

# RADWIN

RADWIN 2000

Broadband Wireless Transmission System

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USER MANUAL



RELEASES 2.5.40

# 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.



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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.

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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.

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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.

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- 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, 12 AWG grounding cable - which must be used with the unit to insure compliance.
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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.

## Brief

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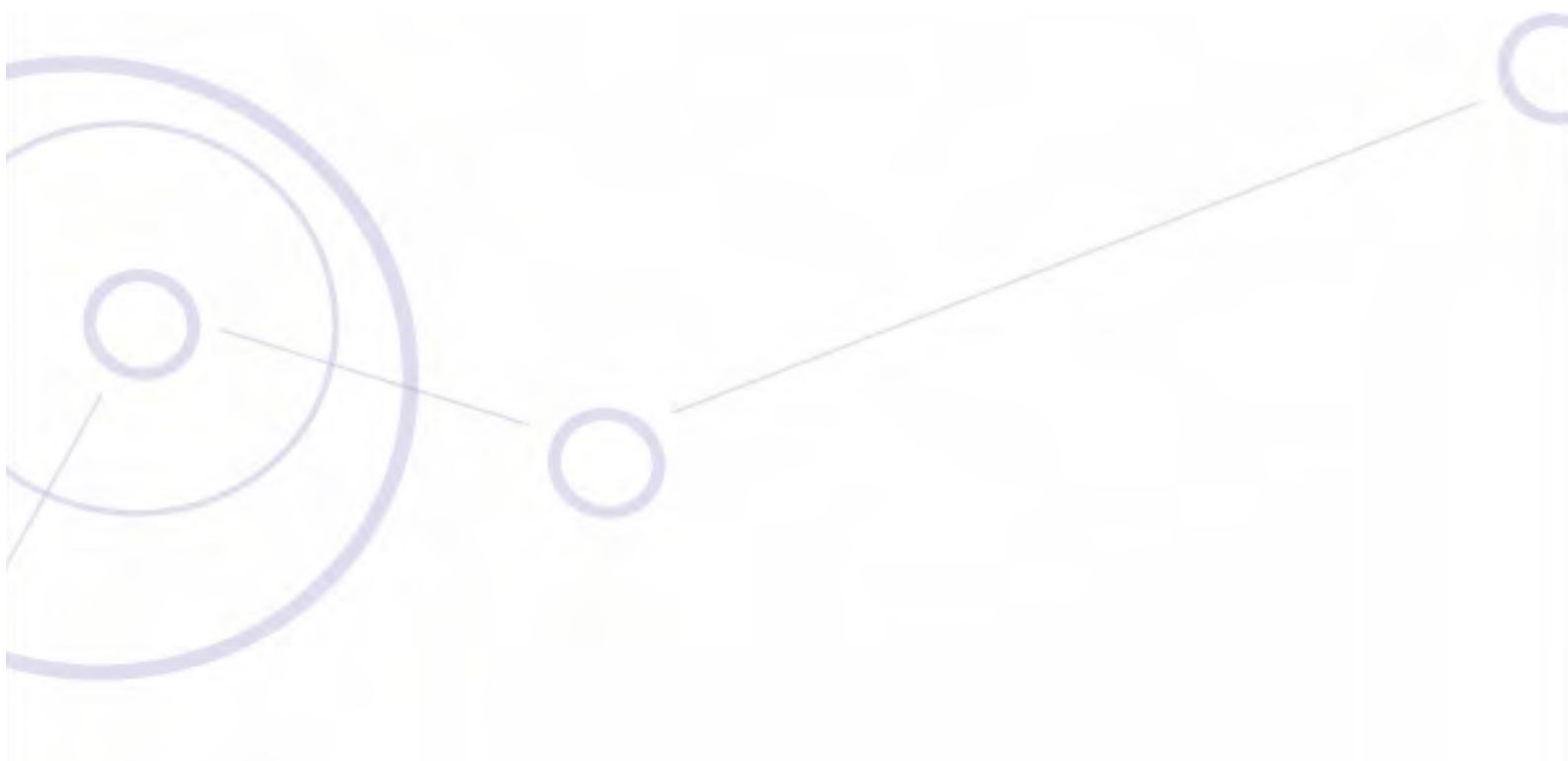




RADWIN 2000

Broadband Wireless Transmission System

USER MANUAL



RELEASE 2.5.40

## Part 1: Basic Installation

# 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 three product series:

- RADWIN 2000 C - Series supporting 100 Mbps symmetric (full duplex and asymmetric) throughput and up to 16 E1s/T1s
- RADWIN 2000 L - Series supporting 50 Mbps symmetric (full duplex) throughput and up to 16 E1s/T1s
- RADWIN 2000 PDH - Series supporting 16 E1s/T1s and 10 Mbps Ethernet (Note that this model may only be used with an IDU-C or IDU-E. It cannot be used with a PoE device.)
- RADWIN 2000 X - Series supporting 3 E1s or 4 T1s and 10Mbps capacity (net throughput, full duplex)

## RADWIN 2000 highlights:

- High capacity (up to 100Mbps full duplex net throughput)
- Native TDM transport up to 16 E1/T1 ports
- Multi-band products for maximum flexibility
- Advanced air-interface based on MIMO, antenna Diversity and OFDM technologies
- Superior range performance
- Simple installation and management
- High Tx power of 25dBm
- Support for 10MHz, 20MHz and 40MHz channel bandwidths
- Monitored Hot Standby (1+1) for TDM services
- Ring Topology (including 1+1) for Ethernet service
- QoS support
- Separate management and Ethernet traffic VLAN support
- GSU support for distributed hub sites
- Hub Site Synchronization

The RADWIN 2000 radio series supports the 4.8 - 6 GHz, 2.4 GHz and 3.4 - 3.7 GHz spectrum bands, and complies with international standards and regulations (FCC, IC Canada, ETSI and WPC India). DFS is supported where required by regulation.

## What's new in Release 2.5.40

The main changes in release 2.5.40 from release 2.5.30 are:

- » The new RADWIN 2000 X series addressing corporate Access needs
- » Further support for frequencies in the 3.x bands for RADWIN 2000 C and RADWIN 2000 X
- » RADWIN 2000 C support for the 2.5 GHz band according the BRS (FCC/IC) regulation.

Details are set out in [Table 1-1](#) below.

### Terminology

- **3.X 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 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.

## More About New and Extended RADWIN 2000 Products

### RADWIN 2000 C-series 3.X Products

The new RADWIN 2000 C-series 3.X products are intended for IP and TDM backhaul applications. Integrated and connectorized products are available. The products are multiple band with default bands as shown in [Table 1-1](#) below.

These products are broadly compatible with all features set of RADWIN 2000 with the following differences:

- The 3.X products support 5, 10 and 20 MHz channel bandwidths.



- The 5 Mhz channel bandwidth is supported under Licensed bands only
- 40MHz channel bandwidth is not supported under 3.X GHz products.

- Channel minimum step under the band 3.650-3.675 GHz is 1 MHz. ACS and Spectrum View are supported (Low Resolution Bands).
- Channel minimum step under 3.4-3.7 GHz Universal ,3.475-3.650 IC RSS-192 and 3.4 -3.7 GHz ETSI is 250KHz. ACS and Spectrum View are not supported (High Resolution Bands).
- All products in this series support both Ethernet and TDM services

Otherwise, all other features of release 2.5.00 related to RADWIN 2000 C Products are supported.

### RADWIN 2000 C-series BRS Products

In principle, there is no difference between working under BRS and any other FCC regulated-band. You do need to know how to choose the correct channel. Further information about BRS may be found in [Chapter 24](#).

### RADWIN 2000 X-series for 3.X Products

The new RADWIN 2000 X-series for 3.X products are intended for Access applications. The series differs from the RADWIN 2000 C-series 3.X products in that it is limited to 10 Mbps full duplex net throughput and **only** supports 5 MHz channel bandwidth.

### Summary.

Table 1-1: Summary: Frequencies for RADWIN 2000 C and RADWIN 2000 X Series

RADWIN 2000 Series	Frequency bands	Channel Bandwidth (MHz)	Capacity (Mbps)	TDMs	Notes
C-Series	FCC part 90 subpart Z and IC RSS-197 supporting 3.650-3.675 GHz	5/10/20	100, aggregate net throughput	16	No change
	FCC part 27 named as BRS, supporting 2.5-2.7 GHz band				New product
	IC RSS-192 supporting 3.475 – 3.650 GHz				No change
	ETSI 3.4 -3.7 GHz (*)	5/10/20	100, aggregate net throughput	16	No change
	Universal 3.3-3.8 GHz	5/10/20	100, aggregate net throughput	16	Extends existing product
X-Series	FCC part 90 subpart Z and IC RSS-197 supporting 3.650-3.675 GHz	5	10, full duplex net throughput	4 T1s/ 3 E1s	New product
	IC RSS-192 supporting 3.475– 3.650 GHz				
	Universal 3.3-3.8 GHz	5	10, full duplex net throughput	4 T1s/ 3 E1s	New product
	ETSI 3.4 -3.7 GHz(*)	5	10, full duplex net throughput	4 T1s/ 3 E1s	New product

- **Table 1-1** applies both to integrated and connectorized ODUs.
- (\*) ETSI uses a split band as follows.
  1. 3.403-3.490 GHz up to 16 dBm
  2. 3.470-3.610 GHz up to 23 dBm
  3. 3.590-3.710 GHz up to 25 dBm



See also [page 20-9](#).

## Key Applications

### **Cellular Backhaul**

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

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

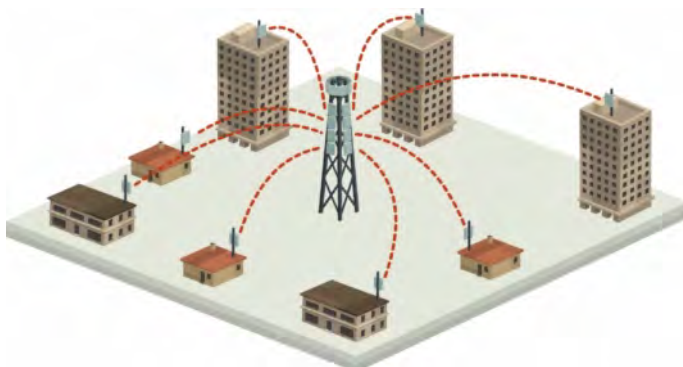


*Figure 1-1: Typical Cellular Backhaul application*

### **Broadband Access**

With RADWIN 2000 solutions, service providers can expand their service footprint rapidly and affordably, providing high-capacity services that match the ever-growing demand for high-quality, high-speed broadband.

RADWIN 2000 is the ideal solution for last mile access, for large corporations requiring high capacity either or both IP or TDM traffic.



*Figure 1-2: Typical Broadband Access application*



Figure 1-3: Typical WiFi Backhaul Application

## Mobility Applications

RADWIN 2000 radios have been successfully deployed in a variety of Mobility Applications:

### Border Control

RADWIN 2000 may be used in both towers and patrol vehicles to provide live video surveillance. Handoff from tower to tower as the patrol vehicles moves along the patrol road is seamless. The towers may be sited several kilometers apart (depending on topography) and are themselves synchronized using RADWIN GSU.

### Installation Security

Securing an installation like a factory or an airport is broadly similar to Border Control, however the distance are smaller and the towers may be connected to a control room using cables.

### Railway solutions

This is a relatively new application and includes for example,

- » On-board surveillance
- » On-board monitoring and control
- » Passenger services including Internet access

For further information about Mobility Applications, contact RADWIN Customer Support.

## Key Features of RADWIN 2000

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

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

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

### » High Capacity

The RADWIN 2000 system provides a high-capacity link of 100 Mbps net throughput full duplex

### » 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 20MHz. 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. For example the RW-2050-0250 connectorized radio supports the bands: 5.9 GHz, 5.8 GHz, 5.4 GHz, 5.3 GHz, 4.9 GHz, 2.4 GHz and 3.4-3.7 GHz. The RADWIN 2000 Multi-band products support the regulations of FCC, IC Canada, ETSI and WPC India. DFS is supported where required by regulation.

#### » 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 resend 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 25dBm whereas the 2.4 GHz band supports a maximum Tx power of 26dBm.

#### » Superior range performance

The RADWIN 2000 system supports high capacity at superior ranges. The Link Budget Calculator ([Chapter 21](#)) 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 WinLink 1000

Site Synchronization is supported with any mix of RADWIN 2000 and WinLink 1000 links. RADWIN 2000 can be used to backhaul WinLink 1000 collocated links without mutual interference

**» Monitored Hot Standby (1+1):**

The RADWIN Monitored Hot Standby (MHS) protects up to sixteen E1/T1 services with RADWIN 2000 and up to four E1/T1 services with WinLink 1000. 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
- WinLink 1000 can backup a RADWIN 2000 link

A major *benefit* of RADWIN MHS is that it can underpin an affordable Service Level Agreement structure by protecting part of the RADWIN 2000 trunks with WinLink 1000.

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



CCM/AES uses a symmetric 128-bit encryption key (EK), and a nonce, and provides both message encryption and authenticating signature. The nonce mechanism enables the receiver to remember already received genuine messages and reject all replayed messages.

- Initial encryption and authentication is based on a user-defined master key (Link Password). While standard Wireless LAN encrypts only the Ethernet Payload, the AES encrypts both the source and destination MAC addresses.
- In addition to normal log on access, Read or Write Community access is available at log on
- Link Lock is a part of the RADWIN 2000 security concept. It is designed to discourage physical theft of units and “piggybacking” using an otherwise identical ODU to steal bandwidth or information. It locks a pair of synchronized ODUs for mutually exclusive communication.

» **SFP support in the IDU-C**

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

» **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.

## Components of a RADWIN 2000 Link

### *The Outdoor Unit (ODU)*

The ODU is the radio transceiver of the RADWIN 2000 system. It supports two antennas for MIMO operation. It is available with an integrated antenna (*Integrated Antenna ODU*) or with connectors for an external antenna (*Connectorized ODU*).

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

The ODU comes in two form factors as shown in [Figure 1-4](#) below:

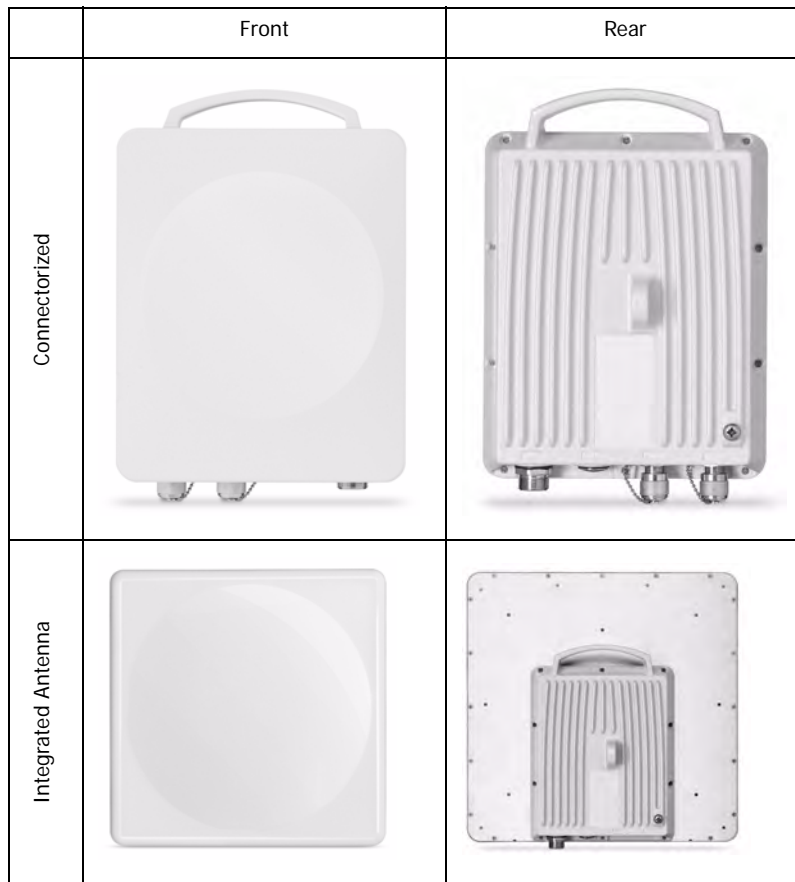


Figure 1-4: ODU Form Factors

- **Integrated Antenna ODU**

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

- **Connectorized ODU**

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

---

See the RADWIN Product Catalog for the range of ODU products available in release 2.5.40.



The external antenna choices are:

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

### **The Indoor Unit (IDU)**

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

**New style IDU-E for both WinLink 1000 and RADWIN 2000**

The new style IDU-E is a carrier grade, compact, half 19 inch wide, 1U plastic unit, providing up to two Ethernet ports and up to two E1/T1 interfaces. It offers Layer 2 support for Ethernet service and HSS support for collocated links. It is a low cost unit intended for both Access applications and Enterprise use.



*Figure 1-5: New style IDU-E - front view (Note new HSS LED on the left)*

The IDU-E rear panel (right to left) has a 25 pin Dry Contact Alarms port, the two (or no) trunk ports, two LAN ports, an ODU port and finally a 3 pin DC power plug identical to that used on the IDU-C.



*Figure 1-6: New style IDU-E: Rear panel*

**IDU-C**

The IDU-C is a carrier-class 19 inch, 1U unit, providing E1/T1 ports, Ethernet ports, an SFP port, a STANDBY port for MHS control, dry contact alarms and indication LEDs. It has two DC power feed connectors. An AC to DC converter is available for powering the IDU-C from an AC source. The IDU-C is designed to be rack mounted.

Four IDU-C products are available in release 2.5.40 with 16, 8 and 4 E1/T1 ports and with Ethernet only ports.



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



Figure 1-8: IDU-C, 16 E1/T1 ports, front panel

## Power Over Ethernet (PoE) Devices

### Basic PoE Device



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

It may be used with both WinLink 1000 and RADWIN 2000 radios.

Figure 1-9: Basic PoE device - showing the radio Ethernet port

### Outdoor (Ruggedized) DC PoE Device



This unit may be used with both WinLink 1000 and RADWIN 2000 radios.

Figure 1-10: Ruggedized DC-PoE Device: Input is -20 to -60 VDC (single input)

## GSU

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 standard WinLink 1000 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 (see [Chapter 11](#)).

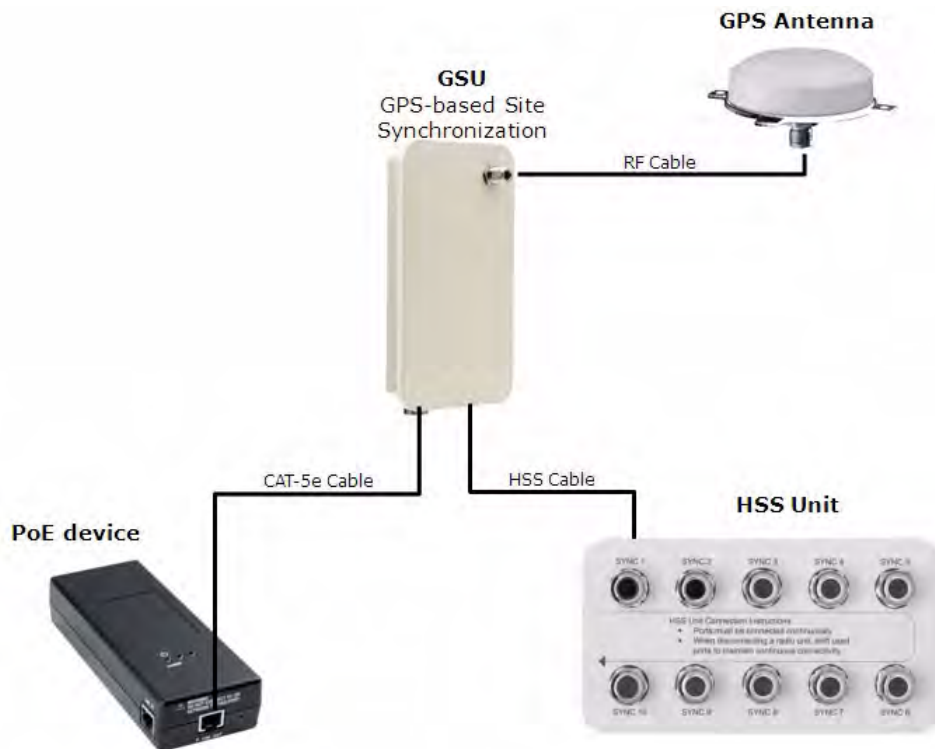


Figure 1-11: General GSU configuration

## 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 1-12: ODU with integrated Flat Panel antenna*

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

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



*Figure 1-13: External Antennas for use with RADWIN 2000*

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

## **RADWIN Manager**

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

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

The RADWIN Manager provides:

- Installation Wizard
- Frequency band selection
- On-line monitoring of air interface quality allowing the administrator to monitor the service and status of each link



- On-line monitoring of equipment alarms and QoS
- Local and remote loopback testing
- Configuration Wizard and site settings
- Integrated software upgrade utility
- On-line user manual and help files
- Link Budget Calculator for calculating the expected performance of the RADWIN 2000 wireless link and the possible service configurations for a specific link range.

The RADWIN Manager can easily be integrated with any SNMP based NMS system.

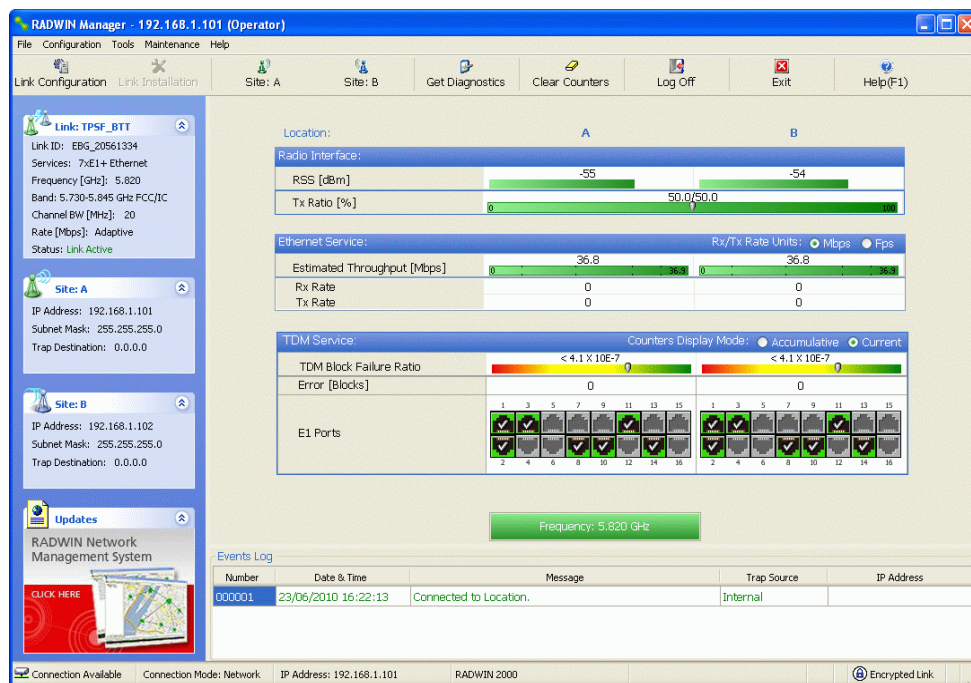


Figure 1-14: RADWIN Manager window

## 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. The intuitive easy-to-use RNMS provides a full range of network surveillance, monitoring, configuration and fault management capabilities. It offers users complete visibility and control over their RADWIN-based networks.

## Accessories

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

- PoE devices
- AC Power Adaptors
- External Lightning Protection Units
- Cables to connect the various system elements
- Grounding cables

## 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

## How to Use this Manual

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

*Table 1-2: User Manual - General layout*

Section	General Content	Purpose
1	Basic Installation	Core information to install and operate a link
2	Advanced Installation	Specialized installation techniques
3	Technical Information	Background for advanced use

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

*Table 1-3: User Manual layout*

Chapter/ Appendix	Subject	Audience
2	Site Preparation	Site survey team
3	Hardware Installation	Field technician
4	Getting Started with the RADWIN Manager	Installation technician
5	Installing the Link	Installation technician
6	The RADWIN Manager: Main Window	Installation technician, System manager
7	Configuring the Link	Installation technician, System manager
8	Site Configuration	Installation technician, System manager
9	Monitoring and Diagnostics	Installation technician, System manager



## A Little Terminology

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.

## Conventions Used in this Manual

### Notifications

Notifications consist of Notes, Cautions and Warnings.



---

The purpose of a **Note** is to

- Draw your attention to something that may not be obvious or counter-intuitive
  - Emphasize a special feature or peculiarity of the 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
- 



---

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

---



---

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

---

### Typographical conventions

#### General

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

#### Software

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

We would describe the chain of menu commands indicated in the navigation example of [Figure 1-15](#) like this,

**Tools | Active Alarms | 1 A**

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

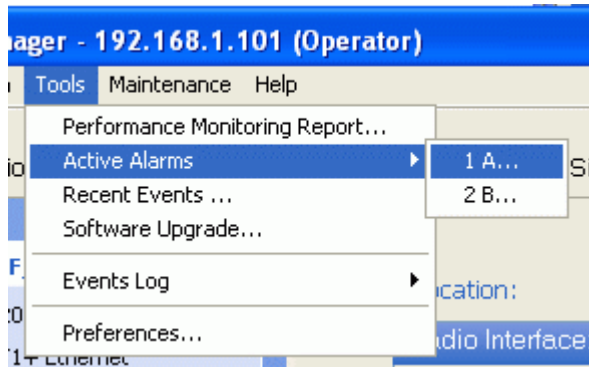


Figure 1-15: Menu navigation in the RADWIN Manager

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

“Click **Next** to continue.”

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

## Windows Terminology

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

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

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

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

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

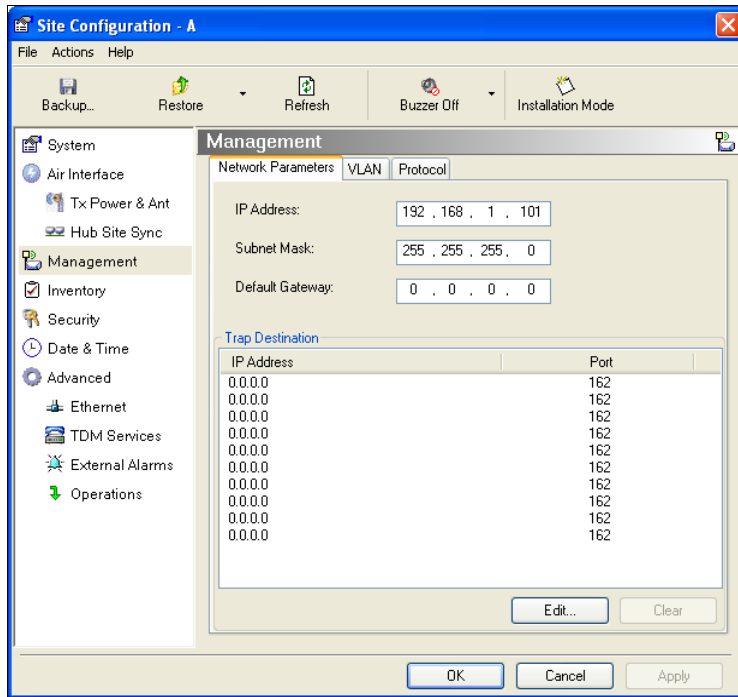


Figure 1-16: Site Configuration window with open Management panel

## Viewing and Printing

This manual is optimized for viewing online as a PDF file. To this end it uses an 11 point Tahoma typeface for main text. 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 inkjet printers also give good output

# Site Preparation

## Planning the Link Site

### *Overview*

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

A Site Survey consists of three stages:

1. Preliminary survey - The proposed link is analyzed **in the office** using a topographic map.
2. Physical survey - The locations of the 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 21](#) 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 21](#)).
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 IEEE 10/100BaseT standards.

---

6. Measure and record the path length of the cable from the ODU position to the indoor equipment room.
7. Determine the ground and lightning connection points of the installation. The ODU and IDU must both be grounded.
8. Using the Ohmmeter, measure and record the resistance of the required installation to the grounding point. The resistance must be less than 10 ohm.
9. Review the results of the physical site survey. Decide if the site is suitable for the 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 5-6](#)) 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 change band with "Combo" WinLink 1000 products and 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).
- If you are using WinLink 1000 radios, install the collocated links with different antenna polarizations.
- If you are using the RADWIN 2000 radios, 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**).



---

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

---

# Hardware Installation

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



---

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

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

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## Safety Practices

### ***Preventing overexposure to RF energy***

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

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

### ***Grounding***

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

- The **ODU** should be earthed by a wire with diameter of at least **12AWG**.  
The RADWIN 2000 ODU must be properly grounded to protect against lightning. It is the user's responsibility to install the equipment in accordance with Section 810 of the National Electric Code, ANSI/NFPA No.70-1984 or Section 54 of the Canadian Electrical Code. These codes describe correct installation procedures for grounding the

outdoor unit, mast, lead-in wire and discharge unit. It also lays down the size of grounding conductors and connection requirements for grounding electrodes.

The RADWIN 2000 ODU must be grounded to a Protective Earth as described in [Chapter 18](#) and in accordance with the Local Electrical Regulations.

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

Further, you should -

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

More detailed guidelines are supplied in [Chapter 18](#).

### ***Protection against Lightning***

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

See [Chapter 18](#) for detailed installation instructions of lightning protection devices.

### ***General***

- It is recommended that installation of the outdoor unit be contracted to a professional installer.
- Before working on equipment connected to power lines or telecommunication lines, you should remove jewelry or any other metallic object that may come into contact with energized parts.
- Use extreme care when installing antennas near power lines.
- Use extreme care when working at heights.
- When using an AC power source for RADWIN 2000 always use the AC power adapter supplied by RADWIN.
- Use the right tools. In addition to standard tools required for any kind of ODU or antenna installation, RADWIN 2000 requires additional specific tools detailed on [page 3-5](#) below.

## **Package Contents**

The RADWIN 2000 packages include the following items:

### ***ODU Package Contents***

The ODU package contains:

- One ODU - see [Figure 3-2](#) and [Figure 3-3](#) below for front and rear view
- An ODU mounting kit - see [Figure 3-1](#) below
- A CD containing -

- the RADWIN Manager
- Quick Start Guide
- User Manual - the document you are reading
- Link Budget Calculator
- Label showing the MAC address and the alternative Community string. The label is self-adhesive. You should keep this label safe
- Cable glands (to be used with the ODU-IDU cable)



*Figure 3-1: ODU Mounting kit*



**ODU - Front View**



**ODU - Rear View**

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



ODU - Front View



ODU - Rear View

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

**IDU-E package containing:**

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



Figure 3-4: IDU-E- front view

**IDU-C Package Contents**

The IDU-C package contains:

- IDU-C - see [Figure 3-5](#) below.
- 19" rack mounting kit - see [Figure 3-7](#) below
- Two DC power plugs for power cables - see [Figure 3-7](#) below



Figure 3-5: IDU-C Package contents - the IDU-C, Ethernet only



Figure 3-6: IDU-C Package contents - the IDU-C, 16 E1/T1 ports



Figure 3-7: IDU-C Package contents - the mounting kit and DC power plugs

### External Antenna Package Contents

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

### Additional Tools and Materials Required

The following is a list of the equipment and materials required to install RADWIN 2000 hardware.

#### Tools and Materials

- Crimping tool for RJ-45 (if the ODU-IDU cable is without connectors)
- Spanner/wrench 13 mm ( $\frac{1}{2}$ " )
- Drill (for wall mounting only)
- Cable ties
- Sealing material

#### Cables and connectors

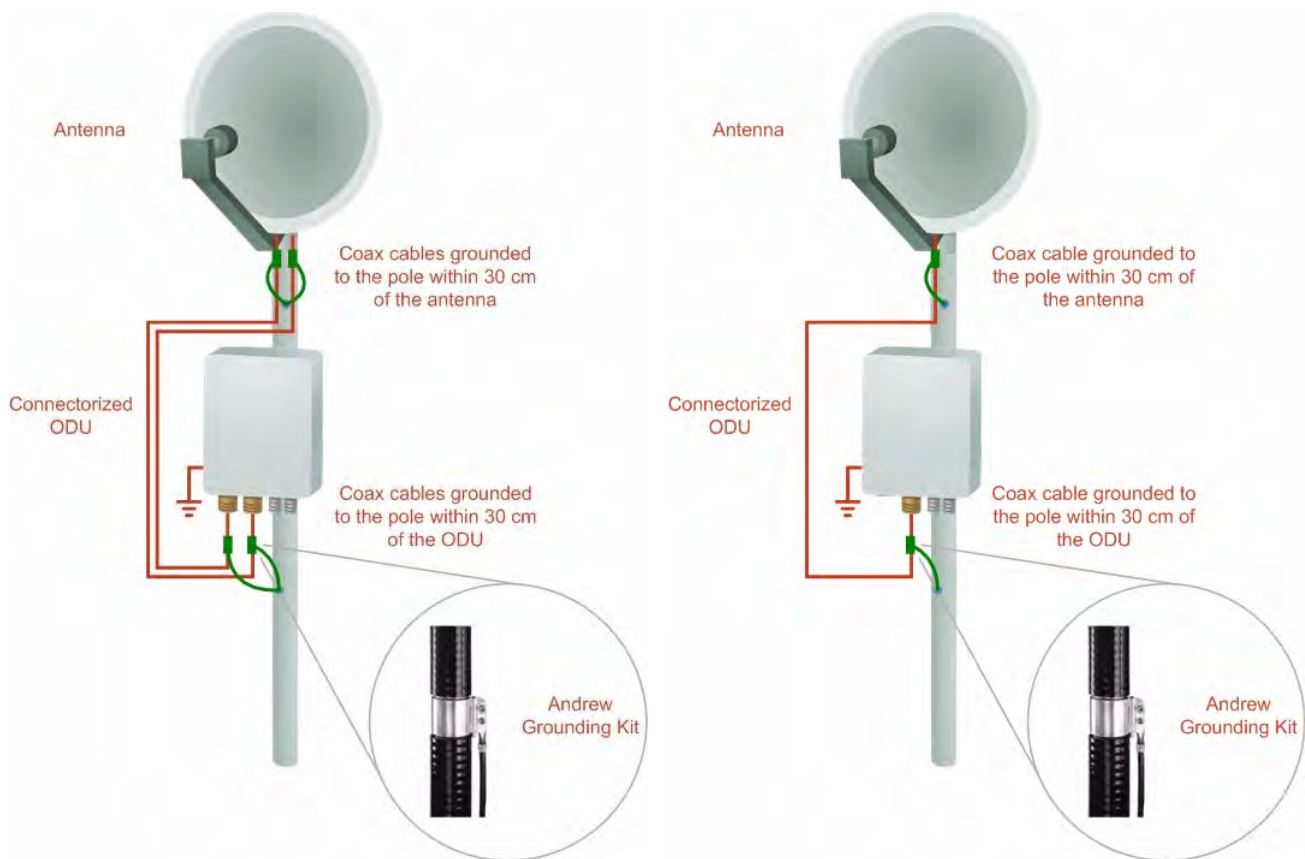
- ODU grounding cable 12AWG
- IDU grounding cable 18AWG
- ODU-IDU cable (outdoor class, CAT-5e, 4 twisted pairs, 24AWG)
- For PoE based links: A crossed Ethernet LAN cable

## Hardware Installation Sequence

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

1. Mounting the ODUs, page [page 3-7](#).
2. Mounting the external antennas (if used), page [page 3-7](#).
3. Mounting the Lightning Protection devices (if used), page [page 3-8](#).
4. Outdoor connections, page [page 3-8](#).
5. Mounting the IDUs, page [page 3-9](#).
6. Indoor connections, page [page 3-12](#).
7. Aligning the ODUs/antennas, page [page 3-13](#).

See [Figure 3-8](#) below, which illustrates a typical installation of a RADWIN 2000 or a WinLink 1000 with external antenna(s).



*Figure 3-8: Typical Installation (with external antenna) Left: RADWIN 2000 Right: WinLink 1000*

The installation steps are detailed in the following sections.

## Outdoor installation

### *Preparing the ODU before Deployment*

Each ODU must be pre-loaded with an IP address. This may be done prior to deployment in the field, or on-site using a Laptop computer. The process is quite straight-forward and described in [Chapter 19](#).

### *Mounting the ODU*

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



---

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

---

A RADWIN 2000 link operates in pairs of two ODUs with the same configuration. Both ODUs must be installed, and the antennas aligned for maximum throughput.



---

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

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

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

1. Ensure that the ODU is properly grounded.
2. Mount the ODU onto the pole or wall. Ensure that the unit is oriented so that the cable connectors are at the bottom. **(If they are on top, water may penetrate into the unit causing damage.)** It is possible to mount an ODU horizontally. See [Chapter 17](#) for details.
3. Refer also to [Chapter 17](#) for detailed ODU mounting kit contents and schematics.



- 
- Do not tighten the ODU to its mounting brackets until the alignment process of the antenna is complete.
  - Ensure that there are no direct obstructions in front of the ODU or interference from man-made obstacles.
- 

### *Mounting external antennas*

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

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





Do not stand in front of a live antenna.

➤ **To mount an external antenna:**

1. To mount an external antenna, ensure that the antenna is properly grounded and then mount the antenna onto the pole. Refer to [Chapter 17](#) for detailed antenna mounting instructions.
2. Follow the mounting instructions supplied with the antenna.

## ***Mounting the Lightning Protection Devices***

The use of lightning protection is dependent on regulatory and end user requirements. The RADWIN 2000 ODU is designed with surge limiting circuits to minimize the risk of damage due to lightning strikes. RADWIN recommends the use of additional surge arrestor devices to protect the equipment from nearby lightning strikes.

Refer to [Chapter 18](#) for detailed installation instructions of lightning protection devices.

## ***Outdoor Connections***

➤ **To complete the outdoor connections:**

1. Connect the ground cable to the ODU chassis as marked on the ODU.
2. Connect the antenna cable(s) to the ODU.
3. Connect the lightning protection device to the ODU (see [Chapter 18](#)).
4. Attach the ODU-IDU cable to the ODU RJ-45 connector (see [Appendix B](#) for the connector pinout)
5. Screw in the cable glands to ensure hermetic sealing of the ODU.
6. Secure the cables to the pole, mast or brackets using UV-rated cable ties.

## **Indoor Installation**

### ***Installing IDU-E***

#### **IDU-E Installation**

The IDU-E can be wall mounted, placed on a desktop or take up one half of a 1U rack slot. The unit should be grounded, cabled to the ODU and connected to power using the supplied AC/DC adapter.



*Figure 3-9: New style IDU-E: Rear panel*

### Mounting the IDU-C

IDU-Cs are all rack mountable, as shown in [Figure 3-10](#). A front panel keyed schematic of a rack mounted IDU-C is shown in the figure below.

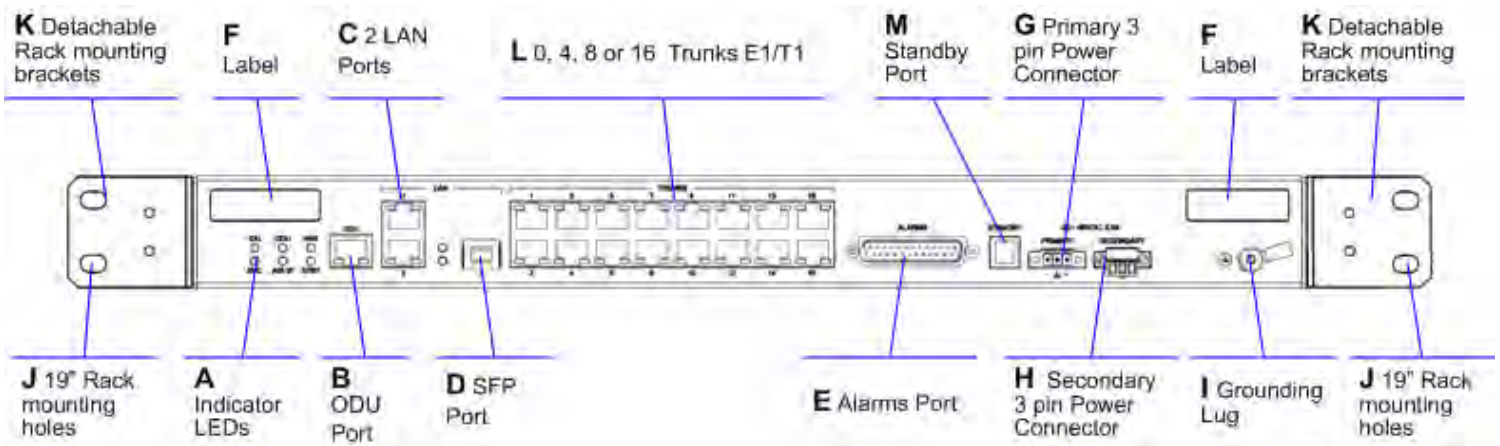


Figure 3-10: IDU-C front panel

Further description of the keyed items in [Figure 3-10](#) is shown in [Table 3-1](#) below:

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

Key	Label	Remarks
A	Indicator LEDs	See <a href="#">Figure 3-11</a> .
B	ODU Port	RJ-45 connector, see <a href="#">Table B-1</a> .
C	LAN RJ45Ports	Ethernet, RJ-45 connector, see <a href="#">Table B-3</a> .
D	LAN SFP Port	See <a href="#">Appendix C</a> .
E	Alarm Ports	Standard DB25 female connector, see <a href="#">Table B-7</a> .
F	Label indent	Place for adhesive identification labels.
G	Primary 3 pin Power Connector	Standard 3 pins in line power connector, see <a href="#">Table B-8</a> .
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 <a href="#">Table B-5</a> .
M	Standby Port	Hot Standby ready: HSB cable socket, see <a href="#">Table B-6</a> .

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



Figure 3-11: 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 3-12: IDU-E Front Panel LEDs

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

Table 3-2: IDU-C Front Panel LEDs

Name	Color	Function	
IDU	Green 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	
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 <a href="#">Table 3-3</a> following.		
STBY		<b>Hot Standby Mode - for use with Trunks only</b>	<b>Link State</b>
	Green Blinking Green Red Orange Off	Primary Secondary Primary Secondary Off	Active Not active Not active Active HSM not activated
		<b>Hot Standby Mode - For use with Ethernet only in a 1+1 Ring application)</b>	<b>Link State</b>
	Green Blinking Green Red Orange Off	Hardware ready	

Table 3-3: IDU-C and New Style 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: <ul style="list-style-type: none"> <li>This ODU is a master that is generating signals and detecting signals</li> <li>This ODU is a master that is generating signals but detected improper signals</li> <li>This ODU is a client "Continue Tx" but is not detecting signals</li> <li>This ODU is a client "Disable Tx" and is detecting signals from multiple sources</li> </ul> All orange cases transmit.
Off	HSS is not activated Disconnection between ODU and IDU

➤ **To mount an IDU-C:**

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.



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

### Connecting power to the IDU

The IDU-C has redundant power connection circuits (items G and H in [Figure 3-10](#) above). An enlarged schematic of the power connectors is shown in below:

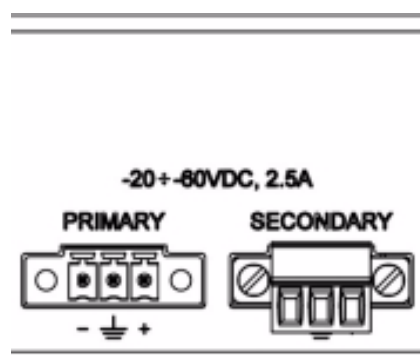


Figure 3-13: IDU-C Power connectors

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

Ensure that the IDUs at both sites are powered up.

The IDU-E has a single three pin power connector, the same as used on the IDU-C.

## Connecting the ODU to the IDU

The ODU-IDU cable conducts all the user traffic between the IDU and the ODU, and also provides power to the ODU. The maximum length of the ODU-IDU cable is 100m (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 3-10](#) above).

## Installing a Link using PoE Devices

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

### ➤ To prepare a link using PoE devices:

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

## Connecting User Equipment

### ➤ To connect user equipment to an IDU:

1. Connect user switch/router or any other compatible device to the IDU panel RJ-45 ports designated LAN. (For an IDU-C, see item C in [Figure 3-10](#) 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 3-10](#) above.)
3. IDU-C only: To use the SFP Port (labeled item D in [Figure 3-10](#) 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.



---

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

---

### ➤ To connect user equipment to a PoE device:

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

## Connecting and Aligning ODUs / Antennas

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

To speed up the installation time, alignment of a RADWIN 2000 system should be performed by two teams simultaneously, at site A and at site B.

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

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

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

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

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



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

---

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

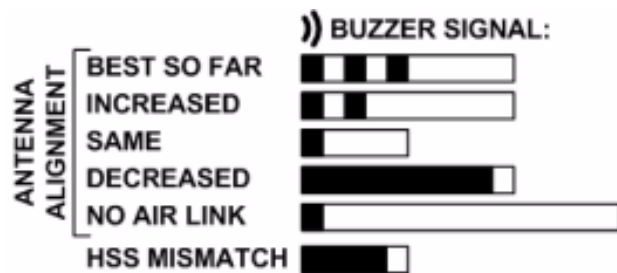


Figure 3-14: Beep Sequence for antenna alignment



**Note**

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

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

➤ **To align two external monopolar antennas:**



**Note**

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

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

# 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 4-1](#) below:

*Table 4-1: PC Requirements for the RADWIN Manager Application*

	Windows Version		
	2000	XP Pro	Vista/7
Memory	128 MB	512 MB	1 GB
Processor	P III	P IV	P IV Dual Core

Requirements common to all systems are:

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

### *Installing the Software*

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, choose 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 pre-load each ODU with its network address prior to physical installation. The procedure is quite straight forward, and set out in [Chapter 19](#).



**Note**

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

### ➤ To start the RADWIN Manager:

1. Connect the managing computer to one of the two LAN ports as shown in [Figure 4-1](#) below:

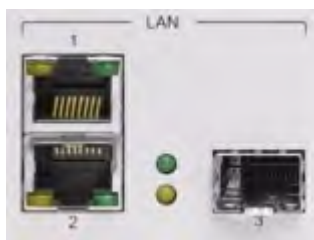


Figure 4-1: LAN ports on the front panel of the IDU-C



For IDU-E users: The LAN ports are located on the rear panel on the unit.

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

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

**ping 10.0.0.120**

You should see something like this:

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

C:\Documents and Settings\vera>ping 10.0.0.120

Pinging 10.0.0.120 with 32 bytes of data:

Reply from 10.0.0.120: bytes=32 time=6ms TTL=63
Reply from 10.0.0.120: bytes=32 time=3ms TTL=63
Reply from 10.0.0.120: bytes=32 time=3ms TTL=63
Reply from 10.0.0.120: bytes=32 time=3ms TTL=63

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

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

Figure 4-2: Pinging an uninstalled and unconfigured link

Any other response from ping means that the ODU is not responding. Check your Ethernet connection and that both the 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 4-3: First time log-on window

## The RADWIN Manager log-on Concept

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 4-3 above). You are offered an *extended* log-on window:



Figure 4-4: Extended log-on window



Connection through the RMNS Sever will be available in a future release. If you have an immediate requirement for this service, please contact RADWIN Customer Support.

At the User Type field, click the list button:

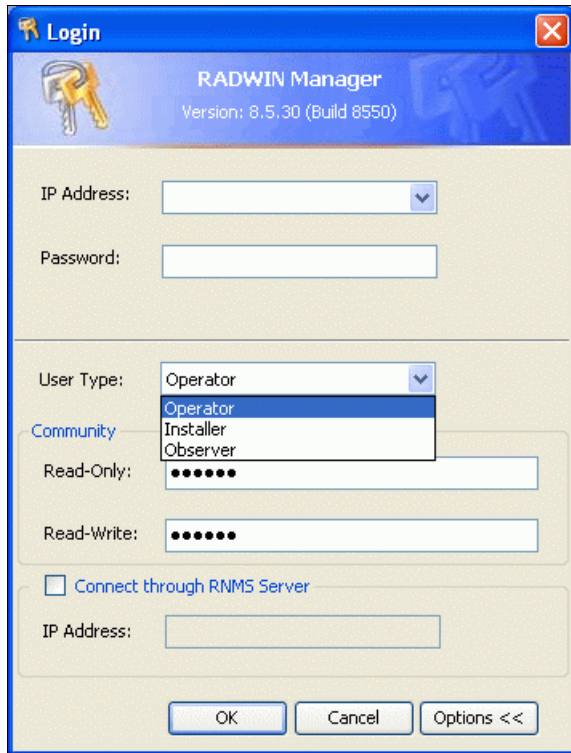


Figure 4-5: Log on window exposing the user types.

There are three user types:

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

The following table summarizes these options:

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

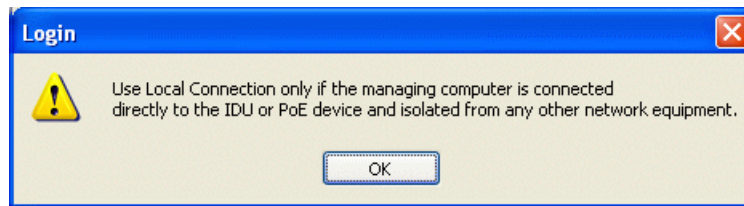
User Type	Default Password	Function	Community	Community String
Observer	<i>admin</i>	Monitoring	Read-Only	<i>public</i>
Operator	<i>admin</i>	Installation, configuration	Read-Write	<i>netman</i>
Installer	<i>wireless</i>	Operator plus set band	Read-Write	<i>netman</i>

The Network Manager should change the default passwords as soon as possible.

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

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

- If you log on using **Local Connection**, but your physical connection is not local (i.e. anything other than a direct connection between the managing computer and the IDU), then any configuration you carry out may affect other links in the network. **Do not do this!**



- Network log on (IP address to the ODU) is recommended.
- If you log on via an over-the-air IP address, you will receive a warning. If you reset the site to which you are connected to factory settings, you can lock yourself out of the link.



- If you log on using **Local Connection** through a PoE device, you will need to connect it to the managing computer using a crossed Ethernet cable.
- 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 8-7. See also, [Chapter 19](#)).

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 4-10](#)).

## 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:

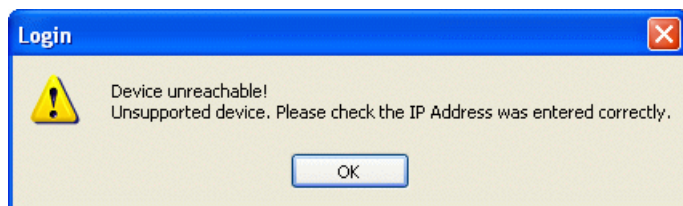


Figure 4-6: Unsupported device message

### Incorrect IP Address

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

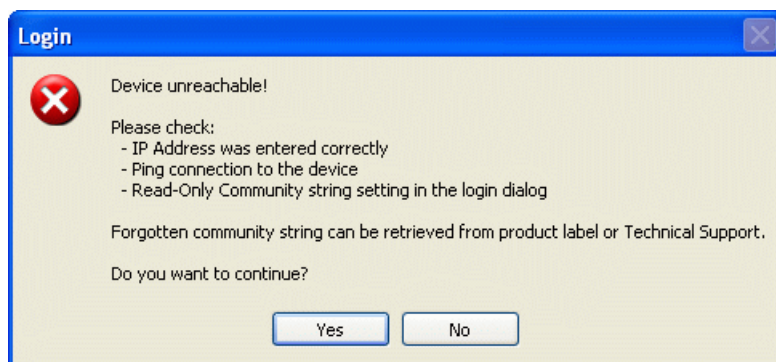




Figure 4-7: Unreachable device message

In both of the above situations, if you click **No**, you will see a warning graphic  alongside the IP Address field.

### Incorrect Password

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

### Invalid Read/Write Community String

This will result in the following message:

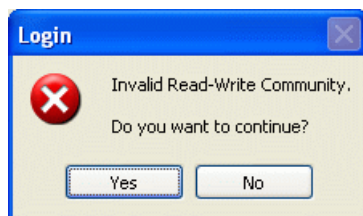


Figure 4-8: Invalid Community String message

### 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:



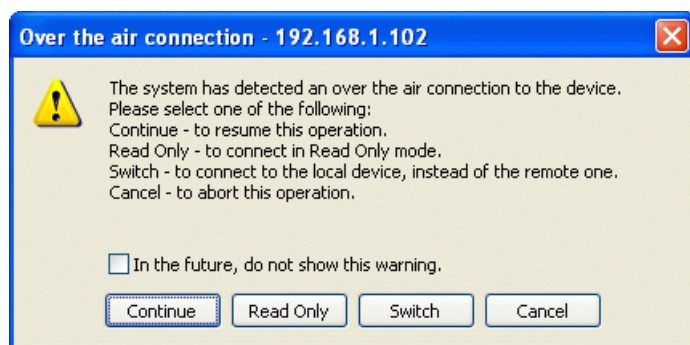


Figure 4-9: Logging on to an over-the-air site

## Continuing without an IP Address

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

Table 4-3: RADWIN Manager: Offline Functionality

Menu level			Function	Reference
Top	+1	+2		
File	Log Off		Return to log-on dialog. Same as Log Off button	
	Exit		Exit the RADWIN Manager. Same as Exit button	
Tools	Change Password		Change the log-on password	<a href="#">page 4-8</a>
	Events Log	Clear Events	Clear local events log	<a href="#">page 9-17</a>
		Save to File	Save events log data to a file	
Preferences		Set managing computer preferences		
Help	RADWIN Manager Help		View online help version of the User Manual	
	Link Budget Calculator		Calculator opened in default browser	<a href="#">Chapter 21</a>
	Get Diagnostics Information		Obtain system information	<a href="#">page 9-1</a>
	About RADWIN Manager		RADWIN Manager build information	

### Changing the Log-On Password

➤ To change the log on password:

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

The Change Password dialog box appears.

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



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

3. Click **OK** to confirm.

## First steps

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



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

Other defaults are shown in [Table 4-4](#).

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

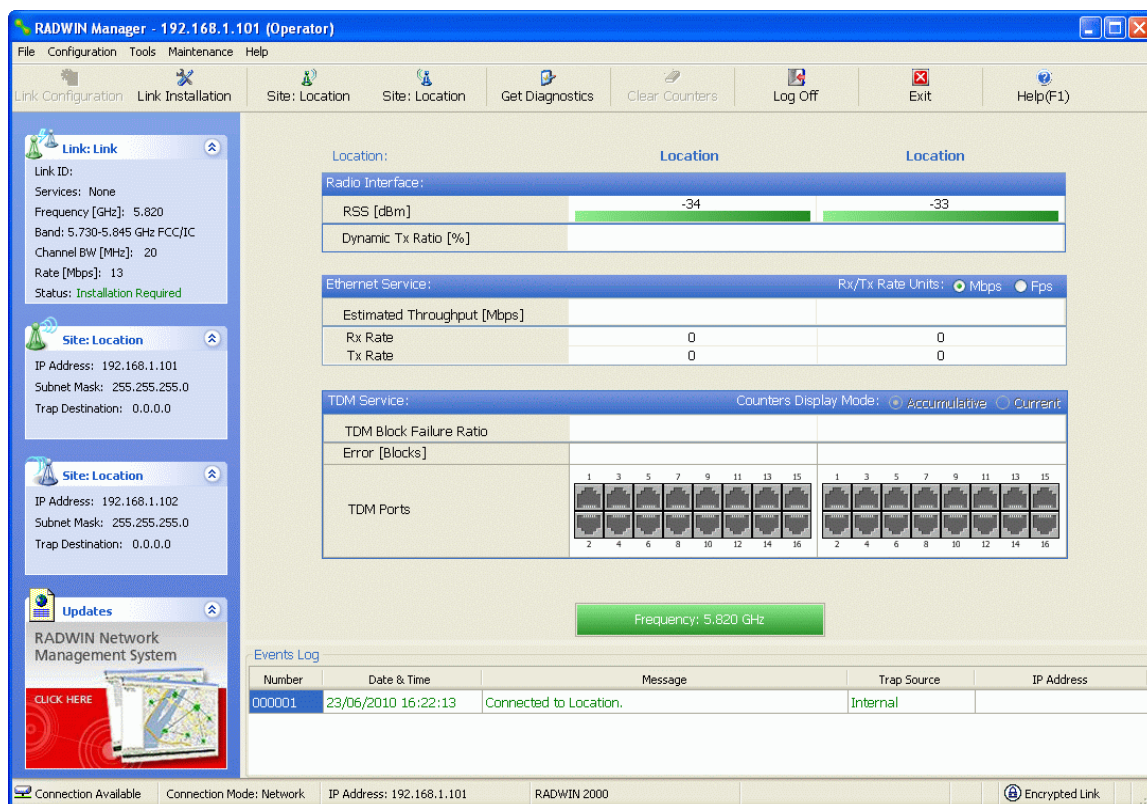


Figure 4-10: Opening RADWIN Manager window prior to installation - IDU-C





---

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 6](#).

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.



---

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

---



- 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 20](#).
  - Use of an incorrect band may be in violation of local regulations.
- 

2. **Link Configuration** - described in [Chapter 7](#).

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

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

3. **Site Configuration** - described in [Chapter 8](#).

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

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

---

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



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

## Default RADWIN 2000 Settings

The default settings of the RADWIN 2000 configuration parameters are listed in the second column of [Table 4-4](#) below. The third column shows the values we use in this manual for illustrative purposes.

*Table 4-4: Default Settings*

Parameter	Default Value	Illustrative Value	
Factory default band	Product dependent	5.820GHz	
ODU IP Address	10.0.0.120	192.168.1.101 and 102	
Subnet Mask	255.0.0.0	255.255.255.0	
Trap destination	0.0.0.0	0.0.0.0	
RADWIN Manager log-on passwords			
Observer		admin	
Operator		admin	
Installer		wireless	
Link ID	Link	EBG_20561334	
Link Name	Name	TPSF_BTT	
Site 1	Site	A	
Site 2	Site	B	
Location (per site)	Location	A	B
Name (per site)	Name	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	
Community values		Read-write – netman	
		Read-only – public	

## Using RADWIN Manager Spectrum View

Prior to running the Installation Wizard ([Chapter 5](#)), you may use 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 4-11](#)) and click **Tools | Spectrum View**. A display similar to the following appears:

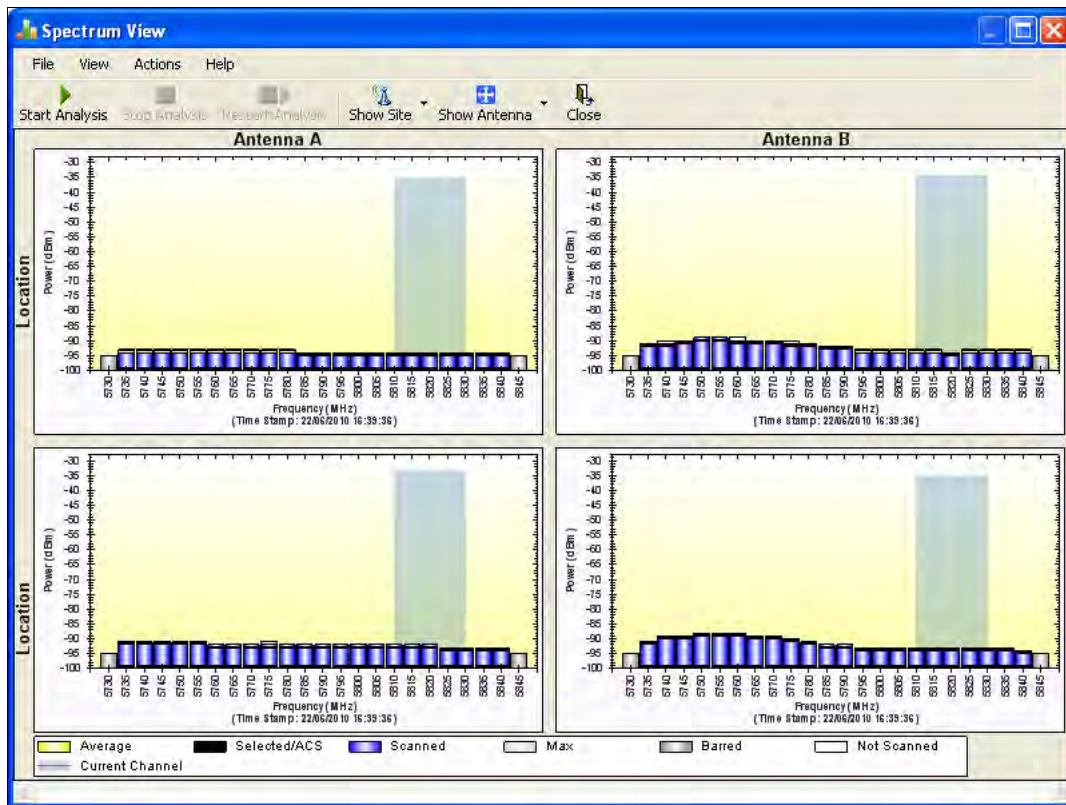


Figure 4-11: Spectrum View - Opening Display on installed link

See [Chapter 23](#) for detailed information about operating Spectrum View and understanding the displayed statistics.

# Installing the Link

## Overview

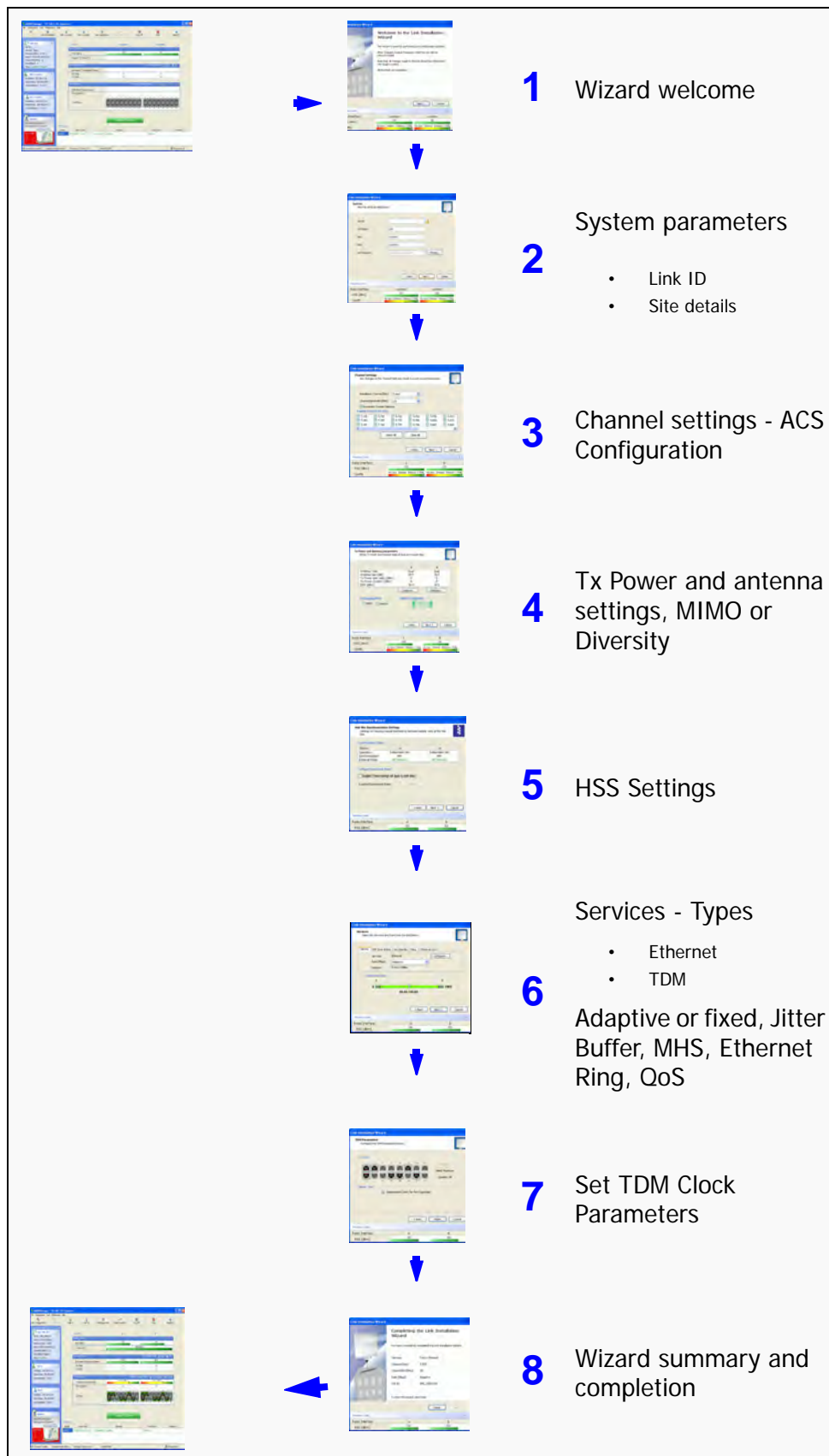
The installation is carried out using the Installation wizard. Its operation is detailed in the following pages in a tutorial style.

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

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

The Installation wizard has steps as shown in [Table 5-1](#) below.

Table 5-1: Link Installation Wizard



## 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 3](#) on [page 3-16](#).

The Installation Wizard opens:

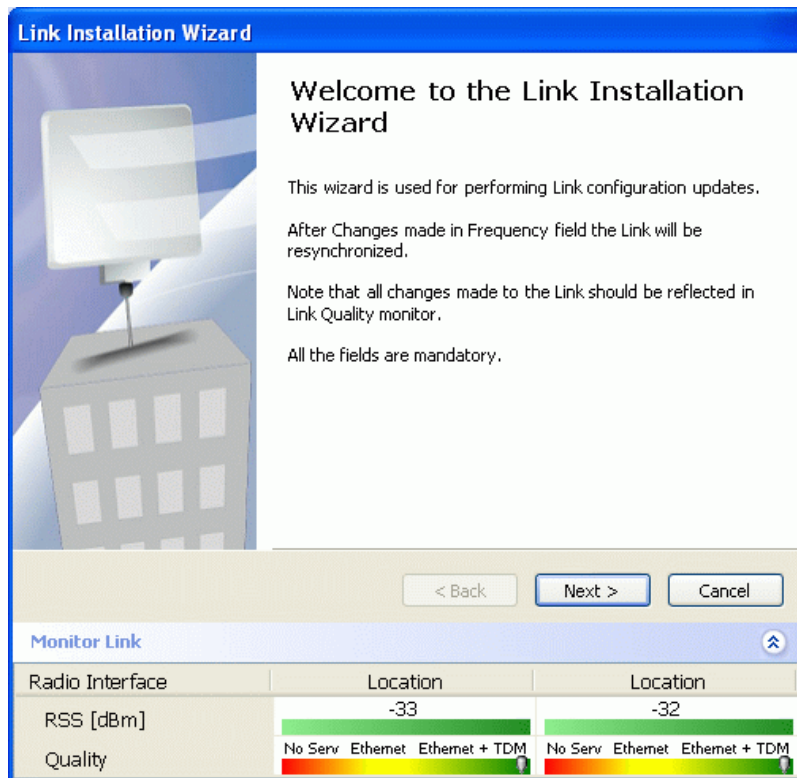


Figure 5-1: Link Installation Wizard

The bottom data area reproduces the corresponding data from the main window - which the above panel obscures. See [Chapter 6](#) 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 5-2: Installation Wizard, System dialog box

➤ **To complete Installation Step 2:**

1. Enter a Link ID. **The Link ID must be identical for both ODU's 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.



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:



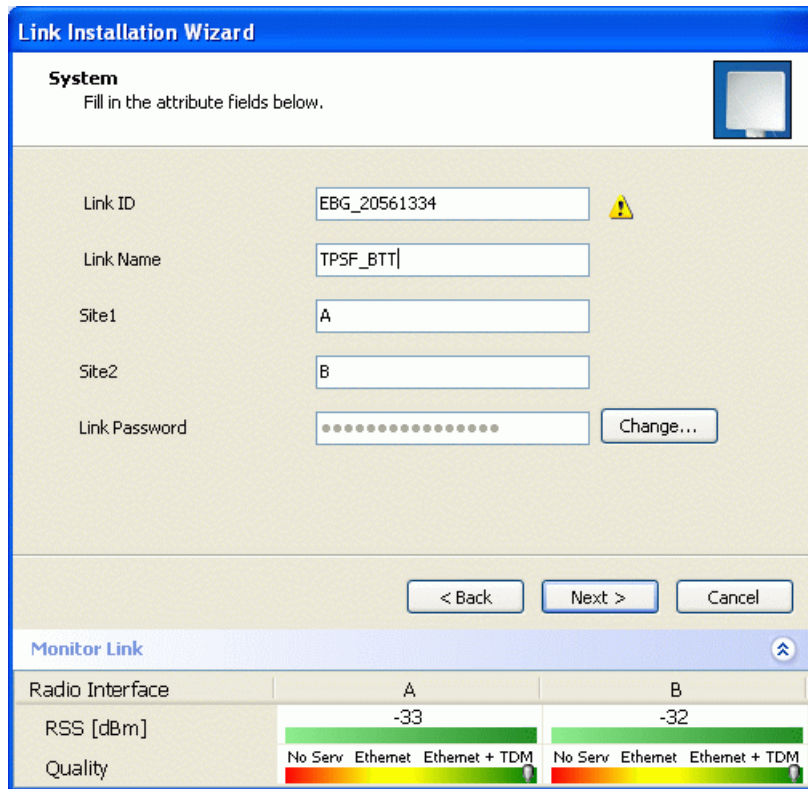


Figure 5-3: Installation Wizard, System dialog box filled out

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.




---

Use the Hide characters check box for maximum security

---



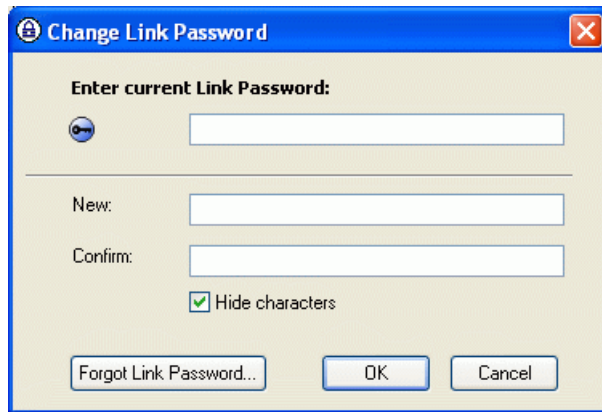


Figure 5-4: Change Link Password dialog box

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:

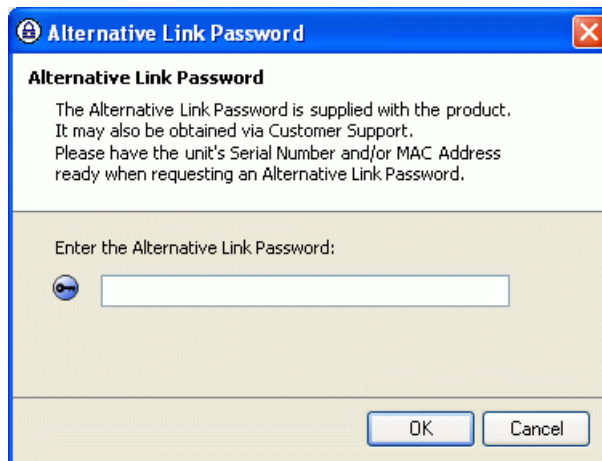


Figure 5-5: Lost or forgotten Link Password recovery

Follow the instructions to use the Alternative Link Password, and click **OK** to finish. You are returned to the window in [Figure 5-4](#) 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.



- 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 8-13](#).

### 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 5-6** below. A channel switch takes place sufficiently fast as to ensure no loss of service.

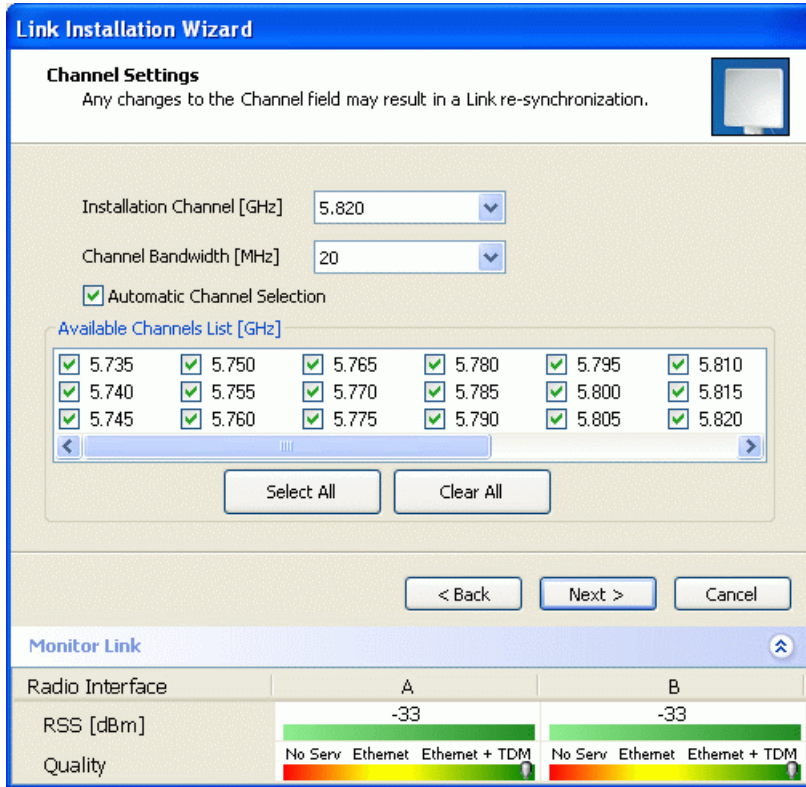


Figure 5-6: Channel Settings - Automatic Channel Selection

The default frequency for the product is shown.

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

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

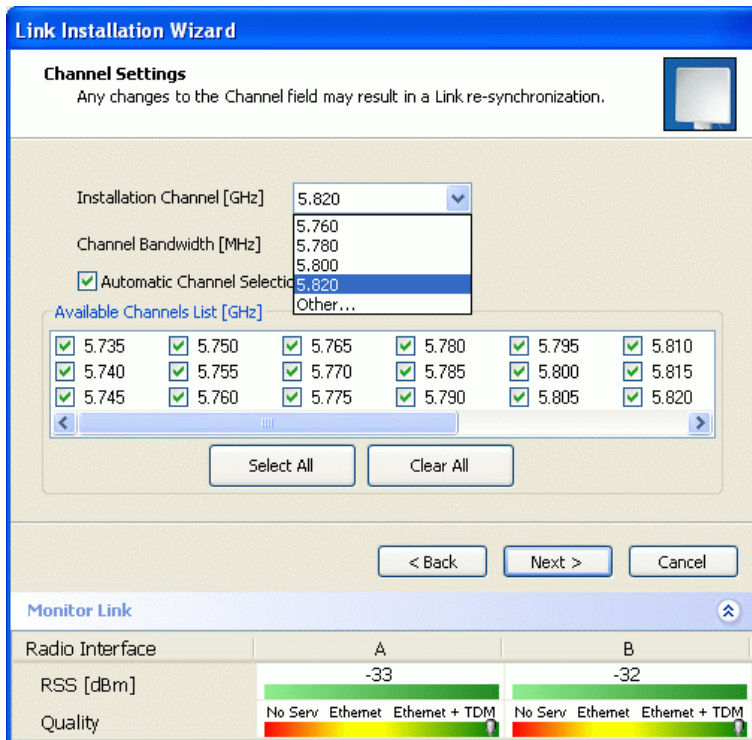


Figure 5-7: Channel Settings - Showing available installation rates

2. Choose the required Channel Bandwidth.

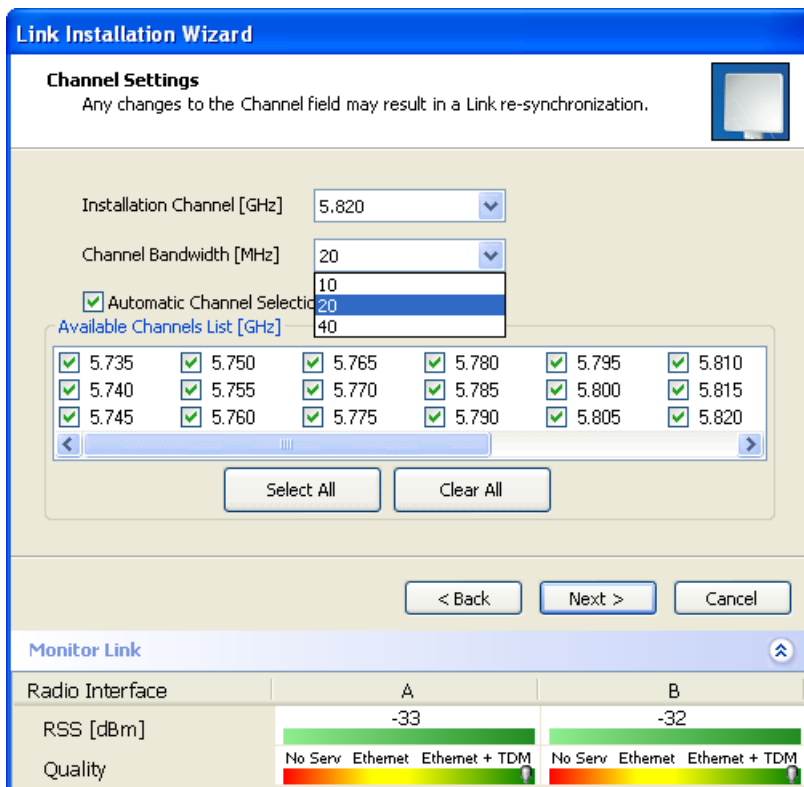


Figure 5-8: Channel Settings - Showing available Channel Bandwidths

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 5-7** above.

5. Click **Next**.

## Step 4, Tx Power and Antenna Settings

The Tx Power and Antenna Parameters dialog appears.

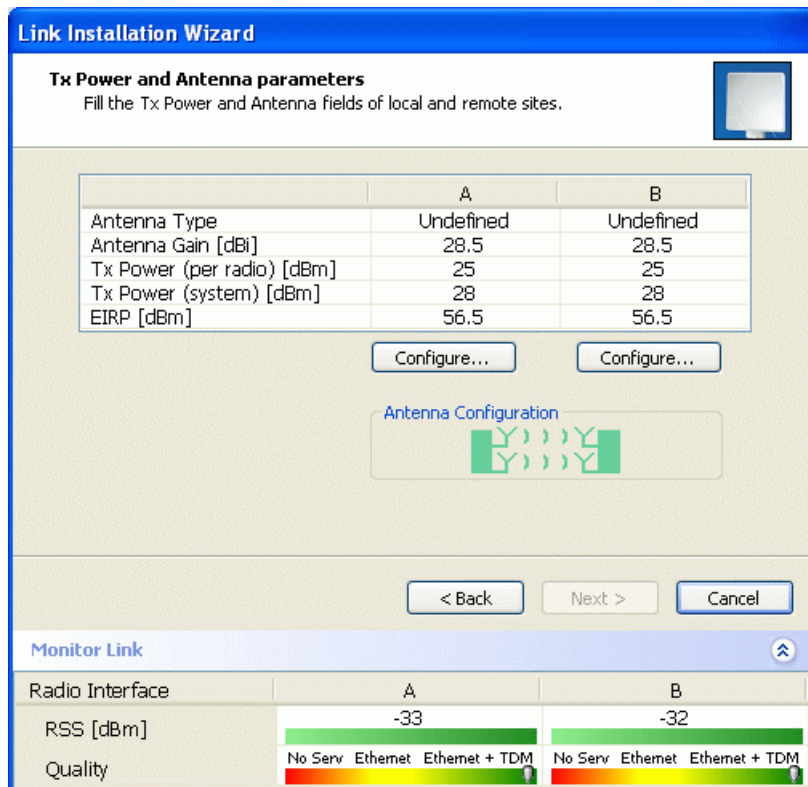


Figure 5-9: Transmission Power and Antenna Parameters

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

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

### About Single and Dual Antennas

Each RADWIN 2000 ODU is made of 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 Both Sites

When using dual antennas at both sites (single bipolar antenna or two mo-unipolar antennas) you can choose between MIMO Mode and Diversity Mode.

### ***MIMO Mode***

With MIMO the system doubles the link capacity. At the same time, it keeps the same rate and modulation per radio as was used with single antenna, thus increasing capacity, range and availability.

For example with a dual antenna RADWIN 2000 can transmit at modulation of 64QAM and FEC of 5/6 and get an air rate of 130 Mbps, compared to 65 Mbps with single antenna.

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

Upon selecting Antenna Type as Dual, RADWIN 2000 automatically selects MIMO 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 it 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 or-bust 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 5-2 summarizes the situation:

Table 5-2: MIMO - Diversity settings

Number of Antennas		Mode	Graphic Indication	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 5-3 below:

Table 5-3: RADWIN 2000 Air rates

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

Table 5-3: RADWIN 2000 Air rates (Continued)

Antenna	Modulation	FEC	Air-Rate [Mbps]
Dual	64QAM	3/4	117
Dual	64QAM	5/6	130

### 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** in [Figure 5-10](#) below.

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

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

It appears in [Figure 5-10](#) as **Max EIRP**.

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

Then, the following relationship must be satisfied:

$$maxAvailableTxPower \leq \min(maxRegEIRP - AntennaGain + CableLoss, maxRegTxPower) \quad \dots (*)$$

These parameters are controlled as follows:

**➤ To set Tx Power and configure antennas:**

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



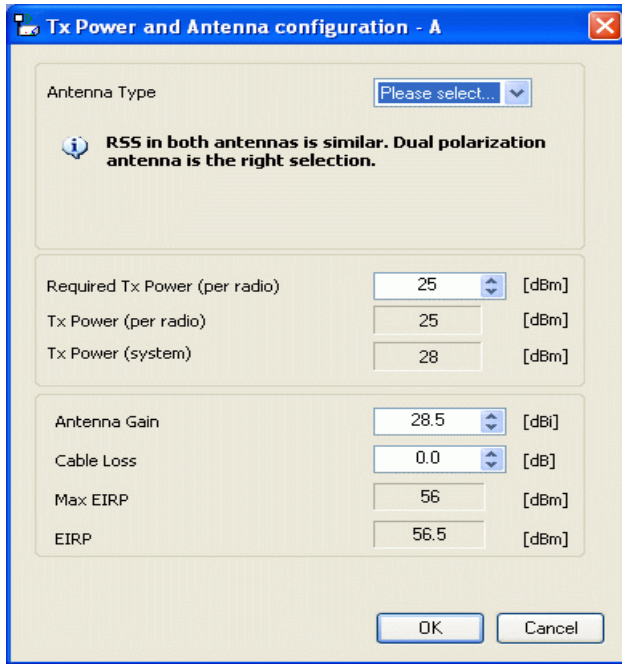


Figure 5-10: Antenna configuration dialog

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

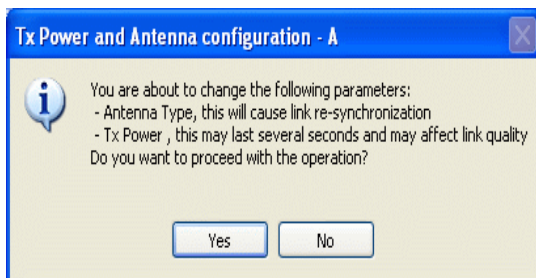


Figure 5-11: Antenna type change warning

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

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



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

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



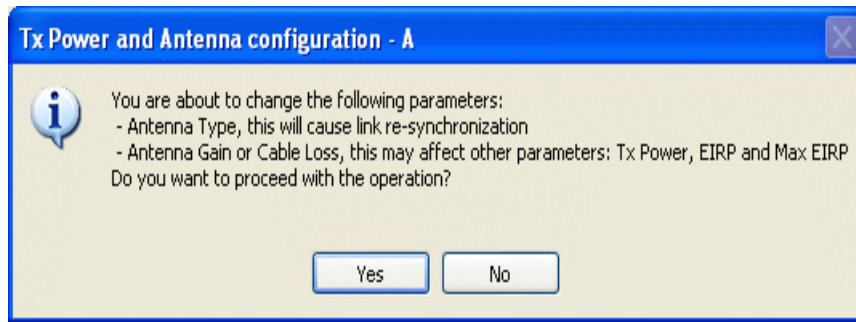


Figure 5-12: Antenna parameters change warning



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

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

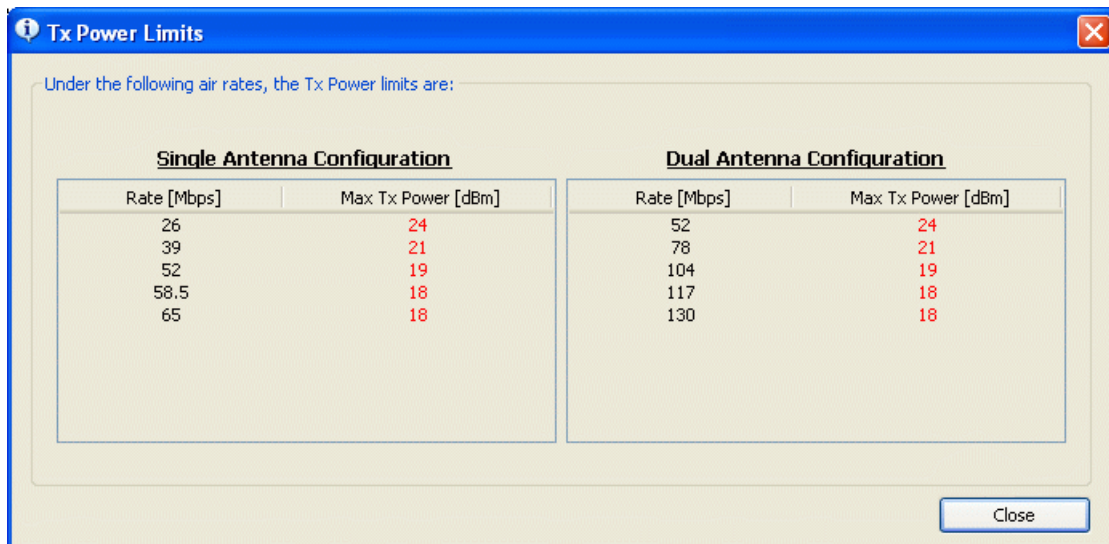


Figure 5-13: Tx Power Limits

The precise relationship between the items in inequality (\*) and the window of [Figure 5-10](#) 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 5-13](#) only shows rates where the maximum Tx Power is the limitation, rather than regulations. When you close the window of [Figure 5-13](#), the change you requested will **not** be honored, and you will need to try again.



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

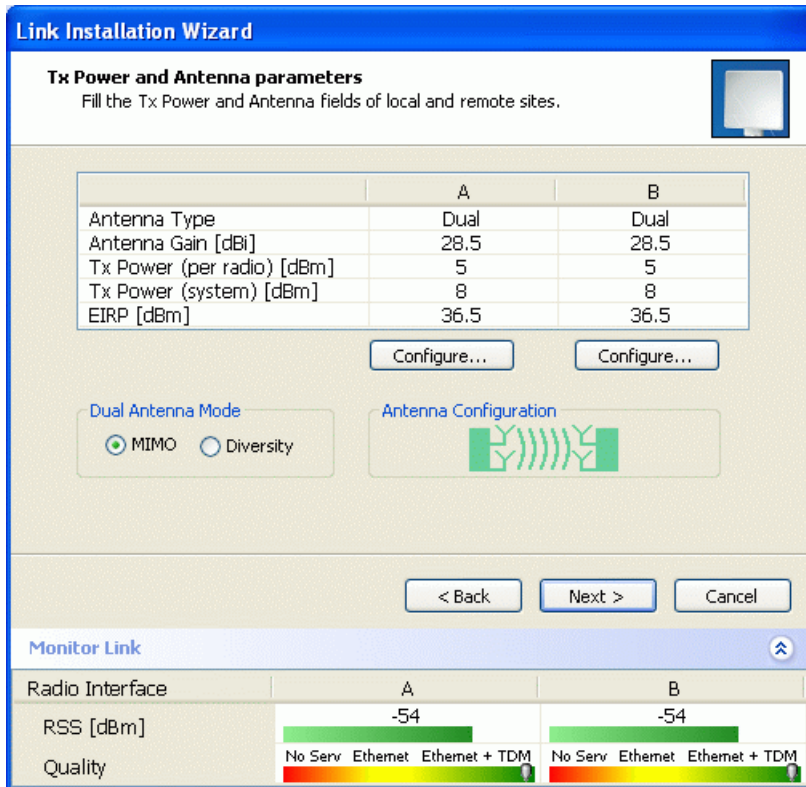


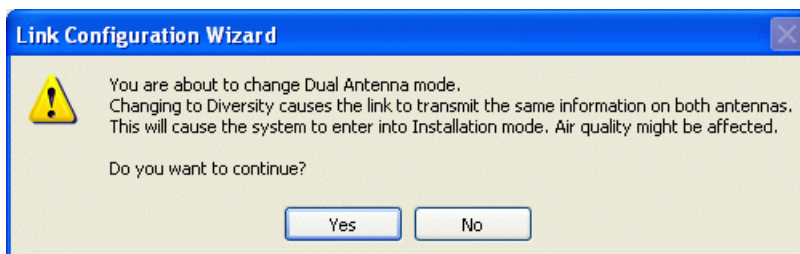
Figure 5-14: Antennas configured for two dual and Tx power 5 dBm

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 [page 5-9](#) above.

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



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

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

## Step 5, Hub Site Synchronization Settings

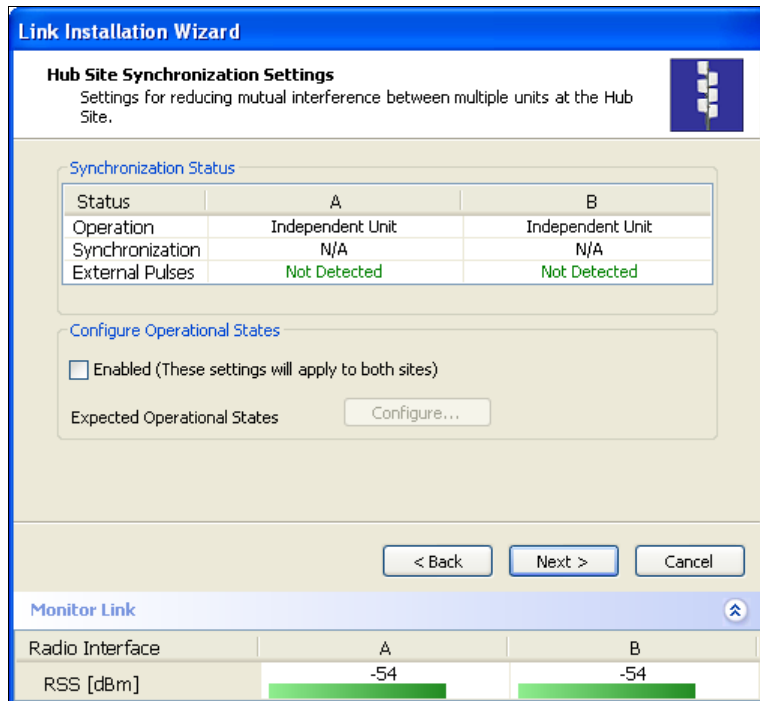


Figure 5-15: HSS Settings

The Synchronization Status dialog box displays the current status of each side of the link. See [Chapter 10](#) for instructions about installing and configuring collocated links. If you do not require HSS, click **Next**.

## Step 6, Services

The Services dialog appears:

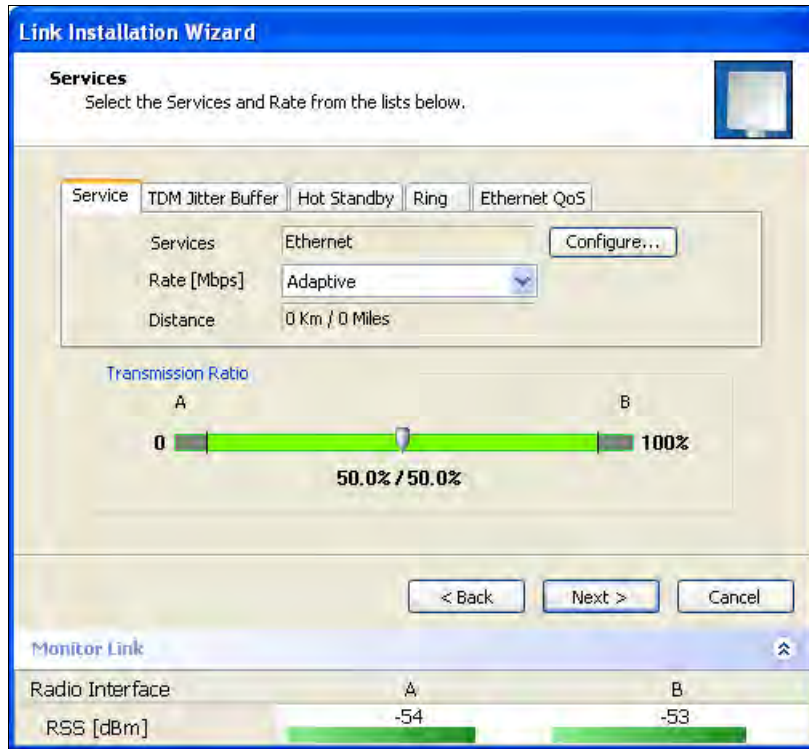


Figure 5-16: Services and Rates - RADWIN 2000 C only

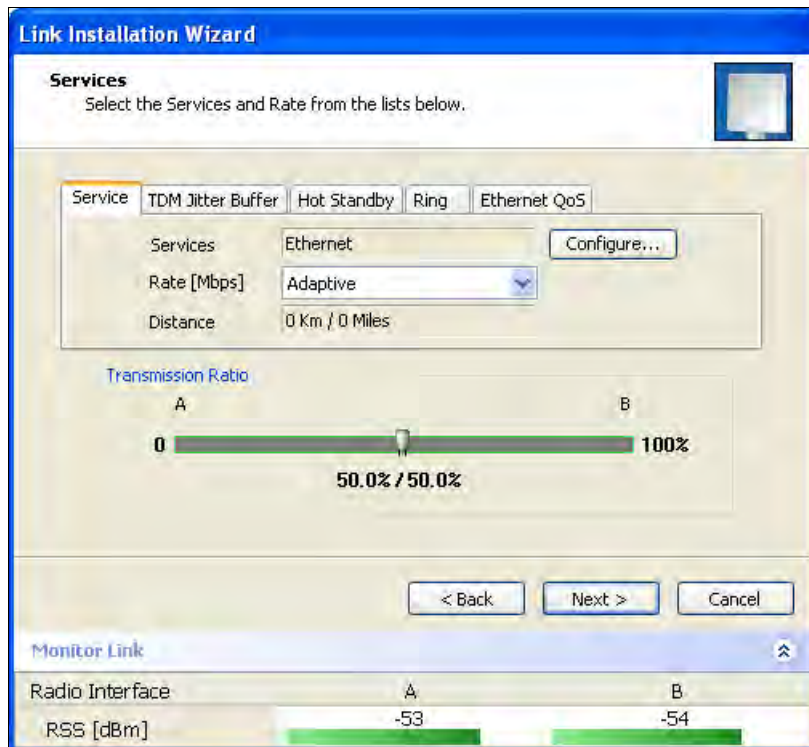


Figure 5-17: Services and Rates for RADWIN 2000 collocated as a client

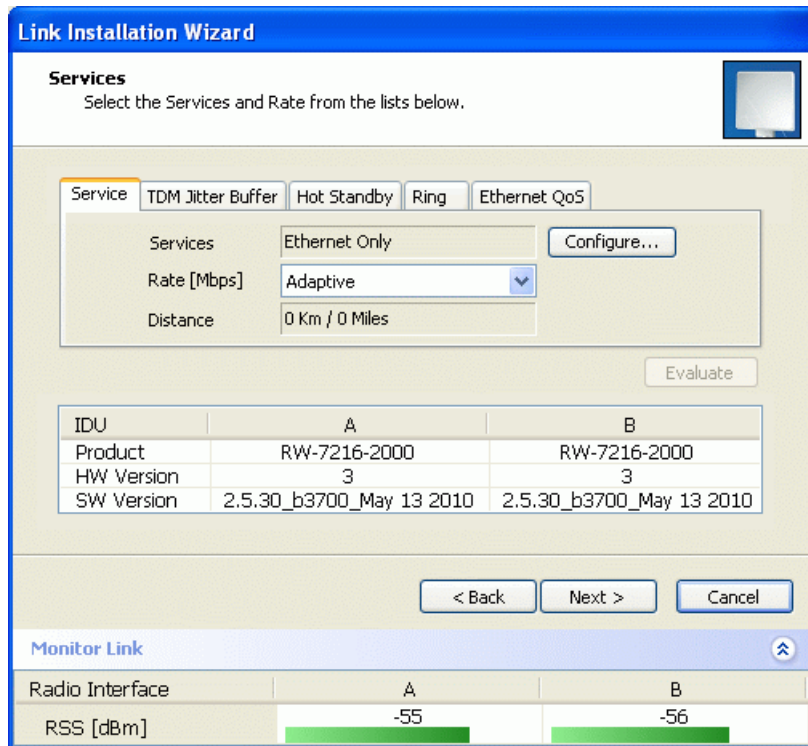


Figure 5-18: Services and Rates for models RADWIN 2000 L and RADWIN 2000 PDH

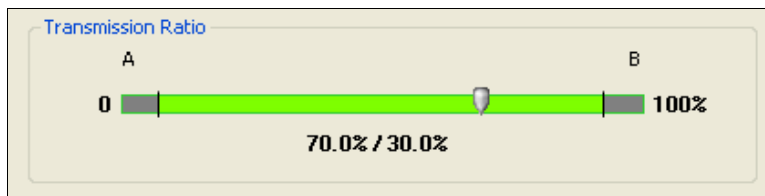
For -

- a collocated link
- Models RADWIN 2000 L and RADWIN 2000 PDH

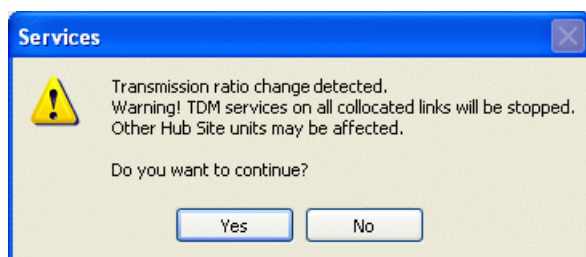
proceed to **TDM Services selection**.

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.



If you change the Transmission Ratio, you will be offered the following warning:



Otherwise, click **Yes** to continue.



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 7](#)).

### 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. Possible scenarios are shown in [Table 5-4](#). In all cases where Asymmetric Allocation is available, it is static for all traffic conditions.

Table 5-4: Asymmetric Allocation with Collocated Links - Scenarios

HSS Master	HSS Client	Scenario: If you try to...	Result	Remarks
RADWIN 2000	WinLink 1000	Change master to asymmetric allocation	Link down	Reversion to 50/50 restores link
	RADWIN 2000		<ul style="list-style-type: none"> <li>Releases prior to 2.4 - Link down</li> <li>Release 2.4 later (RADWIN 2000 PDH and RADWIN 2000 L series) - Link down</li> <li>Release 2.4 and later (RADWIN 2000 C series) - TDM services stopped, link set to transmission ratio of master</li> </ul>	Release 2.4 and later (RADWIN 2000 C series) - Asymmetric Allocation slider visible but cannot be changed
RADWIN 2000	WinLink 1000	Change client to asymmetric		
	RADWIN 2000		Asymmetric Allocation slider <b>not</b> displayed	You cannot do this
WinLink 1000	WinLink 1000	Change client to asymmetric		
	RADWIN 2000		Asymmetric Allocation slider <b>not</b> displayed	You cannot do this

The Services and Rates dialog as shown in [Figure 5-16](#) will be different:



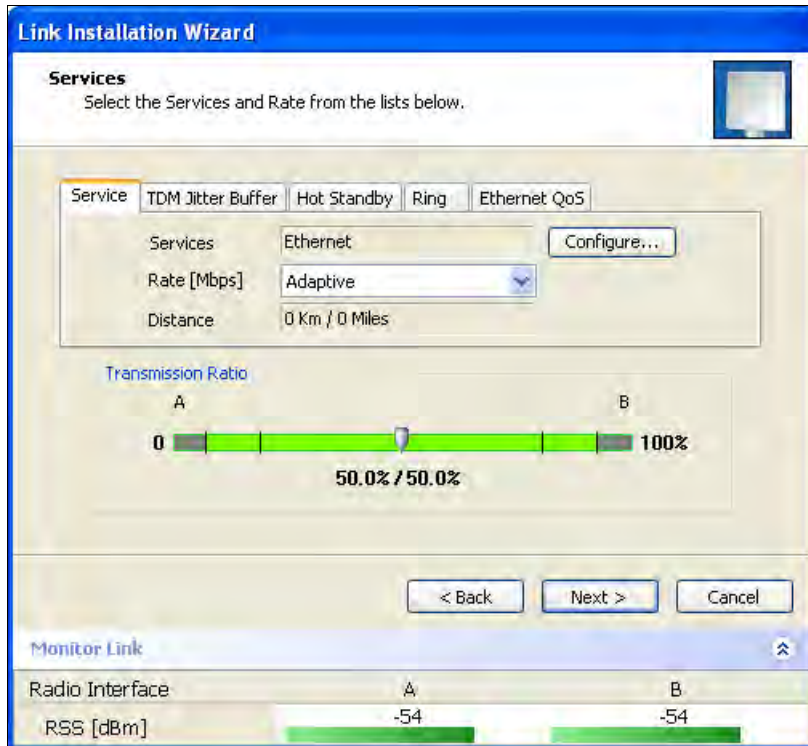


Figure 5-19: Services and Rates - RADWIN 2000 C master, RADWIN 2000 clients

The yellow areas should **not** be used. Using those areas, you may lose 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 5-34](#) below.

### ***TDM Services selection***

#### **➤ To select services:**

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

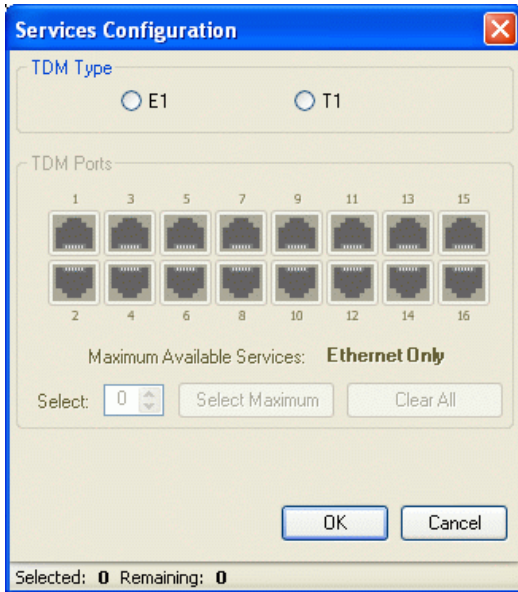


Figure 5-20: TDM Type selection

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

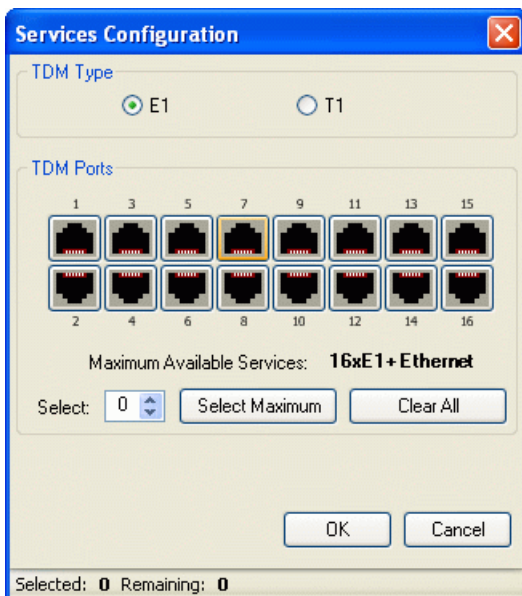


Figure 5-21: TDM service port selection

- 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.



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



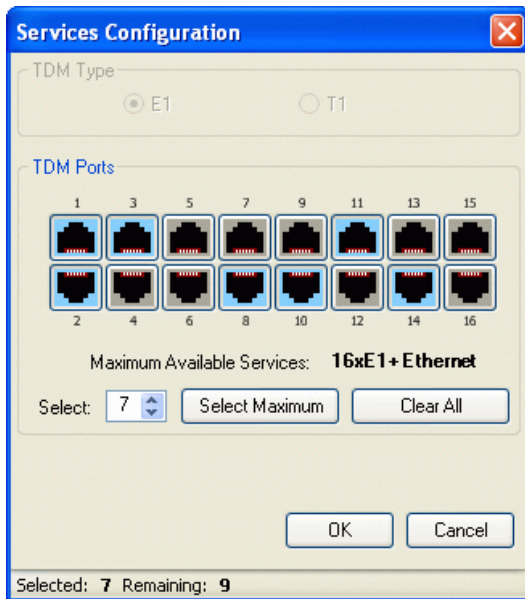


Figure 5-22: TDM Service port selection - seven services selected

4. Click **OK**. You are returned to the Services and rates dialog of [Figure 5-24](#). It is updated to reflect your choice.

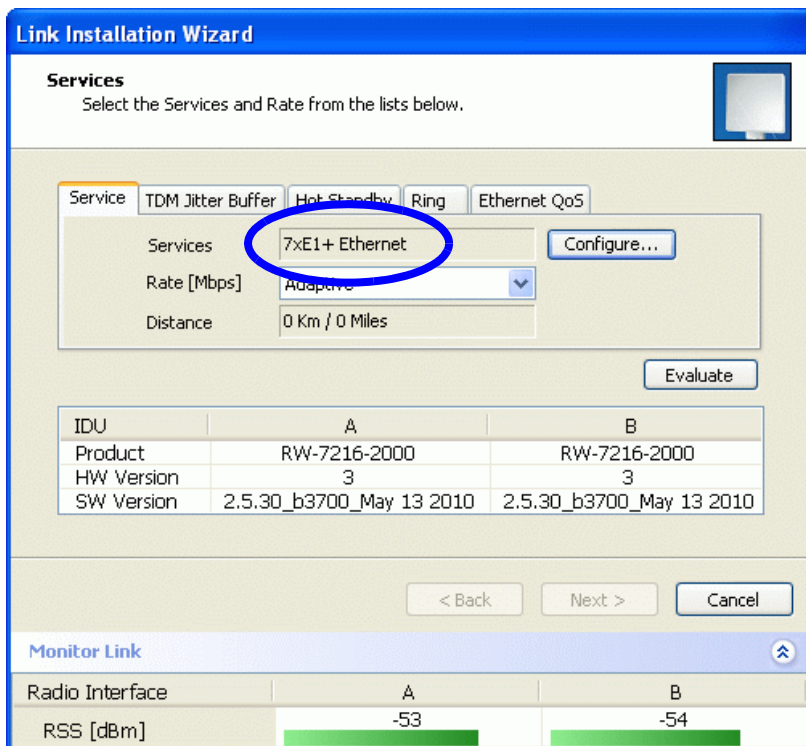


Figure 5-23: Services and Rates - Services chosen



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.

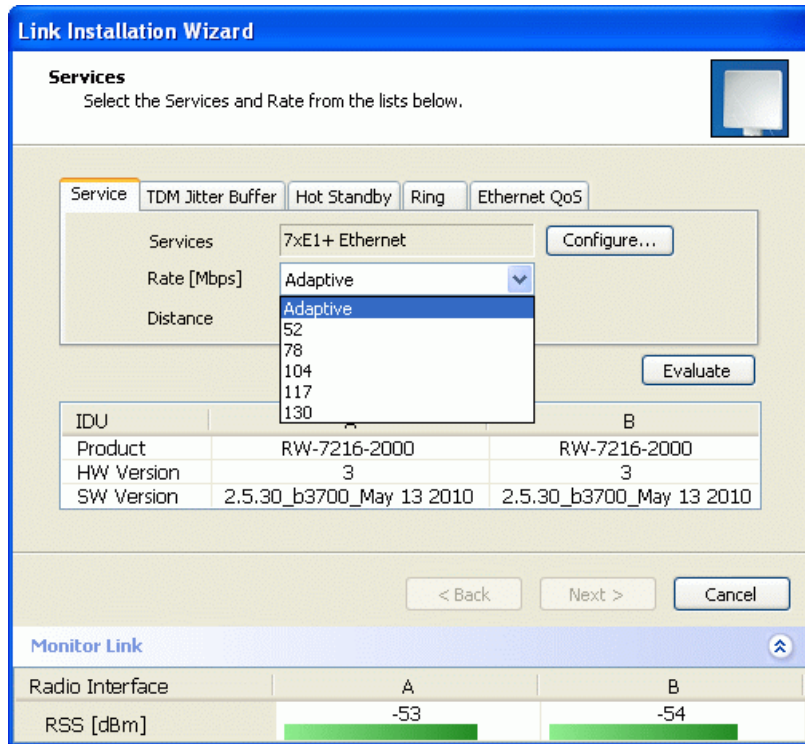
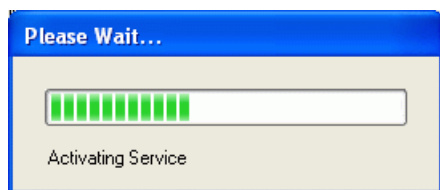


Figure 5-24: Services and Rates dialog: Available rates

➤ **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 5-24](#).

### 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 12](#). 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:

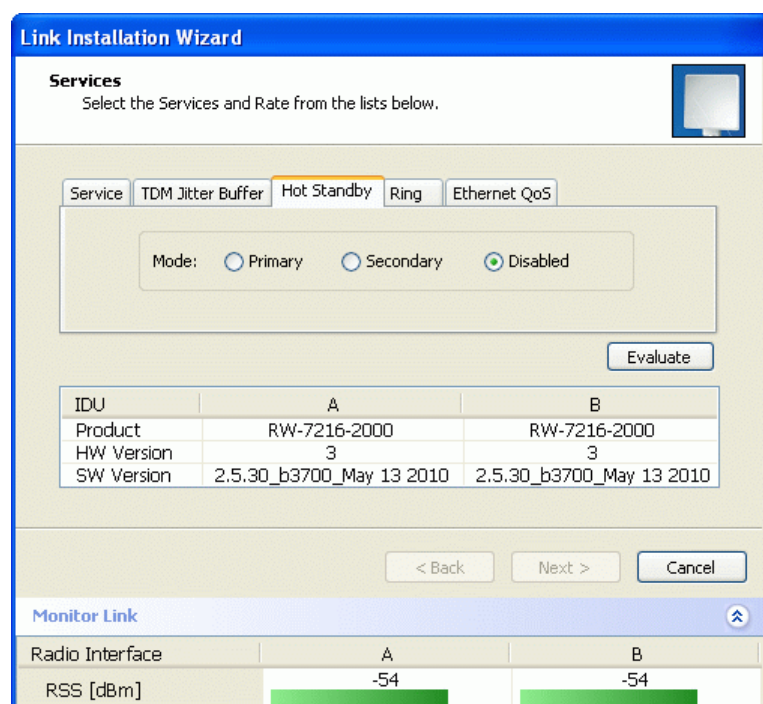


Figure 5-25: Choosing Hot Standby Mode

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

### ***Ethernet Ring***

To install and use the Ethernet Ring feature, see [Chapter 13](#).

### ***Ethernet QoS***

To install and use the Ethernet QoS feature, see [Chapter 25](#).

### ***Setting the TDM Jitter Buffer***

➤ To set the TDM Jitter Buffer size:

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

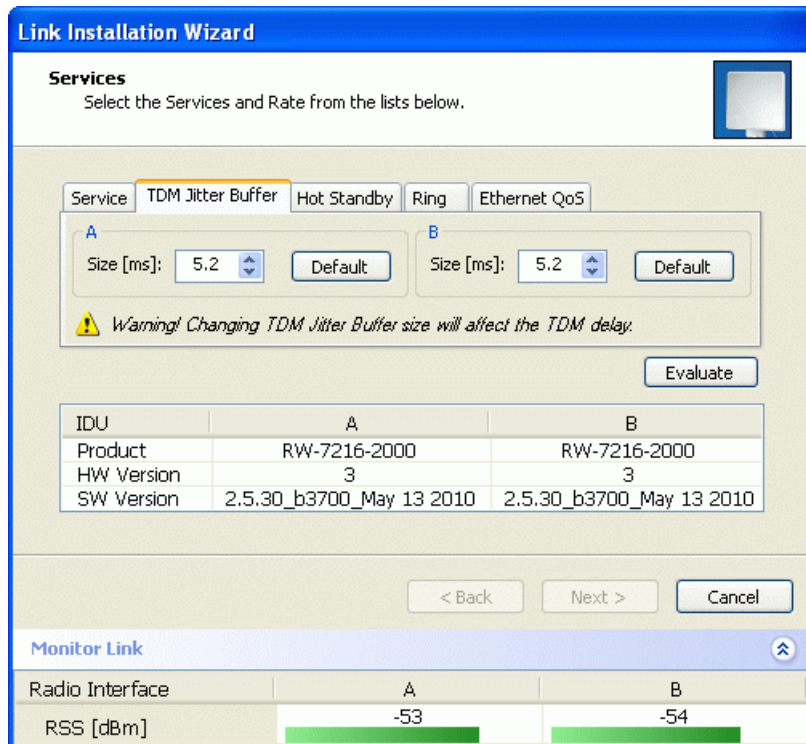


Figure 5-26: TDM Jitter Buffer Configuration



- 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.

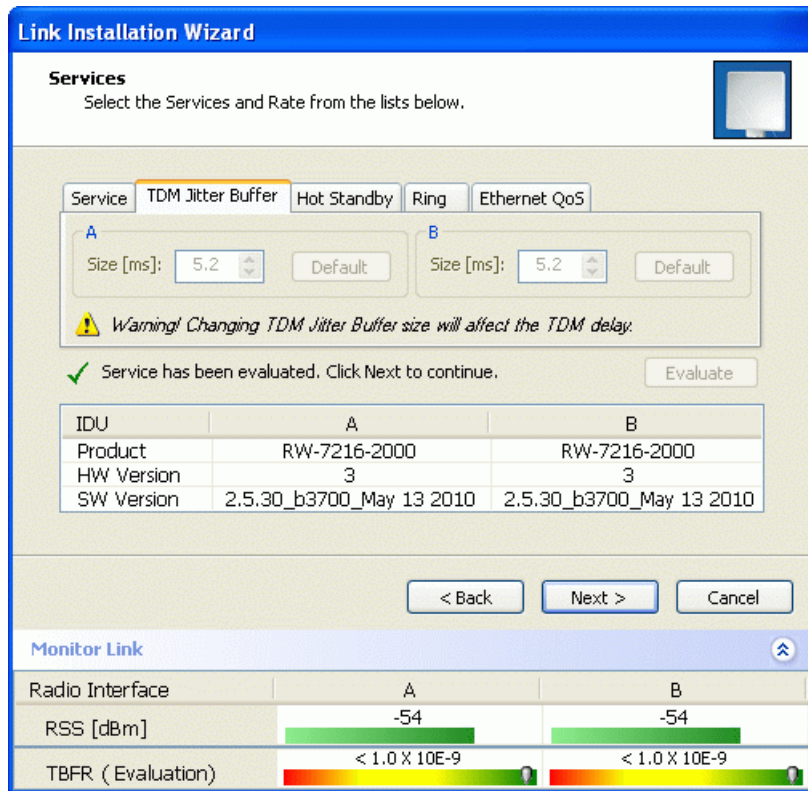


Figure 5-27: TDM Jitter Buffer Configuration - TBFR evaluation bar

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:

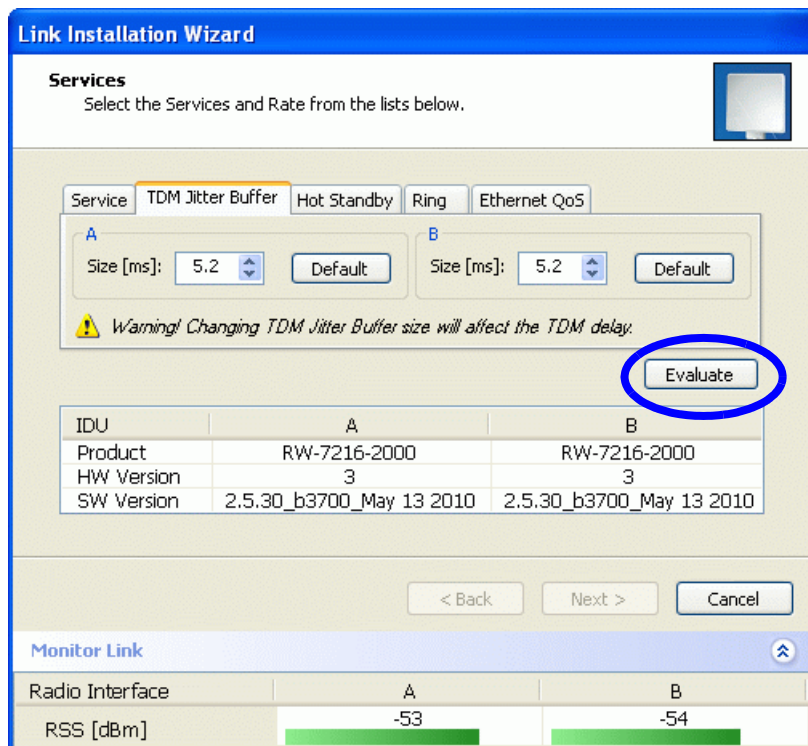


Figure 5-28: Services and TDM delay set - link ready for evaluation

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.



The transmission rates used by RADWIN 2000 are shown in [Table 5-3](#) above.

## Step 7, TDM Clock Configuration

The following dialog is displayed:

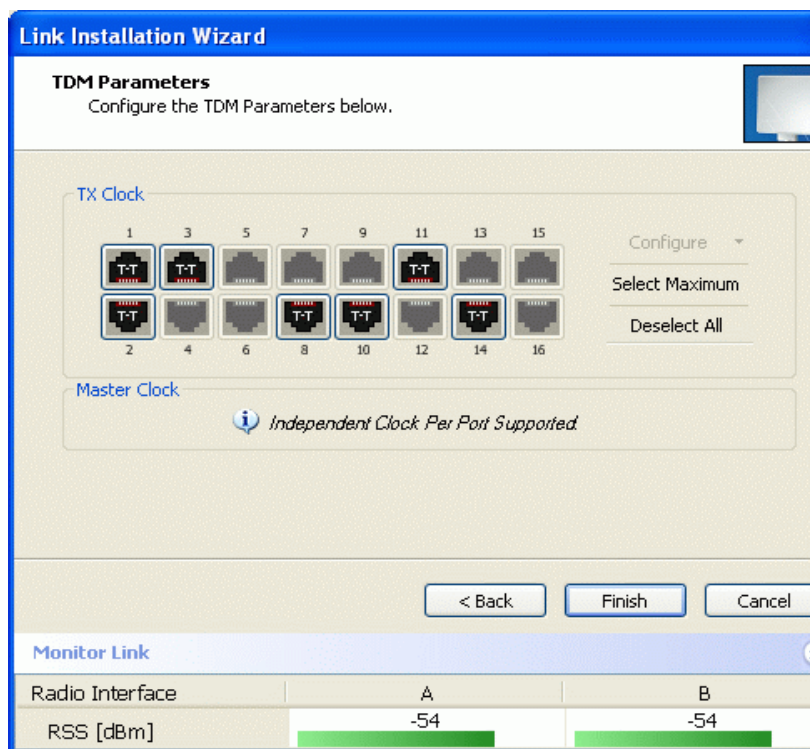


Figure 5-29: TDM Parameters Configuration (1)

### ➤ To configure TDM clock parameters:

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



- **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 5-30](#) below

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

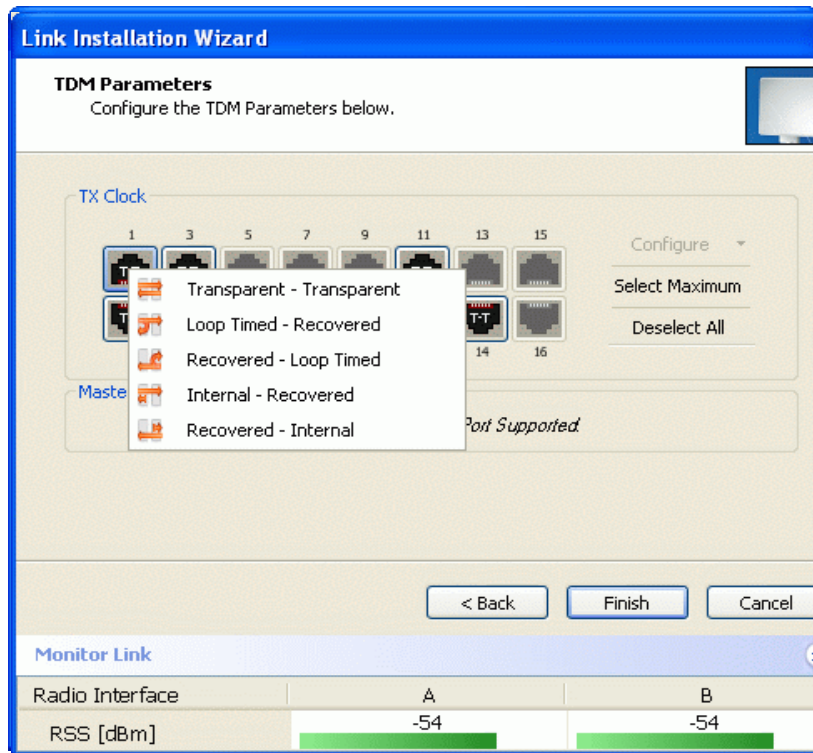


Figure 5-30: TDM Parameters Configuration (2)

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



**Note**

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

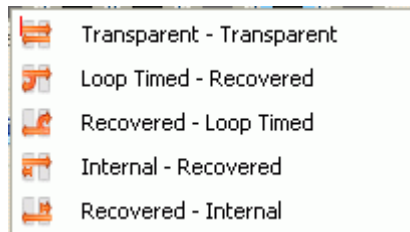


Figure 5-31: TDM Parameters

**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**

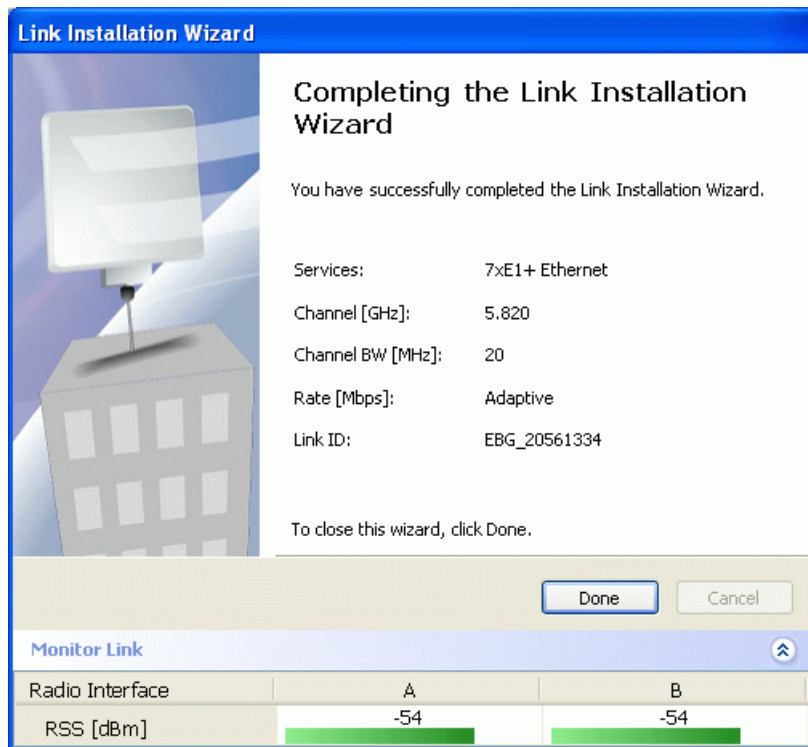
The Site A port uses its internal oscillator to generate its transmit clock while the Site B port regenerates the clock received at the Site A port.

**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.

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

**Step 8, Installation Summary and Exit**



*Figure 5-32: Installation Wizard Exit Summary*

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

The main window now reflects the installation:



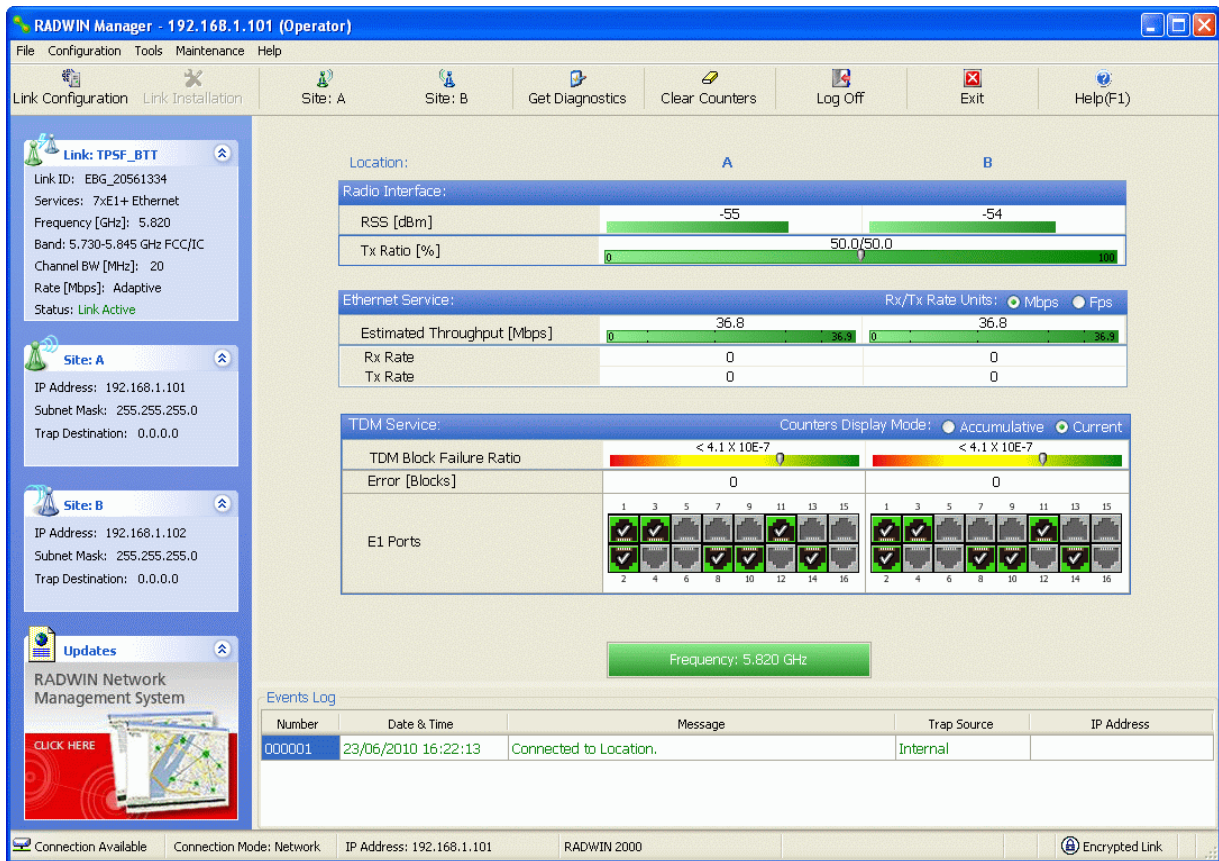


Figure 5-33: Main window of the Manager after installation with loaded trunks

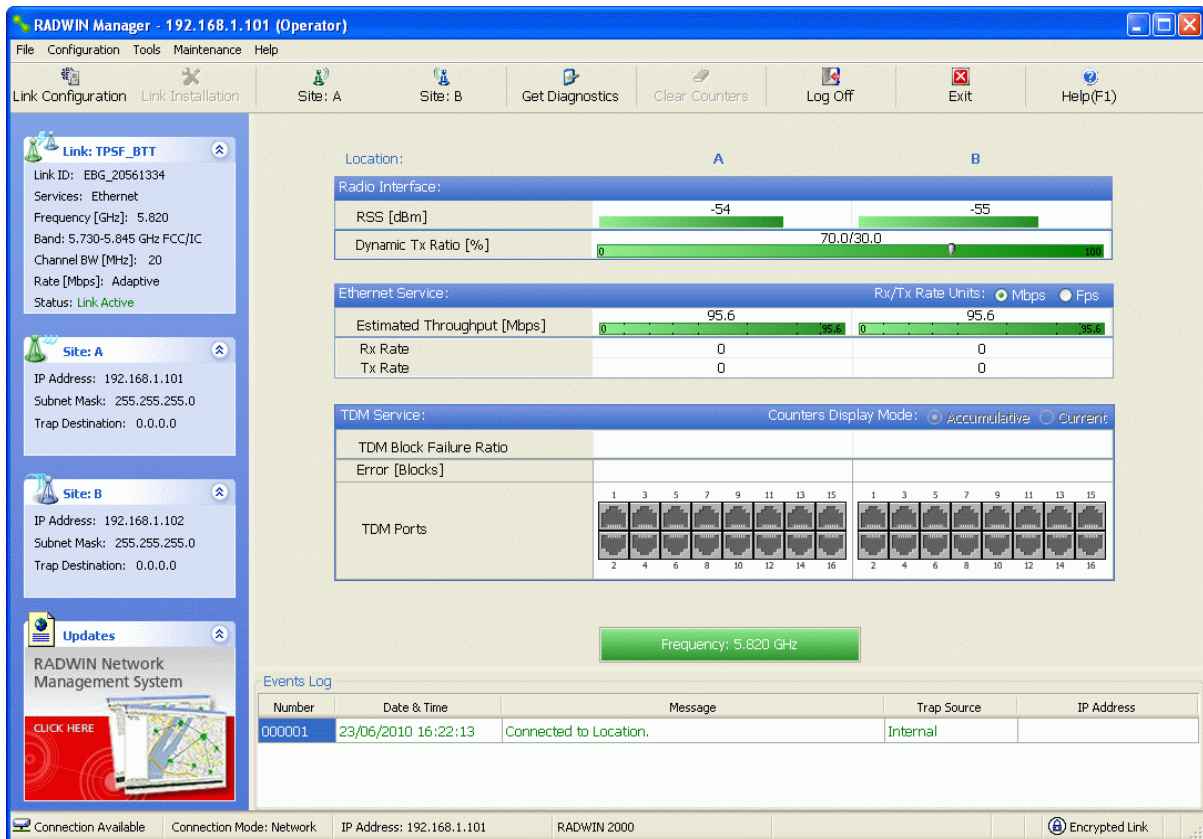


Figure 5-34: Main window of the Manager after installation with asymmetric capacity allocation - No HSS

Figure 5-34 shows the results of a 70%/30% Transmission ratio on a lone link (no HSS). Observe that near 100Mbps is available in either direction

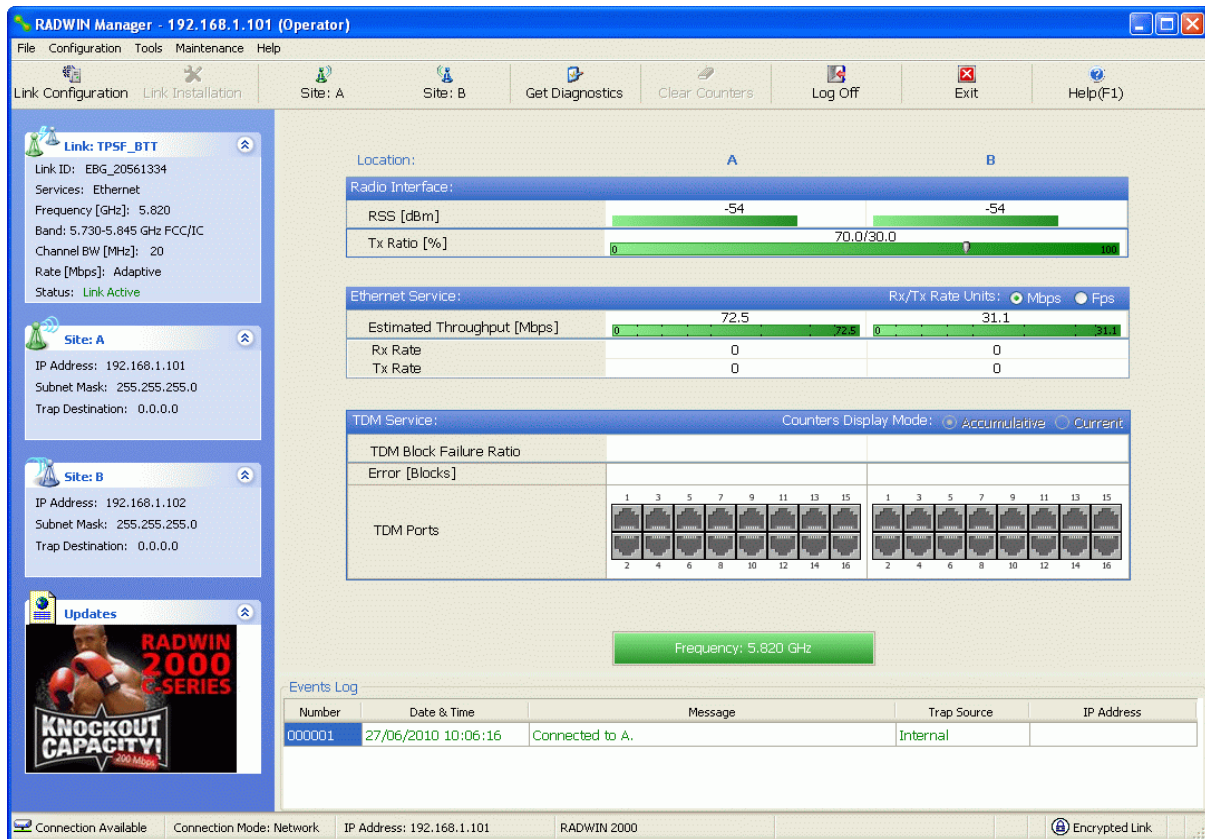


Figure 5-35: Main window of the Manager after installation with asymmetric capacity allocation - HSS enabled

Figure 5-35 shows the results of a 70%/30% Transmission ratio on a lone link with HSS. The allocation is “hard”.

➤ **To verify the installation:**

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



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 7](#).

# The RADWIN Manager: Main Window

## One Manager for all RADWIN Radio Products

The RADWIN Manager application is largely generic to all RADWIN Radio Products.

Functionality differences are minimal according to radio series (WinLink 1000 and RADWIN 2000) capabilities.

## The Main Window of the RADWIN Manager

Ensure that the RADWIN Manager is running.

The main window should look similar to that in [Figure 6-1](#):



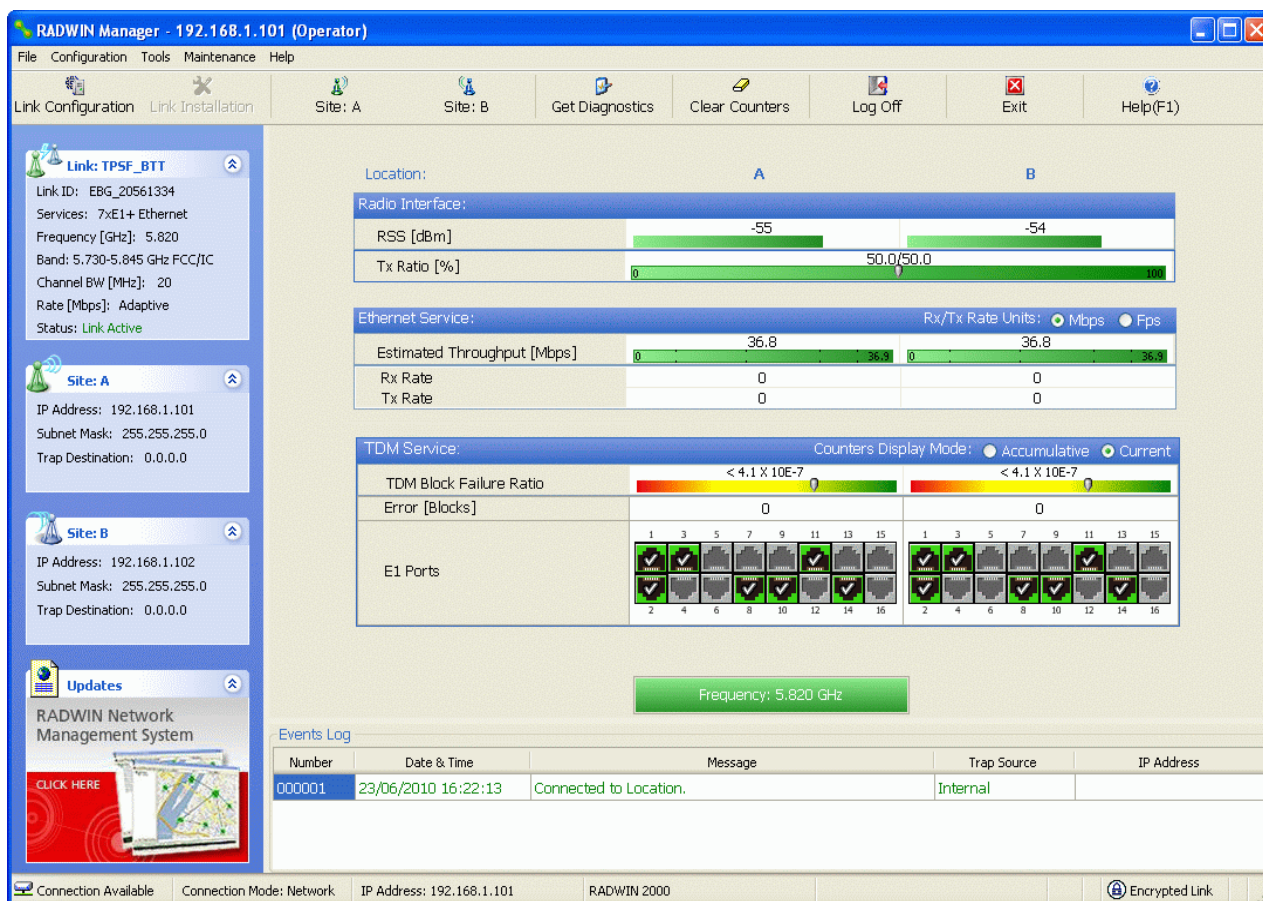
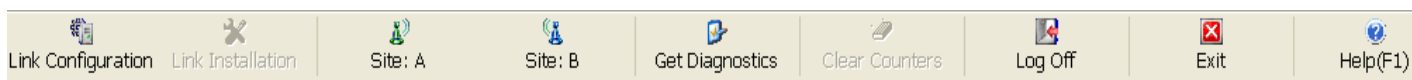


Figure 6-1: Main window, Wireless Link is Active

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 Toolbar

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 6-1](#):

Table 6-1: 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. <b>This button is disabled until a link installation has been completed</b>
Link Installation	Performs preliminary configuration of the system. <b>This button is disabled after the link is installed</b>
Site: <Site 1 name>	Opens the Site configuration dialog for <b>Site 1</b> . Same as <b>Configuration   1 Configure &lt;Site 1 name&gt;</b>

Table 6-1: RADWIN Manager Toolbar (Continued)

Item	Description
Site: <Site 2 name>	Opens the Site configuration dialog for <b>Site 2</b> . Same as <b>Configuration   2 Configure &lt;Site 2 name&gt;</b>
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:

File Configuration Tools Maintenance Help

The RADWIN Manager menu functionality is displayed in [Table 6-2](#).

Table 6-2: 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	
Configuration	Link Configuration		Run the Configuration Wizard. Not available in Installation Mode	<a href="#">Chapter 7</a>
	1 Configure <Site 1 name>		Opens the Site configuration dialog for <b>Site 1</b> . Has a path to return to Installation Mode	<a href="#">Chapter 8</a>
	2 Configure <Site 2 name>		Opens the Site configuration dialog for <b>Site 2</b> . Has a path to return to Installation Mode	
	Link Installation		Runs the Installation Wizard. Not available in Configuration Mode	<a href="#">Chapter 5</a>

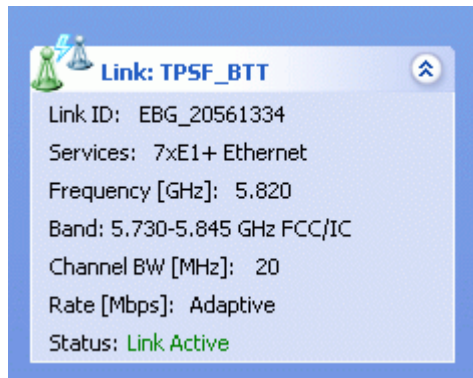
Table 6-2: RADWIN Manager main menu functionality (Continued)

Menu level			Function	Reference
Top	+1	+2		
Tools	Performance Monitoring Report		On screen and printable	Chapter 9
	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 15
	Spectrum View		Monitor and evaluate spectrum availability	Chapter 23
	Change Band (Installer only)		Change the link band	Chapter 20
	Change Password		Change the log-on password dialog	page 4-8
	Events Log	Clear Events	Clear local events log	page 9-17
		Save to File	Save events log file	
Preferences		Local preferences dialog		
Maintenance	Clear counters		Clear TDM counters	
	Loopbacks		Set TDM loopbacks	page 9-4
	Estimate Eth. Throughput		Estimate Ethernet throughput by transmitting full size frames over the air for 30 sec	page 9-11
	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 21
	Get Diagnostics Information		Obtain system information	page 9-1
	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 9-2](#).

The two lower left panels show basic link site details:

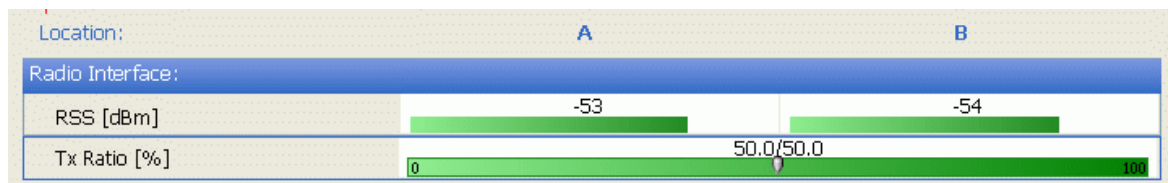


The three fields for each site are user definable. See [page 8-7](#).

### 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):

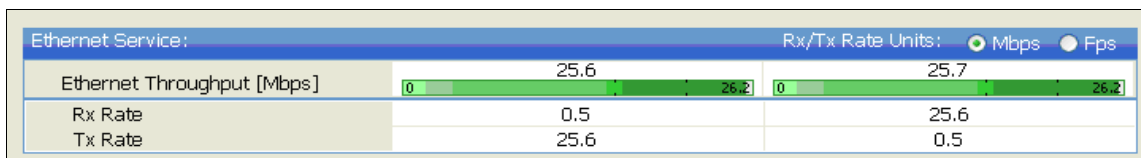
- Radio Interface, Received Signal Strength (RSS) in dBm and Transmission Ratio:



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

- Ethernet Service:

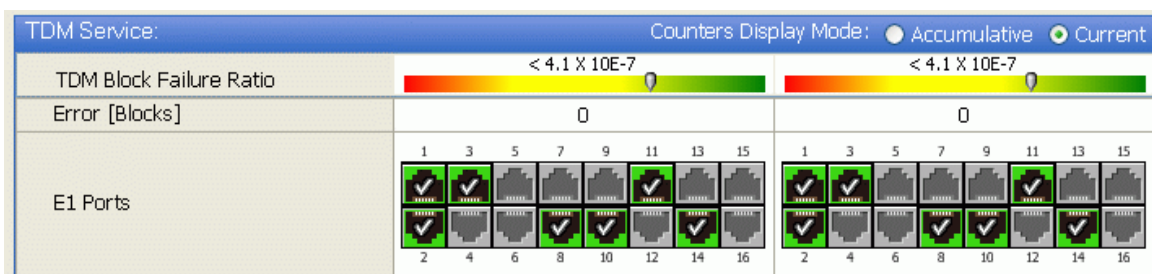




- *Estimated Ethernet Throughput:* The numbers are the current calculated throughputs at each site. The colored bars (with numbers) indicate the maximum possible throughput having regard for air conditions.
- *Rx and Tx Rates:* The Rx and Tx rates are the receive and transmit rates **on the LAN side** 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 new style 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: It shows the link frequency. The color of the box indicates the status



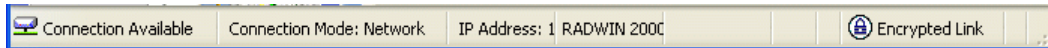
- **Green** is an active link
- **Red** is an inactive link
- **Magenta** indicates an authentication or compatibility problem
- **Brown** indicates severe compatibility problem

Events Log

The Events Log, stores alarms generated from both sides of the link and is detailed in [Chapter 9](#).

Events Log				
Number	Date & Time	Message	Trap Source	IP Address
000001	27/06/2010 10:06:16	Connected to A.	Internal	
000002	28/06/2010 16:11:31	TDM Counters were cleared for both sides	Internal	

**Status Bar**



The Status bar, displays the following icons:

Table 6-3: Status bar indicators

Icon or Label		Purpose
<b>Connectivity</b>		Shows if RADWIN Manager is communicating with the ODU.
<b>Connection available</b>		Connection mode to the ODU <ul style="list-style-type: none"> <li>Over-the-Air connection - using the IP address of the remote unit.</li> <li>Local connection - direct connection to the IDU without using an IP address.</li> <li>Network connection - through a LAN</li> </ul>
		ODU unreachable
<b>IP Address</b>		Log on IP address
<b>Encryption indicator</b>		Normally encrypted link
		Unencrypted link - lock open
		Link password validation failed. The link is encrypted with default keys. Service and configuration are unavailable. Change the link password.
<b>Link Lock</b>		Link Lock enabled
		Link Lock encrypted
		Link Lock mismatch
<b>Ethernet Ring Member</b>		
<b>DFS in use</b>		
<b>Rescue Alarm</b>		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:





# 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 5](#).

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.

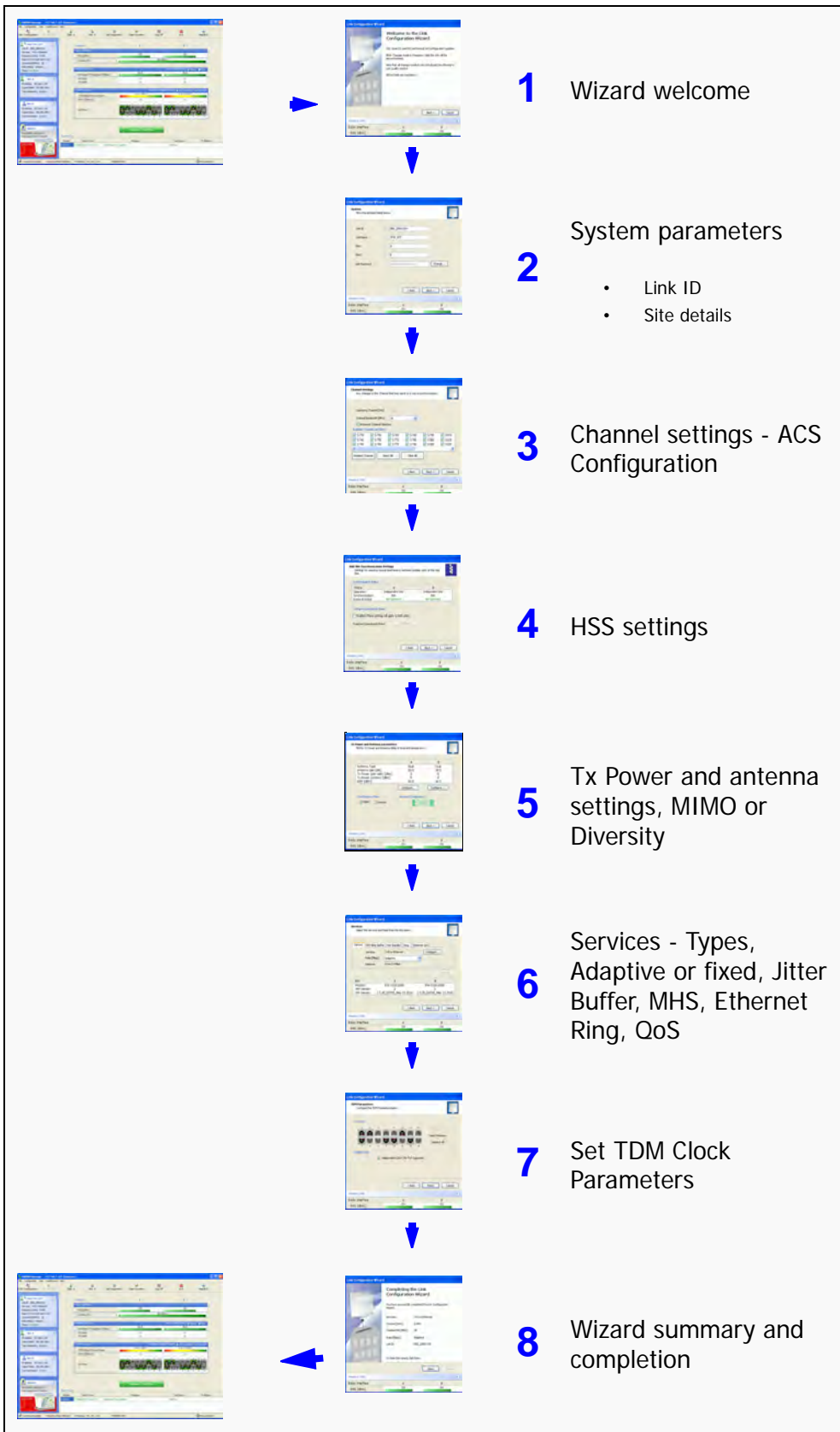
For ease of use, the Link Configuration wizard follows the same pattern as Link Installation. You should therefore be familiar with the content of [Chapter 5](#).

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 7-1](#) below.

Table 7-1: Link Configuration Wizard



## 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 5](#).

The Configuration Wizard opens:

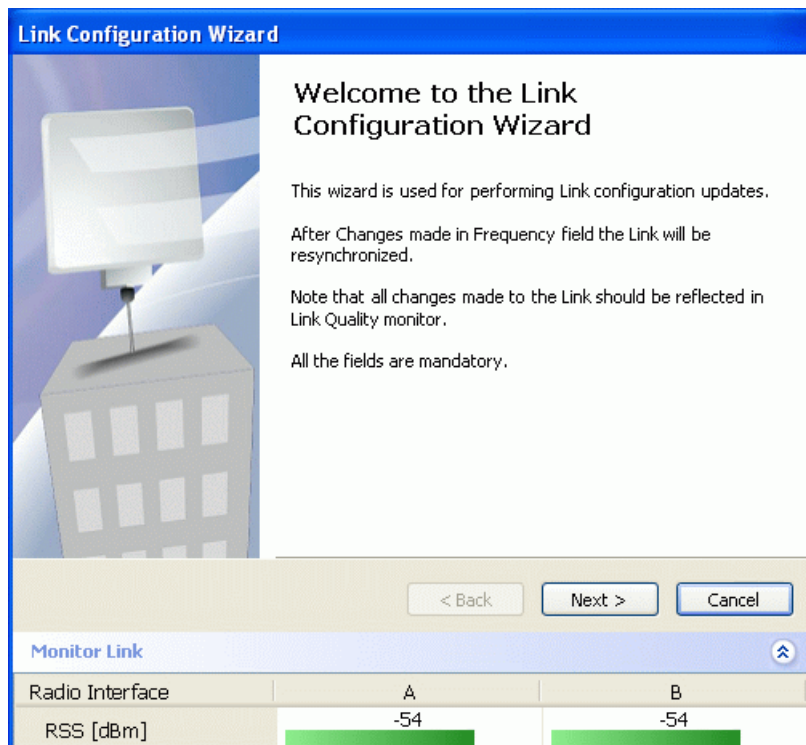


Figure 7-1: Link Configuration Wizard

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

### Step 2, System Parameters

The System dialog box opens:

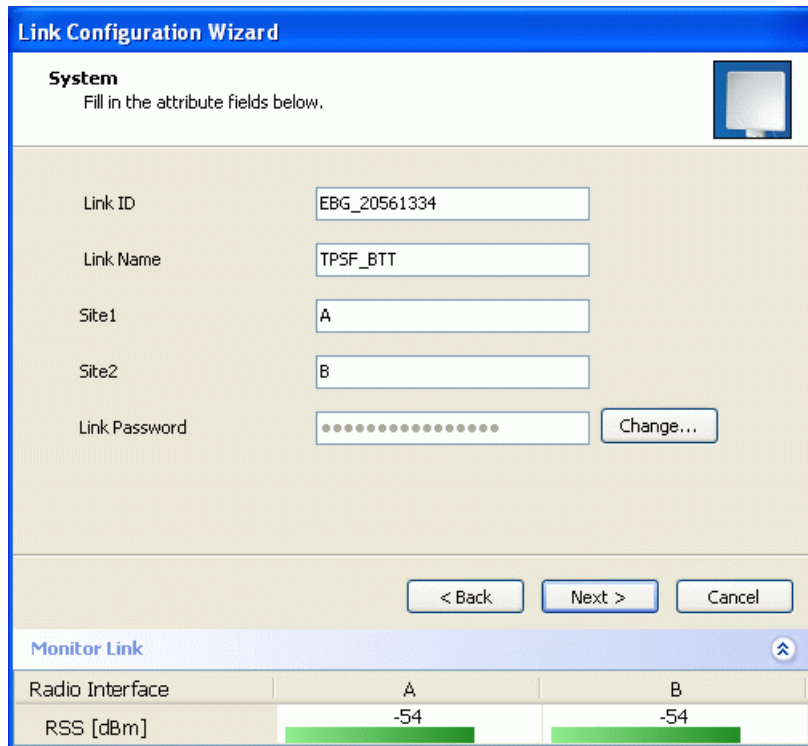


Figure 7-2: Configuration Wizard, System dialog box

The System attributes may be edited and the Link Password may be changed exactly as in the corresponding Link Installation step on [page 5-5](#).

Click **Next** to continue.

### Step 3, Channel Settings

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

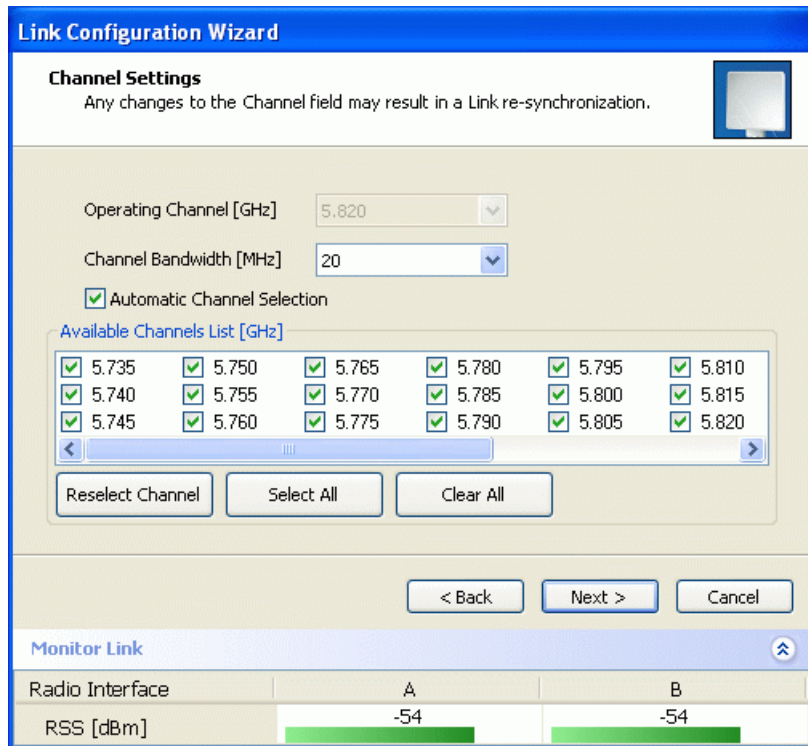
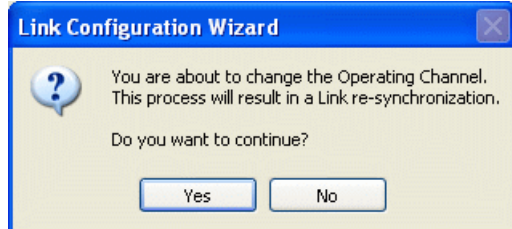


Figure 7-3: Channel Settings dialog box - Automatic Channel Selection

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:



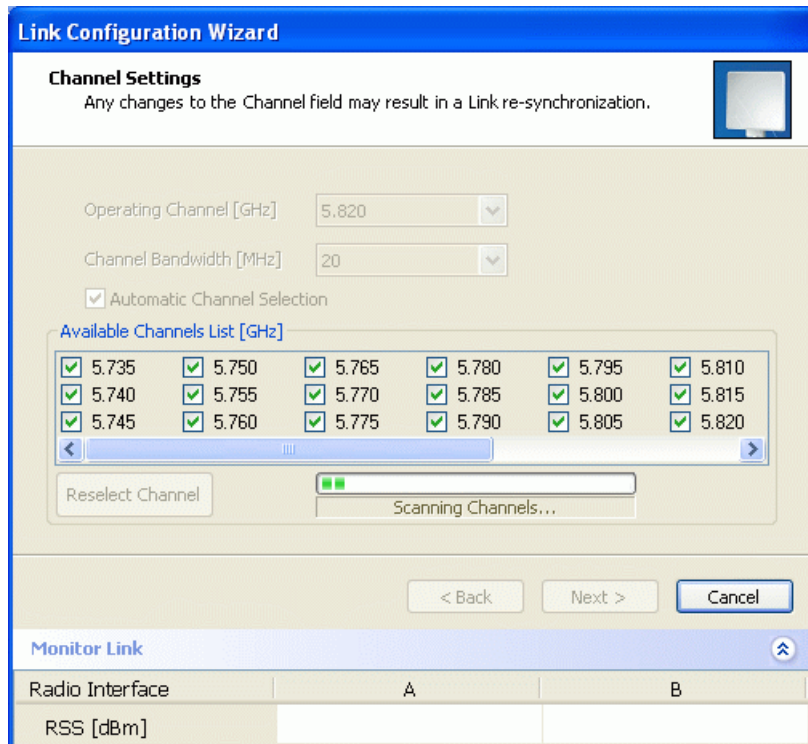


Figure 7-4: Searching for the best operating channel

The link will return to the status of [Figure 7-3](#) above with a possible change to the operating channel.

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

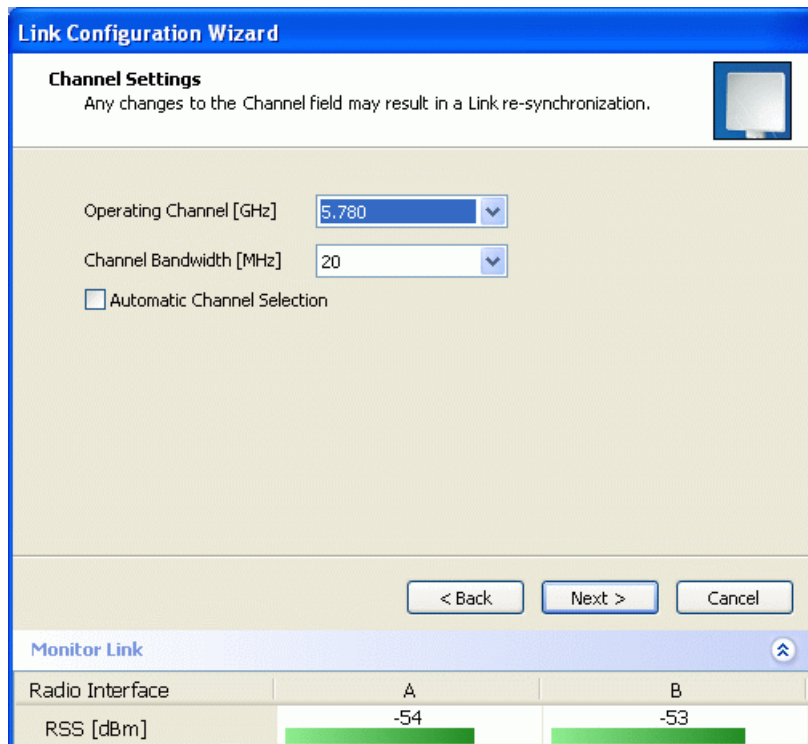


Figure 7-5: Channel Settings without automatic channel selection

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

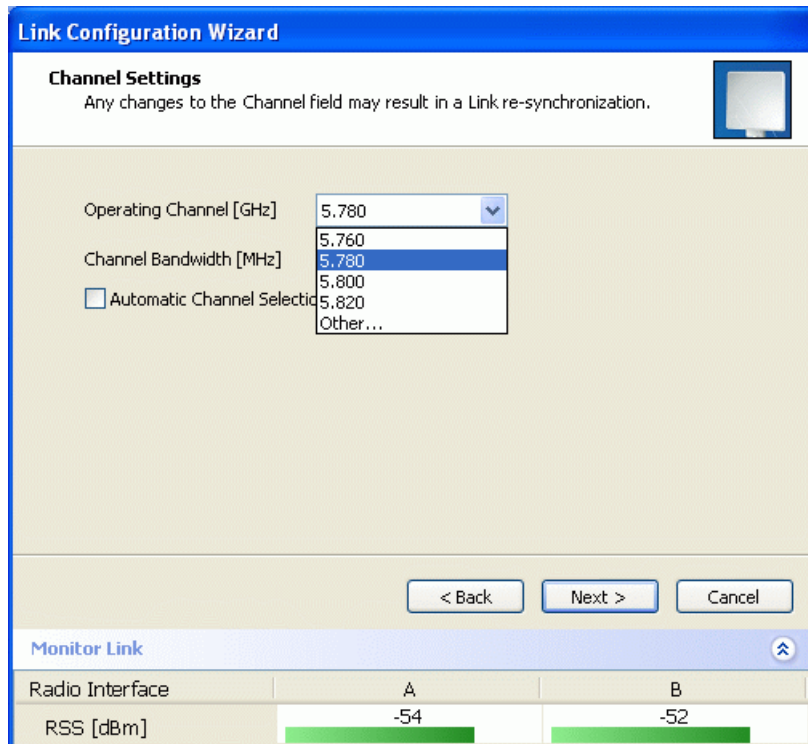


Figure 7-6: Channel frequency options

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

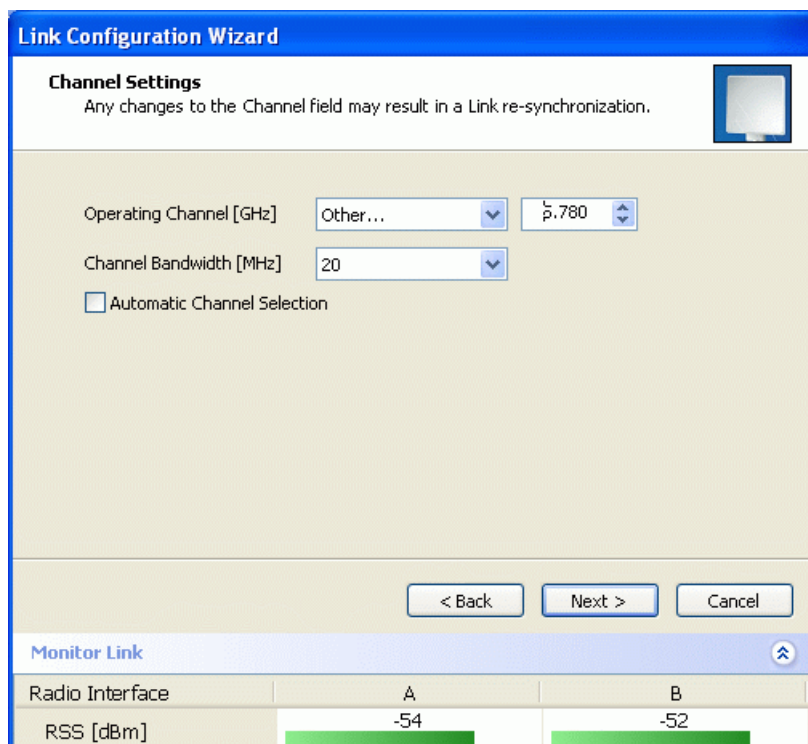


Figure 7-7: Choosing an “Other” Operating Channel frequency

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

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

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:

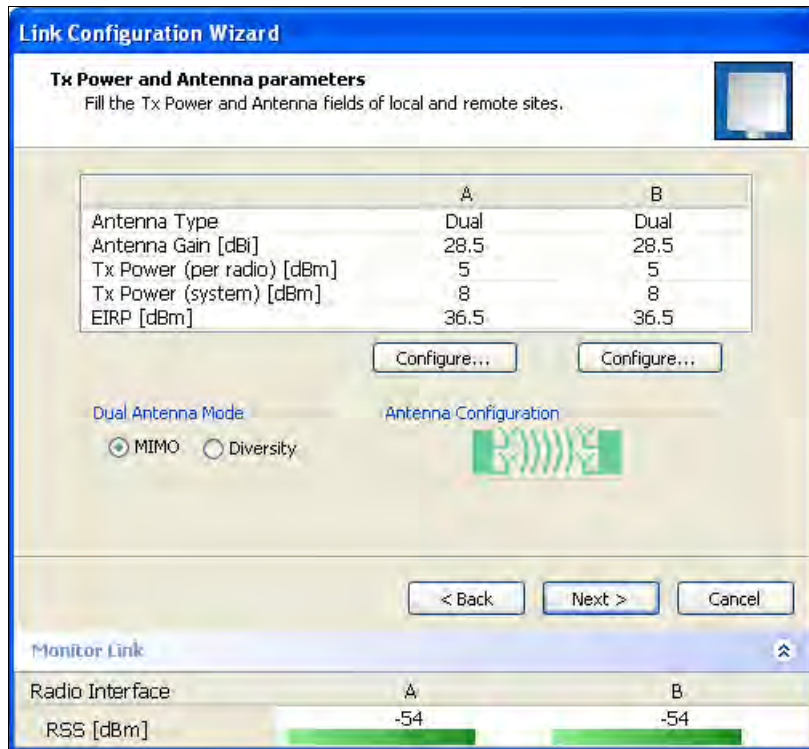


Figure 7-8: Transmission Power and Antenna Parameters

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:

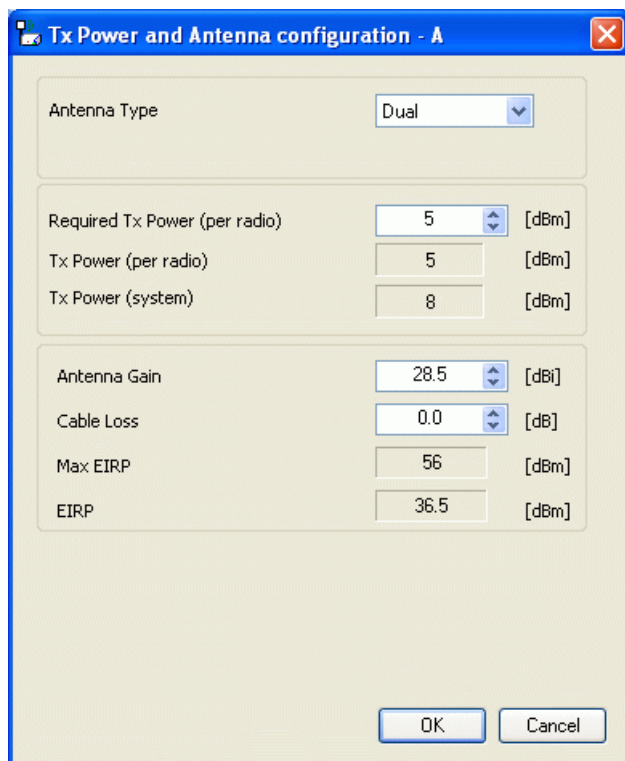
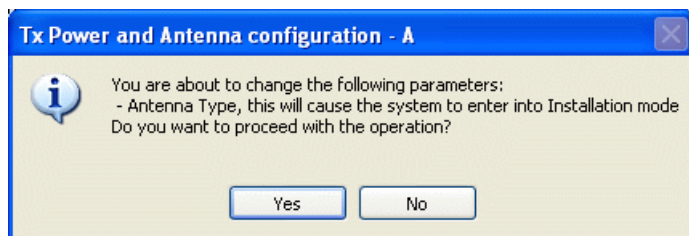


Figure 7-9: Antenna configuration dialog with opened type selection

(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:



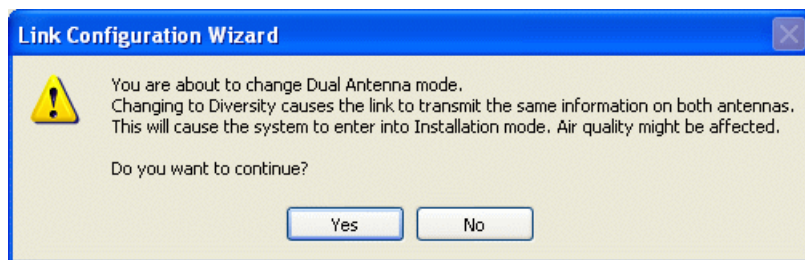
In this context, entering Installation mode causes a service break until it is restored by running the Installation wizard.

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

You may also change the Required Tx Power, Antenna Gain and Cable Loss. The procedure is the same as that set out in the Installation procedure on [page 5-13](#).

### Switching Between Single and Dual Antennas

Single/Dual Antenna mode selection works precisely the same way as shown on [page 5-20](#). If you use this option you will receive a warning similar to this:



### Switching Between MIMO and Diversity Modes

A similarly worded warning applies to a 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

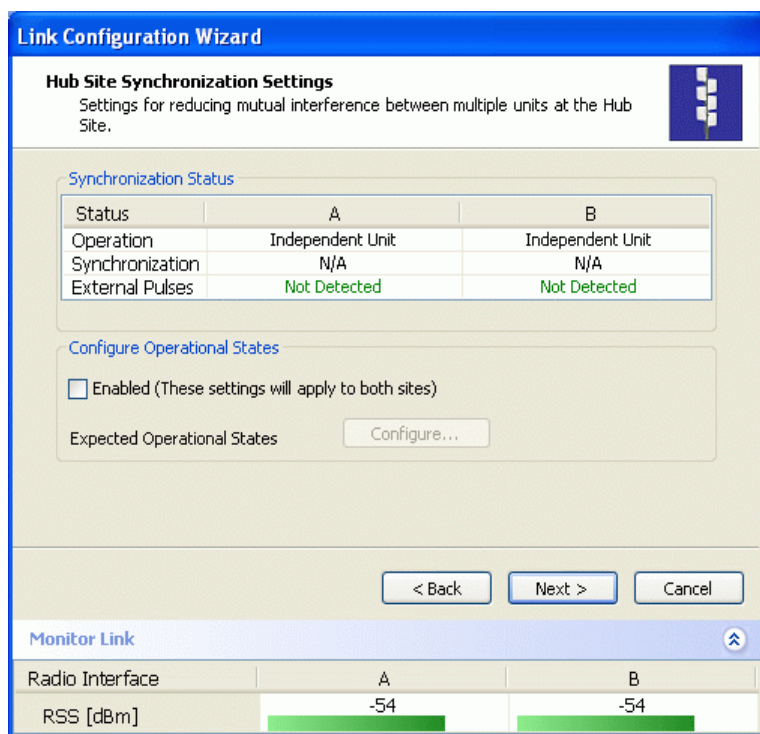


Figure 7-10: HSS Settings

The Synchronization Status dialog box displays the current status of each side of the link. See [Chapter 10](#) for instructions about installing and configuring collocated links. If you do not require HSS, click **Next**.

## Step 6, Services

Here is the services dialog:



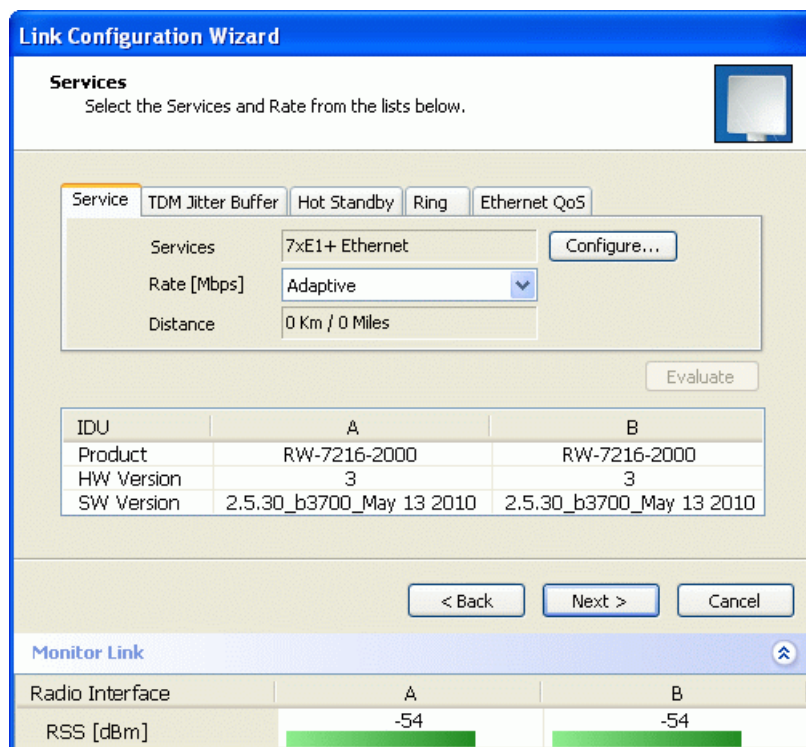


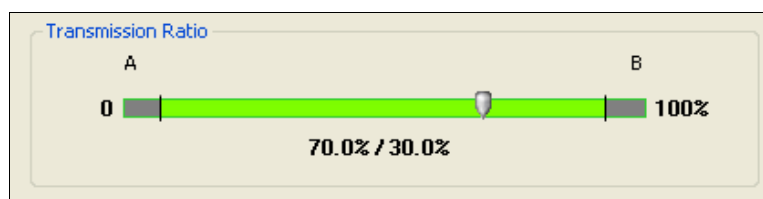
Figure 7-11: Services and Rates dialog

To choose Services, see the corresponding Installation procedure in [Chapter 5](#).

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 7-11](#), 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 5](#).

Click **Next** to continue.

## Step 7, TDM Clock Configuration

The following dialog is displayed:

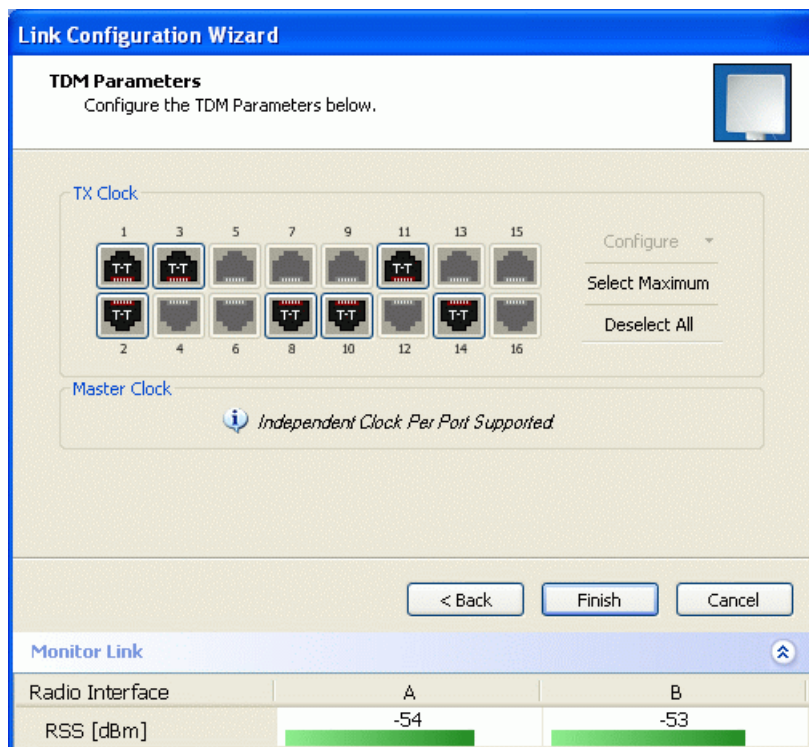


Figure 7-12: TDM Parameters Configuration

To configure the TDM Parameters, see the corresponding procedure in [Chapter 5](#).

## Step 8, Configuration Summary and Exit

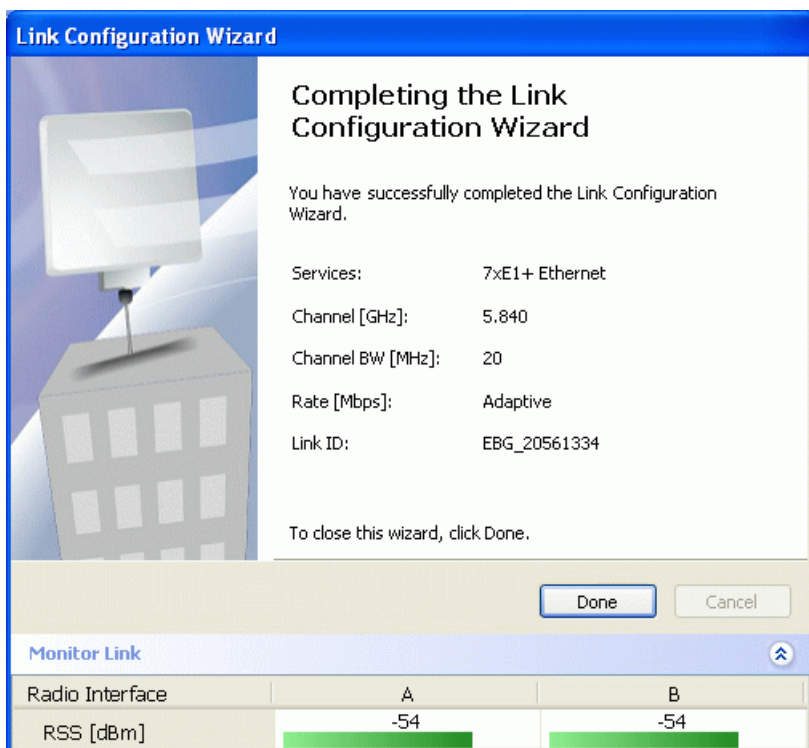


Figure 7-13: Configuration Wizard Exit Summary

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

The main window now reflects the configuration:

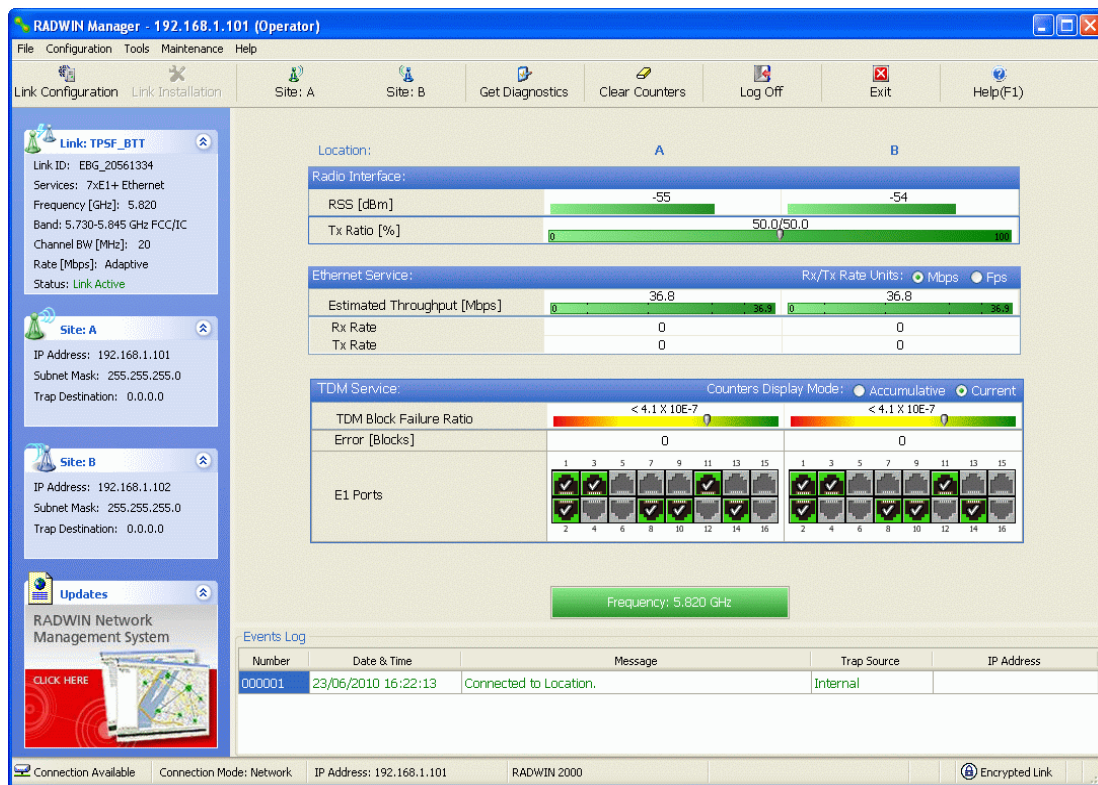


Figure 7-14: Main window of the manager after configuration



# 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.

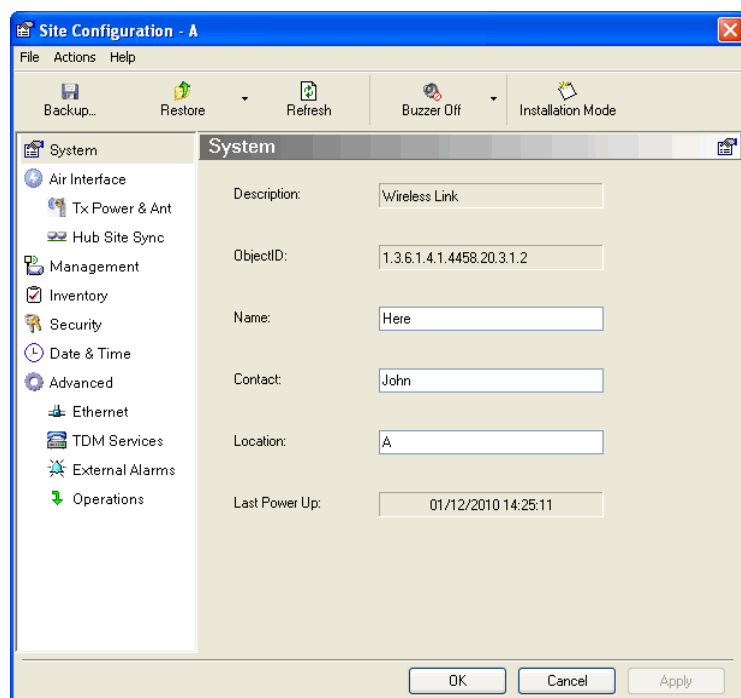


Figure 8-1: Configuration Dialog Box

**Functions on the left of the dialog box:**

<b>System</b>	Edit the contact person and location details. View the system details
<b>Air Interface</b>	Change the Tx Power, cable loss, antenna type and settings. View HSS settings
<b>Management</b>	Configure the IP address, Subnet Mask, Default Gateway, Trap Destination and VLAN
<b>Inventory</b>	View the hardware and software inventory (product identification, versions, MAC address and serial number)
<b>Security</b>	Change the Community Values and the Link Password. Set Link Lock.
<b>Date and Time</b>	Set the date and time of the link from an NTP servers or from the managing computer
<b>Advanced</b>	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:**

<b>Backup</b>	Save the current ODU software to a file
<b>Restore</b>	Restore an ODU's software or configuration from a backup file created by the backup facility
<b>Refresh</b>	Refresh current panel with latest values
<b>Installation Mode</b>	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 8-1](#) 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:

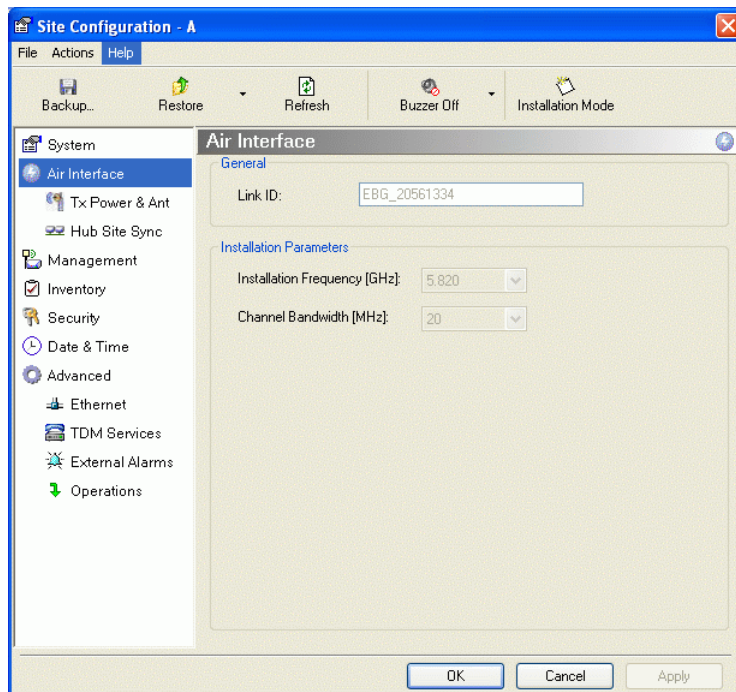


Figure 8-2: Air interface details

## Changing the Transmit Power

Each site can have a different Tx Power level.

➤ **To change the Transmit Power:**

1. Choose a site to configure.  
The Configuration dialog box opens.
2. Choose Air Interface (see [Figure 8-3](#)).
3. Choose the required Transmit (Tx) Power Level.
4. Click **Apply** to save the changes.

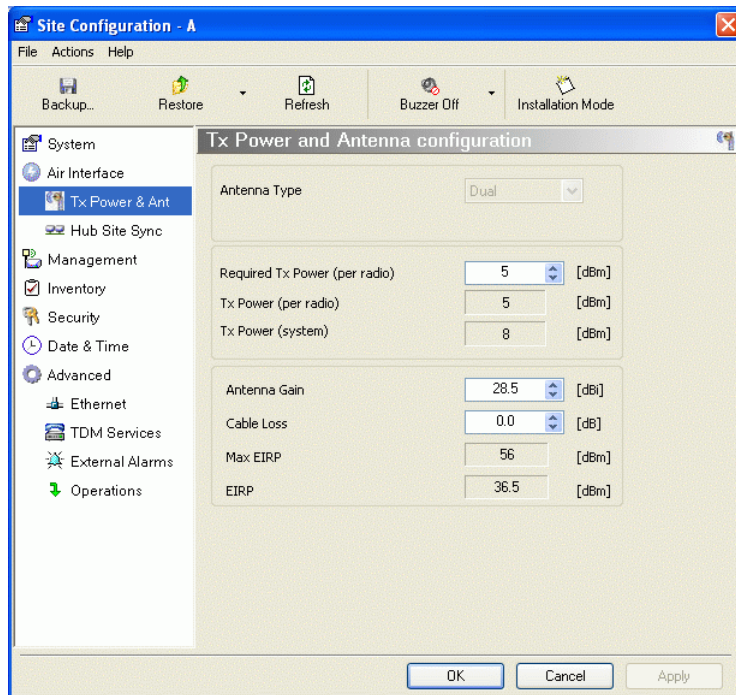


Figure 8-3: Changing the Transmit Power

For detailed explanation about the relationship between these parameters, see page [5-13](#) to [5-21](#).



**Caution**

Changing the Tx Power will affect service quality. The same considerations apply here as were noted in the Installation procedure on [page 5-17](#).

## Hub Site Sync

Here you can view the HSS status:

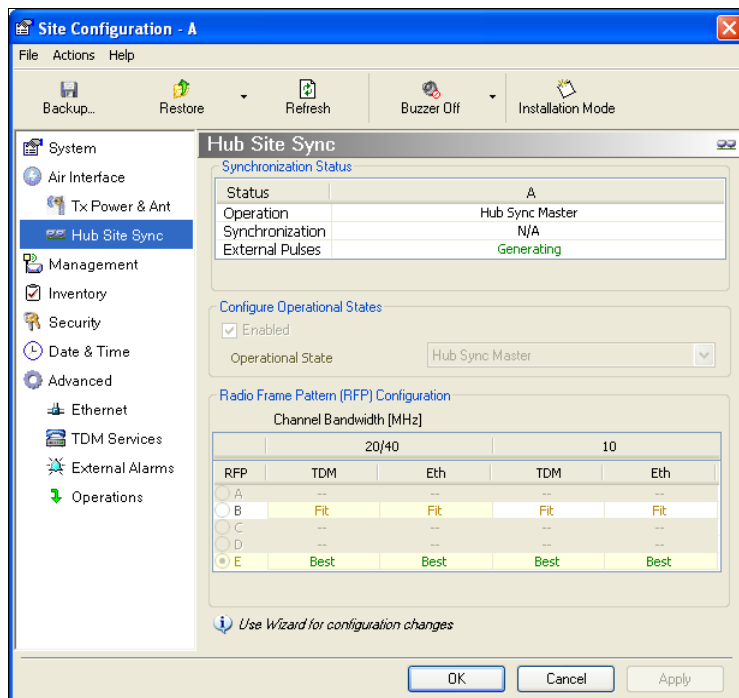


Figure 8-4: HSS Status

## 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 19](#) for detailed instructions about the best way to do this on-site.

See [Chapter 14](#) 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:

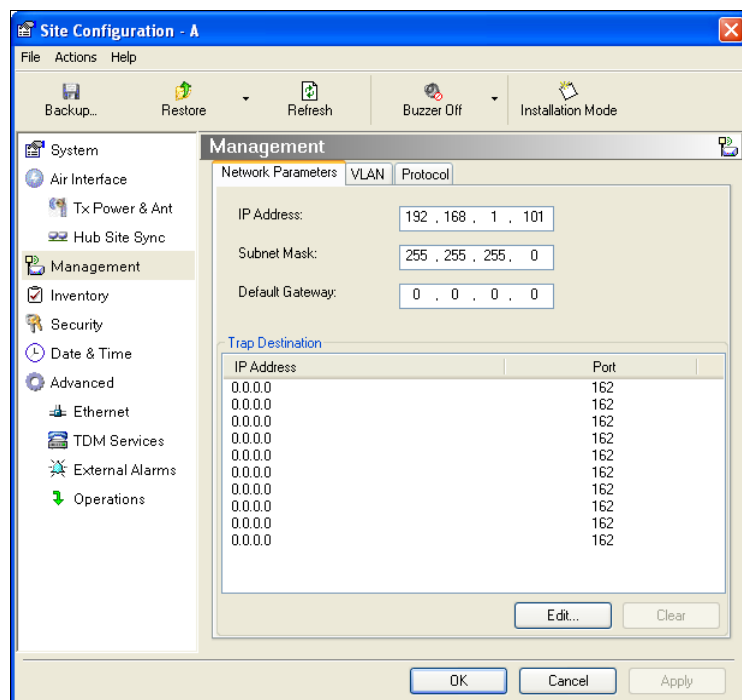


Figure 8-5: Management Addresses - Site Configuration dialog box

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



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

7. Enter the Subnet Mask.
8. Enter the Default Gateway.
9. Enter the Trap Destination. This could be the IP address of the managing computer. The events log will be stored at this address.
10. Click **Apply** to save the changes.

### Configuring VLAN Settings



VLAN 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.
5. Check the **Enabled** box.
6. Enter a VLAN ID. Its value should be between 1 and 4094.

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

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



**Caution**

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

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

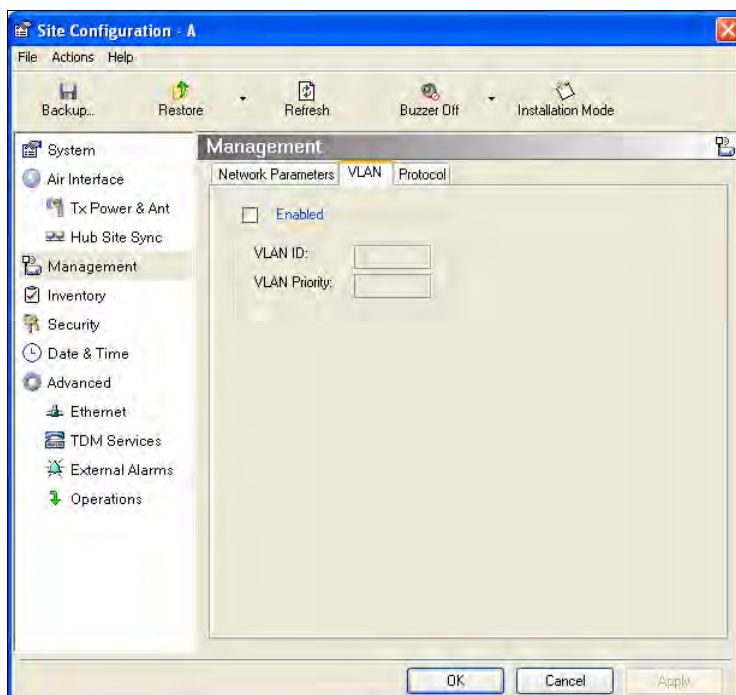


Figure 8-6: Configuring management traffic VLAN Settings

## Lost or forgotten VLAN ID

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



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

### Enable / Disable Telnet Access

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:

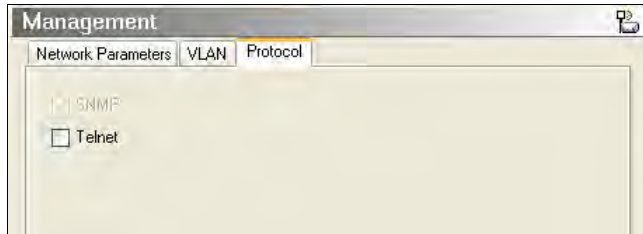


Figure 8-7: Enable/Disable Telnet Access

## Displaying the Inventory

➤ To view the inventory data

1. Choose a site from the main menu.  
The Configuration dialog box opens.
2. Choose Inventory.

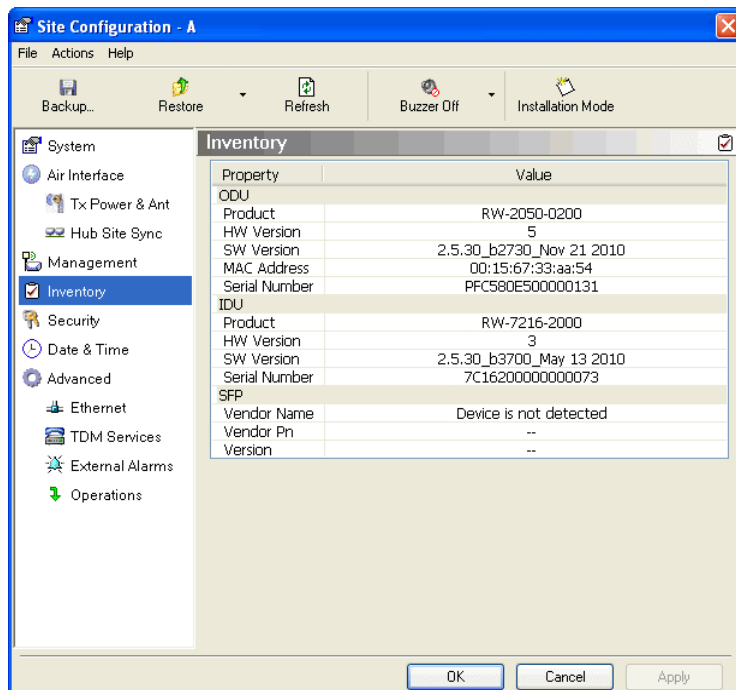


Figure 8-8: Inventory window

## Security Features

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

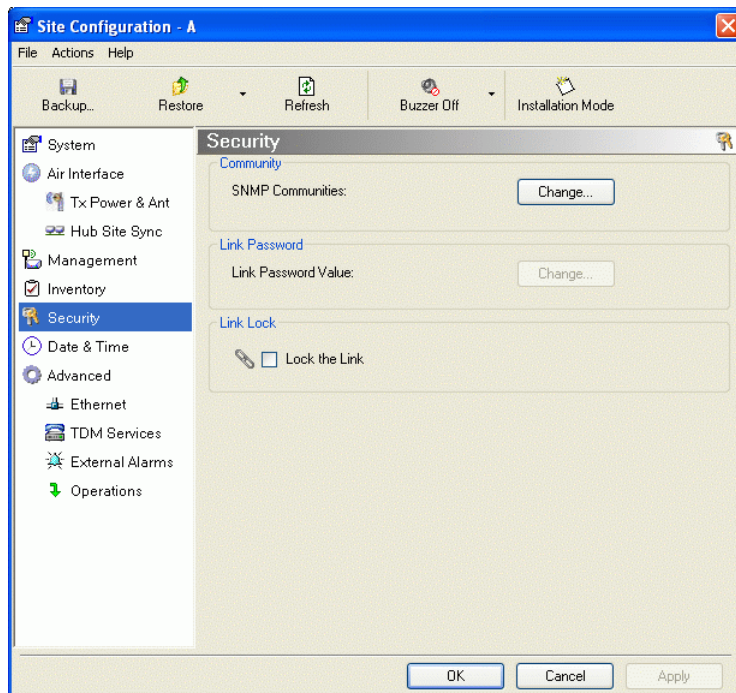


Figure 8-9: Available security features

### Changing the Link Password

This item is only available when the link is down. Otherwise, it works the same way as the corresponding item on [page 5-8](#).

### RADWIN Manager Community Strings

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

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

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

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

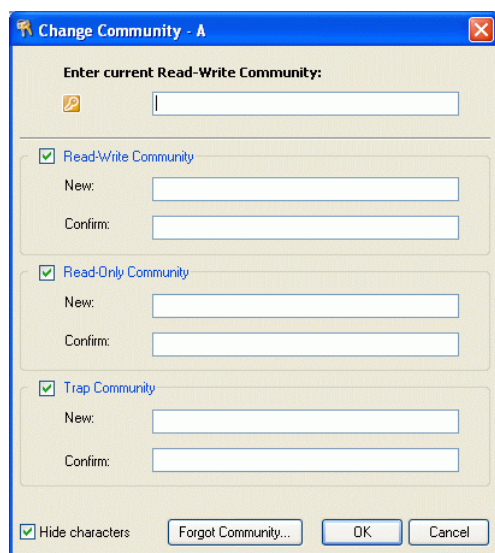


Figure 8-10: Changing the Community String

## Forgotten Community string

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

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

When you have the alternative Community key, click the **Forgot Community** button and enter the Alternative Community key (Figure 8-11). Then change the read-write Community string.

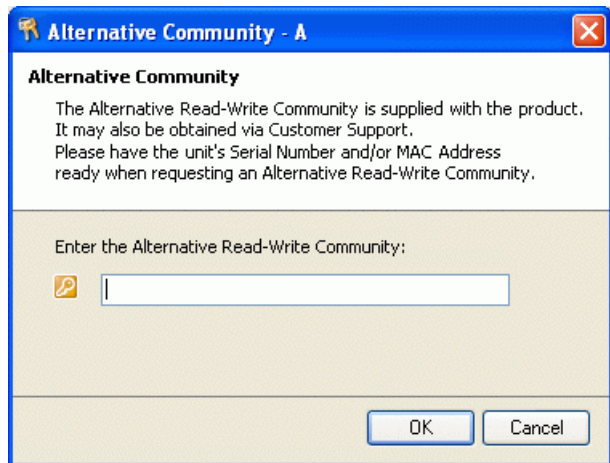


Figure 8-11: Alternative Community Dialog box

## Link Lock Security Feature

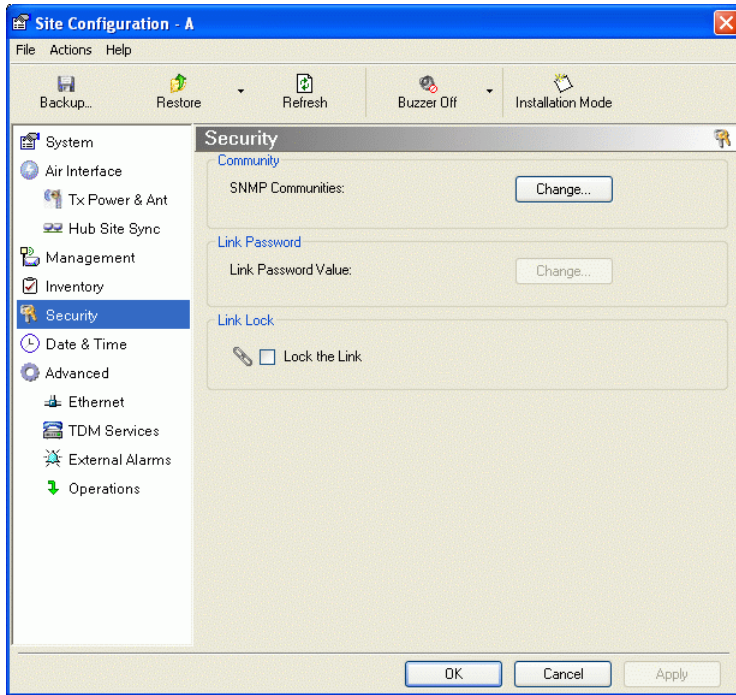
Link Lock is a part of RADWIN's security concept intended to meet a form of abuse encountered in the field. It is designed to prevent the situation where a remote ODU can be stolen and used as a "pirate" link to steal services or information. The Link Lock feature actually locks the local ODU to be synchronized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

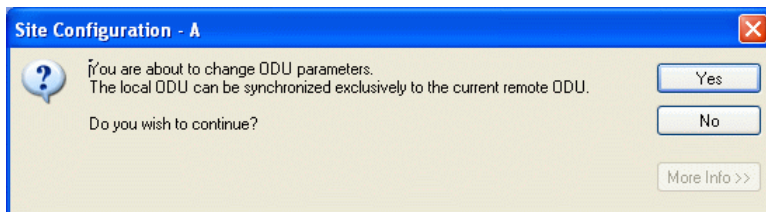
Link Lock can only be removed when the link is unsynchronized. In such a case, an alarm is raised by the RADWIN Manager.

### ➤ 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:



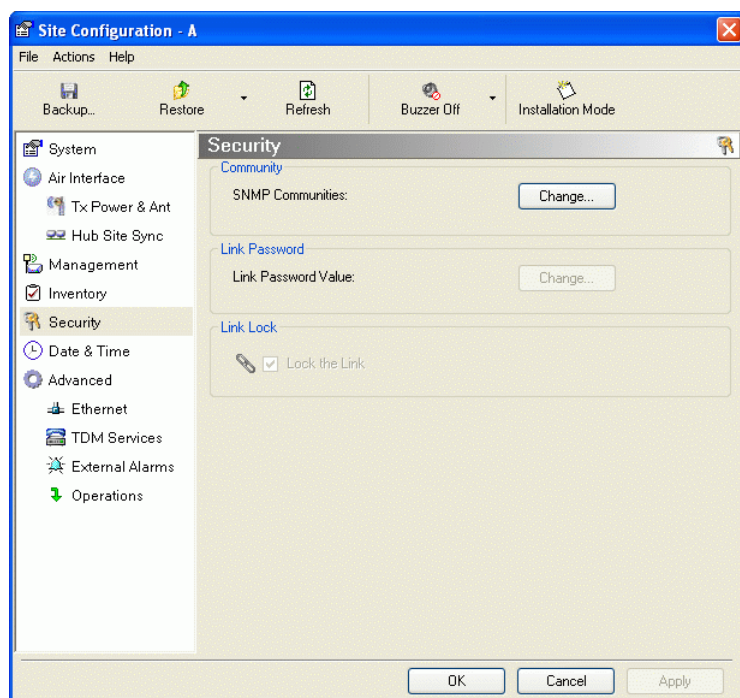
4. Click the **Yes** button and you are returned to the main window of the RADWIN Manager.

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. If you repeat steps 1 and 2 above, the Security screen will look like this:





The Link Lock check-box is now unavailable.

5. If required, repeat the procedure for Site B.



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:

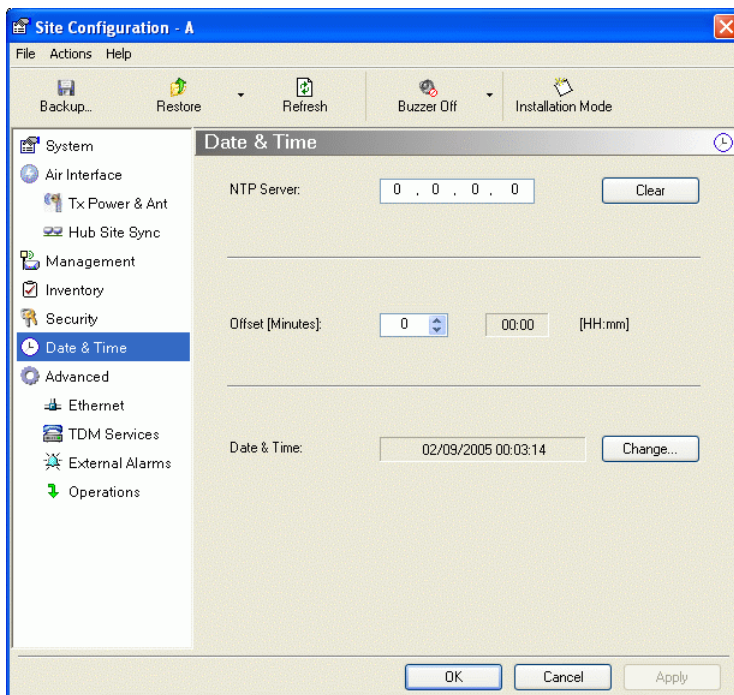


Figure 8-12: Date and Time Configuration

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<sup>1</sup>.
7. To manually set the date and time, click Change and edit the new values.

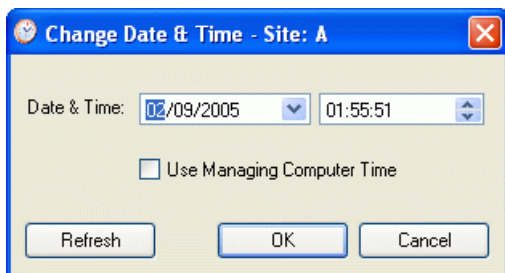


Figure 8-13: Change Date and Time

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

1. Greenwich Mean Time



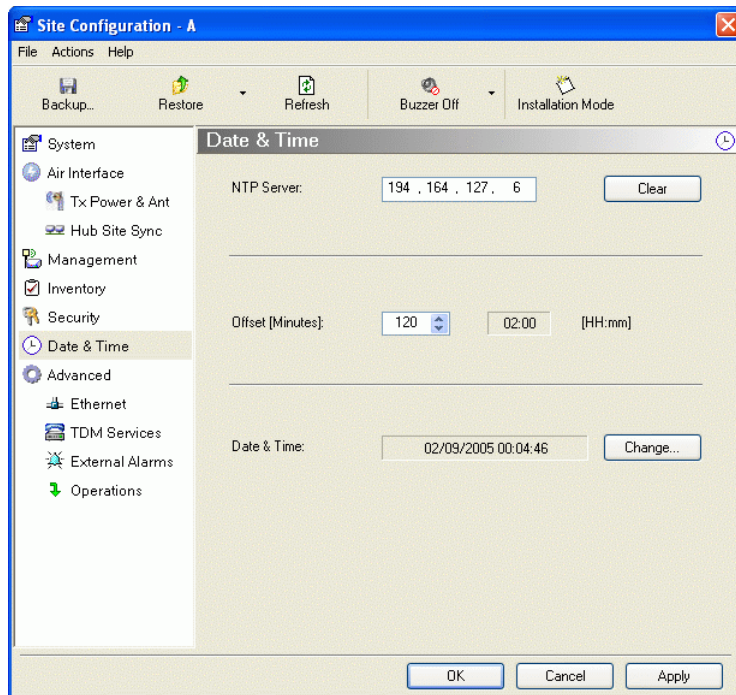


Figure 8-14: Date and Time configured from an NTP Server

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

## Ethernet Properties

### *Configuring the Bridge*

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

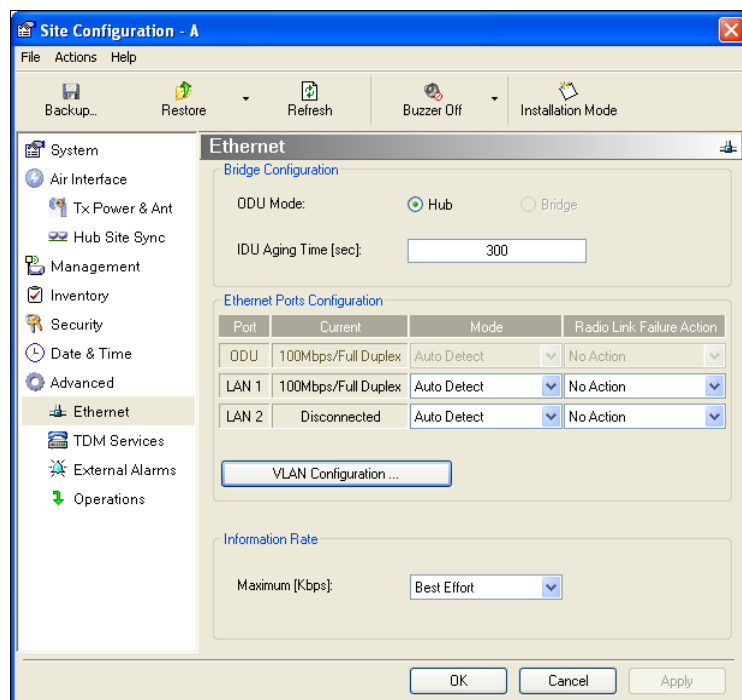


Figure 8-15: Bridge, VLAN and MIR Configuration

### ODU Mode



RADWIN 2000 C-Series ODU products work in Hub mode only. The bridge capability is built in to the IDU-C (it is not configurable). If an IDU-C is connected to an RADWIN 2000 C ODU, then the IDU-C performs the bridging.

This parameter controls the ODU mode with two optional values:

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



Changing these modes requires system reset.

### IDU Aging time

This parameter controls the IDU aging time.

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

The default value is 300 seconds.



- 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 8-1: 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 is configured to auto-detect by default and may not be changed.

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

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



**Caution**

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

### ➤ To configure the Ethernet Mode:

1. From the **Configuration** menu, choose the site to configure.  
The Site Configuration dialog box opens.
2. Click **Advanced | Ethernet**.
3. In the Ethernet Ports Configuration pane, use the drop-down menu to choose the configuration.
4. Click **Apply** to save the changes.

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



**Note**

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

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

## VLAN Tagging for Ethernet Service: Configuration

If you are using a PoE device, this feature is unavailable. You may skip this section.



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.

To set up VLAN tagging for Ethernet Service, click the VLAN Configuration... button in **Figure 8-15**. The following window is displayed:

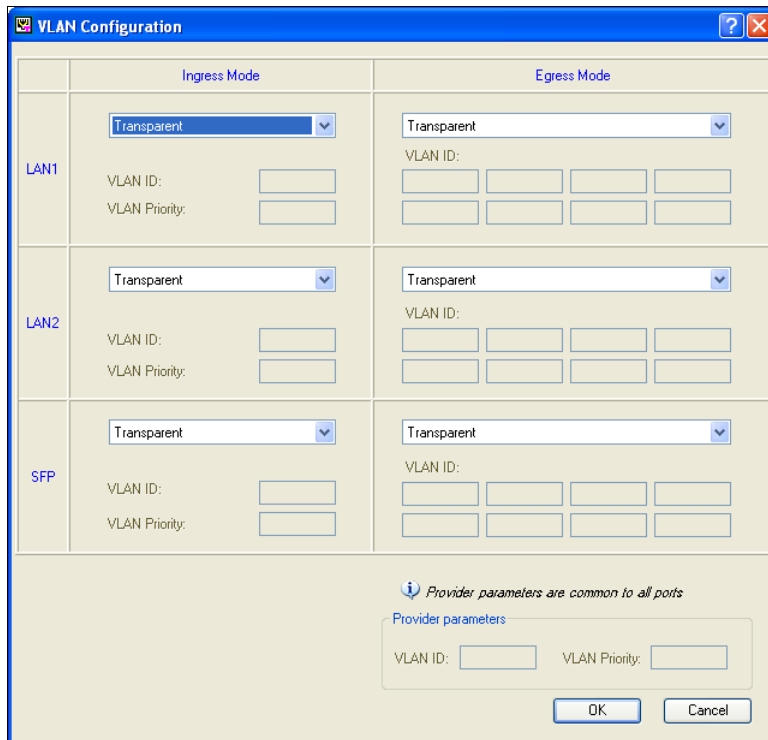
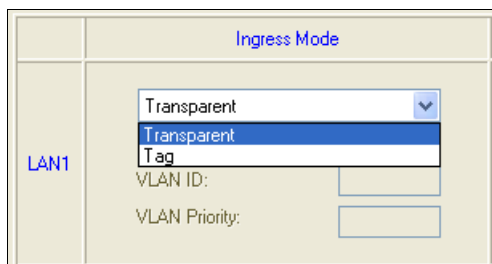


Figure 8-16: VLAN tag settings

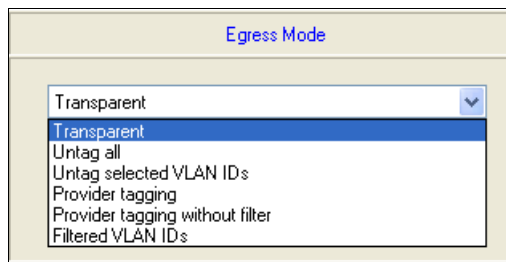


If you are using a new style IDU-E, the SFP row will not appear.

The choices for Ingress Mode are -



and for Egress Mode are -



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 14](#).

## 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 8-15](#) 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" which will give Z above.

---

The minimum value is 256 Mbps.

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



- 10 Mbps for RADWIN 2000 PDH
- 50 Mbps for RADWIN 2000 L
- 100 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.

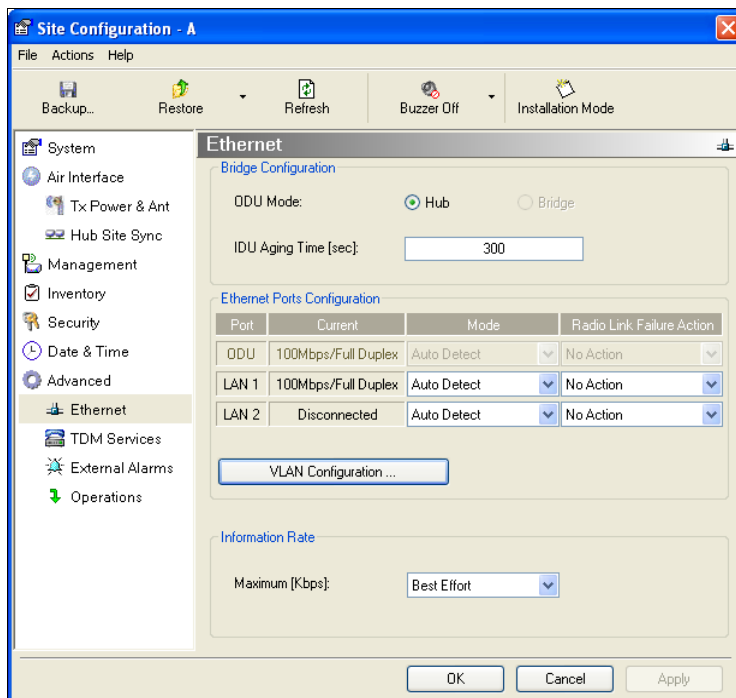


Figure 8-17: Bridge Configuration - Site Configuration dialog box

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

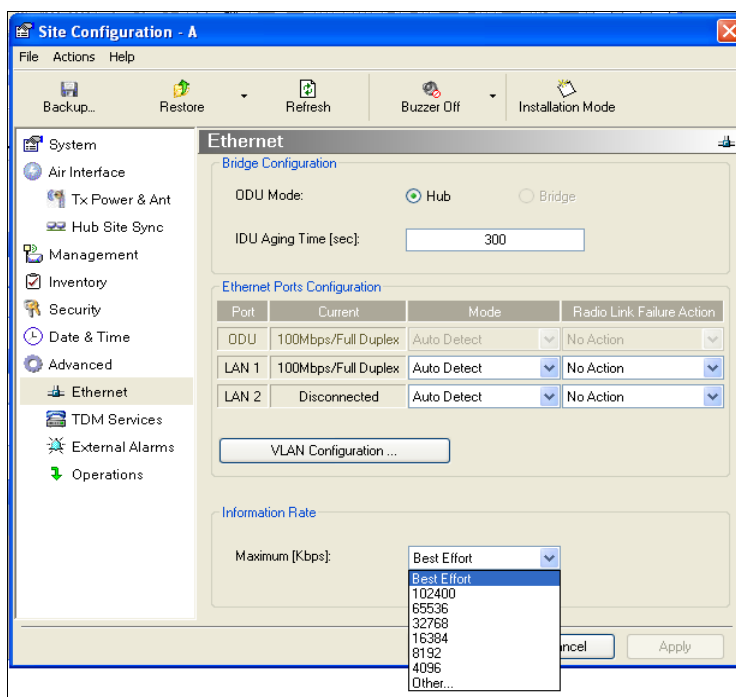


Figure 8-18: Ethernet MIR - Throughput selection

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.

## TDM MHS Status

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

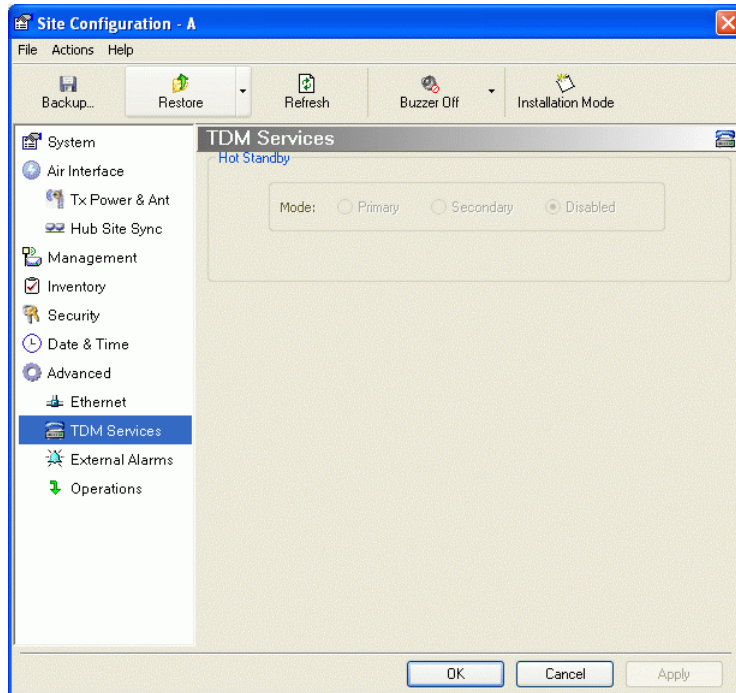


Figure 8-19: TDM MHS status

## Setting External Alarm Inputs

The IDU-C and the new style 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 pinout. You may enable or disable each of the alarms and configure the alarm description text appearing in the alarm trap message. The ODU sends the alarm within less than a second from actual alarm trigger.

### ➤ To set the external alarm inputs:

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



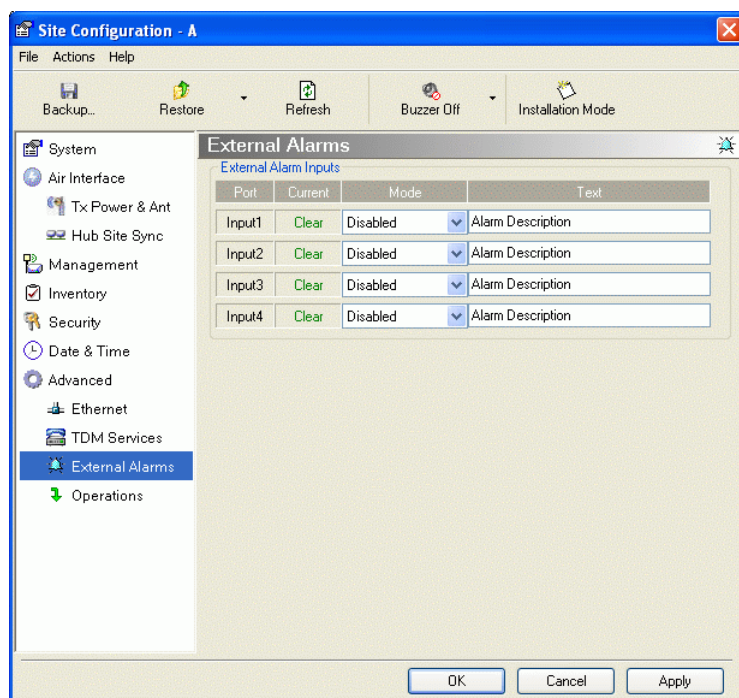


Figure 8-20: External Alarms Configuration

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.




---

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.

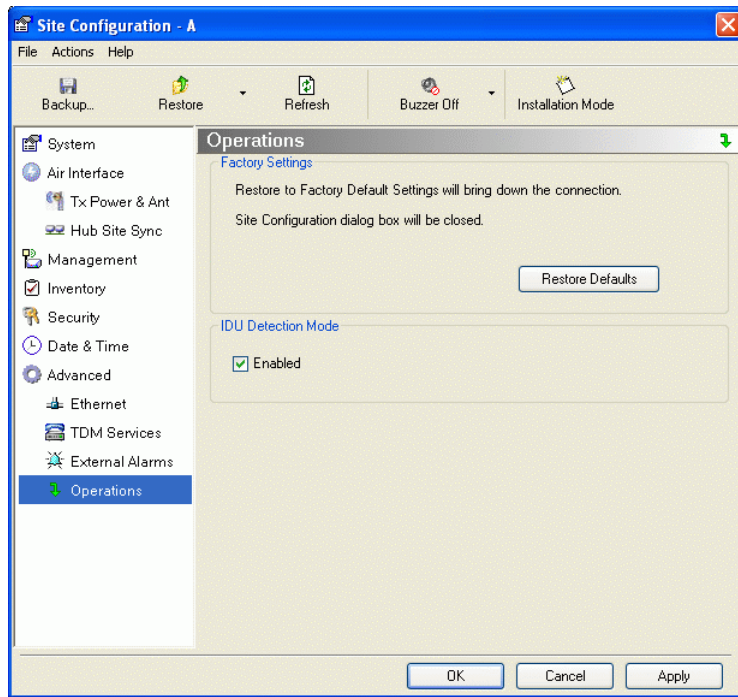
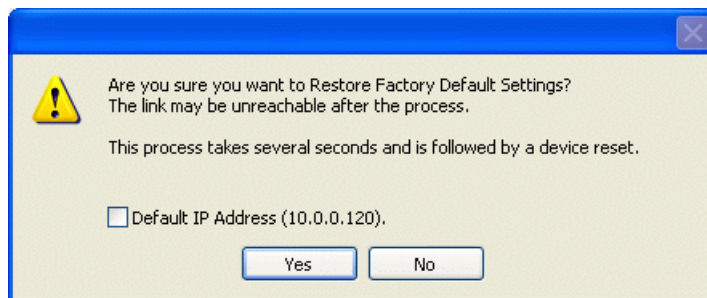


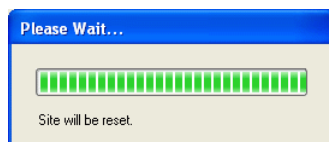
Figure 8-21: Site Configuration - Reset to factory defaults

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 8-21), should be disabled.

To disable IDU Detection Mode, just toggle the check box in [Figure 8-21](#).

## 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. Backup files are matched to the MAC address of the site ODU. 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:

**192.168.1.101\_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:

**192.168.1.101\_1.12.2009\_00.backup**

**192.168.1.101\_1.12.2009\_01.backup**

...

#### ➤ To backup the ODU software a file:

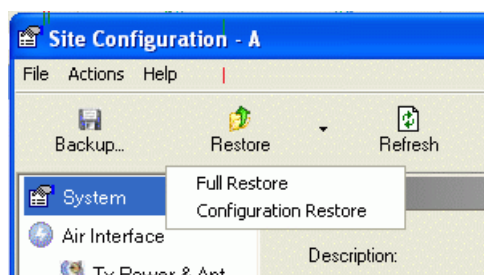
1. Choose a site to back up. The Site Configuration dialog box opens.
2. Click **Backup**.
3. In the Save As dialog box, indicate in which folder and under what name configuration file is to be saved, and click **Save**.

### *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.

#### ➤ 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.

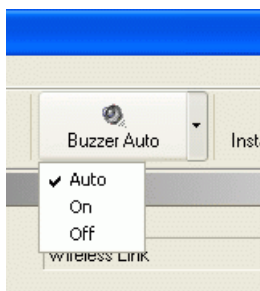


Figure 8-22: Alignment tone buzzer states

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 192.168.1.101
```

you will be asked for a user name and password.

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

```

C:\ Telnet 192.168.1.101
login: admin
Password:
Hello admin, welcome to ODU Management CLI!
-----+-----
      Software Revision      2.5.00_b2625_Jun  6 2010
-----+-----
admin@192.168.1.101-> Type "help" for help.
admin@192.168.1.101-> _
    
```

Figure 8-23: 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 8-2](#). Note that some of the commands are model-specific. For example, TDM commands will not apply to Ethernet only and PoE based links.

Table 8-2: Telnet Commands Summary

Command	Explanation
display inventory	Displays ODU product name, Name, Location, hardware and software revisions, uptime, MAC address, IDU product name, IDU software and hardware revisions
display management	Displays IP, Subnet, Gateway, Traps table
display link	Displays State, Link ID, Channel BW, RSS, TSL, Frequency/ACS, DFS, Rate/ARA, Distance
display ethernet	Displays Bridge Mode, Aging time, Port table (State, Status and action)
display tdm	Displays Clock Mode, Master Clock Mode, Current Clock, Quality, TDM table (Line status, Error Blocks)
display ntp	Displays Time, Server and Offset
display PM <interface:AIR,LAN1,LAN2,TDM1, TDM2,...,TDM16> <interval:current,day,month>	Shows the performance monitor tables for each interface according to user defined monitoring intervals
set ip <ipaddr> <subnetMask> <gateway>	Set the ODU IP address, subnet mask and gateway. The user must reset the ODU after the command completion
set trap <index:1-10> <ipaddr> <port:0-65535>	Set a specific trap from the traps table (e.g. set trap 3 192.168.1.101 162)
set readpw <oldpasswd> <passwd>	Set the read access password (Read Community)
set writepw <oldpasswd> <passwd>	Set the read-write access password (Read-Write Community)
set trappw <oldpasswd> <passwd>	Set the trap Community string
set buzzer <mode:0=OFF,1 =ON>	Toggle the buzzer mode (0 – off, 1 – on)
set tpc<power:Value between minimal Tx power, and maximal Tx power>	Set the ODU Tx Power. If a wrong value is entered, both min and max values shall be displayed in the error reply
set bridge <mode:0=Bridging OFF,1= Bridging ON >	Set the ODU bridge mode (0 – off, 1 – on)
set name <new name>	Set the name of the link
set location <new location>	Set the name of the location

Table 8-2: Telnet Commands Summary (Continued)

Command	Explanation
set contact <new contact>	Set the name of the site manager
set <ssid>	Set Link ID
set ethernet <port:MNG,LAN1,LAN2> <mode:AUTO,10H,10F,100H,100F,DISABLE>	Set the mode and speed of each Ethernet port
reboot	Resets both the IDU and the ODU. The user is warned that the command will reset the ODU. A new Telnet session to the ODU may be opened after the reset is complete. (Watch the IDU LEDs.)
help	Displays the available commands

Figure 8-24, below, shows the available Telnet commands using the **help** command.

```

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

admin@192.168.1.101-> help

Display commands
display inventory
display management
display link
display ethernet
display tdm
display ntp
display PM <interface:AIR,MNG,LAN1,LAN2,TDM1,TDM2,TDM3,...,TDM15,TDM16>
<interval:current,day,month>
display bands

Set - immediate commands
set ip <ipaddr> <subnetMask> <gateway>
set trap <index:1-10> <ipaddr> <port:1-65535>
set readpw <writePasswd> <newPasswd>
set writepw <writePasswd> <newPasswd>
set trappw <writePasswd> <newPasswd>
set buzzer <mode:0=OFF,1=AUTO,2=ON>
set tpc <power:Value between minimal TX power, and maximal TX power>
set name <new name>
set location <new location>
set contact <new contact>
set ethernet <port:MNG,LAN1,LAN2> <mode:AUTO,10H,10F,100H,100F,DISABLE>
reboot
help

Set - reset required commands
set ssid <ssid>
set rate <index:1-15,adaptive>
set bridge <mode:0=Bridging OFF,1=Bridging ON>

Command "help" finished OK.
    
```

Figure 8-24: Telnet Management window

# 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 9-1: Get Diagnostics Data and Description

Data	Description
System Data	General information about the system
Link Information	Information about the link properties
Events Log	<ul style="list-style-type: none"> <li>List of system events including those from other sites if this site is defined as the trap destination</li> <li>Last 256 events from both sites</li> </ul>
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**.

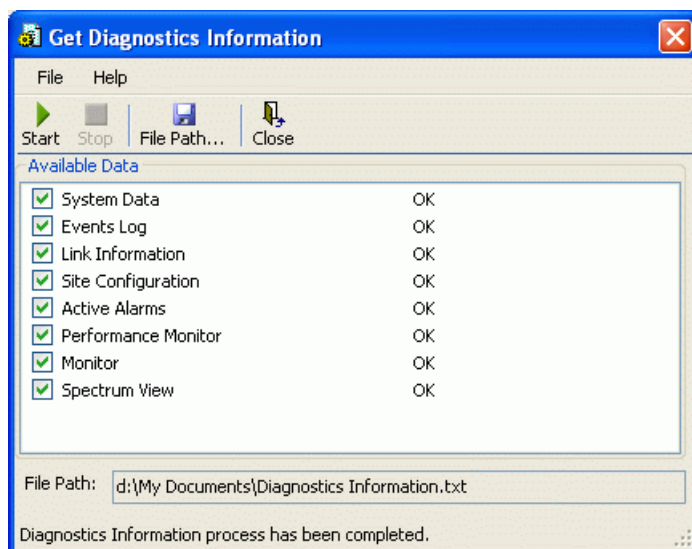


Figure 9-1: Get Diagnostics Dialog Box

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 9-2: 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:

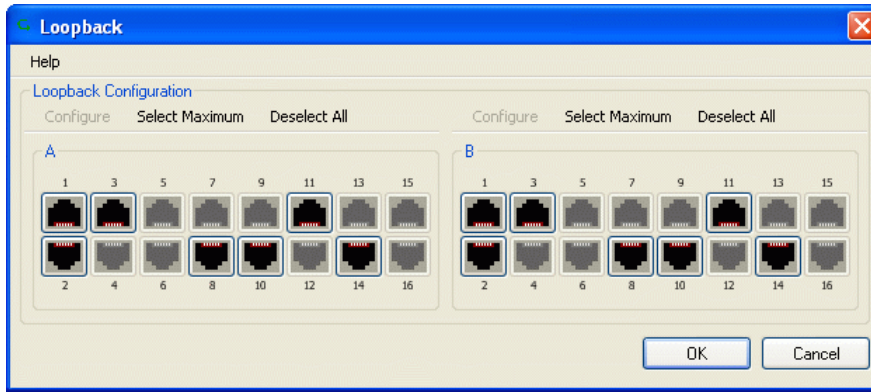


Figure 9-2: Loopback configuration box

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

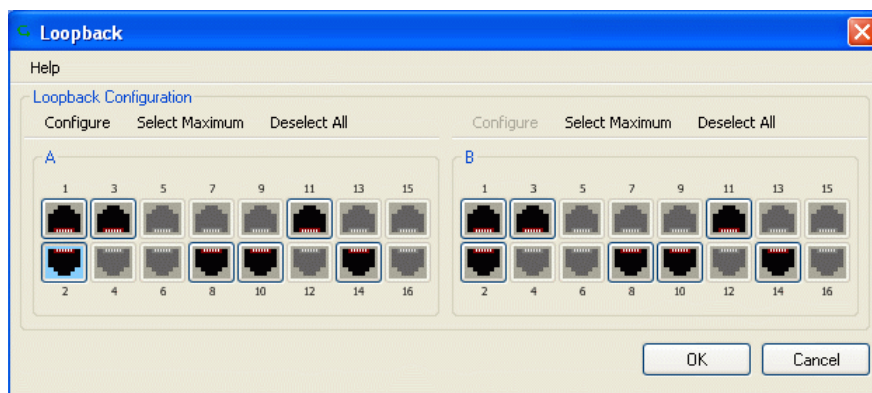


Figure 9-3: Loopback configuration box with one Site A port selected

- Click configure to choose a loopback mode:



Figure 9-4: Loopback options

- Click the required loopback mode.

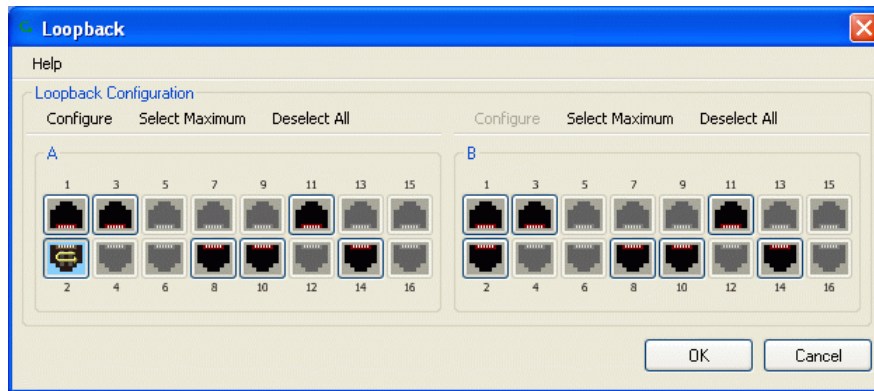


Figure 9-5: Loopback defined

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.

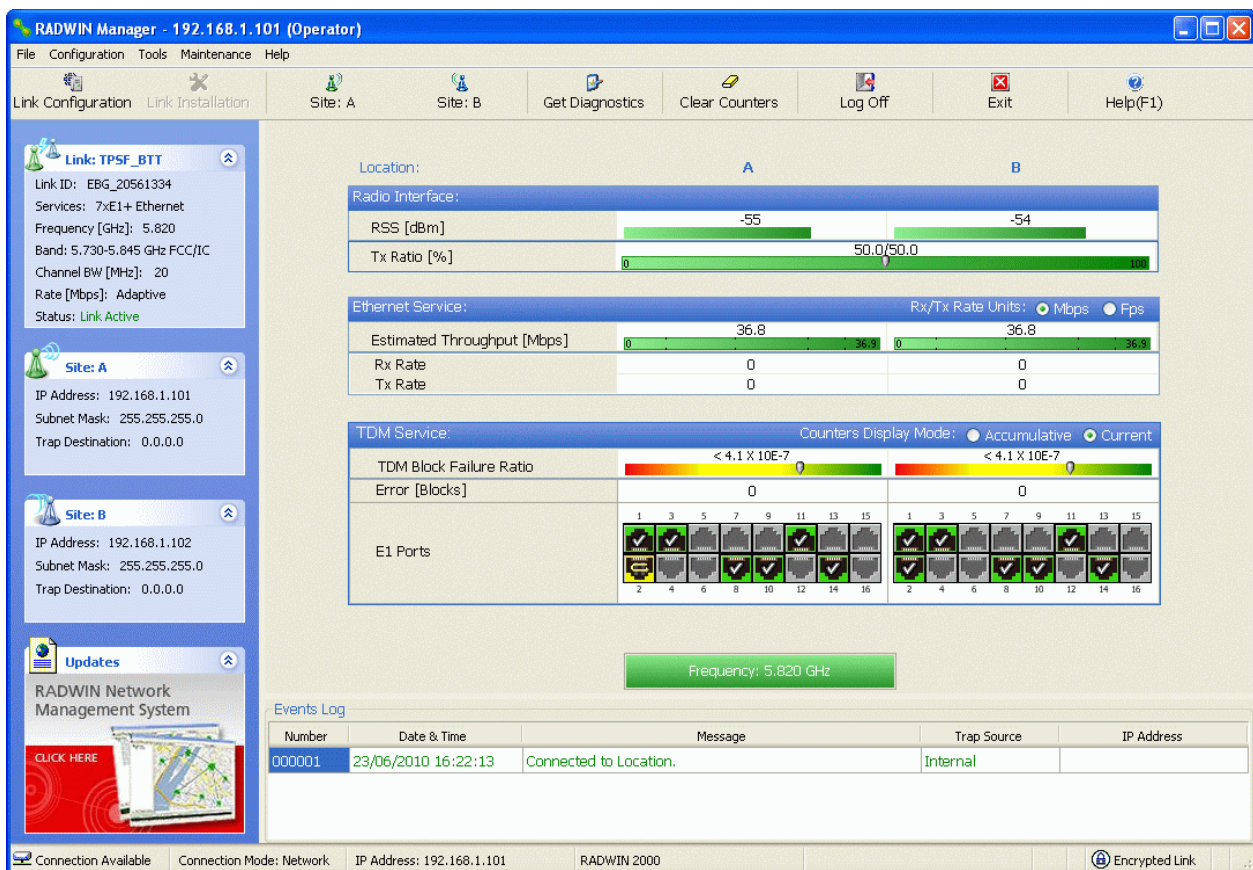


Figure 9-6: Site A port 2 set to loopback

### ➤ To deactivate a loopback:

- Return to the situation of [Figure 9-4](#) and click **None**.

When a loopback is deactivated, the corresponding icon in [Figure 9-6](#) 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.

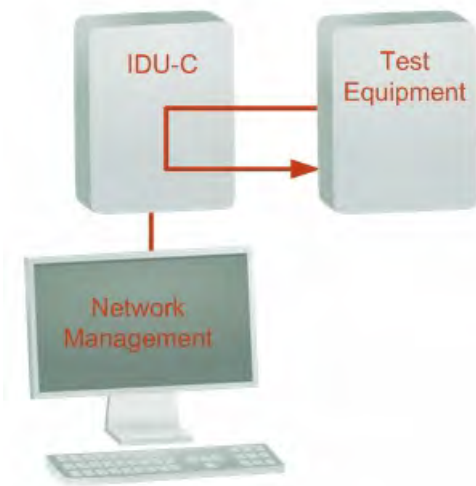


Figure 9-7: Local Line Loopback

### 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.

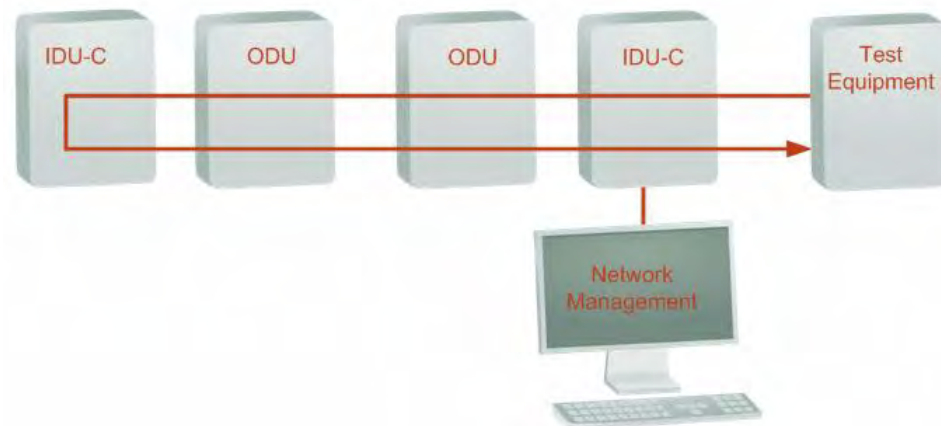


Figure 9-8: Remote Reverse Loopback

### 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.



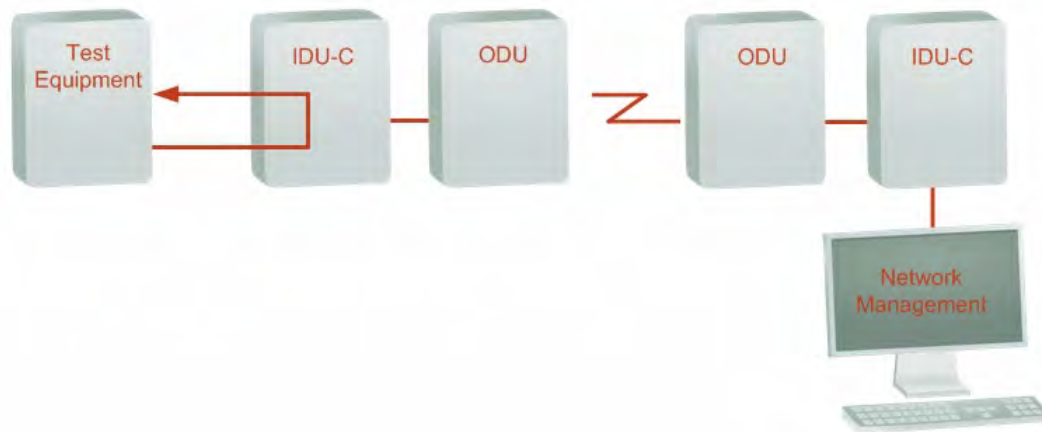


Figure 9-9: Remote Line Loopback

### 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.

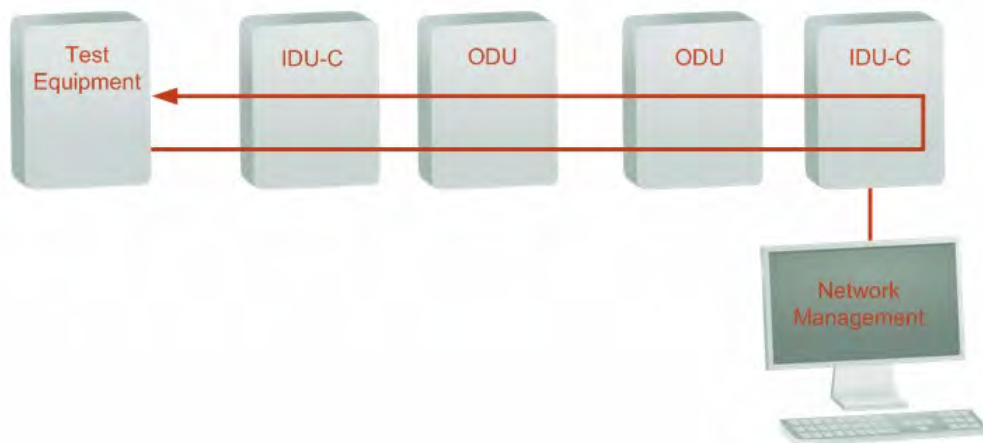


Figure 9-10: Local Reverse Loopback

## Reinstalling and Realigning a Link

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



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 5](#)).

## The Link Budget Calculator

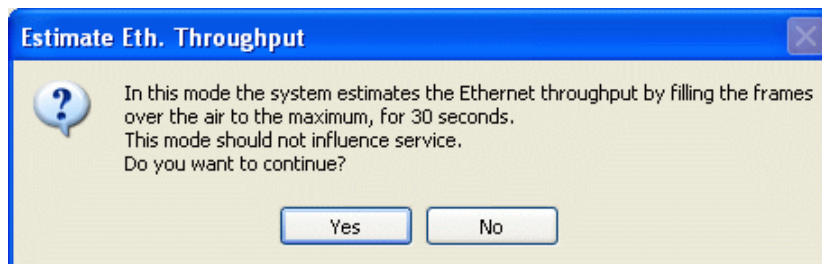
The Link Budget Calculator is part of the RADWIN Manager software and is found in the Help menu. This useful utility enables you to calculate the expected performance of the wireless link and the possible configurations for a specific link range including antenna size, cable loss and climate conditions. For full details, see [Chapter 21](#).

## 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:

Ethernet Service:		Rx/Tx Rate Units: <input checked="" type="radio"/> Mbps <input type="radio"/> Fps	
Estimated Throughput [Mbps]	0	36.8	36.8
Rx Rate	0.0	0.0	0.0
Tx Rate	0.0	0.0	0.0

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 9-13](#) 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:

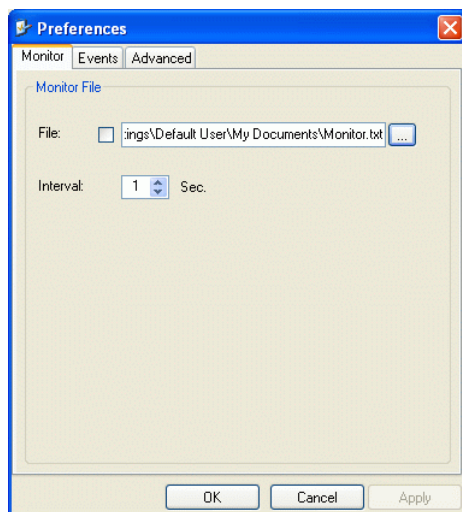



Figure 9-11: Preferences dialog box

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:

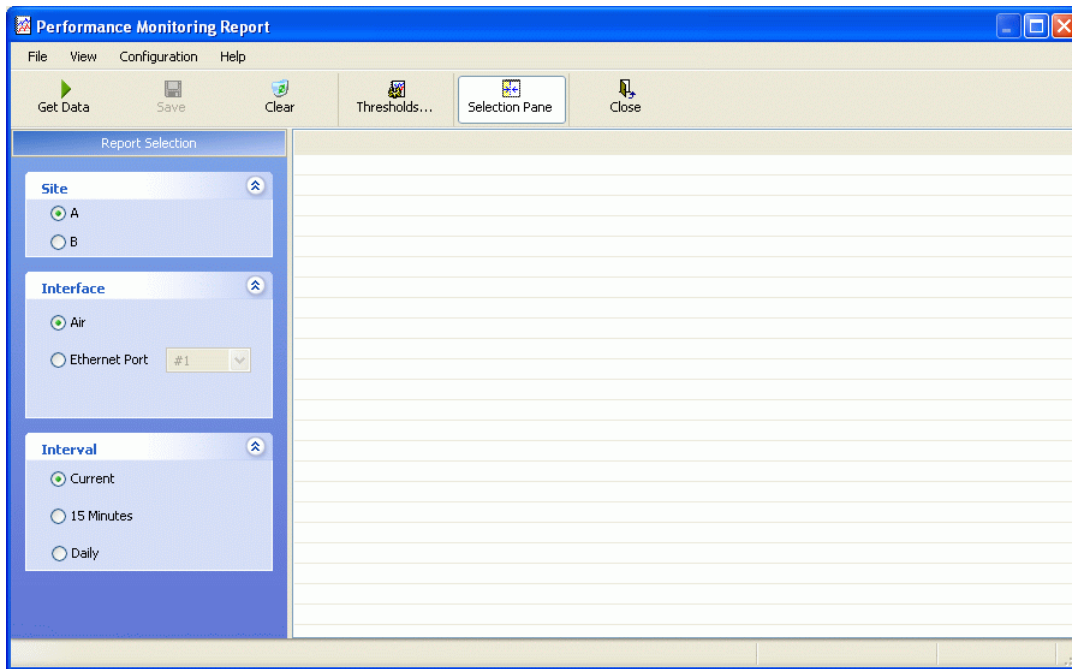


Figure 9-12: Basic Performance Monitoring Report

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:

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 13:30:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 13:15:00	-54	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 13:00:00	-55	-54	0	0	5	5	0	0	39	0	0	0
✓	19/07/2010 12:45:00	-100	-54	2	2	5	5	0	0	1	0	0	0
✓	19/07/2010 12:30:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 12:15:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 12:00:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 11:45:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 11:30:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 11:15:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 11:00:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 10:45:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 10:30:00	-54	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 10:15:00	-54	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 10:00:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 09:45:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 09:30:00	-54	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 09:15:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 09:00:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 08:45:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 08:30:00	-55	-54	0	0	5	5	0	0	0	0	0	0

Figure 9-13: 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.

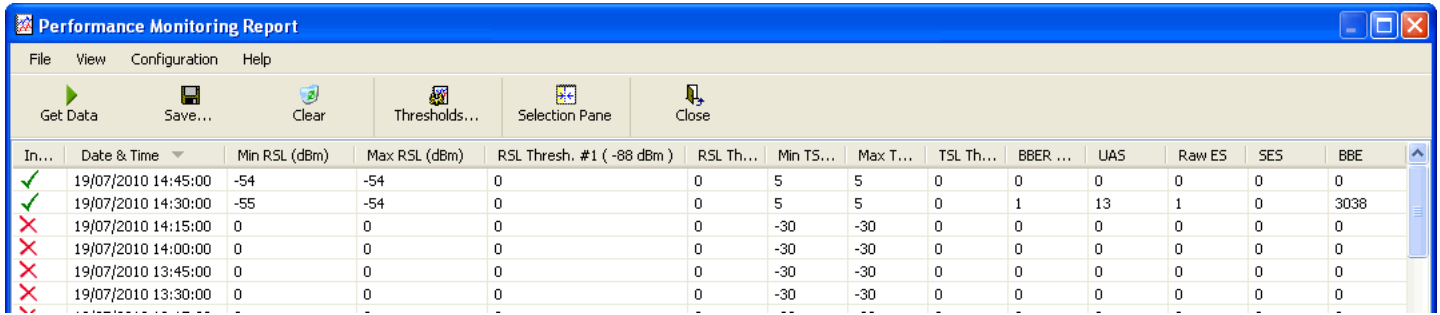


Figure 9-14: Performance Monitoring Report showing the effect of a Reset

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 9-3](#) and [Table 9-4](#) 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 9-3: 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 9-3: Explanation of performance data

Data type	Reported Value	Explanation
<b>Additional Air Interface PM Data</b>	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.
<b>Additional Ethernet Interface PM Data</b>	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
<b>TDM interface</b>	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 9-4: 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:

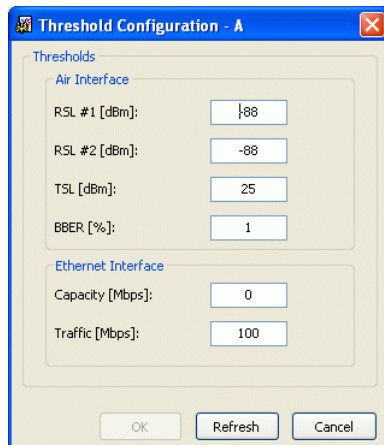


Figure 9-15: Threshold configuration dialog box

### 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 below 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:


The screenshot shows the RADWIN Manager interface for a link named 'TPSF\_BTT'. The main display area shows various performance metrics for Site A and Site B, including Radio Interface (RSS, Tx Ratio), Ethernet Service (Throughput, Rx/Tx Rate), and TDM Service (Block Failure Ratio, Error Blocks, E1 Ports). The Events Log is located at the bottom of the window and is circled in red. It contains the following data:

Number	Date & Time	Message	Trap Source	IP Address
000001	29/06/2010 11:44:40	Device unreachable!	Internal	
000002	29/06/2010 11:44:58	Connected to A.	Internal	

Figure 9-16: 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.



To store the Events Log, first define the IP address, subnet mask, default gateway and trap destination address of the managing computer (see [page 8-7](#) for details).

## RADWIN Manager Traps

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

Table 9-5: 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 <a href="#">this web site</a> .
Device unreachable!	Error	Check connectivity to ODU
Connected to <site_name>	Information	
<site_name> Site will be reset.	Information	
Restore Factory Default Settings in process on Site <site_name>	Information	
Factory Settings: The process was not finished due to connection issues.	Warning	Factory setting failed due to connectivity problem to ODU
Reset: The process was not finished due to connection issues.	Warning	Factory setting failed due to connectivity problem to target - ODU will not be reset
Cannot Write to Monitor file. There is not enough space on the disk.	Warning	Free some space on disk on the managing computer and retry
Windows Error: <error_ID>. Cannot Write to Monitor file.	Warning	Operating System error on the managing computer
TDM Counters were cleared for both sides	Information	
Identical IP addresses at <local_site_name> and <remote_site_name>	Warning	Set up a different IP to each site
The Product is not identified at the <local_site_name> site.	Warning	RADWIN Manager is incompatible with the ODU software version
The Product is not identified at the <remote_site_name> site.	Warning	
The Product is not identified at both sites.	Warning	
Product Not Identified!	Warning	
The Manager identified a newer ODU release at the <remote_site_name> site.	Warning	ODU release is newer than RADWIN Manager release. Wizards are not available. RADWIN Manager will be used just for monitoring. Upgrade the RADWIN Manager. (You will get this message as a pop up)
The Manager identified a newer ODU release at both sites.	Warning	
The Manager identified a newer ODU release at the <local_site_name> site.	Warning	



Table 9-5: RADWIN Manager Trap Messages (Continued)

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

## Setting the Events Preferences


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

### ➤ To set the Message color:

1. From the **Tools** menu, choose **Preferences**.  
The Preferences dialog box appears.
2. Click the **Events** Tab:



Figure 9-17: 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.

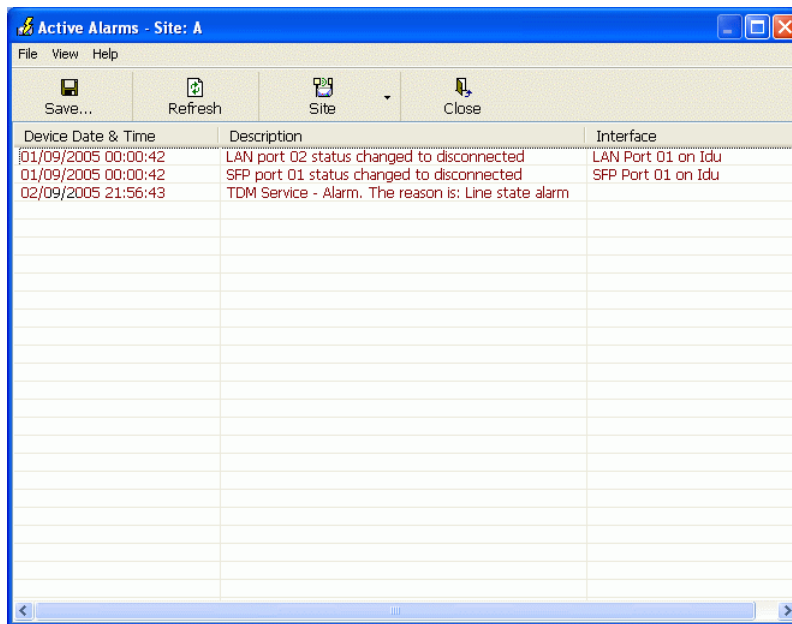
### ***Active Alarms***

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 9-18: 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 9-6: Active Alarms command buttons*

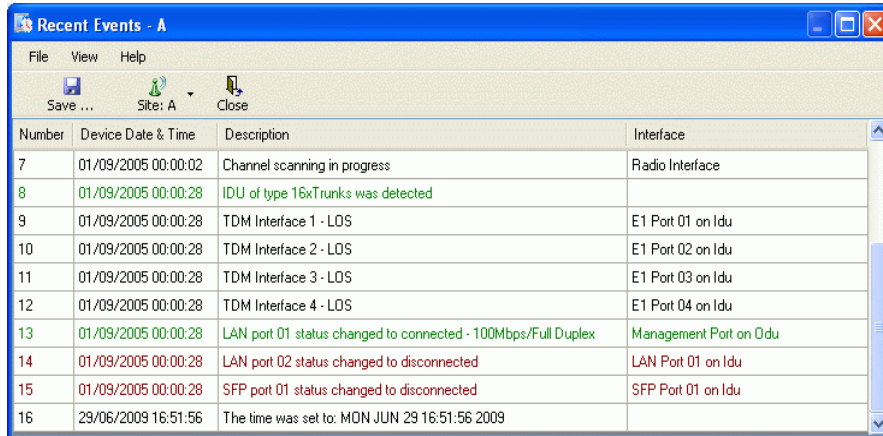
Command	Action
<b>Save</b>	Saves the alarms in CSV or text format for further analysis
<b>Refresh</b>	Shows the active alarms at the moment of refresh
<b>Site</b>	Selects site for the active alarms
<b>Close</b>	Closes the active alarm window

## Viewing Recent Events

Each ODU stores the last 256 events:

➤ To view the last 256 events:

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



Number	Device Date & Time	Description	Interface
7	01/09/2005 00:00:02	Channel scanning in progress	Radio Interface
8	01/09/2005 00:00:28	IDU of type 16xTrunks was detected	
9	01/09/2005 00:00:28	TDM Interface 1 - LOS	E1 Port 01 on Idu
10	01/09/2005 00:00:28	TDM Interface 2 - LOS	E1 Port 02 on Idu
11	01/09/2005 00:00:28	TDM Interface 3 - LOS	E1 Port 03 on Idu
12	01/09/2005 00:00:28	TDM Interface 4 - LOS	E1 Port 04 on Idu
13	01/09/2005 00:00:28	LAN port 01 status changed to connected - 100Mbps/Full Duplex	Management Port on Odu
14	01/09/2005 00:00:28	LAN port 02 status changed to disconnected	LAN Port 01 on Idu
15	01/09/2005 00:00:28	SFP port 01 status changed to disconnected	SFP Port 01 on Idu
16	29/06/2009 16:51:56	The time was set to: MON JUN 29 16:51:56 2009	

Figure 9-19: 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:

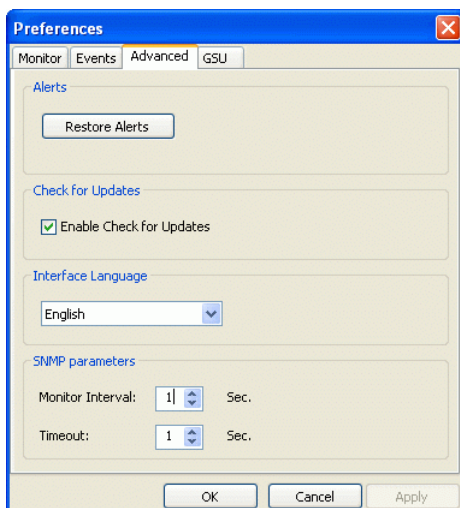


Figure 9-20: Advanced Preferences

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

## Other Advanced Preferences

### ***Enable and Disable Checking for Software Updates***

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

### ***Setting the RADWIN Manager Language***

In the dialog of [Figure 9-20](#), you can set the RADWIN Manager interface language, where other localizations are available.

### ***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 9-7: 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	Alarm detected at the Site B interface or Local or Remote loopback
	Red	Alarm detected at the Site A interface
	Off	Ethernet only IDU or E1/T1 not configured

Table 9-7: LED fault indicators (Continued)

LED	Status	Remedy
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: <ul style="list-style-type: none"> <li>This ODU is a master that is generating signals and detecting signals</li> <li>This ODU is a master that is generating signals but detected improper signals</li> <li>This ODU is a client "Continue Tx" but is not detecting signals</li> <li>This ODU is a client "Disable Tx" and is detecting signals from multiple sources</li> </ul> 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 9-8: 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).



RADWIN 2000

Broadband Wireless Transmission System

USER MANUAL



RELEASE 2.5.40

## Part 2: Site Synchronization



# Hub Site Synchronization

## What is Hub Site Synchronization?

When several units 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 interfering radios, and whether WinLink 1000 or RADWIN 2000 units are installed.



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HSS does not eliminate the need for careful RF planning to ensure the design will work as planned. See Chapter 2 of the User Manual (both WinLink 1000 and RADWIN 2000) for information on installation site survey.

For WinLink 1000 units, Hub Site Synchronization support depends on the product model.

---

The RADWIN Hub Site Synchronization (HSS) 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. 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 10-1** illustrates interference caused by non-synchronized collocated units.

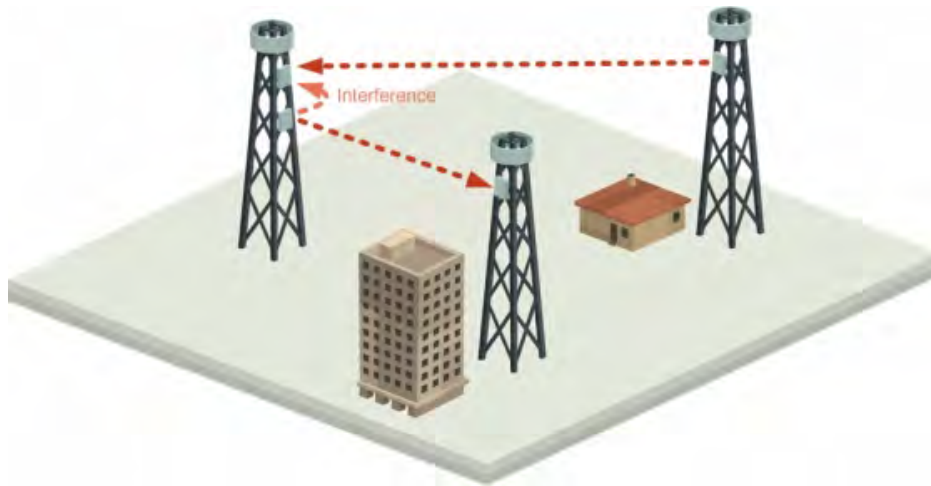


Figure 10-1: Interference caused by collocated units

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

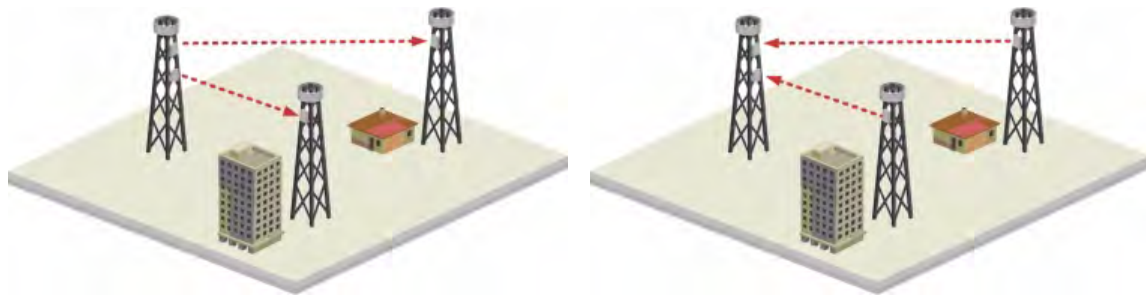


Figure 10-2: Collocated units using Hub Site Synchronization (1)

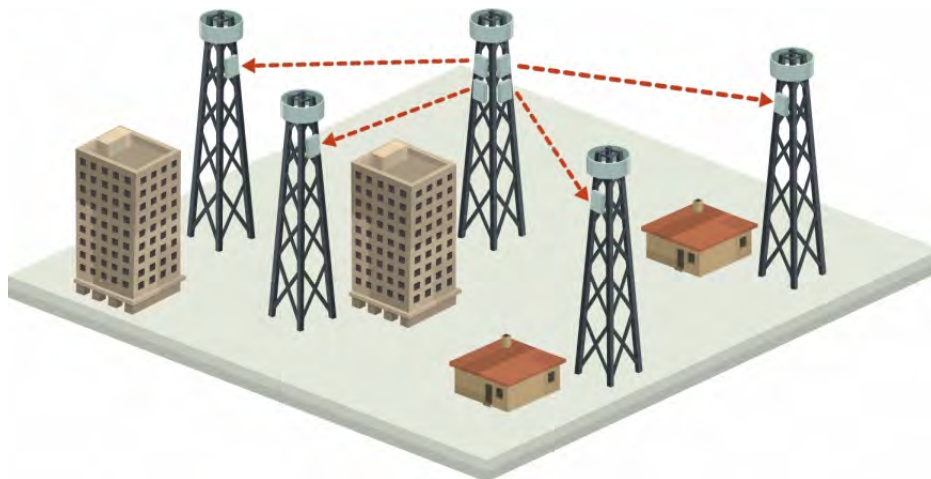


Figure 10-3: Collocated units using Hub Site Synchronization (2)

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.



WinLink 1000 radios used as independent units do not require HSS hardware.

## 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.

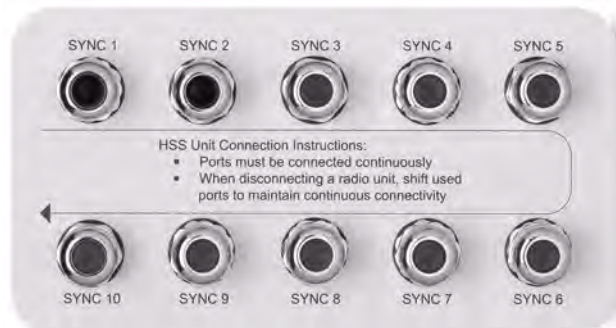


Figure 10-4: HSS Interconnection Unit



- 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

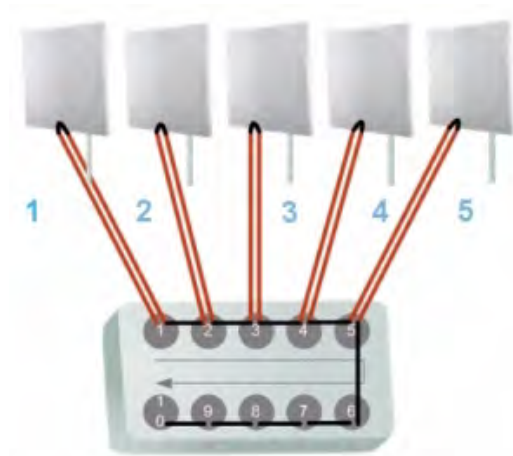


Figure 10-5: HSS Wiring schematic

The wiring, as shown in [Figure 10-5](#) 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 10-6](#). 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.

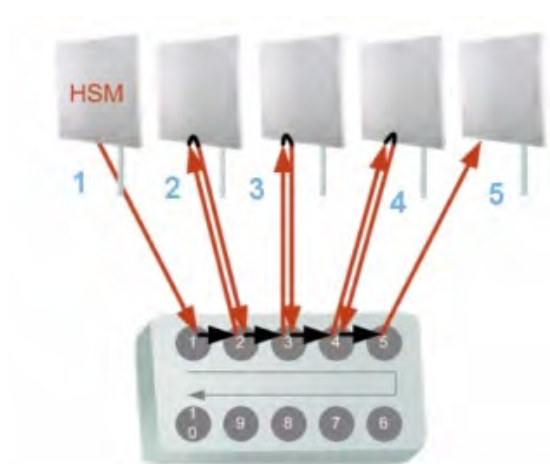


Figure 10-6: HSS sync signal path with ODU 1 as HSS Master

## 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 10-7](#). 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 10-7](#).

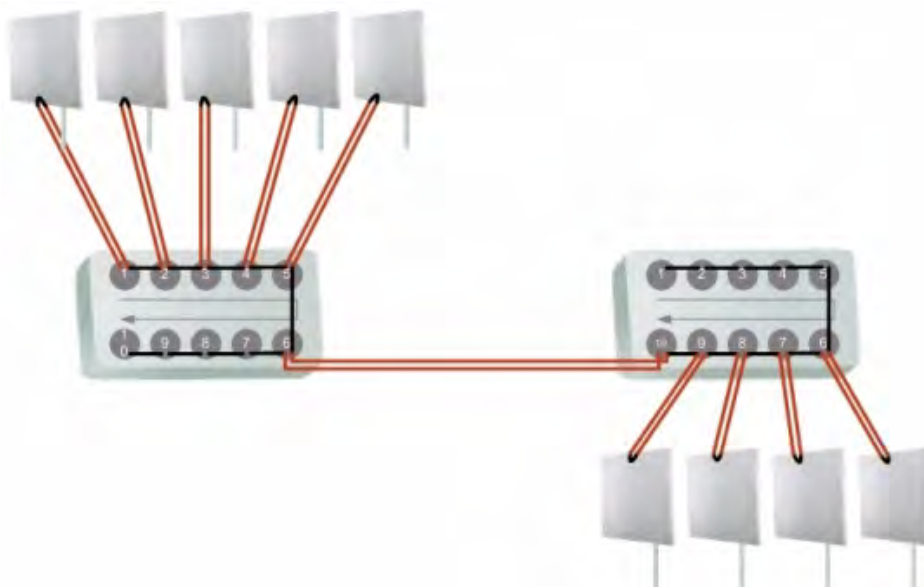


Figure 10-7: Cascading two HSS units

4. To add a further HSS unit: Connect the next available SYNC port from the second HSS unit in **descending order** (SYNC 5 in [Figure 10-7](#)) to SYNC 1 of the third HSS unit.
5. ODUs are connected to the third HSS unit from SYNC 2 as shown in [Figure 10-8](#), in **ascending order**:

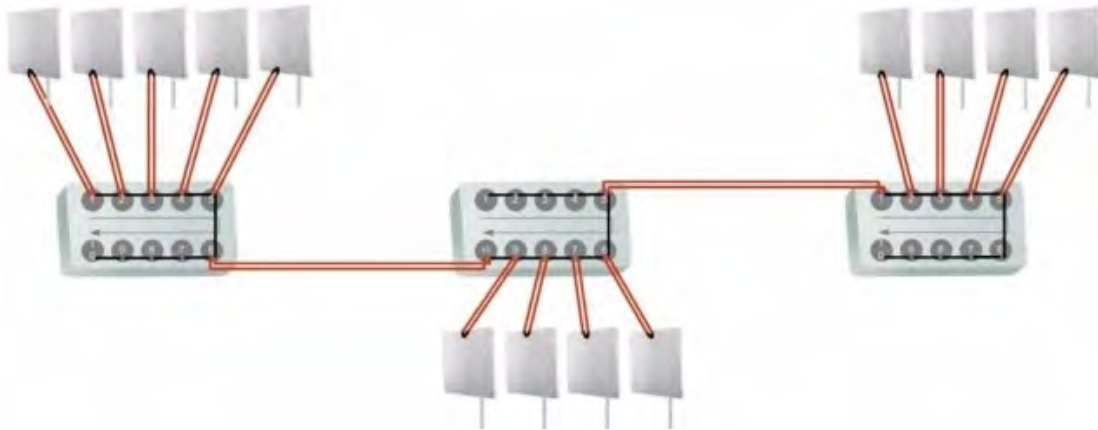


Figure 10-8: Cascading three HSS units

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 10-7**

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

#### **Three cascaded HSS units as shown in Figure 10-8**

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

## 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:

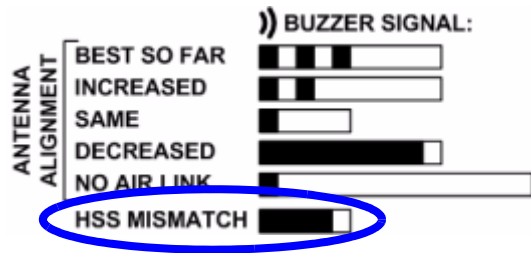


Figure 10-9: ODU beep for HSS Error

## ODU/HSS Unit Connection Pinout

Table 10-1: 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

## 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.

Both WinLink 1000 and RADWIN 2000 use the Time Division Duplex (TDD) mechanism.

Under HSS, TDD enables synchronization of transmission for the collocated units as shown in [Figure 10-10](#):



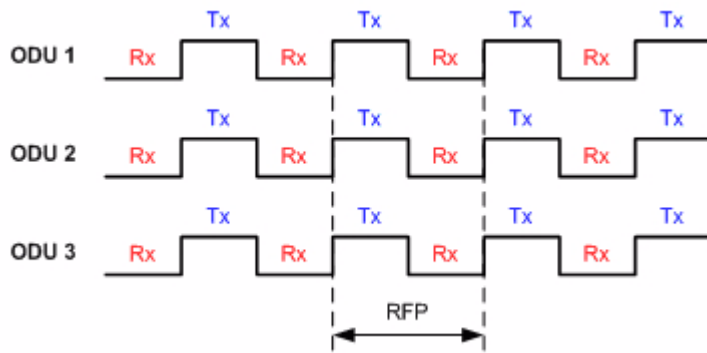


Figure 10-10: Radio Frame Pattern

Five RFP types (A to 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 the [Table 10-2](#) and [Table 10-3](#).

The tables describe the efficiency of the air interface according to the RFP type, radio products mix, services and channel bandwidth. The tables may also be viewed in the RADWIN Manager and in the Link Budget Calculator for both WinLink 1000 and RADWIN 2000. The efficiency of the air interface will vary according to the product used.

Table 10-2: 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 10-3: Radio Frame Pattern Table - WinLink 1000

RFP	20 MHz		10 MHz		5 MHz	
	TDM	Ethernet	TDM	Ethernet	TDM	Ethernet
A	Best fit	Best fit	Available	Available	N/A	N/A
B	N/A	N/A	Best fit	Available	Best fit	Available
C	N/A	N/A	N/A	Best fit	N/A	Available
D	N/A	N/A	N/A	N/A	N/A	Best fit
E	Available	Available	Available	Available	N/A	N/A

**Legend:**

**Best fit** - optimal RFP choice for TDM and Ethernet services.

**Available** - available RFP for TDM and Ethernet services, but not optimal.

**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 RFP, the following considerations should be borne in mind:

- When synchronizing RADWIN 2000 units you must use RFP B or E

- If you mix RADWIN 2000 and WinLink 1000 units in a collocated site, you must use RFP B or E
- 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 5, 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:

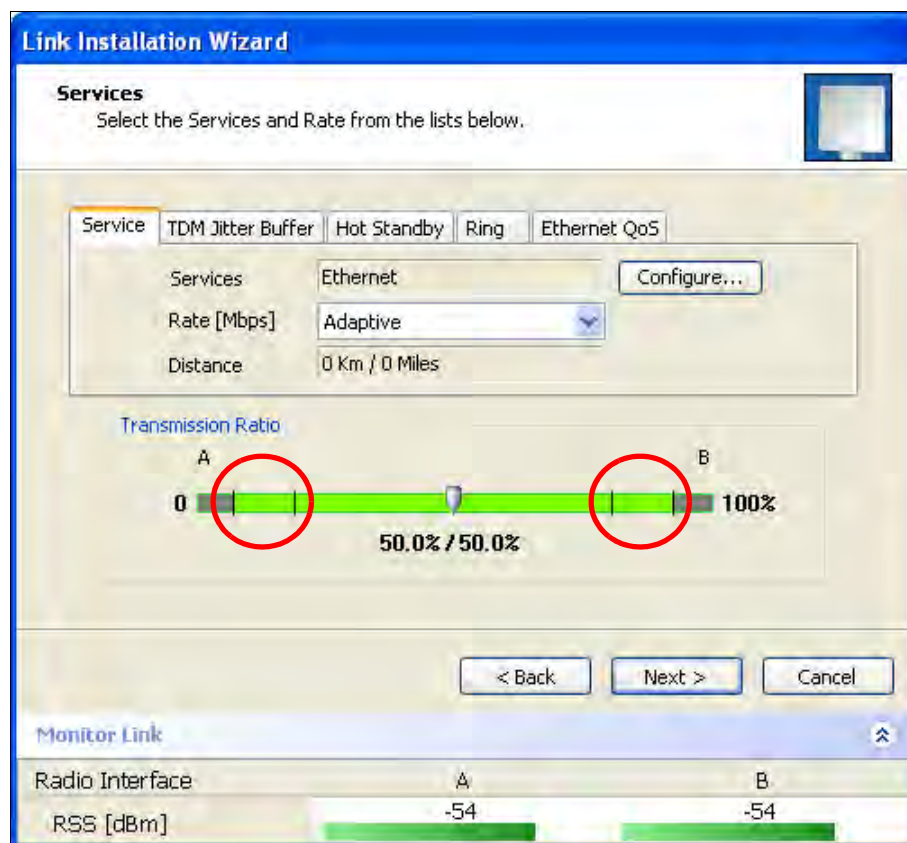


Figure 10-11: Services and Rates - RADWIN 2000 C master, RADWIN 2000 clients

- 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:

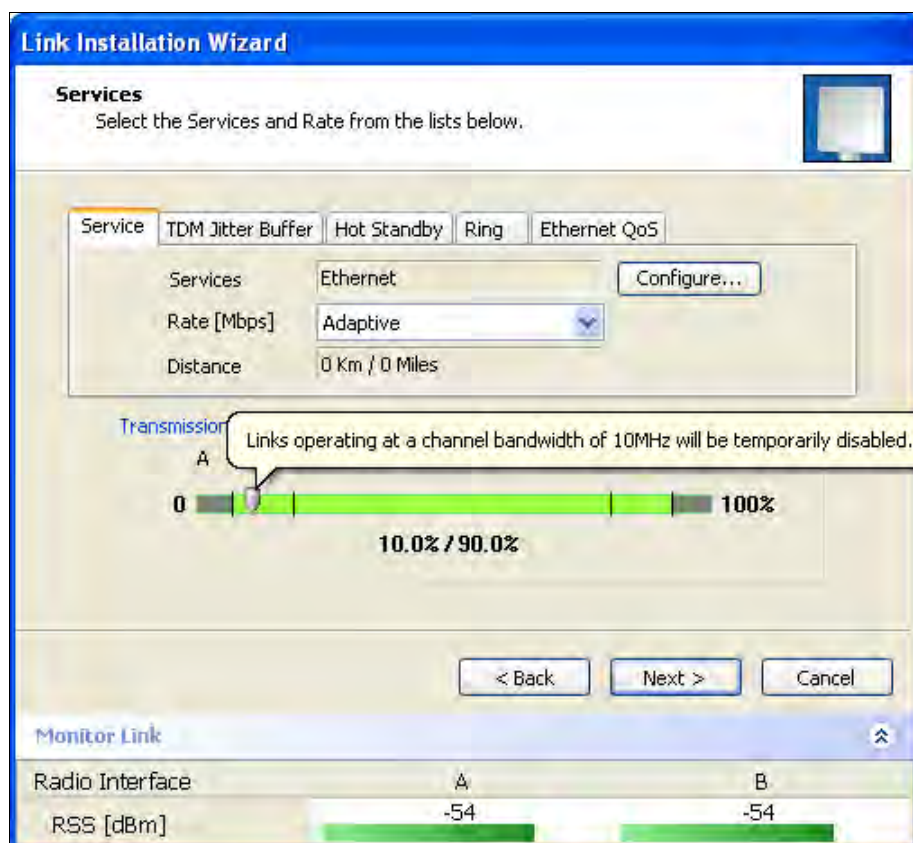


Figure 10-12: Services and Rates - RADWIN 2000 C master, RADWIN 2000 clients - Extreme asymmetric allocation

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 10-11](#)) is primarily determined by three factors:

- The RFP in use (B or E)
- Channel Bandwidth
- Link distance

The first two parameters are entered during Link Installation/Configuration.

- Possible scenarios are shown in [Table 10-4](#). Whenever Asymmetric Allocation is available, it is static for all traffic conditions.

Table 10-4: Asymmetric Allocation with Collocated Links - Scenarios

HSS Master	HSS Client	Scenario: If you try to...	Result	Remarks
RADWIN 2000	WinLink 1000	Change master to asymmetric allocation	Link down	Reversion to 50/50 restores link
	RADWIN 2000		<ul style="list-style-type: none"> <li>Releases prior to 2.4 - Link down</li> <li>Release 2.4 later (RADWIN 2000 PDH and RADWIN 2000 L series) - Link down</li> <li>Release 2.4 and later (RADWIN 2000 C and RADWIN 2000 Xseries) - TDM services stopped, link set to transmission ratio of master</li> </ul>	Release 2.4 and later (RADWIN 2000 C and RADWIN 2000 Xseries) - Asymmetric Allocation slider visible but cannot be changed
RADWIN 2000	WinLink 1000			
	RADWIN 2000	Change client to asymmetric	Asymmetric Allocation slider <b>not</b> displayed	You cannot do this
WinLink 1000	WinLink 1000			
	RADWIN 2000	Change client to asymmetric	Asymmetric Allocation slider <b>not</b> displayed	You cannot do this

### RFP: WinLink 1000 Considerations

- When WinLink 1000 radios are collocated with RADWIN 2000 radios using HSS, all radios must use RFP B or E.
- The performance of WinLink 1000 radios that operate with these RFPs can be seen in the Link Budget Calculator.
- The choice of the unit to be the HSS master is a matter of convenience. There is no technical reason to prefer a WinLink 1000 over a RADWIN 2000 as HSS master or vice versa. It is however, recommended that you use the RADWIN 2000 as master, since it will enforce the correct RFP on the other collocated units.

The following list summarizes the effect of using RFP B or E on WinLink 1000 radios. These effects should be taken into consideration when planning new installations:

- Channel bandwidth 5 MHz is available under RFP E but is **only** supported for WinLink Access products
- For products supporting a maximum throughput of 18.1 Mbps, the maximum Ethernet throughput is 14.5 Mbps at 20 MHz channel bandwidth and 9.3 Mbps at 10 MHz channel bandwidth
- For products supporting maximum throughput of 22.5 Mbps, the maximum Ethernet throughput is 21.4 Mbps at the 20 MHz channel and 9.3 Mbps at 10 MHz channel bandwidth

## HSS Status LED on the IDU-C and New Style IDU-E

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

Table 10-5: IDU-C and New Style 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: <ul style="list-style-type: none"> <li>This ODU is a master that is generating signals and detecting signals</li> <li>This ODU is a master that is generating signals but detected improper signals</li> <li>This ODU is a client "Continue Tx" but is not detecting signals</li> <li>This ODU is a client "Disable Tx" and is detecting signals from multiple sources</li> </ul> All orange cases transmit.
Off	HSS is not activated HSS is not supported (WinLink 1000 only) Disconnection between ODU and IDU

## Link Configuration and HSS

For WinLink 1000 HSS-enabled units and all RADWIN 2000 units, the Hub Site Synchronization Settings dialog box appears in both the Link Installation and Configuration Wizards.

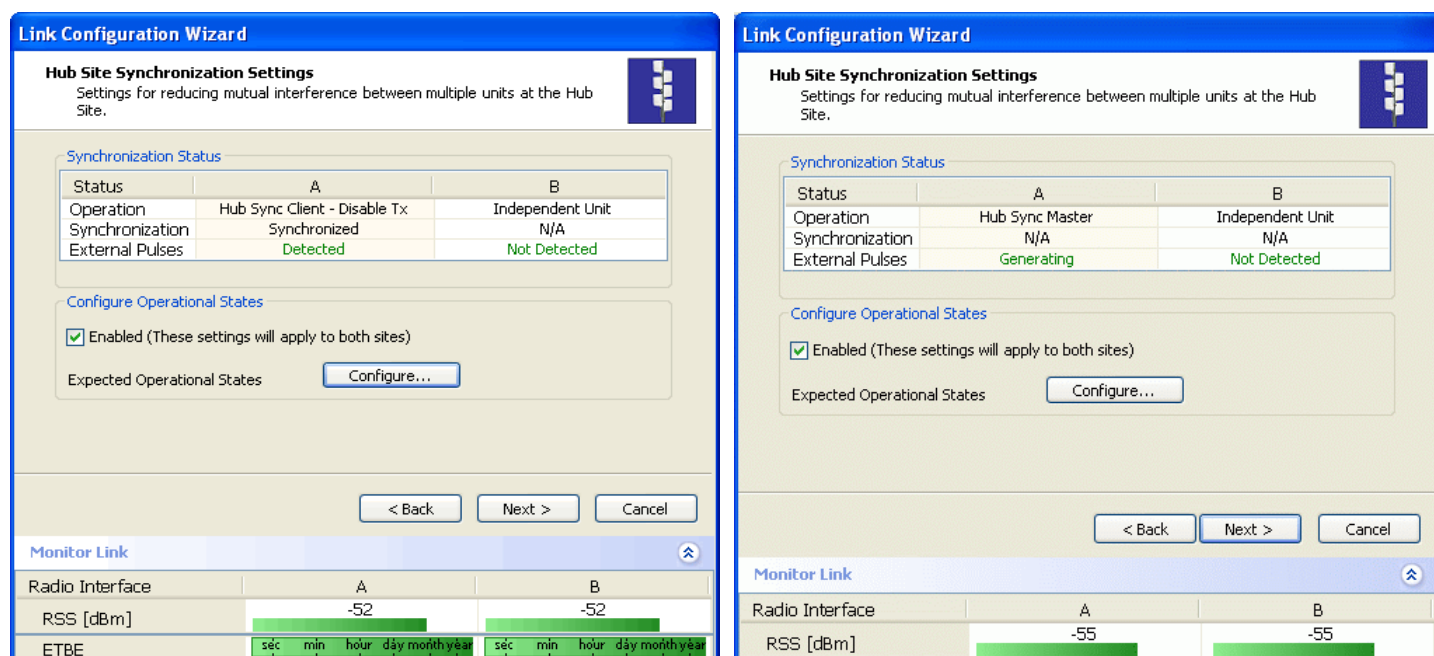


Figure 10-13: HSS Settings: Left - WinLink 1000 client, Right - RADWIN 2000 master

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)



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 10-6: 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	
Generating and detected	HSM, but other HSM present	Orange
Generating and Improperly Detected	RADWIN 2000 ODU is HSM, but but detects a WinLink 1000 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. Occurs only for RADWIN 2000, which 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.



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.



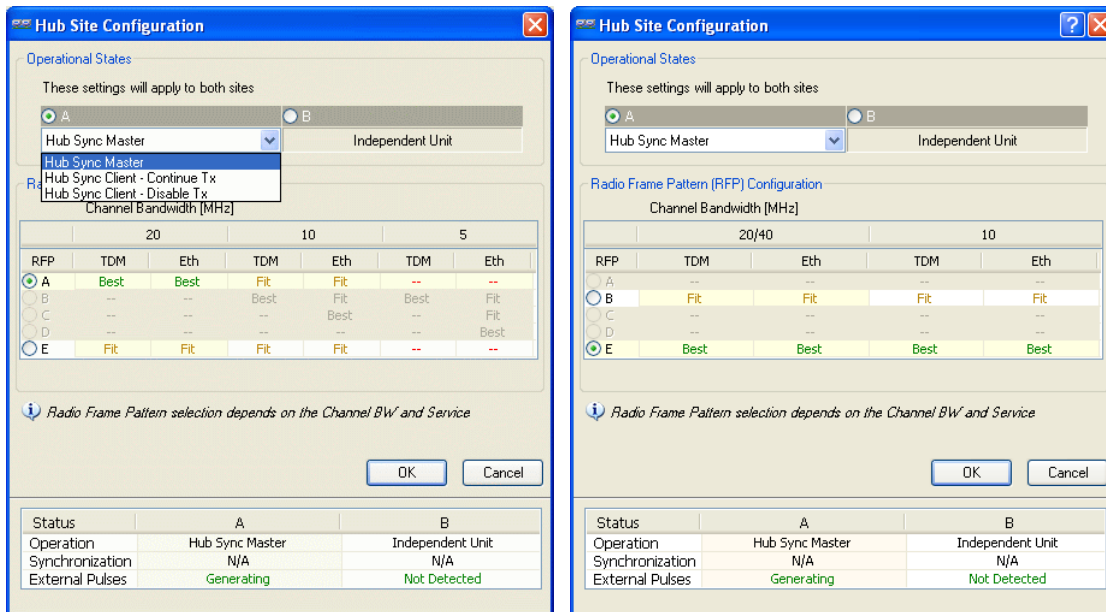


Figure 10-14: Hub Site Configuration dialog - Left WinLink 1000, right RADWIN 2000

## Site Configuration and HSS

For units that support HSS, the Hub Site Sync option appears in the Air Interface section and displays the current HSS of the unit. Configure the unit from the Link Configuration Wizard according to the procedure described above.

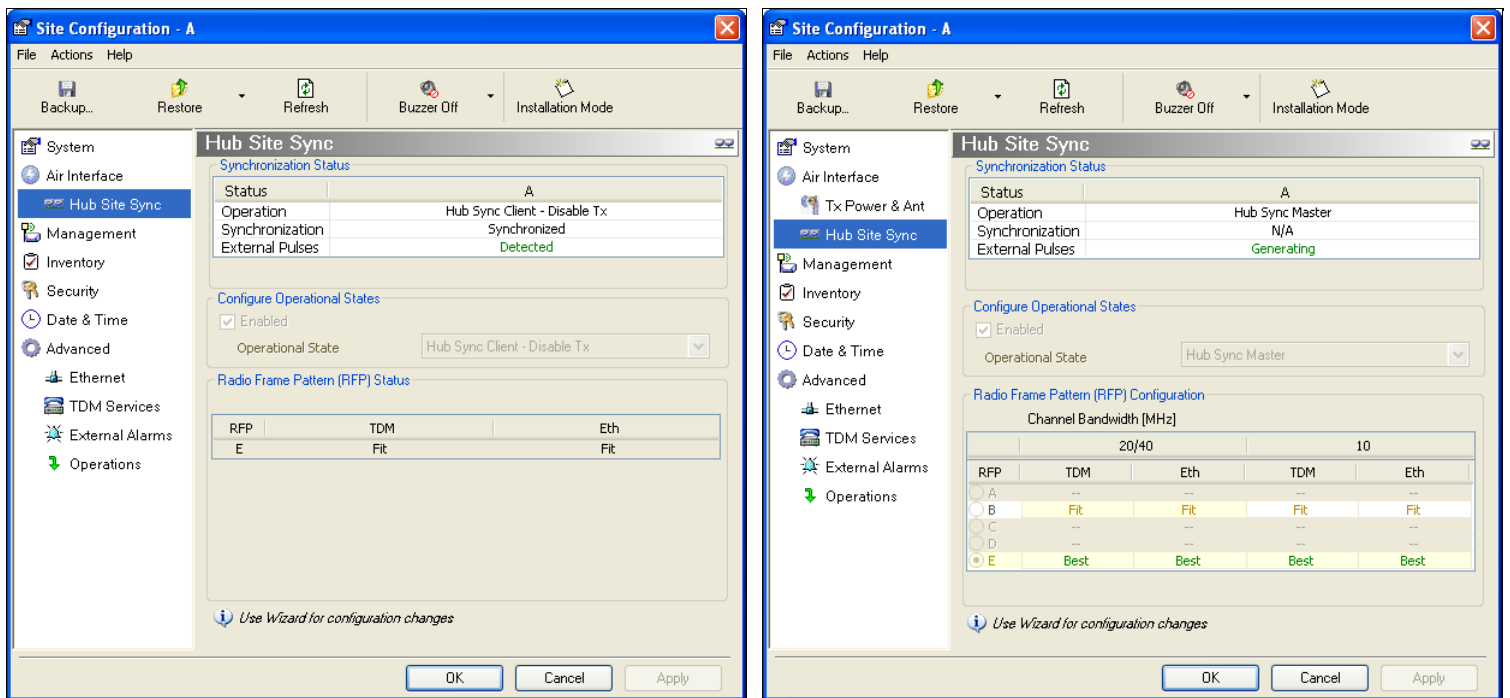


Figure 10-15: Site Configuration: HSS - Left - WinLink 1000 client, Right - RADWIN 2000 master

For WinLink 1000 units without HSS support, [Figure 10-16](#) is displayed instead of [Figure 10-15](#):



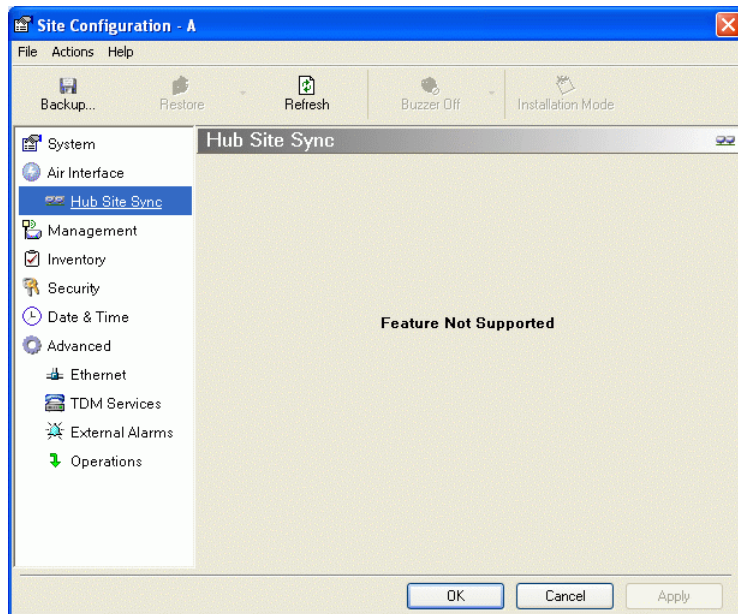


Figure 10-16: HSS Not Supported

# 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 standard WinLink 1000 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 11-1](#), 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.

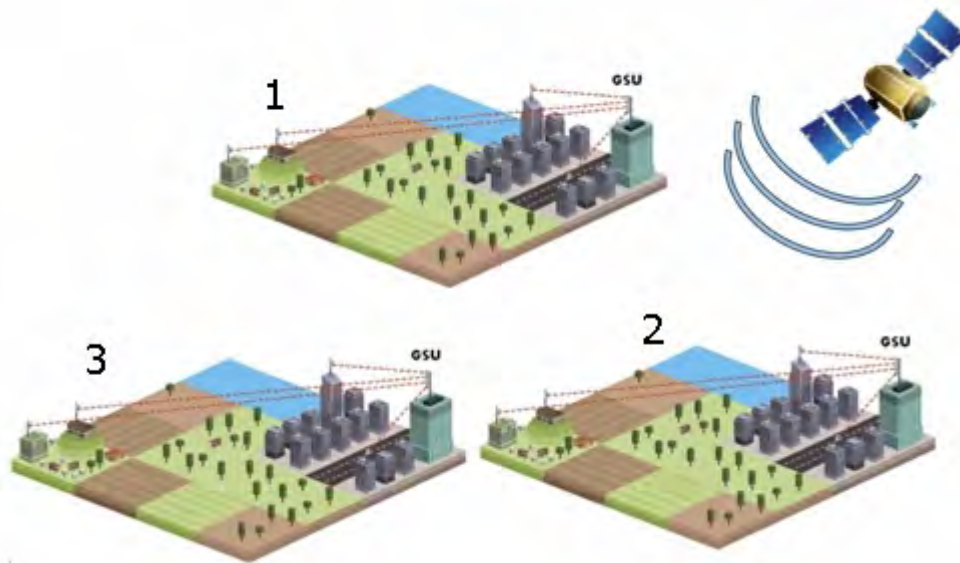


Figure 11-1: GSU Scenario - Independent distributed sites

**Multiple Distributed Sites with Communication**

What happens if, in **Figure 11-1**, the GSU towers themselves have radios communicating as shown in **Figure 11-2**?

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 11-3**. 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.

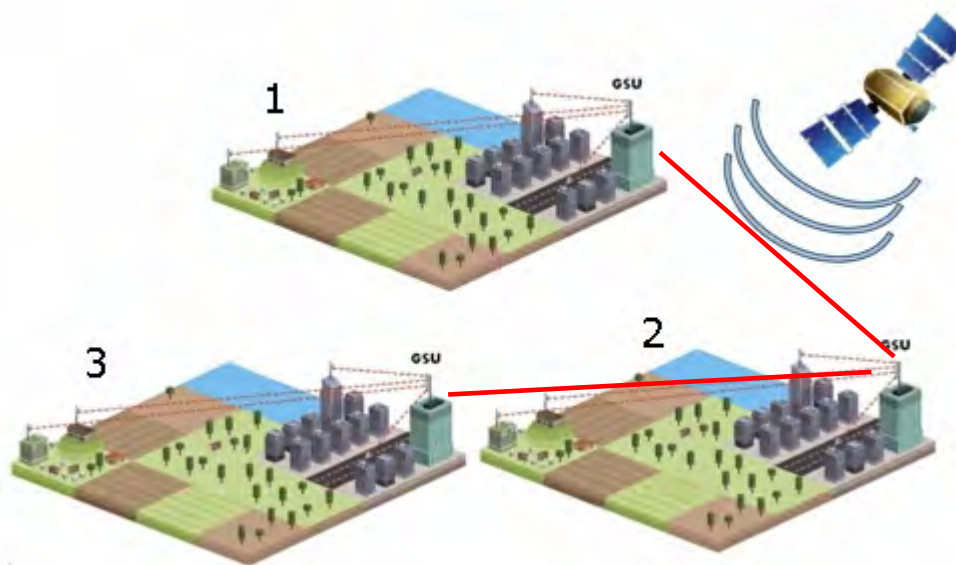


Figure 11-2: GSU Scenario - Communicating distributed sites

## 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:

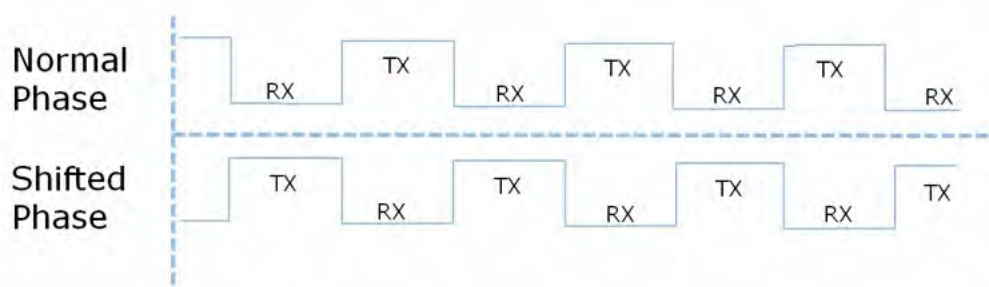
- The GSU sites (marked 1, and 3 above) are sufficiently far apart as to ensure that there is no mutual interference between communicating sites (1-2 and 2-3 above)
- There should be no interference between non-communicating sites (1 and 3 above).

To see how it works, we use [Figure 11-2](#). 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 11-3](#).

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 11-3: 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.

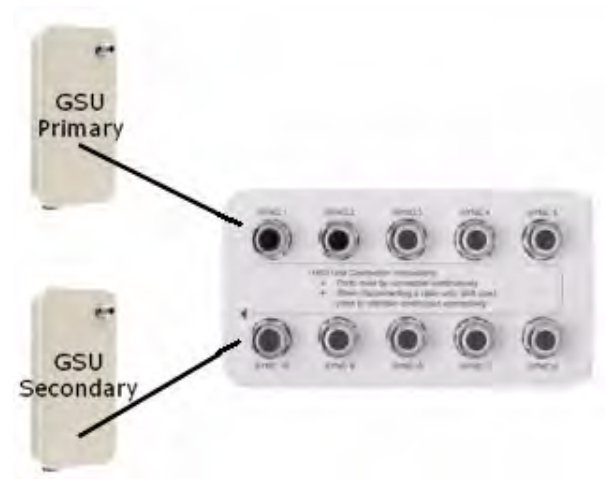


Figure 11-4: Make the GSUs the first two collocated units

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

The GSU uses the same container and cabling as a WinLink 1000 unit.

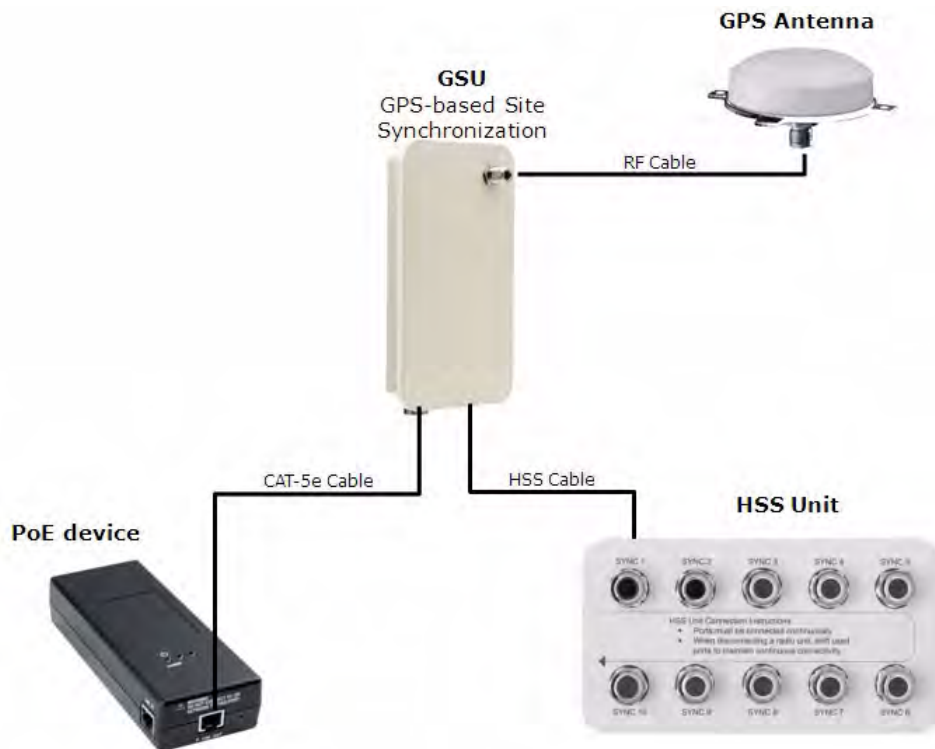


Figure 11-5: General GSU configuration

In that respect, all of the considerations of [Chapter 3](#), [Chapter 17](#) and [Chapter 18](#) of the use Manual apply to the GSU.

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

### Preparing the GSU for Use

Use the method of [Chapter 19, Preloading an ODU with an IP Address](#) to change the IP address from the default (10.0.0.120). In the example screen captures below, we use 192.168.222.20 with Subnet Mask 255.255.252.0.

### 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 preloading 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 4](#).

#### The GSU Main Window

Here is the main window for GSU configuration:



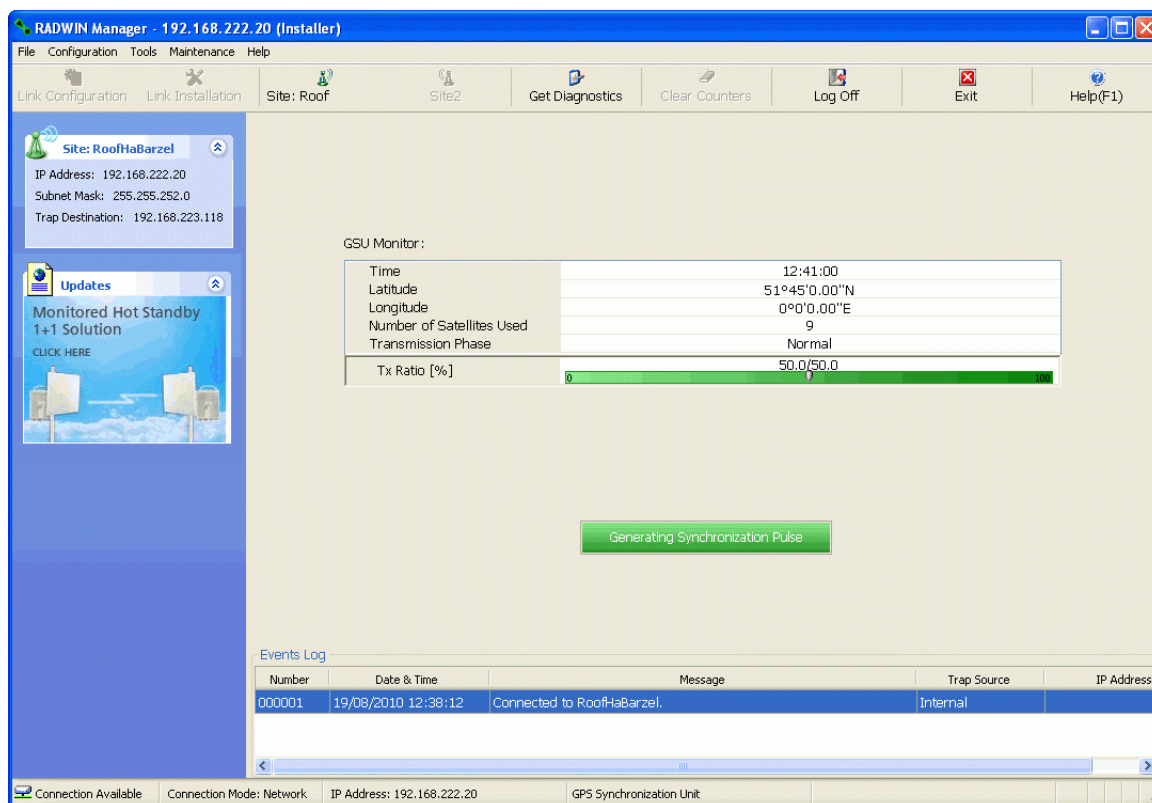


Figure 11-6: GSU Main widow at startup

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 WinLink 1000. Notice that there are no Installation or Configuration wizards. Such configuration as is necessary is carried out using a modified version of Site Configuration for WinLink 1000.

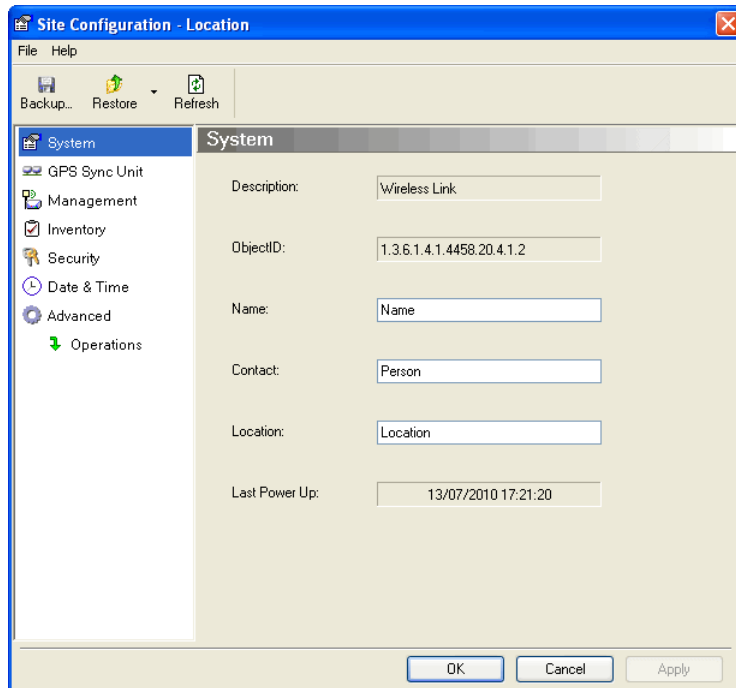
Similarly, the Tool bar is a subset of that applicable to the WinLink 1000.



## Using Site Configuration for the GSU

### *Site Configuration: System*

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



*Figure 11-7: Site Configuration: System*

It is similar to that of the WinLink 1000.

**Site Configuration: GPS Sync Unit**

This window is the main GSU configuration tool:

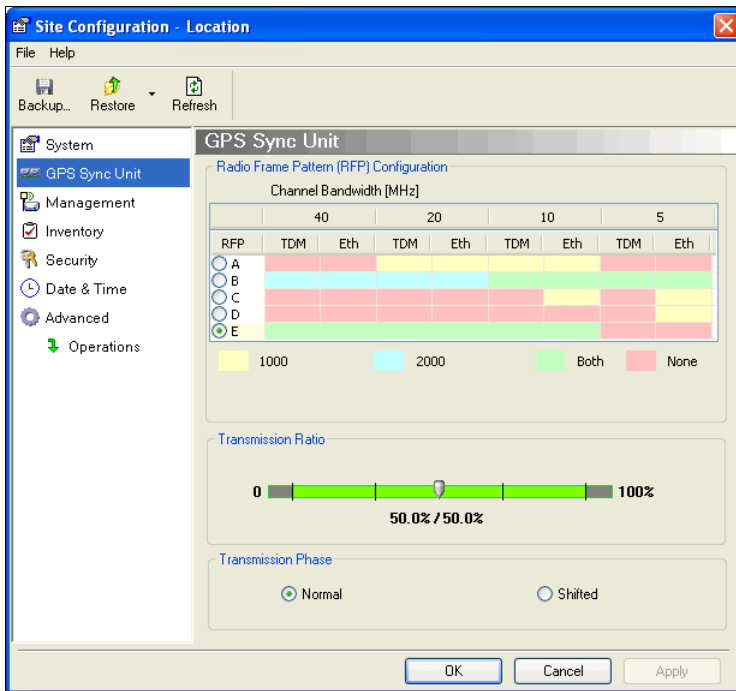


Figure 11-8: Site Configuration: GPS Sync Unit



The 1000 and 2000 labels refer to WinLink 1000 and RADWIN 2000 radios, respectively. The actual annotation seen may vary, but the intention should be clear.

**1. Setting the RFP for HSS**

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



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