USER MANUAL

RADWIN 2000 BROADBAND WIRELESS TRANSMISSION SYSTEM

Release 2.8.20

RADWIN

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 by FCC rules 47 CFR part 15.204.



Warning

It is the responsibility of the installer to ensure that when configuring the radio in the United States (or where FCC rules apply), the Tx power is set according to the values for which the product is certified. The use of Tx power values other than those, for which the product is certified, is expressly forbidden by FCC rules 47 CFR 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. The installer should configure the output power level of antennas according to country regulations and antenna type.

Warning

- Where Outdoor units are configurable by software to Tx power values other than those for which the product is certified, it is the responsibility of the Professional Installer to restrict the Tx power to the certified limits.
- The RADWIN 2000 2.5GHz BAND device (FCC ID: Q3KRW2025) complies with FCC RF radiation exposure limits. This equipment should be installed and operated with a minimum distance of 104.6cm between the radiator and your body for 2.5 GHz operations
- This product was tested with special accessories - indoor unit (IDU or PoE), FTP CAT 5e shielded cable with sealing gasket, 10 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 numérique de la classe B est conforme à 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.

HAZLOC Compliance

The following compliance statements apply to the RADWIN 2000 C series:

The product codes which are HAZLOC compliant have the following form:

RW-abcd-Hefg

where:

a = 2 (RADWIN 2000 C series)

b = 9/8/2/0 (Frequency standard: Universal, BRS, ETSI, FCC and B – Argentina)

cd = 23/25/30/44/48/49/50/54/60/64 (Frequency band: 2.3, 2.5, 3.0, 4.4, 4.8, 4.9, 5.8, 6.0, and 6.4GHz)

H = Hazloc compliant

e = 1 / 2 (Integrated / External antenna)

fg = 200/100/50/25/10 (Capacity: 200, 100, 50, 25Mbps)

This equipment is suitable for use in Class 1, Division 2, Groups A, B, C and D or non-hazardous locations only. Use only the supplied Power over Ethernet PSU.

Warning

EXPLOSION HAZARD – Do not disconnect while circuit is live unless area is know to be non-hazardous.

Avertissement

RISQUE D'EXPLOSION – Ne pas débrancher tant que le circuit est sous tension à moins qu'il ne s'agisse d'un emplacement non dangereux.

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USER MANUAL

RADWIN 2000 BROADBAND WIRELESS TRANSMISSION SYSTEM

Release 2.8.20

Part 1: Basic Installation

RADWIN

Chapter 1

About this User Manual

Manual Structure

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

Table 1-1: User Manual - General layout

Section	General Content	Purpose
1	Basic Installation and Configuration	Core information to physically install a link: Site preparation and hardware Installation
2	Site Synchronization	Intra-site with Hub Site Synchronization, inter-site with the GPS Synchronization Unit
3	Advanced Installation Topics	Software upgrade, VLAN, QoS, Radar Mitigation, Dynamic Frequency Selection (Radar avoidance), Capacity upgrade
4	Field Installation Topics	Link Budget Calculator, Spectrum View, Web interface
5	Product Reference	Technical specifications, wiring tables, MIB reference

Typographical Convention

Where a term is defined or introduced for the first time, it is shown in **Boldface**.

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. Tables for most part, use 7 or 8 point fonts. Here are a few pointers for hard-copy printing:

- The text and table typefaces used are 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 ink jet printers also give good output

Notifications

Notifications consist of Warnings, Cautions and Notes.



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



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



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

Occasionally we use a Note as a **Tip**:



This is about a useful short-cut or method not otherwise obvious.

Terminology

- **Universal bands** refer to RADWIN Universal bands as described above.
- **3.X or 3.X GHz** refers to the frequency range 3.3 – 3.8GHz
- **BRS** refers to the 2.5 GHz band subject to the FCC BRS regulations
- A **3.X** ODU is an ODU pre configured to operate in the 3.X GHz licensed bands
- A **3.X Link** in a RADWIN 2000 link using a pair of 3.X ODUs
- **High Resolution Bands** - Channel minimum step is 250 KHz. applies to 3.475 - 3.650 GHz IC, 3.4 -3.7 GHz ETSI and the 3.3 - 3.8 GHz Universal band.
- **Low Resolution Bands** - Channel minimum step is 1 MHz. Applies to FCC regulations in the 3.650 - 3.675 GHz band.
- In the field, a link typically has a local or headquarters site as for example in **Figure 1-1** 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 occasionally 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 switch
  - **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.
- The terms **uplink** and **downlink**, originate from the field of Satellite communications. In a backhaul or ISP context, **uplink** is from the user to the network and **downlink** is from the network to the user.

Chapter 2

Introduction

Welcome to RADWIN 2000!

RADWIN 2000 is a portfolio of carrier-class wireless broadband radios in the sub-6 GHz range. These radios offer unmatched performance and robustness.

The RADWIN 2000 portfolio consists of four product series:

- RADWIN 2000 A - Series supporting either 25 Mbps aggregate net throughput and up to 4 E1s/T1s or 10 Mbps aggregate net throughput, Ethernet only
- RADWIN 2000 B - Series supporting 50 Mbps aggregated net throughput and Up to 8 E1/T1
- RADWIN 2000 C - Series supporting 200 Mbps aggregate net throughput and up to 16 E1s/T1s
- RADWIN 2000 X - Series supporting 20 Mbps aggregate net throughput and up to 3 E1s or 4 T1s

What's new in Release 2.8.20

GA 2.8.20 release is available as a software upgrade for eligible products as set out in the Compatibility section of the 2.8.20 Release Note.

The main changes in GA release 2.8.20 since the last GA release, 2.8.00 are:

Ethernet Hub Site Synchronization (EHSS)

EHSS may be used to collocate several RADWIN 2000 radios without use of HSS cables and an external HSS unit. The conditions for its use are:

- The ODU hardware levels must be as in the following table:

Table 2-1: EHSS Support - Minimum Hardware levels

Family	Hardware Level
RADWIN 2000 A	4
RADWIN 2000 B RADWIN 2000 C	9

- Ethernet connectivity is required between collocated units using any one of an IDU-C, IDU-E or IDU-H.

Some EHSS highlights are:

- EHSS supports both Ethernet and TDM services
- EHSS configuration using the RADWIN Manager is similar to that of the existing Serial HSS (SHSS)
- EHSS uses VLAN to separate EHSS sync signals from traffic
- EHSS enabled ODUs with a Sync port may be collocated with Serial HSS enabled units

Extreme Cold Resistant Products

Variants of existing ODU and IDU-C products capable of operating at temperatures as low as -55ºC are available. Please contact Customer Support for details.

SNMPv3 Support

- **Confidentiality** - Encryption of packets to prevent unauthorized "snooping"
- **Integrity** - Ensure that packets have not been tampered with in transit including an optional packet replay protection mechanism
- **Authentication** - Validation of message source
- **Security** - DES security level
- Applies to RADWIN 2000 A, RADWIN 2000 B and RADWIN 2000 C. series
- SNMPv1 support is retained for customers requiring it. Further, the newest releases of the RADWIN Manager will continue to support SNMPv1 for ODUs not upgraded to the current release.

Backup and Restore Configuration Between Different ODUs

The Backup/Restore facility enables you to backup the ODU software and carry out a configuration-only or full software restore. Subject to certain limitations, you may also restore to another ODU of the same type.

New Regulations

5.8 GHz ETSI for 40MHz channel bandwidth is available. You should ensure that it is permitted for your location.

Supported Frequencies Summary

Table 2-2: Frequencies for *RADWIN 2000* families (Other than 6.4 GHz)

RADWIN 2000 Series	Frequency bands	Channel Bandwidth (MHz)	Capacity (Mbps)	TDMs
A-Series	5.x GHz ETSI, Universal,WPC	5/10/20	25, aggregate net throughput	4
			10, aggregate net throughput	
C-Series	• 3.4 ETSI, 3.5 ETSI, 3.6 ETSI (*) • 3.5 IC, Universal, 3.6 FCC/IC[a]	5/10/20	100, aggregate net throughput	16 E1/T1
	• 5.8 GHz FCC/IC • 5.9 GHz Universal • 5.7 GHz Universal • 5.8 GHz MII China • 5.8 GHz WPC India • 5.4 GHz FCC (20 MHz) • 5.4 GHz IC • 5.4 GHz Universal • 5.4 ETSI • 5.3 GHz IC • 5.3 GHz FCC (20MHz) • 5.3 GHz Universal • 4.9 GHz Universal • 4.9 GHz FCC/IC • 4.8 GHz Universal • 4.8 GHz per Argentina Regulations	5/10/20/40[b]	200, aggregate net throughput	16 E1/T1
B - Series	4.9 GHz FCC, multi frequency 5.x GHz	5/10/20	50, aggregate net throughput	8 E1/T1
	5.8 GHz FCC/IC, multi frequency 5.x GHz			
	5.4 GHz ETSI, multi frequency 5.x GHz			
	5.4 GHz Universal, multi frequency 5.x GHz			
	6.0 GHz Universal			
	5.8 GHz WPC			
	2.4 GHz ETSI	5/10/20/40		
	2.4 GHz Universal			
X - Series	• 3.4 ETSI, 3.5 ETSI, 3.6 ETSI • 3.5 IC, Universal, 3.6 FCC/IC[b]	5/10/20	20, aggregate net throughput	3 E1/4 T1

a. Supports restricted mode only
b. Supports restricted mode only

Table 2-3: Frequencies for *RADWIN 2000* 6.4 GHz products

RADWIN 2000 Series	Frequency bands	Channel Bandwidth (MHz)	Capacity (Mbps)	TDMs
C series	6.4 GHz Universal	10/20	100, aggregate net throughput	16 E1/T1
B series	6.4 GHz Universal		50, aggregate net throughput	8 E1/T1



- **Table 1-1** applies both to integrated and connectorized ODUs.
- The B Series product include small form factor integrated models, connectorized for alternative use with external antennas
- (*) ETSI uses a split band as follows.
  - 3.403 - 3.490 GHz up to 16 dBm
  - 3.470 - 3.610 GHz up to 23 dBm
  - 3.590 - 3.710 GHz up to 25 dBm

  See also **page 21-9**.

Key Features of RADWIN 2000

» **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, depending on model.

» **GbE support**

GbE support is available for Ethernet services only using a GbE PoE device or IDU-C0.

» **High Capacity**

The RADWIN 2000 system provides a high-capacity link of up to 200 Mbps net aggregate throughput

» **Superior Spectral Efficiency**

Built on advanced MIMO and OFDM technologies, the RADWIN 2000 system provides a high-capacity link at channel bandwidths of 5, 10 and 20 MHz. These channel bandwidths supports high robustness of the air interface under interference and harsh conditions.

» **Multi-band Products**

Every RADWIN 2000 Multi-band radio supports multiple frequency bands. The RADWIN 2000 Multi-band products support the regulations of FCC, IC Canada, ETSI and WPC India. DFS is supported where required by regulation.

» **Telco grade**

Extremely robust performance under harsh weather conditions

» **Operates in nLOS/NLOS and dense environments**

» **Advanced Air Interface**

The RADWIN 2000 system provides an advanced air-interface based on MIMO, antenna diversity and OFDM technologies, resulting in an exceptionally robust air interface and high frequency band granularity.

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 re-send the information. This process is repeated until the transmission is error free or the error continues beyond a pre-determined 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**

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).

The 5 GHz bands support a maximum Tx power of 25 dBm whereas the 2.4 GHz band supports a maximum Tx power of 26 dBm.



Maximum allowable Tx power may be limited by local regulations.

» **Superior range performance - up to 120 Km/75 miles**

The RADWIN 2000 system supports high capacity at superior ranges. The Link Budget Calculator (**Chapter 20**) is used to determine the capacity and range according to the choice of product, antenna, type of service and environmental conditions.

» **HSS Interoperability between RADWIN 2000 and other RADWIN radio products**

In addition to the legacy Serial HSS, RADWIN 2000 now supports Ethernet HSS, requiring nothing more than Ethernet connectivity between collocated ODUs. Ethernet HSS support is model dependent.

» **Monitored Hot Standby (1+1):**

The RADWIN Monitored Hot Standby (MHS) protects up to sixteen E1/T1 services with RADWIN 2000. It is designed to provide high reliability high-capacity Point-to-Point Links. The RADWIN MHS **is** -

- Designed to provide redundancy and high reliability for carrier class operators
- Optimized for high capacity links operating in license-free bands
- A comprehensive solution providing protection against both equipment failure and loss of air interface, by simple connectivity between a primary link and a secondary link

- Able to use a different band for maximum protection to the air interface

The main **features** of the RADWIN MHS are –

- Cut-over from the primary to the secondary link completely automatic
- Cut-over time no more than 50 ms
- Automatic restore to primary link as soon as it becomes available

A major **benefit** of RADWIN MHS is that is can underpin an affordable Service Level Agreement structure.

MHS supports TDM services; Ethernet services are carried by both links independently.

» **Spectrum View**

Spectrum View displays a visual representation of spectrum availability during the link installation. It is an RF survey tool supporting the link installation prior to service activation.

Use Spectrum View to assist you to choose the operating channel.

» **Diversity**

RADWIN 2000 links using dual-pole antennas may be configured to transmit the same data through both radios. This feature provides added data transmission integrity under harsh 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 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) recommendations.

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

- Supports SNMPv3

» **SFP support in the IDU-C and IDU-H**

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.

» **Separate management and traffic VLAN support**

» **Ethernet Ring Topology**

» **QoS Support (RADWIN 2000 C based links)**

QoS enables Operator and Service Providers to offer delay-sensitive services such as VoIP, IP-TV, time critical applications and online games.

» **Web based Management**

Manage and control a RADWIN link using a Web browser (MS Internet Explorer, Mozilla Firefox, Google Chrome) or from a **smartphone**.

Components of a RADWIN 2000 Link

Major Components

A link consists of a pair of hardware-identical sites. The major element of each site is the ODU radio transceiver. The ODU actually contains two radios, which may be connected to a dual pole integrated or external antenna. The ODU itself is connected to a PoE device or an IDU that provides power and L2 ethernet data transport. The PoE or IDU provides an Ethernet LAN connection to user equipment (typically a switch).

Accessories

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

- PoE devices - Both Gigabit and 100 Mbps
- HSS unit - Collocation unit for intra-site synchronization
- IDU-H Aggregation unit for a collocated hub site instead of multiple PoE devices
- GSU for inter-site synchronization
- Antennas
- AC Power Adaptors
- ODU and antenna mounting kits
- Lightning protector for use with all RADWIN outdoor products
- Ethernet repeater - enables you to extend non-GbE PoE - ODU cables beyond the 100m limit
- CAT 5e cables of various lengths specifically for use with RADWIN radios and PoE devices
- Grounding cables

Link Management Tools

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 intuitive, easy-to-use RADWIN Manager has a conventional 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
- Local and remote loopback testing
- Configuration Wizard and site settings
- Integrated software upgrade utility
- Spectrum View utility
- QoS management
- VLAN management
- 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 SNMPv1 and SNMPv3 based NMS system.

RADWIN Web Interface for Management

The Web Interface enables you to carry out basic link management functions using a Web browser. It is an easy way to rapidly configure and setup a link.

It may be used to -

- Establish a link on a minimal basis for Ethernet only
- Check link parameters and make basic changes
- View the link Inventory
- Inspect the Recent Events logs

Full details are supplied in **Chapter 26**.

RADWIN Network Management System (RNMS)

The RADWIN Network Management System enables Service Providers to manage all RADWIN links in their network from a Network Operations Center (NOC).

Using RNMS, Service Providers can configure and monitor up to 10,000 RADWIN links[1]. The intuitive easy-to-use RNMS provides a full range of network surveillance, monitoring, configu-

1. Depending on license type

ration and fault management capabilities. It offers users complete visibility and control over their RADWIN-based networks.

Documentation supplied with RADWIN 2000

The technical documentation supplied with a RADWIN 2000, is located on the product 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
- Link Budget Calculator

Chapter 3

Site Survey

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 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 radio installation (**on-site**).

The Site Survey

Introduction

RADWIN 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 equipment.
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 **Chapter 26** 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 equipment or using the RADWIN Manager) to determine the expected performance.

Stage 2: Physical Survey

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



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 **Chapter 26**).
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.



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

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 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 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 installation site, to determine whether there are available channels within the radio 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.



It is possible to install the 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 marker in the Quality bar on the Channel Setting window (see **Figure 6-6**) moving into the green area.

RF Planning for Dense Installations and Collocated Sites

Interference may arise from

- Self interference from collocated RADWIN radios
- Other collocated radio devices installed on the same site.

To avoid or minimize interference, follow these recommendations:

- For collocated RADWIN units, use an HSS unit to synchronize between them. Select a different operating channels for each collocated RADWIN unit.
- If one or more collocated units are not RADWIN units, ensure that there is a physical separation of at least three meters between a RADWIN unit and any other collocated radio on the site.
- Use the largest possible frequency gap between these units.
- Choose the best frequency channel (as clear as possible form interference). You may have to use the Change Band facility available for all RADWIN 2000 products.
- To select a frequency channel, move the link to **Installation Mode** (using Site configuration) and start the Installation wizard. In the **Channel Settings** window, use the quality bar at the bottom to help you choose a better channel (clearer of interference).
- Use the **Spectrum View** tool to find the best working channel (**Tools | Spectrum View**).

- Decreasing the Tx Power of a link will reduce collocation interference (**Site Configuration | Air Interface**).


Note

Use the Link Budget Calculator to determine the minimum Tx Power required to maintain link stability.

Chapter 4

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 3**. It is intended to guide qualified field technicians.

Note

The material in this chapter is generic to all RADWIN radio link products unless stated otherwise.

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 re-sellers or distributors are not liable for injury, damage or violation of regulations associated with the installation of outdoor units or antennas.

This chapter covers the following topics:

- Unpacking and checking supplied equipment:
  - ODUs
  - IDUs
  - PoE devices
  - IDU-H aggregation unit
  - Antennas
  - Accessories
- Tools required for installation
- Safety practices
- Mounting an ODU
- Connecting an ODU
- Grounding and lightning protection for an ODU
- Network connection
- Powering up
- Establishing a radio link

What's in the box

Unpacking and Checking

➢ **For each of the items below, do the following:**

1. Remove the equipment from the box.
2. Check that everything listed on the included Bill of Materials or Pro-forma Invoice is present.
3. If any item is missing, contact Customer Service. You will be advised whether to return the package for replacement, or whether the missing item can be supplied separately.
4. Do not dispose of the packaging until the unit is installed and operational.

ODU Radios

A RADWIN 2000 ODU package includes the following items:

- One ODU - see the next figure for front and rear view

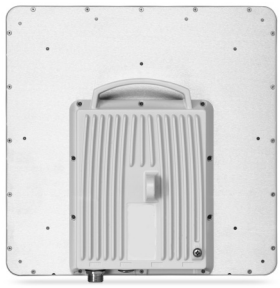
	Front	Rear
Connectorized		
Integrated Antenna		

Figure 4-1: Standard ODU Form Factors - All series other than A and B

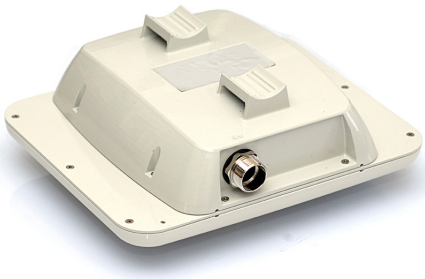
	Front	Rear
Connectorized		
Integrated Antenna		

Figure 4-2: Small form factor ODU: A and B series only

- An ODU mounting kit
- A CD containing -
  - the RADWIN Manager
  - Quick Start Guide
  - User Manual - the document you are reading
  - Link Budget Calculator
- A self-adhesive label showing the MAC address and the alternative Community string. You should keep this label in a safe place
- Cable glands (to be used with the ODU-IDU cable)

Further to **Figure 4-2** above:

- **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 (IP67) case.
- **Connectorized ODU**

  This ODU has 2xN-type connectors for connecting an external antenna
- **Embedded (Connectorized) ODU**

  The Embedded ODU has two N-type connectors for an external antenna and a built-in low gain antenna.
- **The small form factor ODU package**

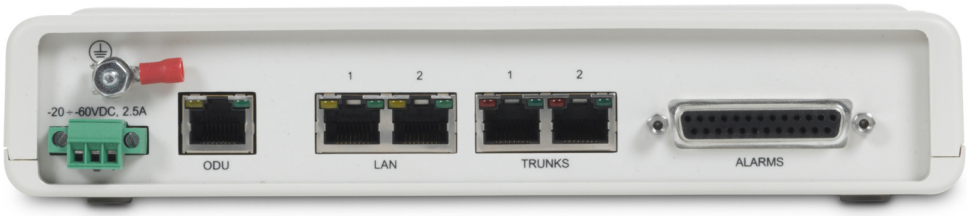
  It also contains a special mounting kit adapter and two metal ties.

IDU-E Package Contents

- IDU-E
- AC/DC Converter
- IDU-E wall-mounting drilling template
- Self adhesive label showing the IDU LED operation



Figure 4-3: IDU-E- front view



IDU-E: Rear panel

IDU-C Package Contents

The IDU-C package contains:

- IDU-C - see **Figure 4-4** below.
- 19" rack mounting kit - see **Figure 4-6** below
- Two DC power plugs for power cables - see **Figure 4-6** below

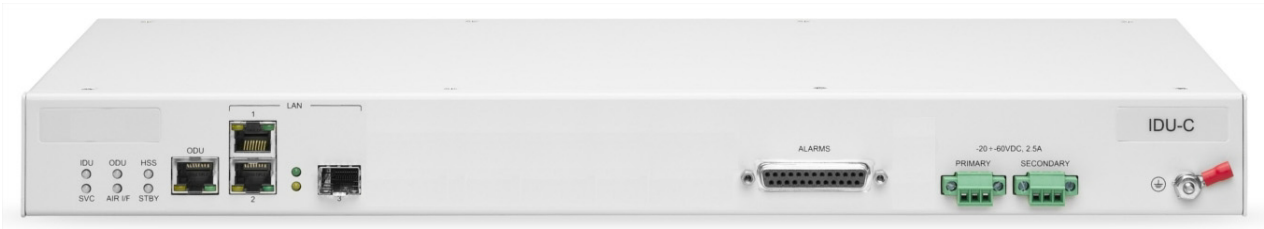


Figure 4-4: IDU-C Package contents - the IDU-C, Ethernet only

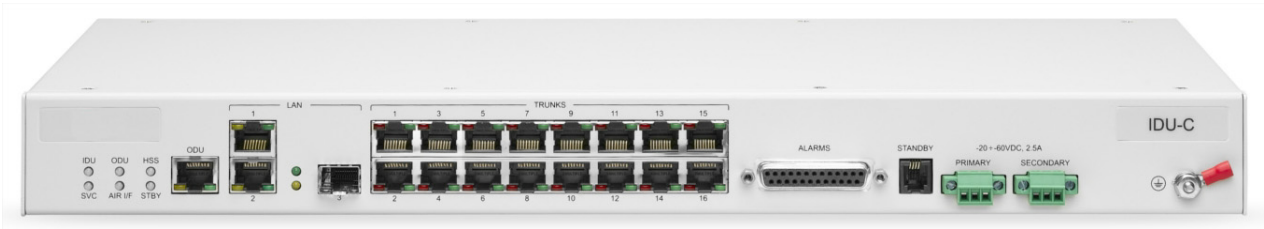


Figure 4-5: IDU-C Package contents - the IDU-C, 16 E1/T1 ports

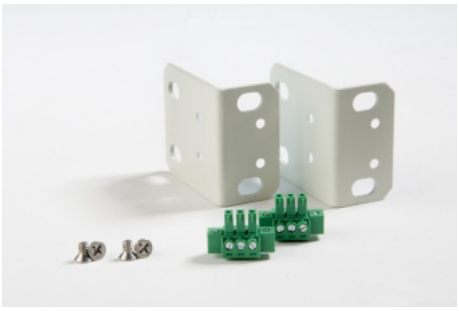


Figure 4-6: IDU-C Package contents - the mounting kit and DC power plugs

Power over Ethernet (PoE) Devices



RADWIN's Gigabit Power over Ethernet (GbE PoE) device provides data and power to RADWIN 2000 outdoor units. The PoE device is available with a variety of AC cables with different plug types.

This is the recommended PoE device for use with all RADWIN radios.

The unit comes with a VAC cable. Both the cable length and plug are region dependent.

Figure 4-7: GbE PoE device



The Outdoor (Ruggedized) DC PoE Device may be used for all RADWIN radios. It will not support Gigabit performance. Two models are available using power input of 20 to 60 VDC or 10 to 30 VDC. The unit may be installed in a vehicle using respectively 24VDC or 12VDC power circuits.

Figure 4-8: Ruggedized DC-PoE Device

IDU-H aggregation unit

The IDU-H provides aggregation for multiple RADWIN ODUs at a hub site. It supports all RADWIN ODUs. It features -

- Six PoE ports (PoE legacy mode / RADWIN PoE)
- Up to 25W per PoE port
- 2 LAN Interfaces 10/100/1000 Mbps; auto-negotiation
- SFP Interfaces: 2 x SFP ports of 1000 Mbps (standard MSA)

It is 19" rack mounted, 1U and half width. Power feeding is 44VDC - 56VDC, Dual redundant inputs through standard IDU-C type adapters.

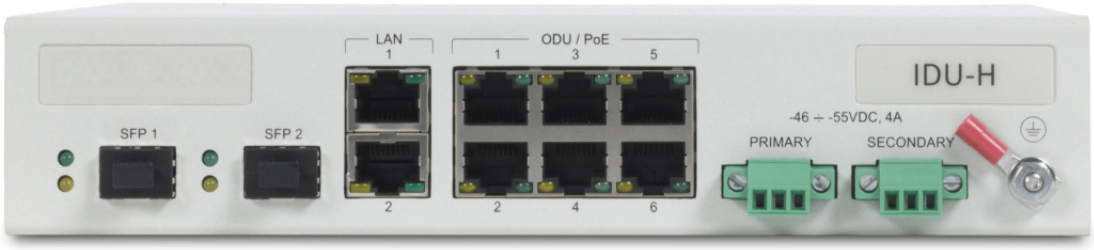


Figure 4-9: IDU-H front panel

The IDU-H package contains:

- One IDU-H
- One short mounting ear
- One long mounting ear
- One dual connector to join two units mounted side by side
- Two DC power plugs for power cables - see **Figure 4-10** below

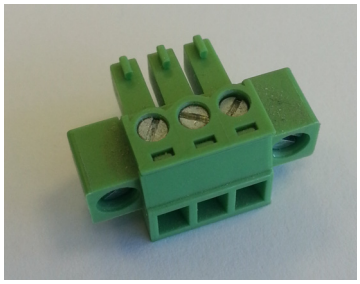


Figure 4-10: DC three pin power plug

The power connectors are 3 pin in line female, with polarities (left to right) minus, ground, plus. If required, an AC/DC power adapter should be ordered separately, depending on your region.

The IDU-H may be installed in single or double configurations:



Figure 4-11: IDU-H front view - single configuration



Figure 4-12: IDU-H front view - double configuration

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 4-13: ODU with integrated Flat Panel antenna

External Antennas

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

The Flat Panel antenna shown below can be used either as an integrated or external antenna.

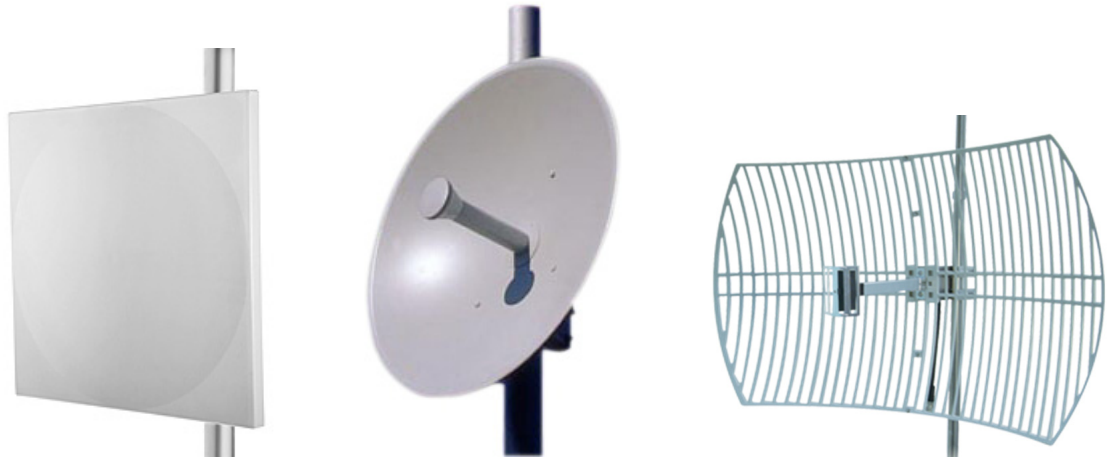


Figure 4-14: External Antennas for use with *RADWIN 2000*

Antenna Kits

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

See the RADWIN products catalog for a more detailed offering of external antennas. External

A typical antenna kit contains -

- An antenna
- Two RF cables 1.2 m (4') long
- Mounting kit

Accessories

Hub Site Synchronization (HSS) Unit

The HSS unit synchronizes collocated ODUs to prevent self interference. It is particularly useful at a multi-sector base station employing several ODUs.

A single HSS unit supports up to ten collocated ODUs. In addition to each unit being connected to its PoE device, the collocated unit has an additional cable that is connected to the HSS Unit. The HSS Unit is a compact, weatherproof (IP67) connector box that is installed on the same mast as the ODUs. All collocated units connect to this box using an HSS cable. Cables in prepared lengths are available for purchase.

The HSS unit is supplied with ten protective covers; any port not in use must be closed with a protective cover.

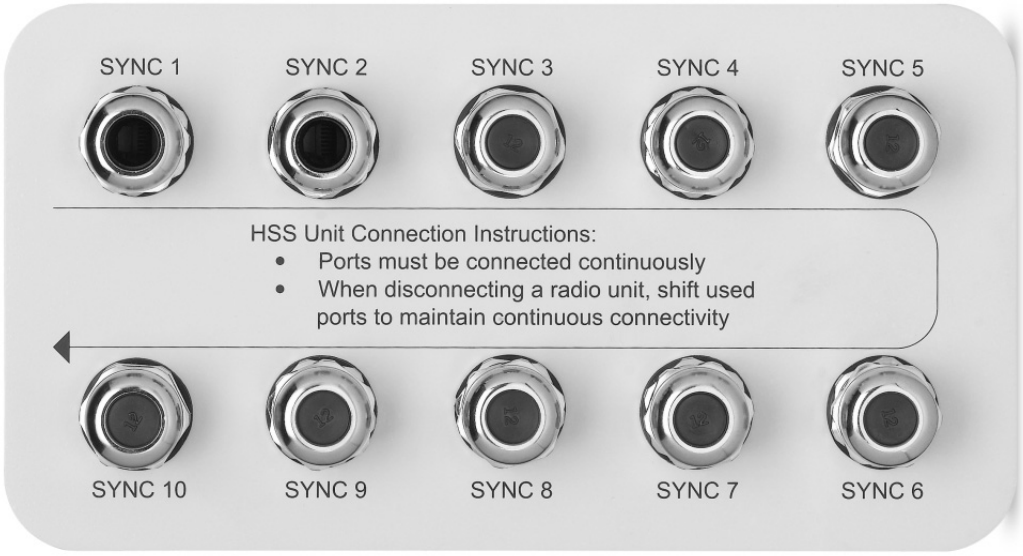


Figure 4-15: HSS Interconnection Unit

See **Chapter 11** and **Chapter 12** for further details about the use of HSS.

RADWIN GSU

The GPS-based synchronization unit (GSU) is designed to handle inter-site interferences under large-scale deployment scenarios.

The RADWIN GSU is an outdoor unit consisting of GPS antenna and a PoE device.

The RADWIN GSU is connected to the HSS Unit using a standard HSS cable. It synchronizes the transmission timing of multiple Hub-Sites to the same clock source thus eliminating self interference (see **Chapter 14**).

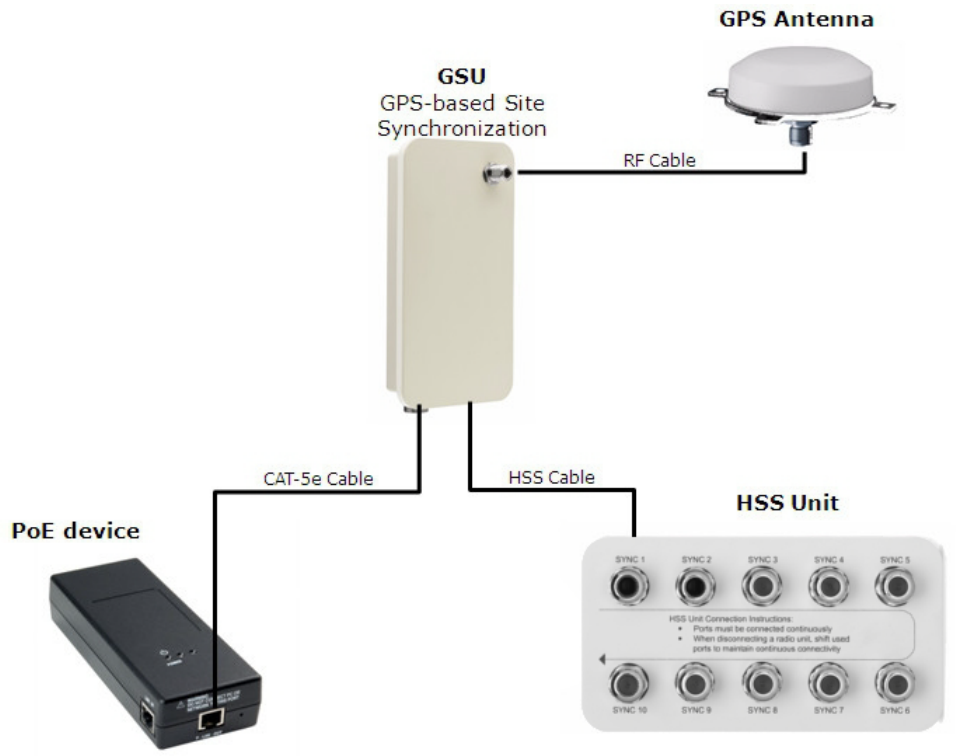


Figure 4-16: General GSU configuration

Lightning Protector Unit (LPU)

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. It is designed for use with RADWIN products.



Figure 4-17: RADWIN Lightning Protector

The lightning protector incorporates high-power gas discharge tube and current transistor protection in a single protector unit. Technical specifications are shown in **Appendix A**.

Ethernet cable Repeater

The RADWIN Ethernet repeater enables you to extend the PoE to ODU cable beyond the 100m limit (but no more than 200m). The unit looks physically like the lightning protection device in **Figure 4-17**. Its use is very simple as shown in the following schematic:

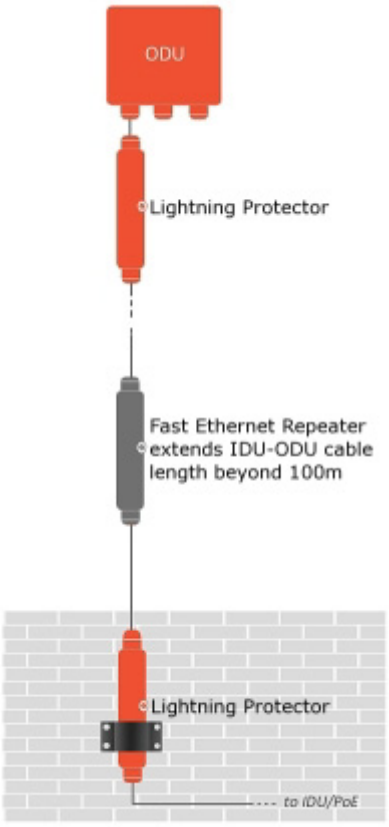


Figure 4-18: Using an Ethernet repeater with lightning protectors

Note

The Ethernet repeater cannot be used with GbE IDU-ODU cables.

Tools required for installation

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-PoE cable is without connectors)
- Spanner/wrench 13 mm (½")
- Drill (for wall mounting only)
- Cable ties
- Sealing material
- Waterproofing tape such as Scotch 23 Tape ¾" wide, from 3M to ensure IP-67 compliant protection against water and dust

Cables and connectors

- ODU grounding cable 10 AWG
- ODU-PoE cable (outdoor class, CAT-5e, 4 twisted pairs, 24AWG):
  - Up to 100 m. for 100BaseT connection.

- For a 1000BaseT connection (HBS only) use an ODU-PoE cable no longer than 75m.



For 1000BaseT, you should use RADWIN supplied ODU-PoE cables, which guarantees 1Gb performance. RADWIN cannot guarantee 1Gb performance if you use third party cables.

- External CAT-5e cable diameter should be between 7-9 mm to ensure waterproof sealing.

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:

- All ODUs should be earthed by a wire with diameter of at least **10 AWG**.

  RADWIN 2000 ODUs 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. RADWIN 2000 ODUs must be grounded to a Protective Earth in accordance with the Local Electrical Regulations.
- The earth lug on any IDU 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

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 lightning protector devices to protect the equipment from nearby lightning strikes.

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 devices, always use the AC power adapter supplied by RADWIN.
- Use the right tools!
- Do not mount an ODU upside down or horizontally. Doing this may void you product warranty.

Internal ESD Protection circuits

RADWIN equipment 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/PoE are Transformer-isolated and include internal ESD (Electro-Static-Discharge) Protection circuits.

Before Field Installing ODUs

Prior to installing ODUs in the filed, you might like to consider pre-loading them with their intended IP addresses. In a large dispersed network this would be done in the warehouse ahead of deployment. To do this, see **Chapter 25** for details.

Hardware Installation Workflow for a RADWIN 2000 Link

Installing a Link

Site Survey

The Site Survey is carried out as described in **Chapter 3**. Recall that the Site Survey has three main steps:

- Stage 1: Preliminary Survey
- Stage 2: Physical Survey
- Stage 3: RF Survey

Site preparation

Site Preparation includes -

- Obtaining any necessary legal and statutory permits for installation of radio equipment
- Clearing physical obstructions as far as possible
- Erecting a mast or tower if required. A mast-sited ODU typically uses a pole attached to the mast.
- Installing a pole on a building wall if required

- Constructing a weather-proof cabinet to house a PoE device or other IDU if it is not to be housed indoors
- Ensuring availability of power, typically standard local AC power
- Ensuring that there is a LAN cable in place from the user's switch to the PoE/IDU location

Mounting a Standard Form Factor ODU

Use a mounting kit to mount the ODU on a pole as shown in the following figures:

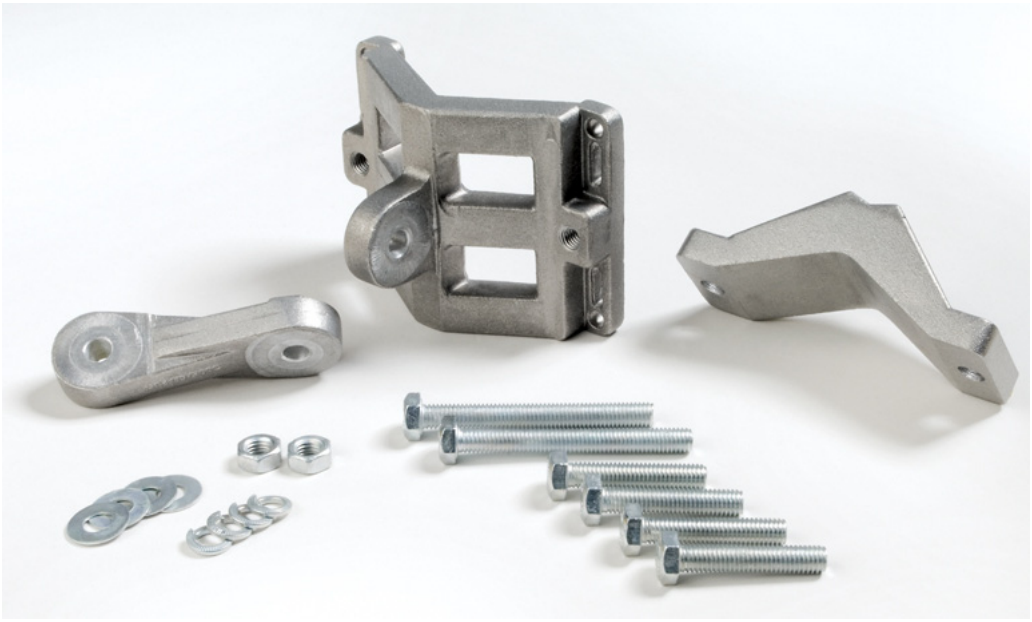


Figure 4-19: Standard form factor Standard Mounting kit

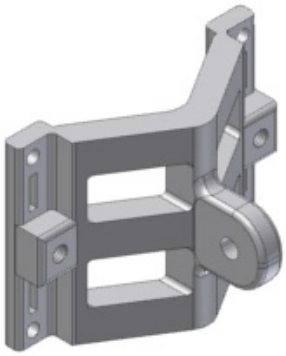


Figure 4-20: Large Clamp

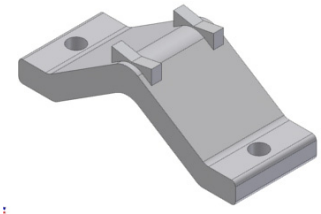


Figure 4-21: Small Clamp

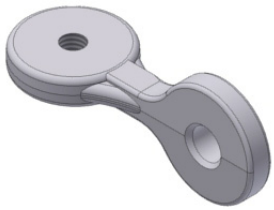


Figure 4-22: Arm

Table 4-1: Bill of Materials: Standard mounting kit

Item No.	Description	Quantity
1	Large Clamp (see **Figure 4-20**)	1
2	Small Clamp (see **Figure 4-21**)	1
3	Arm (see **Figure 4-22**)	1
4	Screw hex head M8x40	4
5	Screw hex head M8x70	2
6	Washer flat M8	4
7	Washer spring M8	3
8	M8 Nuts	2

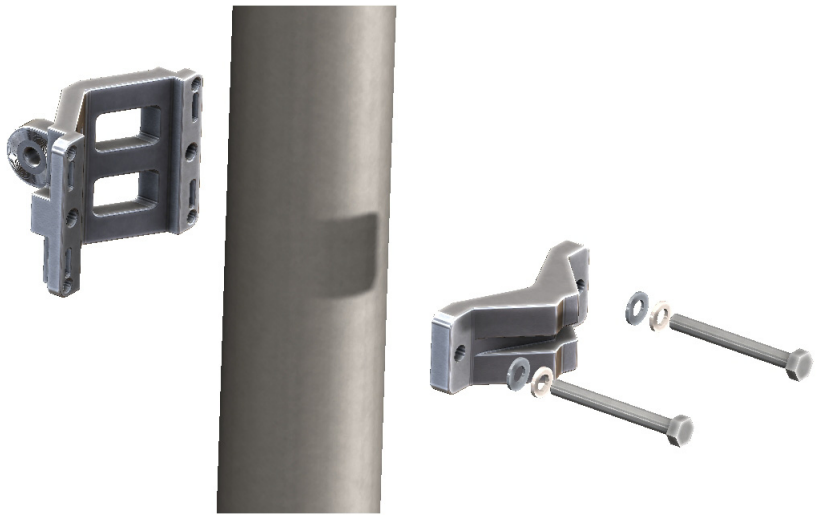


Figure 4-23: Attaching the mounting kit to the pole

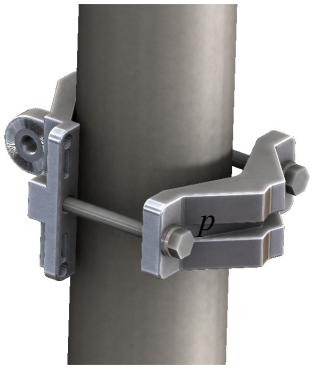


Figure 4-24: Mounting kit in place on the pole



Figure 4-25: Mounted connectorized ODU



Figure 4-26: Mounted ODU: Integrated antenna

The purpose of the arm (**Figure 4-22**), is to enable single-pole antennas (deprecated) to be rotated through 90° for correct vertical alignment or simply to distance the antenna or ODU from the pole.

Grounding the ODU

There is a grounding lug on the rear of the ODU as shown in **Figure 4-27**. Connect it to ground using 10 AWG wire. Grounding is often carried out in conjunction with lightning protection.



Figure 4-27: ODU: Grounding lug

Mounting a Small Form Factor ODU

A small form factor ODU mounting kit has a mounting kit adapter and two metal ties:



Figure 4-28: Small form factor ODU - *Rear, metal tie*

The mounting ties are threaded through the mounting slots provided and the unit mounted on a pole.

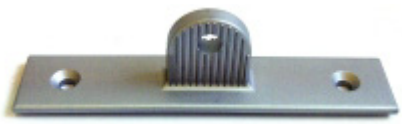


Figure 4-29: Mounting adapter

Table 4-2: Mounting adapter kit for small form factor ODUs

Item No.	Description	Quantity
1	Metal ties	2
2	Mounting adapter	1
3	Screw M5x10, CSK, Phillips, stainless steel	2

The mounting adapter is used with the standard mounting kit shown in **Figure 4-19**. It is not included in the ODU package and must be ordered separately.

➢ **To mount a small form factor ODU using a mounting kit:**

1. Referring to **Figure 4-30** below: Secure the adapter (3) to the rear of the ODU (2) using the two screws provided (4). Use a Phillips screwdriver set to a torque of 2.0 NM.

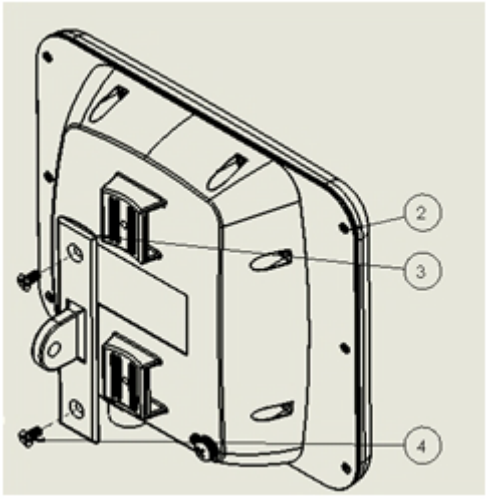


Figure 4-30: Securing the mounting adapter

2. Referring to **Figure 4-31** below: Attach the ODU mounting kit (1) to the mounting adapter ear (4) and proceed as above, for a standard ODU.

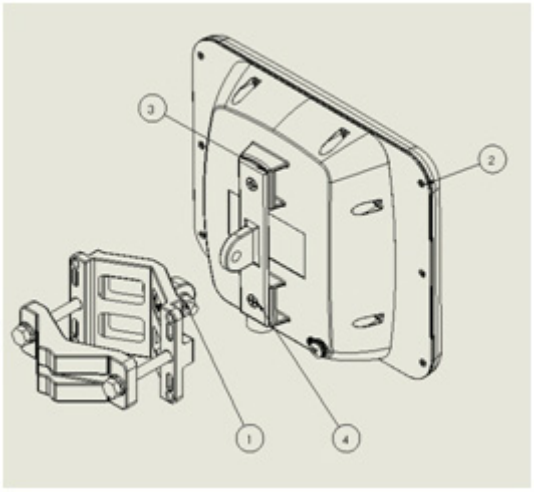


Figure 4-31: Attaching a standard mounting kit

Note

- When mounting an ODU on a pole or wall, ensure that the unit is oriented so that the cable connectors are at the bottom.
- Do not mount an ODU horizontally
- For an ODU with an integrated antenna: Do not tighten the ODU to its mounting bracket until the antenna alignment process is complete.
- Ensure that there are no direct obstructions in front of the ODU or interference from man-made obstacles.

Installing a PoE device

The PoE device (**Figure 4-7**) is a very simple piece of equipment. It has a recessed three pin AC power plug, a matching power cable, a LAN-In port (from a switch), a LAN-Out port (to the ODU) and a power LED, green under normal operation. It is typically strapped into a network equipment rack using plastic ties. It may also sit free on a tray or table-top.

Connecting the ODU to the PoE device

Connect the HBS to the LAN-Out port only. It will not work on the LAN-In port.

Connecting the PoE Device to a Network

Connect the PoE to network equipment such as a switch from the LAN-In port. Connecting network equipment to the LAN-Out port may damage it.

Powering up the ODU from a Poe Device

Connecting the ODU port labelled IDU to a powered up PoE is sufficient. If you have not already closed and weather-sealed the ODU IDU port, then inside it you can see an amber colored power LED which turn green when the ODU is configured. (See **Chapter 6**.)

The IDU-H: An Alternative to PoE Devices

Using an IDU-H instead of several PoE devices

The IDU-H is an aggregation switch with the functionality of six PoE devices. It is ideal for use at a site having several collocated ODUs. It also affords the connectivity required to use Ethernet HSS for collocation (see **Chapter 13**).

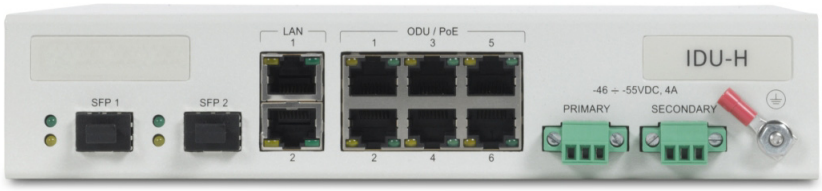


Figure 4-32: IDU-H front panel

Installing an IDU-H

The IDU-H can sit on a table top, but is best installed in a rack using the supplied ears as in **Figure 4-11** and **Figure 4-12**.

Connecting the ODU to an IDU-H

Connect the ODU IDU port to any of the six PoE ports of the IDU-H.

Connecting the IDU-H device to a network

The IDU-H has two LAN ports, either of which may be used for network connection.

Grounding and Powering Up the IDU-H

The IDU-H has redundant power connection circuits. An enlarged view of the power connectors is shown in below:

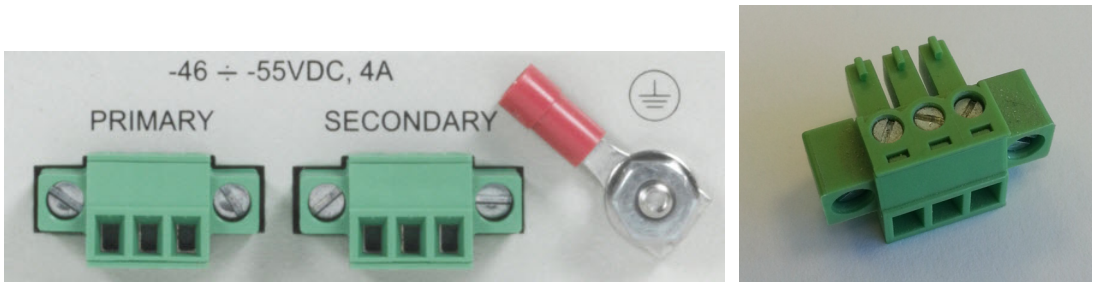


Figure 4-33: IDU-H power connectors, grounding lug and power plug.

- For direct DC connection: The connectors are 3 pin in line female, with polarities (left to right) minus, ground, plus.
- For AC connection: To avoid damage to the IDU-H, always use an AC/DC adapter and power plug supplied by RADWIN.

Warning

Ground the unit with a 10 AWG wire before applying power.

IDU-H - Functional Overview

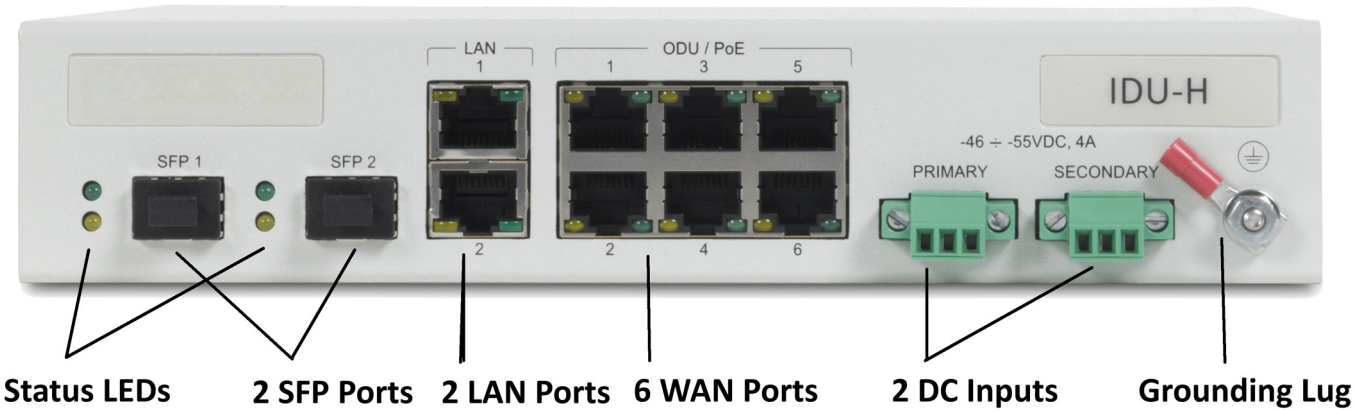


Figure 4-34: IDU-H front panel

The front panel is very straight forward: The SFP ports are standard. The LAN ports are Ethernet and support GbE. The six ODU WAN ports function identically to the LAN-Out port on a PoE device.

The IDU-H LEDs

Table 4-3: IDU-H LED Indicators

Port	Green	Yellow
WAN (2xRJ45 LEDs)	Link / Activity	Duplex or Port's PoE status (configurable)
LAN (2xRJ45 LEDs)	Link / Activity	Duplex
SFP (2 panel mounted LEDs)	Link / Activity	Duplex

Installing an IDU-E

The IDU-E can be wall mounted, placed on a desktop or take up one half of a 1U rack slot. The unit looks deceptively like a simple domestic router: It is not. It must be properly grounded, cabled to the ODU and connected to power using the supplied AC/DC adapter.

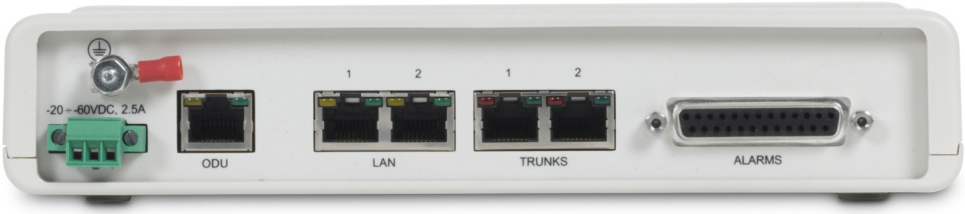


Figure 4-35: IDU-E: Rear panel

Although the three pin power plug is physically similar to that of the other IDUs, the power requirements are quite different:

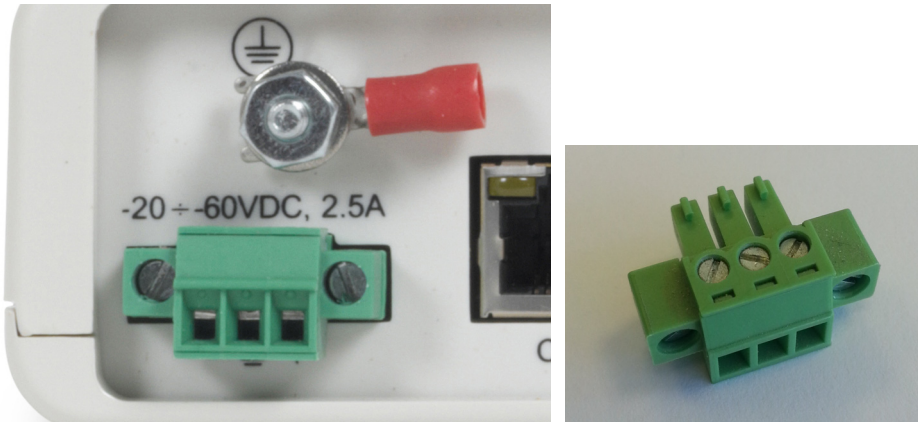


Figure 4-36: IDU-E power connector, grounding lug and power plug

- For direct DC connection: The connector is a 3 pin in line female, with polarities (left to right) minus, ground, plus.
- For AC connection: To avoid damage to the IDU-H, always use an AC/DC adapter and power plug supplied by RADWIN.

IDU-E LEDs

The IDU-E LEDs share the same functionality as the corresponding IDU-C LEDs. They are described in the next section.

Mounting an IDU-C

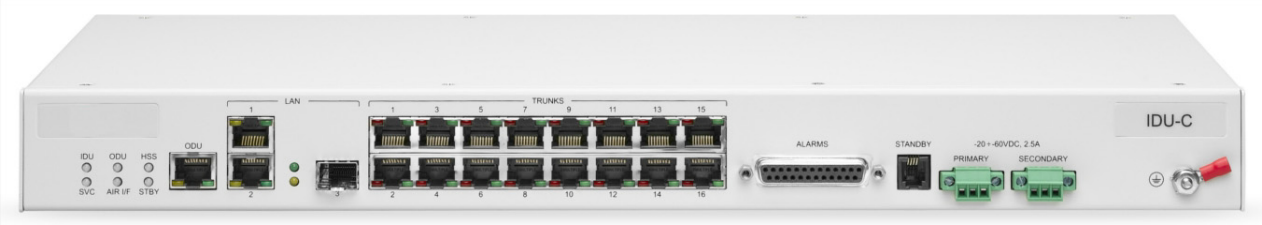


Figure 4-37: IDU-C Package contents - the IDU-C, 16 E1/T1 ports

IDU-Cs are all rack mountable, as shown in **Figure 4-38**. A front panel keyed schematic of a rack mounted IDU-C is shown in the figure below.

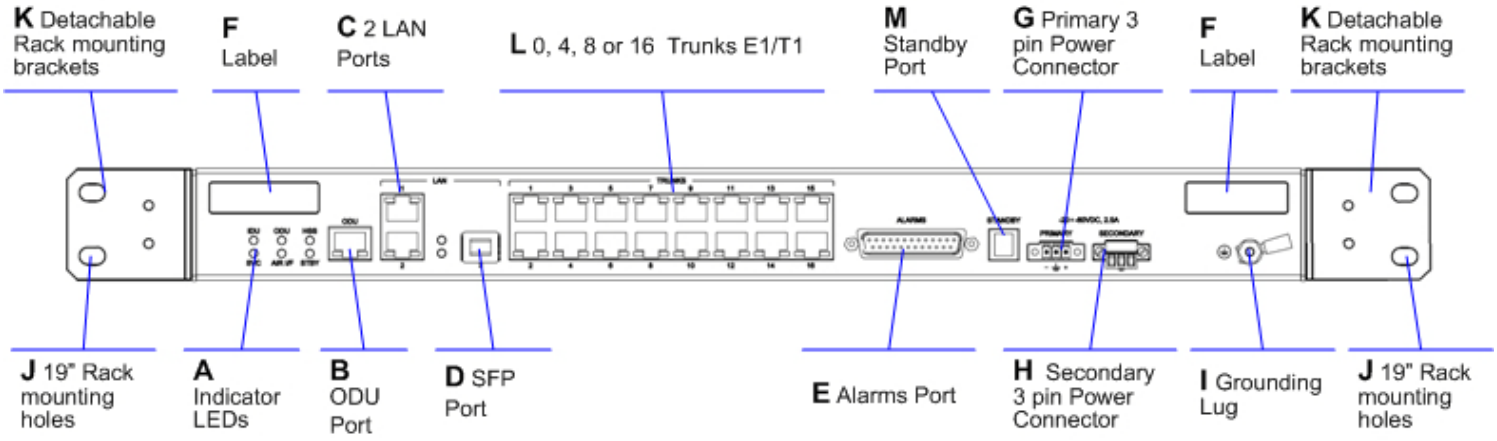


Figure 4-38: IDU-C front panel

Further description of the keyed items in **Figure 4-38** is shown in **Table 4-4** below:

Table 4-4: Components of an IDU-C front panel

Key	Label	Remarks
A	Indicator LEDs	See **Figure 4-39**.
B	ODU Port	RJ-45 connector, see **Table B-1**.
C	LAN RJ45Ports	Ethernet, RJ-45 connector, see **Table B-3**.
D	LAN SFP Port and Status LEDs	See **Appendix C**.
E	Alarm Ports	Standard DB25 female connector, see **Table B-7**.
F	Label indent	Place for adhesive identification labels.
G	Primary 3 pin Power Connector	Standard 3 pins in line power connector, see **Table B-8**.
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 B-4**.
M	Standby Port	Hot Standby ready: HSB cable socket, see **Table B-5**.

The Indicator LEDs (Item A in **Table 4-4** above) are shown in more detail below:



Figure 4-39: IDU-C Front Panel LEDs

The IDU-E Front Panel LEDS look like this and are functionally the same as the IDU-C LEDs.

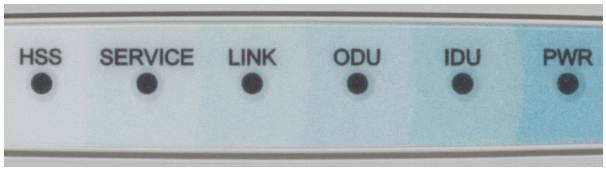


Figure 4-40: IDU-E Front Panel LEDs

The purpose of the LEDs is shown in **Table 4-5** below:

Table 4-5: IDU-C Front Panel LEDs

Name	Color	Function
IDU	Green Blinking Green Red Blinking Orange	IDU operational During power-up only Failure During power-up; continues if ODU fails to load IDU firmware. Also, when using an IDU-C to replace a PoE device in which case all other LEDs off.
ODU	Green Red	ODU-to-IDU communication link is operating ODU-to-IDU communication link is disrupted

Table 4-5: IDU-C Front Panel LEDs (Continued)

Name	Color	Function	
AIR I/F	Green Orange Red	Wireless link is synchronized During installation mode; also signals software mismatch on some identical ODUs Wireless link lost synchronization	
SVC	Green Orange Blinking Orange Red Off	E1 or T1 line is synchronized Alarm detected at the opposite site interface; Normal or LOSS Local or remote loopback Alarm detected at this site interface Ethernet only IDU or E1/T1 not configured	
HSS	See supplementary **Table 4-6** following.		
STBY		**Hot Standby Mode - for use with Trunks only**	**Link State**
	Green Blinking Green Red Orange Off	Primary Secondary Primary Secondary Off	Active Not active Not active Active HSM not activated
		Hot Standby Mode - For use with Ethernet only in a 1+1 Ring application)	**Link State**
	Green Blinking Green Red Orange Off	Hardware ready	

Table 4-6: IDU-C and IDU-E Front Panel LEDs for HSS

Color	Function
Green	This ODU is HSS master, generating signal, and HSS Sync is OK
Blinking Green	This ODU is a HSS client and in Sync
Red	HSS not operational due to improper signal detection. This ODU is not transmitting
Orange	HSS is operational. One of the following conditions apply: • This ODU is a master that is generating signals and detecting signals • This ODU is a master that is generating signals but detected improper signals • This ODU is a client "Continue Tx" but is not detecting signals • This ODU is a client "Disable Tx" and is detecting signals from multiple sources All orange cases transmit.
Off	HSS is not activated Disconnection between ODU and IDU

To rack-mount an IDU-C (The keys refer to Figure 4-38):

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.

Mounting External Antennas

Mounting a Flat Panel External Antenna

Typically, a flat panel antenna such as that shown in **Figure 4-14** is used. It has four bolts for a mounting kit adapter.

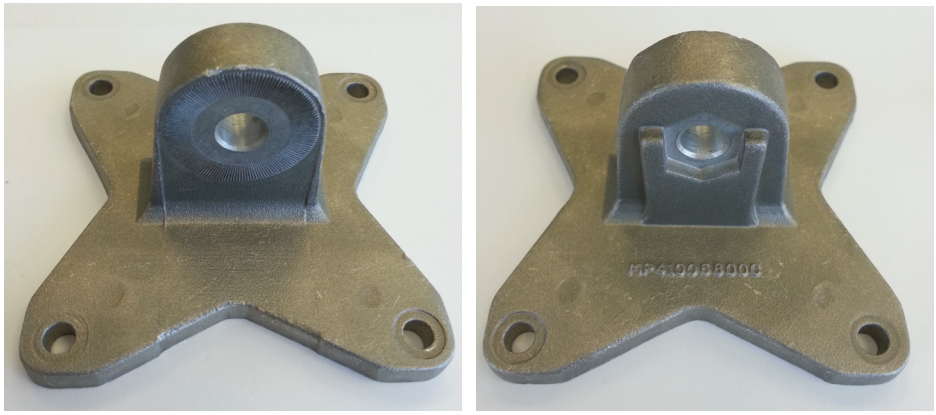


Figure 4-41: Flat panel antenna mounting kit adapter

It is mounted on a pole in exactly the same manner as the ODU itself using the adapter shown in **Figure 4-41**. The left hand view in shows the knurled surface adjacent to the mounting kit ear. The right hand view shows the recess for the mounting kit holding nut.



Figure 4-42: Flat Panel antenna - rear with mounting kit adapter



Figure 4-43: Flat Panel antenna - mounted

Other Antenna Types

Many of the antennas of the types shown in **Figure 4-14** use the standard mounting kit of **Figure 4-19**. Some third party antennas use pole clamps, similar to those shown below:

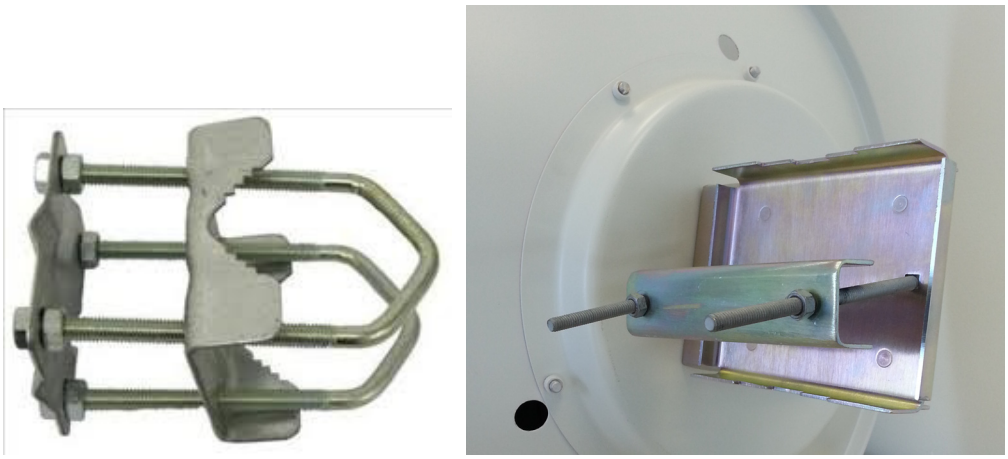


Figure 4-44: Pole clamps for external antennas

Grounding an External Antenna

External antennas should be individually grounded using a suitable Grounding Kit such as an Andrew Type 223158-2 (**http://www.commscope.com**).

Warning

Do not stand in front of a live 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 lightning protector devices to protect the equipment from nearby lightning strikes.

In what follows, ODU may be any type of RADWIN outdoor radio unit and IDU may be any type of RADWIN IDU used with such products (PoEs, IDU-H, IDU-C etc.)



Figure 4-45: RADWIN Lightning Protection Kit

Table 4-7: LPU Kit contents

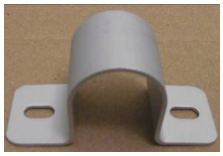
Item	Quantity	View/Remarks
LPU (shown wrapped)	1	
U wall clamp	1	

Table 4-7: LPU Kit contents (Continued)

Item	Quantity	View/Remarks
RJ-45 connectors (shown wrapped)	2	
0.5m CAT-5e cable	1	
Metal tie	1	
Quick Installation Guide	1	Pamphlet

For any type of IDU-ODU connection, lightning protection units (LPUs) are installed in pairs, as shown in the next figure:

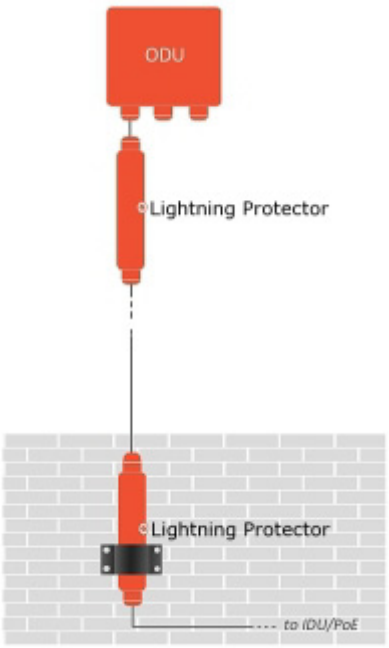
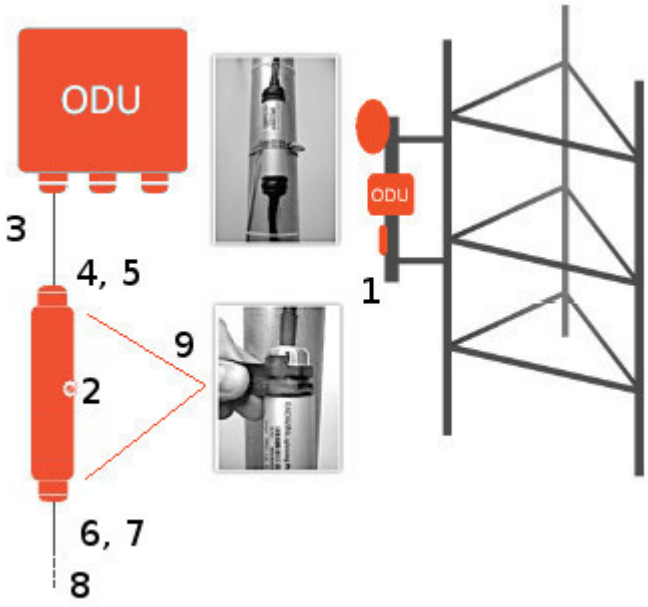


Figure 4-46: Basic use of lightning protectors

To install a LPU on a pole adjacent to an ODU (HBS or HSU):

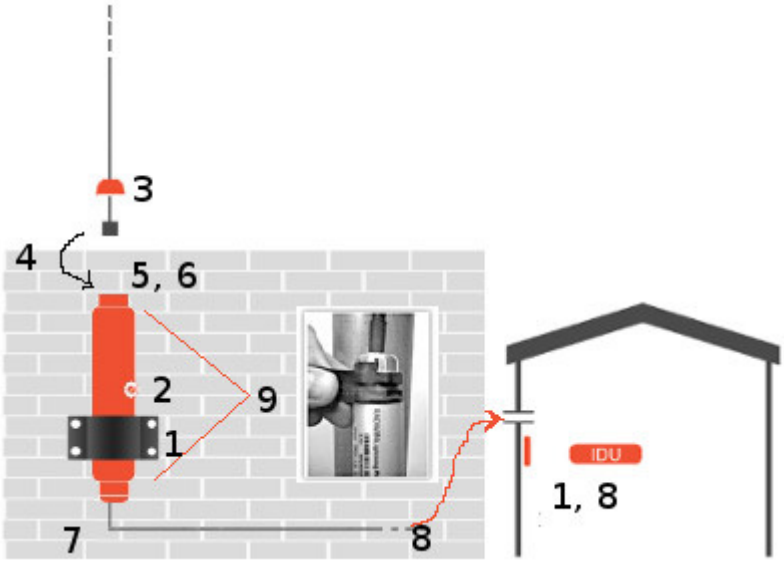
1. Mount one LPU on the ODU pole, as close as possible to the ODU.
2. Ground the LPU to the pole using the grounding lug.
3. Connect the 0.5 meter CAT-5e cable to the IDU port of the ODU.
4. Connect the other end of the cable to the top of the LPU.
5. Tighten the top cable LPU gland cap.
6. Connect the main ODU-IDU cable from the IDU to the bottom end of the LPU.



7. Tighten the bottom cable LPU gland cap.
8. Run the main ODU-IDU cable towards the IDU location.
9. Insulate both LPU connections. See the next section, **Additional Consideration for Waterproofing** below.

To install a LPU on a wall adjacent to an IDU (PoE or IDU-H):

1. Use the supplied wall clamp to mount the second LPU as close as possible to the indoor access point to the IDU.
2. Ground the LPU to an earth strip using the grounding lug.
3. Remove the top cable LPU gland cap together with the rubber sealing tube.
4. Thread the IDU cable from the upper LPU, through the removed cap from the previous step.



5. Plug it in to the top of the LPU.
6. Screw down and tighten the LPU cap.
7. Connect the 0.5 m CAT-5e cable to the Bottom of the LPU.

8. Connect the other end (via the indoor access point) to the IDU.
9. Insulate both LPU connections. See the next section, **Additional Consideration for Waterproofing** below.

Additional Consideration for Waterproofing
Lightning Protectors and Ethernet Repeaters

If these units are installed at locations heavily exposed to heavy dust, rain or corrosive moisture (for example, close to the sea), you should protect them further as in the following procedure. In the remainder of this section, "unit" refers to either a Lightning Protection Unit or a Repeater.

➢ **To seal a unit against excessive dust and moisture:**

1. Obtain a high quality sealing material such as Scotch 23 Tape ¾" wide, from 3M to ensure IP-67 compliant protection against water and dust.
2. Cut two pieces each 25 cm long, of Scotch 23 splicing tape. Remove the plastic cover to expose the tacky side of the sealing tape as shown in **Figure 4-47**.

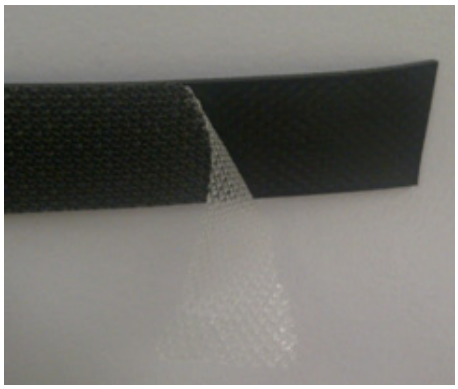


Figure 4-47: Exposing the tack side of the sealing tape

3. After connecting the short CAT-5 IDU/ODU cable (provided in the box) from the ODU to the unit, tighten the cable gland cap firmly and use the insulation tape scotch 23 to fully cover both of the cable glands.
4. Connect the tape with tacky side up on the cable gland cap and the CAT-5 cable. Start at **Start Point** at the bottom of the cable gland as shown in **Figure 4-48**. Finish at **End Point** of the CAT-5 cable, 2.5cm after the end of the shrink tubing. Stretch the tape and apply half-overlapped to form gap-free joint.

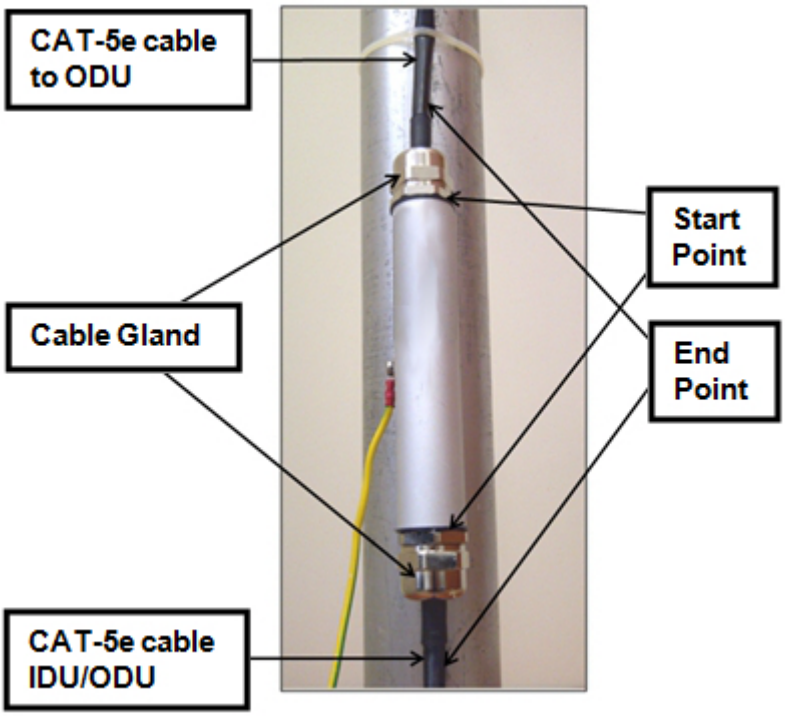


Figure 4-48: Start and End points for protective-taping the unit

5. Wrap two layers of any scotch vinyl plastic electrical type (e.g Scotch Super 88 Vinyl Plastic Tape from 3M) to protect the joints as shown in **Figure 4-49**. Ensure that the bottom of the cable gland and the end of the CAT-5 cable are covered with the sealing splicing tape and with vinyl plastic tape.



Figure 4-49: Protecting the unit joints with vinyl tape

6. Mount the unit on the pole using the mounting ring as shown in **Figure 4-50**. Ground the unit using the GND screw. For lightning protection, repeat the same procedure to install the second unit connected to the IDU.

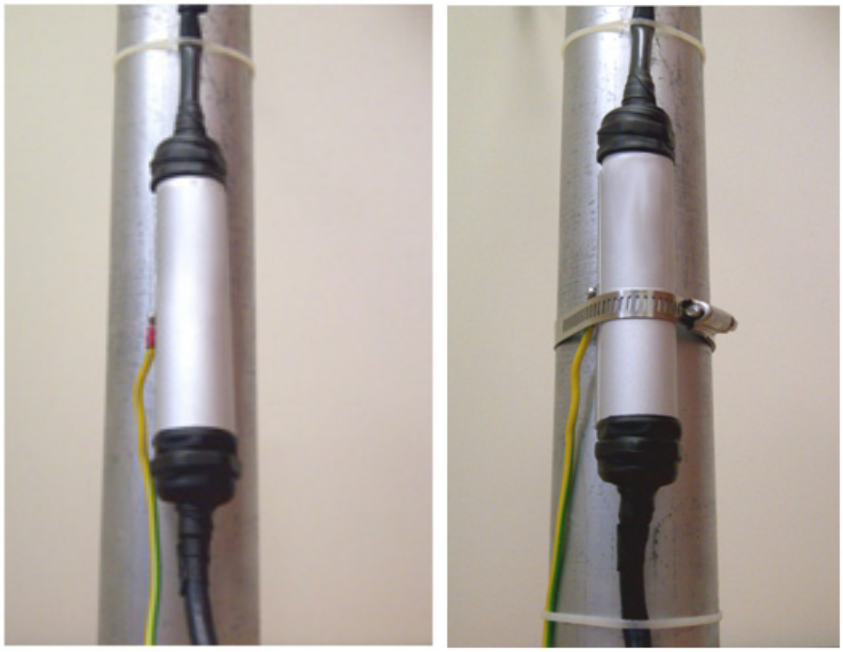


Figure 4-50: Mounted and strapped to the pole

External Ports for CAT-5e Cables

All external ODU ports should be water sealed. Use the same materials and method as for the LPU cable glands.

Mounting the Ethernet Repeater

The RADWIN Ethernet repeater enables you to extend the PoE to ODU cable beyond the 100m limit (but no more than 200m). The unit looks physically like the lightning protection device in **Figure 4-17**. It's use is very simple as shown in the following schematic:

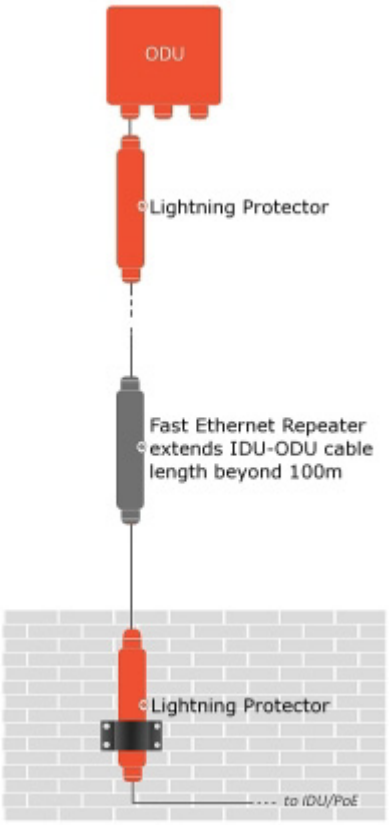


Figure 4-51: sing an Ethernet repeater with lightning protectors

Note

The Ethernet repeater cannot be used with GbE IDU-ODU cables.

Connecting an ODU to an 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 (328ft) in accordance with 10/100BaseT standards.

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

To connect the ODU to the IDU, route the cable from the ODU to the IDU, secure the cable along its path and connect the cable to the ODU RJ-45 connector on the IDU (see item B in **Figure 4-38** above).

Connecting User Equipment

➢ **To connect user equipment to an IDU:**

1. Connect user switch/router or any other compatible device to one of the IDU panel RJ-45 ports designated LAN. (For an IDU-C, see item C in **Figure 4-38** above. For an IDU-H see **Figure 4-9** above.)
2. Connect user E1/T1 traffic to the IDU panel RJ-45 ports designated TRUNKS. (For an IDU-C, see labeled item L in **Figure 4-38** above.)
3. IDU-C and IDU-H only: To use the SFP Port(s) (see **Figure 4-38** and **Figure 4-9** 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 B** for connector pinouts.


Note

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

For TDM Users

You may use SFP units configured for TDM with the IDU-H. Be aware however, than the TDM performance will be limited to TDM over Ethernet. If you require native mode TDM performance, you should use an IDU-E or an IDU-C.

Connecting and Aligning ODUs / Antennas

You perform antenna alignment using the ODU's buzzer.

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 dual-pole antennas:**

1. For external dual-pole 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 dual-pole 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.

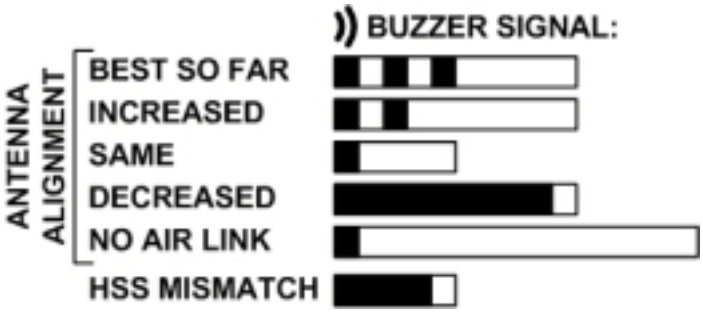


Figure 4-52: Beep Sequence for antenna alignment

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.

Chapter 5

Getting Started with the RADWIN Manager

Installing the RADWIN 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 5-1** below:

Table 5-1: PC Requirements for the RADWIN Manager Application

	Windows Version		
	XP Pro	Vista/7	
		32 bit	64 bit
Memory	512 Mb	1 Gb	2 Gb
Processor	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

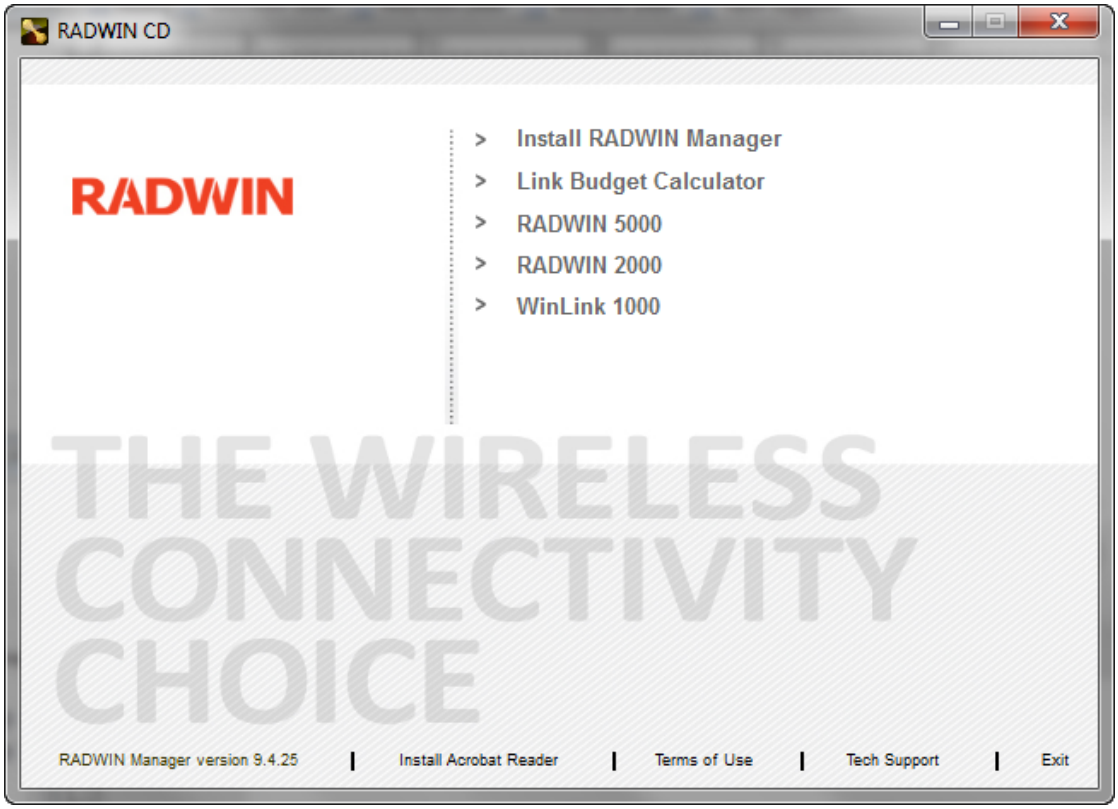
Installing the Software

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

➢ **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.

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 preload each ODU with its network address prior to physical installation. The procedure is quite straight forward, and set out in **Chapter 25**.

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 5-1** below:

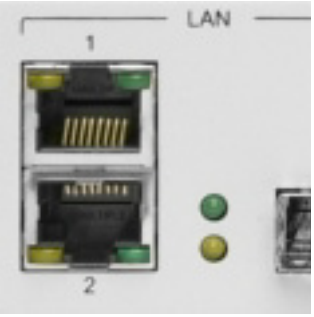


Figure 5-1: LAN ports on the front panel of the IDU-C

Note

- For IDU-E users: The LAN ports are located on the rear panel on the unit.
- From release 2.6 and higher, LAN ports support GbE (10/100/1000 Mbps)

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:

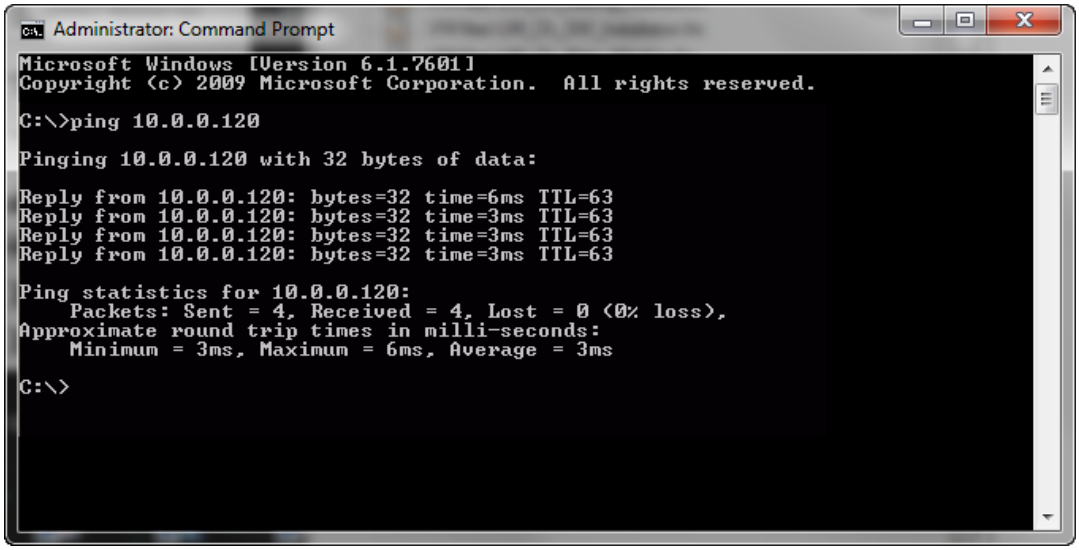


Figure 5-2: Pinging an uninstalled and unconfigured link

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 Log-on dialog box appears.

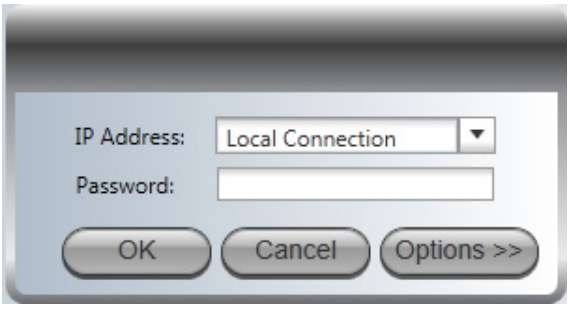


Figure 5-3: First time log-on window

The RADWIN Manager log-on Concept

RADWIN 2000 supports SNMPv1 and SNMPv3 either separately or together. The log-on procedure differs slightly between operation under SNMPv1 and SNMPv3. In what follows below, we assume that SNMPv1 is in use. In **Table 5-2** below, we show the difference between SNMPv1 and SNMPv3 at log-on time.

The RADWIN Manager provides three levels of access in one of two entry modes. To see them, click **Options** at any time in the Log on window (**Figure 5-3** above). You are offered an extended log-on window:

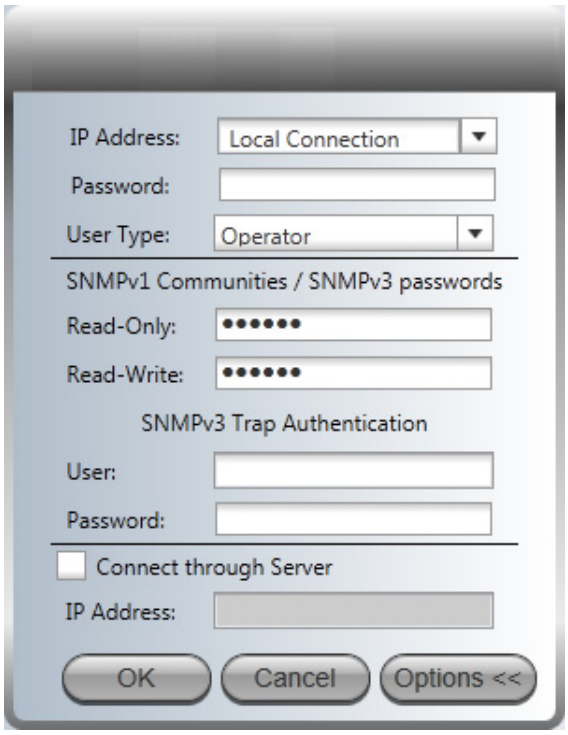


Figure 5-4: Extended log-on window

At the User Type field, click the list button:

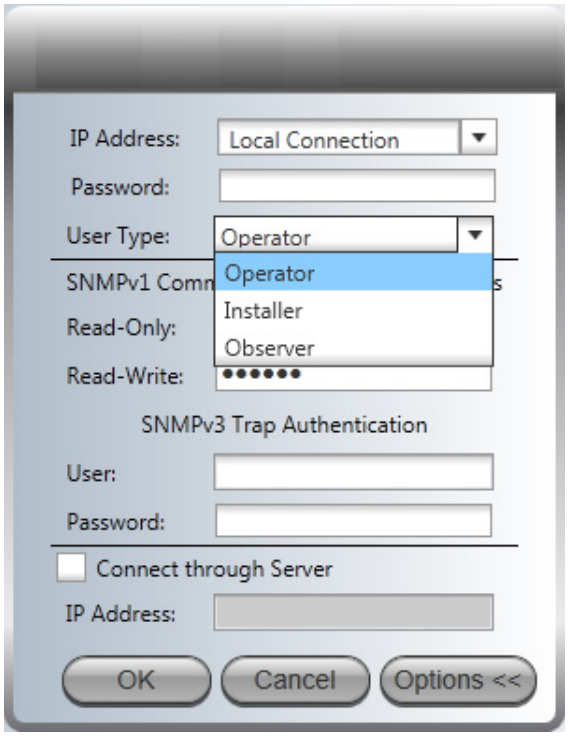


Figure 5-5: Log on window exposing the user types.

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.

If you are using Trap Authentication, enter the User and Password. Leaving these fields blank or incorrect, will not prevent you from logging on. You will not be able to see trap messages directed to the trap message address associated with a defined user. The allocation and association of a trap address with a user is described in **Chapter 9**, **Site Management: IP Address, VLAN and Protocol**.

If you are connecting through the RNMS server check the RMNS connect button and enter your server IP address.The following table summarizes these options:

Table 5-2: User types, default passwords and function

User Type	Default Password	Function	SNMPv1		SNMPv3	
			Community	Community String	Password	Default Value
Observer	***admin***	Monitoring	Read-Only	***public***	Read-Only	***public***
Operator	***admin***	Installation, configuration	Read-Write	***netman***	Read-Write	***netman***
Installer	***wireless***	Operator plus set-band	Read-Write	***netman***	Read-Write	***netman***

The Network Manager should change the default passwords as soon as possible, particularly if SNMPv3 is to be used.

➢ **Continuing the log-on procedure:**

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

Warning

- The **Local Connection** method uses broadcast packets to "discover" the attached ODU
- 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!**
- Do **not** carry out this procedure using a multi homed managing computer also connected to a network. It will flood the network with broadcast packets. Further, it will throw any other links on the network into Installation or Inactive mode.



- In any event, as a precaution, default log-on over Local Connection is read-only mode. Check the Read/Write enable box to carry out installation procedures.
- **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, VLAN and Protocol** on page **9-7**. See also, **Chapter 25**).

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, then you may only log on as Observer

The RADWIN Manager main window is displayed (see **Figure 5-10**).

Log-on Errors and Cautions

Unsupported Device

Attempting to connect to an unsupported device on an otherwise valid IP address (for example, a LAN printer) will result in the following error message:

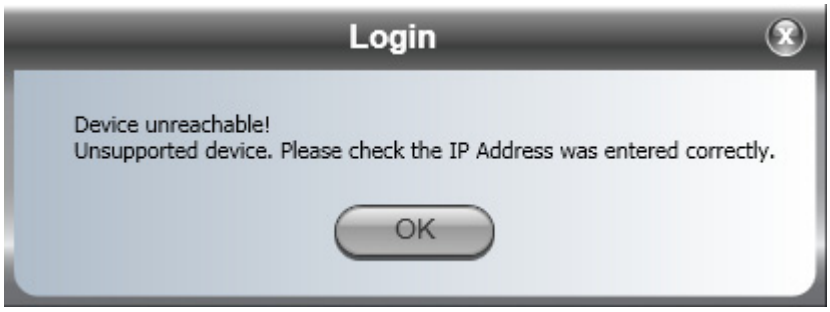


Figure 5-6: Unsupported device message

Incorrect IP Address or Invalid Read/Write Community Strings

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



Figure 5-7: Unreachable device message

To deal with lost or forgotten Community Strings:

1. Send an email request for to RADWIN Customer Support for an alternative key. Your email must include the ODU serial number shown on the adhesive sticker on rear of one of your ODUs.

2. The reply will contain an alternative key, which functions as a temporary master Community String. Copy/paste the supplied alternative key to both the Read-Only and Read-Write fields in the log-on window (**Figure 5-4**). This gets you to the RADWIN Manager main window.
3. Use the procedure on **page 9-14** to enter new Community Strings.

Incorrect Password

If you type an incorrect password in the Login window, the following message will be displayed:

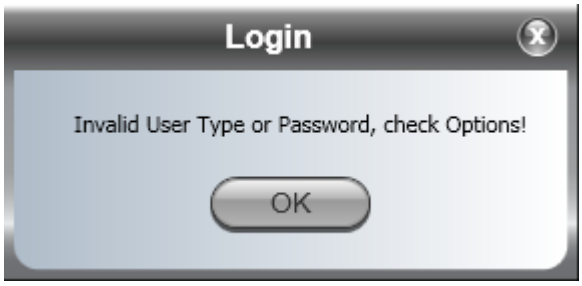


Figure 5-8: Invalid password message

Logging in to the Over-the-Air Site

You can log on to the over-the-air site of an established link (Site B in our example). However, you will be first offered the following caution:

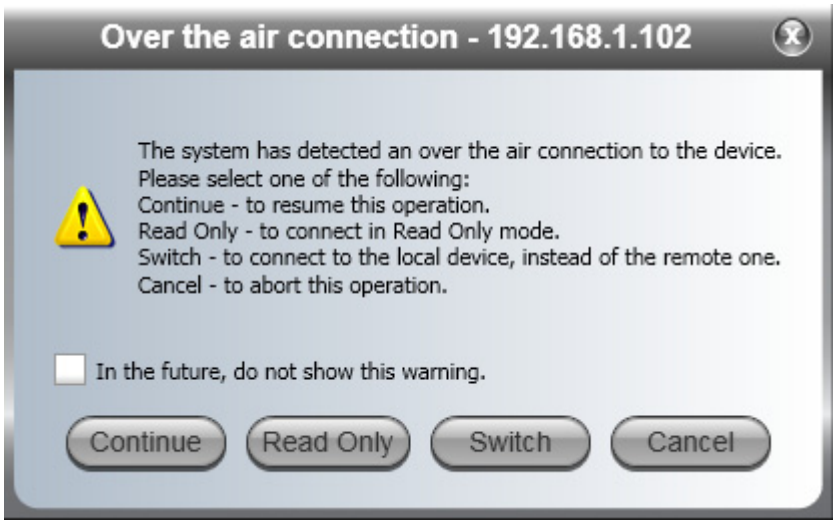


Figure 5-9: Logging on to an over-the-air site

Note

If you upgraded from an 8.x .xx release of the RADWIN Manager, you will notice that it is no longer possible to work in "Offline mode". You can only enter the Manager when it is connected to a valid RADWIN device.

Changing the Log-On Password

➢ **To change the log on password:**

1. Log on to a valid IP address.

2. From the **Tools** menu, select **Change Password**.

   The Change Password dialog box appears.

3. Enter the current password, and the new password.



A valid log-on password must contain at least five characters excluding SPACE, TAB, and any of ">#@|*?;."

4. Click **OK** to confirm.

Default RADWIN 2000 Settings

The default settings of the RADWIN 2000 configuration parameters are listed in the second column of **Table 5-3** below. The third column shows the values we use in this manual for illustrative purposes.

Table 5-3: Default and Illustrative Settings

Parameter	Default Value	Illustrative Value	
Factory default band	Product dependent	5.820GHz	
ODU IP Address	10.0.0.120	10.104.2.2 and 4	
Subnet Mask	255.0.0.0	255.255.0.0	
Default Gateway	0.0.0.0	10.104.10.21	
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	Here	There
Contact (per site)	Person	John	Mary
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		
Protocol	SNMPv1	SNMPv1 (may be v1, v3 or both)	

Table 5-3: Default and Illustrative Settings (Continued)

Parameter	Default Value	Illustrative Value
Community values	Read-write – netman	
	Read-only – public	

First steps

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

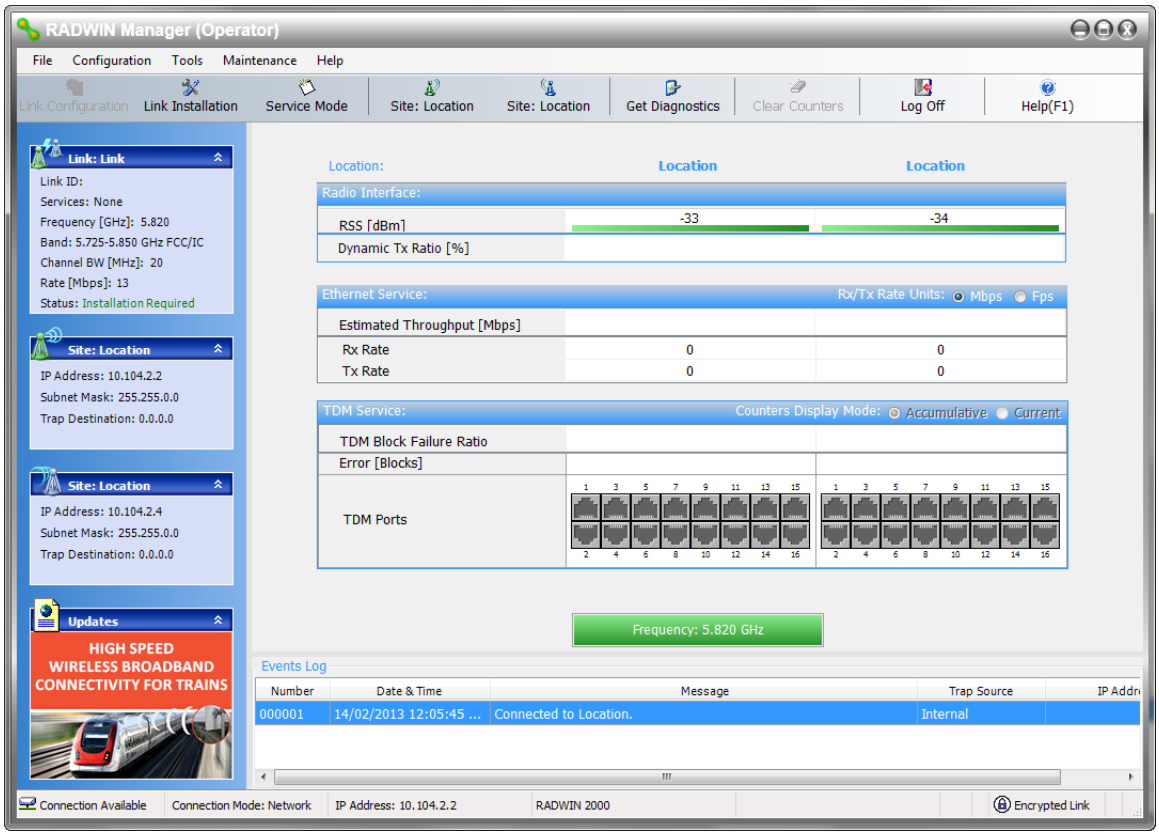


Figure 5-10: Opening *RADWIN Manager* window prior to installation - Using *IDU-C* s

Note

The Dynamic Tx Ratio bar only appears for model RADWIN 2000 C

A detailed field by field description of the contents of the RADWIN Manager main window may be found in **Chapter 7**.

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 link-wide 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 **Chapter 22**.
- Use of an incorrect band may be in violation of local regulations.

2. **Link Configuration** - described in **Chapter 8**.

   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 using 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 9**.

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

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

Note

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

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

Using RADWIN Manager Spectrum View

Prior to running the Installation Wizard (**Chapter 6**), consider running the RADWIN Manager Spectrum View utility.

The RADWIN Manager Spectrum View utility is an RF survey tool designed to support the link installation prior to full link service activation. The tool provides comprehensive and clear information enabling easier, faster and better quality installations.

To launch Spectrum View, go to the main window menu (**Figure 5-11**) and click **Tools | Spectrum View**. A display similar to the following appears:

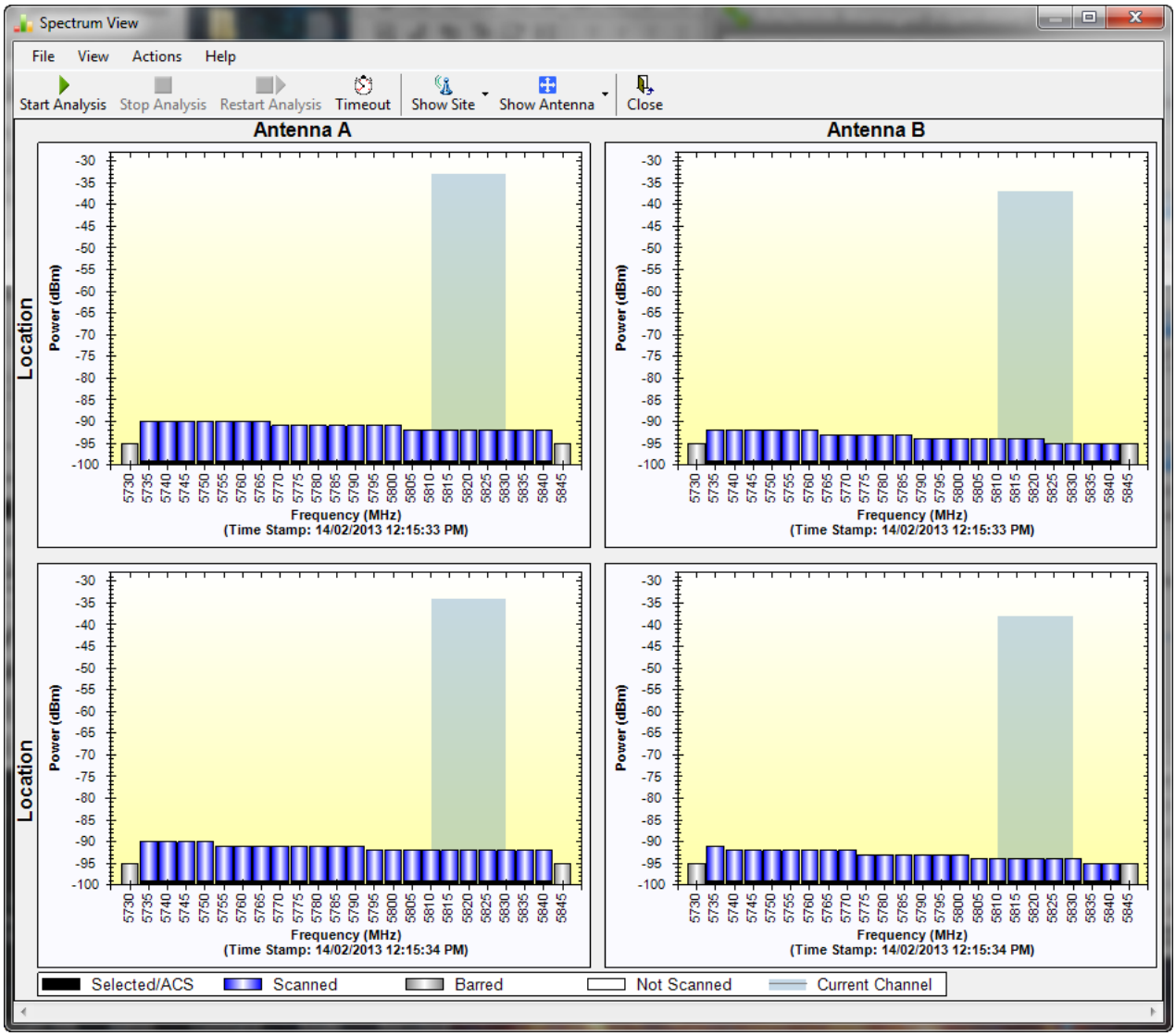


Figure 5-11: Spectrum View - Opening Display on an uninstalled link

The top pair of analysese relate to the managed site; the bottom pair relate to the remote site.

See **Chapter 27** for detailed information about operating Spectrum View and understanding the displayed statistics.

Chapter 6

Installing the Link

Overview

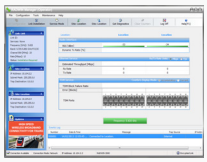
The installation is carried out using the Installation wizard. Its operation is detailed in the following pages in a tutorial style.

For the purpose of explanation, we will set up a example 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 8 main steps as shown in **Table 6-1** below.

Table 6-1: Link Installation Wizard





1 Wizard welcome



2 System parameters

- Link ID
- Site details



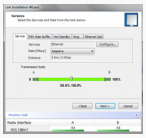
3 Channel settings - ACS Configuration



4 Tx Power and antenna settings, MIMO or Diversity



5 HSS Settings



6 Services - Types

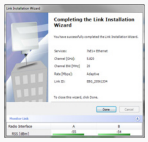
- Ethernet
- TDM

Adaptive or fixed, Jitter Buffer, MHS, Ethernet Ring, QoS



7 Set TDM Clock Parameters





8 Wizard summary and completion

Installation

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 **Chapter 4**.

The Installation Wizard opens:



Figure 6-1: Link Installation Wizard

The bottom data area reproduces the corresponding data from the main window - which the above panel obscures. See **Chapter 7** for a field by field description of this data area.

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

Step 2, System Parameters

The system dialog box opens:

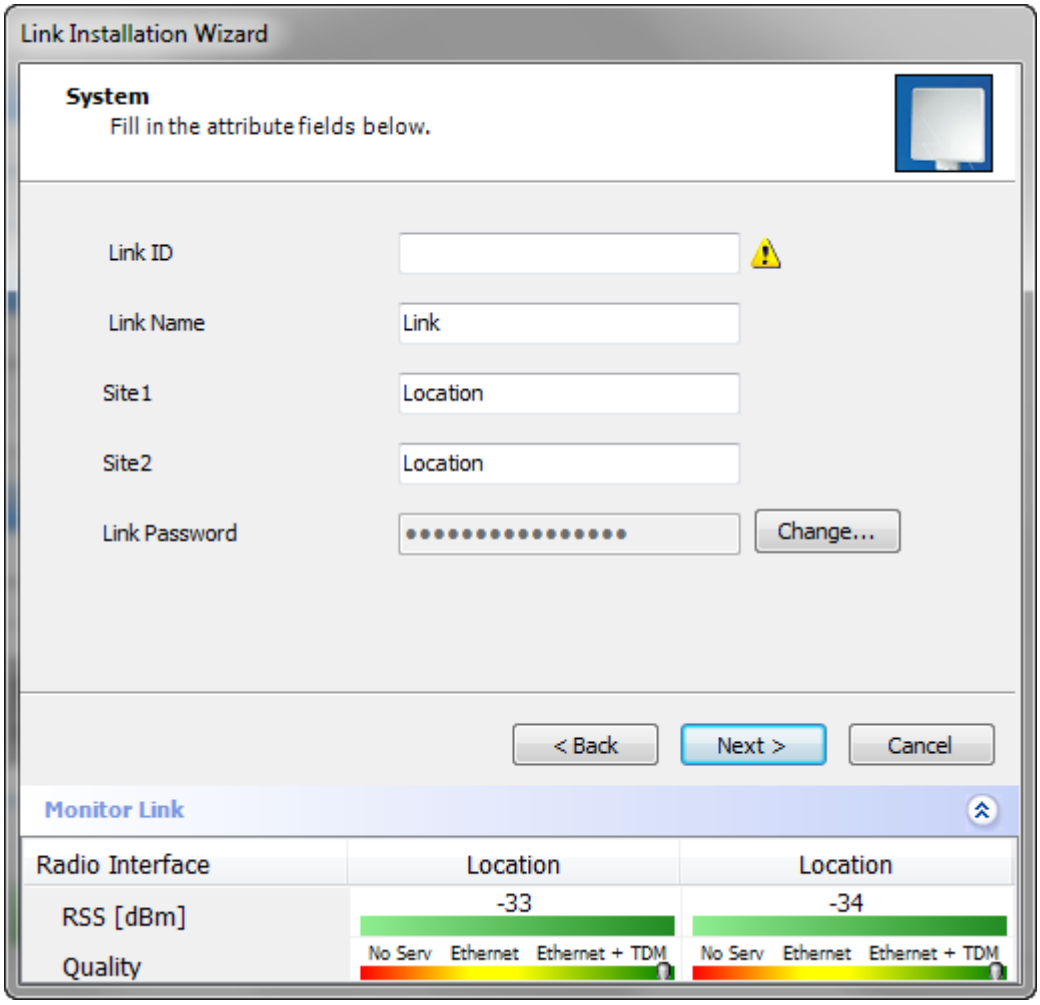


Figure 6-2: Installation Wizard, System dialog box

To complete Installation Step 2:

1. Enter a Link ID. **The Link ID must be identical for both ODUs in the link, otherwise they will not communicate.** 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.
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.

Here is our completed System panel:

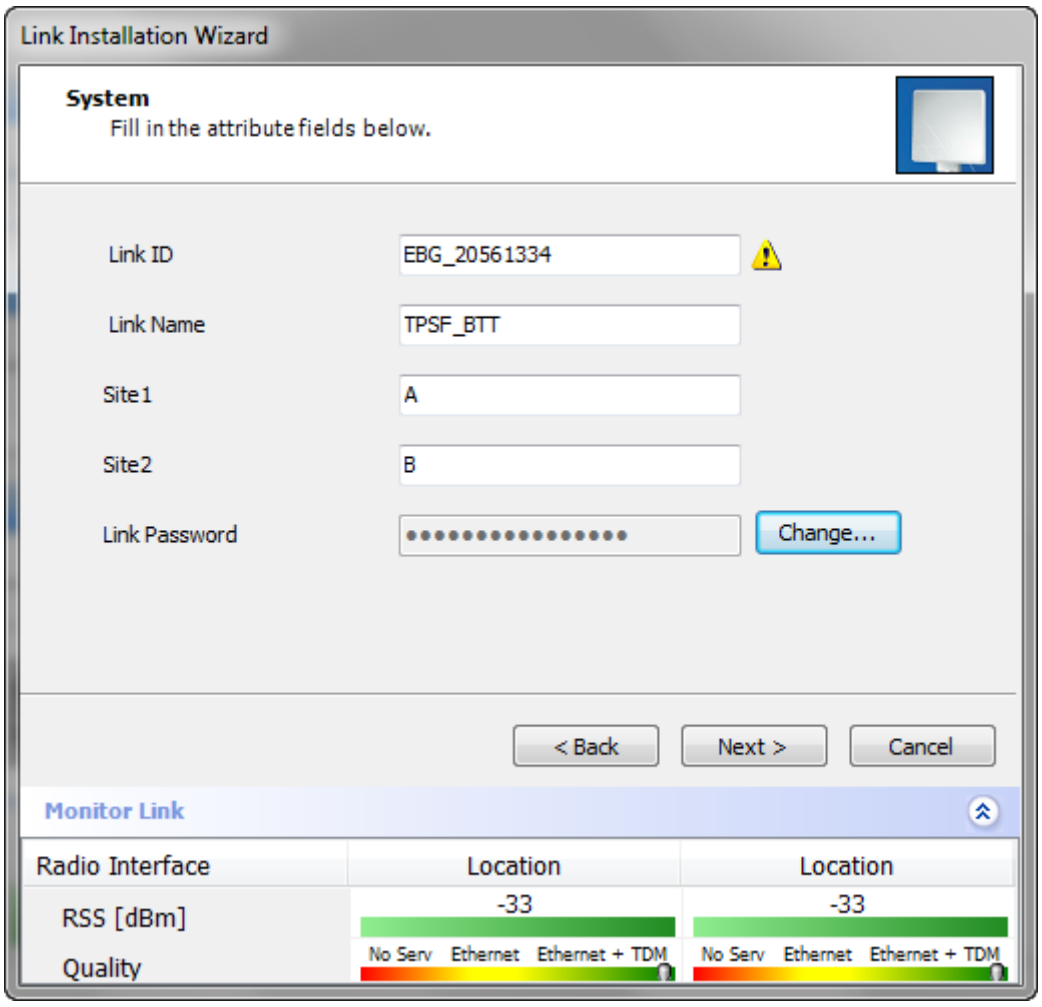


Figure 6-3: Installation Wizard, System dialog box filled out

5. Click **Next**.

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

   The Channel Setting dialog box appears. Proceed to **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

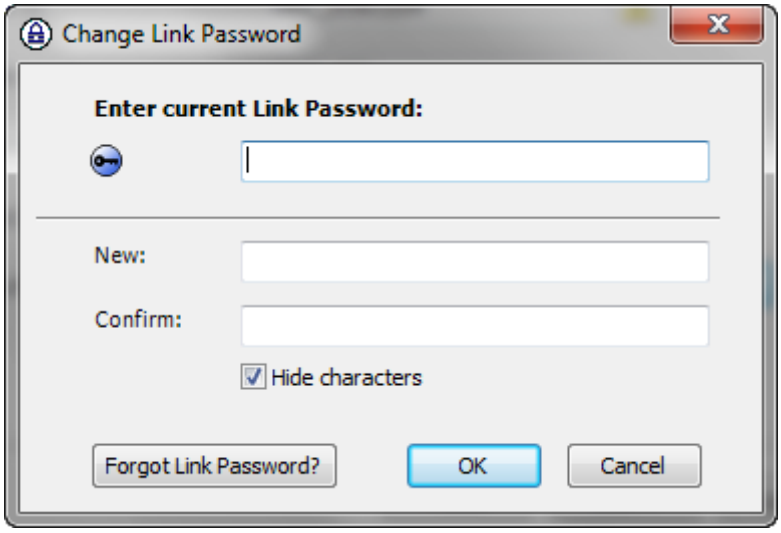


Figure 6-4: Change Link Password dialog box

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:

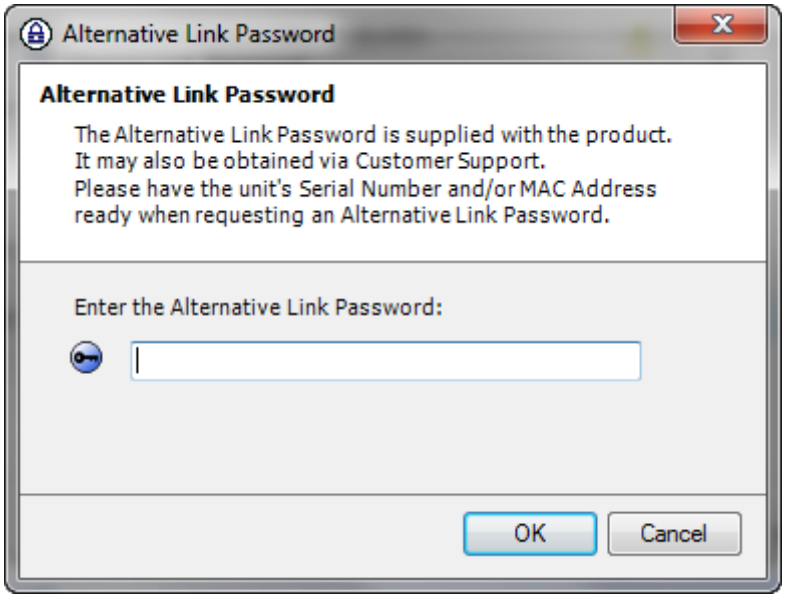


Figure 6-5: Lost or forgotten Link Password recovery

   Follow the instructions to use the Alternative Link Password, and click **OK** to finish. You are returned to the window in **Figure 6-4** 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

- A link password must contain at least eight but no more than 16 characters excluding SPACE, TAB, and any of "\>#@|*?;."
- 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 9-14**.

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 6-6** below. A channel switch takes place sufficiently fast as to ensure no loss of service.

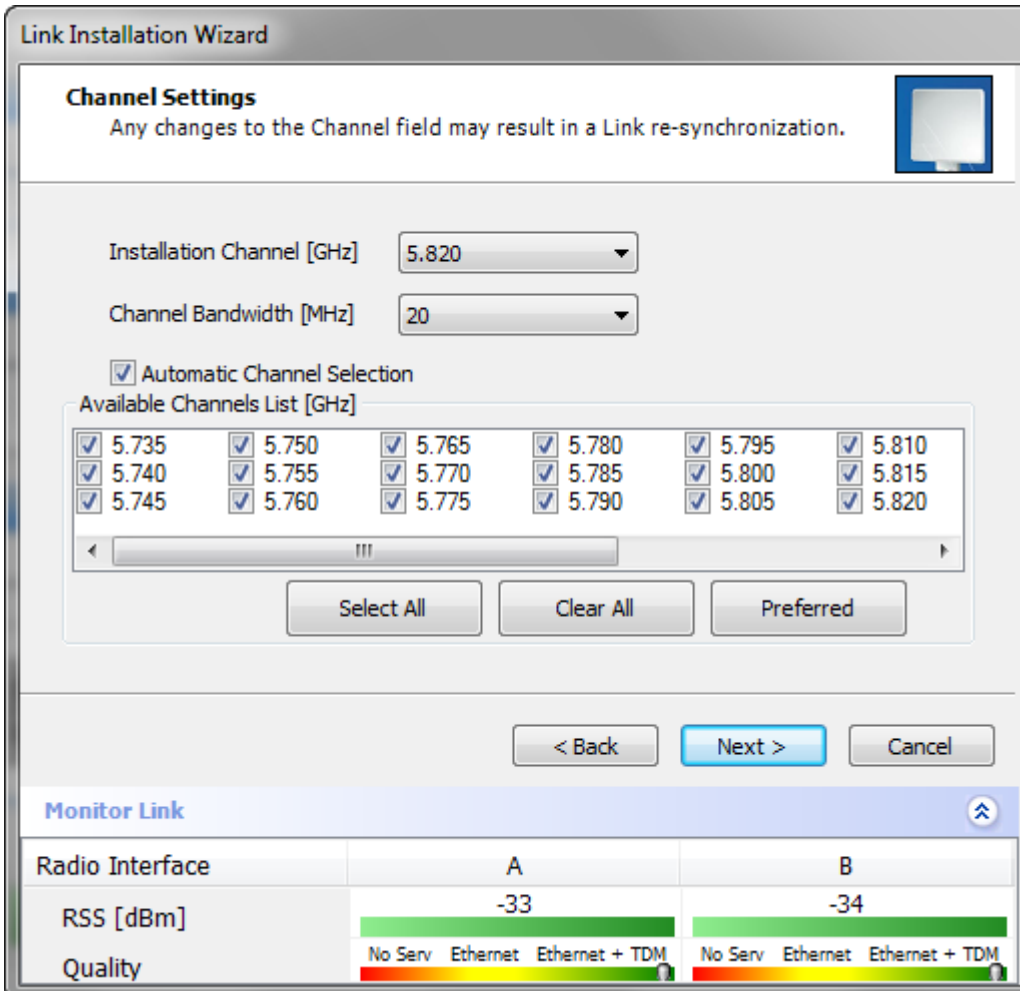


Figure 6-6: Channel Settings - Automatic Channel Selection

The default frequency for the product is shown.

Of the selected channels, you may choose a set of preferred channels which will be used by ACS with highest priority. To use this feature, click the **Preferred** button:

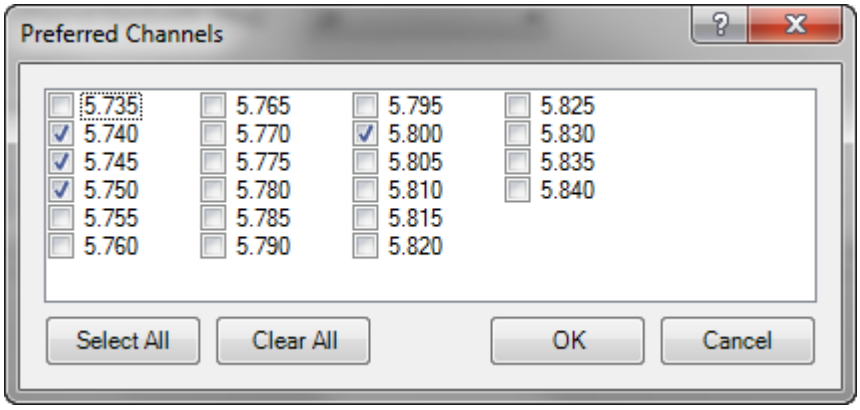


Figure 6-7: Choosing preferred channels

Typically, you would based your preferred channels on based on a spectrum analysis. (You may acquire a spectrum analysis using the Spectrum View tool,**Chapter 27**.

Check the preferred channels and then **OK**. The other channels will be used by ACS, but only if the preferred channels become to noisy.

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

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

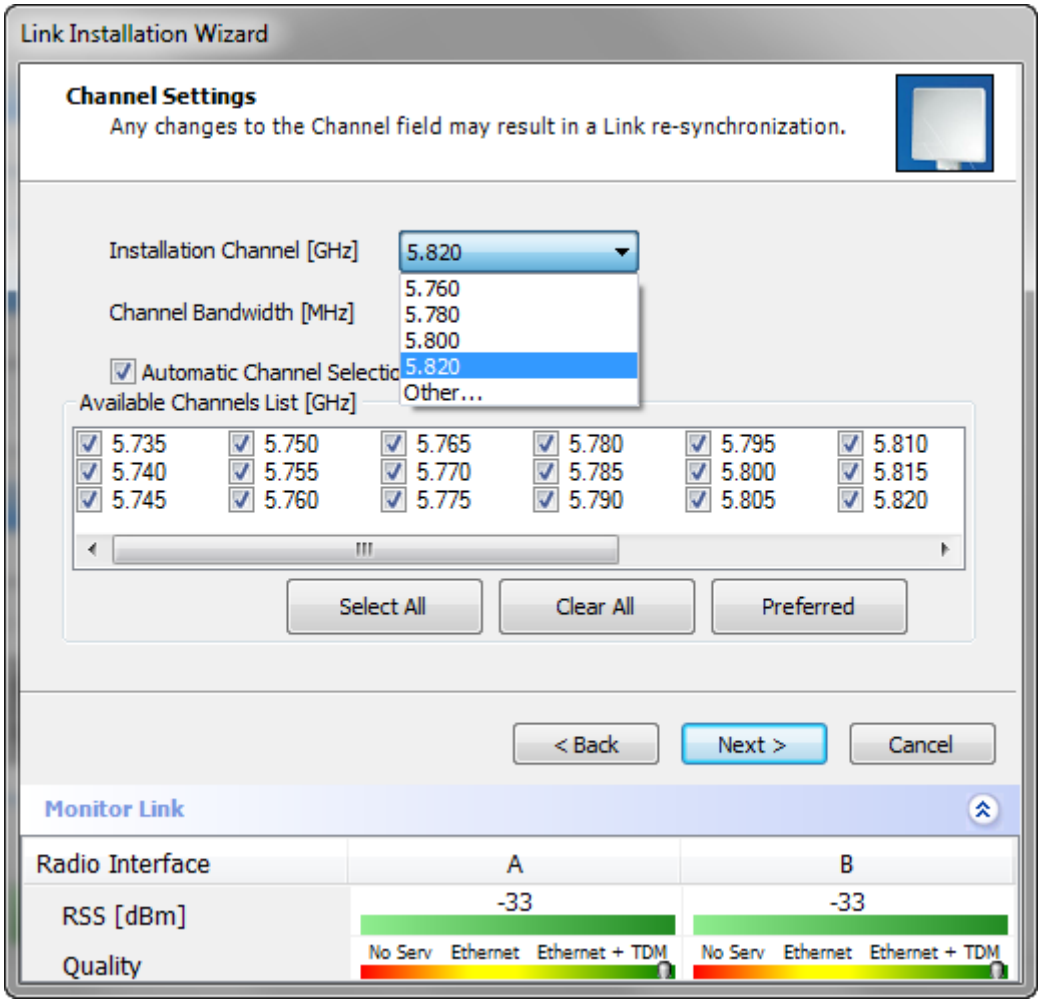


Figure 6-8: Channel Settings - Showing available installation rates

2. Choose the required Channel Bandwidth.

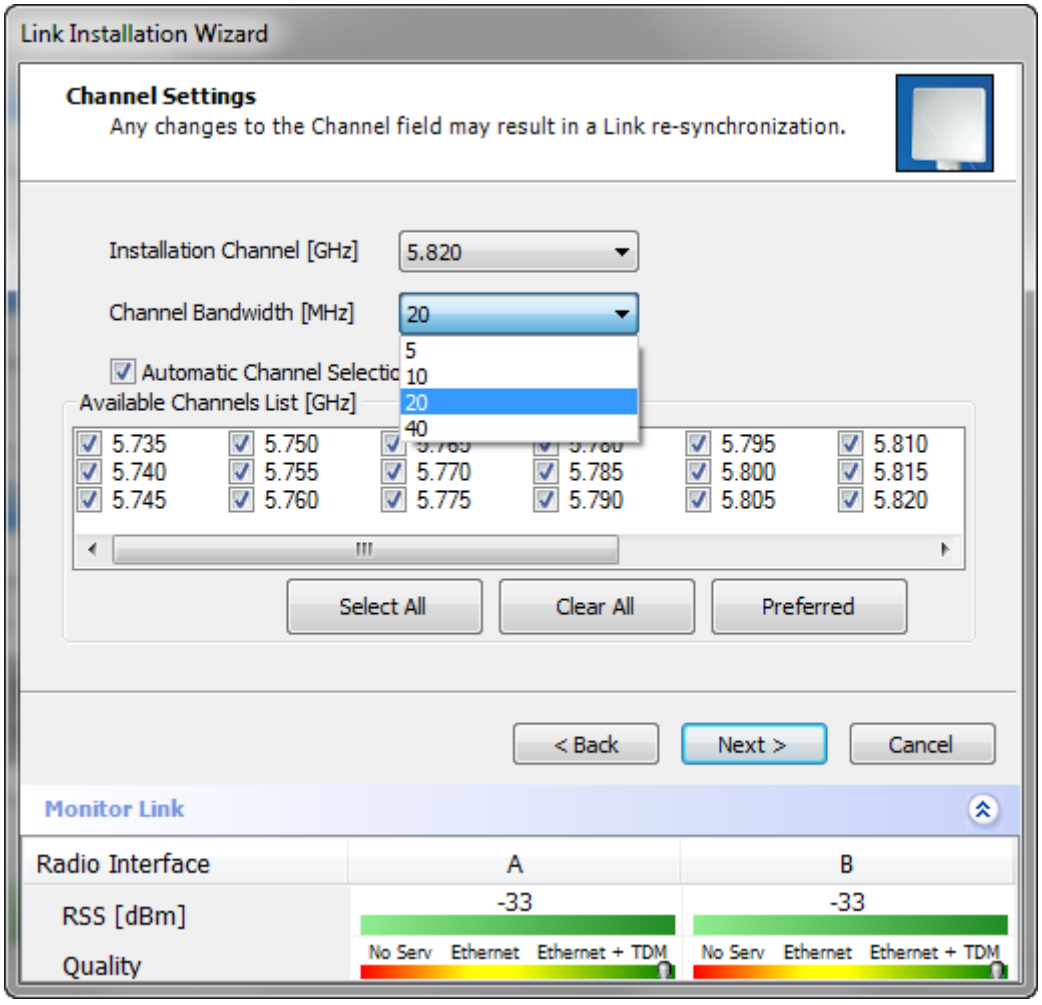


Figure 6-9: Channel Settings - Showing available Channel Bandwidths

3. Click the check box if Automatic Channel Selection is required.
4. 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 6-8** above.
5. Click **Next**.

Step 4, Tx Power and Antenna Settings

The Tx Power and Antenna Parameters dialog is displayed.

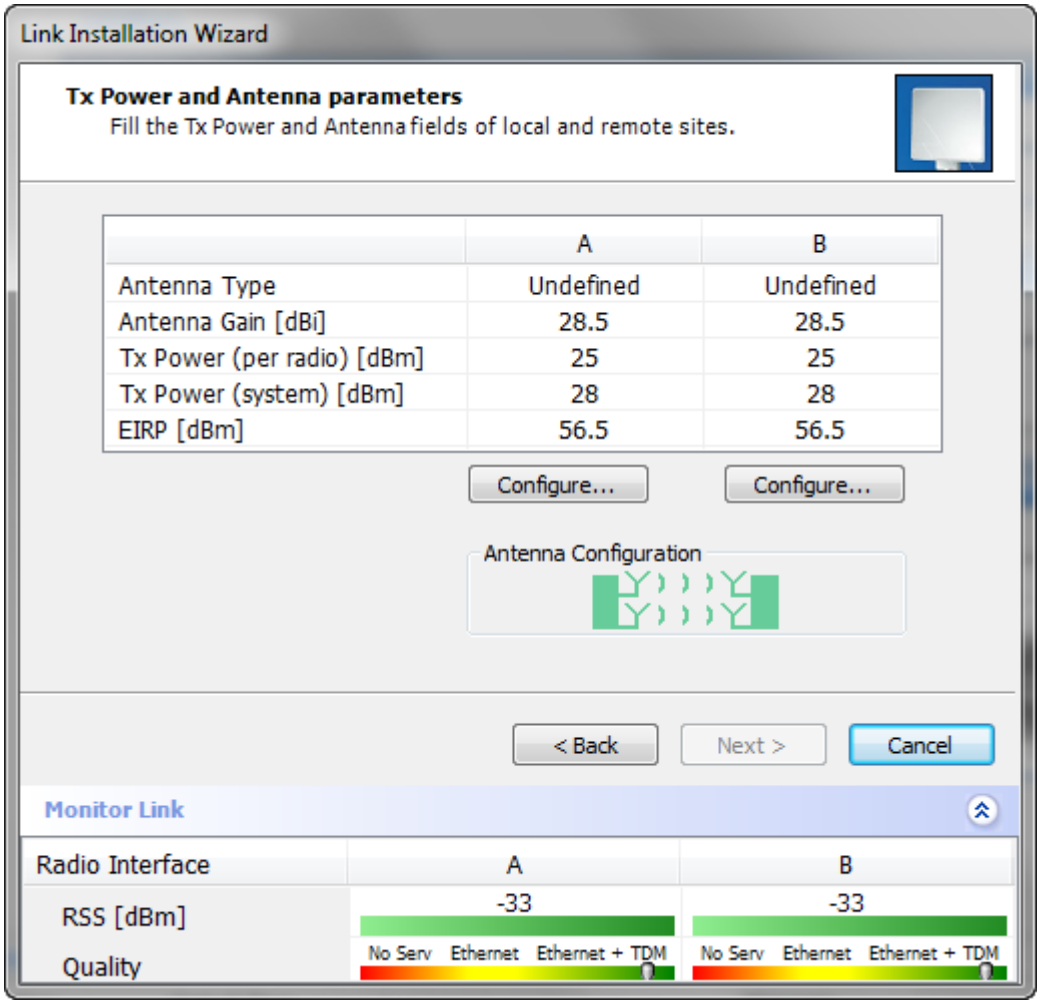


Figure 6-10: Transmission Power and Antenna Parameters

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 background information in **Appendix F**, **Setting Antenna Parameters** should be considered.

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:

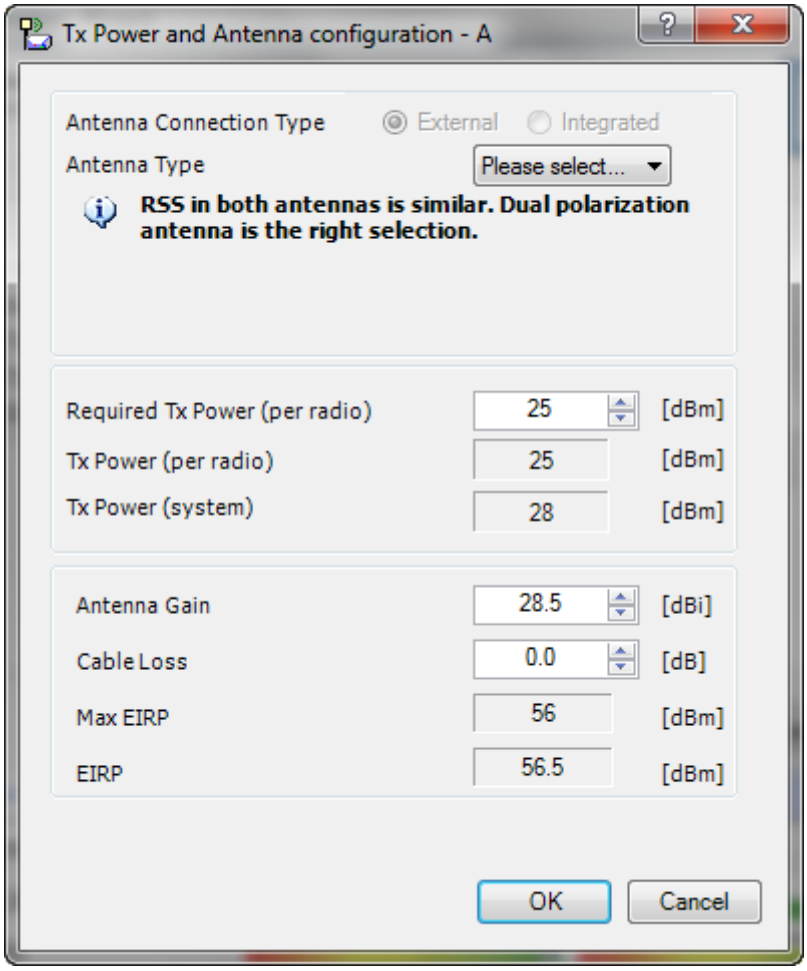


Figure 6-11: Antenna configuration dialog

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

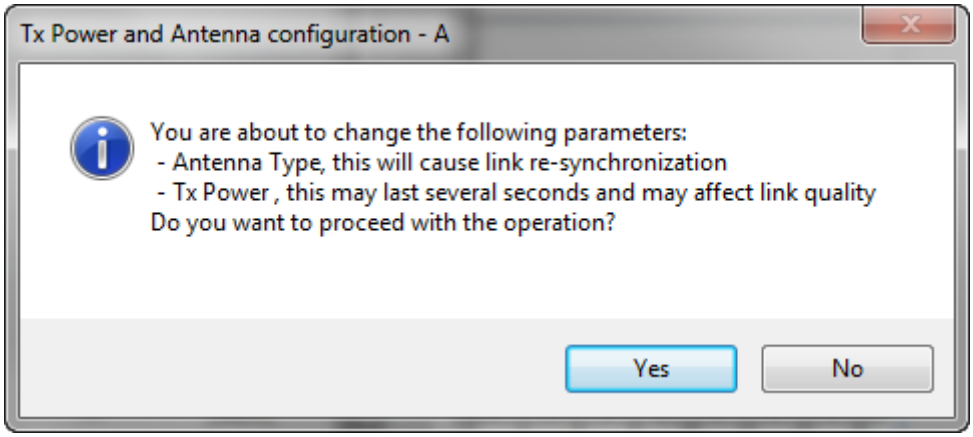
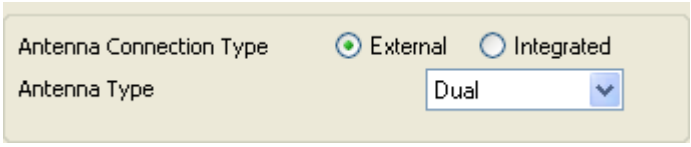


Figure 6-12: Antenna type change warning

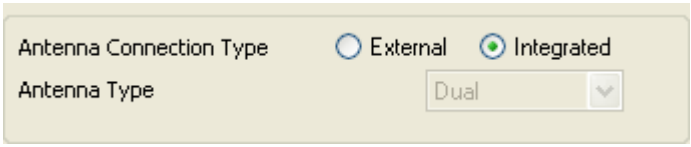
For RADWIN 2000 B Links:

These ODUs may be switched between the SFF embedded antenna and external antennas. To this end, the Antenna Connection Type radio buttons are always enabled:



Note

Use the Integrated radio button to enable the embedded antenna.



Observe that the SFF embedded antenna functions as a dual antenna and cannot be changed.

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:

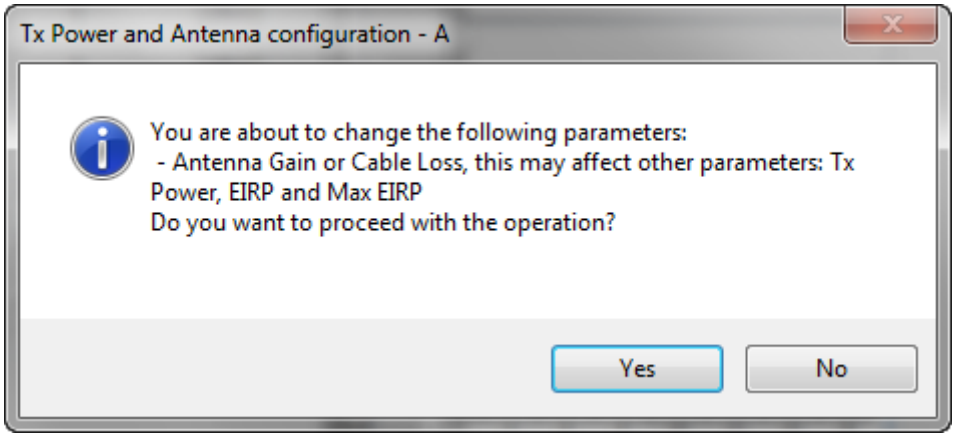


Figure 6-13: Antenna parameters change warning

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:

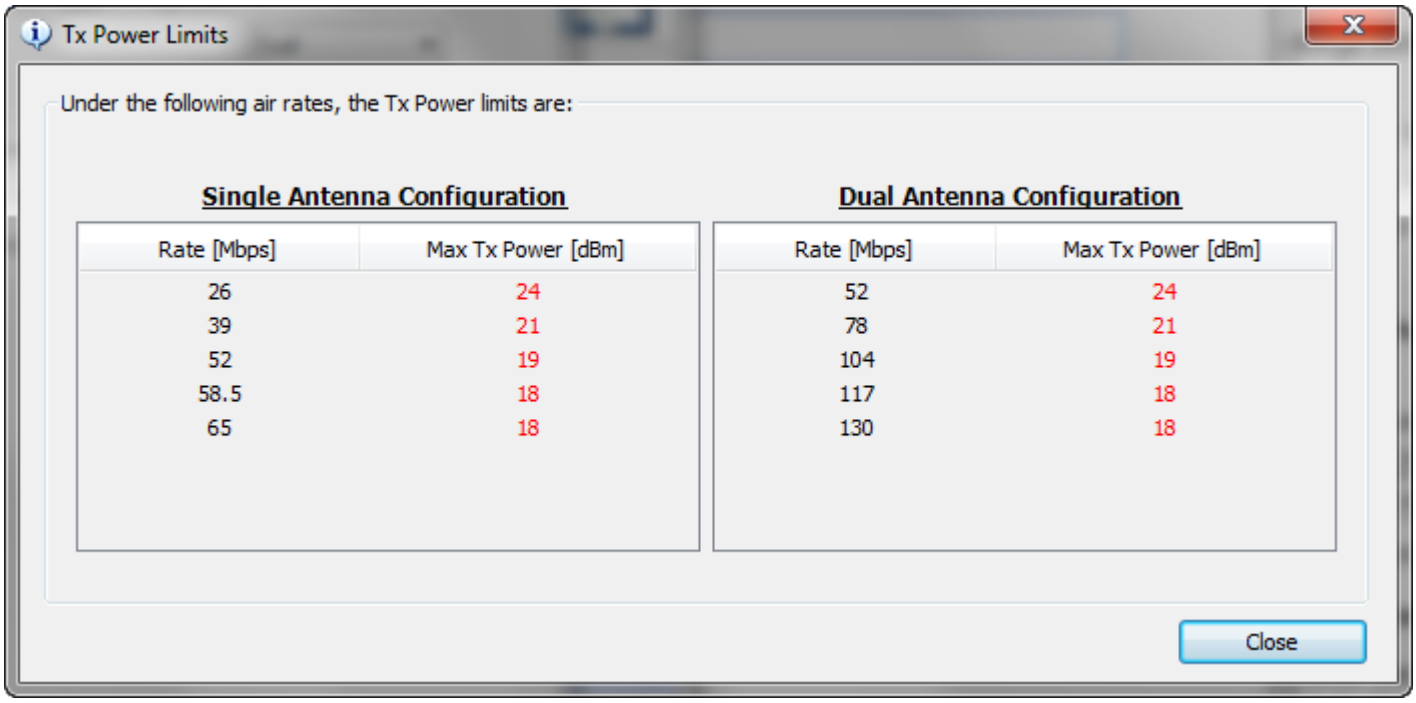


Figure 6-14: Tx Power Limits

The precise relationship between the items in inequality **(*)** and the window of **Figure 6-11** is as follows:

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

The table in **Figure 6-14** only shows rates where the maximum Tx Power is the limitation, rather than regulations. When you close the window of **Figure 6-14**, the change you requested will **not** be honored, and you will need to try again.

Note

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.

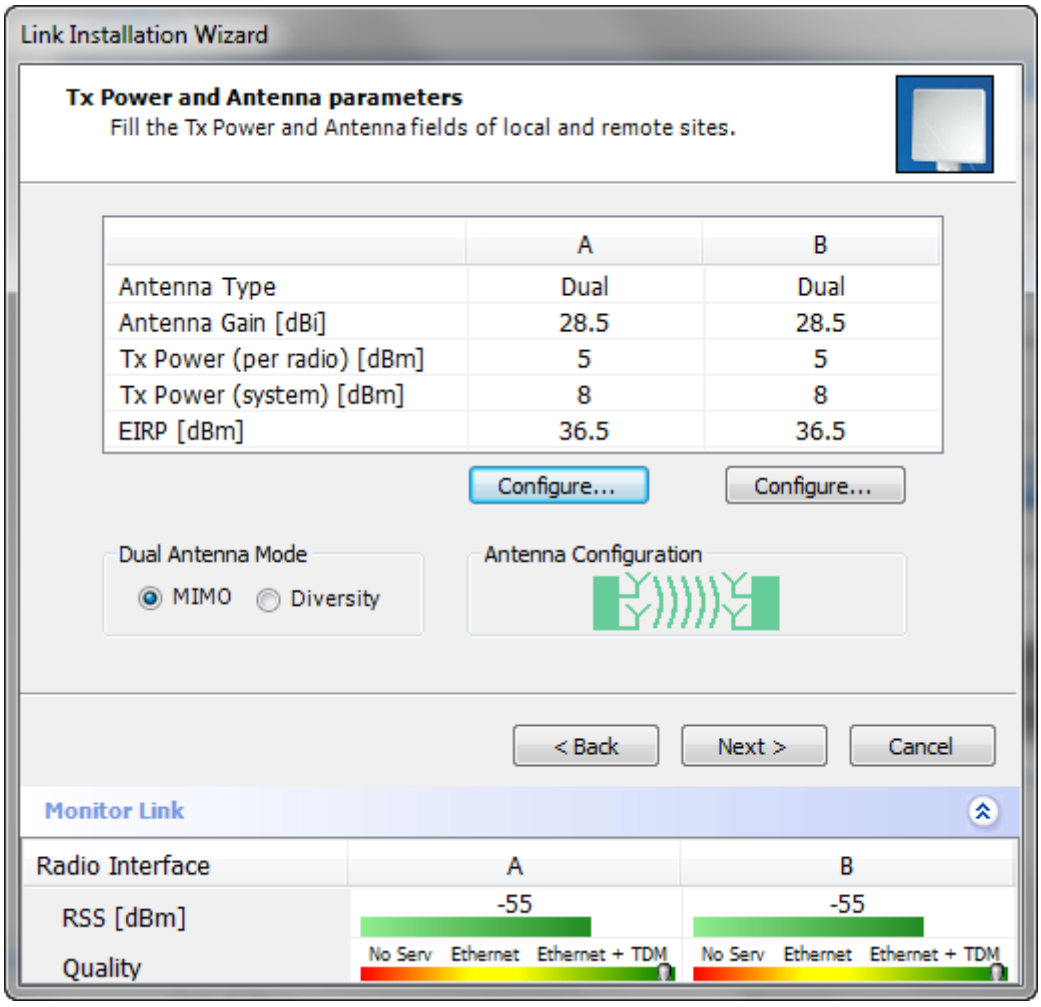
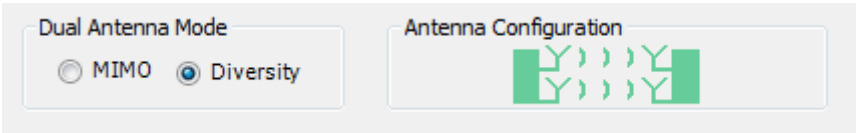


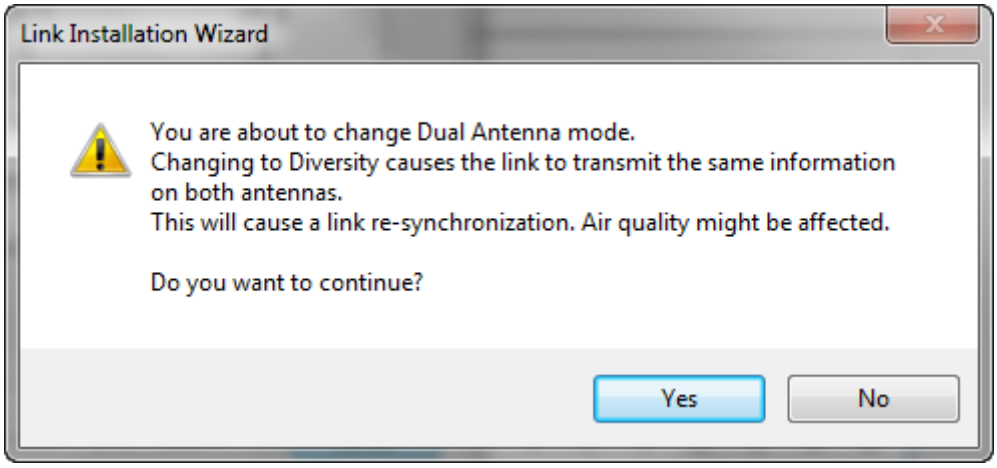
Figure 6-15: Antennas configured for two dual and Tx power 5 dBm

5. Choose Dual Antenna mode if appropriate. The green Antenna Configuration diagram indicates the active state. For dual antennas in Diversity mode it looks like this:



There are intermediate modes available for dual antennas opposite a single antenna as set out on **Figure 6-10** above.

If you make a change you will see a warning similar to this:



A similarly worded warning applies to a s switch from MIMO to Diversity mode

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

Step 5, Hub Site Synchronization Settings

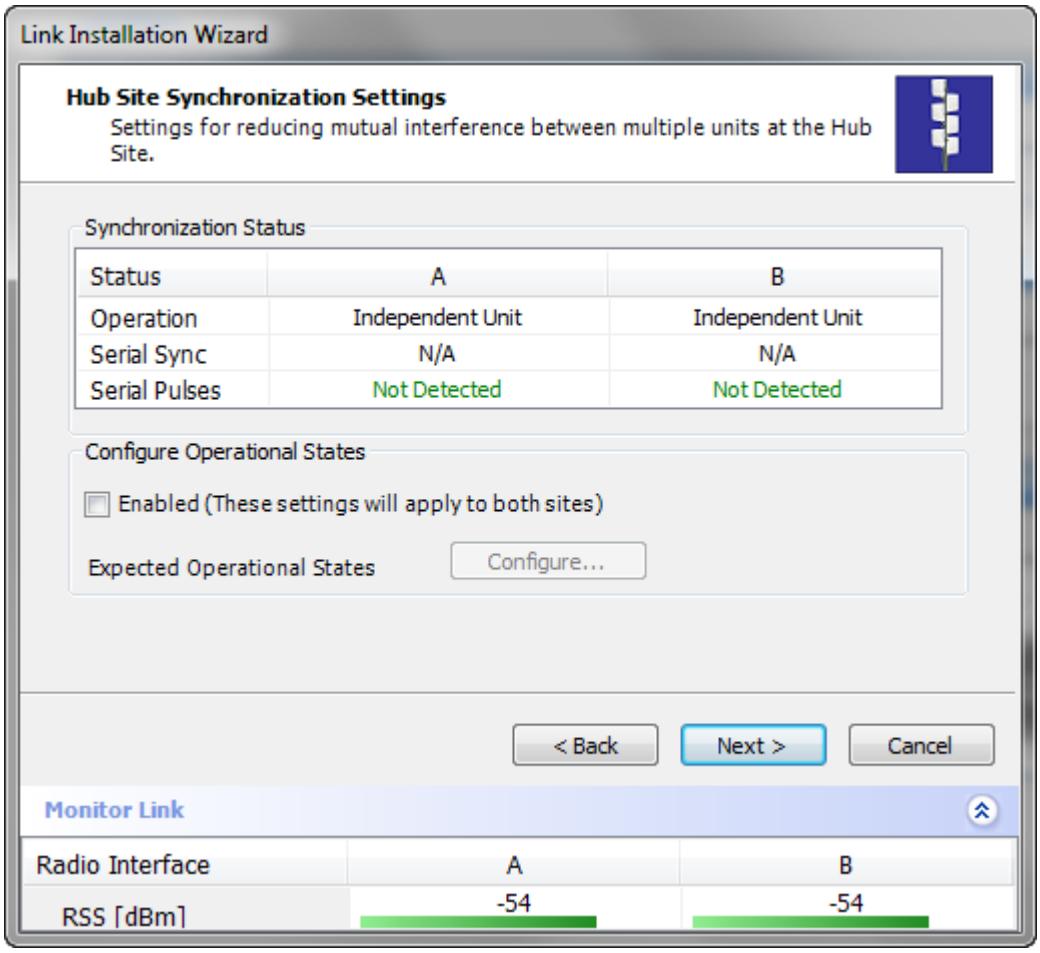


Figure 6-16: HSS Settings

The Synchronization Status dialog box displays the current status of each side of the link. See the **Site Synchronization** section for instructions about installing and configuring collocated links. If you do not require HSS, click **Next**.

Step 6, Services

The Services dialog appears:

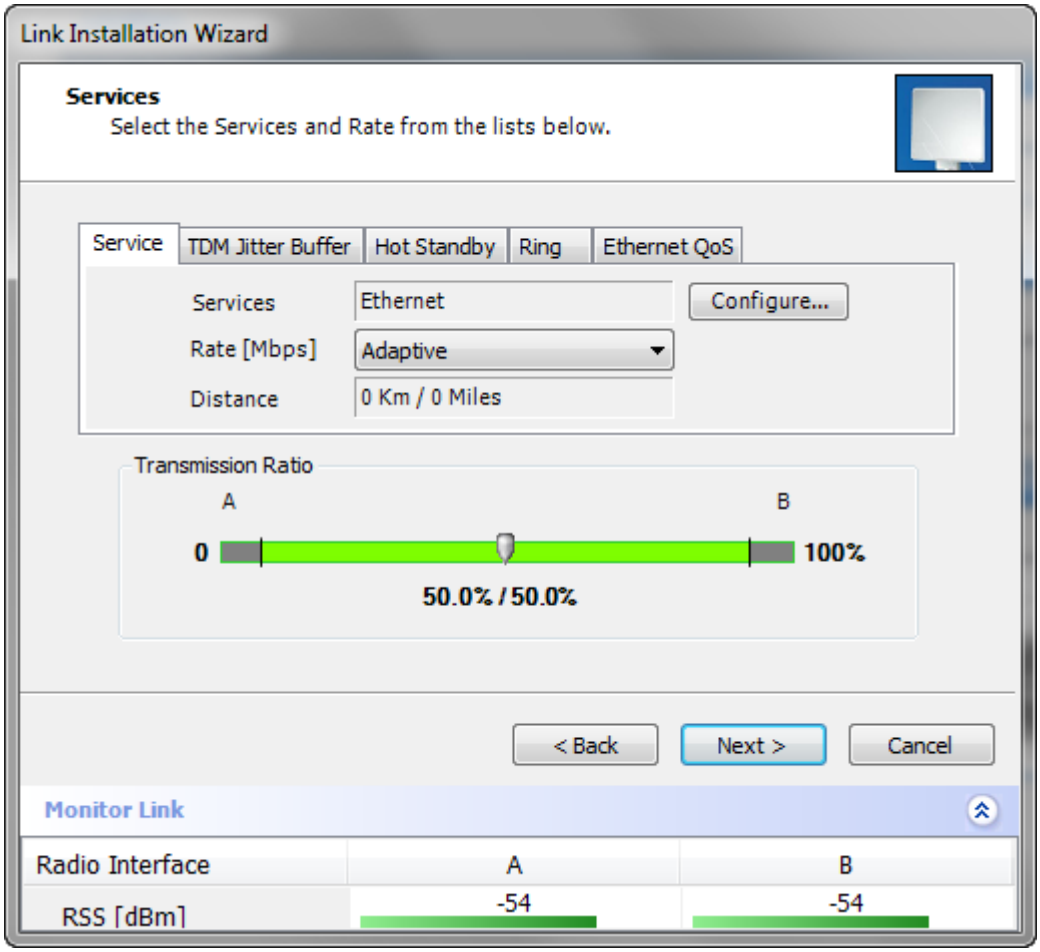


Figure 6-17: Services and Rates - *RADWIN 2000 C* only

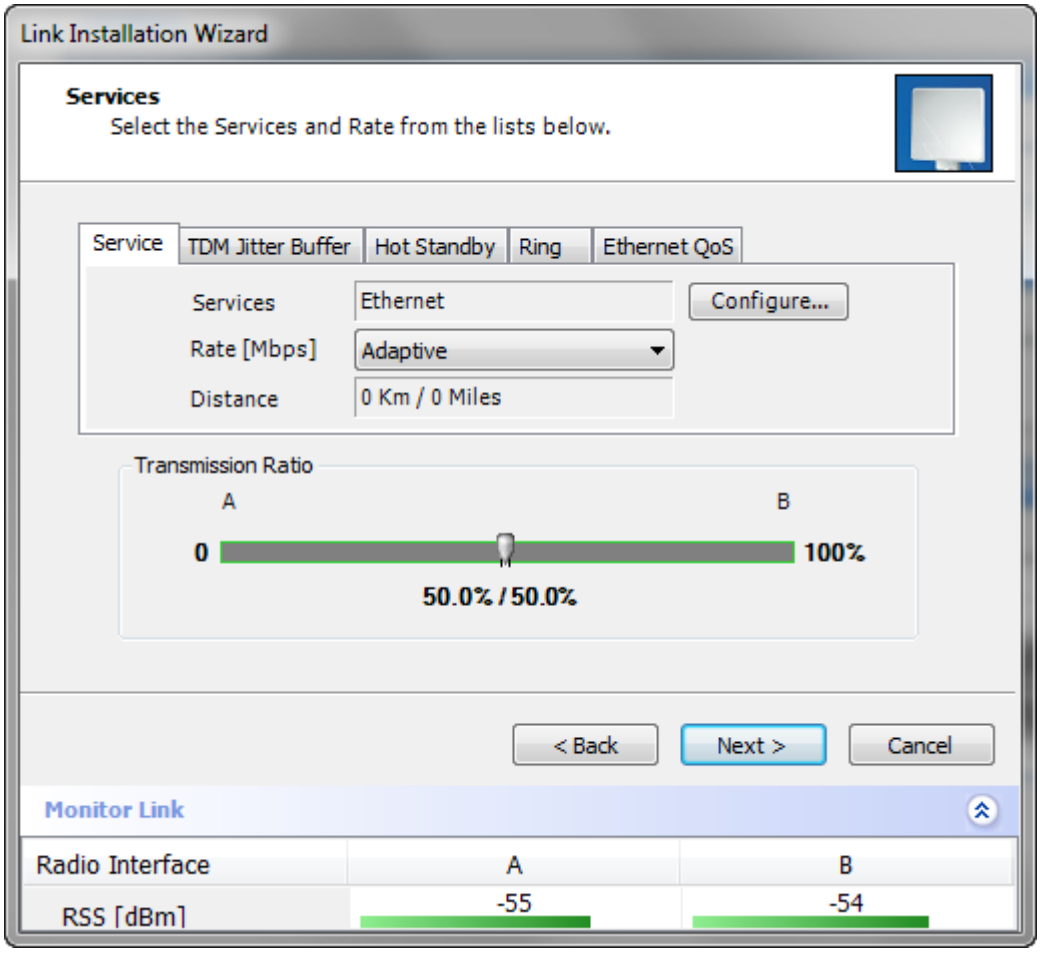
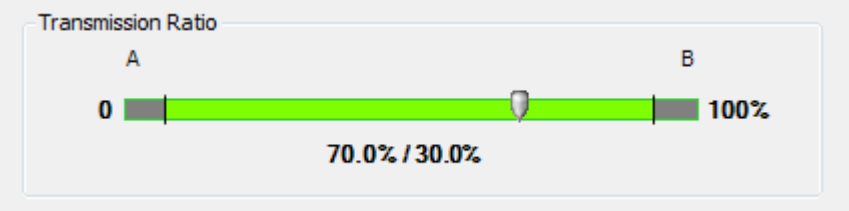


Figure 6-18: Services and Rates for *RADWIN 2000* collocated as a client

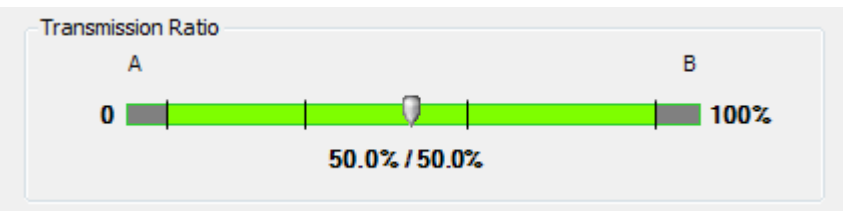
For a collocated link proceed to **TDM Services selection**.

Otherwise, you can use the green slider to allocate asymmetric Ethernet capacity by changing the Transmission Ratio between the sites.

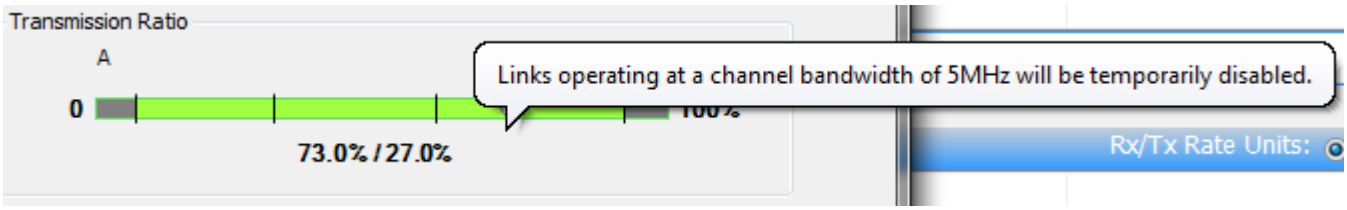
For example: Suppose that during congestion, you might want to use 70% for the downlink and 30% for the uplink. Your choice would typically be based on your experienced traffic load during periods of congestion.



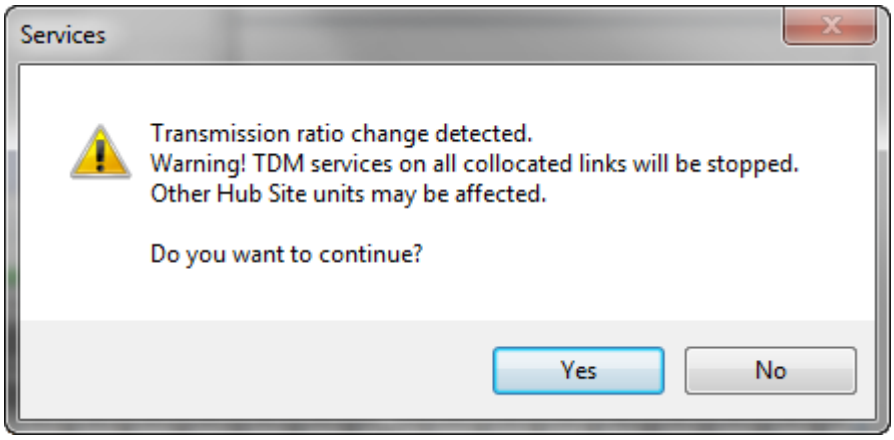
For a collocated link you will see a display like this:



If you choose a Transmission ratio outside the two tick marks, you run the risk of disabling collocated links operating on a lower channel bandwidth:



Whatever the case, if you change the Transmission Ratio on a collocated link, you will be offered the following warning:



The conditions under this may occur are detailed below.

Caution

If you have active collocated links, or if you are uncertain of whether collocated links provide TDM services do not use this option now. You can do it at a less disruptive time using the Link Configuration (**Chapter 8**).

Otherwise, click **Yes** to continue.

Limitations on the use of Asymmetric Allocation

For non collocated links, capacity allocation between uplink and downlink traffic is determined automatically according to actual Ethernet traffic and air interface conditions. Your manual allocation using this feature "cuts in" during congestion.

Asymmetric Allocation and Collocation

The use of Asymmetric Allocation is limited where the link is collocated. You may only change the HSM (master) from symmetric to asymmetries allocation. If you do this, the affects on collocated clients are as follows:

- Releases prior to 2.4 - Link down
- Release 2.4 and later (RADWIN 2000 C series) - TDM services stopped, link set to transmission ratio of master
- Release 2.4 and later (RADWIN 2000 C series) - Asymmetric Allocation slider visible but cannot be changed

The last two items also apply to collocated links using EHSS.

Note

The behavior of a collocated RADWIN 5000 base station, is very similar to that of a RADWIN 2000 C radio. There will be slight differences between the Transmission Ratio of a regular RADWIN 2000 radio and a RADWIN 5000 base station.

Services and Rates

The Services and Rates dialog as shown in **Figure 6-17** will be different:

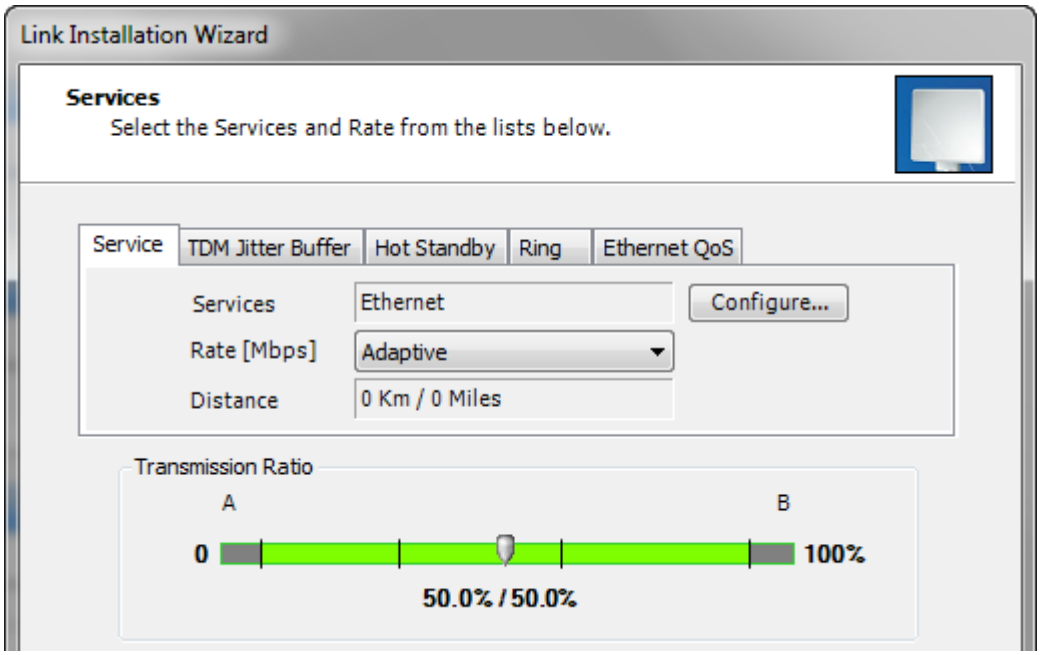


Figure 6-19: Services and Rates - *RADWIN 2000 C* master, *RADWIN 2000* clients

The areas outside the tick marks should be avoided. Using those areas, you may loose the collocated link with the longest distance between sites.

Asymmetric Allocation and TDM

You cannot use this feature when TDM services are used. Selection of TDM ports as in the next section will reset the Ethernet balance to 50% in each direction and the green slider will not appear in subsequent Installation or Configuration runs.

Cancelling TDM port use will make the allocation bar reappear, re-enabling asymmetric Ethernet traffic allocation.

If you are not using TDM services, clicking **Next** will take you to **Step 8,** and completion of the installation. Your Ethernet capacity allocation will be reflected in **Figure 6-36** below.

TDM Services selection

➢ **To select services:**

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

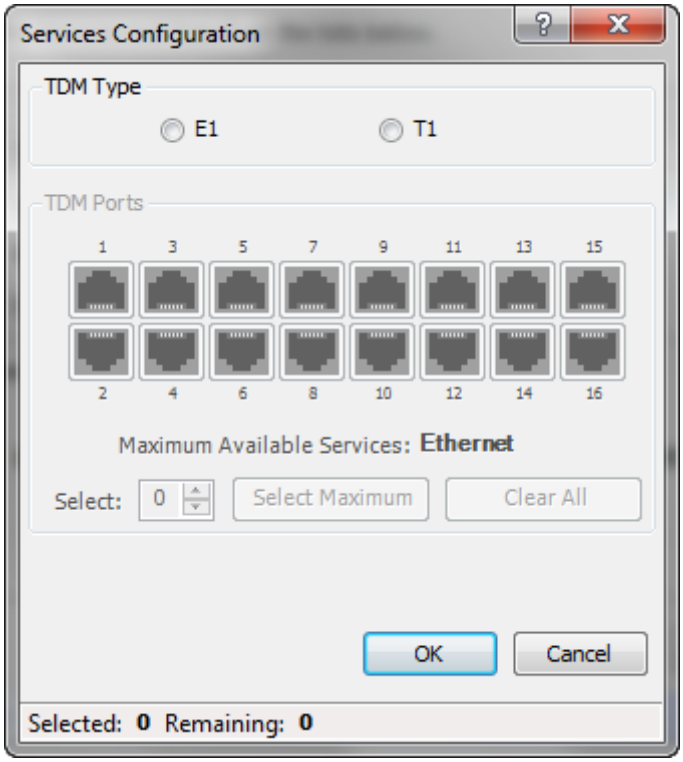


Figure 6-20: TDM Type selection

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

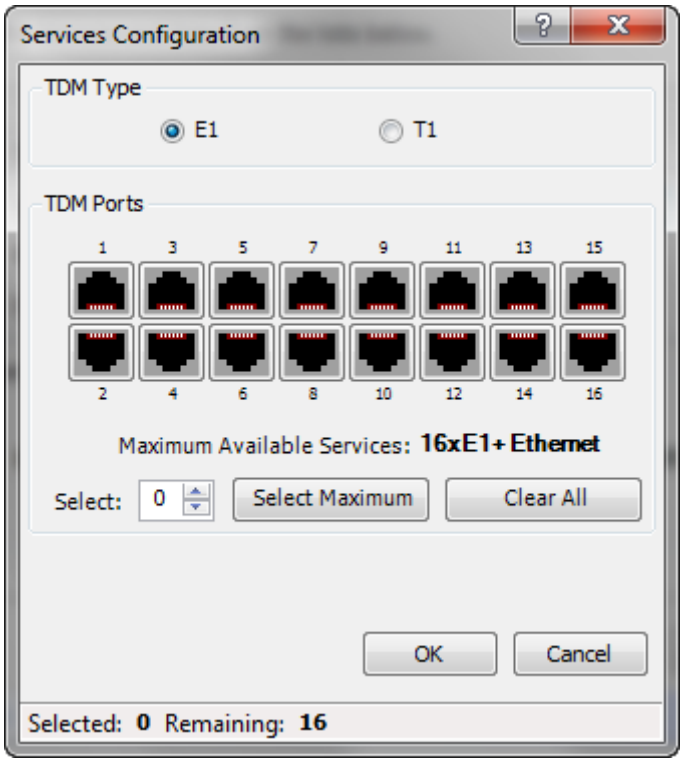


Figure 6-21: TDM service port selection

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.

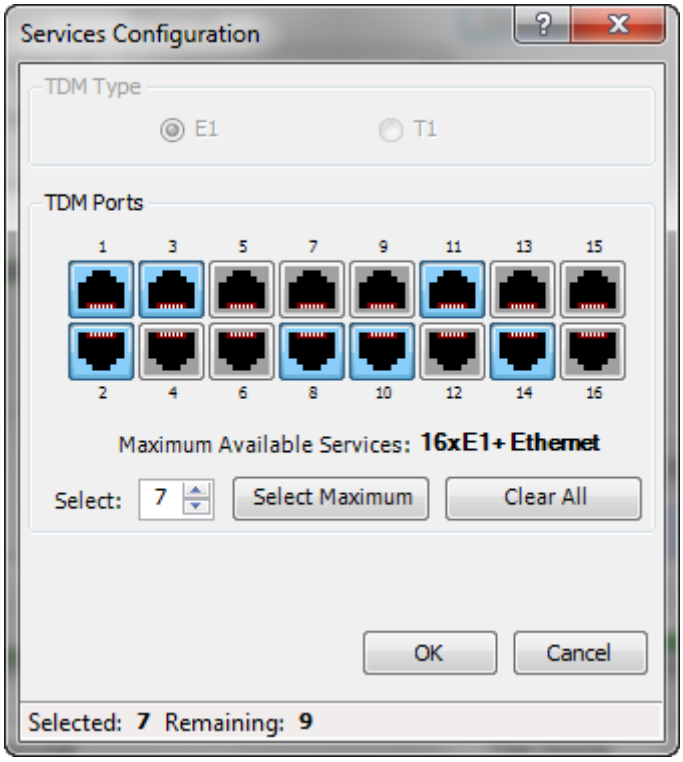


Figure 6-22: TDM Service port selection - seven services selected

4. Click **OK**. You are returned to the Services and rates dialog of **Figure 6-24**. It is updated to reflect your choice.

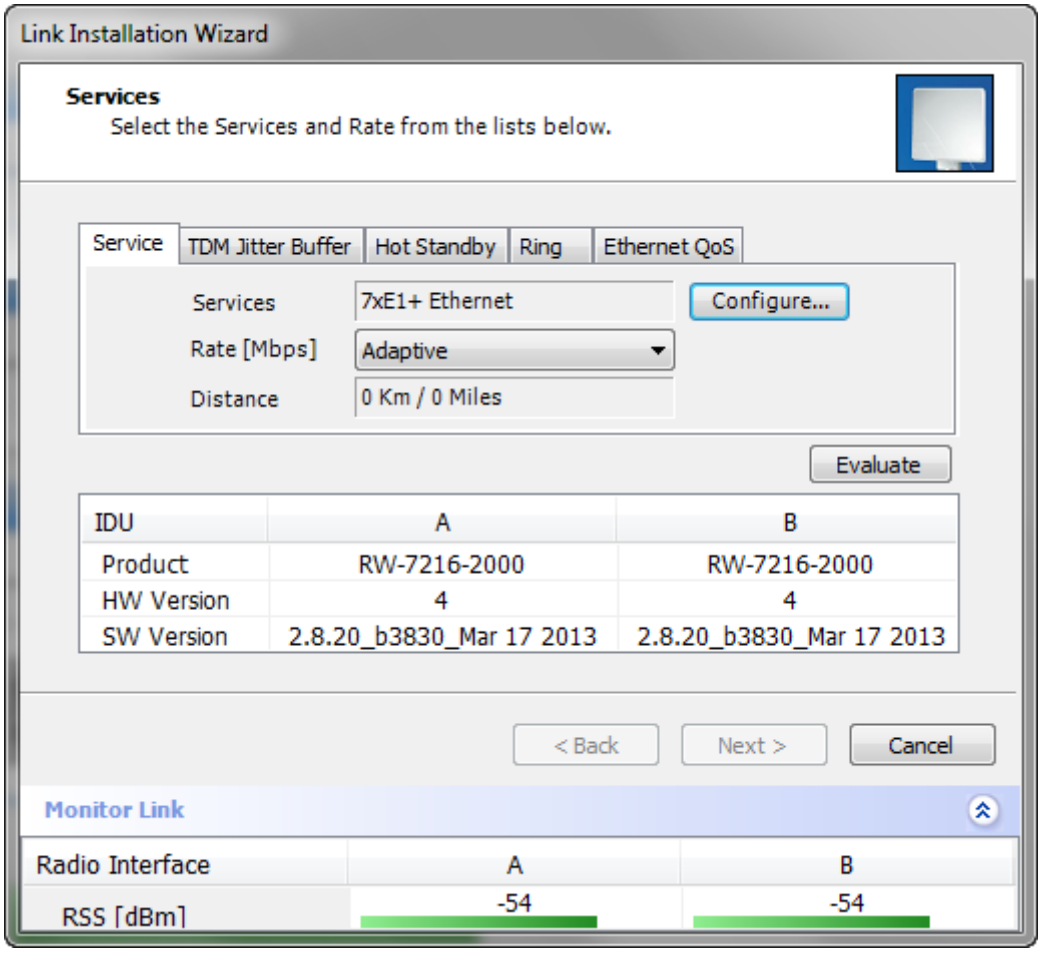


Figure 6-23: Services and Rates - Services chosen

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.

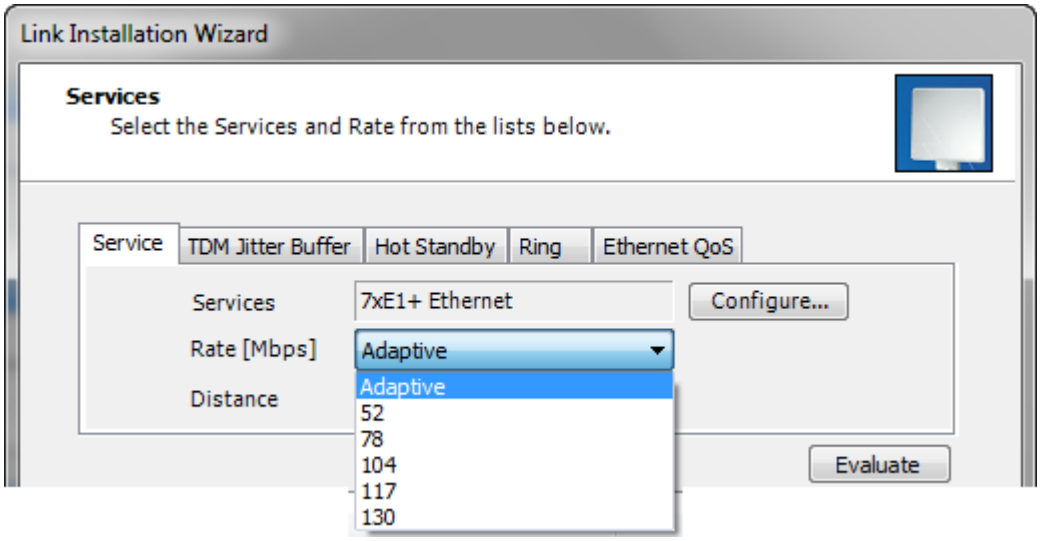
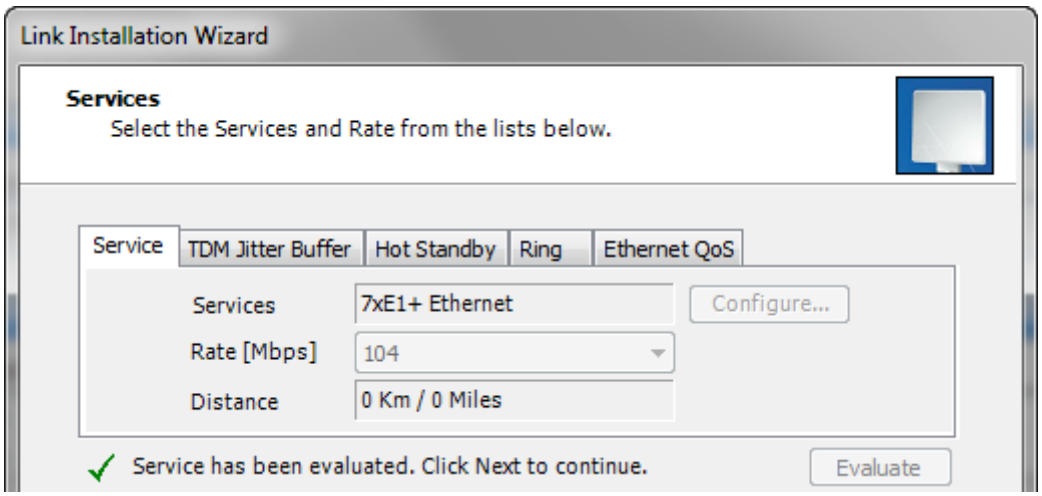


Figure 6-24: Services and Rates dialog: Available rates

To choose a modulation rate:

1. Choose Adaptive or one of the available rates.
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 6-23**.

Setting Monitored Hot Standby Mode

If you are not using Hot Standby Mode, you may skip this section.

To install and use the Hot Standby feature, see **Chapter 15**. The following procedure can be used to switch links between primary and secondary or to disable the mode.

To set the Hot Standby Mode:

1. Click the Hot Standby tab. The following dialog appears:

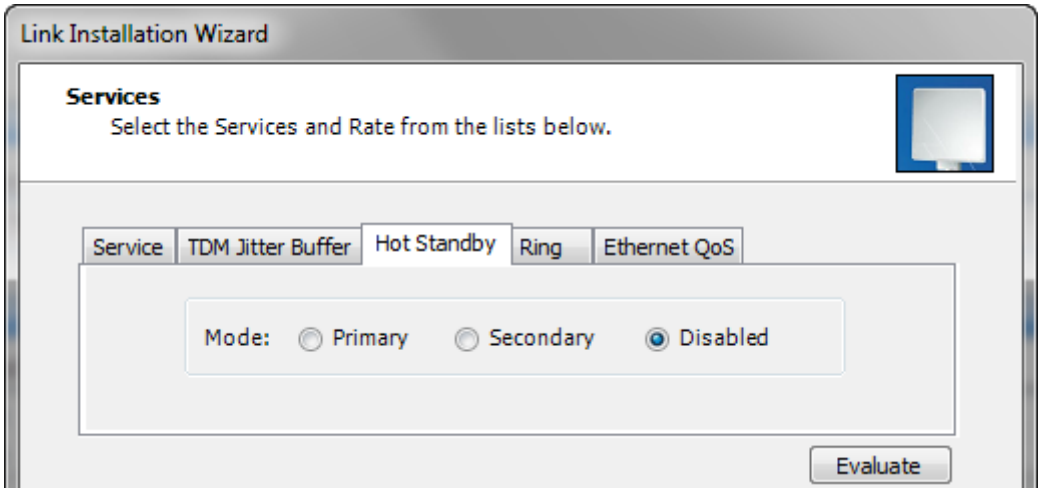


Figure 6-25: Choosing Hot Standby Mode

2. Click the radio button to make this link primary or secondary.

Ethernet Ring

To install and use the Ethernet Ring feature, see **Chapter 16**.

Ethernet QoS

To install and use the Ethernet QoS feature, see **Chapter 20**.

Setting the TDM Jitter Buffer

➢ **To set the TDM Jitter Buffer size:**

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

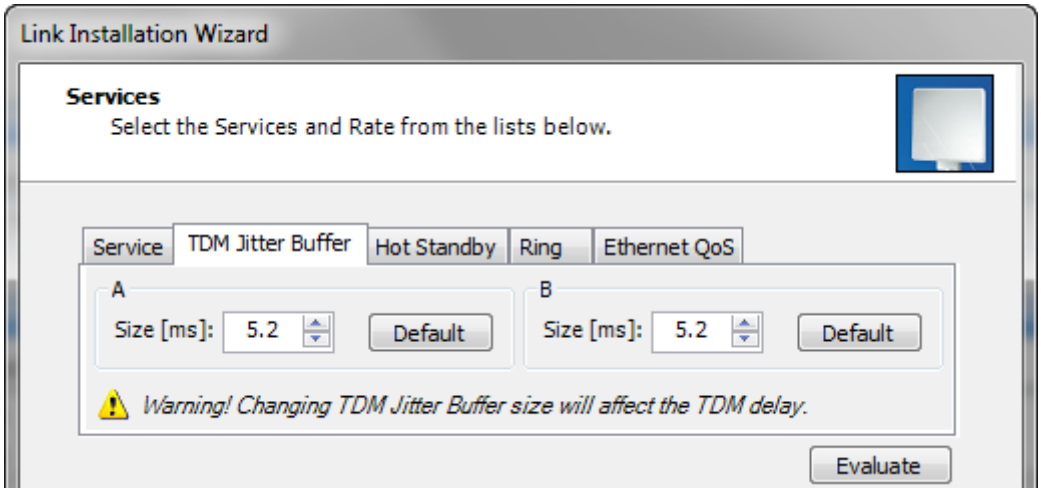


Figure 6-26: TDM Jitter Buffer Configuration

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.

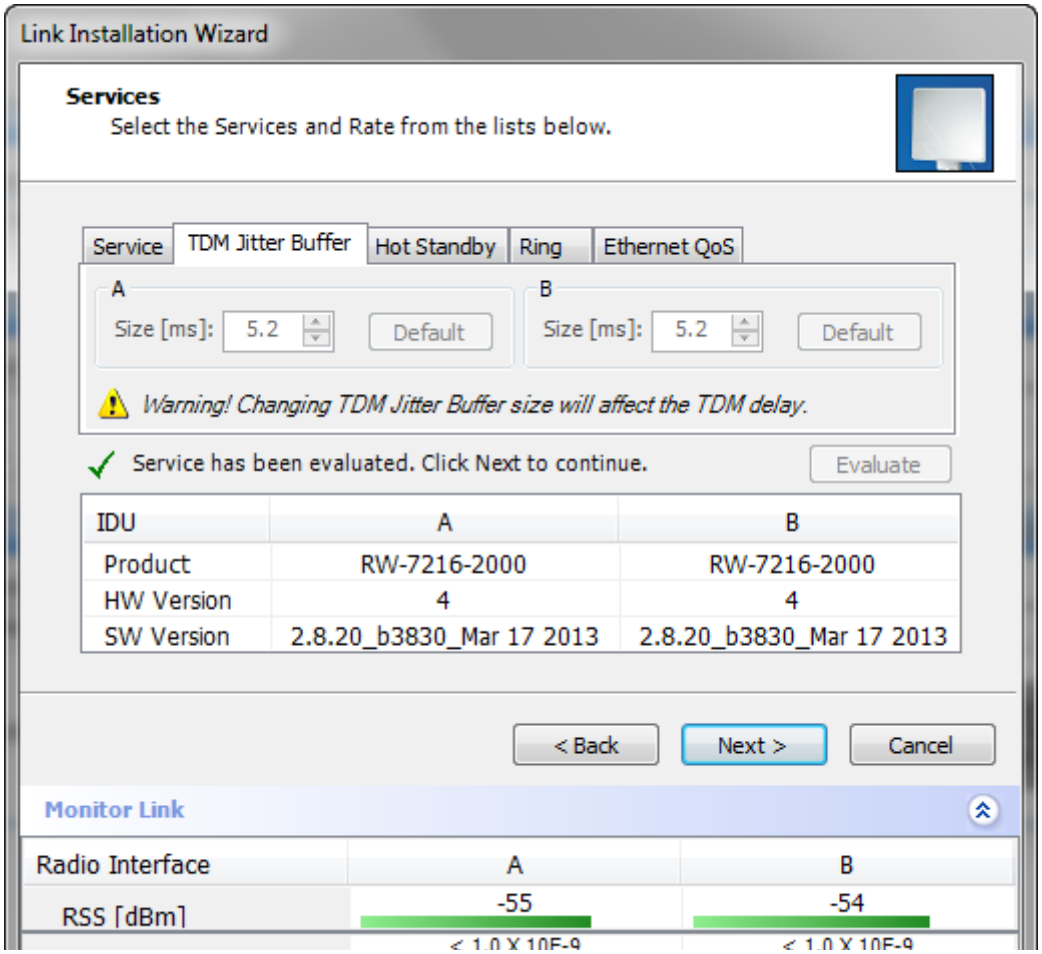


Figure 6-27: TDM Jitter Buffer Configuration - TBFR evaluation bar

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:

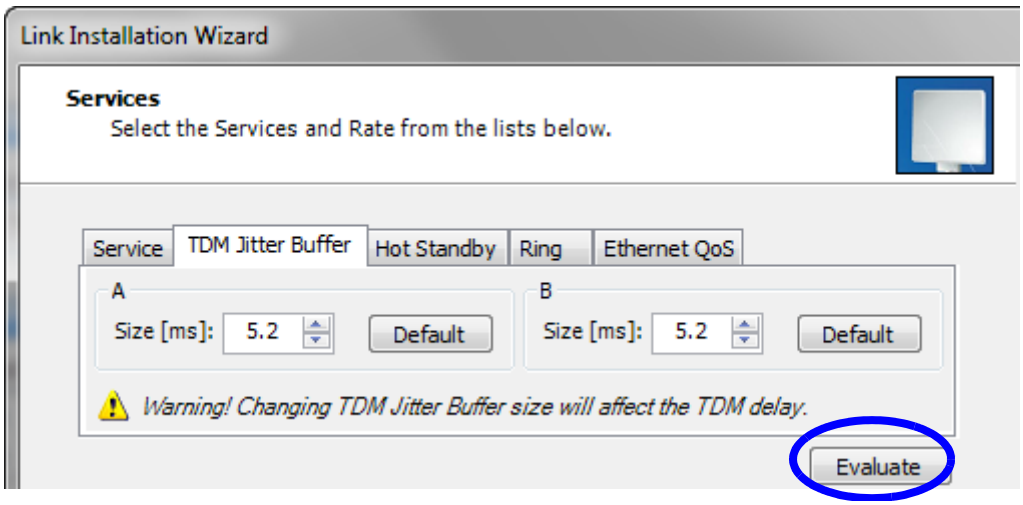


Figure 6-28: Services and TDM delay set - link ready for evaluation

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 F-2**.

Step 7, TDM Clock Configuration

Using E1 TDM Ports

The following dialog is displayed:

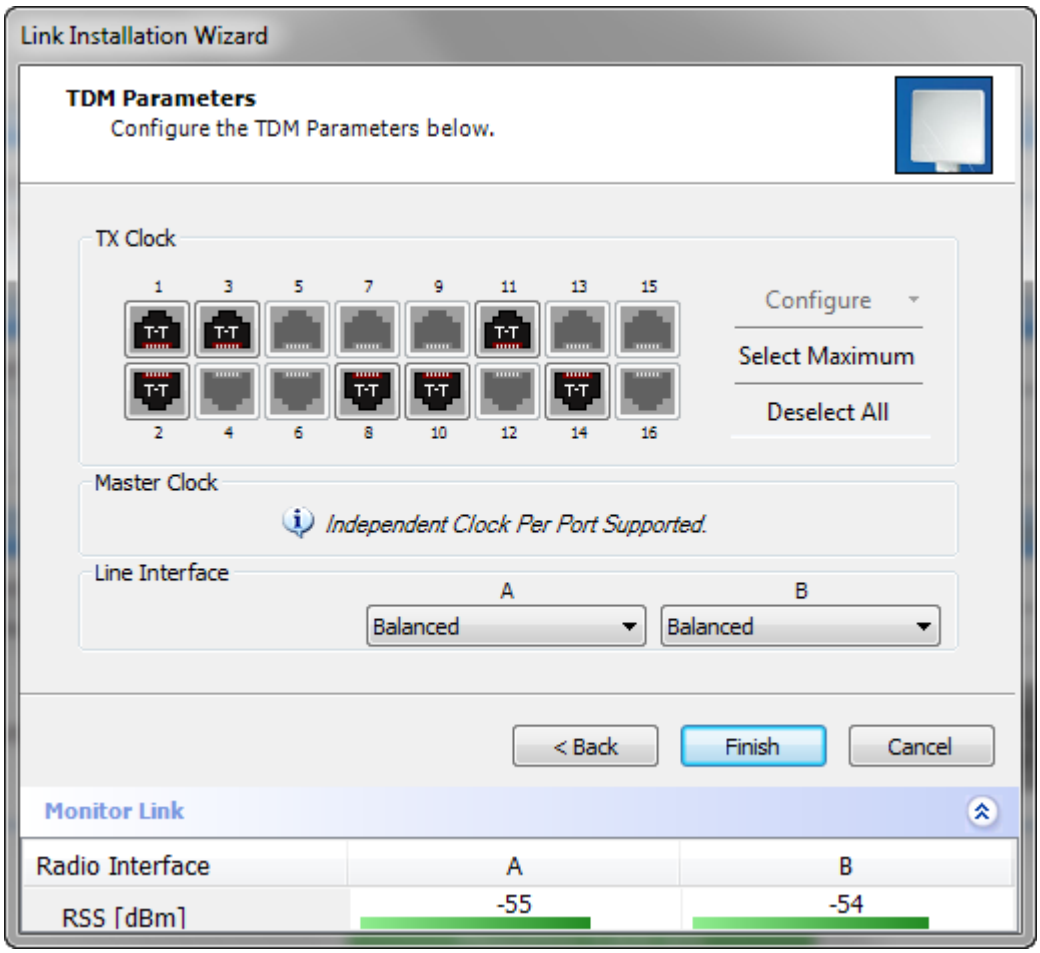


Figure 6-29: TDM E1 Parameters Configuration (1)

➢ **To configure TDM clock parameters:**

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

Note

- **Select Maximum** will select the maximum number of services that were configured for the air interface for configuration
- **Deselect All** unconditionally deselects all of the services for configuration
- Without selecting anything, right-clicking any port will cause the appearance of the drop down list of **Figure 6-30** below

2. Right click any port. The following drop down list is displayed:

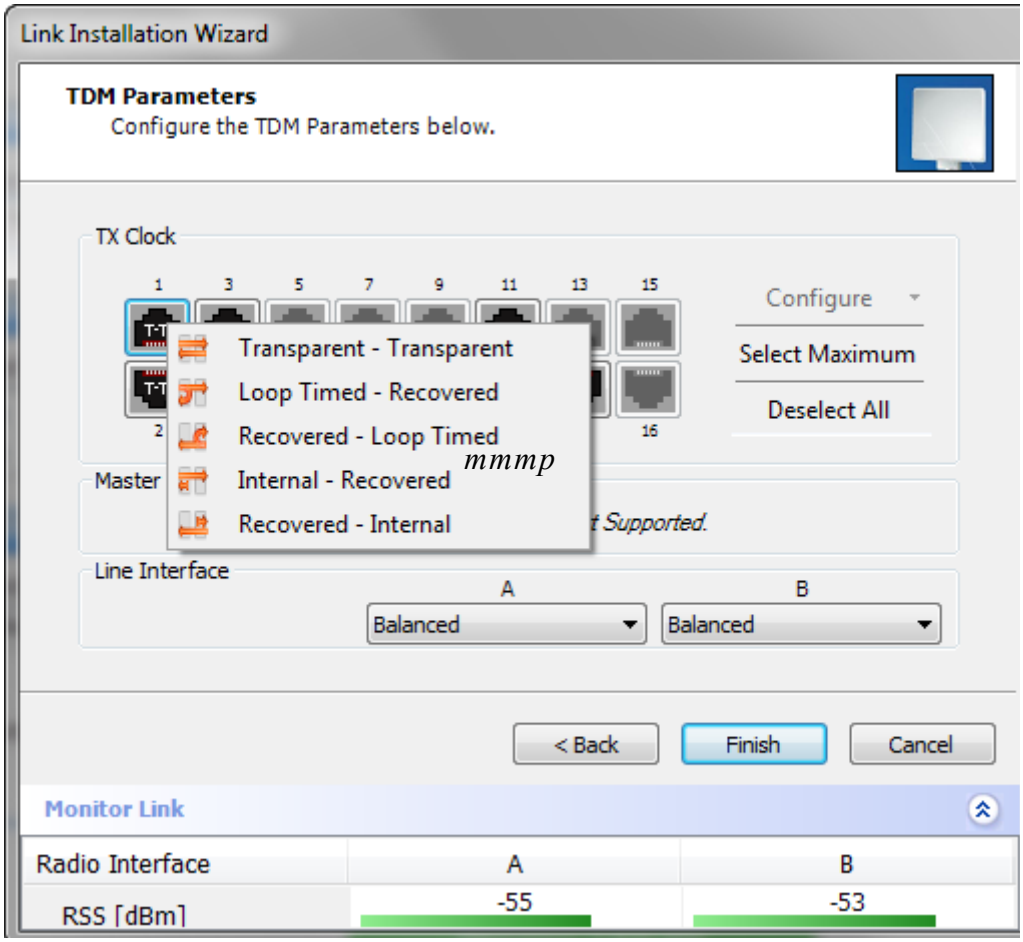


Figure 6-30: TDM Parameters Configuration (2)

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

Note

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

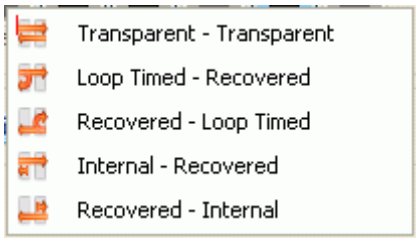


Figure 6-31: TDM Parameters

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.

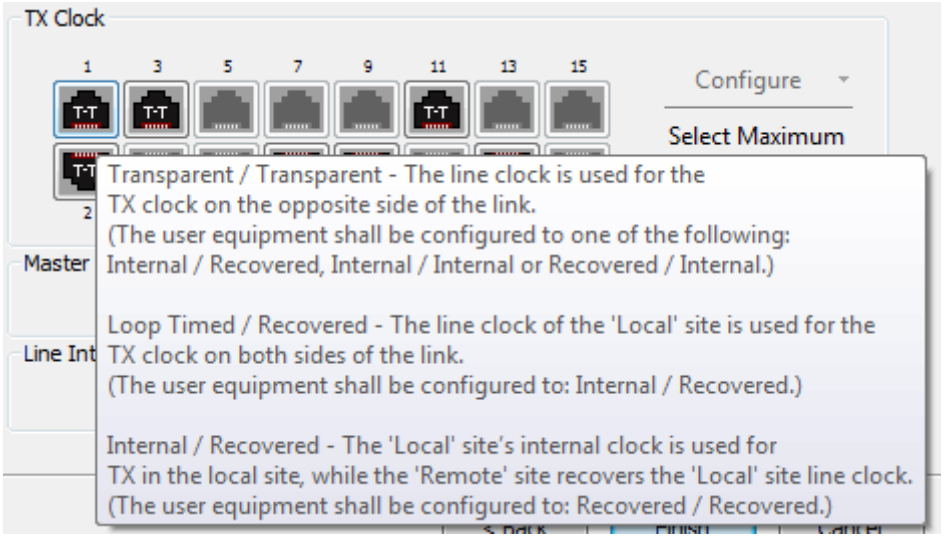
Internal/Recover

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.

Mousing-over any port causes a pop-up help ballon:



4. You may configure the E1 ports to unbalanced mode (75 ohm). You should configure both sides of the link as balanced or unbalanced.

   Figure 6-32 shows an adapter cable for connecting devices with balanced E1 interface to the user equipment with unbalanced E1 interface. The Y splitter cable includes one RJ-45 balanced connector (left) and two unbalances BNC coaxial connectors (right).

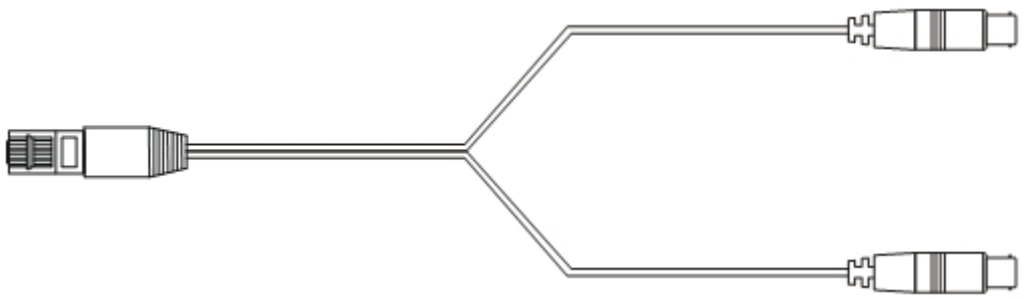


Figure 6-32: Unbalanced E1 adapter cable (Y Splitter)

   See **Appendix B** for further technical details.

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

Using T1 TDM Ports

If you are using T1 (or international equivalents), the Clock Configuration is a little different:

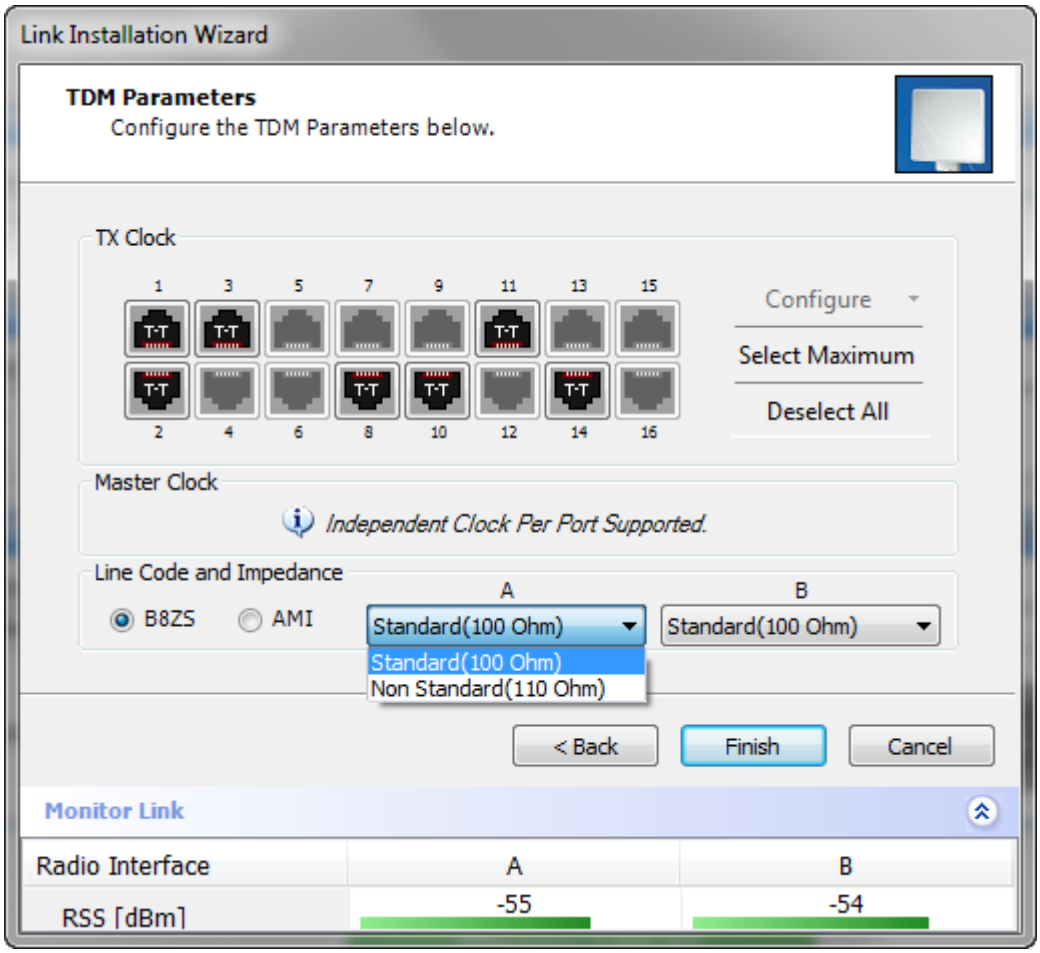


Figure 6-33: TDM T1 Parameters Configuration

Here you should also chose the Line Code and Impedance. Some regulatory areas (such as Japan) require a 110 Ohm line impedance.

Step 8, Installation Summary and Exit

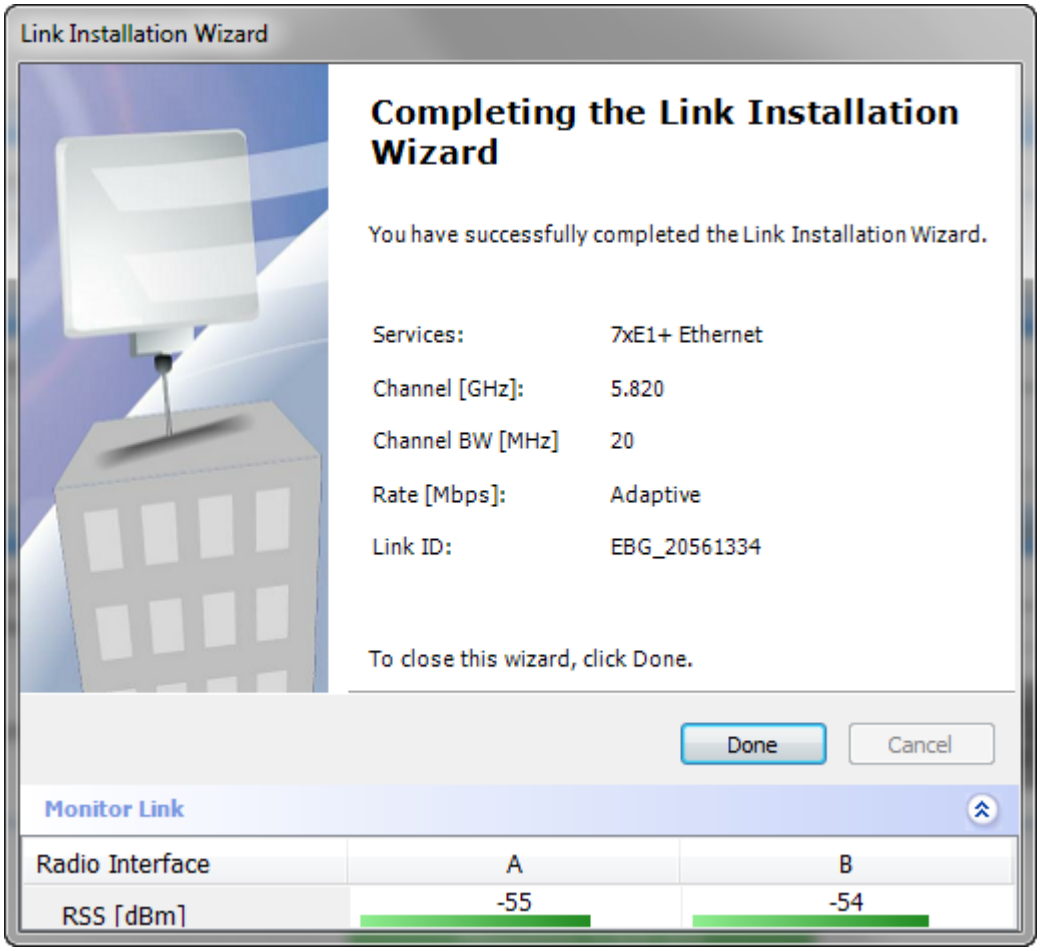


Figure 6-34: Installation Wizard Exit Summary

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

The main window now reflects the installation:

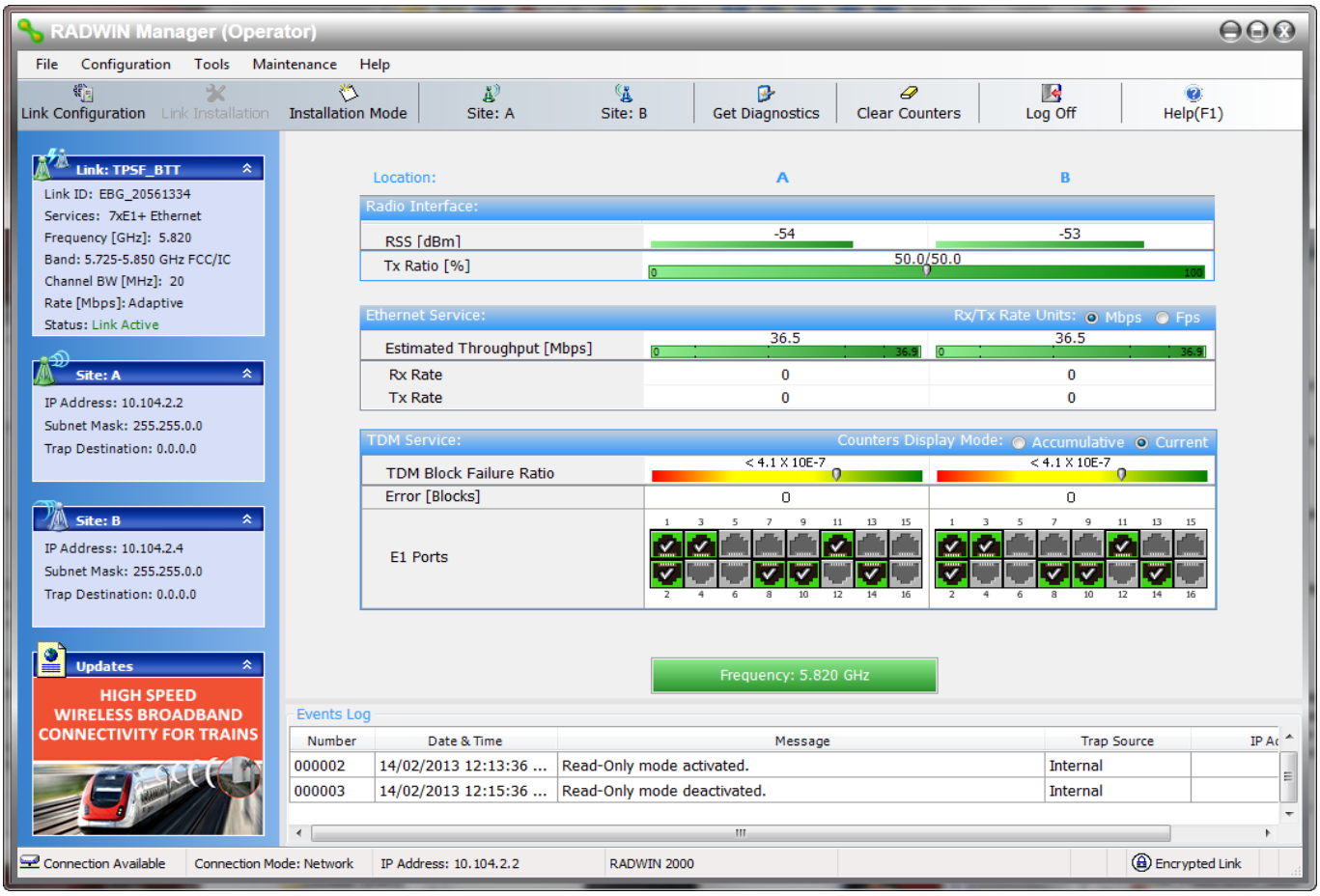


Figure 6-35: Main window of the Manager after installation with loaded trunks

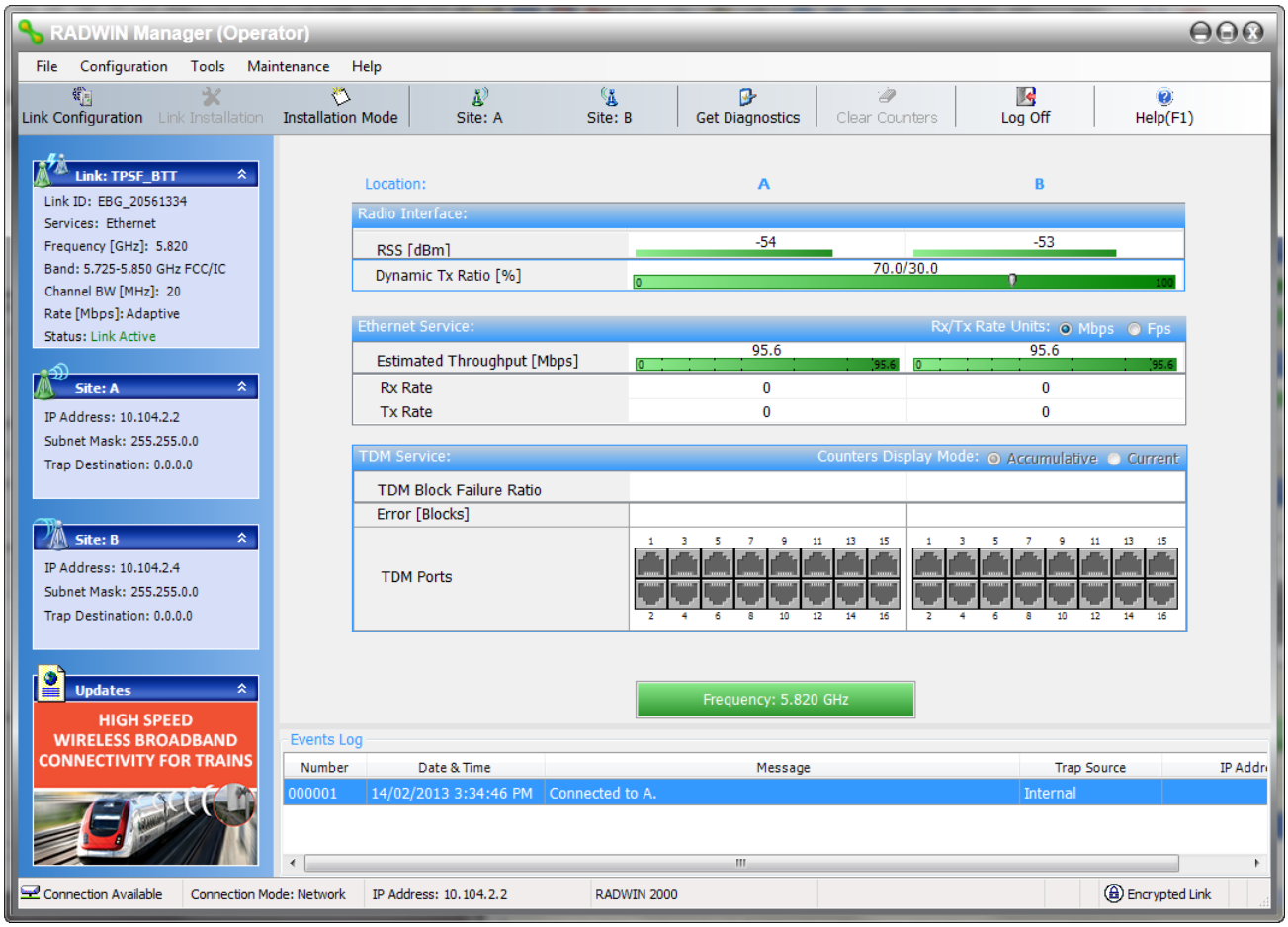


Figure 6-36: Main window of the Manager after installation with asymmetric capacity allocation - No HSS

Figure 6-36 shows the results of a 70%/30% Transmission ratio on a lone link (no HSS). Observe that near 100Mbs is available in either direction

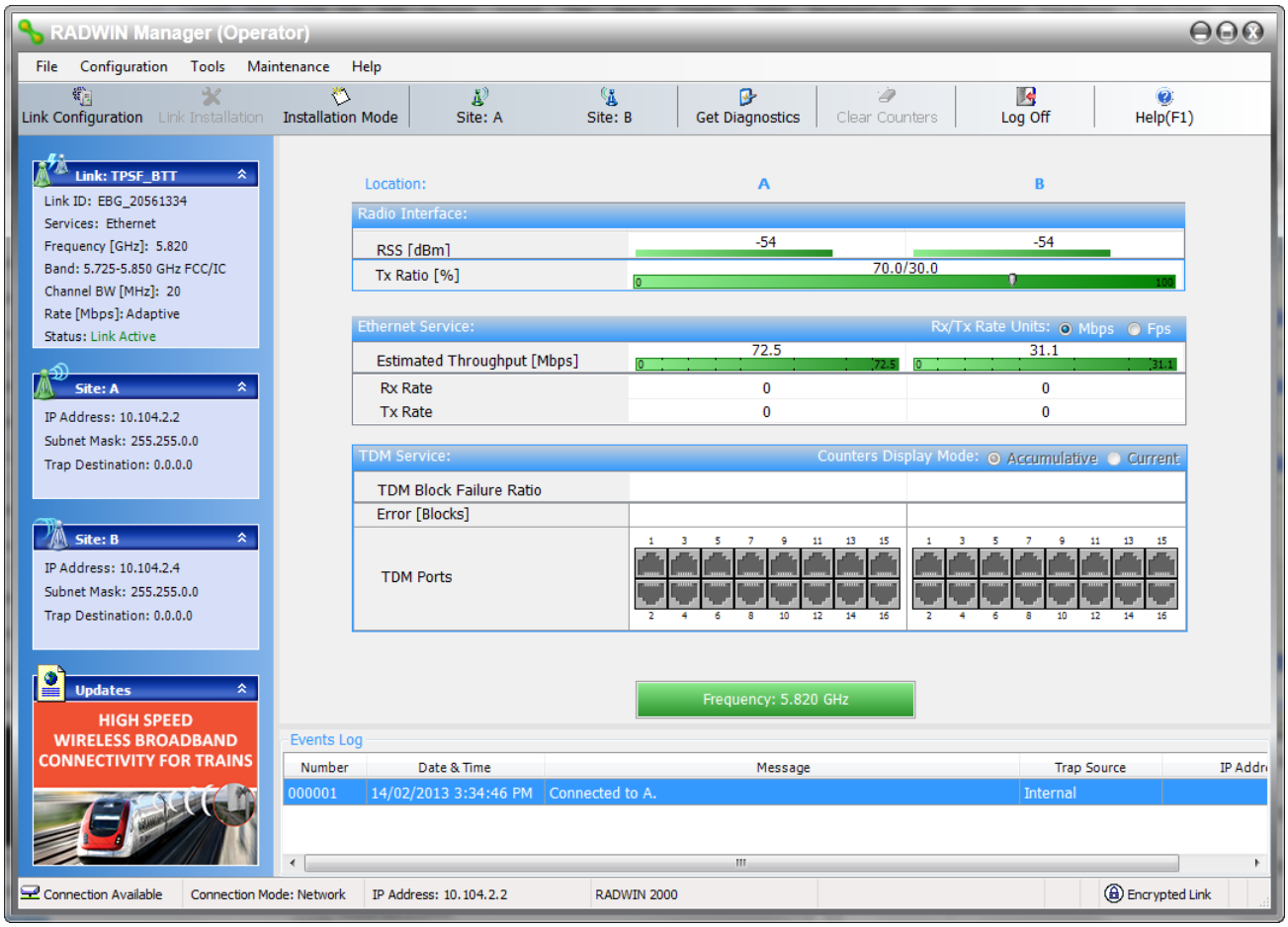


Figure 6-37: Main window of the Manager after installation with asymmetric capacity allocation - HSS enabled

Figure 6-37 shows the results of a 70%/30% Transmission ratio on a lone link with HSS. The allocation is "hard".

Our final example uses the same pair of ODUs with a pair of IDU-Cs supporting GbE:

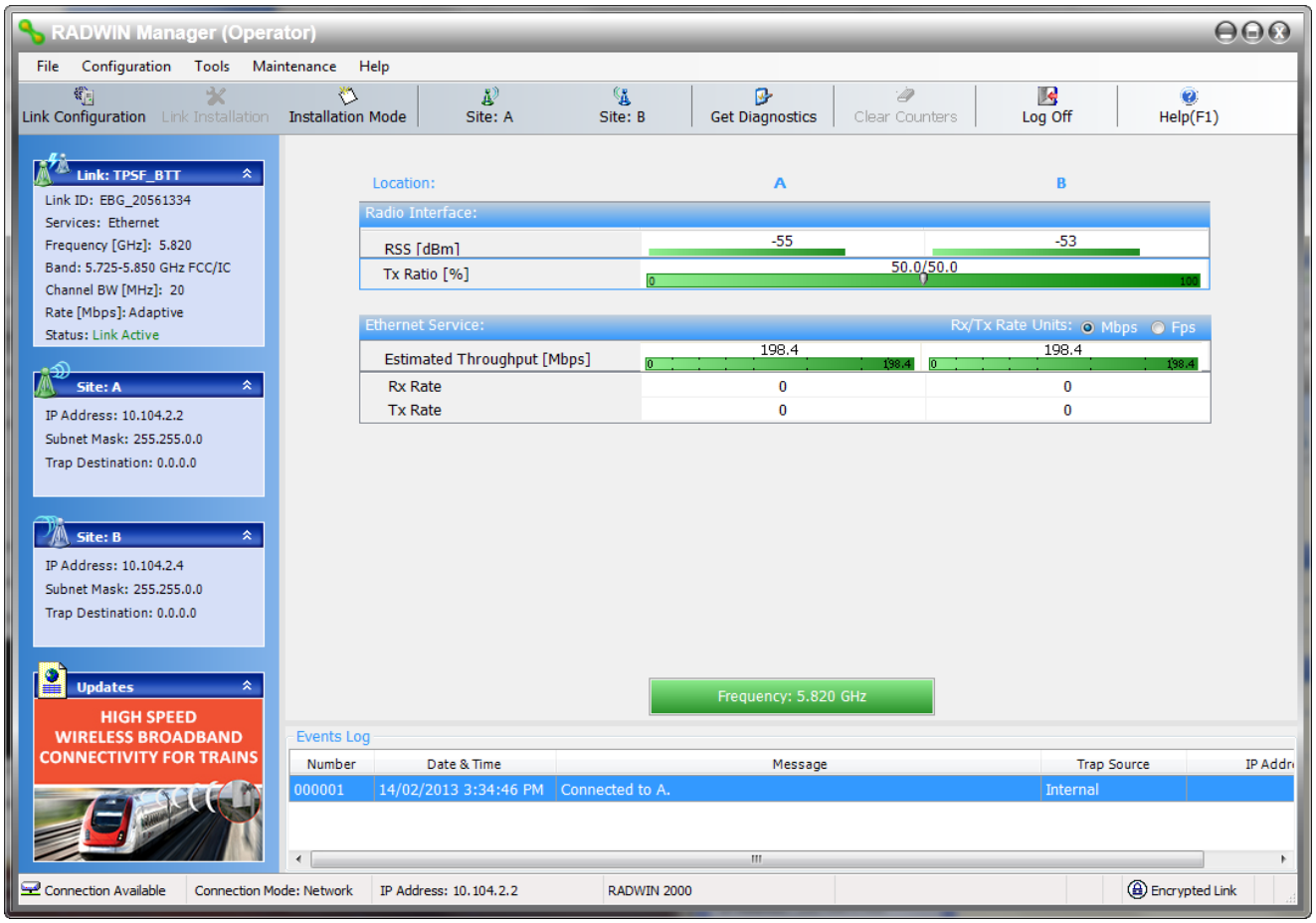


Figure 6-38: Main window of the Manager - Using GbE IDU-Cs. 200 Mbps in both directions.

➢ **To verify the installation:**

- Verify that the Received 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 8**.

Chapter 7

The RADWIN Manager: Main Window

The Main Window of the RADWIN Manager

Ensure that the RADWIN Manager is running.

The main window should look similar to that in **Figure 7-1**:

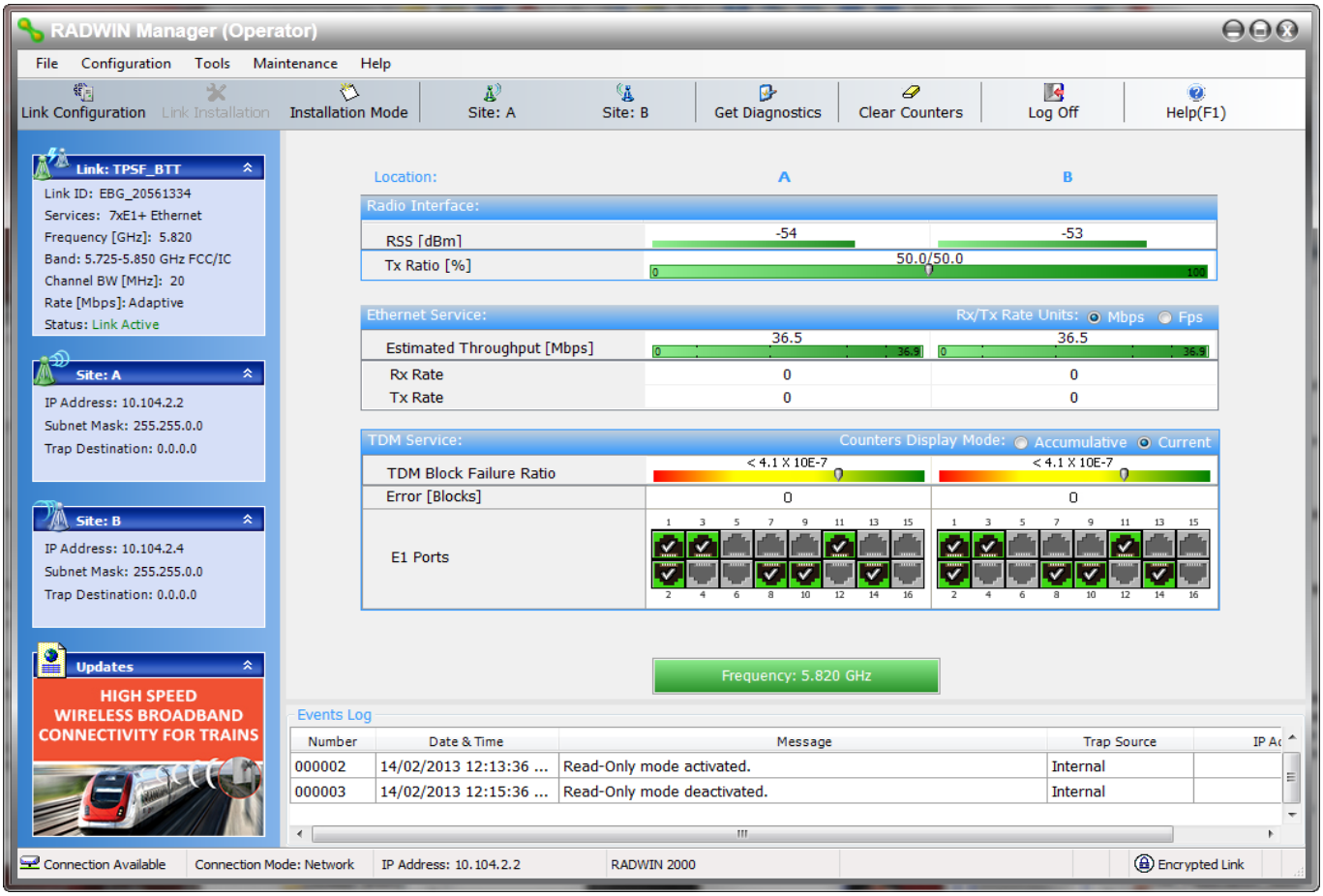


Figure 7-1: Main window, Wireless Link is Active

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 Tool bar

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



In Installation mode, Link Configuration is grayed out and Link Installation is open.

The button functions are set out in **Table 7-1**:

Table 7-1: 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**
Installation Mode	Enter Quick Insllation mode. See **Chapter 23**.
Site: <Site 1 name>	Opens the Site configuration dialog for **Site 1**. Same as **Configuration | 1 Configure <Site 1 name>**
Site: <Site 2 name>	Opens the Site configuration dialog for **Site 2**. Same as **Configuration | 2 Configure <Site 2 name>**
Get Diagnostics	Obtain system information
Clear Counters	Clears TDM error blocks counters. Disabled for Ethernet-only link
Log off	Closes the current session and logs off RADWIN Manager
Exit	Exits RADWIN Manager
Help	Opens Help on the use of contextual online help

Main Menu Functionality

The main menu contains the following items:



The RADWIN Manager menu functionality is displayed in **Table 7-2**.

Table 7-2: 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	

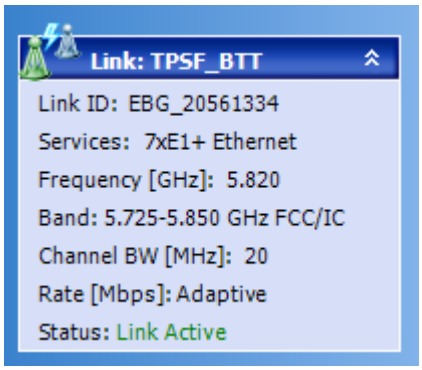
Table 7-2: RADWIN Manager main menu functionality (Continued)

Menu level			Function	Reference
Top	**+1**	**+2**		
Configuration	**Link Configuration**		Run the Configuration Wizard. Not available in Installation Mode	This chapter
	1 Configure <Site 1 name>		Opens the Site configuration dialog for **Site 1.** Has a path to return to Installation Mode	**Chapter 9**
	2 Configure <Site 2 name>		Opens the Site configuration dialog for **Site 2**. Has a path to return to Installation Mode	
	Link Installation		Runs the Installation Wizard. Not available in Configuration Mode	**Chapter 6**
Tools	**Performance Monitoring Report**		On screen and printable	**Chapter 10**
	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	**Chapter 17**
	Spectrum View		Monitor and evaluate spectrum availability	**Chapter 27**
	Change Band (Installer only)		Change the link band	**Chapter 22**
	Events Log	**Clear Events**	Clear local events log	**Chapter 10**
		Save to File	Save events log file	
	Preferences		Local preferences dialog	
Maintenance	**Clear counters**		Clear TDM counters	
	Loopbacks		Set TDM loopbacks	**Chapter 10**
	Estimate Eth. Throughput		Estimate Ethernet throughput by transmitting full size frames over the air for 30 sec	**Chapter 10**
	Reset	**1 <Site 1 name>**	Reset <Site 1 name> ODU	
		2 <Site 2 name>	Reset <Site 2 name> ODU	
Help	**RADWIN Manager Help**		View help on online help	
	Link Budget Calculator		Calculator opened in default browser	**Chapter 26**
	Get Diagnostics Information		Obtain system information	**Chapter 10**
	Check for Updates		Check for updates from the RADWIN Web site	
	About RADWIN Manager		Manager build and system information	

Elements of the RADWIN Manager Main Window

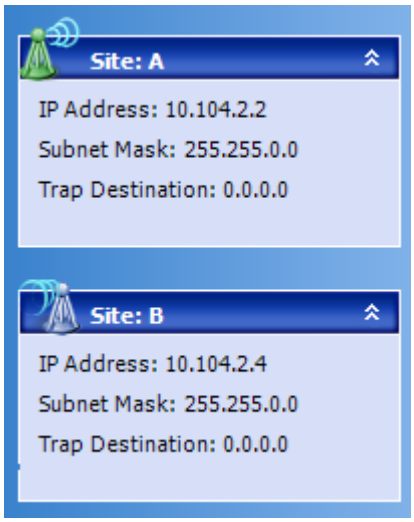
Link details pane

The Link details pane on the left is split into three sections, which are largely self explanatory. The top section summarizes information about the link:



For Link status possibilities and color codes, see **Table 10-2**.

The two lower left panels show basic link site details:



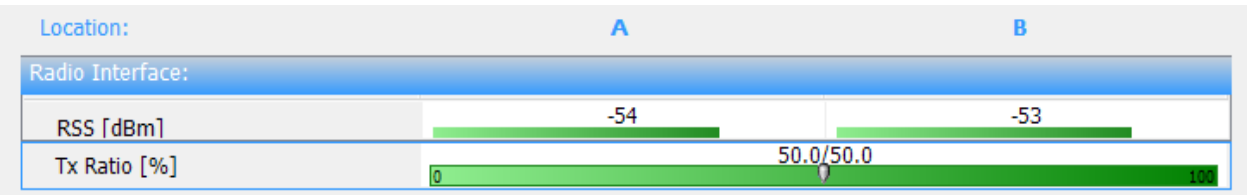
The three fields for each site are user definable. See **page 9-7**.

The Monitor pane

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

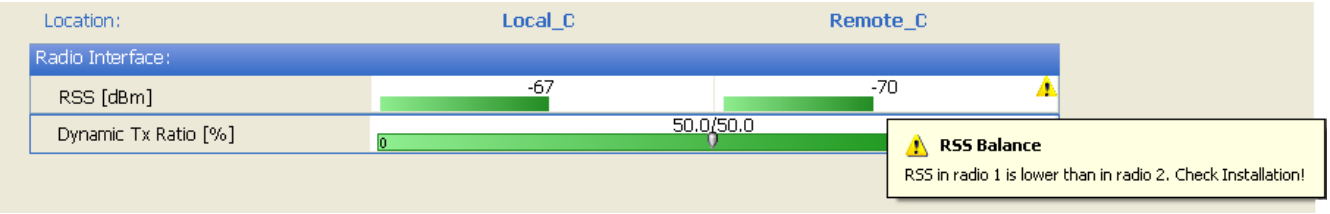
Received Signal Strength

Radio Interface, Received Signal Strength (RSS) in dBm and Transmission Ratio:



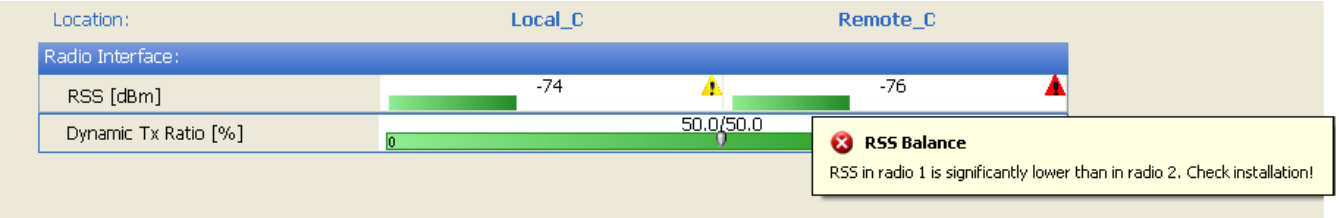
Under normal operating conditions the RSS for both sites should be balanced with occasional fluctuations of 1-2 dBM. The main causes of consistent imbalance are as follows:

- A consistent RSS imbalance may be caused by different TX Power settings at each site. There is no warning indicator but it may be easily corrected using **Site Configuration | Tx Power & Ant** or by rerunning the Configuration wizard.
- A yellow warning triangle will be displayed for an RSS difference of more than 8 dBm between the two polarizations on the same site (the RSS display is the combination of both polarizations on this site)



Notice the mouse-over tool-tip explaining the problem.

- A red warning triangle indicates an RSS difference of more than 16 dBm between the two polarizations on the same site



Again, notice the mouse-over tool-tip explaining the problem.

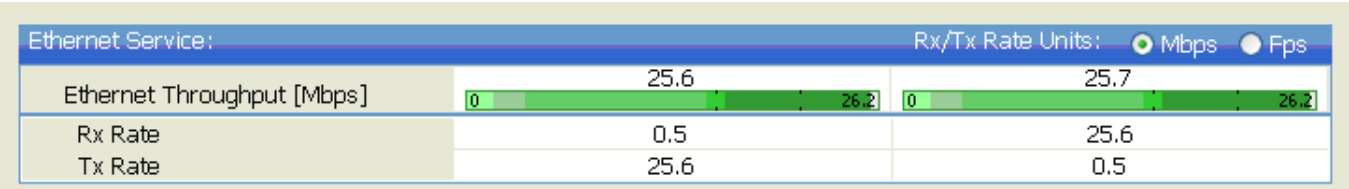
The latter two cases are usually the result of a physical problem at the indicated site. Probable causes are:

- Interference
- Antenna polarity problem
- ODU malfunction

Note

The Dynamic Tx Ratio bar only appears for model RADWIN 2000 C

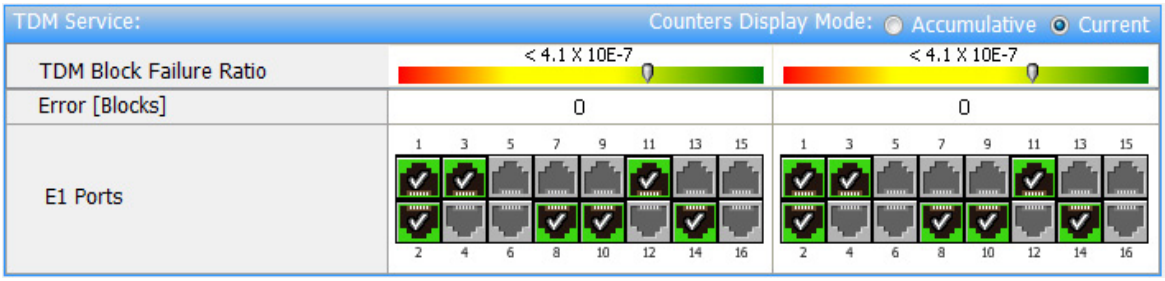
Ethernet Service



- Estimated 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: The Rx and Tx rates are the receive and transmit rates **on the LAN side** of each ODU, not the air side. For a balanced link, the Rx and Tx rates at the LAN side of Site A will match the Tx and Rx rates at the LAN side of Site B respectively. In all cases, The LAN side Rx rate shown will be the same as the air side Tx rate for each individual ODU.
- Actual Ethernet traffic received and transmitted rates per site, is in Mbps of Fps, selectable in the panel title bar.

TDM Services (IDU-C and IDU-E)



- The title bar enables you to switch between Accumulative and Current view.
- Immediately below the title bar is displayed the TDM Block Failure Ratio. It is zeroed 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
  - Gray - Inactive

Frequency box

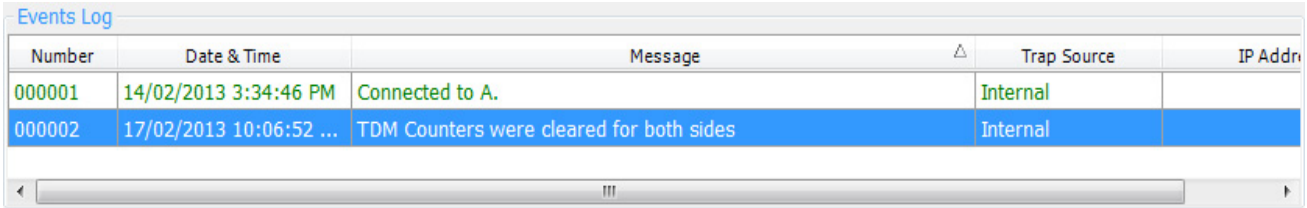


The Frequency box shows the link frequency. The color of the box indicates the status as follows:

- Green is an active link
- Red is an inactive link
- Magenta indicates an authentication or compatibility problem
- Brown indicates severe compatibility problem

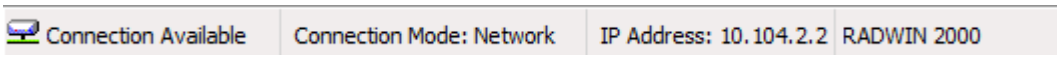
Events Log

The Events Log, stores alarms generated from both sides of the link and is detailed in **Chapter 10**.



The little triangular arrow-head on the right of the Message header indicates the order of messages. Default as shown, is from oldest to newest. Click it to change the order.

Status Bar



The Status bar, displays the following icons:

Table 7-3: 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
		ODU unreachable
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.
Link Lock		Link Lock enabled
		Link Lock encrypted
		Link Lock mismatch
Ethernet Ring Member		
DFS in use		
Rescue Alarm		In the event of an active alarm, opens alarms dialog

RADWIN RNMS users will see an additional field showing the IP address of the RNMS server:



Chapter 8

Configuring the Link

Overview

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 **Chapter 6**.

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.

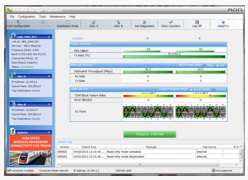
For ease of use, the Link Configuration wizard follows the same pattern as Link Installation. You should therefore be familiar with the content of **Chapter 6**.

The following parameters are configured using the Link Configuration Wizard:

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

The Configuration Wizard has seven steps as shown in **Table 8-1** below.

Table 8-1: Link Configuration Wizard





1 Wizard welcome



2 System parameters

- Link ID
- Site details



3 Channel settings - ACS Configuration



4 HSS settings



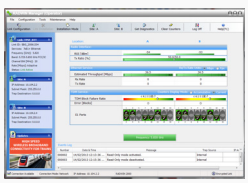
5 Tx Power and antenna settings, MIMO or Diversity



6 Services - Types, Adaptive or fixed, Jitter Buffer, MHS, Ethernet Ring, QoS



7 Set TDM Clock Parameters





8 Wizard summary and completion

Configuration

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.

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 6**.

The Configuration Wizard opens:

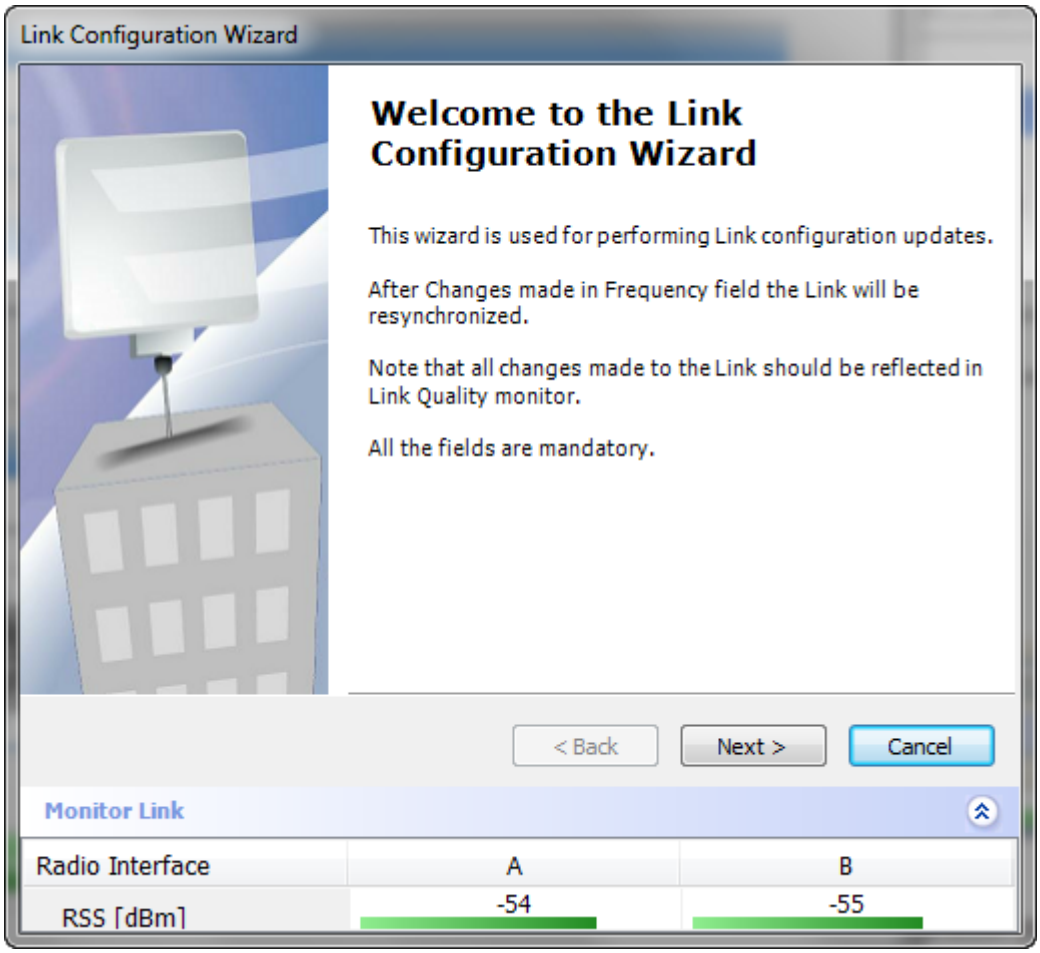


Figure 8-1: Link Configuration Wizard

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

Step 2, System Parameters

The System dialog box opens:

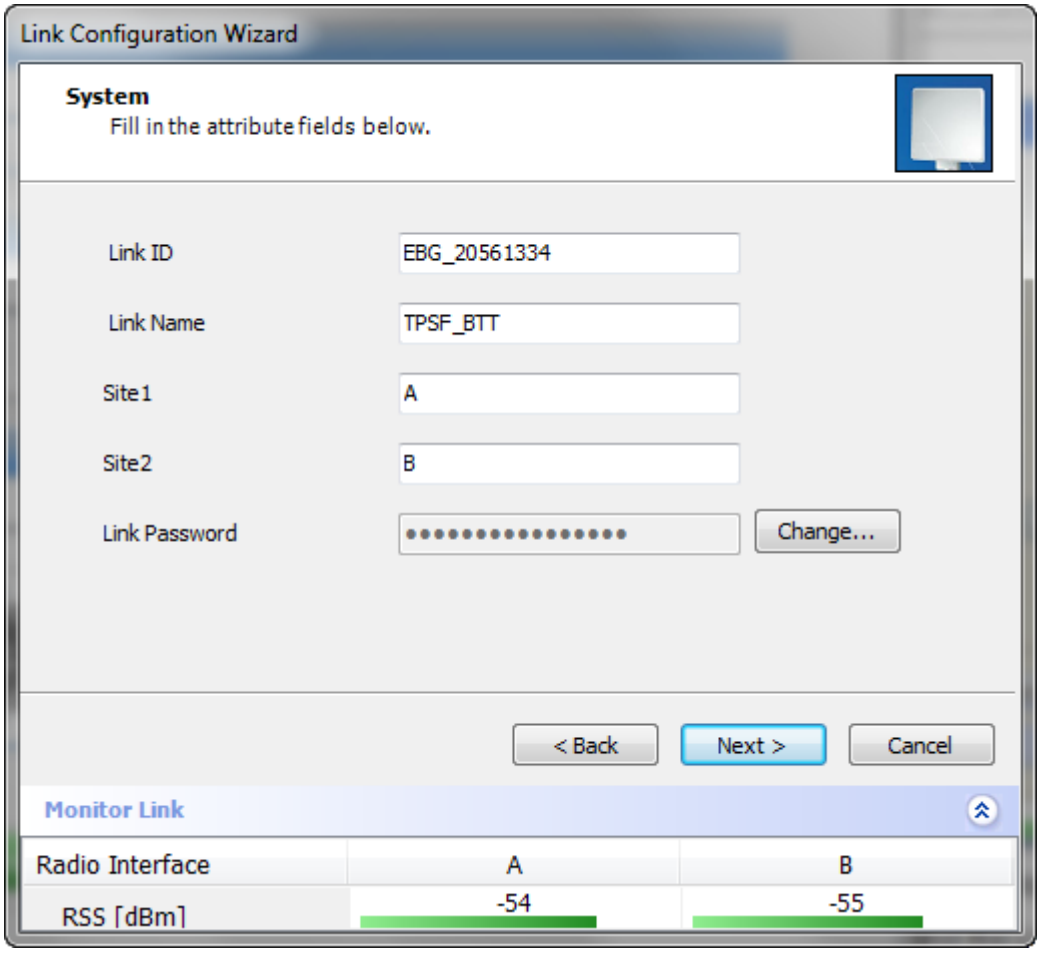


Figure 8-2: Configuration Wizard, System dialog box

The System attributes may be edited and the Link Password may be changed exactly as in the corresponding Link Installation step on **page 6-5**.

Click **Next** to continue.

Step 3, Channel Settings

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

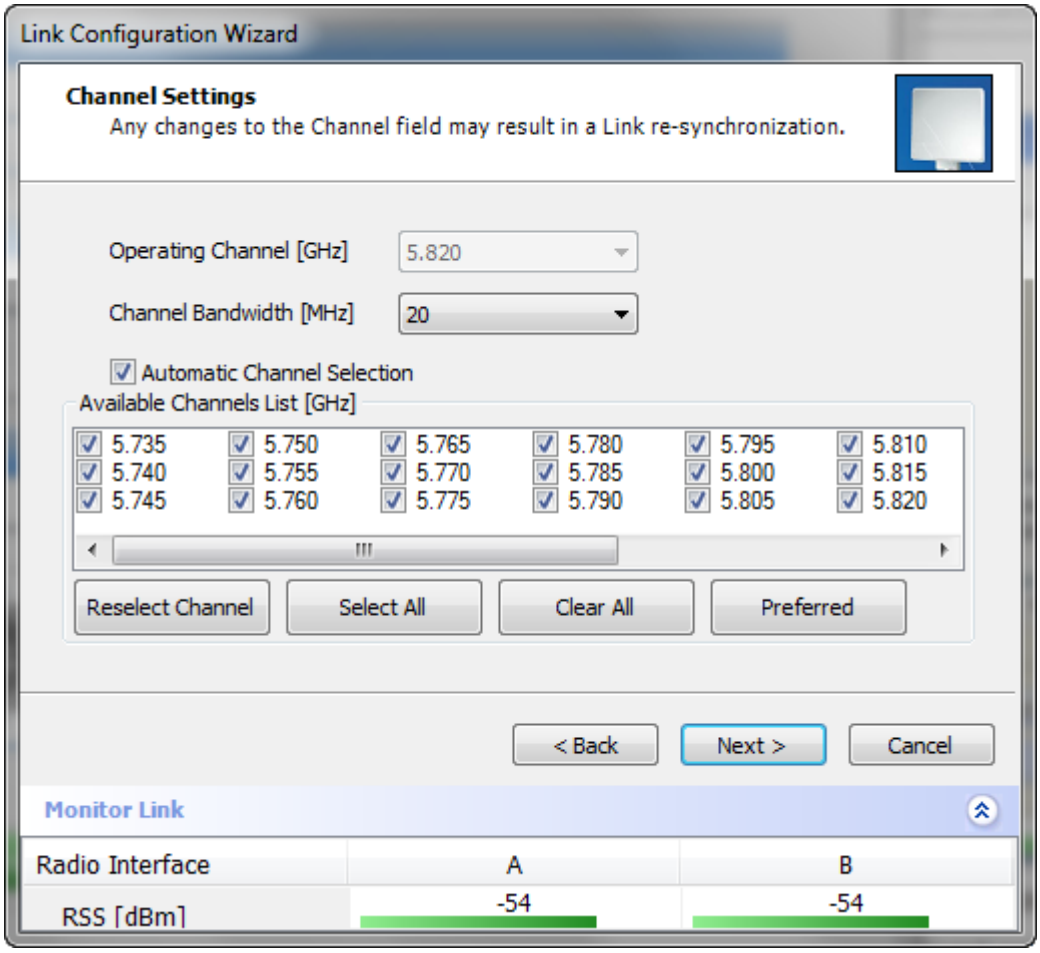
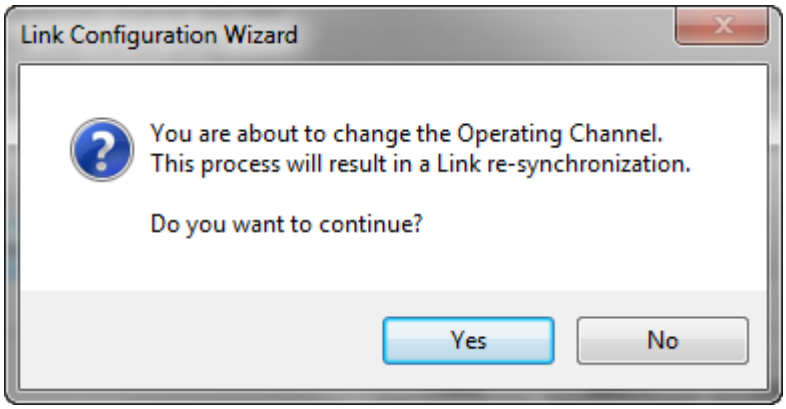


Figure 8-3: Channel Settings dialog box - Automatic Channel Selection

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:

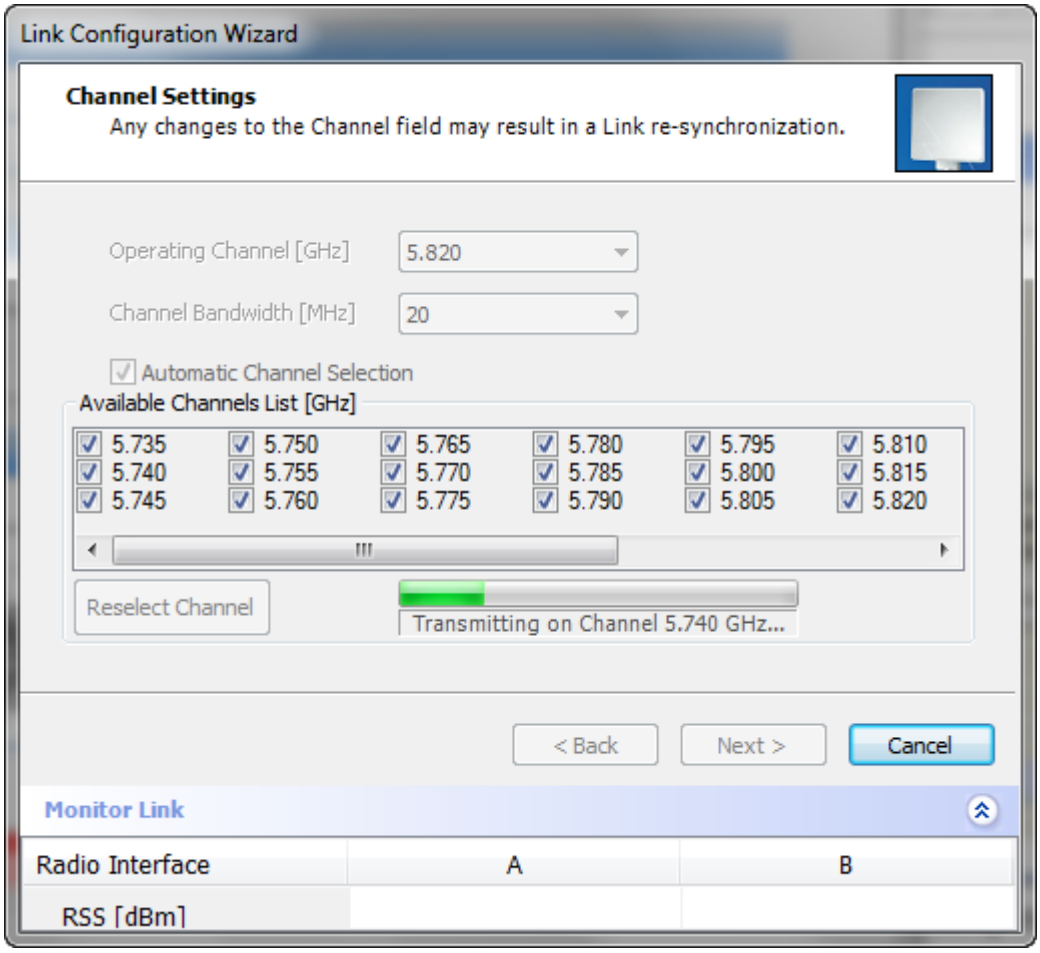


Figure 8-4: Searching for the best operating channel

The link will return to the status of **Figure 8-3** above with a possible change to the operating channel.

You may choose a channel subset and set preferred channels as for Link Installation as shown on **page 6-16**.

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

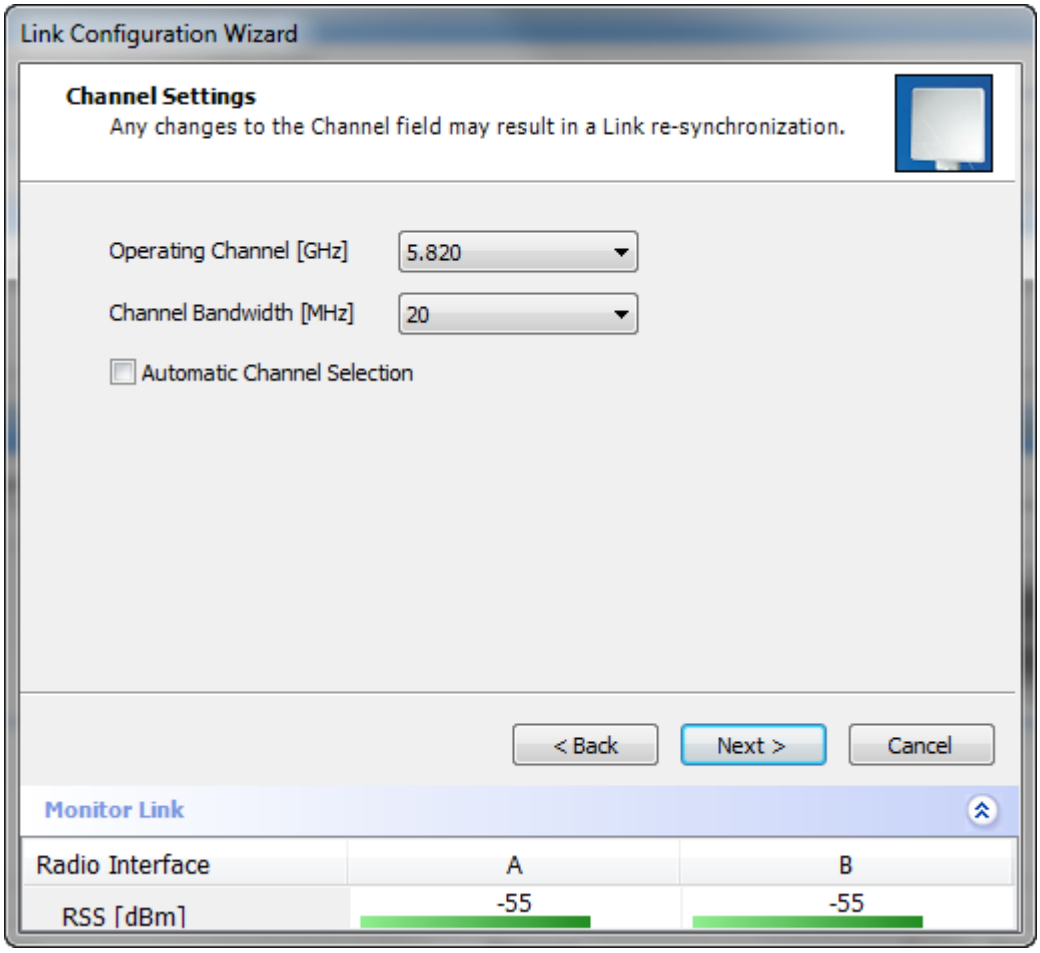


Figure 8-5: Channel Settings without automatic channel selection

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

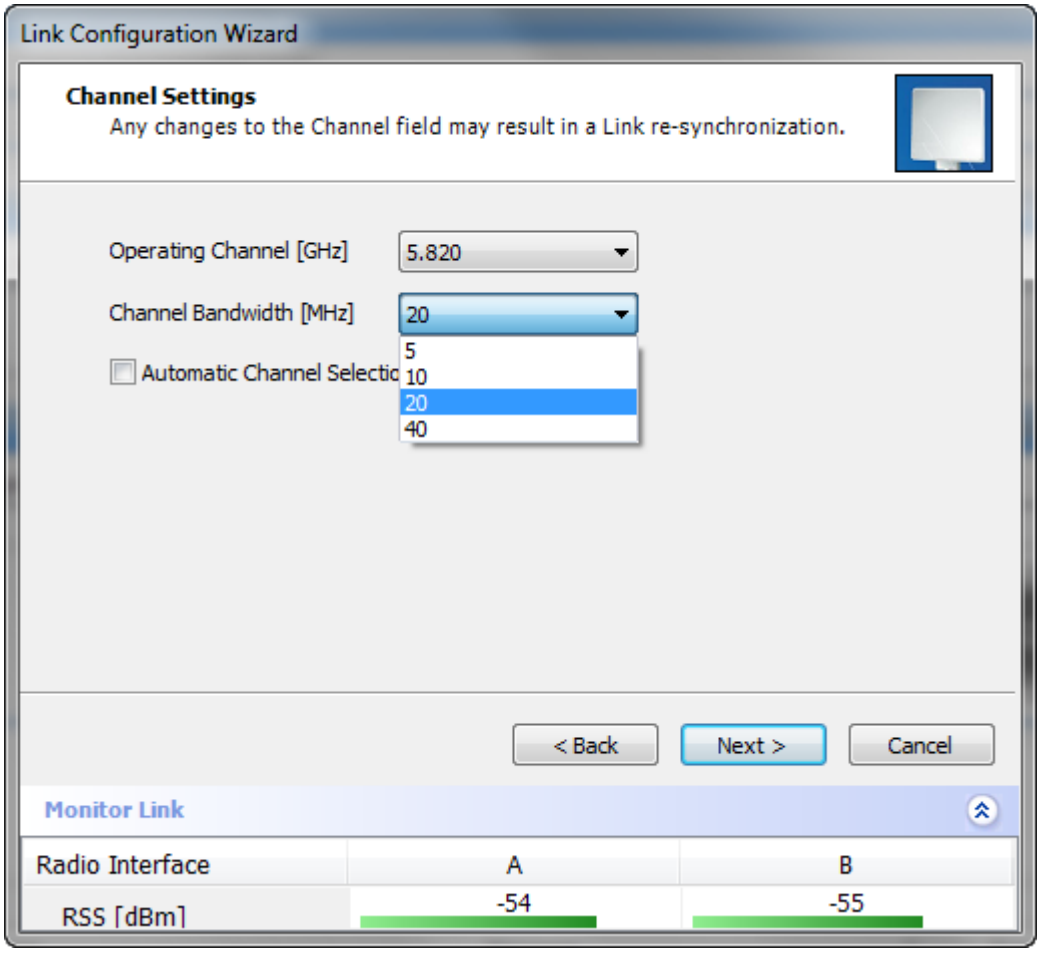


Figure 8-6: Channel frequency options

Selecting one of the frequencies presented returns you to the status of **Figure 8-5** with the appropriate change. If you choose **Other...**, the following window opens:

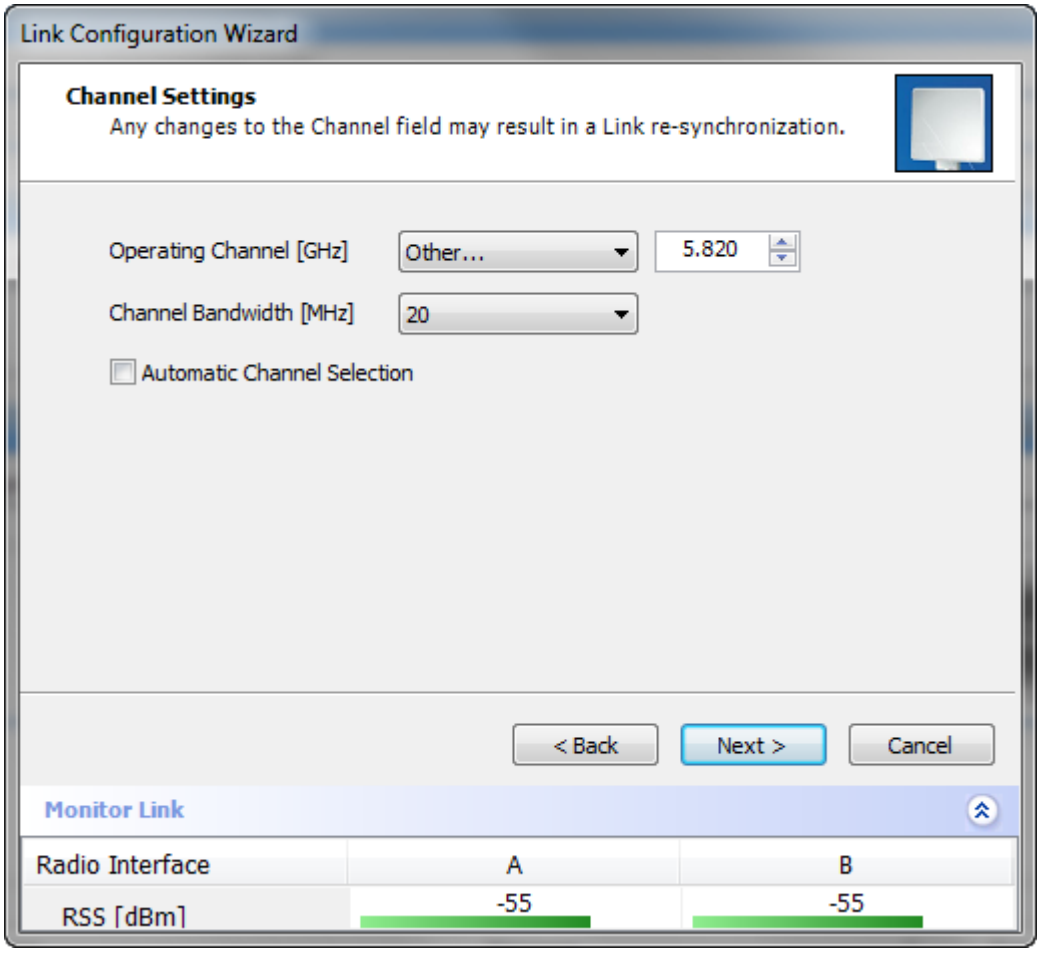


Figure 8-7: Choosing an "Other" Operating Channel frequency

The right hand drop-down list (showing the current Operating Channel) allows you to fine-tune the frequency in increments of ±5MHz within a range of the operating band, which in this example is 5.725 - 5.850 GHz.

The Channel Bandwidth may also be changed. The available choices are 5, 10, 20 and 40MHz depending on model and regulation (see **Appendix A**).

For the purposes of this illustration, we choose adaptive channel selection and operating channel frequency 5.820 GHz.

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

Step 4, Tx Power and Antenna Settings

The Tx Power and Antenna Settings window is similar to that for Installation:

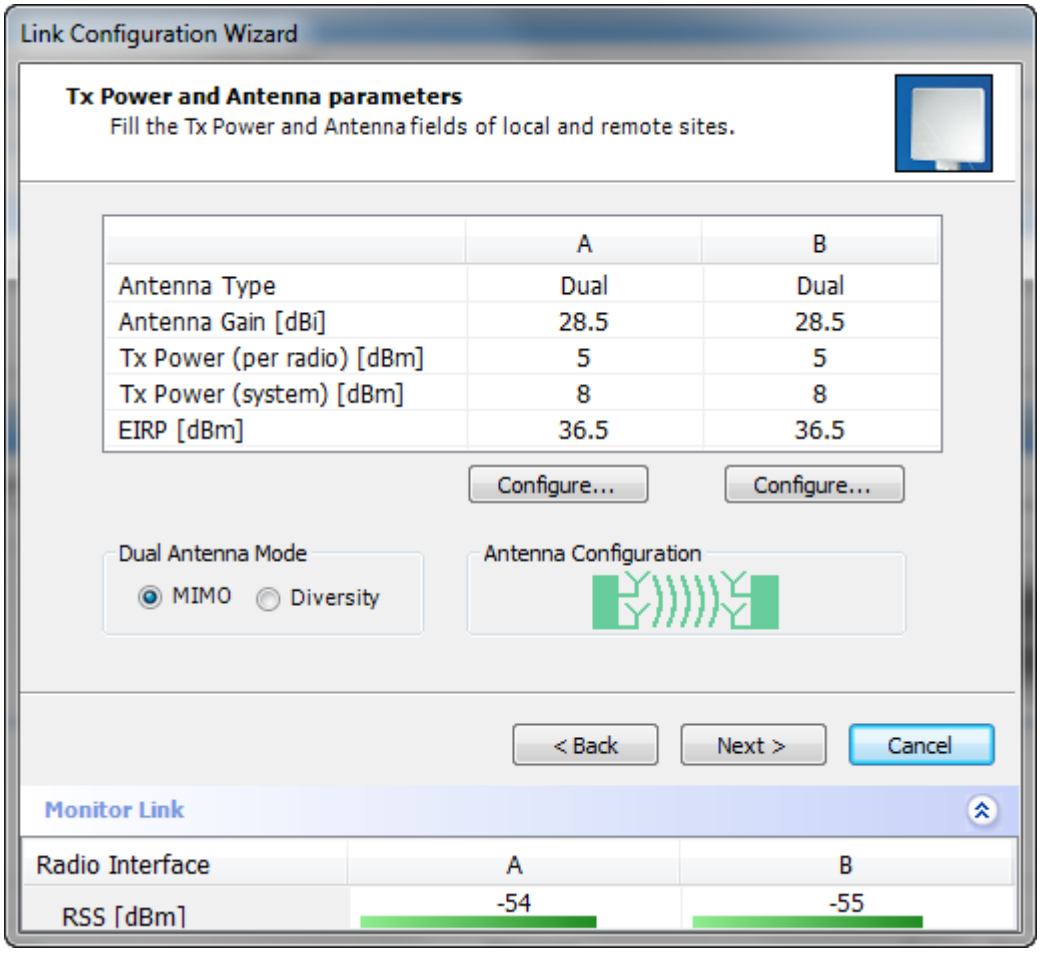


Figure 8-8: Transmission Power and Antenna Parameters

As in Installation mode, you need to consider three items:

- Number of antennas at each Link site (1 or 2)
- Tx Power setting for each one
- MIMO or Diversity mode

Changing Number of Antennas and Tx Power

TX Power, Antenna Gain and Cable Loss

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

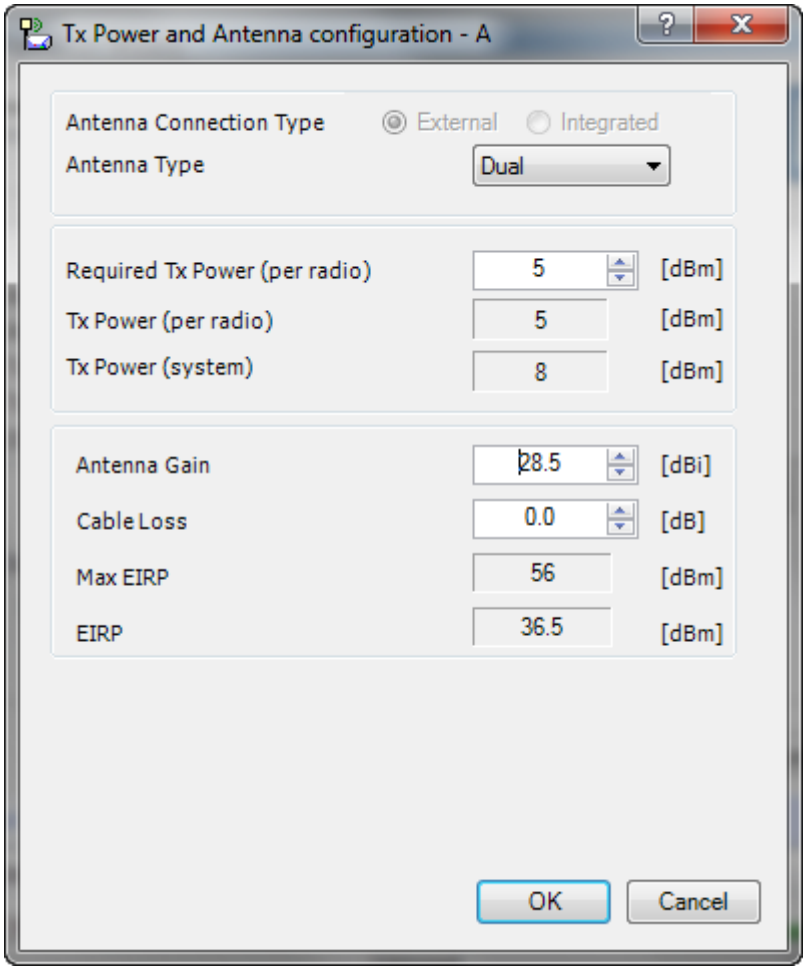
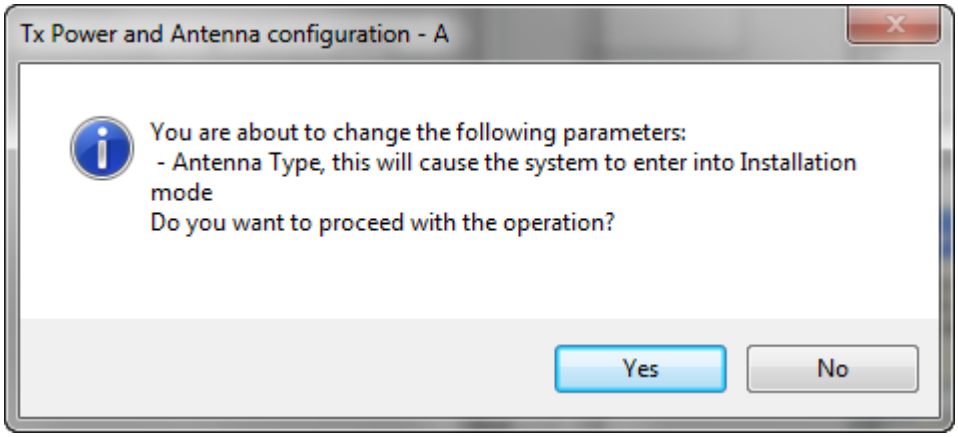


Figure 8-9: Antenna configuration dialog with opened type selection

(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:



You may also change the Required Tx Power, Antenna Gain and Cable Loss. The procedure is the same as for the corresponding Installation, Step 4: **Tx Power and Antenna Settings**.

Caution

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

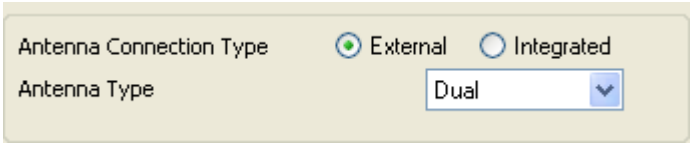
If you are uncertain, do not do this without expert technical assistance.

Switching Between Single and Dual Antennas

Single/Dual Antenna mode selection works precisely the same way as shown for Installation, Step 4.

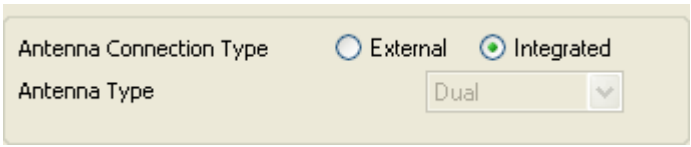
For RADWIN 2000 B Links:

These ODUs may be switched between the SFF embedded antenna and external antennas. To this end, the Antenna Connection Type radio buttons are always enabled:



Note

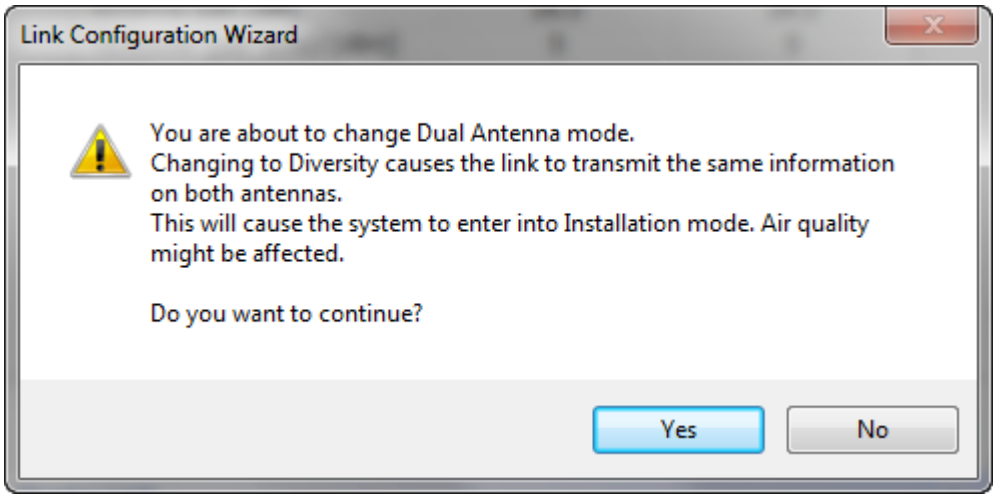
Use the Integrated radio button to enable the embedded antenna.



Observe that the SFF embedded antenna functions as a dual antenna and cannot be changed.

Switching Between MIMO and Diversity Modes

A similarly worded warning applies to a s switch from Diversity to MIMO mode.



The considerations are otherwise no different from those set out in the corresponding Installation step.

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

Step 5, Hub Site Synchronization Settings

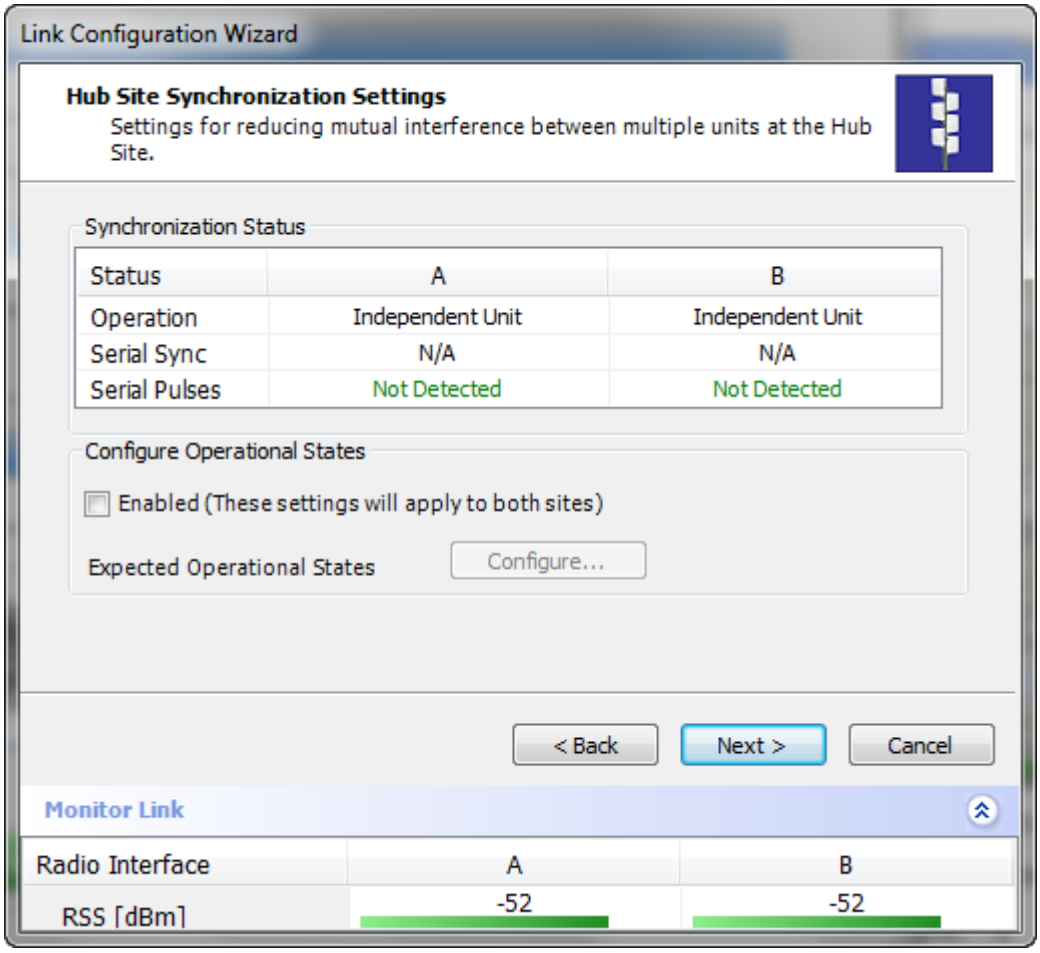


Figure 8-10: HSS Settings

The Synchronization Status dialog box displays the current status of each side of the link. See **Site Synchronization** for instructions about installing and configuring collocated links. If you do not require HSS, click **Next**.

Step 6, Services

Here is the services dialog:

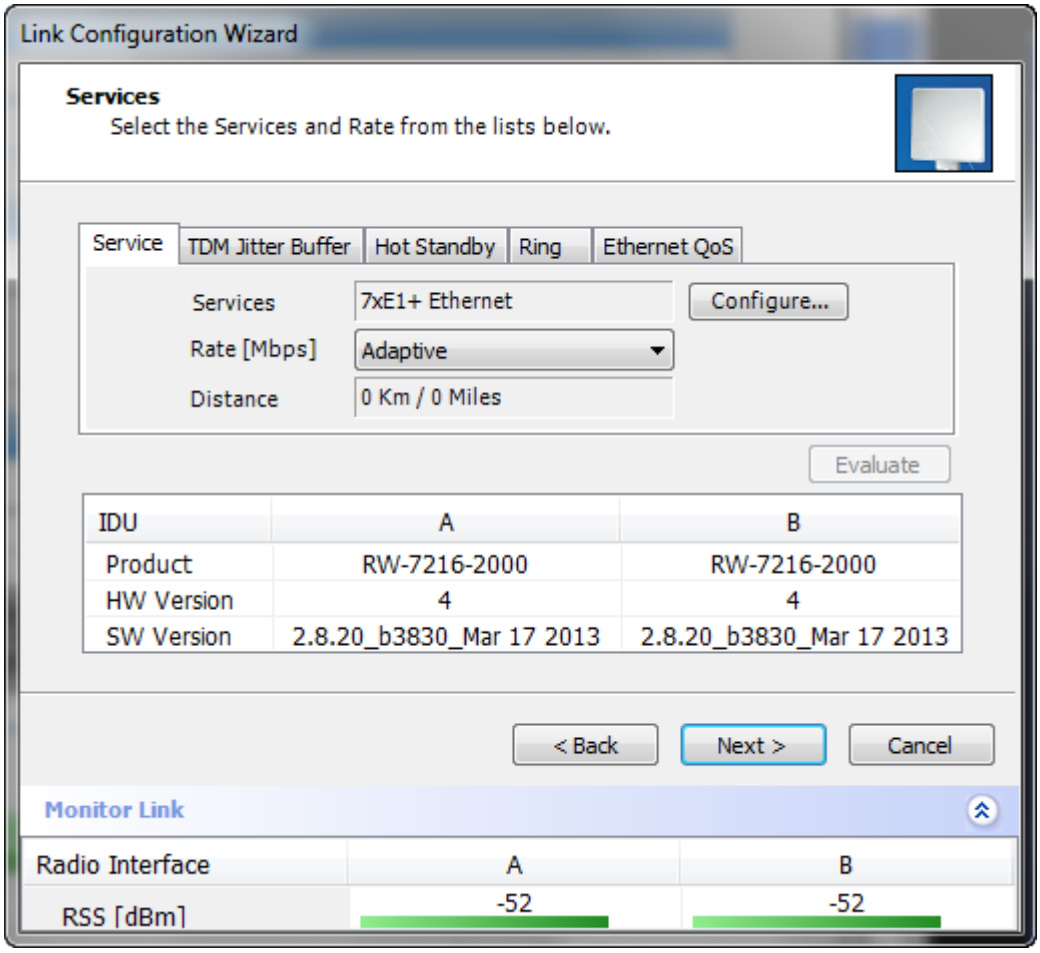


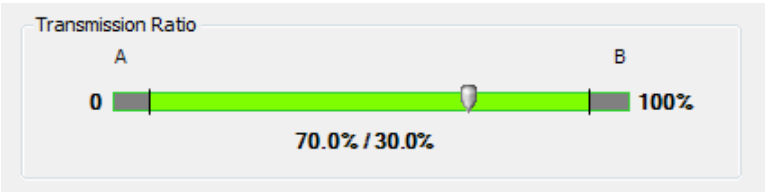
Figure 8-11: Services and Rates dialog

To choose Services, see the corresponding Installation procedure in **Chapter 6**.

If you are using a link that -

- is non-collocated
- is Ethernet-only
- uses model RADWIN 2000 C ODUs

then you may use Asymmetric Allocation. You may change the capacity allocation here the same way as during installation. In place of the IDU box in **Figure 8-11**, you will see the Asymmetric Allocation slider:



The procedures for setting the Jitter Buffer and Hot Standby parameters are also the same as the corresponding procedures in **Chapter 6**.

Click **Next** to continue.

Step 7, TDM Clock Configuration

The following dialog is displayed:

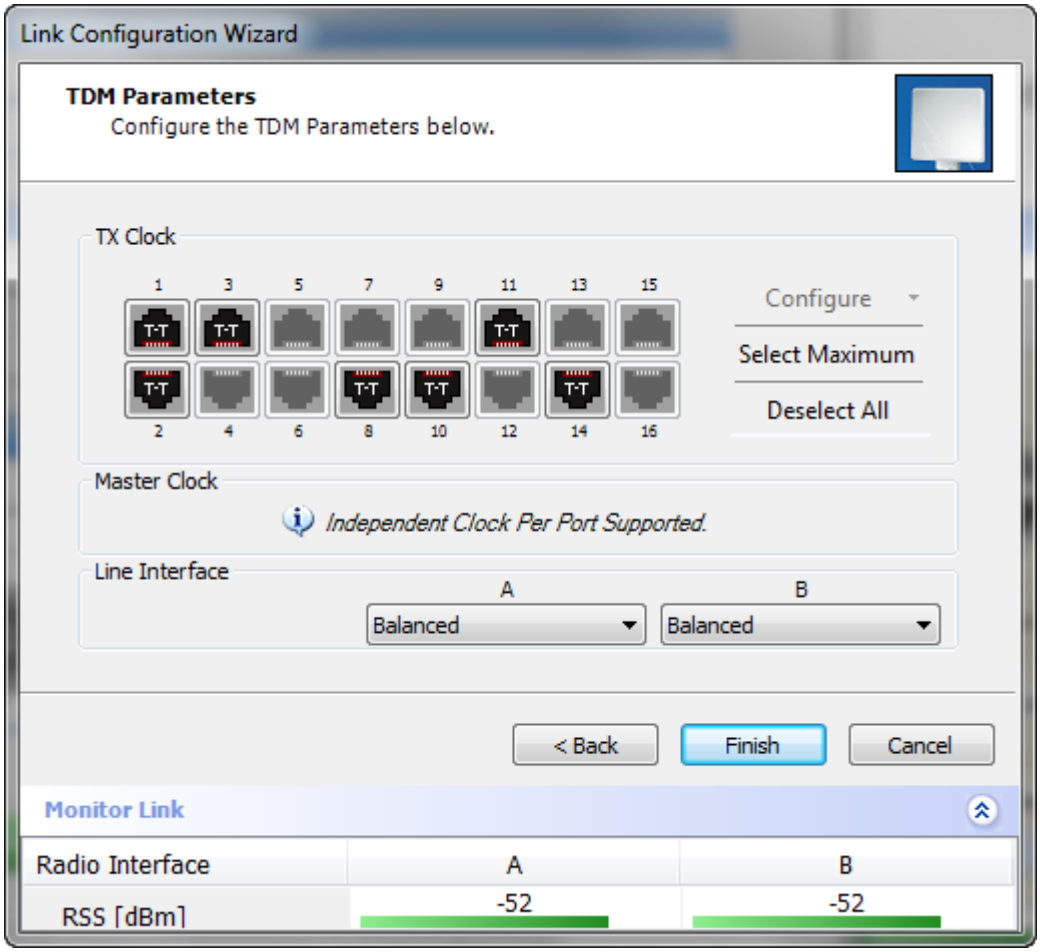


Figure 8-12: TDM Parameters Configuration

To configure the TDM Parameters, see the corresponding procedure in **Chapter 6**.

Step 8, Configuration Summary and Exit

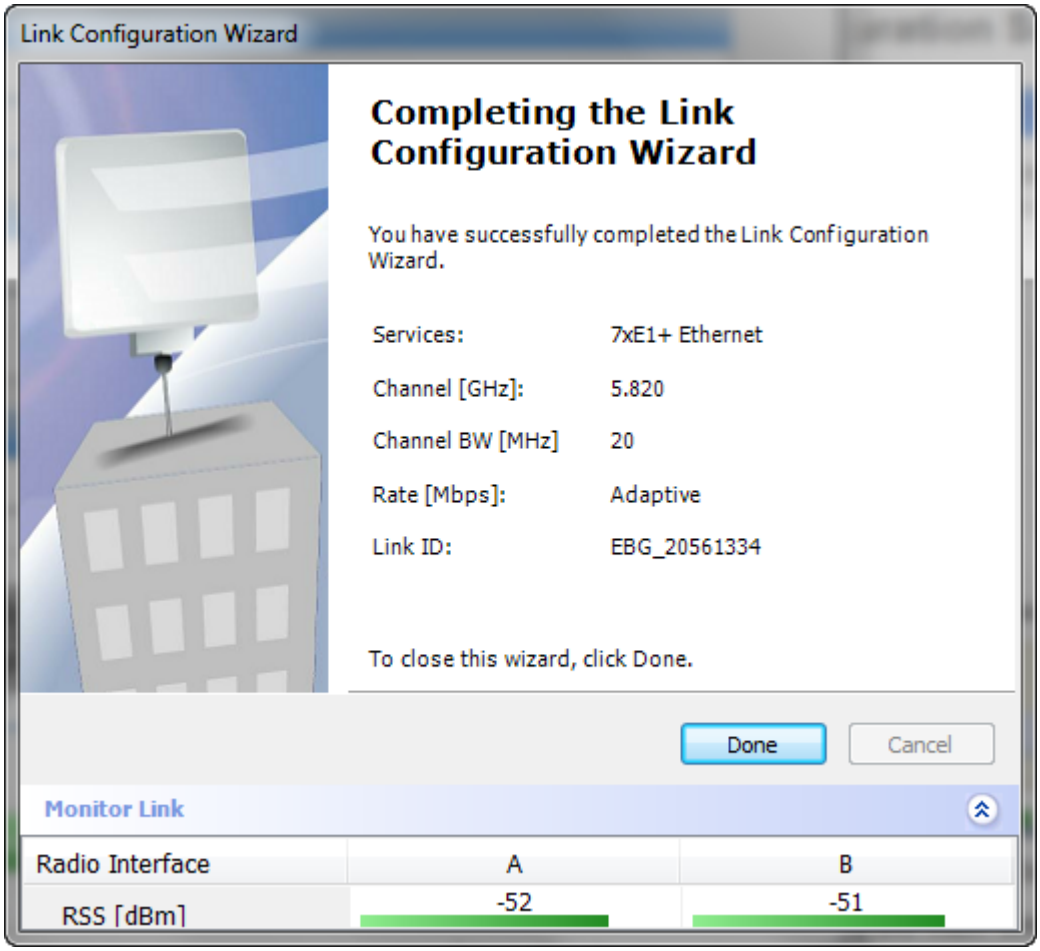


Figure 8-13: Configuration Wizard Exit Summary

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

The main window now reflects the configuration:

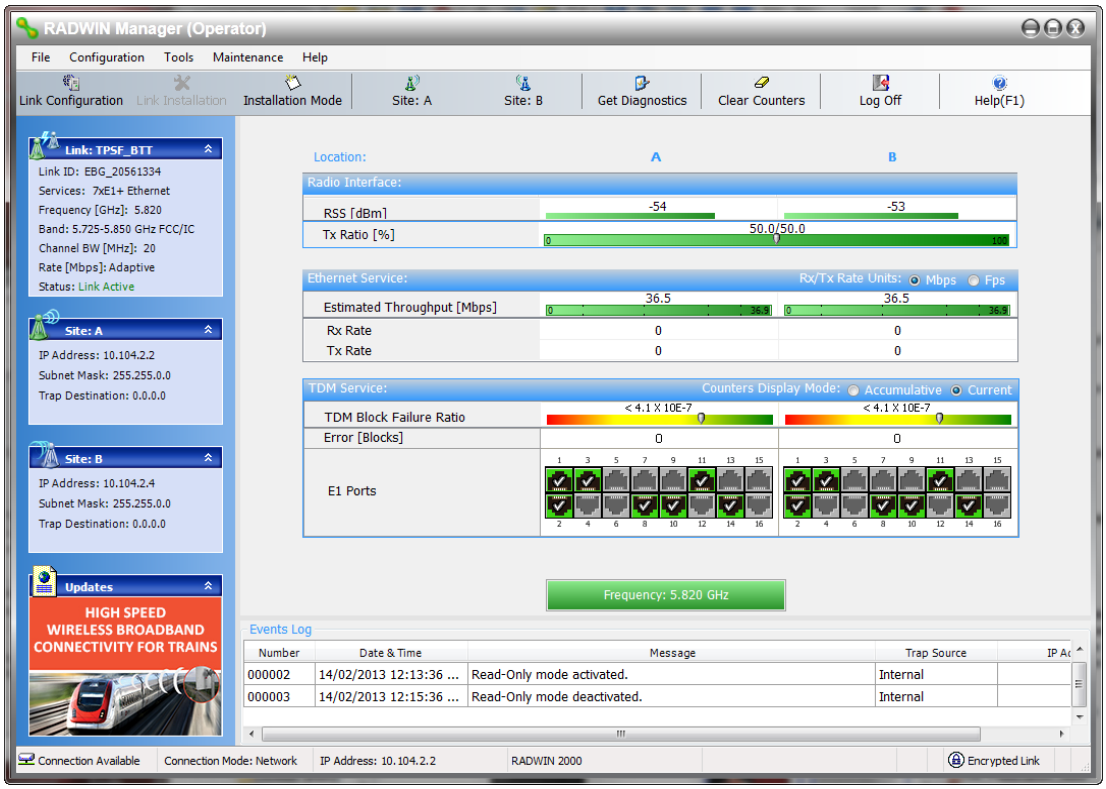


Figure 8-14: Main window of the manager after configuration

Chapter 9

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
- Hub Site Synchronization status
- Network management including VLAN
- Inventory - link hardware and software model details
- Security settings
- Date and time
- Ethernet service settings
- TDM Hot Standby status
- External alarms settings
- Operations - Revert to factory settings

The Operations dialog offers a "doorway" to jump into installation mode.

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

- Backup ODU software
- Restore ODU software or configuration from a backup file
- Refresh the current panel
- 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.

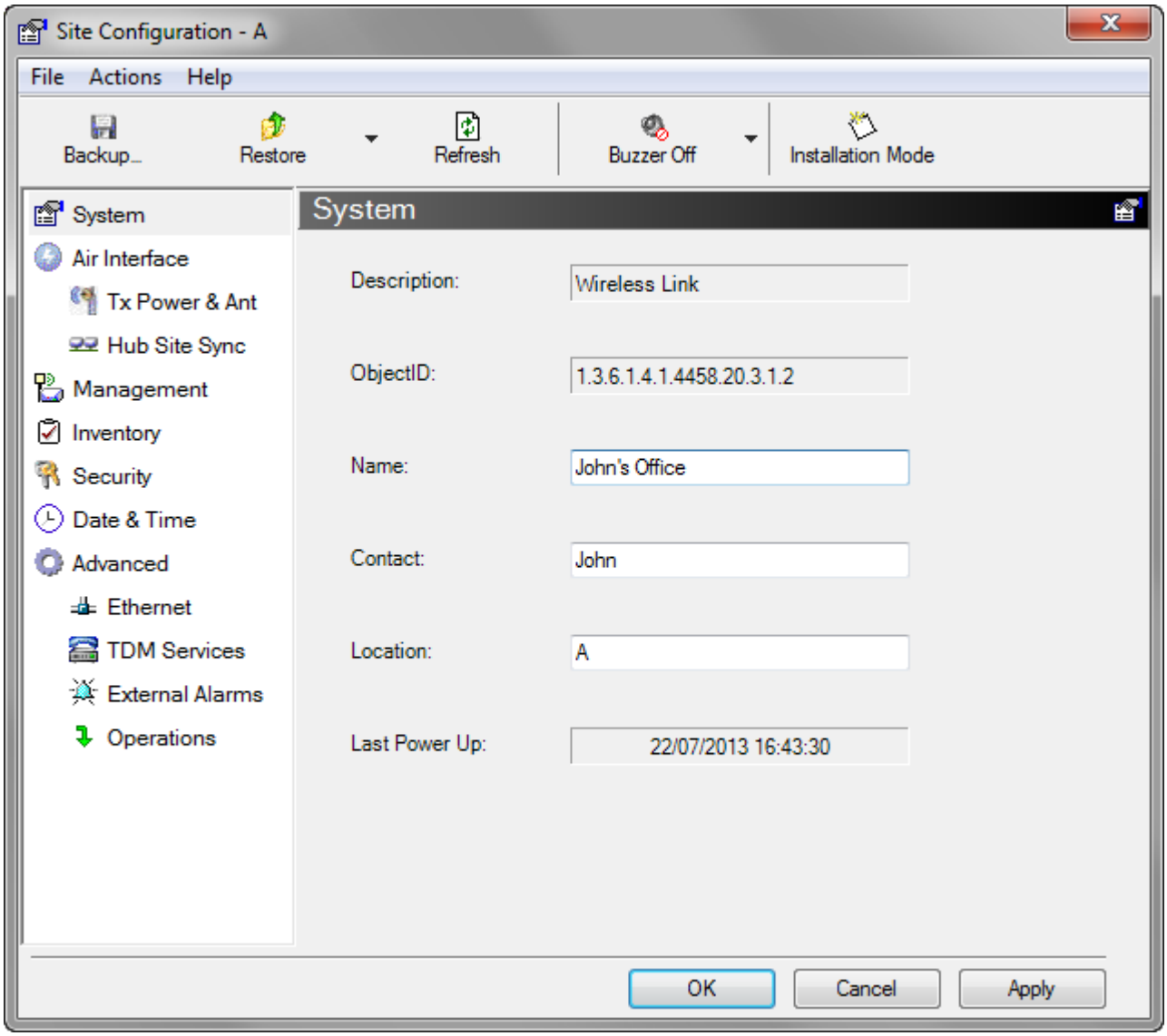


Figure 9-1: Configuration Dialog Box

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. View HSS settings
Management	Configure the IP address, Subnet Mask, Default Gateway, Trap Destination and VLAN
Inventory	View the hardware and software inventory (product identification, versions, MAC address and serial number)
Security	Change the Community Values and the Link Password. Set Link Lock.
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, IDU aging time, set the Ethernet ports configuration, set max. information rate, TDM MHS status, set the external alarm inputs, restore factory settings, set IDU detection mode.

Functions at the top of the dialog box:

Backup	Save the current ODU software to a file
Restore	Restore an ODU's software or configuration from a backup file created by the backup facility
Refresh	Refresh current panel with latest values
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 9-1** above).
2. Choose the appropriate item in the left hand list to open a dialog box.
3. Click **Apply** to save changes.

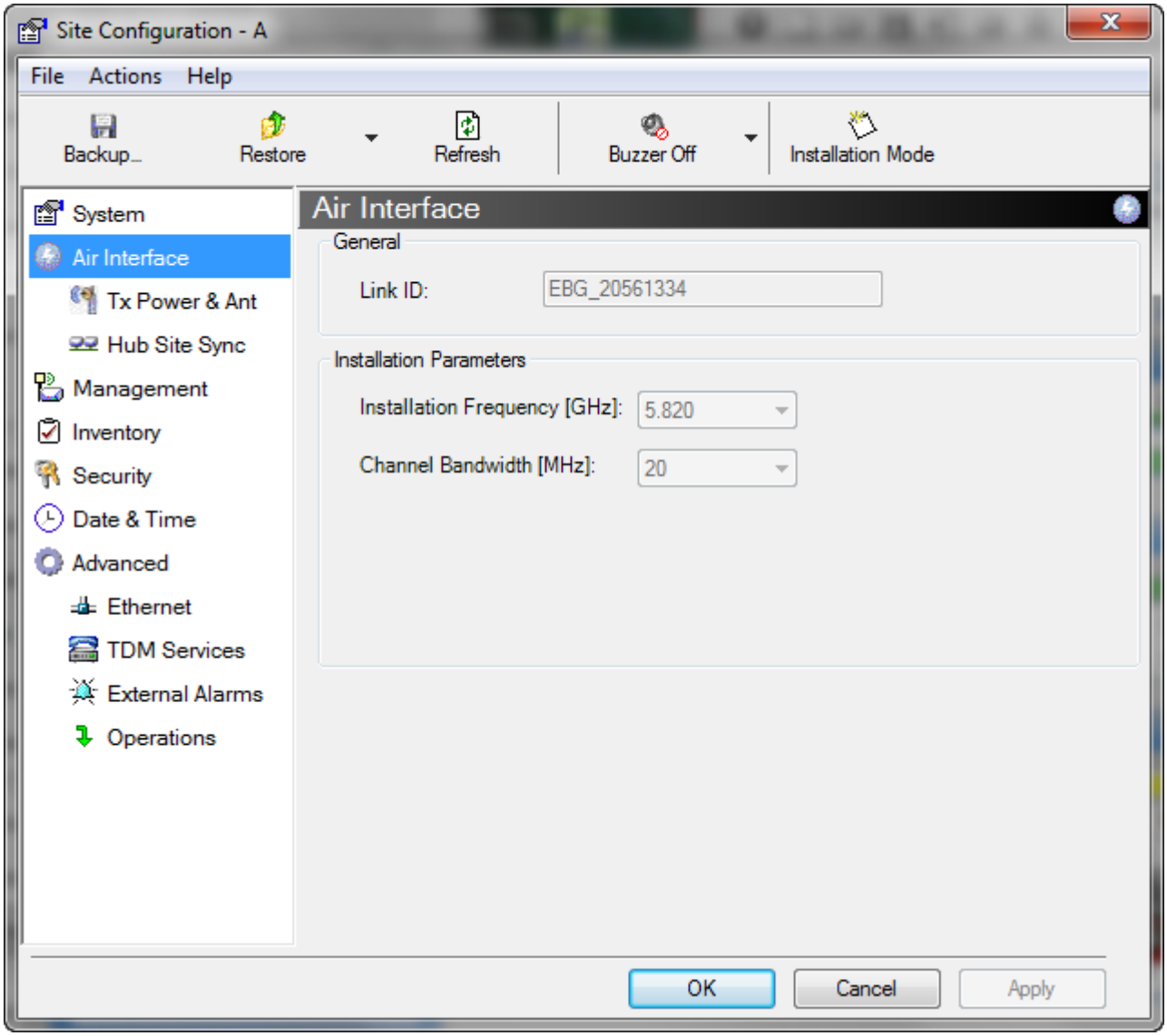
In subsequent instructions, we will simply say "Choose a site to configure" on the understanding that the foregoing procedure is implied.

Viewing System Details

This is the first window displayed - as depicted above. You can edit the contact details and site names.

Viewing Air Interface Details

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



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 9-2**).
3. Choose the required Transmit (Tx) Power Level.
4. Click **Apply** to save the changes.

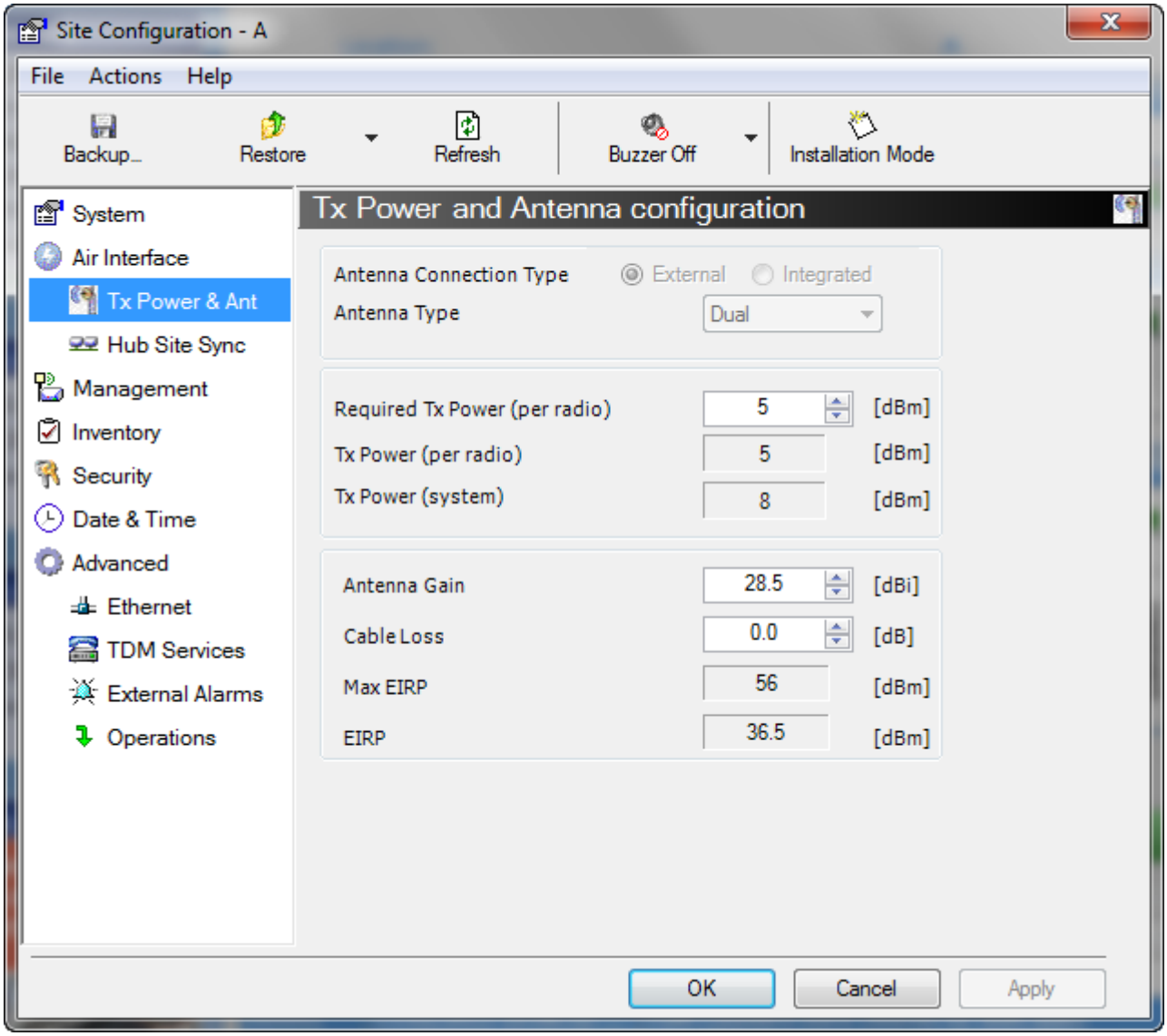


Figure 9-2: Changing the Antenna Type and Transmit Power

The Antenna Connection type reflects the installed ODU. In our example, we are using an external antenna on a RADWIN 2000 C ODU, so the first two fields are set and grayed out as shown. If you have a connectorized RADWIN 2000 A model, you will be able to switch between external and integrated antennas.

The antenna type (Dual, Single) may only be changed if you access the ODU by Local Connection.

For detailed explanation about the relationship between the Tx power, antenna gain and cable loss parameters, see Installation, Step 4..

Caution

Changing the Tx Power will affect service quality. The same considerations apply here as were noted in the Installation procedure, Step 4.

Hub Site Sync

Here you can view the HSS status. For our example, HSS is disabled and the status is as follows:

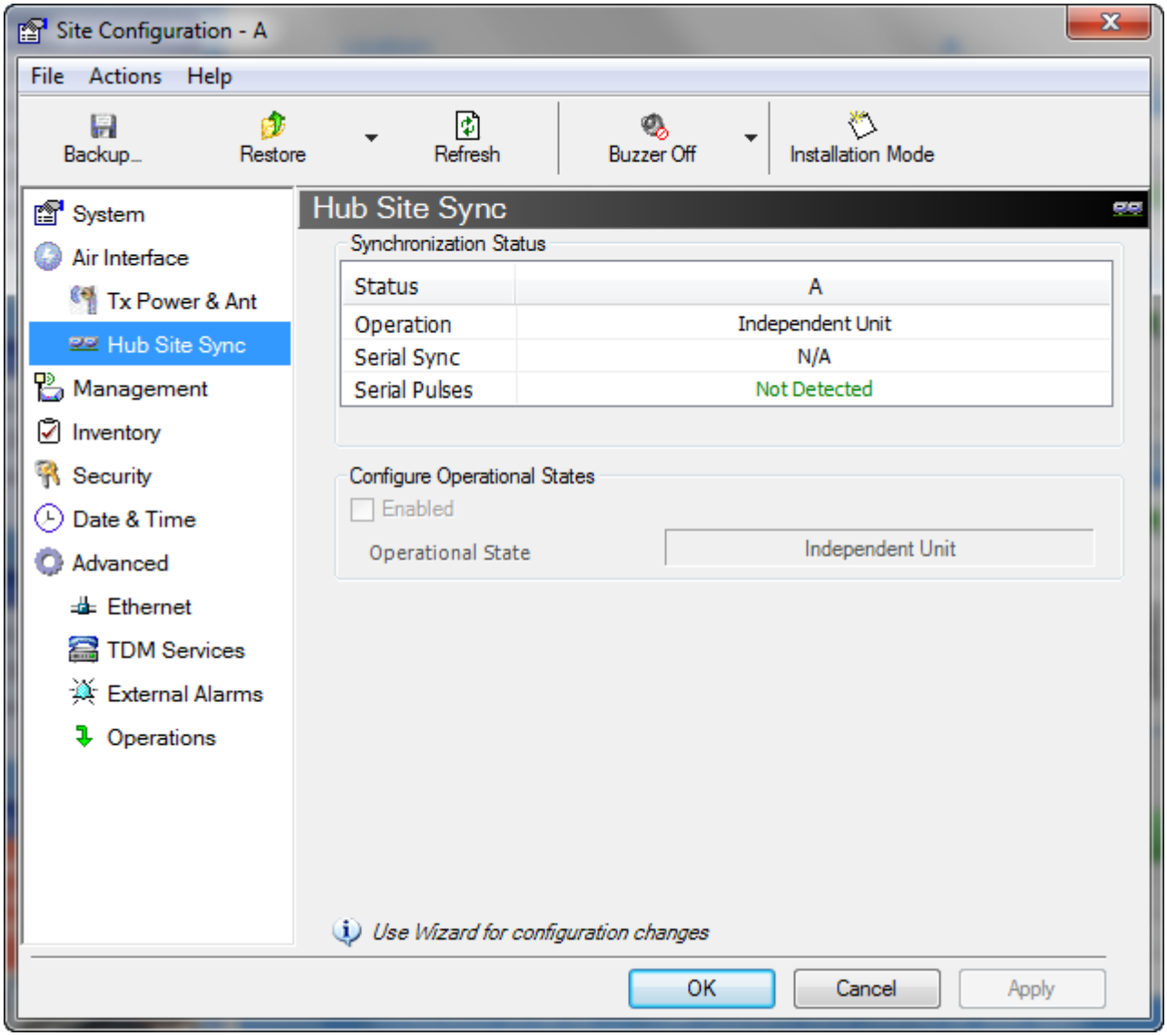
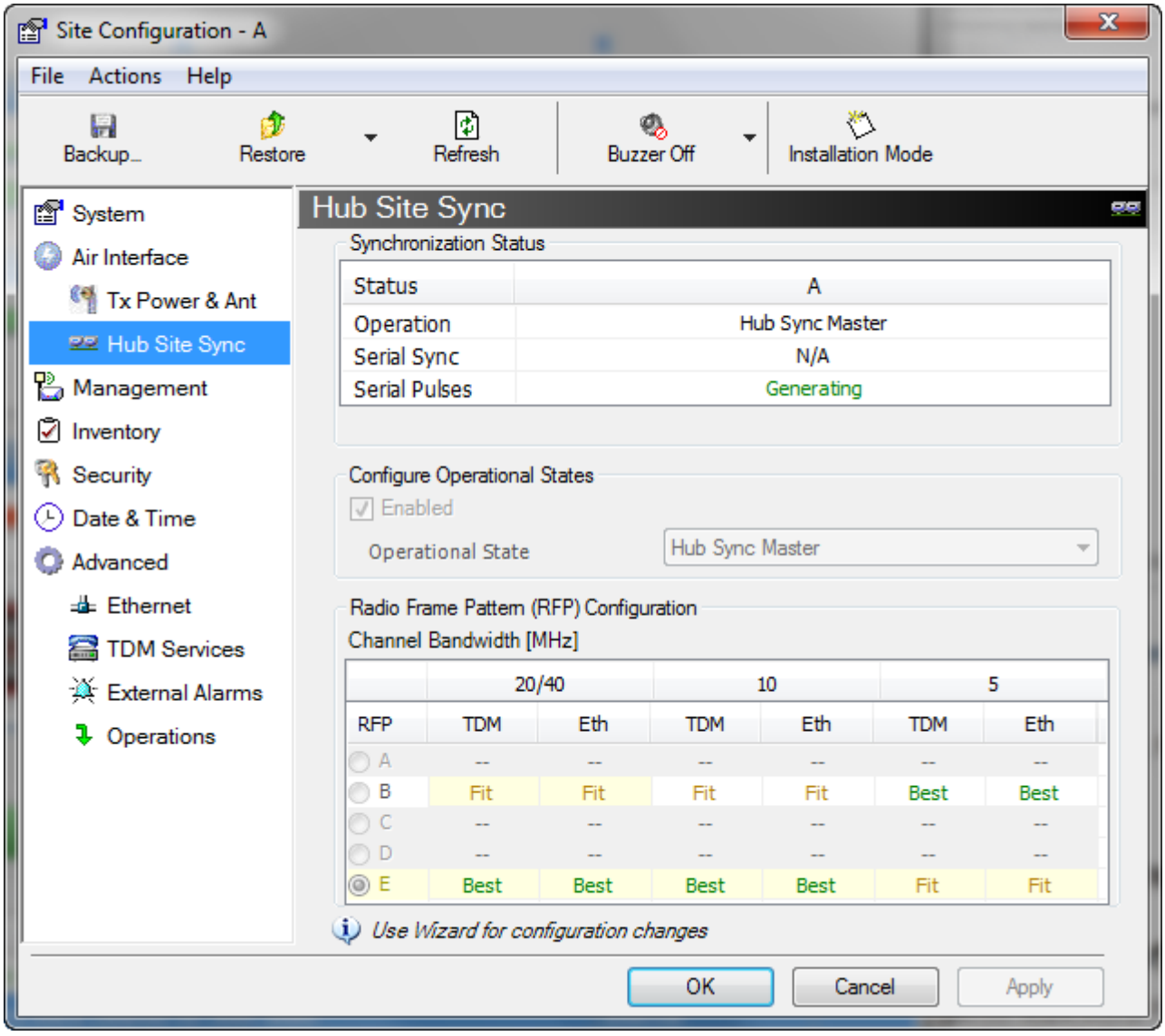


Figure 9-3: HSS Status: HSS disabled

If we enable HSS and set Site A as HSM, the window looks like this:



For further details about HSS, see **Chapter 11**.

Site Management: IP Address, VLAN and Protocol

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 **Chapter 25** for detailed instructions about the best way to do this on-site.

See **Chapter 18** for further details about VLAN Functionality for RADWIN 2000.

➢ **To define the Management Addresses:**

1. Choose a site to configure. The Configuration dialog box opens:

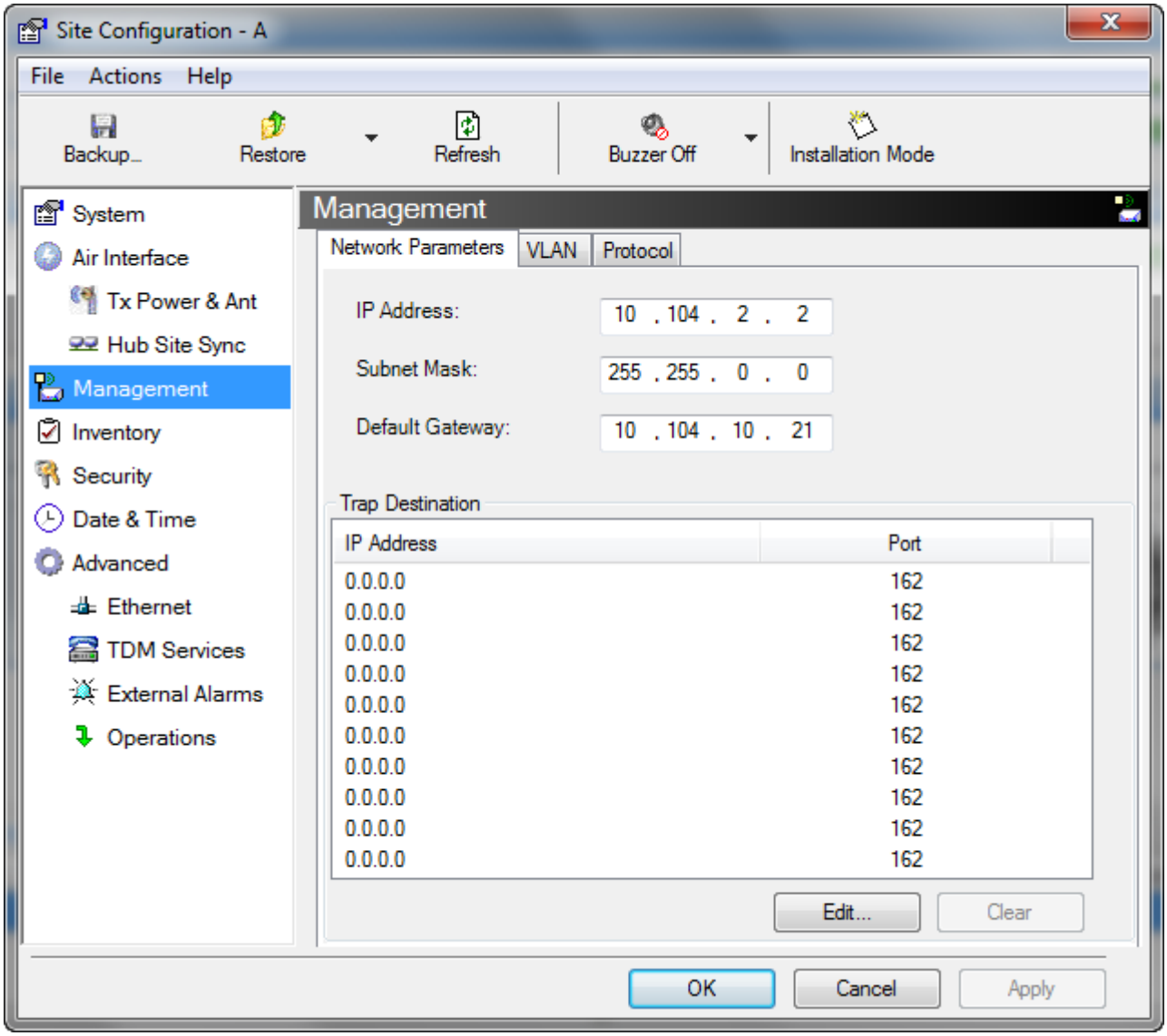


Figure 9-4: Management Addresses - Site Configuration dialog box

2. Choose **Management**.
3. Enter the IP address of the ODU in the IP Address field.

Note

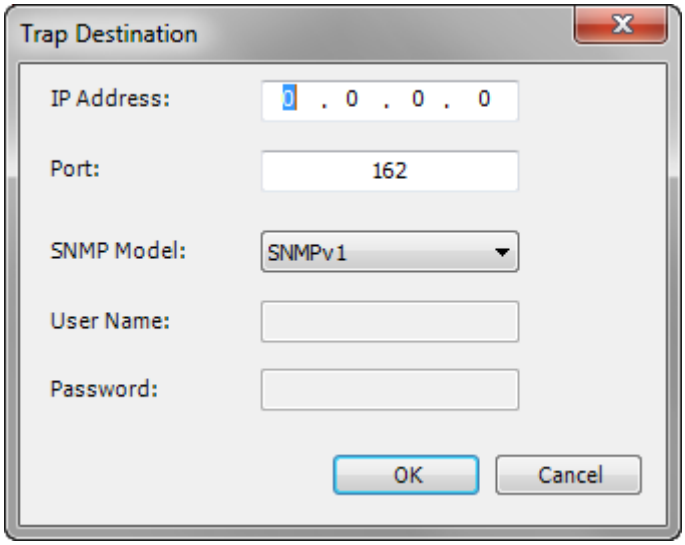
If performing configuration from the RADWIN Manager, the IP address is that entered from the Login window.

4. Enter the Subnet Mask.
5. Enter the Default Gateway.

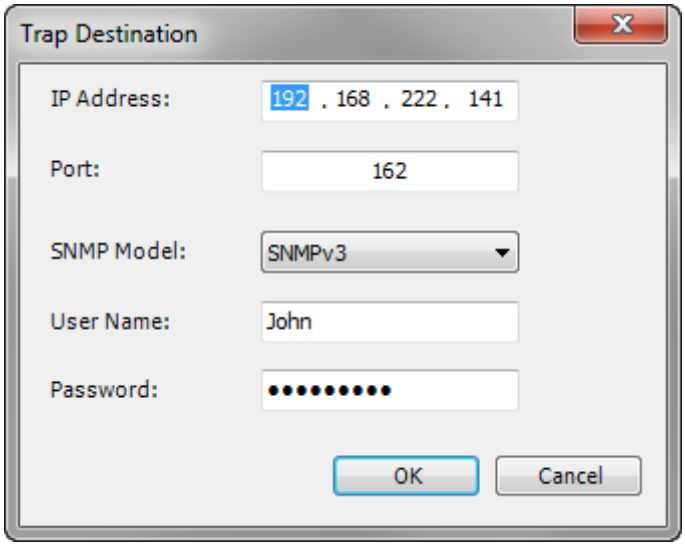
Configuring IP Addresses for Trap Destinations

➢ **To enter a Trap Destination:**

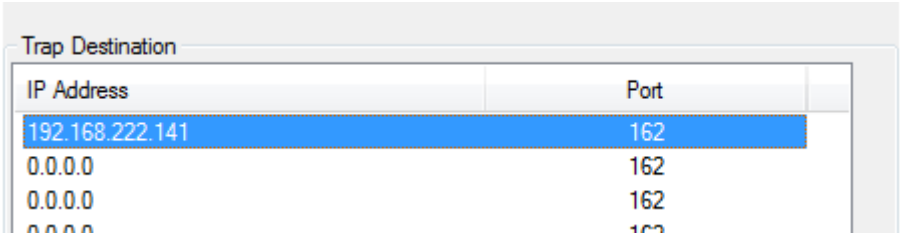
1. In the Trap Destination table, double click a line to be edited. The following entry window is displayed:



2. Enter the Trap Destination IP Address and Port. It could be the IP address of the managing computer. The events log will be stored at the addresses chosen.
3. For Security model you may choose between SNMPv1 or SNMPv3. The choice is site dependent. If you choose SNMPv1, you may only enter an IP address and port number. For SNMPv3, you should supply a user name and password:



4. Click **OK** to save your choice. Here is the result:



At any time, click **Apply** to save accumulated Management changes.

Configuring VLAN for Management

Tip

VLAN IDs are used by RADWIN products in three separate contexts: Management VLAN, Traffic VLAN and Ethernet Ring. It is recommended that you use different VLAN IDs for each context.

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.

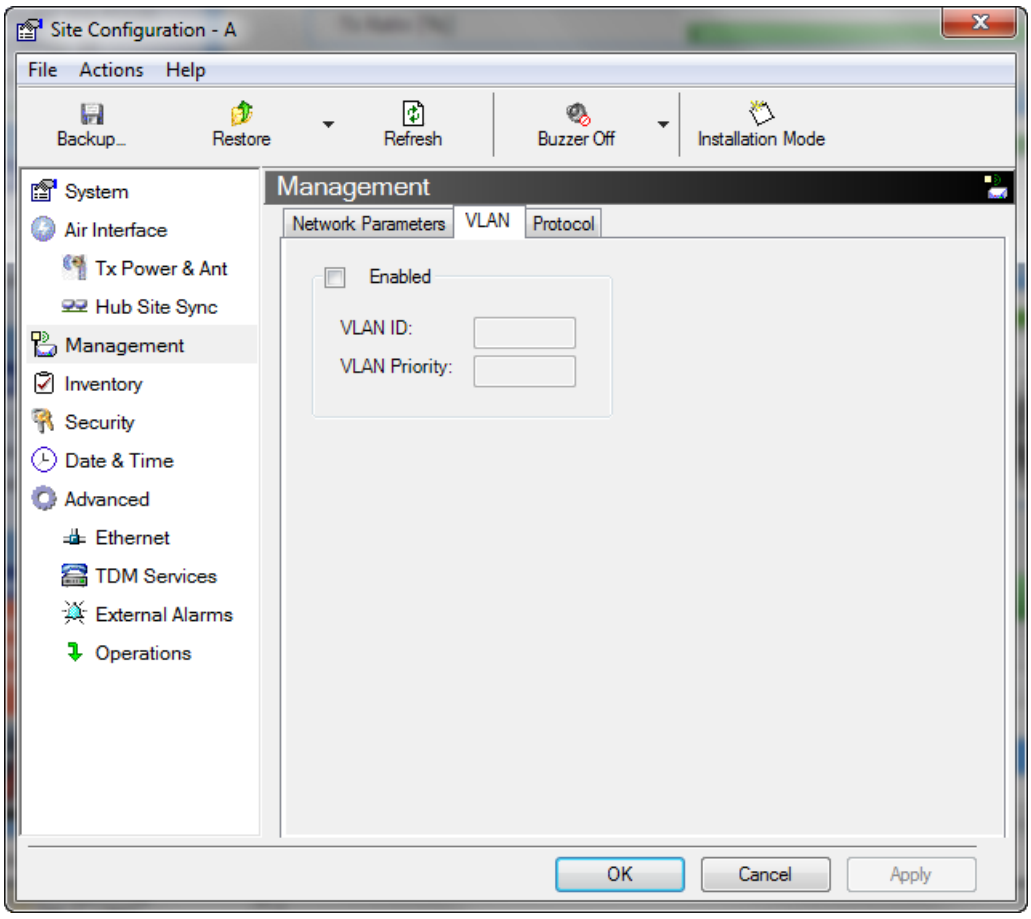


Figure 9-5: Configuring management traffic VLAN Settings

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**.

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.

Supported Protocols

Supported protocols are shown in **Figure 9-6**.

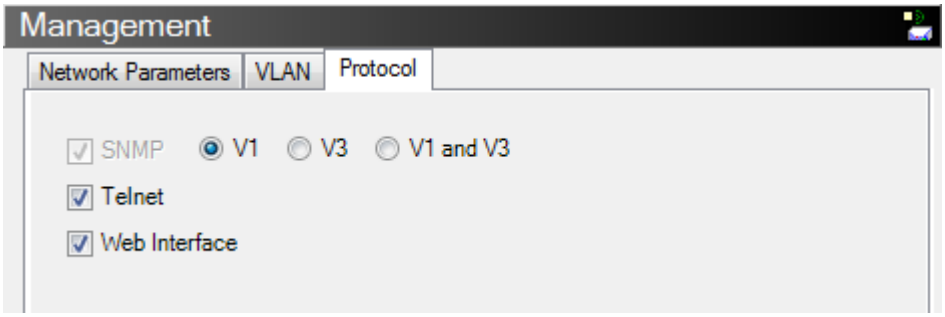
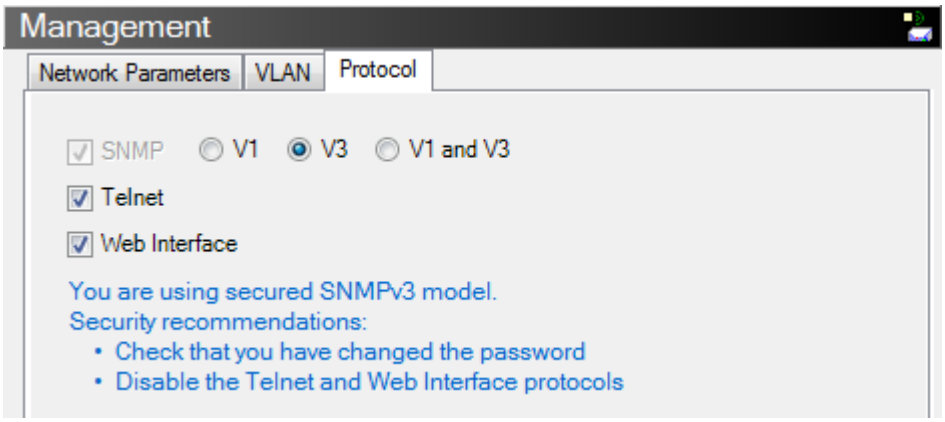


Figure 9-6: Supported Protocols

SNMP support is permanently enabled. You may choose between SNMPv1, SNMPv3 or both. If you choose SNMPv3, you will be offered the following cautionary message:



For a link managed in a network, direct access to an ODU using Telnet is considered to be a security breach. Telnet access may be enabled or disabled by clicking the Protocol tab and enabling/disabling Telnet access using the Telnet check-box. Similar considerations apply to access via the Web Interface.

- For further details about Telnet access see page **9-44**.
- For further details see **Chapter 28**.

Telnet and Web Interface access modes when available, are site specific. If for example, site A is the operator site and site B the client site, you may wish to disable these protocols for site B but leave them enabled for site A.



If either access mode poses a general security risk, you must disable them for each site separately.

Displaying the Inventory

To view the inventory data

1. Choose a site from the main menu.

   The Configuration dialog box opens.

2. Choose **Inventory**.

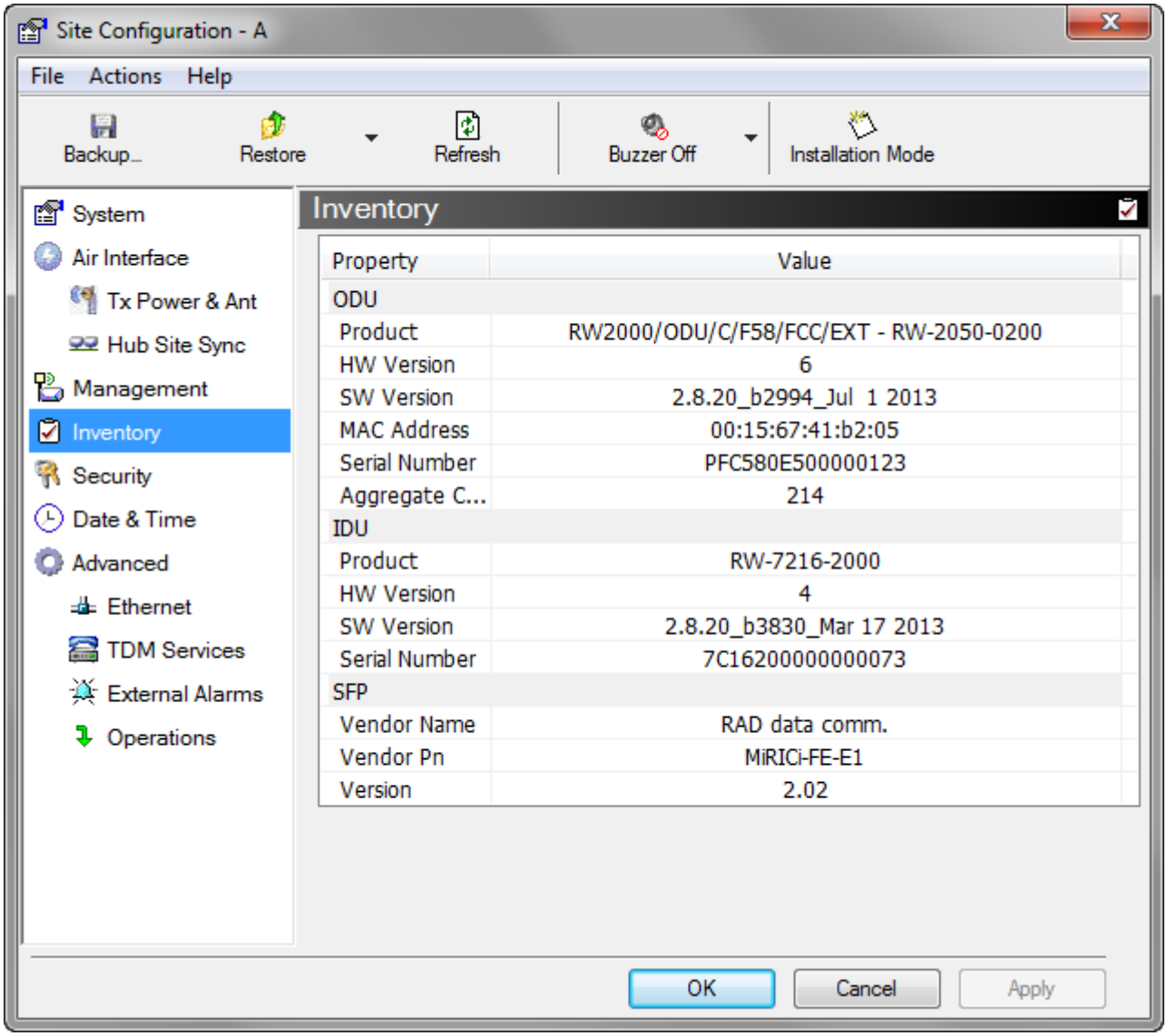


Figure 9-7: Inventory window

Security Features

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

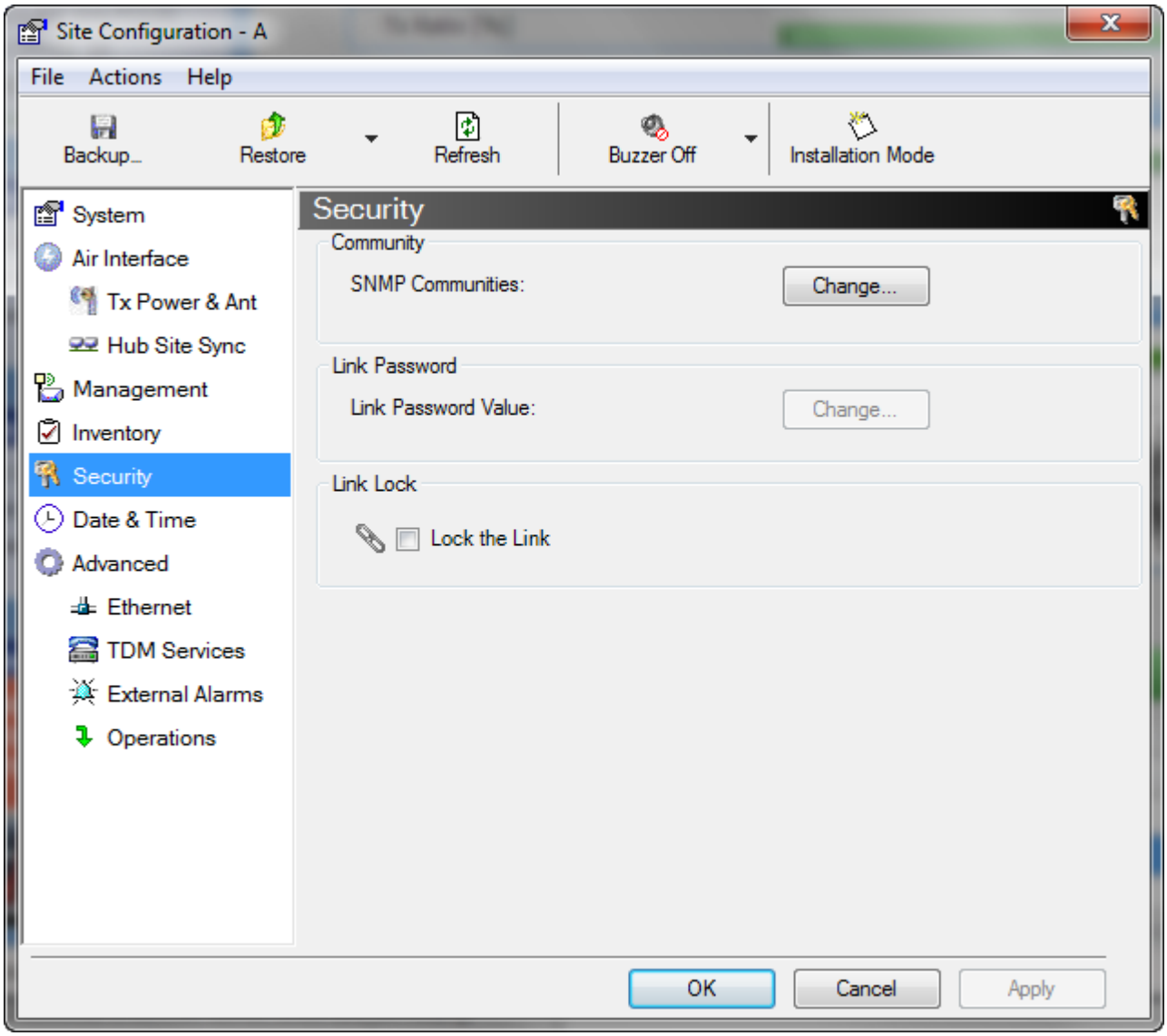


Figure 9-8: Available security features

Changing the Link Password

This item is only available when the link is down. Otherwise, it works the same way as the corresponding item in **Chapter 6**.

RADWIN Manager Community Strings

The ODU communicates with the RADWIN Manager using the SNMPv1 or SNMPv3 protocol. The SNMPv1 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. You must know the password and the correct Community string to gain access to the system. You 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 pur-

pose of setting new Community. You must also have available the serial number or the MAC address of the ODU.

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 SNMPv1 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. A community string must contain at least five and no more than 32 characters excluding SPACE, TAB, and any of "\>#@|*?;."
5. Click **OK** to save.

Editing SNMPv3 Passwords

To commence the process, you must enter the current Read-Write Community password as shown in the first field of **Figure 9-9** below. Change the Read-Write an d Read-Only passwords as indicated. A password must be between 8 and 31 characters long. The same character restrictions for the SNMPv1 community strings also apply here.

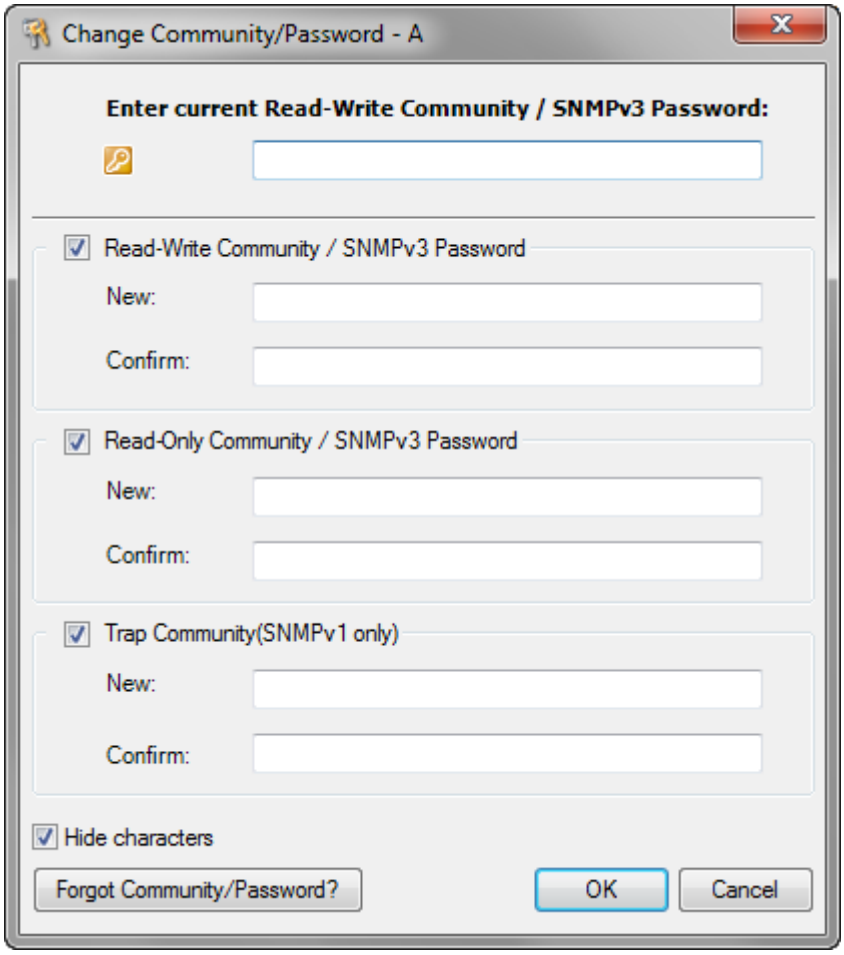


Figure 9-9: Changing the Community *Strings/Passwords*

Forgotten SNMPv1 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 9-10**). Then change the read-write Community string.

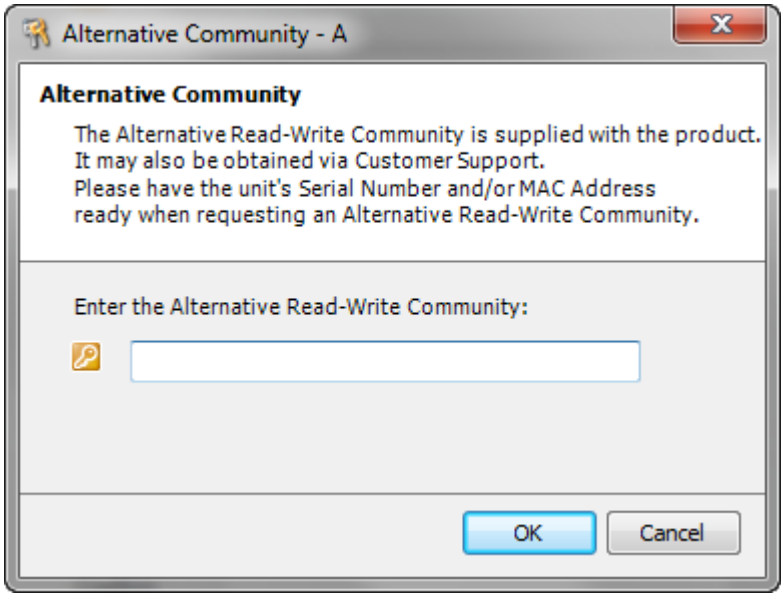


Figure 9-10: Alternative Community Dialog box

Link Lock Security Feature

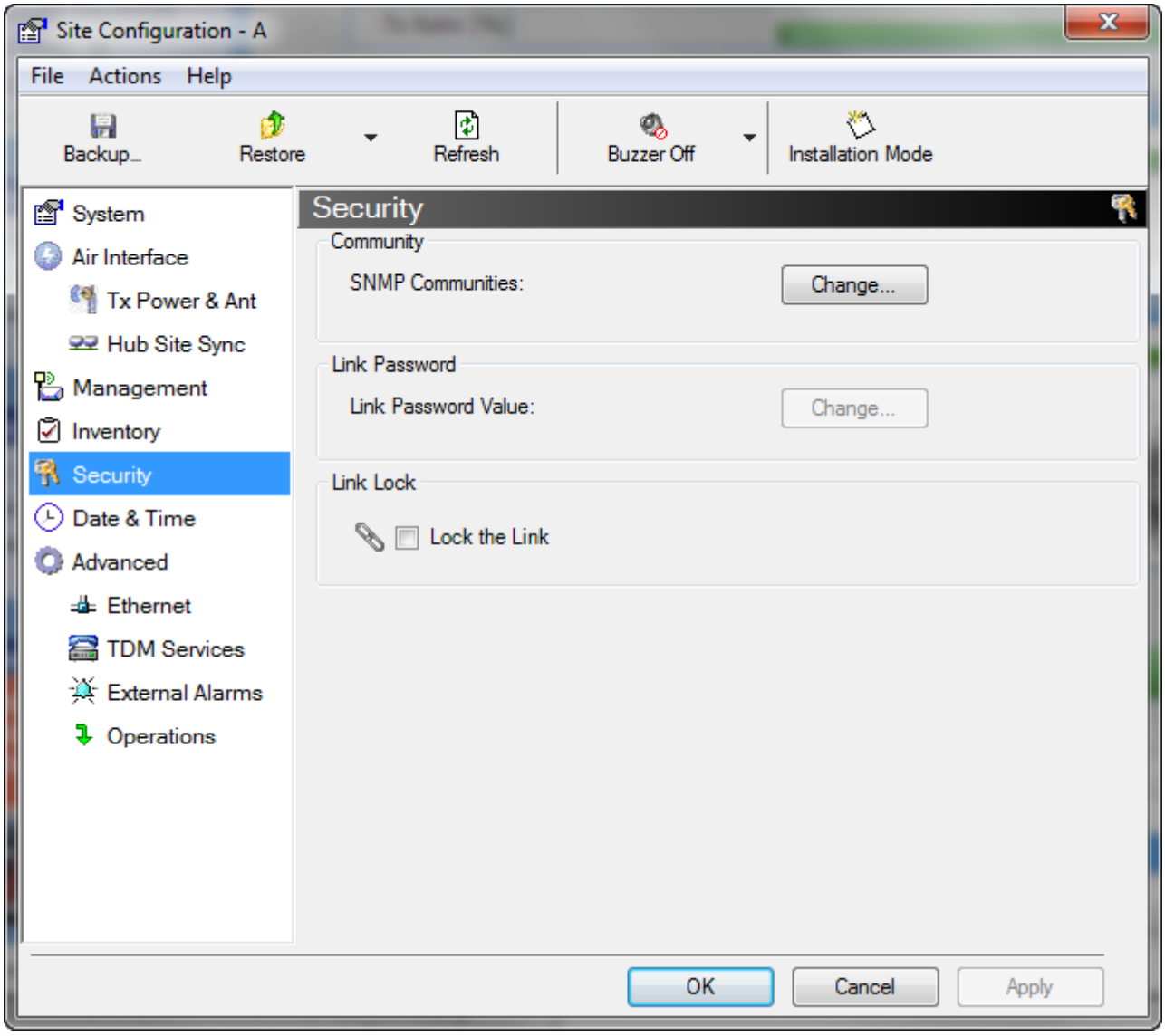
Link Lock is a part of RADWIN's security concept intended to meet a form of abuse encountered in the field. It is designed to prevent the situation where a remote ODU can be stolen and used as a "pirate" link to steal services or information. The Link Lock feature actually locks the local ODU to be synchronized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

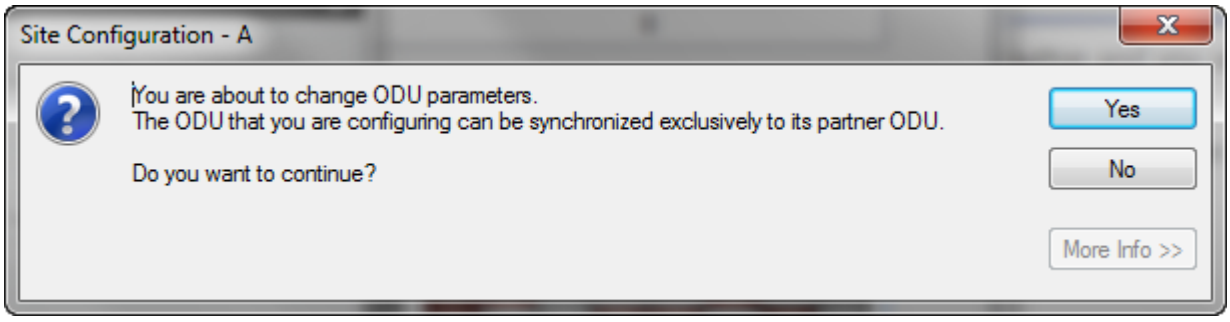
Link Lock can only be removed when the link is unsynchronized. In such a case, an alarm is raised by the RADWIN Manager.

➢ **To enable Link Lock:**

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

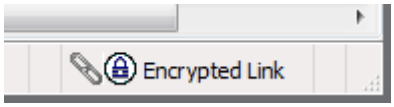


3. Click the Link Lock check-box and then **OK**. You are asked to confirm the lock:

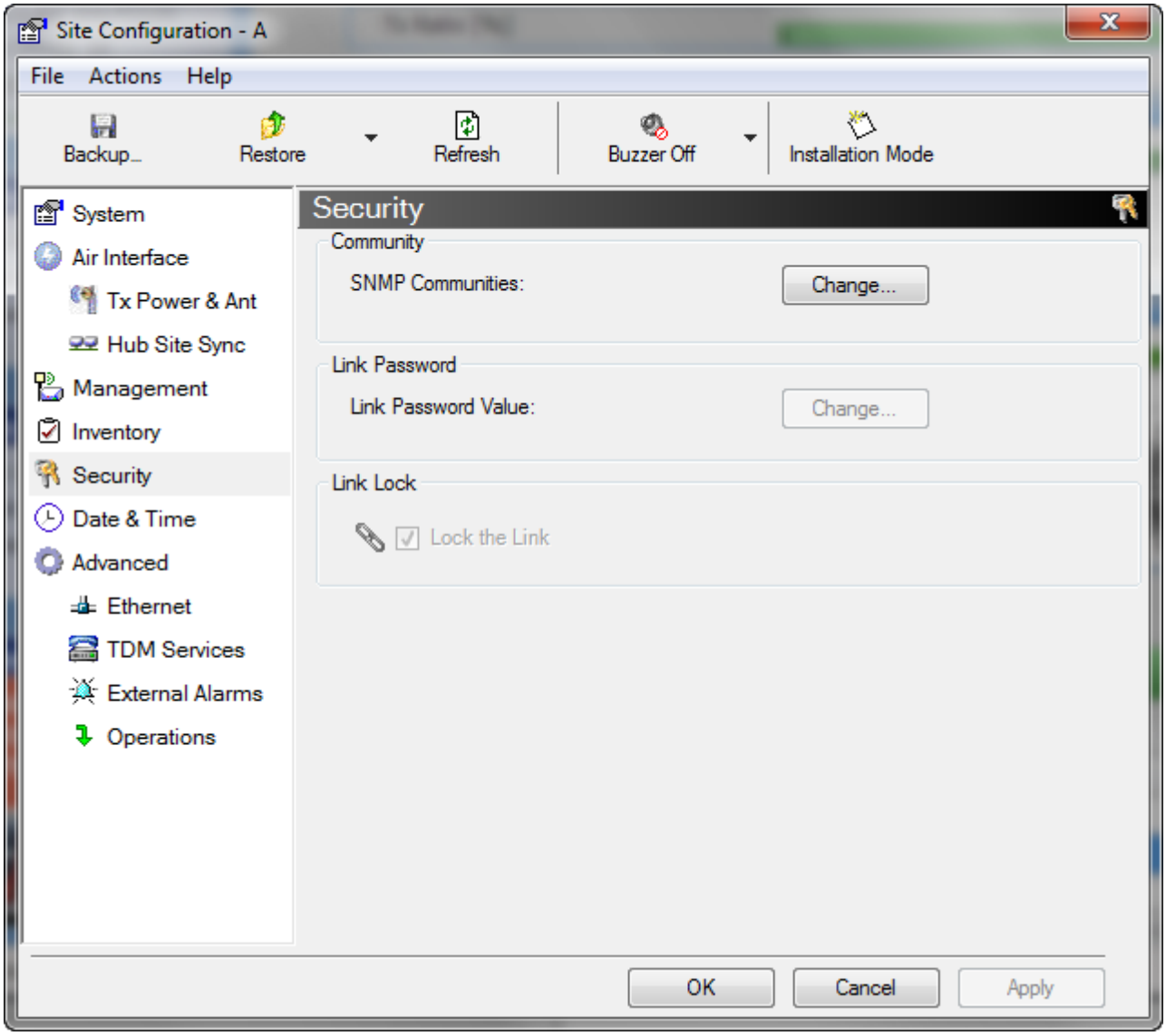


4. Click the **Yes** button and you are returned to the main window of the RADWIN Manager.

   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 and the Security screen will look like this:



The Link Lock check-box is now unavailable.

5. If required, 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.

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.



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:

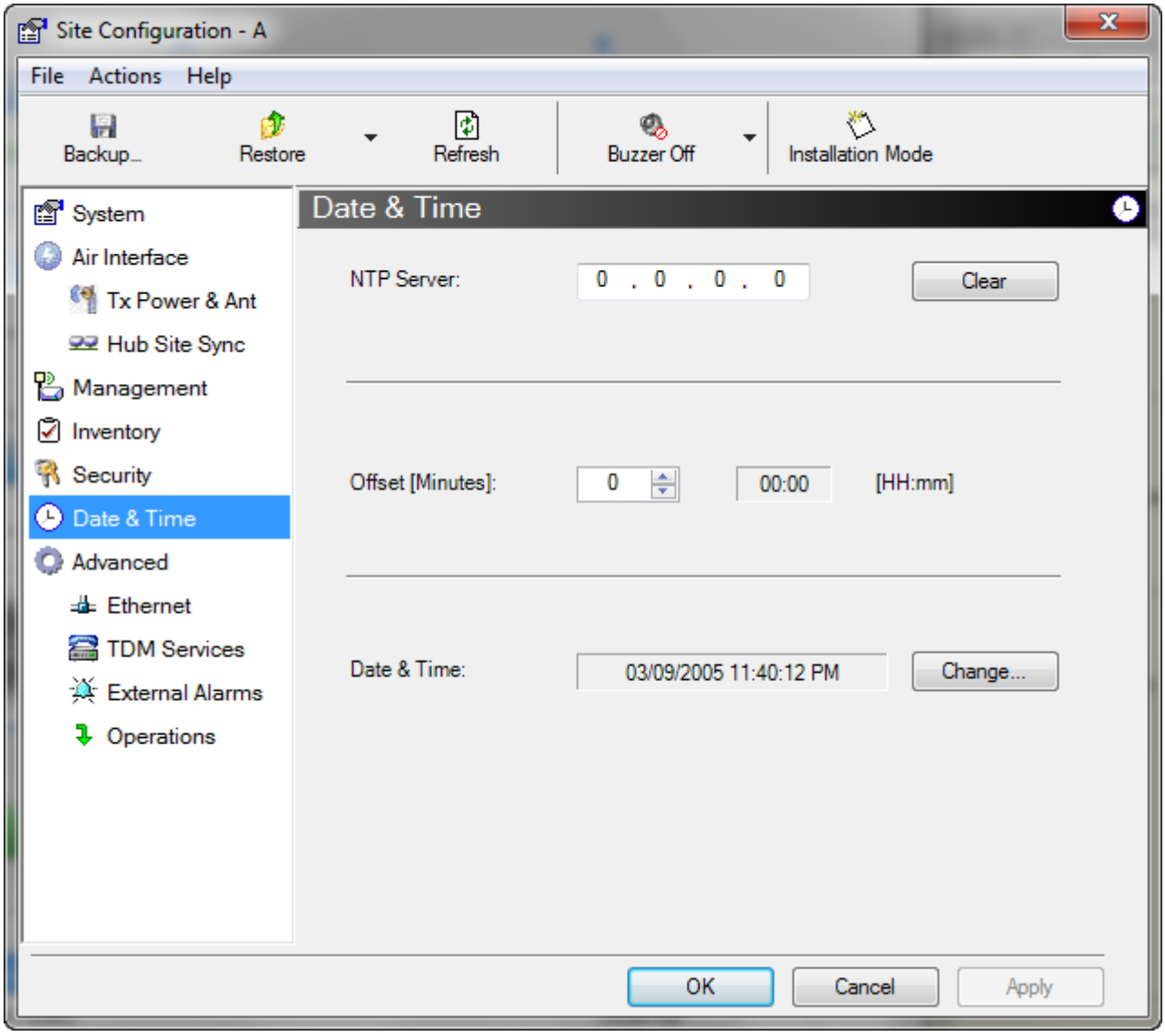


Figure 9-11: Date and Time Configuration

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.

1. Greenwich Mean Time

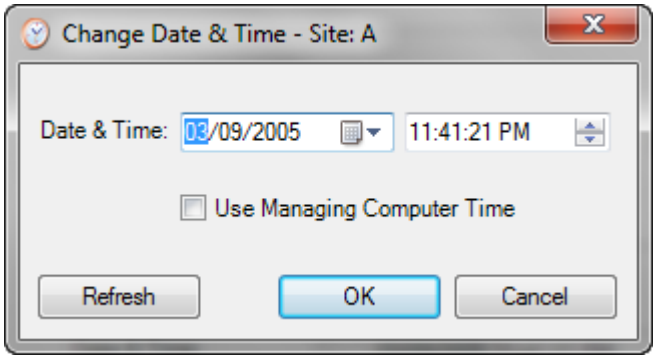


Figure 9-12: Change Date and Time

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

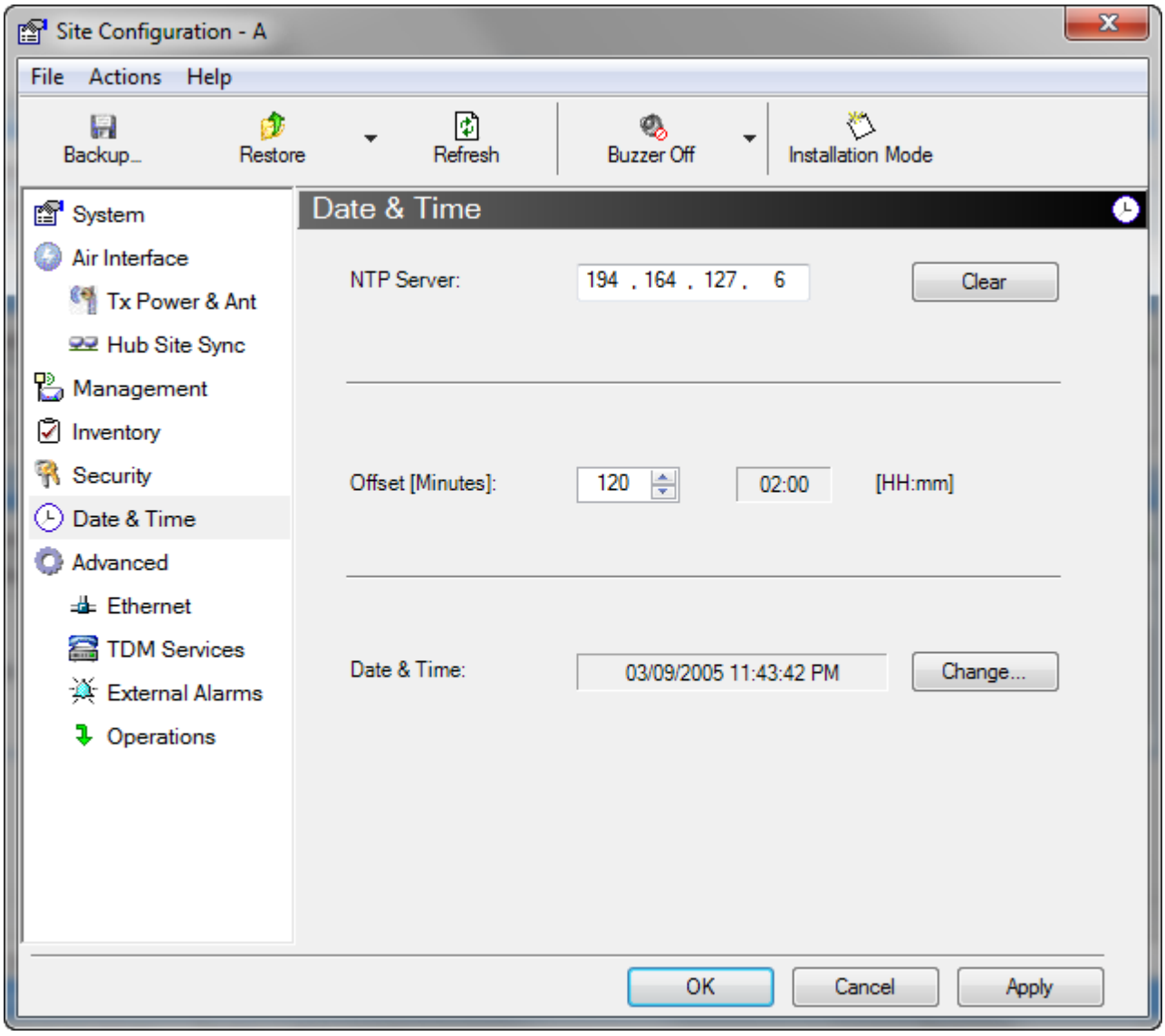


Figure 9-13: Date and Time configured from an NTP Server

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

Ethernet Properties

ODU Mode

- **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.

RADWIN 2000 C ODUs work in Hub mode only and bridging is performed by the IDU-C. The bridge capability is built in to the IDU-C (it is not configurable).

Other RADWIN 2000 models control the choice of Hub or Bridging mode.

Configuring the Bridge

Bridge configuration is required in various network topologies, such as protection (Ethernet 1+1) and ring applications.

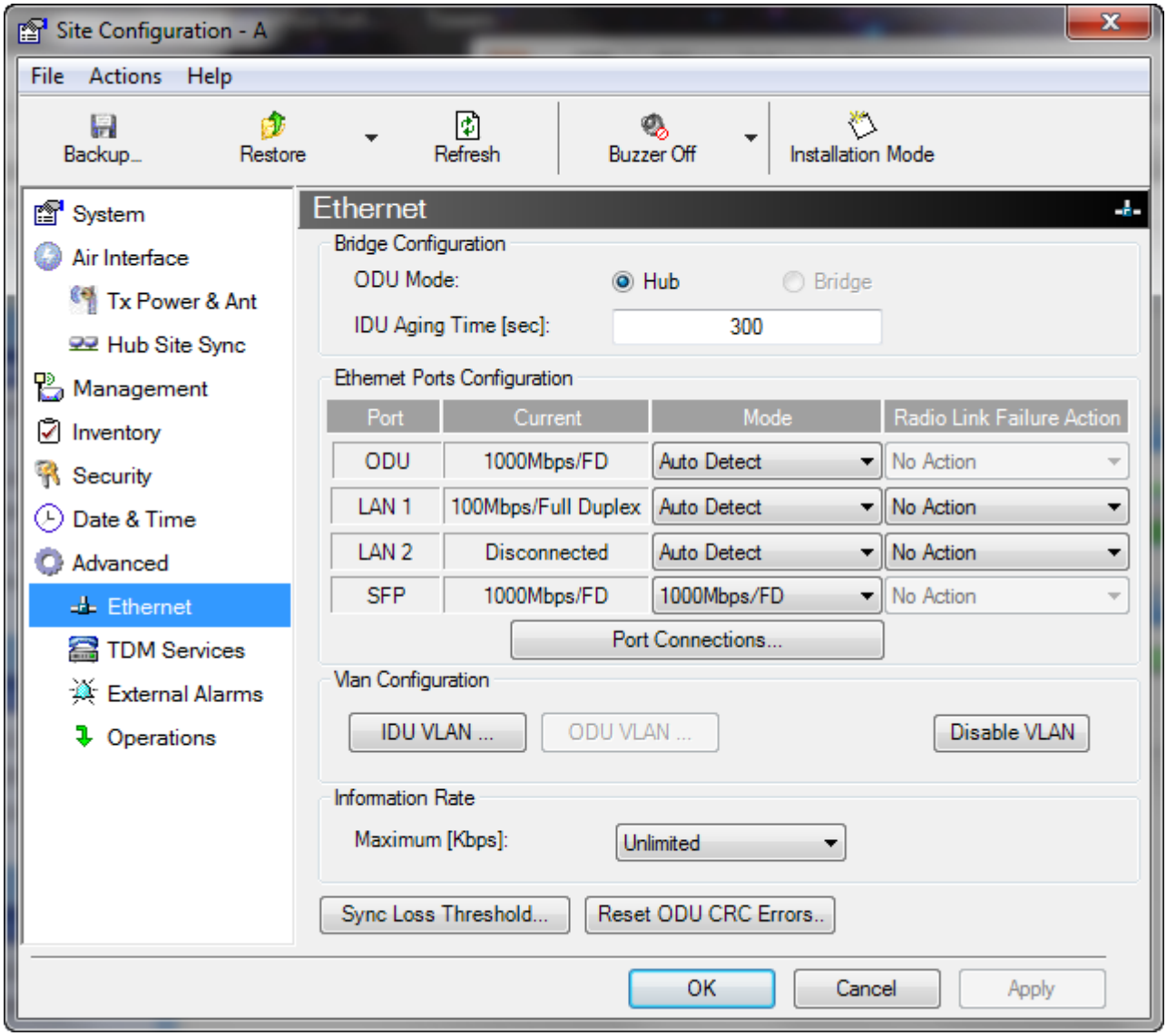


Figure 9-14: Bridge, VLAN and MIR Configuration using an IDU-C

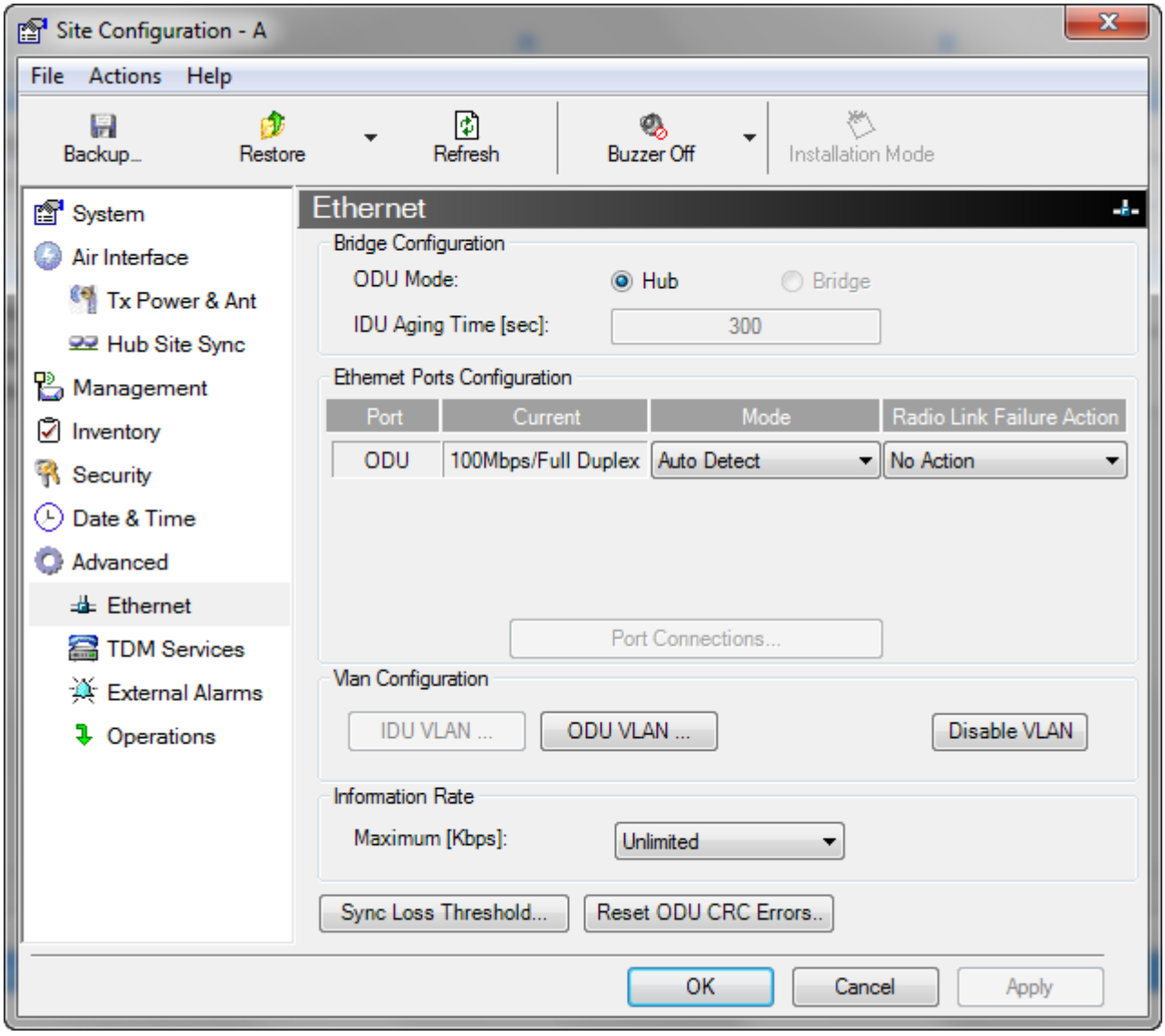


Figure 9-15: Bridge, VLAN and MIR Configuration using a PoE device

Note

In **Figure 9-14** and **9-15**, the ODU supports GbE and may operate at up to 1000 Mbps. The latest IDU-C models (hardware versions 6 and later) and the new GbE PoE will support up to 1000 Mbps at their LAN ports. A suitable SFP module will also support GbE.

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 9-1: 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

Configuring Ethernet Ports Mode

The ODU Ethernet port mode is configurable for line speed (10/100/1000BaseT) 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 required mode.
4. Click **Apply** to save the changes.

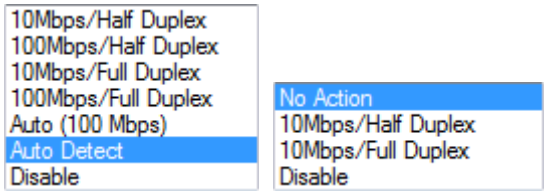
Note

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:

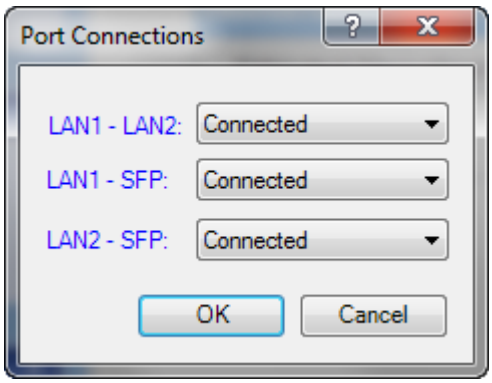
- Connect to the system from the remote site
- Connect via other Ethernet port (of the IDU)
- Power down the equipment and connect immediately after power up (the fastest way is to enter install mode)

The **Mode** and **Radio Link Failure Action** options vary somewhat with IDU or PoE type. For a GbE PoE device they are respectively, as follows:



Port Connections

For IDU-C based links the Port Connections window enables you to control communication between the two LAN ports and the SFP:



The port combinations shown may be **Connected** or **Disconnected**. For IDU-Es, you will only see LAN1-LAN2.

CRC Error Detection for GbE Ports

The CRC error count for GbE LAN ports may be seen as mouse-over tool-tips:

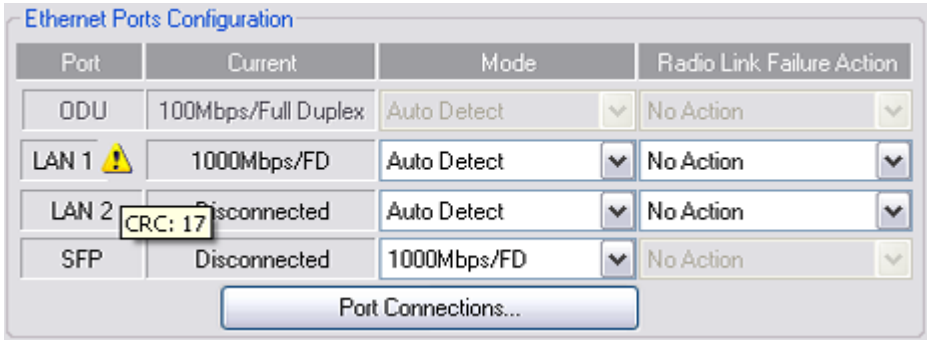


Figure 9-16: GbE LAN Port with CRC error warning and CRC count tool-tip

The occurrence of CRC errors on a port is indicated by the yellow triangular caution sign; to see the CRC error count, mouse over the caution sign.

VLAN Tagging for Ethernet Service: Configuration



VLAN IDs are used by RADWIN products in three separate contexts: Management VLAN, Traffic VLAN and Ethernet Ring. It is recommended that you use different VLAN IDs for each context.

Two modes of VLAN tagging for Ethernet service are supported: ODU mode for PoE links and IDU mode for links using IDU-Cs.

VLAN Tagging - ODU Mode

If the ODU is configured with either

- a PoE device instead of an IDU-C
- an IDU-C with IDU detection disabled

the window shown in **Figure 9-15** will be displayed. Clicking the **ODU VLAN Configuration** button opens the following window:

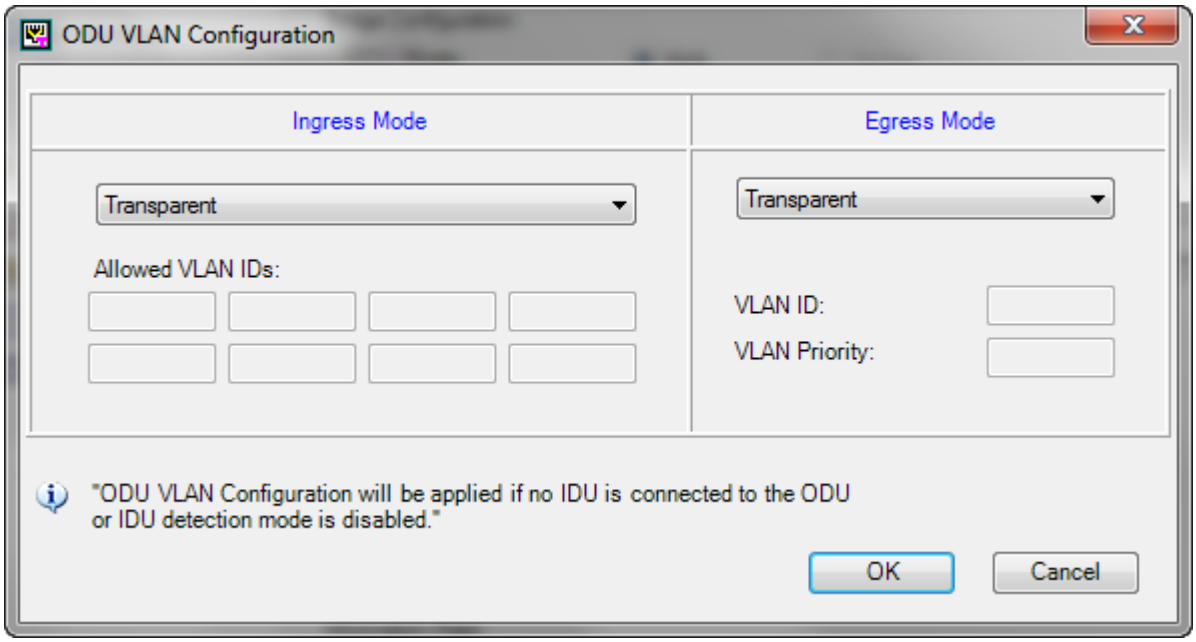
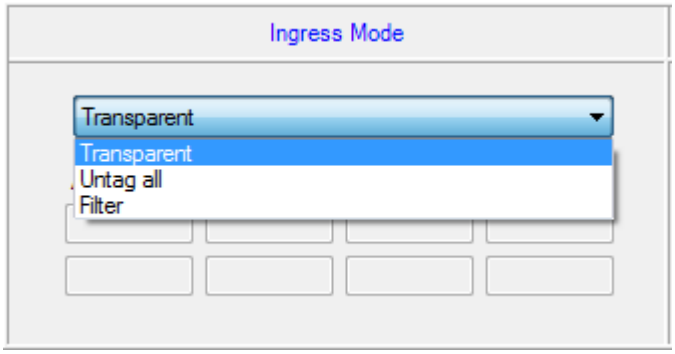


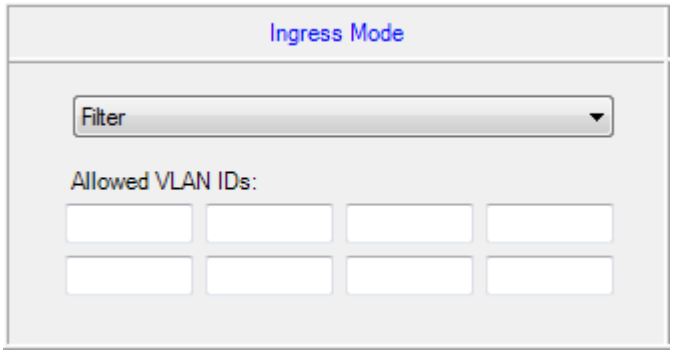
Figure 9-17: ODU VLAN Configuration

The **Ingress** options are:

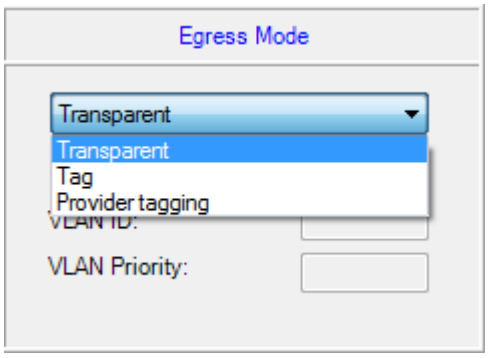


Transparent mode passes through all frames transparently. **Untag all** removes tagging from all frames. **Filter** mode passes through packets with VLAN IDS listed in the table. Untagged packets are also filtered. They are blocked by the ODU.

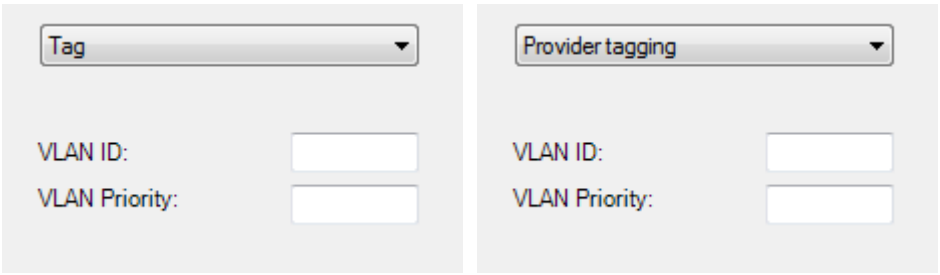
The table of Allowed VLAN IDs is enable when you select the Filter option. You may enter up to eight VLAN IDs.



The **Egress** options are:



Transparent mode passes frames without tagging. Both **Tag** mode **Provider Tagging** each requires that you assign a VLAN ID and VLAN Priority:



The VLAN ID must be in the range 2 to 4094 and the VLAN Priority is an integer between 0 and 7.

When you are done, remember to click **OK** (**Figure 9-17**).

VLAN Tagging - IDU Mode

To set up IDU mode VLAN tagging for Ethernet Service, click the **VLAN Configuration...** button in **Figure 9-14**. The following window is displayed:

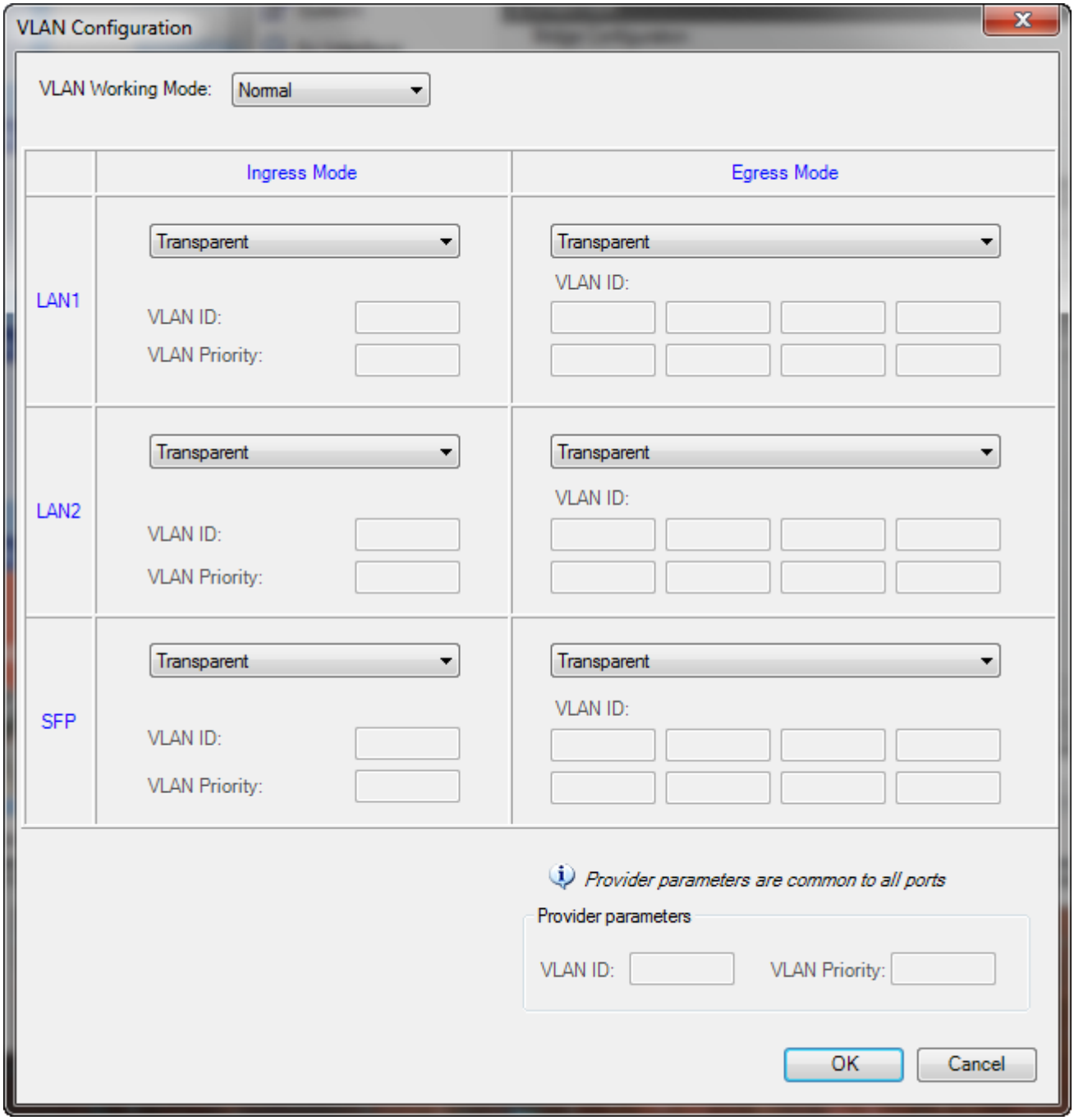


Figure 9-18: VLAN tag settings

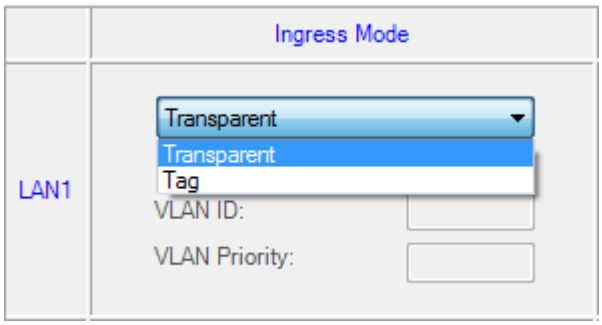
Note

If you are using a IDU-E, the SFP row will not appear.

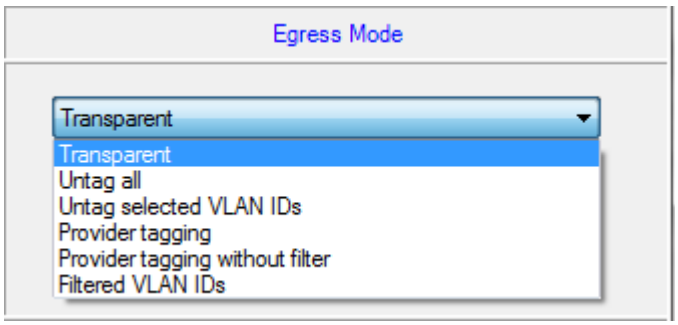
In **Normal** mode, you must manually assign each required VLAN ID to a port, whether for tagging or untagging. **Membership** mode allows you to allocate blocks of VLAN IDs.

Normal Mode

The choices for Ingress Mode are -



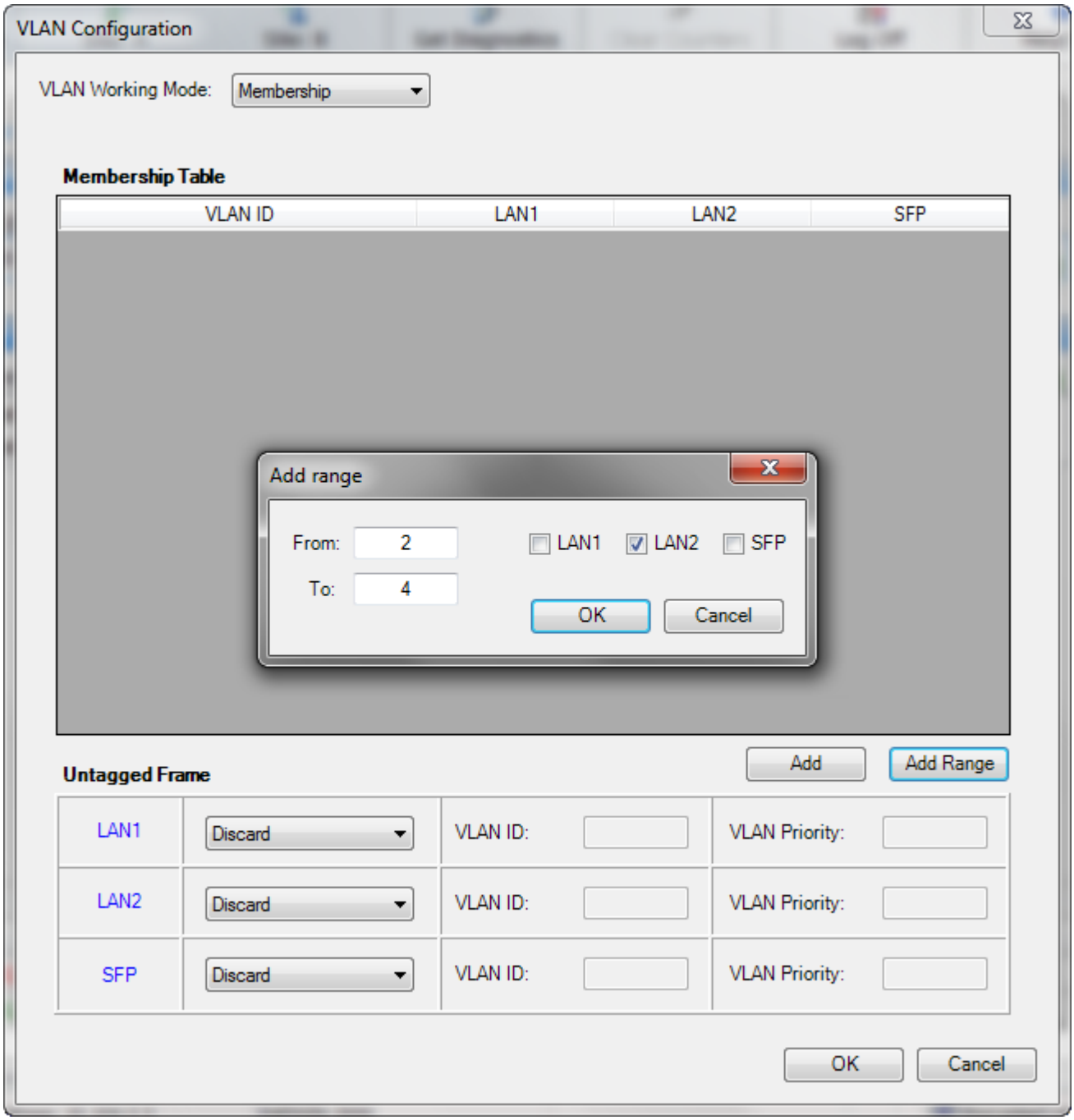
and for Egress Mode are -



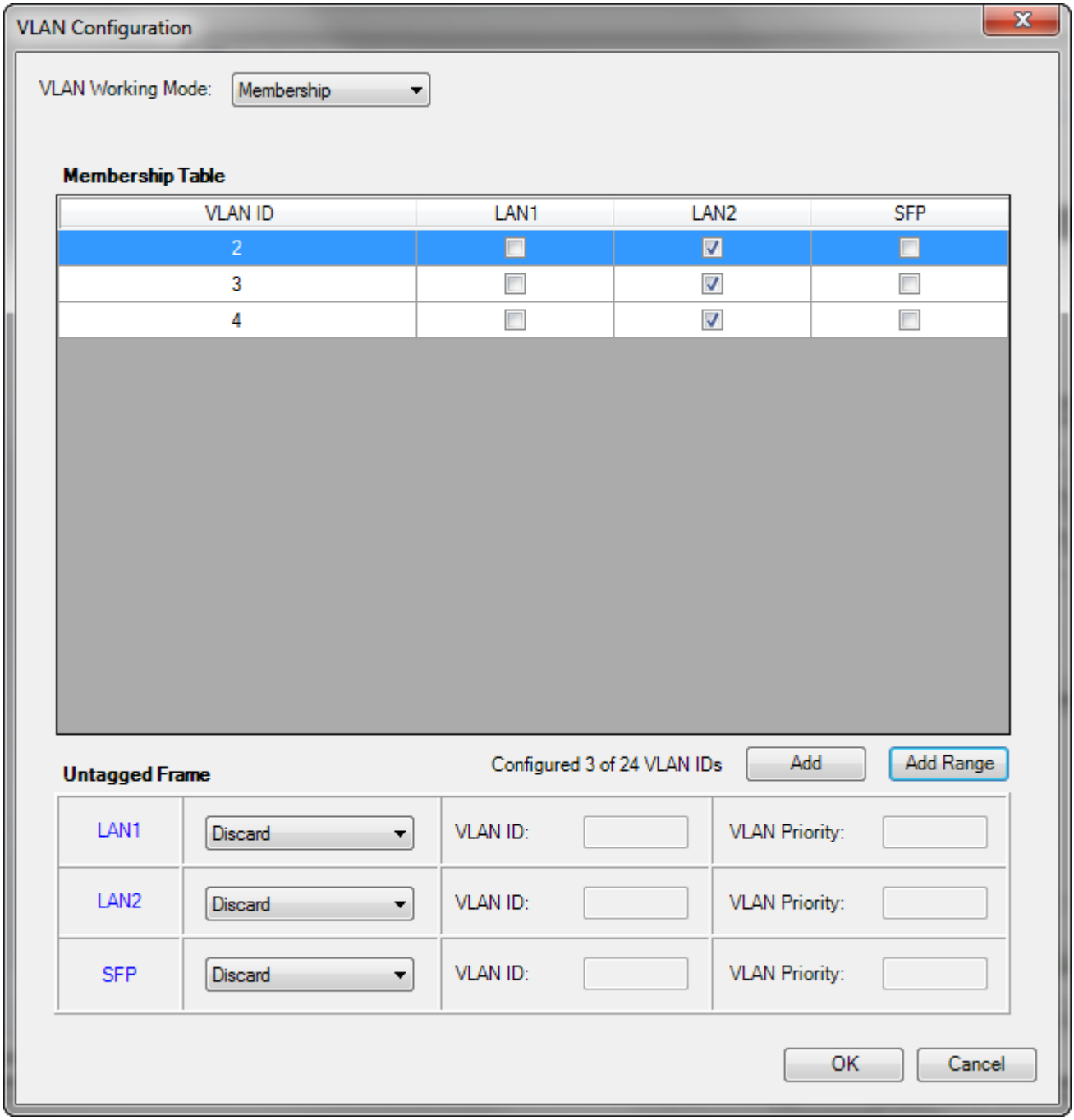
Membership mode

In Membership Mode you may assign VLAN IDs in blocks to the ports. The next three figures shows the work flow.

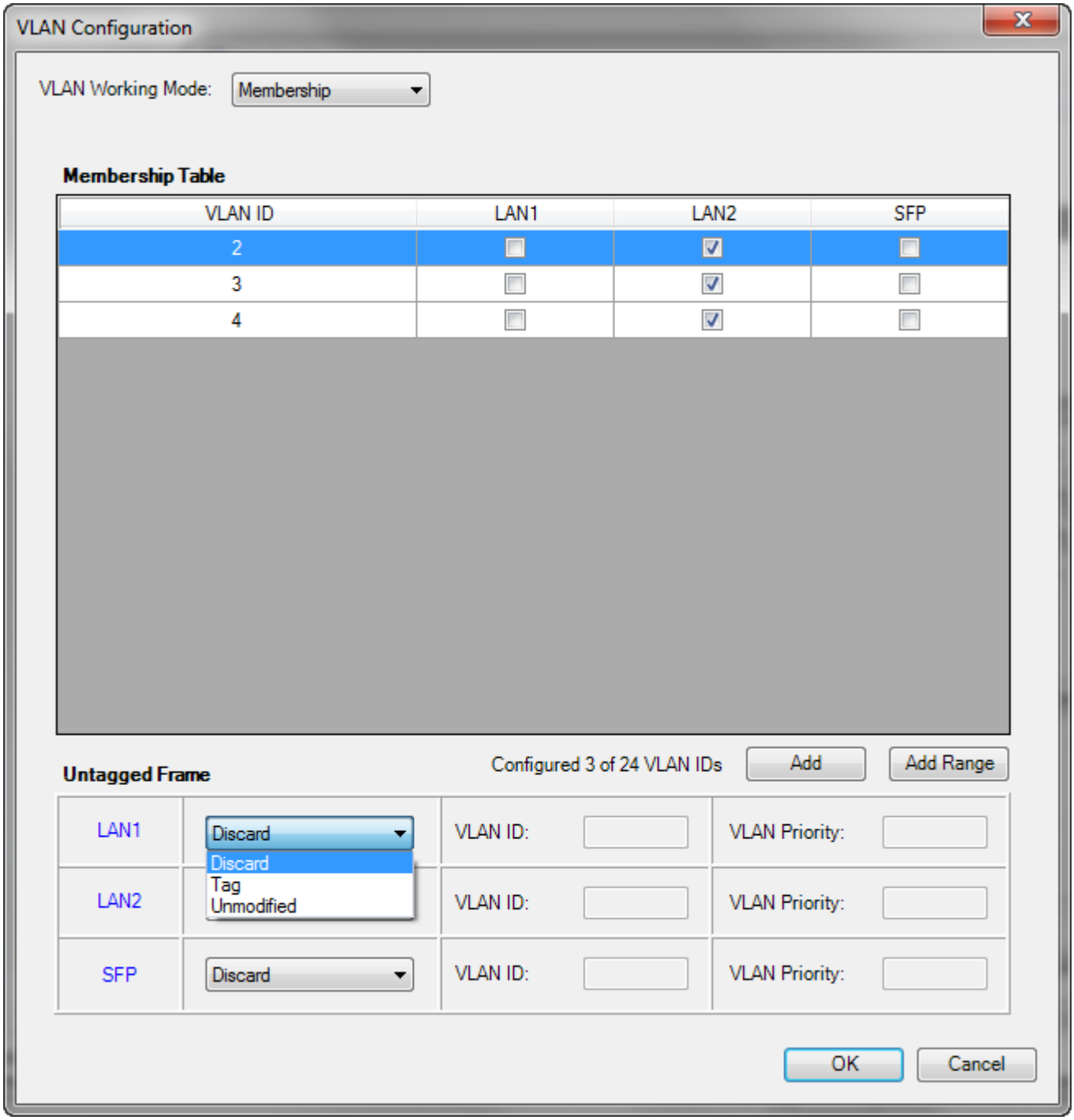
To configure VLAN using Membership mode:



1. Add a range of VLAN IDs or a single line item.



2. Assign participating ports to each VLAN ID.



3. Set untagged port VLAN IDs as required and click **OK** to accept. At any point you may return to the last display to see you VLAN assignments.

Note

The details of setting up VLAN tagging require advanced network management skills beyond the scope of this manual. Further information for the Network Manager is provided in **Chapter 18**.

Completely Disabling VLAN

It may be necessary to disable VLAN for several reasons apart from re-configuration. For example, setting a VLAN ID to the LAN port used by the managing computer can effectively lock you out of the link. The remedy for this situation is to reset the relevant site(s) and log on again. You have "two minutes of grace" before the VLAN settings take hold. During this

period, you should navigate to **Site Configuration | Ethernet** and then click the **Disable VLAN** button. Any VLAN settings for the site will be lost.

Setting the Maximum Information Rate (MIR)

What is the MIR

The maximum Ethernet throughput of the link (MIR) can be limited. The default setting is Best Effort (see **Figure 9-14** above), where the highest information rate available for the link conditions and settings is used.

What is it for

The MIR setting limits the throughput for Ethernet service. It does not affect the capacity of TDM services.

If the Link Budget Calculator or air conditions limit the capacity to X Mbps, and suppose that you use Y (< X) Mbps for TDM services, then you are left with X - Y=Z Mbps for Ethernet.

Suppose for example, that Z = 20 Mbps.

As a Service Provider, you can decide to sell a package based on 10Mbps and charge $P1 for it, or 15 Mbps for $P2 > $P1.

The MIR setting allows you do this.

The default value is "best effort" (shown as "Unlimited") which will give Z above.



The minimum value is 256 Mbps.

The maximum value will be the minimum between Z above and -

- 25/10 Mbps for RADWIN 2000 A (Model dependent)
- 50 Mbps for RADWIN 2000 B
- 20 Mbps for RADWIN 2000 X
- 200 Mbps for RADWIN 2000 C

The MIR setting is independent per direction.

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.

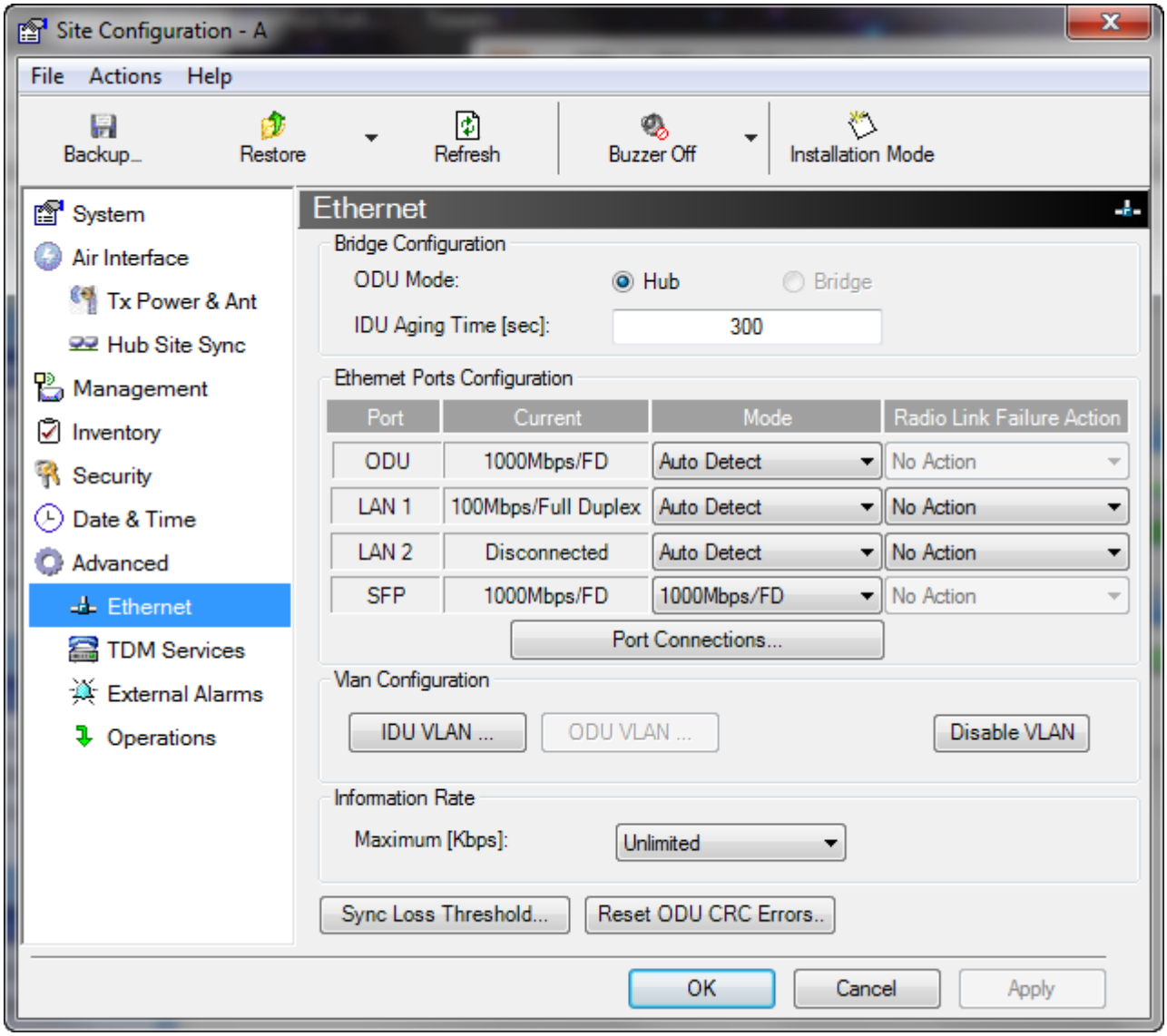


Figure 9-19: Ethernet Configuration - Site Configuration dialog box

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

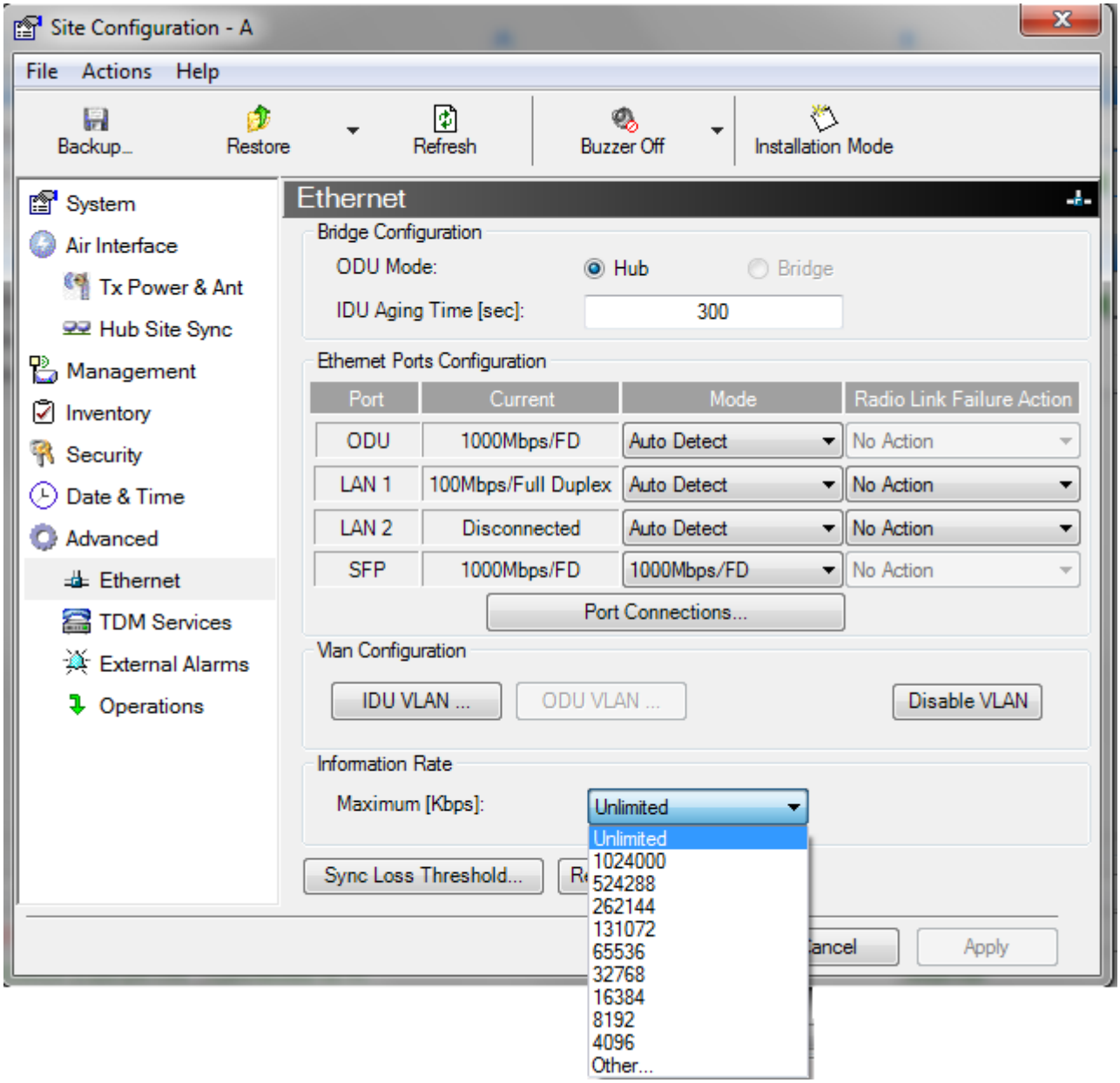


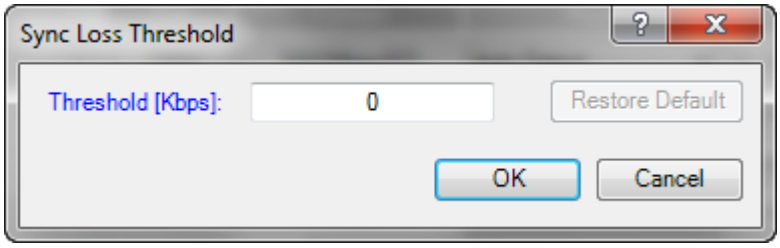
Figure 9-20: Ethernet MIR - Throughput selection

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.

Figure 9-21: Air interface details

Setting the sync-loss Threshold

You may change the sync-loss threshold by clicking the **sync-loss Threshold** button:



The sync-loss threshold value, which you enter is absolute. sync-loss will only occur if throughput falls below it.

Note

- The default value is determined by an algorithm taking into account your current link radio parameters
- There is a provision to override an excessively high value that would lead to continuous sync-loss "thrashing": An excessively high value will be ignored by the system.
- An excessively low value may prevent sync-loss events almost entirely, in turn preventing the ACS mechanism from working effectively.

TDM MHS Status

Here you can see the TDM MHS status. There is nothing to set.

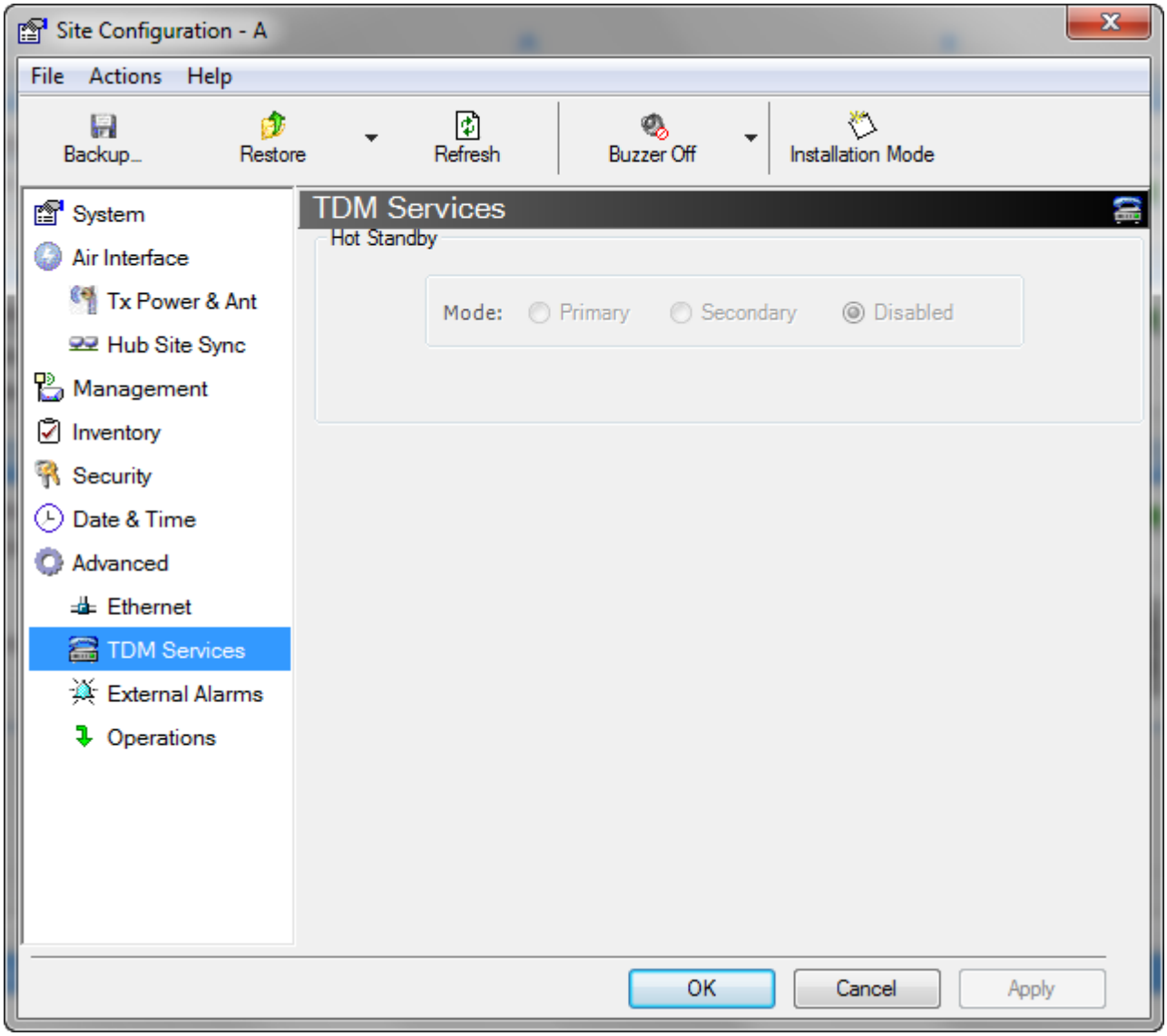


Figure 9-22: TDM MHS status

Setting External Alarm Inputs

The IDU-C and the IDU-E have 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 B**, for wiring specifications and pin-out. 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.

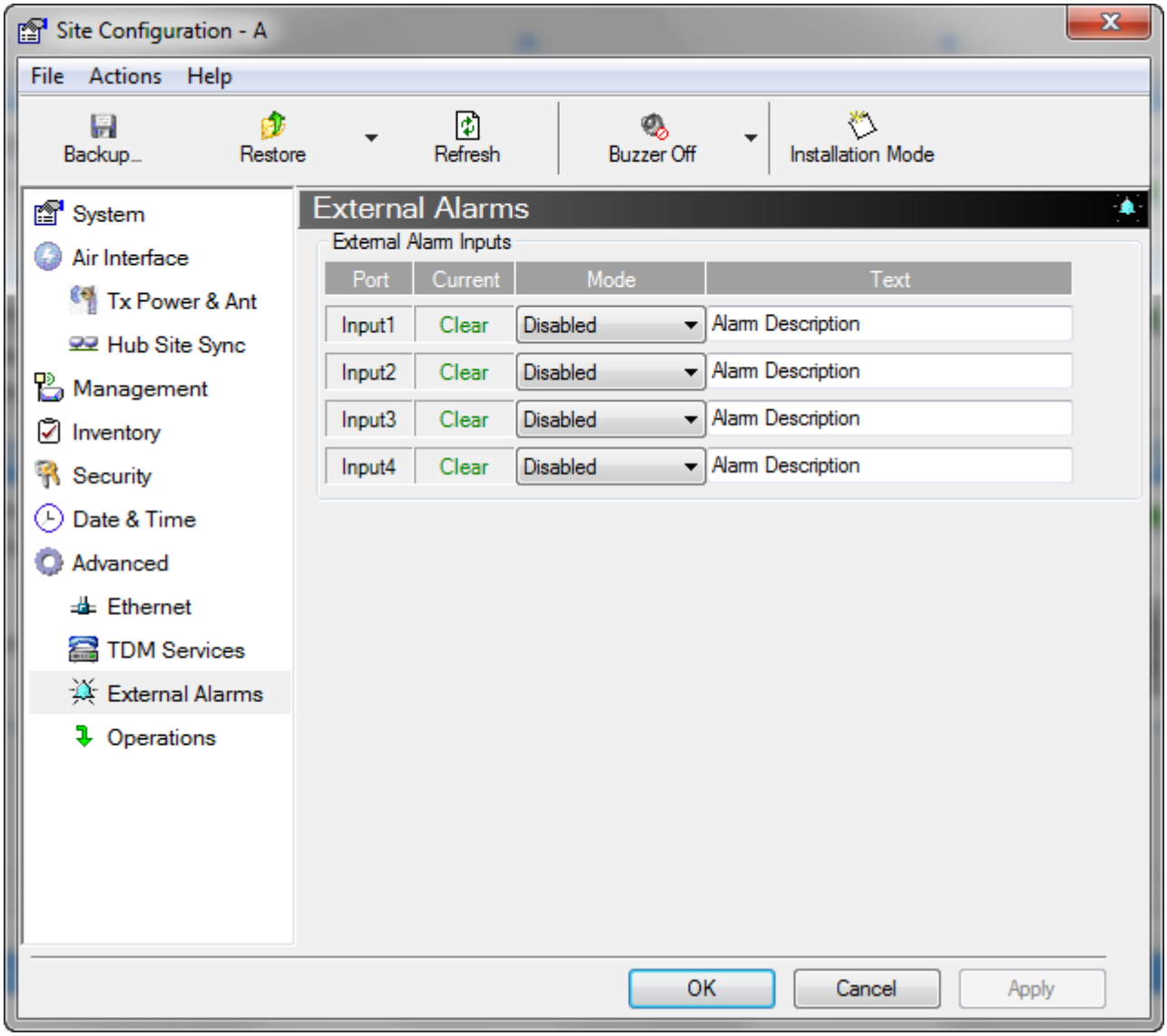


Figure 9-23: External Alarms Configuration

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.

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.

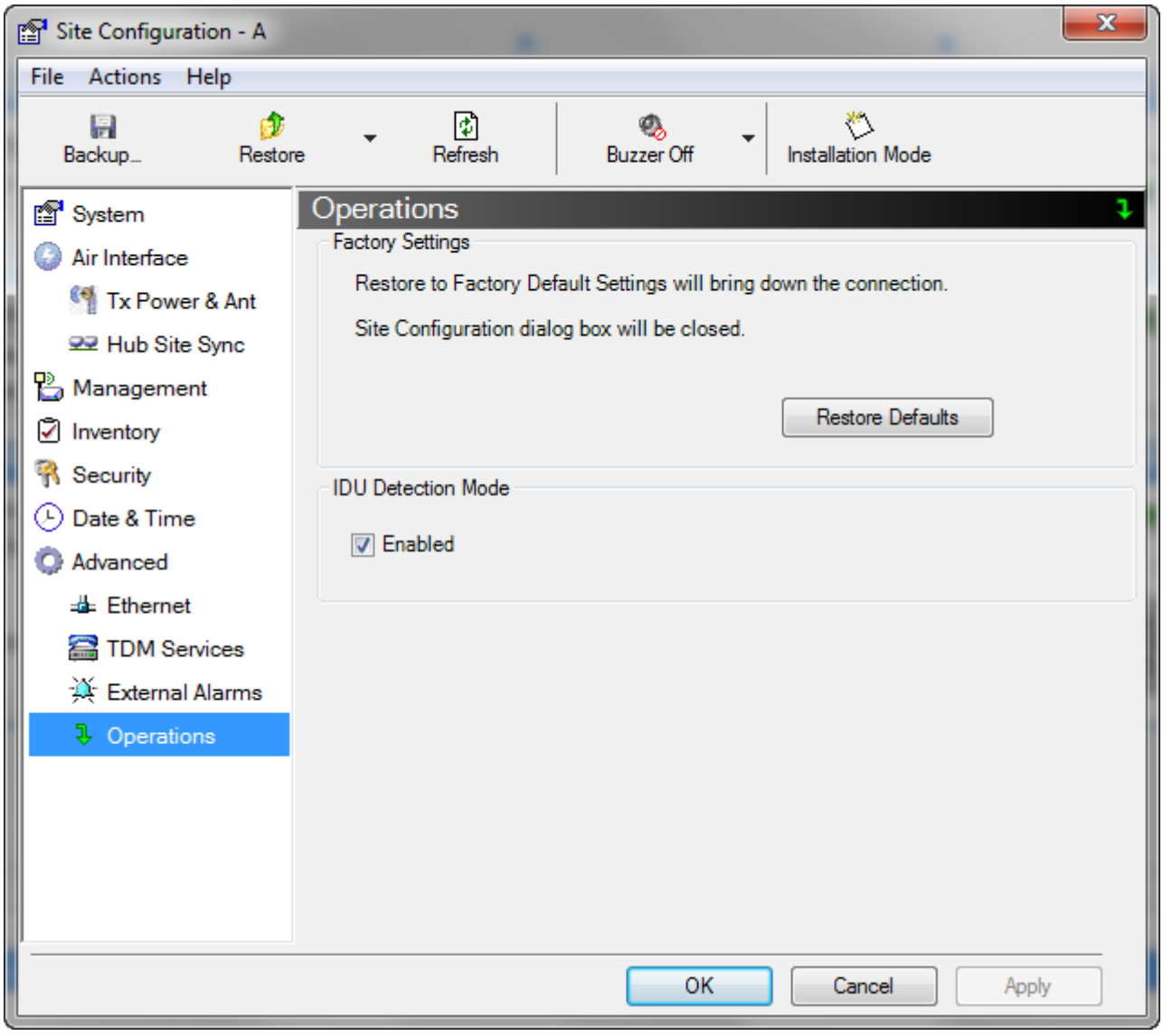
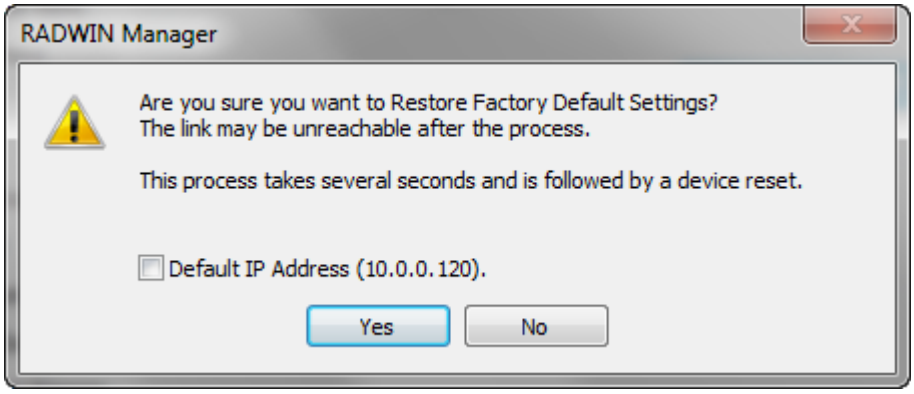


Figure 9-24: Site Configuration - Reset to factory defaults

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 9-24**), should be disabled.

To disable IDU Detection Mode, just toggle the check box in **Figure 9-24**.

Backup/Restore of ODU Software Files

Backup ODU Software to a File

RADWIN Manager allows you to backup the ODU software of both units of a link to the managing computer as binary files. Each site is backed up in a separate file. The default backup file name is constructed from the ODU IP address and the date as in the following example:

Backup of Site A as used in our examples:

10.104.2.2_1.12.2009.backup

If you perform more than one backup on a given date you will need to change the file name to something like this:

10.104.2.2_1.12.2009_00.backup

10.104.2.2_1.12.2009_01.backup

...

➢ **To backup the ODU software a file:**

1. Choose a site to back up. The Site 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 ODU Software or Configuration

Backup files can be uploaded from the managing computer. You may choose a full software restore or configuration-only restore. You may restore a backup file to another ODU subject to the following provisions:

- The backup was performed with RADWIN Manager, release 2.8.20 or higher
- The source and target ODUs have the same
  - Product ID
  - Hardware version
  - Capacity

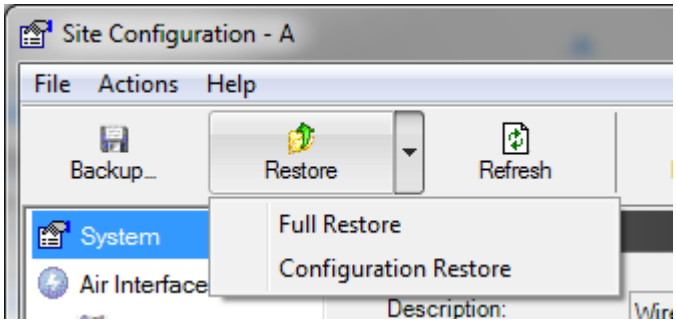
You can check Product ID, Hardware version and Capacity from the Inventory display for the source ODU.

➢ **To restore from a backup file:**

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

   The Site Configuration dialog box opens.

2. Click **Restore**. You are offered the choice of a Full or Configuration Restore as shown:



3. Click the required Restore type. You are then offered a standard Open File dialog box.
4. From the Open File dialog box, navigate to your backup storage area and choose file to upload. Click **OK**.

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.

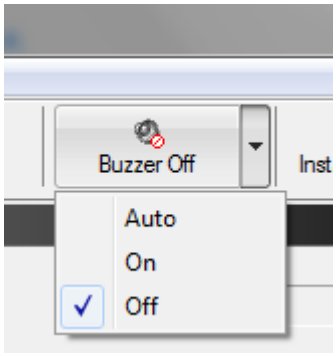


Figure 9-25: Alignment tone buzzer states

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.

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 10.104.2.2

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**).

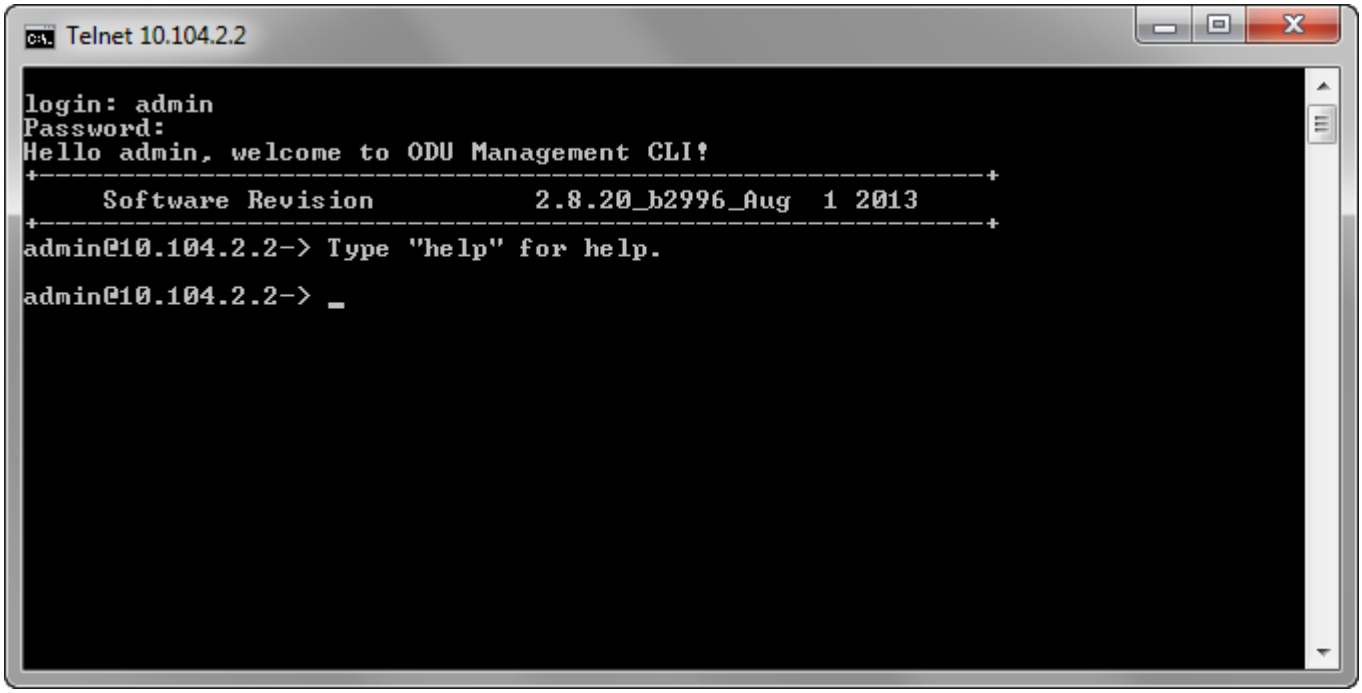


Figure 9-26: Telnet session log on

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 9-4**. Note that some of the commands are model-specific. For example, TDM commands will not apply to Ethernet only and PoE based links.

Table 9-2: Telnet - Display 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 ethernet_errors	Display FCS errors for ODU/IDU Rx, IDU LAN1/LAN2
display tdm	Displays Clock Mode, Master Clock Mode, Current Clock, Quality, TDM table (Line status, Error Blocks)
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
display bands	Display available bands
display ratio	Display uplink/downlink ratio,per mille
display syncloss_thresh	Display sync-loss threhold in Kbps

Table 9-3: Telnet - Set immediate commands

Command	Explanation
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 10.104.2.2 162)
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,2=ALWAYS_ON,3=AUTO>	Set the buzzer mode
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 name <new name>	Set the name of the link
set location <new location>	Set the site name
set contact <new contact>	Set the name of the location
set ethernet <port:MNG,LAN1,LAN2> <mode:AUTO,10H,10F,100H,100F,DISABLE>	Set the mode and speed of each Ethernet port
set syncloss_thresh	Set sync-loss threshold in Kbps (default 1000 Kbps)
resync	Resyncs the ODUs. The user is warned that the command will drop service for a few seconds. The air interface is reset but not lost. The Telnet session is maintained. (Watch the IDU LEDs.)
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 ODU may be opened after the reset is complete. (Watch the IDU LEDs.)
help	Displays the available commands

Table 9-4: Telnet - Set commands requiring reset

Command	Explanation
set <ssid>	Set Link ID
set rate <index:1-7,adaptive>	Set the rat. Index is to the table as appears in the Config Wizard
set bridge <mode:0=Bridging OFF,1= Bridging ON >	Set the ODU bridge mode (0 – off, 1 – on)
set ratio <1-1000>	set uplink/downlink ratio, per mille
set dual_tx_mode (mode: 1=MIMO, 2=Diversity)	Set dual antenna mode to MIMO or Diversity
set preferred frequencies clear	Clear preferred frequencies. Requires a resync.
set preferred frequencies add <freq>	Add a preferred frequency in MHz. Requires a resync.

Chapter 10

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
- TDM port loopbacks
- Reinstalling and realigning a link
- Link Budget Calculator
- Performance monitoring
- Throughput checking
- Events, alarms and Traps
- Reverting alert messages
- Remote power fail indication
- Troubleshooting
- Replacing an ODU
- Restoring to factory setup
- Online help
- Obtaining support

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 10-1: Get Diagnostics Data and Description

Data	Description
System Data	General information about the system
Link Information	Information about the link properties
Events Log	• List of system events including those from other sites if this site is defined as the trap destination • Last 256 events from both sites
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
Spectrum View	Data from last Spectrum View run

To get diagnostics

1. From the **Help** menu, choose **Get Diagnostics Information**.

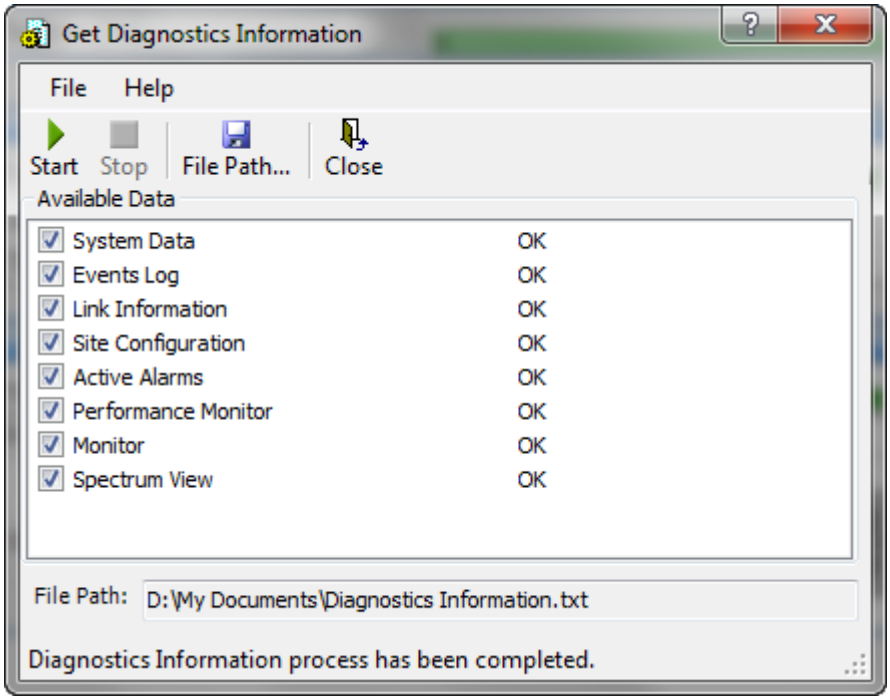


Figure 10-1: Get Diagnostics Dialog Box

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 10-2: Link Compatibility Trap Messages

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

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:

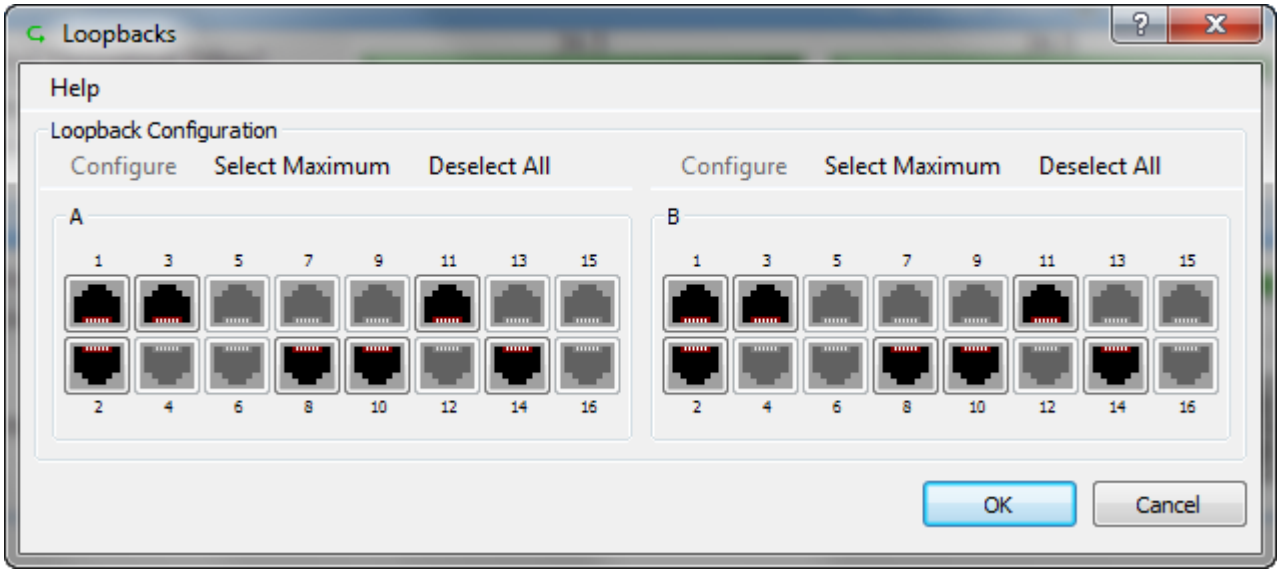


Figure 10-2: Loopback configuration box

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:

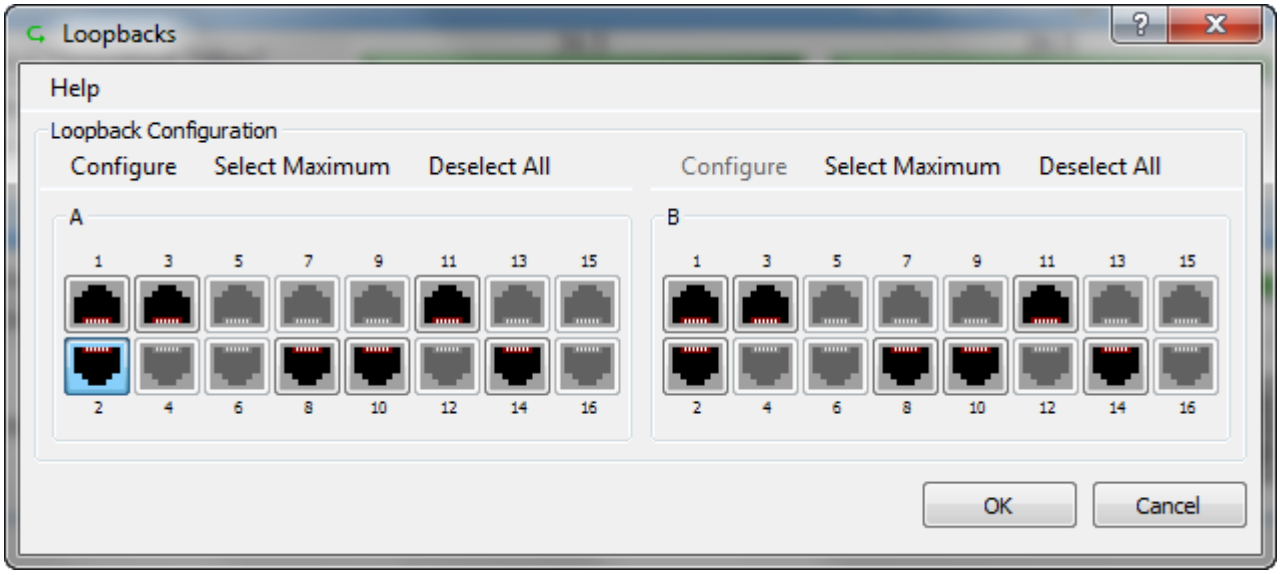


Figure 10-3: Loopback configuration box with one Site A port selected

3. Click configure to choose a loopback mode:

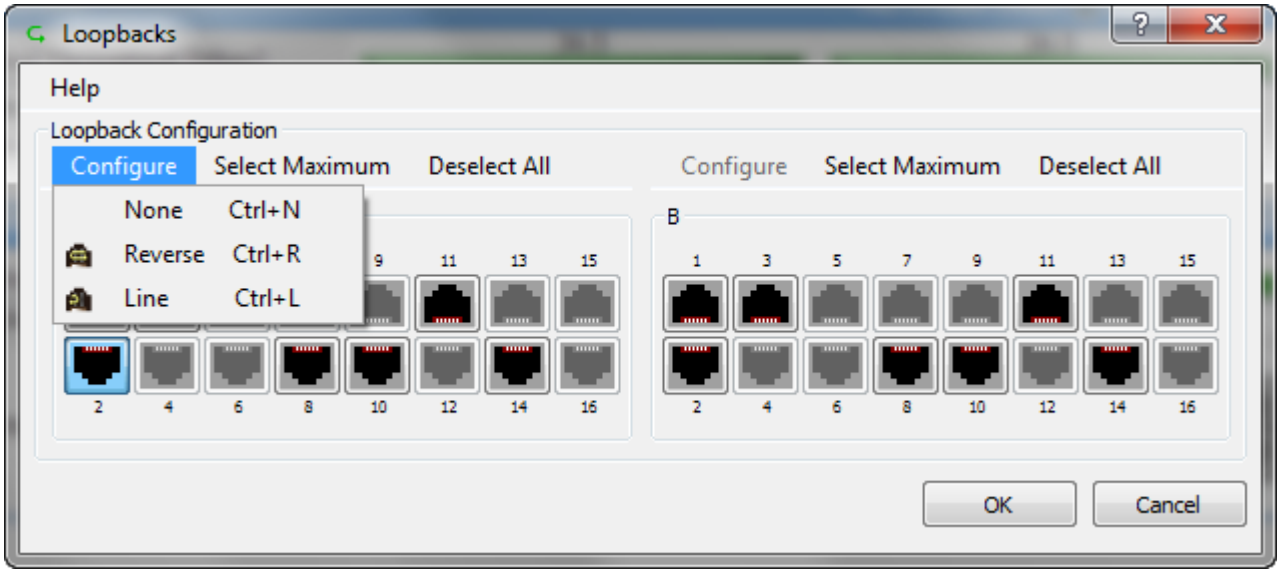


Figure 10-4: Loopback options

4. Click the required loopback mode.

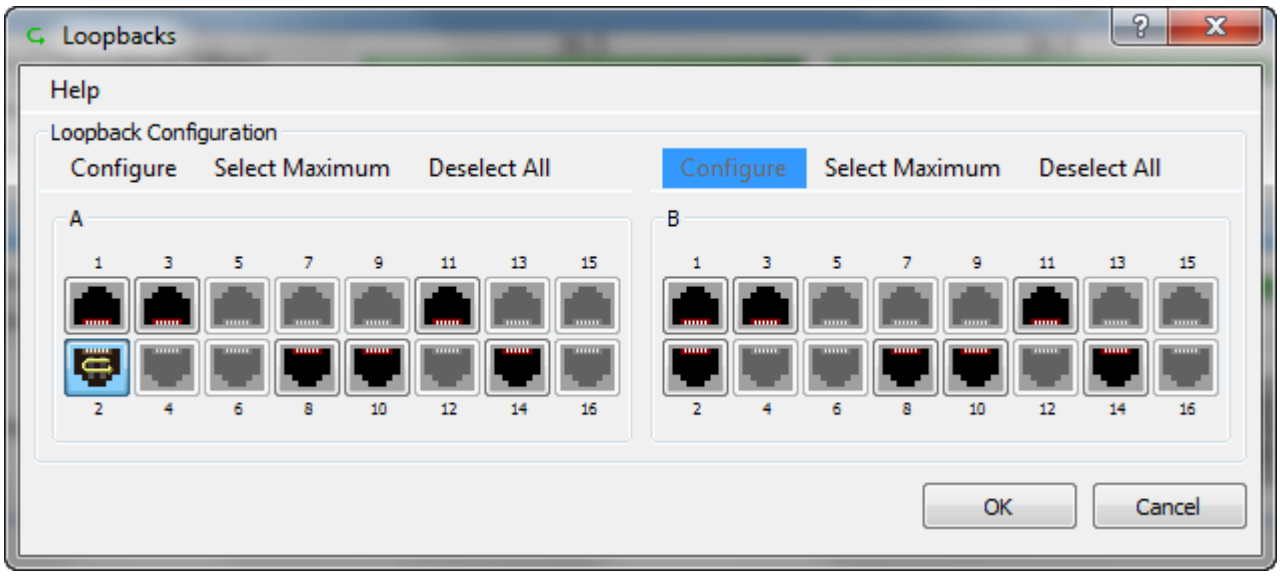


Figure 10-5: Loopback defined

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

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

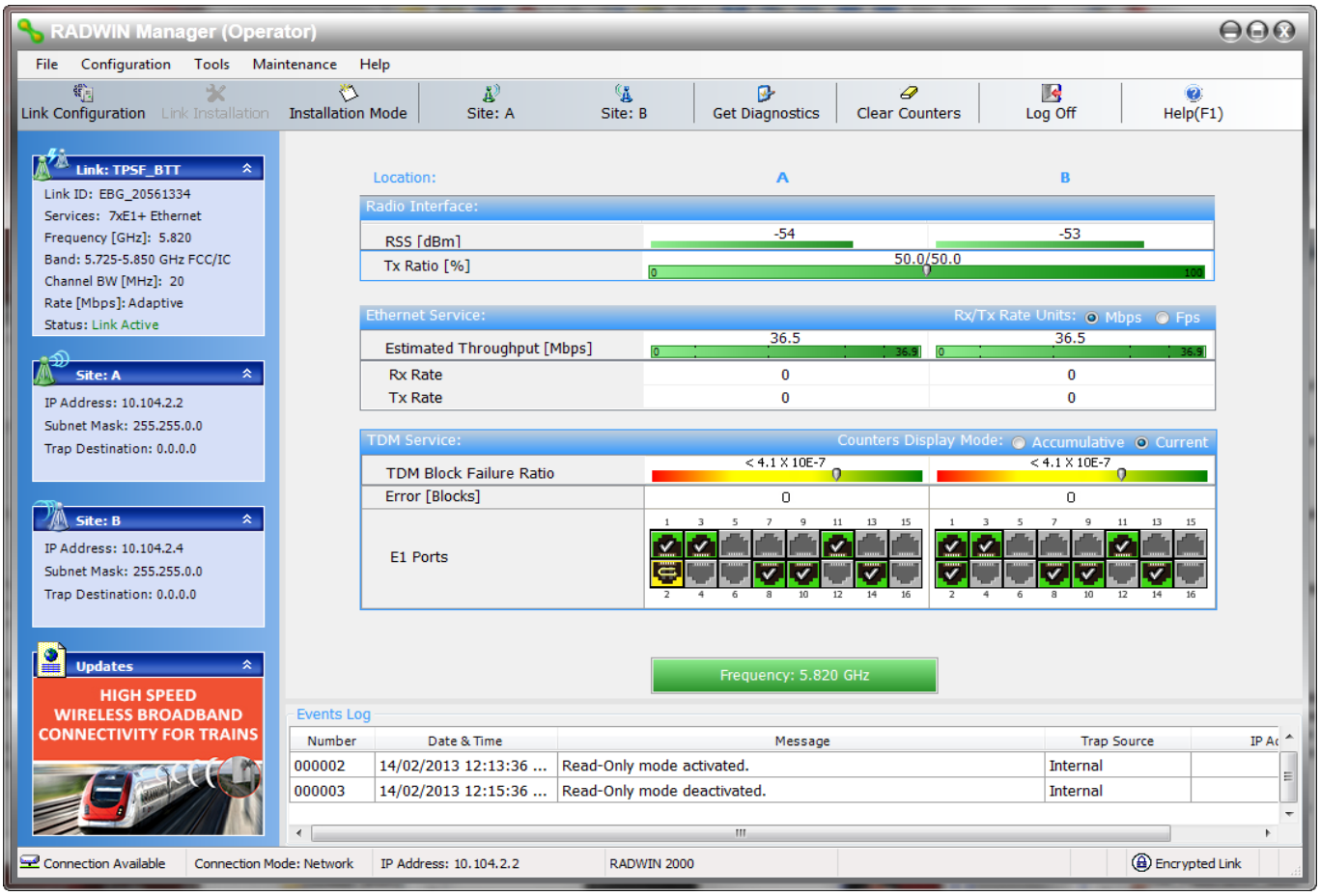


Figure 10-6: Site A port 2 set to loopback

To deactivate a loopback:

- Return to the situation of **Figure 10-4** and click **None**.

  When a loopback is deactivated, the corresponding icon in **Figure 10-6** reverts to its previous state (like the right side of the figure).

Local Line Loopback

A Local line loopback can be set to test the local E1/T1 port and its connection to local side user equipment. In this mode, data coming from the local user equipment is looped back to it. This loopback is initiated from a managing computer connected to the local unit.

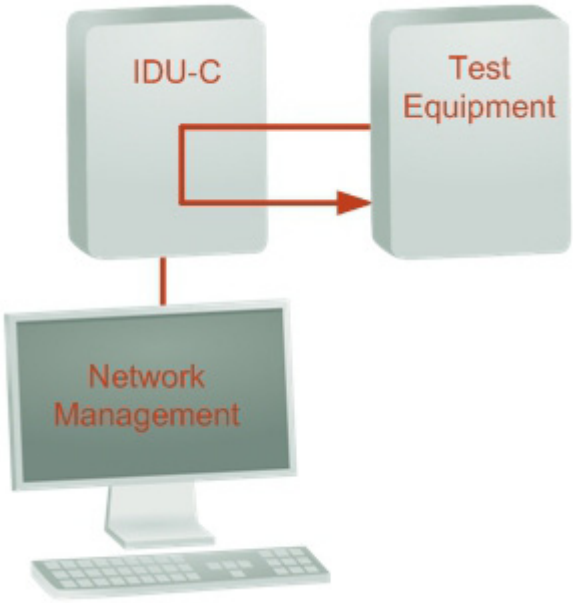


Figure 10-7: Local Line Loopback

Remote Reverse Loopback

A remote reverse loopback can be set to test connection between the local and remote units and between the local E1/T1 port and its connection to the local user equipment. In this mode, data coming from the local user equipment is looped back at the remote side. This loopback is initiated from a managing computer connected to the local unit.

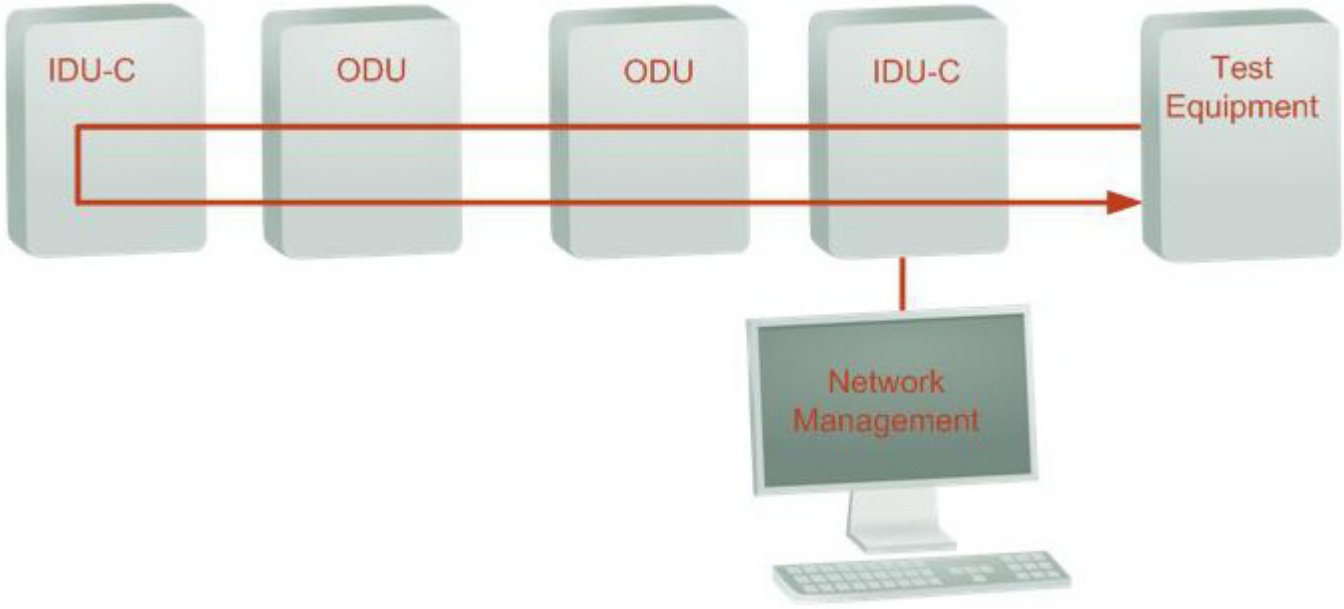


Figure 10-8: Remote Reverse Loopback

Remote Line Loopback

The remote unit can be set to a line loopback to test the remote E1/T1 port and its connection to the remote side 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.

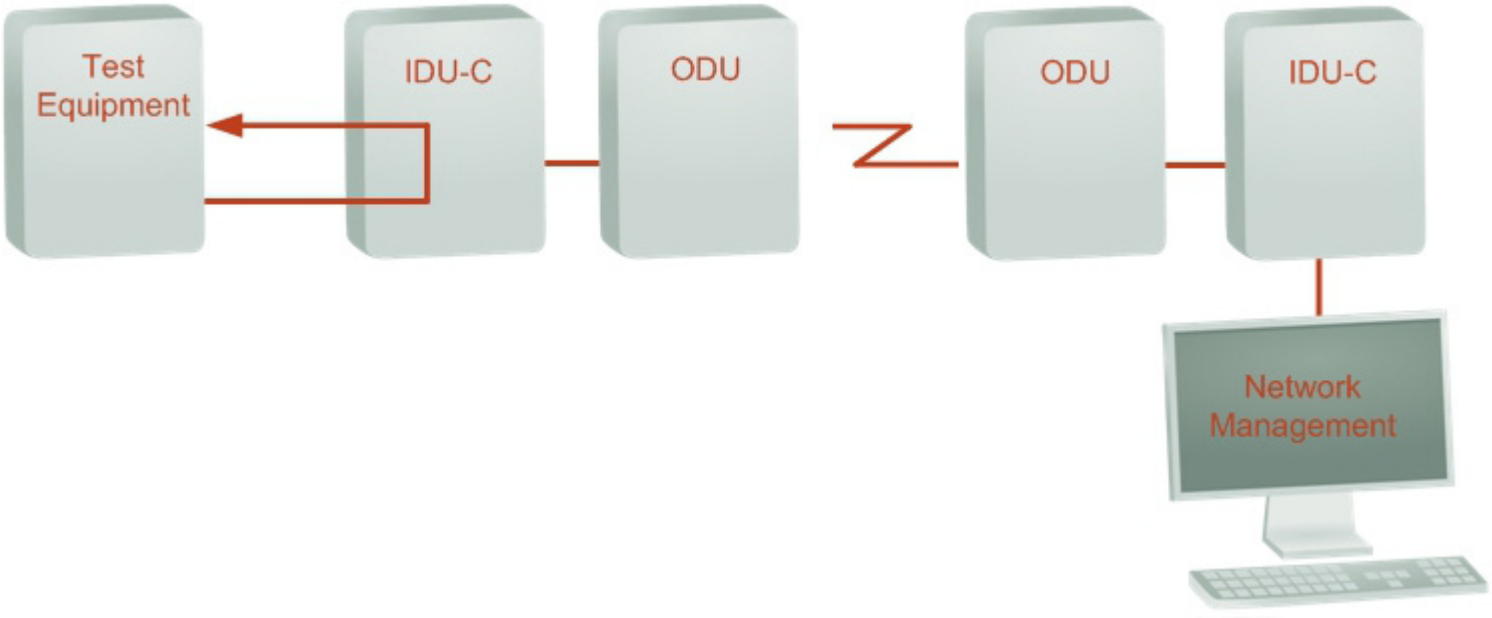


Figure 10-9: Remote Line Loopback

Local Internal Loopback

The local unit can be set to close a remote 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.

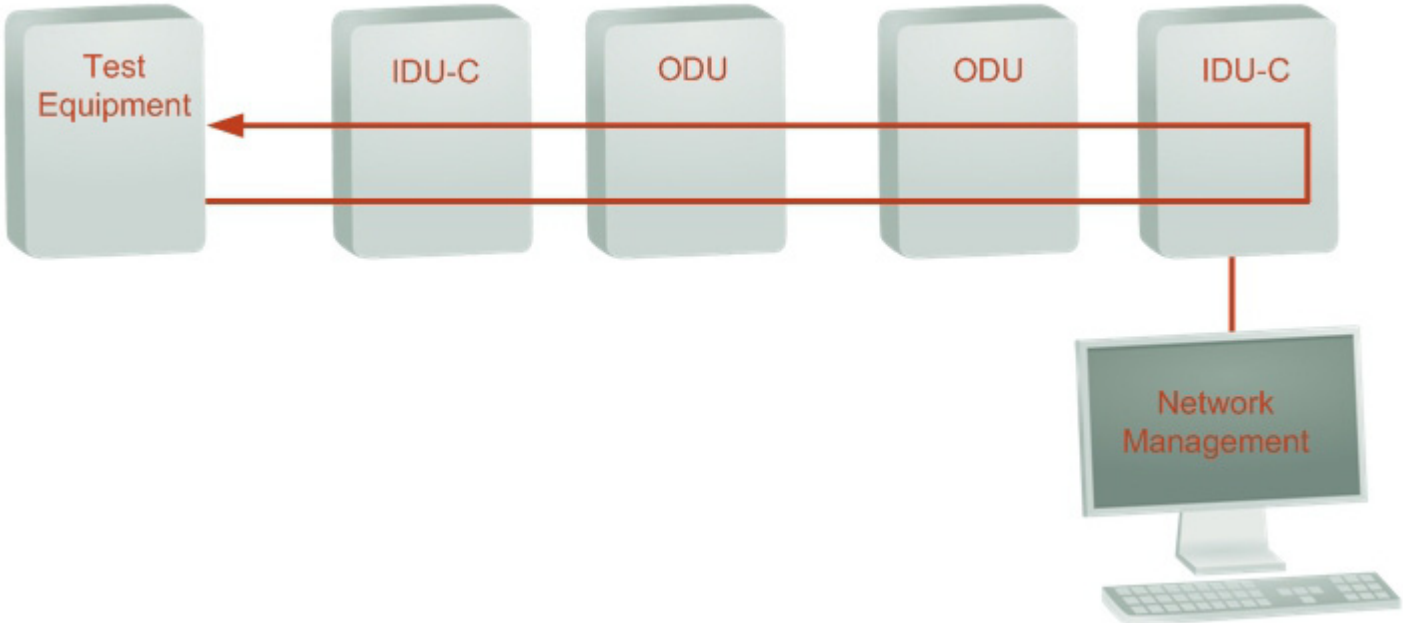


Figure 10-10: Local Reverse Loopback

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 6**).

The Link Budget Calculator

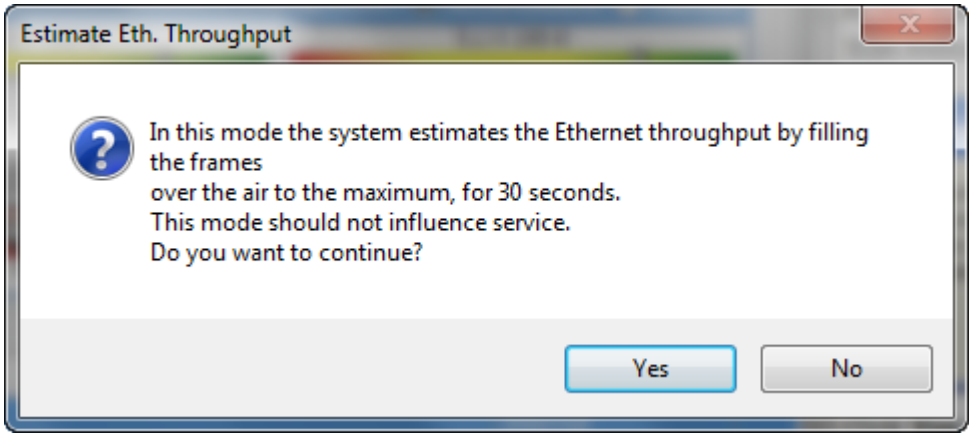
The Link Budget Calculator is part of the RADWIN Manager software and is found in the Help menu. This useful utility enables you to calculate the expected performance of the wireless link and the possible configurations for a specific link range including antenna size, cable loss and climate conditions. For full details, see **Chapter 26**.

Throughput Checking

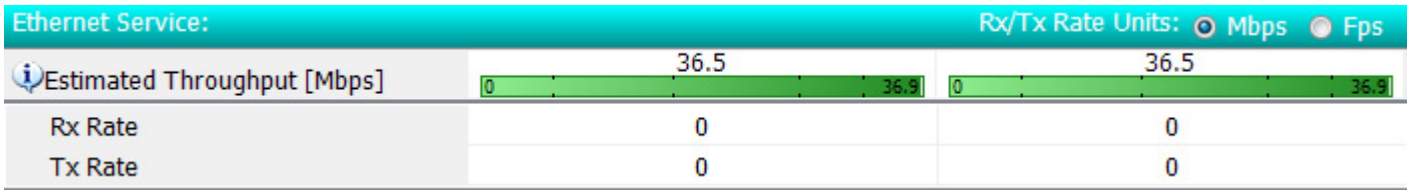
In this mode, RADWIN 2000 estimates Ethernet throughput by filling frames over the air to maximum for 30 seconds. This mode should not influence service.

To use Throughput Checking:

1. At the main menu, click **Maintenance | Estimated Eth. Throughput.** A confirmation message appears:



2. Click **Yes** to continue. The Ethernet services area changes appearance and the estimated throughput is displayed:



At the end of 30 seconds, the display reverts to normal.

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. See **page 10-16** below.

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:

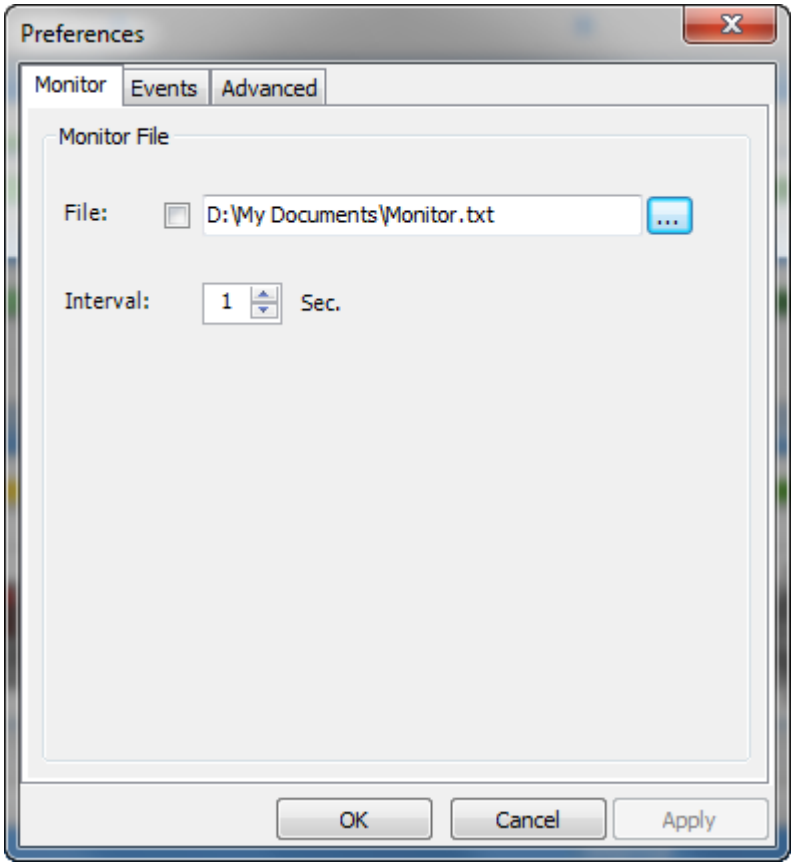


Figure 10-11: Preferences dialog box

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.

➢ **To obtain performance monitoring reports:**

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

   You are presented with the following window:

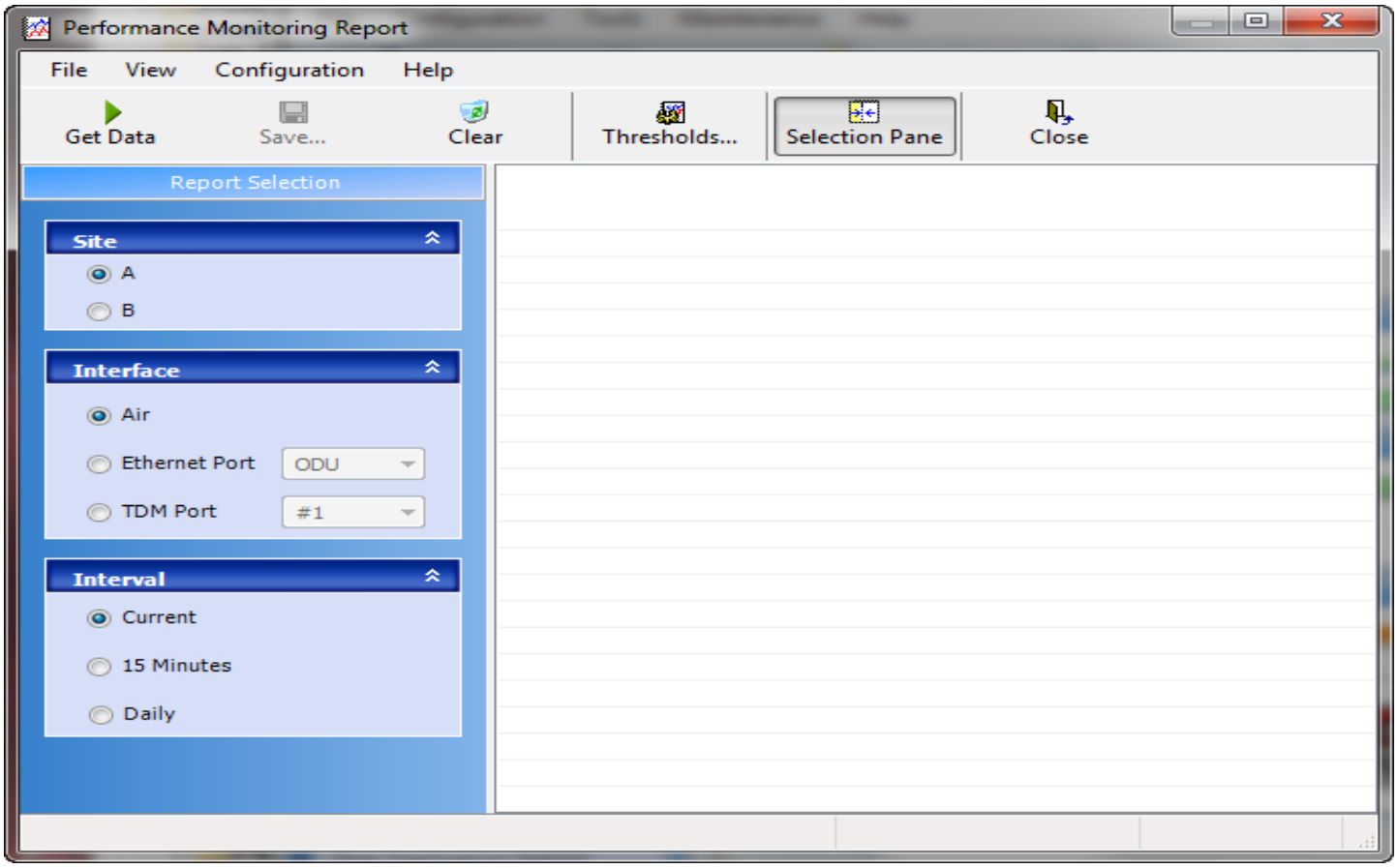


Figure 10-12: Basic Performance Monitoring Report

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:

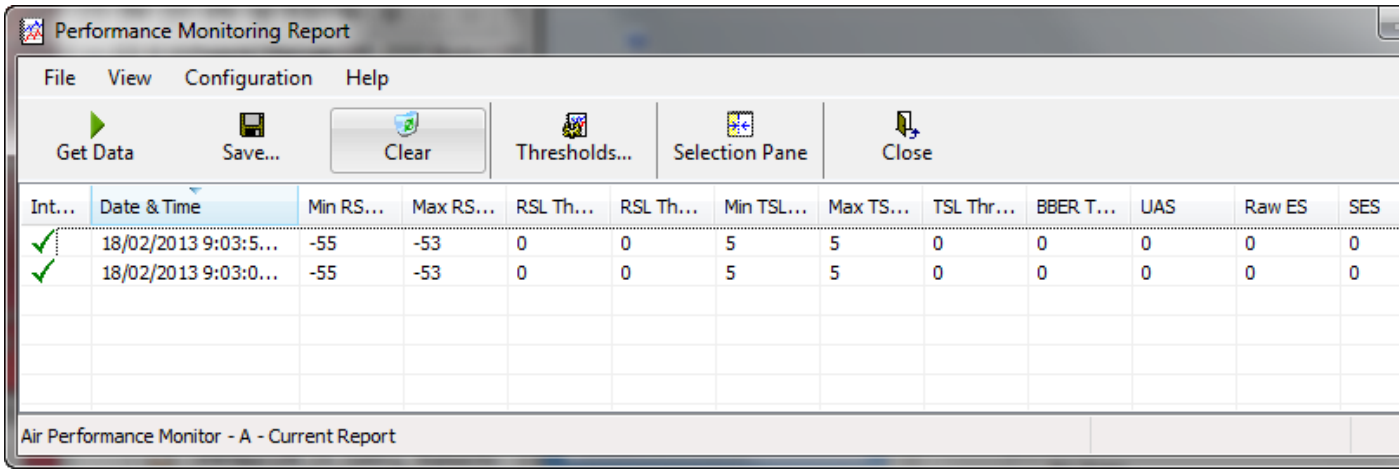
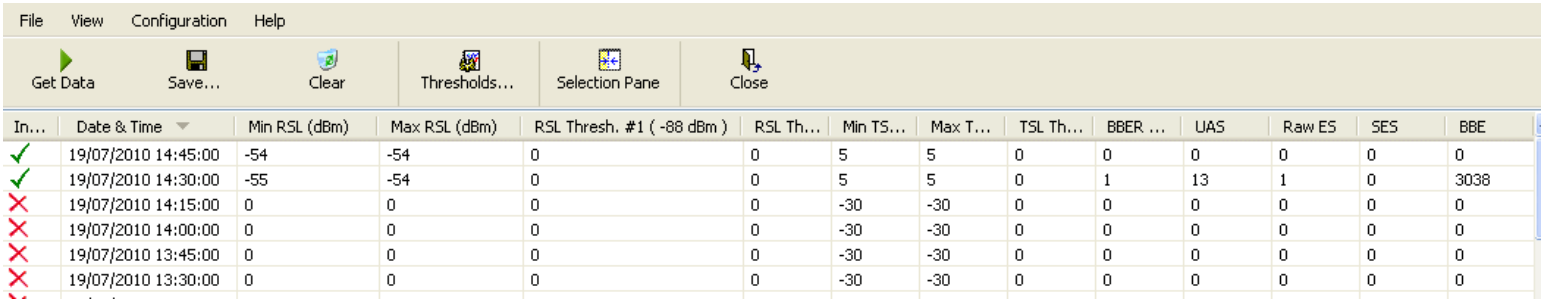


Figure 10-13: A typical Performance Monitoring Report based on 15 minute intervals

Notice the Min RSL value of -100 on the fourth line. It Indicates that during the interval 12:30 to 12:45, there was a link sync-loss. The next figure shows the effect of a reset between 14:15 and 14:30.



In...	Date & Time	Min RSL (dBm)	Max RSL (dBm)	RSL Thresh. #1 (-88 dBm)	RSL Th...	Min TS...	Max T...	TSL Th...	BBER ...	UAS	Raw ES	SES	BBE
✓	19/07/2010 14:45:00	-54	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 14:30:00	-55	-54	0	0	5	5	0	1	13	1	0	3038
✗	19/07/2010 14:15:00	0	0	0	0	-30	-30	0	0	0	0	0	0
✗	19/07/2010 14:00:00	0	0	0	0	-30	-30	0	0	0	0	0	0
✗	19/07/2010 13:45:00	0	0	0	0	-30	-30	0	0	0	0	0	0
✗	19/07/2010 13:30:00	0	0	0	0	-30	-30	0	0	0	0	0	0

Figure 10-14: Performance Monitoring Report showing the effect of a Reset

The prior data is invalidated as shown by the red crosses in the left hand column. Further, Min and Max RSL for the invalidated period is set to zero.

3. 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 **Table 10-3** and **Table 10-4** 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 10-3: Explanation of performance data

Data type	Reported Value	Explanation
Generic PM Data	UAS – Unavailable Seconds	Seconds in which the interface was out of service.
	Raw ES – Raw Errored Seconds	The number of seconds in which there was at least one error block. Note that the notion 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).

Table 10-3: Explanation of performance data

Data type	Reported Value	Explanation
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 Receive Signal Level (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 Transmit Signal Level (TSL) was above the specified threshold.
	BBER Threshold	The number of seconds in which the Background Block Error Ratio (BBER) exceeded the specified threshold.
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.
	Throughput threshold	Seconds count when throughput fell below the threshold
	Traffic threshold	Seconds count when actual traffic exceeded the threshold
TDM interface	Active seconds	The number of seconds that the configured TDM services are active

Performance Monitoring Report Toolbar

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

Table 10-4: 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
Selection Pane	Toggle on/off left panel
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:

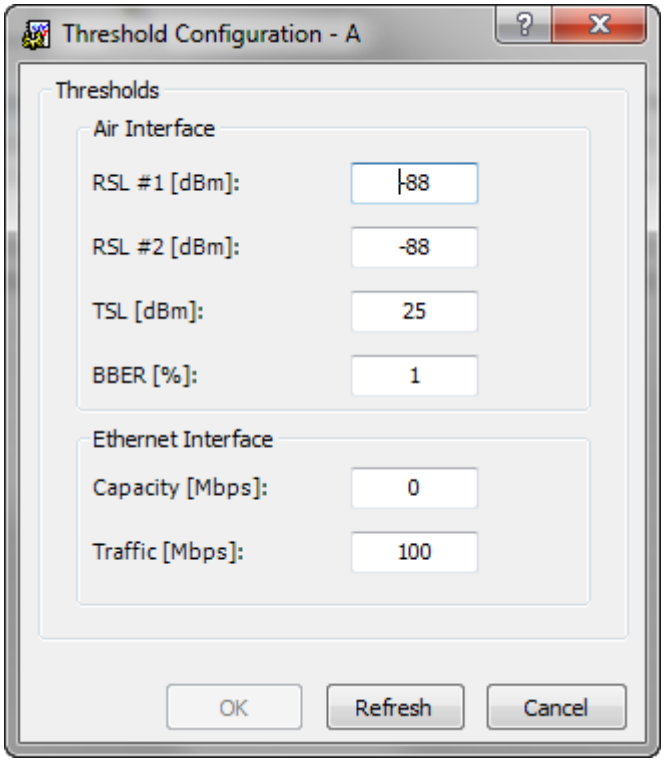


Figure 10-15: Threshold configuration dialog box

RSL Thresholds

Two RSL Thresholds can be defined. They are used as an indicator of problems in the radio channel. You can check the RSS from the Link Budget Calculator results during installation. Values of -5dB and -8dB from the current RSS are typical.

TSL Threshold

A counter is maintained, of the number of second intervals during which Tx power exceeds this threshold.

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.

Ethernet Thresholds - Capacity

This is used as a basis for checking adherence to a Service Level Agreement. It is the number of seconds count that the link capacity falls bellow the threshold.

Ethernet Thresholds - Traffic

The number of seconds count that received traffic exceeded this threshold. It can be used to measure traffic peaks.

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.



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 E**.

The events are displayed in the Events Log in the lower right-hand panel of the RADWIN Manager main window:

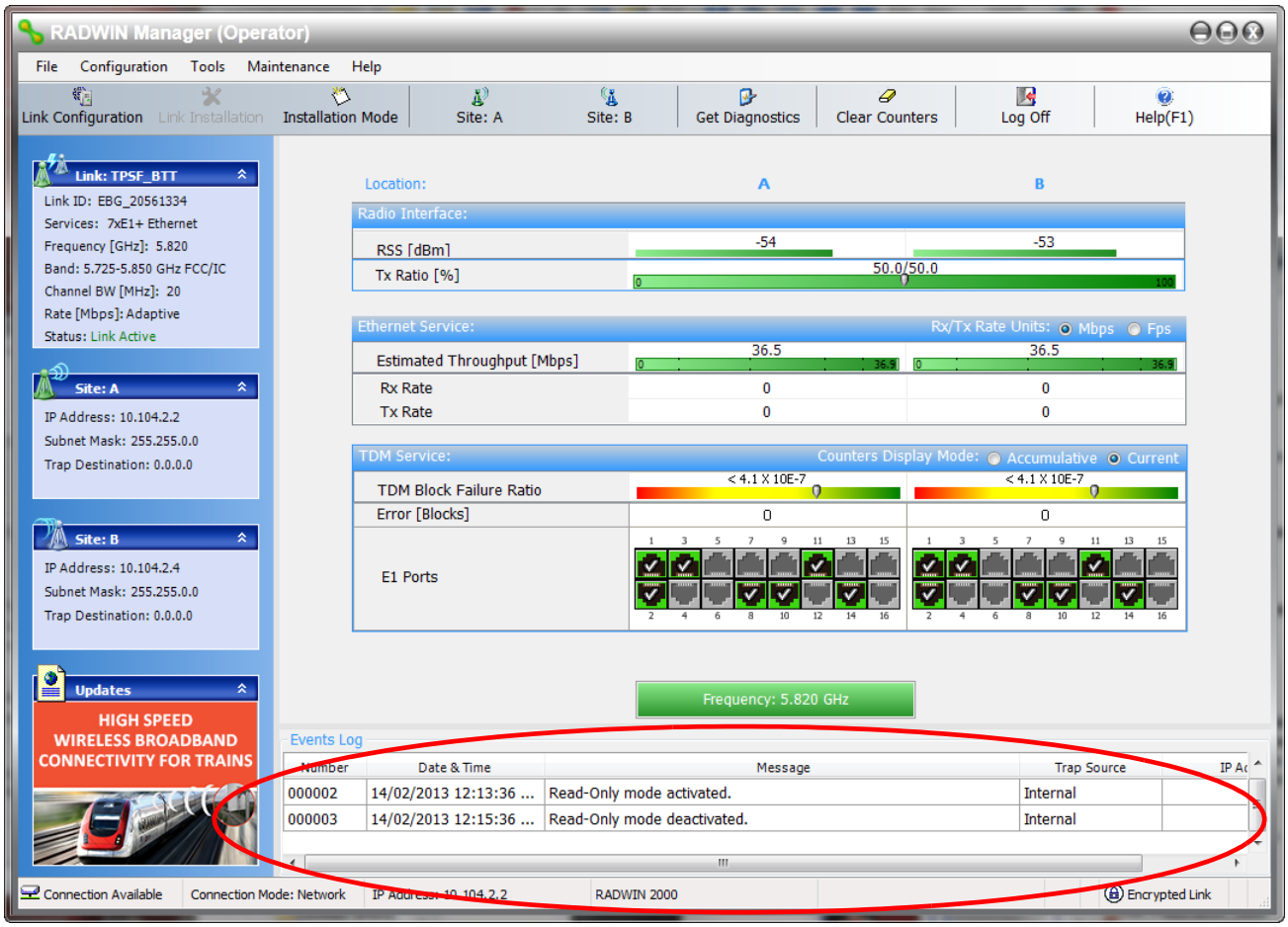


Figure 10-16: Events Log Display

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 destination address of the managing computer (see **Chapter 9** for details).

RADWIN Manager Traps

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

Table 10-5: 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	
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	
Different IDU Detection Mode at <Site1 Name> and <Site2 Name>	Warning	IDU detection mode set differently at the two sites

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:

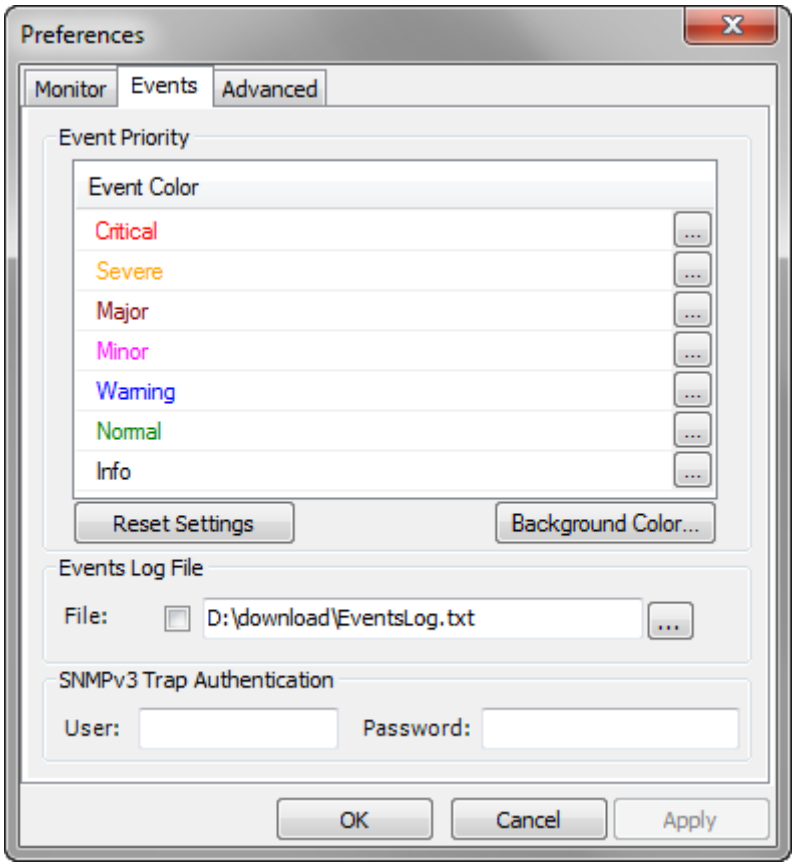


Figure 10-17: Preferences dialog box - Event tab

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.

SNMPv3 Trap Authentication

The SNMPv3 User and Password are relevant if you are using SNMPv3. In this, case trap messages are keyed to the user name and password and not visible to anyone else. The preferences entered here, relate to trap messages sent to the specified user if specified or to all trap messages, otherwise. For associating a user with a trap address, see **Configuring IP Addresses for Trap Destinations**.

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:**

1. From the **Tools** menu, choose **Active Alarm Summary**.
2. Choose either of the sites offered.

   The Active Alarms Summary window opens:

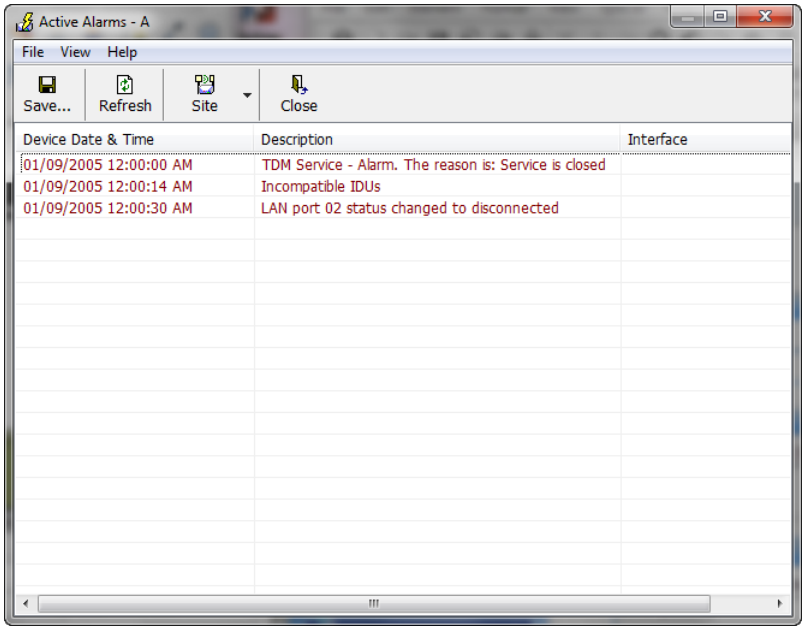


Figure 10-18: Active Alarms Summary

The active alarms display does not update itself until the **Refresh** button is used.

The following table provides an explanation of the command buttons.

Table 10-6: Active Alarms command buttons

Command	Action
Save	Saves the alarms in CSV or text format for further analysis
Refresh	Shows the active alarms at the moment of refresh
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 **t**he following is displayed:

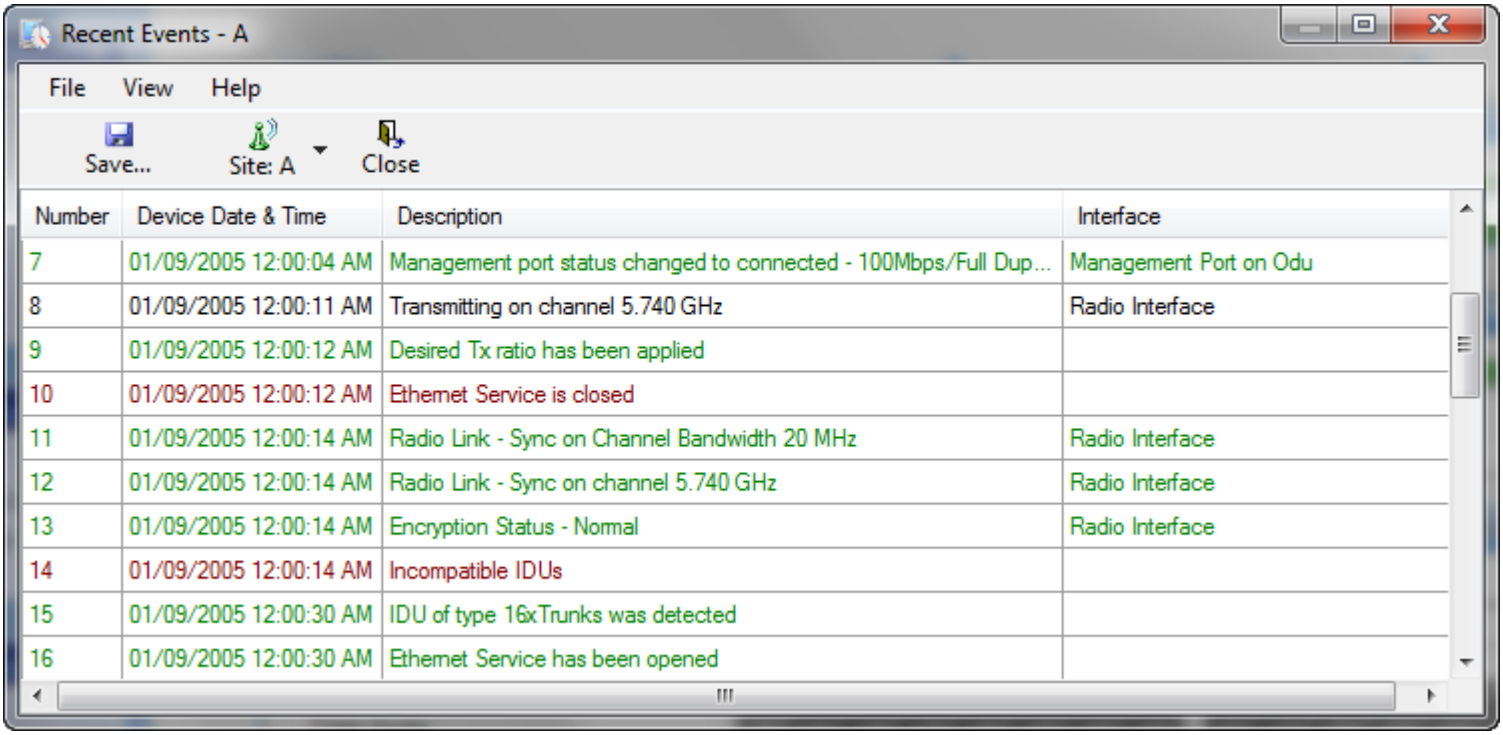


Figure 10-19: Recent Events - Up to last 256 events at Site A

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

Reverting Alert 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:

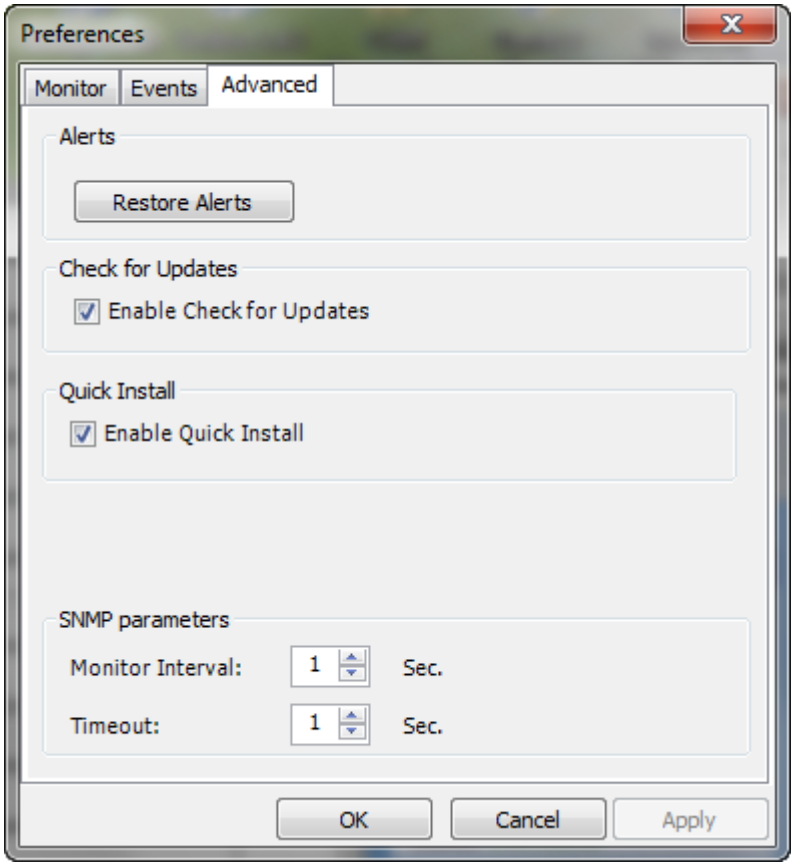


Figure 10-20: Advanced Preferences

Just click the **Restore Defaults** button, followed by **OK**.

Other Advanced Preferences

Enable and Disable Checking for Software Upgrades

If you are not on a network with Internet access, disable this.

Setting SNMP Parameters

Use these choices to set the SNMP monitoring interval and time-out. These are only significant if you are using an SNMP based network management system such as RADWIN NMS.

Remote Power Fail Indication

Remote power fail indication indicates to one side that the other side has suffered a power failure. The failed site sends a final trap indication about the power loss just before powering off.

A "Dying-Gasp" circuit identifies the power failure at a minimum interval of 20 milliseconds before the ODU or IDU powers off. During that interval a message notifying the power failure is sent to opposite site. External alarm output number 4 indicates power failure at the opposite site.

Troubleshooting

Use the following table to troubleshoot LED fault indications:

Table 10-7: LED fault indicators

LED	Status	Remedy
PWR	**Off**	Check that power is connected to the IDU
IDU	**Red**	Check that the IDU/ODU cable is properly wired and connected.
ODU	**Red**	Check that the IDU/ODU cable is properly wired and connected.
AIR I/F	**Orange**	Complete the installation procedure from the RADWIN Manager
	Red	Check the antenna alignment. Check that the radio configuration of both site A and site B units are the same (Channel and Link ID).
SVC	**Orange** **Red** **Off**	Alarm detected at the Site B interface or Local or Remote loopback Alarm detected at the Site A interface Ethernet only IDU or E1/T1 not configured
HSS	**Red** **Orange**	HSS not operational due to improper signal detection. This ODU is not transmitting HSS is operational. One of the following conditions apply: • This ODU is a master that is generating signals and detecting signals • This ODU is a master that is generating signals but detected improper signals • This ODU is a client "Continue Tx" but is not detecting signals • This ODU is a client "Disable Tx" and is detecting signals from multiple sources All orange cases transmit.
STBY	**Red** **Orange**	MHS mode Primary, Link state not active MHS mode Secondary, Link state active

Use the following table to troubleshoot faults in the system:.

Table 10-8: System Troubleshooting

Symptom	Remedy
No power	Ensure that power is connected to the IDU
	Ensure that the ODU cable is properly wired and connected
No signal	Complete the installation procedure from the RADWIN Manager
	Check the antenna alignment. Check that the radio configuration of both site A and site B units is the same (channel settings and Link ID)
Weak signal received	Check the antenna alignment, reconfigure the link
	Check the alignment tone sounds the Best Signal sequence

Replacing an ODU

Prior to any action ensure that both ODUs have the same software version. You can see this on the inventory panels for each site.

For Site A, click **Site A | Inventory** and note the ODU software version. Repeat this for Site B using **Site B | Inventory**.

If either ODU has an old software version, perform a software upgrade. It is important to configure the new ODU identically to the old ODU to avoid configuration mismatches, which will disrupt the link.

An ODU may be reconfigured in several ways.

- **Use the backup configuration**

  If a backup of the configuration is available, restore that configuration using **Site A| Restore**. Recall that backup files are linked to a MAC address. **This won't work for an identical replacement ODU.**
- **Manual configuration**

  The new ODU can be configured manually according to the link configuration. Remember to use the same settings for Link ID, channels, link password, IP addresses, and names.

Restoring Factory Setup

To restore factory setup:

- Use Site Configuration A or B, and then **Operations | Restore Defaults**. Always restore the over-the-air site (B) first.

Online Help

Online help can be accessed from the Help menu on the main window of the RADWIN Manager.

Customer Support

Customer support for this product can be obtained from the local VAR, Integrator or distributor from whom it was purchased.

For further information, please contact the RADWIN distributor nearest to you or one of RADWIN's offices worldwide (see **RADWIN Worldwide Offices** at the beginning of this manual).

USER MANUAL

RADWIN 2000 BROADBAND WIRELESS TRANSMISSION SYSTEM

Release 2.8.20

Part 2: Site Synchronization

RADWIN

Chapter 11

Hub Site Synchronization

What is Hub Site Synchronization (HSS)

When several radios are collocated at a common hub site, interference may occur from one unit to another. RADWIN ODU units support the collocation of more than two units at a central site. Like any other RF deployment, the wireless operation is highly dependent on factors such as available frequencies, the physical spacing between radios, other third party interfering radios, and whether other RADWIN radios are installed.

Note

HSS does not eliminate the need for careful RF planning to ensure the design will work as planned. See **Chapter 3** for information on installation site survey.

RADWIN HSS

The RADWIN HSS method uses carries pulses sent to each ODU, which synchronize their transmission with each other. The pulse synchronization ensures that transmission occurs at the same time for all collocated units. This also results in all of the hub site units receiving data at the same time, eliminating the possibility of interference that could result if some units transmit while other units at the same location receive.

Figure 11-1 illustrates interference caused by non-synchronized collocated units.

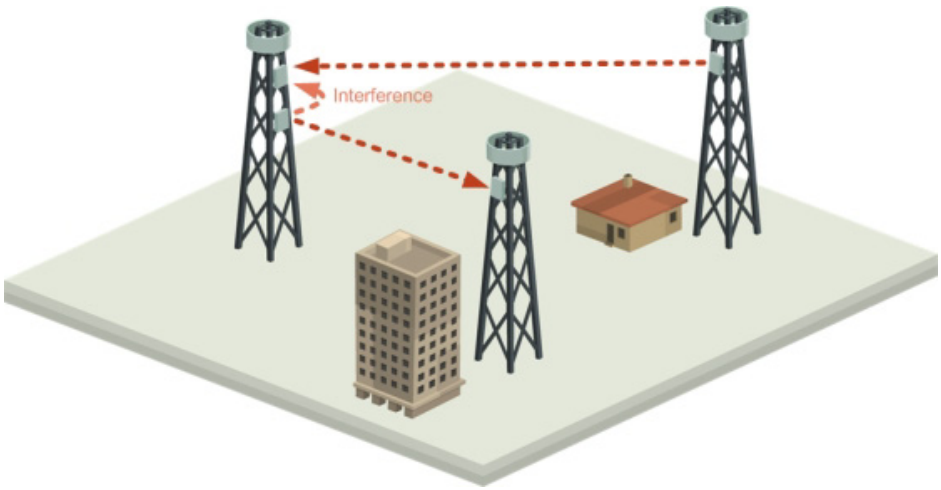


Figure 11-1: Interference caused by collocated units

Adding HSS removes interference as shown in the next two figures:

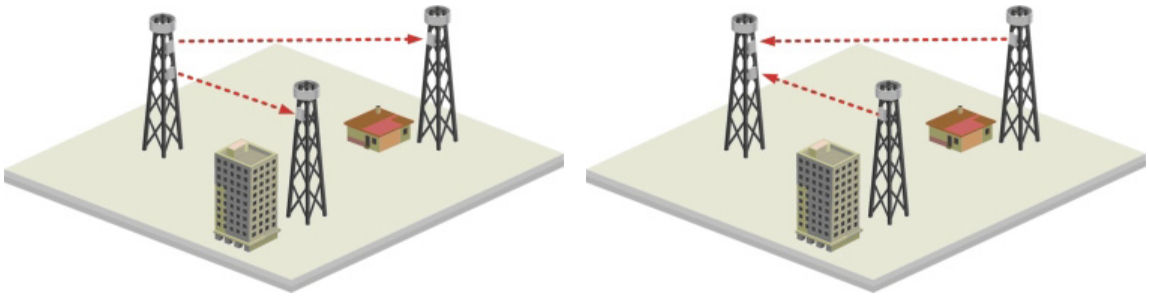


Figure 11-2: Collocated units using Hub Site Synchronization (1)

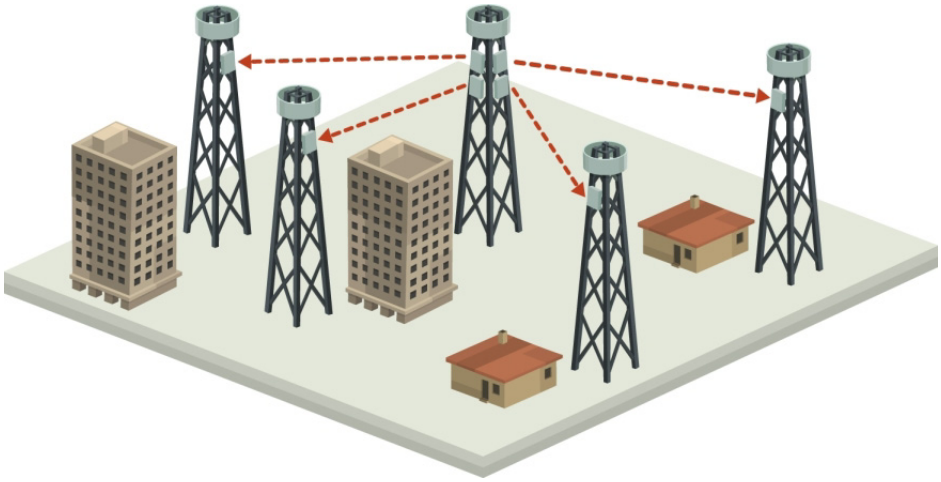


Figure 11-3: Collocated units using Hub Site Synchronization (2)

The units are connected to each other with HSS cables and HSS Distribution Units.

One of the radios in the site is defined as HSS Master and generates synchronization pulses.

The other collocated radios in the site - the HSS Clients, are connected to the HSS Master and synchronize their transmission to the pulses. An HSS Client can be configured to work in one of two modes:

- **HSS Client-Continue Transmission** (HSC-CT): If the unit loses synchronization with the HSS Master, the link remains active. However, without synchronization pulses, it is possible that this unit will cause interference.
- **HSS Client-Disable Transmission** (HSC-DT): If the unit loses synchronization with the HSS Master, the link is dropped until the synchronization pulses resume. This setting prevents the unit from causing interference.

The remote ODUs that are not located at the hub site, are called Independent Units (INU).

RADWIN offers two types of HSS:

» **Serial HSS**

The RADWIN Serial Hub Site Synchronization (SHSS) method uses a cable connected from the master ODU to all collocated ODUs; this cable carries pulses sent to each ODU, which synchronize their transmission with each other. SHSS is covered in **Chapter 12**.

» **Ethernet HSS**

The Ethernet HSS (EHSS) method requires Layer 2 Ethernet connectivity between collocated ODUs. It has two requirements:

- Collocated ODUs providing Ethernet services only, should be connected to an IDU-H instead of regular PoE devices. Other simple switches may work with degraded performance. They are not recommended and problems arising from their use will not be eligible for any kind of support.
- Collocated ODUs providing E1/T1 services should use an IDU-C or IDU-E and then be connected to an IDU-H functioning as a switch. One of the LAN ports on the IDU-C or IDU-E is connected to any of the six IDU-H PoE ports or the two LAN ports. (This is possible because the IDU-C or IDU-E LAN cable only uses four pins for data; the power pins are not used so there is no risk of damage to them.) In this way, up to eight such ODUs may be collocated.

Note

You may only use one IDU-H. That is, they may not be cascaded.

Caution

If you are using an IDU-C0 (GbE) it must be connected to the IDU-H LAN port only. Connecting it to the P0E ports will damage the unit and in any event, it will not work.

HSS Concepts: Radio Frame Pattern (RFP)

A Radio Frame Pattern (RFP) is the cycle duration of transmit and receive of the air-frame.

Without HSS

When selecting TDM or Ethernet services, the system automatically and transparently chooses the optimal RFP. When TDM and Ethernet services are configured, the RFP is optimized for TDM.

RFP and HSS

When HSS is used, the RFP for the collocated radios must be selected manually.

RADWIN 2000 uses the Time Division Duplex (TDD) mechanism.

Under HSS, TDD enables synchronization of transmission for the collocated units as shown in **Figure 11-4**:

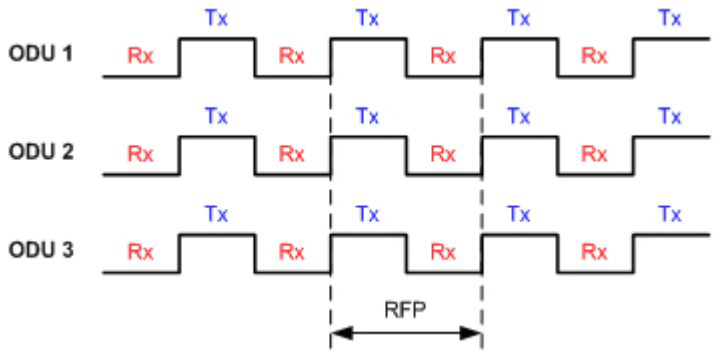


Figure 11-4: Radio Frame Pattern

Two RFP types (labelled B and E) are available. Under HSS the RFP must be configured by the user depending on the type of the radio products, services and channel bandwidth in accordance with **Table 11-2**.

The table describe the efficiency of the air interface according to the RFP type, services and channel bandwidth. The tables may also be viewed in the RADWIN Manager and in the Link Budget Calculator. The efficiency of the air interface will vary according to the product used.

Table 11-1: Radio Frame Pattern Table - RADWIN 5000 HBS

RFP	5/10/20/40 MHz	
	TDM	Ethernet
E	N/A	Best fit

Table 11-2: Radio Frame Pattern Table - RADWIN 2000

RFP	40 MHz		20 MHz		10 MHz		5 MHz	
	TDM	Ethernet	TDM	Ethernet	TDM	Ethernet	TDM	Ethernet
B	Available	Available	Available	Available	Available	Available	Best fit	Best fit
E	Best fit	Best fit	Best fit	Best fit	Best fit	Best fit	Available	Available

Table 11-3: Legend for Radio Frame Pattern Tables

Item	Description
Best fit	Optimal RFP choice for TDM and Ethernet services
Available	Available RFP for TDM and Ethernet services, but not optima
N/A	Service unavailable

Select the RFP that gives you the **Best Fit** or **Available** for required system services and select the channel bandwidth accordingly.



The RFP must be the same for each link within the collocated system.

RFP: General Radio Frame Pattern

When setting the RPF, the following considerations should be borne in mind:

- Selection of the RFP influences the capacity, latency and TDM quality
- RFP influences capacity and latency. Jitter buffer configuration can be used to set the TDM quality (see the User Manual, **Chapter 6, TDM Services selection**)
- Using the Link Budget Calculator, you can see the affect of the RFP on the Ethernet throughput.

RFP: RADWIN 2000 Considerations

- The performance of RADWIN 2000 radios that operate with RFPs B or E can be seen in the Link Budget Calculator.
- For RADWIN 2000 C series: If the HSS Master works in asymmetric Tx/Rx ratio, then all other collocated RADWIN 2000 units must operate in the same Tx/Rx ratio. In this case the ratio will be fixed and not automatic-adaptive.
- Installation/Configuration considerations: If you are using RADWIN 2000 C master and RADWIN 2000 clients, the Services and Rates dialog will look like this:

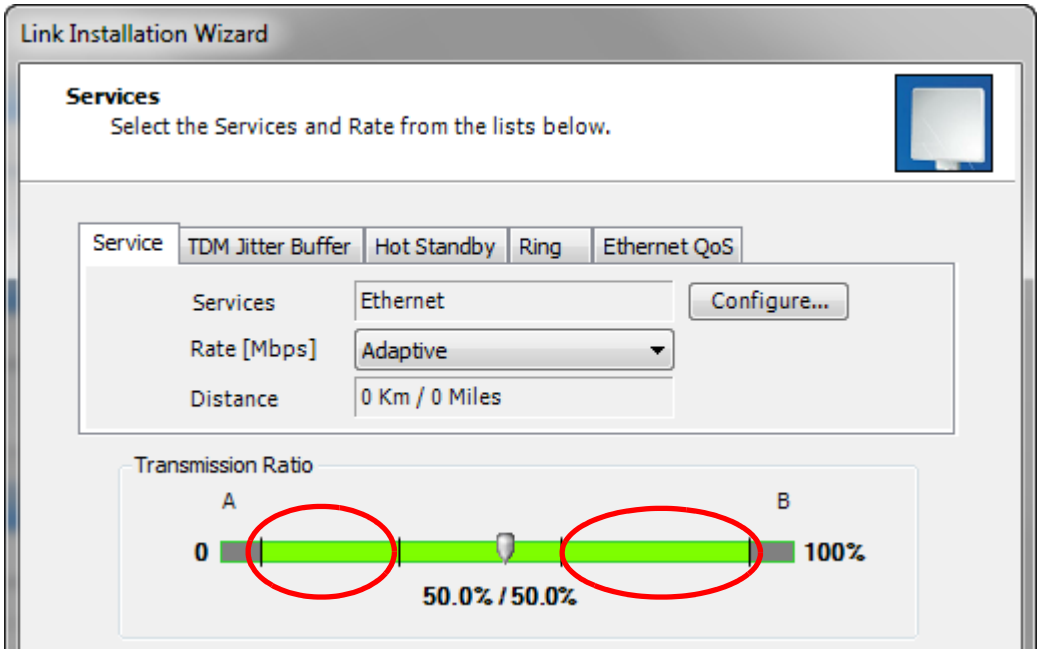


Figure 11-5: Services and Rates - RADWIN 2000 C HSM and HSC

- The circled areas should not be used. Using those areas, you may loose the collocated link with the longest distance between sites. If you do move the slider into a circled area, you will receive a popup warning:

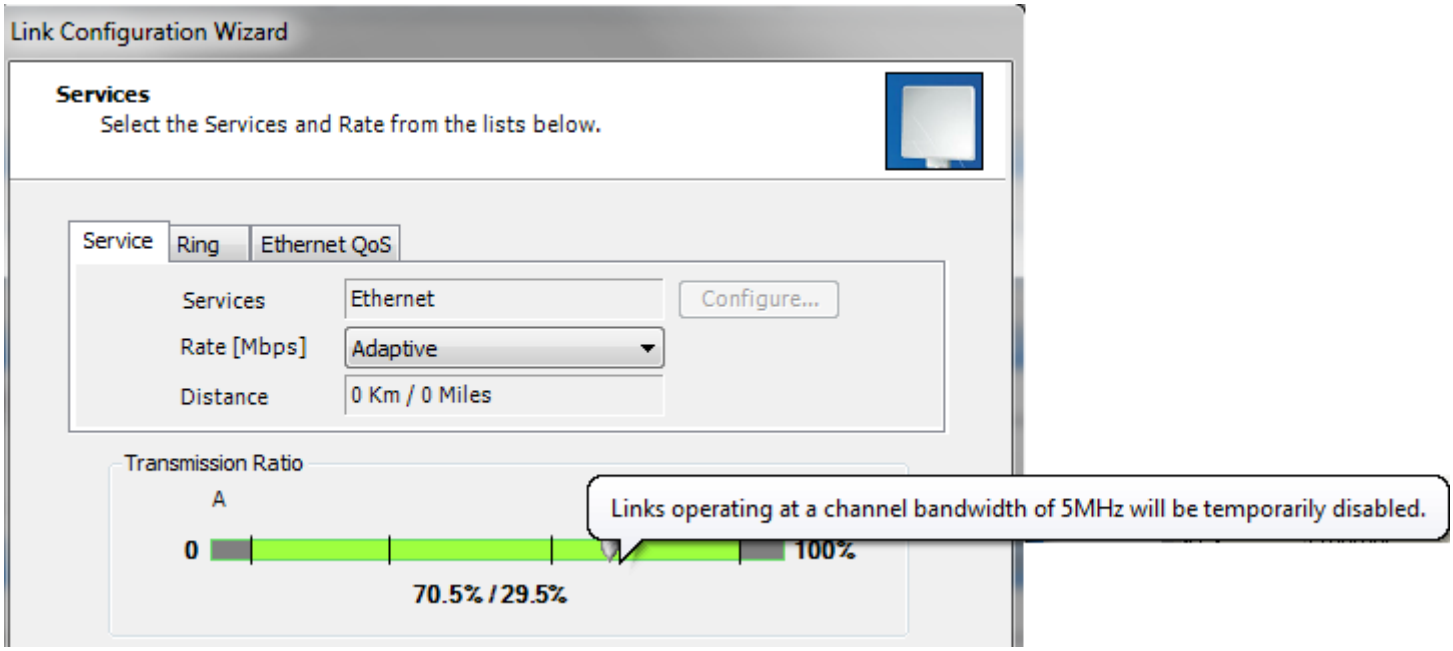


Figure 11-6: Services and Rates - RADWIN 2000 C HSM and HSC - Extreme asymmetric allocation

By restricting one direction into the restricted area, the more distant sites may not even be able to sustain the link much less send or receive data.

- Asymmetric Allocation and Collocation: If the link is collocated, the use of Asymmetric Allocation is limited.

  The effective available range for Asymmetric Allocation (between the two circled tick in **Figure 11-5**) is primarily determined by three factors:

  - The RFP in use (B or E)
  - Channel Bandwidth
  - Link distance
- Whenever Asymmetric Allocation is available, it is static for all traffic conditions
- Possible scenarios are shown in **Table 11-4**. (References to RADWIN 2000 C apply to RADWIN 2000 B)

Table 11-4: Asymmetric Allocation with Collocated Links - Scenarios

Scenario: If you try to...	Result	Remarks
Change master to asymmetric allocation	• Releases prior to 2.4 - Link down • Release 2.4 and later (RADWIN 2000 C and RADWIN 2000 Xseries) - TDM services stopped, link set to transmission ratio of master	Release 2.4 and later (RADWIN 2000 C and RADWIN 2000 Xseries) - Asymmetric Allocation slider visible but cannot be changed
Change client to asymmetric	Asymmetric Allocation slider **not** displayed	**You cannot do this!**

RFP: RADWIN 5000 Base Station Considerations

Recall that for collocation purposes, a RADWIN 5000 Base Station behaves like a RADWIN 2000 C unit. Where one or more Base Stations are collocated with RADWIN 2000 unit, it is recommended that the RADWIN 2000 be used at the HSM. You can only use RFP E when collocating mixed product types.

HSS Status LED on the IDU-C and IDU-E

The IDU-C and IDU-E have a front panel HSS status LED:

Table 11-5: IDU-C and IDU-E Front Panel LEDs for HSS

Color	Function
Green	This ODU is HSS master, generating signal, and HSS Sync is OK
Blinking Green	This ODU is a HSS client and in Sync
Red	HSS not operational due to improper signal detection. This ODU is not transmitting
Orange	HSS is operational. One of the following conditions apply: • This ODU is a master that is generating signals and detecting signals • This ODU is a master that is generating signals but detected improper signals • This ODU is a client "Continue Tx" but is not detecting signals • This ODU is a client "Disable Tx" and is detecting signals from multiple sources All orange cases transmit.
Off	HSS is not activated HSS is not supported (WinLink 1000 only) Disconnection between ODU and IDU

HSS Error Notification

In the event of an HSS installation fault, the ODU will sound a beep pattern according to the following chart, also printed on the ODU product label:

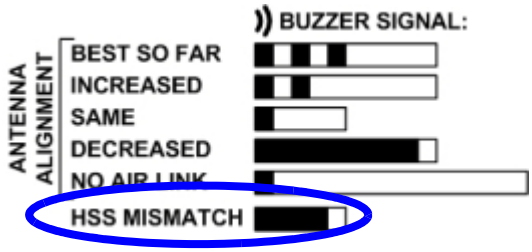


Figure 11-7: ODU beep for HSS Error

For this purpose, ODU buzzer must be set to **Auto** or **On**.

Chapter 12

Serial Hub Site Synchronization

RADWIN Serial HSS

The RADWIN Serial Hub Site Synchronization (SHSS) method uses a CAT 5e cable connected from the master ODU to all collocated ODUs; this cable carries pulses sent to each ODU, which synchronize their transmission with each other.

Since the SHSS unit is still shown in the RADWIN Catalog as an "HSS unit", in the remainder of this chapter we will continue with this convention on the clear understanding that we are dealing only with SHSS.

Hardware Installation

Connecting an HSS Unit

A single HSS unit supports up to ten collocated ODUs. In addition to each unit being connected to its IDU or PoE device, the collocated unit has an additional cable that is connected to the HSS Unit. The HSS Unit is a compact, weatherproof (IP67) connector box that is installed on the same mast as the ODUs. All collocated units connect to this box using CAT-5e cable. Cables in prepared lengths are available for purchase.

The HSS unit is supplied with ten protective covers; any port not in use must be closed with a protective cover.

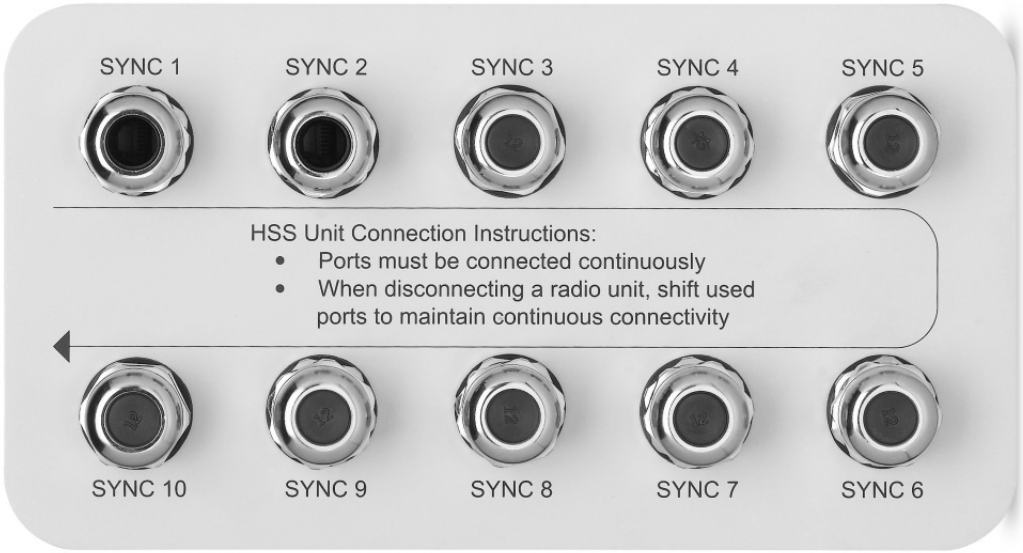


Figure 12-1: HSS Interconnection Unit

Note

- For a single HSS unit, ensure that the collocated units are connected in sequence from SYNC 1. If an ODU is removed from the hub site, then all remaining ODUs must be reconnected to maintain the connectivity.
- You may cascade (daisy-chain) two or more HSS Units with an HSS cable. The method is described in detail below.

To connect an ODU to an HSS unit:

1. Unscrew the protective cover from the port marked SYNC 1.
2. Connect the RJ-45 connector from one end of the prepared CAT-5e cable to SYNC 1.
3. Connect the other end of the CAT-5e cable to the ODU connector labeled SYNC.
4. Tighten the protective seal that is on the prepared cable over the RJ-45 connector.
5. Repeat for all ODUs that are to be collocated at the hub site. The next ODU to be connected is inserted in SYNC 1, SYNC 2, followed by SYNC 3 and so on.

Using a Single HSS Unit

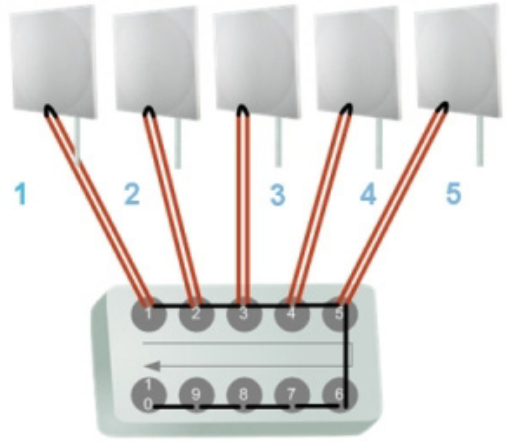


Figure 12-2: HSS Wiring schematic

The wiring, as shown in **Figure 12-2** is self explanatory. The Sync signal path is less self evident. If we set ODU 1 (on SYNC 1) to HSS Master, then the Sync signal path is as shown in **Figure 12-3**. The signal travels from ODU 1 to SYNC 1, from SYNC 1 to SYNC 2, from SYNC 2 to ODU 2 and back again. The back and forth paths repeat for the second to fourth ODU, from left to right. The signal exits the HSS unit at SYNC 5 and terminates in ODU 5.

The choice of the ODU on SYNC 1 as HSS master is not mandatory, but is good practice. If for example we were to use ODU 3 as HSS master, the Sync signal path would be ODU 3 to SYNC 3, then left and right to SYNC 2 and SYNC 4. It would then propagate to ODUs 2 and 4, terminating at both ODUs 1 and 5.

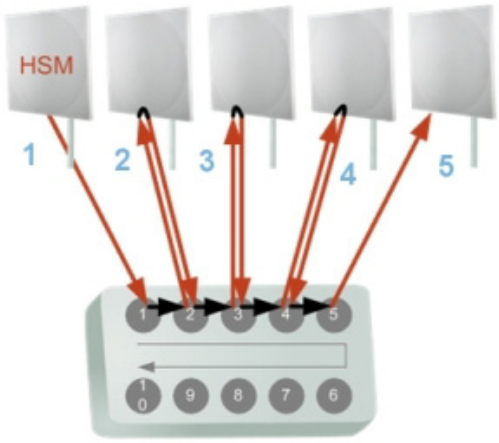


Figure 12-3: HSS sync signal path with ODU 1 as HSS Master

Using More than One HSS Unit

In a large collocation site, several HSS units may be cascaded (daisy-chained) subject to the following conditions:

Condition 1: Cabling Sequence

1. Up to nine ODUs may be connected to the first HSS unit using HSS ports SYNC 1, SYNC 2, SYNC 3,... up to SYNC 9 in order without leaving empty ports.

2. The next available SYNC port of the first HSS unit should be connected to SYNC 10 of the second HSS unit as shown in **Figure 12-4**. In the illustration, the next available port on the first HSS unit is SYNC 6.
3. The second HSS unit may be filled out with up to nine more ODUs in **reverse** order. That is, connect SYNC 9, SYNC 8, SYNC 7... as shown in **Figure 12-4**.

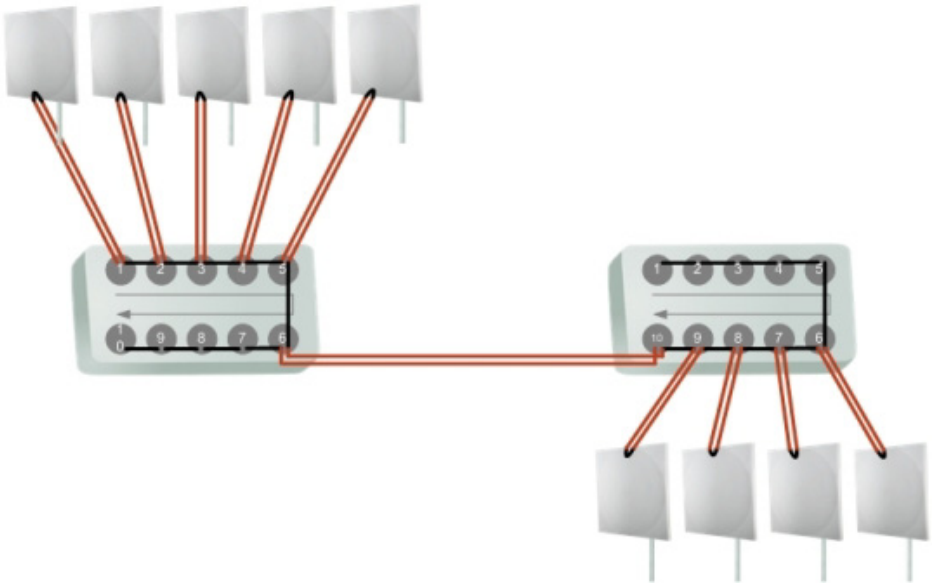


Figure 12-4: Cascading two HSS units

4. To add a a further HSS unit: Connect the next available SYNC port from the second HSS unit in **descending order** (SYNC 5 in **Figure 12-4**) to SYNC 1 of the third HSS unit.
5. ODUs are connected to the third HSS unit from SYNC 2 as shown in **Figure 12-5**, in **ascending order**:

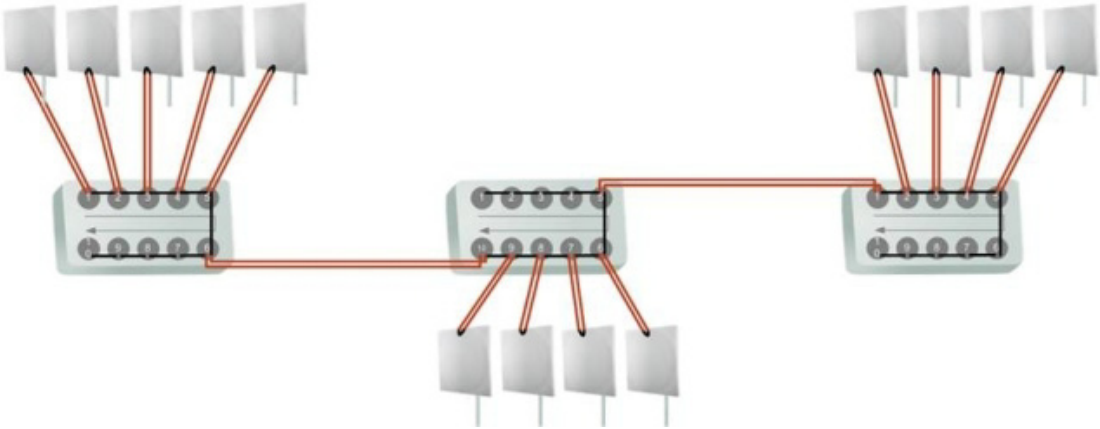


Figure 12-5: Cascading three HSS units

6. If further ODUs are required, observe the convention that additional even numbered units are populated in **descending order** from SYNC 9 and odd numbered HSS units are populated in **ascending order** from SYNC 2.

Note

If an ODU is disconnected from an HSS unit, then all remaining ODUs must be moved up or down to maintain the connectivity.

Condition 2: Total HSS Cable Length

The total path of the HSS sync pulse must not exceed 300m. This applies no matter how many HSS units are used. To illustrate the method for calculating the sync pulse path length we show three examples. For our purpose, let:

L_{mn} denote the length of the ODU-HSS unit cable at SYNC n on HSS unit m

H_m be the length of the cable joining HSS unit m to HSS unit m+1

One HSS unit with five collocated ODUs

$$PathLength = L_{11} + 2 \times L_{12} + 2 \times L_{13} + 2 \times L_{14} + L_{15}$$

Two cascaded HSS units as shown in Figure 12-4

$$PathLength = L_{11} + 2 \times L_{12} + 2 \times L_{13} + 2 \times L_{14} + 2 \times L_{15} + H_1 + 2 \times L_{29} + 2 \times L_{28} + 2 \times L_{27} + L_{26}$$

Three cascaded HSS units as shown in Figure 12-5

$$PathLength = L_{11} + 2 \times L_{12} + 2 \times L_{13} + 2 \times L_{14} + 2 \times L_{15} + H_1 + 2 \times L_{29} + 2 \times L_{28} + 2 \times L_{27} + 2 \times L_{26} + H_2 + 2 \times L_{32} + 2 \times L_{33} + 2 \times L_{34} + L_{35}$$

ODU/HSS Unit Connection Pinout

Table 12-1: ODU/HSS Unit Connection Pinout

Color	ODU RJ-45	HSS UNIT RJ-45
White/Green	1	1
Green	Not connected	
White/Orange		
Orange	6	6
Blue	4	4
White/Blue	5	5
White/Brown	7	7
Brown	8	8

Link Configuration and HSS

The Hub Site Synchronization Settings dialog box appears in both the Link Installation and Configuration Wizards.

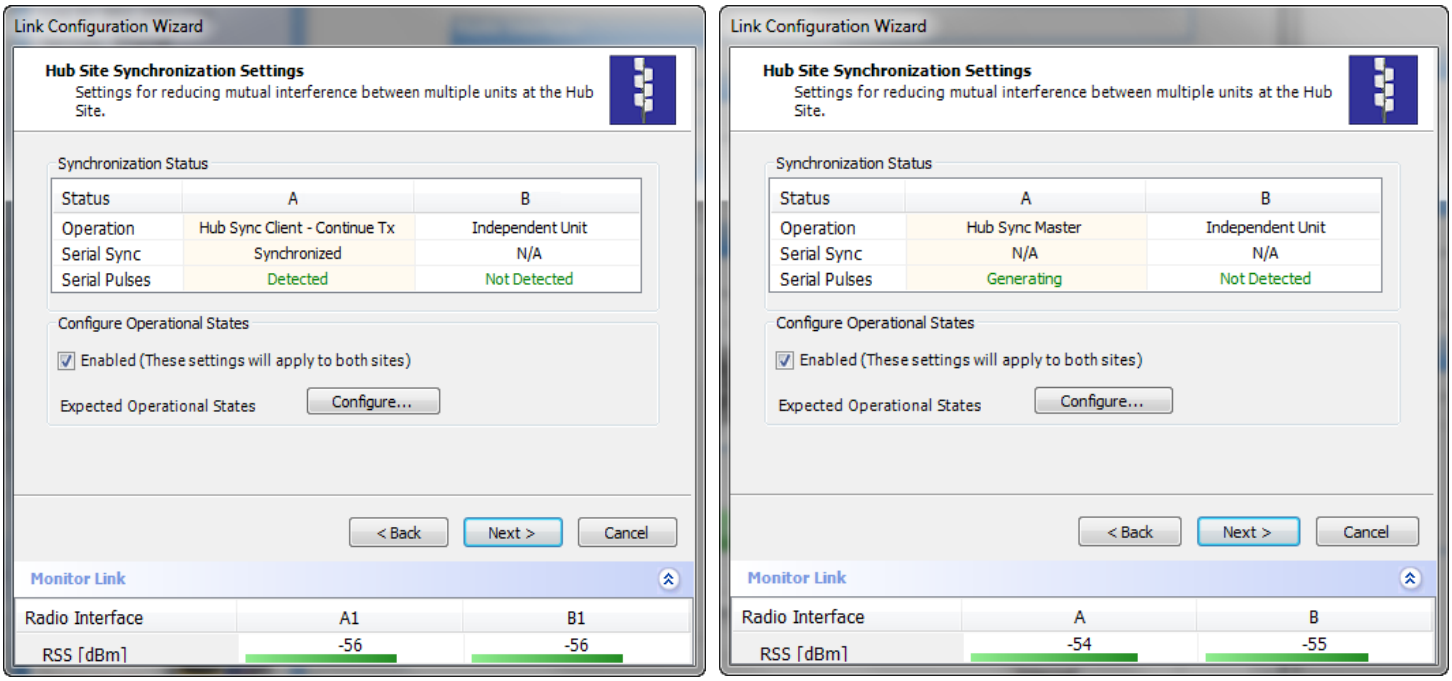


Figure 12-6: HSS Settings: Left - client, Right - master

The Synchronization Status dialog box displays the current status of each side of the link.

- Operation: Type of unit
  - Hub Sync Master (HSM)
  - Hub Sync Client - Disable Transmission (HSC-DT)
  - Hub Sync Client - Continue Transmission (HSC-CT)

Note

Continue Transmission is intended to work if there is no HSM pulse. If a wrong HSM pulse is detected, a WinLink 1000 will resync, adapting to the HSM RFP and continue whereas RADWIN 2000 may stop.

  - Independent Unit
- Synchronization:
  - N/A- for Master or Independent Units
  - Synchronized - for Hub Site Clients
  - Not Synchronized - for Hub Site Clients
- External Pulses:

Table 12-2: External Pulse Status

HSS Sync Status	Meaning	Color code
Generating	**ODU is HSM and generates the sync pulse**	**Green**
Detected	**ODU is HSC and detects the sync pulse**	
Not detected	**ODU is independent**	

Table 12-2: External Pulse Status (Continued)

HSS Sync Status	Meaning	Color code
Generating and detected	**HSM, but other HSM present**	**Orange**
Generating and Improperly Detected	**RADWIN 2000 ODU is HSM, but detects a HSM signal that is not RFP E**	
Not detected	**HSC but no HSM present**	
Improperly detected	**HSC but HSM pulse doesn't fit the HSC as configured. ODU stops transmitting.**	**Red**

To configure the Operational States of the Hub Site unit

1. Click the **Enabled** check box
2. Click the **Configure** button

   The Hub Site Configuration dialog box with the current status of the ODUs is displayed.
3. Select the type of unit configuration from the drop-down list.
4. Select the appropriate RFP radio button. Some RFP options may be disabled depending on the bandwidth previously selected.

Note

Take care to avoid incorrect configuration of bandwidth, RFP or to set multiple Hub Sync Masters, as system interference can occur. RADWIN Manager provides error messages and tool tips if the system is configured with mismatches.

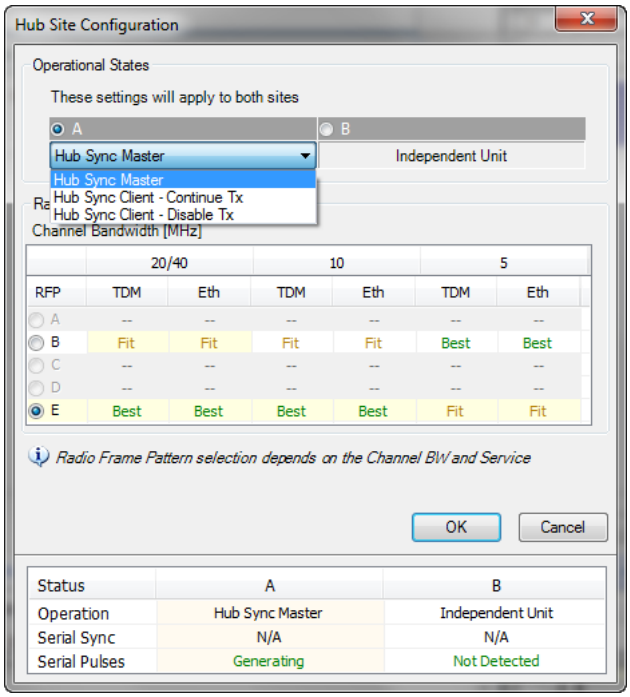


Figure 12-7: Hub Site Configuration dialog

Site Configuration and SHSS

For units that support SHSS, the Hub Site Sync option appears in the Air Interface section and displays the current HSS status of the unit.

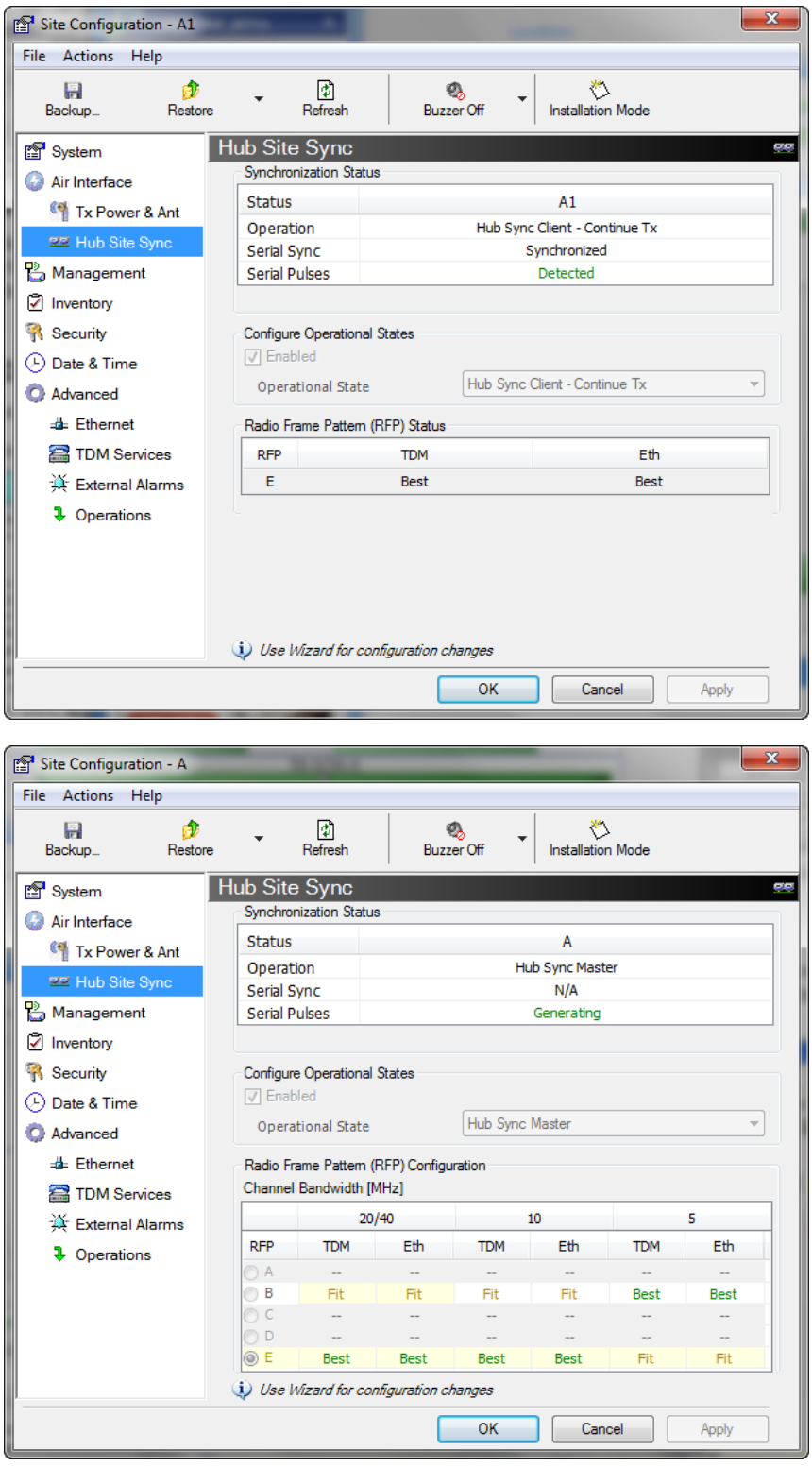


Figure 12-8: Site Configuration: SHSS - Top - client, Bottom - master

Chapter 13

Ethernet Hub Site Synchronization

RADWIN Ethernet HSS

Ethernet HSS Requirements

The RADWIN Ethernet Hub Site Synchronization (EHSS) method provides intra-site synchronization without the need for external cables or an HSS unit. Sync signals are exchanged between collocated radios over the regular Ethernet connection.

The Ethernet HSS (EHSS) method requires Layer 2 Ethernet connectivity between collocated ODUs. It has two requirements:

- Collocated ODUs providing Ethernet services only, should be connected to an IDU-H instead of regular PoE devices. Other simple switches may work with degraded performance. They are not recommended and problems arising from their use will not be eligible for any kind of support.
- Collocated ODUs providing E1/T1 services should use an IDU-C or IDU-E and then be connected to an IDU-H functioning as a switch. One of the LAN ports on the IDU-C or IDU-E is connected to any of the six IDU-H PoE ports or the two LAN ports. (This is possible because the IDU-C or IDU-E LAN cable only uses four pins for data; the power pins are not used so there is no risk of damage to them.) In this way, up to eight such ODUs may be collocated.



Note

You may only use one IDU-H. That is, they may not be cascaded.



Caution

If you are using an IDU-C0 (GbE) it must be connected to the IDU-H LAN port only. Connecting it to the P0E ports will damage the unit and in any event, it will not work.



Caution

VLAN Tagging should not use the VLAN ID used by EHSS and vice versa.

EHSS Concepts

Sync Frames

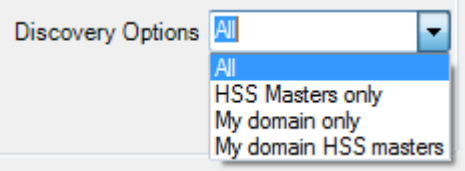
Sync frames are exchanged between collocated ODUs using Layer-2 broadcasting.

Domain

To prevent network flooding, each group of collocated ODUs is configured with an internal "domain name". The default name must be changed to prevent sync frames being received over the LAN by another ODU, which could be then mistakenly configured as a client of an HSM at the wrong location.

Discovery

Discovery by the HSM and HSCs is provided using the following choice of filters:



Using discovery at the HSM, you can select only those HSCs in the HSM's domain; when configuring a new HSC you may use discovery to pick the correct HSM.

VLAN

VLAN is used to separate sync frames from traffic so as to give sync frames highest priority. If you have collocated ODUs running close to full capacity, failure to do so, would result in excessive jitter and dropped traffic frames.

By default, the VLAN ID 1997 and priority 7 are reserved for HSS. You may change the VLAN ID but not the priority.

Installing Collocated EHSS ODUs

Ethernet Services Only

Use an IDU-H for the collocated ODUs instead of separate PoE devices. The IDU-H has two LAN ports, one of which will be connected to a switch.

Ethernet and TDM Services

To attain Layer 2 connectivity for up to two such ODUs, you should connect one of the two the IDU-C (or IDU-E) LAN ports to the IDU-H LAN ports. You may use the second IDU-C (or IDU-E) LAN port to connect to a switch. As pointed out earlier, you may only collocate two ODUs in this way.

Link Configuration and EHSS

The Hub Site Synchronization Settings dialog box appears in both the Link Installation and Configuration Wizards. To illustrate EHSS configuration, we will use two RADWIN 2000 C links

set up as in **Table 13-1**:

Table 13-1: Link settings to demonstrate EHSS

Parameter	Link Name			
	Link 1		Link 2	
Operating band (by ACS)	5.745 GHz		5.825 GHz	
Site Name	A1	B1	A2	B2
Link ID	EBG_205613341		EBG_205613342	
Rate	Adaptive			
Ethernet Configuration	Auto Detect			
Service	Ethernet Only			
CBW	20 MHz			
ODU IP Address	10.104.3.2	10.104.3.4	10.103.3.2	10.103.3.4
Subnet Mask	255.255.0.0			
Default Gateway	10.104.10.21		10.103.10.21	
Trap destination	0.0.0.0			
EHSS Domain Name	EHSS			
Required EHSS Status	HSM	INU	HSC (Continue Tx)	INU

We illustrate the EHSS configuration procedure from the Configuration wizard.

➢ To configure an EHSS Master:

1. Log on to the A1 site of Link 1.
2. Open the Configuration Wizard and proceed (by repeatedly clicking **Next**) to the Hub Site Synchronization Settings window.

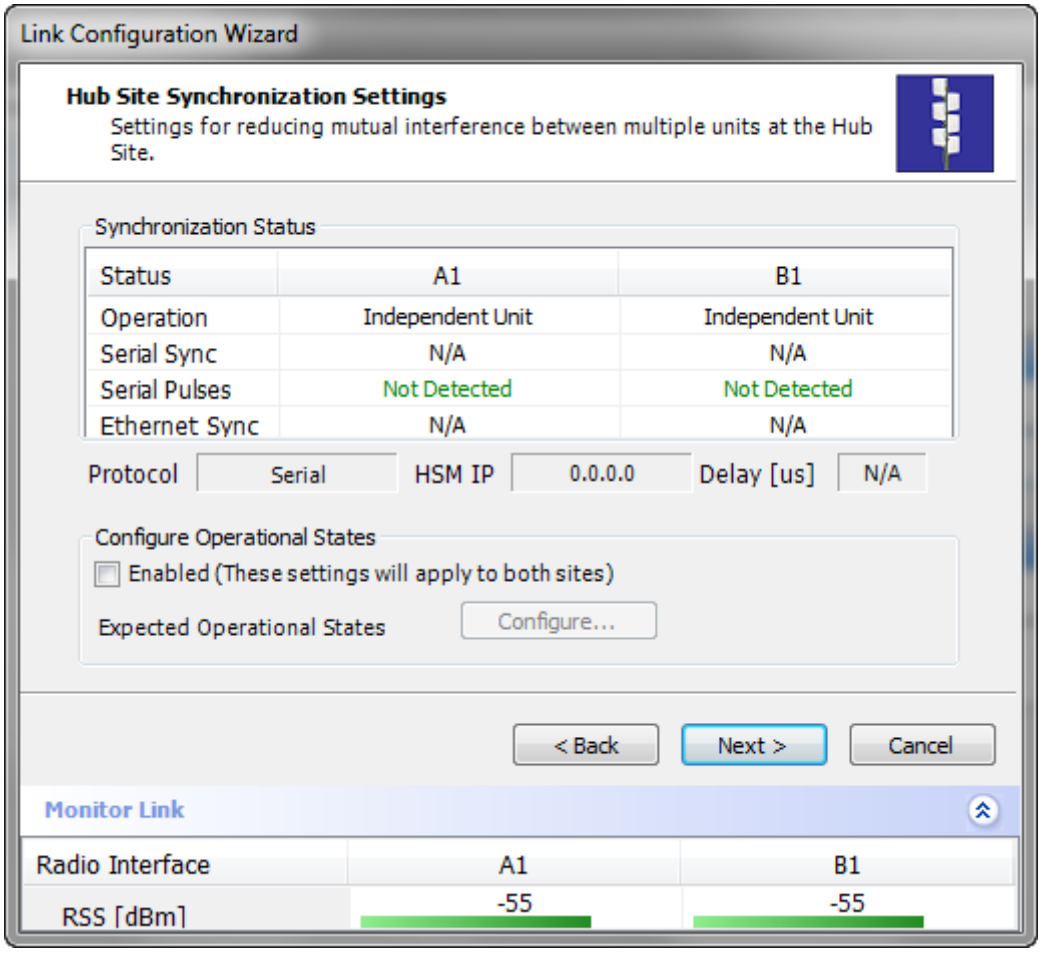
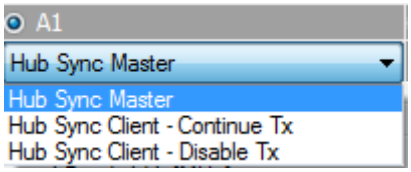


Figure 13-1: HSS Settings window

3. Check the **Enabled** box. The Configure button, grayed out in **Figure 13-1**, is enabled. Click it to open the full Configuration window. Notice that under site A1, Hub Sync Master is shown by default. Here is the full range of options:



Later, we will need one of the client options for the collocated site.

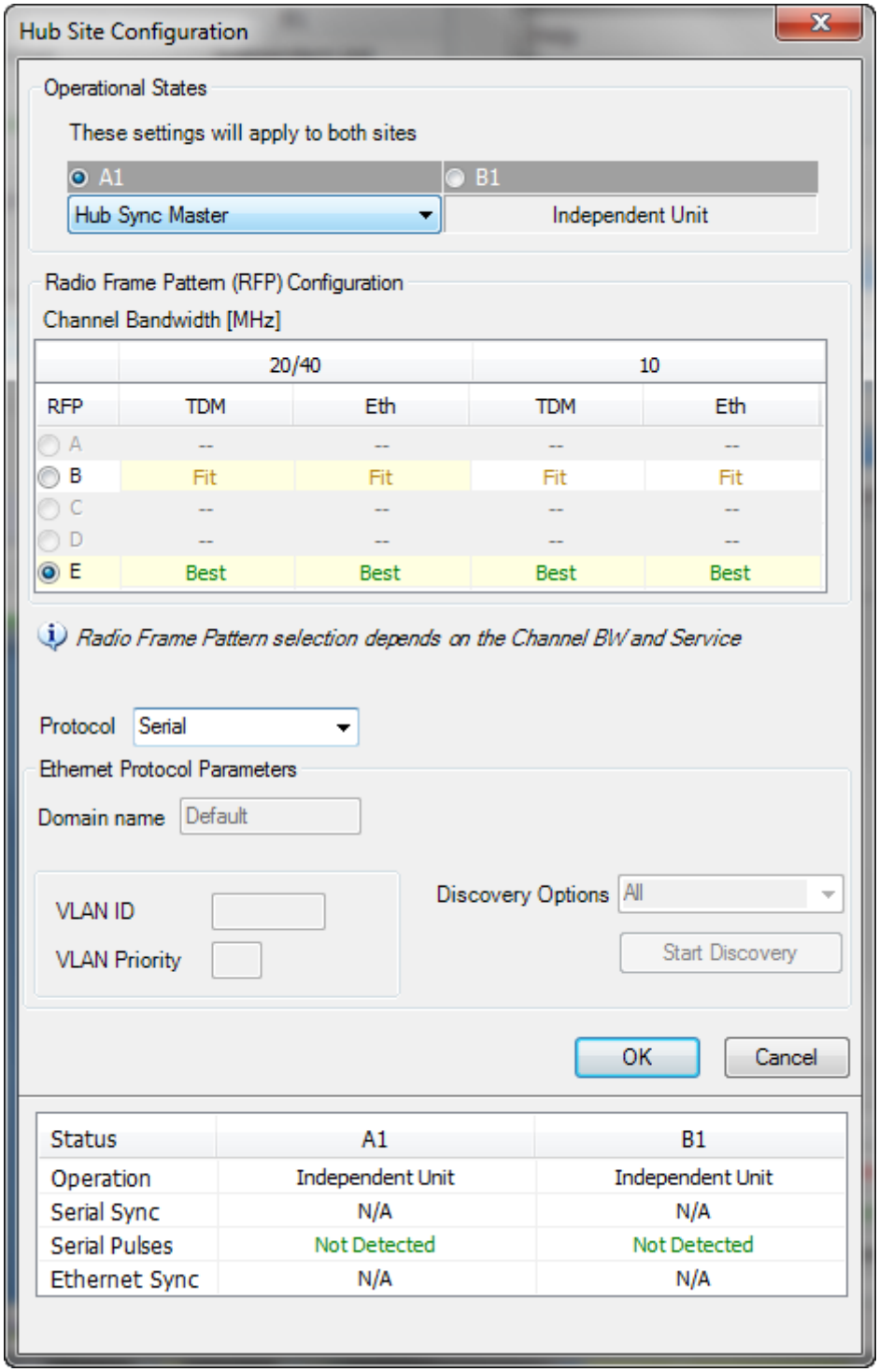
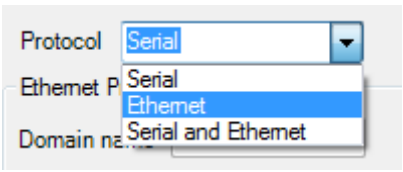


Figure 13-2: HSS Configuration window

4. Choose the Ethernet protocol:



5. The bottom part of the window looks like this:

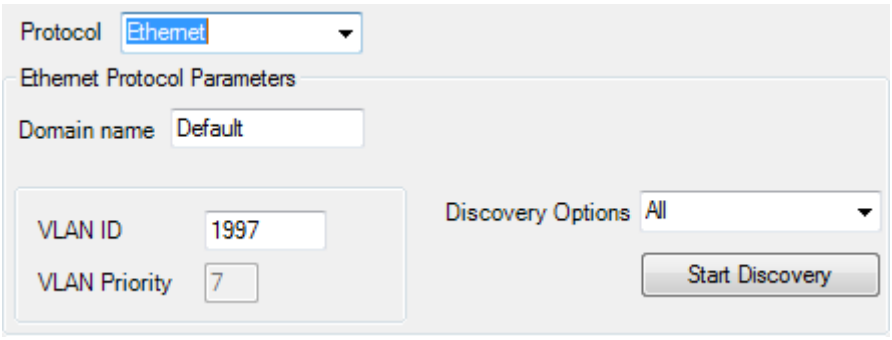
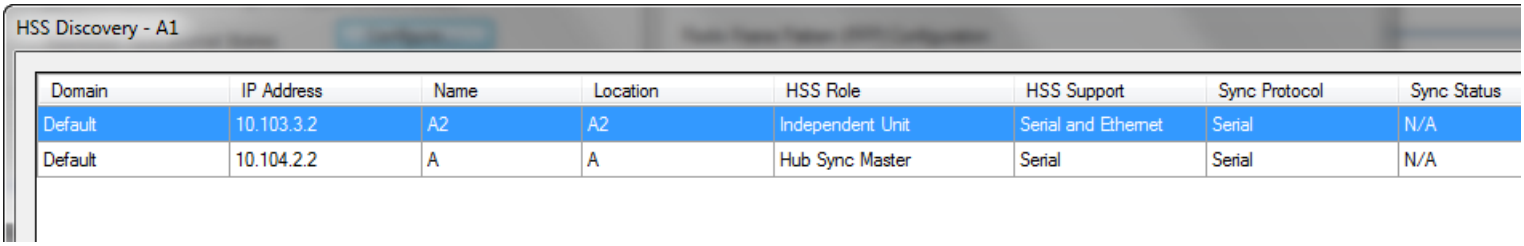


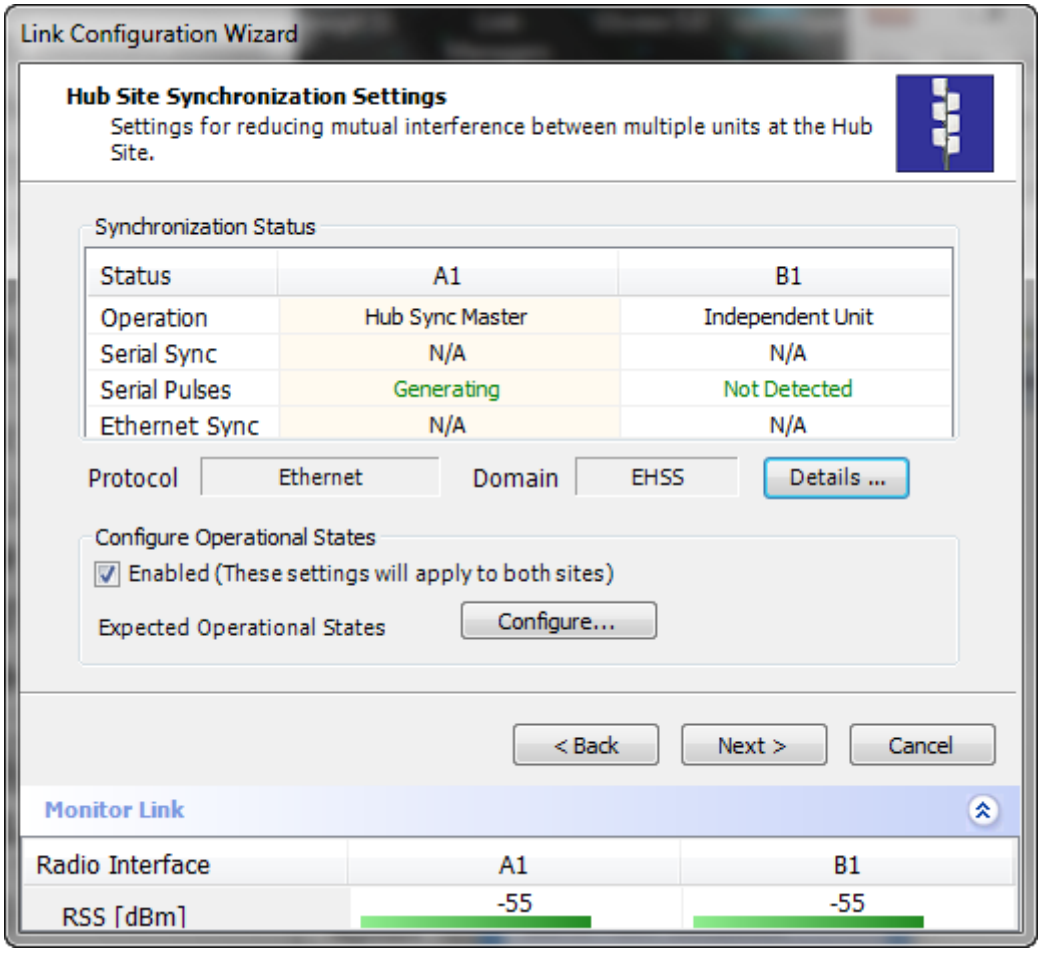
Figure 13-3: HSS Configuration Domain name, VLAN ID and Discovery

6. The default Domain name is (not surprisingly) **Default**. We will changed it to EHSS.
7. Choose a VLAN ID for the domain. Do not use this VLAN ID for traffic or management VLAN. The VLAN priority is set to 7 (maximum possible). For our example, we will leave the default VLAN ID as is.
8. Click the Start Discovery button. Here is an extract of the Discovery display:



It shows other HSMs (of either type) on the same subnet and any other collocatable ODUs configured or not.

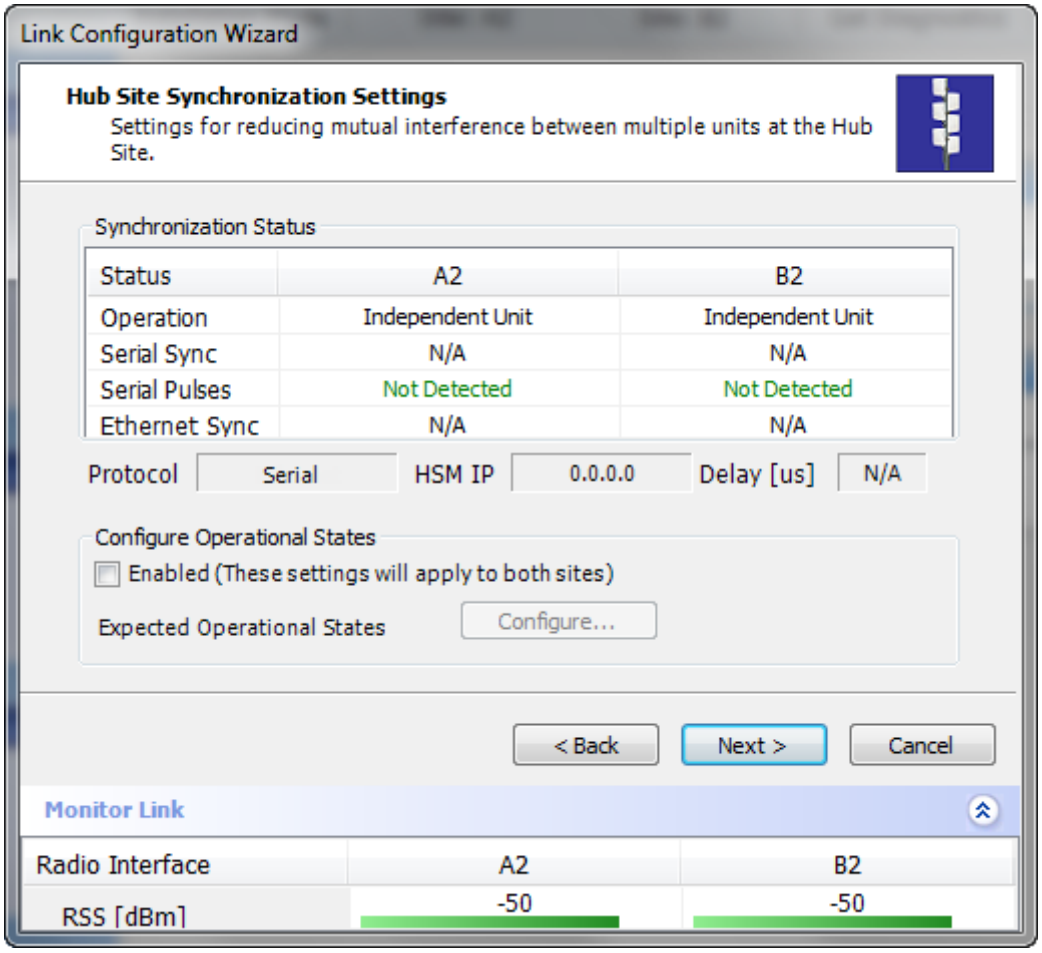
9. At this point you can click OK to exit the HSS window and continue with regular configuration. Here is the HSS window display after configuration:



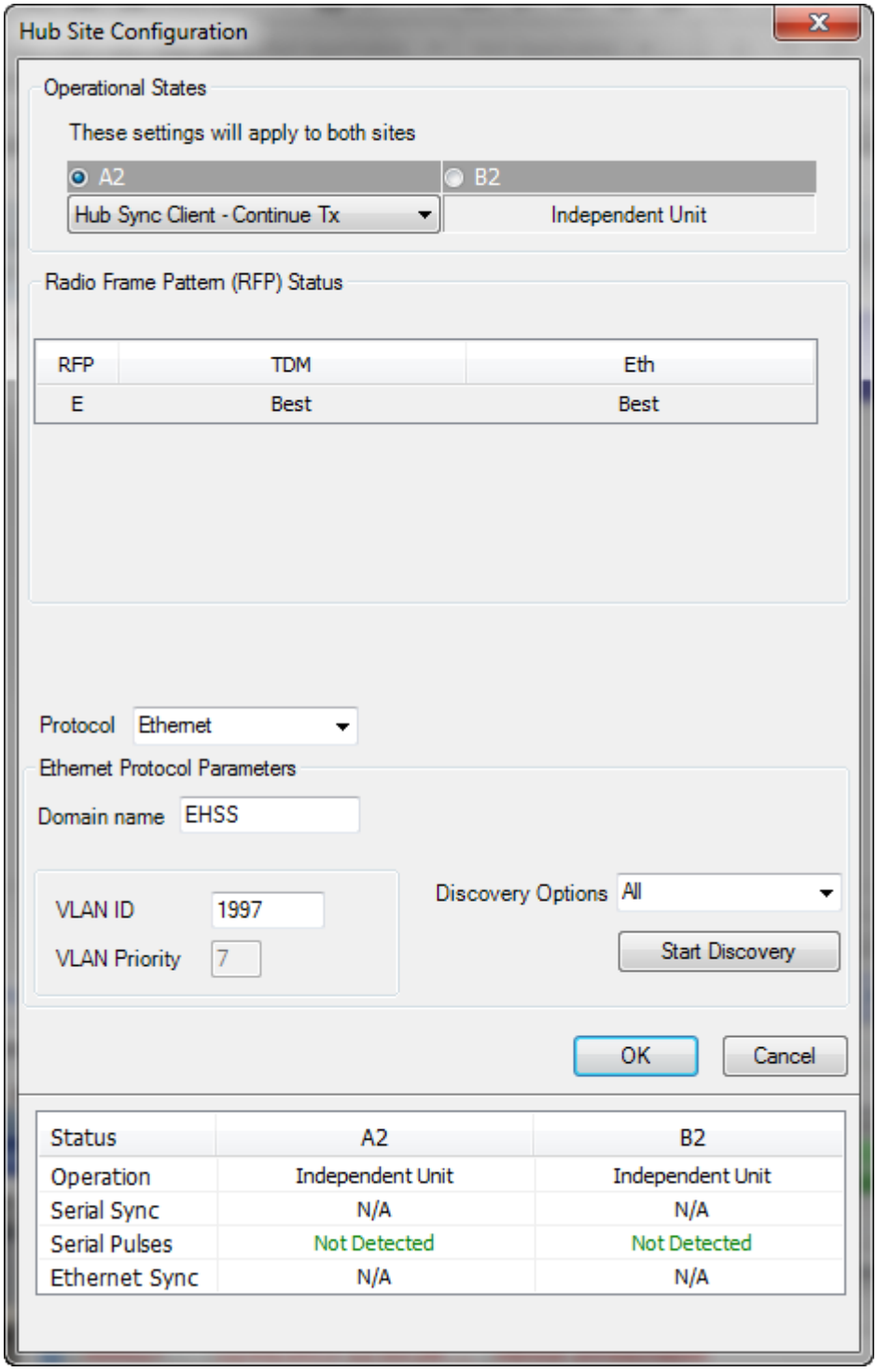
10. The Details button offers a list of configured EHSS client. It is empty for now, so click Next to continue.

➢ To configure an EHSS Client:

1. Start the Configuration Wizard as for the HSS Master and get to this point:



2. Check the Enabled check box, click Configure and in the following display choose an HSS client:

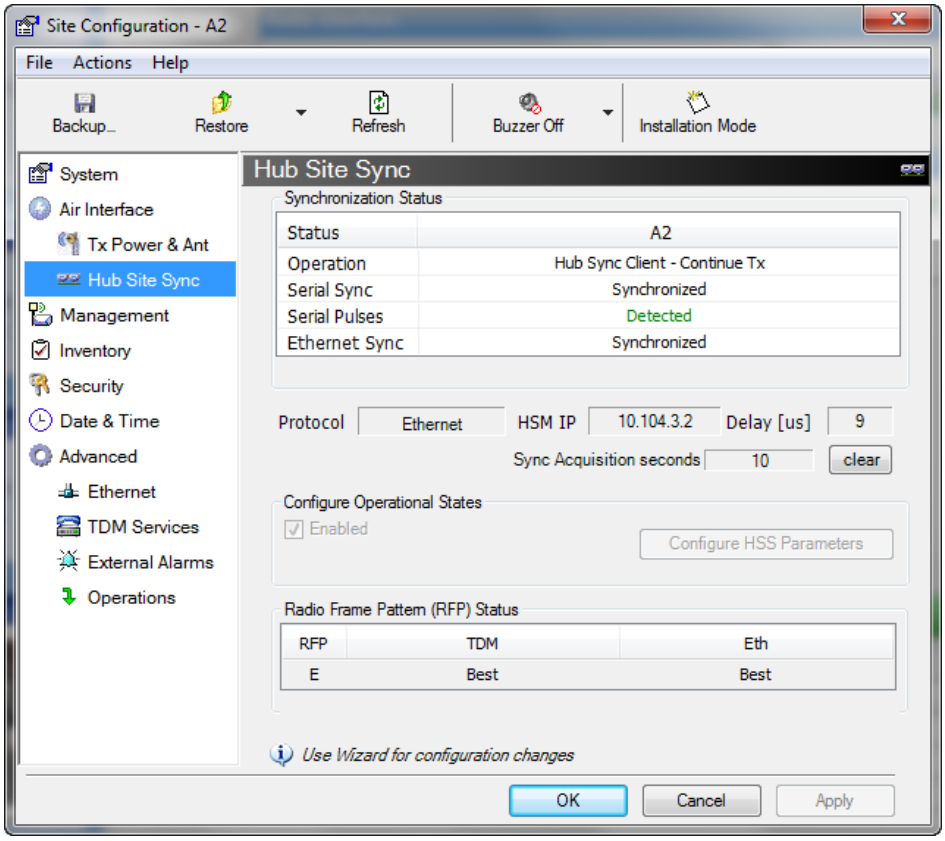


3. Click **OK** to continue the Configuration wizard in the usual way.

If for some reason, the discovery process (which occurs anyway) does not pick up a domain, or you are installing a replacement unit and you do not know the domain, use the Start Discovery button to obtain a list of responding HSMs. You should be able to identify the correct HSM (from its IP address) and note the domain name for entry in the previous window.

Site Configuration and EHSS

For units that support EHSS, the Hub Site Sync option appears in the Air Interface section and displays the current HSS status of the unit.



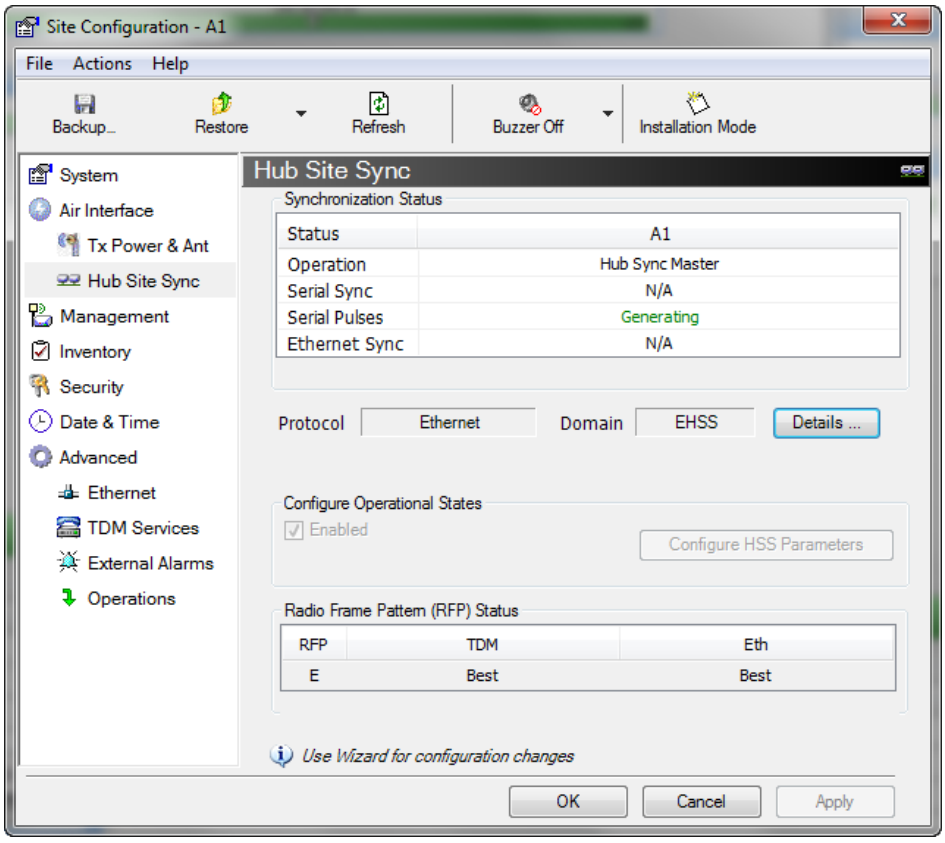


Figure 13-4: Site Configuration: EHSS - Top - client, Bottom - master

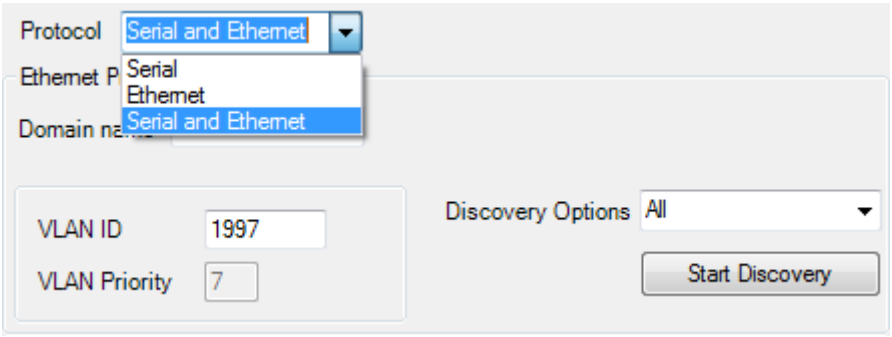
The Details button in the (bottom) HSM window offers a list of collocated clients.

Mixing EHSS and SHSS enabled ODUs

ODUs using both HSS styles may be collocated as follows:

To collocate EHSS and SHSS ODUs:

1. Ensure that the EHSS master also supports SHSS. (It will have a Sync port.)
2. Connect the EHSS Sync port of the EHSS master to the first port of the HSS unit.
3. Configure the EHSS master to support both Serial and Ethernet HSS as shown:



4. Ensure that all other collocated ODUs are configured as clients as described above (EHSS) and in **Chapter 12** (SHSS).

Chapter 14

Using the RADWIN GSU

What is it for

The GPS-based synchronization unit (GSU) is designed to handle inter-site interferences under large-scale deployment scenarios.

The GSU is an outdoor unit consisting of a small size enclosure, a GPS antenna and a PoE device.

The GSU is connected to the HSS Unit using a standard HSS cable. It synchronizes the transmission timing of multiple Hub-Sites to the same clock source thus eliminating mutual interference.

GSU Functionality

The GSU receives a synchronization signal from the GPS once per second. It distributes a RADWIN proprietary synchronization signal to all other ODU units using the RS422 protocol and the standard HSS mechanism, where the GSU acts as an HSM unit.

When the GSU doesn't receive a synchronization signal from the GPS for 30 seconds, it moves automatically to Self-Generation mode and acts as a regular HSM unit, until the GPS recovers.

Typical GSU Scenarios

Independent Distributed Sites

In the scenario of **Figure 14-1**, we have multiple independent collocated sites, which may interfere with each other. To meet this situation, we coordinate all of them using the GSU as shown.

The GSU functions like "wide area HSS unit", ensuring that all participating radios at the locations marked **GSU** each transmit and receive at the same time.

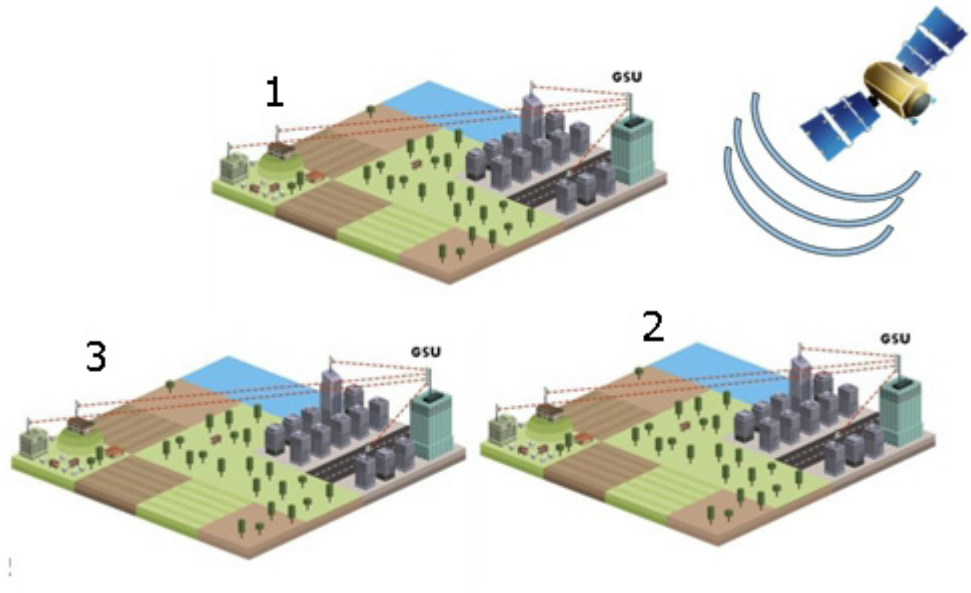


Figure 14-1: GSU Scenario - Independent distributed sites

Multiple Distributed Sites with Communication

What happens if, in **Figure 14-1**, the GSU towers themselves have radios communicating as shown in **Figure 14-2**?

Consider GSU 1 and GSU 2: Both collocated towers transmit and receive simultaneously. However, the radios communicating at GSU 1 and GSU 2 must transmit and receive in turn according to the scheme in marked "Normal Phase" in **Figure 14-3**. This is an impossible situation, if all the links must send and receive together. It is further complicated by adding a third and further sites as shown.

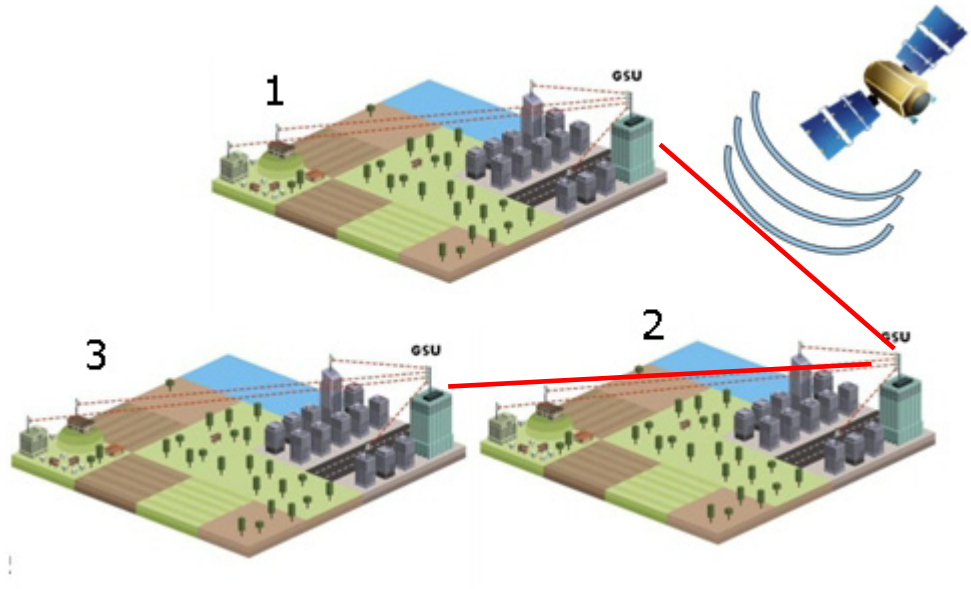


Figure 14-2: GSU Scenario - Communicating distributed sites

Cascaded Sites using Shifted Phase Transmission

The solution offered here is not a "universal cure". The following conditions are necessary, but in any specific case may not be sufficient:

- The GSU sites (marked 1, and 3 above) are sufficiently far apart as to ensure that there is no mutual interference between communicating sites (1-2 and 2-3 above)
- There should be no interference between non-communicating sites (1 and 3 above).

To see how it works, we use **Figure 14-2**. The GSU towers are numbered and marked for cascading, 1-2 and 2-3. There should **not** be a link between 1 and 3.

The GSU can synchronize the TDD timing of several sites enabling the cascading of consecutive links without mutual interference.

To use cascading, the TDD timing of the even-ordered links (GSU 2 above) must be "shifted" (Shifted Phase) and odd-ordered links (GSU 1 and GSU 3 above) must be "unshifted" (Normal Phase). The phase shift is half of the Radio Frame Duration (RFD) from the chosen RFP. The scheme is shown in **Figure 14-3**.

Since the GSU is always HSS master (HSM), at each GSU location, the GSU can "force" the synchronization of its collocated radios. By half RFD shifting, alternate collocated sites can talk to each other.

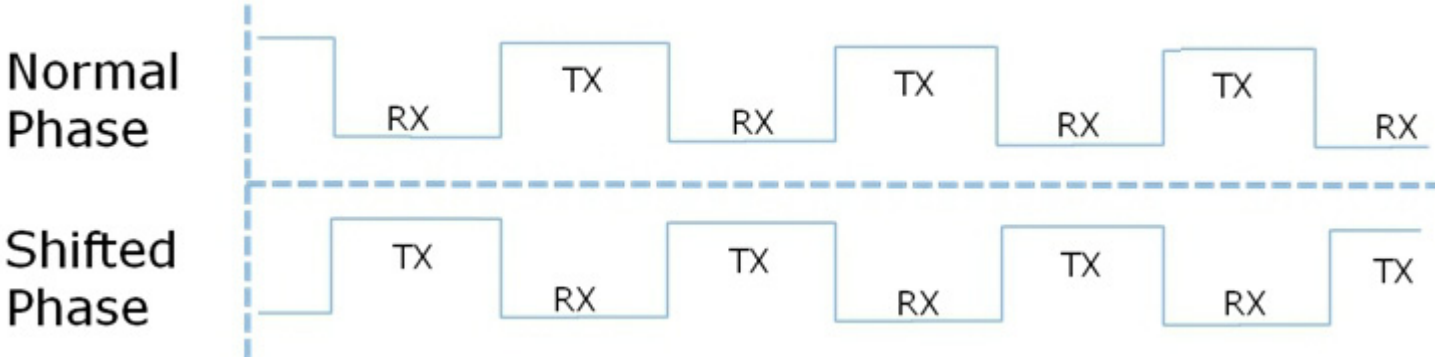


Figure 14-3: Phase shifted transmission - phase shift is 1/2 the RFD

Choice of normal or shifted phase is configurable per GSU using the RADWIN Manager.

GSU Redundancy

The GSU is designed to support redundancy, improving the robustness of a GSU based topology.

In redundancy mode, two GSUs are installed at the same HSS site. One of them self-configures to generate HSS sync signals. We will call it the Primary unit. The other one, the Secondary unit remains dormant merely polling the first GSU. If the Primary GSU fails, then the Secondary GSU becomes active immediately. If the Primary unit becomes active again, it remains dormant, reversing the original roles. The choice of the Primary GSU is random and of no significance.

If the Primary GSU fails, and then the Secondary GSU also fails to receive sync signals from its GPS, then it moves to self-generation HSM mode like an ordinary HSM ODU until its GPS recovers.

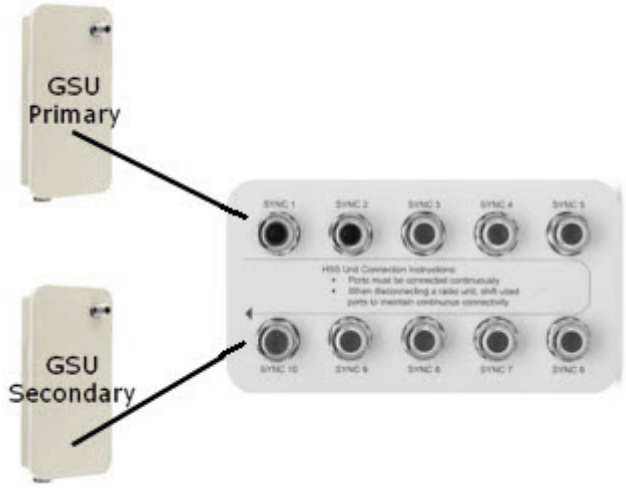


Figure 14-4: Make the GSUs the first two collocated units

Redundancy switching is completely transparent to the GSU-managed links.

GSU Kit Contents

The GSU package includes:

- 1 x GSU
- 1 x Mounting Kit
- 1 x GPS Antenna
- 1 x GPS Antenna Mounting Kit
- 1 x RF Cable, 1.5m
- CD

GSU Installation

Overview

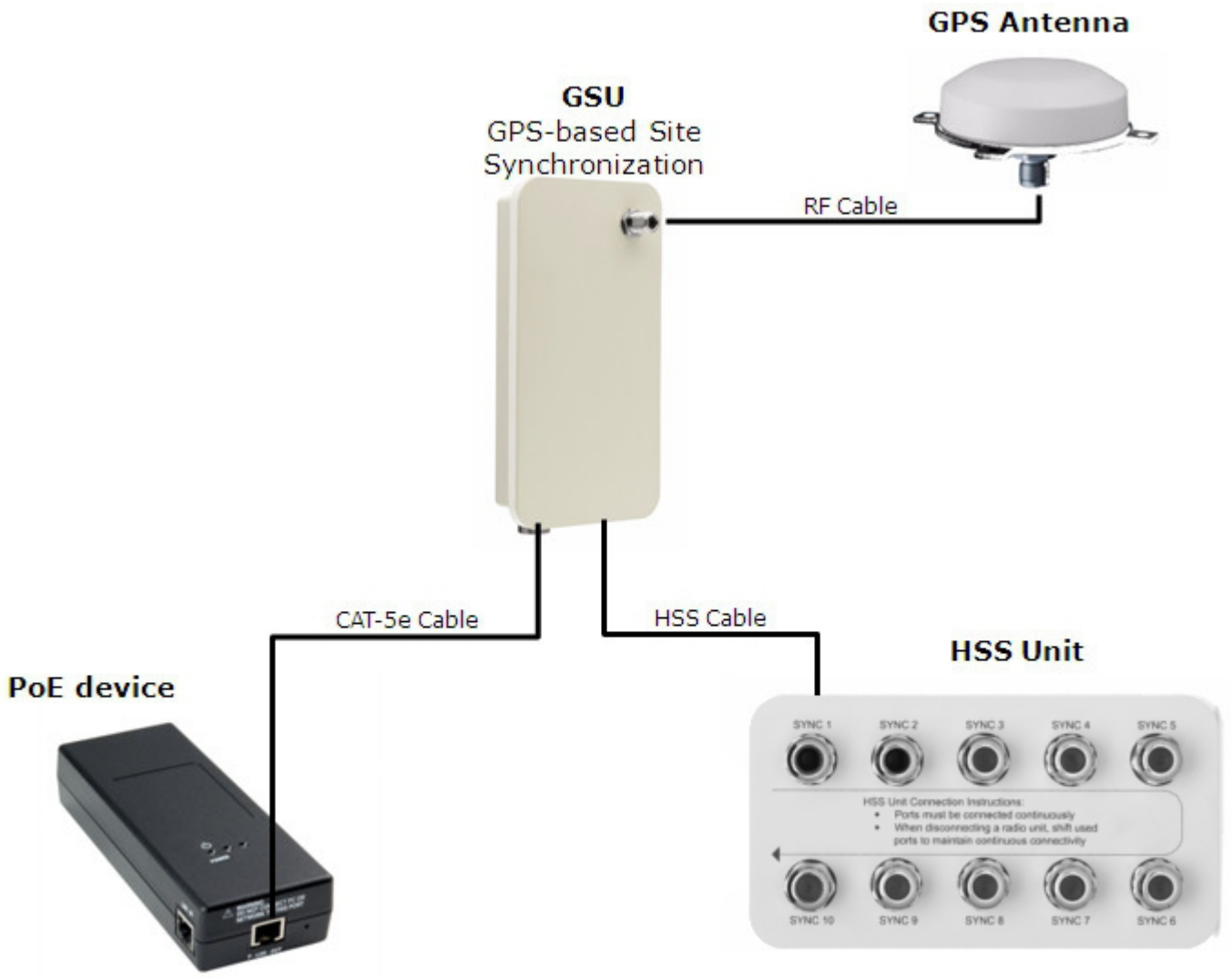


Figure 14-5: General GSU configuration

It may be configured using the regular RADWIN Manager or Telnet.

Preparing the GSU for Use

Log on to the unit using Local Connection or IP address 10.0.0.120 to change its IP address from the default (10.0.0.120). In the example screen captures below, we use 10.104.20.1 with Subnet Mask 255.255.0.0 and Gateway 10.104.10.21.

Mounting the GSU

Mount the GSU and antenna. Ensure that its ODU port connected to its PoE device and the HSS cable is connected to the HSS unit as shown. The external LAN port of the PoE device is connected to the managing computer. If you are accessing the GSU through a network it is essential that you use the IP pre-loading method. The default IP address may be inaccessible and you may not use the Local Connection method over a network.

Configuring the GSU

Getting Started

To configure the GSU, you log on to it, exactly as in **Chapter 5**.

The GSU Main Window

Here is the main window for GSU configuration:

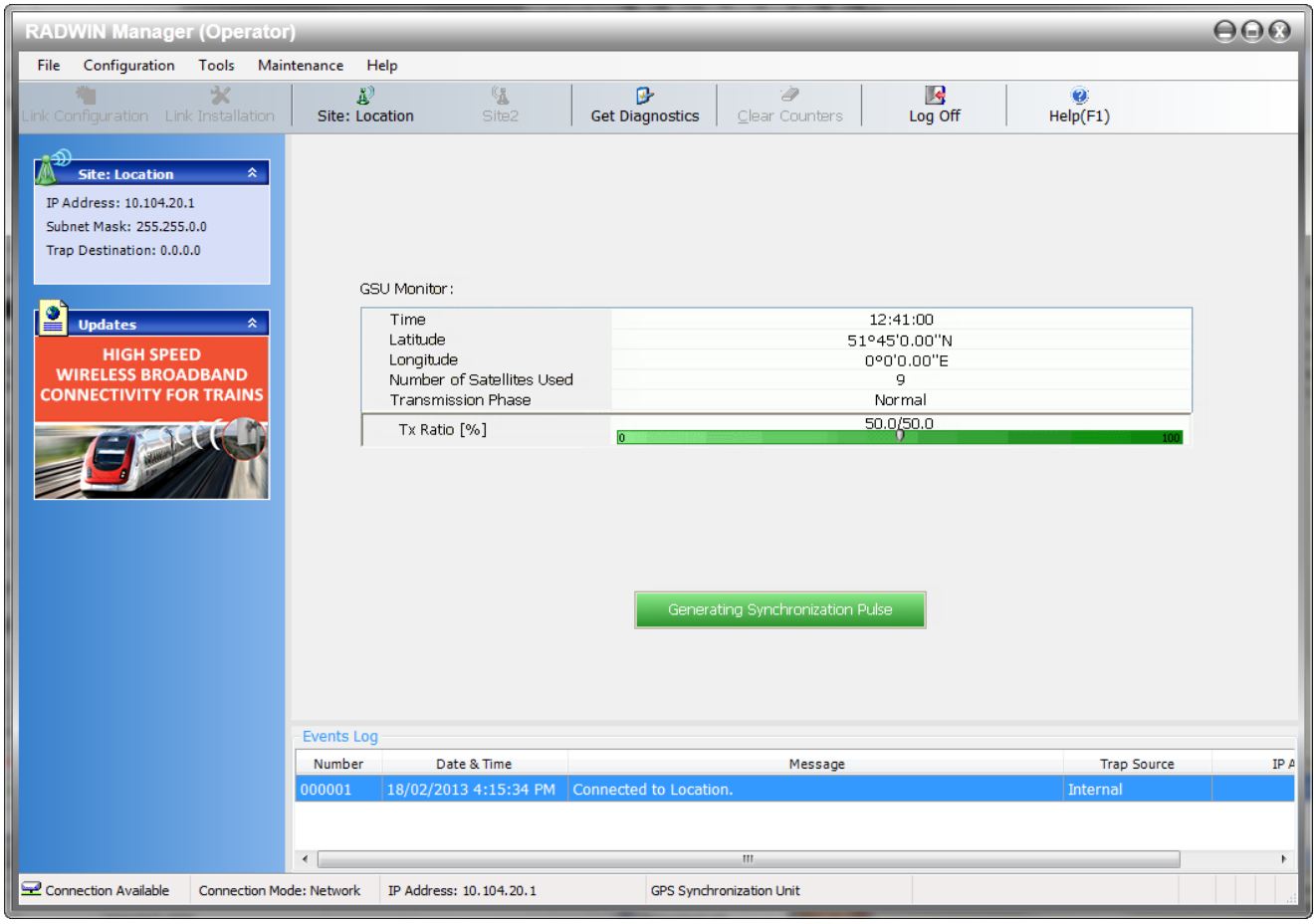


Figure 14-6: GSU Main widow at startup

The top five items in the GSU Monitor panel are taken from a satellite. The transmission Phase may be **Normal** as shown or **Shifted**. It purpose, together with the **Tx Ratio** bar, will be explained below.

The Status Box

Under normal operating conditions, it will be green as shown, indicating that it is synchronized with a satellite.



If satellite synchronization is lost, then the GSU will function as an independent HSM and the status box will change color:



The Main Menu

The main menu is a subset of the main menu applicable to the RADWIN 2000. Notice that there are no Installation or Configuration wizards. Such configuration as is necessary is carried out using a modified version of the standard Site Configuration.

Similarly, the Tool bar is a subset of that applicable to the RADWIN 2000.

Using Site Configuration for the GSU

Site Configuration: System

Here is the opening window for **Site Configuration**:

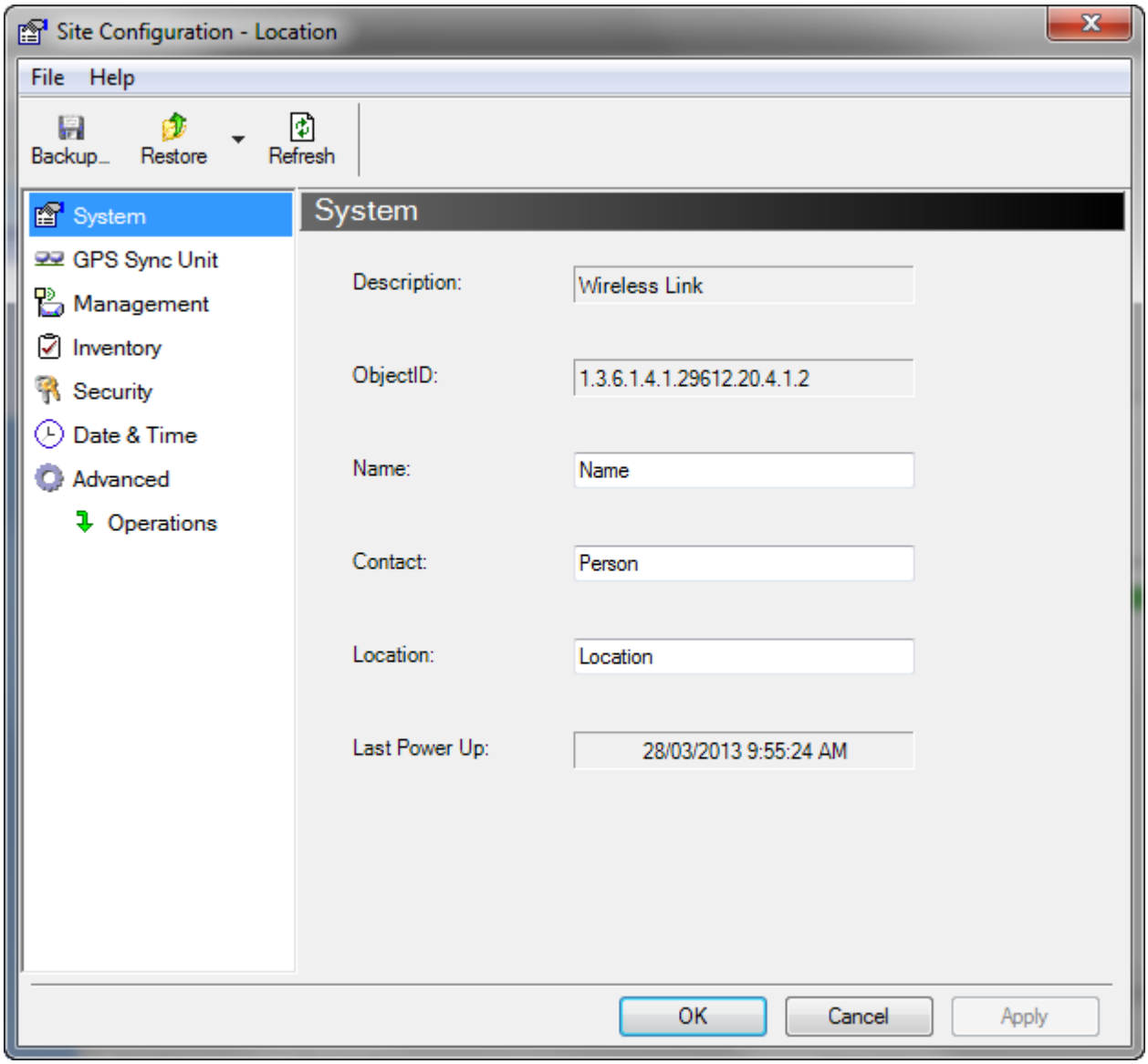


Figure 14-7: Site Configuration: System

Site Configuration: GPS Sync Unit

This window is the main GSU configuration tool:

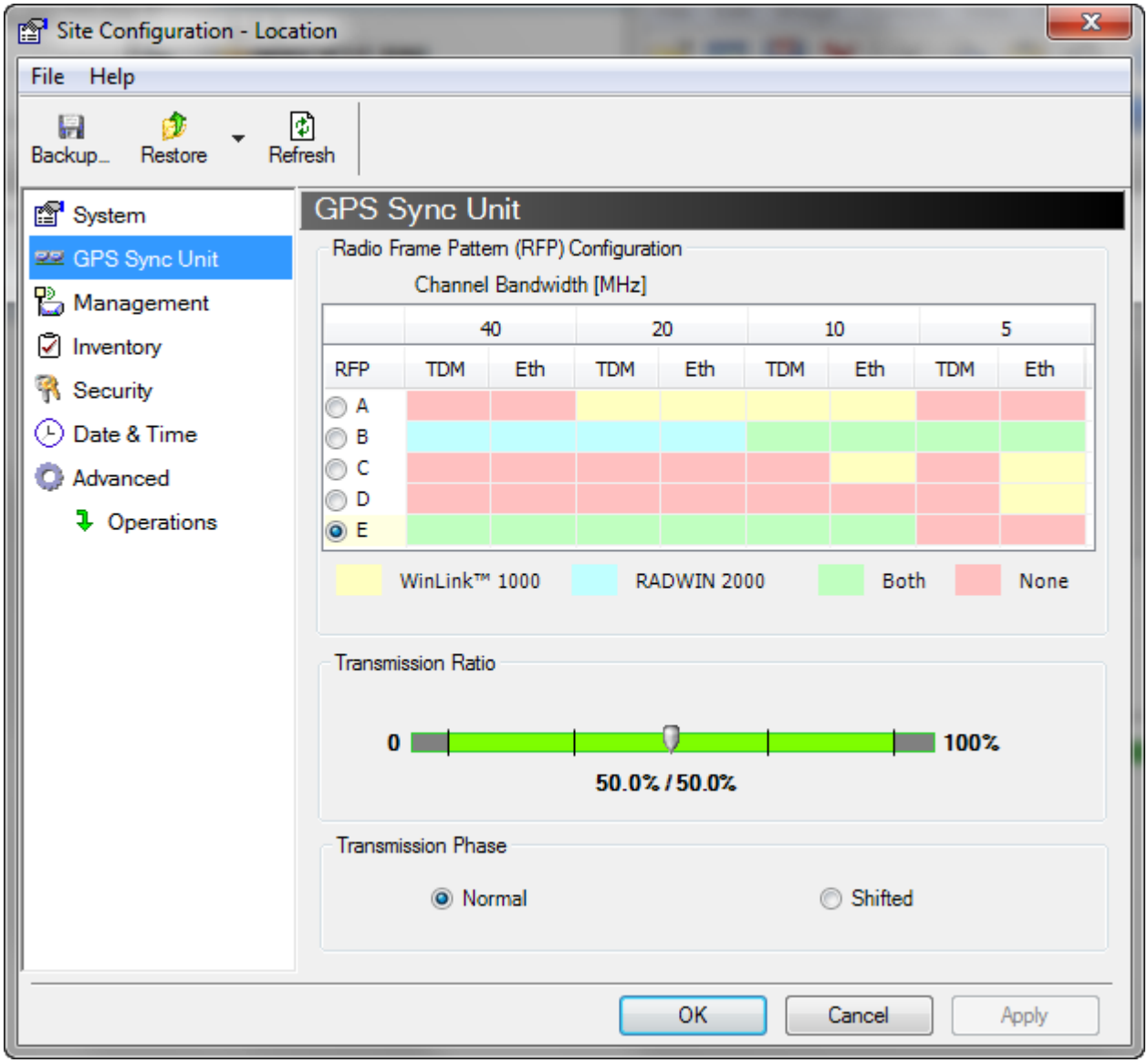


Figure 14-8: Site Configuration: GPS Sync Unit

1. Setting the RFP for HSS

The GSU is automatically configured as HSS Master (HSM).

Note

Ensure that no other collocated ODU is configured as HSM.

If the hub site consists only of WinLink 1000 units, then any suitable RFP may be chosen. If there are one or more RADWIN 2000 units, you must use RFP B or E.

The permitted RFPs are also dependent on channel bandwidth and are color coded as follows:

You May use RFP/Channel Bandwidth combinations with this color	For these collocated radios
	WinLink 1000 only
	RADWIN 2000 only
	WinLink 1000 and RADWIN 2000 together
	None - unavailable

There is a further restriction: If there are two distributed sites transmitting to each other, they must both use the same RFP. This requirement, together with use of shifted transmission phase (item 3 below), ensures that communicating distributed sites to not interfere with each other by transmitting simultaneously.

Two GSU managed sites transmitting with shifted transmission phase and using the same RFP, transmit one half a RFD apart (see **Figure 14-3** above).

2. Setting the Tx Transmission Ratio

Since the GSU is always HSM, it must be able to cater for hub site RADWIN 2000 C based links. (See the RADWIN 2000 User Manual, Chapter 5). If you use asymmetric allocation, shifted transmission phase becomes unavailable and you cannot "cascade" links as described in step 1.

3. Choosing the Transmission Phase

Chose the Transmission Phase in accordance with considerations in step 1 above. If you choose Shifted Phase then the Asymmetric Ratio selector is disabled.

Site Configuration: Management

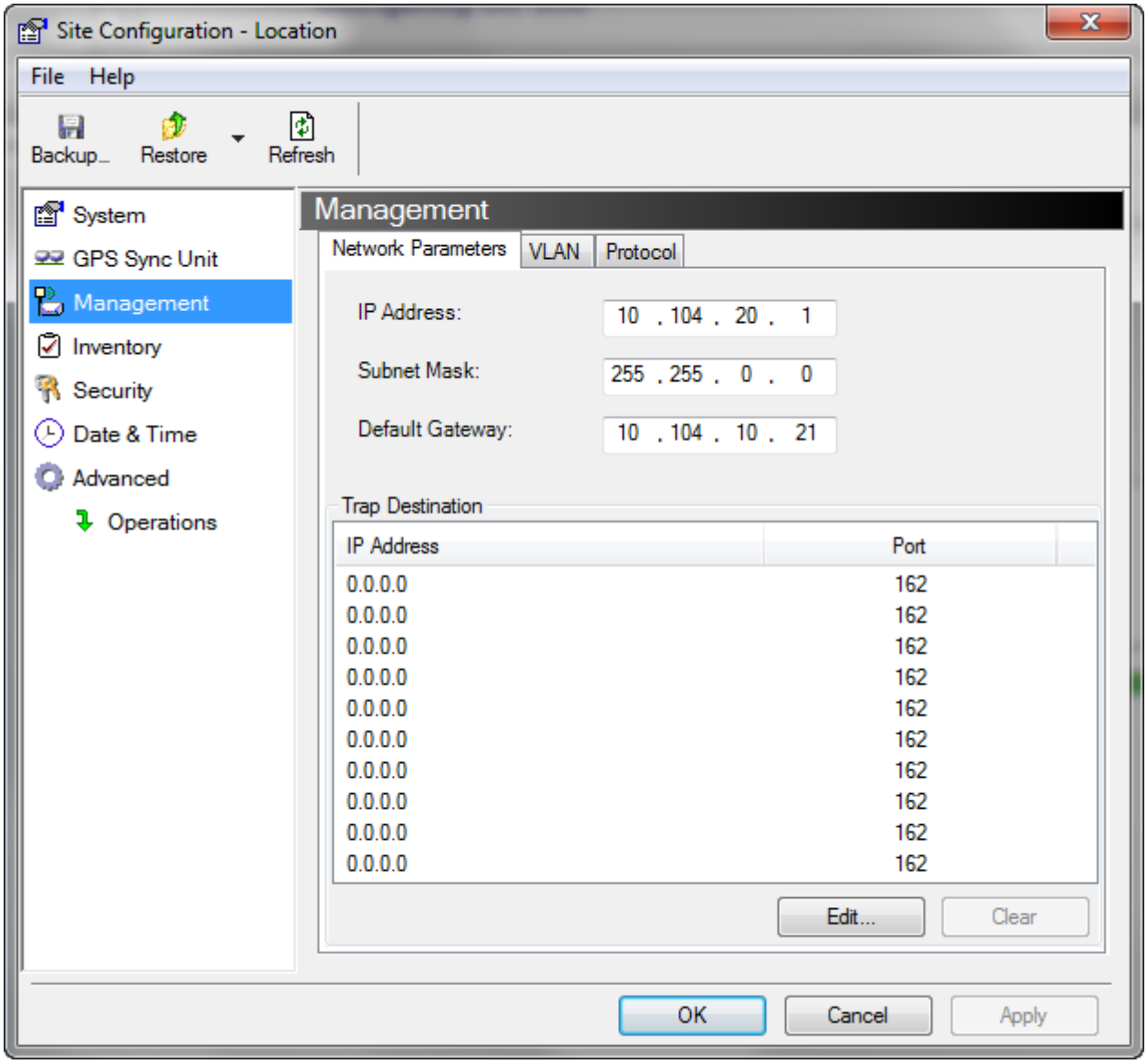


Figure 14-9: Site Configuration: Management

Here you set the GSU IP address, subnet mask and gateway. You also set trap addresses here. It is identical to the corresponding panel for RADWIN 2000.

Site Configuration: Inventory

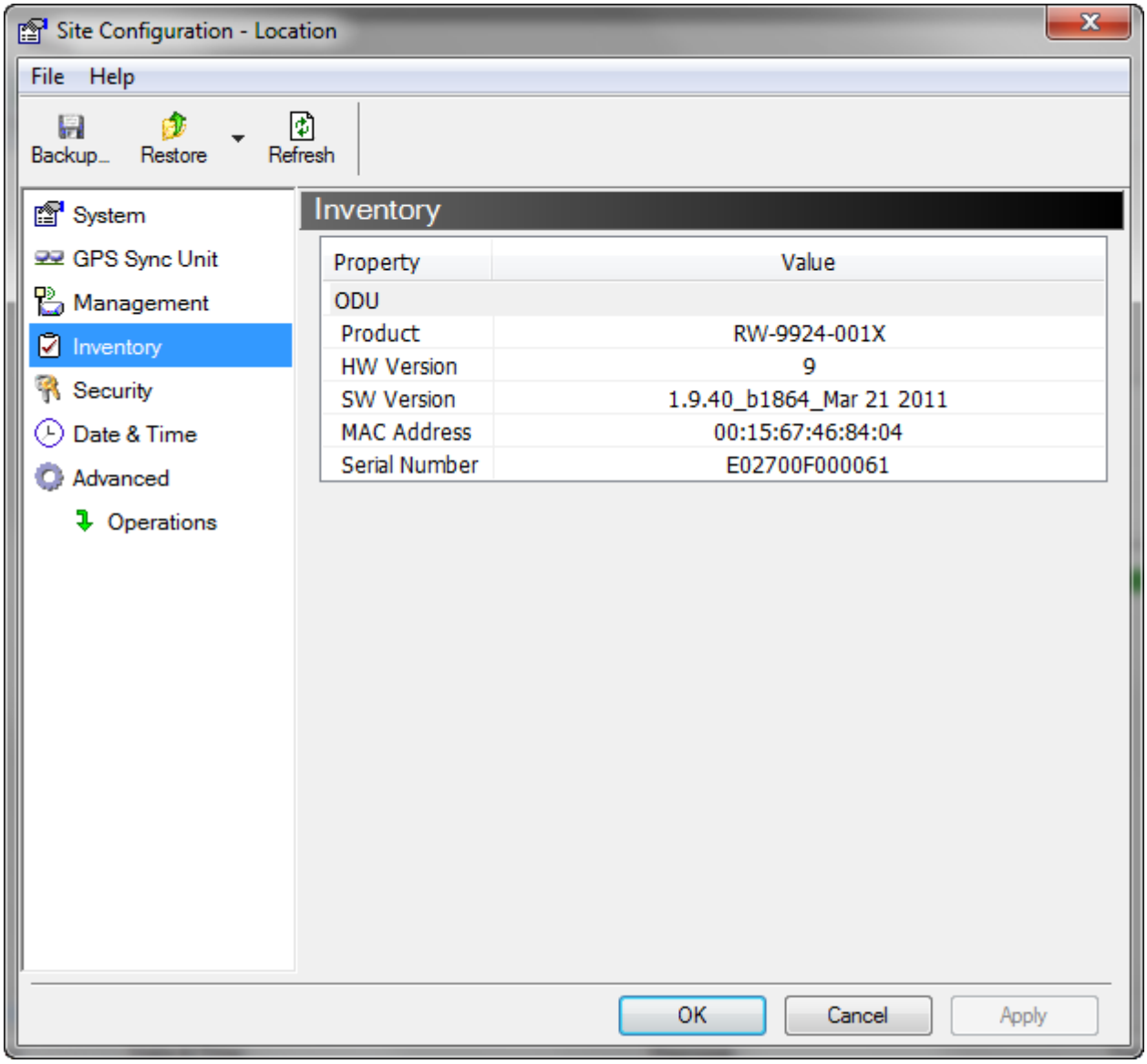


Figure 14-10: Site Configuration: Inventory

Site Configuration: Security

You can only change the SNMP Community strings:

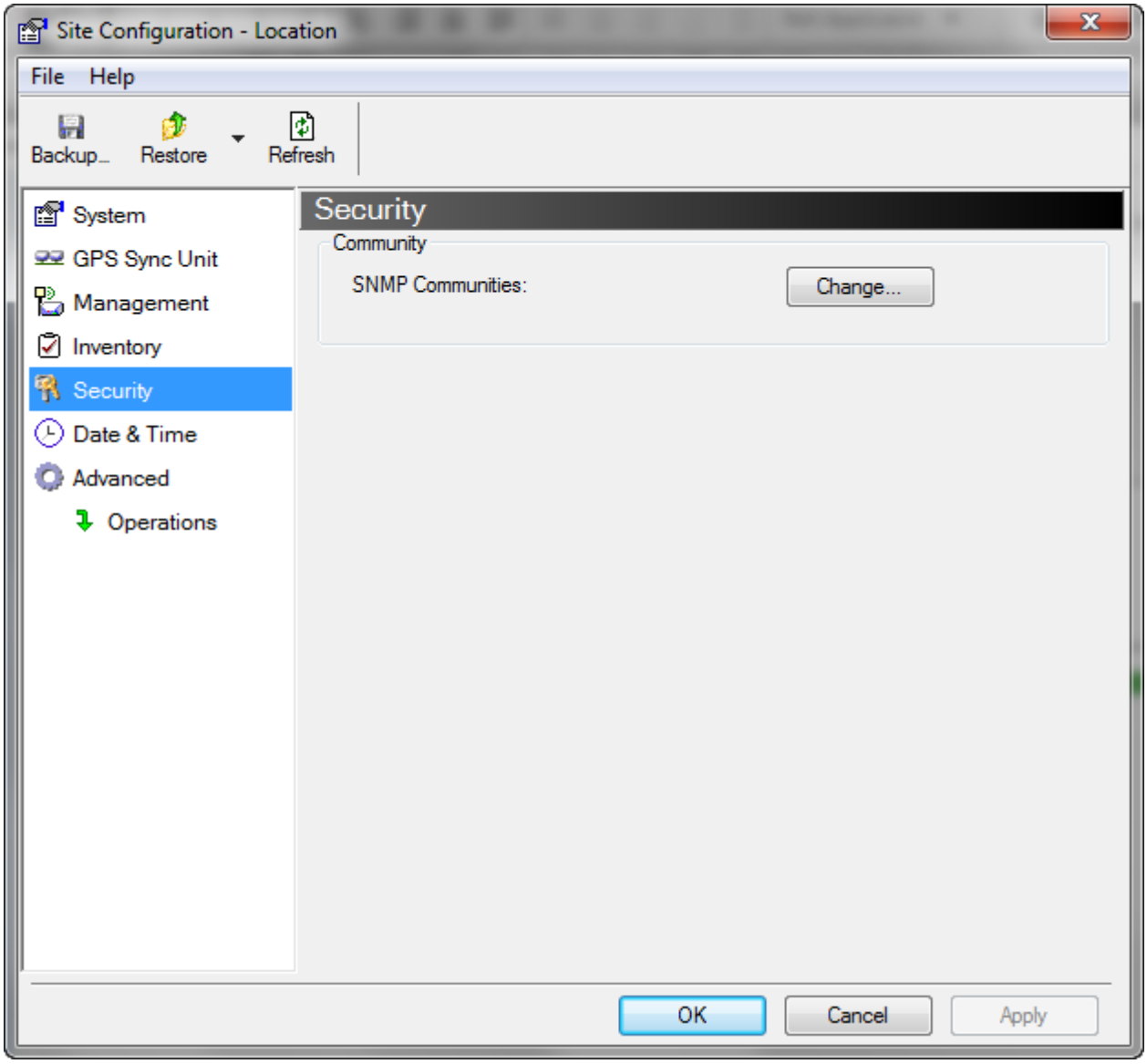


Figure 14-11: Site Configuration: Security

Site Configuration: Date and Time

ODU Recent events, alarms and traps are time-stamped from the time method chosen here (NTP, managing computer, ODU default).

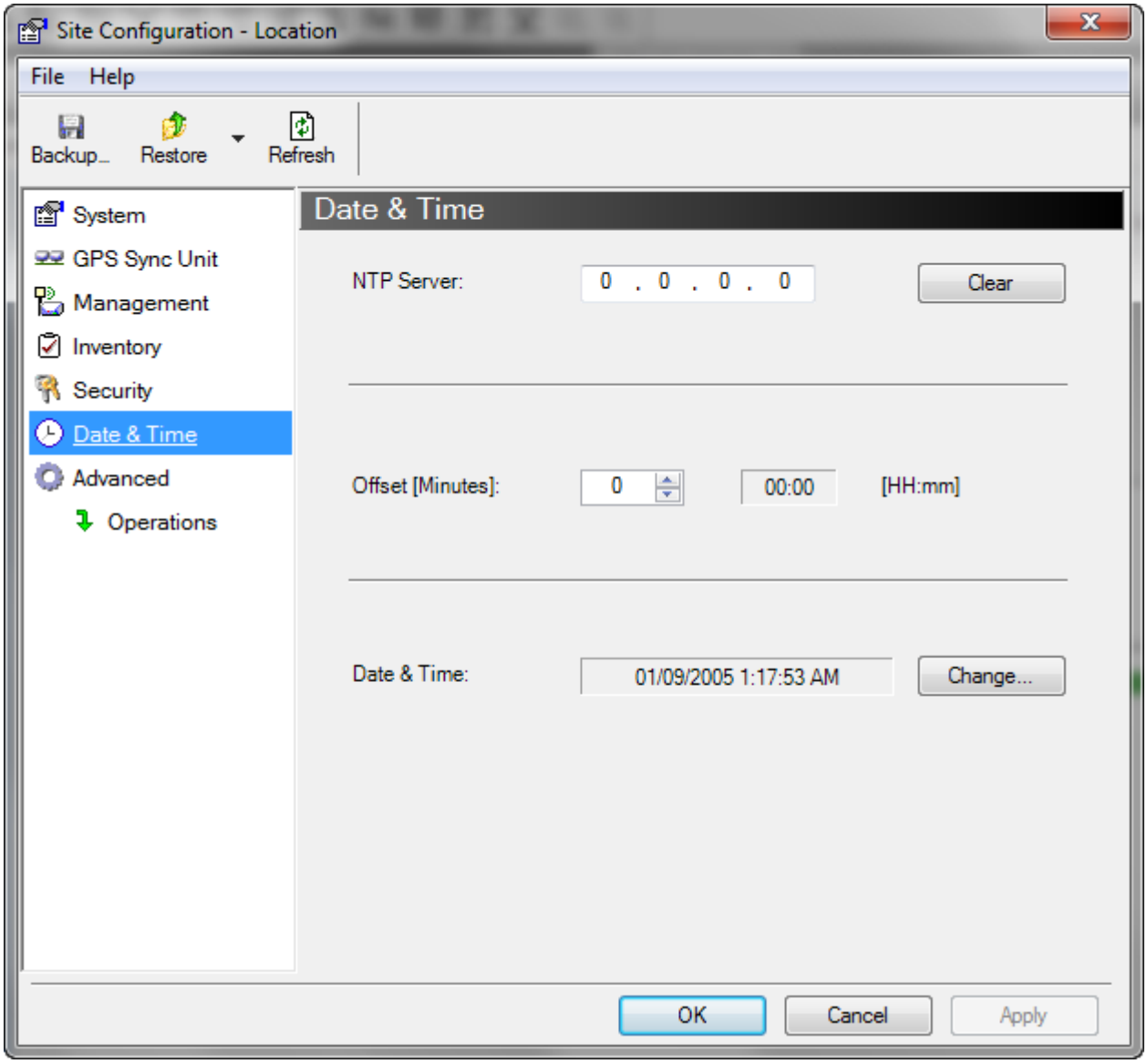


Figure 14-12: Setting the date and time for trap reporting

Site Configuration: Operations

The only available action here is Restore System Defaults:

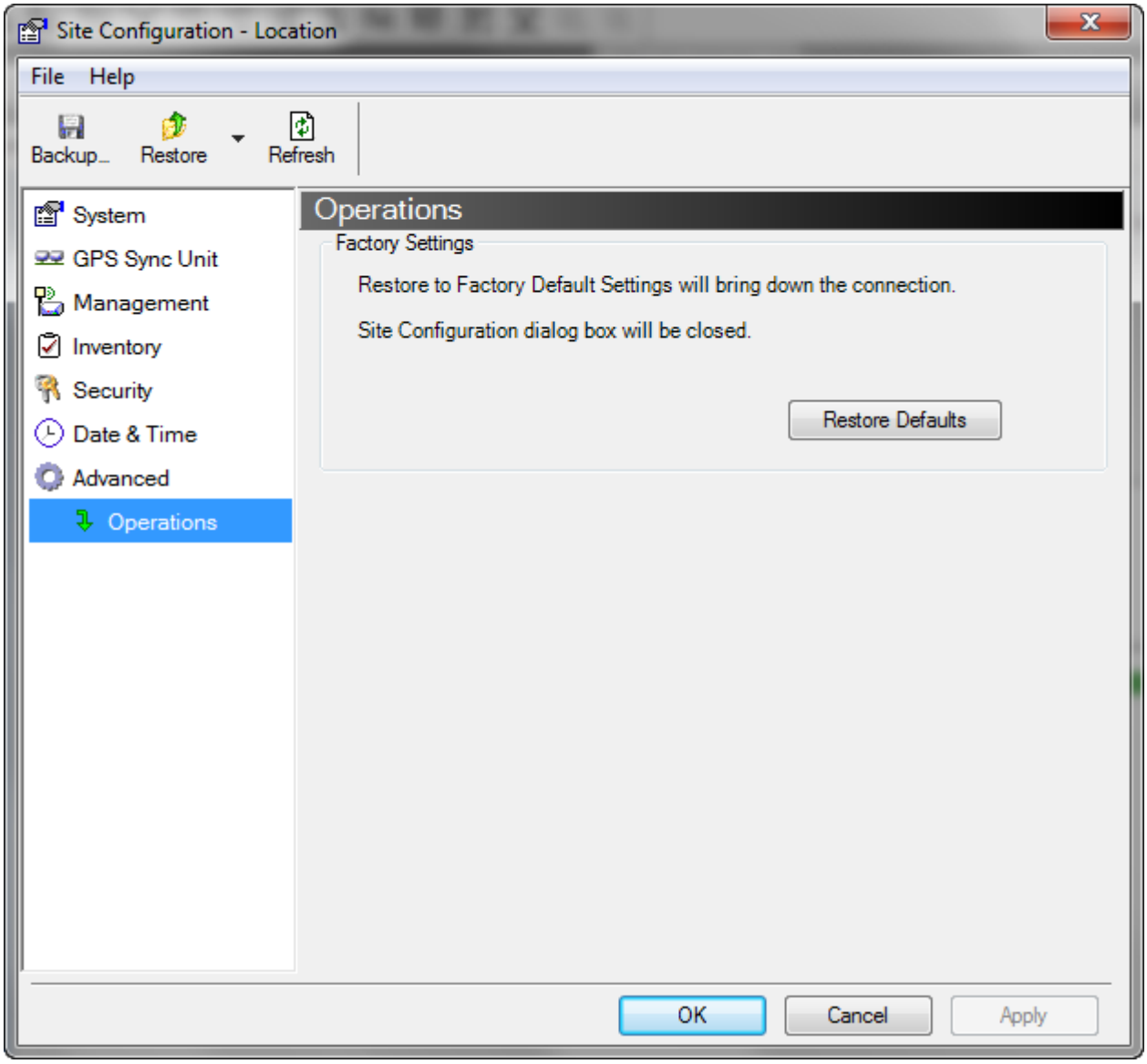


Figure 14-13: Site Configuration: Operations

GSU Preferences

The **Preferences** window adds a new tab for the GSU:

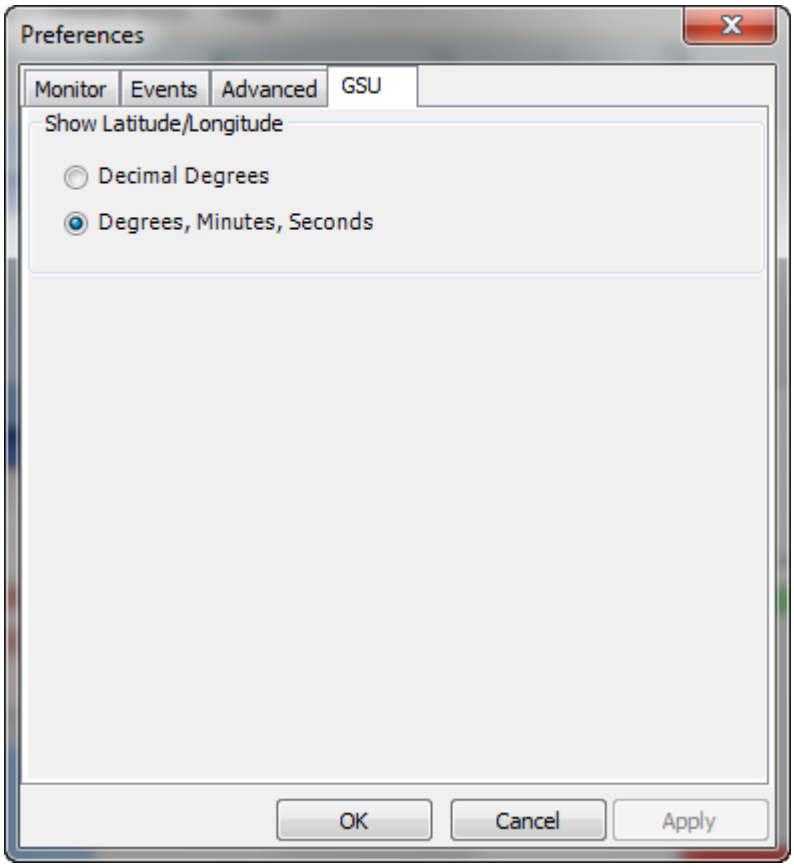


Figure 14-14: Site Configuration: Operations

You may chose the units for latitude/longitude coordinates.

GSU Monitoring and Diagnostics

The monitoring and diagnostic reports are similar to those of WinLink 1000.

GSU Telnet Support

To configure the GSU with Telnet, start a Telnet session, using

telnet <GSU_ipaddr>.

For example, if you run Telnet as follows,

telnet 10.104.20.1

you will be asked for a user name and password. You must log on with administrator privilege under user name, **admin** and password **netman**.

The available commands are the same as for WinLink 1000 with the addition of four additional display commands and three additional set commands.

The additional **display** commands are

display rfp

The rpf value displayed is anindex from 2 to 6, 2 for A, 3 for B and so on.

display ratio

display tx_phase

display gpsinfo

The last one, **display gpsinfo**, is the most interesting:

admin@10.104.20.1-> display gpsinfo

Current GPS time	102941.000
Current GPS latitude	51.500000
Current GPS N\S Indicator	N
Current GPS longitude	0.000000
Current GPS E\W Indicator	E
Current GPS number of satellites	09
Current GPS altitude	84.0

Command "display gpsinfo" finished OK.

The three additional **set** commands are

set rfp <index> (2-6)

set ratio <ratio>

set tx_phase <mode:1=normal,2=shifted>

Software Upgrade for GSUs

All GSUs in a distributed site can be updated simultaneously. Use an IP list as described in **Chapter 17**.

USER MANUAL

RADWIN 2000 BROADBAND WIRELESS TRANSMISSION SYSTEM

Release 2.8.20

Part 3: Advanced Installation

RADWIN

Chapter 15

Monitored Hot Standby Installation Procedure

What is a RADWIN Monitored Hot Standby

The RADWIN Monitored Hot Standby (MHS a.k.a 1+1) is a duplicated link set up as a primary link and a secondary link in hot standby mode as shown in **Figure 15-1** below.

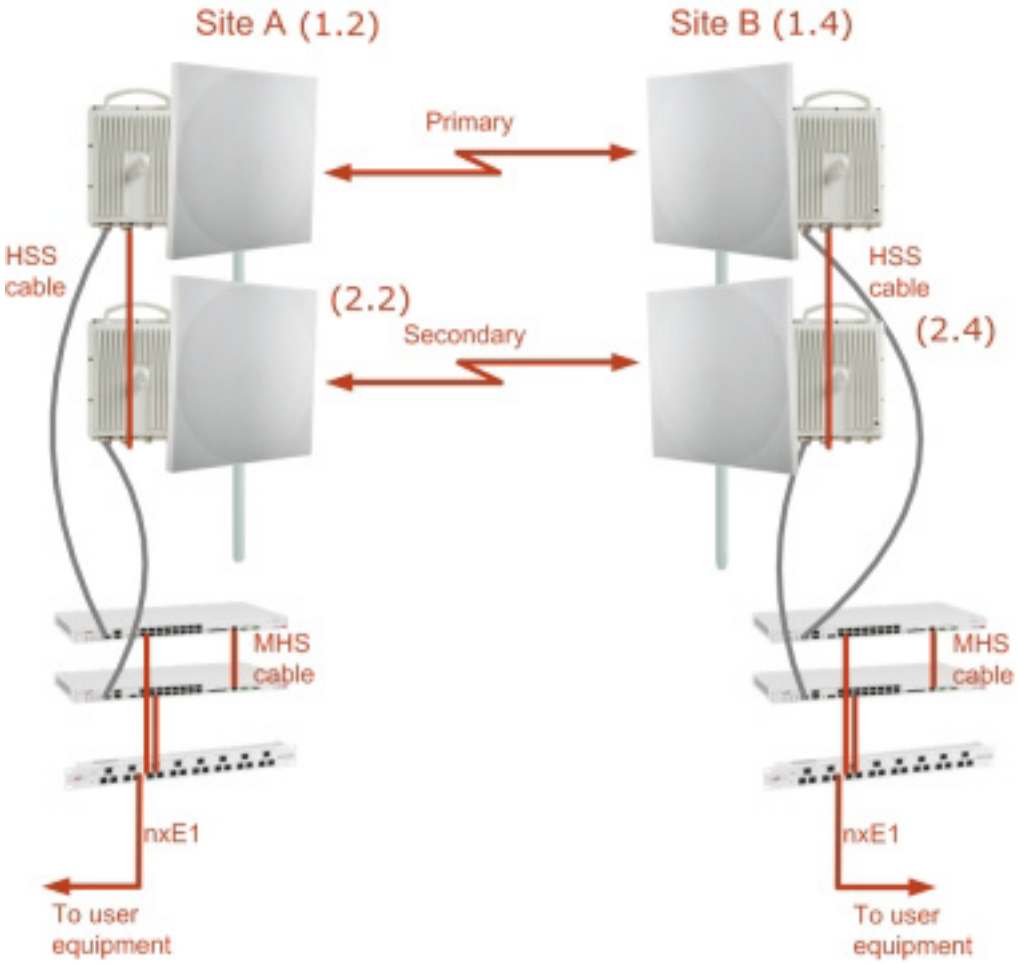


Figure 15-1: RADWIN Monitored Hot Standby

RADWIN MHS provides redundancy and backup to TDM services. It is designed to provide high reliability high-capacity Point-to-Point links. The RADWIN MHS is -

- Designed to provide redundancy and high reliability for carrier class operators
- Optimized for high capacity links operating in license-free bands
- A comprehensive solution providing protection against both equipment failure and loss of air interface, by simple connectivity between a primary link and a secondary link

The main service redundancy features of the RADWIN MHS are –

- TDM service cut-over from the primary to the secondary link is completely automatic
- TDM service cut-over time no more than 50 ms
- Automatic restore to primary link as soon as it becomes available
- Support for up to sixteen TDM channels for RADWIN 2000

MHS is supported between two RADWIN 2000 links using IDU-Cs. In what follows, ODU refers to a RADWIN 2000 radio and IDU refers to an IDU-C.

What RADWIN MHS provides

Equipment Protection

Equipment protection is provided for the electrically-active network elements, ODU and IDU.

The primary IDU and the secondary IDU are connected by a cable to monitor failure and to control protection switching. Switching time is less than 50ms.

Air-Interface Protection

Air-Interface protection is unique to RADWIN and is optimized for wireless links operating in license-free bands.

The primary link and the secondary link use different frequency channels. If the air-interface of the primary link is disturbed and cannot carry the required TDM service, then the system automatically switches to the secondary link.

In addition, improved robustness and frequency planning flexibility is achieved, as the primary and secondary air interfaces can operate in the same frequency band or in different frequency bands.

Automatic Channel Selection (ACS) can be configured for each link to add additional robustness.

The primary and secondary links are synchronized using Hub Site Synchronization (HSS).

It is recommended that both sites be installed with HSS cables. If HSS fails at one site, it can be operated from the other site by remote configuration.

Purpose of this Chapter

This chapter is an installation and maintenance guide for RADWIN MHS. It applies to all RADWIN radio products able to support the Monitored Hot Standby operational mode.

Who Should Read this

This chapter is intended for persons responsible for the installation and maintenance of RADWIN MHS. To use it you need to know how to -

- Install a RADWIN 2000 radio link
- Use the RADWIN Manager software

RADWIN MHS Kit Contents

- One Y-Connection Patch Panel
- One MHS cable



Figure 15-2: RADWIN Y-Connection Patch Panel

Installing a RADWIN MHS

Note

The following procedure is substantially generic to all RADWIN radio products. What you see on your running RADWIN Manager may differ in some details from the screen captures used to illustrate this chapter.

Figure 15-1 above is a schematic of a RADWIN MHS. **Figure 15-3** shows how to connect the IDUs to the Patch Panel.

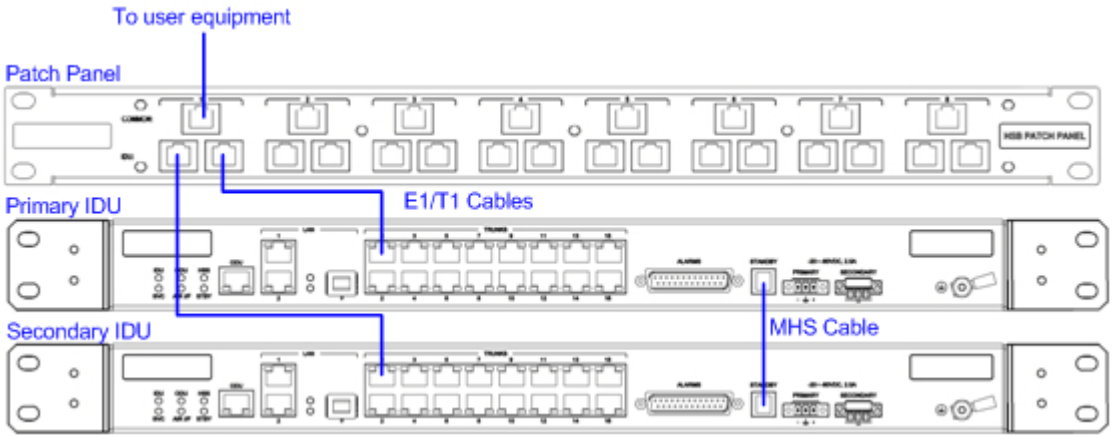


Figure 15-3: How to connect the IDUs to the Patch Panel

Note

- With RADWIN 2000 links you can protect up to 16 TDM ports. To protect more than eight TDM ports use two Patch Panels at each site.
- Ethernet services are carried independently by primary and secondary links. Each link carries different Ethernet traffic. MHS does not protect Ethernet traffic.

In what follows, it will be assumed that –

1. We will depart from our usual Site A / Site B conventions. Sites A and B on the primary link will be Sites 1.2 and 1.4 respectively. The corresponding sites on the secondary link will be Sites 2.2 and 2.4. The site names reflect their IP addresses. This is a useful convention and is reflected in the screen captures below.
2. The link will be managed from Site 1.2; Site 1.4 may be a remote site.
3. The links intended as the primary and secondary will be referred to their respective names, Primary Link and Secondary Link as shown in **Figure 15-1** above, despite their having yet to be installed.

➢ **To install a Hot Standby Link:**

1. Set up Primary Link in the usual way. Ensure that it is fully operational in accordance with the relevant instructions in Part 1 of the .

Note

Do not proceed unless this condition is fully met!

2. Connect user equipment to Site 1.4.
3. At Site 1.2, disconnect the TDM cables from the external equipment or disconnect external equipment from the Hot Standby Patch Panel.
4. The HSS cable (connecting the ODUs) should be connected at Site 1.2. The ODU belonging to the primary link should be configured as HSM, whereas the ODU belonging to the secondary link should be configured as HSC-CT.
5. Establish Secondary Link in the usual way, with HSS enabled. **The two link frequencies should be at least 5MHz apart.**
6. Connect the MHS cables at Sites A and B as shown in **Figure 15-1** and **Figure 15-3** above.
7. Run the Configuration Wizard for Primary Link. Activate TDM services in the usual way. Navigate to the **Hot Standby** tab, in the Services Configuration panel:

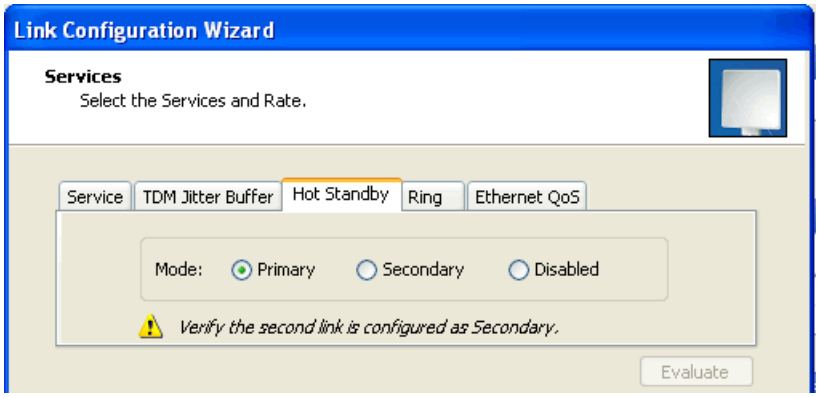


Figure 15-4: Services Configuration Panel: Hot Standby mode selection

Check the Primary button to configure Primary Link as the primary link.

8. Complete the Wizard, and then move to Secondary Link.
9. Repeat step 7 for Secondary Link. For the Services Hot Standby tab, this time, check the Secondary button.
10. Complete the Wizard.
11. At Site 1.2, reconnect the Hot Standby Patch panel to the external equipment.

From this point on, we will simply refer to primary and secondary link (no capitalized names).

At the end of the process, the RADWIN Manager main windows should look like this:

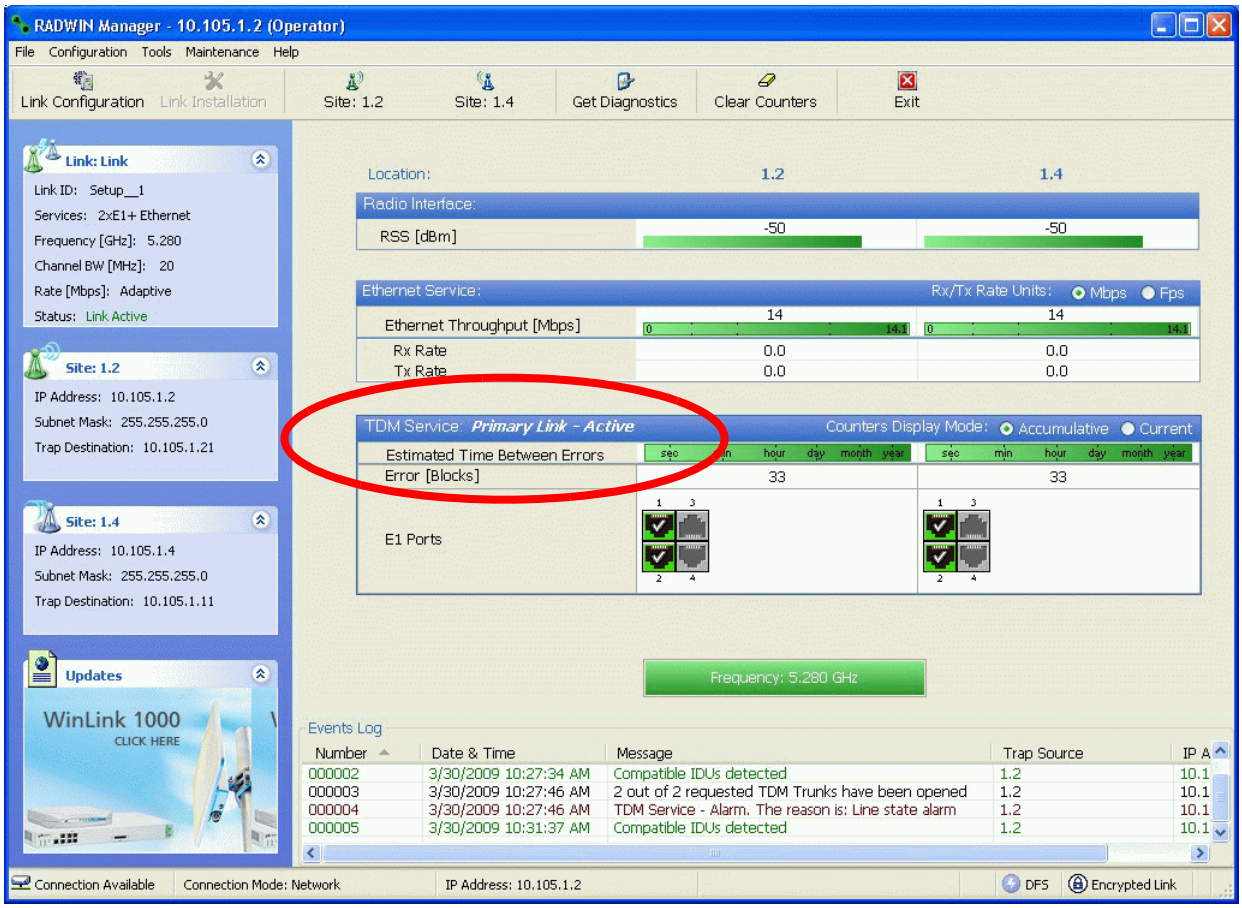


Figure 15-5: The primary link under normal operation

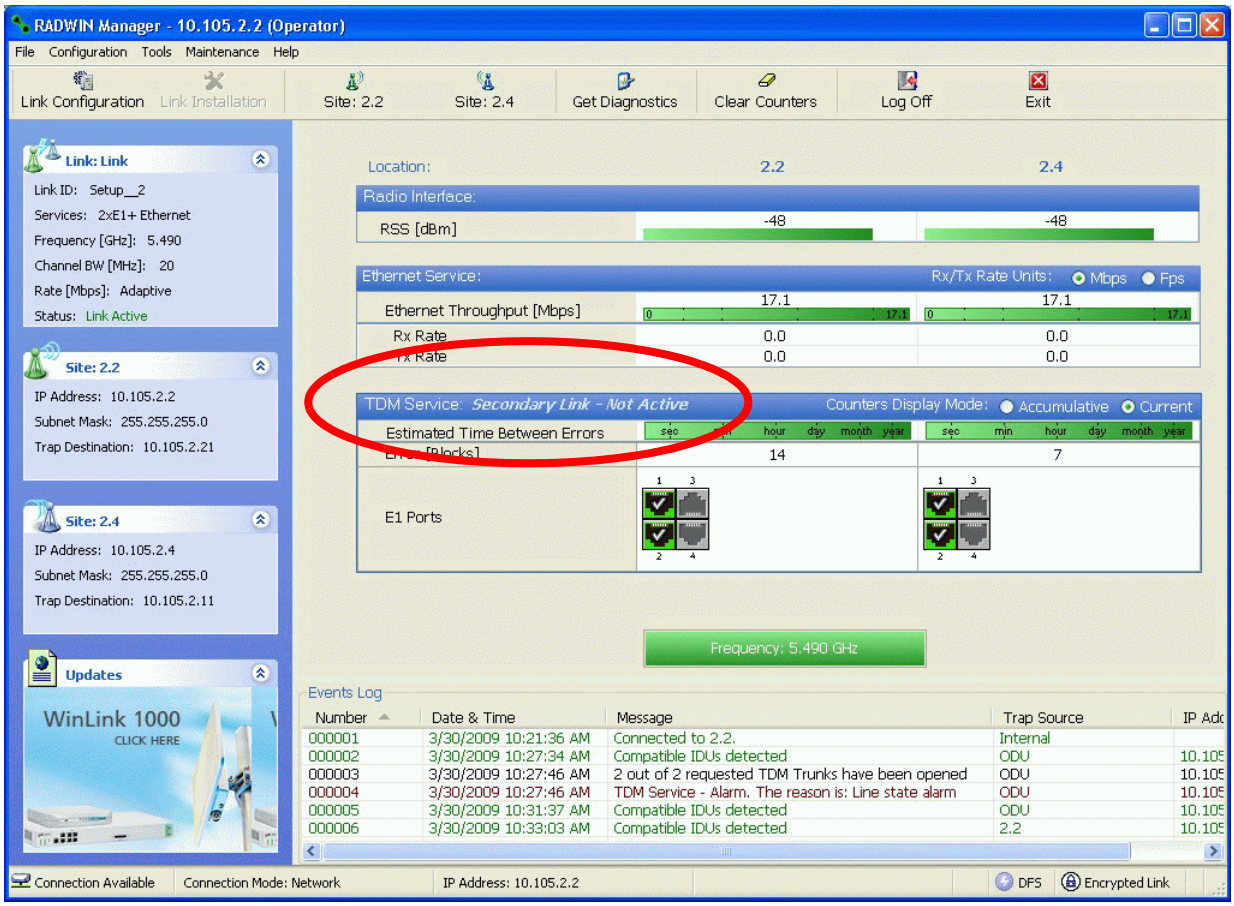


Figure 15-6: The secondary link under normal operation

To see what happens following a cut-over from the primary link to the secondary link, you need to have running two copies of the RADWIN Manager – one logged into the primary link, and one logged into the secondary link.

Here then, is the situation after a cut-over to the secondary link:

For the primary link, the following window will appear for a few seconds:

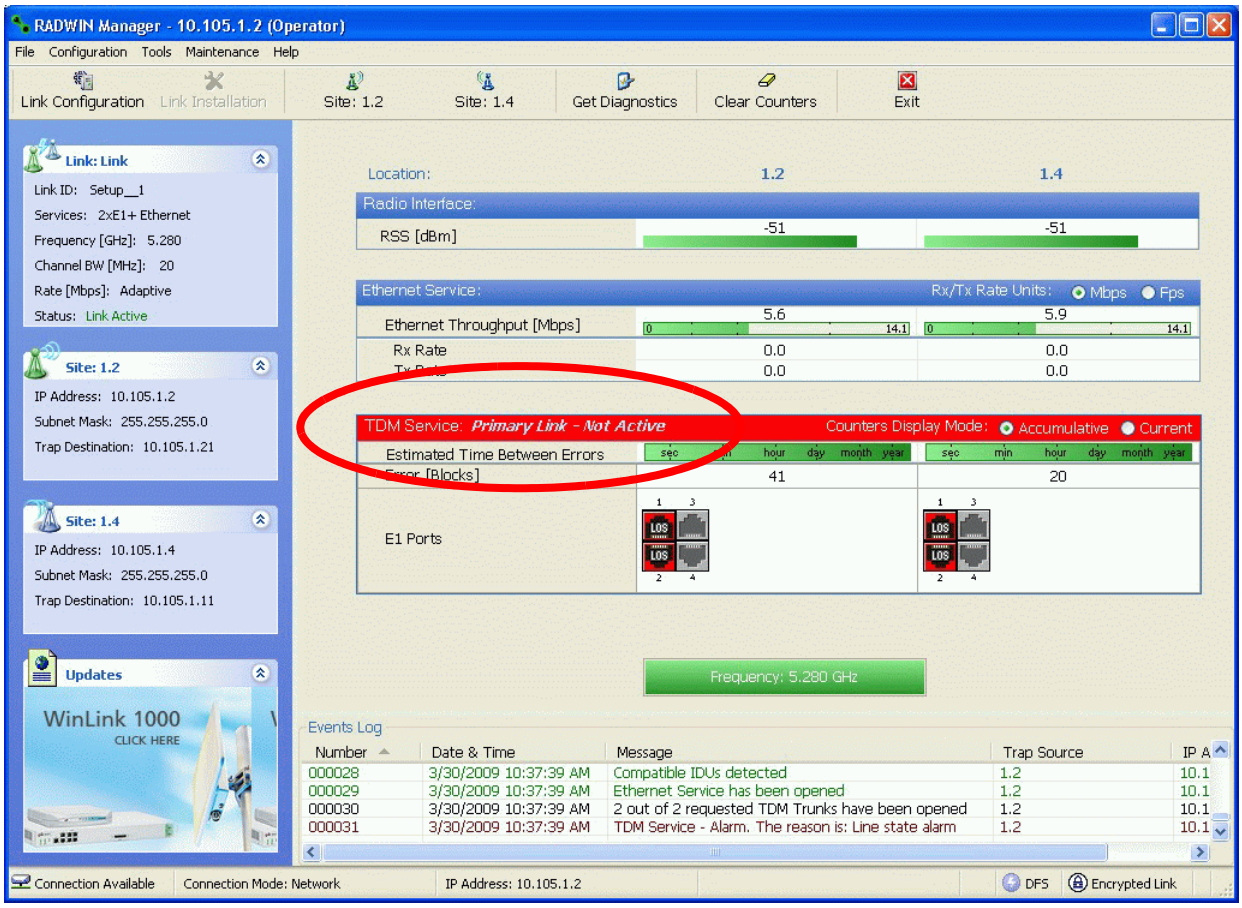


Figure 15-7: Primary link a few seconds before regular No-Link display

It will then revert to the standard No-Link-available window.

On the secondary link Manager window, you will see a window like this:

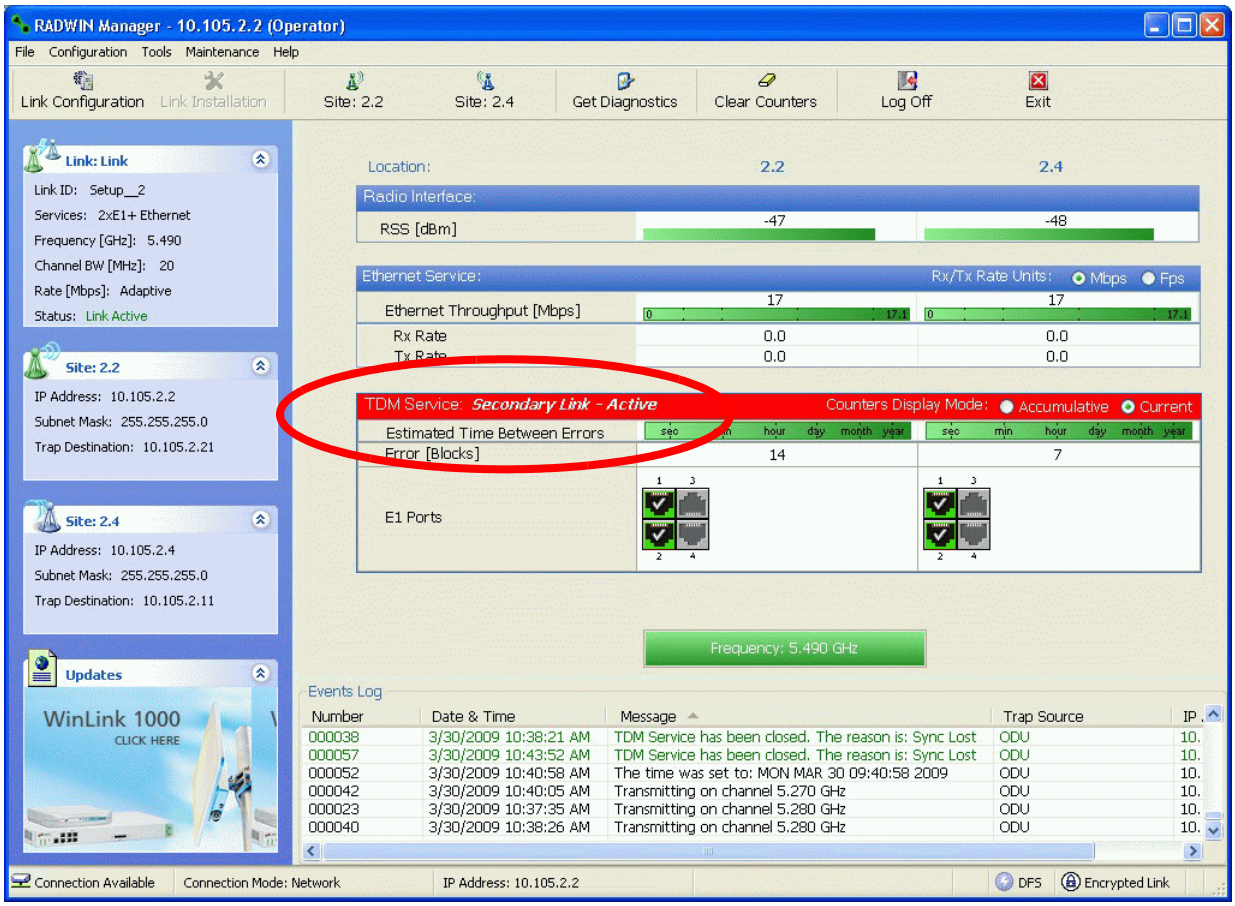


Figure 15-8: Secondary Link operating as the Hot Standby link

Notice that the active link notice is highlighted in red, so that there is no mistaking which link is operational.

Maintaining a RADWIN MHS Link

IDU Replacement

There are two situations, which must be treated differently.

Situation 1:

To replace either of the IDUs at Site 1.4 or the IDU at Site 2.2, nothing special is required. Simply disconnect the IDU to be replaced – and replace it with a new one. Replacing a secondary link IDU obviously has no effect on the TDM service. Disconnecting the Site 1.4 primary IDU activates Hot Standby. After the Site 1.4 primary IDU is replaced, the Link will detect the change and switch back to the primary link.

If you replaced the Site 2.2 IDU, remember to reconnect the MHS cable.

Situation 2:

Replacing the Site 1.2 IDU is different, and requires several steps.

➢ **To replace the Site 1.2 primary link IDU:**

1. Power off the Site 1.2 IDU. This activates the secondary link using Hot Standby.

2. Run the Configuration manager on the secondary link, and in the Hot Standby panel of **Figure 15-4** above, check the Disabled button.
3. Replace the Site 1.2 IDU without connecting it to the ODU (to prevent transmission by the primary link with the undefined IDU).
4. Reconnect the MHS cable between the IDUs at Site 1.2.
5. Again, run the Configuration Wizard on the secondary link, and in the panel of **Figure 15-4** above, check the Secondary button to re-enable the link as secondary.
6. Connect the new Site 1.2 IDU to its ODU.

   The Hot Standby will automatically revert to the primary link within 50ms.

ODU Replacement

Both the primary and secondary replacement ODUs require pre-configuration prior to insertion into the link. The items to be preconfigured are

- HSS mode
- Link ID
- Frequency
- Hot Standby mode – using the new Services panel in **Figure 15-4** above
- IP address (optional)

Note

Pre-configuration **must** be carried out before the new ODU is connected to its IDU. If you try to do it "live" against its IDU, it will cause spurious transmissions and a service break.

➢ **To preconfigure an ODU:**

1. Attach the new ODU to an IDU or a PoE device.
2. Run the RADWIN Manager and use Hot Standby tab of **Figure 15-4** above to configure the new ODU to Primary or Secondary mode as required.
3. Ensure that it is set to the proper HSS mode in accordance with **Figure 15-4** above. Enter the required Link ID and frequency.

➢ **To replace an ODU for primary or secondary link, at either site:**

- Install the preconfigured ODU. (Since the other link is working normally, nothing need be done with it. If the secondary ODU was replaced, TDM service remains as is on the primary link. If the primary ODU was replaced, then the TDM service will shift back to the primary link.)

Switching Logic

Switching from Primary Link to Secondary Link

Switching from primary link to secondary link will occur following:

- Loss of the primary air interface due to sync-loss

- Loss of the primary air interface due to failure of the receiver to acquire expected E1/T1 data during a period of 24ms
- The Primary equipment (either ODU or IDU, local or remote) is powered off

Following the switch from the primary to the secondary link, the primary and secondary link Manager main windows should look like this:

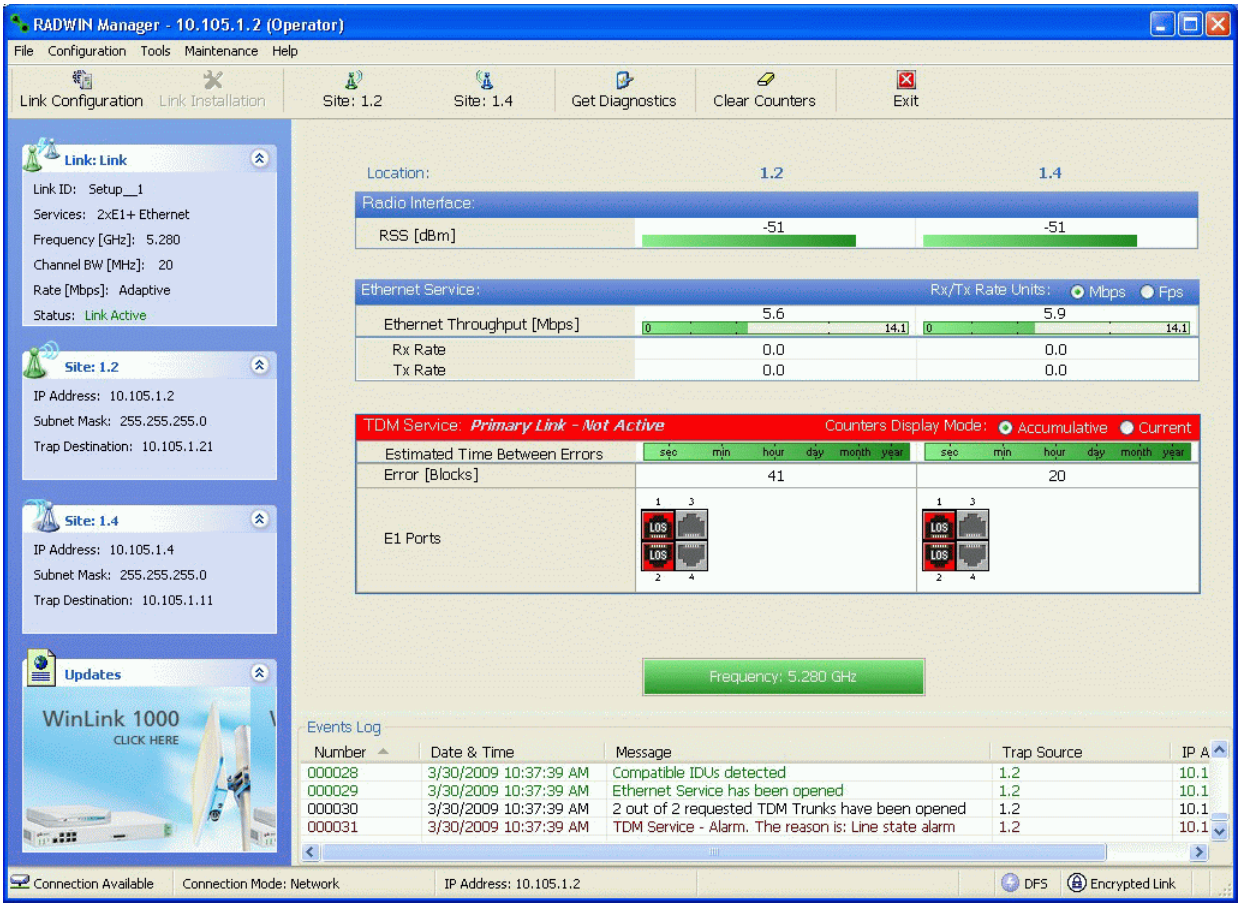


Figure 15-9: Primary link after the switch over to secondary link (After a few seconds the display moves to No-Link display, with TDM ports grayed out.)

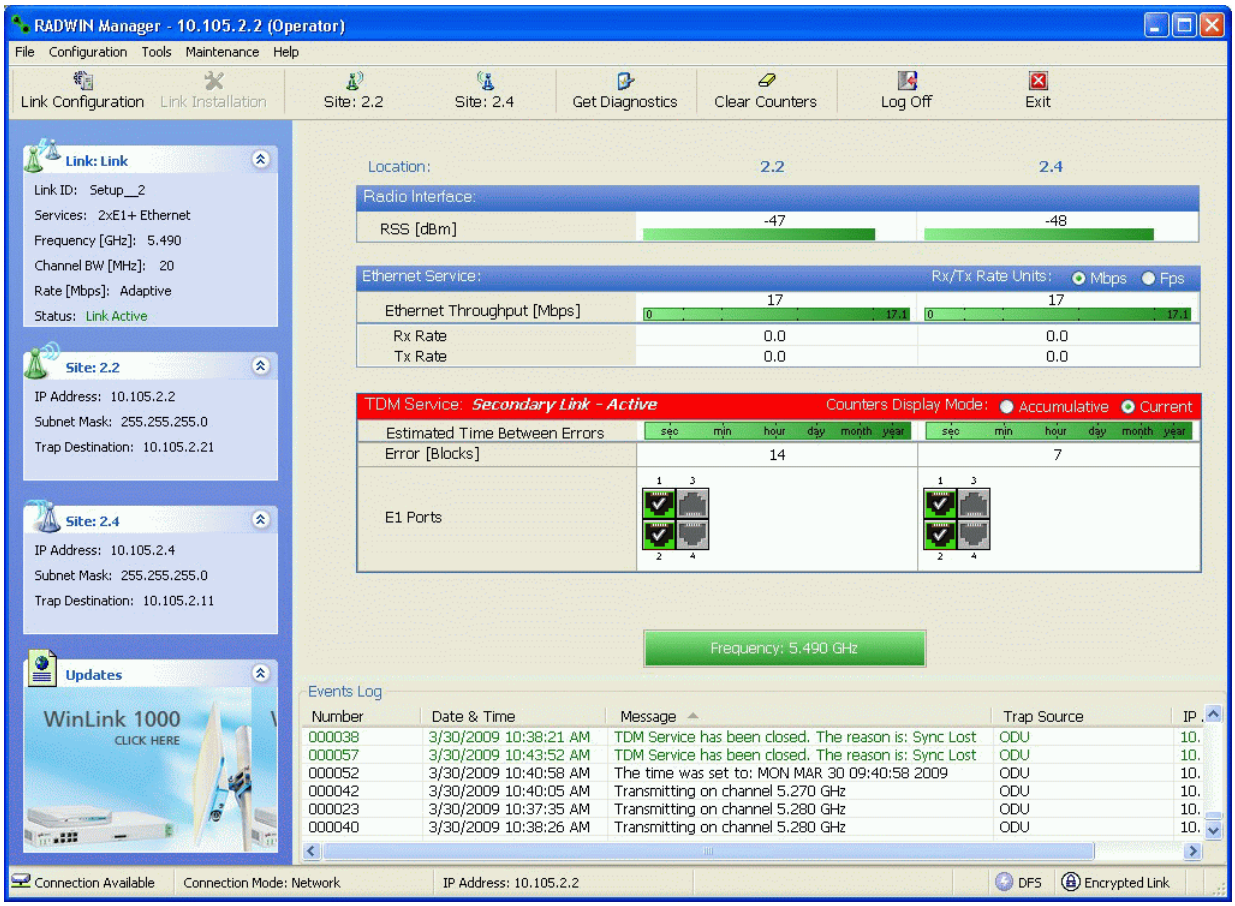


Figure 15-10: Secondary link operating after the switch over to secondary. (After a few moments the TDM icons become green.)

Switching back from the Secondary to the Primary Link

Switching back from the secondary link to the primary link will occur after the primary link has become and remains fully functional for a continuous period of at least one second. Following reversion from the secondary link to the primary link, the Manager main windows should look like this:

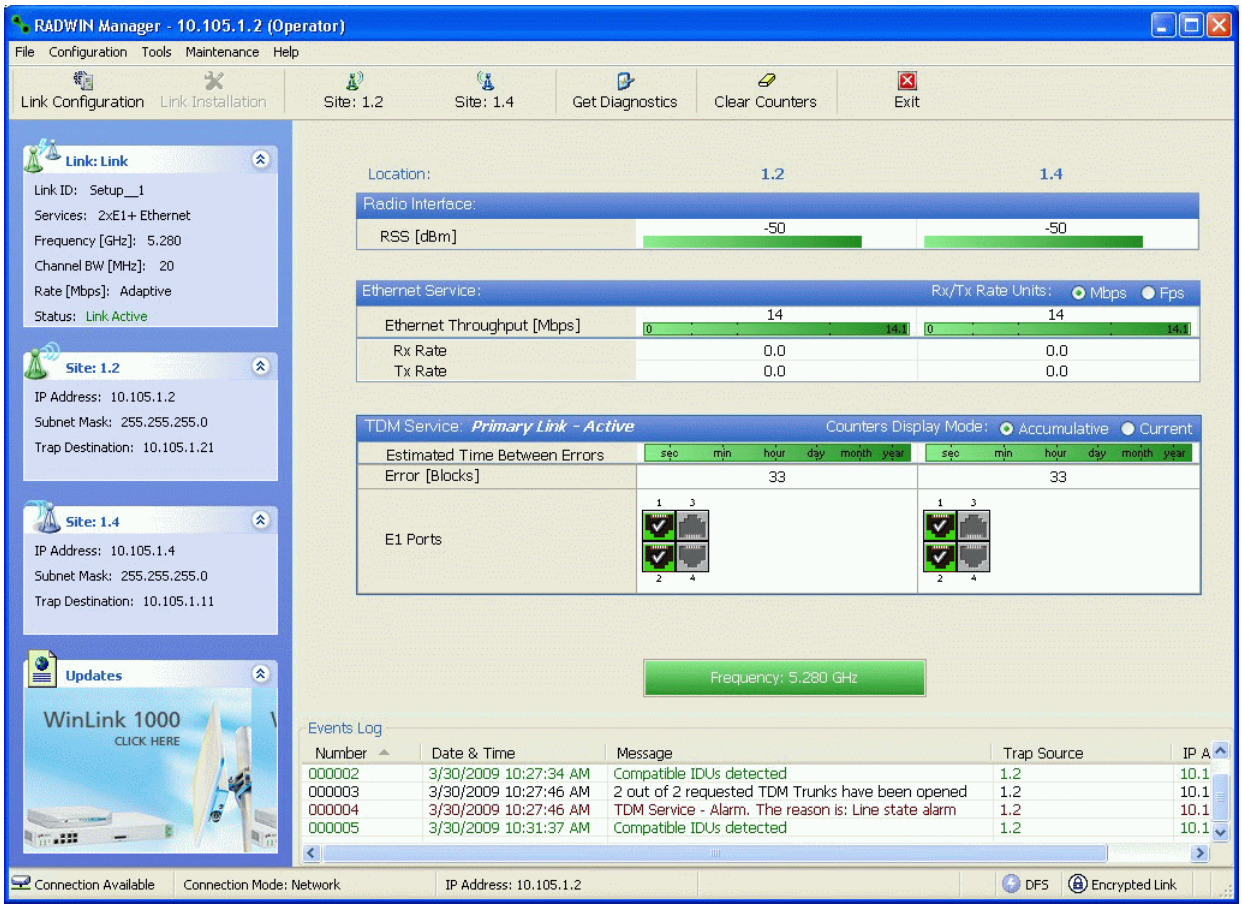


Figure 15-11: Primary link operating after the switch back from secondary

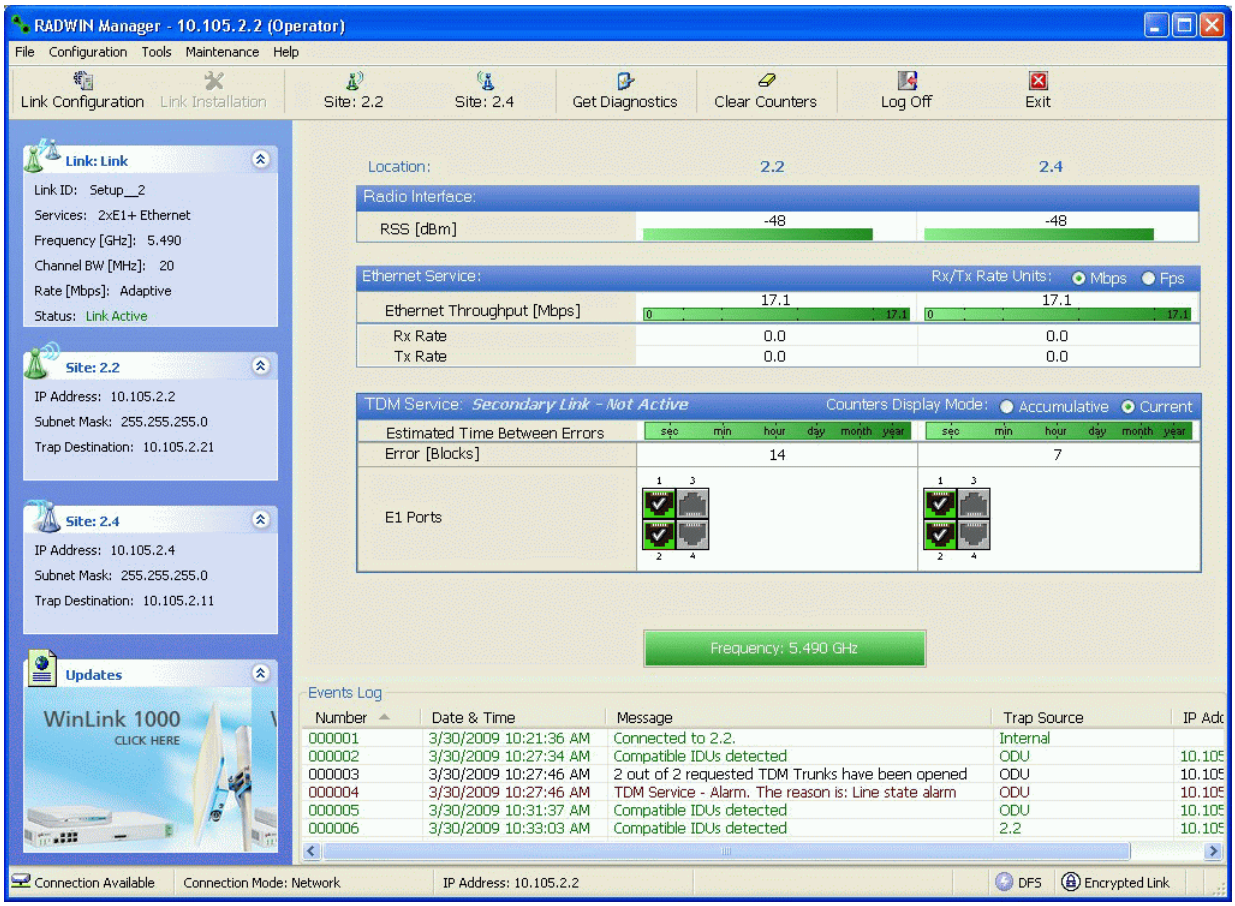


Figure 15-12: Secondary Link operating after the switch back to Primary

System Operation description

Normal operation	• TDM services are carried by the primary link • The secondary link (equipment and air interface) is operating but not carrying user traffic • TDM ports on the secondary IDUs are tri-state

Switching to backup	• Switching to secondary will occur in the following cases:
	  • Loss of the primary air interface due to sync-loss
	  • Loss of the primary air interface due to failure of the receiver to acquire expected TDM data during a period of 24ms
	  • Primary equipment power off (either ODU or IDU, local or remote)
	• The switching result would be:
	  • TDM ports on the primary IDUs turn to tri-state
	  • TDM ports on the secondary IDUs become active

Backup operation	• TDM services are carried by the secondary link
Switching back to primary	• Switching back to primary will occur as soon as the Primary link is fully functional for 1 second

Chapter 16

The RADWIN Ethernet Ring

Scope

The description of RADWIN Ethernet Ring in this Chapter is completely generic: Both WinLink 1000 and RADWIN 2000 links may participate in an Ethernet ring.



Caution

VLAN IDs are used by RADWIN products in three separate contexts: Management VLAN, Traffic VLAN and Ethernet Ring. It is recommended that you use different VLAN IDs for each context.

What is an Ethernet Ring

An Ethernet ring consists of several nodes connected by hops (links). Loops are not allowed with Ethernet; therefore one hop is a **Ring Protection Link** (RPL) which "blocks" Ethernet traffic. In the event of failure in the ring, the Ring Protection Link unblocks and Ethernet traffic in the ring is restored.

Some terminology:

- **Normal State** – all member links are functional except the RPL which is blocked.
- **Blocked** - the air-link is up but Ethernet traffic is not transmitted across the link. The Ethernet service panel for the RPL in the RADWIN Manager is labeled **Idle**
- **Unblocked** - Ethernet traffic is transmitted across the RPL. The Ethernet service panel for the RPL in the RADWIN Manager is labeled **Active**
- **Protection State** – a member link is broken and the RPL passes Ethernet traffic
- **Ring Protection Link** - as described above
- **Ring Link** - any member link controlled by the RPL
- **Independent Link** - not subject to ring protection

- **Ring Protection Message** (RPM) - control message used to monitor and control the ring.

Note

RPM messages are **broadcast**, so it is essential (to prevent flooding) to associate the RPL and member Ring LInks with a VLAN ID. This requires in turn, that equipment used in the ring either supports VLAN or can transparently pass through VLAN tagged packets.

RADWIN Ethernet Ring

The following figure describes the RPL behavior during a ring failure and recovery cycle.

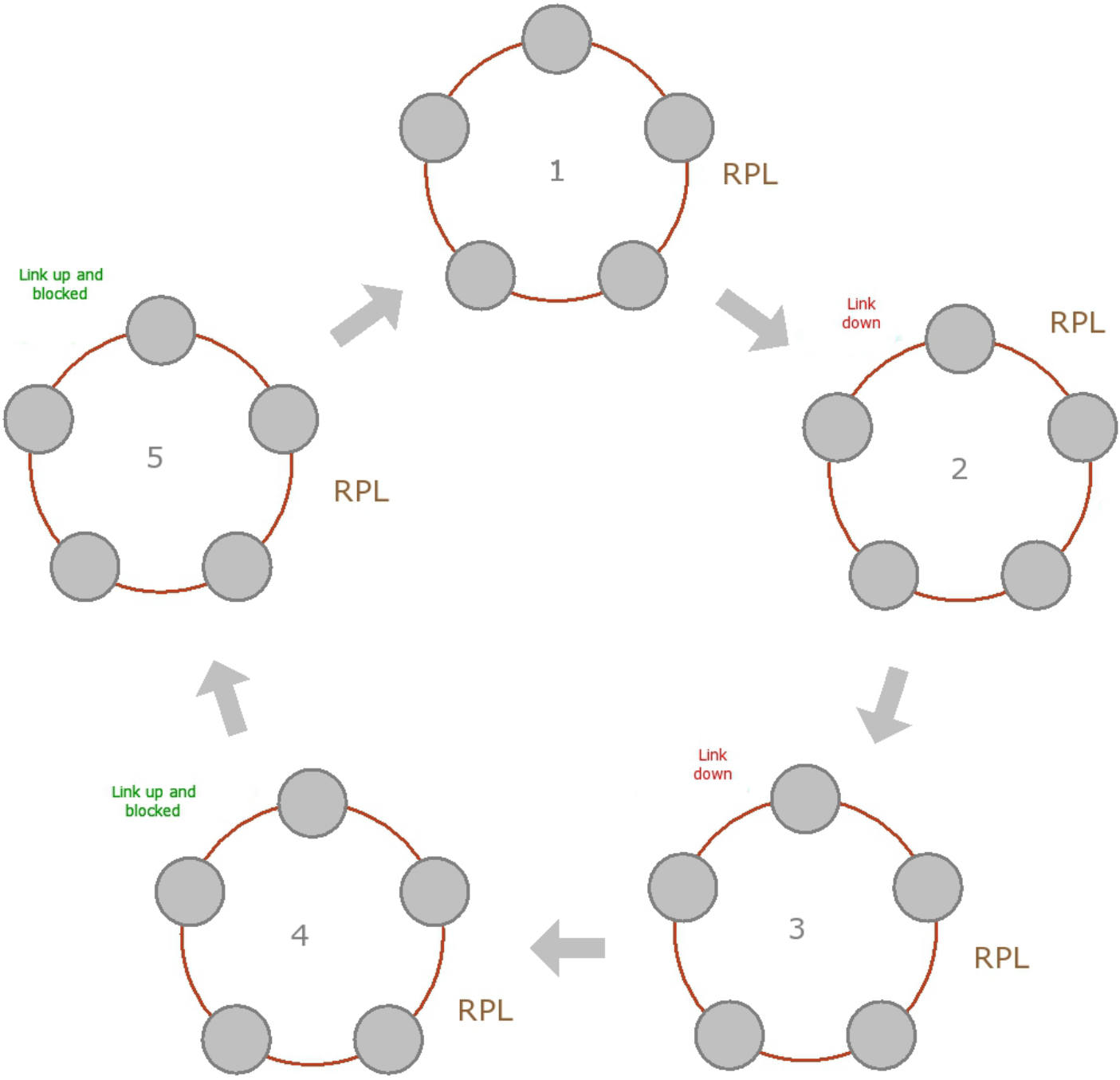


Figure 16-1: Ring Protection mechanism

The steps below follow the numbering in **Figure 16-1**:

1. Normal operation

Ethernet traffic runs in the ring, but does not pass through the RPL, which is blocked. The RPL does however, broadcast RPM packets through the ring.

2. Ring Link down, RPL notified

The RPL detects a link-down condition by the non-arrival of an RPM packet. It remains blocked for the **Minimum time for failure detection** which is configurable using the RADWIN Manager (see page **16-10**).

3. Ring Link down, RPL unblocked for traffic

The RPL unblocks for Ethernet traffic after the **Minimum time for failure detection** expires and no RPM message has been received.

4. Ring Link restored but still blocked for traffic

The Ring Link is restored, but remains blocked for the **Minimum time for recovery**, set using the RADWIN Manager, to avoid rapid fluctuations leading to potential short term loops (see page **16-10**).

5. Ring Link restored, RPL blocked for traffic

The RPL blocks to Ethernet traffic after the **Minimum time for recovery** expires and restores Ethernet traffic to the Ring Link (with a special RPM packet).

Return to 1.) Ring Link restored, RPL blocked for traffic

The ring is back to normal operation.

With RADWIN links, RADWIN's Ring Protection solution prevents Ethernet loops in the ring at all times. The ring is always broken somewhere.

- Under a ring configuration a RADWIN Ring Link that was down and commences recovery, keeps blocking Ethernet traffic. The RPL identifies this situation, blocks itself and then unblocks the other Ring Link. This is the transition from step 4 to 5 in **Figure 16-1**.
- If the failed hop is not a RADWIN link then there are two possibilities:
  - If the hop Ring Link can signal that it is down by issuing a Loss of Signal (LOS) at the Ethernet port, then the RPL will control the RADWIN link connected to that port in the same manner as described above, to prevent an Ethernet loop.
  - Otherwise, there may be a short loop period when the RPL is still open for traffic and the Ring Link is also unblocked during the **Minimum time for recovery**.

Ethernet Ring Topologies Supported by RADWIN

The following ring topologies are supported:

Table 16-1: Topologies supported by *RADWIN* Ethernet Ring

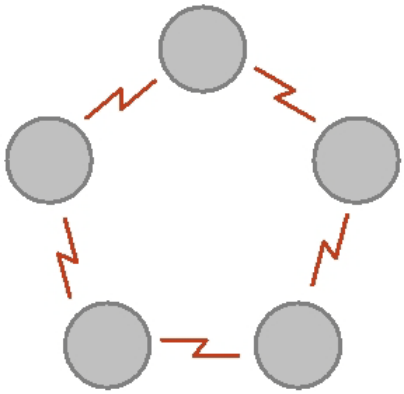
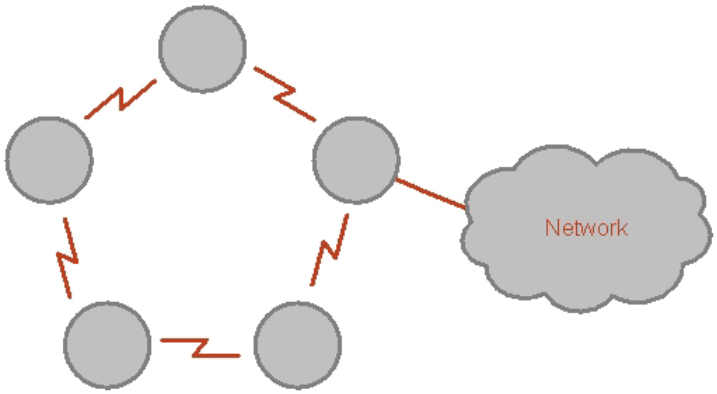
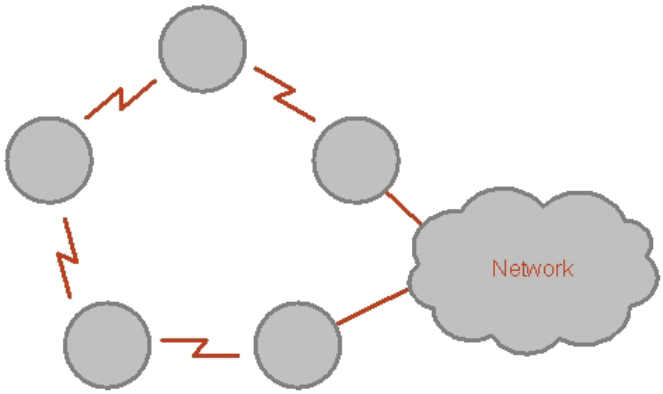
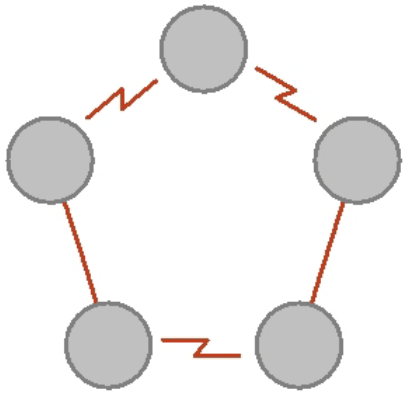
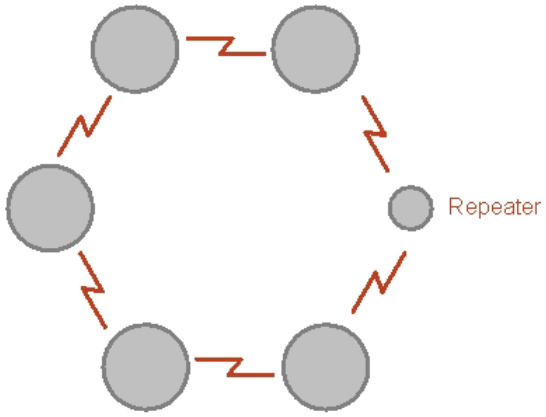
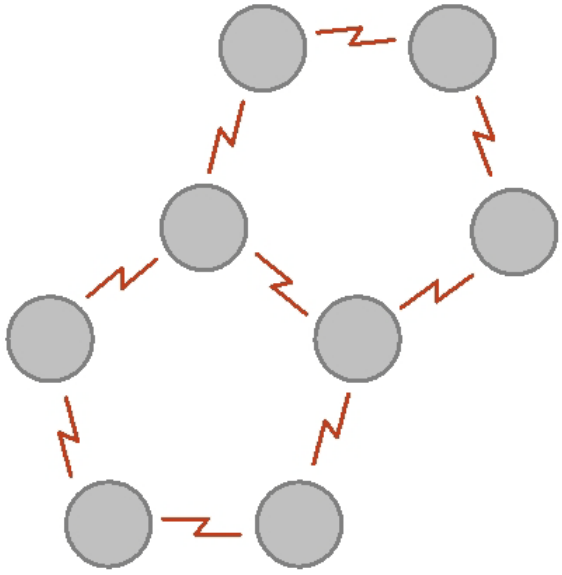
Stand-alone ring	The ring is not connected to other rings 
Single-homed ring	One of the nodes is connected to another network / ring: 
Dual-homed ring	Two adjacent nodes are connected through a non-RADWIN link (e.g. micro wave or fiber):  Note: • The network has to be layer 2 and support VLANs • The ring control broadcasts RPM packets. Hence it is recommended to prevent these packets from propagating into the network

Table 16-1: Topologies supported by *RADWIN* Ethernet Ring (Continued)

Mixed ring	Some of the hops are connected through non-RADWIN links: 
Repeater sites	Some of the hops are connected through RADWIN links with PoE devices, not supporting ring functionality: 
Shared ring	RADWIN rings with shared hops.  Note: • A RADWIN link hop can be a part of up to 4 rings • The RPL cannot be a shared link • The two RPLs should use different Minimum Time for Activation values to prevent duplicate action causing a loop

Protection Switching

Protection switching occurs upon failure in the ring.

The Ethernet service restoration time depends on the number of hops in the ring. With four hops the Ethernet service is restored in less than 50 ms.

In single and dual homed topologies the service restoration may take longer due to the aging time of the external switches. Switches that are immediately aware of routing changes reduce the restoration time.

Hardware Considerations

Ethernet Ring Protection is supported by the IDU-C, IDU-E and PoE.

A typical Ring Protection Link consists of an IDU-C or IDU-E, a PoE and two ODUs as shown in **Figure 16-2**. Hence one end of the RPL and of ring controlled links, as shown in **Figure 16-2** has to be an IDU. It is recommended to have an IDU at each node to have the flexibility to change the RPL.

A ring node is built from two ODUs from adjacent links. The ODUs can be connected to either an IDU or to a PoE device as in **Figure 16-2**. Port names in the IDU are shown.

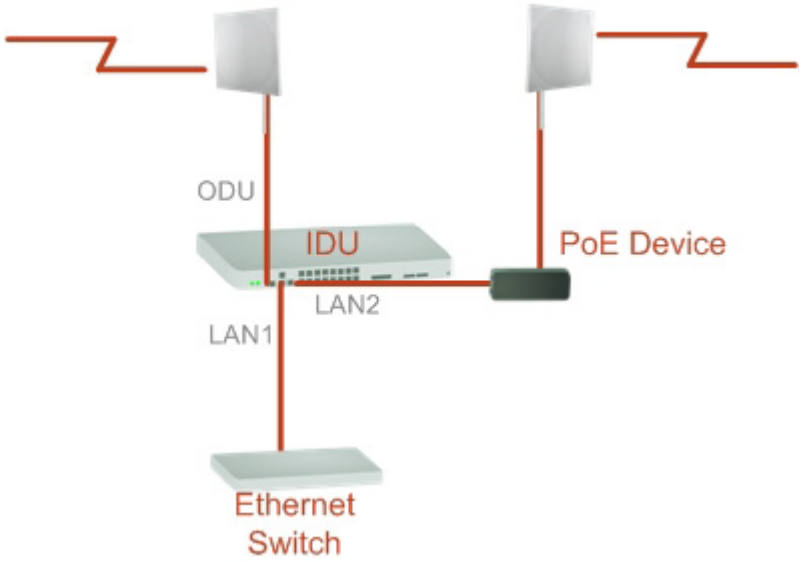


Figure 16-2: Node with IDU and PoE device

Note

Connect the switch at the site only to one IDU.

The switching function is carried out by the IDU-Cs and IDU-Es, both of which provide Layer 2 support (see **Chapter 18**).

Special Case: 1 + 1 Ethernet Redundancy

The same device may be used to provide economic 1 +1 redundancy for a single link.

A 1+1 Ethernet is a ring with two nodes. One of the links is RPL.

The equipment in a 1+1 Ethernet installation is as follows:

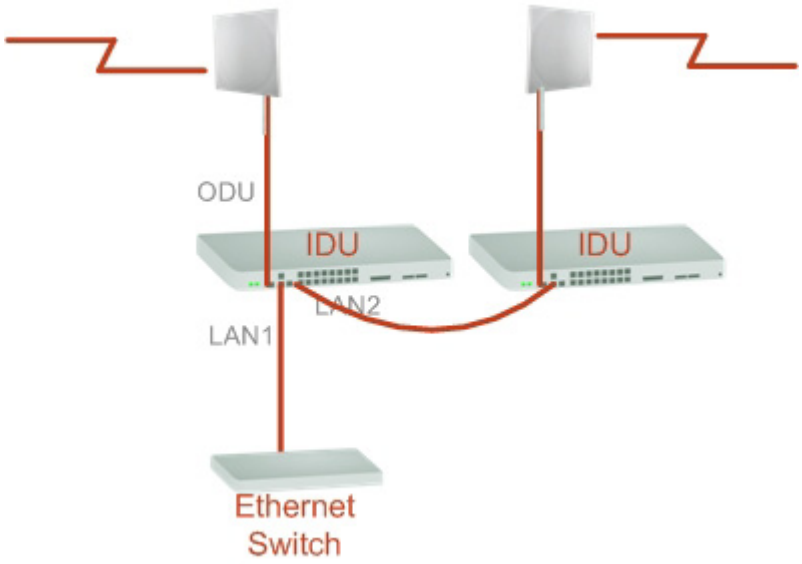


Figure 16-3: 1+1 Ethernet

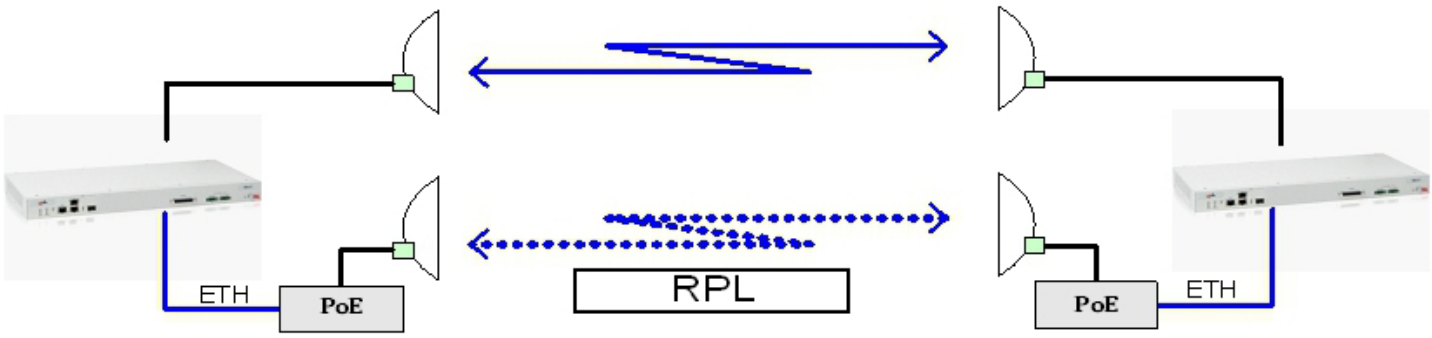


Figure 16-4: Using IDU-C or IDU-E with PoEs for the RPL

Notice that link content drops from four PoEs plus two switches to two PoEs and two IDU-Cs or IDU-Es.

Using RADWIN Manager to Set up a Ring

Creating a Ring using RADWIN Manager requires two stages:

6. Set up each participating link separately, in the usual way
7. For each link, run the Configuration wizard to define it as RPL or a Ring Link

Note

- The Ring uses a VLAN ID for the RPL. It is used to manage the Ring and nothing else; it is completely separate from the management and traffic VLANs referred to elsewhere
- A regular Ring Link may be a member of up to four rings and each of their RPL VLAN IDs must be configured

Here then, is step 2 in more detail:

To integrate a link into an Ethernet Ring:

1. Using either the Installation or Configuration wizards, navigate to the Services window and chose the Ring tab.

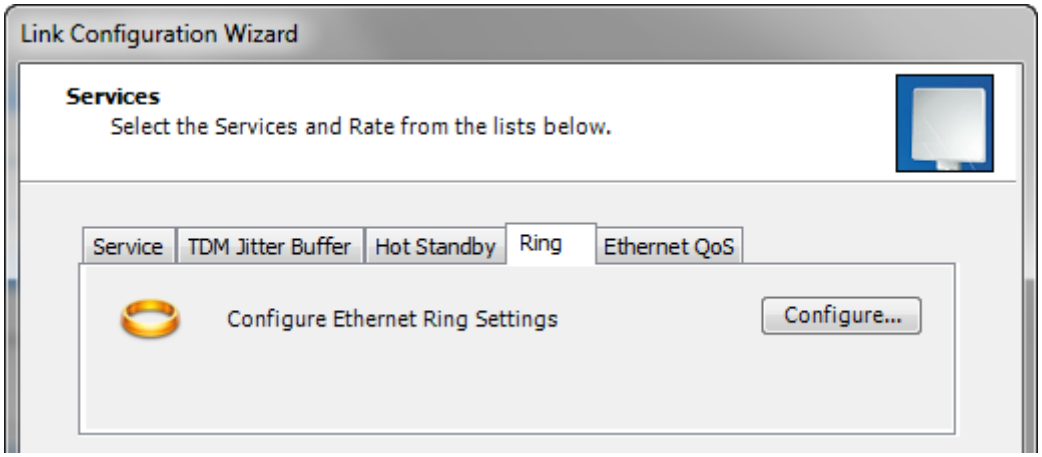


Figure 16-5: Services window with Ring selected

2. Click **Configure**. The Ring definition window is displayed. The default is Independent Link and is used when the link is not part of any Ring.

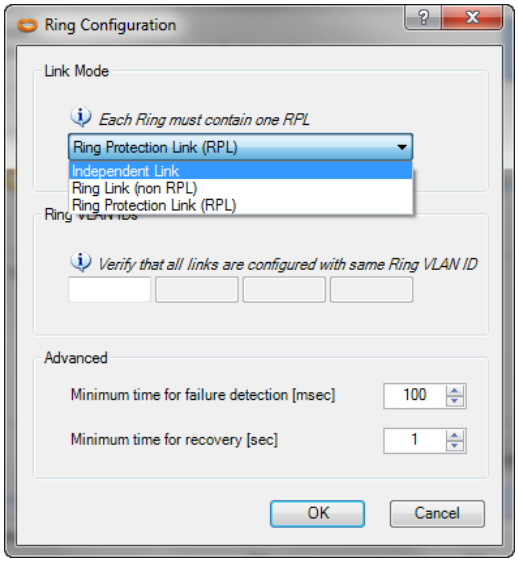


Figure 16-6: Ring Options

3. To configure the link as a regular Rink link, click **Rink Link (Non- RPL)** and enter the ring LAN VIDs (at least one) to which it belongs and click **OK**:

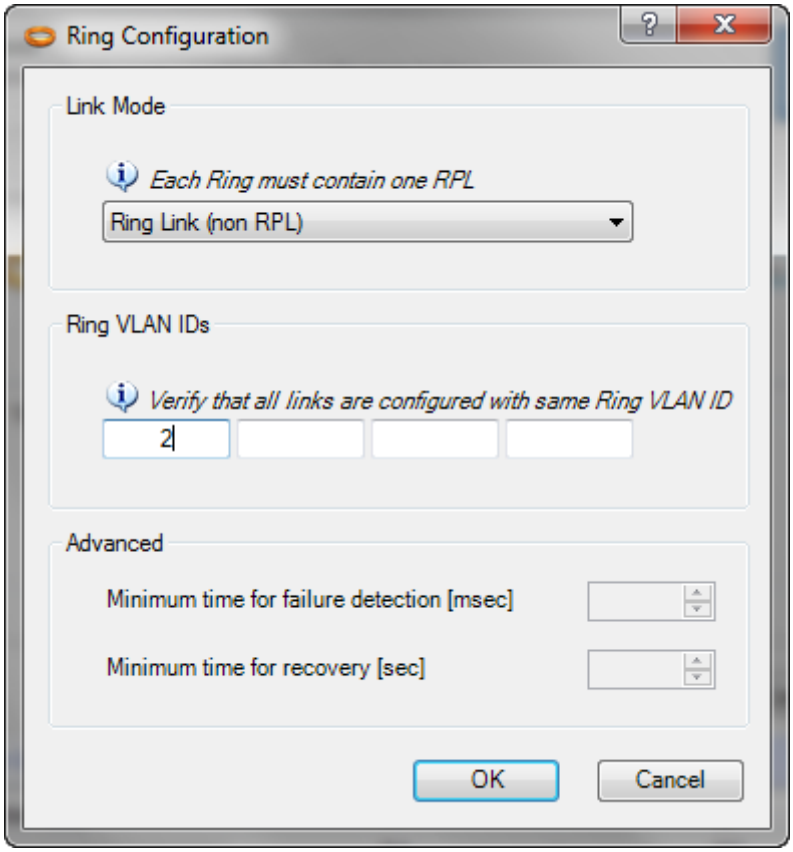


Figure 16-7: Configuring Ring LAN VIDs

4. To configure the link as RPL, click **Ring Protection Link (RPL)** and enter its Ring VID.

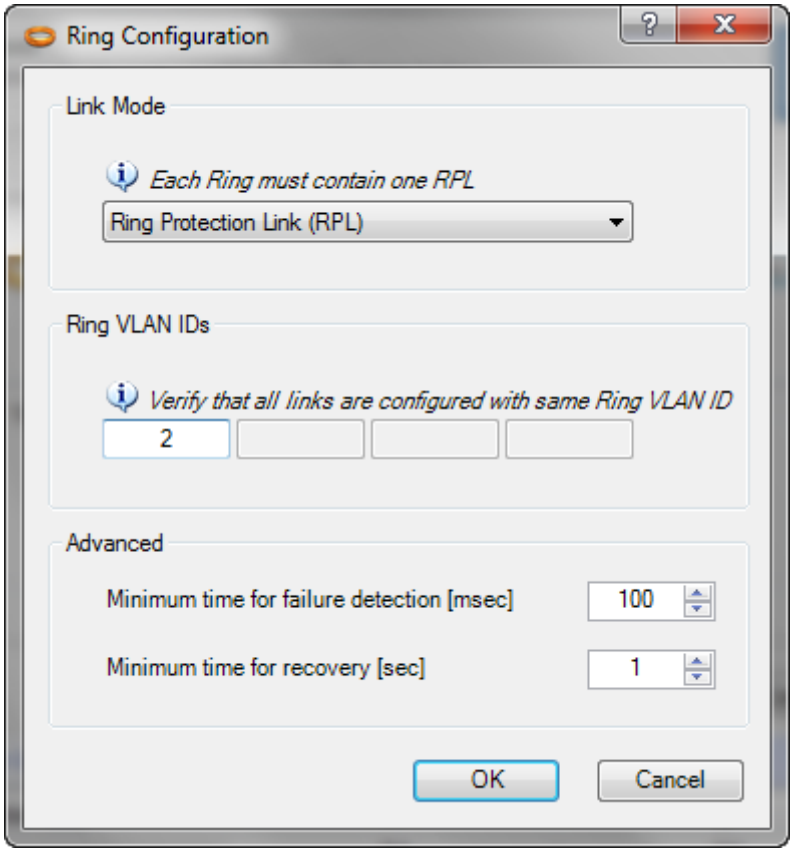


Figure 16-8: Configuring RPL VIDs

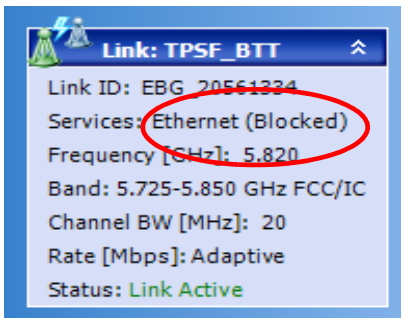
5. Enter the minimum times for failure detection and recovery.

   For dual-homed configurations, where part of the ring goes through the core, if a core segment fails, the core should be allowed to recover before the RPL enters Protection State. Otherwise, it could happen that both the core and the RADWIN ring will switch in parallel. You should therefore, configure a **Minimum time for failure detection** high enough to take this possibility into account.

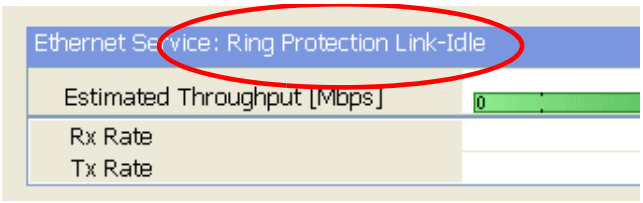
   The **Minimum time for recovery** is a delay switch to prevent rapid "on-off" fluctuations. It functions like a delay switch use to protect electrical devices from rapid "on-off" power fluctuations, which in this context, may lead to potential short term loops.

6. Click **OK** to accept your settings.

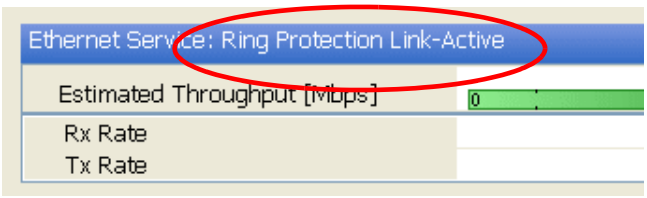
   The RPL will be clearly indicated in the RADWIN Manager. In the Link status area on the top left, you will see an Ethernet (Blocked) notice:



   A Link-Idle message is displayed on the Ethernet Services Bar:



When the RPL cuts in as a result of a failure, the "Ethernet (Blocked)" notice disappears. The Ethernet Services Bar indicated that the RPL is active:



Upon restoration of the broken link, the RPL returns to idle status with the appropriate indications on the RADWIN Manager main window.

On the status bar for all ring member links, you will see the ring membership indicator icon:



Caution

- Do not configure more than one RPL. If you do, you will break the Ring
- If you forget to configure one RPL in a Ring, you will introduce a loop into your network

Chapter 17

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
- Upgrade from a list
- Delayed upgrade
- Various ODU reset options

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



The following procedure is generic to all RADWIN point to point radio and GSU products.

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

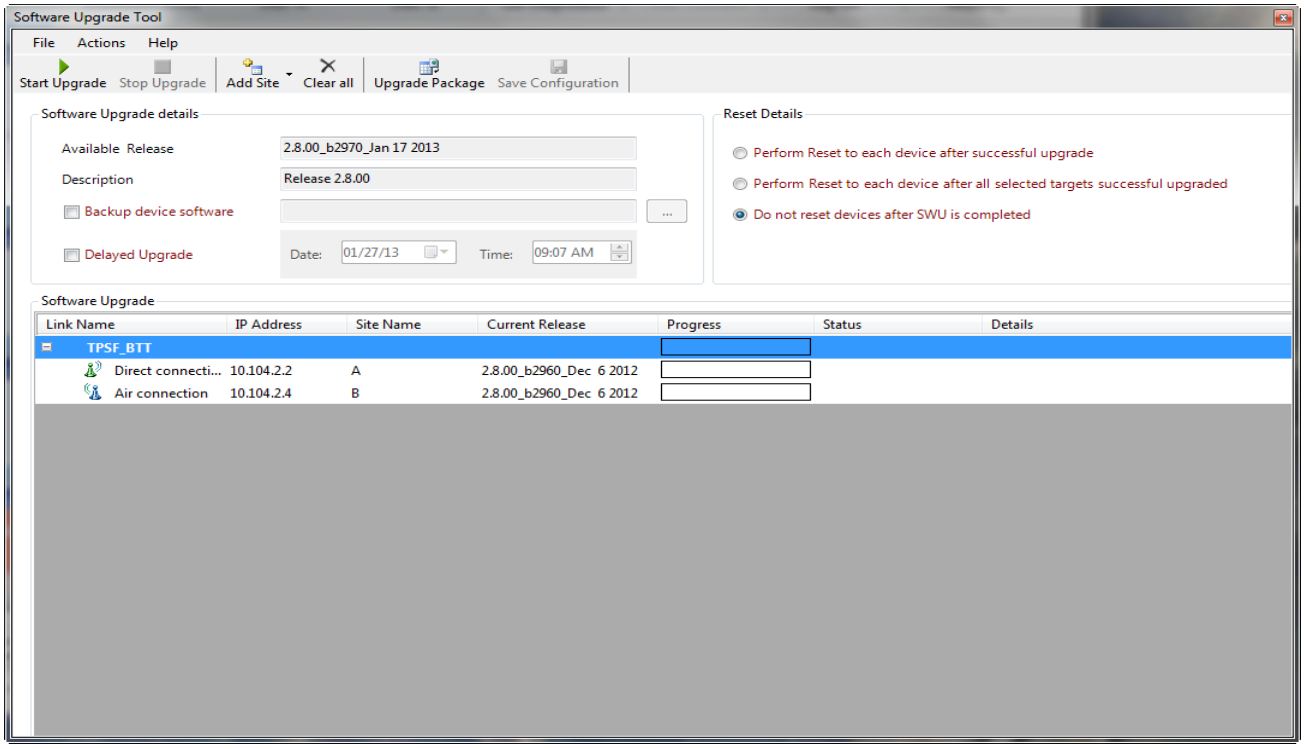


Figure 17-1: Software Upgrade Utility - Main window

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".

Warning

What follows about adding sites manually or from a list file, assumes that all sites to be upgraded are of the same type - either WinLink 1000 or RADWIN 2000. but not both. **This will not work with a mixed list.**

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

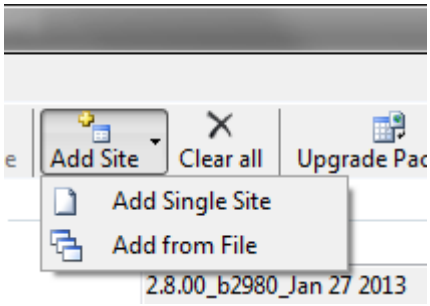


Figure 17-2: Add site options

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

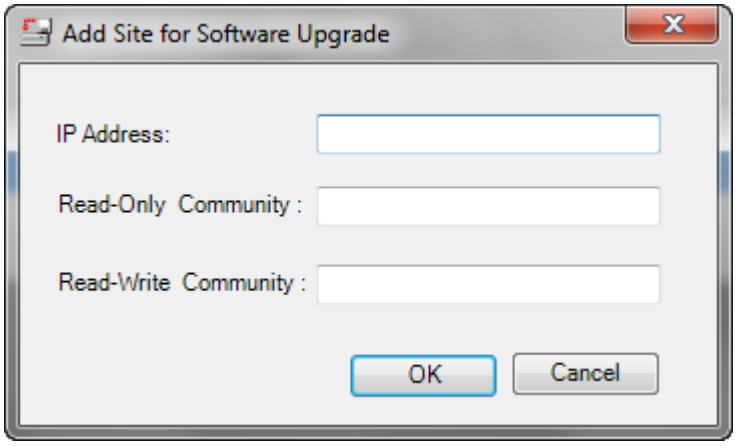


Figure 17-3: Adding a single site for upgrade

Enter the IP address of the site, the Community strings (Default: **public** and **net-man**, respectively) and then click OK. The site will appear in the Software Upgrade list box.

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 17-2**. The list has the following format:

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

Here is an example:

10.104.2.2,public,netman

10.104.2.4,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.

Note

You can only include one type of ODU in a list. That is, you need separate list for RADWIN 2000, WinLink 1000 and GSU products.

4. You make limited changes to the list by right-clicking any line:

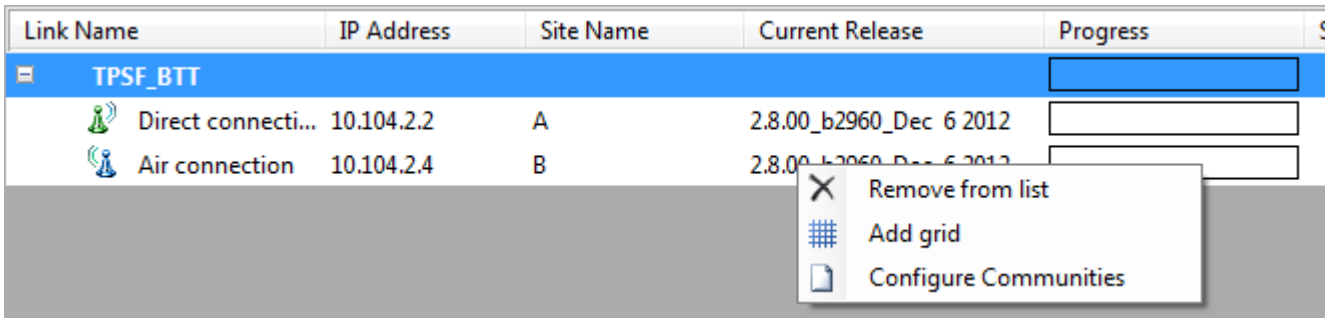


Figure 17-4: Software Upgrade site options

5. To back up your existing system, check **Backup device software** check-box. Then click the ... button for a standard file dialog. The default location is the My Documents directory on the managing computer or the last backup directory you used.

Note

The backup here is the same as that in page 9-42, and serves the same purpose. It provides a fallback if the upgrade proves problematic.

6. In addition to the previous step, you may opt to perform a delayed upgrade. Check the Delayed Upgrade box, and enter the date and time for the delayed upgrade.
7. The radio buttons on the right determines how your sites should be reset. 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.
8. Click **Start Upgrade** to commence the process. For an immediate upgrade you will be able to observe the upgrade progress from the green progress bars:

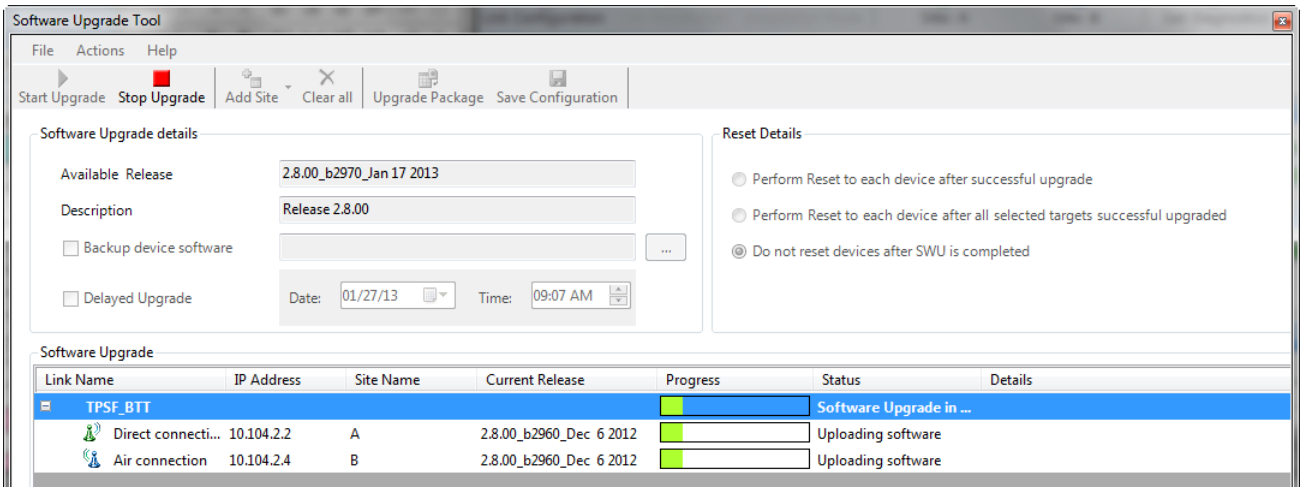


Figure 17-5: Software upgrade in progress - Note the stop button

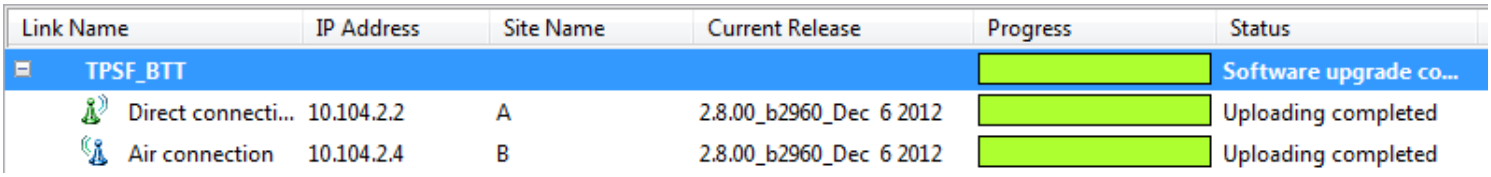
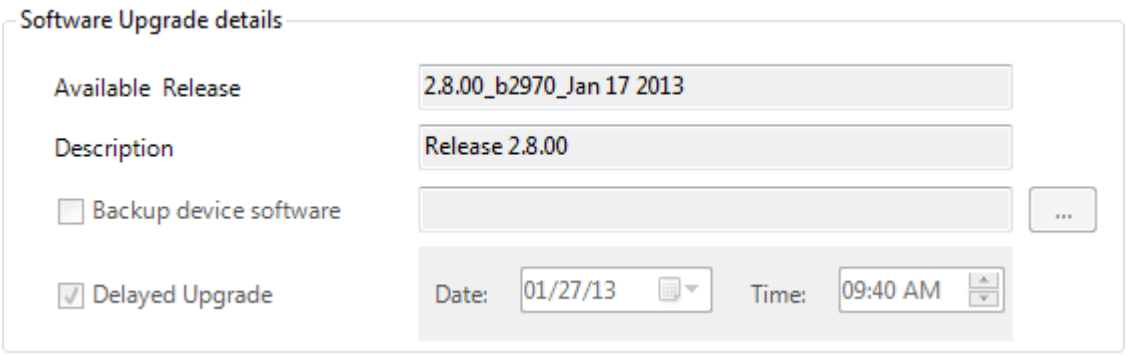


Figure 17-6: Software upgrade completed successfully

9. Click **Close** to exit.
10. If you requested a delayed upgrade, a notice like this will appear:



Caution

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

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 10-3** for details.

Software Upgrade for GSUs

All GSUs in a distributed site can be updated simultaneously. Use an IP list as described above.

Chapter 18

VLAN Functionality with RADWIN 2000

VLAN Tagging - Overview

VLAN Terminology

Both the technical literature and the RADWIN Manager use the terms VLAN ID and VID interchangeably to denote a VLAN identification number.

VLAN Background Information on the Web

The standards defining VLAN Tagging are IEEE_802.1Q and extensions.

For general background about VLAN see **http://en.wikipedia.org/wiki/Virtual_LAN**.

Background information about **Double Tagging** also known as **QinQ** may be found here: **http://en.wikipedia.org/wiki/802.1QinQ**.

VLAN Tagging

VLAN tagging enables multiple bridged networks to transparently share the same physical network link without leakage of information between networks:

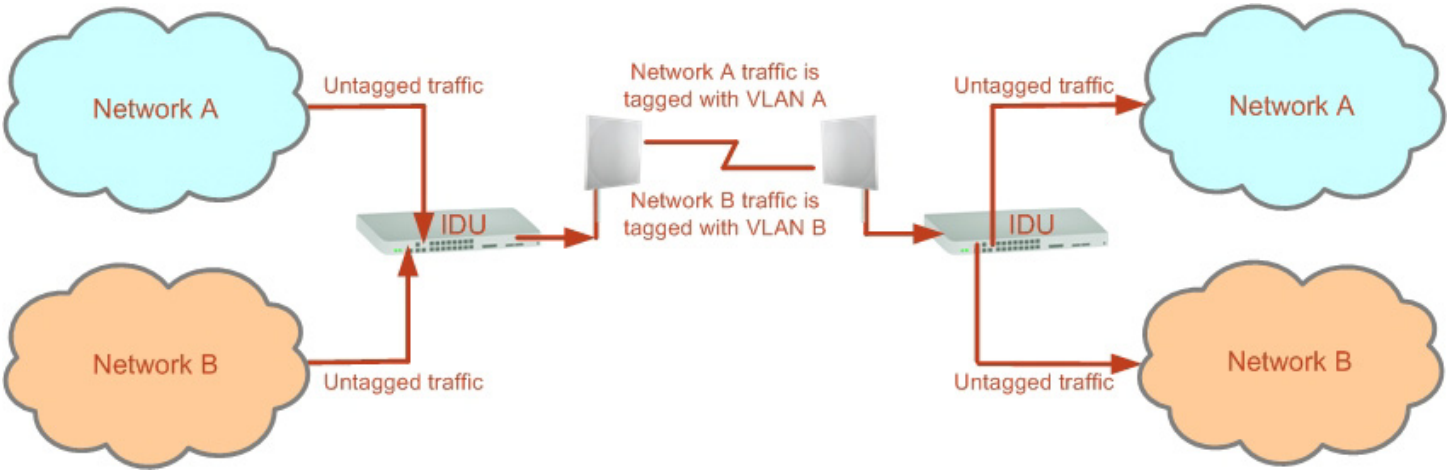


Figure 18-1: Two network using the same link with tagging

IEEE 802.1Q is used as the encapsulation protocol to implement this mechanism over Ethernet networks.

QinQ (Double Tagging) for Service Providers

QinQ is useful for Service Providers, allowing them to use VLANs internally in their "transport network" while mixing Ethernet traffic from clients that are already VLAN-tagged.

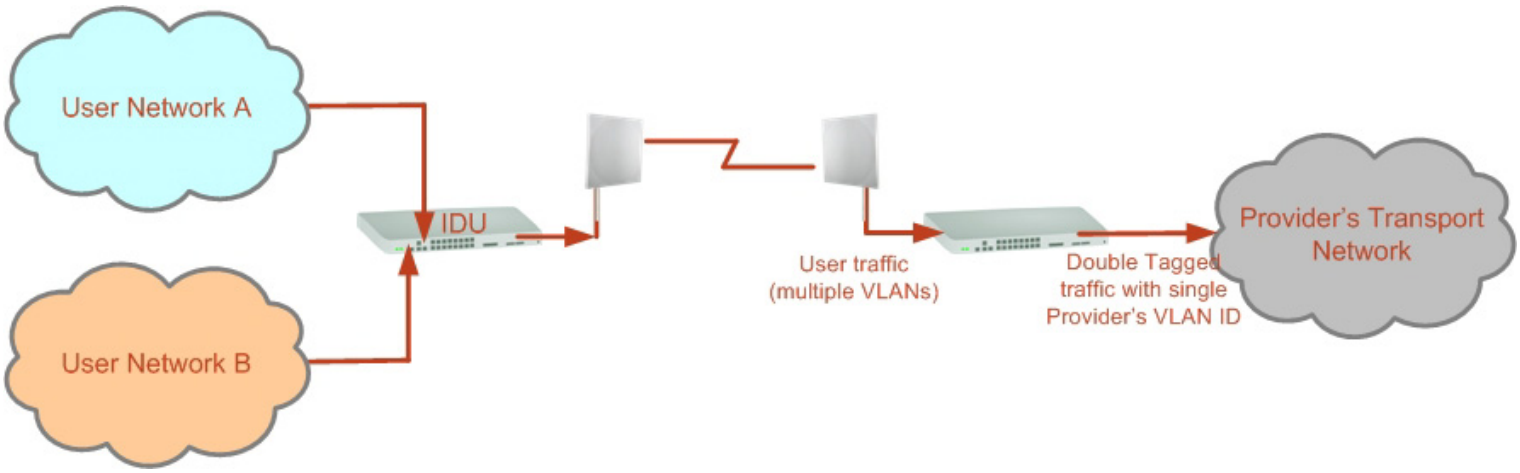


Figure 18-2: Separating client data streams using double tagging

The outer tag (representing the Provider VLAN) comes first, followed by the inner tag. In QinQ the EtherType = 0x9100. VLAN tags may be stacked three or more deep.

When using this type of "Provider Tagging" you should keep the following in mind:

- Under Provider Tagging, the system double-tags egress frames towards the Provider's network. The system adds a tag with a VLAN ID and EtherType = 0x9100 to all frames, as configured by the service provider (Provider VLAN ID).
- The system always adds to each frame, tags with VLAN ID and EtherType = 0x9100. Therefore,
  - For a frame without a tag – the system will add a tag with VLAN ID and EtherType = 0x9100 so the frame will have one tag
  - For a frame with a VLAN tag – the system will add a tag with VLAN ID and EtherType = 0x9100 so the frame will be double-tagged
  - For a frame with a VLAN tag and a provider tag – the system will add a tag with VLAN ID and EtherType = 0x9100 so the frame will be triple-tagged and so on

VLAN Untagging

VLAN Untagging means the removal of a VLAN or a Provider tag.

Port Functionality

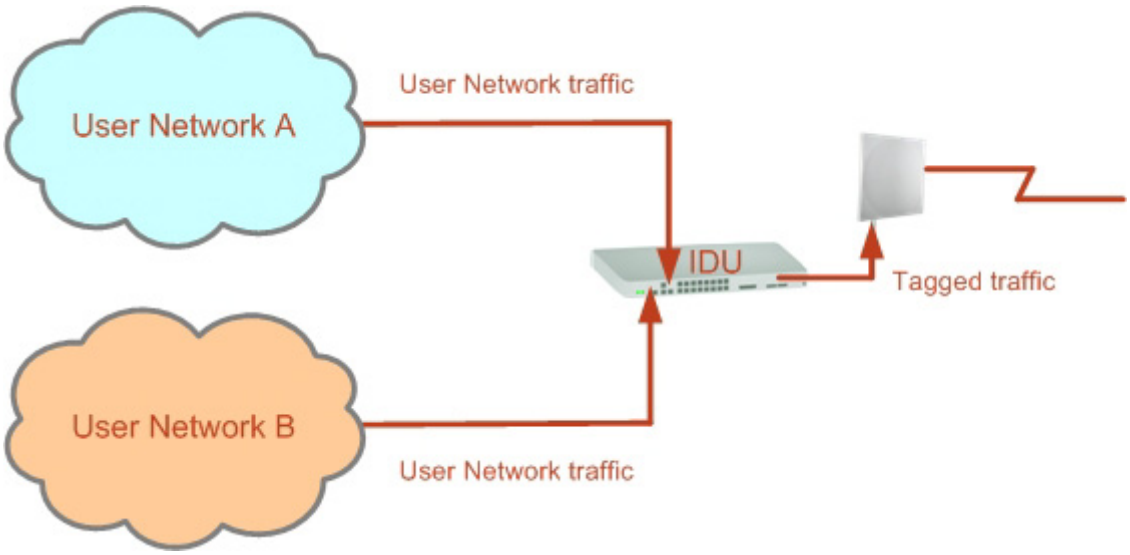
The VLAN functionality is supported by all LAN and SFP ports in the IDU.

Each port can be configured how to handle Ethernet frames at the ingress direction (where frames enter the IDU) and at the egress direction (where frame exit the IDU).

The configuration is independent at each port.

Ingress Direction

Table 18-1: Port settings - Ingress direction

Transparent	The port 'does nothing' with regard to VLANs - inbound frames are left untouched.
Tag	Frames entering the port without VLAN or QinQ tagging are tagged with VLAN ID and Priority[a], which are preconfigured by the user. Frames which are already tagged at ingress are not modified. 

a. Priority Code Point (PCP) which refers to the IEEE 802.1p priority. It indicates the frame priority level from 0 (lowest) to 7 (highest), which can be used to prioritize different classes of traffic (voice, video, data, etc).

Egress Direction

Table 18-2: Port settings - Egress direction

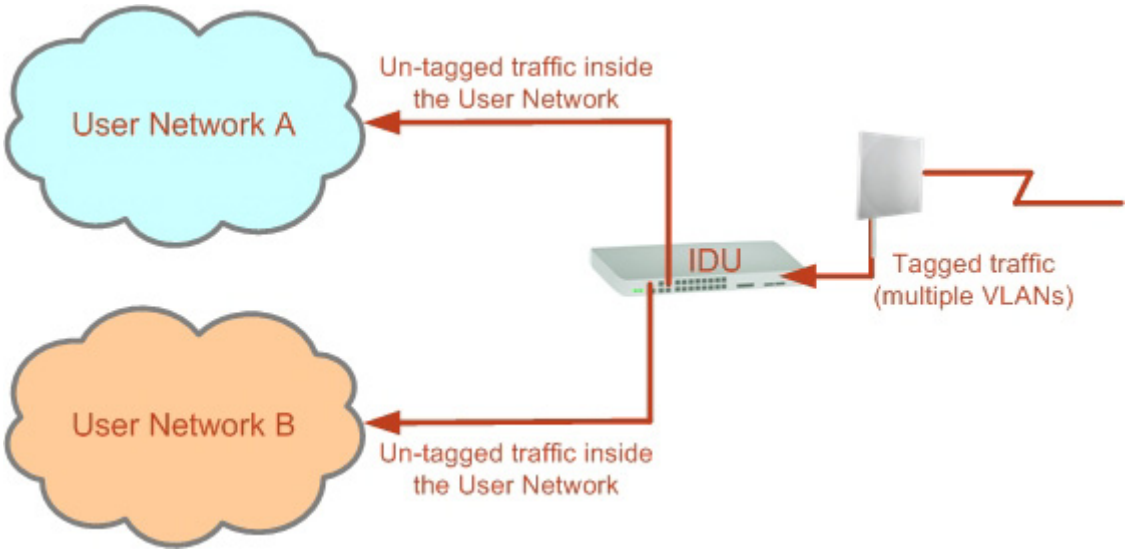
Transparent	The port 'does nothing' with regard to VLANs - outbound frames are left untouched.
Untag all	All frames are untagged. 

Table 18-2: Port settings - Egress direction (Continued)

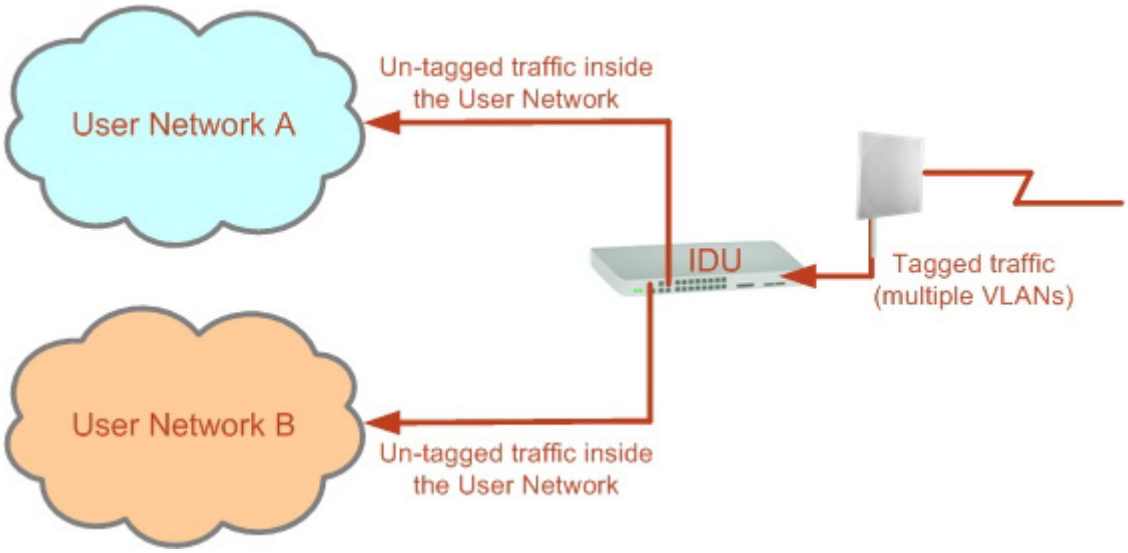
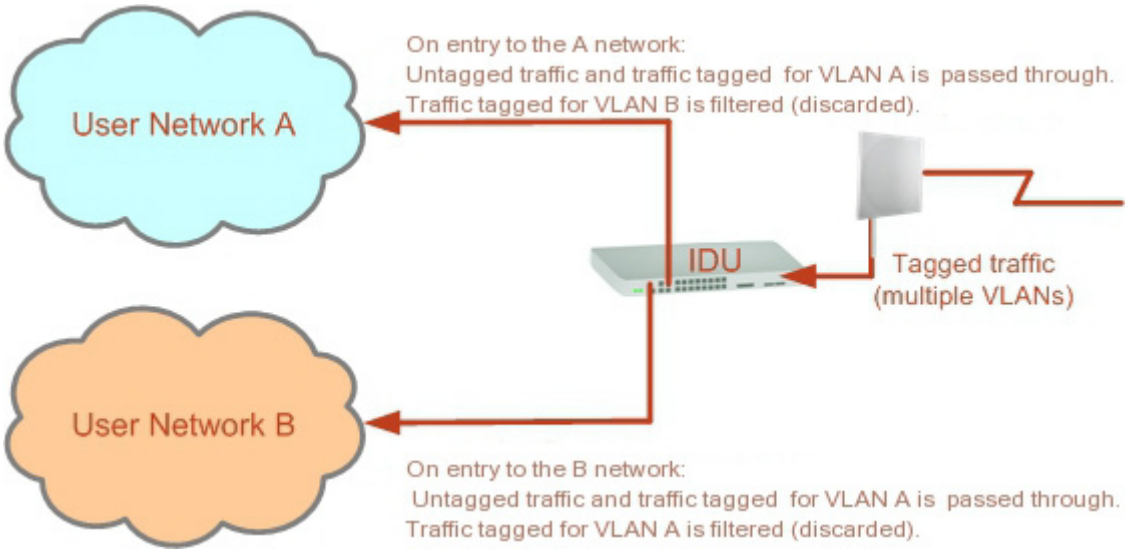
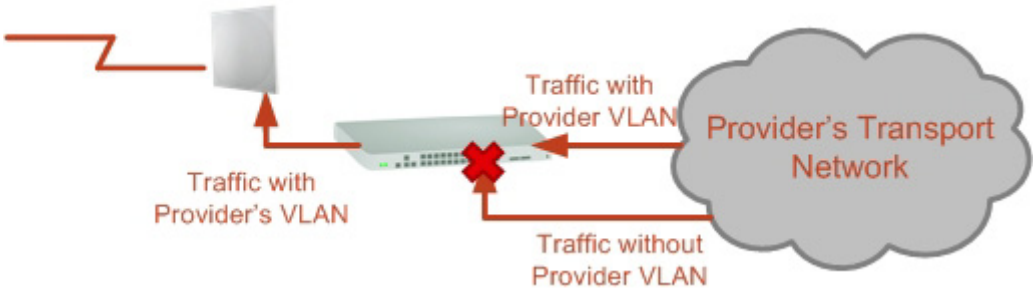
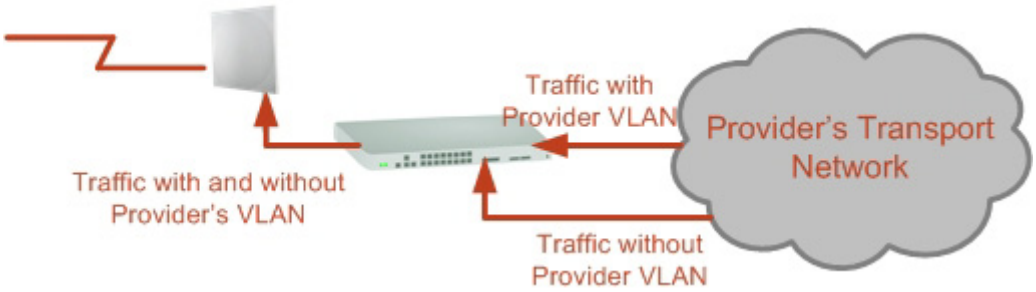
Untag selected VIDs	Untags only frames tagged with one of the user defined VIDs. You can define up to eight VIDs per port. Other frames are not modified. 
Filtered VLAN IDs at egress	This setting allows for mutual filtering of multiple ingress tags not relevant at the egress end: 

Table 18-2: Port settings - Egress direction (Continued)

Provider tagging	With Provider tagging, the system double-tags egress frames towards the provider's network. All frames are tagged QinQ with a VLAN ID, which is configured by the service provider (Provider VLAN ID).  With this setting, ingress frames which are not tagged with the configured Provider VLAN ID are blocked (filtered).  Note: Each port can be configured independently to a tagging mode. However, only a single Provider VLAN ID can be defined per IDU.
Provider tagging without filter	This setting functions like **Provider tagging**. However, all ingress frames are passed through. 

VLAN Availability

VLAN is available for links using either WinLink 1000 or RADWIN 2000 radios. VLAN support requires the use of IDU-Cs or IDU-Es for WinLink 1000. For RADWIN 2000 you may also use a PoE device and configure ODU VLAN. See **Chapter 9**.

VLAN Configuration Using the RADWIN Manager

Tip

VLAN IDs are used by RADWIN products in three separate contexts: Management VLAN, Traffic VLAN and Ethernet Ring. It is recommended that you use different VLAN IDs for each context.



Disclaimer

If you are **not** a VLAN expert, please be aware that incorrect VLAN configuration may cause havoc on your network. The facilities described below are offered as a service to enable you to get best value from your RADWIN 2000 links and are provided "as is". Under no circumstances does RADWIN accept responsibility for network system or financial damages arising from incorrect use of these VLAN facilities.

Management Traffic and Ethernet Service Separation

You can define a VLAN ID for management traffic separation. You should configure the system to prevent conflicts as detailed below.

When configured for the default operational mode, a "Provider port" will handle ingress traffic as follows:

- Filters frames that are not tagged with the Provider VLAN ID
- Removes the Provider double tag

Therefore, if a port is configured for management traffic separation by VLAN and as 'Provider port', then the received management frames must be double tagged as follows:

- The outer tag has to be the Provider's tag (so the frame is not filtered)
- The internal tag has to be management VLAN ID

To avoid mix-ups, best practice is to:

- Separate the management and data ports
- Define only a data port with Provider function

All IDU-C and IDU-E models have two LAN ports so you can easily separate management and Ethernet service.

VLAN Tagging for Ethernet Service: Configuration

VLAN Configuration is carried out per site. It is up to you to ensure consistency between the link sites. The discussion below is based on Site A however, it also applies to Site B.

See also **VLAN Tagging for Ethernet Service: Configuration**.

To set up VLAN tagging for Ethernet service, enter Site Configuration for Site A, choose the Ethernet tab and click the **VLAN Configuration...** button (**Figure 9-14**). The following window is displayed:

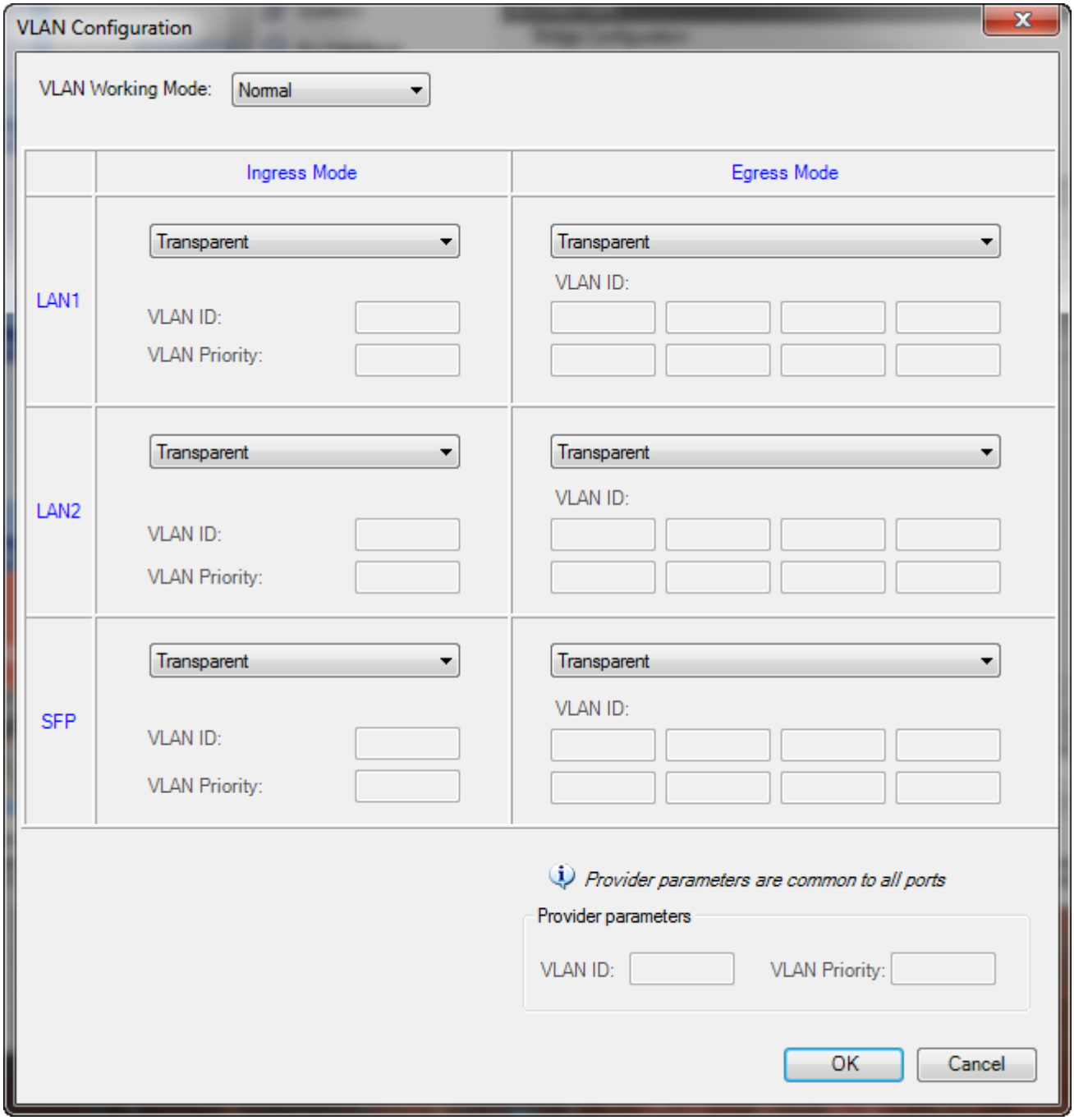


Figure 18-3: VLAN tag settings

Note

If you are using a IDU-E, the SFP row will not appear.

Normal and **Membership** modes are different ways of entering VLAN settings and are described in detail in **VLAN Tagging for Ethernet Service: Configuration on page 9-27**. What follows below is a short summary.

The choices for Ingress Mode are -

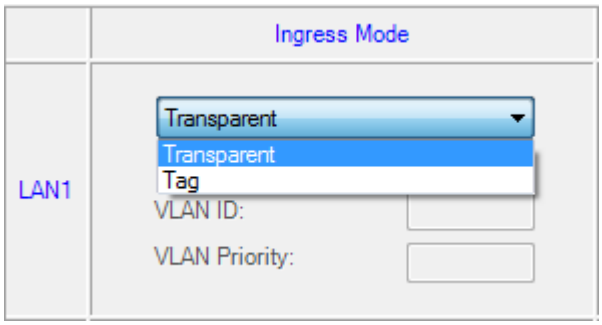


Figure 18-4: VLAN: Ingress modes

The two choices correspond respectively to the two rows of **Table 18-1**. Choosing **Tag** causes the VLAN ID and VLAN Priority fields to become available:

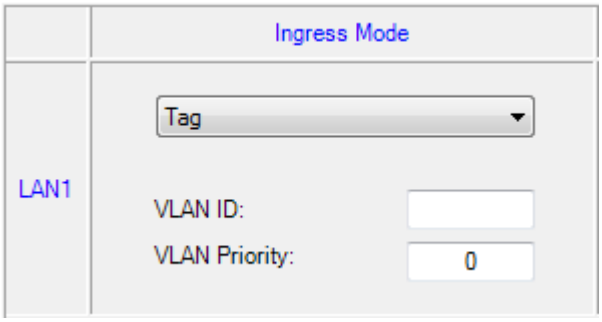


Figure 18-5: VLAN: Ingress mode - setting VLAN ID and Priority

Note

Throughout this chapter, all VLAN IDs must be between 2 and 4094, inclusive. All VLAN priorities must be between 0 and 6, inclusive. The values entered are range-checked. If for example, you enter a VLAN ID of 4095, then 4094 will be reflected back.

The choices for Egress Mode are -

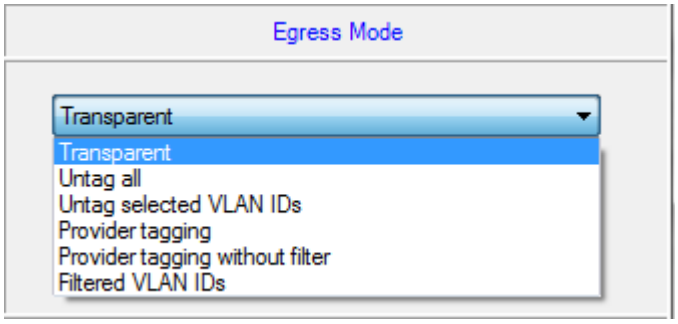


Figure 18-6: VLAN: Egress modes

The five non-transparent choices correspond respectively to the five rows of **Table 18-2** in the order, row 1, 2, 4, 5, 3.

The first two choices, **Transparent** and **Untag all** require no further action.

Untag selected VIDs causes the eight VLAN ID fields to become available:

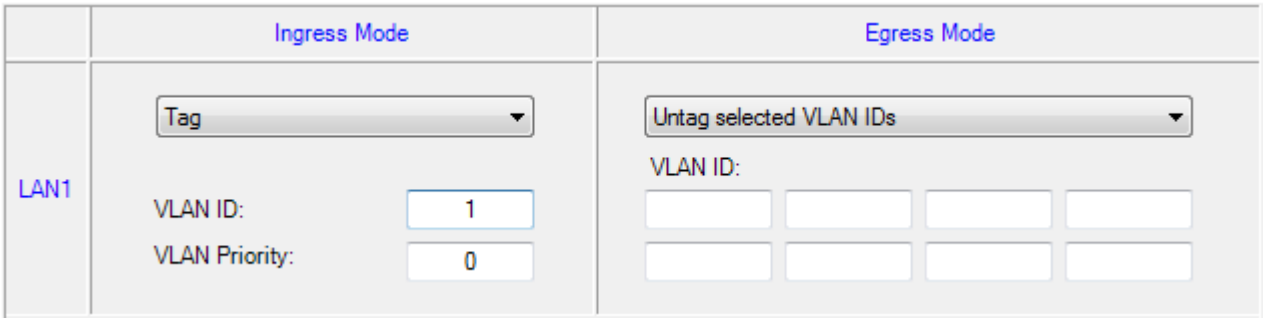


Figure 18-7: Untagging selected VIDs

You may nominate up to eight VIDs for untagging; beyond simple range checking, there is no other validation.

Both **Provider tagging** and **Provider tagging without filter** enable the **Provider parameters** fields:

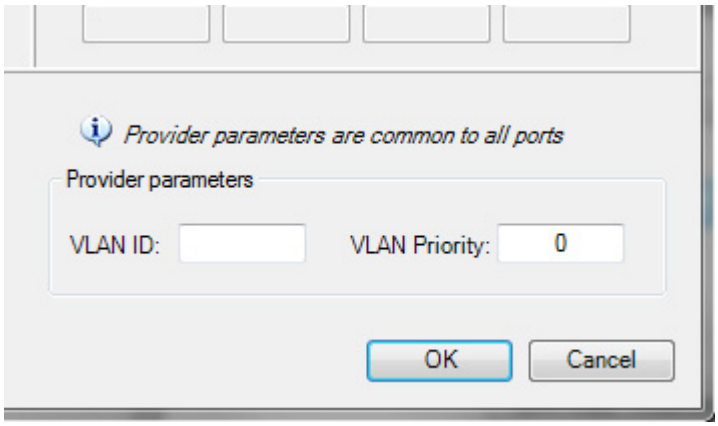


Figure 18-8: Provider parameters

There is of course only one Provider VLAN ID. It is most likely yours, as the Provider!

Filtered VLAN IDs enables you to filter and block only frames tagged with one of the user defined VIDs. You can define up to eight VIDs per port. Other frames are not modified and are forwarded transparently.

When you are finished, remember to click **OK** (**Figure 18-3**) to save your entries.

Chapter 19

FCC/IC DFS Installation Procedure

FCC/IC 5.4/5.3 GHz Links: Background

The FCC/IC regulation for 5.4/5.3 GHz allows unlicensed wireless data equipment, provided that it does not interrupt radar services. If radar activity is detected, the equipment must automatically change frequency channel. This feature is termed Dynamic Frequency Selection (DFS). According to the standard, a channel with active radar is prohibited from use for 30 minutes. Before using a channel for transmission, the radio equipment must probe it for radar signals for a period of 60 seconds.



The FCC/IC regulations for 5.4 GHz band requires the frequency range 5600 – 5650 MHz to be banned from use. The FCC regulation for 5.4 GHz band requires that within 35 km radius from any (Terminal Doppler Weather Radars) TDWR location the frequency range 5570 – 5680 MHz shall be banned from use.

Follow the instructions in the last section of this chapter.

RADWIN radio products support DFS as well as ACS.

An immediate consequence of the FCC/IC regulation for 5.4/5.3 GHz is that the standard method of link installation using a single default fixed installation channel, cannot be used.

Instead of the installation procedure of **Chapter 6**, a **link activation** method is used.The ODUs do not transmit until they are both configured and in place. An activation button may be found by navigating to **Site:Location|Air Interface.**

The ODUs are either supplied from the factory ready for use at 5.4 GHz or 5.3 GHz FCC/IC or alternatively, they can be set up for these bands using the RADWIN Manager.



The following procedure is generic to all relevant point to popint RADWIN radio products. What you see on your running RADWIN Manager may differ in some details from the screen captures used to illustrate this chapter.

FCC/IC 5.4/5.3 GHz Link Activation

To Activate a FCC/IC 5.4/5.3 GHz Link:

1. Install RADWIN Manager software as usual.
2. Connect the PC to the IDU-ODU pair to be used as the local site.
3. Run the RADWIN Manager and log in as Installer. You will see the following window:

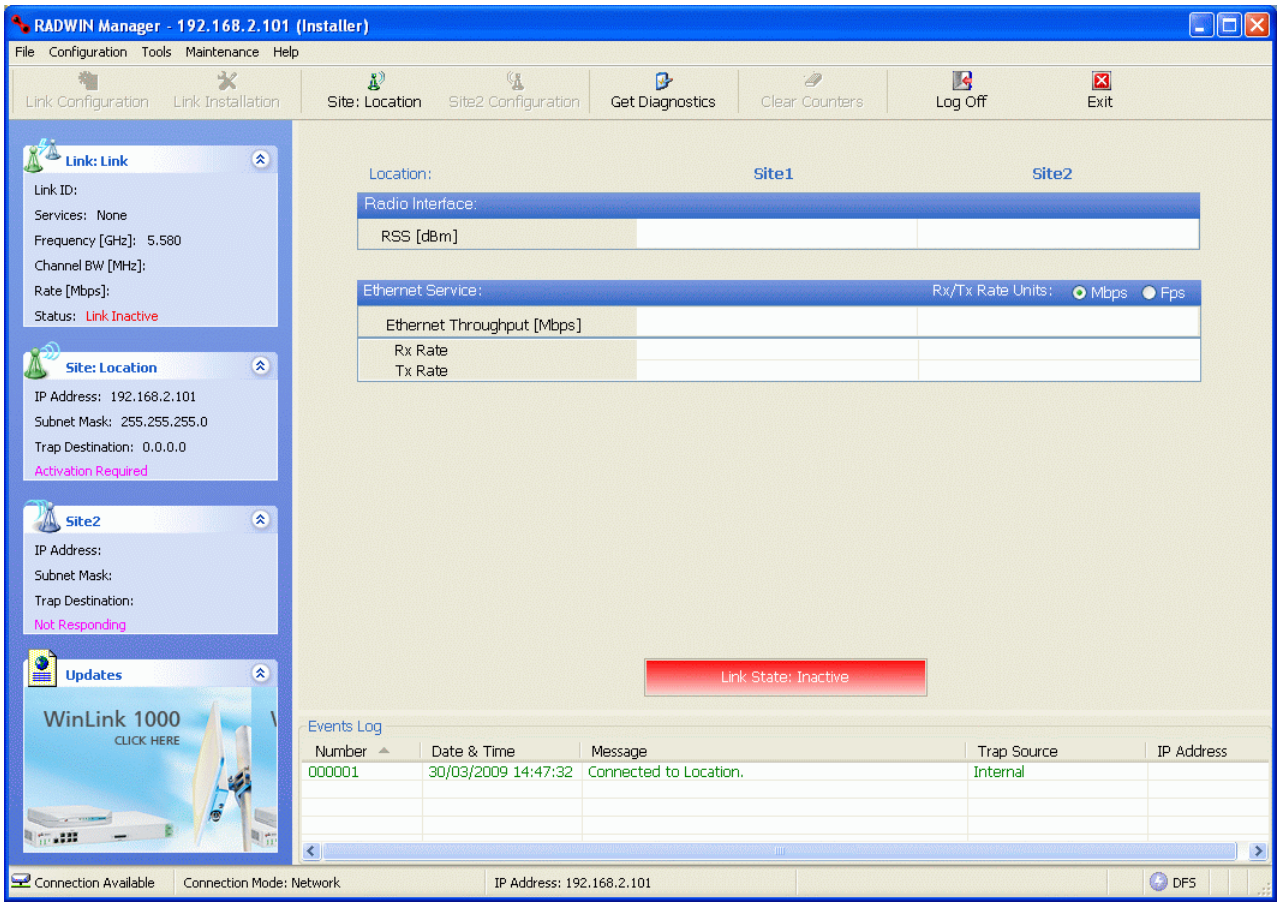


Figure 19-1: Activating an ODU - Inactive link

When the Manager Main Screen is displayed it appears with the Link Status label red and showing Inactive.

4. Click **Site:Location | Air Interface** for the logged in site.
5. The Air Interface dialog box opens:

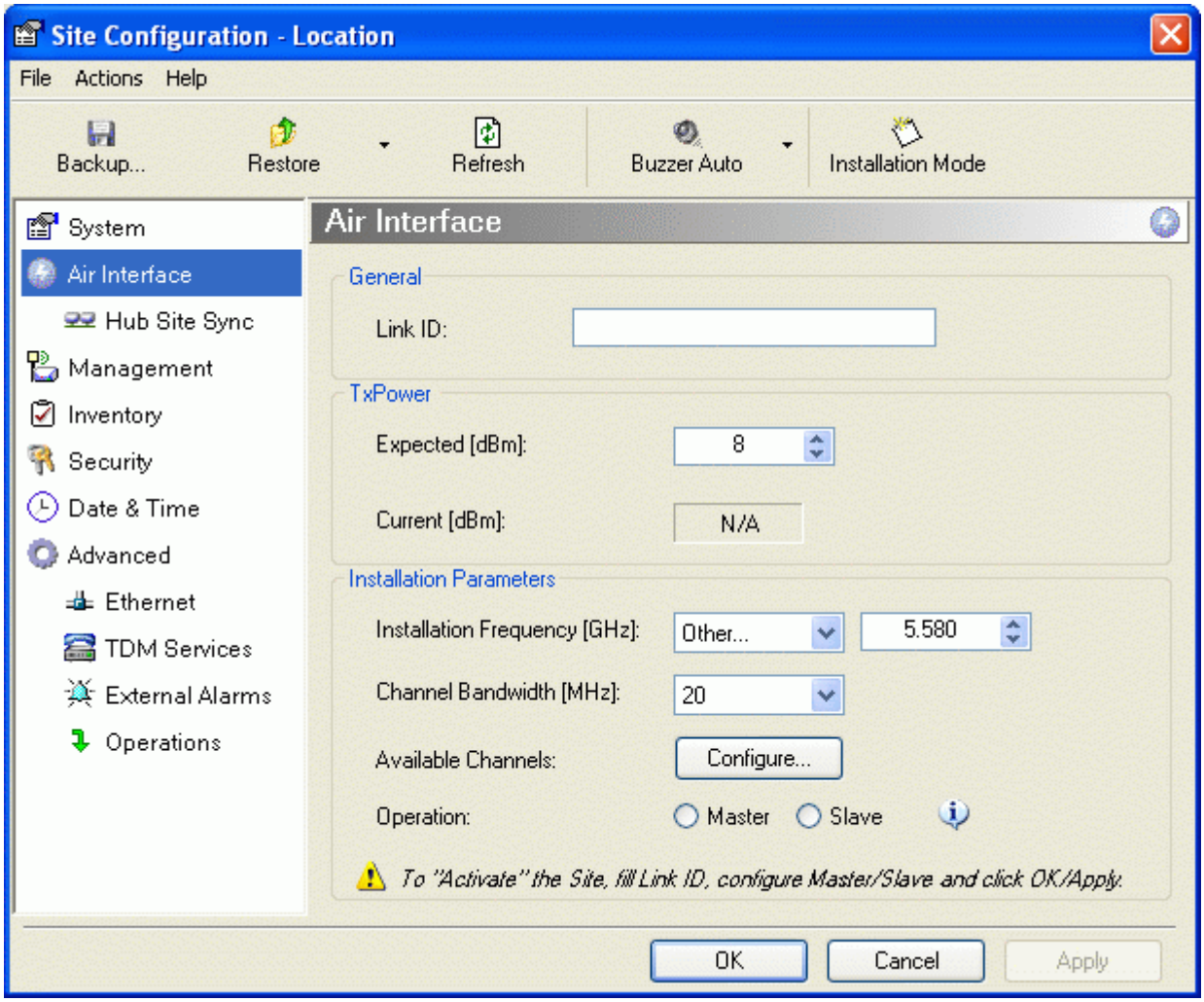


Figure 19-2: Air Interface dialog box

6. Enter the Link ID and note it for use with the second site of the link.
7. Check the **Master** radio button.
8. Click **OK.** The following window appears:

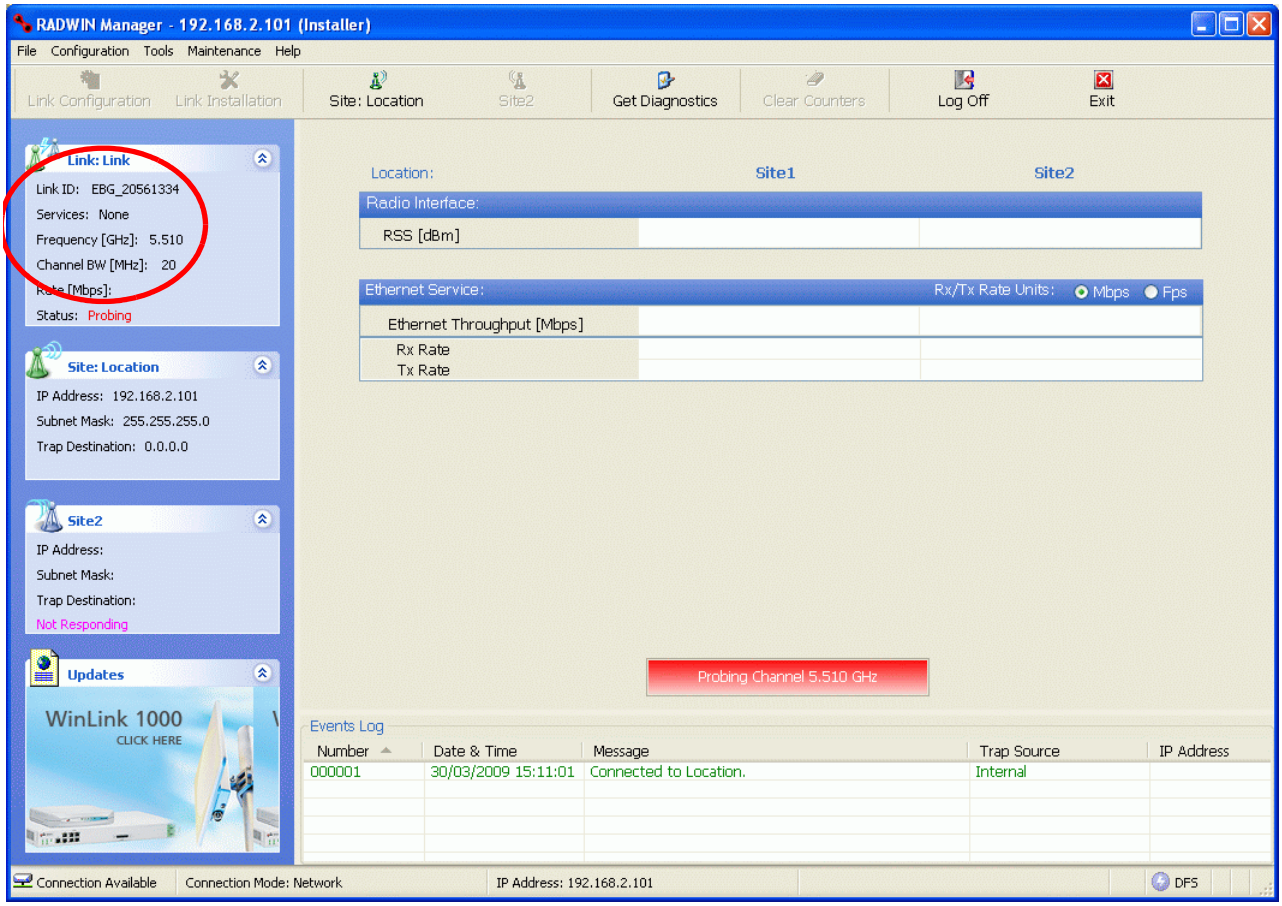


Figure 19-3: The local ODU after activation - Probing

Notice that the Link ID is shown in the Link details pane (circled).

9. Repeat the above procedure for the remote ODU, ensuring that in the Air Interface window, that you enter exactly the same Link ID, but this time that you check the **Slave** radio button.

   If both ODUs are powered up, after a minute or so a link will be established. If you are still connected to the remote site (from the previous steps), the window of **Figure 19-3** will look like this:

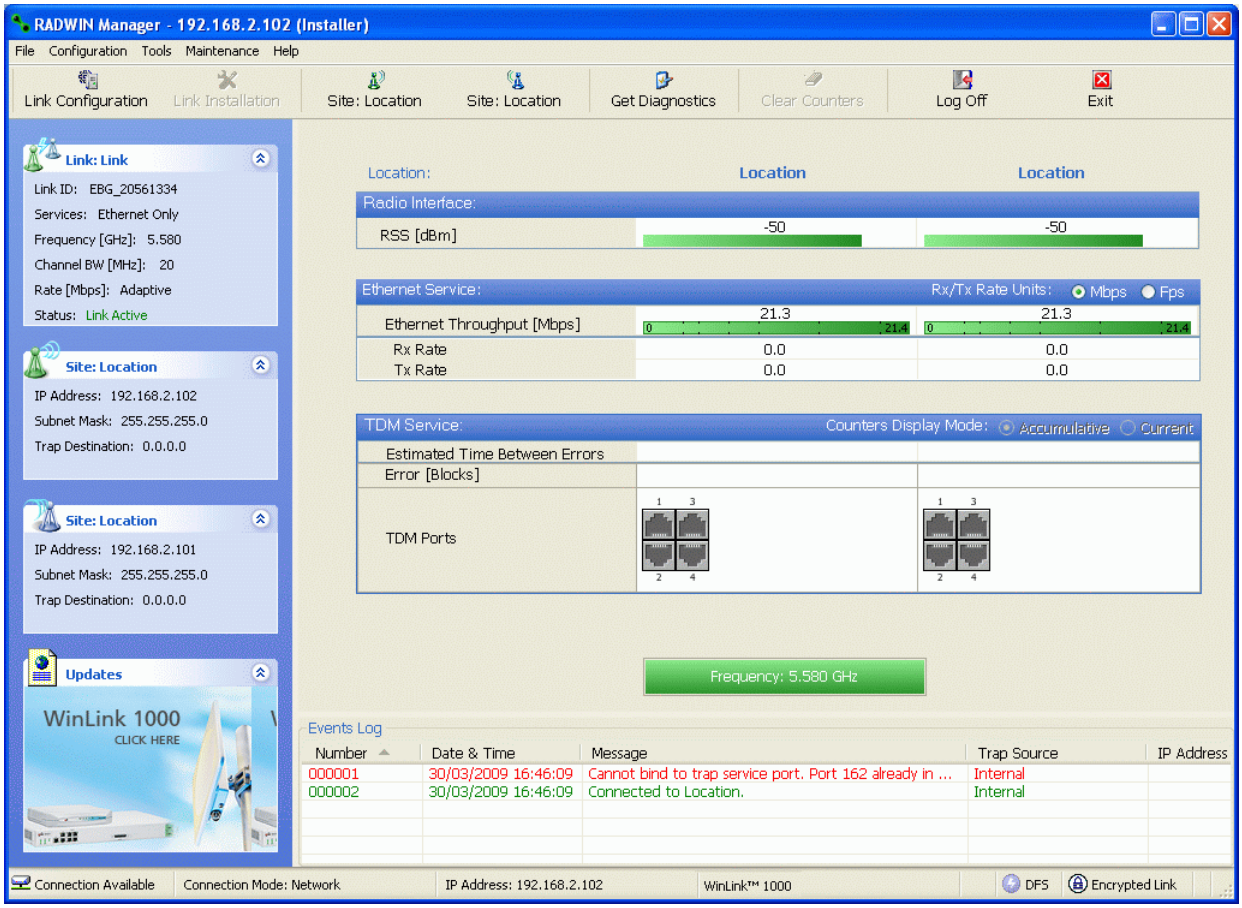


Figure 19-4: Both sites activated and awaiting configuration

FCC/IC 5.4/5.3 GHz Link Configuration

The Configuration procedure may be carried out from either site using the Configuration wizard as shown in **Chapter 8**.

Note

Both sites in a FCC/IC 5.4/5.3 GHz Link must be configured identically.

The only difference is in the Channel Settings window:

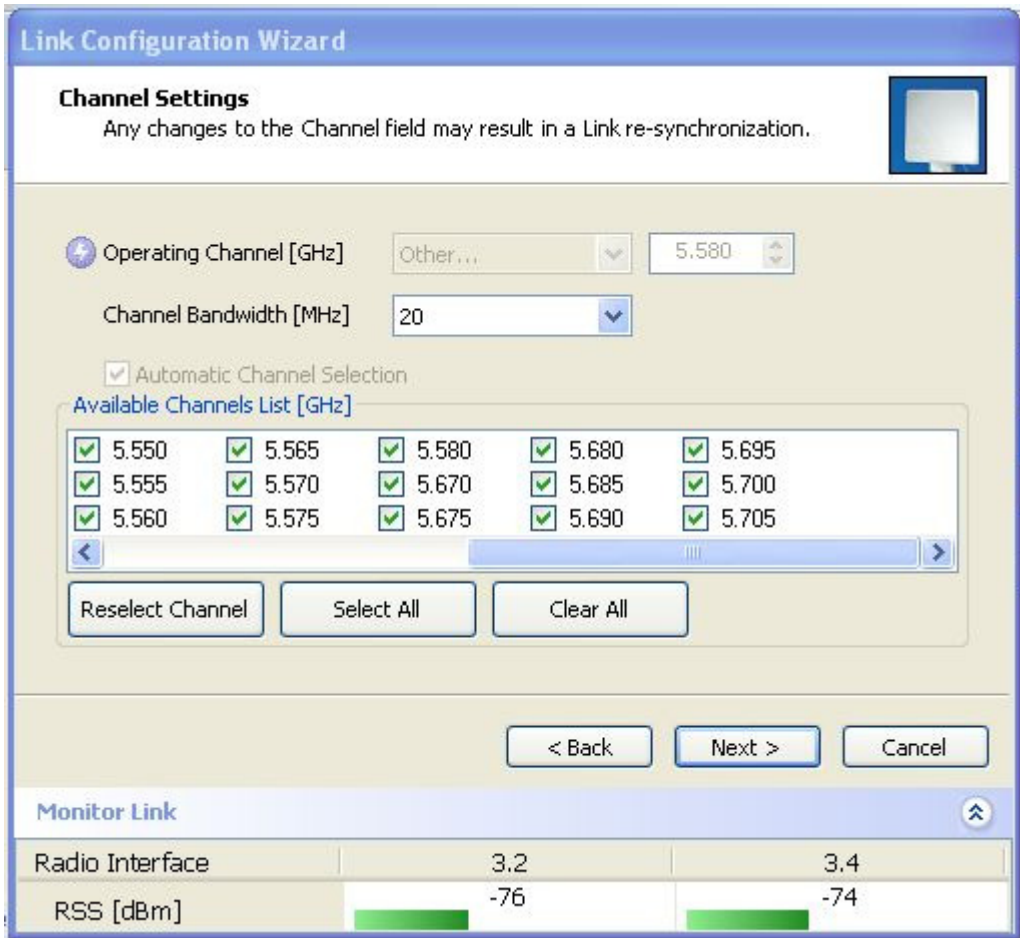


Figure 19-5: Channel Select dialog box - ACS permanently enabled

Note

ACS cannot be disabled.

Upon completion of the wizard, the Site configuration dialogs can be used in the usual way. Once operational, the RADWIN Manager window is the same as for other radio equipment models.

Here is the RADWIN Manager main window upon completion of the wizard:

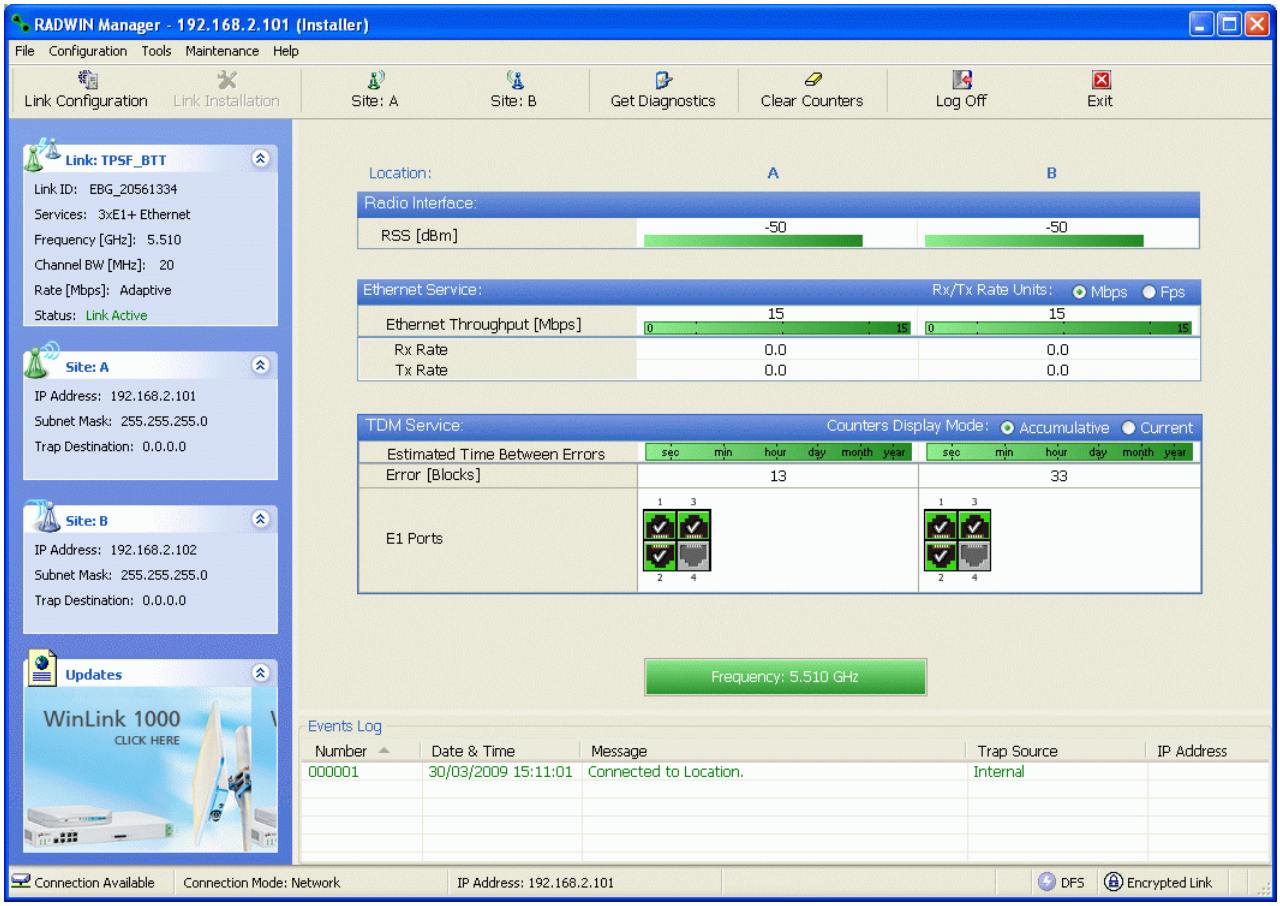


Figure 19-6: FCC/IC 5.4/5.3 GHz operational

FCC 5.4GHz Device Registration

The FCC requires that devices installed within 35 km of any TDWR location should be registered in the voluntary WISPA sponsored database.

The FCC has published a TDWR Location Information table that lists the exact location of all TDWR towers (see **Table 19-1** at the end of the chapter).

1.When installing a 5.4 GHz device define your exact location (latitude and longitude)

2. Use the TDWR Location Information table to determine if the distance between the device and any TDWR tower is less than 35 km.

3.If the distance is less than 35 km then register the device in the voluntary WISPA sponsored database (following section)

4.Disable the frequencies between 5570 – 5680 MHz from the available channels list.

5.The frequency range between 5.600 to 5.650 GHz is not included in the available channels list.

Registering the Device

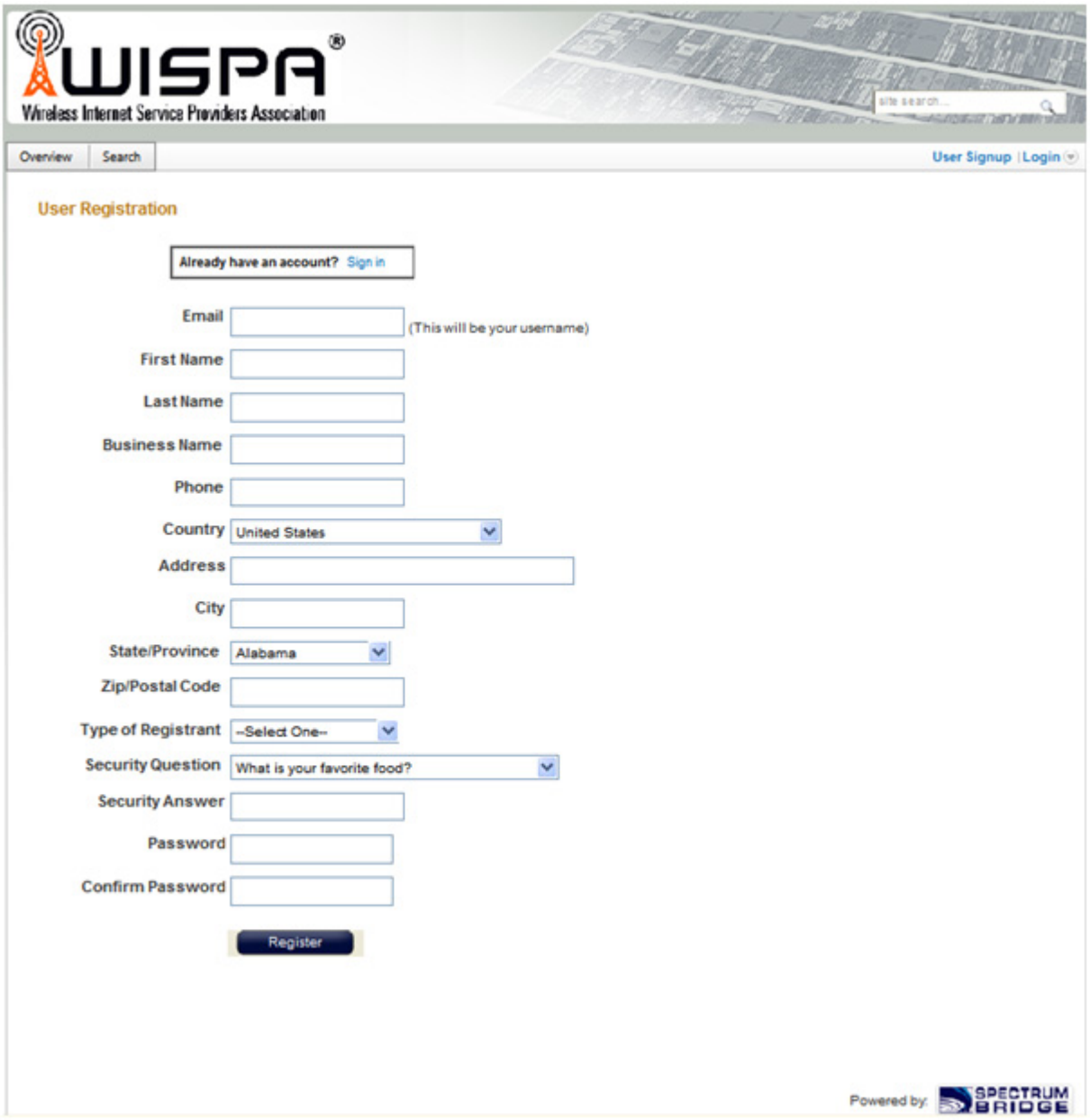
To register a device:

1. Enter the website http://www.spectrumbridge.com/udia/home.aspx and follow the instructions.

   At your first entry into the site, you will be required to register as a user:



2. Click the **User Registration** button to enter the registration page.



3.Fill in the registration page and click **Register**.

4.To complete device registration enter the Register Device tab as shown:



You are offered this:



5.Fill in the required information in the preceding web page and click the **Register Device** button.

TDWR Table

The following table contains the latitude and longitude locations of Terminal Doppler Weather Radars (TDWR). Use this table to determine if the Master or Client device installed is within 35 km radius of a TDWR location. If one of the installed devices is within 35 km radius of any TDWR location then disable all frequencies between 5570 – 5680 MHz from the available channels list.

Table 19-1: Latitude and longitude locations of TDWRs

STATE	CITY	LONGITUDE	LATITUDE	FREQUENCY	TERRAIN ELEVATION (MSL) [ft]	ANTENNA HEIGHT ABOVE TERRAIN [ft]
AZ	PHOENIX	W 112 09 46	N 33 25 14	5610 MHz	1024	64
CO	DENVER	W 104 31 35	N 39 43 39	5615 MHz	5643	64
FL	FT LAUDERDALE	W 080 20 39	N 26 08 36	5645 MHz	7	113
FL	MIAMI	W 080 29 28	N 25 45 27	5605 MHz	10	113
FL	ORLANDO	W 081 19 33	N 28 20 37	5640 MHz	72	97
FL	TAMPA	W 082 31 04	N 27 51 35	5620 MHz	14	80
FL	WEST PALM BEACH	W 080 16 23	N 26 41 17	5615 MHz	20	113
GA	ATLANTA	W 084 15 44	N 33 38 48	5615 MHz	962	113
IL	MCCOOK	W 087 51 31	N 41 47 50	5615 MHz	646	97
IL	CRESTWOOD	W 087 43 47	N 41 39 05	5645 MHz	663	113
IN	INDIANAPOLIS	W 086 26 08	N 39 38 14	5605 MHz	751	97
KS	WICHITA	W 097 26 13	N 37 30 26	5603 MHz	1270	80
KY	COVINGTON CINCINNATI	W 084 34 48	N 38 53 53	5610 MHz	942	97
KY	LOUISVILLE	W 085 36 38	N 38 02 45	5646 MHz	617	113
LA	NEW ORLEANS	W 090 24 11	N 30 01 18	5645 MHz	2	97
MA	BOSTON	W 070 56 01	N 42 09 30	5610 MHz	151	113
MD	BRANDYWINE	W 076 50 42	N 38 41 43	5635 MHz	233	113
MD	BENFIELD	W 076 37 48	N 39 05 23	5645 MHz	184	113
MD	CLINTON	W 076 57 43	N 38 45 32	5615 MHz	249	97
MI	DETROIT	W 083 30 54	N 42 06 40	5615 MHz	656	113
MN	MINNEAPOLIS	W 092 55 58	N 44 52 17	5610 MHz	1040	80
MO	KANSAS CITY	W 094 44 31	N 39 29 55	5605 MHz	1040	64
MO	SAINT LOUIS	W 090 29 21	N 38 48 20	5610 MHz	551	97
MS	DESOTO COUNTY	W 089 59 33	N 34 53 45	5610 MHz	371	113
NC	CHARLOTTE	W 080 53 06	N 35 20 14	5608 MHz	757	113
NC	RALEIGH DURHAM	W 078 41 50	N 36 00 07	5647 MHz	400	113
NJ	WOODBRIDGE	W 074 16 13	N 40 35 37	5620 MHz	19	113
NJ	PENNSAUKEN	W 075 04 12	N 39 56 57	5610 MHz	39	113
NV	LAS VEGAS	W 115 00 26	N 36 08 37	5645 MHz	1995	64

Table 19-1: Latitude and longitude locations of TDWRs (Continued)

STATE	CITY	LONGITUDE	LATITUDE	FREQUENCY	TERRAIN ELEVATION (MSL) [ft]	ANTENNA HEIGHT ABOVE TERRAIN [ft]
NY	FLOYD BENNETT FIELD	W 073 52 49	N 40 35 20	5647 MHz	8	97
OH	DAYTON	W 084 07 23	N 40 01 19	5640 MHz	922	97
OH	CLEVELAND	W 082 00 28	N 41 17 23	5645 MHz	817	113
OH	COLUMBUS	W 082 42 55	N 40 00 20	5605 MHz	1037	113
OK	AERO. CTR TDWR #1	W 097 37 31	N 35 24 19	5610 MHz	1285	80
OK	AERO. CTR TDWR #2	W 097 37 43	N 35 23 34	5620 MHz	1293	97
OK	TULSA	W 095 49 34	N 36 04 14	5605 MHz	712	113
OK	OKLAHOMA CITY	W 097 30 36	N 35 16 34	5603 MHz	1195	64
PA	HANOVER	W 080 29 10	N 40 30 05	5615 MHz	1266	113
PR	SAN JUAN	W 066 10 46	N 18 28 26	5610 MHz	59	113
TN	NASHVILLE	W 086 39 42	N 35 58 47	5605 MHz	722	97
TX	HOUSTON INTERCONTL	W 095 34 01	N 30 03 54	5605 MHz	154	97
TX	PEARLAND	W 095 14 30	N 29 30 59	5645 MHz	36	80
TX	DALLAS LOVE FIELD	W 096 58 06	N 32 55 33	5608 MHz	541	80
TX	LEWISVILLE DFW	W 096 55 05	N 33 03 53	5640 MHz	554	31
UT	SALT LAKE CITY	W 111 55 47	N 40 58 02	5610 MHz	4219	80
VA	LEESBURG	W 077 31 46	N 39 05 02	5605 MHz	361	113
WI	MILWAUKEE	W 088 02 47	N 42 49 10	5603 MHz	820	113

Chapter 20

Quality of Service

Availability

The Quality of Service (QoS) feature is available for links using RADWIN 2000 C radios. If you already have this model, you can access the feature by carrying out a Software Upgrade to the 2.8.20 release.

To use the facility you must be familiar with the use of VLAN (802.1p) or Diffserv.

QoS - Overview

QoS is a technique for prioritization of network traffic packets during congestion.

RADWIN 2000 C links support two classification criteria, VLAN based or Diffserv based. You may choose which of them to use.

Table 20-1: Default priorities an d allocation by VLAN ID and Diffserv

Quality queue	Priority		REDAT %
	Diffserv	VLAN	
Real time	48-63	6-7	15
Near real time (responsive applications)	32-47	4-5	20
Controlled load	16-31	2-3	25
Best effort	0-15	0-1	40



For REDAT (Remaining Ethernet Data - Ethernet throughput) measurement. See **page 10-9**. REDAT measures remaining Ethernet throughput after reduction of bandwidth used by TDM channels. Use the Link Budget Calculator to see how much remaining bandwidth is available for Ethernet.

Based upon the classification criterion chosen, received packets will be mapped into one of four quality groups: Real time, Near real time, Controlled load and Best effort.

You may partition the total link capacity across the four Quality queues. The default weights as percentages are shown in **Table 20-1**.

Further, you may also limit the maximum information rate (MIR) for each queue per site.

Setting up QoS

You may set up QoS from either the Installation or Configuration wizards. Before doing so, set up for VLAN (**Chapter 18**) or Diffserv, depending on which you intend to use.

➢ To define QoS settings for a link:

1. Using either the Installation or Configuration wizards, navigate to the Services window and choose the QoS tab.

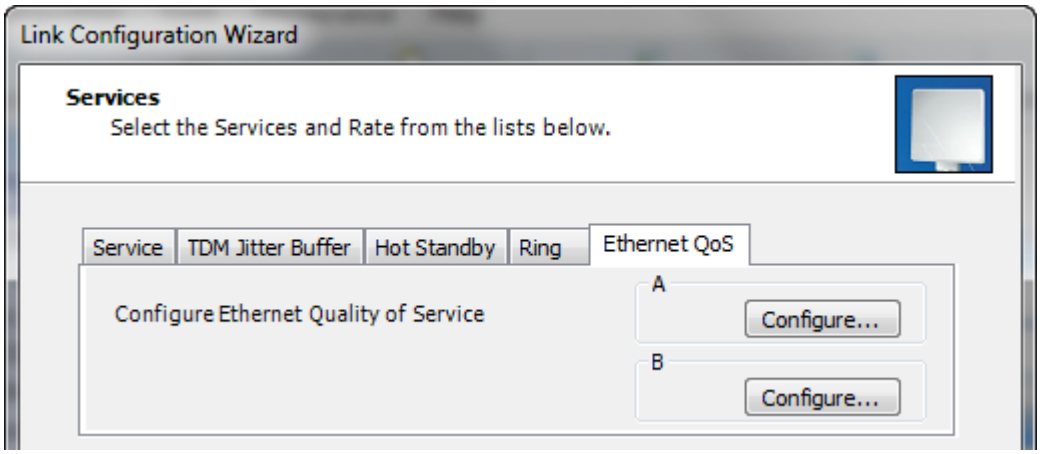


Figure 20-1: Services window with QoS selected

Although QoS is a link-oriented feature, each site may have its own separate parameters.

2. Click the **Configure** button for a site.

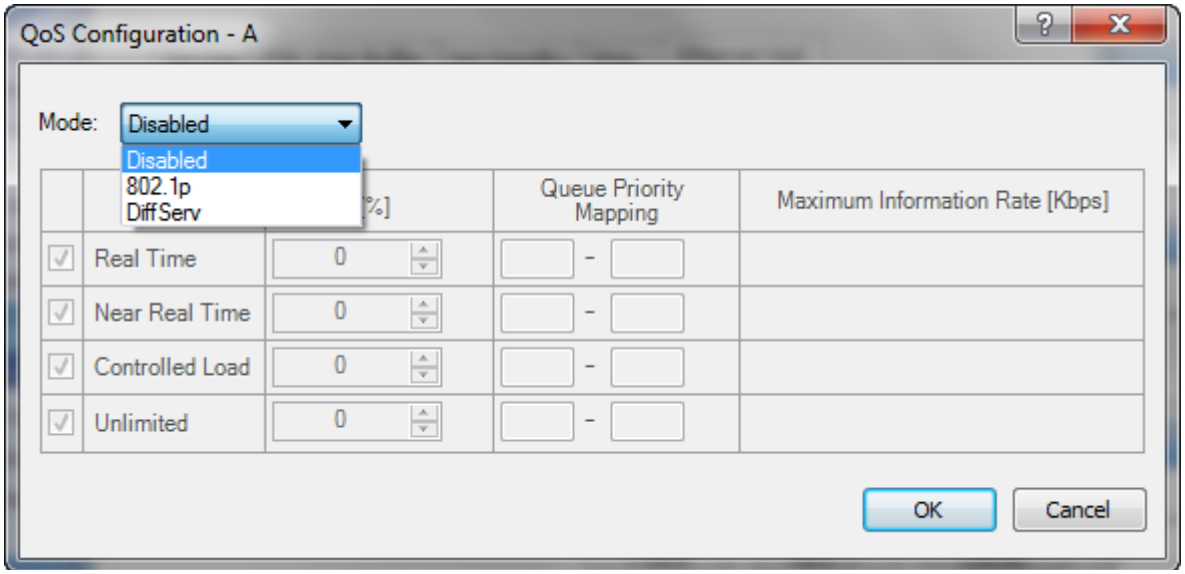


Figure 20-2: Ethernet QoS Configuration - Mode selection

3. Choose the required mode - 802.1p (VLAN) or Diffserv.

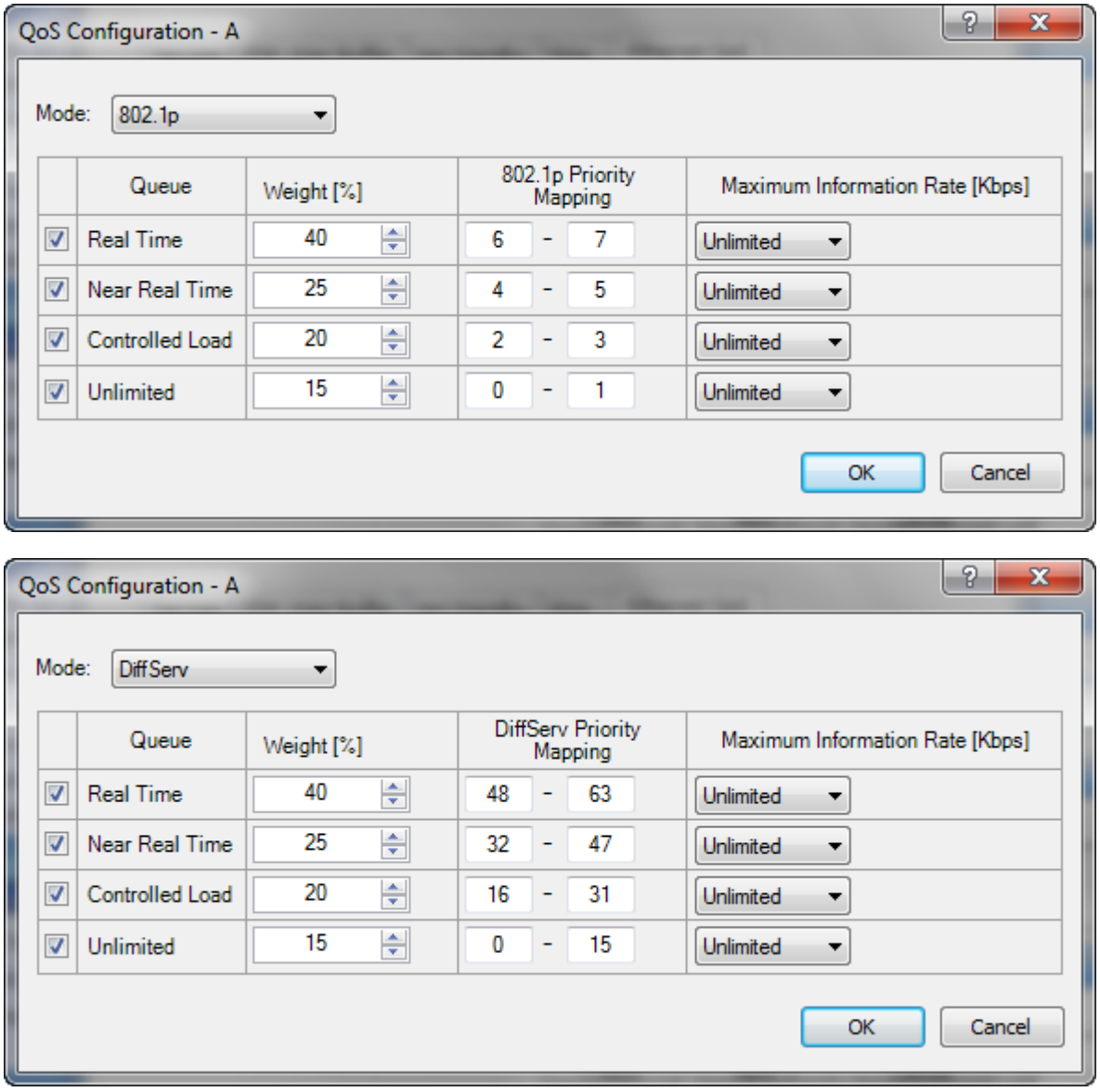


Figure 20-3: Top: VLAN allocation. Bottom: Diffserv allocation

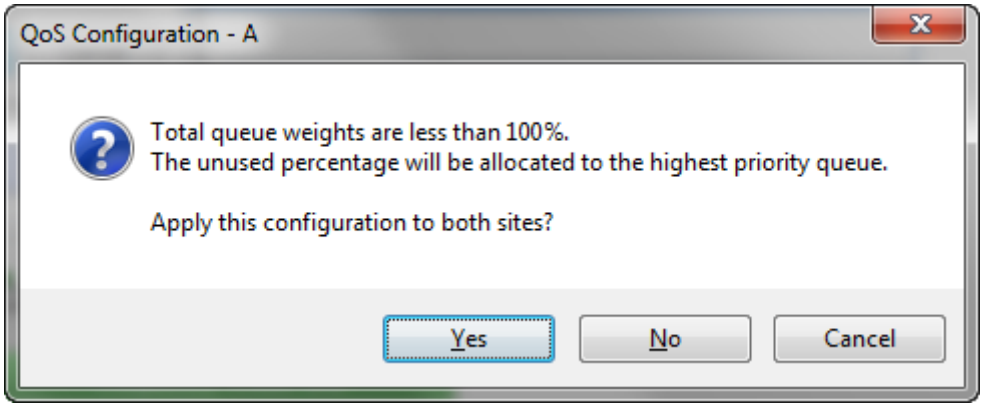
4. The entry fields in both cases are self evident. Upon clicking **OK**,

- If you over-book the Weight column, the last entered field will be reduced so that the total is 100%.
- No weight field may be left zero. If you do, you will not be able to proceed until it is set to something:

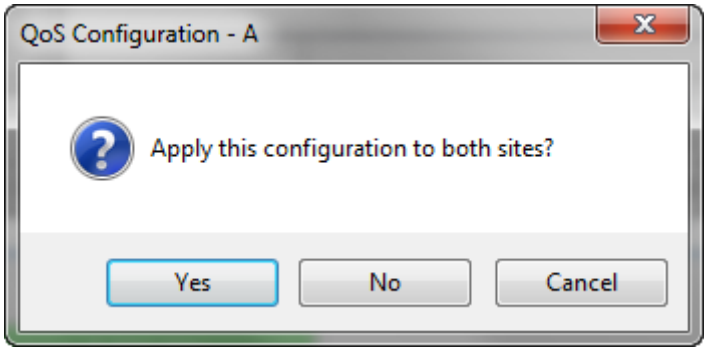


This reflects the implementation policy under which no checked queue may be completely starved. If you really do not want to use a queue under congestion, uncheck it.

- If you are under-booked, you will receive this notice:



- In any event, you may automatically apply the same settings to both link sites:



5. Priorities: You are completely responsible for the completeness and consistency of your VLAN or Diffserv priorities.
6. Choose a Maximum Information Rate for each queue:

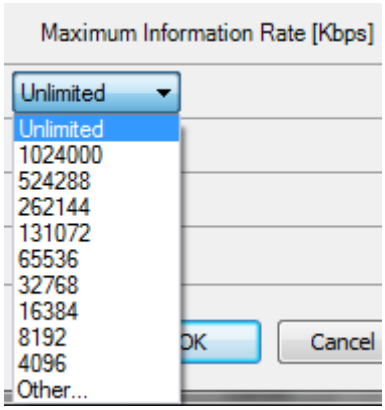


Figure 20-4: MIR choice - per queue

If you previously used **Site | Ethernet | Maximum Information Rate** (**Chapter 9**) to globally limit the site, then your choice in **Figure 20-4** will also be limited.l

7. Click **OK** on the exit dialog to accept the settings. If you did not use these settings for the opposite site, you should configure it now.
8. Complete the wizard in the usual way.

Disabling QoS

In the dialog of **Figure 20-2**, choose the **Disabled** mode. The two sites may be enabled or disabled independently.

Chapter 21

Capacity Upgrade

What is Capacity Upgrade

A RADWIN 2000 A series ODU may have its capacity increased by application of an upgrade license key. The Capacity Upgrade process consists of three steps:

- Data Gathering - preparation of a list of RADWIN 2000 A ODUs for upgrade by serial number
- Acquisition - purchasing the Capacity Upgrade keys
- Application - activating the Capacity Upgrade using the RADWIN Manager

Applicability

You may only upgrade a RADWIN 2000 A unit from 10 Mbps to 25 Mbps.

Data Gathering

For each relevant link, prepare a table similar to **Table 21-1**:

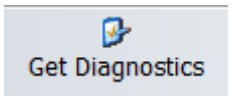
Table 21-1: RADWIN 2000 A ODU Capacity Upgrade Link List

ODU Name (1)	ODU MAC Address (2)	ODU Serial Number (3)	Capacity Upgrade Key (4)
Site A	00xxyy41b205	PFC580E500000123	
Site B	00xxyy41b20e	PFC580E500000124	

Columns 1 is for your own convenience. Column 2 provides a precise connection between ODU identification and its serial number. Later you will copy/paste the Capacity Upgrade key into column 4 as a permanent convenient record.

➢ **To get the required link information:**

1. Log on to the link.
2. Run the **Get Diagnostics** utility from the main button menu.



3. Load the generated **Diagnostics Information.txt** file into a plain text editor (like Notepad)
4. Search for the text string **Inventory**. You should see something like this:

```
Inventory
 ODU
  Product <Some product ID String>
  HW Version 6
  SW Version 2.8.00_b2970_Jan 17 2013
  MAC Address <Your MAC address>
  Serial Number PFC580E500000123
  ...
```

5. Copy the MAC Address to column 2 of the table (most likely for Site A).
6. Copy the string following the Serial Number to column 3 of the table.
7. Repeat the process to get the ODU serial number for Site B.
8. If you have several links, aggregate the Link Lists into one list (consider using a spreadsheet for the purpose).

Acquisition

Send the supplier of your equipment a Purchase Order for your Capacity Upgrade List (Use the aggregated version of **Table 21-1**). Ensure that you include a current email address for receipt of the key list. Upon completion of the order, you will receive an email with an attached list consisting of serial numbers and a licence key per serial number. The licence keys are quite long and it is important that you receive them in electronic format for subsequent copy/pasting.

Application

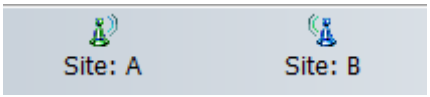
Carrying out the Capacity Upgrade

Each ODU must be upgraded individually. The process is very unforgiving of errors, so you should carefully carry out the following steps. It is assumed that you have **Table 21-1** in a sortable format such as a spread sheet.

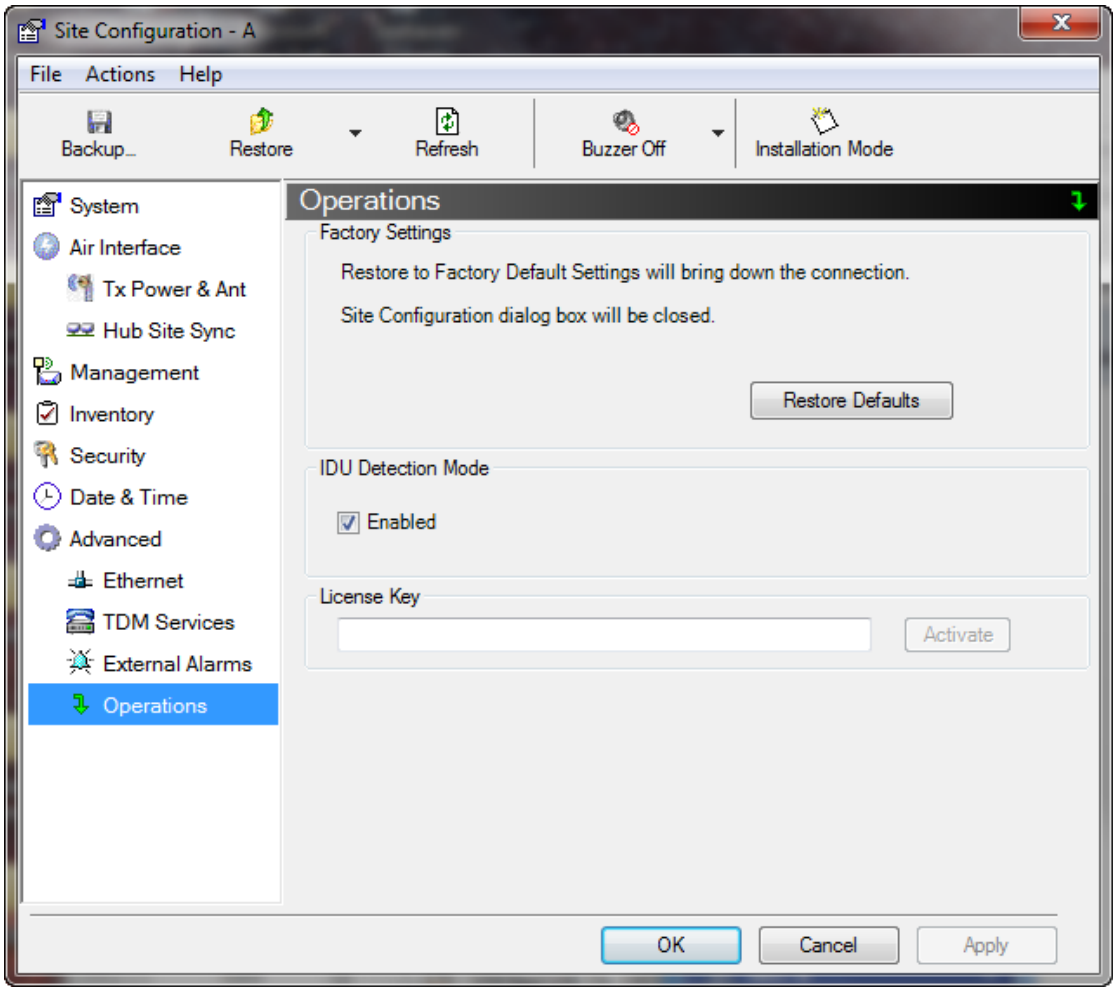
➢ **To prepare for application of the Capacity Upgrade keys:**

1. Sort **Table 21-1** by serial number.
2. Make a working copy of the Capacity Upgrade keys attachment file. Keep the original in a safe place.
3. Load the working copy into a spread sheet program and ensure that it is sorted by serial number.
4. Ensure that your table and the sorted list match line for line - if not check carefully for errors of missed units.

5. Copy/paste the key column into column 4 of your own table.
6. For each link, log on as Installer. (For isolated "spare" ODUs, you may log on using Local Connection.)
7. Open each Site in turn.



8. Open the **Inventory** page to check which line item in your table matches it.
9. Copy the Capacity Upgrade key to the clipboard
10. Open the the **Operations** page:



11. Paste the key to the **License Key** field. The **Activate** button is enabled.
12. Click the **Activate** button. You will receive a confirmatory message if the activation succeeded or an error message if not. In the latter case, you will need to be in contact with your equipment supplier to solve the problem.

Completing the Capacity Upgrade

To make the upgrade effective, each upgraded ODU must be reset.

Persistency of the Capacity Upgrade

The upgrade is persistent across an ODU reset. If however, you restore a capacity upgraded ODU to factory defaults, you will need to apply the Capacity Upgrade to it again. This further underlines the importance of saving the license keys attachment file in a safe place and maintaining a record like **Table 21-1**.

Chapter 22

Changing the Factory Default Band

Why this is Needed

All ODUs supplied by RADWIN come with preconfigured with a factory default product-dependent band according to the ODU part number.

For ODUs supporting Multi-band, it may be changed using the procedure in this chapter. The procedure is generic, applying to all ODUs with the Multi-band feature.

Caution

- 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 5-1**.
- An installed copy of the RADWIN Manager
- A PoE device
- An Ethernet LAN cable
- An IDU-ODU cable

The procedure

Note

The following procedure is generic to all relevant RADWIN radio products. What you see on your running RADWIN Manager may differ in some details from the screen captures used to illustrate this chapter.

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 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.

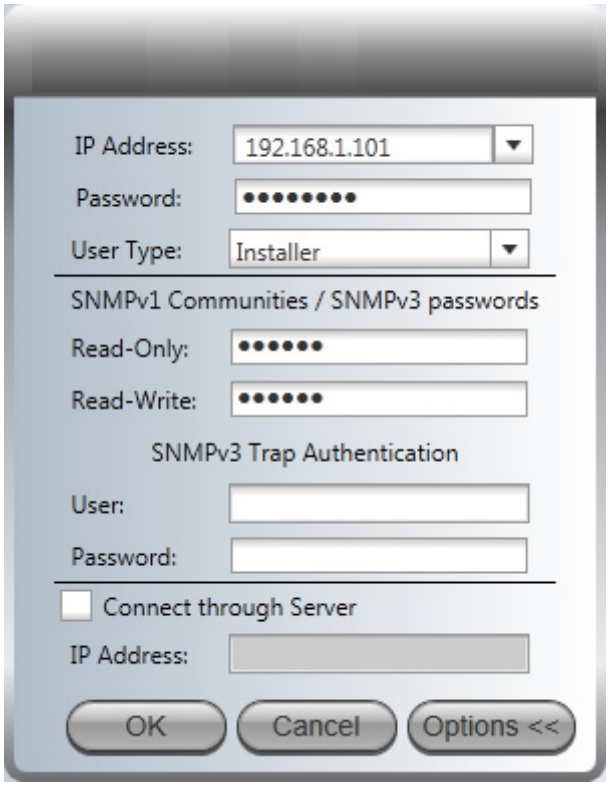


Figure 22-1: Becoming Installer

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

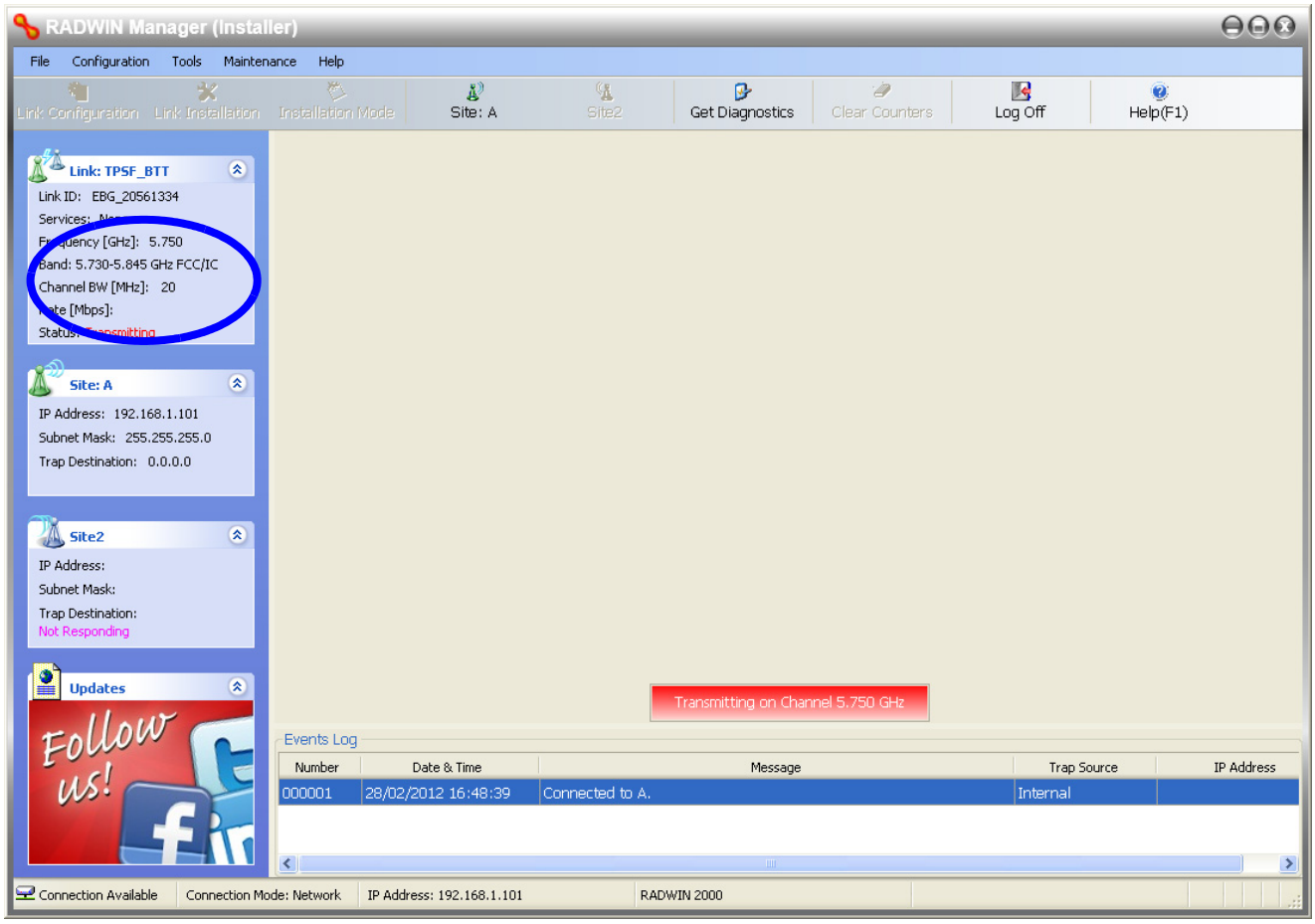


Figure 22-2: Opening *RADWIN Manager* window prior to band change (default circled)

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

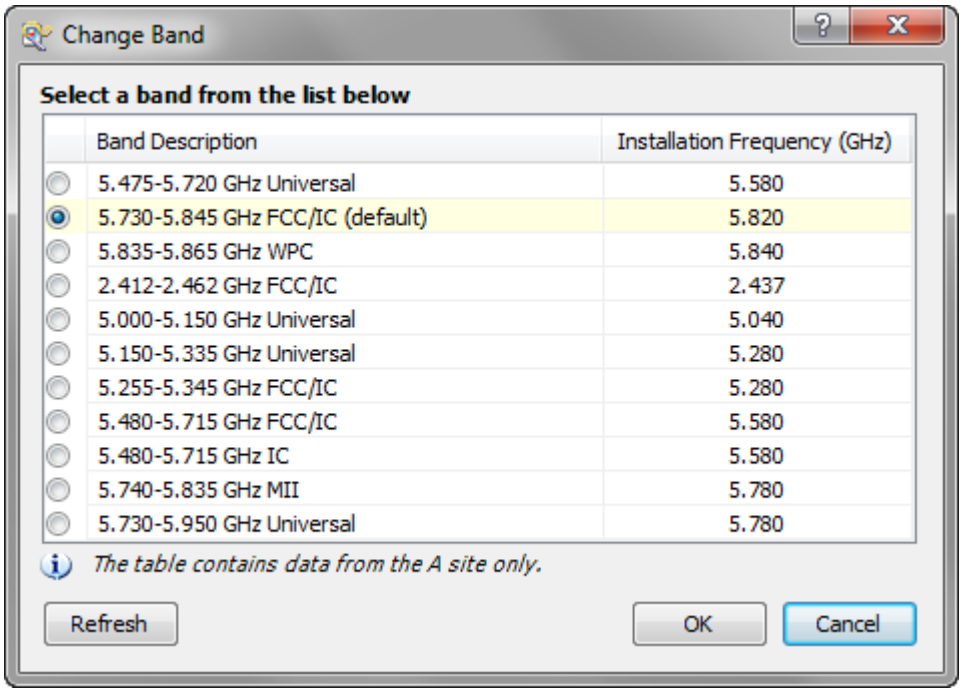


Figure 22-3: Change Band dialog

Note

The bands appearing in **Figure 22-3** are product dependent. To see which bands are available for your product, check your product Inventory (see **Figure 9-7**) and then consult RADWIN Customer Support.

8. Click the band required:

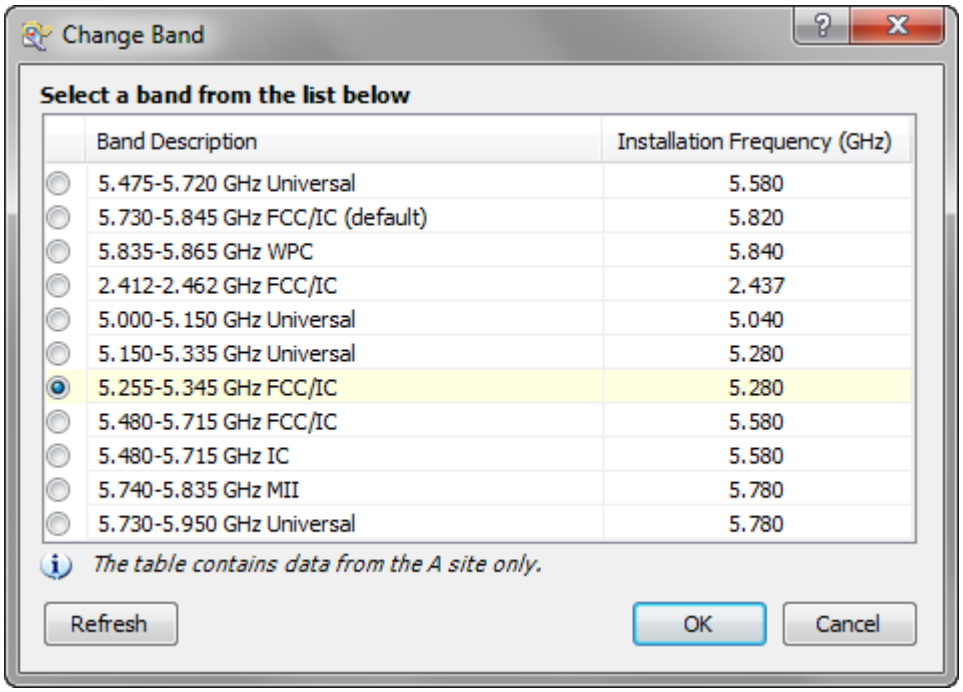


Figure 22-4: A different band selected

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

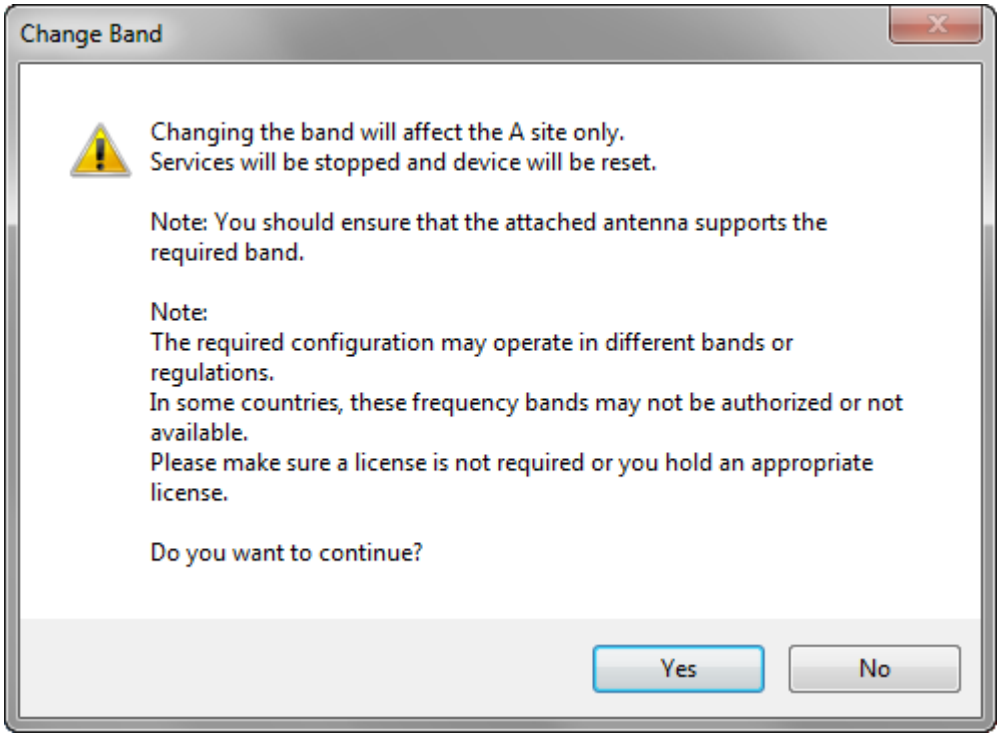


Figure 22-5: Change Band confirmation

The change, which may take some time, is carried out. The result is reflected in the RADWIN Manager main window:

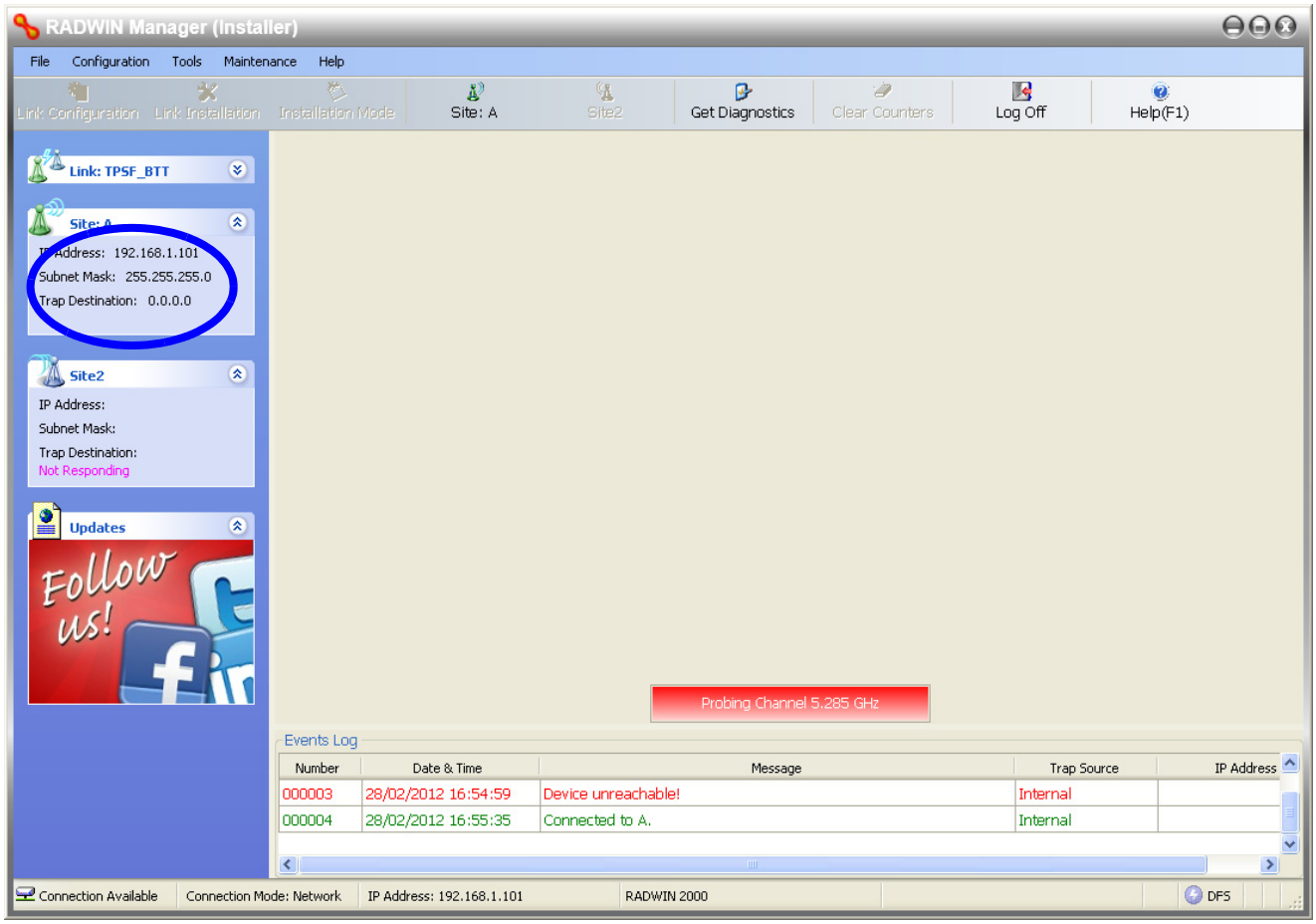


Figure 22-6: Main Window after band change - new band circled

Note

If you carry out this operation on a link, the band is effective on both sites and you are placed in installation mode.

Changing Band for DFS

Changing to a DFS band is similar to the foregoing procedure.

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

Special Products or Features: Entering a License Key

If you go to the Operations window as Installer (**Figure 22-7**), 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.

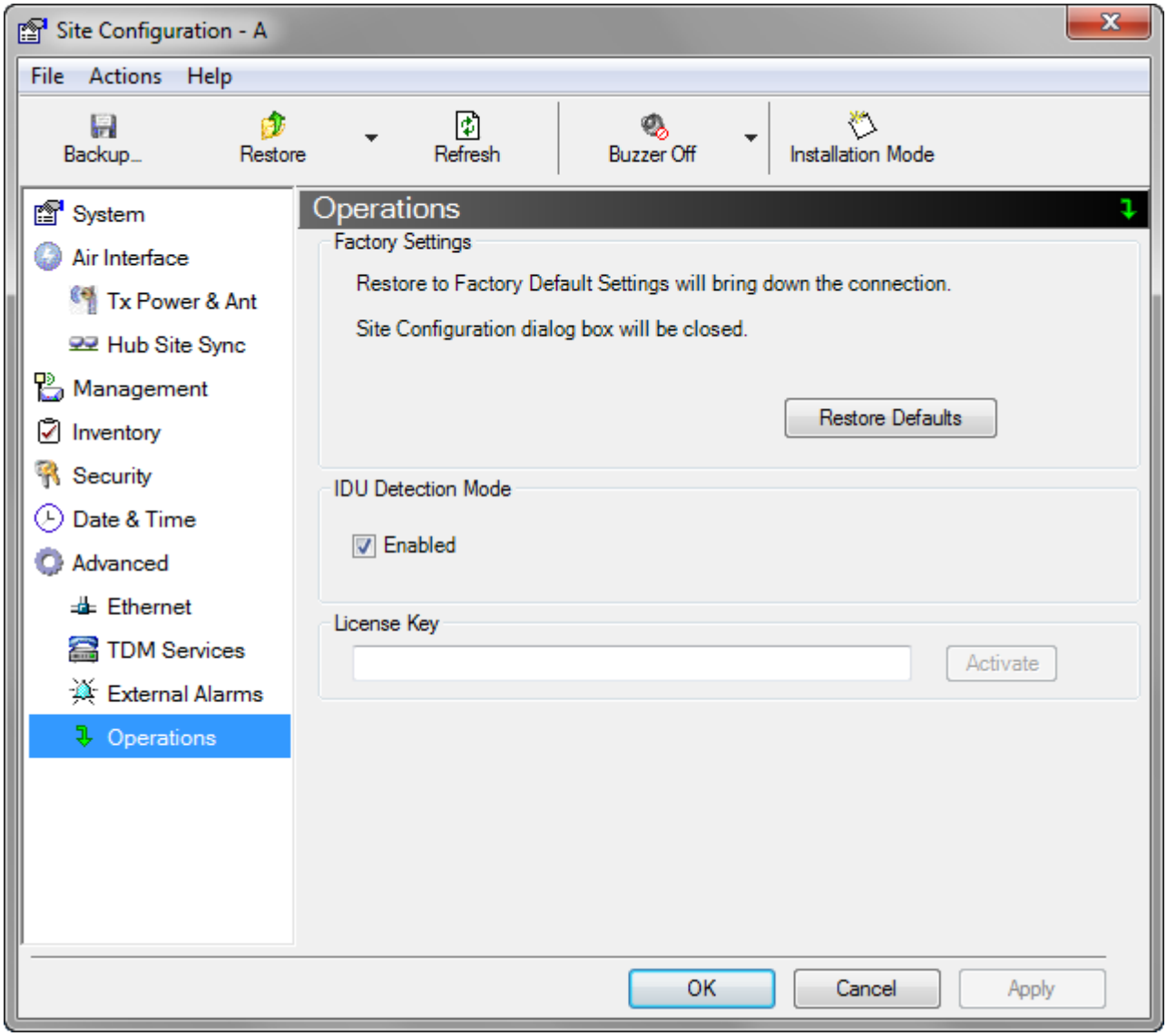


Figure 22-7: Using the Operations window to enter a license key

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.

Provisions for Licensed 3.X and 2.5 GHz Bands

Overview

3.X Bands

The new RADWIN 2000 C and RADWIN 2000 X series add additional bands in the 3.X GHz range to those in Release 2.5.00. The new supported bands fall into two categories: The first category consists of those falling under the ubiquitous FCC, IC or ETSI regulation. The second category is referred to as RADWIN Universal bands. These bands are known to be regulated but the numerous combinations of regulation and location preclude specific support.

Release 2.8.20 supports the band 3.3-3.8 GHz as follows:

- FCC part 90 subpart Z and IC RSS-197 supporting 3.650-3.700 GHz
  - 3.650 -3.675 GHz in Restricted mode
  - Hardware ready for the Unrestricted Mode band operating in all 50 MHz of the 3.650-3.700 GHz band
- IC RSS-192 supporting 3.475 – 3.650 GHz
- ETSI 3.4 -3.7 GHz split into three sub-bands, 3.650-3.675 GHz, 3.475-3.650 GHz and 3.590-3.710 GHz
- RADWIN Universal 3.300-3.800 GHz.

Integrated and connectorized products are available. All of them are multiple band with the default band being 3.650-3.675 GHz other than the ETSI 3.4 - 3.7 GHz models.

The new products may be operated under 5, 10 and 20 MHz channel bandwidths and are broadly compatible with the full feature set of RADWIN 2000.

To meet regulatory requirements, a somewhat different procedure is required to set up links using these bands.

2.5GHz Bands for BRS/EBS

The rationale for these bands and relevant details are described in **Chapter 24**. The installation method ids the same as for other licenced FCC bands as described below.

Terminology Recap

- **Universal bands** refer to RADWIN Universal bands as described above
- **3.X or 3.X GHz** refers to the frequency range 3.300 – 3.800GHz
- A **3.X ODU** is an ODU pre configured to operate in the 3.X GHz licensed bands
- A **3.X Link** in a RADWIN 2000 link using a pair of 3.X ODUs
- **High Resolution Bands** - Channel minimum step is 250 KHz. Applies to 3.475 - 3.650 GHz IC RSS-192, 3.4 -3.7 GHz ETSI and the 3.3 - 3.8 GHz Universal band.
- **Low Resolution Bands** - Channel minimum step is 1 MHz. Applies to FCC regulations in the 3.650-3.675 GHz band.
- **Inactive Mode** - An ODU is powered up, in communication with a managing computer but not transmitting. It is required where regulation does not permit the use of RADWIN's default Installation Mode frequency and channel bandwidth. The ODU may transmit using the licensed or registered band, channel bandwidth and permitted Tx power.
- **Regular Mode** - The usual default Installation Mode

Regulatory Considerations for 3.650-3.675 GHz FCC/IC part 90 sub part Z

Restricted Mode

The band is supported in accordance with 3.650-3.675 FCC/IC part 90 subpart Z:

RADWIN Ltd. conforms to FCC DA 07-4605 (November 14, 2007) FCC-certified with FCC-ID: Q3KRW2030 and supporting the following equipment requirements:

"Restricted contention protocols can prevent interference only with other devices incorporating the same or similar protocols. Equipment using a restricted protocol can operate only on the lower 25 megahertz (3650-3675 MHz)."

Transmission power options

Table 22-1shows the extent of compliance by RADWIN 2000 C products to FCC/IC power limits, having regards to antenna type and transmission power options.

Table 22-1: FCC/IC compliance by antenna and transmission power

		Measured				
		Frequency		Power		
Antenna	**Nominal CBW**	**Low Center Frequency Channel [MHz]**	**High Center Frequency Channel [MHz]**	**Max Conducted Tx Power per Pole [dBm]**	**Total Conducted Max Tx Power [dBm]**	**Max EIRP [dBm]**
21dBi INT	**5 MHz**	3653	3672	11.14	14.14	35.14
	10 MHz	3655	3670	14.46	17.46	38.46
	20 MHz	3660	3665	17.36	20.36	41.36
21dBi EXT (22dBi-1dB feeder)	**5 MHz**	3653	3672	11.14	14.14	35.14
	10 MHz	3655	3670	14.46	17.46	38.46
	20 MHz	3660	3665	17.36	20.36	41.36
24dBi EXT (25 - 1dB feeder loss)	**5 MHz**	3653	3672	8.65	11.65	35.65
	10 MHz	3655	3670	11.36	14.36	38.36
	20 MHz	3660	3665	13.73	16.73	40.73

Higher Transmission Power Options and Restrictions:

Table 22-2 defines the maximum transmission power and EIRP limits for the specified frequency and channel bandwidths.

It specifies the power limits to be used by the operator when assigning center frequencies.

Table 22-2: Higher Transmission Power Limits

Nominal CBW	**Low Center Frequency Channel [MHz]**	**High Center Frequency Channel [MHz]**	**Max Conducted Tx Power per Pole [dBm]**	**Total Conducted Max Tx Power [dBm]**	**Max EIRP [dBm]**
5 MHz	3653	3672	15.60	18.60	35.60
10 MHz	3655	3670	18.69	21.69	38.69
	3656	3669	22.00	25.00	38.50
20 MHz	3660	3665	21.18	24.18	41.18
	3661	3664	22.60	25.60	39.10

Availability Summary for FCC/IC and Universal 3.X GHz

Table 22-3: Availability for FCC/IC and Universal 3.X GHz

Products series	Occupied Band GHz	Regulation	Mode	Channel Bandwidth MHz	Max Tx Power dBm	Frequency Step KHz
RADWIN 2000 C	3.650-3.675	FCC/IC	Regular	5, 10, 20	25	1000
	3.475-3.650	IC	Inactive			250
	3.300-3.800	Universal			Unlimited	
RADWIN 2000 X	3.650-3.675	FCC/IC	Regular	5	25	1000
	3.475-3.650	IC	Inactive			250
	3.300-3.800	Universal			Unlimited	

Band Splitting for ETSI 3.4 - 3.7GHz

The ETSI 3.4 - 3.7GHz band is split into three sub-bands reflecting the different Max Tx Power allowed in each one. The details are shown in below:

Table 22-4: Band split for ETSI 3.4-3.7GHz

Products series	Occupied Sub-Band GHz	Center Frequency GHz	Mode	Channel Bandwidth MHz	Max Tx Power dBm	Frequency Step KHz
RADWIN 2000 C	3.403-3.490	3.413-3.480	Inactive	5, 10, 20	16	250
	3.470-3.610	3.480-3.600			23(†)	
	3.590-3.710	3.600-3.700			25(‡)	
RADWIN 2000 X	3.403-3.490	3.413-3.480	Inactive	5	16	250
	3.470-3.610	3.480-3.600			23(†)	
	3.590-3.710	3.600-3.700			25(‡)	

Note

(†) The 3.480 GHz frequency is overlapped, occurring in two different bands as shown. If you wish to use the 3.480 GHz frequency, you should set Max TX Power to 16 dBm.

(‡) The 3.600 GHz frequency is overlapped, occurring in two different bands as shown. If you wish to use the 3.600 GHz frequency, you should set Max TX Power to 23 dBm.

Using he RADWIN Manager to set up a 3.X or BRS Link

Inactive and Active Mode

Low Resolution Band 3.X ODUs may be installed and configured in the usual way.

What follows applies to High Resolution Band ODUs.

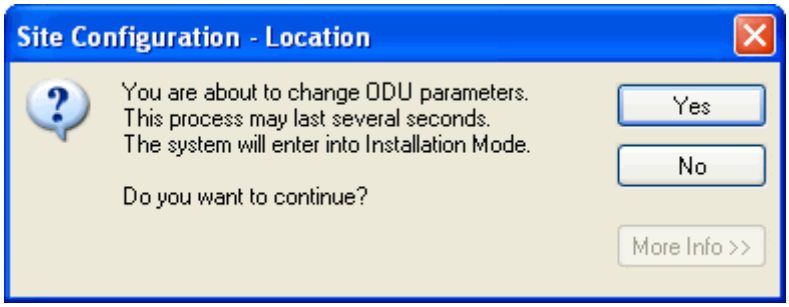
To ensure compliance with the relevant license, 3.X ODUs for IC, ETSI and Universal must be configured from an inactive mode where the ODU is powered up, in communication with a managing computer but not transmitting.

Setting up a link is a two stage procedure:

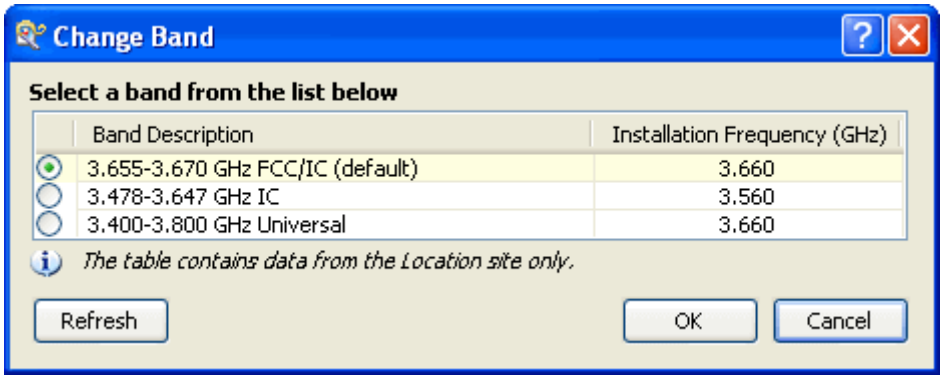
1. Activate the ODUs by individually by configuring the band, frequency and channel bandwidth for the license
2. Complete link configuration in the usual way

To set up a 3.X or BRS ODU:

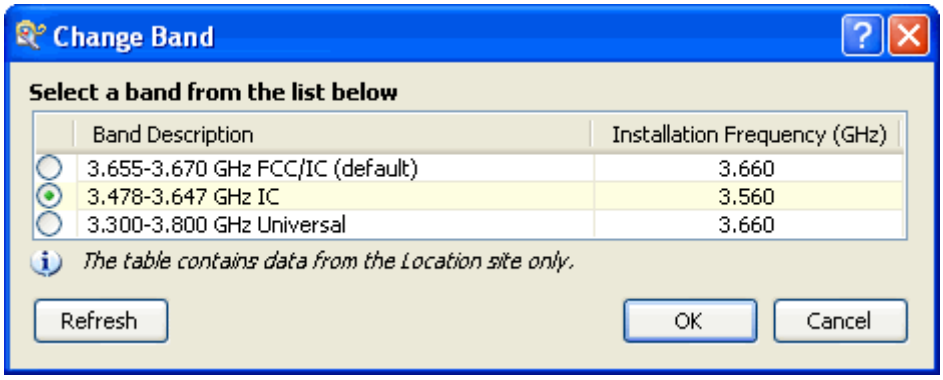
1. Log on to it as Installer (Operator sufficient for ETSI) and set the IP address as shown in **Chapter 25**.
2. Navigate to Site:Location|Air Interface and enter the Link ID for the ODU.
3. Click OK to dismiss the Site Configuration window. Answer Yes to the following popup message:



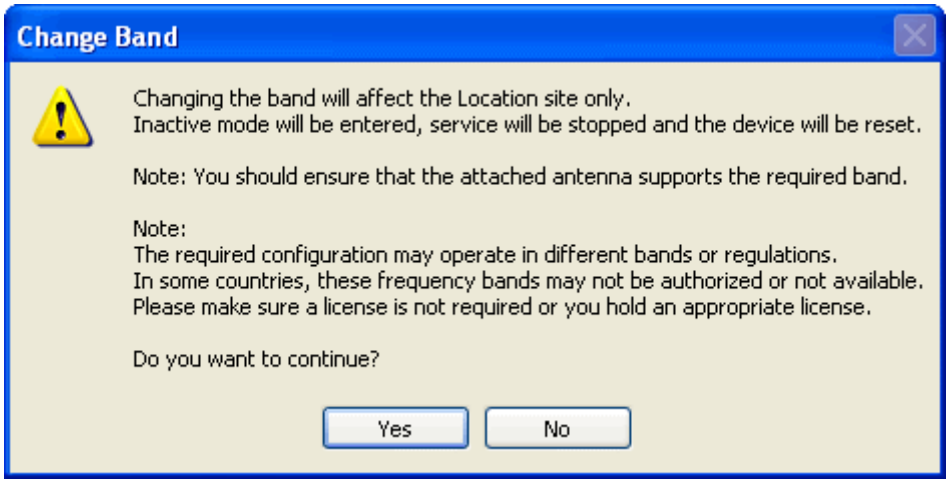
4. For ETSI models, skip to step 7 below. For all others, navigate to Tools|Change Band. The following window is displayed:



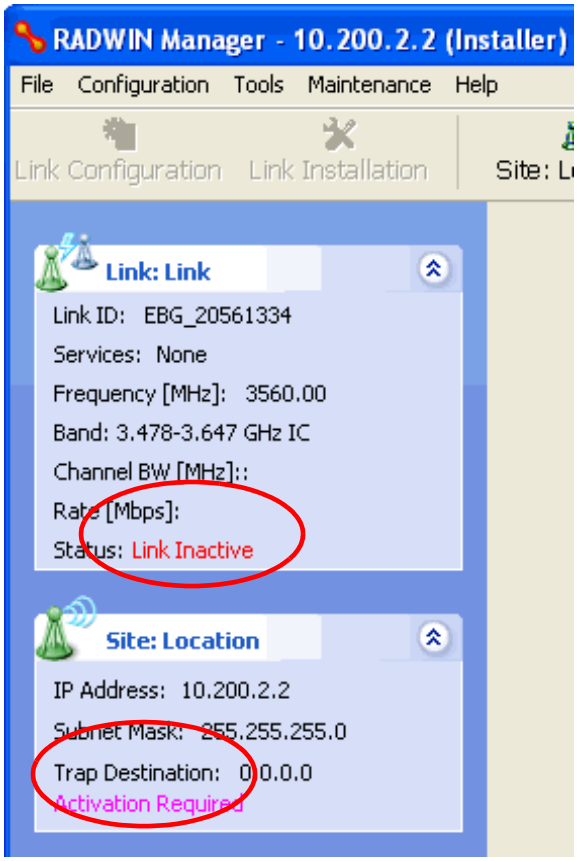
5. Choose the required band. For illustration, we will choose the IC band.



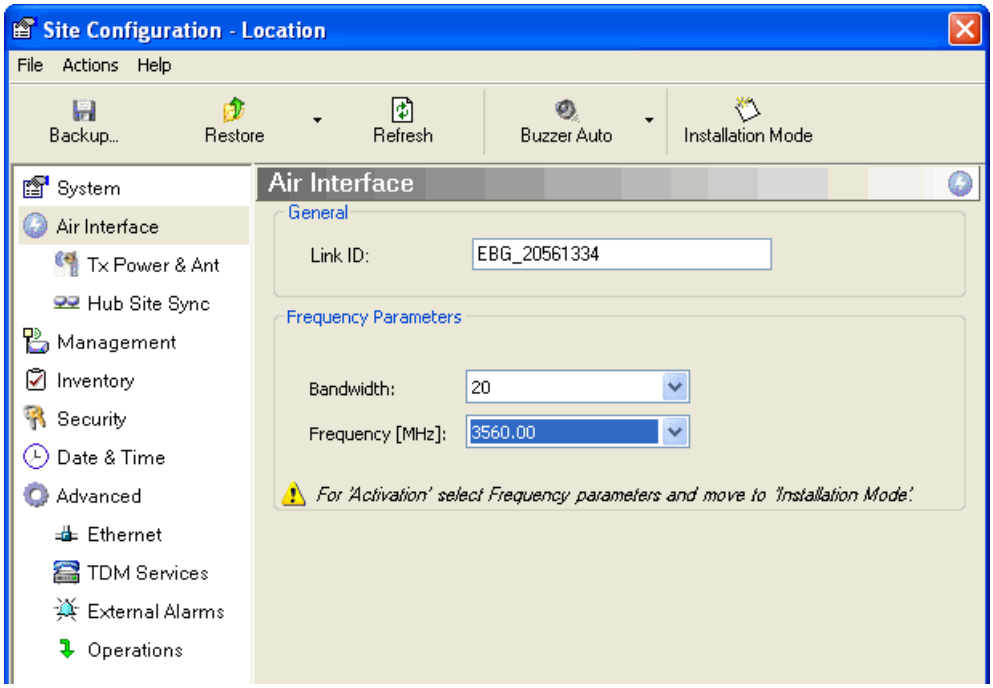
6. Click OK to continue and accept the notification message which appears:



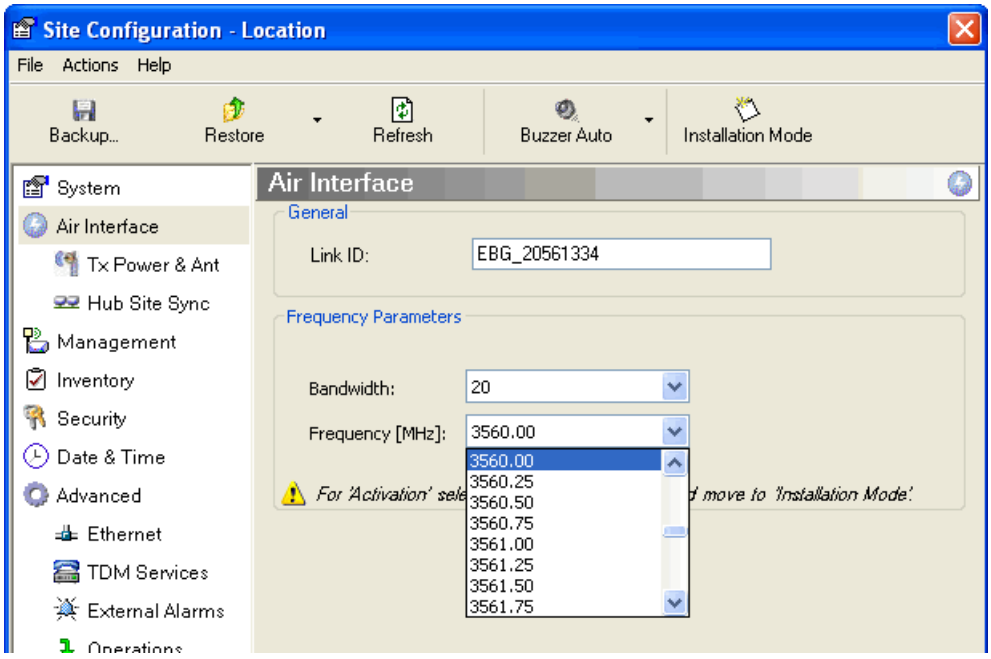
After a few seconds, the ODU goes into inactive mode:



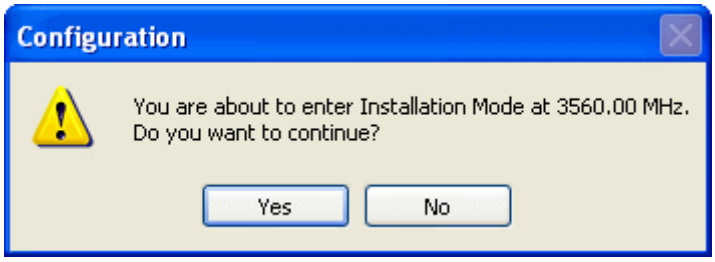
7. Activate the ODU by navigating to Site:Location|Air Interface:



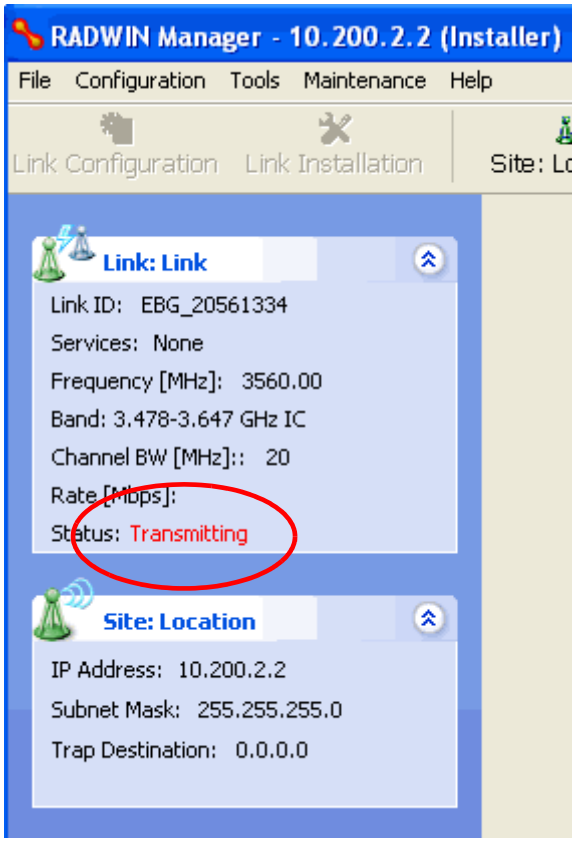
8. Choose a frequency from the drop down list:



9. Enter Installation Mode and confirm your choice:



10. After a few moments of processing, you may click OK to dismiss the Site Configuration window. The ODU is now in normal Installation Mode:



11. Repeat the above procedure for the second ODU in the link, ensuring that the Link ID is entered correctly and the same band is chosen.

12. From this point, you may install both ODUs in the field according to the procedures in this User Manual.

Chapter 23

Quick Install Mode

Why this is Needed

It may be required to temporarily suspend service traffic over a link without losing the link connection. The simplest way to do this is to place the link in Installation mode but without changing any configured parameters. Quick Install Mode is a "one click" method for doing this. The method is completely generic, working identically for both WinLink 1000 and RADWIN 2000 products.

Enabling Quick Install

By default, this feature is disabled.

➢ **To enable Quick Install mode:**

1. Log on to the RADWIN Manager, navigate to **Tools | Preferences** and click the **Advanced** tab:

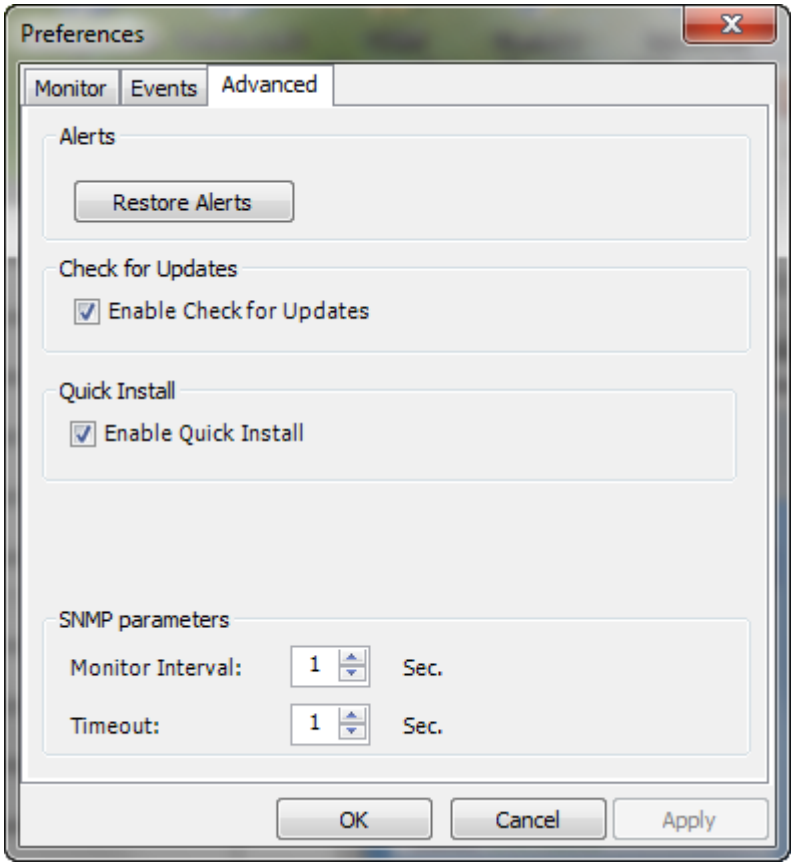


Figure 23-1: Preferences: Quick Install

2. Check the **Enable Quick Install** box and then OK. A new button is added to the main window toolbar:

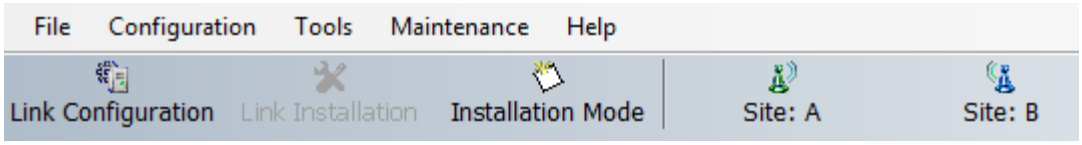


Figure 23-2: New Install Mode button for Quick Install mode

Quick Install mode may be disabled by unchecking the **Enable Quick Install** box.

Using Quick Install

➢ **To suspend service traffic and enter Installation mode:**

1. Click the Install mode button. You are offered a confirmatory message:

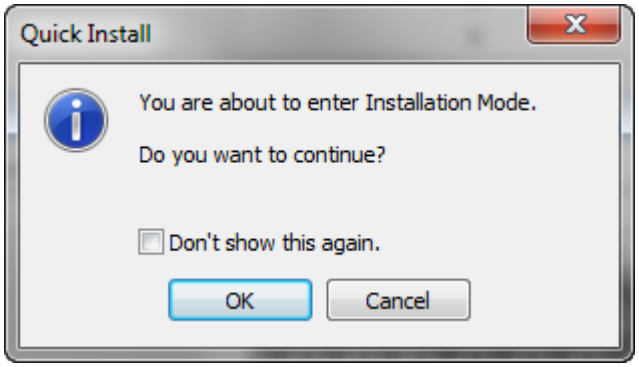


Figure 23-3: Change to Installation Mode cautionary message

2. Click **Yes** to continue. The link goes into Installation mode. The main window looks the same as if you had entered Installation mode in the usual way through one of the **Site** windows with the exception of the toolbar:

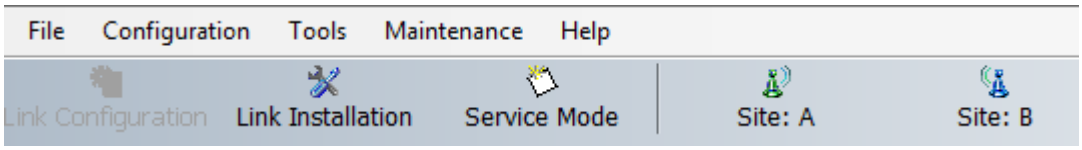


Figure 23-4: Service Mode button to resume link service traffic

3. When you are ready to resume normal service traffic, click the **Service Mode** button. The following cautionary message is displayed:

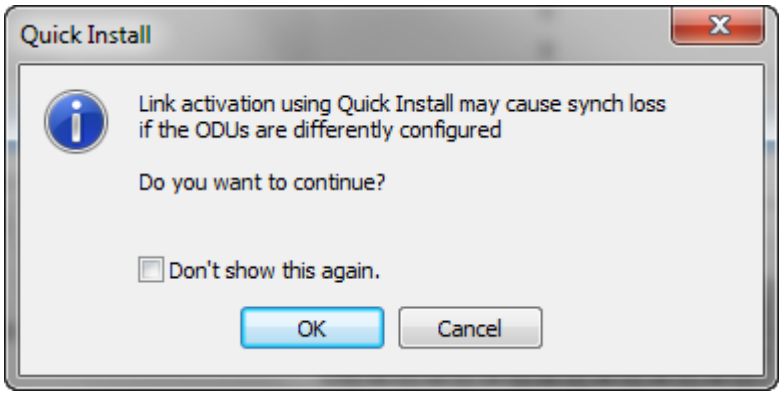


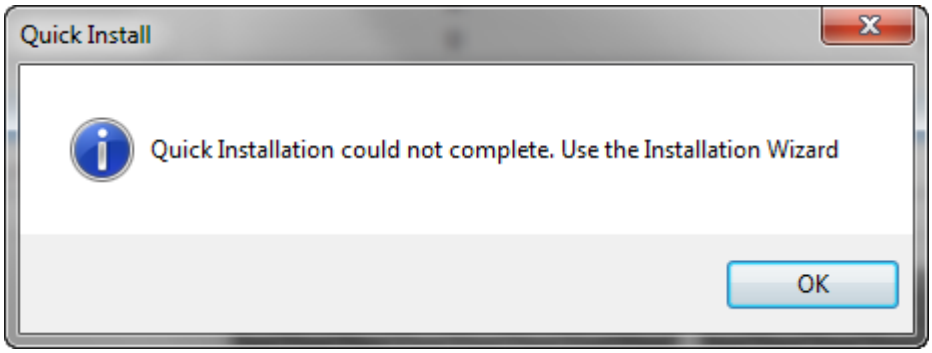
Figure 23-5: Resumption of services cautionary message

4. Click **Yes** to continue. The link will resume normal services with your last set configuration parameters provides that you did not change link parameters in a a way leading to sync-loss.

Note

It is also possible to change parameters in a way leading to service degradation. For example mis-configuring the number of antennas or transmission parameters at one side of the link may allow service to resume, but in a degraded fashion.

You may only enter Quick Install mode from a configured link. If you set both sites back to factory settings and chose Quick Install, you will not be able to continue:



Chapter 24

BRS/EBS Considerations

What is BRS/EBS

The Broadband Radio Service (BRS), formerly known as the Multipoint Distribution Service (MDS)/Multichannel Multipoint Distribution Service (MMDS), is a US **FCC regulated** commercial service. **The relevant FCC rule is 47CFR part 27 subpart M**.

In the past, it was generally used for the transmission of data and video programming to subscribers using high-powered wireless cable systems. However, over the years, it has evolved to include digital two-way systems capable of providing high-speed, high-capacity broadband service, including two-way Internet service via cellularized communication systems. Such services provide consumers integrated access to voice, high-speed data, video-on-demand, and interactive delivery services from a wireless device.

For further details see:

http://wireless.fcc.gov/services/index.htm?job=service_home&id=ebs_brs

This link (part of the FCC site) contains the Technical Rules covering matters such as:

- Operational scope
- Geographic service area
- Antenna registration

BRS/EBS Bands

The BRS/EBS band (post-transition) is illustrated in **Figure 24-1** below and in more detail in the three tables following.

Observe that the BRS/EBS spectrum is divided into small channels, mainly of 5.5 and 6 MHz. There are two small ranges of 0.333 MHz channels as well.

BRS/EBS user may lease blocks of up to four contiguous channels to achieve their required channel bandwidth. These are often referred to as single, double, triple or quad bands.

Post transition freq. assignments per FCC CFR47 PART 27 sec. 27.5:2009

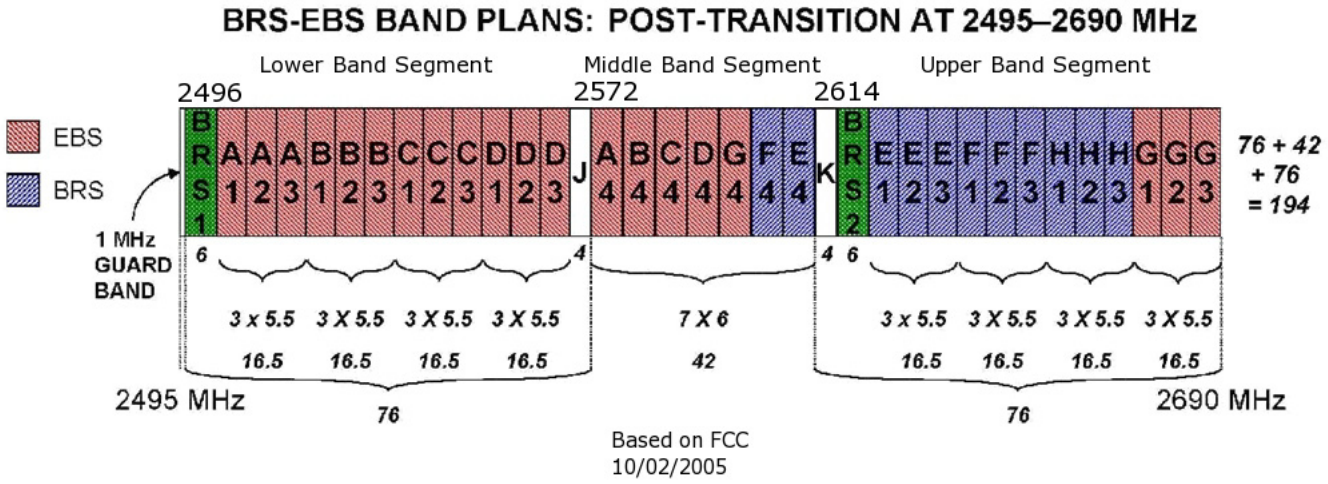


Figure 24-1: BRS/EBS Bands Schematic

The tables below provide a detailed view of the spectrum from 2.495 GHz to 2.690 GHz

The sections marked J and K are not detailed since they are not supported by RADWIN products.

Table 24-1: BRS/EBS Lower Band Segment (LBS)

Channel type	Channel Tag	CBW MHz	Band MHz	
			From	To
BRS Guard	**1**	6	2496.0	2502.0
EBS	**A1**	5.5	2502.0	2507.5
	A2		2507.5	2513.0
	A3		2513.0	2518.5
	B1		2518.5	2524.0
	B2		2524.0	2529.5
	B3		2529.5	2535.0
	C1		2535.0	2540.5
	C2		2540.5	2546.0
	C3		2546.0	2551.5
	D1		2551.5	2557.0
	D2		2557.0	2562.5
	D3		2562.5	2568.0

Table 24-1: BRS/EBS Lower Band Segment (LBS) (Continued)

Channel type	Channel Tag	CBW MHz	Band MHz	
			From	To
EBS (not supported by RADWIN)	**JA1**	0.33333	2568.0	2572.0
	JA2			
	JA3			
	JB1			
	JB2			
	JB3			
	JC1			
	JC2			
	JC3			
	JD1			
	JD2			
	JD3			

Table 24-2: BRS/EBS Middle Band Segment (MBS)

Channel type	Channel Tag	CBW MHz	Band MHz	
			From	To
EBS	**A4**	6	2572	2578
	B4		2578	2584
	C4		2584	2590
	D4		2590	2596
	G4		2596	2602
BRS/EBS	**F4**		2602	2608
	E4		2608	2614

Table 24-3: BRS/EBS to *RADWIN 2000* CBW mapping and Max Tx Power

BRS/ EBS Band	Channel Type	Total CBW MHz	RADWIN 2000 CBW MHz	Max Tx Power dBm
LBS & HBS 5.5 MHz/slice	Single	5.5	5	22
	Double	11.0	10	23
	Triple	16.5	Don't use **(‡)**	
	Quad	22.0	20	24

Table 24-3: BRS/EBS to *RADWIN 2000* CBW mapping and Max Tx Power

BRS/ EBS Band	Channel Type	Total CBW MHz	RADWIN 2000 CBW MHz	Max Tx Power dBm
MBS 6 MHz / slice	Single	6	5	22
	Double	12	10	23
	Triple	18	Don't use **(‡)**	
	Quad	24	20	24

(‡) Using a triple channel would be wasteful over a single link.

Table 24-4: BRS/EBS Upper Band Segment (UBS)

Channel type	Channel Tag	CBW MHz	Band MHz	
			From	To
EBS/EBS, mixed (not supported by RADWIN)	**KH1**	0.33333	2614.0	2618.0
	KH2			
	KH3			
	KG1			
	KG2			
	KG3			
	KF1			
	KF2			
	KF3			
	KE1			
	KE2			
	KE3			
BRS Guard	**2**	6	2618	2624
BRS/EBS	**E1**	5.5	2624.0	2629.5
	E2		2629.5	2635.0
	E3		2635.0	2640.5
	F1		2640.5	2646.0
	F2		2646.0	2651.5
	F3		2651.5	2657.0
BRS	**H1**		2657.0	2662.5
	H2		2662.5	2668.0
	H3		2668.0	2673.5
EBS	**G1**		2673.5	2679.0
	G2		2679.0	2684.5
	G3		2684.5	2690.0

Setting up a BRS/EBS link using RADWIN 2000 2.5GHz Band

The key issue in setting up a RADWIN 2000 2.5GHz Band BRS link is the choice of an appropriate channel bandwidth (CBW), which in turn depends on whether you are leasing a single, double, triple or quad band set.

RADWIN BRS radios operate with channel bandwidths selectable from 5, 10 and 20 MHz. Choose your channel bandwidth in accordance with **Table 24-3**.



RADWIN does not support the bands labeled J and K in **Figure 24-1**.

USER MANUAL

RADWIN 2000 BROADBAND WIRELESS TRANSMISSION SYSTEM

Release 2.8.20

Part 4: Field Installation Topics

RADWIN

Chapter 25

Pre-loading an ODU with an IP Address

Why this is Needed

All ODUs supplied by RADWIN come preconfigured 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 6**.

There are two situations under which ODUs may need to be pre-loaded with an IP address prior to installation to a link:

- Changing an individual ODU in the field
- Preparing a large number of ODUs in a warehouse prior to deployment in the field, according to a network installation plan.

This chapter explains how do this.

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 5-1**
- An installed copy of the RADWIN Manager
- A PoE device
- An Ethernet LAN cable
- An IDU-ODU cable
- If you have connectorized ODUs, two N-type RF terminators



Caution

Do **not** carry out this procedure using a multi homed managing computer also connected to a network. It will flood the network with broadcast packets. Further, it will throw any other links on the network into Installation mode.

The procedure

Note

The following procedure is generic to all RADWIN radio products. What you see on your running RADWIN Manager may differ in some details from the screen captures used to illustrate this chapter.

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 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.

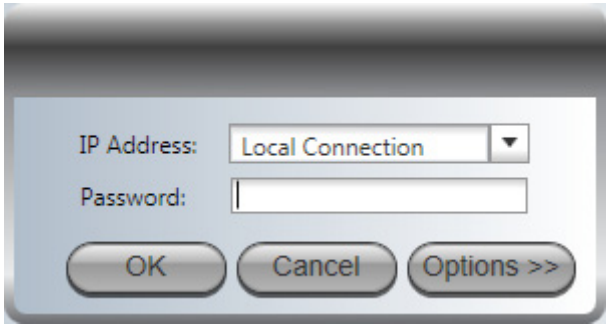


Figure 25-1: Log on Window for Local Connection

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

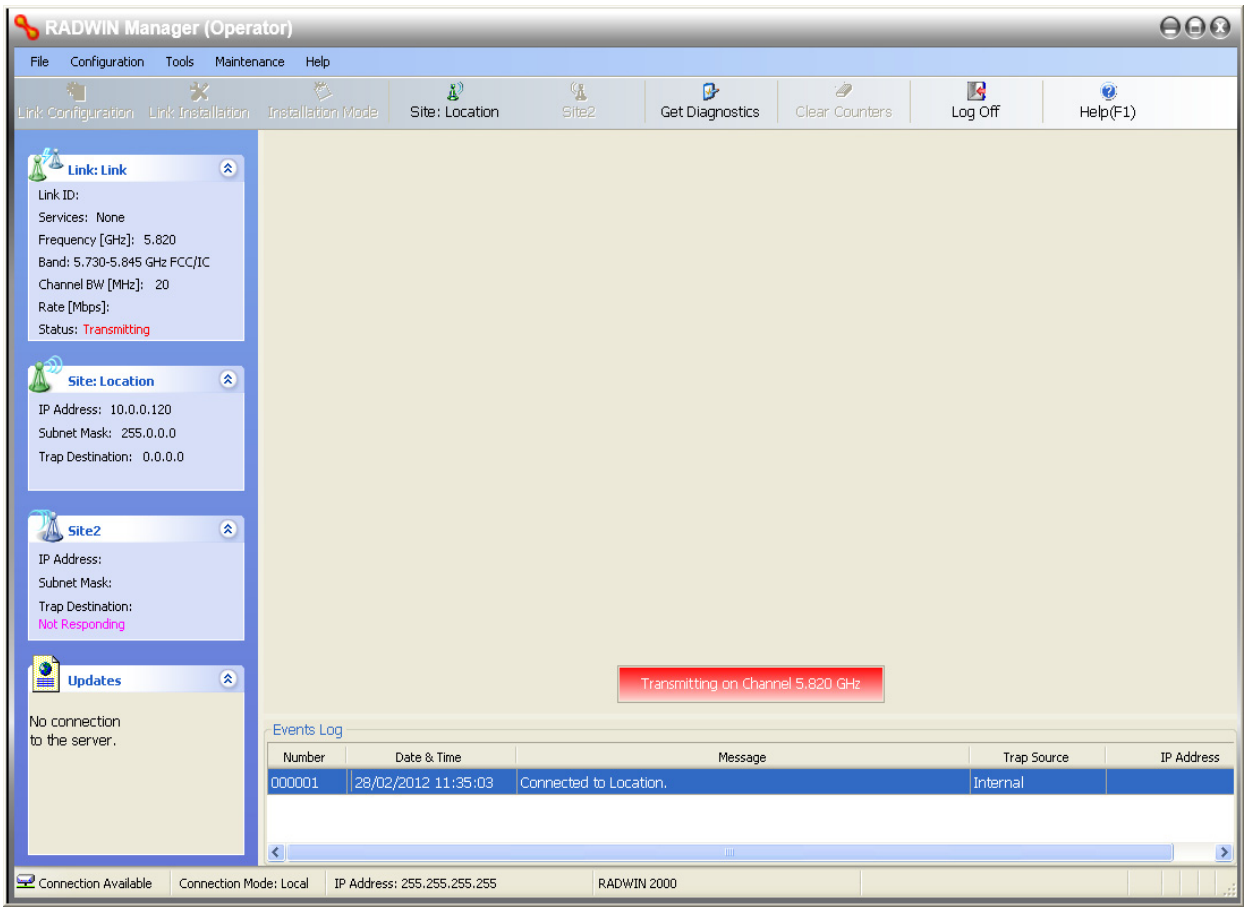


Figure 25-2: Opening *RADWIN Manager* window prior to installation

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

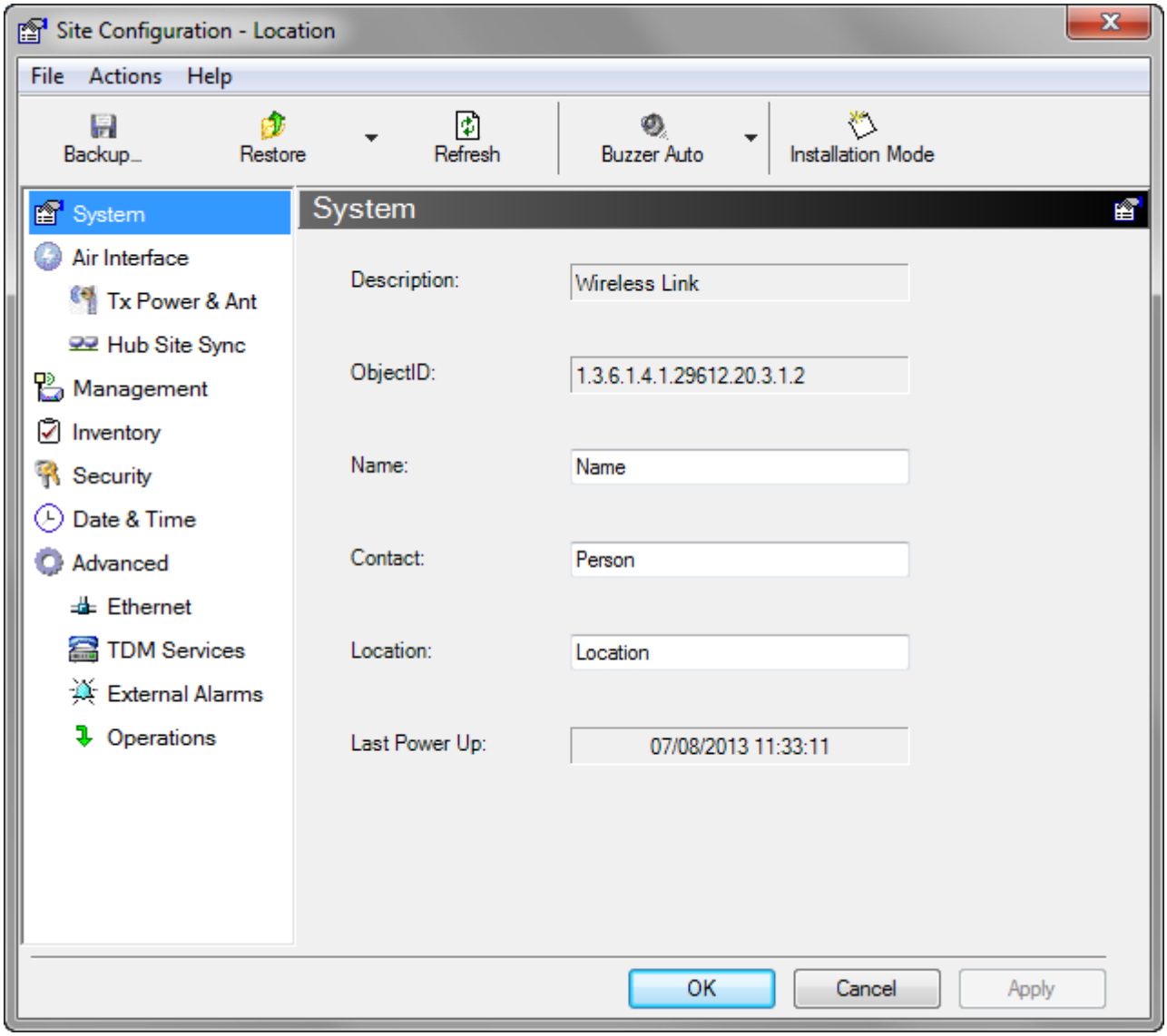


Figure 25-3: Configuration Dialog Box

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

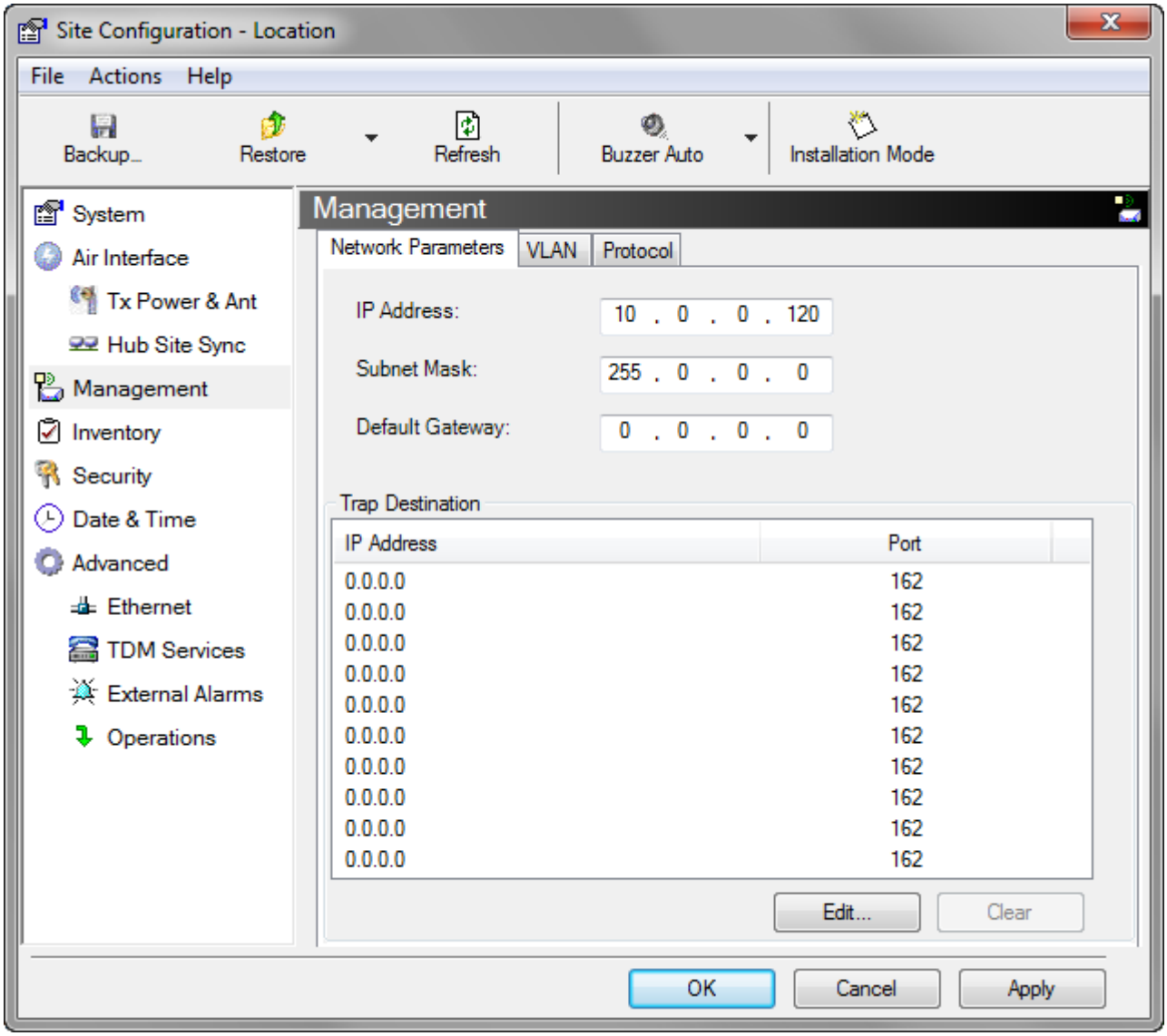


Figure 25-4: Management Addresses - Site Configuration dialog box

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

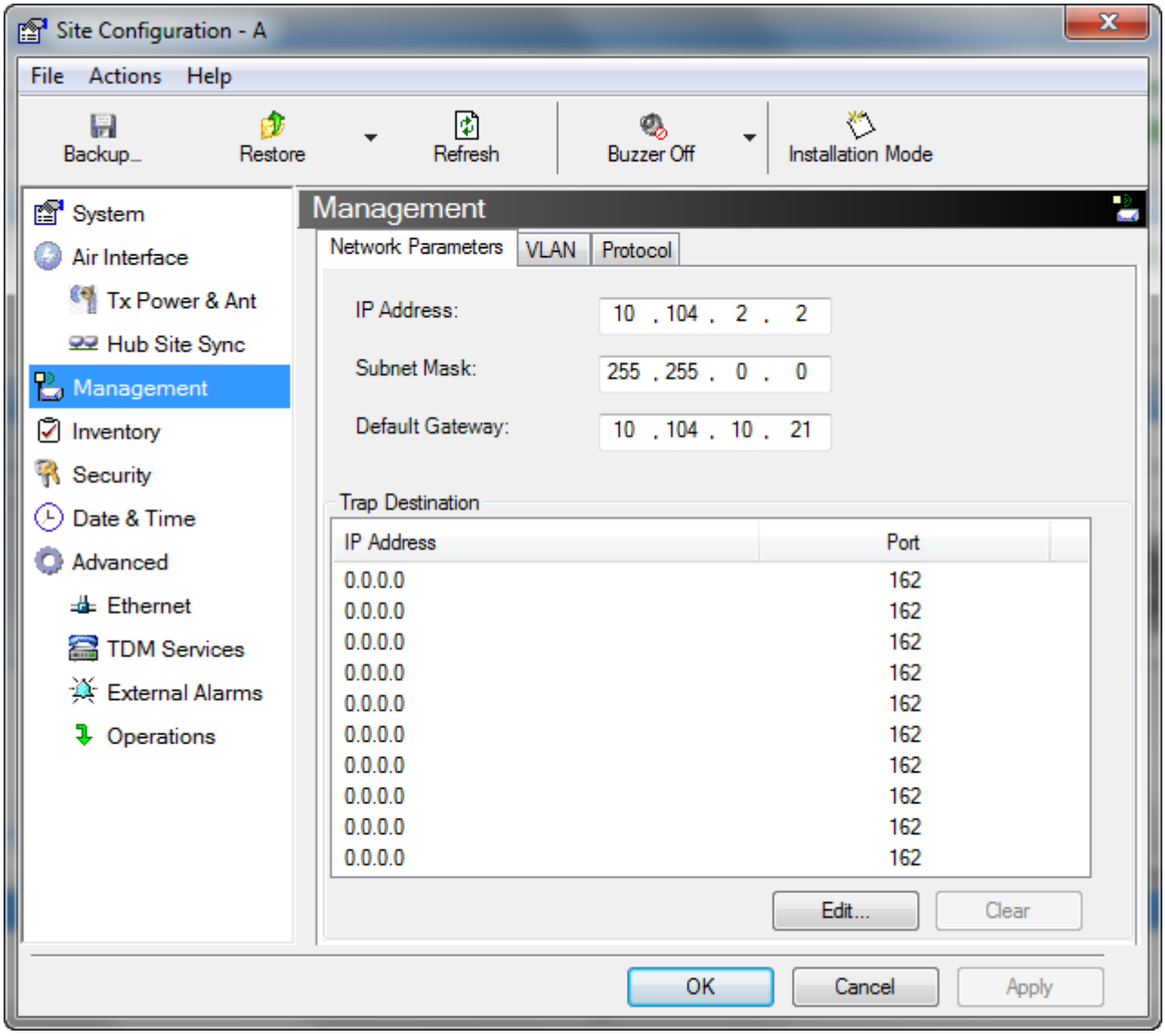


Figure 25-5: ODU with IP Addressing configured

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

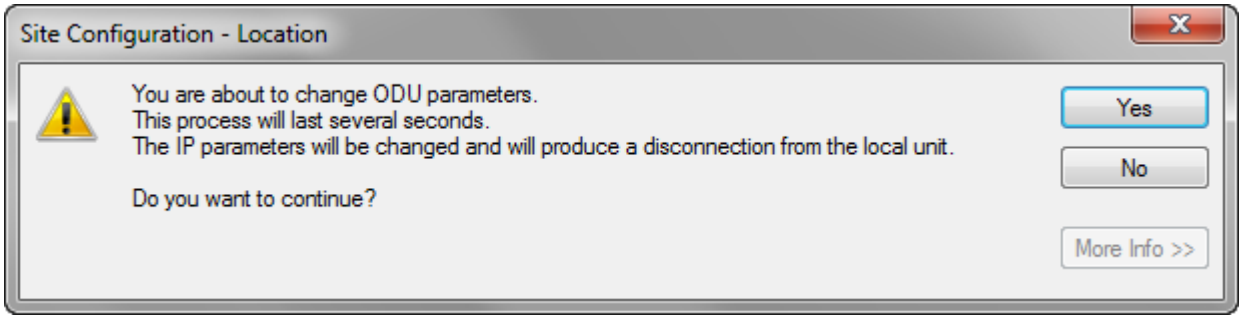


Figure 25-6: Confirmation of IP Address change

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.

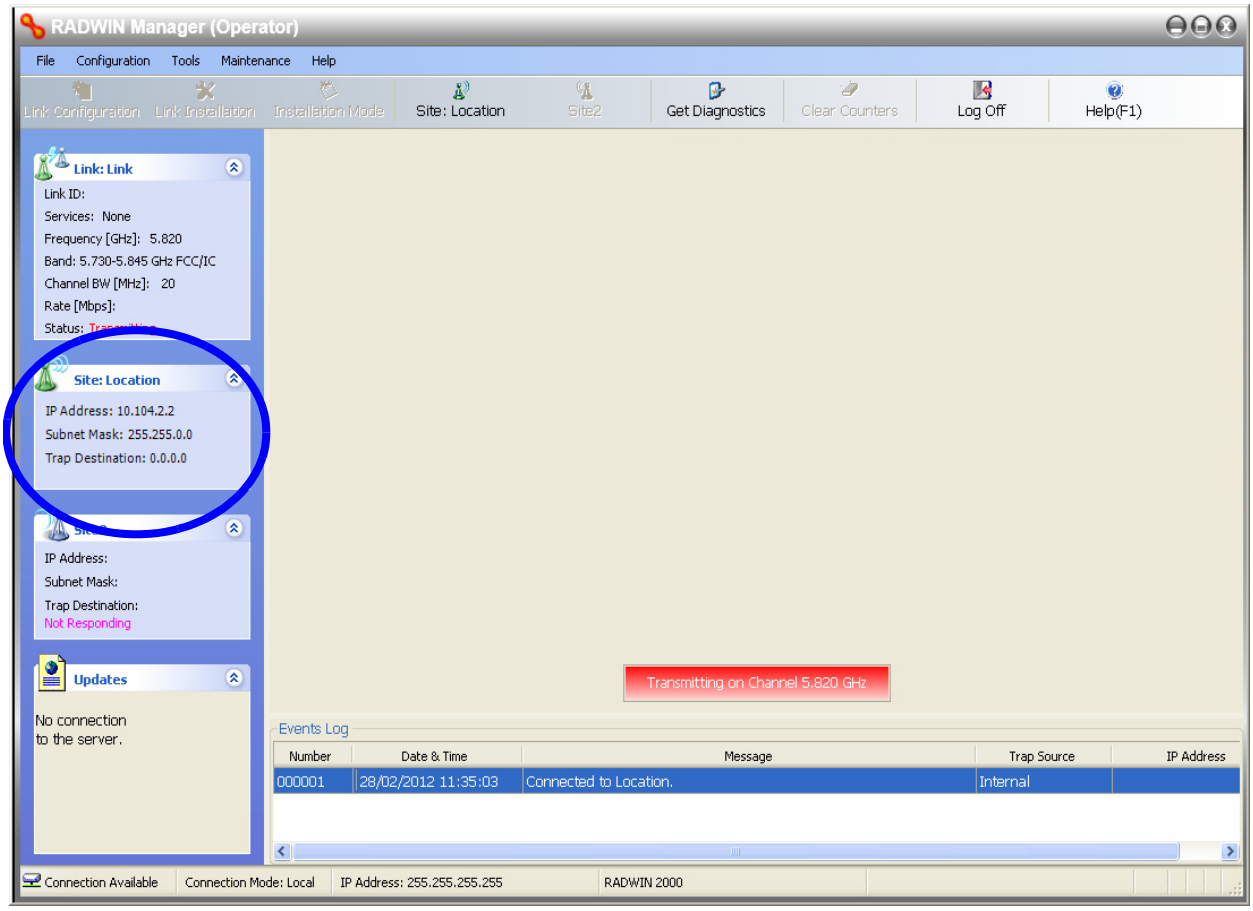


Figure 25-7: Main Window after IP Address change

Some additional things you may want to do now:

- Go to Site **Installation | Air Interface**. You can enter a Link ID and change the Installation Frequency and Channel Bandwidth.
- If you log on as Installer, you can change the default band (**Chapter 22**).

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 Manager will revert to that shown in **Figure 25-2** above. In any event, power down the changed ODU; your changes will take effect when you power it up again.

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

Tip: How to Recover a Forgotten ODU IP Address

If you have an ODU with lost or forgotten IP address, use the above procedure to log on to it using Local Connection. The IP address will appear in the left hand status area:

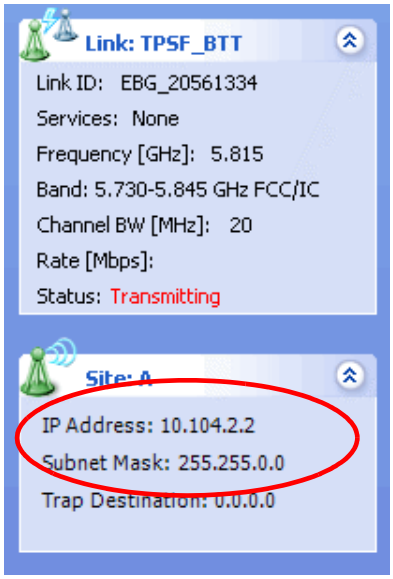


Figure 25-8: Existing IP address displayed after log-on with Local Connection

Chapter 26

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
- 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,

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

$$ExpectedFadeMargin = ExpectedRSS - Sensitivity$$

where Sensitivity is dependent on air-rate.

Min and Max Range

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

MaxRange (with Adaptive checked) is the largest range for which $ExpectedRSS \ge Sensitivity$, 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 $ExpectedRSS \ge Sensitivity + RequiredFadeMargin$.

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).

$$Availability = 1 - 6 \times 10^{-7} \times Cfactor \times frequency_{GHz} \times (RequiredRange_{KM})^3 \times 10^{\frac{-ExpectedFadeMargin}{10}}$$

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 26-1** 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: $\sqrt{R^2_{Mean} + \left[\frac{ExpectedRange}{2}\right]^2} - R_{Mean}$

where $R_{Mean} = 6367.4425Km$.

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.

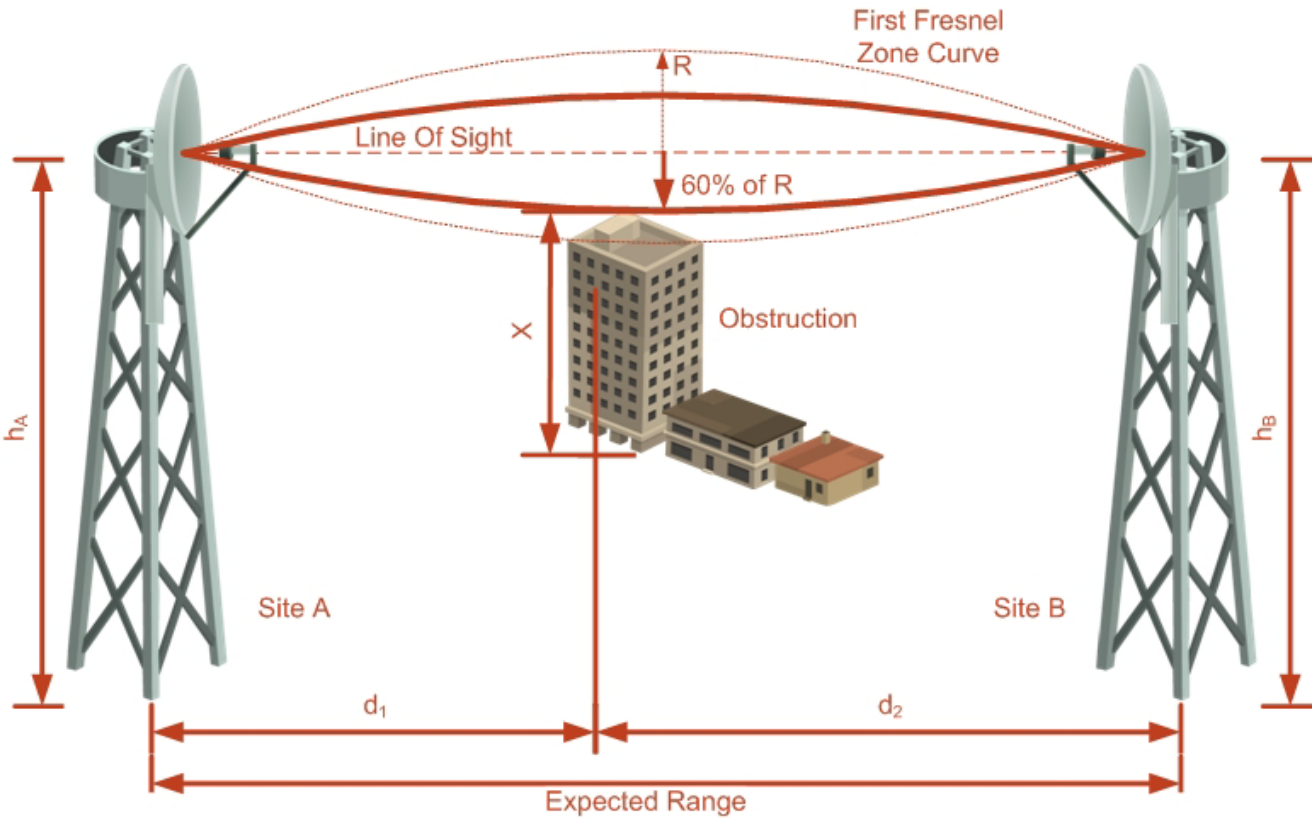


Figure 26-1: Fresnel zone

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 26-1** 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**.

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, from the RADWIN Manager application or from the Windows Start Menu.

➢ **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 Windows Start Menu:**

- Choose **Start | Programs |** RADWIN Manager.

➢ **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:

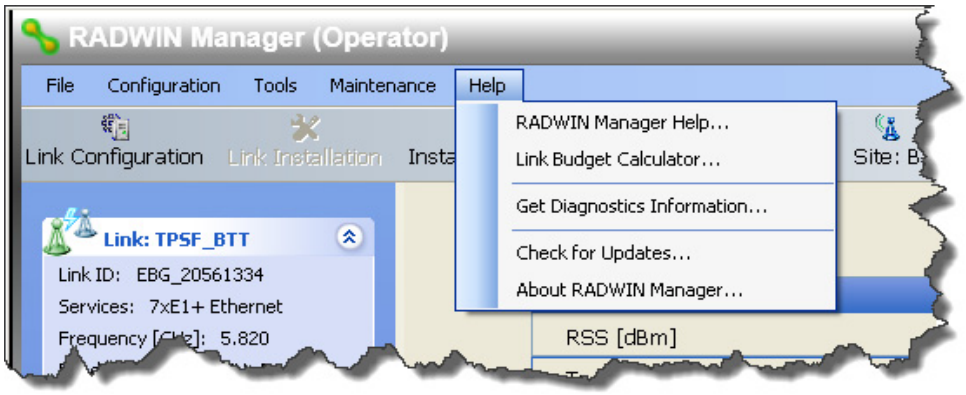


Figure 26-2: Accessing the Link Budget Calculator

➢ **To run the Link Budget Calculator from the Windows Start Menu:**

- Click **Start | Programs |** RADWIN Manager **| Link Budget Calculator**.

However invoked, your browser displays the following page:

RADWIN 2000 | RADWIN 5000 HPMP | WinLink 1000

Product	Band	5.730-5.845 GHz FCC/IC Integrated
	Series	RADWIN 2000 C
Radio	Channel Bandwidth	20 MHz / Auto ?
	Tx Power	18 dBm [-8 - 18]
	Antenna Type	Dual +3 dB
	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
Range	Min	0.1 Km / 0.1 Miles
	Max	15.4 Km / 9.6 Miles
	Required/Climate	10 Km Coordinates / Good (C=0.25) ?
Services	Type	Ethernet Only
	Ethernet Throughput	88.5 Mb/s (48.5 Mb/s Full Duplex)
Installation	Antenna height for LOS	9 Meter / 30 Feet 7 Meter / 23 Feet (0.6 Fernel) 2 Meter / 7 Feet (Boresight clearance)
		Calculate

Figure 26-3: Link Budget window

Note

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



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

➢ **To use the Link Budget Calculator for RADWIN 2000:**

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

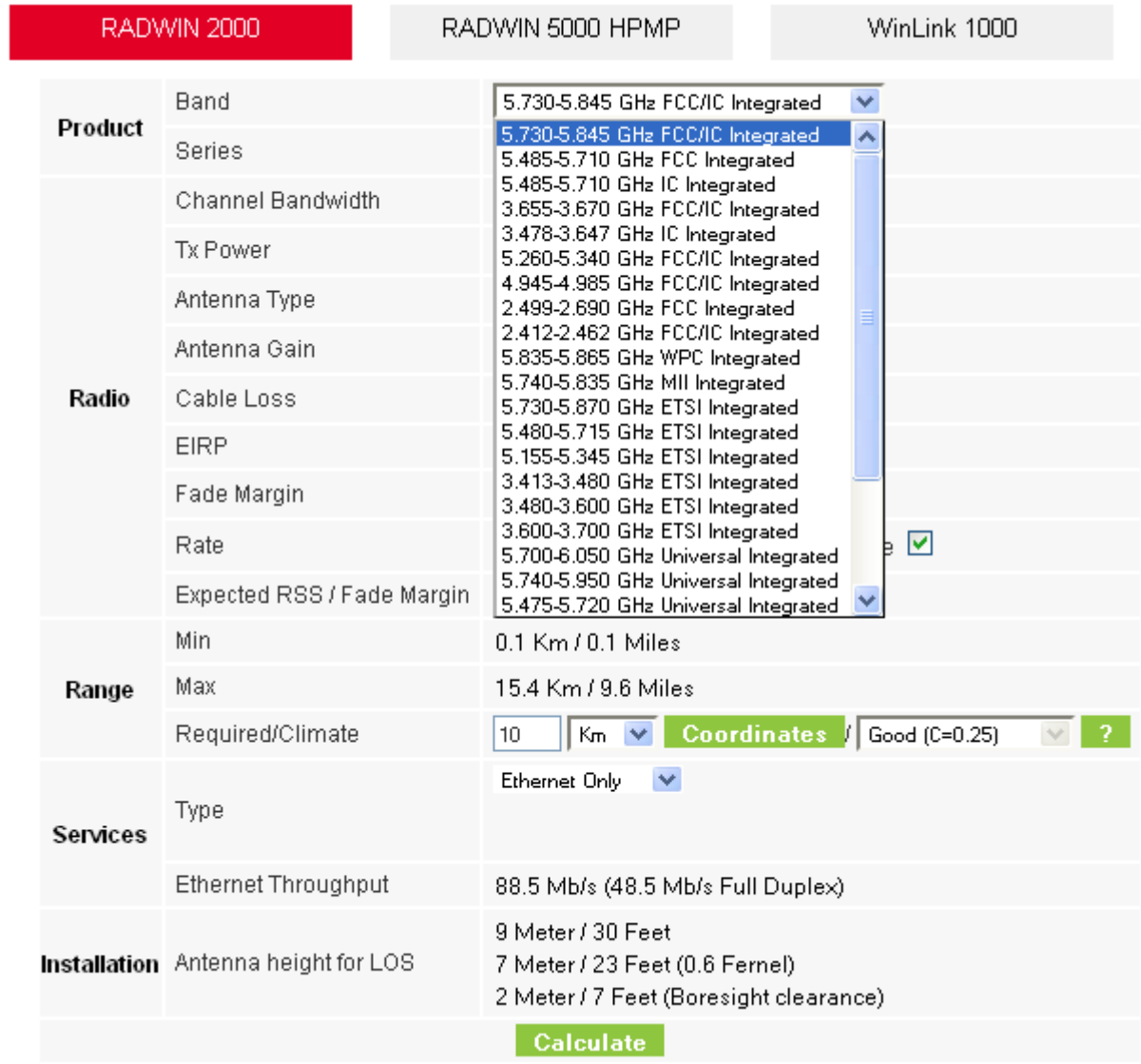


Figure 26-4: Band selector

2. Chose the relevant RADWIN 2000 series.

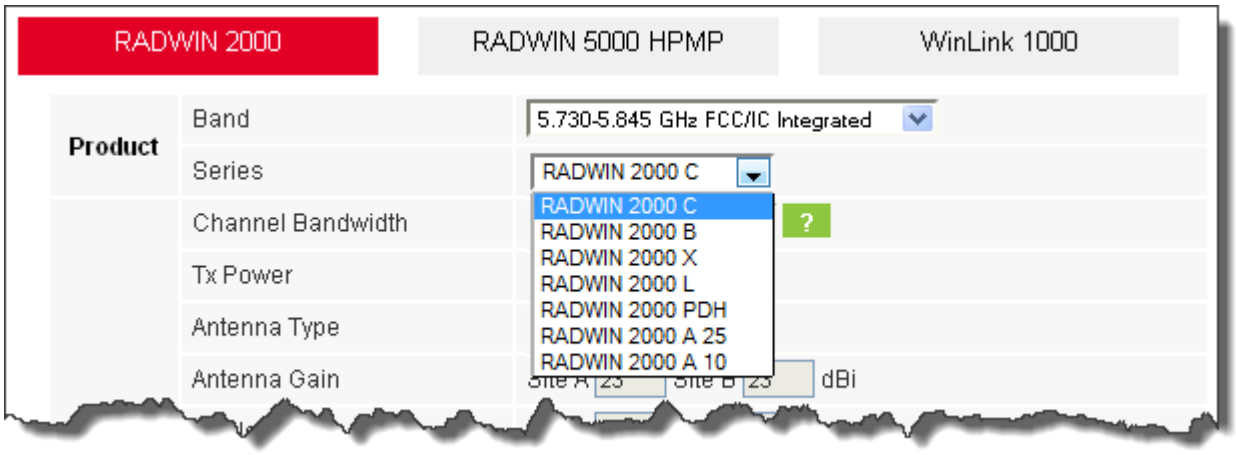


Figure 26-5: RADWIN 2000 series selector

3. Choose the Channel Bandwidth.

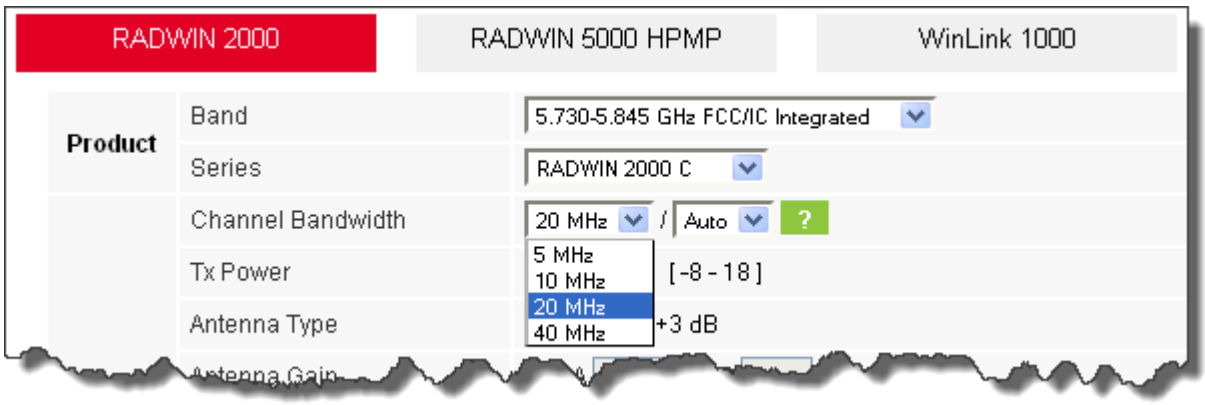


Figure 26-6: RADWIN 2000 Channel Bandwidth selector

4. For a collocated link choose the RFP. Use the Help button to the right of the RFP selection box for help:

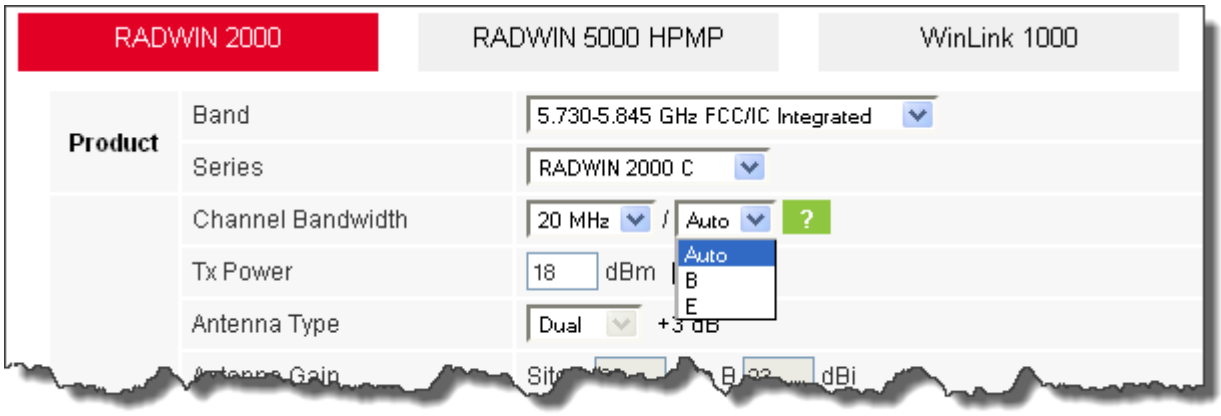


Figure 26-7: RFP Selector

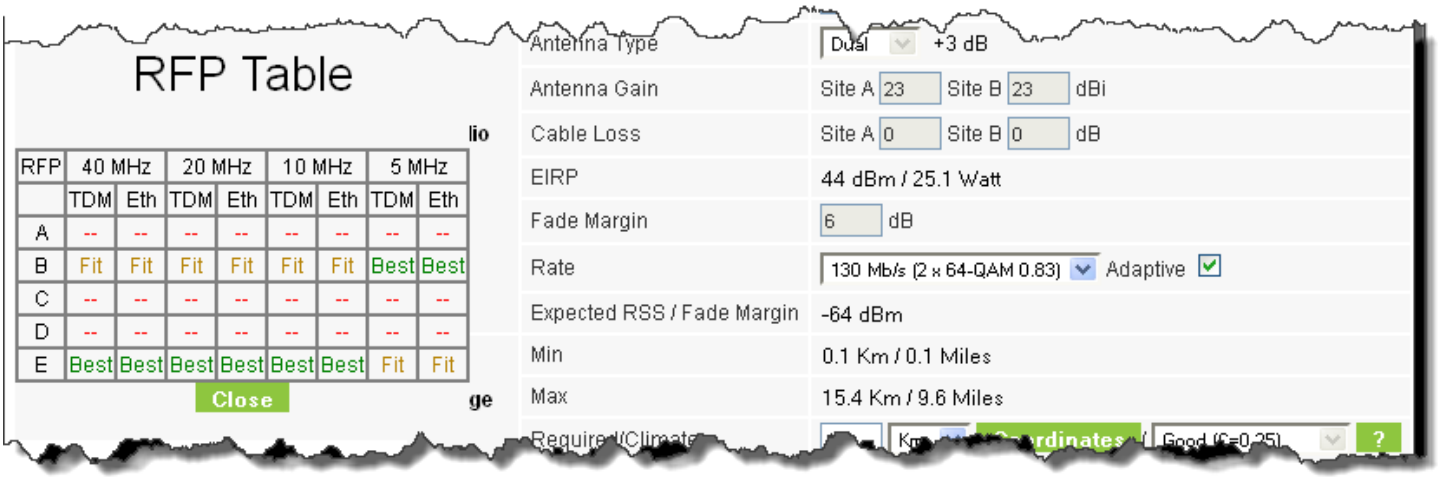


Figure 26-8: RFP Selection Guide

Note

For collocation with:

- RADWIN 2000 products, you may only use RFP B or E.
- WinLink 1000 products, you may only use RFP E.

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

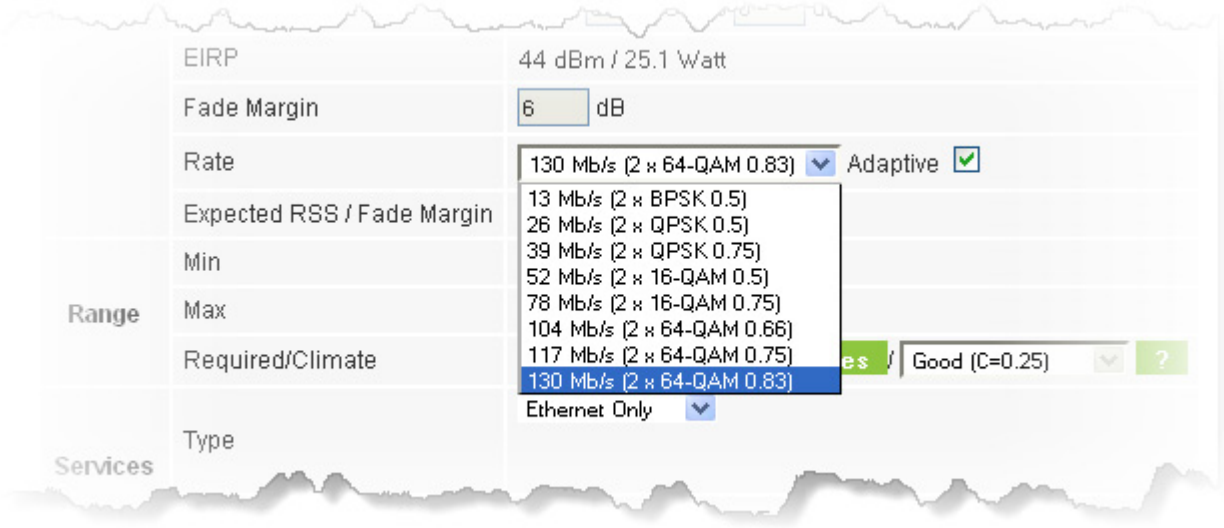


Figure 26-9: Rate selector

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 line-o- sight (LOS) conditions. For degraded link conditions, a larger Fade margin should be used.

The EIRP is given in dBm and Watts.

6. 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.

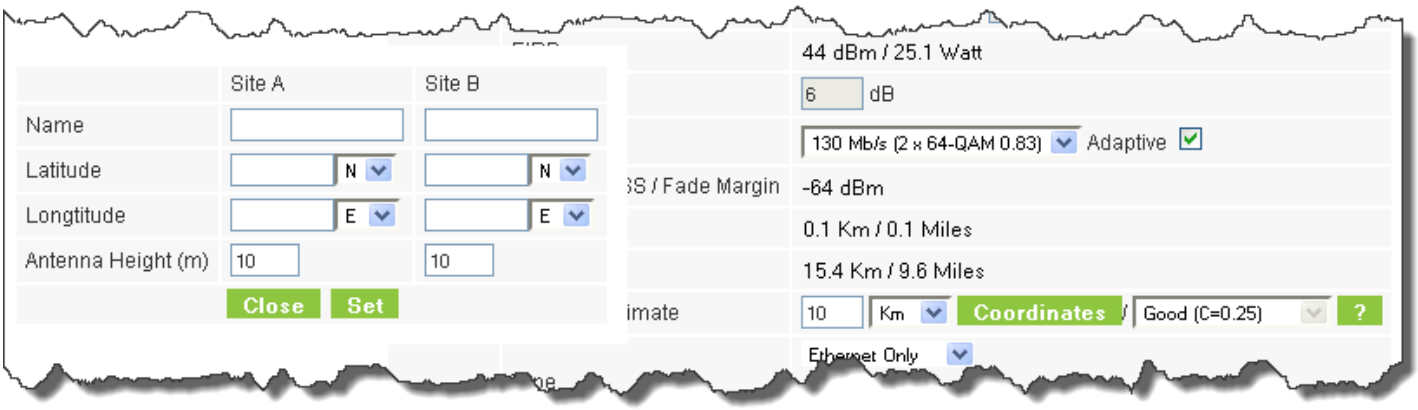
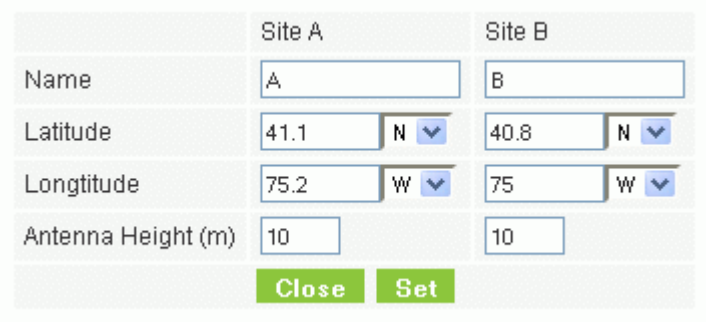


Figure 26-10: Calculation of distance from site coordinates

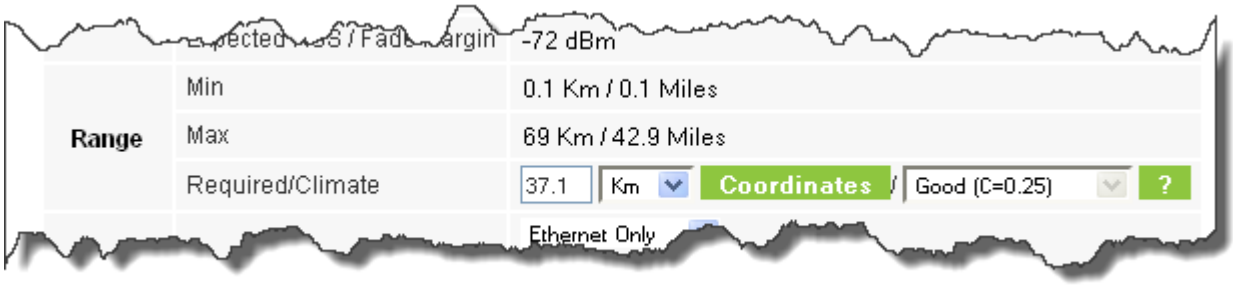
For example, enter:

Site A: 41.1°N lat 74.2°W Long

Site B: 40.8°N lat 74.0°W Long



7. Click **Set**. The distance and link budget is calculated.



8. 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.

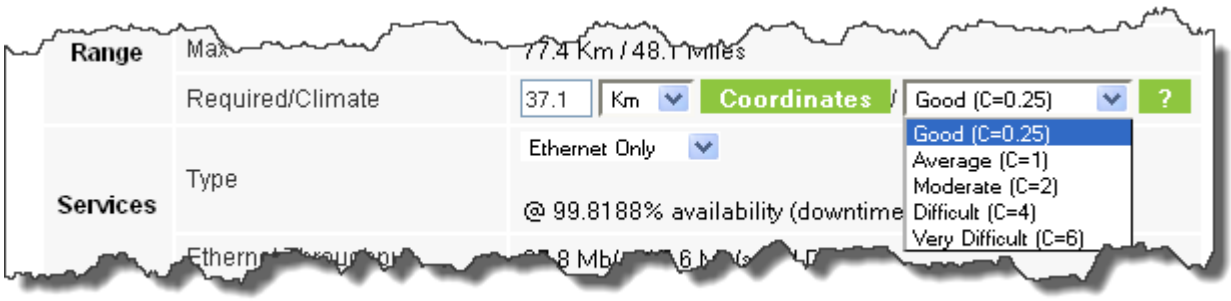


Figure 26-11: Climactic C Factors

The C factor does not affect the foregoing range calculation. It only affects the Availability calculation for a link with non-adaptive rate.

For help about what these C factor values mean, click the **?** button to the right of the list in **Figure 26-11**.

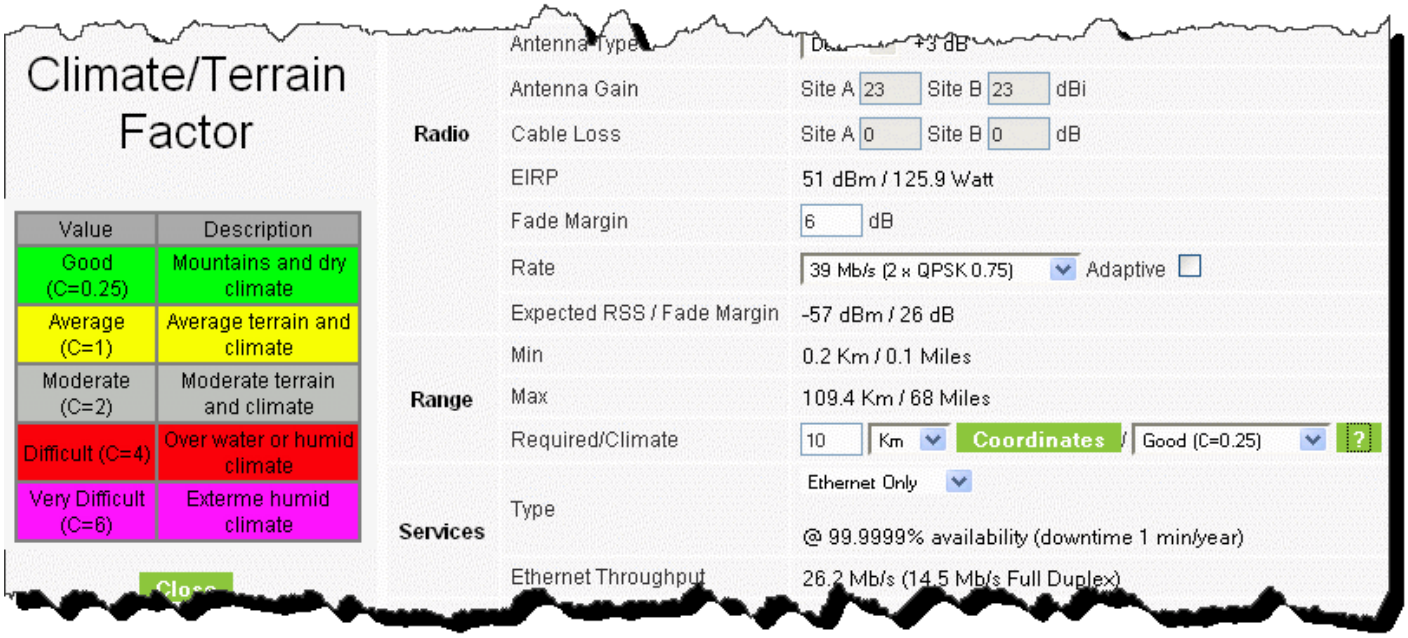


Figure 26-12: Climactic C Factor description

In **Figure 26-13** we display a map of the world showing C Factor contours:

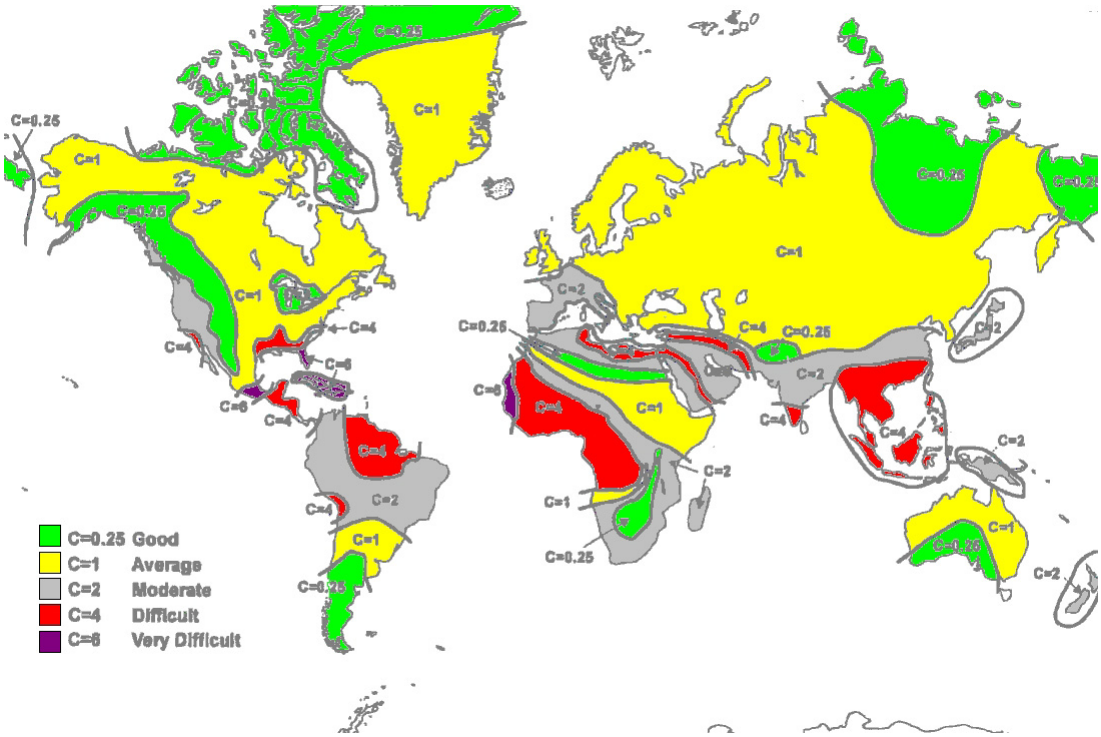


Figure 26-13: World map showing C Factor contours

9. At any time, click **Calculate** to recalculate the required performance estimate.

Note

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

	Expected RSS / Fade Margin	-72 dBm
Range	Min	0.1 Km / 0.1 Miles
	Max	69 Km / 42.9 Miles
	Required/Climate	37.1 Km Coordinates / Good (C=0.25) ?
Services	Type	Ethernet Only
	Ethernet Throughput	42.2 Mb/s (23.6 Mb/s Full Duplex)
Installation	Antenna height for LOS	40 Meter / 131 Feet 13 Meter / 43 Feet (0.6 Fernel) 27 Meter / 89 Feet (Boresight clearance)

Figure 26-14: LBC - Results section

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.

Chapter 27

Spectrum View

What is Spectrum View?

The RADWIN Manager Spectrum View utility is an RF survey tool designed to support the link installation prior to full link service activation. The tool provides comprehensive and clear spectral measurement information enabling easier, faster and better quality installations.

You can view real-time spectrum information, save the spectral information and view retrieved spectral information from historic spectrum scans.

RADWIN's spectrum measurement and estimation algorithms are designed to show accurate information accommodating variations in frequency, temperature and interference power and at the same time overcoming anomalies that tend to occur in high interference environments.

Running Spectrum View

To launch Spectrum View, go to the RADWIN Manager main window menu and click **Tools | Spectrum View**.

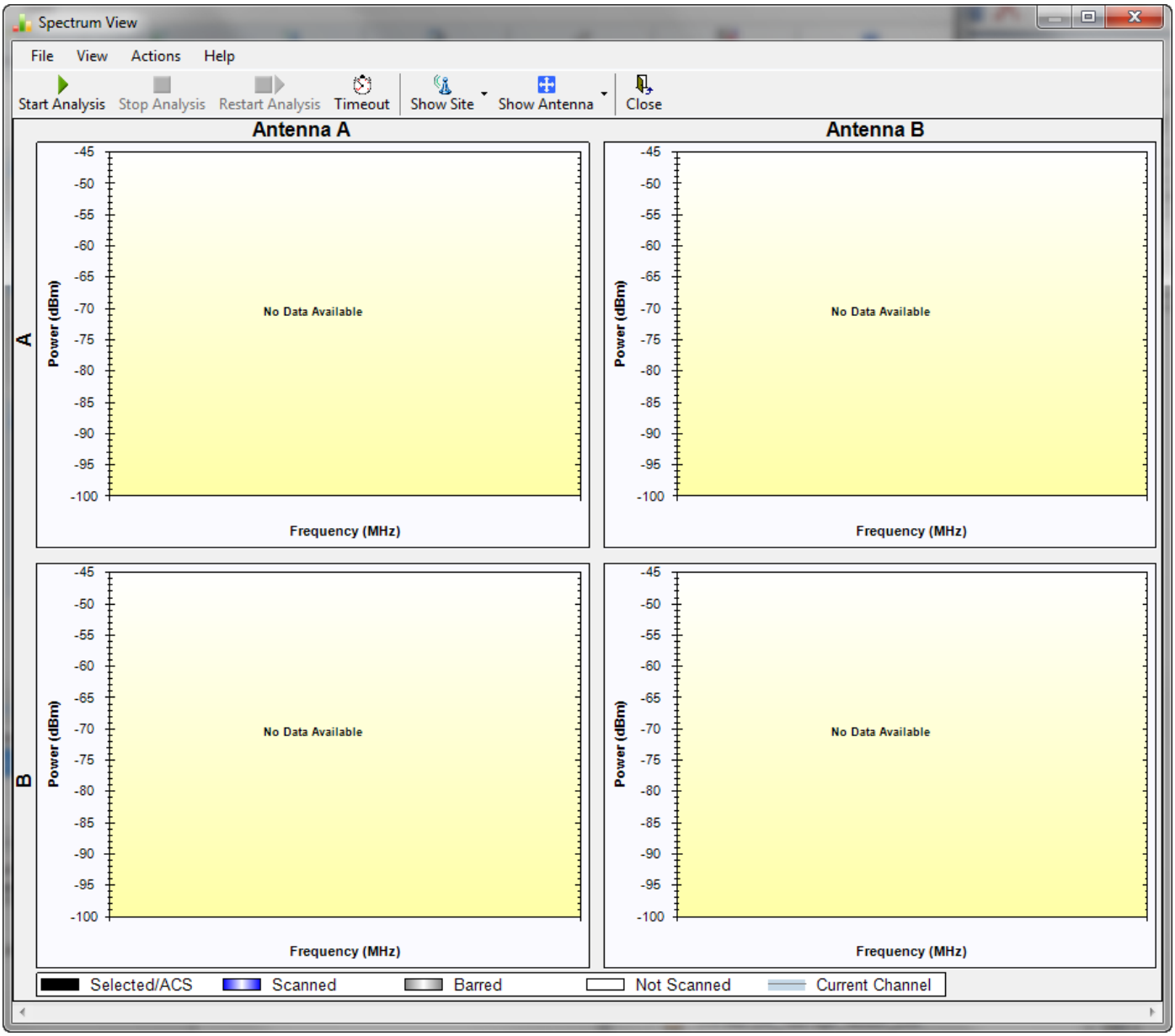
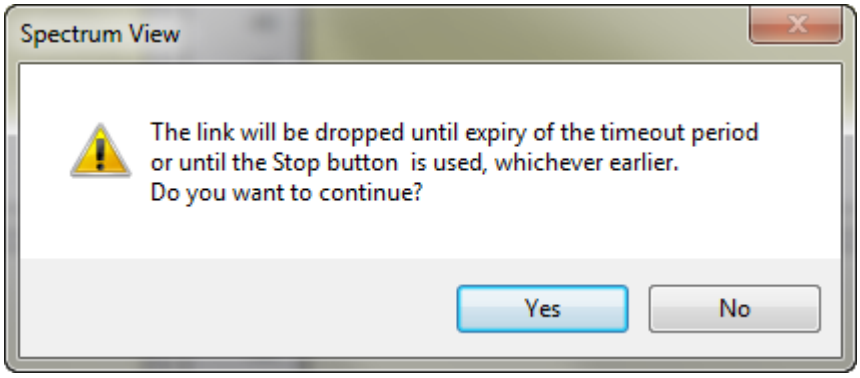


Figure 27-1: Starting the analysis

To obtain a spectrum analysis:

1. Use the Timeout button to set the maximum time for the analysis. The default is 120 seconds.
2. Click **Start Analysis**. Since the anlysis will drop the link for its duration as set in 1, you are asked for confirmation:



3. Click **Yes**. After a few moments, the first results for the managing site appear:

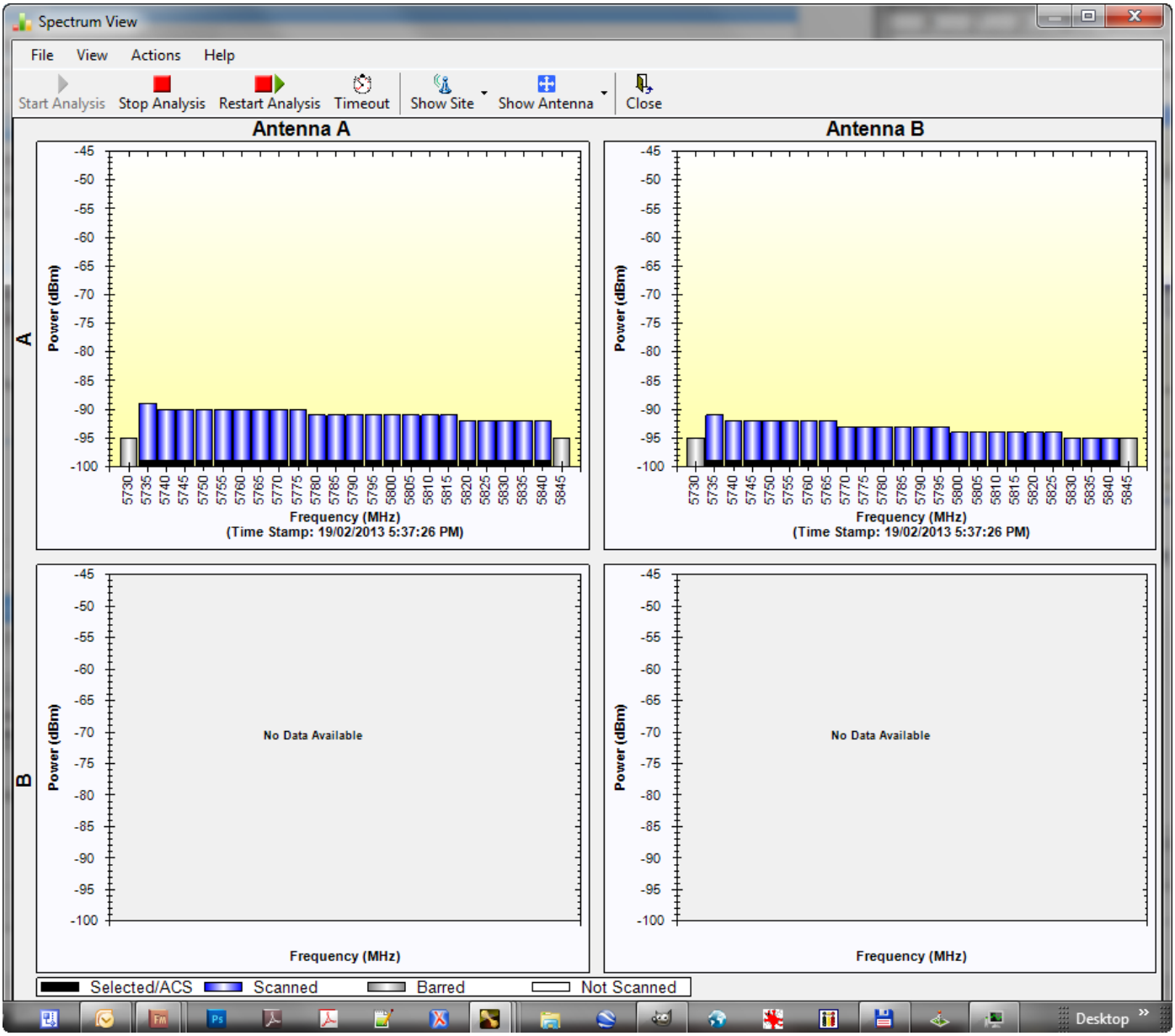


Figure 27-2: Site A (managing site) done

The over-the-air site takes a little longer:

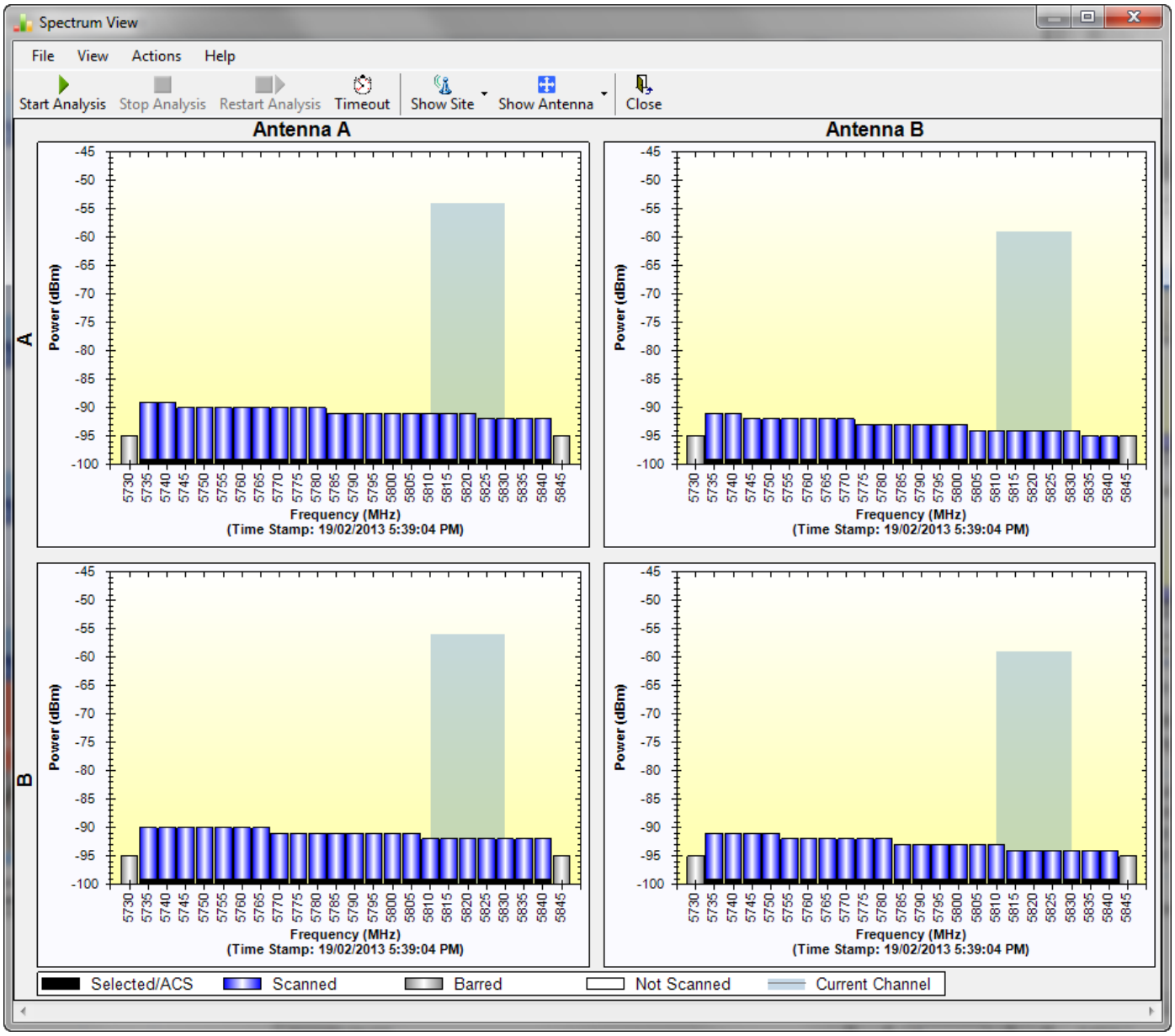


Figure 27-3: Site B (over- the-air site) done, showing current channel

The analysis complete when the Start Analysis button reverts to green. It never runs for longer than the timeout value and you may stop it any time by clicking the red **Stop Analysis** button.

Note

If you are using a high resolution licensed band, the **Stop Analysis** button works differently: It will halt the analysis of the managed site (Site A), but it will not halt analysis of the over-the-air site (Site B).You should therefore ensure that the timeout value is not too high.

The results for the over-the-air site are displayed after the link is re-established regardless of whether the analysis completes by itself or was stopped.

Understanding the Spectrum View Display

Information Displayed

Figure 27-4 shows an annotated display taken from a live link.

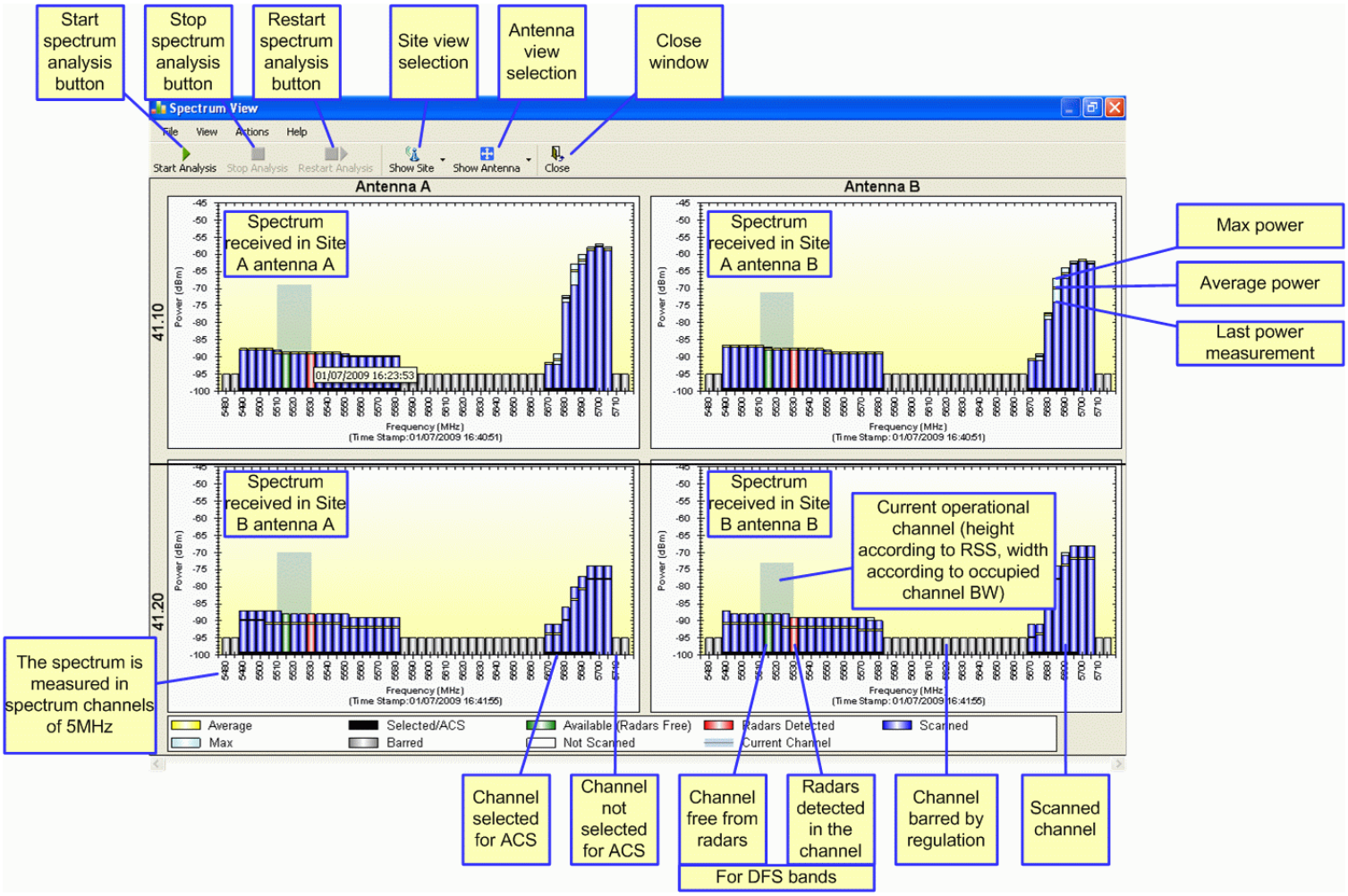


Figure 27-4: RADWIN 2000 Spectrum View - annotated display

From **Figure 27-4** above, you can see that the Spectrum View provides clear information including:

- Spectral measurement for each of the 4 receivers that make a RADWIN 2000 link (two sites x two antennas per site)
- Spectral power measurements in 5MHz channel granularity
- Current, average and maximum power per channel
- Indication of
  - channels free from radars
  - channels with radars detected
  - barred channels (for DFS bands)
- Indication of scanned and un-scanned channels
- Indication of channels selected for ACS
- Notation of the current operational channel of the RADWIN 2000 link

- Time stamp of the last spectrum scan
- Further, it supports zoom capability, selective view of antennas and sites constituting the link and selectable detail level

Changing the Display

Moving the mouse anywhere over one the display areas changes it to a cross hair. The mouse may then be used to select an area for zooming, or to enable a right-click System menu.

Selecting a rectangle and clicking will zoom the channels below it to full panel width:

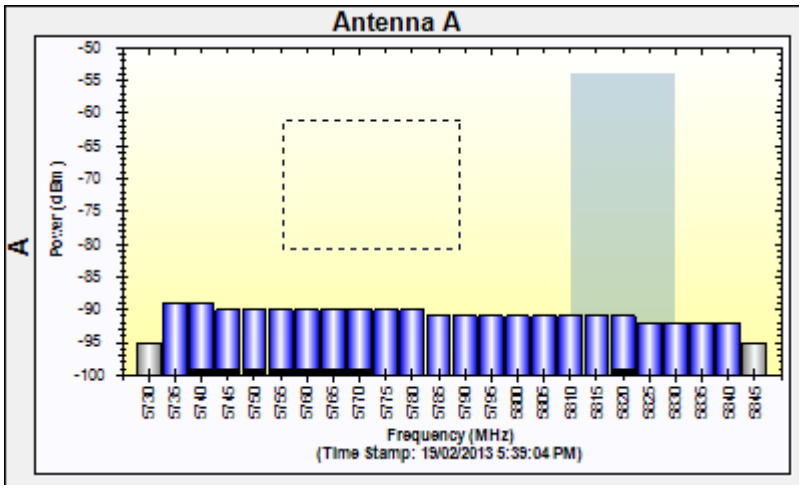


Figure 27-5: Selecting an area of interest to zoom with the right mouse button down

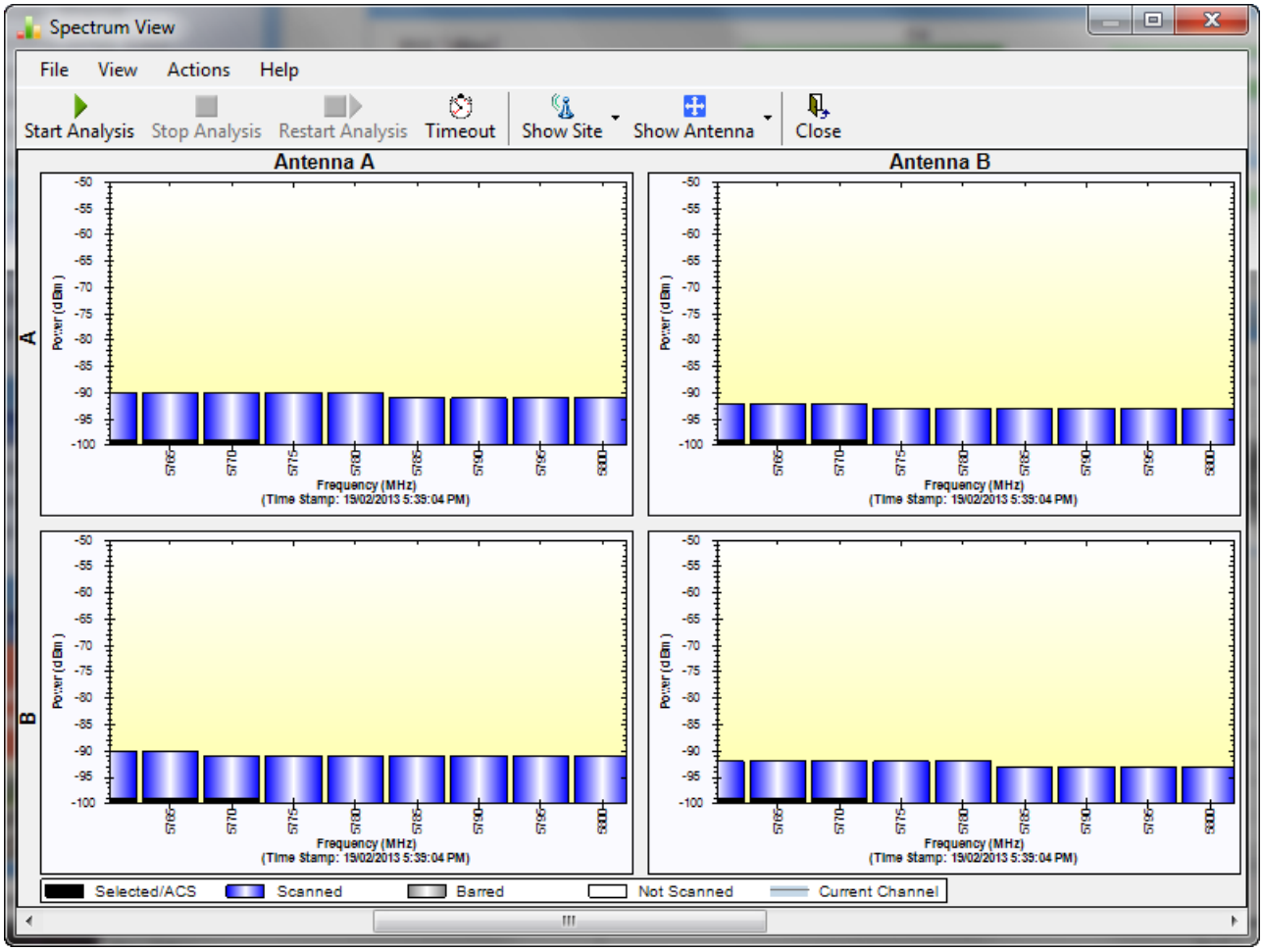


Figure 27-6: Requested section zoomed

The zoom can be reversed using the System menu obtained by right-clicking any of the Spectrum View display panels. It also offers display variations such as maximum, average and current power per channel.

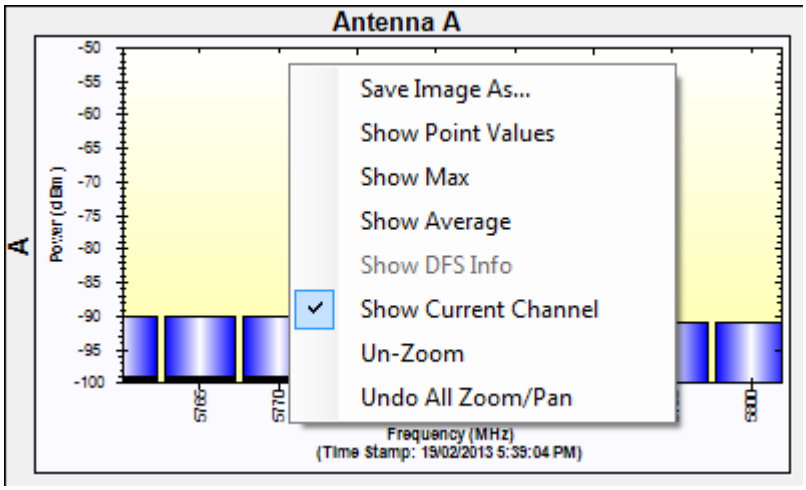


Figure 27-7: Spectrum View System menu

Here are two examples:

If you click **Show Max**, each panel will show the peak values recorded during the analysis:

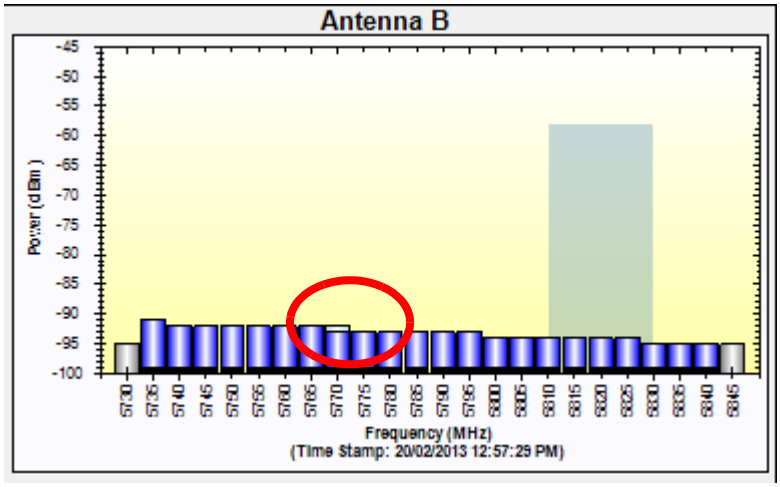


Figure 27-8: Effect of setting **Show Max**

If you click **Show Average**, each panel will show the average values recorded during the analysis:

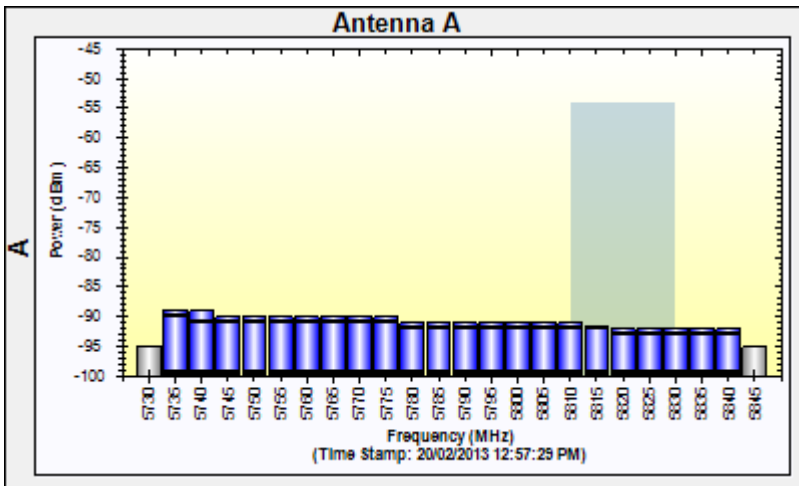


Figure 27-9: Effect of setting **Show Average**

Restricting the Panels to be Displayed

Click **View** for further viewing options:

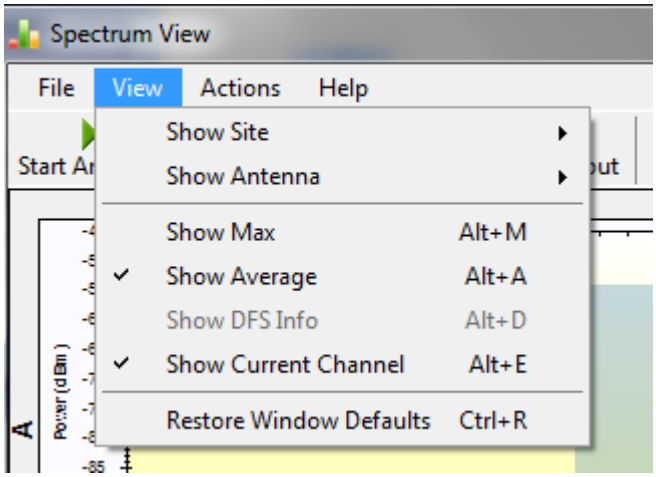


Figure 27-10: Further viewing options

If for example you want Antenna A only, the resulting display will look like this:

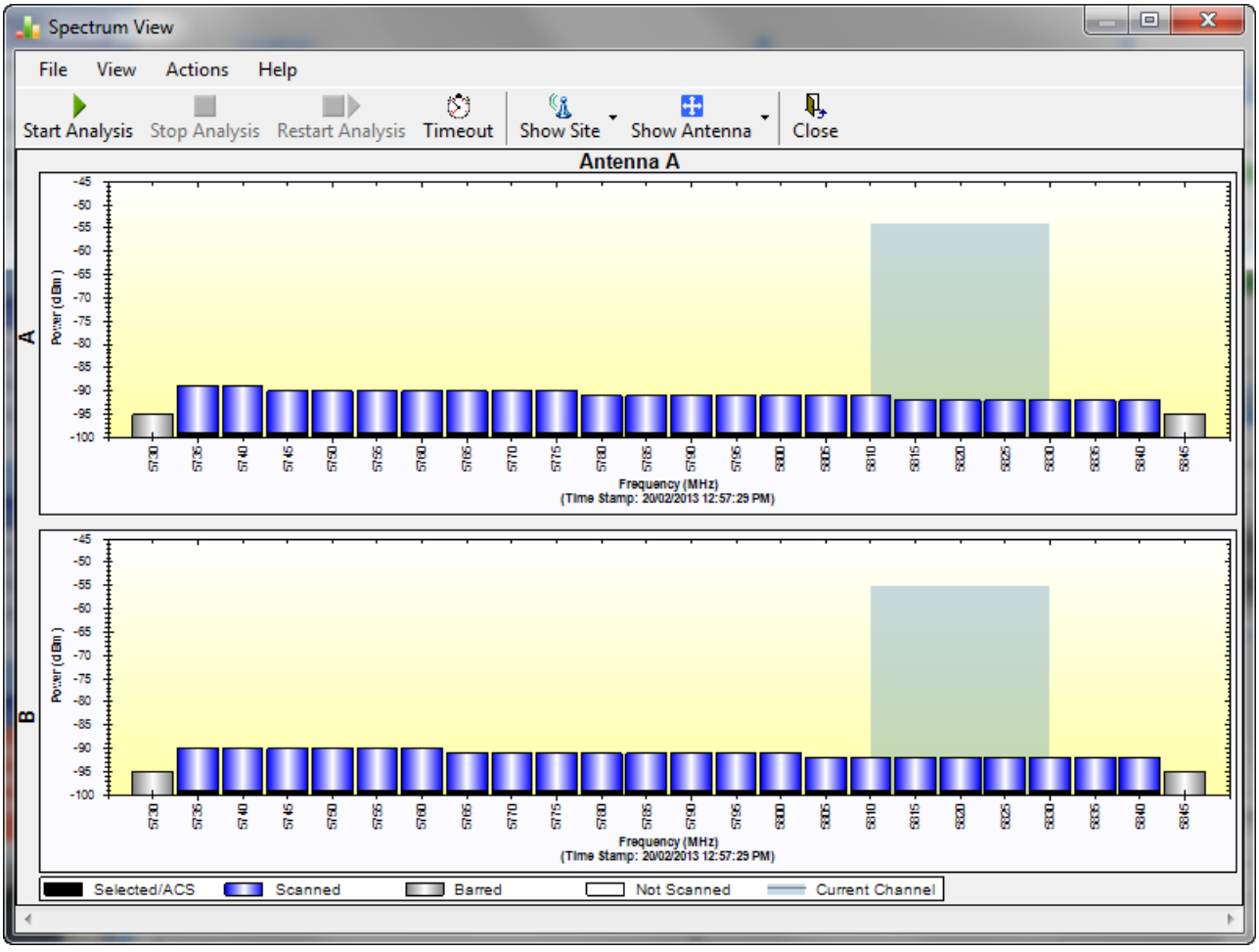


Figure 27-11: Antenna A selected

Saving a Spectrum Analysis

Your analysis can be saved in a CSV (comma separated values) text file. Use the **Files | Save** menu item in the usual way.

The Spectrum View information is logged as part of the Diagnostics Information to improve link and system diagnostics and remote support. It can be retrieved from the RADWIN Manager menu using **Help |Get Diagnostic Information**.The Spectrum View values in dBm, are noise-floor (NF) relative.

Here is an extract from a saved Spectrum View, imported to MS Excel:

Table 27-1: Spectrum View - Site A

Spectrum View - Site: A								
Frequency	**Is Scanned**	**Last Scan Timestamp**	**Last NF-AntennaA**	**Last NF-AntennaB**	**Average NF-AntennaA**	**Average NF-AntennaB**	**Max NF-AntennaA**	**Max NF-AntennaB**
5735	TRUE	20/02/2013 12:57	-89	-91	-90	-92	-89	-91
5740	TRUE	20/02/2013 12:57	-89	-92	-91	-93	-89	-92
5745	TRUE	20/02/2013 12:57	-90	-92	-91	-93	-90	-92
5750	TRUE	20/02/2013 12:57	-90	-92	-91	-93	-90	-92
5755	TRUE	20/02/2013 12:57	-90	-92	-91	-93	-90	-92
5760	TRUE	20/02/2013 12:57	-90	-92	-91	-93	-90	-92
....								
5815	TRUE	20/02/2013 12:57	-92	-94	-92	-95	-91	-94
5820	TRUE	20/02/2013 12:57	-92	-94	-93	-95	-92	-94
5825	TRUE	20/02/2013 12:57	-92	-94	-93	-95	-92	-94
5830	TRUE	20/02/2013 12:57	-92	-95	-93	-95	-92	-95
5835	TRUE	20/02/2013 12:57	-92	-95	-93	-95	-92	-95
5840	TRUE	20/02/2013 12:57	-92	-95	-93	-95	-92	-95
Rx Power - AntennaA: -54								
Rx Power - AntennaB: -58								

Table 27-2: Spectrum View - Site B

Spectrum View - Site: B								
Frequency	**Is Scanned**	**Last Scan Timestamp**	**Last NF-AntennaA**	**Last NF-AntennaB**	**Average NF-AntennaA**	**Average NF-AntennaB**	**Max NF-AntennaA**	**Max NF-AntennaB**
5735	TRUE	20/02/2013 12:57	-90	-91	-91	-92	-90	-91
5740	TRUE	20/02/2013 12:57	-90	-91	-91	-92	-90	-91
5745	TRUE	20/02/2013 12:57	-90	-91	-91	-92	-90	-91
5750	TRUE	20/02/2013 12:57	-90	-92	-91	-93	-90	-92
5755	TRUE	20/02/2013 12:57	-90	-92	-91	-93	-90	-92
5760	TRUE	20/02/2013 12:57	-90	-92	-91	-93	-90	-92
5765	TRUE	20/02/2013 12:57	-91	-92	-92	-93	-91	-92
...								
5810	TRUE	20/02/2013 12:57	-92	-94	-93	-94	-92	-93
5815	TRUE	20/02/2013 12:57	-92	-94	-93	-95	-92	-94
5820	TRUE	20/02/2013 12:57	-92	-94	-93	-95	-92	-94
5825	TRUE	20/02/2013 12:57	-92	-94	-93	-95	-92	-94
5830	TRUE	20/02/2013 12:57	-92	-94	-93	-95	-92	-94
5835	TRUE	20/02/2013 12:57	-92	-94	-93	-95	-92	-94
5840	TRUE	20/02/2013 12:57	-92	-95	-93	-95	-92	-95
Rx Power - AntennaA: -55								
Rx Power - AntennaB: -58								

Management Integration

Spectrum view information is supported in RADWIN's MIB and can be used by external Network Management applications.

Chapter 28

Using the Web Interface

What is it For

The Web Interface (WI) enables you to carry out basic link management functions using a Web browser. It is an easy way to rapidly configure and setup a link.

It may be used to -

- Establish a link on a minimal basis for Ethernet only
- Check link parameters and make basic changes
- View the link Inventory
- Inspect the Recent Events logs

Who Needs it

The WI is a tool for technicians to "quick-install" a link with minimum effort. The technician may use the WI to install a link for Ethernet service.

It may also be employed by a user for a quick look at current operating parameters and the Recent Events logs. If the link was previously installed using the RADWIN Manager, then the WI monitor window will also show TDM services.

How it Works

Suppose that you have Site A (managing computer) on IP address 10.104.2.2 and Sit B (over-the-air) on IP address 10.104.2.4, you would simply point your browser to either of these addresses and log on as shown below. As far as the WI is concerned, the site to which you log on becomes the **managed site** and the other site is "seen" as the **over-the-air site** regardless of the site to which you are physically connected.

What it Provides

The WI provides an Installation/Configuration wizard as well as site configuration dialogs.

Prerequisites

Hardware

You need a regular LAN connection between a managing computer and one of the link ODUs. The WI is available for RADWIN 2000 C and RADWIN 2000 B ODUs at release level 2.6.00 or later.

Software

Your computer should have at least version 6 of MS Internet Explorer. The Web interface also works with other browsers such as Mozilla Firefox version 3 and later.

Technical Background

You should be familiar with the concepts underlying the RADWIN Manager and preferably with the Manager itself.

Special Considerations Working with the WI

Advanced Configurations

For setup configurations using features such as HSS, TDM service, VLAN and QoS, you will need to use the RADWIN Manager.

More on how WI Works

User Interface Considerations

Most standard Windows based Wizards have **Next**, **Back** and **Cancel** buttons on each Wizard window. Typically a Wizard does not commit your input until you complete it. You can always "back out" from the Wizard, abandoning your input by using the standard **Cancel** button. **The Web Interface Wizard works differently:**

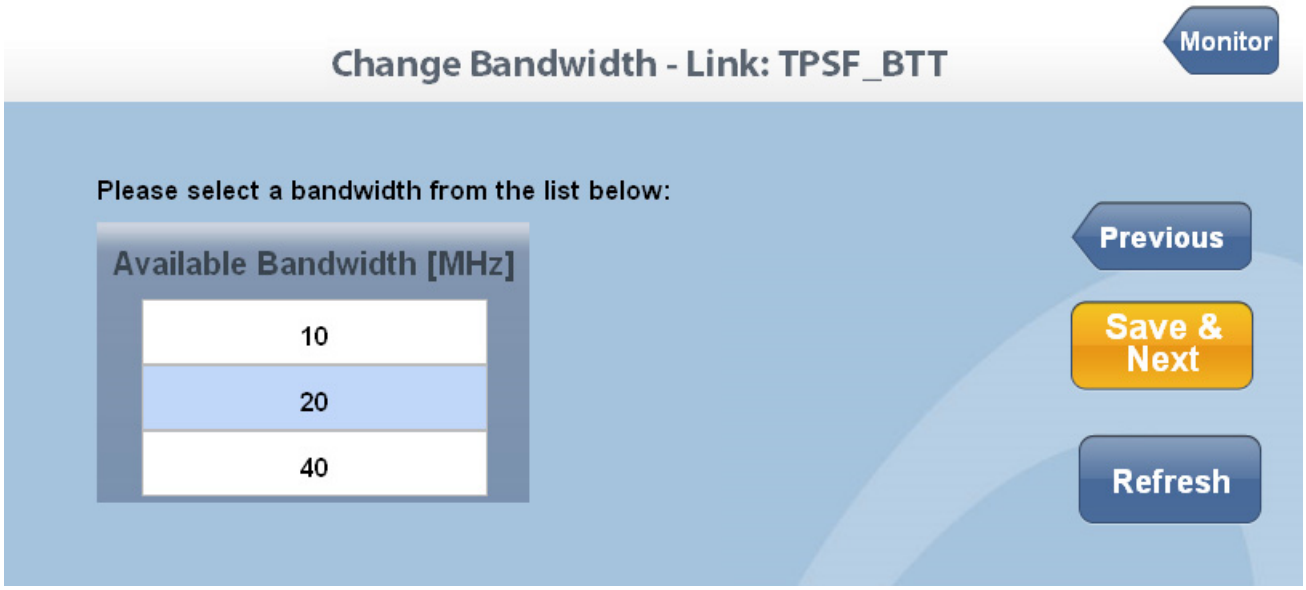


Figure 28-1: Web interface - A typical Wizard window

Suppose that the Wizard window illustrated in **Figure 28-1** is your current window. Then -

- It you use **Save & Next**, it first commits the data on the current window before moving to the next one.
- If you return to the previous window with the **Previous** button, it does not commit the current window
- If you exit the Wizard using the **Monitor** button, the current window is not committed, but prior commits are not undone.

Major implications of these differences will be pointed in **Caution** messages below.

Operational Effects

Several WI functions cause temporary sync-loss. Typically, changing the number of antennas falls into this category. These cases will be pointed out in **Warning** messages.

Some Working Tips

You can:

- Log on to a ODU on the default IP address of 10.0.0.120/8, set the Link ID and IP address instead of using the RADWIN Manager as in **Chapter 25**. Unlike the latter method, you need to reset the ODU to see the change in the Web Interface.
- Change the operating Band of an ODU instead of using the RADWIN Manager as in **Chapter 22**. If you do, always change the band of the physical over-the-air site first, so that you do not lock yourself out of the link.
- Install/configure a link to work with Ethernet only.
- Look at Recent Events for either site
- Drop back to Installation mode without losing installed TDM services

You cannot:

- Change default Tx power
- Configure MIMO/Diversity
- Manage TDM services
- Manage HSS
- Manage other features such as GSU (when supported), MHS, Ethernet Ring, VLAN, QoS
- Perform Software upgrade

Be very careful:

- Using this tool if your link is providing customer service which may not be interrupted with sync-losses

Never:

- Leave your browser unattended while in Installation mode - and then forget to return!

Scope of this Chapter

The remainder of this chapter is divided into three sections: Logging on, Link Configuration and Installation and Site Configuration.

Logging on

To use the Web interface, simply point your browser to the IP address of the site to which you are connected.

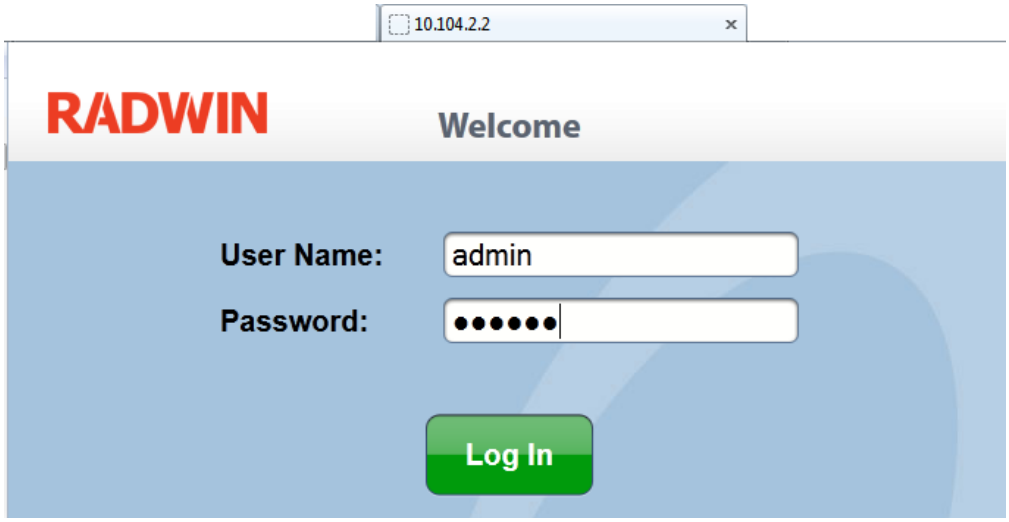


Figure 28-2: Web interface - Log on

The User Name and Password are respectively, **admin** and **netman** as used for Telnet access. You must click the **Log In** button to effect entry to the WI.

The Main Window

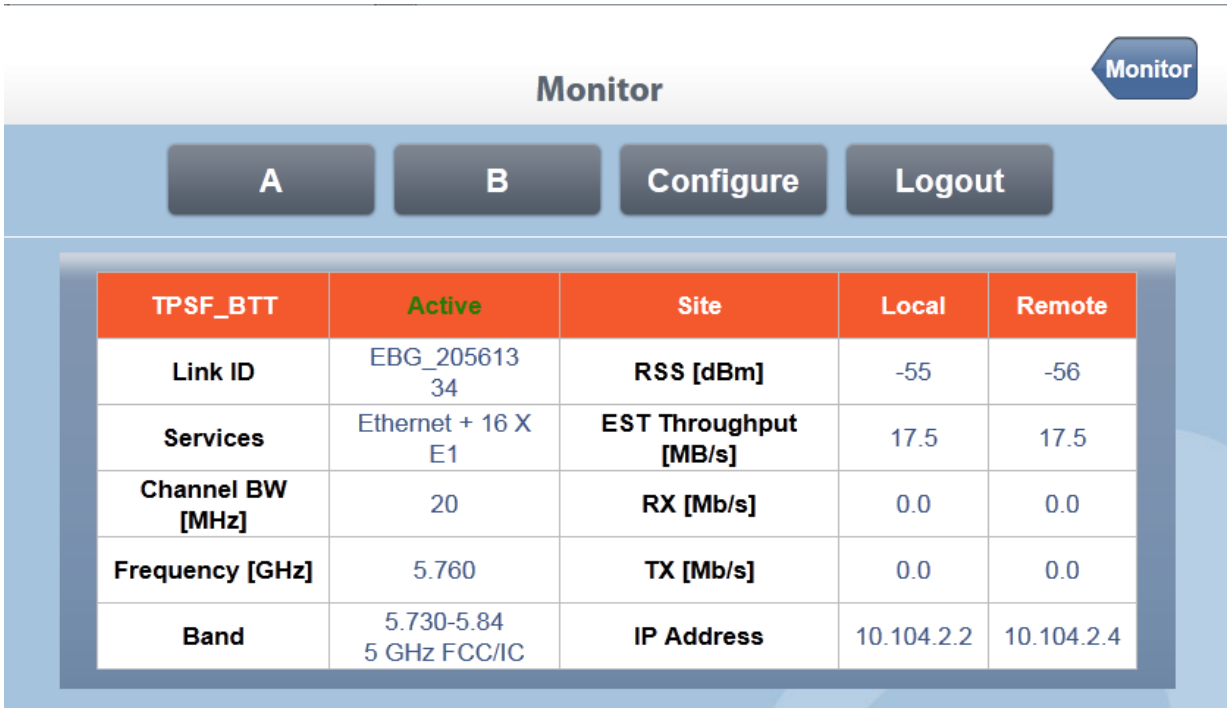


Figure 28-3: Web interface - Main window

The main window shows a subset of the link operating parameters. The **A** and **B** buttons open Site Configuration for Site A and Site B respectively. The **Configure** button opens a Configuration Wizard.



For the purposes of illustration, we are using a link with 16 E1 ports configured. The reason for doing this will become apparent below.

Getting in to Installation Mode

Under certain circumstance you may be better off working in Installation mode, particularly if you want to change the Operating Band or Operating Channel.To this end, click the managed site button (**A** here), **Air Interface** and then **Installation Mode**. Figure 28-3 changes:

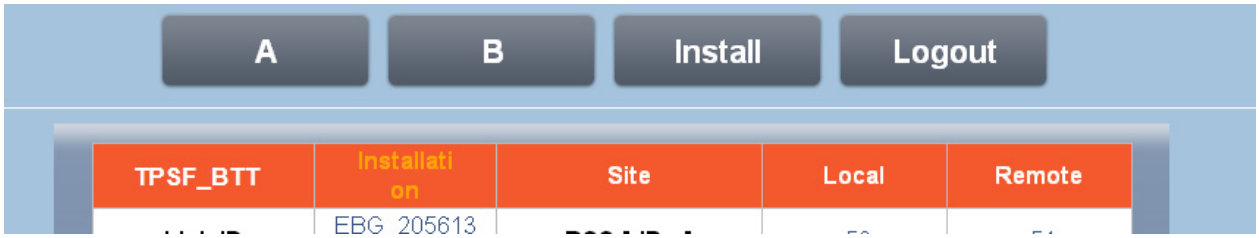


Figure 28-4: Web interface - Main window, Installation Mode

Using the Configuration Wizard

➢ **To configure a link using the Configure Wizard:**

1. Start the Wizard by clicking the **Configure** button. The System page is displayed:

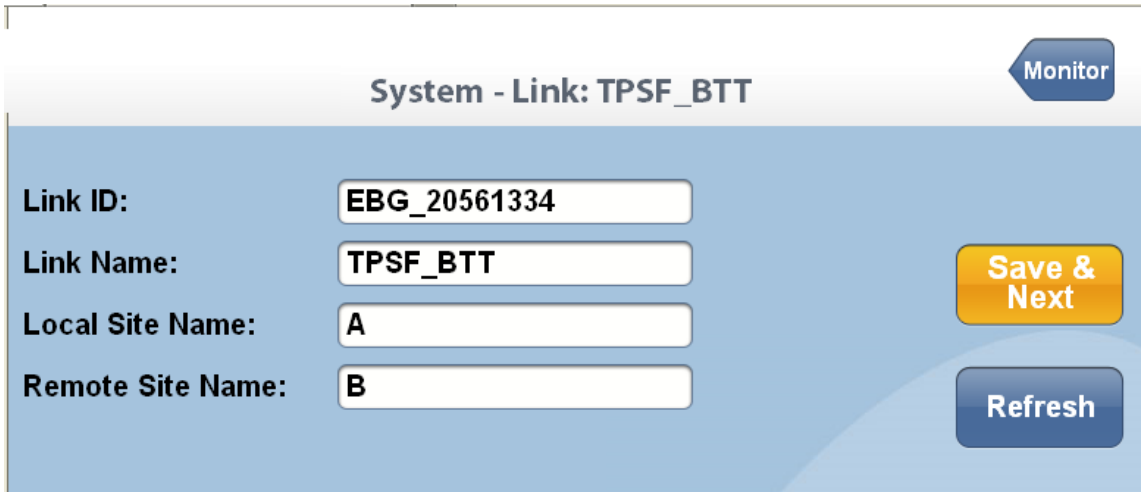


Figure 28-5: Web interface - Configuration System window

The similarity to the corresponding RADWIN Manager Configuration Wizard panel is quite intentional. The fields have the expected meanings. The Refresh button will revert your changes to the previous values provide you have not used the **Save & Next** button.

2. The second Wizard panel configures the Operating Channel settings:

Caution

- Under Install Mode, these four fields may take a default values which you should change
- Commits are carried out as soon as you click **Save & Next**

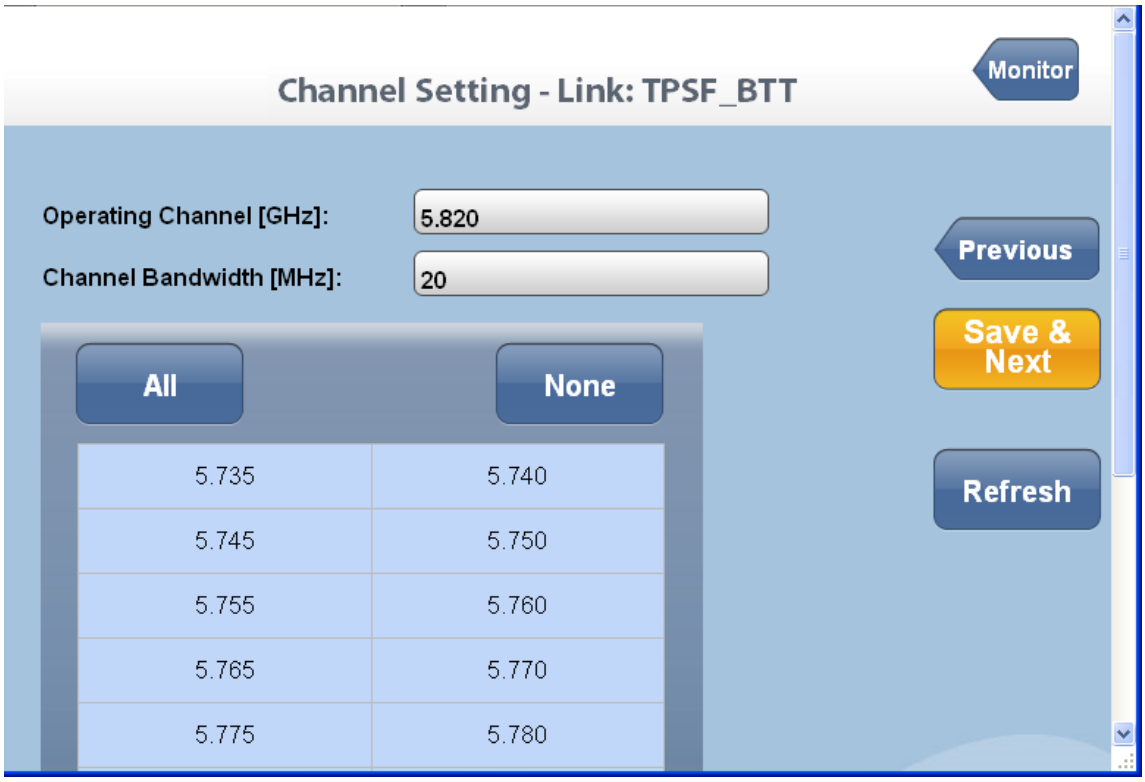


Figure 28-6: Web interface - Configuration Channel settings

The only thing you may change here are the operating channels for ACS or none. If you make any changes, as soon as you click **Save & Next**, the link will immediately be reset to effect them. In Installation Mode, you may change the **Operating Channel**:

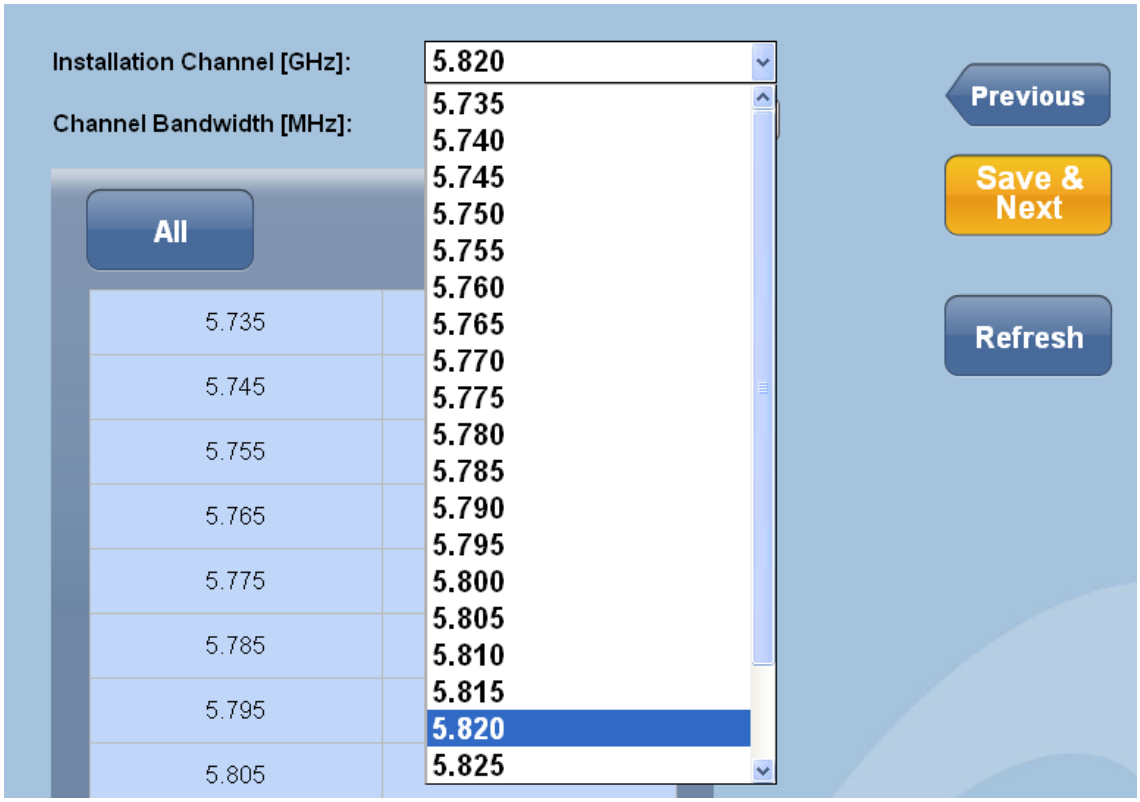
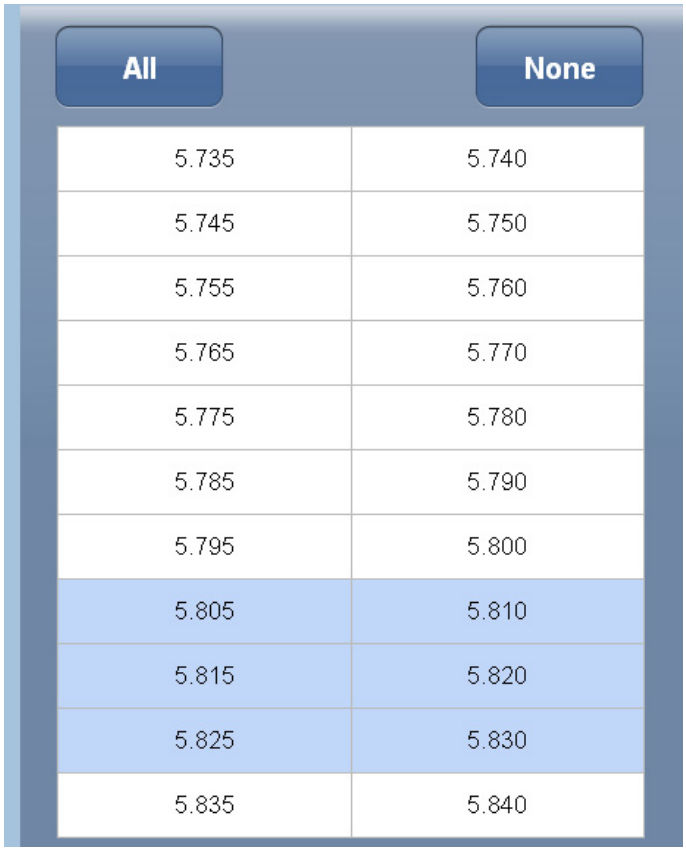
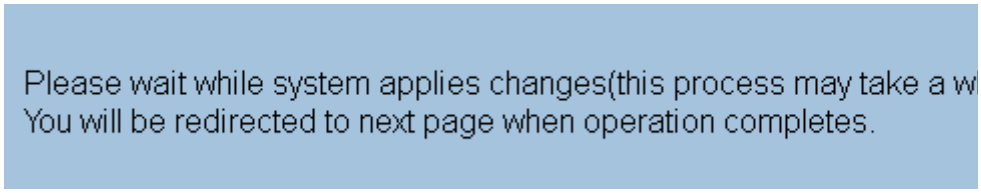


Figure 28-7: Web interface - Installation Channel settings

You may select additional channels for ACS or none by using the **All** or **None** buttons or alternatively, manually selecting channels by clicking them. Suppose that you choose these:



You will receive the following advisory notice:



Warning

Changing Operating Channels (for ACS) in either Configuration or Installation mode is applied immediately upon clicking **Save and Next**, and is accompanied by a short sync-loss.

3. The next wizard panel displays antenna types and Tx power:

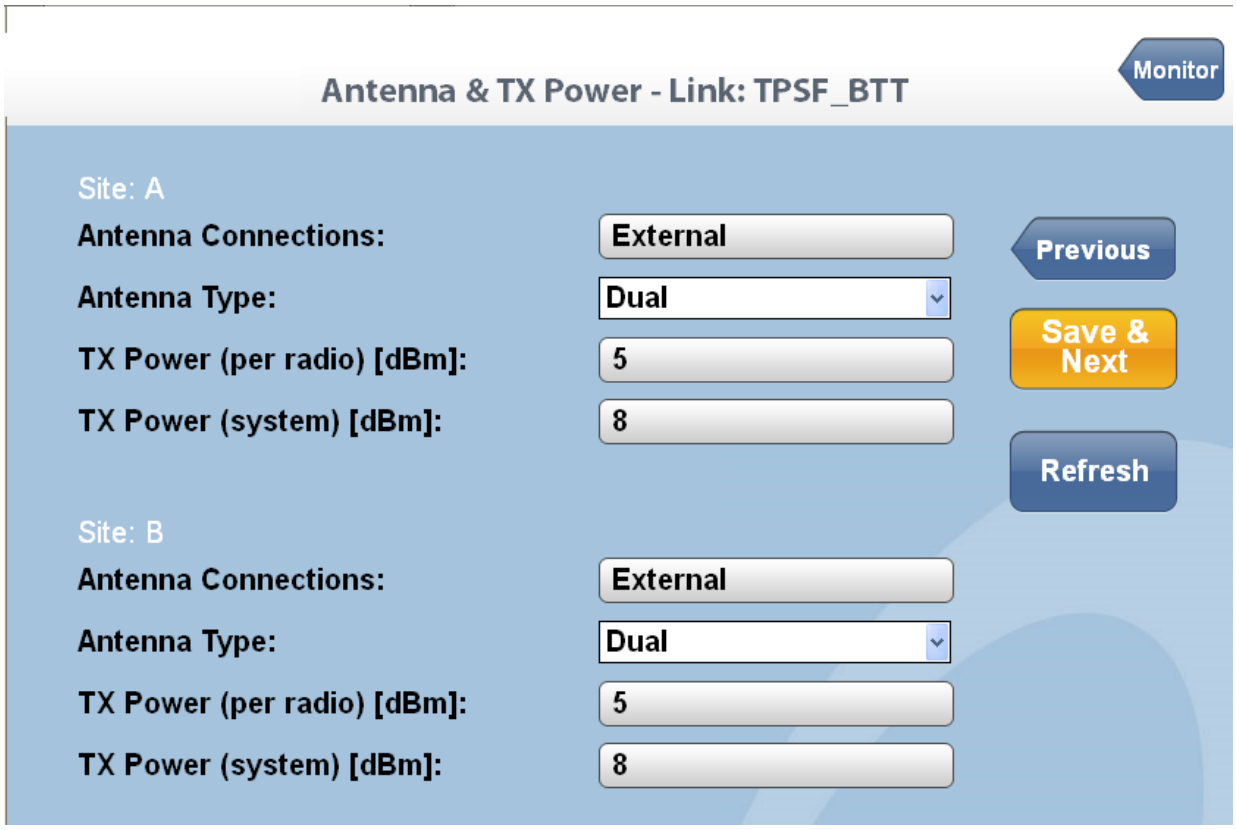
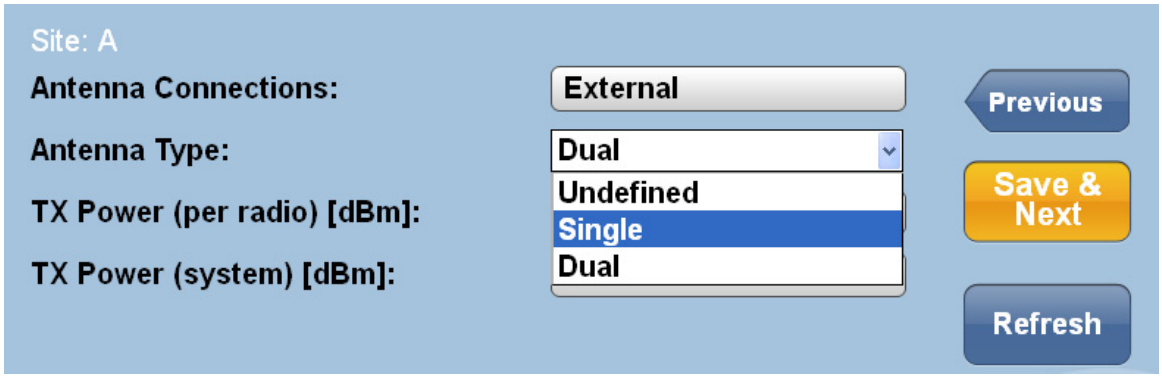


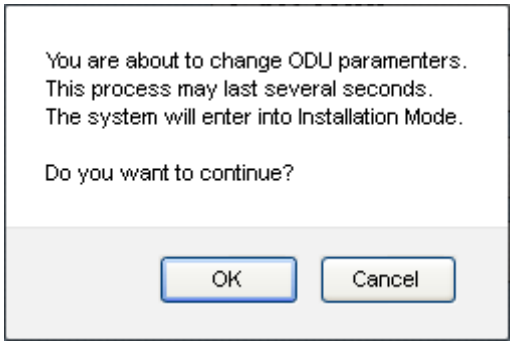
Figure 28-8: Web interface - Antenna settings

The only fields that you can change here are the antenna types. (Required Tx power may become available for modification in a future release.)

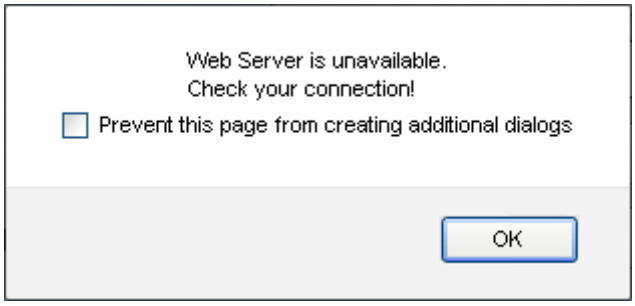
4. Suppose that you change the Site A antenna type to single:



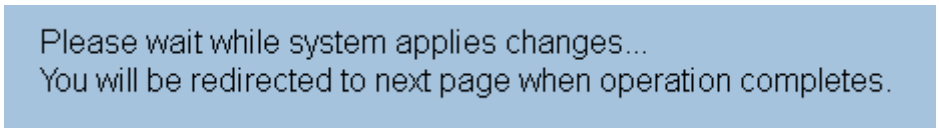
You are asked for confirmation. Click **OK**:



5. Accept the next browser-initiated confirmation:



The WI displays the following advisory message:



Warning

This operation leaves the link in Installation mode, where it remains until completion of the Wizard. The link then reverts to normal Active mode.

The next page - **Change Bandwidth**, is displayed:

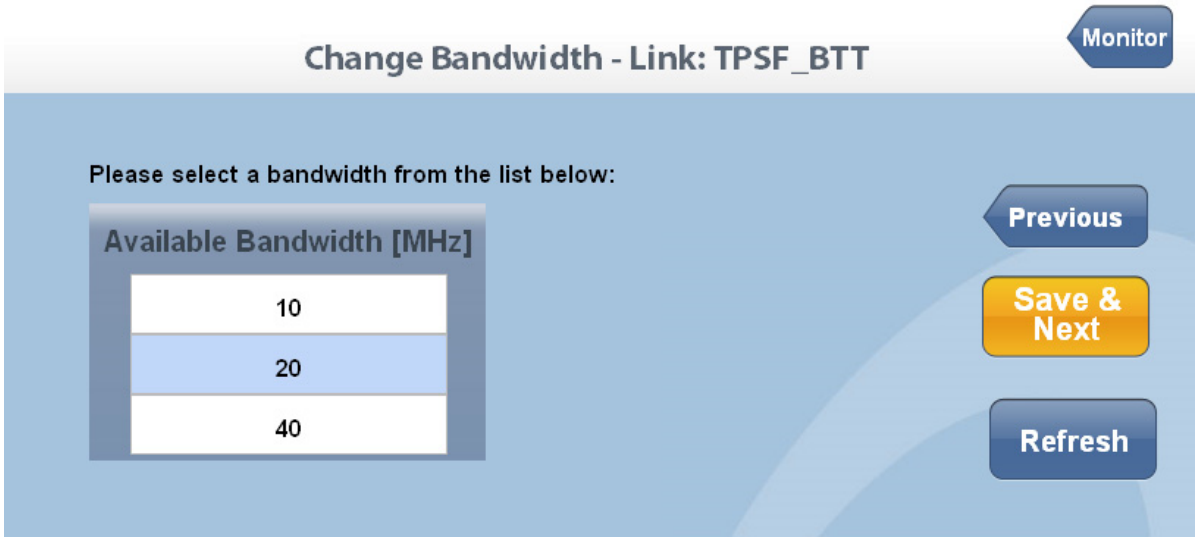
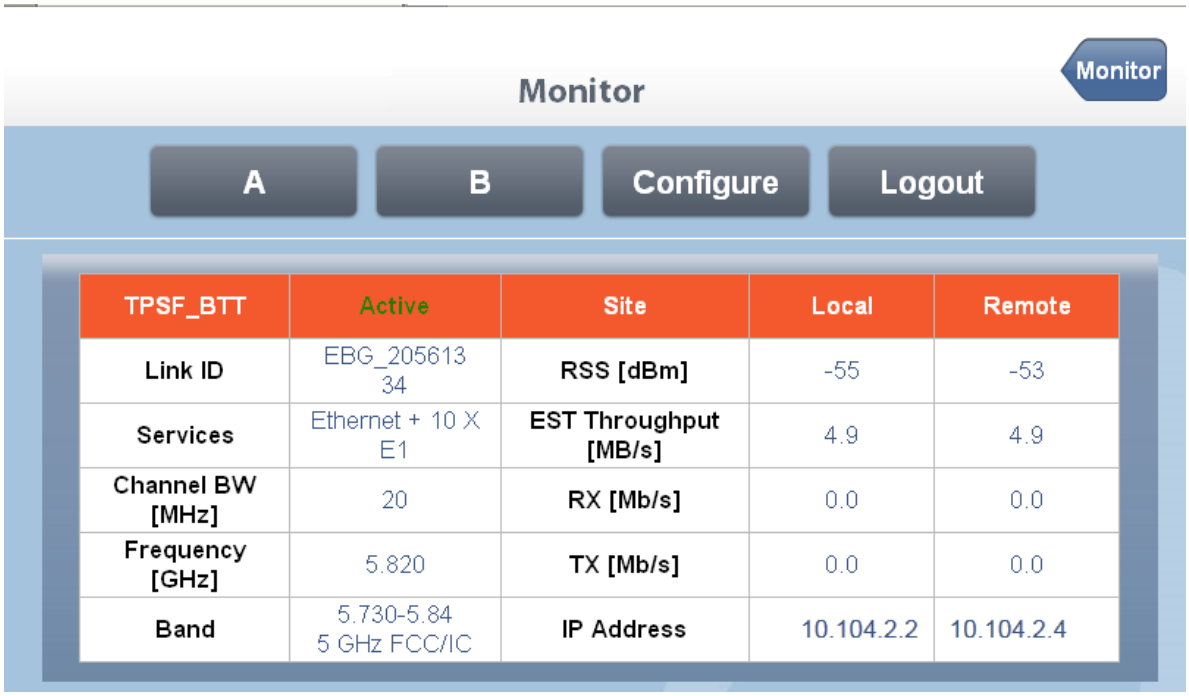


Figure 28-9: Web interface - Channel Bandwidth settings

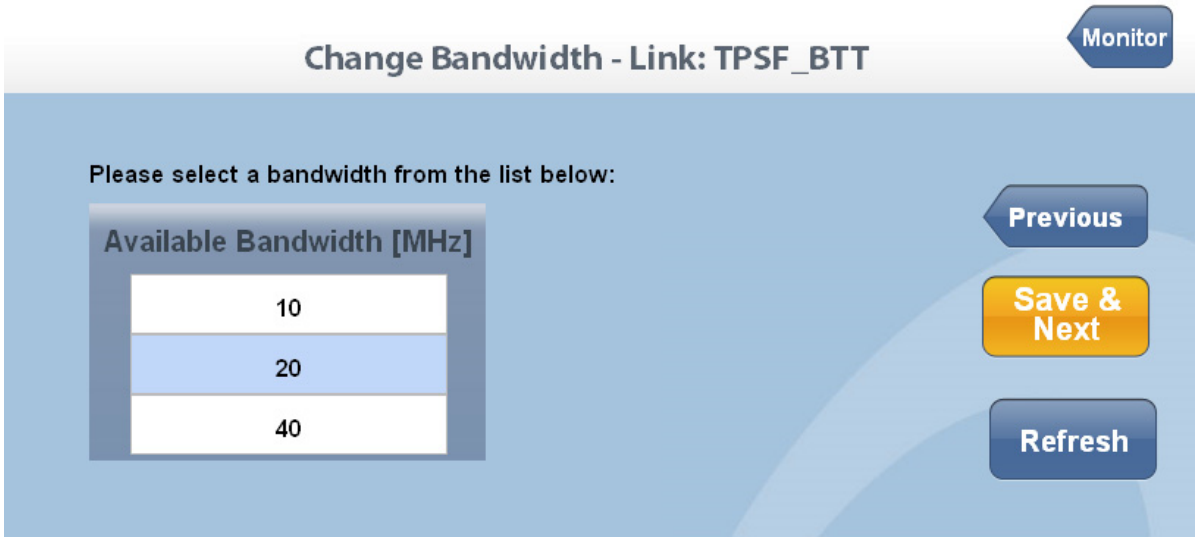
6. For this example, leave the Bandwidth as is, and click **Save & Next**. Here is the result:



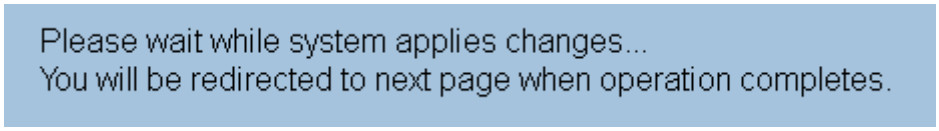
TPSF_BTT	Active	Site	Local	Remote
Link ID	EBG_20561334	RSS [dBm]	-55	-53
Services	Ethernet + 10 X E1	EST Throughput [MB/s]	4.9	4.9
Channel BW [MHz]	20	RX [Mb/s]	0.0	0.0
Frequency [GHz]	5.820	TX [Mb/s]	0.0	0.0
Band	5.730-5.845 GHz FCC/IC	IP Address	10.104.2.2	10.104.2.4

The most obvious indication that something has changed is the reduced number of available E1 channels (from 16 to 10) reflecting the drop in link capacity due to the antenna change. Less obvious is the Estimated ethernet Throughput, which has dropped from 17.5Mbps to 4.9Mbps on both sides of the link.

7. For the purpose of illustration we revert the link to dual antennas at bot sites and run through the **Configure** Wizard again. Get to the last panel, Change Bandwidth:



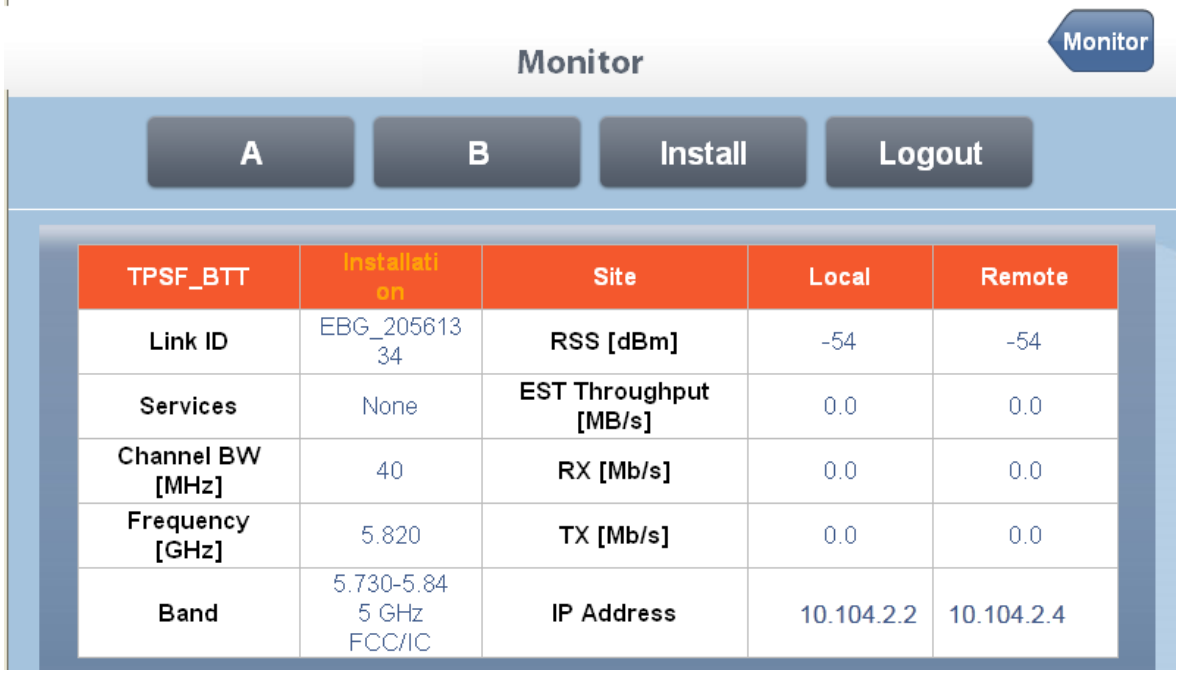
8. Change the Channel Bandwidth to 40Mhz. (It is supported by the link regulation in use.) Click **Save & Next**. The following advisory message is displayed:



Warning

Changing the Channel bandwidth drops the link into Installation mode, and it remains so after completing the Wizard.

After a few moments you are shown the main window:



Here then, is the final result:

Warning

You are in Installation mode! The link is up, but services are stopped. You must "walk" through the Install Wizard again, changing nothing. This will revert the link to Active mode with all services enabled. If you do not do this, you will have to re-configure your services in the usual way, using the RADWIN Manager.

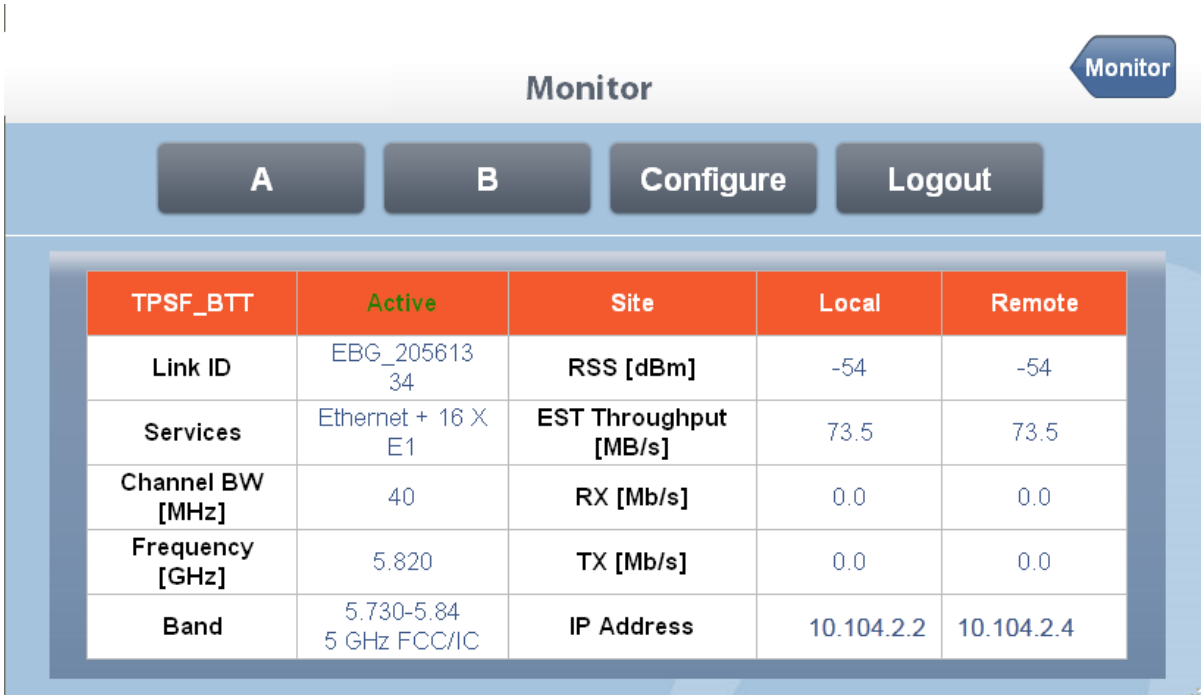


Figure 28-10: Web interface - Configuration completed

Observe the dramatic increase in the Estimated Ethernet Throughput (from 17.5Mbps to 73.5Mbps on both sides of the link.)

Site Configuration

General

Site specific parameters may be managed by clicking the appropriate site button. There are some differences between what you may do with the managed site (A here) and the over-the-air site (B here). If you click the site A button, you are shown the System window. Common to all of the Site Configuration windows is the button menu:



Figure 28-11: Web Interface - Site Configuration button menu

The blue button indicates the currently active window. We will describe in detail each of the button menu items below.

On the right hand side of each Site Configuration window ia pair of action buttons:

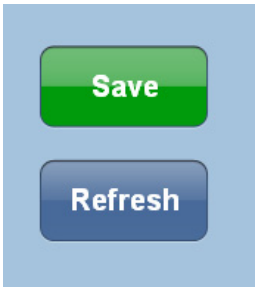


Figure 28-12: Web Interface - Site Configuration action buttons

Save commits the current window. If you made changes but prefer to revert them to their original values, use the **Refresh** button.

Note

Refresh will revert to the last saved values or the original values if **Save** was not used. If you changed anything outside the WI with the RADWIN Manager or any other network management tool, Refresh with update the WI.

System

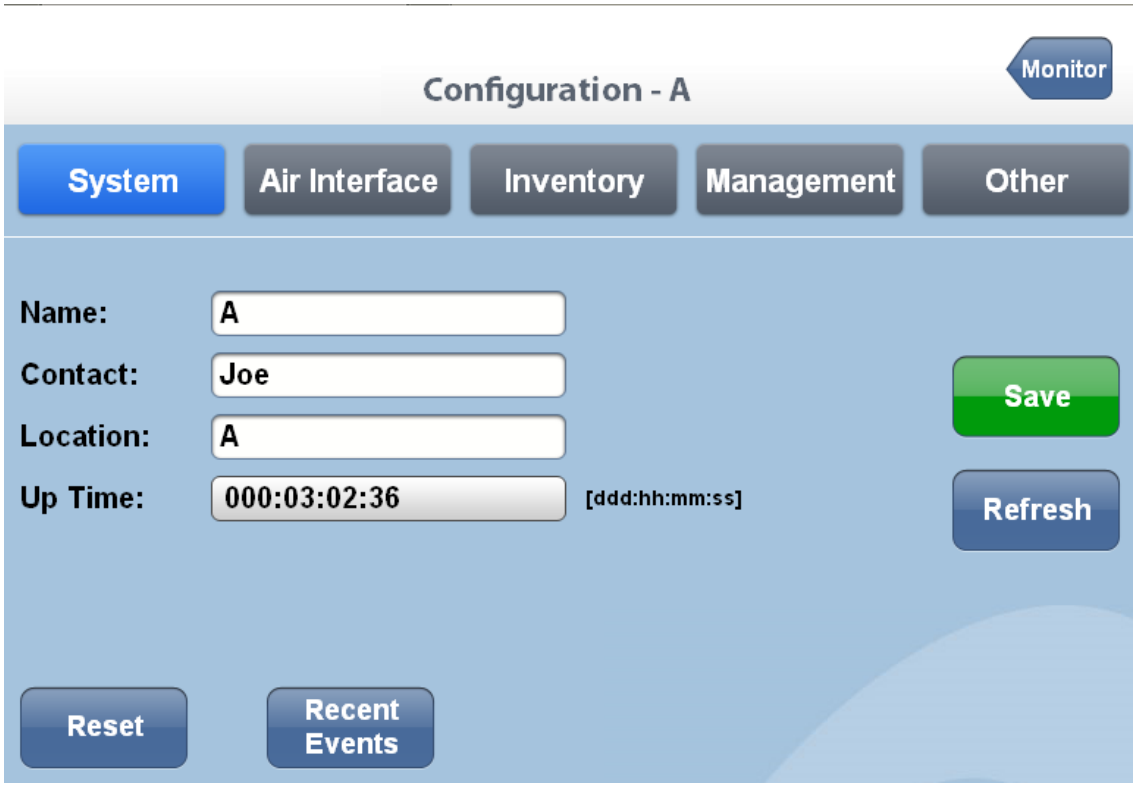
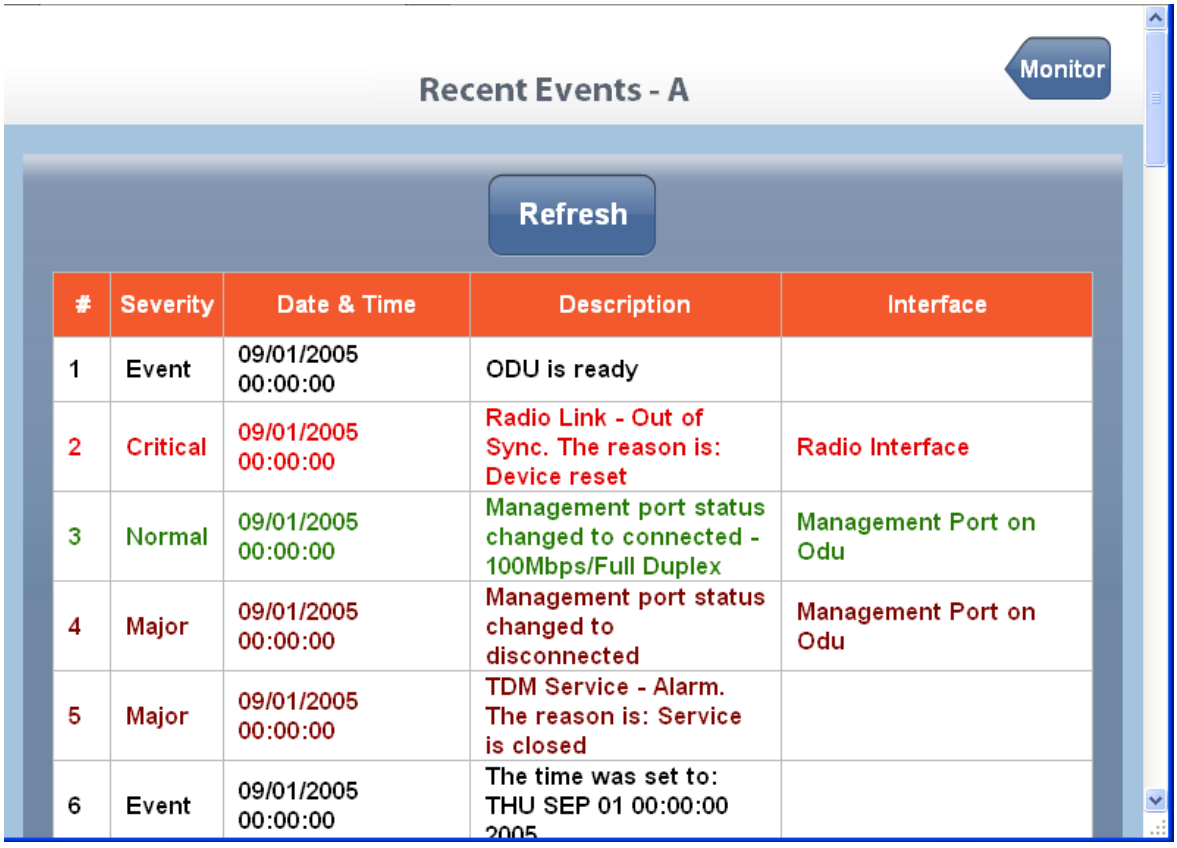


Figure 28-13: Web Interface - Site Configuration System window

In this window, the **Name**, **Contact** and **Location** fields may be changed. Location is the site name (A). if you click **Recent Events**, the site A ODU Recent Events list is displayed:



#	Severity	Date & Time	Description	Interface
1	Event	09/01/2005 00:00:00	ODU is ready	
2	Critical	09/01/2005 00:00:00	Radio Link - Out of Sync. The reason is: Device reset	Radio Interface
3	Normal	09/01/2005 00:00:00	Management port status changed to connected - 100Mbps/Full Duplex	Management Port on Odu
4	Major	09/01/2005 00:00:00	Management port status changed to disconnected	Management Port on Odu
5	Major	09/01/2005 00:00:00	TDM Service - Alarm. The reason is: Service is closed	
6	Event	09/01/2005 00:00:00	The time was set to: THU SEP 01 00:00:00 2005	

Figure 28-14: Web Interface - Site Configuration Recent Events list

From here, you are returned to the WI main window (**Monitor** button).

If you open the Site Configuration window for site B (over-the-air), the **Recent Events** button is missing. To sse the Recent Events list for site B, you must log on to site B. You may do it by simply opening up another browser window or tab, concurrently with the site A tab.

Air Interface

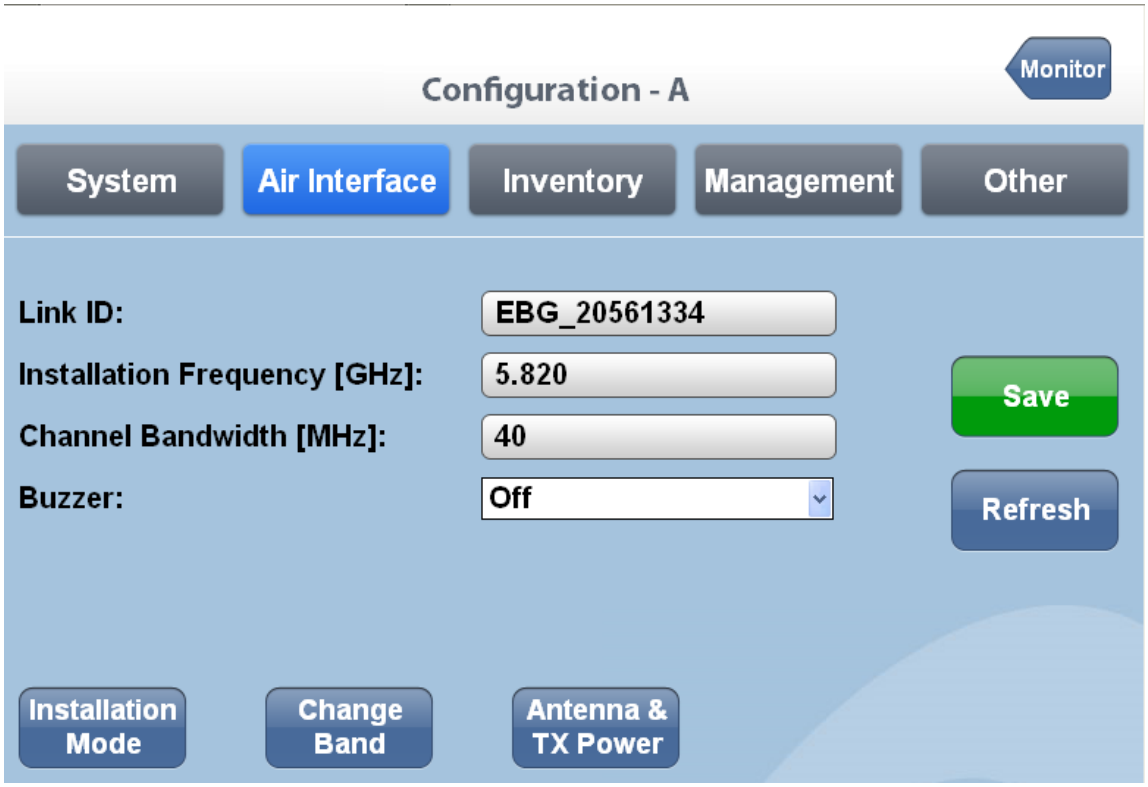


Figure 28-15: Web Interface - Site Configuration Air Interface

The only editable field is the Buzzer state. The three buttons at the bottom are fully functional and should be used with care:

Installation Mode

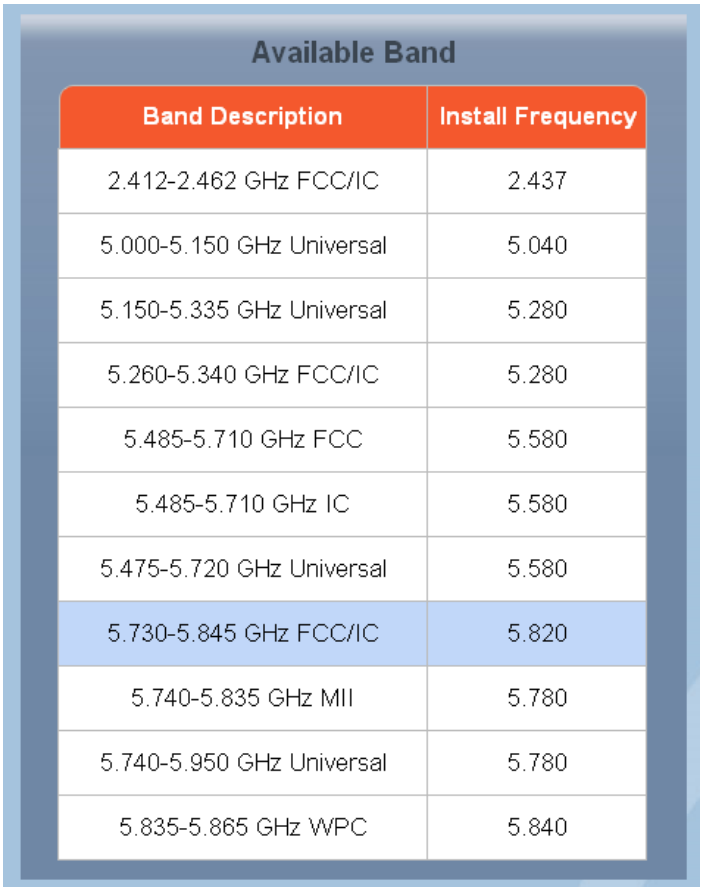
This button places the link in Installation mode: Services are stopped.

Change Band

Change Band should be used with care. It is not available on the Air Interface window of the over-the-air site (B). Again, you must create a separate session to use it on B.

To change Band for a Link:

1. Log On to the over-the-air site (B).



2. Chose the required band and save. You will lose contact with site B.
3. Repeat the process for site A. The link will re-sync using the newly chosen band in Installation mode.
4. Re-install the link.

Antenna & Tx Power

The Antenna and Tx Power window is for information only.

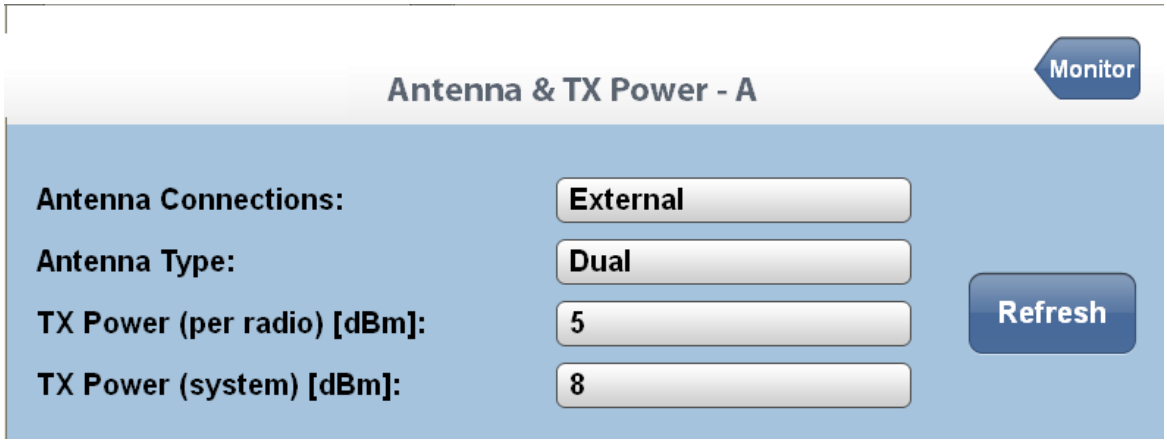
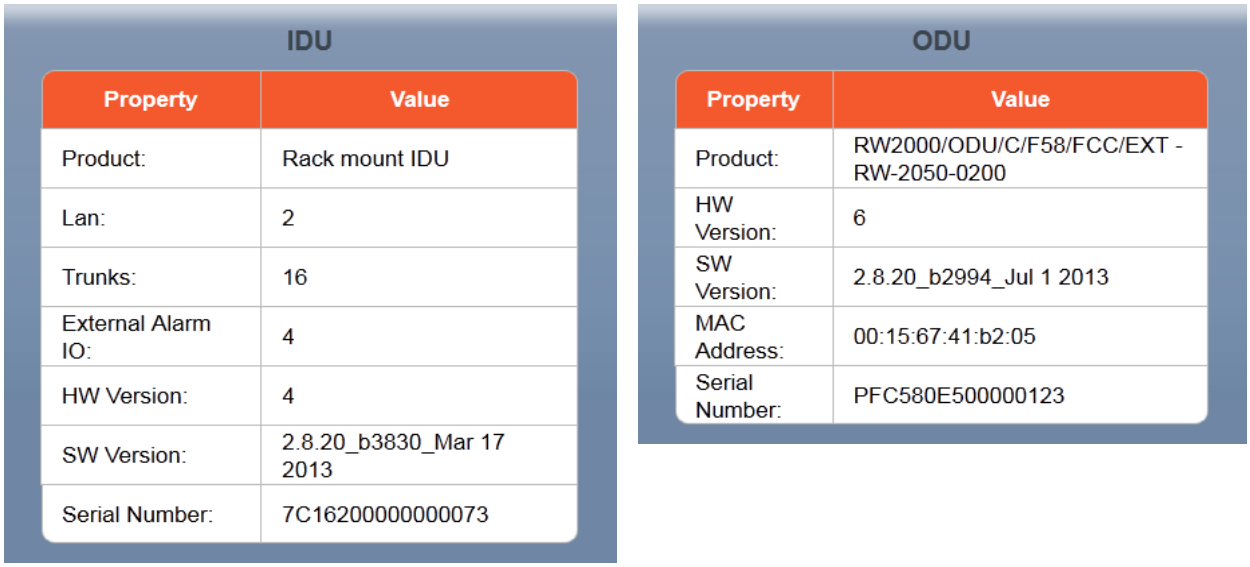


Figure 28-16: Web Interface - Site Configuration, Antenna details

Inventory

The Inventory display is for information only, and has separate panels for the ODU and IDU:



IDU

Property	Value
Product:	Rack mount IDU
Lan:	2
Trunks:	16
External Alarm IO:	4
HW Version:	4
SW Version:	2.8.20_b3830_Mar 17 2013
Serial Number:	7C16200000000073

ODU

Property	Value
Product:	RW2000/ODU/C/F58/FCC/EXT - RW-2050-0200
HW Version:	6
SW Version:	2.8.20_b2994_Jul 1 2013
MAC Address:	00:15:67:41:b2:05
Serial Number:	PFC580E500000123

Figure 28-17: Web Interface - Site Configuration, Inventory

Management

The Management window may be used to change the site IP Address, Subnet Mask and Default Gateway. In addition, you may define Trap Destinations.

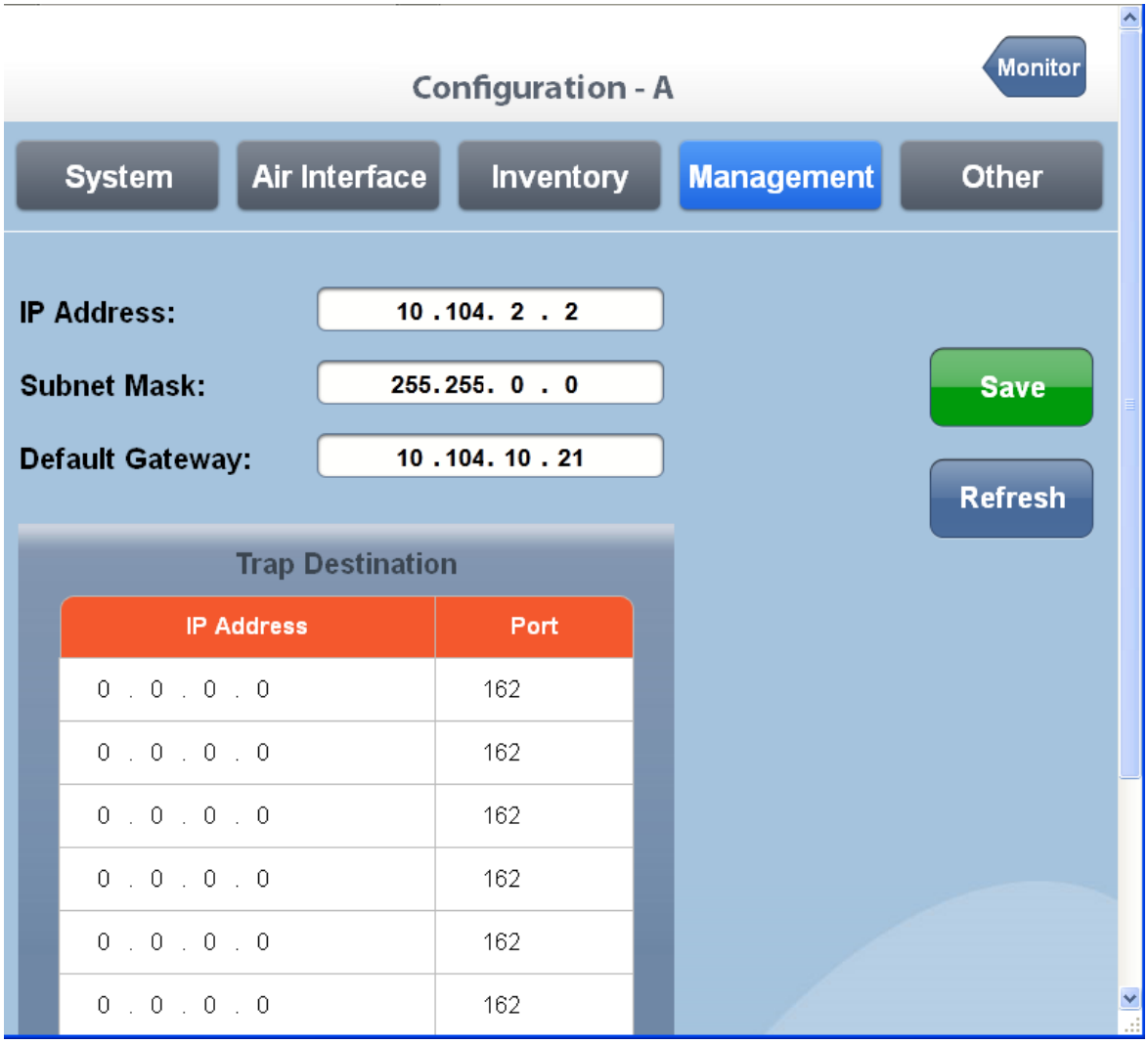


Figure 28-18: Web Interface - Site Configuration, Management

You can use the WI Management feature to set up set up directly connected ODUs with IP addresses other than the default (10.0.0.120/8). Further you can make changes within an existing network. But always change the over-the-air site first, so that you do not lock yourself out of the link.

Other

Here you may change the Ethernet ports configuration:

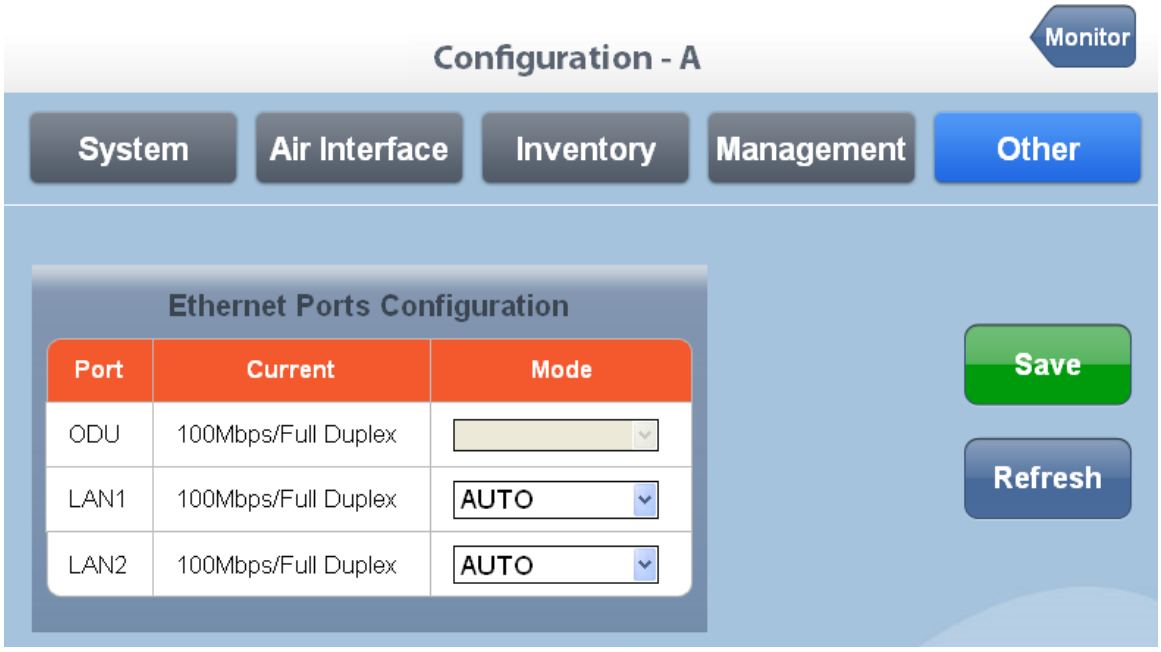


Figure 28-19: Web Interface - Site Configuration, Ethernet ports configuration

You may change the mode for LAN 1 and LAN 2 only:

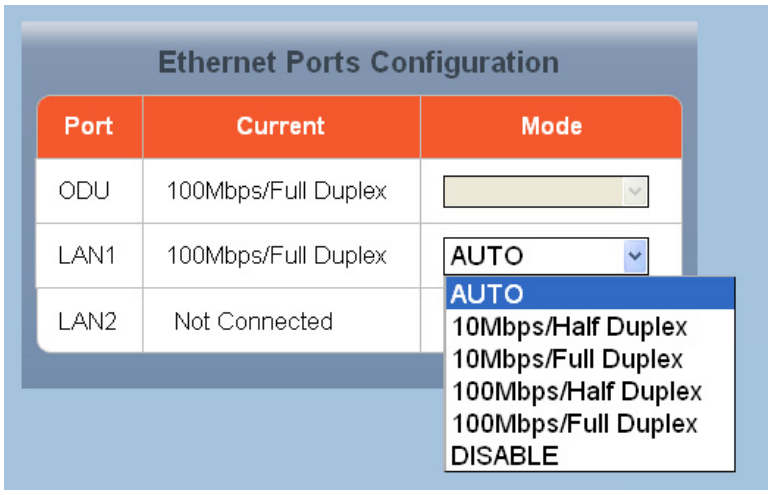


Figure 28-20: Web Interface - Site Configuration, Ethernet ports configuration, detail

Here is the corresponding situation for a link using GbE support:

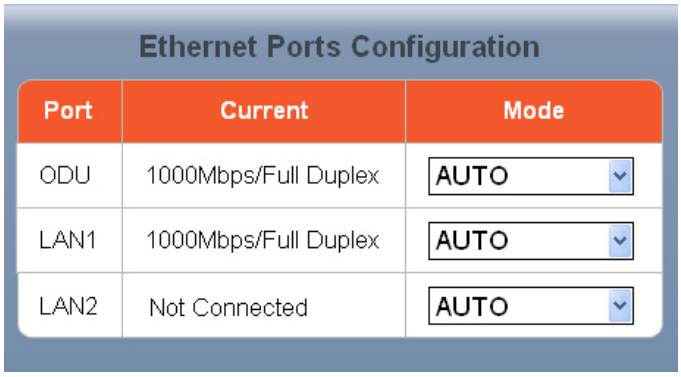
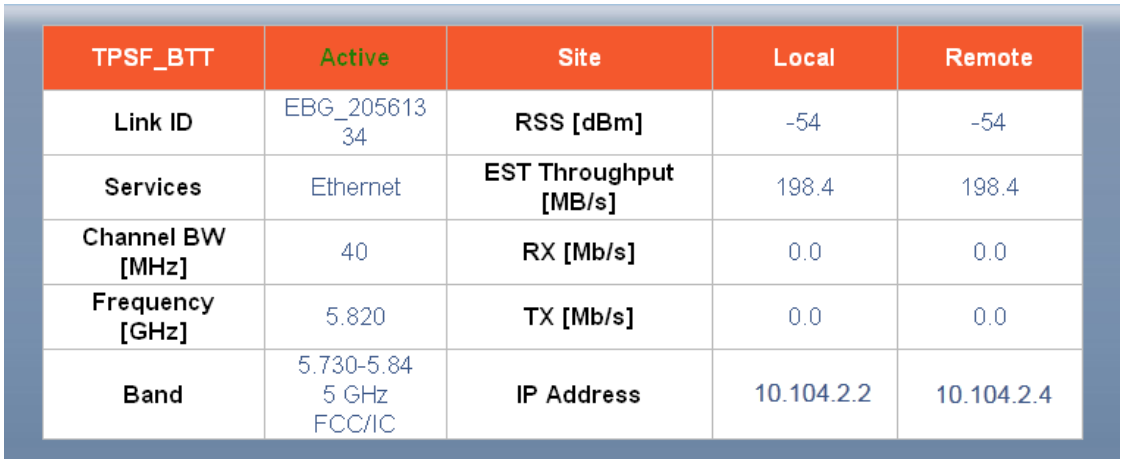


Figure 28-21: Web Interface - Site Configuration, Ethernet ports configuration with GbE

Notice that under GbE support, the ODU port mode is also configurable. Here is the Monitor panel for the GbE link:



TPSF_BTT	Active	Site	Local	Remote
Link ID	EBG_20561334	RSS [dBm]	-54	-54
Services	Ethernet	EST Throughput [MB/s]	198.4	198.4
Channel BW [MHz]	40	RX [Mb/s]	0.0	0.0
Frequency [GHz]	5.820	TX [Mb/s]	0.0	0.0
Band	5.730-5.845 GHz FCC/IC	IP Address	10.104.2.2	10.104.2.4

Figure 28-22: Monitor panel for *RADWIN 2000 C* link, using Ethernet only and GbE support

Note the 200 Mbps aggregate throughput in both directions.

USER MANUAL

RADWIN 2000 BROADBAND WIRELESS TRANSMISSION SYSTEM

Release 2.8.20

Part 5: Product Reference

RADWIN

Appendix A

Technical Specifications

Scope of these Specifications

This appendix contains technical specifications for the major link components appearing in this User Manual. They are correct at the date of publication, but are intended for general background only. The latest authoritative and most up to date technical specifications are available as Data Sheets obtainable from RADWIN Customer Service.

In any event, RADWIN reserves the right to change these specifications without notice.

ODU

Capacity (Net Aggregate or FD)

Series	Max Throughput (Mbps)	Services	Notes
RADWIN 2000 A	10	Ethernet Only	Separate groups, not selectable
	25	4 E1/T1	
RADWIN 2000 B	50	8 E1/T1	SFF embedded antenna
RADWIN 2000 C	200	16 E1/T1	
RADWIN 2000 X	20	3 E1 or 4 T1	

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
ODU to IDU/PoE Interface	Outdoor CAT 5e cable; Maximum cable length: 100 m

Radio

Range	Up to 120 km / 75 miles
Radio Modulation	2x2 MIMO-OFDM (BPSK/QPSK/16QAM/64QAM)
Adaptive Modulation & Coding	Supported
Automatic Channel Selection	Supported
Diversity	Supported
Spectrum View	Supported

Duplex Technology	TDD
Error Correction	FEC k = 1/2, 2/3, 3/4, 5/6
Max Tx Power	25 dBm
Duplex Technology	TDD
Ethernet Connection	10/100/1000BaseT
Supported Indoor Units	IDU-C, IDU-E, IDU-H, PoE devices (specified below)
QoS	Packet classification to 4 queues according to 802.1p and Diffserv, Dynamic scheduling according to air interface changes
VLAN	Supported
Ethernet Ring Protection	Supported including Ethernet 1+1
Hub Site Synchronization (HSS)	Supported
Monitored Hot Standby (MHS)	1+1 with RADWIN 2000 link or WinLink 1000 link

Rate – Dual Antenna [Mbps] @ 20MHz CBW	13	26	39	52	78	104	117	130
Rate – Single Antenna [Mbps] @ 20MHz CBW	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] for 4.8 – 6 GHz	25			24	21	19	18	
Max Tx Power [dBm] for 2.4 GHz	26			25	24	24	21	20
Max Tx Power [dBm] for 2.5 GHz (BRS)	See **Table 24-3**							
Sensitivity (dBm) @BER <10e-11@ 20MHz CBW	-88	-86	-83	-81	-77	-72	-70	-67
Encryption	AES 128							

Supported Bands

The bands shown below are supported by RADWIN products. Both the bands and related Channel Bandwidths are product dependent.

Band (GHz)	Regulation	Occupied Frequency Range (GHz)	CBW (MHz)	DFS?	Compliance (Notes)
2.3	**Universal**	2.3045-2.4745	5	No	N/A (Supported CBW product dependent)
		2.302-2.477	10		
		2.297-2.482	20		
		2.287-2.492	40		
2.4	**FCC/IC**	2.4095-2.4645	5	No	FCC 47CFR, Part 15, Subpart C and IC RSS-210
		2.407-2.467	10		
		2.402-2.472	20		
		2.392-2.482	40		
2.4	**ETSI**	2.4095-2.4745	5	No	ETSI EN 300 328 (Supported CBW product dependent)
		2.407-2.477	10		
		2.402-2.482	20		
		2.392-2.492	40		
2.5	**FCC BRS**	2.4965-2.6925	5	No	FCC 47CFR, Part 27, Subpart M (BRS/EBS)
		2.494-2.695	10		
		2.489-2.700	20		
3.4	**ETSI**	3.4105-3.4825	5	No	ETSI EN 302 326-2 (Nominally, 3.5 GHz ETSI)
		3.408-3.485	10		
		3.403-3.490	20		
3.5	**ETSI**	3.4775-3.6025	5		
		3.475-3.605	10		
		3.470-3.610	20		
3.6	**ETSI**	3.5975-3.7025	5		
		3.595-3.705	10		
		3.590-3.710	20		
3.5	**IC**	3.4755-3.6495	5	No	IC RSS-192
		3.473-3.652	10		
		3.468-3.657	20		
	Universal	3.2975-3.8025	5	No	N/A
		3.295-3.805	10		
		3.290-3.810	20		
	FCC/IC	3.6505-3.6745	5	No	FCC Part 90 Subpart Z and IC RSS-197 (Restricted)
		3.650-3.675	10		
		3.650-3.675	20		
4.4	**Universal**	4.3975-5.0025	5	No	N/A
		4.395-5.005	10		
		4.390-5.010	20		

Band (GHz)	Regulation	Occupied Frequency Range (GHz)	CBW (MHz)	DFS?	Compliance (Notes)
4.8	**Universal**	4.8075-4.9025	5	No	N/A
		4.805-4.905	10		
		4.800-4.910	20		
		4.790-4.920	40		
4.9	**FCC/IC**	4.9425-4.9875	5	No	FCC 47CFR, Part 90, Subpart Y and IC RSS-111
		4.940-4.990	10		
		4.940-4.990	20		
	Universal	4.8975-5.0025	5	No	N/A
		4.895-5.005	10		
		4.890-5.010	20		
		4.880-5.020	40		
5.0	**Universal**	4.9975-5.1525	5	No	N/A
		4.995-5.155	10		
		4.990-5.160	20		
		4.980-5.170	40		
5.1	**ETSI**	5.150 – 5.350	10	Yes	ETSI EN 301 893
		5.150 – 5.350	20		
	Universal	5.1475-5.3375	5	No	N/A
		5.145-5.340	10		
		5.140-5.345	20		
		5.130-5.355	40		
5.2	**FCC/IC**	5.2525-5.3475	5	Yes	FCC 47CFR, Part 15, Subpart E and IC RSS-210
		5.255-5.345	10		
		5.255-5.345	20		
		5.255-5.345	40		

Band (GHz)	Regulation	Occupied Frequency Range (GHz)	CBW (MHz)	DFS?	Compliance (Notes)
5.4	ETSI	5.475 – 5.720	10	Yes	ETSI EN 301 893
		5.475 – 5.720	20		
		5.475 – 5.720	40		
	FCC/IC	5.4775-5.7175	5	Yes	FCC 47CFR, Part 15, Subpart E and IC RSS-210
		5.480-5.715	10		
		5.480-5.715	20		
		5.480-5.715	40		
	Universal	5.4725-5.7225	5	No	N/A
		5.470-5.725	10		
		5.465-5.730	20		
		5.455-5.740	40		
	IC	5.4775-5.7175	5	Yes	IC RSS-210
		5.480-5.715	10		
		5.480-5.715	20		
		5.480-5.715	40		
5.8	ETSI	5.725 – 5.875	10	Yes	ETSI EN 302 502
		5.725 – 5.875	20		
	FCC/IC	5.7275-5.8475	5	No	FCC 47CFR, Part 15, Subpart C and IC RSS-210
		5.725-5.850	10		
		5.725-5.850	20		
		5.725-5.850	40		
	MII China	5.7375-5.8375	5	No	MII China (Supported CBW product dependent)
		5.735-5.840	10		
		5.730-5.845	20		
		5.720-5.855	40		
	WPC India	5.8325-5.8675	5	No	GSR-38 (Supported CBW product dependent)
		5.830-5.870	10		
		5.825-5.875	20		
		5.815-5.885	40		
5.9	Universal	5.7275-5.9525	5	No	N/A
		5.725-5.955	10		
		5.720-5.960	20		
		5.710-5.970	40		
6.0	Universal	5.6975-6.0525	5	No	N/A
		5.695-6.055	10		
		5.690-6.060	20		
		5.680-6.070	40		
6.4	Universal	5.895-6.4050	10	No	N/A (No products in WinPro)
		5.890-6.410	20		

The following Max Tx Power limitations apply to all products supporting the 3.5GHz ETSI band:

Occupied Sub-Band GHz	Center Frequency GHz	Mode	Channel Bandwidth MHz	Max Tx Power dBm	Frequency Step KHz
3.403-3.490	3.413-3.480	Inactive	5, 10, 20	17	250
3.470-3.610	3.480-3.600			23(†)	
3.590-3.710	3.600-3.700			25(‡)	



(†) The 3.480 GHz frequency is overlapped, occurring in two different bands as shown. If you wish to use the 3.480 GHz frequency, you should set Max TX Power to 17 dBm.

(‡) The 3.600 GHz frequency is overlapped, occurring in two different bands as shown. If you wish to use the 3.600 GHz frequency, you should set Max TX Power to 23 dBm.

Management

Management Application (per link)	RADWIN Manager Web based manager for RADWIN 2000 B and RADWIN 2000 C series.
Protocol	SNMP and Telnet
NMS	RADWIN NMS

Environmental

Operating Temperatures	ODU: -35°C to +60°C / -31°F to +140°F
Humidity	100% condensing, IP67 (totally protected against dust and against immersion up to 1m)
Storage	-40° to 85°C / -40°F to 185°F

Mechanical

ODU with Integrated Antenna	37.1/14.84(W) x 37.1/14.84(H) x 9.00/3.6(D) cm/in; 4.2 kg / 9.2 lbs including Mounting Kit
ODU Connectorized (including SFF antenna ODUs in RADWIN 2000 B series)	18.0/7.2(W) x 27.0/10.8(H) x 5.5/2.2(D) cm/in; 3 kg / 6.6 lbs including Mounting Kit

Power

Power Feeding	Dual feeding, -20 to -60 VDC (AC/DC converter is available)
Power Consumption - alone	25W
Power Consumption with IDU	See IDU specifications, this Appendix

Safety

FCC/IC (cTUVus)	UL 60950-1, UL 60950-22, CAN/CSA C22.2 60950-1, CAN/CSA C22.2 60950-22
ETSI/IEC	EN/IEC 60950-1, EN/IEC 60950-22

EMC

FCC	47 CFR Class B, Part 15, Subpart B
ETSI	EN 300 386, EN 301 489-1, EN 301 489-4
CAN/CSA	CISPR 22Class B
AS/NZS	CISPR 22Class B

IDU-E

TDM Interface

Number of ports	2 or no TDM port
Max ports usable by RADWIN 2000	2
Type	E1/T1 configurable by RADWIN Manager
Framing	Unframed (transparent)
Timing	Independent timing per port, Tx and Rx
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
Jitter Buffer	Jitter Buffer configuration enabling a latency from 5ms to 16ms for interference immunity confront
Clock Recovery Resolution	0.05ppb
Clock stability	20ppm as clock master (crucial for wander requirements of cellular operators)

Ethernet Interface

Number of Ports	2
Type	10/100BaseT with Auto-Negotiation (IEEE 802.3u). Framing/Coding IEEE 802.3
Connector	RJ-45
Line Impedance	100Ω
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 at 20 MHz Channel Bandwidth

Dry Contact Alarms

Dry Contact Alarms	4 Inputs + 4 Outputs; Configurable by the RADWIN Manager

ODU Interface

Connector	RJ-45
Cable	Outdoor CAT-5e cable; Maximum cable length: 100 m

Mechanical

Style	Half 19" wall mounted or desktop
Dimensions	22cm(W) x 17cm(D) x 4.4cm(H)
Weight	0.5 kg/1.1 lbs

Power

Power Consumption	
With RADWIN 2000 ODU	< 35W
Alone	< 5W
Power Feeding Options	110 – 240 VAC*; -20 to -60 VDC

Environmental

Operating Temperatures	0°C - 50°C / 32°F - 122°F
Humidity	90% non-condensing
Storage	-20° to 70°C / --4°F to 158°F Humidity 95%

Safety

TUV	UL 60950-1, CAN/CSA C22.2 60950-1
EN/IEC	60950-1

EMC

FCC	47 CFR Class B, Part 15, Subpart B
ETSI	EN 300 386, EN 301 489-4
CAN/CSA-CEI/IEC	CISPR 22 Class B
AS/NZS	CISPR 22:2006 Class B

IDU-C

TDM Interface

Number of ports	16, 8, 4 ports or no TDM ports.
Max ports usable by RADWIN 2000	16 (model dependent)
Type	E1/T1 configurable by RADWIN Manager
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 (default 8 ms)
Impedance	E1: 120Ω, balanced, T1: 100Ω, balanced
Jitter & Wander	According to ITU-T G.823, G.824
Jitter Buffer	Jitter Buffer configuration enabling a latency from 5ms to 16ms for interference immunity confront
Clock Recovery Resolution	0.05ppb
Clock stability	20ppm as clock master (crucial for wander requirements of cellular operators)
Monitored Hot Standby	Supported

Ethernet ports

Number of Ports	2
Type	10/100/1000BaseT with Auto-Negotiation (IEEE 802.3u). Framing/Coding IEEE 802.3
Connector	RJ-45
Line Impedance	100Ω
SFP Interface	1 port, 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

Dry Contact Alarms

Dry Contact Alarms	4 Inputs + 4 Outputs; Configurable by the RADWIN Manager

ODU Interface

Connector	RJ-45
Cable	Outdoor CAT-5e cable; Maximum cable length: 100 m

Mechanical

Style	1U 19” Rack mounted
Dimensions	43.6cm(W) x 21cm(D) x 4.4cm(H)
Weight	1.5 kg/3.3 lbs

Power

Power Consumption	
With RADWIN 2000 ODU	< 35W
Alone	<10W
Power Feeding Options	Dual feeding, -20 to -60VDC, AC Power Adapters available

Environmental

Operating Temperatures	0°C - 50°C / 32°F - 122°F
Humidity	90% non-condensing
Storage	-20° to 70°C / --4°F to 158°F Humidity 95%

Safety

TUV	UL 60950-1, CAN/CSA C22.2 60950-1
EN/IEC	60950-1

EMC

FCC	CFR47 Class B, Part 15, Subpart B
ETSI	EN 300 386, EN 301 489-4, EN 301 489-1
CAN/CSA-CEI/IEC	CISPR 22 Class B
AS/NZS	CISPR 22:2006 Class B

IDU-H (Aggregation Unit)

Ethernet Interface

PoE Interfaces	6 x legacy mode PoE ports(10/100/1000Mbps), up to 25W per port
Ethernet Ports	2 x RJ-45 PHY ports of 10/100/1000 Mbps Based-T Ethernet
LAN Interface Framing/Coding	IEEE 802.3/U
LAN Interface Line Impedance	100Ω
LAN Interface Ethernet Mode	Auto-negotiation 10/100/1000
SFP Interfaces	2 x SFP ports of 1000 Mbps (standard MSA)
MAC Address Entries	Up to 1K MAC Address entries
Maximal Frame Size	2048 bytes
Ethernet Latency	3 ms

Mechanical

Dimensions	1U 19" Rack mounted, half width
Weight	0.8Kg

Power

Internal Power Consumption	< 15W @ Maximal Power feeding
Power Feeding	44VDC - 56VDC, Dual redundant inputs. 3 pin female DC connector
Grounding	Front panel grounding lug
Protection	- DC input Line & Reverse Polarity protection - PoE Ports over/under Current & over/under Voltage protections

Environmental

Operating Temperatures	-40°C to 55°C / -40°F to 131°F
Humidity	90% non-condensing
Storage	-40° to 70°C / -40°F to 158°F Humidity 95%

Safety

TUV	UL60950-1, CAN/CSA-C22.2 No. 60950-1
ETSI/IEC	EN/IEC 60950-1

EMC

FCC	47CFR Part 15, Subpart B, Class B
ETSI	EN 300 386; 301 489-4; 301 489-1
CAN/CSA- AS/NZS	CISPR 22 Class B

GbE PoE Device - Indoor, AC

Electrical

AC Input Voltage	100 - 240 VAC nominal, 90 - 264 VAC max range
Input Frequency	47 - 63 Hz
Input Current	2.0 A (rms) 115 VAC at Max. load 1.2 A (rms) 230 VAC at Max. load
Max. In-rush Current	30A for 115VAC at Max. load 60A for 230VAC at Max. load
Standby Power	0.5W (Max) at 240Vac
DC Output Voltage	56 VDC
Protection	• Short circuit protection • Auto recovery • Over voltage protection
Indication	Green led for normal operation

Interfaces

PoE output	RJ-45 connector
PoE to ODU Interface	Outdoor CAT 5e; Maximum cable length: 75m for 1000BaseT or 100m for 10/100BaseT.
Ethernet input	RJ-45 connector
AC input on device	Standard socket IEC320 C14 type
AC cable	Variety of AC plugs available (see below)
Ethernet / ODU	RADWIN RJ-45 connector
Ethernet LAN interface type	RJ-45, 10/100/1000BaseT Interface (Line Impedance -100Ω)

Mechanical

Case	Plastic
Dimensions	16cm(W) x 6.3cm(D) x 3.33cm(H)
Weight	250g

Environmental

Operating Temperatures	0°C to 40°C/32°F to 104°F
Humidity	90% non-condensing

Safety

ULCSA	60950-1, C22.2 No. 60950-1
ETSI/IEC	IEC/EN 60950-1

EMC

ESD	61000-4-2
RS	61000-4-3
EFT	61000-4-4
Surge	61000-4-5
CS	61000-4-6
DIPS	61000-4-11
EMI	FCC part 15 class B, CISPR Pub 22 class B, AS/NZS CISPR 22 class B

PoE Device - Outdoor, DC

Electrical

Input voltage range	-20 to -60 VDC (single input)
Output voltage	48VDC / 0.6A
Power Consumption	0.5W (not including radio)
Protections	Differential - 15KW Common – 3KW

Interfaces

Ethernet LAN interface type	RJ-45, 10/100BaseT Interface (Line Impedance -100Ω)
DC input	2 pins connector
ODU (PoE Port)	RJ-45

Mechanical

Enclosure	All weather cases
Dimensions	24.5cm(H) x 13.5cm(W) x 4.0cm(D)
Weight	1.0kg/2.2lbs

Environmental

Operating Temperatures	-35° C to 60° C / -31° F to 140° F
Humidity	Up to 100% non-condensing
Standards	IEC 60721-3-4 Class 4M5 IP67

Safety

FCC/IEC/ CAN/CSA	Designed to meet 60950-1, 60950-22

EMC

ETSI	Designed to meet EN 300 386; EN 301 489-1
FCC	Designed to meet 47CFR Part 15, Subpart B, Class B
CAN/CSA	Designed to meet ICES-003 Class B
AS/NZS	Designed to meet CISPR 22 class B

GSU

Configuration

Architecture	Outdoor Synchronization Unit; Including External GPS Antenna, HSS cable and PoE device
GSU to PoE Interface	Outdoor CAT 5e cable; Maximum cable length: 100 m

Mechanical

Dimensions	24.5cm(H) x 13.5cm(W) x 4.0cm(D)
Weight	1.0kg/2.2lbs

Power

Power Feeding	Power provided by PoE device
Max Power Dissipation	10Watt

Environmental

Operating Temperature Range	-35°C to 60°C / -13°F to 140°F
Humidity	Up to 100% non-condensing

Safety

EN/IEC	Designed to meet EN/IEC 60950-1, 60950-22

EMC

FCC	Designed to meet 47CFR Class B, Part 15, Subpart B
ETSI	Designed to meet EN 300 386; EN 301 489-4; EN 301 489-1
CAN/CSA-CEI/IEC	Designed to meet CISPR 22-02
AS/NZS	Designed to meet CISPR22 Class B

Lightning Protector

Electrical

Compatible Interfaces	10/100/1000BaseT
Data Rates	Up to 1000Mbps
Nominal Operational Voltage	48 VDC
Maximum Operational Voltage	60 VDC - 650 mA
Maximum Continuous current	1 A
Impedance	90 to 110 Ohm
Connection type	RJ45 CAT 5e STP (shielded)
Pin-out	8 wires + shielding
Pins Protected	All pins protected
Response time	<5 microseconds (with ODU)

Nominal discharge currents

Line to Line	500 A @ 8/20µs
Line to Ground	2000 A @ 8/20µs

Impulse Discharge Current

20000 A, 8/20 µs	1 operation minimum
10000 A, 8/20 µs	> 10 operations
2000 A, 10/350 µs	1 operation
200 A, 10/1000 µs	> 300 operations
200 A, 10/700 µs	> 500 operations

Impulse Spark-over

DC Spark-over ±20 % @ 100 V/s	150 V
100 V/µs	350 V
1000 V/µs	500 V
Capacitance	< 2 pF
DC Holdover Voltage	80V

Mechanical

Enclosure	Metal
Connection to bonding Network	Screw
Dimensions	150mm
Weight	220 gram (0.22Kg)

Environmental

Operating temperature	-40°C to 60°C
Storage temperature	-50°C to 70°C
Enclosure rating	IP67
Humidity	100% non condensing

Fast Ethernet CAT-5e cable repeater

Electrical

Compatible Interfaces	100BaseT
Data Rates	Up to 1000Mbps
Nominal Operational Voltage	48 VDC
Maximum Operational Voltage	60 VDC - 650 mA
Current consumption	0.5 A
Impedance	90 to 110 Ohm
Connection type	RJ45 CAT 5e STP (shielded)
Pin-out	8 wires + shielding

Mechanical

Enclosure	Metal
Connection to bonding Network	Screw
Dimensions	150mm
Weight	220 gram (0.22Kg)

Environmental

Operating temperature	-40°C to 60°C
Storage temperature	-50°C to 70°C
Enclosure rating	IP67
Humidity	100% non condensing

Safety

TUV	UL 60950-1, UL 60950-22, CAN/CSA C22.2 60950-1, CAN/CSA C22.2 60950-22
ETSI/IEC	EN/IEC 60950-1, EN/IEC 60950-22

EMC

FCC	CFR47 Class B, Part 15, Subpart B
ETSI	EN 300 386, EN 301 489-4, EN 301 489-1
CAN/CSA-AS/NZS	CISPR 22 Class B

Antenna Characteristics

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 transmission range is a function of the antenna gain and transmitting power. These factors are limited by country regulations.

The RADWIN 2000 may be operated with an integrated antenna attached to the ODU unit, or with an external antenna wired to the ODU via N-type connectors. All cables and connections must be connected correctly to reduce losses. The required antenna impedance is 50Ω.

Appendix B

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.

The following table shows the connector pinout:

Table B-1: ODU-IDU RJ-45 Connector Pinout

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

ODU/HSS Unit Connection Pinout

Table B-2: ODU/HSS Unit Connection Pinout

Color	ODU RJ-45	HSS UNIT RJ-45
White/Green	1	1
Green	Not connected	
White/Orange		
Orange	6	6
Blue	4	4
White/Blue	5	5

Table B-2: ODU/HSS Unit Connection Pinout (Continued)

Color	ODU RJ-45	HSS UNIT RJ-45
White/Brown	7	7
Brown	8	8

User Port Connectors

LAN Port

The LAN 10/100BaseT interface terminates in an 8-pin RJ-45 connector, wired in accordance to **Table B-3**.

Table B-3: Fast Ethernet Connector Pinout

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

Trunk Ports - E1/T1 RJ45 Connector

The E1/T1 interfaces terminate in 8-pin RJ-45 connectors, as shown in **Table B-4** below:

Table B-4: Trunk Ports - E1/T1 RJ45Pinout

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

Hot Standby Port RJ-11

Table B-5: Hot Standby RJ-11 Port Pinout

Signal	Pin Side A	Pin Side B
HSB out	**1**	**2**
HSB in	**2**	**1**
Ground	**3**	**3**
Ground	**4**	**4**

IDU (all models) Alarm Connector

The IDU Alarm interface is a 25 pin D type female connector. Its pinout is listed in **Table B-6**.

Table B-6: IDU Alarm Connector (Dry-Contact)

I/O	Description	Pin
Input 1	Positive	14
Input 1	Negative	15
Input 2	Positive	16
Input 2	Negative	17
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 figure below, shows 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 Amp. 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.

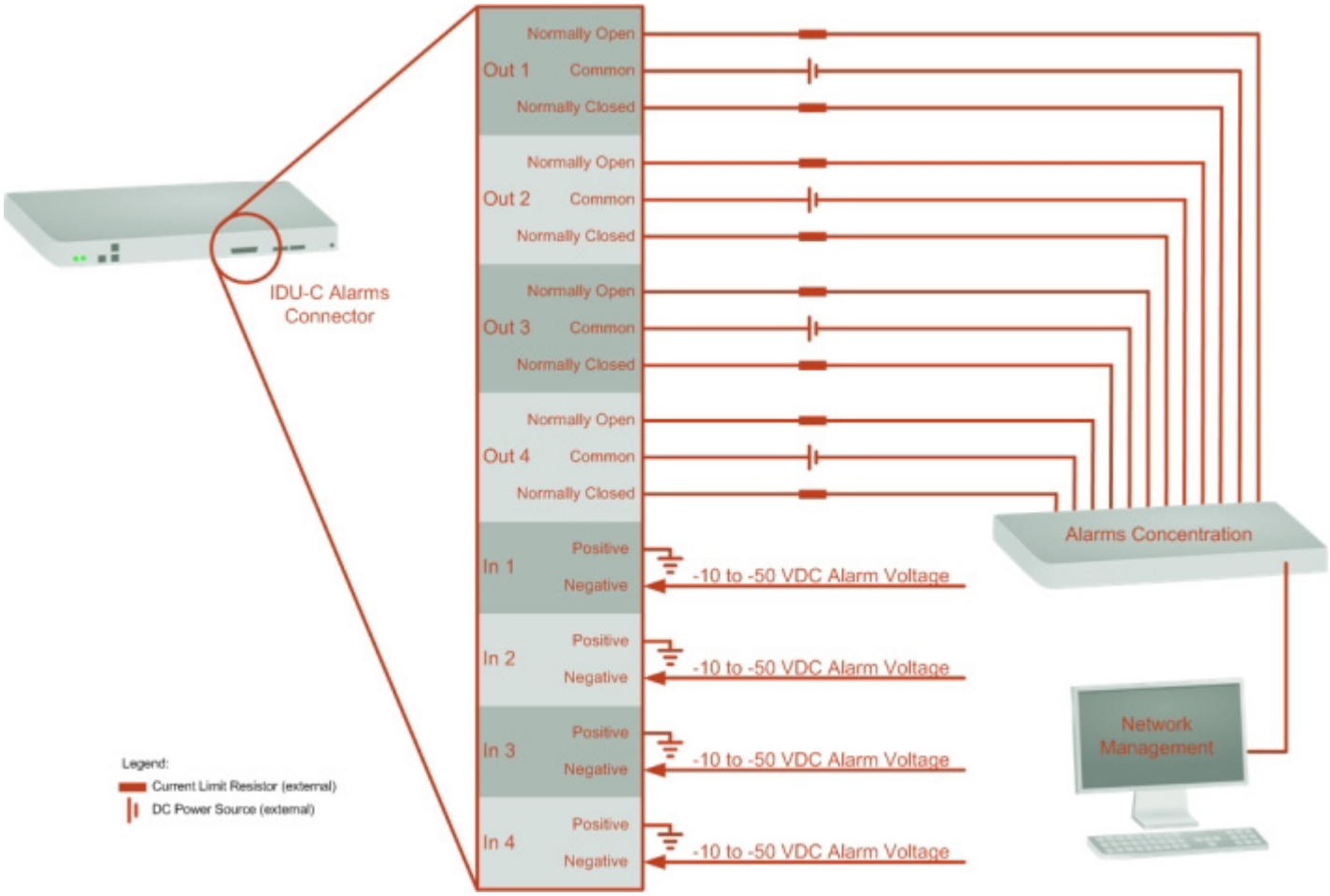


Figure B-1: Example for connecting the alarm connector

DC Power Terminals

IDU-C & E

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

Function	Pin
+	Right
Chassis	Center
–	Left

DC PoE

Table B-8: Terminal Block 2-pin -48VDC

Function	Pin
+	Right
–	Left

Unbalanced Mode for E1 Interface

You may configure the E1 interface to unbalanced mode (75 ohm) using the RADWIN Manager.

Figure B-2 shows an adapter cable for connecting devices with balanced E1 interface to the user equipment with unbalanced E1 interface. The Y splitter cable includes one RJ-45 balanced connector (left) and two unbalances BNC coaxial connectors (right).

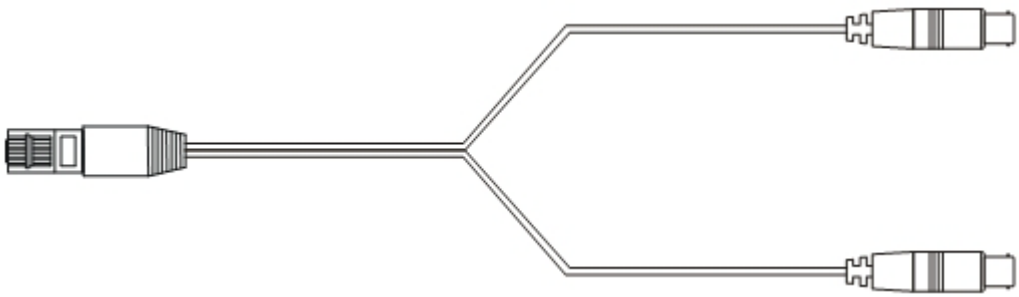


Figure B-2: Unbalanced E1 adapter cable (Y Splitter)

Figure B-3 provides a schematic:

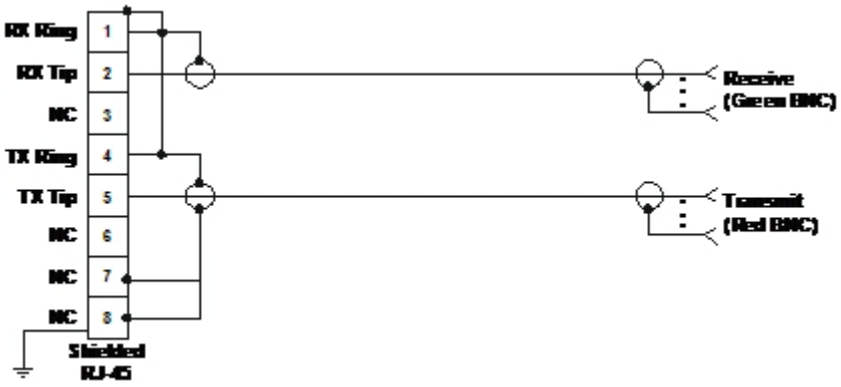


Figure B-3: Unbalanced E1 adapter cable (Y Splitter) - schematic

Table B-9: E1 Y Splitter Pinout for Unbalanced Mode

BNC Connector	Color Code	RJ-45 Connector Pin
2 (NGND)	Red	1, 4, 7, 8
1 (Center)		2
2 (NGND)	Green	1, 4, 7, 8
1 (Center)		5

Note

The Y-splitter cable cannot be used as a balanced to unbalanced converter. The cable merely provides a physical interface conversion without any impedance matching. Some devices automatically detect cable insertion and change the impedance internally

Appendix C

Small Form-factor Pluggable Transceiver

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 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 IDU-C:

Table C-1: SFP Type and Interface description

SFP Type	Interface Description
100baseT/1000baseT	100BaseT,1000BaseT IEEE 802.3, UTP CAT 5
100baseFX/1000baseFX	Multimode fiber-optic (MMF) link spans up to 2km long
100baseLX/1000baseLX	Single-mode fiber optic (SMF) links pans up to 10km
100baseBX/1000baseBX	SMF single-strand link spans up to 10 km or 40 km
E1/T1/FE	E1/T1 with 100 M
E3/T3/FE	E3/T3 with 100 M
E1/T1/GBE	E1/T1 with 1000 M
E3/T3/GBE	E3/T3 with 1000 M

Appendix D

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.



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 5-2** 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 D-1** below:

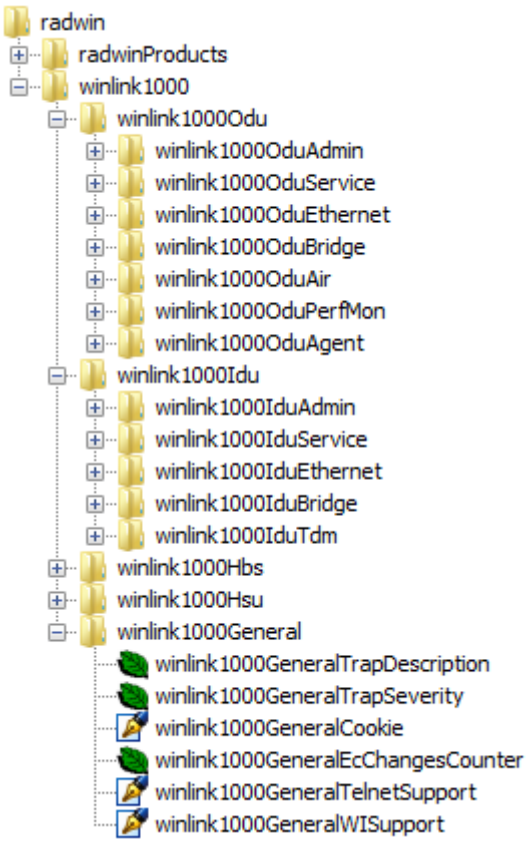


Figure D-1: Top Level Sections of the private MIB

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)** and GSU (where applicable):

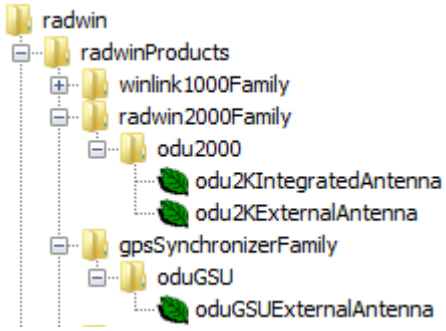


Figure D-2: Product MIB for *RADWIN 2000*

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 GpsSynchronizerFamily MIB defines the GSU.

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 D-1: Supported RFC 1213 Variables

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.
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 D-2: Private MIB Parameters (Sheet 1 of 29)

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. HBS only: A set command with a value of 4 will cause a device reset for the entire sector. 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) advancedAuto (3).
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.
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.

Table D-2: Private MIB Parameters (Sheet 2 of 29)

Name	OID	Type	Access	Description
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	ODU 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.
winlink1000OduAdmRmtPermittedOduType	1.3.6.1.4.1.4458.1000.1.1.32	DisplayString	RW	Mobile Application: permitted partner OduType.
winlink1000OduAdmCpuID	1.3.6.1.4.1.4458.1000.1.1.33	Integer	RO	CPU ID
winlink1000OduAdmOvrdCmd			RW	Ability to perform special command in the ODU.
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).
winlink1000OduSrvRingLinkMode	1.3.6.1.4.1.4458.1000.1.2.4.1	Integer	RW	Mode of the link regarding ring topology.
winlink1000OduSrvRingTopologySupported	1.3.6.1.4.1.4458.1000.1.2.4.2	Integer	RO	Ring Topology options are: supported not supported
winlink1000OduSrvRingVlanIdTable			N/A	Ring VLAN IDs table.
winlink1000OduSrvRingVlanIdEntry			N/A	VLAN ID of the internal ring messages. Valid values are 1 to 4094. Initial value is 0 meaning VLAN unaware. INDEX { winlink1000OduSrvRingVlanIdIndex }
winlink1000OduSrvRingVlanIdIndex	1.3.6.1.4.1.4458.1000.1.2.4.3.1.1	Integer	RO	Index of VLAN ID of the internal ring messages.

Table D-2: Private MIB Parameters (Sheet 3 of 29)

Name	OID	Type	Access	Description
winlink1000OduSrvRingVlanId	1.3.6.1.4.1.4458.1000.1.2.4.3.1.2	Integer	RW	VLAN ID of the internal ring messages. Valid values are 1 to 4094. Initial value is 0 meaning VLAN unaware.
winlink1000OduSrvRingEthStatus	1.3.6.1.4.1.4458.1000.1.2.4.4	Integer	RO	Represents the Ethernet service blocking state of a Rings link
winlink1000OduSrvRingMaxAllowedTimeFromLastRpm	1.3.6.1.4.1.4458.1000.1.2.4.5	Integer	RW	Defines the minimal time (in ms) required for determination of ring failure.
winlink1000OduSrvRingWTR	1.3.6.1.4.1.4458.1000.1.2.4.6	Integer	RW	Defines the minimal time (in ms) required for ring recovery.
winlink1000OduSrvQoSMode	1.3.6.1.4.1.4458.1000.1.2.5.1	Integer	RW	Mode of QoS feature.
winlink1000OduSrvQoSConfTable			N/A	QoS configuration table.
winlink1000OduSrvQoSConfEntry			N/A	QoS configuration table. INDEX { winlink1000OduSrvQoSConfIndex }
winlink1000OduSrvQoSConfIndex	1.3.6.1.4.1.4458.1000.1.2.5.2.1.1	Integer	RO	Index of QoS Configuration.
winlink1000OduSrvConfVlanQGroups	1.3.6.1.4.1.4458.1000.1.2.5.2.1.2	Integer	RO	Frames classification according to VLAN Priority IDs.
winlink1000OduSrvConfDiffservQGroups	1.3.6.1.4.1.4458.1000.1.2.5.2.1.3	Integer	RO	Frames classification according to Diffserv.
winlink1000OduSrvConfQueMir	1.3.6.1.4.1.4458.1000.1.2.5.2.1.4	Integer	RW	Desired Private MIR.
winlink1000OduSrvConfQueWeight	1.3.6.1.4.1.4458.1000.1.2.5.2.1.5	Integer	RW	QoS queueu's weights in percent.
winlink1000OduSrvQoSVlanQGroupsSetStr	1.3.6.1.4.1.4458.1000.1.2.5.3	DisplayString	RW	Frames classification according to VLAN IDs string for set.
winlink1000OduSrvQoSDiffservQGroupsSetStr	1.3.6.1.4.1.4458.1000.1.2.5.4	DisplayString	RW	Frames classification according to Diffserv IDs string for set.
winlink1000OduSrvQoSMaxRTQuePercent	1.3.6.1.4.1.4458.1000.1.2.5.5	Integer	RO	Maximal percent for RT & NRT queues.
winlink1000OduSrvVlanSupport	1.3.6.1.4.1.4458.1000.1.2.6.1	Integer	RO	ODU Ethernet port VLAN support and configuration availability indication. 1 - ODU VLAN Functionality Not Supported 2 - ODU VLAN Functionality Supported 3 - ODU VLAN Functionality Supported and Available
winlink1000OduSrvVlanIngressMode	1.3.6.1.4.1.4458.1000.1.2.6.2	Integer	RW	ODU Ethernet port ingress VLAN mode.
winlink1000OduSrvVlanEgressMode	1.3.6.1.4.1.4458.1000.1.2.6.3	Integer	RW	ODU Ethernet port egress VLAN mode.
winlink1000OduSrvEgressTag	1.3.6.1.4.1.4458.1000.1.2.6.4	Integer	RW	ODU ethernet port egress VLAN tag. Right most digit is Vlan priority (0-7) other digits compose Vlan Id (2-4094)
winlink1000OduSrvEgressProviderTag	1.3.6.1.4.1.4458.1000.1.2.6.5	Integer	RW	ODU ethernet port egress Provider VLAN tag. Right most digit is Vlan priority (0-7) other digits compose Vlan Id (2-4094)
winlink1000OduSrvVlanIngressAllowedVIDs	1.3.6.1.4.1.4458.1000.1.2.6.6	DisplayString	RW	ODU ethernet port VLAN IDs that will not be filtered on ingress. w|w|w|w|w|w|w|w| (where w = {0-4094} and w != 1)
winlink1000OduSrvVlanDisable	1.3.6.1.4.1.4458.1000.1.2.6.7	Integer	RW	Disable VLAN functionality. The following values can be set: 3 - Disable ODU & IDU VLAN Configurations.
winlink1000OduServiceVlanProviderListTPIDstr			RO	Holds the possible Provider TPIDs.
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 }
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.

Table D-2: Private MIB Parameters (Sheet 4 of 29)

Name	OID	Type	Access	Description
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.
winlink1000OduEthernetGbeSupported	1.3.6.1.4.1.4458.1000.1.3.4	Integer	RO	Supported Giga bit Ethernet in ODU.
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	1.3.6.1.4.1.4458.1000.1.4.4.3.1.101	Counter	RO	Number of bytes received by this port.
winlink1000OduBridgeTpPortOutBytes	1.3.6.1.4.1.4458.1000.1.4.4.3.1.102	Counter	RO	Number of bytes transmitted by this port.
winlink1000OduBridgeConfigMode	1.3.6.1.4.1.4458.1000.1.4.4.102	Integer	RO	ODU bridge configuration mode
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. The Sector ID in Point-To-Multi-Point systems.
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. The value is relevant only for point to point systems.
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. Relevant only for point to point systems.
winlink1000OduAirTotalFrames	1.3.6.1.4.1.4458.1000.1.5.9.2	Counter	RO	Total number of 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. The value is relevant only for point to point systems .
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 D-2: Private MIB Parameters (Sheet 5 of 29)

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). Rewriteable only in Point-To-Point products.
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).
winlink1000OduAirAutoChannelSelectionState	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.

Table D-2: Private MIB Parameters (Sheet 6 of 29)

Name	OID	Type	Access	Description
winlink1000OduAirChannelBWEntry			N/A	Channel Bandwidth table entry. INDEX { winlink1000OduAirChannelBWIndex }
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.
winlink1000OduAirChannelBWHSSATDDConflictPerCBW	1.3.6.1.4.1.4458.1000.1.5.25.1.4	Integer	RO	Indication for possible Link drop per CBW due to conflict between HSS and ATDD.
winlink1000OduAirChannelBWMinRatioForSupporting	1.3.6.1.4.1.4458.1000.1.5.25.1.5	Integer	RO	Minimal TX ratio that may be used by the HSM and still enable proper operation of the aforementioned CBW.
winlink1000OduAirChannelBWMaxRatioForSupporting	1.3.6.1.4.1.4458.1000.1.5.25.1.6	Integer	RO	Maximal TX ratio that may be used by the HSM and still enable proper operation of the aforementioned 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. In GSS mode: if generating then 1PSP is auto generated by the GSS Unit. if generatingAndDetecting then 1PSP is generated by GPS satellites signal.
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) typeE(6) typeF(7)}. 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 }

Table D-2: Private MIB Parameters (Sheet 7 of 29)

Name	OID	Type	Access	Description
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) typeE(6).
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.
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.
winlink1000OduAirHssRfpEthChannelBW40MHz			RO	Represents the compatibility of Ethernet service under Channel BW of 40MHz in the specific Radio Frame Pattern.
winlink1000OduAirHssRfpTdmChannelBW40MHz			RO	Represents the compatibility of TDM service under Channel BW of 40MHz in the specific Radio Frame Pattern.
winlink1000OduAirHssRfpStr	1.3.6.1.4.1.4458.1000.1.5.40.8	DisplayString	RO	Hub Site Synchronization supported patterns
winlink1000OduAirHssHsmID	1.3.6.1.4.1.4458.1000.1.5.40.9	Integer	RO	A unique ID which is common to the HSM and all its collocated ODUs
winlink1000OduAirHssTime			RO	Hub Site Synchronization GPS time
winlink1000OduAirHssLatitude			RO	Hub Site Synchronization GPS Latitude
winlink1000OduAirHssNSIndicator			RO	Hub Site Synchronization GPS N/S Indicator
winlink1000OduAirHssLongitude			RO	Hub Site Synchronization GPS Longitude
winlink1000OduAirHssEWIndicator			RO	Hub Site Synchronization GPS E/W Indicator
winlink1000OduAirHssNumSatellites			RO	Hub Site Synchronization GPS Number of satellites
winlink1000OduAirHssAltitude			RO	Hub Site Synchronization GPS Altitude
winlink1000OduAirHssRfpPhase	1.3.6.1.4.1.4458.1000.1.5.40.17	Integer	RW	Hub Site Synchronization GPS RFP phase
winlink1000OduAirHssInterSiteSynchronizationMode			RW	Inter-Site Synchronization Mode - independent / synchronized
winlink1000OduAirHssInterSiteSynchronizationAvailability			RO	Inter-Site Synchronization Availability
winlink1000OduAirHssSatellitesSatSyncRequired			RW	Satellites Synchronization Is Required
winlink1000OduAirHssDomainID	1.3.6.1.4.1.4458.1000.1.5.40.21	DisplayString	RW	EHSS domain. Indentify set of CUs with same HSS synchronization
winlink1000OduAirHssSupportedSynchronizationProtocol	1.3.6.1.4.1.4458.1000.1.5.40.22	Integer	RO	Supported Synchronization Protocols
winlink1000OduAirHssDesiredSynchronizationProtocol	1.3.6.1.4.1.4458.1000.1.5.40.23	Integer	RW	Desired Synchronization Protocols
winlink1000OduAirHssDiscover	1.3.6.1.4.1.4458.1000.1.5.40.24	Integer	RW	Initiate Discovery process of ODUs on the network.
winlink1000OduAirHssNumberOfDiscoveredODUs	1.3.6.1.4.1.4458.1000.1.5.40.25	Integer	RO	Number OF Discovered ODUs in network.

Table D-2: Private MIB Parameters (Sheet 8 of 29)

Name	OID	Type	Access	Description
winlink1000OduAirHssDiscoverTable			N/A	HSS Discover Table.
winlink1000OduAirHssDiscoverEntry			N/A	ODU Discover Table entry. INDEX { winlink1000OduAirHssDiscoverIndex }
winlink1000OduAirHssDiscoverIndex			RO	HSS Discover Table Index.
winlink1000OduAirHssDiscoverODUDescription			RO	Hold ODU HSS status in compress format: Domain IP HSS Role Hss support Enabled HSS protocol Sync Status Location.
winlink1000OduAirHssMasterSlaveCompatibility	1.3.6.1.4.1.4458.1000.1.5.40.27	Integer	RO	EHSM version compatibility. Relevant to Ethernet HSS Clients only.
winlink1000OduAirHssNumberOfAssociatedCU	1.3.6.1.4.1.4458.1000.1.5.40.28	Integer	RO	Number of associated Ethernet HSS Clients. Relevant to Ethernet HSS Masters only
winlink1000OduAirHssAssociatedCUTable			N/A	Associated Ethernet HSS Clients Table. Releant for Ethernet HSS Masters only.
winlink1000OduAirHssAssociatedCUTableEntry			N/A	Associated Ethernet HSS Clients Table Entry. Releant for Ethernet HSS Masters only. INDEX { winlink1000OduAirHssAssociatedCUIndex }
winlink1000OduAirHssAssociatedCUIndex	1.3.6.1.4.1.4458.1000.1.5.40.29.1.1	Integer	RO	Associated Ethernet HSS Clients Table Index. Releant for Ethernet HSS Masters only.
winlink1000OduAirHssAssociatedCUDescription	1.3.6.1.4.1.4458.1000.1.5.40.29.1.2	DisplayString	RO	Holds Associated Ethernet HSS Clients Description in compress format: IP Delay Compatibility Ethernet Speed Ethernet Rx rate
winlink1000OduAirHssSyncStatusEth	1.3.6.1.4.1.4458.1000.1.5.40.30	Integer	RO	Ethernet HSS Client Synchronization Level
winlink1000OduAirHssEthVLANTag	1.3.6.1.4.1.4458.1000.1.5.40.31	Integer	RW	Ethernet HSS VLan Tag: The least significate decimal digit is the VLan Priority(0-6) and the rest of the digits represents VLan ID (2-4094)
winlink1000OduAirHssHSMIPAddress	1.3.6.1.4.1.4458.1000.1.5.40.32	IPAddress	RO	HSMs IP address. Relevant for HSC synchronized over Ethernet.
winlink1000OduAirHssDelayToHSM	1.3.6.1.4.1.4458.1000.1.5.40.33	Integer	RO	Delay in microseconds to HSM. Relevant for HSC synchronized over Ethernet.
winlink1000OduAirHssSyncAcquisitionSeconds			RW	Accumulated quantity of seconds in clock acquisition while connected to current HSM
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: single-pole or dual-pole.

Table D-2: Private MIB Parameters (Sheet 9 of 29)

Name	OID	Type	Access	Description
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. -2 : Radio 2 RSS is much stronger than Radio 1 RSS. -1 : Radio 2 RSS is stronger than Radio 1 RSS. -0 : Radio 2 RSS is equal to Radio 1 RSS. 1 : Radio 1 RSS is stronger than Radio 2 RSS. 2 : Radio 1 RSS is much stronger than Radio 2 RSS.
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. Relevant in point to point systems.
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.
winlink1000OduAirComboFrequencyBandId	1.3.6.1.4.1.4458.1000.1.5.53.1.1.7	Integer	RO	Reflects the frequency band Id.
winlink1000OduAirComboSubBandChannelBW5AdminState			RO	Reflects the CBW 5MHz admin state vector.
winlink1000OduAirComboSubBandChannelBW10AdminState			RO	Reflects the CBW 10MHz admin state vector.
winlink1000OduAirComboSubBandChannelBW20AdminState			RO	Reflects the CBW 20MHz admin state vector.
winlink1000OduAirComboSubBandChannelBW40AdminState			RO	Reflects the CBW 40MHz admin state vector.
winlink1000OduAirComboSubBandAllowableChannels			RO	Reflects the allowable channels vector.
winlink1000OduAirComboSubBandChannelBWAvail			RO	Reflects the available CBWs vector.
winlink1000OduAirComboSubBandChannelBandwidth			RO	Reflects the sub-band default channel bandwidth.
winlink1000OduAirComboSubBandMinFreq			RO	Reflects the sub-band default minimal frequency.
winlink1000OduAirComboSubBandMaxFreq			RO	Reflects the sub-band default maximal frequency.
winlink1000OduAirComboSubBandFrequencyResolution			RO	Reflects the sub-band frequency resolution.
winlink1000OduAirComboSubBandDefaultChannelList			RO	Reflects the default channel list vector.
winlink1000OduAirComboSubBandDfsState			RO	Reflects the sub-band DFS state.
winlink1000OduAirComboNumberOfSubBands	1.3.6.1.4.1.4458.1000.1.5.53.2	Integer	RO	Represents the number of Multi-band sub bands.
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.
winlink1000OduAirComboCurrentSubBandDesc	1.3.6.1.4.1.4458.1000.1.5.53.4	DisplayString	RO	Current Sub Band description.
winlink1000OduAirInternalMaxRate	1.3.6.1.4.1.4458.1000.1.5.54	Integer	RO	Max Ethernet throughput of the site (in Kpbs).

Table D-2: Private MIB Parameters (Sheet 10 of 29)

Name	OID	Type	Access	Description
winlink1000OduAirCapacityDirection	1.3.6.1.4.1.4458.1000.1.5.55	Integer	RW	Capacity direction of the site.
winlink1000OduAirSpectrumAnalysisOperState	1.3.6.1.4.1.4458.1000.1.5.56.1	Integer	RW	Spectrum Analysis operation state. The configurable values are Spectrum Analysis Stop Start and Restart. Not Supported value indicates that the feature is not supported on the device. Not Supported is not a configurable state.
winlink1000OduAirRxPowerAntennaA	1.3.6.1.4.1.4458.1000.1.5.56.2	Integer	RO	Received Signal Strength in dBm of Antenna A.
winlink1000OduAirRxPowerAntennaB	1.3.6.1.4.1.4458.1000.1.5.56.3	Integer	RO	Received Signal Strength in dBm of Antenna B.
winlink1000OduAirNumberOfSpectrumChannels	1.3.6.1.4.1.4458.1000.1.5.56.4	Integer	RO	Represents the number of Spectrum Channels.
winlink1000OduAirSpectrumChannelTable			N/A	ODU Spectrum Analysis Channel Table.
winlink1000OduAirSpectrumChannelTableEntry			N/A	ODU Spectrum Analysis Channel Table entry. INDEX { winlink1000OduAirSpectrumChannelIndex }
winlink1000OduAirSpectrumChannelIndex	1.3.6.1.4.1.4458.1000.1.5.56.5.1.1	Integer	RO	ODU Spectrum Channel index.
winlink1000OduAirSpectrumChannelFrequency	1.3.6.1.4.1.4458.1000.1.5.56.5.1.2	Integer	RO	ODU Spectrum Channel frequency in MHz.
winlink1000OduAirSpectrumChannelScanned	1.3.6.1.4.1.4458.1000.1.5.56.5.1.3	Integer	RO	An indication of the vaildity of the channel's data. If the channel was scanned the data is valid, else not.
winlink1000OduAirSpectrumChannelScanningTimestamp	1.3.6.1.4.1.4458.1000.1.5.56.5.1.4	TimeTicks	RO	Channel last scan timestamp in hundredths of a second since device up time. If the channel was not scanned than the return value will be 0.
winlink1000OduAirSpectrumChannelLastNFAntennaA	1.3.6.1.4.1.4458.1000.1.5.56.5.1.5	Integer	RO	Normalized Noise Floor value in dBm - of Antenna A - (including 2 neighbor frequencies).
winlink1000OduAirSpectrumChannelLastNFAntennaB	1.3.6.1.4.1.4458.1000.1.5.56.5.1.6	Integer	RO	Normalized Noise Floor value in dBm - of Antenna B - (including 2 neighbor frequencies).
winlink1000OduAirSpectrumChannelAverageNFAntennaA	1.3.6.1.4.1.4458.1000.1.5.56.5.1.7	Integer	RO	Average normalized Noise Floor value in dBm - of Antenna A - over all dwells.
winlink1000OduAirSpectrumChannelAverageNFAntennaB	1.3.6.1.4.1.4458.1000.1.5.56.5.1.8	Integer	RO	Average normalized Noise Floor value in dBm - of Antenna B - over all dwells.
winlink1000OduAirSpectrumChannelMaxNFAntennaA	1.3.6.1.4.1.4458.1000.1.5.56.5.1.9	Integer	RO	Max normalized Noise Floor value in dBm - of Antenna A - over all dwells.
winlink1000OduAirSpectrumChannelMaxNFAntennaB	1.3.6.1.4.1.4458.1000.1.5.56.5.1.10	Integer	RO	Max normalized Noise Floor value in dBm - of Antenna B - over all dwells.
winlink1000OduAirSpectrumChannelCACPerformed	1.3.6.1.4.1.4458.1000.1.5.56.5.1.11	Integer	RO	Was CAC performed on the channel.
winlink1000OduAirSpectrumChannelLastCACTimestamp	1.3.6.1.4.1.4458.1000.1.5.56.5.1.12	TimeTicks	RO	Last CAC performed timestamp in hundredths of a second since device up time. If no CAC has performed on the channel the return value will be 0.
winlink1000OduAirSpectrumChannelRadarDetected	1.3.6.1.4.1.4458.1000.1.5.56.5.1.13	Integer	RO	Was Radar detected on the channel.
winlink1000OduAirSpectrumChannelRadarDetectionTimestamp	1.3.6.1.4.1.4458.1000.1.5.56.5.1.14	TimeTicks	RO	Last Radar Detection timestamp in hundredths of a second since device up time. If no Radar has detected on the channel the return value will be 0.
winlink1000OduAirSpectrumChannelAvailable	1.3.6.1.4.1.4458.1000.1.5.56.5.1.15	Integer	RO	Is the channel available for use.
winlink1000OduAirSpectrumChannelMaxBeaconRss	1.3.6.1.4.1.4458.1000.1.5.56.5.1.16	Integer	RO	The max RSS value of a received beacon on the specific channel in dBm.

Table D-2: Private MIB Parameters (Sheet 11 of 29)

Name	OID	Type	Access	Description
winlink1000OduAirSpectrumChannelCompressed	1.3.6.1.4.1.4458.1000.1.5.56.5.1.17	OctetString	RO	Compress all the Spectrum data per channel into one variable. Frequency (4 bytes) Scanned (1 byte) Timestamp (4 bytes) Last NF Antenna A (1 byte) Last NF Antenna B (1 byte) Avg NF Antenna A (1 byte) Avg NF Antenna B (1 byte) Max NF Antenna A (1 byte) Max NF Antenna B (1 byte) CAC Performed (1 byte) Last CAC Timestamp (4 bytes) Radar Detected (1 byte) Radar Detected Timestamp (4 bytes) Channel Available (1 byte) Max Beacon RSS (1 byte).
winlink1000OduAirChipMinMaxFreq			RO	The minimum and maximum frequencies in MHz which the chip supports.
winlink1000OduAirSpectrumAnalysisTimeout	1.3.6.1.4.1.4458.1000.1.5.56.7	Integer	RW	Spectrum analysis timeout in seconds.
winlink1000OduAirAntConfAndRatesStatus	1.3.6.1.4.1.4458.1000.1.5.57	Integer	RO	Description: Antenna configuration and Rates status (1 = Single antenna with single data stream 2 = Dual antenna with single data stream 3 = Dual antenna with dual data stream).
winlink1000OduAirDualAntTxMode	1.3.6.1.4.1.4458.1000.1.5.58	Integer	RW	Description: Transmission type when using Dual radios (MIMO or AdvancedDiversity using one stream of data).
winlink1000OduAirTxOperationMode	1.3.6.1.4.1.4458.1000.1.5.59	Integer	RW	This parameter controls the Operation mode of frames sent over the air. The Operation mode is either normal (1) for regular transmission where frame size is determined by the traffic or throughput test (2) when the user requests an actual over the air throughput estimation using full frames. The latter lasts no more than a predetermined interval (default 30 sec).
winlink1000OduAirDesiredNetMasterTxRatio	1.3.6.1.4.1.4458.1000.1.5.60.1	Integer	RW	This parameter is reserved to the element manager provided with the product.
winlink1000OduAirCurrentNetMasterTxRatio	1.3.6.1.4.1.4458.1000.1.5.60.2	Integer	RO	Represents the actual Net Master Tx RAtio.
winlink1000OduAirMinUsableMasterTxRatio	1.3.6.1.4.1.4458.1000.1.5.60.3	Integer	RO	Represents the minimal value the user can configure for Desired net mAster Tx Ratio.
winlink1000OduAirMaxUsableMasterTxRatio	1.3.6.1.4.1.4458.1000.1.5.60.4	Integer	RO	Represents the maximal value the user can configure for Desired net mAster Tx Ratio.
winlink1000OduAirAccumulatedUAS	1.3.6.1.4.1.4458.1000.1.5.61	Integer	RO	Accumulates the Unavailable seconds of the Air Interface. Relevant for point to point systems.
winlink1000OduAirDistStr	1.3.6.1.4.1.4458.1000.1.5.62	DisplayString	RO	Possibilities of the link according to RFP and CBW
winlink1000OduAirChannelsDefaultFreqStr			RO	A string representing the channels available. Each character represents one frequency when '1' means its available and '0' means its not.
winlink1000OduAirAntConnectionType	1.3.6.1.4.1.4458.1000.1.5.64	Integer	RW	Antenna connection type (External(1) Integrated(2) Embedded_External(3) Embedded_Integrated(4)).
winlink1000OduAirAllowableChannelsStr			RW	A string representing the allowable channels. Each character represents one channel when '1' means its available and '0' means its not.
winlink1000OduAirDfsAlgorithmTypeState			RW	Bitmap for state of Radar Algorithm Type. Filters by bit's position: 0 = Zero PW 1 = Fixed 2 = Variable 3 = Staggered 4 = Long.
winlink1000OduAirDfsLastDetectedTbl			N/A	Last detected radars table.
winlink1000OduAirDfsLastDetectedEntry			N/A	ODU Multi-band Sub Bands Table entry. INDEX { winlink1000OduAirDfsLastDetectedIndex }
winlink1000OduAirDfsLastDetectedIndex			RO	Dfs Last Detected Radars Table Index.
winlink1000OduAirDfsLastDetectedTime			RO	Dfs time of the last detected radar.
winlink1000OduAirDfsLastDetectedAlgorithmType			RO	Dfs type of the last detected radar.

Table D-2: Private MIB Parameters (Sheet 12 of 29)

Name	OID	Type	Access	Description
winlink1000OduAirDfsLastDetectedFrequency			RO	Dfs frequency of the last detected radar.
winlink1000OduAirPreferredChannelsStr	1.3.6.1.4.1.4458.1000.1.5.67	DisplayString	RW	A string representing the preferred channels. Each character represents one channel when '1' means its preferred and '0' means its not.
winlink1000OduAirSyncLossThreshold	1.3.6.1.4.1.4458.1000.1.5.68	Integer	RW	When the current throughput is below this threshold (in Kbps) sync loss will occur.
winlink1000OduAirGeoLocation			RW	Geographic device location in format: latitude longitude.
winlink1000OduAirAggregateCapacity	1.3.6.1.4.1.4458.1000.1.5.70	Integer	RO	Aggregate Capacity of the ODU in Mbps.
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.
winlink1000OduPerfMonCurrCompressed			RO	Holds a compressed string of all data per interface. Compressed Air Interface Structure (size in brackets): UAS (4) ES (4) SES (4) BBE (4) Integrity (1) MinRSL (1) MaxRSL (1) RSLThresh1Exceeded (4) RSLThresh2Exceeded (4) MinTSL (1) MaxTSL (1) TSLThresh1Exceed (4) BBERThresh1Exceed (4) RxMBytes (4) TxMBytes (4) EthCapacityThreshUnder (4) HighTrafficThreshExceed (4) Compressed Etherent ODU interface (size in brackets): UAS (4) ES (4) SES (4) BBE (4) Integrity (1) RxMBytes (4) TxMBytes (4) EthCapacityThreshUnder (4) HighTrafficThreshExceed (4) ActiveSeconds (4)
winlink1000OduPerfMonIntervalTable			N/A	This table defines/keeps the counters of the last day (in resolution of 15 min intervals).
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.

Table D-2: Private MIB Parameters (Sheet 13 of 29)

Name	OID	Type	Access	Description
winlink1000OduPerfMonIntervalCompressed			RO	Holds a compressed string of all data per interface. Compressed Air Interface Structure (size in brackets): UAS (4) ES (4) SES (4) BBE (4) Integrity (1) MinRSL (1) MaxRSL (1) RSLThresh1Exceeded (4) RSLThresh2Exceeded (4) MinTSL (1) MaxTSL (1) TSLThresh1Exceed (4) BBERThresh1Exceed (4) RxMBytes (4) TxMBytes (4) EthCapacityThreshUnder (4) HighTrafficThreshExceed (4) Compressed Etherent ODU interface (size in brackets): UAS (4) ES (4) SES (4) BBE (4) Integrity (1) RxMBytes (4) TxMBytes (4) EthCapacityThreshUnder (4) HighTrafficThreshExceed (4) ActiveSeconds (1)
winlink1000OduPerfMonDayTable			N/A	This table defines/keeps the counters of the last month (in resolution of days).
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.
winlink1000OduPerfMonDayCompressed			RO	Holds a compressed string of all data per interface. Compressed Air Interface Structure (size in brackets): UAS (4) ES (4) SES (4) BBE (4) Integrity (1) MinRSL (1) MaxRSL (1) RSLThresh1Exceeded (4) RSLThresh2Exceeded (4) MinTSL (1) MaxTSL (1) TSLThresh1Exceed (4) BBERThresh1Exceed (4) RxMBytes (4) TxMBytes (4) EthCapacityThreshUnder (4) HighTrafficThreshExceed (4) Compressed Etherent ODU interface (size in brackets): UAS (4) ES (4) SES (4) BBE (4) Integrity (1) RxMBytes (4) TxMBytes (4) EthCapacityThreshUnder (4) HighTrafficThreshExceed (4) ActiveSeconds (1)
winlink1000OduPerfMonAirCurrTable			N/A	This table defines/keeps the air 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.
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.

Table D-2: Private MIB Parameters (Sheet 14 of 29)

Name	OID	Type	Access	Description
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 air counters of the last day (in resolution of 15 min intervals).
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 air counters of the last month (in resolution of days).
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.
winlink1000OduPerfMonAirDayBBERThresh1Exceed			RO	Number of seconds Background Block Error Ratio exceeded the BBER1 threshold per Day.
winlink1000OduPerfMonEthCurrTable			N/A	This table defines/keeps the ethernet counters of the current 15 min interval.

Table D-2: Private MIB Parameters (Sheet 15 of 29)

Name	OID	Type	Access	Description
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.
winlink1000OduPerfMonEthCurrEthCapacityThreshUnder	1.3.6.1.4.1.4458.1000.1.6.7.1.3	Gauge	RO	The number of times throughput was below threshold in the present 15 minutes period. Relevant for point to point systems.
winlink1000OduPerfMonEthCurrHighTrafficThreshExceed	1.3.6.1.4.1.4458.1000.1.6.7.1.4	Gauge	RO	The number of times actual traffic was above threshold in the present 15 minutes period.
winlink1000OduPerfMonEthCurrActiveSeconds	1.3.6.1.4.1.4458.1000.1.6.7.1.5	Gauge	RO	The number of seconds in which RPL Ethernet swervice was not blocked in the present 15 minutes period.
winlink1000OduPerfMonEthIntervalTable			N/A	This table defines/keeps the ethernet counters of the last day (in resolution of 15 min intervals).
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.
winlink1000OduPerfMonEthIntervalEthCapacityThreshUnder			RO	The number of times throughput was below threshold in the each interval. Relevant for point to point systems.
winlink1000OduPerfMonEthIntervalHighTrafficThreshExceed			RO	The number of times actual traffic was above threshold in the each interval.
winlink1000OduPerfMonEthIntervalActiveSeconds			RO	The number of seconds in which RPL Ethernet service was not blocked in the each interval.
winlink1000OduPerfMonEthDayTable			N/A	This table defines/keeps the ethernet counters of the last month (in resolution of days).
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.
winlink1000OduPerfMonEthDayEthCapacityThreshUnder			RO	The number of times throughput was below threshold each day. Relevant for point to point systems.
winlink1000OduPerfMonEthDayHighTrafficThreshExceed			RO	The number of times actual traffic was above threshold each day.
winlink1000OduPerfMonEthDayActiveSeconds			RO	The number of seconds in which RPL Ethernet service was not blocked each day.
winlink1000OduPerfMonTdmCurrTable			N/A	This table defines/keeps the TDM 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 TDM counters of the last day (in resolution of 15 min intervals).

Table D-2: Private MIB Parameters (Sheet 16 of 29)

Name	OID	Type	Access	Description
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 TDM counters of the last month (in resolution of days).
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.
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.
winlink1000OduPerfMonEthCapacityThreshKbps	1.3.6.1.4.1.4458.1000.1.6.24	Integer	RW	When the current throughput is below this threshold the corresponding counter is incremented
winlink1000OduPerfMonHighTrafficThreshKbps	1.3.6.1.4.1.4458.1000.1.6.25	Integer	RW	When the current traffic is above this threshold then corresponding counter is incremented.
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.
winlink1000OduAgnGenLocalConnectionMode			RW	Local Connection (Broadcast) Configuration Mode. Options are: 1 - SNMP Read-Write 2 - SNMP Read-Only.
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.

Table D-2: Private MIB Parameters (Sheet 17 of 29)

Name	OID	Type	Access	Description
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 }
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.

Table D-2: Private MIB Parameters (Sheet 18 of 29)

Name	OID	Type	Access	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
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
winlink1000IduAdmVlanSupported	1.3.6.1.4.1.4458.1000.2.1.10	Integer	RO	Identifies if the local IDU supports VLAN tag/untag
winlink1000IduAdmVlanEgressMode	1.3.6.1.4.1.4458.1000.2.1.11	DisplayString	RW	VLAN tag/untag egress values
winlink1000IduAdmVlanIngressMode	1.3.6.1.4.1.4458.1000.2.1.12	DisplayString	RW	VLAN tag/untag ingress values
winlink1000IduAdmVlanDefaultPortVIDs	1.3.6.1.4.1.4458.1000.2.1.13	DisplayString	RW	VLAN tag/untag default VLAN ids for each port - Right most digit is Vlan priority (0-6) other digits compose Vlan Id (1-4094)
winlink1000IduAdmVlanLan1UntaggedVIDs	1.3.6.1.4.1.4458.1000.2.1.14	DisplayString	RW	VLAN untagged VIDs for LAN1 port
winlink1000IduAdmVlanLan2UntaggedVIDs	1.3.6.1.4.1.4458.1000.2.1.15	DisplayString	RW	VLAN untagged VIDs for LAN2 port
winlink1000IduAdmVlanSfpUntaggedVIDs	1.3.6.1.4.1.4458.1000.2.1.16	DisplayString	RW	VLAN untagged VIDs for Sfp port
winlink1000IduAdmVlanLan1FilteredVIDs	1.3.6.1.4.1.4458.1000.2.1.17	DisplayString	RW	VLAN filtered VIDs for LAN1 port
winlink1000IduAdmVlanLan2FilteredVIDs	1.3.6.1.4.1.4458.1000.2.1.18	DisplayString	RW	VLAN filtered VIDs for LAN2 port
winlink1000IduAdmVlanSfpFilteredVIDs	1.3.6.1.4.1.4458.1000.2.1.19	DisplayString	RW	VLAN filtered VIDs for Sfp port
winlink1000IduAdmPortsConnection	1.3.6.1.4.1.4458.1000.2.1.20	Integer	RW	IDU ports connection bitmap. bit 0 - LAN1-LAN2 bit 1 - SFP-LAN1 bit 2 - SFP-LAN2 bit values: 0 - ports are disconnected. 1 - ports are connected.
winlink1000IduAdmVlanMode	1.3.6.1.4.1.4458.1000.2.1.21	Integer	RW	Local IDU Vlan Mode.
winlink1000IduAdmVlanMembershipVIDs	1.3.6.1.4.1.4458.1000.2.1.22	OctetString	RW	VLAN Membership VLAN IDs list.
winlink1000IduAdmVlanMembershipPortsCode	1.3.6.1.4.1.4458.1000.2.1.23	OctetString	RW	VLAN Membership ports code. Each value represent the relation (bitmap) Between the suitable VID to the IDU ports. bit 0 - LAN1 bit 1 - LAN2 bit 2 - SFP bit value 0 - not member of appropriate VID bit value 1 - member of appropriate VID
winlink1000IduAdmVlanMembershipUntagged Handle	1.3.6.1.4.1.4458.1000.2.1.24	DisplayString	RW	VLAN Membership Untagged frames handling. The 3 values representing LAN1 LAN2 and SFP accordingly. For each port the optional values are: 1 - Discard 2 - Tag 3 - Leave Unmodified

Table D-2: Private MIB Parameters (Sheet 19 of 29)

Name	OID	Type	Access	Description
winlink1000IduAdmVlanMembershipTagUntagged	1.3.6.1.4.1.4458.1000.2.1.25	DisplayString	RW	VLAN Membership Untagged frames tagging. The 3 values representing LAN1 LAN2 and SFP accordingly. The value on each port entry represent the tagging value which is built of: VLAN ID & VLAN Priority.
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. - A-Symetric TDD Mode Is Obligated.
winlink1000IduSrvEthActive	1.3.6.1.4.1.4458.1000.2.2.12	Integer	RO	Represents the Ethernet service activation state.

Table D-2: Private MIB Parameters (Sheet 20 of 29)

Name	OID	Type	Access	Description
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.
winlink1000IduEthernetGbeSupported	1.3.6.1.4.1.4458.1000.2.3.6	Integer	RO	Supported Giga bit Ethernet in IDU.
winlink1000IduEthernetOduInErrors	1.3.6.1.4.1.4458.1000.2.3.7	Counter	RO	The number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.
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 D-2: Private MIB Parameters (Sheet 21 of 29)

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.
winlink1000IduTdmType	1.3.6.1.4.1.4458.1000.2.6.18	Integer	RW	TDM Type (The value undefined is read-only).

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Name	OID	Type	Access	Description
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.
winlink1000IduTdmBackupLinkConfiguration	1.3.6.1.4.1.4458.1000.2.6.24	Integer	RW	The current configuration of the backup link.
winlink1000IduTdmLineInterfaceConfiguration	1.3.6.1.4.1.4458.1000.2.6.25	Integer	RW	TDM Line interface configuration.
winlink1000IduTdmLineImpedanceConfiguration	1.3.6.1.4.1.4458.1000.2.6.26	Integer	RW	TDM line impedance configuration (standardT1 - 100Ohm nonStandardT1 - 110Ohm) Applicable only for T1 TDM type.
winlink1000HbsAirState			RO	Holds the state of the HBS.
winlink1000HbsAirOpMode			RW	Holds the operation mode of the HBS.
winlink1000HbsAirAvailTimeSlots			RO	This parameter holds the number of available time slots (not in use) in the air interface.
winlink1000HbsAirSectorCbwSupportedStr			RO	Represents the channel bandwidth which is supported by the HBS and all connected HSUs.
winlink1000HbsAirCompressedMon			RO	Holds HBS monitor data in compressed format: HBS Traffic Monitor In Bytes(4) Out Bytes(4) In Frames(4) Out Frames(4) HBS State (1) HBS Freq (4) Number of Links (2) EC Change Counter (4) Current Ratio (2) Total Air Frames (4) HBS Rx Rate in Kbps (4) HBS Tx Rate in Kbps (4) HBS Rx Rate in Fps (4) HBS Tx Rate in Fps (4) HBS Set Mode (1).
winlink1000HbsAirConfChanges			RO	16 characters that represent 16 HSUs. Each time a configuration is been changed increment the relevant character.
winlink1000HbsAirConfTable			N/A	Holds the table for all registered HSUs in the sector (16 entries).
winlink1000HbsAirConfEntry			N/A	HSUs configuration table entry. INDEX { winlink1000HbsAirConfIndex }
winlink1000HbsAirConfIndex			RO	HSUs configuration table index.
winlink1000HbsAirConfUpMir			RW	Uplink MIR towards specific HSU in units of kbps.
winlink1000HbsAirConfDownMir			RW	Downlink MIR towards specific HSU in units of kbps.
winlink1000HbsAirConfHsuName			RW	HSU name.
winlink1000HbsAirConfHsuLocation			RW	HSU location.
winlink1000HbsAirConfDualAntTxMode			RW	Spatial multiplexing: MIMO (1) or Diversity (2)
winlink1000HbsAirConfNumOfTs			RW	Number of time slot which are allocated to specific HSU.
winlink1000HbsAirConfGeoLocation			RW	Geographic device location in format: latitude longitude.
winlink1000HbsAirConfHsuType			RW	HSU type (1 = Fixed 2 = Stationary 3 = Mobile)
winlink1000HbsAirConfHsuLevel			RW	HSU level (1 .. 4)
winlink1000HbsAirConfDesiredRateIndex			RW	The rate index of both sides of the link to this HSU.
winlink1000HbsAirConfMacAddress			RO	HSU MAC Address.
winlink1000HbsAirConfNumOfTsUp			RW	Number of UL time slot which are allocated to specific HSU.
winlink1000HbsAirLinkNumOfLinks			RO	Number of links in the links table.
winlink1000HbsAirLinkTable			N/A	Holds the table for all links in the sector.
winlink1000HbsAirLinkEntry			N/A	Link table entry. INDEX { winlink1000HbsAirLinkIndex }

Table D-2: Private MIB Parameters (Sheet 23 of 29)

Name	OID	Type	Access	Description
winlink1000HbsAirLinkIndex			RO	HSUs configuration table index.
winlink1000HbsAirLinkHsuId			RO	HSU ID of specific link (if registered). Unregistered links have -1.
winlink1000HbsAirLinkState			RO	Holds the state of specific link.
winlink1000HbsAirLinkWorkingMode			RO	Indicates the sub-state within the version compatibility.
winlink1000HbsAirLinkSessionId			RO	Holds the Session ID of the link.
winlink1000HbsAirLinkHbsEstTput			RO	Holds the Estimated throughput from the HBS to the HSU.
winlink1000HbsAirLinkHsuEstTput			RO	Holds the Estimated throughput from the HSU to the HBS.
winlink1000HbsAirLinkRange			RO	Holds the range of specific link.
winlink1000HbsAirLinkHbsRss			RO	Holds the RSS of specific link (HBS side).
winlink1000HbsAirLinkHbsRssBal			RO	Holds the RSS Balance of specific link (HBS side). -2 : Radio 2 RSS is much stronger than Radio 1 RSS. -1 : Radio 2 RSS is stronger than Radio 1 RSS. -0 : Radio 2 RSS is equal to Radio 1 RSS. 1 : Radio 1 RSS is stronger than Radio 2 RSS. 2 : Radio 1 RSS is much stronger than Radio 2 RSS.
winlink1000HbsAirLinkHsuRss			RO	Holds the RSS of specific link (HSU side).
winlink1000HbsAirLinkHsuRssBal			RO	Holds the RSS Balance of specific link (HSU side). -2 : Radio 2 RSS is much stronger than Radio 1 RSS. -1 : Radio 2 RSS is stronger than Radio 1 RSS. -0 : Radio 2 RSS is equal to Radio 1 RSS. 1 : Radio 1 RSS is stronger than Radio 2 RSS. 2 : Radio 1 RSS is much stronger than Radio 2 RSS.
winlink1000HbsAirLinkHsuSerial			RO	Holds the serial number for specific HSU.
winlink1000HbsAirLinkTxOperMode			RO	Holds the TX operation mode.
winlink1000HbsAirHsuInBytes			RO	Number of frames received in the HSU Lan port.
winlink1000HbsAirHsuOutBytes			RO	Number of frames transmitted from the HSU Lan port.
winlink1000HbsAirHsuInFrames			RO	Number of bytes received in the HSU Lan port.
winlink1000HbsAirHsuOutFrames			RO	Number of bytes transmitted from the HSU Lan port.
winlink1000HbsAirHsuMacAddress			RO	HSU MAC Address.
winlink1000HbsAirMaxTputDown			RO	Max Throughput Downlink.
winlink1000HbsAirMaxTputUp			RO	Max Throughput Uplink.
winlink1000HbsAirLinkCompressedMon			RO	Holds all the link information in compressed binary (Bytes/octets). Fields included (size in bytes): Link State(1) Link Working Mode(1) Session Id(4) HBS Est. Tput(4) HSU Est. Tput(4) HBS Rss(1) HBS Rss Balance(1) HSU Rss(1) HSU Rss Balance(1) Tx Operation Mode(1) HSU In Bytes(4) HSU Out Bytes(4) HSU In Frames(4) HSU Out Frames(4) HSU ID (1 bytes) HSU Rx Rate In Kbps (4) HSU Tx Rate In Kbps (4) HSU Rx Rate In Fps (4) HSU Tx Rate In Fps (4) Peak throughput in the DL direction (4) Peak throughput in the UL direction (4).

Table D-2: Private MIB Parameters (Sheet 24 of 29)

Name	OID	Type	Access	Description
winlink1000HbsAirLinkCompressedStatic			RO	Holds all the configuration data of this link in compressed format. Helps the NMS to get info regarding new Unregistered links. Fields Included: SessionID (4 bytes) HSU IP address (4 bytes) HSU Name (32 bytes) HSU Location (32 bytes) HSU Serial number (16 bytes) HSU MAC Address (12 bytes) Air Link Range Max Throughput Down (4 bytes) Max Throughput Up. (4 bytes) Cpacity Limit (4 bytes) HSU Antenna type (1 byte) Aggregate Capacity (4 bytes)
winlink1000HbsAirCpeCapacityLimit			RO	Capacity Limit in Kilo bit per second.
winlink1000HbsAirLinkAntennaType			RO	HSU External Antenna Type: single-pole or dual-pole.
winlink1000HbsAirHsuRxRateInKbps			RO	HSU Rx Rate in Kbps.
winlink1000HbsAirHsuTxRateInKbps			RO	HSU Tx Rate in Kbps.
winlink1000HbsAirHsuRxRateInFps			RO	HSU Tx Rate in Fps.
winlink1000HbsAirHsuTxRateInFps			RO	HSU Tx Rate in Fps.
winlink1000HbsAirLinkPeakTputDown			RO	Peak throughput in the DL direction (kbps).
winlink1000HbsAirLinkPeakTputUp			RO	Peak throughput in the UL direction (kbps).
winlink1000HbsAirLinkUtilDownSecRelMill			RO	The average time percentage (in thousandths) out of the BTS DL capability that was used for transmitting data to the SU.
winlink1000HbsAirLinkUtilUpSecRelMill			RO	The average time percentage (in thousandths) out of the BTS UL capability that was used for receiving data from the SU.
winlink1000HbsAirLinkUtilDownAllocRelMill			RO	The time percentage (in thousandths) relative to the SU DL allocation that was used for transmitting data to the SU.
winlink1000HbsAirLinkUtilUpAllocRelMill			RO	The time percentage (in thousandths) relative to the SU UL allocation that was used for receiving data from the SU.
winlink1000HbsAirLinkUtilDownTrafficKbps			RO	Average data throughput (Exported in Kbps) transmitted in the DL towards the SU during the last second.
winlink1000HbsAirLinkUtilUpTrafficKbps			RO	Average data throughput (Exported in Kbps) received in the UL from the SU during the last second.
winlink1000HbsAirLinkUtilCompressedMon			RO	One string that holds the 6 Utilization per link values: DownSecRel (2 bytes) UpSecRel (2 bytes) DownAllocRel (4 bytes) UpAllocRel (4 bytes) DownTraffic (4 bytes) UpTraffic (4 bytes).
winlink1000HbsAirComboSwitchSectorFreqBandId			RW	Switch Frequency band for the whole sector.
winlink1000HbsAirGeoAzimuth			RW	Geographic sector azimuth in degrees * 10.
winlink1000HbsAirGeoBeamwidth			RW	Geographic sector beamwidth in degrees * 10.
winlink1000HbsAirMaxDistanceMetersMobility			RW	Maximum distance in meters. Used by Mobility links only.
winlink1000HbsAirComboSwitchSectorFreqBandIdStr			RW	Switch Frequency band for the whole sector overriding some of the Combo parameters.
winlink1000HbsAirTimeSlotAllocationBitmap			RW	Time Slots Allocation Bitmap for the entire sector (Hex Value).
winlink1000HbsAirAvailTimeSlotsUp			RO	This parameter holds the number of available UL time slots (not in use) in the air interface.

Table D-2: Private MIB Parameters (Sheet 25 of 29)

Name	OID	Type	Access	Description
winlink1000HbsAirDownUtilMill			RO	Sector Air Interface utilization in the Downlink direction (thousandths). Average time percentage out of the entire BTS DL capability that was used for transmitting data to all the SUs.
winlink1000HbsAirUpUtilMill			RO	Sector Air Interface utilization in the Uplink direction (thousandths). The average number of timeslots that were used in the UL (by all the links) out of the entire number of timeslots.
winlink1000HbsAirDownTrafficKbps			RO	Average data throughput (expressed in Kbps) transmitted in the DL towards all the SUs during the last second.
winlink1000HbsAirUpTrafficKbps			RO	Average data throughput (expressed in Kbps) received in the UL from all the SUs during the last second.
winlink1000HbsAirCompressedMonSec			RO	One string that holds the 4 Utilization per Sector values: DownUtil (2 bytes) UpUtil (2 bytes) DownTraffic (4 bytes) UpTraffic (4 bytes).
winlink1000HbsBridgeAgingTime			RW	Timeout in seconds for aging.
winlink1000HbsBridgeVlanTable			N/A	Holds the bridge Vlan operations towards all the registered HSUs.
winlink1000HbsBridgeVlanEntry			N/A	HBS bridge Vlan table entry. INDEX { winlink1000HbsBridgeVlanIndex }
winlink1000HbsBridgeVlanIndex			RO	HBS bridge Vlan table index.
winlink1000HbsBridgeVlanIngress			RW	HBS bridge Vlan ingress.
winlink1000HbsBridgeVlanEgress			RW	HBS bridge Vlan egress.
winlink1000HbsBridgeVlanFilterIn			RW	HBS bridge Vlan filter in.
winlink1000HbsBridgeVlanFilterOut			RW	HBS bridge Vlan filter out.
winlink1000HbsBridgeVlanDoubleTag			RW	HBS bridge Vlan double tag.
winlink1000HbsBridgeVlanDefaultId			RW	HBS bridge Vlan default id.
winlink1000HbsBridgeMembershipTable			N/A	Holds the bridge membership relations for all the registered HSUs.
winlink1000HbsBridgeMembershipEntry			N/A	HBS bridge membership table entry. INDEX { winlink1000HbsBridgeMembershipIndex }
winlink1000HbsBridgeMembershipIndex			RO	HBS bridge membership table index.
winlink1000HbsBridgeMembershipState			RW	HBS bridge membership state bitmap. Each bit represents Blocked/Opened relation (membership) between two HSUs. Blocked=0 (bit) Opened=1 (bit). This object holds the relation to 32 HSUs.
winlink1000HbsBridgeMembershipState2nd			RW	HBS bridge membership state bitmap. Each bit represents Blocked/Opened relation (membership) between HSU and LAN/Stack port of the HBS. Blocked=0 (bit) Opened=1 (bit). Only 2 bits are used.
winlink1000HbsBridgeFloodOverloadProtect			RW	Flood overload protection 1- Enabled 2- Disabled.
winlink1000HbsServiceCommandStr			RW	Ability to perform special command in the HBS. Format (string): Operation Index Session Param1 Param2 ....| ParamN The index and SessionID can be uniting to one parameter. On registered HSU it is HSU-ID and on Unregistered it is Session-ID.
winlink1000HbsServiceVlanTable			N/A	Holds the Vlan operations towards all the registered HSUs.
winlink1000HbsServiceVlanEntry			N/A	HBS service Vlan table entry. INDEX { winlink1000HbsServiceVlanIndex }
winlink1000HbsServiceVlanIndex			RO	HBS service Vlan table index.

Table D-2: Private MIB Parameters (Sheet 26 of 29)

Name	OID	Type	Access	Description
winlink1000OduServiceVlanTblTag			RW	The VID to be used when adding TAG or adding Provider
winlink1000OduServiceVlanTblPri			RW	The Vlan priority 0-7 to be used when adding TAG or adding Provider
winlink1000OduServiceVlanTblMajorMode			RW	The Vlan major mode
winlink1000OduServiceVlanTblEgressMode			RW	The Vlan mode in the Egress direction
winlink1000OduServiceVlanTblIngressMode			RW	The Vlan mode in the Ingress direction
winlink1000OduServiceVlanTblEgressFilter1			RW	VLAN Filter1 VID
winlink1000OduServiceVlanTblEgressFilter2			RW	VLAN Filter2 VID
winlink1000OduServiceVlanTblEgressFilter3			RW	VLAN Filter3 VID
winlink1000OduServiceVlanTblEgressFilter4			RW	VLAN Filter4 VID
winlink1000OduServiceVlanTblUntagFilteredBitmap			RW	Represents (in bitmap) if to Untag a frame after it is filtered (Egress direction) [4 bits represent 4 filters].
winlink1000OduServiceVlanTblProviderTPID			RW	Holds the Provider TPID that is used in all provider operations.
winlink1000HbsServiceQoSMode			RW	Quality of Service mode.
winlink1000HbsServiceQoSVlanQGroupsStr			RW	Frame classification according to VLAN priority (all 4 groups separated by comma).
winlink1000HbsServiceQoSDiffservQGroupsStr			RW	Frame classification according to Diffserv (all 4 groups separated by comma).
winlink1000HbsServiceQoSMaxRtQuePct			RO	Maximal percent for RT and NRT queues.
winlink1000HbsServiceQoSTable			N/A	Holds the QoS operations towards all the registered HSUs.
winlink1000HbsServiceQoSEntry			N/A	HBS service QoS table entry. INDEX { winlink1000HbsServiceQoSIndex }
winlink1000HbsServiceQoSIndex			RO	HBS service QoS table index.
winlink1000HbsServiceQoSConfAdminState			RW	QoS administrative state. The valid values are: enabled (1) disabled (2).
winlink1000HbsServiceQoSConfUpQueMir			RW	Private MIR for each QoS group of the Uplink direction (4 values separated by comma).
winlink1000HbsServiceQoSConfUpQueWeight			RW	Weight in percent for each QoS group of the Uplink direction (4 values separated by comma).
winlink1000HbsServiceQoSConfDownQueMir			RW	Private MIR for each QoS group of the Downlink direction (4 values separated by comma).
winlink1000HbsServiceQoSConfDownQueWeight			RW	Weight in percent for each QoS group of the Downlink direction (4 values separated by comma).
winlink1000HbsServiceMobilitySupported			RO	Mobility Support (1 = Not supported 2 = Supported)
winlink1000HbsServiceMaxNumOfHSUs			RO	Holds the maximum number of registered HSUs in the HBS.
winlink1000HbsPerfMonThreshTable			N/A	Holds the performance monitor thresholds towards all the registered HSUs.
winlink1000HbsPerfMonThreshEntry			N/A	HBS performance monitor threshold table entry. INDEX { winlink1000HbsPerfMonThreshIndex }
winlink1000HbsPerfMonThreshIndex			RO	HBS performance monitor threshold table index.
winlink1000HbsPerfMonTxThresh1			RW	HBS performance monitor transmit power threshold.
winlink1000HbsPerfMonRxThresh1			RW	HBS performance monitor receive power threshold 1.
winlink1000HbsPerfMonRxThresh2			RW	HBS performance monitor receive power threshold 2.

Table D-2: Private MIB Parameters (Sheet 27 of 29)

Name	OID	Type	Access	Description
winlink1000HbsPerfMonBBERThresh1			RW	HBS performance monitor BBER threshold.
winlink1000HbsPerfMonEstThroughputThreshKbps			RW	HBS performance monitor estimated throughput Threshold.
winlink1000HbsPerfMonHighTrafficThreshKbps			RW	HBS performance monitor high traffic threshold.
winlink1000HbsPerfMonAirGenCurrTable			N/A	This table defines/keeps the ethernet counters of the current 15 min interval.
winlink1000HbsPerfMonAirGenCurrEntry			N/A	This is an entry in the Current Interval Table. INDEX {ifIndex }
winlink1000HbsPerfMonAirGenCurrRxMBytes			RO	Current RX Mega Bytes starting from the present 15 minutes period. (Represents the LAN traffic RX direction toward the HSU)
winlink1000HbsPerfMonAirGenCurrTxMBytes			RO	Current Transmit Mega Bytes starting from the present 15 minutes period. (Represents the LAN traffic TX direction from the HSU)
winlink1000HbsPerfMonAirGenCurrEthCapacityThreshUnder			RO	The number of times throughput was below threshold in the present 15 minutes period. Relevant for point to point systems.
winlink1000HbsPerfMonAirGenCurrHighTrafficThreshExceed			RO	The number of times actual traffic was above threshold in the present 15 minutes period.
winlink1000HbsPerfMonAirGenCurrActiveSeconds			RO	The number of seconds in which RPL Ethernet swervice was not blocked in the present 15 minutes period.
winlink1000HbsPerfMonAirGenIntervalTable			N/A	This table defines/keeps the ethernet counters of the last day (in resolution of 15 min intervals).
winlink1000HbsPerfMonAirGenIntervalEntry			N/A	This is an entry in the Interval Table. INDEX {ifIndex winlink1000HbsPerfMonAirGenIntervalIdx }
winlink1000HbsPerfMonAirGenIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.
winlink1000HbsPerfMonAirGenIntervalRxMBytes			RO	Current RX Mega Bytes per interval. (Represents the LAN traffic RX direction toward the HSU).
winlink1000HbsPerfMonAirGenIntervalTxMBytes			RO	Current Transmit Mega Bytes per interval. (Represents the LAN traffic TX direction from the HSU)
winlink1000HbsPerfMonAirGenIntervalEthCapacityThreshUnder			RO	The number of times throughput was below threshold in the each interval. Relevant for point to point systems.
winlink1000HbsPerfMonAirGenIntervalHighTrafficThreshExceed			RO	The number of times actual traffic was above threshold in the each interval.
winlink1000HbsPerfMonAirGenIntervalActiveSeconds			RO	The number of seconds in which RPL Ethernet service was not blocked in the each interval.
winlink1000HbsPerfMonAirGenDayTable			N/A	This table defines/keeps the ethernet counters of the last month (in resolution of days).
winlink1000HbsPerfMonAirGenDayEntry			N/A	This is an entry in the Days Table. INDEX {ifIndex winlink1000HbsPerfMonAirGenDayIdx }
winlink1000HbsPerfMonAirGenDayIdx			RO	This table is indexed per Day number. Each interval is of 15 minutes and the oldest is 96.
winlink1000HbsPerfMonAirGenDayRxMBytes			RO	Current RX Mega Bytes per day. (Represents the LAN traffic RX direction toward the HSU)
winlink1000HbsPerfMonAirGenDayTxMBytes			RO	Current Transmit Mega Bytes per day. (Represents the LAN traffic TX direction from the HSU)
winlink1000HbsPerfMonAirGenDayEthCapacityThreshUnder			RO	The number of times throughput was below threshold each day. Relevant for point to point systems.

Table D-2: Private MIB Parameters (Sheet 28 of 29)

Name	OID	Type	Access	Description
winlink1000HbsPerfMonAirGenDayHighTrafficThreshExceed			RO	The number of times actual traffic was above threshold each day.
winlink1000HbsPerfMonAirGenDayActiveSeconds			RO	The number of seconds in which RPL Ethernet service was not blocked each day.
winlink1000HsuAirState			RO	Holds the state of the HSU.
winlink1000HsuAirLinkState			RO	Holds the state of the HSU link.
winlink1000HsuAirHsuId			RO	Holds the HSU ID as sent by the HBS.
winlink1000HsuAirLocalDeregister			RW	Performs Local HSU Deregistration when - only when the link is off.
winlink1000HsuAirRemoteCompressedMon			RO	Holds all the configuration data of The HBS in compressed format. Fields Included: Rss (1 byte) Rss Balance (1 byte) Est. Tput (4 bytes) In Bytes of the whole sector (4 bytes) Out Bytes of the whole sector (4 bytes) In Frames of the whole sector (4 bytes) Out Frames of the whole sector (4 bytes) Max Throughput DownLink (4 bytes) Max Throughput UpLink (4 bytes) Rx Rate In Kbps of the whole sector (4 bytes) Tx Rate In Kbps of the whole sector (4 bytes) Rx Rate In Fps of the whole sector (4 bytes) Tx Rate In Fps of the whole sector (4 bytes) Peak Throughput in the DL direction in Kbps (4 bytes) Peak Throughput in the UL direction in Kbps(4 bytes)
winlink1000HsuAirRemoteCompressedStatic			RO	Holds all the configuration data of the HBS in a compressed format. Helps the NMS to get info regarding new Unregistered links. Fields Included: Location (32 bytes) IP address (8 bytes in hexa) Subnet mask (8 bytes in hexa) HBS Antenna type (1 byte) HBS Agent Version (4 bytes)
winlink1000HsuAirRssThreshSync			RW	HSUs will be sychnornized immediately if RSS is better than threshold.
winlink1000HsuServiceCommandStr			RW	Ability to perform special command in the HSU. Format (string): Operation Param1 Param2 ....| ParamN.
winlink1000HsuServiceHsuType			RW	HSU type (1 = Fixed 2 = Stationary 3 = Mobile)
winlink1000HsuServiceHsuLevel			RW	HSU level (1 .. 4)
winlink1000HsuEthernetPoESupported			RO	Indicated if this HSU has special port for PoE devices.
winlink1000HsuEthernetPoETemperature			RO	Holds the temperature (Celsius) of the POE component.
winlink1000HsuEthernetPoEEquConsumption			RO	Holds the consumption of the connected equipment (milliampere).
winlink1000HsuEthernetPoEEquVoltage			RO	Holds the voltage of the connected equipment (Volt).
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.
winlink1000GeneralTelnetSupport	1.3.6.1.4.1.4458.1000.100.5	Integer	RW	Enable/Disable Telnet protocol.

Table D-2: Private MIB Parameters (Sheet 29 of 29)

Name	OID	Type	Access	Description
winlink1000GeneralWISupport	1.3.6.1.4.1.4458.1000.100.6	Integer	RW	Enable/Disable Web Interface protocol. Mandatory Disabled - No option to enable the feature. Mandatory Enabled - No option to disable the feature.

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.

Trap Parameters

Table D-3: MIB Traps (Sheet 1 of 6)

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.

Table D-3: MIB Traps (Sheet 2 of 6)

Name	ID	Severity	Description
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.
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.
spectrumAnalysis	23	normal	Indicates that the ODU is in Spectrum Analysis mode. Contains a single parameter which is its description: 1 - Description: Spectrum analysis in progress.
hbsHsuDeregisteredOffline	24	normal	Indicates that a HSU was deregistered offline (out of link)
hbsHsuDeregisteredSuccessfully	25	normal	Indicates that a HSU was deregistered successfully
hbsHsuRegisteredSuccessfully	26	normal	Indicates that a HSU was registered successfully
hbsHsuRegistrationFailed	27	normal	Indicates that registration has failed
hbsHsuViolatedState	28	normal	Indicates (on the HBS side) that a HSU is is violated state
hsuViolatedState	29	normal	Indicates (on the HSU side) that the HSU is is violated state
hbsUnregisteredSynchronizedHsu	30	normal	Indicates an unregistered HSU has been synchronized.
hbsUnregisteredUnsynchronizedHsu	31	normal	Indicates an unregistered HSU lost synchronization.
cableQuality	32	normal	1Gbps rate is not supported due to bad line quality.
httpAuthentication	33	normal	HTTP Authentication Failure.
telnetAuthentication	34	normal	Telnet Authentication Failure.
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.

Table D-3: MIB Traps (Sheet 3 of 6)

Name	ID	Severity	Description
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	major	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
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.

Table D-3: MIB Traps (Sheet 4 of 6)

Name	ID	Severity	Description
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	normal	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.
ringRplStateActiveAlarm	128	major	RPL state changed to Active.
desiredRatioCanNotBeAppliedAlarm	129	normal	Indicates Desired UL/DL RAtio Can Not Be Applied.
cbwMismatch	130	major	Indicates that a Channel Bandwidth mismatch was detected.Contains two parameters: 1 - Description: Channel Bandwidth Mismatch: one side is %n0 MHz and the other is %n1 MHz. %n0 is the local Channel Bandwidth value in MHz. %n1 is the remoet Channel Bandwidth value in MHz.
gpsNotSynchronized	131	major	Indicates that the GPS is not synchronized with satellites. Pulses are self generated.
pdTooHighDueCbwLimitations	132	major	Indicates that link cannot be established because link range is too large for channel bandwidth.
hbsEncryptionAlarm	133	major	Indicates an encryption key mismatch. Contains a single parameter which is its description including the HSU's name
hbsEhServiceClosedToHsu	134	major	Indicates an encryption key mismatch. Contains a single parameter which is its description including the HSU's name
hbsUnsynchronizedHsuAlarm	135	warning	Indicates a registered HSU lost synchronization.
hbsInactiveHbsAlarm	136	major	Indicates HBS is InActive.
incompatibleHsu	137	critical	Indicates that the HSU is not compatible to HBS. Contains a single parameter which is its description: 1 - Description: Incompatible ODUs.
hsuUnsupportedBeacon	138	warning	Indicates an unsupported beacon has arrived at HSU
lanPortDisconnectedAlarm	139	major	Indicates the LAN port status changed to disconnected. Contains a single parameter, which is its description: 1 - Description: LAN port status changed to disconnected.
poePortDisconnectedAlarm	140	major	Indicates the POE port status changed to disconnected. Contains a single parameter, which is its description: 1 - Description: POE port status changed to disconnected.
poePowerConsumptionAlarm	141	major	Indicates the POE Power Consumption is above allowed maximum. Contains a single parameter, which is its description: 1 - Description: POE consumption above allowed maximum. port closed.
hobupFaultyStateAlarm	149	major	This Alarm will indicate that the Hot Backup module is in faulty state. 1 - Description: Hot Backup fault detected: %s unit. %s - Primary Or Secondary Unit
tdmServiceClear	200	major	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.

Table D-3: MIB Traps (Sheet 5 of 6)

Name	ID	Severity	Description
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).
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.

Table D-3: MIB Traps (Sheet 6 of 6)

Name	ID	Severity	Description
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.
desiredRatioCanNotBeAppliedClear	229	normal	Indicates Current UL/DL Ratio Is Equal To Desired Ratio.
cbwMatch	230	normal	Indicates that a Channel Bandwidth match was detected. Contains a single parameter which is its description: 1 - Channel Bandwidth value in MHz.
switchCbwAndChannel	231	normal	Indicates that the system is switching Channel Bandwidth and channel frequency. Contains two parameters: 1 - Switching to Channel Bandwith %n0 MHz and to channel %n1 GHz.
ringRplStateIdle	232	normal	RPL state changed to Idle.
ringEthServiceStatus	233	normal	Indicates Ethernet service's state - blocked \ unblocked. Contains a single parameter: 1 - Description: Ethernet's state (blocked \ unblocked)
ringFirstRpmReceived	234	normal	Ring application: in non-RPL link indicates first from a specific RPL was received. Contains a single parameter: 1 - Description: RPM's VLAN ID
ringEthernetSrviceUnblockedTO	235	normal	Ring application: in non-RPL link Ethernet service is unblocked due to RPM timeout.
gpsSynchronized	236	normal	Indicates that the GPS is synchronized with satellites.
hbsEncryptionClear	237	normal	Indicates that encryption is OK. Contains a single parameter which is its description including the HSU's name
hbsEhServiceOpenedToHsu	238	normal	Indicates that encryption is OK. Contains a single parameter which is its description including the HSU's name
hbsSynchronizedHsuAlarm	239	normal	Indicates a registered HSU is synchronized.
hbsActiveHbs	240	normal	Indicates when HBS has been activated.
switchCBW	241	normal	Switching Channel Bandwidth.
changeRatio	242	normal	HBS Tx ratio has changed.
lanPortClear	243	normal	Indicates the LAN port status changed to connected. Contains two parameters: 1 - Description: LAN port status changed to connected - %s 2 - %s Is the Eth. mode (speed & duplex)
poePortClear	244	normal	Indicates the POE port status changed to connected. Contains two parameters: 1 - Description: POE port status changed to connected - %s 2 - %s Is the Eth. mode (speed & duplex)
poePowerConsumptionClear	245	normal	Indicates the POE power consumption is valid. Contains two parameters: 1 - Description: POE consumption within limits. port is opened. 2 - %s Is the Eth. mode (speed & duplex)
incompatibleHbsHsu	246	normal	Incompatible HBS/HSU software versions - no service.
mobilityLinkOff	247	normal	Mobility - Link cannot be established due to: 1 - The HBS does not support Mobility 2 - Lack of resources in the HBS for HSU level
enterLocalConnection	248	normal	Entering Local Connection (Broadcast) Mode.
hobupActiveStateFaultyClear	249	normal	This clear alarm will indicate that the Hot Backup unit is in active state. Contains a single parameter, which is its description: 1 - Description: Hot Backup %s unit activated. %s - Primary Or Secondary Unit
hobupStandbyState	250	normal	Contains a single parameter, which is its description: 1 - Description: Hot Backup in Standby state: %s unit. %s - Primary Or Secondary Unit

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 10-5**.

Appendix E

External Alarms Specification

External Alarms Specification

The IDU-C and IDU-E support external input and output alarms through a standard DB25 pin female connector (see page B-3 for pinout details).

Input alarms

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

Output alarms

Output alarms are generated through dry contact relays to indicate various system events such as sync-loss or disconnection. An alarm is raised if at least one of the conditions in one of the tables below, is met.

IDU-C and IDU-E Alarms

Table E-1: IDU-C/E - 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

Table E-2: IDU-C - Input Alarms Description

Alarm	Description	Alarm On Conditions	Alarm Off Condition
Input 1	User Defined External Alarm	Voltage in range -10 to -50VDC	Voltage > 0VDC
Input 2			
Input 3			
Input 4			

Appendix F

Setting Antenna Parameters

Antenna Issues

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:

About Single and Dual Antennas

Each RADWIN 2000 ODU has two radio transceivers (radios). The radios make use of algorithms that utilize both MIMO and 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 the Both Link Sites

When using dual antennas at both sites (single dual-pole antenna or two single-pole antennas) you can choose between MIMO Mode and Diversity Mode.

MIMO Mode

Under this mode, 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 selects this mode and doubles the air rates.

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

Diversity Mode

Diversity Mode uses two antennas to improve the quality and reliability of the link. Often, there is not a clear line-of-sight (LOS) between transmitter and receiver. Instead the signal is reflected along multiple paths before finally being received.

Each such "bounce" can introduce phase shifts, time delays, attenuations, and even distortions that can destructively interfere with one another at the aperture of the receiving antenna. Antenna diversity is especially effective at mitigating these multi-path situations.

This is because multiple antennas afford a receiver several recordings of the same signal. Each antenna will be exposed to a different interference environment. Thus, if one antenna is undergoing a deep fade, it is likely that another has a sufficient signal. Collectively such a system can provide a robust link.

Antenna diversity requires antenna separation which is possible by using a dual-polarization antenna or by two spatially separated antennas.

Use Diversity instead of MIMO in the following situations:

- When the system cannot operate in MIMO Mode
- When one of the receivers has high interference compared to the second receiver (i.e. the system is "unbalanced")
- When you achieve higher capacity in Diversity Mode than in MIMO Mode
- When high robustness is of importance and the capacity of Diversity Mode is sufficient (up to 25 Mbps full duplex)

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 at One Site, Dual Antennas at the Other

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 (depending on the polarization of installed antennas).

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

Table F-1 summarizes the situation:

Table F-1: MIMO - Diversity settings

Number of Antennas		Mode	Max Full Duplex Capacity
Site A	Site B		
2	2	MIMO	50 Mbps
		Diversity	25 Mbps
2	1		25 Mbps
1	2		25 Mbps
1	1		25 Mbps

The rates used by RADWIN 2000 are shown in **Table F-2** below:

Table F-2: RADWIN 2000 Air rates

Antenna	Modulation	FEC	Air-Rate [Mbps]	
			20 MHz CBW	40 MHz CBW
Single	BPSK	1/2	6.5	13.5
Single	QPSK	1/2	13	27
Single	QPSK	3/4	19.5	40.5
Single	16QAM	1/2	26	54
Single	16QAM	3/4	39	81
Single	64QAM	2/3	52	108
Single	64QAM	3/4	58.5	121.5
Single	64QAM	5/6	65	135
Dual	BPSK	1/2	13	27
Dual	QPSK	1/2	26	54
Dual	QPSK	3/4	39	81
Dual	16QAM	1/2	52	108
Dual	16QAM	3/4	78	162
Dual	64QAM	2/3	104	216
Dual	64QAM	3/4	117	243
Dual	64QAM	5/6	130	270

Considerations for Changing Antenna Parameters

Let:

max Available Tx Power denote the maximum Tx Power practically available from an ODU. (It appears as **Tx Power per Radio**.)

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

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

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

Then, the following relationship must be satisfied:

$$maxAvailableTxPower \le min(maxRegEIRP - AntennaGain + CableLoss, maxRegTxPower)$$ ... **(*)**

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.



- 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 $10 \times \log_{10} 2 \approx 3$.
- 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.
- 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.

The inequality **(*)** above is always satisfied by the system in accordance with the relevant regulation.

The precise relationship between the items in inequality **(*)** is as follows:

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

Appendix G

RF Exposure

The antennas used for the following transmitters must be installed so as to provide a minimum separation distance from by-standers as specified in the following tables:

Table G-1: Safety Distances for *RADWIN 2000* FCC and IC Products

Frequency Band [GHz]	FCC ID	IC ID	Antenna gain [dBi]	Min. Safety Distance [cm]
5.8	Q3KRW2058	5100A-RW2054	28	223
5.8	Q3KRW2058	5100A-RW2054	24	141
5.3/5.4	Q3KRW2054	5100A-RW2054	23.5 / 28	20
4.9	Q3KRW2049	5100A-RW2054	28	225
4.9	Q3KRW2049	5100A-RW2054	21	113
2.4	Q3KRW2024	5100A-RW2054	19	39
2.4	Q3KRW2024I	5100A-RW2024I	17.5	40
2.5	Q3KRW2025	N/a	24	104.6
3.5	N/A	5100A-RW2030	25	92
3.6/3.7	Q3KRW2030	5100A-RW2030	25	86

Table G-2: Safety Distances for *RADWIN 2000* ETSI Products

Frequency Band [GHz]	Antenna gain [dBi]	Min. Safety Distance [cm]
5.8	24 / 28	20
5.4	23.5 / 28	20
5.3	23.5 / 28	20
2.4	19 / 17.5	20
3.5	25	200

Appendix H

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 10 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. RAD-

WIN 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.

Installation sur pylône et mur

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

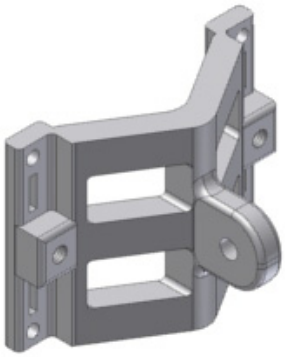
Prudence

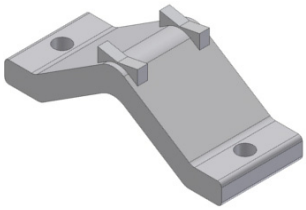
- Les appareils sont prévus pour être installés par un personnel de service.
- Les appareils doivent être connectés à une prise de courant avec une protection de terre.
- Le courant CC du IDU-C doit être fourni par l'intermédiaire d'un disjoncteur bipolaire et le diamètre du câble doit être de 14 mm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

Contenu du kit de montage ODU

Le kit de montage ODU comprend les pièces suivantes:

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





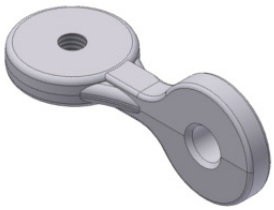
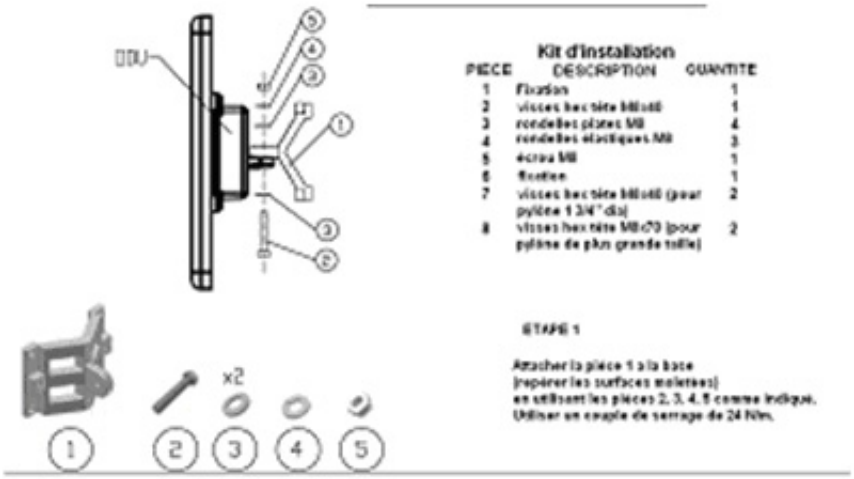


Figure H-1: grande clame *Figure H-2:* petite clame *Figure H-3:* bras

Montage sur un pylône



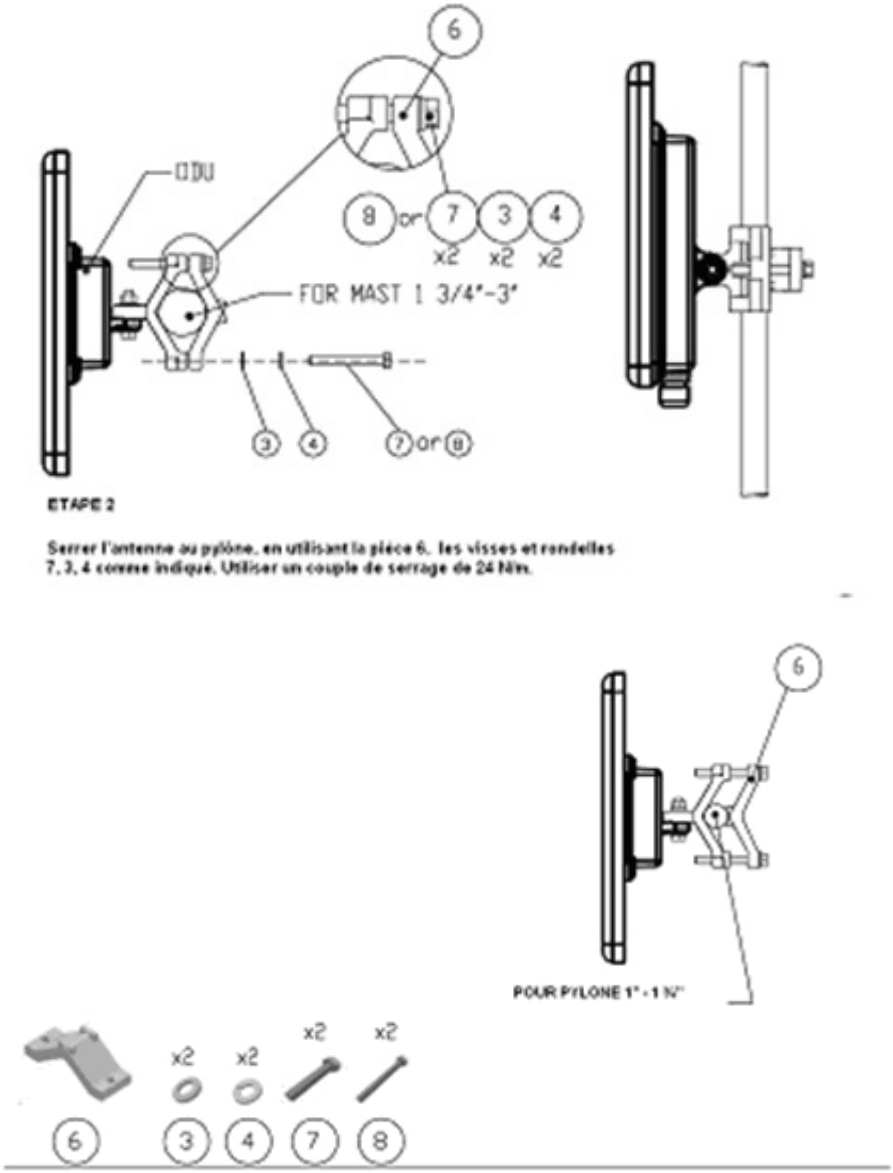


Figure H-4: Montage sur un pylône

Montage sur un mur

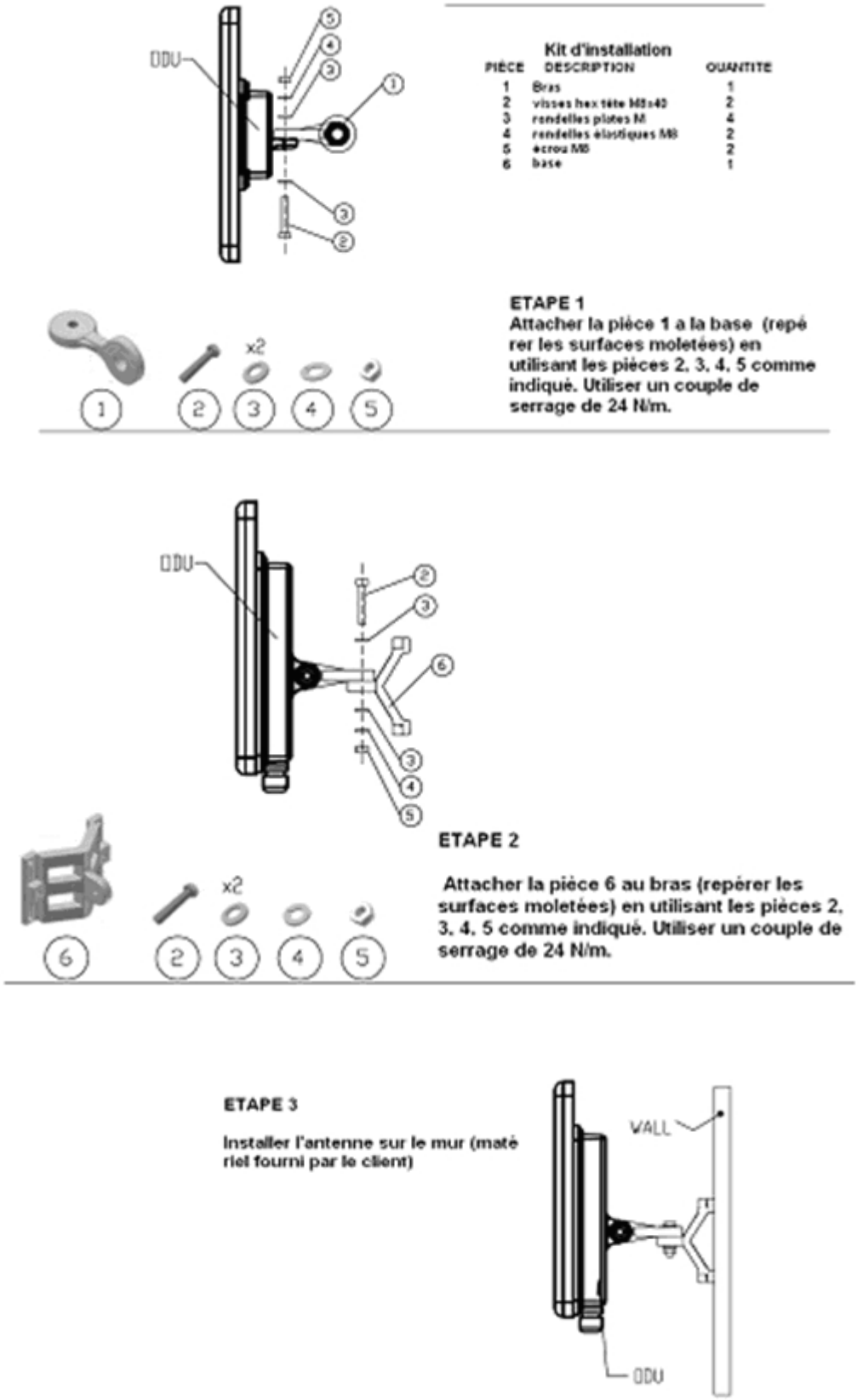


Figure H-5: Montage sur un mur

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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