: <IP_Address>|<Subnet_Mask>|<Default_Gateway>|
winlink1000OduAdmVlanID	1.3.6.1.4.1.4458.1000.1.1.27	Integer	RW	VLAN ID. Valid values are 1 to 4094. Initial value is 0 meaning VLAN unaware.
winlink1000OduAdmVlanPriority	1.3.6.1.4.1.4458.1000.1.1.28	Integer	RW	VLAN Priority. 0 is lowest priority 7 is highest priority.
winlink1000OduAdmSN	1.3.6.1.4.1.4458.1000.1.1.29	DisplayString	RO	IDU Serial Number
winlink1000OduAdmProductName	1.3.6.1.4.1.4458.1000.1.1.30	DisplayString	RO	This is the product name as it exists at EC
winlink1000OduAdmActivationKey	1.3.6.1.4.1.4458.1000.1.1.31	DisplayString	RW	Activates a general key.
winlink1000OduSrvMode	1.3.6.1.4.1.4458.1000.1.2.1	Integer	RW	System mode. The only values that can be set are installMode and slaveMode; normalMode reserved to the Manager application provided with the product. A change is effective after link re-synchronization.
winlink1000OduSrvBridging	1.3.6.1.4.1.4458.1000.1.2.3	Integer	RO	Bridging Mode. Valid values are: disabled (0) enabled (1).
winlink1000OduEthernetRemainingRate	1.3.6.1.4.1.4458.1000.1.3.1	Integer	RO	Current Ethernet bandwidth in bps.
winlink1000OduEthernetIfTable			N/A	ODU Ethernet Interface table.
winlink1000OduEthernetIfEntry			N/A	ODU Ethernet Interface table entry. INDEX { winlink1000OduEthernetIfIndex }

Table J-2: Private MIB Parameters (Sheet 3 of 15)

Name	OID	Type	Access	Description
winlink1000OduEthernetIfIndex	1.3.6.1.4.1.4458.1000.1.3.2.1.1	Integer	RO	ODU Ethernet Interface Index.
winlink1000OduEthernetIfAddress	1.3.6.1.4.1.4458.1000.1.3.2.1.5	DisplayString	RO	ODU MAC address.
winlink1000OduEthernetIfAdminStatus	1.3.6.1.4.1.4458.1000.1.3.2.1.6	Integer	RW	Required state of the interface.
winlink1000OduEthernetIfOperStatus	1.3.6.1.4.1.4458.1000.1.3.2.1.7	Integer	RO	Current operational state of the interface.
winlink1000OduEthernetIfFailAction	1.3.6.1.4.1.4458.1000.1.3.2.1.8	Integer	RW	Failure action of the interface.
winlink1000OduEthernetNumOfPorts	1.3.6.1.4.1.4458.1000.1.3.3	Integer	RO	Number of ODU network interfaces.
winlink1000OduBridgeBasePortTable			N/A	ODU Bridge Ports table.
winlink1000OduBridgeBasePortEntry			N/A	ODU Bridge Ports table entry. INDEX { winlink1000OduBridgeBasePortIndex }
winlink1000OduBridgeBasePortIndex			RO	ODU Bridge Port Number.
winlink1000OduBridgeBaseIfIndex			RO	IfIndex corresponding to ODU Bridge port.
winlink1000OduBridgeTpMode	1.3.6.1.4.1.4458.1000.1.4.4.101	Integer	RW	ODU bridge mode. A change is effective after reset. Valid values: hubMode (0) bridgeMode (1).
winlink1000OduBridgeTpPortTable			N/A	ODU Transparent Bridge Ports table.
winlink1000OduBridgeTpPortEntry			N/A	ODU Transparent Bridge Ports table entry. INDEX { winlink1000OduBridgeTpPortIndex }
winlink1000OduBridgeTpPortIndex			RO	ODU Transparent Bridge Port Number.
winlink1000OduBridgeTpPortInFrames	1.3.6.1.4.1.4458.1000.1.4.4.3.1.3	Counter	RO	Number of frames received by this port.
winlink1000OduBridgeTpPortOutFrames	1.3.6.1.4.1.4458.1000.1.4.4.3.1.4	Counter	RO	Number of frames transmitted by this port.
winlink1000OduBridgeTpPortInBytes	1.3.6.1.4.1.4458.1000.1.4.4.3.1.10 1	Counter	RO	Number of bytes received by this port.
winlink1000OduBridgeTpPortOutBytes	1.3.6.1.4.1.4458.1000.1.4.4.3.1.10 2	Counter	RO	Number of bytes transmitted by this port.
winlink1000OduAirFreq	1.3.6.1.4.1.4458.1000.1.5.1	Integer	RW	Installation Center Frequency. Valid values are product dependent. A change is effective after link re-synchronization.
winlink1000OduAirDesiredRate	1.3.6.1.4.1.4458.1000.1.5.2	Integer	RW	Deprecated parameter actual behavior is read-only. Required Air Rate. For Channel Bandwidth of 20 10 5 MHz divide the value by 1 2 4 respectively.
winlink1000OduAirSSID	1.3.6.1.4.1.4458.1000.1.5.3	DisplayString	RW	Reserved for the Manager application provided with the product.
winlink1000OduAirTxPower	1.3.6.1.4.1.4458.1000.1.5.4	Integer	RW	Required Transmit power in dBm . This is a nominal value while the actual transmit power includes additional attenuation. The min and max values are product specific. A change is effective immediately.
winlink1000OduAirSesState	1.3.6.1.4.1.4458.1000.1.5.5	Integer	RO	Current Link State. The value is active (3) during normal operation.
winlink1000OduAirMstrSlv	1.3.6.1.4.1.4458.1000.1.5.6	Integer	RO	This parameter indicates if the device was automatically selected into the radio link master or slave. The value is undefined if there is no link.
winlink1000OduAirResync	1.3.6.1.4.1.4458.1000.1.5.8	Integer	RW	Setting this parameter to 1 will cause the link to restart the synchronization process.
winlink1000OduAirRxPower	1.3.6.1.4.1.4458.1000.1.5.9.1	Integer	RO	Received Signal Strength in dBm.
winlink1000OduAirTotalFrames	1.3.6.1.4.1.4458.1000.1.5.9.2	Counter	RO	Total Number of received radio frames.
winlink1000OduAirBadFrames	1.3.6.1.4.1.4458.1000.1.5.9.3	Counter	RO	Total number of received radio frames with CRC error.
winlink1000OduAirCurrentRate	1.3.6.1.4.1.4458.1000.1.5.9.4	Integer	RO	Deprecated parameter. Actual rate of the air interface in Mbps. For Channel Bandwidth of 20 10 5 MHz divide the value by 1 2 4 respectively.
winlink1000OduAirCurrentRateIdx	1.3.6.1.4.1.4458.1000.1.5.9.5	Integer	RO	Index of current air rate.

Table J-2: Private MIB Parameters (Sheet 4 of 15)

Name	OID	Type	Access	Description
winlink1000OduAirTxPower36	1.3.6.1.4.1.4458.1000.1.5.10	Integer	RW	Deprecated parameter. Actual behavior is read-only.
winlink1000OduAirTxPower48	1.3.6.1.4.1.4458.1000.1.5.11	Integer	RW	Deprecated parameter. Actual behavior is read-only.
winlink1000OduAirCurrentTxPower	1.3.6.1.4.1.4458.1000.1.5.12	Integer	RO	Current Transmit Power in dBm. This is a nominal value while the actual transmit power includes additional attenuation.
winlink1000OduAirMinFrequency	1.3.6.1.4.1.4458.1000.1.5.13	Integer	RO	Minimum center frequency in MHz.
winlink1000OduAirMaxFrequency	1.3.6.1.4.1.4458.1000.1.5.14	Integer	RO	Maximum center frequency in MHz.
winlink1000OduAirFreqResolution	1.3.6.1.4.1.4458.1000.1.5.15	Integer	RO	Center Frequency resolution. Measured in MHz if value < 100 otherwise in KHz.
winlink1000OduAirCurrentFreq	1.3.6.1.4.1.4458.1000.1.5.16	Integer	RO	Current Center Frequency. Measured in MHz if center frequency resolution value < 100 otherwise in KHz.
winlink1000OduAirNumberOfChannels	1.3.6.1.4.1.4458.1000.1.5.17	Integer	RO	Number of channels that can be used.
winlink1000OduAirChannelsTable			N/A	Table of channels used by automatic channels selection (ACS).
winlink1000OduAirChannelsEntry			N/A	ACS channels table entry. INDEX { winlink1000OduAirChannelsIndex }
winlink1000OduAirChannelsIndex	1.3.6.1.4.1.4458.1000.1.5.18.1.1	Integer	RO	Channel Index.
winlink1000OduAirChannelsFrequency	1.3.6.1.4.1.4458.1000.1.5.18.1.2	Integer	RO	Channel frequency in MHz.
winlink1000OduAirChannelsOperState	1.3.6.1.4.1.4458.1000.1.5.18.1.3	Integer	RW	Channel state. Can be set by the user. Automatic Channel Selection uses channels that are AirChannelsOperState enabled and AirChannelsAvail enabled. A change is effective after link re-synchronization. Valid values: disabled (0) enabled (1).
winlink1000OduAirChannelsAvail	1.3.6.1.4.1.4458.1000.1.5.18.1.4	Integer	RO	Channel state. Product specific and cannot be changed by the user. Automatic Channel Selection uses channels that are AirChannelsOperState enabled and AirChannelsAvail enabled. Valid values: disabled (0) enabled (1).
winlink1000OduAirChannelsDefaultFreq	1.3.6.1.4.1.4458.1000.1.5.18.1.5	Integer	RO	Default channel's availability for all CBWs. The valid values are: forbidden (0) available (1).
winlink1000OduAirDfsState	1.3.6.1.4.1.4458.1000.1.5.19	Integer	RO	Radar detection state. Valid values: disabled (0) enabled (1).
winlink1000OduAirAutoChannelSelection State	1.3.6.1.4.1.4458.1000.1.5.20	Integer	RO	Deprecated parameter. Indicating Automatic Channel Selection availability at current channel bandwidth. Valid values: disabled (0) enabled (1).
winlink1000OduAirEnableTxPower	1.3.6.1.4.1.4458.1000.1.5.21	Integer	RO	Indicating Transmit power configuration enabled or disabled.
winlink1000OduAirMinTxPower	1.3.6.1.4.1.4458.1000.1.5.22	Integer	RO	Minimum Transmit power in dBm.
winlink1000OduAirMaxTxPowerTable			N/A	Table of Maximum transmit power per air rate in dBm.
winlink1000OduAirMaxTxPowerEntry			N/A	Maximum Transmit power table entry. INDEX { winlink1000OduAirMaxTxPowerIndex }
winlink1000OduAirMaxTxPowerIndex	1.3.6.1.4.1.4458.1000.1.5.23.1.1	Integer	RO	Air interface rate index.
winlink1000OduAirMaxTxPower	1.3.6.1.4.1.4458.1000.1.5.23.1.2	Integer	RO	Maximum Transmit power in dBm.
winlink1000OduAirChannelBandwidth	1.3.6.1.4.1.4458.1000.1.5.24	Integer	RW	Channel bandwidth in KHz. A change is effective after reset.
winlink1000OduAirChannelBWTable			N/A	Channel Bandwidths table.
winlink1000OduAirChannelBWEntry			N/A	Channel Bandwidth table entry. INDEX { winlink1000OduAirChannelBWIndex }

Table J-2: Private MIB Parameters (Sheet 5 of 15)

Name	OID	Type	Access	Description
winlink1000OduAirChannelBWIndex	1.3.6.1.4.1.4458.1000.1.5.25.1.1	Integer	RO	Channel Bandwidth index.
winlink1000OduAirChannelBWAvail	1.3.6.1.4.1.4458.1000.1.5.25.1.2	Integer	RO	Channel Bandwidth availability product specific. Options are: Not supported supported with manual channel selection supported with Automatic Channel Selection.
winlink1000OduAirChannelsAdminState	1.3.6.1.4.1.4458.1000.1.5.25.1.3	DisplayString	RO	Channels' availability per CBW.
winlink1000OduAirRFD	1.3.6.1.4.1.4458.1000.1.5.26	Integer	RO	Current radio frame duration in microseconds.
winlink1000OduAirRatesTable			N/A	Air Rate indexes table for current channel bandwidth.
winlink1000OduAirRatesEntry			N/A	Air Rate indexes table entry. INDEX { winlink1000OduAirRatesIndex }
winlink1000OduAirRatesIndex	1.3.6.1.4.1.4458.1000.1.5.27.1.1	Integer	RO	Air Rate index.
winlink1000OduAirRatesAvail	1.3.6.1.4.1.4458.1000.1.5.27.1.2	Integer	RO	Air Rate availability depending on air interface conditions.
winlink1000OduAirDesiredRateIdx	1.3.6.1.4.1.4458.1000.1.5.28	Integer	RW	Required Air Rate index. 0 reserved for Adaptive Rate. A change is effective immediately after Set operation to the master side while the link is up.
winlink1000OduAirLinkDistance	1.3.6.1.4.1.4458.1000.1.5.29	Integer	RO	Link distance in meters. A value of -1 indicates an illegal value and is also used when a link is not established.
winlink1000OduAirLinkWorkingMode	1.3.6.1.4.1.4458.1000.1.5.30	Integer	RO	Link working mode as a result of comparing versions of both sides of the link. Possible modes are: Unknown - no link Normal - versions on both sides are identical with full compatibility with restricted compatibility or versions on both sides are different with software upgrade or versions incompatibility.
winlink1000OduAirMajorLinkIfVersion	1.3.6.1.4.1.4458.1000.1.5.31	Integer	RO	Major link interface version
winlink1000OduAirMinorLinkIfVersion	1.3.6.1.4.1.4458.1000.1.5.32	Integer	RO	Minor link interface version
winlink1000OduAirHssDesiredOpState	1.3.6.1.4.1.4458.1000.1.5.40.1	Integer	RW	Required Hub Site Synchronization operating state.
winlink1000OduAirHssCurrentOpState	1.3.6.1.4.1.4458.1000.1.5.40.2	Integer	RO	Current Hub Site Synchronization operating state.
winlink1000OduAirHssSyncStatus	1.3.6.1.4.1.4458.1000.1.5.40.3	Integer	RO	Hub Site Synchronization sync status.
winlink1000OduAirHssExtPulseStatus	1.3.6.1.4.1.4458.1000.1.5.40.4	Integer	RO	Hub Site Synchronization external pulse detection status.
winlink1000OduAirHssExtPulseType	1.3.6.1.4.1.4458.1000.1.5.40.5	Integer	RO	Hub Site Synchronization external pulse type.
winlink1000OduAirHssDesiredExtPulseType	1.3.6.1.4.1.4458.1000.1.5.40.6	Integer	RW	Hub Site Synchronization required external pulse type. Valid values for read write: {typeA(2) typeB(3) typeC(4) typeD(5)}. Valid value for read only: {notApplicable(1)}.
winlink1000OduAirHssRfpTable			N/A	ODU Radio Frame Patterns (RFP) Table.
winlink1000OduAirHssRfpEntry			N/A	ODU RFP Table entry. INDEX { winlink1000OduAirHssRfpIndex }
winlink1000OduAirHssRfpIndex	1.3.6.1.4.1.4458.1000.1.5.40.7.1.1	Integer	RO	ODU RFP Table index. The index represent the Radio Frame Pattern: typeA(2) typeB(3) typeC(4) typeD(5).
winlink1000OduAirHssRfpEthChannelBW5MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.2	Integer	RO	Represents the compatibility of Ethernet service under Channel BW of 5MHz in the specific Radio Frame Pattern.
winlink1000OduAirHssRfpTdmChannelBW5MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.3	Integer	RO	Represents the compatibility of TDM service under Channel BW of 5MHz in the specific Radio Frame Pattern.
winlink1000OduAirHssRfpEthChannelBW10MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.4	Integer	RO	Represents the compatibility of Ethernet service under Channel BW of 10MHz in the specific Radio Frame Pattern.

Table J-2: Private MIB Parameters (Sheet 6 of 15)

Name	OID	Type	Access	Description
winlink1000OduAirHssRfpTdmChannelBW10MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.5	Integer	RO	Represents the compatibility of TDM service under Channel BW of 10MHz in the specific Radio Frame Pattern.
winlink1000OduAirHssRfpEthChannelBW20MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.6	Integer	RO	Represents the compatibility of Ethernet service under Channel BW of 20MHz in the specific Radio Frame Pattern.
winlink1000OduAirHssRfpTdmChannelBW20MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.7	Integer	RO	Represents the compatibility of TDM service under Channel BW of 20MHz in the specific Radio Frame Pattern.
winlink1000OduAirLockRemote	1.3.6.1.4.1.4458.1000.1.5.41	Integer	RW	This parameter enables locking the link with a specific ODU. The following values can be set: Unlock (default) - The ODU is not locked on a specific remote ODU. Unlock can only be performed when the link is not connected. Lock - The ODU is locked on a specific remote ODU. Lock can only be performed when the link is active.
winlink1000OduAirAntennaGain	1.3.6.1.4.1.4458.1000.1.5.42	Integer	RW	Current Antenna Gain in 0.1 dBi resolution. User defined value for external antenna. Legal range: MinAntennaGain<AntennaGain<MaxAntennaGain .
winlink1000OduAirFeederLoss	1.3.6.1.4.1.4458.1000.1.5.43	Integer	RW	Current Feeder Loss in 0.1 dBm resolution. User defined value for external antenna.
winlink1000OduAirMaxAntennaGain	1.3.6.1.4.1.4458.1000.1.5.44	Integer	RO	Maximum allowed Antenna Gain in 0.1 dBi resolution.
winlink1000OduAirMinAntennaGain	1.3.6.1.4.1.4458.1000.1.5.45	Integer	RO	Minimum allowed Antenna Gain in 0.1 dBi resolution.
winlink1000OduAirMaxEIRP	1.3.6.1.4.1.4458.1000.1.5.46	Integer	RO	Maximum EIRP value as defined by regulation in 0.1 dBm resolution.
winlink1000OduAirAntennaGainConfigSupport	1.3.6.1.4.1.4458.1000.1.5.47	Integer	RO	Antenna Gain Configurability options are product specific: supported not supported.
winlink1000OduAirAntennaType	1.3.6.1.4.1.4458.1000.1.5.48	Integer	RW	External Antenna Type: Monopolar or Bipolar.
winlink1000OduAirRssBalance	1.3.6.1.4.1.4458.1000.1.5.49	Integer	RO	RSS balance. Relation between RSS in radio 1 and RSS in radio 2.
winlink1000OduAirTotalTxPower	1.3.6.1.4.1.4458.1000.1.5.50	Integer	RO	Total Transmit Power in dBm. This is a nominal value While the actual transmit power includes additional attenuation.
winlink1000OduAirInstallFreqAndCBW	1.3.6.1.4.1.4458.1000.1.5.51	DisplayString	RW	Installation frequency Channel BW.
winlink1000OduAirDFStype	1.3.6.1.4.1.4458.1000.1.5.52	Integer	RO	DFS regulation type.
winlink1000OduAirComboSubBandTable			N/A	ODU Multi-band Sub Bands Table.
winlink1000OduAirComboSubBandEntry			N/A	ODU Multi-band Sub Bands Table entry. INDEX { winlink1000OduAirComboSubBandIndex }
winlink1000OduAirComboSubBandIndex	1.3.6.1.4.1.4458.1000.1.5.53.1.1.1	Integer	RO	ODU Multi-band sub bands table index.
winlink1000OduAirComboSubBandId	1.3.6.1.4.1.4458.1000.1.5.53.1.1.2	DisplayString	RO	Represents the Multi-band sub band ID.
winlink1000OduAirComboSubBandDescription	1.3.6.1.4.1.4458.1000.1.5.53.1.1.3	DisplayString	RO	Multi-band sub band description.
winlink1000OduAirComboSubBandInstallFreq	1.3.6.1.4.1.4458.1000.1.5.53.1.1.4	Integer	RO	Represents the Multi-band sub band installation frequency in KHz.
winlink1000OduAirComboSubBandAdminState	1.3.6.1.4.1.4458.1000.1.5.53.1.1.5	Integer	RO	Represents the Multi-band sub band administrative state.
winlink1000OduAirComboSubBandInstallationAllowed	1.3.6.1.4.1.4458.1000.1.5.53.1.1.6	Integer	RO	Reflects if the Multi-band sub band allowes installtion.
winlink1000OduAirComboNumberOfSubBands	1.3.6.1.4.1.4458.1000.1.5.53.2	Integer	RO	Represents the number of Multi-band sub bands.

Table J-2: Private MIB Parameters (Sheet 7 of 15)

Name	OID	Type	Access	Description
winlink1000OduAirComboSwitchSubBand	1.3.6.1.4.1.4458.1000.1.5.53.3	DisplayString	RW	Switch sub band operation with a given sub band ID. The get operation retrieves the current sub band ID.
winlink1000OduPerfMonCurrTable			N/A	This table defines/keeps the counters of the current 15 min interval.
winlink1000OduPerfMonCurrEntry			N/A	This is an entry in the Current Interval Table. INDEX {ifIndex }
winlink1000OduPerfMonCurrUAS	1.3.6.1.4.1.4458.1000.1.6.1.1.1	Gauge	RO	The current number of Unavailable Seconds starting from the present 15 minutes period.
winlink1000OduPerfMonCurrES	1.3.6.1.4.1.4458.1000.1.6.1.1.2	Gauge	RO	Current number of Errored Seconds starting from the present 15 minutes period.
winlink1000OduPerfMonCurrSES	1.3.6.1.4.1.4458.1000.1.6.1.1.3	Gauge	RO	Current number of Severely Errored Seconds starting from the present 15 minutes period.
winlink1000OduPerfMonCurrBBE	1.3.6.1.4.1.4458.1000.1.6.1.1.4	Gauge	RO	Current number of Background Block Errors starting from the present 15 minutes period.
winlink1000OduPerfMonCurrIntegrity	1.3.6.1.4.1.4458.1000.1.6.1.1.5	Integer	RO	Indicates the integrity of the entry.
winlink1000OduPerfMonIntervalTable			N/A	This table defines/keeps the counters of the current 15 min interval.
winlink1000OduPerfMonIntervalEntry			N/A	This is an entry in the Interval Table. INDEX {ifIndex winlink1000OduPerfMonIntervalIdx }
winlink1000OduPerfMonIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.
winlink1000OduPerfMonIntervalUAS			RO	The current number of Unavailable Seconds per interval.
winlink1000OduPerfMonIntervalES			RO	Current number of Errored Seconds per interval.
winlink1000OduPerfMonIntervalSES			RO	Current number of Severely Errored Seconds per interval.
winlink1000OduPerfMonIntervalBBE			RO	Current number of Background Block Errors per interval.
winlink1000OduPerfMonIntervalIntegrity			RO	Indicates the integrity of the entry per interval.
winlink1000OduPerfMonDayTable			N/A	This table defines/keeps the counters of the current 15 min interval.
winlink1000OduPerfMonDayEntry			N/A	This is an entry in the Days Table. INDEX {ifIndex winlink1000OduPerfMonDayIdx }
winlink1000OduPerfMonDayIdx			RO	This table is indexed per interval number. Each interval is of 24 hours and the oldest is 30.
winlink1000OduPerfMonDayUAS			RO	The current number of Unavailable Seconds per interval of 24 hours.
winlink1000OduPerfMonDayES			RO	Current number of Errored Seconds per interval of 24 hours.
winlink1000OduPerfMonDaySES			RO	Current number of Severely Errored Seconds per interval of 24 hours.
winlink1000OduPerfMonDayBBE			RO	Current number of Background Block Errors per interval of 24 hours.
winlink1000OduPerfMonDayIntegrity			RO	Indicates the integrity of the entry per interval of 24 hours.
winlink1000OduPerfMonAirCurrTable			N/A	This table defines/keeps the counters of the current 15 min interval.
winlink1000OduPerfMonAirCurrEntry			N/A	This is an entry in the Current Interval Table. INDEX {ifIndex }
winlink1000OduPerfMonAirCurrMinRSL	1.3.6.1.4.1.4458.1000.1.6.4.1.1	Integer	RO	Current Min Received Level Reference starting from the present 15 minutes period.
winlink1000OduPerfMonAirCurrMaxRSL	1.3.6.1.4.1.4458.1000.1.6.4.1.2	Integer	RO	Current Max Received Level Reference starting from the present 15 minutes period.

Table J-2: Private MIB Parameters (Sheet 8 of 15)

Name	OID	Type	Access	Description
winlink1000OduPerfMonAirCurrRSLThresh1Exceed	1.3.6.1.4.1.4458.1000.1.6.4.1.3	Gauge	RO	Number of seconds Receive Signal Level exceeded the RSL1 threshold in the last 15 minutes.
winlink1000OduPerfMonAirCurrRSLThresh2Exceed	1.3.6.1.4.1.4458.1000.1.6.4.1.4	Gauge	RO	Number of seconds Receive Signal Level exceeded the RSL2 threshold in the last 15 minutes.
winlink1000OduPerfMonAirCurrMinTSL	1.3.6.1.4.1.4458.1000.1.6.4.1.5	Integer	RO	Current Min Transmit Signal Level starting from the present 15 minutes period.
winlink1000OduPerfMonAirCurrMaxTSL	1.3.6.1.4.1.4458.1000.1.6.4.1.6	Integer	RO	Current Max Transmit Signal Level starting from the present 15 minutes period.
winlink1000OduPerfMonAirCurrTSLThresh1Exceed	1.3.6.1.4.1.4458.1000.1.6.4.1.7	Gauge	RO	Number of seconds Transmit Signal Level exceeded the TSL1 threshold in the last 15 minutes.
winlink1000OduPerfMonAirCurrBBERThresh1Exceed	1.3.6.1.4.1.4458.1000.1.6.4.1.8	Gauge	RO	Number of seconds Background Block Error Ratio exceeded the BBER1 threshold in the last 15 minutes.
winlink1000OduPerfMonAirIntervalTable			N/A	This table defines/keeps the counters of the current 15 min interval.
winlink1000OduPerfMonAirIntervalEntry			N/A	This is an entry in the Interval Table. INDEX {ifIndex winlink1000OduPerfMonAirIntervalIdx }
winlink1000OduPerfMonAirIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.
winlink1000OduPerfMonAirIntervalMinRSL			RO	Current Min Received Level Reference per interval.
winlink1000OduPerfMonAirIntervalMaxRSL			RO	Current Max Received Level Reference per interval.
winlink1000OduPerfMonAirIntervalRSLThresh1Exceed			RO	Number of seconds Receive Signal Level exceeded the RSL1 threshold per interval.
winlink1000OduPerfMonAirIntervalRSLThresh2Exceed				Number of seconds Receive Signal Level exceeded the RSL2 threshold ACCESS read-only per interval.
winlink1000OduPerfMonAirIntervalMinTSL			RO	Current Min Transmit Signal Level per interval.
winlink1000OduPerfMonAirIntervalMaxTSL			RO	Current Max Transmit Signal Level per interval.
winlink1000OduPerfMonAirIntervalTSLThresh1Exceed			RO	Number of seconds Transmit Signal Level exceeded the TSL1 threshold per interval.
winlink1000OduPerfMonAirIntervalBBERThresh1Exceed			RO	Number of seconds Background Block Error Ratio exceeded the BBER1 threshold per interval.
winlink1000OduPerfMonAirDayTable			N/A	This table defines/keeps the counters of the current 15 min interval.
winlink1000OduPerfMonAirDayEntry			N/A	This is an entry in the Days Table. INDEX {ifIndex winlink1000OduPerfMonAirDayIdx }
winlink1000OduPerfMonAirDayIdx			RO	This table is indexed per Day number. Each Day is of 15 minutes and the oldest is 96.
winlink1000OduPerfMonAirDayMinRSL			RO	Current Min Received Level Reference per Day.
winlink1000OduPerfMonAirDayMaxRSL			RO	Current Max Received Level Reference per Day.
winlink1000OduPerfMonAirDayRSLThresh1Exceed			RO	Number of seconds Receive Signal Level exceeded the RSL1 threshold per Day.
winlink1000OduPerfMonAirDayRSLThresh2Exceed			RO	Number of seconds Receive Signal Level exceeded the RSL2 threshold per Day.
winlink1000OduPerfMonAirDayMinTSL			RO	Current Min Transmit Signal Level per Day.
winlink1000OduPerfMonAirDayMaxTSL			RO	Current Max Transmit Signal Level per Day.
winlink1000OduPerfMonAirDayTSLThresh1Exceed			RO	Number of seconds Transmit Signal Level exceeded the TSL1 threshold per Day.

Table J-2: Private MIB Parameters (Sheet 9 of 15)

Name	OID	Type	Access	Description
winlink1000OduPerfMonAirDayBBERThresh1Exceed			RO	Number of seconds Background Block Error Ratio exceeded the BBER1 threshold per Day.
winlink1000OduPerfMonEthCurrTable			N/A	This table defines/keeps the counters of the current 15 min interval.
winlink1000OduPerfMonEthCurrEntry			N/A	This is an entry in the Current Interval Table. INDEX {ifIndex }
winlink1000OduPerfMonEthCurrRxMBytes	1.3.6.1.4.1.4458.1000.1.6.7.1.1	Gauge	RO	Current RX Mega Bytes starting from the present 15 minutes period.
winlink1000OduPerfMonEthCurrTxMBytes	1.3.6.1.4.1.4458.1000.1.6.7.1.2	Gauge	RO	Current Transmit Mega Bytes starting from the present 15 minutes period.
winlink1000OduPerfMonEthIntervalTable			N/A	This table defines/keeps the counters of the current 15 min interval.
winlink1000OduPerfMonEthIntervalEntry			N/A	This is an entry in the Interval Table. INDEX {ifIndex winlink1000OduPerfMonEthIntervalIdx }
winlink1000OduPerfMonEthIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.
winlink1000OduPerfMonEthIntervalRxMBytes			RO	Current RX Mega Bytes per interval.
winlink1000OduPerfMonEthIntervalTxMBytes			RO	Current Transmit Mega Bytes per interval.
winlink1000OduPerfMonEthDayTable			N/A	This table defines/keeps the counters of the current 15 min interval.
winlink1000OduPerfMonEthDayEntry			N/A	This is an entry in the Days Table. INDEX {ifIndex winlink1000OduPerfMonEthDayIdx }
winlink1000OduPerfMonEthDayIdx			RO	This table is indexed per Day number. Each interval is of 15 minutes and the oldest is 96.
winlink1000OduPerfMonEthDayRxMBytes			RO	Current RX Mega Bytes per day.
winlink1000OduPerfMonEthDayTxMBytes			RO	Current Transmit Mega Bytes per day.
winlink1000OduPerfMonTdmCurrTable			N/A	This table defines/keeps the counters of the current 15 min interval.
winlink1000OduPerfMonTdmCurrEntry			N/A	This is an entry in the Current Interval Table. INDEX {ifIndex }
winlink1000OduPerfMonTdmCurrActiveSeconds	1.3.6.1.4.1.4458.1000.1.6.10.1.1	Gauge	RO	Parameter indicating whether the TDM service was active. Under TDM backup link the parameter indicates whether the backup link was active.
winlink1000OduPerfMonTdmIntervalTable			N/A	This table defines/keeps the counters of the current 15 min interval.
winlink1000OduPerfMonTdmIntervalEntry			N/A	This is an entry in the Interval Table. INDEX {ifIndex winlink1000OduPerfMonTdmIntervalIdx }
winlink1000OduPerfMonTdmIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.
winlink1000OduPerfMonTdmIntervalActiveSeconds			RO	Parameter indicating whether the TDM service was active. Under TDM backup link the parameter indicates whether the backup link was active.
winlink1000OduPerfMonTdmDayTable			N/A	This table defines/keeps the counters of the current 15 min interval.
winlink1000OduPerfMonTdmDayEntry			N/A	This is an entry in the Days Table. INDEX {ifIndex winlink1000OduPerfMonTdmDayIdx }
winlink1000OduPerfMonTdmDayIdx			RO	This table is indexed per Day number. Each interval is of 15 minutes and the oldest is 96.

Table J-2: Private MIB Parameters (Sheet 10 of 15)

Name	OID	Type	Access	Description
winlink1000OduPerfMonTdmDayActiveSeconds			RO	Parameter indicating whether the TDM service was active. Under TDM backup link the parameter indicates whether the backup link was active.
winlink1000OduPerfMonTxThresh1	1.3.6.1.4.1.4458.1000.1.6.20	Integer	RW	When the Transmit power exceeds this threshold a performance monitoring TSL1 counter is incremented.
winlink1000OduPerfMonRxThresh1	1.3.6.1.4.1.4458.1000.1.6.21	Integer	RW	When the RX power exceeds this threshold a performance monitoring RSL1 counter is incremented.
winlink1000OduPerfMonRxThresh2	1.3.6.1.4.1.4458.1000.1.6.22	Integer	RW	When the RX power exceeds this threshold a performance monitoring RSL2 counter is incremented.
winlink1000OduPerfMonBBERThresh1	1.3.6.1.4.1.4458.1000.1.6.23	Integer	RW	When the BBER exceeds this threshold a performance monitoring BBER counter is incremented. The units are 1/10 of a percent.
winlink1000OduAgnGenAddTrapExt	1.3.6.1.4.1.4458.1000.1.7.1.1	Integer	RW	If 'yes' is chosen the ifIndex Unit Severity Time_T and Alarm Id from the winlink1000OduAgnCurrAlarmTable will be bind to the end of each private trap.
winlink1000OduAgnGenSetMode	1.3.6.1.4.1.4458.1000.1.7.1.2	Integer	RW	This parameter is reserved to the element manager provided with the product.
winlink1000OduAgnNTPCfgTimeServerIP	1.3.6.1.4.1.4458.1000.1.7.2.1	IpAddress	RW	IP address of the server from which the current time is loaded.
winlink1000OduAgnNTPCfgTimeOffsetFromUTC	1.3.6.1.4.1.4458.1000.1.7.2.2	Integer	RW	Offset from Coordinated Universal Time (minutes). Possible values: -1440..1440.
winlink1000OduAgnRealTimeAndDate	1.3.6.1.4.1.4458.1000.1.7.2.3	OctetString	RW	This parameter specifies the real time and date Format 'YYYY-MM-DD HH:MM:SS' (Hexadecimal). A date-time specification: field octets contents range ------ ------- ---------- -------- 1 1-2 year 0..65536 2 3 month 1..12 3 4 day 1.. 31 4 5 hour 0..23 5 6 minutes 0..59 6 7 seconds 0..60 (use 60 for leap-second) 7 8 deci-seconds 0..9 For example Tuesday May 26 1992 at 1:30:15 PM EDT would be displayed as: 07 c8 05 1a 0d 1e 0f 00 (1992 -5 -26 13:30:15)
winlink1000OduAgnCurrAlarmLastChange	1.3.6.1.4.1.4458.1000.1.7.3.1	Integer	RO	This counter is initialized to 0 after a device reset and is incremented upon each change in the winlink1000OduAgnCurrAlarmTable (either an addition or removal of an entry).
winlink1000OduAgnCurrAlarmTable			N/A	This table includes the currently active alarms. When a RAISED trap is sent an alarm entry is added to the table. When a CLEAR trap is sent the entry is removed.
winlink1000OduAgnCurrAlarmEntry			N/A	Entry containing the details of a currently RAISED trap. INDEX { winlink1000OduAgnCurrAlarmCounter }

Table J-2: Private MIB Parameters (Sheet 11 of 15)

Name	OID	Type	Access	Description
winlink1000OduAgnCurrAlarmCounter	1.3.6.1.4.1.4458.1000.1.7.3.2.1.1	Integer	RO	A running counter of active alarms. The counter is incremented for every new RAISED trap. It is cleared after a device reset.
winlink1000OduAgnCurrAlarmSeverity	1.3.6.1.4.1.4458.1000.1.7.3.2.1.2	Integer	RO	Current Alarm severity.
winlink1000OduAgnCurrAlarmId	1.3.6.1.4.1.4458.1000.1.7.3.2.1.3	Integer	RO	Unique Alarm Identifier (combines alarm type and interface). The same AlarmId is used for RAISED and CLEARED alarms.
winlink1000OduAgnCurrAlarmIfIndex	1.3.6.1.4.1.4458.1000.1.7.3.2.1.4	Integer	RO	Interface Index where the alarm occurred. Alarms that are not associated with a specific interface will have the following value: 65535.
winlink1000OduAgnCurrAlarmUnit	1.3.6.1.4.1.4458.1000.1.7.3.2.1.5	Integer	RO	Unit associated with the alarm.
winlink1000OduAgnCurrAlarmTrapID	1.3.6.1.4.1.4458.1000.1.7.3.2.1.6	Integer	RO	ID of the raised trap that was sent when this alarm was raised.
winlink1000OduAgnCurrAlarmTimeT	1.3.6.1.4.1.4458.1000.1.7.3.2.1.7	Integer	RO	Timestamp of this alarm. This number is in seconds from Midnight January 1st 1970.
winlink1000OduAgnCurrAlarmText	1.3.6.1.4.1.4458.1000.1.7.3.2.1.8	DisplayString	RO	Alarm display text (same as the text in the sent trap).
winlink1000OduAgnLastEventsNumber	1.3.6.1.4.1.4458.1000.1.7.4.1	Integer	RO	This counter indicates the size of the winlink1000OduAgnLastEventsTable
winlink1000OduAgnLastEventsTable			N/A	This table includes the last events. When a trap is sent an event entry is added to the table.
winlink1000OduAgnLastEventsEntry			N/A	Entry containing the details of last traps. INDEX { winlink1000OduAgnLastEventsIndex }
winlink1000OduAgnLastEventsIndex	1.3.6.1.4.1.4458.1000.1.7.4.2.1.1	Integer	RO	The index of the table
winlink1000OduAgnLastEventsSeverity	1.3.6.1.4.1.4458.1000.1.7.4.2.1.2	Integer	RO	Current Trap severity.
winlink1000OduAgnLastEventsIfIndex	1.3.6.1.4.1.4458.1000.1.7.4.2.1.3	Integer	RO	Interface Index where the event occurred. Traps that are not associated with a specific interface will have the following value: 65535.
winlink1000OduAgnLastEventsTimeT	1.3.6.1.4.1.4458.1000.1.7.4.2.1.4	Integer	RO	Timestamp of this trap. This number is in seconds from Midnight January 1st 1970.
winlink1000OduAgnLastEventsText	1.3.6.1.4.1.4458.1000.1.7.4.2.1.5	DisplayString	RO	Trap display text (same as the text in the sent trap).
winlink1000IduAdmProductType	1.3.6.1.4.1.4458.1000.2.1.1	DisplayString	RO	IDU configuration description.
winlink1000IduAdmHwRev	1.3.6.1.4.1.4458.1000.2.1.2	DisplayString	RO	IDU Hardware Revision.
winlink1000IduAdmSwRev	1.3.6.1.4.1.4458.1000.2.1.3	DisplayString	RO	IDU Software Revision.
winlink1000OduAdmNumOfExternalAlarmIn	1.3.6.1.4.1.4458.1000.2.1.4	Integer	RO	Indicates the number of currently available External Alarm Inputs.
winlink1000OduAdmExternAlarmInTable			N/A	This is the External Alarm Inputs table.
winlink1000OduAdmExternAlarmInEntry			N/A	Entry containing the elements of a single External Alarm Input. INDEX { winlink1000OduAdmExternAlarmInIndex}
winlink1000OduAdmExternAlarmInIndex	1.3.6.1.4.1.4458.1000.2.1.5.1.1	Integer	RO	This value indicates the index of the External Alarm Input entry.
winlink1000OduAdmExternAlarmInText	1.3.6.1.4.1.4458.1000.2.1.5.1.2	DisplayString	RW	This field describes the External Alarm Input. It is an optional string of no more than 64 characters which will be used in the event being sent as a result of a change in the status of the External Alarm Input. DEFVAL {Alarm Description}
winlink1000OduAdmExternAlarmInAdminState	1.3.6.1.4.1.4458.1000.2.1.5.1.3	Integer	RW	This value indicates if this External Alarm Input is enabled or disabled.
winlink1000OduAdmExternAlarmInStatus	1.3.6.1.4.1.4458.1000.2.1.5.1.4	Integer	RO	This value indicates the current status of the External Alarm Input.
winlink1000IduAdmSN	1.3.6.1.4.1.4458.1000.2.1.6	DisplayString	RO	IDU Serial Number

Table J-2: Private MIB Parameters (Sheet 12 of 15)

Name	OID	Type	Access	Description
winlink1000IduAdmIduDetectionMode	1.3.6.1.4.1.4458.1000.2.1.7	Integer	RW	The parameter defines whether to send Ethernet frames to detect an IDU. The valid writable values are: userDisabled (3) userEnabled (4). A change requires a reset and is effective after reset.
winlink1000IduAdmMountedTrunks	1.3.6.1.4.1.4458.1000.2.1.8	Integer	RO	Number of mounted trunks in the IDU
winlink1000IduAdmLicensedTrunks	1.3.6.1.4.1.4458.1000.2.1.9	Integer	RO	Number of Licensed Trunks in the IDU
winlink1000IduSrvDesiredTrunks	1.3.6.1.4.1.4458.1000.2.2.2	Integer	RW	Required trunks bitmap. Note that the number of possible trunks that can be configured may vary based on the IDU hardware configuration the selected air interface rate and the range of the installation. The provided Manager application enables the user to select only available configurations. A change is effective immediately if applied to a master unit and the link is in service mode.
winlink1000IduSrvServices	1.3.6.1.4.1.4458.1000.2.2.4	ObjectID	RO	This parameter is reserved to the Manager application provided with the product.
winlink1000IduSrvActiveTrunks	1.3.6.1.4.1.4458.1000.2.2.6	Integer	RO	A bitmap describing the currently open TDM trunks.
winlink1000IduSrvAvailableTrunks	1.3.6.1.4.1.4458.1000.2.2.8	Integer	RO	A bitmap describing the number of TDM trunks that can be opened in the current configuration. The values take into account the IDU hardware configuration the air rate and the installation range.
winlink1000IduSrvPossibleServicesTable			N/A	IDU Possible Services table.
winlink1000IduSrvPossibleServicesEntry			N/A	IDU Services table entry. INDEX { winlink1000IduSrvPossibleServicesIndex }
winlink1000IduSrvPossibleServicesIndex	1.3.6.1.4.1.4458.1000.2.2.10.1.1	Integer	RO	Table index Rate index of the air interface.
winlink1000IduSrvPossibleTdmServices	1.3.6.1.4.1.4458.1000.2.2.10.1.2	Integer	RO	Deprecated parameter. A bitmap describing the TDM trunks that can be opened in the corresponding Air Rate.
winlink1000IduSrvPossibleEthServices	1.3.6.1.4.1.4458.1000.2.2.10.1.3	Integer	RO	Deprecated parameter. This parameter describes if the Ethernet Service can be opened in the corresponding Air Rate. The valid values are: disabled (0) enabled (1).
winlink1000IduSrvRemainingRate	1.3.6.1.4.1.4458.1000.2.2.10.1.4	Integer	RO	Current Ethernet bandwidth in bps per air rate.
winlink1000IduSrvTrunkCost	1.3.6.1.4.1.4458.1000.2.2.10.1.5	Integer	RO	Cost of the TDM Service in bps.
winlink1000IduSrvAvailServicesTable			N/A	ODU Possible TDM Services table.
winlink1000IduSrvAvailServicesEntry			N/A	ODU TDM Services table entry. INDEX { winlink1000IduSrvAvailServicesIndex }
winlink1000IduSrvAvailServicesIndex	1.3.6.1.4.1.4458.1000.2.2.11.1.1	Integer	RO	Table index. The index is the bit mask of the TDM service.
winlink1000IduSrvAvailServicesState	1.3.6.1.4.1.4458.1000.2.2.11.1.2	Integer	RO	Represents the TDM service availability.
winlink1000IduSrvAvailServicesMinRateIdx	1.3.6.1.4.1.4458.1000.2.2.11.1.3	Integer	RO	Minimum rate index of the air interface which make the service possible.
winlink1000IduSrvAvailServicesMaxRateIdx	1.3.6.1.4.1.4458.1000.2.2.11.1.4	Integer	RO	Maximum rate index of the air interface which make the service possible.
winlink1000IduSrvAvailServicesReason	1.3.6.1.4.1.4458.1000.2.2.11.1.5	Integer	RO	Information about the TDM Service availability. - Not Applicable if the service is available. The reasons for TDM Service unavailability: - The available throughput isn't sufficient for Service demands; - The IDU HW doesn't support the service; - A Link Password mismatch was detected; - The external pulse type detected is improper for TDM services; - A Software versions mismatch was detected.

Table J-2: Private MIB Parameters (Sheet 13 of 15)

Name	OID	Type	Access	Description
winlink1000IduSrvEthActive	1.3.6.1.4.1.4458.1000.2.2.12	Integer	RO	Represents the Ethernet service activation state.
winlink1000IduSrvEthAvailable	1.3.6.1.4.1.4458.1000.2.2.13	Integer	RO	Represents the Ethernet service availability state.
winlink1000IduSrvEthThroughput	1.3.6.1.4.1.4458.1000.2.2.14	Gauge	RO	Current available Ethernet service throughput in bps.
winlink1000IduSrvEthMaxInfoRate	1.3.6.1.4.1.4458.1000.2.2.15	Integer	RW	Holds the maximum bandwidth (kbps) to be allocated for Ethernet service. Value of zero means that Ethernet service works as best effort. The maximum value is product specific. Refer to the user manual.
winlink1000IduSrvAvailableTrunksT1	1.3.6.1.4.1.4458.1000.2.2.16	Integer	RO	A bitmap describing the TDM trunks that can be opened under T1 configuration. The values take into account the IDU hardware configuration the air rate and the installation range.
winlink1000IduEthernetIfTable			N/A	IDU Ethernet Interface table.
winlink1000IduEthernetIfEntry			N/A	IDU Ethernet Interface table entry. INDEX { winlink1000IduEthernetIfIndex }
winlink1000IduEthernetIfIndex			RO	If Index corresponding to this Interface.
winlink1000IduEthernetIfAddress	1.3.6.1.4.1.4458.1000.2.3.1.1.5	DisplayString	RO	IDU MAC address.
winlink1000IduEthernetNumOfLanPorts	1.3.6.1.4.1.4458.1000.2.3.3	Integer	RO	Number of LAN interfaces in the IDU.
winlink1000IduEthernetNumOfSfpPorts	1.3.6.1.4.1.4458.1000.2.3.4	Integer	RO	The number of SFP interfaces in the IDU.
winlink1000IduEthernetSfpProperties	1.3.6.1.4.1.4458.1000.2.3.5	DisplayString	RO	SFP venfor properties : Vendor Name PN and Revision.
winlink1000IduBridgeTpAging	1.3.6.1.4.1.4458.1000.2.4.4.2	Integer	RW	Timeout in seconds for aging. Note that for this parameter to be effective the ODU must be configured to HUB mode. A change is effective immediately.
winlink1000IduTdmTxClockAvailStates	1.3.6.1.4.1.4458.1000.2.6.1.1	Integer	RO	Available states of the TDM Transmit Clock Control each input status is represented by a bit. When the state is available the bit value is 1. When the state is unavailable the bit value is 0. The available states are: bit 2 = Transparent bit 3 = Local Loop Timed bit 4 = Remote Loop Timed bit 5 = Local Internal bit 6 = Remote Internal
winlink1000IduTdmTxClockDesiredState	1.3.6.1.4.1.4458.1000.2.6.1.2	Integer	RW	Required state of the TDM Transmit Clock Control. A change is effective after re-activation of the TDM service.
winlink1000IduTdmTxClockActualState	1.3.6.1.4.1.4458.1000.2.6.1.3	Integer	RO	Actual state of the TDM Transmit Clock Control.
winlink1000IduTdmMasterClockAvailOptions	1.3.6.1.4.1.4458.1000.2.6.2.1	Integer	RO	Available options of the TDM Master Clock Control each input status is represented by a bit. When the option is available the bit value is 1. When the option is unavailable the bit value is 0. The available options are: bit 2 = Automatic bit 3 = Trunk #1 bit 4 = Trunk #2 bit 5 = Trunk #3 bit 6 = Trunk #4 When no options are available the returned value is: 1
winlink1000IduTdmMasterClockDesired	1.3.6.1.4.1.4458.1000.2.6.2.2	Integer	RW	Required TDM Master Clock. A change is effective after re-activation of the TDM service.
winlink1000IduTdmMasterClockActual	1.3.6.1.4.1.4458.1000.2.6.2.3	Integer	RO	Actual Trunk used for TDM Master Clock.
winlink1000IduTdmConfigTable			N/A	IDU TDM Links Configuration table.
winlink1000IduTdmConfigEntry			N/A	IDU TDM Links Configuration table entry. INDEX { winlink1000IduTdmConfigIndex }
winlink1000IduTdmConfigIndex			RO	Table index.
winlink1000IduTdmIfIndex			RO	Link index in the interface table.

Table J-2: Private MIB Parameters (Sheet 14 of 15)

Name	OID	Type	Access	Description
winlink1000IduTdmLineCoding	1.3.6.1.4.1.4458.1000.2.6.6.1.6	Integer	RW	This parameter applies to T1 trunks only. The parameter controls the line coding. Setting the value to each of the indices applies to all. A change is effective after the next open of the TDM service.
winlink1000IduTdmLoopbackConfig	1.3.6.1.4.1.4458.1000.2.6.6.1.9	Integer	RW	Loop back configuration table. Each of the trunks can be set Normal Line loop back or Reverse line loop back. A change is effective immediately.
winlink1000IduTdmLineStatus	1.3.6.1.4.1.4458.1000.2.6.6.1.10	Integer	RO	Line status.
winlink1000IduTdmCurrentTable			N/A	IDU TDM Links Statistics table.
winlink1000IduTdmCurrentEntry			N/A	IDU TDM Links Statistics table entry. INDEX { winlink1000IduTdmCurrentIndex }
winlink1000IduTdmCurrentIndex			RO	Table index (Same as winlink1000IduTdmLineIndex).
winlink1000IduTdmCurrentBlocks	1.3.6.1.4.1.4458.1000.2.6.7.1.101	Counter	RO	Number of correct blocks transmitted to the line.
winlink1000IduTdmCurrentDrops	1.3.6.1.4.1.4458.1000.2.6.7.1.102	Counter	RO	Number of error blocks transmitted to the line.
winlink1000IduTdmCurrentTxClock	1.3.6.1.4.1.4458.1000.2.6.7.1.103	Integer	RW	TDM Transmit Clock. A change is effective after re-activation of the TDM service.
winlink1000IduTdmCurrentBlocksHigh	1.3.6.1.4.1.4458.1000.2.6.7.1.104	Counter	RO	High part of the 64 bits counter Current Blocks
winlink1000IduTdmRemoteQual	1.3.6.1.4.1.4458.1000.2.6.8	Integer	RO	Estimated average interval between error second events. The valid values are 1-2^31 where a value of -1 is used to indicate an undefined state.
winlink1000IduTdmRemoteQualEval	1.3.6.1.4.1.4458.1000.2.6.9	Integer	RO	Estimated average interval between error second events during evaluation process. The valid values are 1-2^31 where a value of -1 is used to indicate an undefined state.
winlink1000IduTdmSrvEval	1.3.6.1.4.1.4458.1000.2.6.10	Integer	RW	Evaluated TDM service bit mask. Setting this parameter to value that is bigger than the activated TDM service bit mask will execute the evaluation process for 30 seconds. Setting this parameter to 0 will stop the evaluation process immediately.
winlink1000IduTdmBackupAvailableLinks	1.3.6.1.4.1.4458.1000.2.6.11	Integer	RO	Number of TDM backup trunks.
winlink1000IduTdmBackupTable			N/A	IDU TDM Links Statistics table.
winlink1000IduTdmBackupEntry			N/A	IDU TDM Links Statistics table entry. INDEX { winlink1000IduTdmBackupIndex }
winlink1000IduTdmBackupIndex	1.3.6.1.4.1.4458.1000.2.6.12.1.1	Integer	RO	Table index.
winlink1000IduTdmBackupMode	1.3.6.1.4.1.4458.1000.2.6.12.1.2	Integer	RW	TDM backup mode: Enable or Disable where the main link is the air link or the external link. Changes will be effective immediatly.
winlink1000IduTdmBackupCurrentActiveLink	1.3.6.1.4.1.4458.1000.2.6.12.1.3	Integer	RO	TDM backup current active link: N/A air link is active or external link is active.
winlink1000IduTdmJitterBufferSize	1.3.6.1.4.1.4458.1000.2.6.13	Integer	RW	TDM Jitter Buffer Size. The value must be between the minimum and the maximum TDM Jitter Buffer Size. The units are 0.1 x millisecond.
winlink1000IduTdmJitterBufferDefaultSize	1.3.6.1.4.1.4458.1000.2.6.14	Integer	RO	TDM Jitter Buffer Default Size. The units are 0.1 x millisecond.
winlink1000IduTdmJitterBufferMinSize	1.3.6.1.4.1.4458.1000.2.6.15	Integer	RO	TDM Jitter Buffer Minimum Size. The units are 0.1 x millisecond.
winlink1000IduTdmJitterBufferMaxSize	1.3.6.1.4.1.4458.1000.2.6.16	Integer	RO	TDM Jitter Buffer Maximum Size. The units are 0.1 x millisecond.
winlink1000IduTdmJitterBufferSizeEval	1.3.6.1.4.1.4458.1000.2.6.17	Integer	RW	TDM Jitter Buffer Size for evaluation. The value must be between the minimum and the maximum TDM Jitter Buffer Size. The units are 0.1 x millisecond.

Table J-2: Private MIB Parameters (Sheet 15 of 15)

Name	OID	Type	Access	Description
winlink1000IduTdmType	1.3.6.1.4.1.4458.1000.2.6.18	Integer	RW	TDM Type (The value undefined is read-only).
winlink1000IduTdmTypeEval	1.3.6.1.4.1.4458.1000.2.6.19	Integer	RW	TDM Type for evaluation.
winlink1000IduTdmLineStatusStr	1.3.6.1.4.1.4458.1000.2.6.20	DisplayString	RO	Line status.
winlink1000IduTdmHotStandbySupport	1.3.6.1.4.1.4458.1000.2.6.21	Integer	RO	Indicates if Hot Standby is supported.
winlink1000IduTdmDesiredHotStandbyMode	1.3.6.1.4.1.4458.1000.2.6.22	Integer	RW	Desired Hot Standby Mode.
winlink1000IduTdmHotStandbyOperationStatus	1.3.6.1.4.1.4458.1000.2.6.23	Integer	RO	The Link Actual Status.
winlink1000GeneralTrapDescription	1.3.6.1.4.1.4458.1000.100.1	DisplayString	RO	Trap's Description. Used for Trap parameters.
winlink1000GeneralTrapSeverity	1.3.6.1.4.1.4458.1000.100.2	Integer	RO	Trap's Severity. Used for Trap parameters.
winlink1000GeneralCookie	1.3.6.1.4.1.4458.1000.100.3	DisplayString	RW	Reserved for the Manager application provided with the product used for saving user preferences affecting ODU operation.
winlink1000GeneralEcChangesCounter	1.3.6.1.4.1.4458.1000.100.4	Integer	RO	This counter is initialized to 0 after a device reset and is incremented upon each element constant write operation via SNMP or Telnet.

MIB Traps

General

Each ODU can be configured with up to 10 different trap destinations. When the link is operational, each ODU sends traps originating from both Site A and Site B.

The source IP address of the trap is the sending ODU. The trap originator can be identified by the trap Community string or by the trap description text.

Each trap contains a trap description and additional relevant information such as alarm severity, interface index, time stamp and additional parameters. See table **J-3** for additional information.

Trap Parameters

Table J-3: MIB Traps (Sheet 1 of 4)

Name	ID	Severity	Description
trunkStateChanged	1	normal	Indicates a change in the state of one of the TDM trunks. Raised by both sides of the link. Contains 3 parameters: 1 - Description: TDM Interface %n - %x 2 - %n: Is the trunk number 3 - %x: Is the alarm type and can be one of the following: Normal AIS LOS Loopback
linkUp	2	normal	Indicates that the radio link is up. Contains a single parameter which is its description: 1 - Description: Radio Link - Sync on channel %n GHz. %n Is the channel frequency in GHz.
linkDown	3	critical	Indicates that the radio link is down. Contains a single parameter which is its description: 1 - Description: Radio Link - Out of Sync. The reason is: %s. %s Is the reason.
detectIDU	4	normal	Indicates that the IDU was detected. Raised by both sides of the link. Contains a single parameter which is its description: 1 - Description: IDU of Type %s was Detected. %s Is the type of the IDU.
disconnectIDU	5	major	Indicates that the IDU was disconnected. Raised by both sides of the link. Contains a single parameter which is its description: 1 - Description: IDU Disconnected.
mismatchIDU	6	major	Indicates a mismatch between the IDUs. Raised by the master only. Contains a single parameter which is its description: 1 - Description: IDUs Mismatch: One Side is %s and the Other is %s. %s Is the type of the IDU.
openedServices	7	normal	Indicates that services were opened. Raised by the master only. Contains 3 parameters: 1 - Description: %n2 out of %n1 Requested TDM Trunks have been Opened 2 - %n1: Is the requested number of TDM truncks 3 - %n2: Is the actual number of TDM trunks that were opened
closedServices	8	normal	Indicates that services were closed. Raised by the master only. Contains a single parameter which is its description: 1 - Description: TDM Service has been closed. The reason is: %s. %s Is the reason.
incompatibleODUs	9	critical	Indicates that the ODUs are incompatible. Contains a single parameter which is its description: 1 - Description: Incompatible ODUs.
incompatibleIDUs	10	major	Indicates that the IDUs are incompatible. Contains a single parameter which is its description: 1 - Description: Incompatible IDUs.
incompatibleOduIdu	11	major	Indicates that the ODU and IDU are incompatible. Contains a single parameter which is its description: 1 - Description: The IDU could not be loaded. The reason is: %s. %s Is the incompatibility type.
probingChannel	12	normal	Indicates that the ODU is monitoring radar activity. Contains a single parameter which is its description: 1 - Description: Monitoring for radar activity on channel %n GHz. %n is the channel frequency in GHz.
radarDetected	13	normal	Indicates that radar activity was detected. Contains a single parameter which is its description: 1 - Description: Radar activity was detected in %s on channel %n GHz. %s Is the site name. %n Is the channel frequency in GHz.
transmittingOnChannel	14	normal	Indicates that the ODU is transmitting on channel. Contains a single parameter which is its description: 1 - Description: Transmitting on channel %n GHz. %n Is the channel frequency in GHz.
scanningChannels	15	normal	Indicates that the ODU is scanning channels. Contains a single parameter which is its description: 1 - Description: Channel scanning in progress.
incompatiblePartner	16	critical	Indicates that configuration problem was detected and that link installation is required in order to fix it. Contains a single parameter which is its description: 1 - Description: Configuration problem detected. Link installation required.
timeClockSet	17	normal	Indicates that the ODU time clock was set. Contains a single parameter which is its description: 1 - Description: The time was set to: %p. %p Is the date and time.
configurationChanged	18	normal	Indicates that the ODU recovered from an error but there are configuration changes. Contains two parameters: 1 - Description: Configuration changed. Error code is: %n. 2 - %n number.

Table J-3: MIB Traps (Sheet 2 of 4)

Name	ID	Severity	Description
hssOpStateChangedToINU	19	normal	Indicates that the HSS operating state was changed to INU type. Contains a single parameter which is its description: 1 - Description: HSS operating state was changed to: INU.
hssOpStateChangedToHSM	20	normal	Indicates that the HSS operating state was changed to HSM type. Contains a single parameter which is its description: 1 - Description: HSS operating state was changed to: HSM.
hssOpStateChangedToHSC	21	normal	Indicates that the HSS operating state was changed to HSC type. Contains a single parameter which is its description: 1 - Description: HSS operating state was changed to: HSC_DT/HSC_CT.
vlanModeActive	22	normal	Indicates to non-VLAN PC that after 2 minutes the system will support only VLAN tag on management interface. Contains a single parameter which is its description: 1 - Description: VLAN Mode is active. Non-VLAN traffic will be blocked in 2 minutes.
tdmServiceAlarm	100	major	Indicates that TDM Service is in alarm state. Contains a single parameter which is its description: 1 - Description: TDM Service - Alarm.
ethServiceClosed	101	major	Indicates that Ethernet Service is closed. Contains a single parameter which is its description: 1 - Description: Ethernet Service is closed.
ethServiceNotPermitted	102	major	Indicates that Ethernet Service is not permitted. Contains a single parameter which is its description: 1 - Description: A valid IDU could not be detected at %s. Please check your configuration. %s - Is the Local Site name or Remote Site name or both sides of the Link.
encryptionAlarm	103	major	Indicates an encryption key mismatch. Contains a single parameter which is its description: 1 - Description: Encryption Status - Failed. No Services are available.
changeLinkPasswordAlarm	104	major	Indicates that a failure has occurred while attempting to change the Link Password. Contains a single parameter which is its description: 1 - Description: Failed to change the Link Password at/on: %s. %s - Is the Local Site name or Remote Site name or both sides of the Link.
externalAlarmInPort1Alarm	105	major	The trap is sent every time an alarm occurs in the External Alarm Input of port #1. Contains a single parameter which is its description: 1 - Description: External Alarm 1 - <User Text> - Alarm.
externalAlarmInPort2Alarm	106	major	The trap is sent every time an alarm occurs in the External Alarm Input of port #2. Contains a single parameter which is its description: 1 - Description: External Alarm 2 - <User Text> - Alarm.
bitFailedAlarm	107	critical	The trap is sent if there is no way to recover from the situation.Contains two parameters: 1 - Description: ODU power up built in test failed. Error code is: %n 2 - %n number
wrongConfigurationLoadedAlarm	108	major	The trap is sent if there is a way to recover from the situation.Contains two parameters: 1 - Description: Wrong configuration loaded. Error code is: %n 2 - %n number
lanPort1DisconnectedAlarm	109	major	Indicates the LAN port 1 status changed to disconnected.Contains a single parameter which is its description: 1 - Description: LAN port 1 status changed to disconnected.
lanPort2DisconnectedAlarm	110	major	Indicates the LAN port 2 status changed to disconnected.Contains a single parameter which is its description: 1 - Description: LAN port 2 status changed to disconnected.
mngPortDisconnectedAlarm	111	major	Indicates the management port status changed to disconnected.Contains a single parameter which is its description: 1 - Description: Management port status changed to disconnected.
externalAlarmInPort3Alarm	112	major	The trap is sent every time an alarm occurs in the External Alarm Input of port #3. Contains a single parameter which is its description: 1 - Description: External Alarm 3 - <User Text> - Alarm.
externalAlarmInPort4Alarm	113	major	The trap is sent every time an alarm occurs in the External Alarm Input of port #4. Contains a single parameter which is its description: 1 - Description: External Alarm 4 - <User Text> - Alarm.
swVersionsMismatchFullCompatibilityAlarm	114	warning	The trap is sent if SW versions mismatch with full link functionality. Contains a single parameter which is its description: 1 - Description: Software versions mismatch - full link functionality

Table J-3: MIB Traps (Sheet 3 of 4)

Name	ID	Severity	Description
swVersionsMismatchRestrictedCompatibilityAlarm	115	minor	The trap is sent if SW versions mismatch with restricted link functionality. Contains a single parameter which is its description: 1 - Description: Software versions mismatch - restricted link functionality
swVersionsMismatchSoftwareUpgradeRequired	116	major	The trap is sent if SW versions mismatch and SW upgrade is required. Contains a single parameter which is its description: 1 - Description: Software versions mismatch - Software upgrade required
swVersionsIncompatible	117	critical	The trap is sent if SW versions are incompatible. Contains a single parameter which is its description: 1 - Description: SW Versions incompatible
hssMultipleSourcesDetectedAlarm	118	major	Indicates that multiple sync pulse sources were detected. Contains a single parameter which is its description: 1 - Description: HSS multiple sync sources were detected.
hssSyncToProperSourceStoppedAlarm	119	major	Indicates that synchronization to a proper sync pulse source was stopped. Contains a single parameter which is its description: 1 - Description: HSS sync pulse - Down. The reason is: %s. %s - Is the reason for the sync down.
hssSyncPulseDetectedAlarm	120	major	Indicates that HSS additional sync pulse was detected. Contains a single parameter which is its description: 1 - Description: HSS additional sync pulse was detected.
tdmBackupAlarm	121	major	Indicates that the TDM backup link was activated. Contains a single parameter which is its description: 1 - Description: TDM backup alarm - backup link was activated.
linkLockUnauthorizedRemoteODU	122	major	Indicates that the remote ODU is unauthorized.Contains a single parameter which is its description: 1 - Description: Unauthorized remote ODU connection rejected.
linkLockUnauthorizedODU	123	major	Indicates that the ODU is unauthorized.Contains a single parameter which is its description: 1 - Description: Unauthorized ODU connection rejected.
hotStandbyAlarm	124	major	Indicates that the hot standby secondary link was activated. Contains a single parameter which is its description: 1 - Description: Secondary Link Is Active.
sfpInsertion	126	major	Indicates that a device was inserted to SFP Port
sfpPort1DisconnectedAlarm	127	major	Indicates the SFP port 1 status changed to disconnected.Contains a single parameter which is its description: 1 - Description: SFP port 1 status changed to disconnected.
tdmServiceClear	200	normal	Indicates that TDM Service fault is cleared. Contains a single parameter which is its description: 1 - Description: TDM Service - Normal.
ethServiceOpened	201	normal	Indicates that Ethernet Service has been opened. Contains a single parameter which is its description: 1 - Description: Ethernet Service has been opened.
encryptionClear	203	normal	Indicates that encryption is OK. Contains a single parameter which is its description: 1 - Description: Encryption Status - Normal.
changeLinkPasswordClear	204	normal	Indicates that the Link Password was changed successfully. Contains a single parameter which is its description: 1 - Description: Link Password has been changed at/on: %s. %s - Is the Local Site name or Remote Site name or both sides of the Link.
externalAlarmInPort1Clear	205	normal	This Trap is sent every time an External Alarm Input fault of port # 1 is cleared. Contains a single parameter which is its description: 1 - Description: External Alarm 1 - <User Text> - Alarm Cleared.
externalAlarmInPort2Clear	206	normal	This Trap is sent every time an External Alarm Input fault of port # 2 is cleared. Contains a single parameter which is its description: 1 - Description: External Alarm 2 - <User Text> - Alarm Cleared.
lanPort1Clear	209	normal	Indicates the LAN port 1 status changed to connected. Contains two parameters: 1 - Description: LAN port 1 status changed to connected - %s 2 - %s Is the Eth. mode (speed & duplex)
lanPort2Clear	210	normal	Indicates the LAN port 2 status changed to connected. Contains two parameters: 1 - Description: LAN port 2 status changed to connected - %s. 2 - %s Is the Eth. mode (speed & duplex).

Table J-3: MIB Traps (Sheet 4 of 4)

Name	ID	Severity	Description
mngPortClear	211	normal	Indicates the management port status changed to connected. Contains two parameters: 1 - Description: Management port status changed to connected - %s 2 - %s Is the Eth. mode (speed & duplex)
externalAlarmInPort3Clear	212	normal	This Trap is sent every time an External Alarm Input fault of port # 3 is cleared. Contains a single parameter which is its description: 1 - Description: External Alarm 3 - <User Text> - Alarm Cleared.
externalAlarmInPort4Clear	213	normal	This Trap is sent every time an External Alarm Input fault of port # 4 is cleared. Contains a single parameter which is its description: 1 - Description: External Alarm 4 - <User Text> - Alarm Cleared.
swVersionsMatchFullCompatibilityClear	214	normal	The trap is sent if SW versions match. Contains a single parameter which is its description: 1 - Description: Software Versions compatible
swVersionsMatchRestrictedCompatibilityClear	215	normal	The trap is sent if SW versions match and link functionality is not restricted. Contains a single parameter which is its description: 1 - Description: Software Versions compatible
swVersionsMatchSoftwareUpgradeRequiredClear	216	normal	The trap is sent if SW versions match and SW upgrade is successful. Contains a single parameter which is its description: 1 - Description: Software Versions compatible
swVersionsCompatibleClear	217	normal	The trap is sent if SW versions compatible Contains a single parameter which is its description: 1 - Description: Software Versions compatible
hssMultipleSourcesDisappearedClear	218	normal	Indicates that multiple sync pulse sources disappeared. Contains a single parameter which is its description: 1 - Description: HSS multiple sync pulse sources disappeared.
hssSyncToProperSourceAchievedClear	219	normal	Indicates that synchronization to a proper Sync source was achieved. Contains a single parameter which is its description: 1 - Description: HSS sync pulse - Up.
hssSyncPulseDisappearedClear	220	normal	Indicates that HSS additional sync pulse disappeared. Contains a single parameter which is its description: 1 - Description: HSS additional sync pulse was disappeared.
tdmBackupClear	221	normal	Indicates that the TDM main link was activated. Contains a single parameter which is its description: 1 - Description: TDM main link was activated.
linkLockAuthorizedRemoteODU	222	normal	Indicates that the remote ODU is authorized. Contains a single parameter which is its description: 1 - Description: Authorized remote ODU connection accepted.
linkLockAuthorizedODU	223	normal	Indicates that the ODU is authorized. Contains a single parameter which is its description: 1 - Description: Authorized ODU connection permitted.
linkAuthenticationDisabled	224	normal	Indicates that the Link Lock is disabled. Contains a single parameter which is its description: 1 - Description: Link Authentication has been disabled.
hotStandbyClear	225	normal	Indicates that the Primary Link Was Activated. Contains a single parameter which is its description: 1 - Description: Primary Link Is Active.
sfpExtraction	226	normal	Indicates that a device was extracted from SFP Port
sfpPort1Clear	227	normal	Indicates the SFP port 1 status changed to connected. Contains two parameters: 1 - Description: SFP port 1 status changed to connected - %s 2 - %s Is the Eth. mode (speed & duplex)
compatibleIdus	228	normal	Indicates that the ODU has identified compatible Idus on both sides of the link.

RADWIN Manager Traps

The RADWIN Manager application issues traps to indicate various events. These traps are shown in the RADWIN Managerr Events Log.

A list of Trap Messages as displayed by the RADWIN Manager is shown in table **7-5**.

Appendix K

External Alarms Specification

External Alarms Specification

The IDU-C supports external input and output alarms through a standard DB25 pin female connector.

Input alarms

The input alarms are raised by events from external equipment, such as a fire warning, door open or air conditioner failure.

Output alarms

Output alarms are generated through dry contact relays to indicate various system events according to the following table. An alarm is raised if at least one of the conditions is met.

Table K-1: Output Alarms Description

Alarm	Description	Alarm On Conditions	Alarm Off Condition
Output 1	Air interface Alarm	• Link is down • Link in installation mode • Link authentication problem	Link is up or equipment alarm is ON
Output 2	Equipment Alarm	• Built in Test (BIT) error • No connection to the ODU	Both ODU and IDU are in operational state
Output 3	Service Alarm at Site B	N/A	Permanently off
Output 4	Power Failure at Site B	Link Loss due to Power Failure at Site B	Link is up or down without power failure indication within the last two seconds

Appendix L

Regional Notice: French Canadian

Procédures de sécurité

Généralités

Avant de manipuler du matériel connecté à des lignes électriques ou de télécommunications, il est conseillé de se défaire de bijoux ou de tout autre objet métallique qui pourrait entrer en contact avec les éléments sous tension.

Mise à la terre

Tous les produits RADWIN doivent être mis à la terre pendant l'usage courant. La mise à la terre est assurée en reliant la fiche d'alimentation à une prise de courant avec une protection de terre. En outre:

- La cosse de masse sur l'IDU-C doit être constamment connectée à la protection de terre, par un câble de diamètre de 18 AWG ou plus. Le matériel monté sur rack doit être installé seulement sur des racks ou armoires reliés à la terre
- Une ODU doit mise à la terre par un câble de diamètre de 12 AWG ou plus
- Il ne doit pas y avoir de fusibles ou d'interrupteurs sur la connection à la terre

De plus:

- Il faut toujours connecter la terre en premier et la déconnecter en dernier
- Il ne faut jamais connecter les câbles de télécommunication à du matériel non à la terre
- Il faut s'assurer que tous les autres câbles sont déconnectés avant de déconnecter la terre

Protection contre la foudre

L'utilisation de dispositifs de protection contre la foudre dépend des exigences réglementaires et de l'utilisateur final. Toutes les unités extérieures RADWIN sont conçues avec des circuits de limitation de surtension afin de minimiser les risques de dommages dus à la foudre. RADWIN conseille l'utilisation d'un dispositif de parafoudre supplémentaire afin de protéger le matériel de coups de foudre proches.

Matériel supplémentaire requis

L'équipement requis pour l'installation du matériel est le suivant:

- Pince à sertir RJ-45 (si un câble pré-assemblé ODU/IDU n'est pas utilisé)
- Perceuse (pour le montage sur mur seulement)
- Câbles de terre IDU et ODU
- Clef 13 mm (½″)
- Câble ODU - IDU si non commandé (type extérieur, CAT-5e, 4 paires torsadées, 24 AWG)
- Colliers de serrage
- Ordinateur portable avec Windows 2000 ou Windows XP.

Précautions de sécurité pendant le montage de ODU

Avant de connecter un câble à l'ODU, la borne protectrice de masse (visse) de l'ODU doit être connectée à un conducteur externe protecteur ou à un pylône relié à la terre. Il ne doit pas y avoir de fusibles ou d'interrupteurs sur la connection à la terre.

Seulement un personnel qualifié utilisant l'équipement de sécurité approprié doit pouvoir monter sur le pylône d'antenne. De même, l'installation ou le démontage de ODU ou de pylônes doit être effectuée seulement par des professionnels ayant suivi une formation.

Pour monter l'ODU:

1. Vérifier que les supports de fixation de l'ODU sont correctement mis à la terre.
2. Monter l'unité ODU sur le pylône ou sur le mur; se référer à la **Installation sur pylône et mur** au dessous.
3. Connecter la câble de terre au point de châssis sur l'ODU.
4. Relier le câble ODU-IDU au connecteur ODU RJ-45.
5. Visser les presses-étoupe de câbles pour assurer le scellement hermétique des unités ODU.
6. Attacher le *câble au pylône ou aux supports en utilisant des colliers classés* UV.
7. Répéter la procédure sur le site distant.

Prudence

Ne pas se placer en face d'une ODU sous tension.

Connecter la terre à IDU-C

Connecter un câble de terre de 18 AWG à la borne de masse de l'appareil. L'appareil doit être constamment connecté à la terre.

Prudence

- Les appareils sont prévus pour être installés par un personnel de service.
- Les appareils doivent être connectés à une prise de courant avec une protection de terre.
- Le courant CC du IDU-C doit être fourni par l'intermédiaire d'un disjoncteur bipolaire et le diamètre du câble doit être de 14 mm avec un conduit de 16 mm.

Installation sur pylône et mur

L' ODU ou l'O-PoE peuvent être montés sur un pylône ou un mur.

Contenu du kit de montage ODU

Le kit de montage ODU comprend les pièces suivantes:

- une grande clame (voir figure **L-1**)
- une *petite clame* (voir figure **L-2**)
- un bras (voir figure **L-3**)
- quatre visses hex tête M8x40
- deux visses hex tête M8x70
- quatre rondelles plates M8
- trois rondelles élastiques M8
- deux écrous M8.

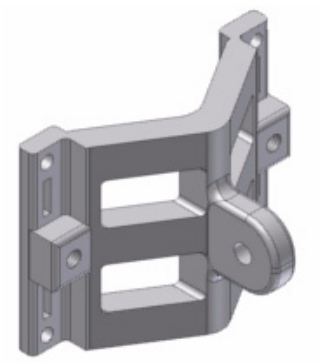


Figure L-1: grande clame

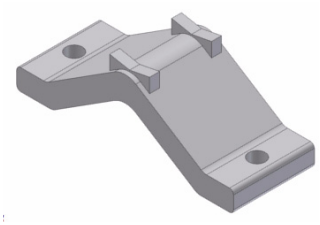


Figure L-2: petite clame

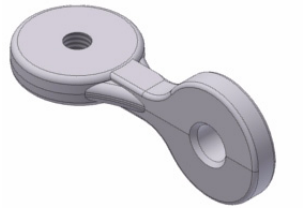


Figure L-3: bras

Montage sur un pylône

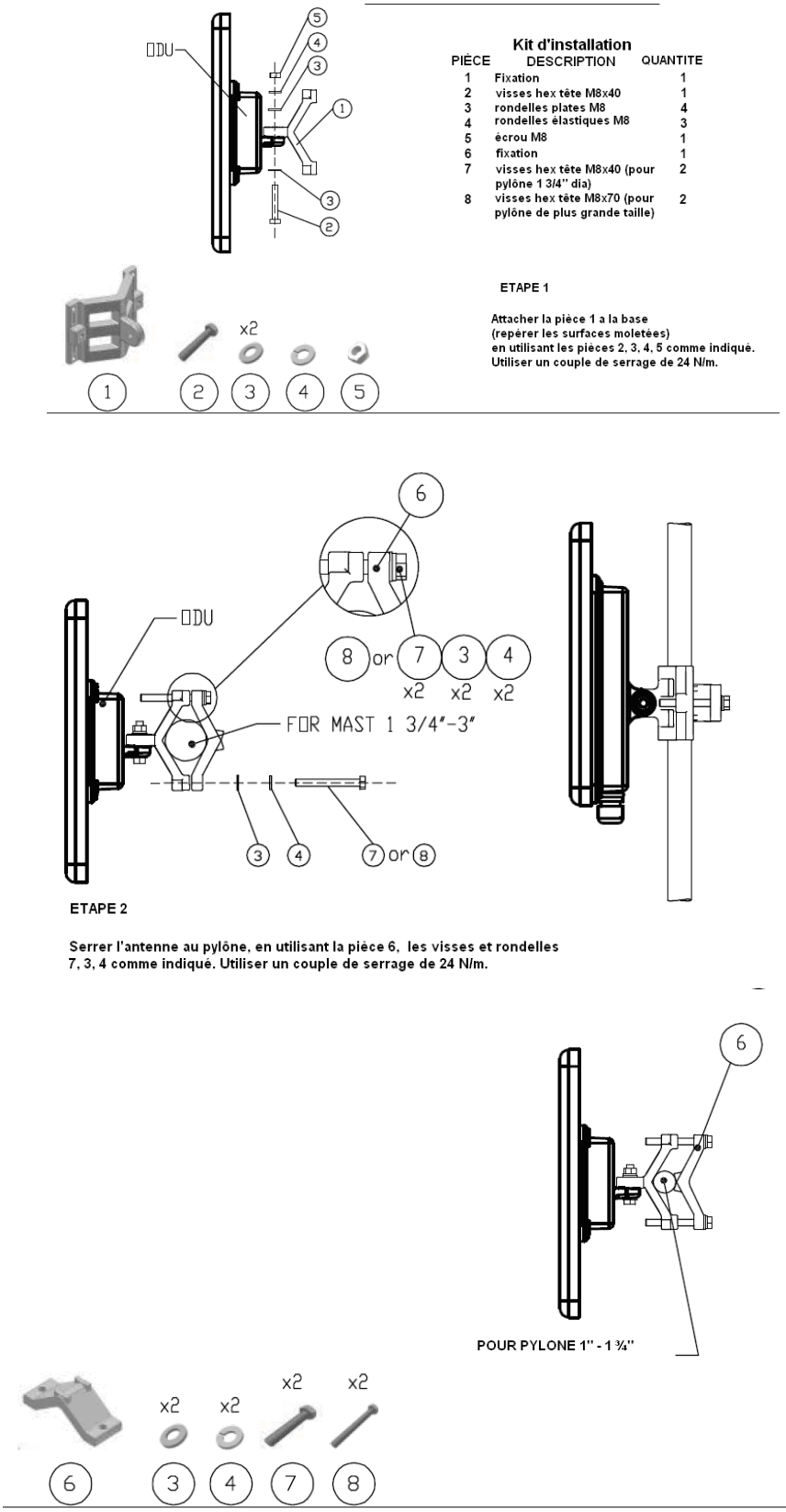
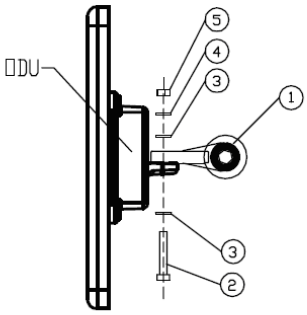


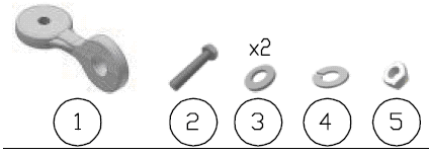
Figure L-4: Montage sur un pylône

Montage sur un mur



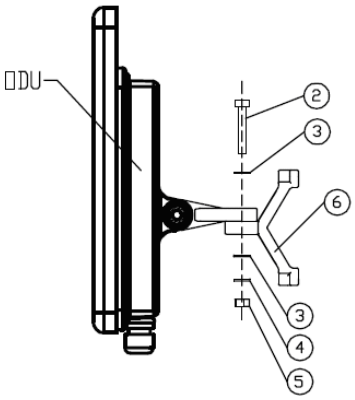
Kit d'installation

PIÈCE	DESCRIPTION	QUANTITE
1	Bras	1
2	visses hex tête M8x40	2
3	rondelles plates M	4
4	rondelles élastiques M8	2
5	écrou M8	2
6	base	1

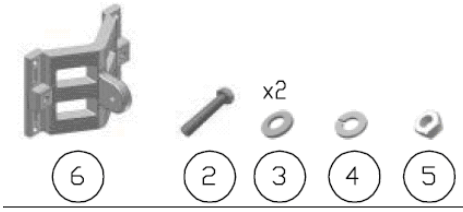


ETAPE 1

Attacher la pièce 1 a la base (repé rer les surfaces moletées) en utilisant les pièces 2, 3, 4, 5 comme indiqué. Utiliser un couple de serrage de 24 N/m.



ETAPE 2



Attacher la pièce 6 au bras (repérer les surfaces moletées) en utilisant les pièces 2, 3, 4, 5 comme indiqué. Utiliser un couple de serrage de 24 N/m.

ETAPE 3

Installer l'antenne sur le mur (maté riel fourni par le client)

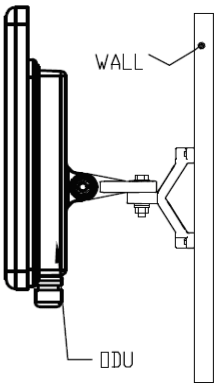


Figure L-5: Montage sur un mur

Montage d'une antenne externe

L'antenne externe optionnelle peut être montée sur un pylône.

Contenu du kit de montage d'une antenne externe

Le kit de montage d'une antenne externe comprend les pièces suivantes

- Douze rondelles plates
- Huit rondelles élastiques
- Huit écrous hex
- Quatre boulons
- Un support en U
- Un support à pivotement
- Deux courroies de fixation en métal

Pour installer une antenne externe sur un pylône:

1. Attacher le support en U à l'arrière de l'antenne en utilisant quatre rondelles plates, quatre rondelles élastiques et quatre écrous hex.
2. Attacher le support à pivotement au support en U en utilisant huit rondelles plates, quatre rondelles élastiques, quatre écrous hex et quatre boulons.
3. Passer les deux courroies de fixation par les fentes verticales dans le support à pivotement.
4. Attacher l'antenne au pylône en utilisant les deux courroies de fixation .

Ajuster l'inclinaison nécessaire en utilisant l'échelle angulaire et serrer tous les boulons et écrous à la position requise.

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