High Capacity Carrier-Class Radio Relay

Installation and Operation Manual
Software Version 1.700

High Capacity Carrier-Class Radio Relay
Installation and Operation Manual

Notice

Quick Start Guide

Installation should be carried out only by a qualified technician. If you are familiar with the system, use this guide to prepare the units for operation. If you are not familiar, please read the Installation and operation Manual carefully.

1. Equipment Required

The following is a list of equipment required for installing a link:

- RJ-45 crimp tool (if pre-assembled cable is not used)
- Drill (for wall mounting only)
- IDU and ODU grounding cables
- O-PoE 10AWG grounding cable
- 13 mm (½″) spanner/wrench
- ODU to IDU cable if not ordered (outdoor class, CAT-5e, 4 twisted pairs)
- ODU to O-PoE both cables (ETH and PoE) if not ordered (outdoor class, CAT-5e, 4 twisted pairs)
- Cable ties
- Laptop running Windows 2000 or Windows XP.

2. Before the Installation

1. Verify that all equipment and tools are available.
2. Install the software on the laptop; the installation takes several minutes.
   The software installation leaves the Manager icon on the desktop.
3. BRS systems only - Activate the link.

3. Installing the Units

➤ **To install the ODU:**

1. At site A, route the ODU cable from the ODU location (on the roof) to the IDU location (inside the building). The maximum length is 100m.
2. Mount the ODU unit to the mast or wall, using the mounting kit and mounting instructions.

Note   *Do not tightly secure the ODU until the alignment process is complete*
When installing the ODU is important to check that there are no direct obstructions in front of the ODU between the two link sites.

3. Verify that the ODU mounting brackets are connected to ground.

4. Connect the ODU chassis ground to ground.

5. Connect the RJ-45 connectors to both ends of the cable using the pinout table and diagram below:

IDU RJ-45		Wire Color	Function	ODU RJ-45
1	twisted	White/Green	Ethernet (RxN)	1
2	pair	Green	Ethernet (RxT)	2
3	twisted	White/Orange	Ethernet (TxT)	3
6	pair	Orange	Ethernet (TxN)	6
4	twisted	Blue	Power (+)	4
5	pair	White/Blue	Power (+)	5
7	twisted	White/Brown	Power (–)	7
8	pair	Brown	Power (–)	8
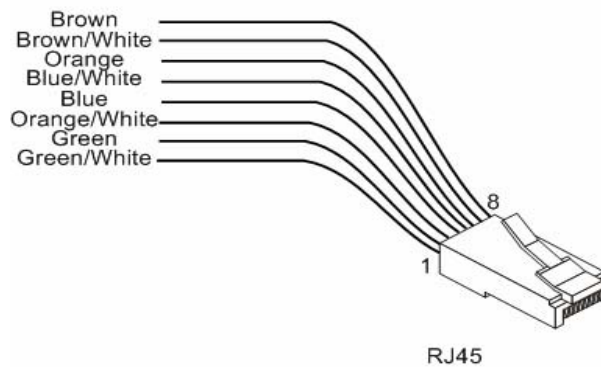
6. Secure the ODU and ground cables to the mast or brackets using cable ties.

7. Repeat the procedure at site B.

➤ **To align the ODU:**

1. Connect power to the site A IDU.

   After approximately 20 seconds the ODU beeper starts beeping. This is normal.

2. Verify normal operation of the IDU by the LED indications on the front panel.

Indicator	Color	Status
PWR	Green	ON
IDU-E	Orange Green	ON for short duration during startup ON during normal operation
ODU	Green	ON shows normal operation
AIR I/F	Orange Green	ON for short duration during startup ON shows normal operation
SERVICE	Green	ON shows normal operation OFF when Service is configured for Ethernet only

Caution **Do not stand in front of a live outdoor unit, see Appendix H**

3. Align the site A ODU in the direction of the site B ODU.

4. Connect power to the site B IDU.

    After approximately 20 seconds the ODU beeper starts beeping. This is normal.

5. Verify normal operation of the IDU by the LED indications on the panel.

Indicator	Color	Status
PWR	Green	ON IDU-C only
IDU	Orange Green	ON for short duration during startup ON during normal operation
ODU	Green	ON shows normal operation
AIR I/F	Orange Green	ON for short duration during startup ON shows normal operation
SERVICE	Green	ON shows normal operation OFF when Service is configured for Ethernet only

6. Make an azimuth sweep with the site B ODU of 180 degrees so that the site A ODU position is learned by the site B ODU.

7. Turn the site B ODU slowly back towards the site A direction, listening to the beep sequence until optimal alignment is achieved.

Best Signal so far

Signal quality increased

No change in signal

Signal quality decreased

No air link

HSS fault

Note   *Three beeps and a pause is the best signal*
Two beeps and a pause, signal quality increased
One beep and pause is no signal change
Any other signal detects no signal between ODUs.

8. Secure the site B ODU to the mast/wall.

9. At site A, adjust the ODU slowly while listening to the beeper sequence until the best signal is attained.

10. Secure the site A ODU to the mast/wall.

11. Monitor the link quality for about 15 minutes to verify stability.

12. Connect the management station to one of the two IDUs in the link.

13. Double-click the Manager icon to start the application.

14. Click the **Installation** button to open the installation wizard and follow the installation steps.

After selection of the radio channel and the link rate (as determined in the Link Budget Calculator utility), verify that the link quality bar in the manager is within the green range for TDM service and within the yellow range for Ethernet service.

Note   *Achieve the best possible link quality values. In case of radio link loss, verify the ODU alignment, or change the radio channel in both sides of the link. When the radio link resumes, continue the installation process.*

➤ **To install the Outdoor PoE (O-PoE):**

1. Route the ODU cable from the ODU location (on the roof) to the   O-PoE location (also on the roof). The maximum combined length of the ODU to Outdoor PoE cable and the O-PoE to user hub/router (or any other compatible device) cable is 100m.

2. Mount the O-PoE unit to the mast or wall, using the mounting kit and mounting instructions.

3. Verify that the O-PoE mounting brackets are connected to ground.

4. Connect the O-PoE chassis to ground.

5. Route the O-PoE AC cable along the mast or wall to a protected/shielded AC outlet.

⚠ **Only UL Listed parts and components will be used for installation. Use UL Listed devices having an environmental rating equal to or better than the enclosure rating to close all unfilled openings**

Warning

4.   Connecting the Power

⚠ **Warning**

Before connecting any cable, the protective earth terminals of the AC/DC adapter must be connected to the protective ground conductor of the mains power cord. If you are using an extension cord (power cable) make sure it is grounded as well.

Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting of the protective earth terminal can make this unit dangerous. Intentional interruption is prohibited.

Connecting Power to an IDU-E

Power is supplied via an external AC/DC converter, which receives power from 100–240 VAC source and converts it to -48 VDC.

➤ **To connect power to the IDU-E:**

1.   At site A, connect the 2-pin connector of the AC/DC converter to the 2-pin DC power connector on the IDU rear panel.

2.   Connect the AC/DC converter 3-prong plug to a mains outlet.

The unit turns on automatically upon connection to the mains.
The green PWR indicator turns on, and the IDU indicator blinks orange for approximately 40 seconds during startup. See *Normal Indicators* section in Chapter 3.

3.   After approximately 20 seconds the ODU starts beeping. The beeps continue until the ODUs are aligned and the link set up.

4.   Wait for approximately one minute, then repeat for Site B.

Connecting Power to an IDU-C

AC power is supplied through a standard 3-prong plug.

AC power should be supplied via a 1.5m (5 ft) standard power cable terminated by a standard 3-prong socket. A cable is provided with the unit.

➤ **To connect AC power to an IDU-C:**

1.   Connect the power cable socket to the power connector on the front panel.

2.   Connect the power cable plug to the mains outlet.

The unit will be turned on automatically upon connection to the mains.

➤ **To connect DC power to an IDU-C**

A special IEC 60320 adapter for -48 VDC or -24 VDC power connection is supplied with the unit.

Connecting Power to an O-PoE

AC power is supplied to the O-PoE via a 3m (10 ft) 3-prong AC cable attached to the unit (pigtail). The AC cable is provided with no termination.

➤ **To connect AC power to an O-PoE:**

Connect the power cable to a protected/shielded AC mains outlet.

The unit will be turned on automatically upon connection to the mains.

⚠️ *Warning*	**To maintain Overvoltage (Installation) Category II, install a suitable surge suppressor device in the branch circuit to limit expected transients to Overvoltage Category II values.** **The limits are based on IEC60664 and are also located in Table 2H of UL60950** **(for mains ≤ 150V, the transient rating is 1500V** **for 150V < mains ≤ 300V, the transient rating is 2500V;** **and for 300V < mains ≤ 600V, the transient rating is 4000V).**

5.   Connecting the User Equipment

➤ **To connect user equipment to the IDU:**

1. Connect the user equipment (such as PBX) to the IDU RJ-45 port designated **Trunk:**
    - On the rear panel of the IDU-E
    - On the front panel of the IDU-C

2. Connect user hub/router or any other compatible device to the IDU RJ-45 port designated **LAN**.
    - On the rear panel of the IDU-E
    - On the front panel of the IDU-C

➤ **To connect user equipment to the O-PoE:**

1. Connect user hub/router or any other compatible device to the port designated ETH via an outdoor shielded CAT-5e cable. To connect directly to PC LAN port, refer to *Appendix A*.

Note	• *IDU-C has an integrated LAN switch that provides two 10/100BaseT ports. The Integrated LAN switch does not support spanning tree.* • *The two LAN ports can be connected to two separate LAN segments.*

Caution	Do not connect both LAN ports to the same LAN segment, a loop will be created that will flood the network.

Caution   For O-PoE only UL Listed parts and components are used for installation. Use UL listed devices having an environmental rating equal to or better than the enclosure rating to close all unfilled openings.

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Chapter 1

Introduction

1.1 Overview

The system is a carrier-class, high capacity, Point-to-Point broadband wireless transmission system. Legacy TDM and Ethernet services are combined over 2.3 to 2.7 and 4.9 to 5.9 GHz bands, with deployment suitable in FCC, ETSI, CSA-regulated countries, and other regions. The system provides up to 48 Mbps wireless link and supports ranges of up to 80 km (50 miles) with an external antenna.

The screens shown in this manual are for version 1.700. For systems with earlier ODU hardware versions contact your supplier for the relevant manual.

Application

Figure 1-1 illustrates a typical point-to-point application of two units.
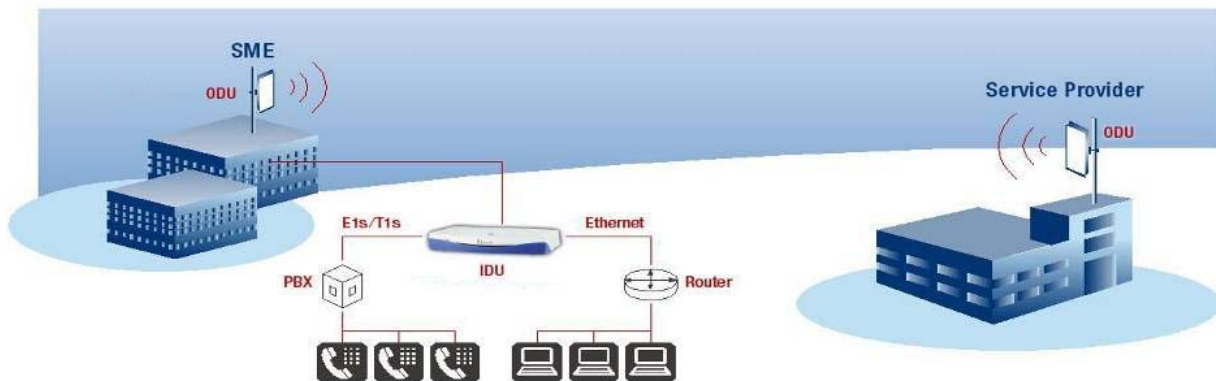
Figure 1-1. Typical Application

Versions

The system is available in several different frequency ranges, with versions for ETSI and FCC regulations;

- F23, 2.300–2.400 GHz

- F24, 2.400–2.4835 GHz

- F25, 2.496–2.690 GHz

- F49, 4.940–4.990 GHz

- F53, 5.250–5.350 GHz

- F54, 5.470–5.725 GHz

- F58, 5.725–5.850 GHz

- F59, 5.865–5.935 GHz

Several special systems are also available;

- AIND, All Indoor unit, F58/FCC with 4T1 support - integrates the ODU and the IDU-C into a single 19" IDU-C box.

- ACCESS, Ethernet only units powered over the Ethernet via PoE unit. Available in F23, F24, or F58 frequency ranges.

- ACCESS-CL, ODU is equipped with special hardware for the collocation of several units, using a method called Hub Site Synchronization (HSS).

Features

Wireless Link

Up to 48 Mbps air rate is delivered for Ethernet and E1/T1 traffic. The system supports a variety of spectrum bands and can be configured to operate in any channel in the band with a carrier step resolution of 5, 10, or 20 MHz.

Operation complies with ETSI, CSA, CN, UK, and the FCC 47CFR Part 15 and subpart C and E requirements.

Time Division Duplex (TDD) transmission is employed. This technology simplifies the installation and configuration procedure. There is no need to plan and to allocate separate channels for the uplink and downlink data streams.
Operation over 2.4 GHz and 5.x GHz bands is not affected by harsh weather conditions, such as fog, heavy rain etc.

LAN Interface

The LAN port provides 10/100BaseT interfaces with autonegotiation and transparent VLAN support. Traffic handling is provided by a MAC-level self-learning bridge.

TDM Interface

The TDM interface accepts E1 or T1 traffic, supporting the following:

- Unframed operation (E1 and T1)

- AMI and B8ZS zero suppression (T1).

Advanced Encryption System

User's data security is ensured with one of the most sophisticated commercially available combined encryption and authentication techniques, CCM/AES. This technique combines message authentication (preventing antispoofing 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, both the source and destination MAC addresses are encrypted.

Management

The user-friendly SNMP-based management tool provides full local and remote end-to-end configuration, management, event log and performance monitoring capabilities.

Alternatively each site can be configured or monitored via a Telnet terminal.

Diagnostics and Performance Monitoring

The system supports activating local and remote loopbacks on E1/T1 links.

The data transmission process constantly monitors and evaluates received signal strength and signal quality. It also monitors received traffic and frame rate (FPS) for local and remote units.

Automatic Channel Select

The Automatic Channel Select feature operates via a Dynamic Frequency Selection (DFS) mechanism. This enables coexistence with any radar system that may be active in the area. Channel monitoring is performed and the channel with the lowest interference for the transmission is selected. Operation complies with ETSI requirements where the ETSI version has been purchased.

Adaptive Modulation

Modulation is changed automatically depending on channel characteristics in order to guarantee continuation of service. The adaptive modulation enables the user to maximize Ethernet throughput without degradation of the TDM service quality. When Ethernet only service is used, the adaptive modulation enables improving the Ethernet performance in case of air performance degradation (periodical interference or RSS changes).

In case of interference at one site, there is no need to use a lower modulation at the other site (as in previous versions). In such a case the actual rate changes

automatically only at the problematic site, while the second side of the link maintains the highest possible rate (Asymmetric).

Adaptive modulation can be selected in both Installation and Configuration wizards.

Transmit Power Control

Transmit Power Control (TPC) function, provides the capability of defining the transmit power in order to comply with the ETSI standard requirement of 30 dB maximum. See *Table 4-1* for full details of transmit power control.

Alarm Connector

The IDU-C has eight external alarm inputs and outputs in the form of dry-contact relays. The Alarm interface is located on the front panel of the IDU-C. The user enables or disables each of the alarms and configures the text that appears in the alarm trap. The ODU sends the alarm within less than a second from actual alarm trigger.

The alarm connector is available as an ordering option for the IDU-E.

Link Compatibility

Version compatibility is indicated via software traps. As new hardware is added to existing networks compatibility issues may arise. Trap messages indicate the problem and suggest upgrades as appropriate.

Optional External Antenna

The system supports configuration of an external antenna. In this configuration, the outdoor unit is supplied with an N-type connector that connects through a coax cable to the external antenna.

An external antenna can extend the range of the link, and in some cases, may help to reduce environmental interferences. Various external antennas are available for the different operating frequencies.

For example, an optional flat panel 28 dBi external antenna increases the operation range up to 80 km (50 miles).

Hub Site Synchronization

When several transmission units are collocated at a common hub site interference may occur from one unit to another. The ODU units are supplied with special hardware for the collocation of up to eight units.

Using a method called Hub Site Synchronization (HSS) an external cable is connected to all collocated ODUs, this cable carries pulses sent to each ODU, which synchronize their transmission with each other. (See *Appendix F* for more details).

E1 Trunk Redundancy

IDU-R units have a secondary E1 input which may be connected to external equipment other than the ODU. This provides backup in the event of failure of either the air interface link, or the secondary E1 link.

The user configures which of the two links is the main link and which is the backup link.

1.2 Physical Description

The system consists of an Outdoor Unit (ODU) and an Indoor Unit, which may be an IDU-E or an IDU-C.

Figure 1-2 shows the IDU-E, IDU-C carrier class unit, and an ODU with integrated antenna. *Figure 1-3* shows the Outdoor-PoE unit.

Figure 1-2. Wireless Transmission Units

Figure 1-3. O-PoE Unit

IDU-E

The front panel of the IDU-E includes five LEDs, which display the status of E1/T1 traffic, wireless link, self-test results, the ODU-to-IDU link, and power status. For a detailed description of the front panel LEDs, see *Chapter 3*.

The rear panel of the IDU includes the connectors for power, WAN, LAN, E1/T1, and the ODU. The wiring specifications are detailed in *Appendix A*. The rear panel LEDs are described in *Chapter 3*.

IDU-C

The IDU-C front panel includes four LEDs that display the status of E1/T1and, wireless link, self-test results, and ODU-to-IDU link. For a detailed description of the front panel LEDs, see *Chapter 3*.

ODU

ODU includes a power connector, which receives -48 VDC, and RJ-45 for Ethernet traffic from the IDU. The ODU is attached to a mast using a special mounting kit, which is supplied with the unit.

The ODU can be used with an integrated antenna, as illustrated in *Figure 1-2*, or with an external antenna. If an external antenna is to be used, then the ODU is supplied fitted with an N-type connector.

O-PoE

O-PoE includes an AC power cable with no termination which can be connected to100-220VAC outlet. The designated PoE connector is connected to an ODU via a shielded CAT-5e twisted pair cable and delivers Ethernet traffic with 48VDC power towards the ODU. The designated ETH connector is connected via a shielded CAT-5e twisted pair cable which receives and delivers Ethernet traffic. The wiring specification for the twisted pair cable is detailed in *Appendix A*

The O-PoE is attached to a mast using a special mounting kit, which is supplied with the unit.

Note	*To connect the ETH port from O-PoE to a PC, a crossed LAN cable must me used. See* Appendix A.

1.3 Functional Description

The system comprises of the following units:

- **Outdoor Unit (ODU)**: An enclosed aluminum frame with a front sealed plastic cover, containing an integrated transceiver with an antenna, RF module, modem and standard interfaces. The ODU stores all the configuration parameters of the system. *Figure 1-4* shows the ODU block diagram.

- **Indoor Unit (IDU-E or IDU-C)**: The interface unit between the ODU and the user. It converts 100–240 VAC to -48VDC, and sends it on to the ODU. The IDU does not store any configuration data. Therefore, there is no need for additional configuration of the system when replacing an IDU.

- **Outdoor PoE (O-PoE)):** An enclosed aluminum frame with a front sealed aluminum cover, containing a 110-220VAC to 48VDC switching power supply and an interface interconnecting an un-powered Ethernet infrastructure to ODU.
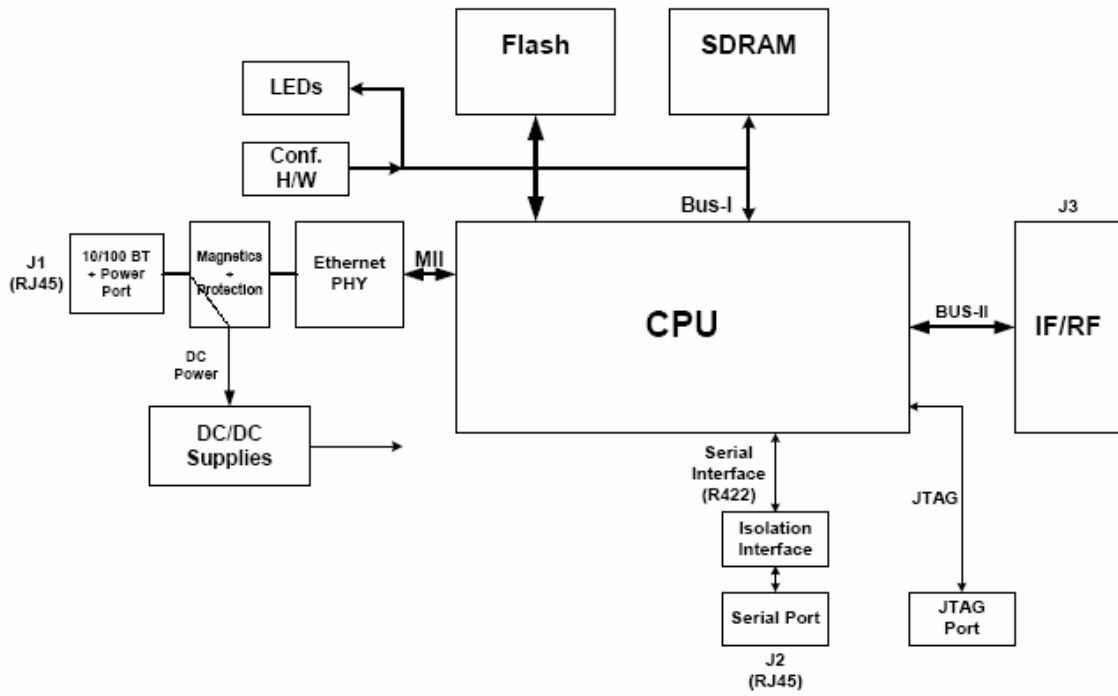
Figure 1-4. ODU Block Diagram

1.4 Technical Specifications

Air Interface

Technology	OFDM
Duplexing Method	Time Division Duplex (TDD)
Capacity	Configurable up to 48 Mbps
Modulation	OFDM - BPSK, QPSK, 16QAM, 64QAM
Channel Resolution	5/10/20 MHz (BRS systems 5 and 10 MHz only)
Transmitter Power	Specification is different per product, for further details refer to the *Link Budget Calculator*
Range	Up to 41 km (25.5 miles) Up to 80 km (50 miles) with an external antenna ACCESS versions up to 20 km.

Frequency Bands [GHz] and Standards	2.300–2.483	FCC, ETSI
	2.496–2.690	FCC part 27 (BRS)
	4.940–4.990	FCC
	5.150–5.350	FCC
	5.470–5.725	ETSI
	5.725–5.850	FCC

Antennas   (See Antenna Characteristics in *Appendix E*)

LAN Interface

PHY	Up to 2 × 10/100BaseT, auto-sensing
Framing/Coding	IEEE 802.3/U
Bridging	Self-learning, up to 2048 MAC addresses
Line Impedance	100Ω
VLAN Support	Transparent
Frame Size	1536 bytes max
Connector	RJ-45

E1 Interface

Data Rate	Unframed (transparent) 2.048 MHz (Specification may be different per ordering option)
Line Interface	HDB3
Connector	RJ-45
No. of Ports	IDU-E: 1 or 2 IDU-C: 4

T1 Interface

Data Rate	Unframed (transparent) 1.544 MHz (Specification may be different per ordering option)
Zero Suppression	AMI, B8ZS
Connector	RJ-45

	No. Of Ports	IDU-E: 1 or 2 IDU-C: 4

Indicators	PWR (green)	Power status (IDU-E only)
	IDU (green)	IDU-C status
	ODU (green/red)	ODU-to-IDU link status
	LINK (green/red)	Link status
	SERVICE (green/red)	E1/T1 signal status

Power	Source	IDU-E: 100–240 VAC via external AC/DC converter
		IDU-C: 100–240 VAC via AC cable
		       -48 VDC (-42 to –60 VDC)
		       24 VDC

	Power Received by the ODU	-48 VDC
	Power Consumption	ODU plus IDU-E – 10W max
		ODU plus IDU-C – 14W max
	Connector	IDU-E 2-pin
		IDU-C AC – 3-pin IEC connector DC – 3-pin terminal block

Alarm Connector	Connector	DB-9 female
	Electrical Characteristics	Dry Contact, 30V/2A Max input current, 0.01A at 0.5W (R=5K)

Physical	***ODU and O-PoE Enclosures***		ODU with integrated antenna
	Height	24.5 cm / 9.3 in	30.5 cm / 12 in
	Width	13.5 cm / 5.13 in	30.5 cm / 12 in
	Depth	4.0 cm / 1.57 in	5.8 cm / 2.3 in
	Weight	1.0 kg / 2.2 lb	1.5 kg / 3.3 lb
	Indoor Unit	**IDU-E**	**IDU-C**
	Height	4.5 cm (1.7 in) 1U	4.5 cm (1.7 in) 1U
	Width	23.5 cm (9.3 in)	29 cm (11.5 in)
	Depth	16.5 cm (6.7 in)	43 cm (17.7 in)
	Weight	0.5 kg (1.1 lb)	1.5 kg (3.3 lb)

Environment	**ODU and O-PoE**	
	Enclosure	All-weather case
	Temperature	-35 to 60°C/-31 to 140°F
	Indoor Unit (IDU-E and IDU-C)	
	Temperature	-0 to 50°C/32 to 122°F
	Humidity	Up to 90%, non-condensing

Chapter 2

Installation and Setup

2.1   Introduction

This section describes the installation, alignment, and setup procedures for the system.

After installing the hardware and establishing a link, refer to *Chapter 3* for operation instructions and *Chapter 4* for configuration instructions.

In case a problem is encountered, refer to *Chapter 5* for test and diagnostic instructions.

⚠️ **Warning**

Internal settings, adjustment, maintenance, and repairs may be performed only by a skilled technician who is aware of the hazards involved. Always observe standard safety precautions during installation, operation, and maintenance of this product.

2.2   Site Requirements and Prerequisites

For the IDU units, allow at least 90 cm (36 in) of frontal clearance for operating and maintenance accessibility. Allow at least 10 cm (4 in) clearance at the rear of the unit for signal lines and interface cables.

The ambient operating temperature should be –45 to 60°C/–49 to 140°F (ODU), or –5 to 45°C/23 to 113°F (IDU) at a relative humidity of up to 90%, non-condensing.

2.3   Package Contents

The packages include the following items:

ODU package containing:

- ODU
- Mast/Wall mounting kit plus mounting instructions
- CD-ROM [Manager program, Installation and Operation Manual, and Link Budget Calculator]
- Self adhesive label showing the MAC address and the alternative community string KEY. Keep this label safe.
- Spare RJ-45 connector

IDU-E or IDU-R package containing:

- IDU-E or IDU-R
- AC/DC Converter
- IDU wall-mounting drilling template
- Self adhesive label showing the IDU LED operation
- Spare RJ-45 connector

Or

IDU-C Package Containing:

- IDU-C
- For AC model, 110/240 VAC with 3-prong connector cable
- For DC model, 3-pin terminal block connector (green)
- 19″ mounting kit
- Spare RJ-45 connector

External antenna (if ordered)

- 1m connecting cable
- Mounting kit

ODU/IDU cable at length ordered (optional)

O-PoE package contains:

- O-PoE
- Mast/Wall mounting kit plus mounting instructions

Spare RJ-45 connector

2.4   Additional Equipment Required

The following is a list of the equipment required for installing the hardware.

- RJ-45 crimp tool (if pre-assembled ODU/IDU cable is not used)
- Drill (for wall mounting only)
- IDU and ODU grounding cables
- 13 mm (½″) spanner/wrench
- Cable ties
- Laptop running Windows 2000 or Windows XP.

2.5   Installation Sequence

The system installation is achieved by following the steps listed below. Each step is detailed in the following sections of this manual:

1. Mounting ODUs at both sites of the link.

2. Assembling the ODU cable and connecting ODU to IDU at both sites.

3. Aligning the ODUs.

4. Installing the management program on the network management station.

5. Running the Installation wizard from the management program.

6. Connecting user equipment to the local and remote IDUs.

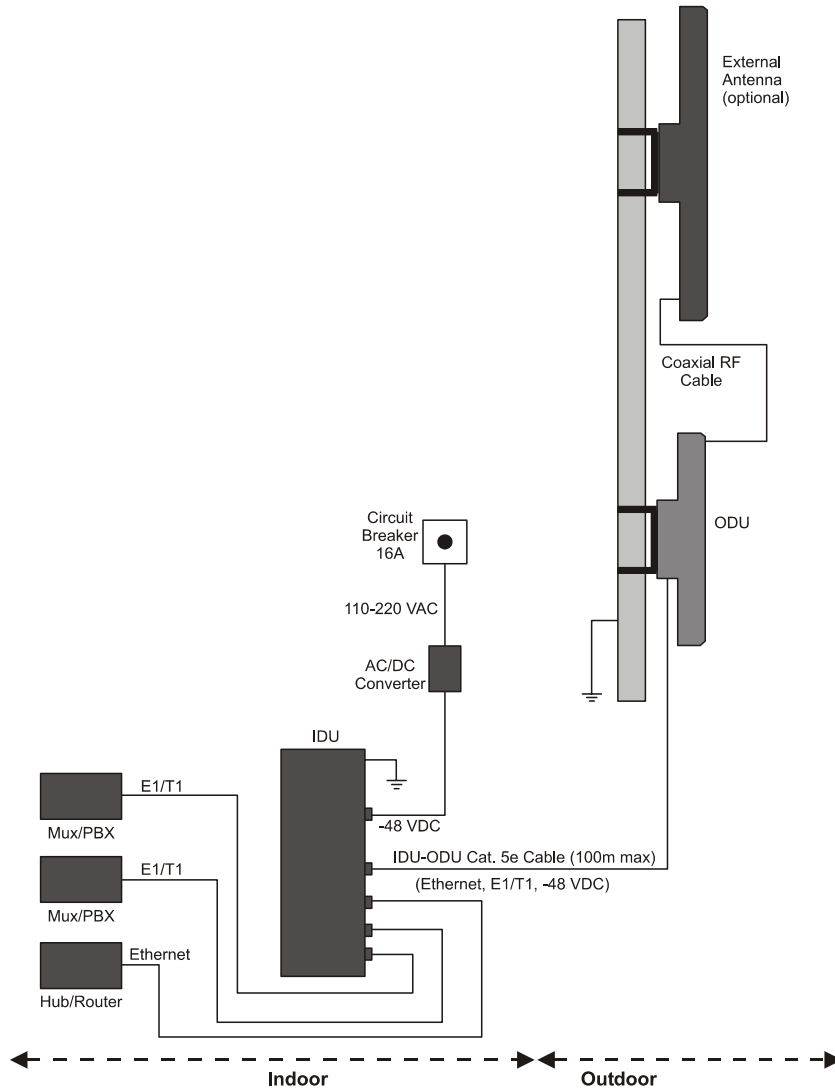*Figure 2-1* illustrates a typical installation with an external antenna.

Figure 2-1. Typical Installation Diagram

2.6   Mounting the ODU

The ODU is the transmitting and receiving element of the system. The ODU can be mounted on a mast or a wall. In both installations, the supplied mounting kit is used to secure the ODU. *Appendix B* describes the mast/wall installation instructions.

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

⚠️
Warning

Prior to connecting cables to the ODU, the protective earth terminal (screw) of the ODU must be connected to an external protective ground conductor or to a grounded mast.
Only a qualified person using the proper safety equipment should climb the antenna mast. Only trained professional installers should be used when installing or dismantling ODUs and masts.

➤ **To mount the ODU:**

1. Mount the ODU unit onto the mast or wall. Refer to *Appendix B* for the ODU mounting instructions.

2. Connect the ground cable to the chassis point on the ODU.

3. Attach the ODU-IDU cable to the ODU RJ-45 connector. If making own ODU-IDU cable, refer to *Appendix A* for the connector pinout.

4. Secure the cable to the mast or brackets using UV-rated cable ties.

5. Repeat the procedure at the remote site.

Note   *Do not tightly secure the ODU to its mounting brackets until the alignment process of the antenna is complete.*
When installing the ODU, check that there are no direct obstructions in front of the ODU or interference from man-made obstacles.

2.7   Connecting the ODU to the IDU

The ODU-IDU cable conducts all the user traffic between the IDU and the ODU. The ODU cable also provides -48 VDC supply and Ethernet to the ODU. The maximum length for one leg of the ODU-IDU cable is 100m (328 ft) in accordance with 10/100BaseT standards.

ODU-IDU cable is supplied pre-assembled with RJ-45 connectors, at the length specified when ordering. If the ODU-IDU cable was not ordered, use Cat. 5e shielded cable. Wiring specifications are given in *Appendix A*.

➤ **To connect the ODU to the IDU**

1. Route the cable from the ODU to the IDU.

2. Secure the cable along its path.

3. Connect the ODU cable to the RJ-45 connector on the IDU designated ODU or WAN. The figures below illustrate typical IDU panels. You may have differences in your panels depending on the hardware ordered.

Figure 2-2. Typical IDU-E Rear Panel

Figure 2-3. IDU-2E1-AL Rear Panel

Figure 2-4. Typical IDU-C Front Panel

Figure 2-5. AIND All Indoor Radio Unit

Note   *Panels may be fitted with different connector combinations than shown, depending on the model ordered.*

2.8   Management Program

Minimum Requirements

The management application is distributed on CD-ROM as an executable file. The application has the following PC requirements:

- Memory: 128 MB RAM
- Disk: 1 GB free hard disk space
- Processor: Pentium 3 or higher
- Network: 10/100BaseT NIC
- Graphics: Card and monitor that support 1024×768 screen resolution with 16 bit color
- Operating system: Windows 2000/XP
- Microsoft Explorer 5.01 or later.

Installing the Software

➤ **To install the management program:**

1. Insert the CD-ROM into your CD-ROM drive.

2. The autorun feature starts to install the software automatically.
   If the installation does not start automatically, run setup.exe.

3. Follow the on-screen instructions of the installation wizard to complete setup of the Management program in the desired location.

Any PC running the management application can be used to configure the units.

2.9   Connecting the Power

⚠️

Warning

Before connecting any cable, the protective earth terminals of the AC/DC adapter must be connected to the protective ground conductor of the mains power cord. If you are using an extension cord (power cable) make sure it is grounded as well.
Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting of the protective earth terminal can make this unit dangerous. Intentional interruption is prohibited.

Connecting Power to an IDU-E

Power is supplied to the IDU-E via an external AC/DC converter, which receives power from a 100–240 VAC source and converts it to -48 VDC.

➤ **To connect power to the IDU-E:**

1. At site A, connect the 2-pin connector of the AC/DC converter to the 2-pin DC power connector on the IDU-E rear panel.

2. Connect the AC/DC converter 3-prong plug to a mains outlet.

    The unit turns on automatically upon connection to the mains.
    The green PWR indicator turns on, and the IDU indicator blinks orange for approximately 40 seconds during startup. See *Normal Indicators* section in Chapter 3.

    After approximately 20 seconds the ODU starts beeping. The beeps continue until the ODUs are aligned and the link set up.

3. Wait for approximately one minute, then repeat for Site B.

Connecting Power to an IDU-C

AC power is supplied to the IDU-C through a standard 3-prong plug.

AC power should be supplied via a 1.5m (5 ft) standard power cable terminated by a standard 3-prong socket. A cable is provided with the unit.

➤ **To connect AC power to an IDU-C:**

1. Connect the power cable socket to the power connector on the front panel.

2. Connect the power cable plug to the mains outlet.

    The unit turns on automatically upon connection to the mains.

➤ **To connect DC power to an IDU-C**

A special IEC 60320 adapter for-48 VDC power connection is supplied with the unit.

Connecting Power to an O-PoE

AC power is supplied to the O-PoE via a 3m (10 ft) 3-prong AC cable attached to the unit (pigtail). The AC cable is provided with no termination.

➤ **To connect AC power to an O-PoE:**

Connect the power cable to a protected/shielded AC mains outlet.

The unit will be turned on automatically upon connection to the mains.

⚠ *Warning*	**To maintain Overvoltage (Installation) Category II, install a suitable surge suppressor device in the branch circuit to limit expected transients to Overvoltage Category II values.** **The limits are based on IEC60664 and are also located in Table 2H of UL60950** **(for mains ≤ 150V, the transient rating is 1500V;** **for 150V < mains ≤ 300V, the transient rating is 2500V;** **for 300V < mains ≤ 600V, the transient rating is 4000V).**

2.10   Aligning ODUs with the Beeper

Perform the ODU alignment using the beepers located inside the ODUs. The beeper facility is not suitable for aligning the All Indoor Units (AIND). To align an AIND system see *Appendix D*.

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

➤ **To align the ODUs via ODU Beeper:**

⚠ *Warning*	**Do not stand in front of a live ODU.**

1. Verify that power is connected to the IDUs at both sites.

2. The ODU starts beeping 20 seconds after power up, and continues beeping until the ODUs are aligned, and the installation is complete.

3. Verify normal operation of the IDU by the LED indications on the front panel. (See *Normal Indications*.)

4. Coarsely align the site B ODU in the direction of the site A ODU.

5. Make an azimuth sweep of 180 degrees with the site A ODU. So that the strongest signal from site B can be learnt.

6. Slowly turning the site A ODU back towards the position of Site B, listen to the beeps until the best signal is reached. See *Figure 2-6* for the beeper signals.

Best Signal so far

Signal quality increased

No change in signal

Signal quality decreased

No air link

HSS fault

Figure 2-6. Beeper Sequence for ODU Alignment

7. Secure the site A ODU to the mast/wall.

8. At site B, adjust the ODU slowly whilst listening to the beeper sequence until the best signal is attained.

9. Secure the site B ODU to the mast/wall.

10. Monitor the link quality for about 15 minutes to verify stability.

2.11   Starting the Manager Program

➤ **To start the Manager:**

1. Connect the management station to the LAN.

2. Double-click the Manager icon on the desktop, or click **Start > Programs > Manager**.

    The Login dialog box appears.
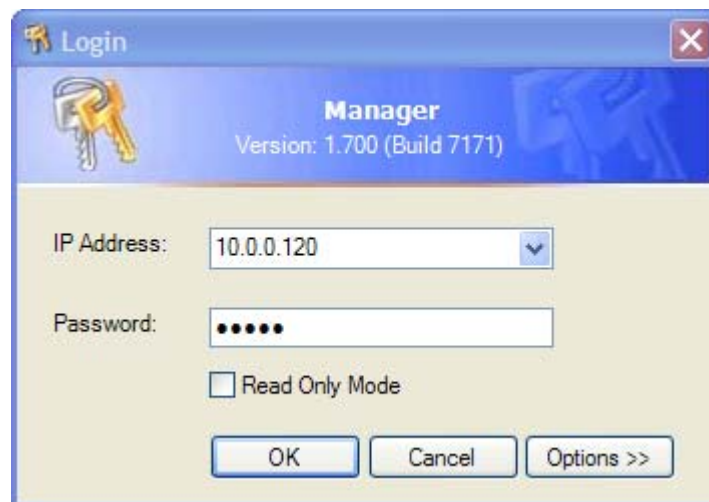
Figure 2-7. Login Screen

3. Select the Connection Mode for the IP Address:

    ▪ Local Mode:
       Select Local Connection (Broadcast), if user is connected directly to the IDU LAN port.

    ▪ Network Mode
       Enter IP address (of the ODU)

Default address: 10.0.0.120

The Subnet mask is 255.0.0.0. Versions 1.700 and up, any valid subnet mask may be used.

Note   *The actual IP address is defined during link configuration (see Defining the Management Addresses).*

4. Enter the password

Default password – **admin** (see the section on *Changing the Management Password*)

5. Click the Read only check box if entering the system as a Read only user.

6. If you are a user with Read-Write permission, click **Options** to enter the community options.

The system is protected with Community passwords. A user may be defined with read-only permission or with read-write permission. See the section *Changing Community Values* for more detail.
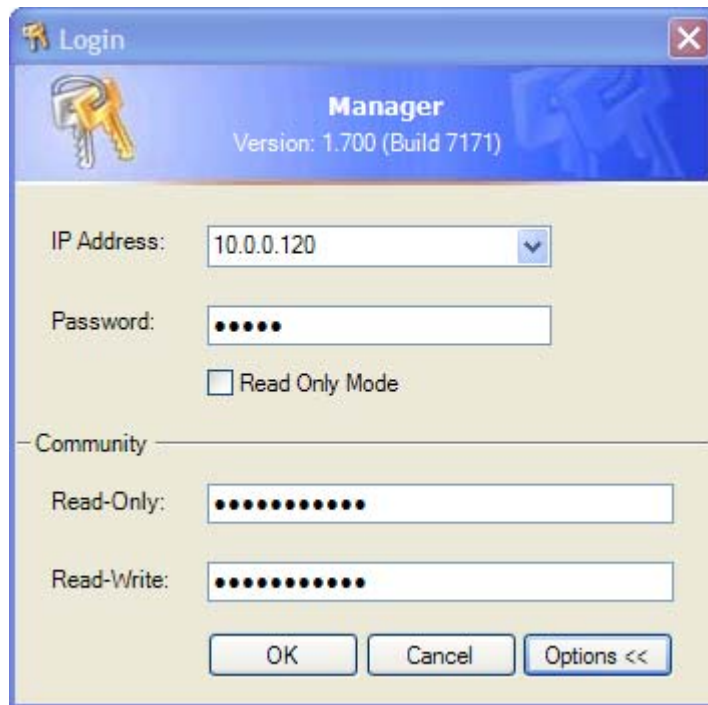
Figure 2-8. Login Screen with Community Options Visible

- If using the system for the first time, leave the default community passwords, **netman** for read-write, and **public** for read-only.

- If community values have previously been defined, enter them in the read-only or read-write communities.

- If you are a user with read-only permission, click the Read Only Mode check box.

The Manager main screen is displayed (see *Figure 2-9*).

Note   *With BRS systems the link must be activated at both sites when installing for the first time. A red Inactive Link box appears in the center of the Manager screen. Activation is performed later.*
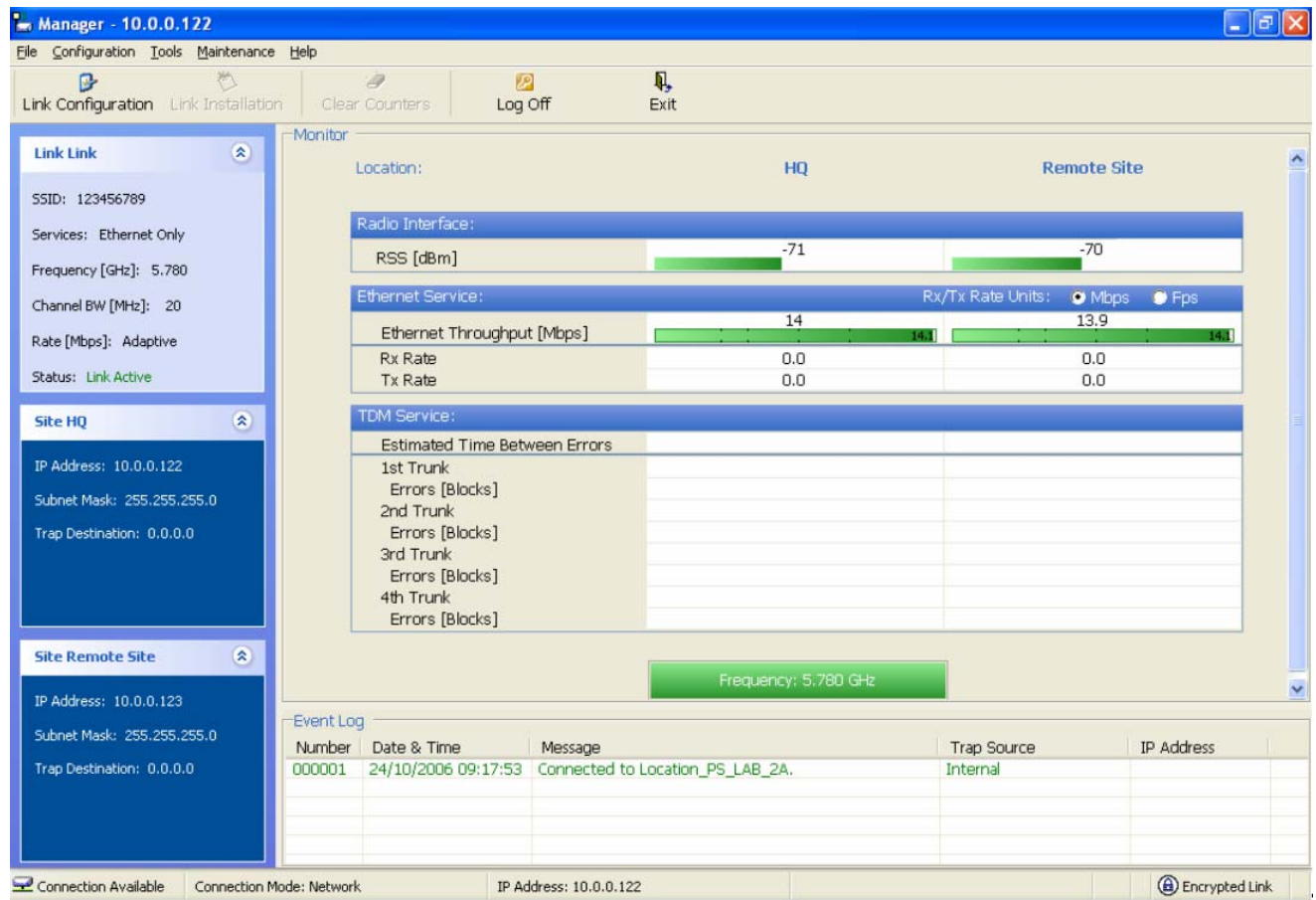
Figure 2-9. Manager Main Screen

2.12   Over the Air Connection indication

During the login the Manager reports on over the air connection.

Note   *Over the Air connection to remote unit is not recommended*

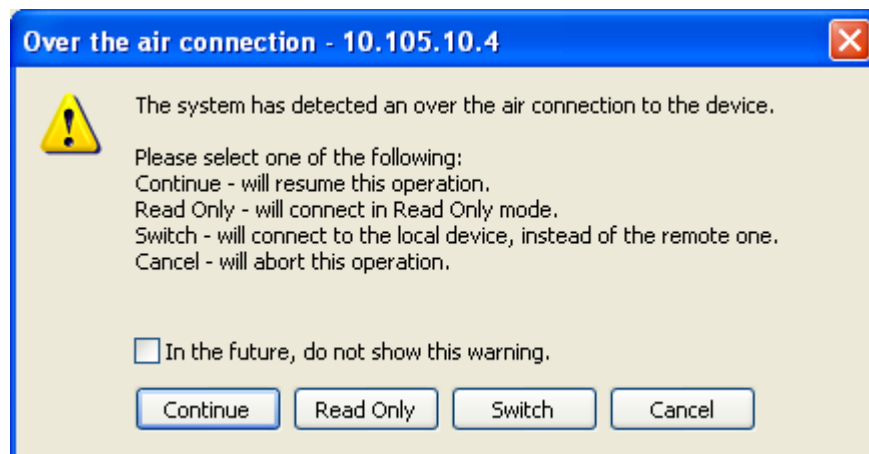- Select the relevant option for your login requirements.

Figure 2-10. Over the Air Connection

2.13   Installing the Link

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

Note

For HSS screens see Appendix F.

➤ **To install the link:**

1. Verify that the management station is properly connected to the same LAN as the IDU, and the Manager application is running.

2. With BRS systems you need to activate the link at both sites, see *Appendix G* for method. Once the link is activated, continue installation from this point.

3. In the toolbar, click the **Link Installation** button.

    The Installation wizard opens, (see *Figure 2-11*).
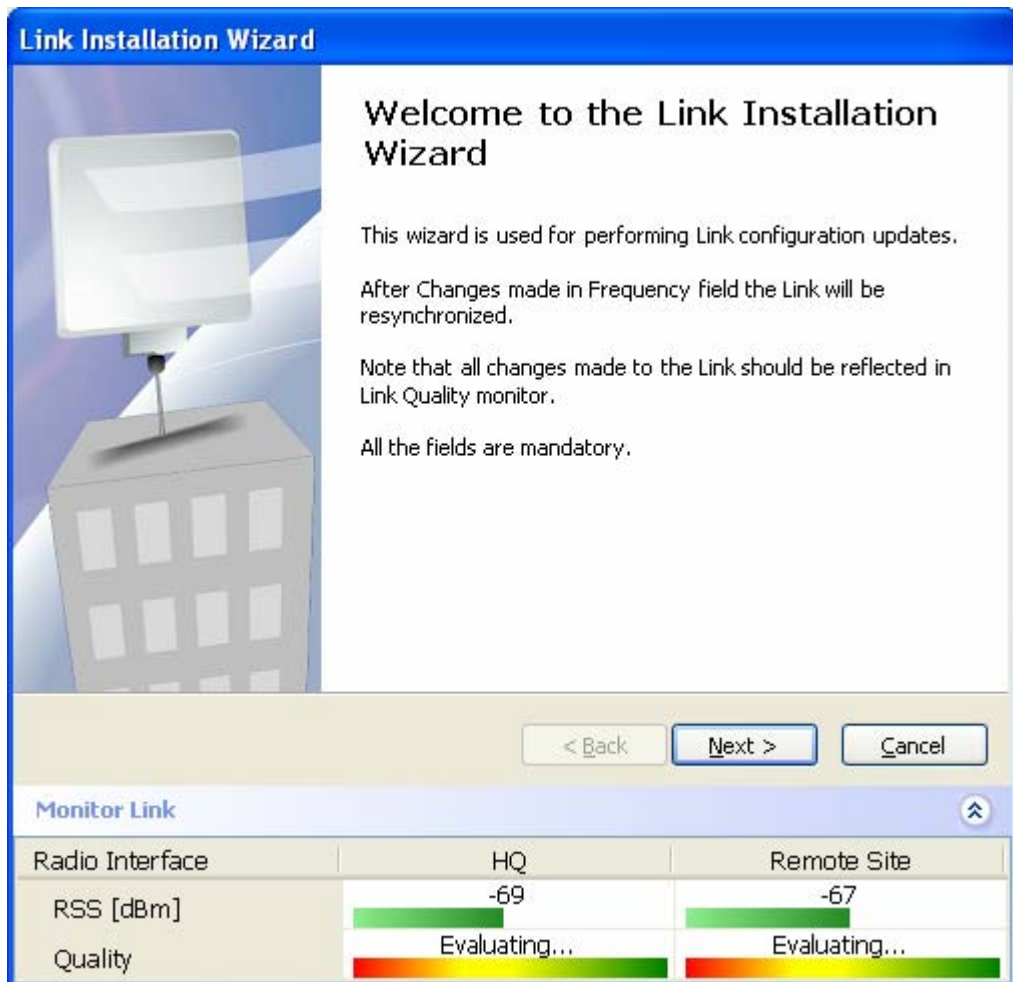
Figure 2-11. Link Installation Wizard

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

    The system dialog box opens (see *Figure 2-12*)

Figure 2-12. Installation Wizard, System dialog box

5. Enter a SSID (System ID). The SSID must include at least eight alphanumeric characters. Up to 24 characters are allowed.

Note   *Both sides of a link must have the same SSID number for data transmission to take place.*

6. Enter a Link Name for the link identification.

7. Enter a name for site 1.

8. Enter a name for site 2.

9. Enter the Link Password (version 1.400 and after). See *Changing the Link Password* for details on the Link Password.

Note   *It 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 Technical Support or use the alternative password supplied with the product. See Changing the Link Password for more details.*

10. Click **Next**.

       The default link with a rate of 9 Mbps is evaluated.

       The *Channel Setting* dialog box appears. This dialog box may be different according to the version that you have purchased.

Changing the Link Password

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

    The Change Link Password dialog box opens.

Note   *Use the Hide Characters check box for maximum security.*
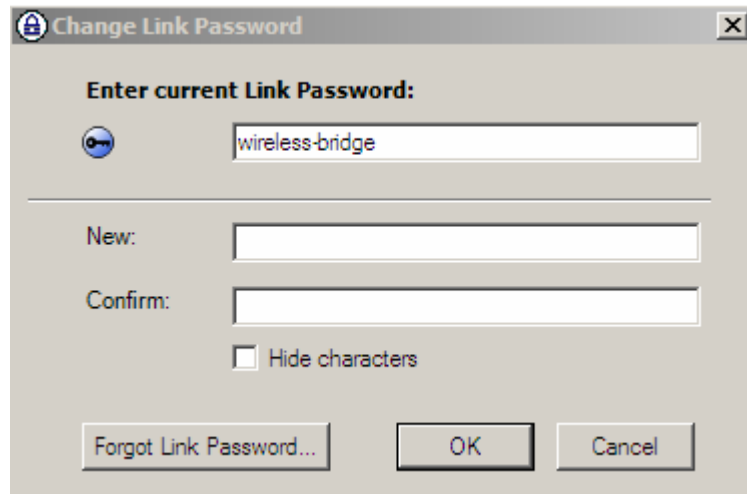

Figure 2-13. Change Link Password dialog box

2. Enter the default link password **wireless-bridge**.

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 successful message.

Note   *Restoring Factory Defaults returns the Link Password to wireless-bridge.*

Selecting Channels

Systems later than version 1.300 have a feature called Automatic Channel Select, which allows you to define several alternative frequency channels if interference is detected on the channel in use.

Automatic Channel Select

Automatic Channel Select (ACS) gives the ability to change frequency channels automatically if interference is detected on the current operating channel.
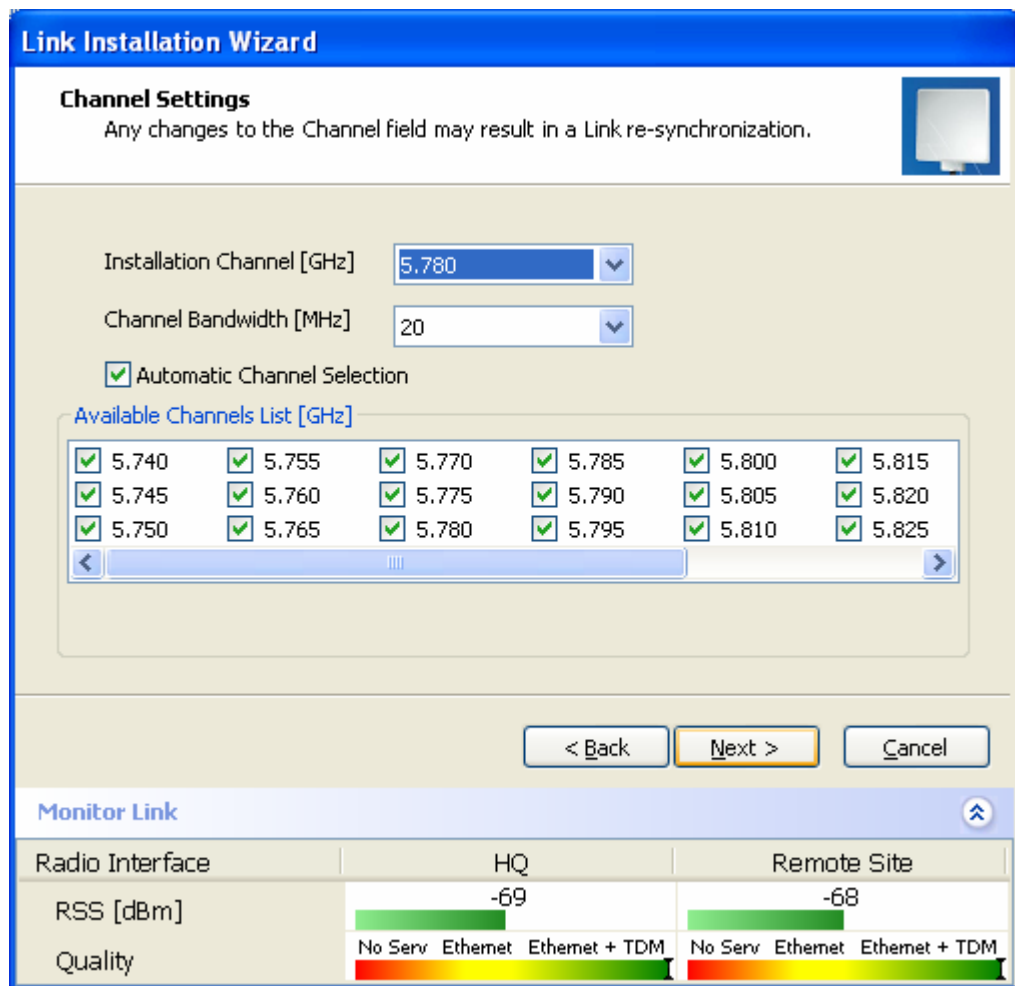
Figure 2-14. Channel Select dialog box - Automatic Channel Select

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

2. Select the required Channel Bandwidth 5, 10, or 20 MHz. Default is 20 MHz.

   When changing the channel bandwidth evaluation of the link is repeated.

Note

ACS is disabled if 5 or 10 MHz channel bandwidth are selected.
F2.x GHz versions with TDM services operate at 10 or 20 MHz steps only.
Ethernet Only also supports 5 MHz bandwidth.

3. Click the check box if Automatic Channel Selection is required.

4. Click the check boxes in the Available Channels List of all the allowable channels that can be automatically selected.

   Selecting a new channel causes the system quality to change. The quality bar shows the adjustment until the system finds the best quality link.

5. If you are not satisfied with the channel that is selected automatically, click Reselect Channel.

   A new channel is selected from one of the Available Channels that has been defined.

6. Click **Next.**

The Evaluating Rate box appears. When the optimum rate for the link is selected the Service Parameters dialog box opens.

5.4 GHz ETSI Version

In accordance with ETSI, if Radar interference is detected, the frequency channel is changed automatically. This feature is termed Dynamic Frequency Selection (DFS). In this version, the Automatic Channel Selection is selected by default and a minimum of two channels must be defined as available.

1. Select the main frequency from the Operating Channel menu.

2. Select the Bandwidth required.

Note   *Automatic Channel Selection is selected by default.*

3. Click at least two check boxes in the Available Channels List of all the allowable channels that can be automatically selected.

Note   *Installation will not continue until at least two channels are defined.*

Selecting a new channel causes the system quality to change. The quality bar shows the adjustment until the system finds the best quality link.

Any channel selected is evaluated for 60 seconds; therefore this selection process may take a few minutes.

4. If you are not satisfied with the channel that is selected automatically, click Reselect Channel.

A new channel will be selected from one of the Available Channels that has been defined.

5. Click **Next.**

The Evaluating Rate box appears. The optimum rate for the link is selected.

The Service Parameters dialog box opens.

BRS Version

Note

Both sites in a BRS Link must be configured identically.
Any changes to the frequency settings cause the link to re-synchronize. A short loss of service will occur during re-synchronization.

➤   **To Configure BRS Channel Settings**

1. Set the Band Plan.

2. Select the Bandwidth required,
    Single Band
    Double Band

3. Select the Frequency from the pull-down menu.

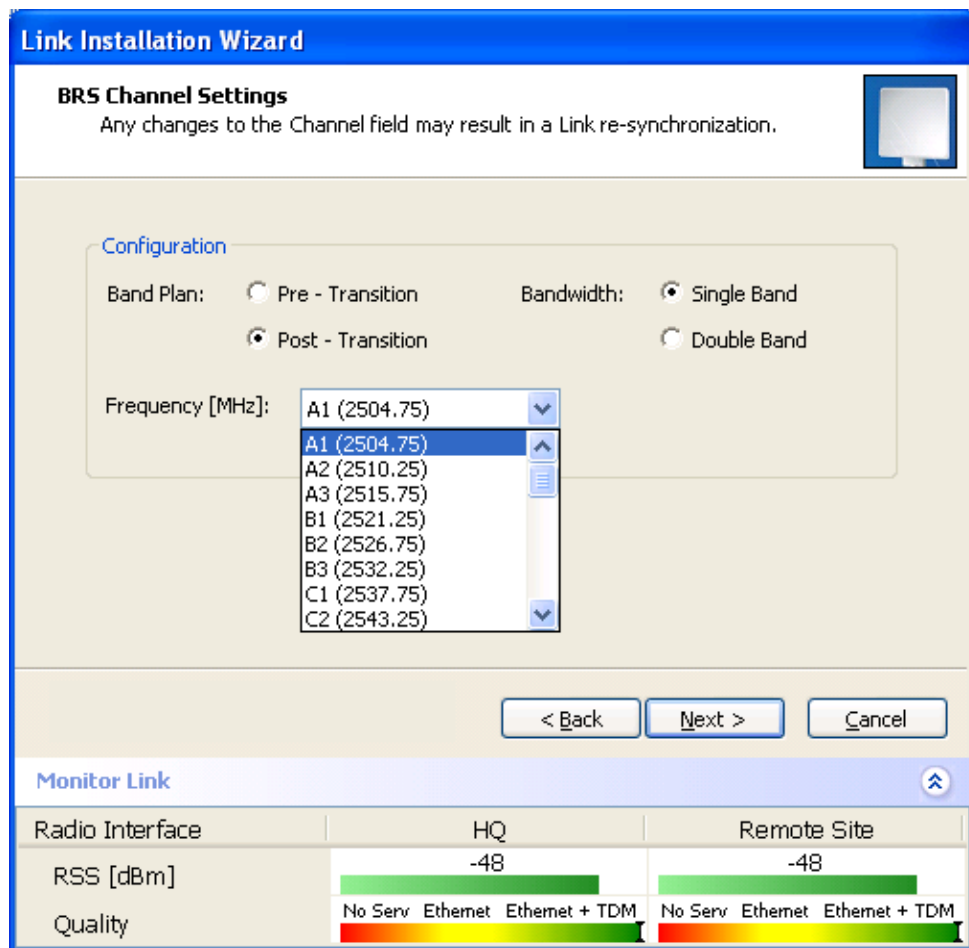4. Click Next. The system is re-synchronized to the changes.

Figure 2-15. BRS Channel Settings Post-Transition

Selecting the Service Parameters

The user defines the type of service required, Ethernet Only or Ethernet with TDM. The bandwidth remaining available for Ethernet if TDM services are required is shown in the dialog box.

Note

ACCESS versions are Ethernet Only.

Figure 2-16. Installation Wizard, Services dialog box

➤ **To select the services:**

- In the Service dialog box, select one of the following:
- E1/T1 – E1/T1 data and Ethernet data.
  The Ethernet BW field shows the remaining bandwidth in Mbps available for Ethernet. The available bandwidth depends on the number of E1/T1 ports selected.
- Ethernet Only

5. Select the required transmission rate.
   If Adaptive is selected, the transmission rate is constantly monitored and adjusted to ensure maximum throughput for the link at the highest quality. ACCESS versions are preset to adaptive and the rate selection is disabled.

6. Click **Next**.

   If TDM services were selected, then the TDM parameters dialog box appears, (see *Figure 2-17*).

7. The optimum transmission rate for the selected services is evaluated. *Table 2-1* shows the rates used.

Note   *ACCESS versions do not have TDM services, they operate at a default rate of 2 Mbps.*

If Ethernet Only was selected, then the Finish screen appears (see *Figure 2-19*) showing a summary of the link configuration, the alignment is complete.

Table 2-1. Rates per Bandwidth

Modulation/FEC	5 MHz	10 MHz	20 MHz
BPSK / ¾	2.25 Mbps	4.5 Mbps	9 Mbps
QPSK / ½	3 Mbps	6 Mbps	12 Mbps
QPSK / ¾	4.5 Mbps	9 Mbps	18 Mbps
16QAM / ½	6 Mbps	12 Mbps	24 Mbps
16QAM / ¾	9 Mbps	18 Mbps	36 Mbps
64QAM / $^2/_3$	12 Mbps	24 Mbps	48 Mbps
64QAM / ¾	13.5 Mbps	27 Mbps	

Setting the Clock Configuration

If TDM services are selected then the TDM parameters dialog box appears. (TDM is not relevant in ACCESS versions.)

The TDM Parameters dialog box contains five working modes; select the appropriate clock mode according to your application. Choosing one of these modes sets the TDM clock behavior on both sides of the link. The user equipment must be configured as described *Table 2-2*.

Table 2-2. TDM Clock Modes

	Unit clock mode		User equipment side	
	Local Unit	Remote Unit	HQ side	Branch side
1	Transparent	Transparent	Internal/Recover	Internal/Recover
2	Loop Time	Recover	Internal	Recover
3	Recover	Loop Time	Recover	Internal
4	Internal	Recover	Recover	Recover
5	Recover	Internal	Recover	Recover

Transparent/Transparent

The clock is transparently regenerated from line clock side to Tx clock on the opposite side of the link.

Loop time/Recover

The local unit receive clock is the transmit clock on both sides of the link.

Recover/Loop time

The remote unit receive clock is the transmit clock on both sides.

Internal/Recover

The local unit internal oscillator generates the clock while the remote unit recovers this clock.

Recover/Internal

The remote unit internal oscillator generates the clock while the local unit recovers this clock.

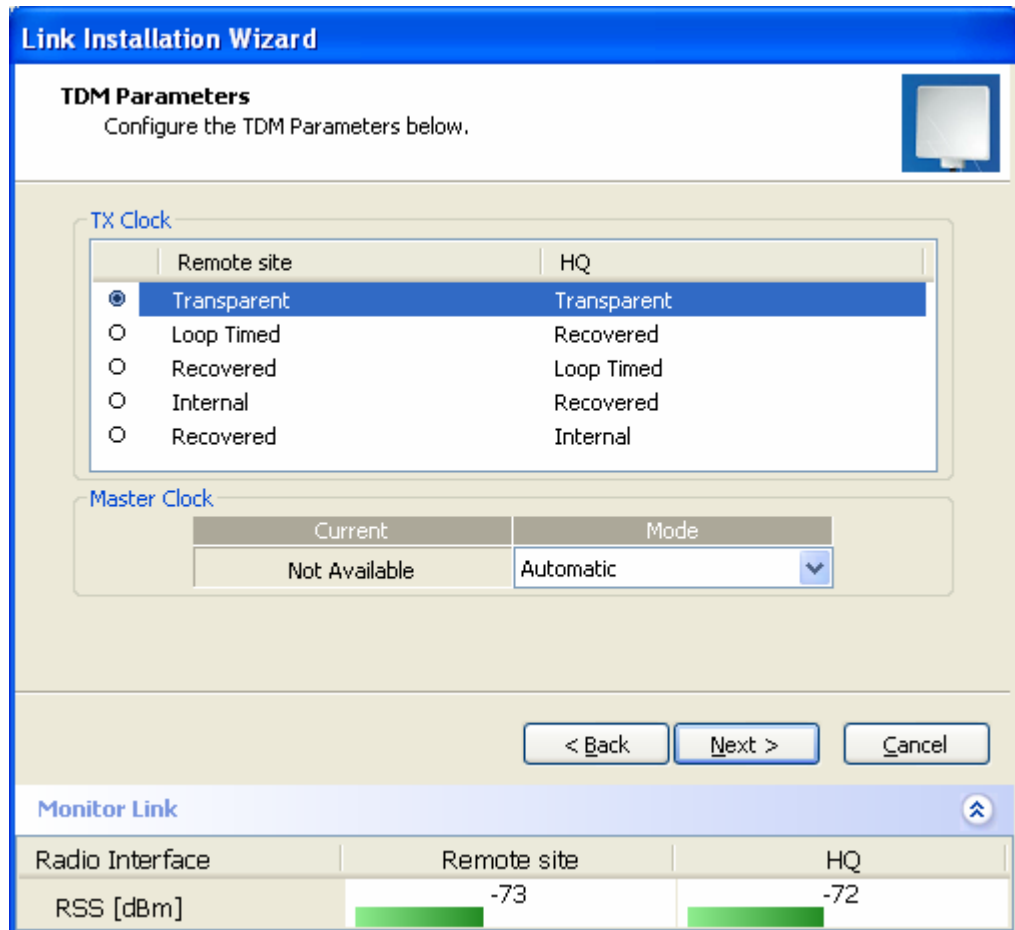**Note** *The Line code option is used with T1 Systems.*

Figure 2-17. TDM Parameters dialog box

Note *This dialog box is available only with IDU-E units, it is activated after TDM service was chosen in the previous Service dialog box. In Ethernet only services, the TDM dialog box does not appear.*

Setting the T1 Line Code

The T1 line code can be set as B8Zs or AMI in the TDM Parameters dialog box.

The default is B8ZS.

➤ **To change the line code**

- In the TDM Parameters dialog box, set the line code to B8ZS or AMI.

Setting the TDM Backup

IDU-R units have two E1 trunk lines, one for air interface via the ODU, and the second external equipment such as a PBX. The TDM backup screen is displayed in IDU-R systems only.

The external equipment status is displayed on the Main screen of the Manager in IDU-R systems.

External Equipment Service: *Main Link - Active*		
● Line State	LOS	LOS
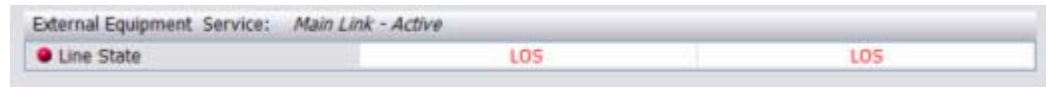
➤ **To use the Backup Mode**

1. Click Enabled Backup Mode.

2. Set which link is backup link; either over-the-air or the external equipment.
    The second link becomes the main link.

➤ **To disable the Backup mode**

1. Click Disable Backup Link

2. Set which link is the Main Link; either over-the-air or the external equipment.

Figure 2-18 shows the TDM backup screen.
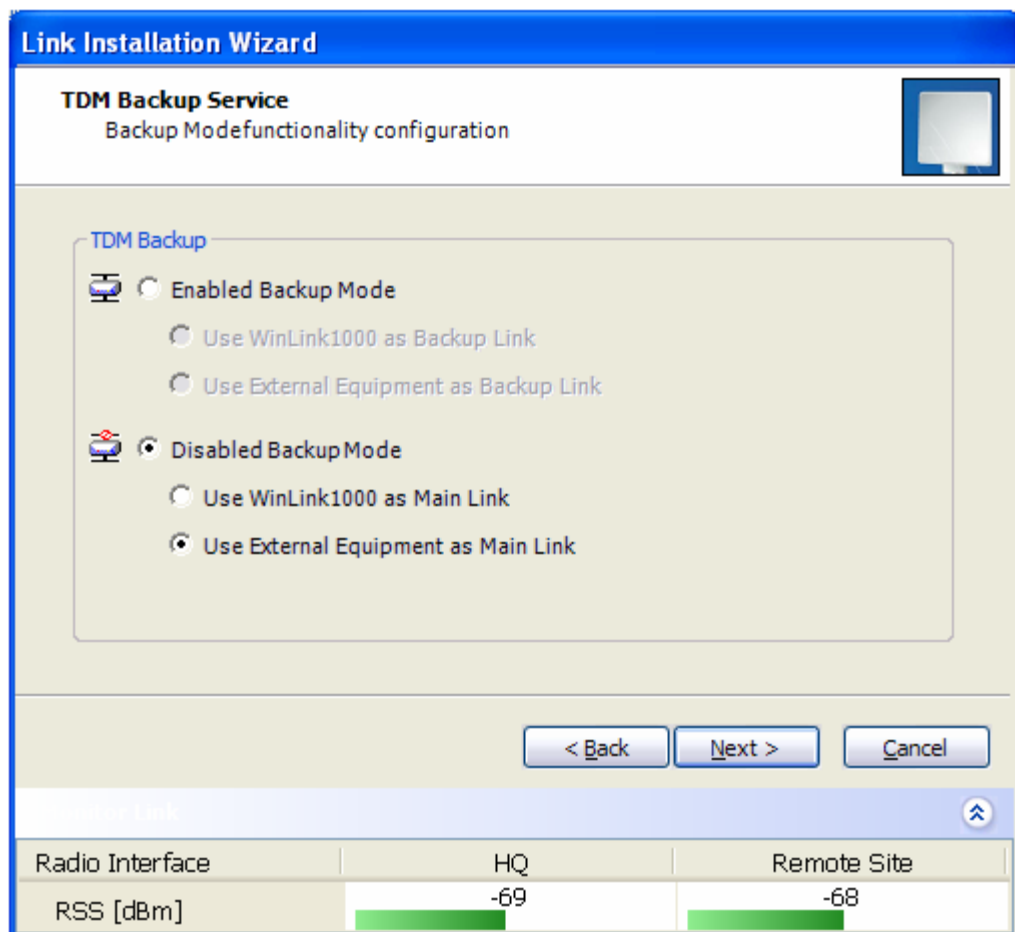
Figure 2-18. TDM Backup, IDU-R units only
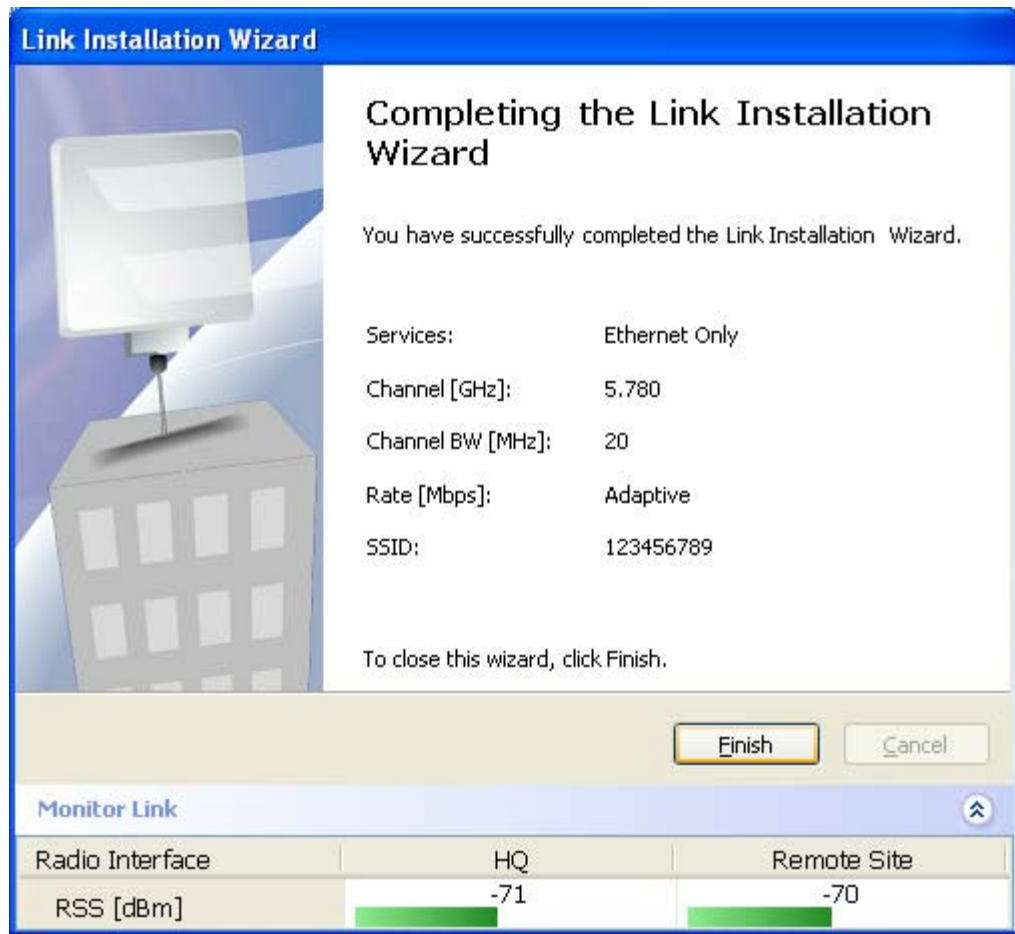
Figure 2-19. Installation Wizard, Finish Screen

3. Click **Finish** to complete the installation wizard.

    When the wireless link is established between the site A and site B units, the Quality bar is within the yellow area for Ethernet only links, or within the green area for Ethernet plus TDM links.

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

2.14   Connecting the User Equipment

The IDU is a standalone desktop, wall-mounted or rack-installed unit. *Figure 2-2* illustrates a typical rear panel of the IDU.

➤ **To connect user equipment to the IDU:**

1. Connect user E1/T1 traffic to the IDU panel RJ-45 port designated **TRUNK**. There may be multiple Trunk ports available depending on unit ordered. Refer to *Appendix A* for the connector pinout.

2. Connect user hub/router or any other compatible device to the IDU panel RJ-45 port designated **LAN**. There may be multiple LAN ports available for

connecting to different LANs depending on the IDU unit ordered.
Refer to *Appendix A* for the connector pinout.

Notes	*Use a straight cable for router connection.*
	Do not connect two LAN ports to the same LAN, or flooding may occur.

Chapter 3

Operation

This section provides the following information:

- Operating procedures (turning-on and turning-off)

- IDU indicators

- Normal Indications

- Default settings

- Managing the system.

3.1 Turning On

➤ **To turn on the system:**

- Connect the AC/DC converter to the IDU power connector and to the mains. See *Chapter 2* for full instructions on connecting the power.

  The PWR indicator lights up (IDU-E only) and remains lit as long as the IDU is receiving power.

No operator attention is required once installed, with the exception of occasional monitoring of front panel indicators and statistics data. Intervention is only required when the system must be configured to its operational requirements, or diagnostic tests are performed.

3.2 Controls and Indicators

IDU Front Panel Indicators

The front panel of the IDU and IDU-E includes a series of LED indicators that show the operating status of the unit. *Figure 3-1* shows the IDU-E front panel, *Figure 3-2* shows an IDU-C front panel. *Table 3-1, Table 3-2*, and *Table 3-3* describe the indicators.
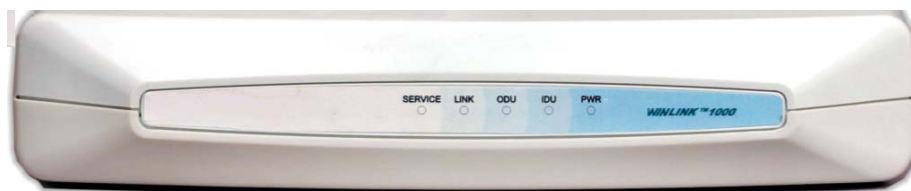

Figure 3-1. IDU-E Front Panel

Figure 3-2. Typical IDU-C Front Panel

Figure 3-3. AIND All Indoor Radio Unit

Table 3-1. Front Panel LEDs

Name	Color	Function
PWR	Green	ON –Power supply is ON (IDU-E only)
IDU	Green	ON – IDU operational
	Orange	ON – During power-up only
	Red	ON – Failure
ODU	Green	ON – ODU-to-IDU communication link is operating
	Red	ON – ODU-to-IDU communication link is disrupted
LINK	Green	ON – Wireless link is synchronized
	Orange	ON – During installation only
	Red	ON – Wireless link lost synchronization
SERVICE	Green	ON – E1 or T1 line is synchronized
	Orange	ON – Alarm detected at the remote interface ON – Local or Remote loopback
	Red	ON – Alarm detected at the local interface

WAN/LAN Indicators

The WAN/LAN and TDM connectors (IDU-E rear panel, IDU-C front panel) have LED indicators that show the operating status. *Table 3-2* and *Table 3-3* describe the indicators.

Table 3-2. WAN/LAN LEDs

Name	Color	Function	Location
LINK	Green	On – Good Ethernet link integrity	WAN/LAN connectors
ACT	Yellow	Blinks according to the Ethernet traffic	WAN/LAN connectors

Table 3-3. TDM Traffic Indicators

Function	Green LED	Red LED
OK	On	Off
AIS	Off	On
LOS	Off	On
Loopback	On	Blinking

Normal Indications

Upon turning on, the PWR LED in the IDU-E front panel illuminates. *Table 3-4* shows the correct status of the indicators at power-up.

Table 3-4. Indicators at Startup

Indicator	Color	Status
PWR	Green	ON (IDU-E only)
IDU	Orange Green	ON for short duration during startup ON during normal operation
ODU	Green	ON shows normal operation
LINK	Orange Green	ON for short duration during startup ON shows normal operation
SERVICE	Green	ON shows normal operation OFF when Service is configured for Ethernet only

If the above LED indications do not appear following initial power turn-on, refer to *Chapter 5* for the diagnostic test instructions.

3.3 Default Settings

Table 3-5 lists the default settings of the configuration parameters.

Table 3-5. Default Settings

Parameter	Default Value
ODU IP Address	10.0.0.120
Subnet Mask	255.0.0.0
Manger Login Password	admin
SSID	–
Link Password	wireless-bridge
Rate	Adaptive
Services	Ethernet
Ethernet Configuration	Auto Detect
Bridge	Non PoE system: Hub Mode, Aging time = 300 sec PoE system: Bridge Mode
Community values	Read-write – netman Read-only – public

3.4 Managing the System

Before starting a management session, make sure that a communication link between local and remote units exists. The Link Status indication bar in the middle of the Main menu must be green and the *Radio Link - Sync* message must appear in the event log (see *Figure 3-4*).
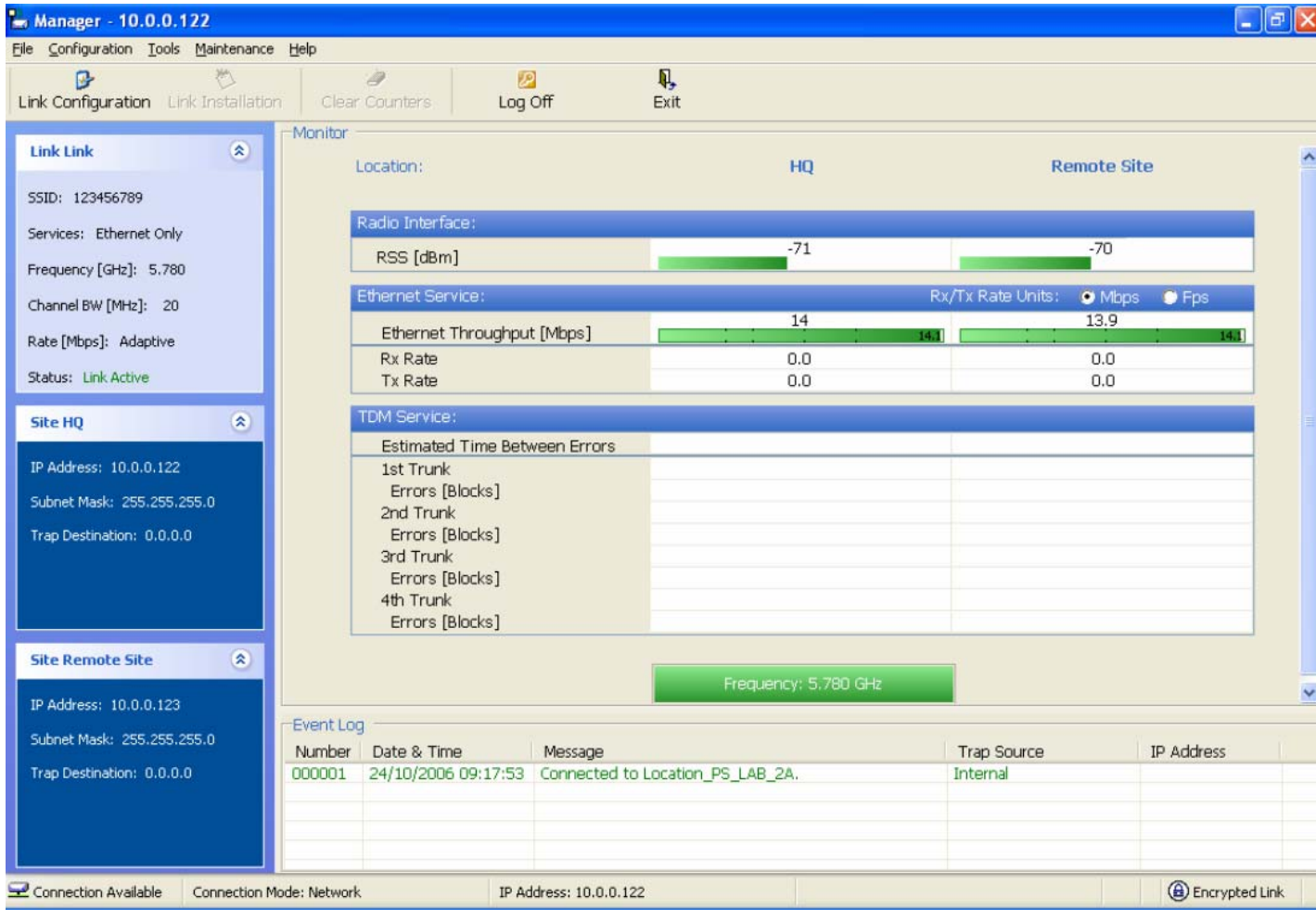
Figure 3-4. Main Screen, Wireless Link is Active

The Manager main screen consists of the following elements:

- Toolbar – includes buttons serving for:

  - Changing configuration parameters of operating wireless link; assigning text files for storing alarms, statistics and configuration data (Link Configuration button)

  - Performing preliminary configuration of the system (Link Installation button). This button is disabled once a link is defined.

  - Clearing error counters (Clear Counters button)

  - Logging off Manager (Log Off button)

  - Exiting Manager (Exit button)

- Menu bar

  - File Menu – Log off, and exit

  - Configuration – use for link configuration, individual site configuration or link installation

  - Tools – set preferences, event log handling, change password

  - Maintenance – Loopbacks, system reset.

- Link details pane – summarizes information on the radio frequency, IP bandwidth, type of TDM service, number of assigned E1 or T1 timeslots, and IP details of the local and remote units.

- Monitor pane – displays the link quality between local and remote devices and the following statistics:

  - Radio signal strength (RSS) in dBm

  - Current Ethernet bandwidth in Mbps. This is not the actual traffic rate, but the maximum capacity that can be supported currently, see *Figure 3-5*. The scale on the bar adjusts according the link distance and the link budget.

  - Local/remote receive and transmit traffic rate, in Mbps or Fps (frames per second).

  - TDM status
    The Estimated Time Between Errors bar gives an indication of the TDM quality. The ETBE constantly calculates the expected TDM Error second ratio according to the current air interface conditions.

  - Link Status. Shows the channel frequency. The color of the box indicates the status.
    Green is an active link
    Red is an inactive link
    Magenta shows an authentication or compatibility problem
    Brown shows severe compatibility problem.

- Event log – stores alarms generated by local and remote units.

- Status Bar – displays the following ions:

  - Connectivity icon showing how the device is connected to the Ethernet.

    - Network mode to the local unit – using IP of the local unit

    - Over the Air connection - using IP address of the remote for over the air connection

    - Local mode using broadcast - direct connection to IDU LAN port without IP address. This mode is only recommended when the managed PC is connected directly to the IDU (no network involved) the managed PC must have a static IP configured. (No DHCP)

  - Encryption icon showing if the link is encrypted

     encrypted link

     Link Password Validation failed. The link is encrypted with default

keys. Service and configuration is unavailable. Need to change the link password in either site

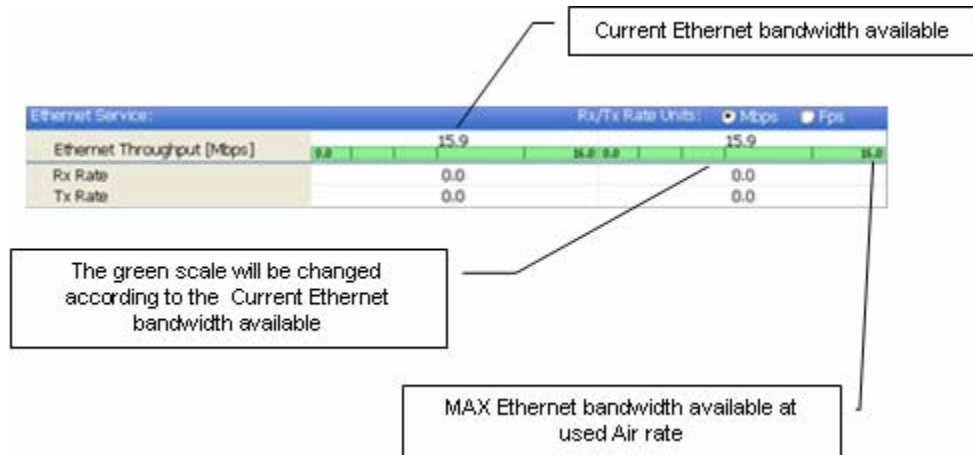☐ No Encryption – an older release is used. No encryption is available

Figure 3-5. Ethernet Bandwidth Indication

➤ **To change link configuration parameters:**

1. In the Main menu, click **Configure Link**.

   The Configure Link wizard appears. See *Chapter 4* for configuration details.

2. Click **Next**.

3. Continue through the configuration wizard and define the Link name and ID, Channel, Rate and Services.

4. Once you finish changing configuration parameters, click **Finish**.

   The system takes a few seconds to activate the link with the new configuration.

3.5 Turning Off

➤ **To turn off the system:**

1. Exit the management application.

2. Remove the AC/DC converter power cord from the mains.

Chapter 4

Configuration

This chapter describes configuration procedures, which are performed after the physical installation of the local and remote units and the Installation Link wizard has been performed. A second wizard is used to redefine the configuration parameters if necessary. Both sites in the link are defined simultaneously.

The following parameters are configured via the Configuration Wizard:

- System parameters
- Frequency channel
- Air interface rate
- Service parameters
- TDM
- Hub Site Synchronization Settings.

The following parameters are configured via the Configuration dialog box.

- Transmit power
- Management and trap addresses
- Bridge mode
- Ethernet mode
- Community values.

Note *For HSS screens see* Appendix F.

4.1   Configuring the System Parameters

After installing the link, the system configuration can be modified.

Note *All parameter changes are automatically applied to both sides of the link.*

➤ **To change general parameters:**

1. In the Main menu, click the **Link Configuration** button.
2. The Configuration wizard opens (*Figure 4-1*).

Figure 4-1. Configuration Link Wizard

3. Click **Next**.
4. The Link Configuration dialog box appears (see *Figure 4-2*).
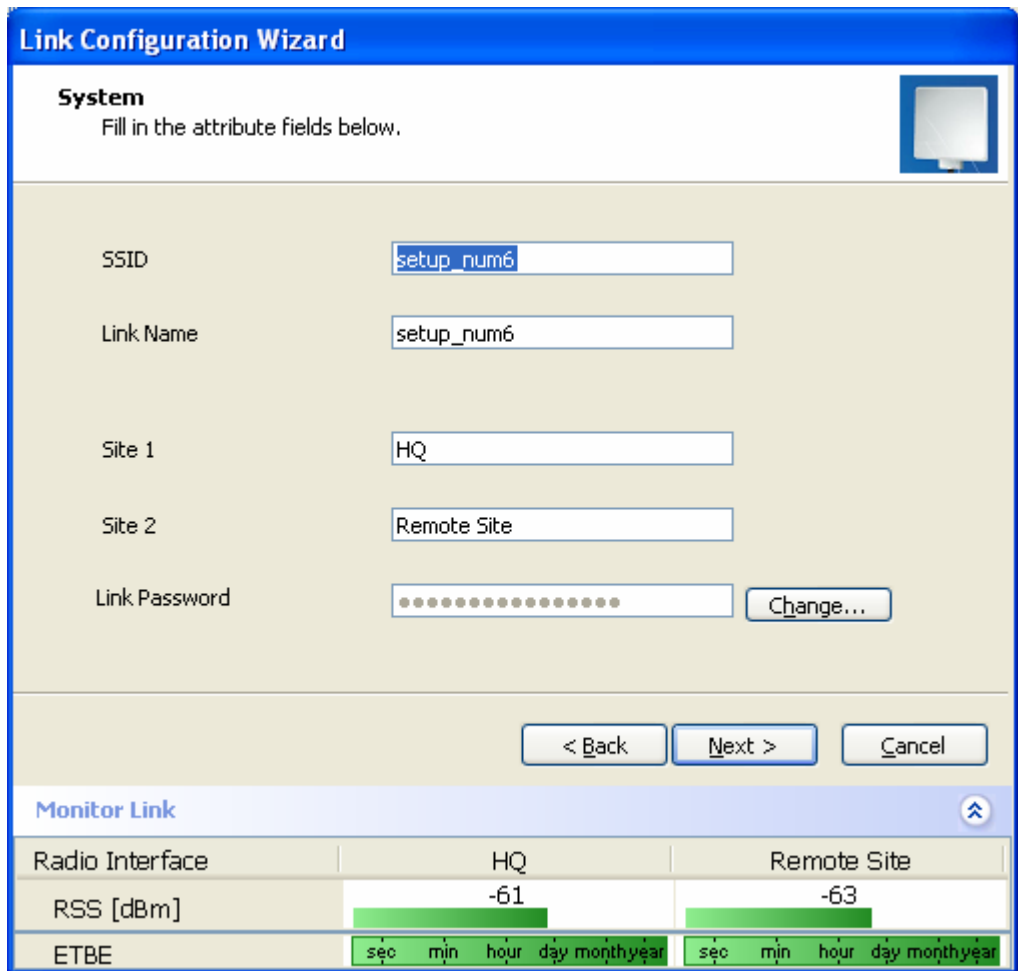
Figure 4-2. Link Configuration, System dialog box

5. In the System dialog box, enter the new data for the link. All fields with a white background can be edited.

6. Click **Next**.

> The Frequency dialog box appears.

4.2   Selecting Channels

The user is required to define the operating frequency channel. Newer versions have a feature called Automatic Channel Select. This allows you to define several allowable frequency channels that can change to in event that interference is detected on the channel in use.

Automatic Channel Select

Automatic Channel Select changes frequency channels automatically if interference is detected on the current operating channel.
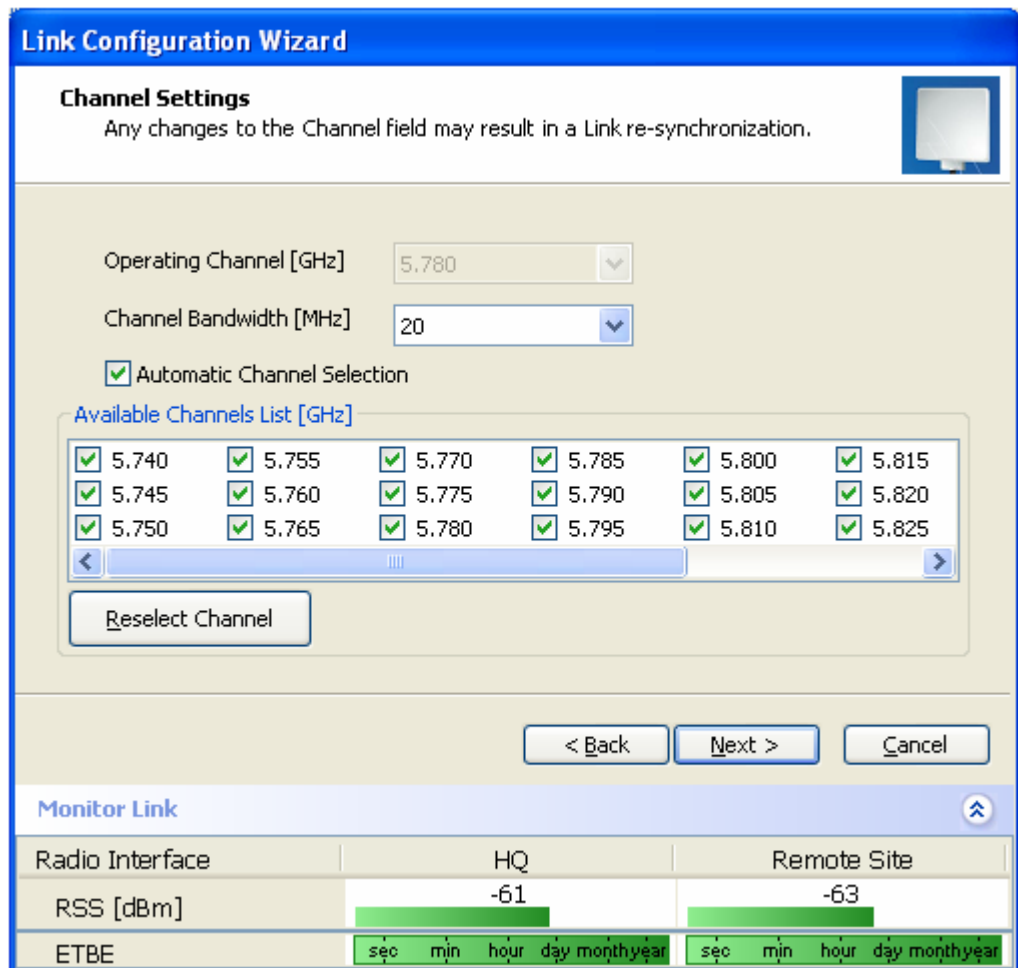
Figure 4-3. Channel Select dialog box - Automatic Channel Select

➤ **To define automatic channel selection:**

1. Select the main frequency from the Operating Channel menu.

2. Select the required Bandwidth 5, 10, or 20 MHz.

Note *F2.x GHz versions operate at 10 or 20 MHz steps only.*

3. Click the check box if Automatic Channel Selection is required.

4. Click the check boxes in the Available Channels List of all the allowable channels that can be automatically selected.

5. If you are not satisfied with the channel that is selected automatically, click **Reselect Channel**.

     A new channel will be selected from one of the Available Channels that have been defined.

Note	*By clicking Reselect Channel, the ODU starts scanning all the channels from the available channels list and looks for radio frequency activity in each of the channels. It tries to select the optimal pure channel. If another channel is required, the operating channel that the ODU finds most pure must be removed from the available channel list.*

6. Click **Next**.

The Rate Select box appears.

5.4 GHz ETSI Version

In accordance with ETSI, unlicensed wireless data equipment is not allowed to interrupt radar services. Therefore, if Radar interference is detected the frequency channel is automatically changed. This feature is termed Dynamic Frequency Selection (DFS). According to the standard, a channel with active Radar is prohibited from use for 30 minutes. Before any transmission, the system probes a channel for Radar signals for a period of 60 seconds.

In the 5.4 GHz ETSI version, the Automatic Channel Selection is selected by default and a minimum of two channels must be defined as available.
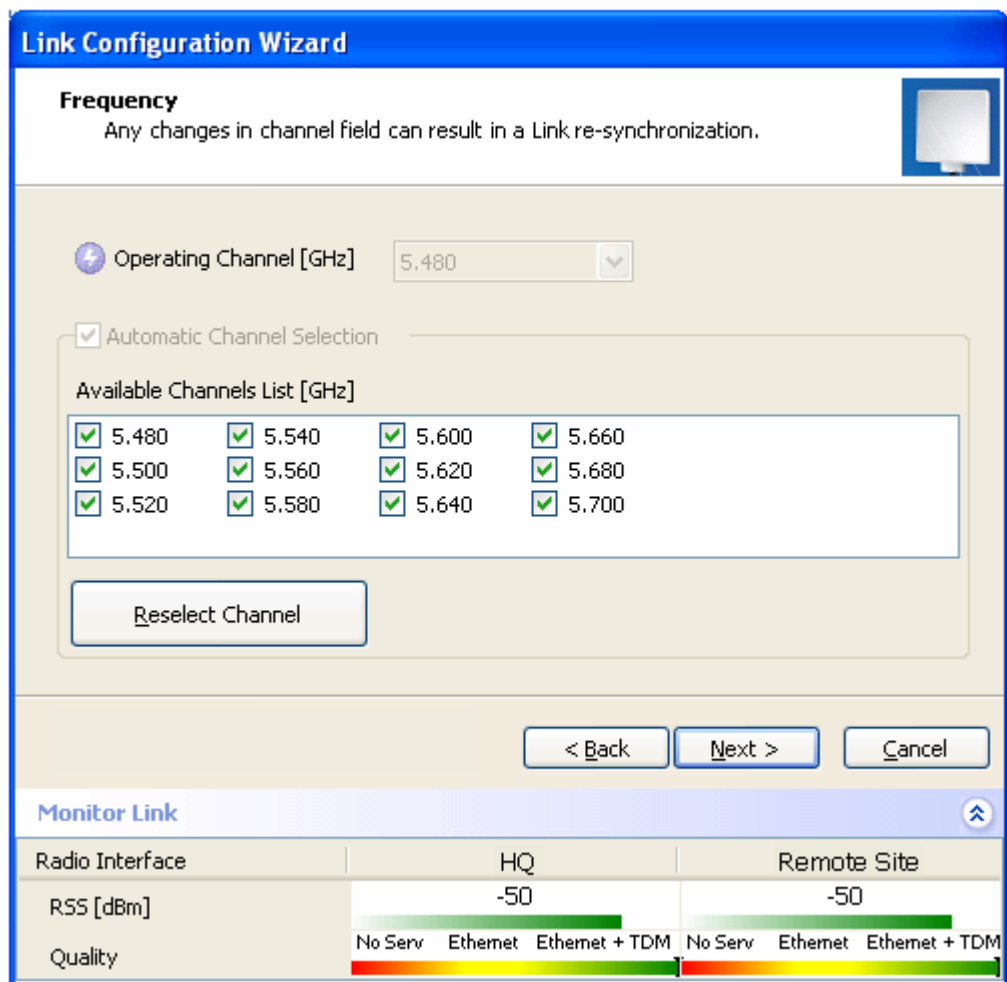
Figure 4-4. Channel Select dialog box (DFS, ETSI requirement)

The ⬤ sign on the configuration Wizard and Status bar indicates that the radar detection is on.

➤ **To define automatic channel selection in the 5.4 ETSI version**

1. Select the main frequency from the Operating Channel menu.

Note   *Automatic Channel Selection is selected by default.*

2. Click at least two check boxes in the Available Channels List of all the allowable channels that can be automatically selected.

Note   *Installation will not continue until at least two channels are defined.*

Selecting a new channel causes the system quality to change. The quality bar shows the adjustment until the system finds the best quality link.

Any channel selected is evaluated for 60 seconds; therefore this selection process may take a few minutes.

3. If you are not satisfied with the channel that is selected automatically, click **Reselect Channel**.

A new channel will be selected from one of the Available Channels that have been defined.

Note   *The reselection process may take a few minutes.*

4. Click **Next.**

The maximum rate is selected according to the link conditions

The quality bar shows the adjustment until the system finds the best quality link.

7. Click **Next**.

The Service Parameters dialog box appears.

BRS Version

Note   *Both sites in a BRS Link must be configured identically.*
Any changes to the frequency settings cause the link to re-synchronize. A short loss of service will occur during re-synchronization.

➤ **To Configure BRS Channel Settings**

1. Set the Band Plan.

2. Select the Bandwidth required,
Single Band
Double Band

3. Select the Frequency from the pull-down menu.

4. Click Next. The system is re-synchronized to the changes.
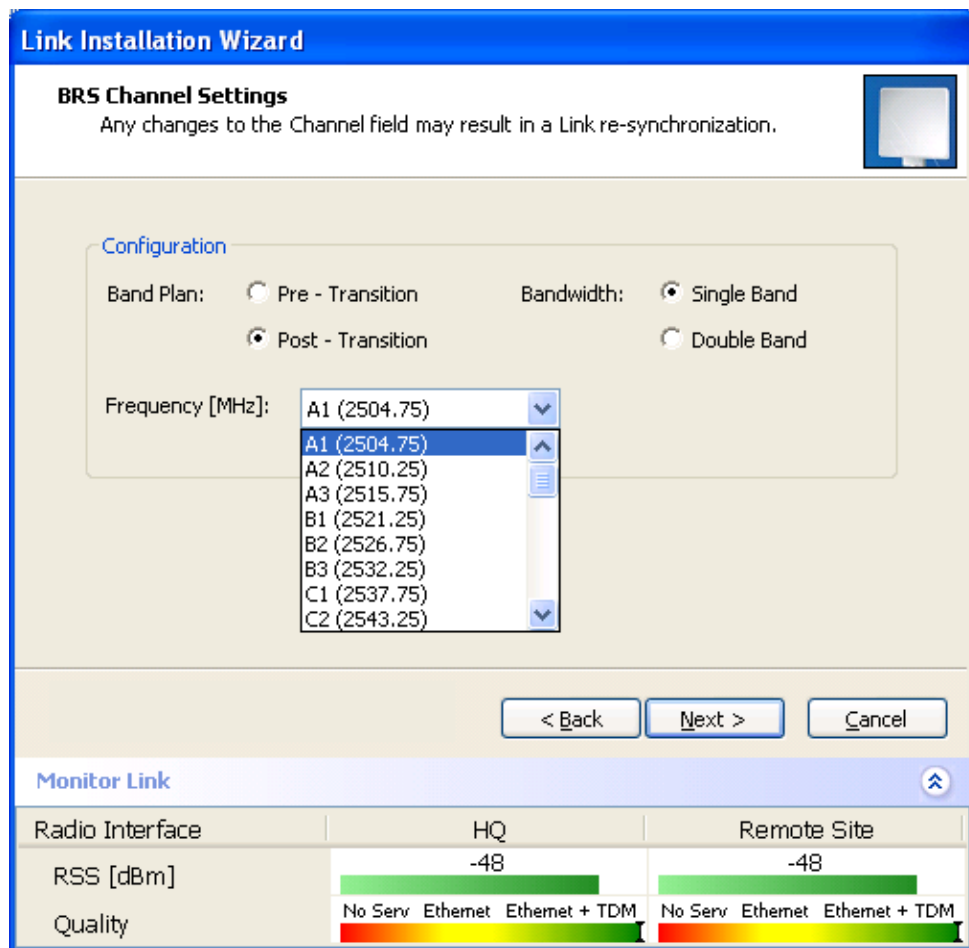
Figure 4-5. BRS Channel Settings Post-Transition

4.3 Configuring Service Parameters

The user defines the type of service required, Ethernet Only or Ethernet with TDM. The bandwidth remaining available for Ethernet if TDM services are required is shown in the dialog box.

Note   *ACCESS versions are Ethernet Only.*

In the Service Parameters dialog box set if the system is to provide E1/T1, (x1 or x2 for IDU-E, or x4 for IDU-C). Define the required transmission rate, and the distance between the sites.

➤ **To configure E1/T1 and Ethernet services:**

1. In the Service dialog box, select one of the following:
    ▪ Ethernet plus a number of E1/T1 channels (see *Figure 4-6*).
    ▪ Ethernet data only.

2. Select the transmission rate required.
    ▪ Adaptive

- 12 Mbps
- 18 Mps
- 24 Mbps

The default rate is Adaptive. ACCESS versions only operate in Adaptive mode.

Adaptive Modulation - The system changes modulation automatically depending on channel characteristics in order to guarantee continuation of service. The adaptive modulation enables the user to maximize Ethernet throughput without degradation of the TDM service quality. When Ethernet only service is used, the adaptive modulation enables improving the Ethernet performance in case of air performance degradation (periodical interference or RSS changes).

In event of interference at one site, there is no need to use a lower modulation at the other site (as in previous versions). In such a case the actual rate changes automatically only at the problematic site, while the second side of the link maintains the highest rate possible (Asymmetric).

Adaptive modulation can be changed in both Installation and Configuration wizards.

3. Type in the distance between the sites.

> If TDM services are selected, then the Evaluate icon shows on the screen whilst the maximum rate is evaluated.
> When evaluation is complete the icon changes and the following message is shown:

> Service has been evaluated, click **Next** to continue.

4. Click **Next**.

> The TDM Parameters dialog box or the Finish screen appears depending on which services were selected.
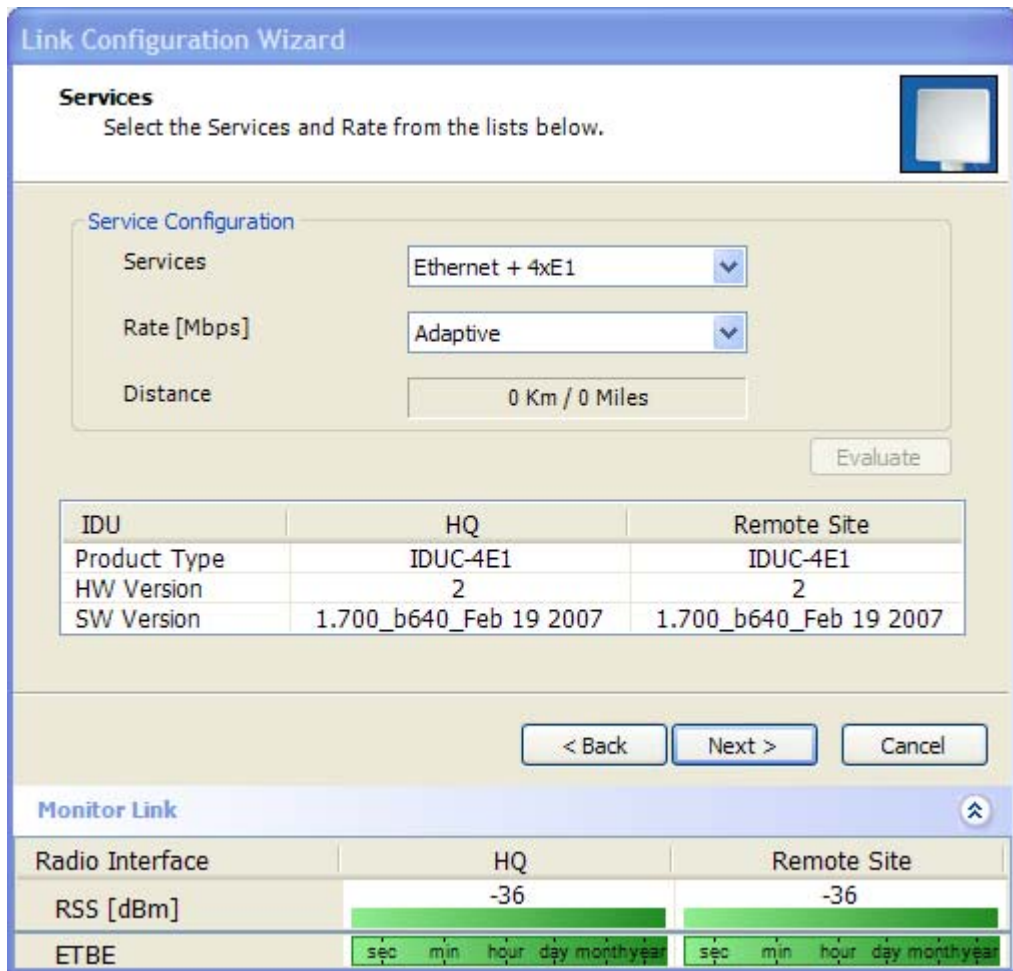
Figure 4-6. Service Parameters Dialog Box, E1/T1 Interface

4.4   Configuring TDM Operation

Setting the Clock Configuration

The TDM clock feature is enabled in all carrier class IDU's in addition to new hardware IDU's. A TDM dialog box will appear where IDU supports the clocking configuration feature (see *Figure 4-7* and *Figure 4-8*).

A new master clock configuration option is available in the Link Configuration Wizard. The automatic mode selects the clock from the first trunk that is working in normal mode (or is configured to loop-back maintenance). If a specific trunk is selected, this trunk shall be used as the system master regardless of the trunks state. The current master clock trunk is also displayed.

Figure 4-7. TDM clock dialog box for T1 IDU
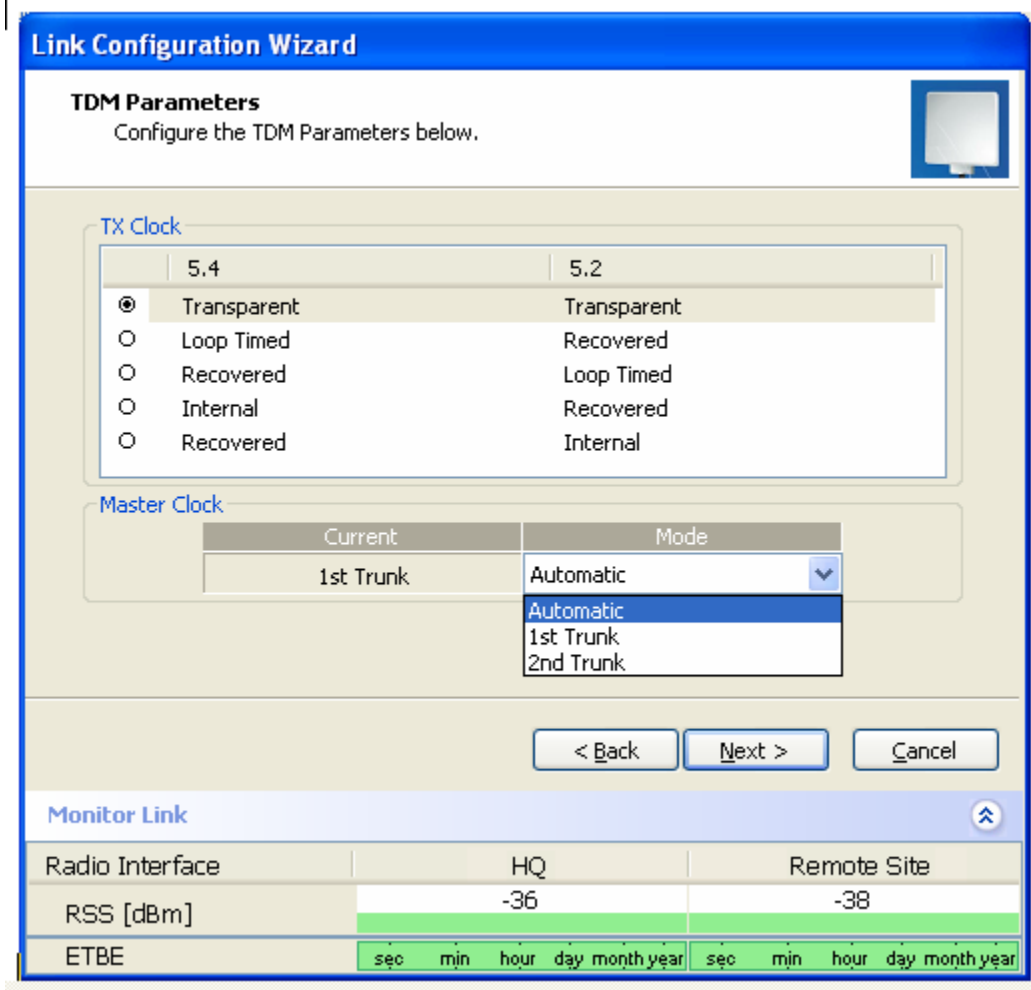
Figure 4-8. TDM clock dialog box for E1 IDU

If TDM services are selected then the TDM parameters dialog box appears.

The TDM Parameters dialog box contains five working modes; select the appropriate clock mode according to your application. Choosing one of these modes sets the TDM clock behavior on both sides of the link. The user equipment must be configured as described *Table 4-1*.

Table 4-1. TDM Clock Modes

	Unit clock mode		User equipment side	
	Local Unit	**Remote Unit**	**HQ side**	**Branch side**
1	Transparent	Transparent	Internal/Recover	Internal/Recover
2	Loop Time	Recover	Internal	Recover
3	Recover	Loop Time	Recover	Internal
4	Internal	Recover	Recover	Recover
5	Recover	Internal	Recover	Recover

Transparent/Transparent

Transparently regenerates the clock from line clock side to Tx clock on the opposite side of the link.

Loop time/Recover

The local unit receive clock is the transmit clock on both sides of the link.

Recover/Loop time

The remote unit receive clock is the transmit clock on both sides.

Internal/Recover

The local unit internal oscillator generates the clock while the remote unit recovers this clock.

Recover/Internal

The remote unit internal oscillator generates the clock while the local unit recovers this clock.

Note

The Line code option is used with T1 Systems.

Setting the T1 Line Code

The T1 line code can be set as B8Zs or AMI in the TDM Parameters dialog box.

The default is B8ZS.

Note

This dialog box is available only when TDM service was selected in the previous Services dialog box.

➤ **To change the line code**

1. Run the Configuration wizard until you reach the Services dialog box.

2. Verify that T1 services have been selected.

3. Click **Next** to open the TDM Parameters dialog box.

4. Set the line code to B8ZS or AMI as required.

5. Click **Next**.

Setting the TDM Backup (IDU-R only)

IDU-R units have two E1 trunk lines, one for air interface via the ODU, and the second external equipment such as a PBX. The TDM backup screen is displayed in IDU-R systems only.

The external equipment status is displayed on the Main screen of the Manager in IDU-R systems.
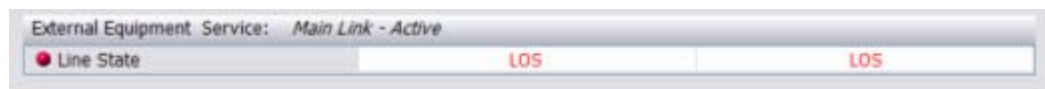
➤ **To use the Backup Mode**

1. Click Enabled Backup Mode.

2. Set which link is backup link; either over-the-air or the external equipment.
   The second link becomes the main link.

3. Click **Next** to continue.

➤ **To disable the Backup mode**

1. Click Disable Backup Link

2. Set which link is the Main Link; either over-the-air or the external equipment.
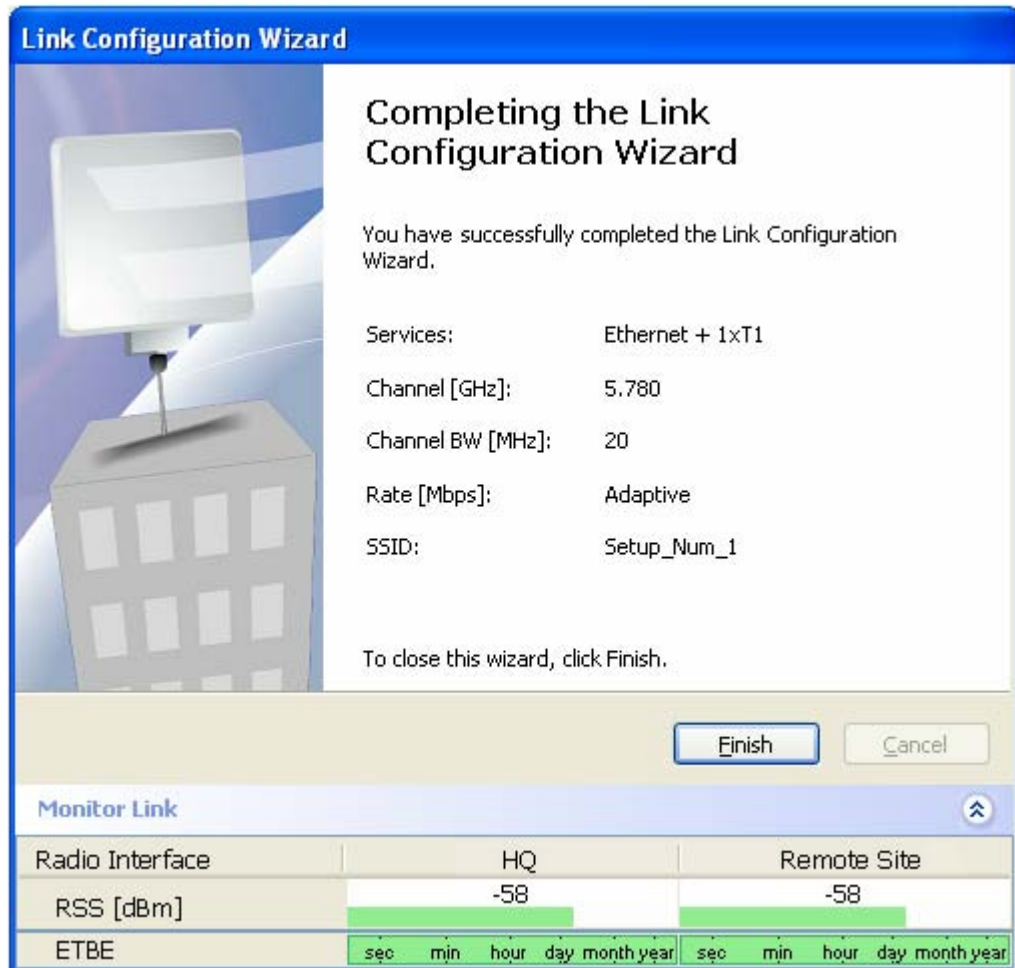
3. Click **Next** to continue.

Figure 4-9. Configuration Link, Finish screen

The Finish screen appears, showing a summary of the link configuration (see *Figure 4-9*).

• Click **Finish** to complete the configuration wizard.

    The Main screen is displayed.

4.5 Editing the Configuration Parameters

You can edit the configuration parameters for each site individually without running a wizard.

From the Configuration dialog box, (see *Figure 4-10*) the following functions are available by selecting the items on the left of the dialog box:

System   Edit the contact person and location details. View the system details

Air Interface   Change the transmit power

Inventory   View the hardware and software inventory.

Management   Configure the IP address, Subnet Mask, Default Gateway, and the Trap Destination.

Security   Change the Community Values and the Link Password

Date and Time   Set the date and time of the server and of the system.

Advanced   Configure the Bridge, define the LAN connection and set the external alarm inputs.

From the Configuration dialog box, the following functions are available by clicking the buttons at the top of the dialog box:

Backup   Save a backup.ini file with the current configuration.

Restore   Load the backup.ini file created by the backup.

Installation Mode   Return to Installation Mode for the entire link. Selecting the Mute check box before clicking the Install Mode button mutes the Beeper.

Mute   Mutes the Beeper at startup. Reactivate the beeper during alignment.

➤   **To edit the Configuration Parameters:**

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

2. Select which site to configure.

The Configuration dialog box opens. (See *Figure 4-10*)
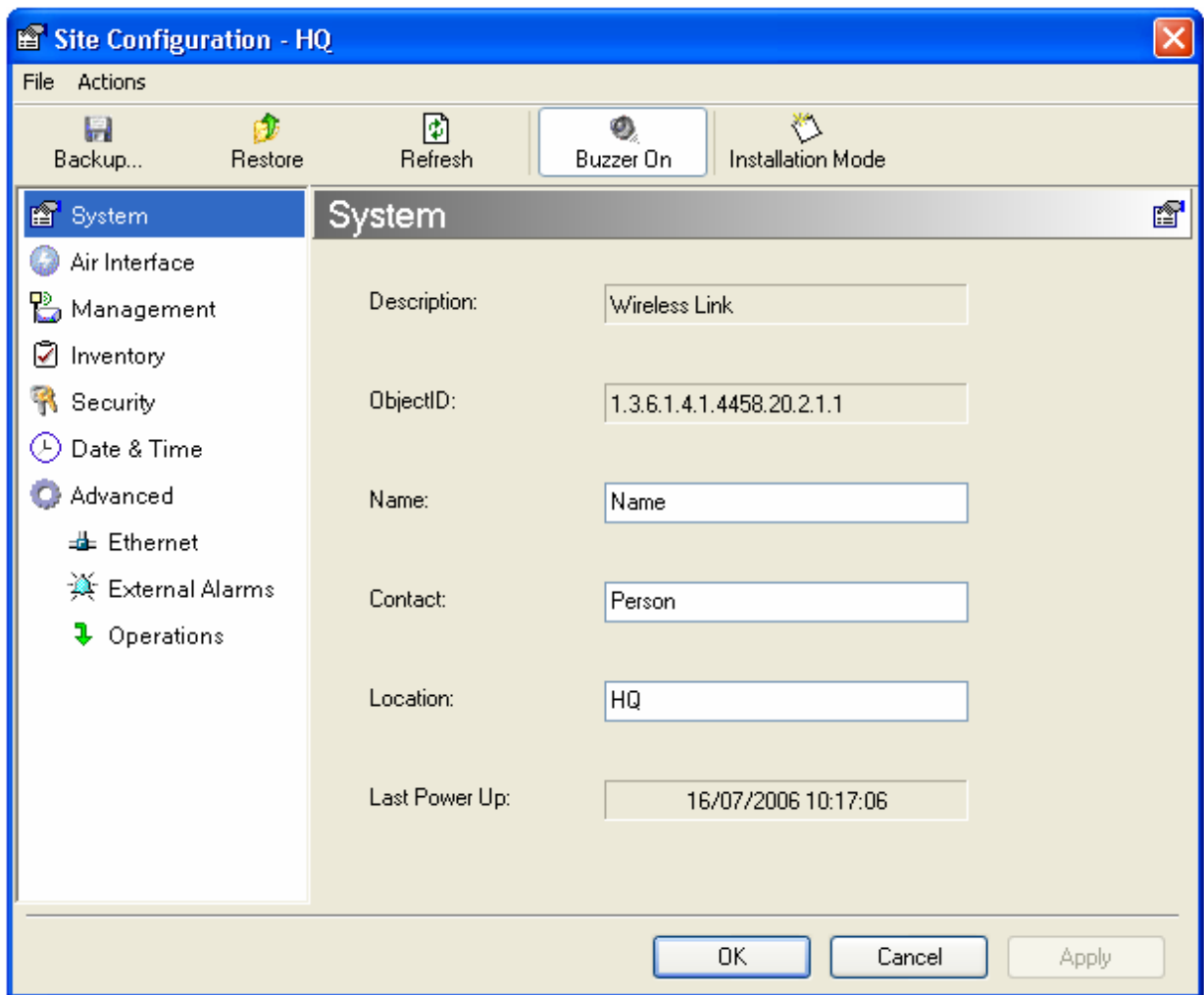
Figure 4-10. Configuration Dialog Box

3. Select the appropriate item in the left hand list to open a dialog box.

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

4.6   Changing the Transmit Power

Each site can have a different transmit power level.

➤ **To change the Transmit Power:**

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

2. Select which site to configure.

    The Configuration dialog box opens.

3. Select Air Interface. (See *Figure 4-11*)

4. Select the required Transmit Power Level. Table 4-2 shows the available power limits for each system.

5. Click Apply to save the changes.
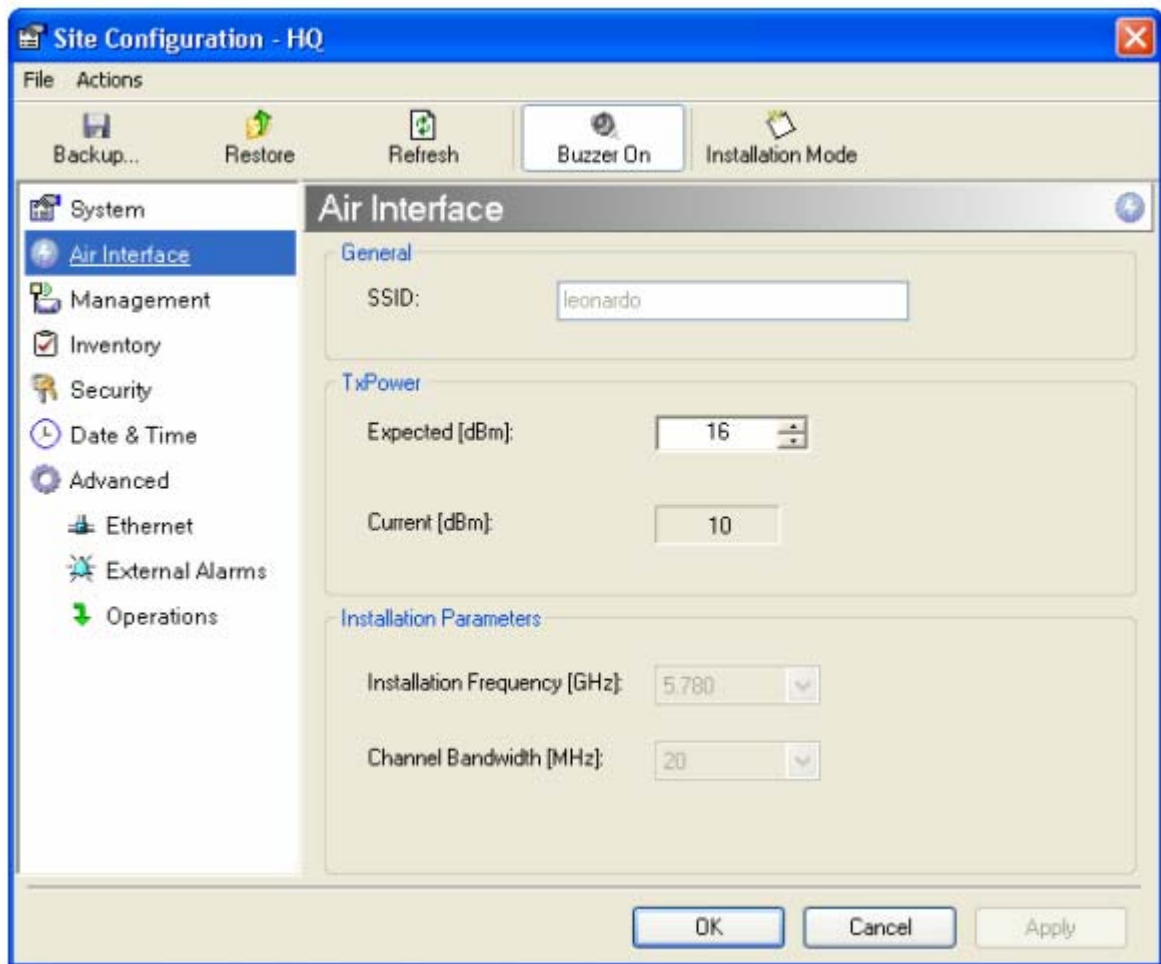
Figure 4-11. Changing the Transmit Power

Table 4-2. Typical Transmit Power Limits

Regulation	Version	Min Tx [dB]	Max Tx [dB]	MaxTx at 36 Mbps [dB]	MaxTx at 48 Mbps [dB]	Power Control
FCC	F58	4	16	14	10	Yes
	F58/EXT	4	16	14	10	Yes
	F49	14	15	15	14	No
	F53	-3	8	8	8	Yes
	F53/EXT	3	3	3	3	No
	F24	18	18	18	18	No
	F53HP	10	16	14	10	Yes
ETSI	F54	2	8	8	8	Yes
	F54/ETSI	2	8	8	8	Yes
	F54-HG/EXT	-3	3	3	3	Yes

4.7   Defining the Management Addresses

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

➤ **To define the Management Addresses:**

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

2. Select which site to configure.

    The Configuration dialog box opens.

3. Select **Management** (see *Figure 4-12*).

4. Enter the IP address of the ODU in the IP address field.

Note   *If performing configuration from the Manager, the IP address is entered in the login screen (Figure 2-4)*

5. Enter the Subnet Mask.

6. Enter the Default Gateway.

7. Enter the Trap Destination. This is the IP address of the PC running the management application. The event log will be stored at this address.

8. Click **Apply** to save the changes.
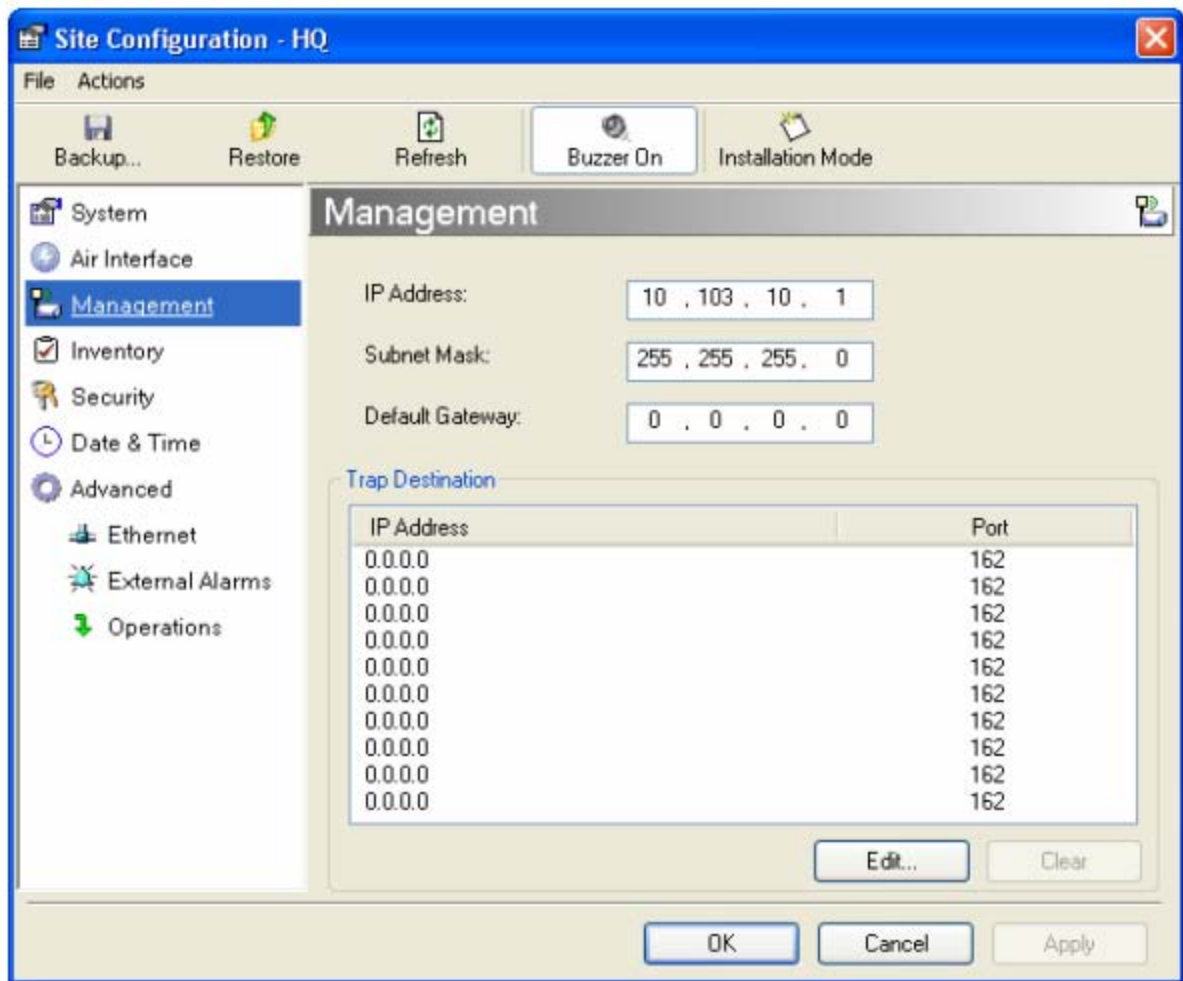
Figure 4-12. Configuration, Management

Notes	*The Installation mode button opens the Link Installation wizard to reinstall the link. The Backup and Restore buttons are for saving and restoring the configuration files.*

4.8   Setting the Date and Time

➤   **To set Date and time**

The ODU maintains a date and time value. The date and time value should be synchronized with any Network Time Protocol (NTP) version 3 compatible server[1]. On power-up the ODU configures the initial date and time using an NTP server. If the server IP is not configured or is not reachable, a default time is set. When configuring the NTP server IP, 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 the manager workstation time. Note that

---

[1] Windows XP is configured by default as a server.

manual setting is not recommended since reset, power up, or synchronization with an NTP server will override the setting.

Note

- *The NTP uses UDP port 123. If a firewall is configured between the ODU and the NTP server this port must be opened[2].*
- *It can take up to 8 minutes for the NTP to synchronize the ODU date and time.*

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

2. Select which site to configure.
   The Configuration dialog box opens.

3. Select Date & Time (see *Figure 4-13*).
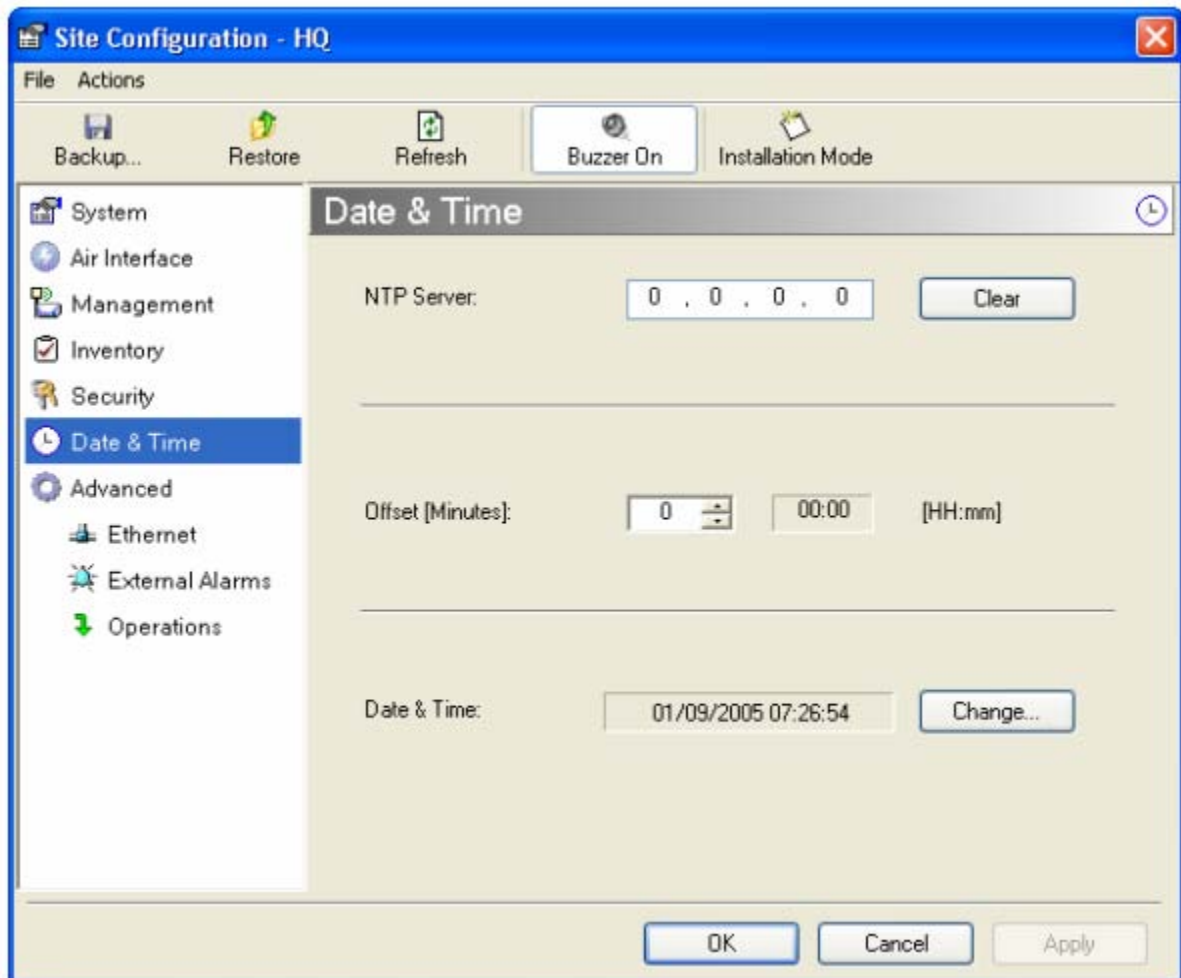
Figure 4-13. Date & Time configuration

4. If entering an address for the NTP Server, click **Clear**, and then enter the new address.

5. Set the Offset value.

---

[2] Windows XP command w32tm /stripchart /computer:<server IP> can be use to check the NTP server connectivity

6. To manually set the date and time, click **Change** (*Figure 4-14*) and edit the new values.
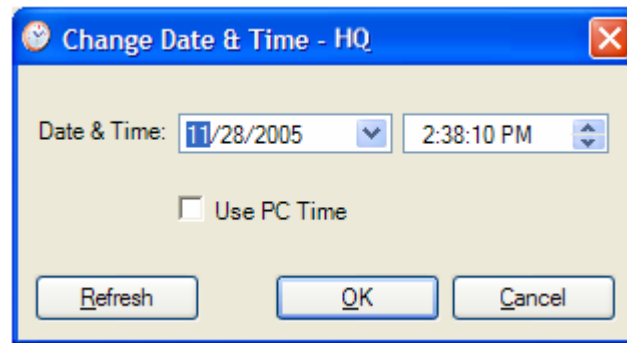
Figure 4-14. Manually changing date and time

4.9   Configuring the Bridge

Bridge configuration is required in various network topologies, such as protection (1+1) and ring application. The bridge configuration parameters are located under the Advanced tab of the Configuration dialog box (*Figure 4-15*).
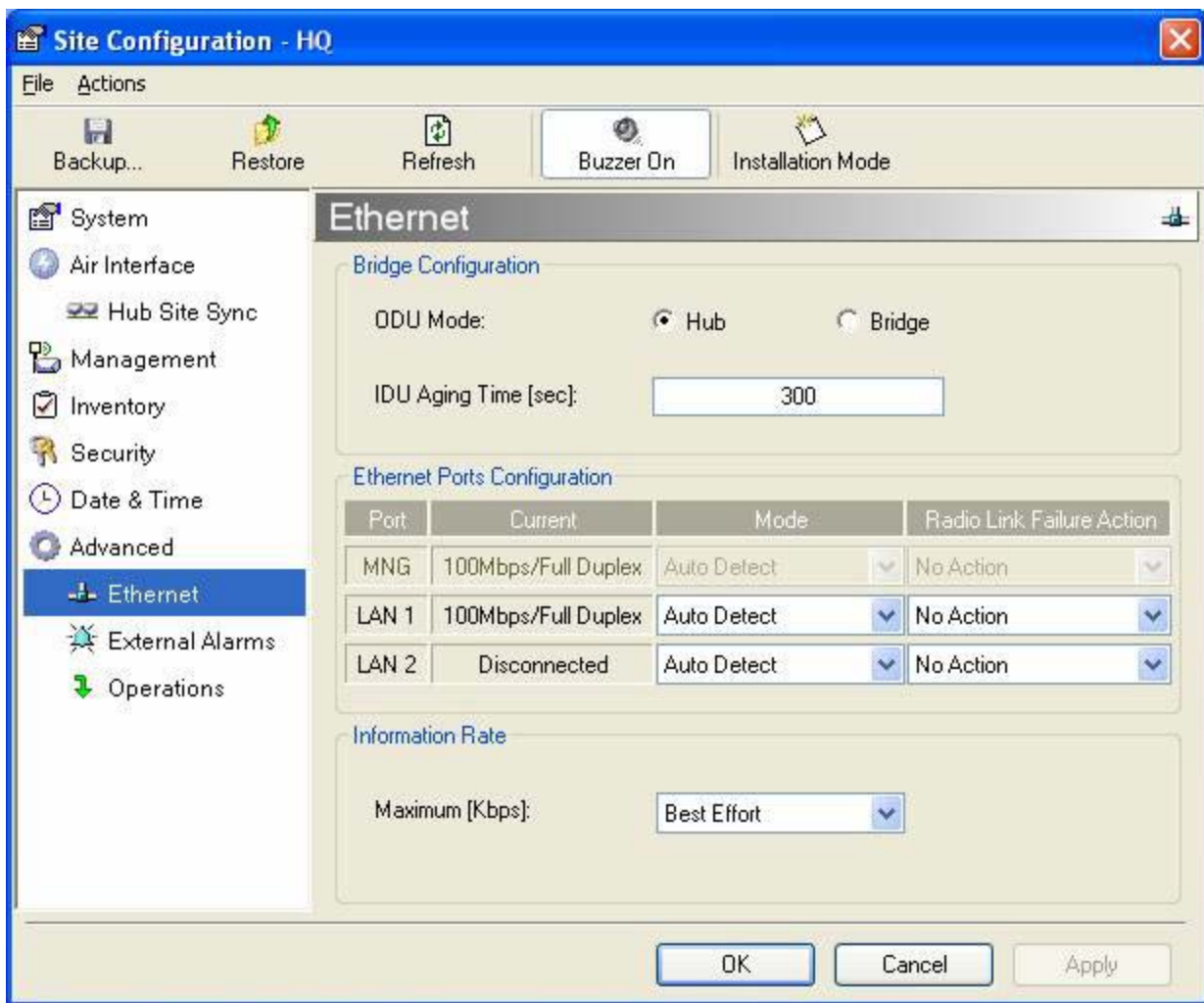
Figure 4-15. Advanced Configuration-Ethernet

ODU Bridge Mode

This parameter controls the ODU mode with two optional values,

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

Note *Changing these modes requires system reset.*

IDU Aging time

This parameter controls the IDU aging time.

The IDU has a 2047 MAC address-learning table. The aging time parameter controls the time each MAC address is dropped from the table.
Default value is 300 seconds.

Notes *Any change to these parameters is effective immediately.*
Each side of the link can be configured separately.

The following list details common configurations; both sides are must be configured with the same parameter.

- Standard (Default) Configuration for Ethernet Applications

  Set IDU aging to 300 seconds, ODU set to Bridge mode, *Figure 4-15*.

- Fast aging mode – for rapid network topology changes

  Set IDU aging to one second, ODU set to Hub mode.

- Hub Mode

  The ODU is set to HUB mode. IDU aging is not applicable.

- Ethernet Bridge

  The ODU is set to Bridge mode. The IDU aging is not applicable.

4.10   Configuring Ethernet Mode

The Ethernet mode is configurable for line speed (10/100BaseT) and duplex mode (half or full duplex). An auto detect feature is provided where the line speed and duplex mode are detected automatically using autonegotiation. Use the manual configuration when external equipment does not support autonegotiation. The default setting is Auto Detect. (See *Figure 4-15*).

The maximum Ethernet Information Rate can be limited via the pull down menu. The default setting is Best Effort.

Note *It is not recommended to configure the port that is used for the management connection, since a wrong configuration can cause management disconnection or Ethernet services interruption.*

➤ **To configure the Ethernet Mode:**

1. From the **Configuration** menu, select the site to reconfigure.

   The Site Configuration dialog box opens.

2. Click **Advanced > Ethernet**.

3. In the Ethernet Ports Configuration pane, use the drop-down menu to select the LAN configuration.

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

Note *It is possible to close the Ethernet service by disconnecting the Ethernet port. The user should be aware that it is possible to close the port and not have any access to the device. If this should occur the workaround is as follows:*
- *Connect the system from the remote site*
- *Connect via other Ethernet port (IDU-C)*
- *Power down the equipment and connect immediately after the power up (the fastest way is to enter install mode).*

4.11   Setting the Maximum Information Rate

The maximum Ethernet throughput of the link can be limited. The default setting is Best Effort, where the highest information rate available for the link conditions and settings is used. (See *Figure 4-15*)

➤ **To set the Ethernet information rate:**

1. From the **Configuration** menu, select the site to reconfigure.

   The Configuration dialog box opens.

2. Click **Advanced > Ethernet**

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

   ▪ Select **Other** to define the throughput with 8 Kbps resolution

   ▪ Select **Best Effort** for the highest information rate possible for the link conditions and settings.

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

Note

ACCESS systems have a maximum rate of 2048 kbps.

4.12   Changing Community Values

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

• Read-Only for retrieving information from the ODU

• Read-Write to configure and control the ODU

• Trap used by the ODU to issue traps.

The community string must be entered at login. The user must know the password and the correct community string in order 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 technical support for the purpose of setting new community; the serial number or the MAC address of the ODU must be supplied.

Note   *The manager application and the ODU use the community strings **public-bru1** for the local unit and **public-bru4097** for the remote unit. These are the factory defaults, but can only be used one time on the first installation.*

A new community string must be set when entering the system for the first time. The read-write community and read-only community have a minimum of five alphanumeric characters. (Bru1 and bru4097 are not permitted). Changing the trap community is optional 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 entering for the first time, use **netman** as the current community. The community string must be changed when entering the system for the first time, and the community string **netman** cannot be used again.

➤ **To change a community:**

1. From the Configuration dialog box, select the **Security** tab

2. Type the current read-write community (default is **netman**).

3. Select the communities to be changed by clicking the check box.

4. Type the new community and re-type to confirm.

5. Click **OK** to save.

Figure 4-16. 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 in order to change the community strings. The alternative community key is supplied with the product, and it is recommended to keep it safe.

If both the read-write community and the alternative community key are unavailable, then an alternative community key can be obtained from customer support using the ODU serial number or MAC address. The serial number is located on the product, and the MAC address is displayed in the manager inventory tab.

When you have the alternative community key, click the **Forgot Community** button and enter the Alternative Community (*Figure 4-17*). Then reconfigure the read-write community string.
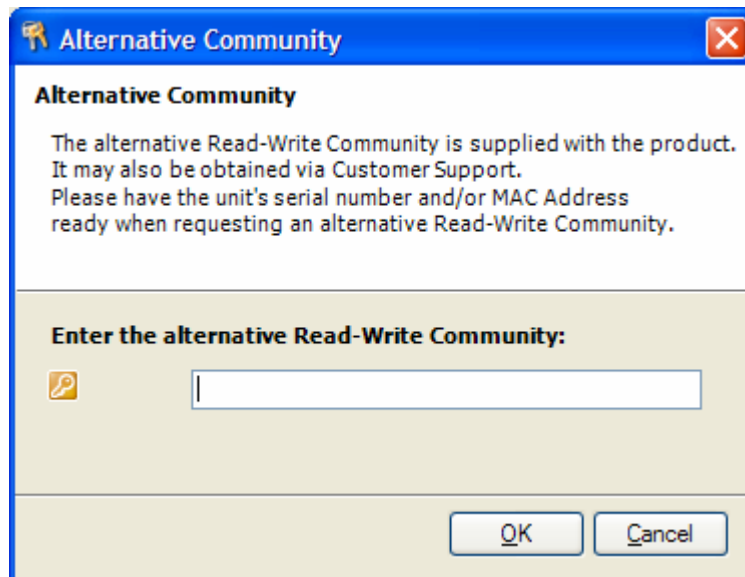
Figure 4-17. Alternative Community Dialog box

4.13   Changing Passwords

There are two passwords necessary to use the system. The first is encountered when running the management software, the second, the link Password is used for encryption purposes and is found when installing or configuring the link.

Changing the Management Password

➤ **To change the management password**

1. From the Tools menu, select Change Password

2. The Change Password dialog box appears.

3. Enter current password, and new password.

4. Click **OK** to confirm.

Changing the Link Password

The Radio Link is encrypted using Advanced Encryption System (AES) using a 128 bit dynamic key. During the installation process a Link Password must be set. An Initial encryption key is generated. Each time a link is established the Encryption key is validated. If the validation failed the link is established but no service or configuration is allowed. In this state the user can change the link password of each of the sites.

Note   *Returning to factory defaults returns the Link Password to the default password* ***wireless-bridge****.*

➤ **To change the Link Password:**

1. From the Configuration dialog box, select the **Security** tab

2. Click **Change** next to the Link Password field box.

    The Change Link Password dialog box appears.

3. Enter the current link password.

4. Enter the new password.

5. Enter the new password again in the Confirm box.

Forgotten the Link Password

In case of a forgotten link password, the user may enter the key password supplied with the product. The key password may be obtained from customer support after validation of the device serial number or MAC address. The user may change the link password of both sides of the link at any time using the Link Configuration Wizard.

➤ **To enter the key password:**

1. From the Configuration dialog box, select the **Security** tab.

2. Click **Change** next to the Link Password field box.

    The Change Link Password dialog box appears.

3. Click the **Forgot Link Password** button.

    The Key Link Password dialog box appears.

4. Type the key link password.

5. A new link password may now be set.

4.14   Muting the Beeper

The ODU beeper starts beeping as soon as power is supplied, and continues until the ODUs are aligned and the link established.

It is possible to mute the beeper until the alignment procedure is to be performed.

➤ **To mute the beeper:**

1. Click on **Configuration** in the Menu bar and select the relevant site.

    The Configuration dialog box opens.

2. In the Configuration dialog box, click the **Buzzer** button. The button toggles between on and off.

3. The Beeper stops.

➤ **To restore the beeper:**

1. Click **Configuration** in the Menu bar and select the relevant site.

    The Configuration dialog box opens.

2. In the Configuration dialog box, click the **Buzzer** button. The button toggles between on and off.

3. The Beeper starts.

4.15   Setting External Alarm Inputs

The IDU-C has two external alarm inputs in the form of dry-contact relays. The Alarm interface is located on the front panel of the IDU-C and is a 9-pin D-type female connector, see *Appendix A* for the pinout. The user enables or disables each of the alarms and can configure the text that appears in the alarm trap. The ODU sends the alarm within less than a second from actual alarm trigger.

➤ **To set the external alarm inputs:**

1. Open the Site Configuration Alarms configuration by clicking **Configuration > Advanced.**
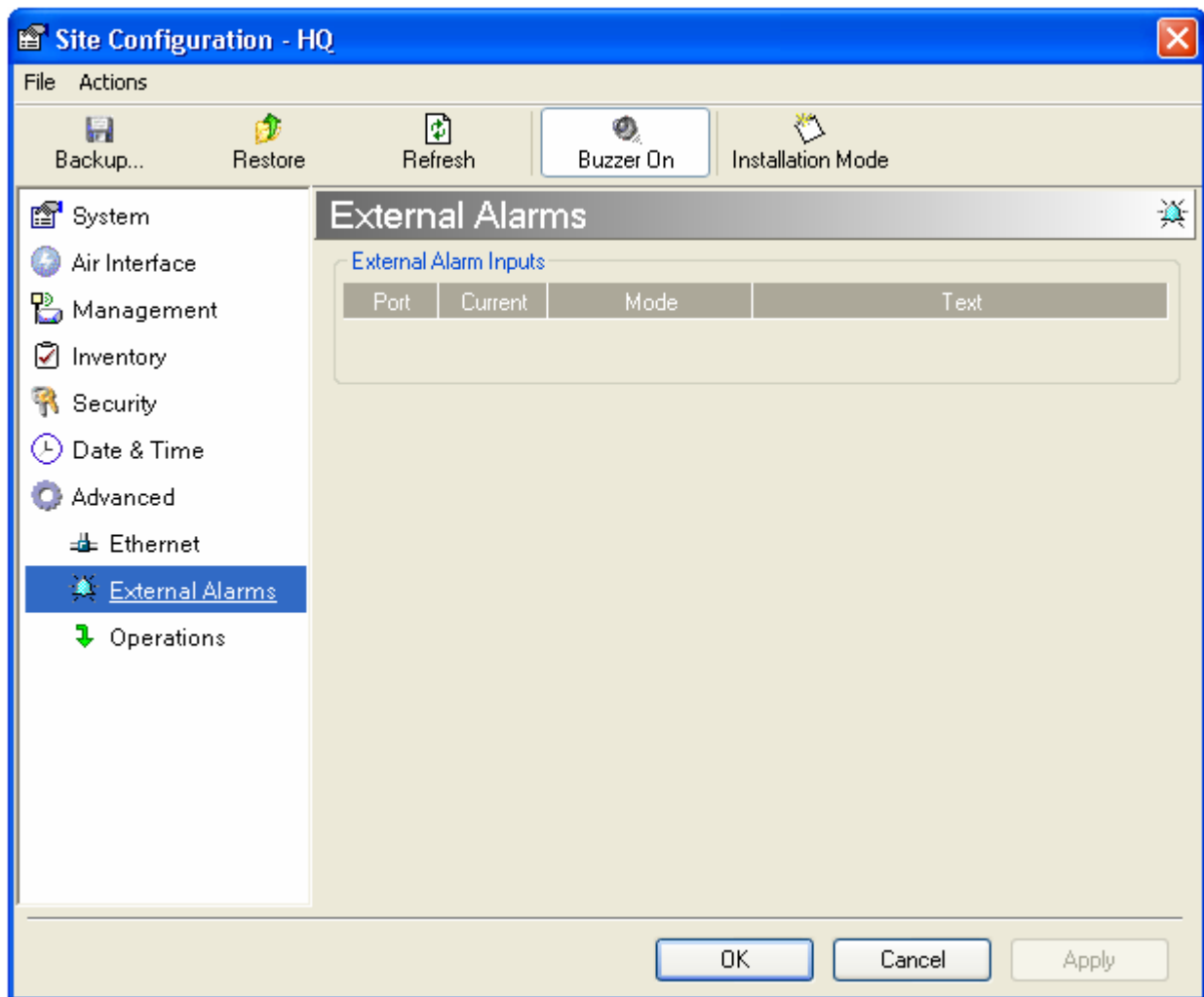
Figure 4-18. External Alarm Configuration

2.   Enter a description of the alarms in the fields.

3.   Click **Apply** to save.

4.16   Managing Configuration Files

Saving Configuration in a File

The management software allows you to save configuration parameters of the local and remote units on the management station as an INI file. Each site is saved in a separate INI file.

➤   **To save the configuration in a file:**

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

2.   Select which site to backup.

The configuration dialog box opens.

3. Click **Backup**.

4. In the Save As dialog box, indicate in which folder and under what name
    configuration file is to be saved, and click **Save**.

Restoring a Configuration File

Configuration files (***.ini**) can be uploaded from the management station. Verified
configuration files can be distributed to other units that use the same
configuration.

➤ **To restore a configuration file:**

1. From the **Configuration** menu, select the site to reconfigure.
    The Configuration dialog box opens.

2. Click **Restore**.

3. From the Open dialog box select *.**ini** file to upload and click **OK**.

4.17   Reinstalling the Link

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

Note

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

➤ **To reinstall the link:**

1. Click **Configuration** in the Menu bar and select any one of the sites.
    The Configuration dialog box opens.

2. Click the **Install Mode** button in the Configuration dialog box.
    A message box asking if you want to enter install mode appears.

3. Click **Yes** to continue.
    The system enters install mode and the beeper starts beeping.

4. Realign the ODUs and complete the Installation wizard (see *Chapter2*).

4.18   Resetting

Note

Resetting the link causes service disconnection.
In order to maintain the link configuration, reset the remote unit first.

➤ **To reset:**

1. From **Maintenance,** reset the remote unit.

2. From **Maintenance,** reset the local unit.

➤ **To reset to Factory Defaults**

1. Click **Configuration** in the Menu bar and select any one of the sites.

   The Configuration dialog box opens.

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

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

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

4. Click the check box if you want to keep the current IP settings.

5. Click **Yes** to continue.

4.19   Displaying the Inventory

➤ **To view the inventory data**

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

2. Select which site to configure.

   The configuration dialog box opens.

3. Select Inventory (*Figure 4-19*).

Note   *This screen is for viewing purposes only.*
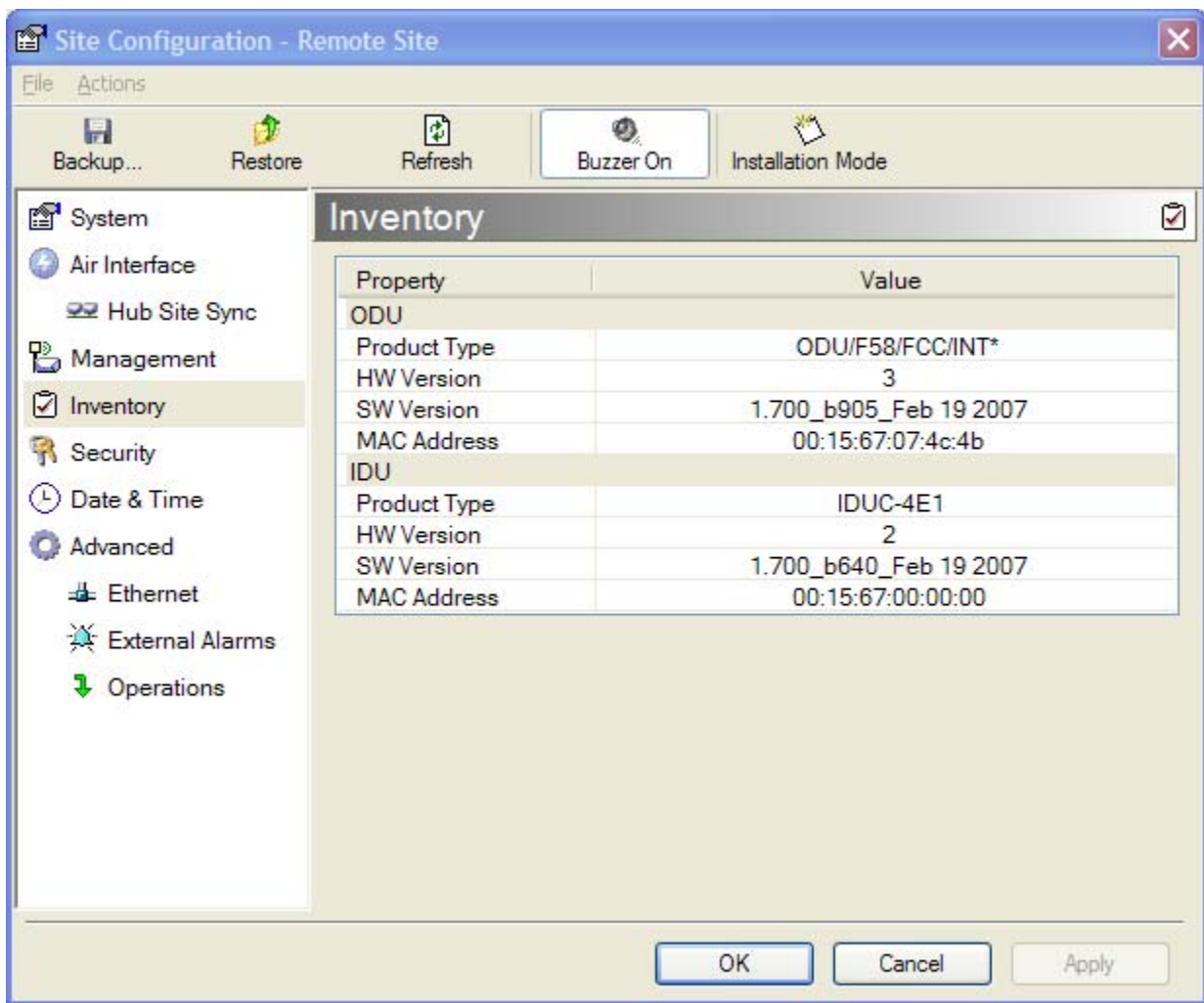
Figure 4-19. Inventory Screen

4.20   Configuration via Telnet

A Telnet terminal can be used to configure and monitor the ODU on site. Remote configuration cannot be performed via Telnet.

The login password is identical to the communities' strings; Read allows display only, Read/Write allows display and set commands.

Table 4- depicts the Telnet commands that are supported:

Table 4-4. Telnet Commands

Command	Explanation
display inventory	Displays ODU product name, Name, Location, hardware and software revisions, uptime, MAC address, IDU product name, IDU software and hardware revisions
display management	Displays IP, Subnet, Gateway, Traps table
display link	Displays State, SSID, 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[1], TDM table (Line status, Error Blocks)
display ntp	Displays Time, Server and Offset
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 (set trap 3 10.0.0.133 162)
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 transmit 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)
reboot	Reset both the IDU and the ODU. The user shall be prompt that the command will reset the card and that he has to reconnect the telnet session after TBD seconds.
help	Displays the available commands

Figure 4-20 shows the available Telnet commands via the Help command.

```
Hello admin, welcome to ODU Management CLI!
+------------------------------------------------------------+
      Software Revision            1.700_b900_Feb 11 2007
+------------------------------------------------------------+



admin@10.103.6.1-> help
     display inventory
     display management
     display link
     display ethernet
     display tdm
     display ntp
     set ip <ipaddr> <subnetMask> <gateway>
     set trap <index:1-10> <ipaddr> <port:0-65535>
     set readpw <oldpasswd> <passwd>
     set writepw <oldpasswd> <passwd>
     set trappw <oldpasswd> <passwd>
     set buzzer <mode:0=OFF,1 =ON>
     set tpc <power:Value between minimal TX power, and maximal TX power>
     set bridge <mode:0=Bridging OFF,1= Bridging ON >
     reboot
     help
Command "help" finished OK.
```

Figure 4-20. Telnet Management Screen

Chapter 5

Diagnostics and Troubleshooting

This chapter describes the diagnostic functions, which include:

- Get Link Information

- Monitoring Performance

- Error detection and alarms including Link Compatibility

- Diagnostic tests (local and remote loopbacks on E1 or T1 link)

- Troubleshooting

- Frequently asked questions.

5.1 Automatic Link Data Collection (Get Link Information)

The Get Link Information feature collects all the link and Manager information which can be used for diagnostics.

In the event of needing to contact technical support please send this file so as to speed up the assistance.

➤ **To get link information**

1. Click **Help** on the menu bar, select **Link Information**.

    The Get Link Information dialog box appears. See *Figure 5-1*.

2. Select or deselect the data options. If the file is to be sent to Technical Support leave all options checked.

3. Click **File Path** to get to the directory to save the file in.

4. Click **Start** to save the information.

    The file is saved as **Link Information.txt**
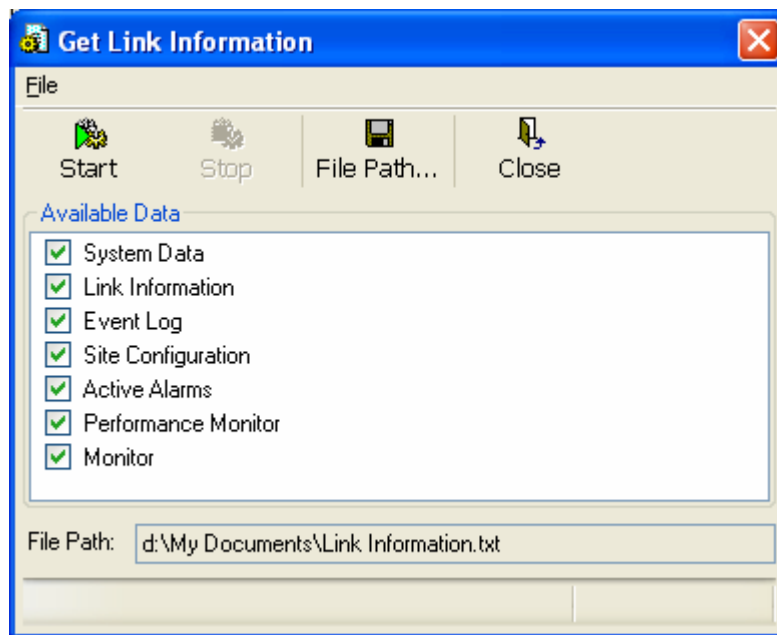
Figure 5-1. Get Link Information

5.2 Monitoring Performance

Traffic is constantly monitored over the radio link and the following statistics data collected:

- Site 1/Site 2 received traffic rate (in Mbps)

- Site 1/Site 2 received frames rate (in Mbps)

- Radio signal strength (in dBm)

- Error (Blocks).

The statistics (monitor) log and event log can be saved as TXT files. New alarms are automatically added to the text file, as they enter the event log.

Saving the Monitor Log

➤ **To save the monitor log**:

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

    The Preferences dialog box appears (see *Figure 5-2*).

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 alarm log file is to be saved.

6. Set the time interval for adding data to the file.

7. Click **OK** to save the file
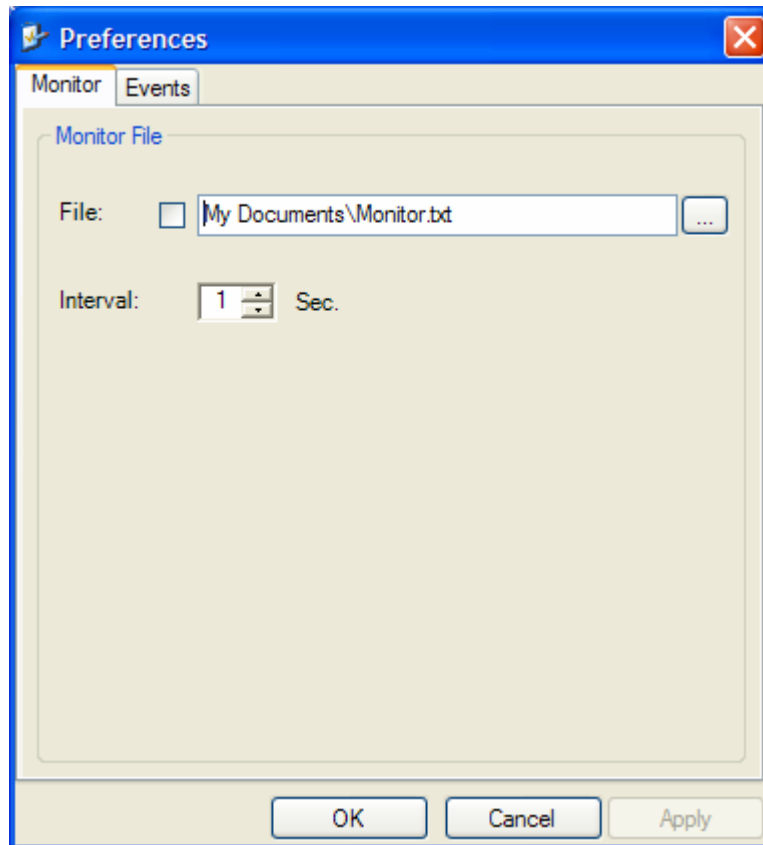
Figure 5-2. Preferences Dialog Box, Monitor Tab

Setting the Events Preferences

You can define a color that the traps are displayed in the monitor pane, according to severity of the event. The severity is predefined.

➤ **To set the trap color:**

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

    The Preferences dialog box appears).

2. Click the **Events** Tab (see *Figure 5-3*).

3. Select the Event priority type and click on the [...] button.

    A color chart opens.

4. Select the desired color.

5. Repeat for all the trap types.

➤ **To set the trap background color:**

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

➤ **To reset the trap colors:**

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

Saving the Events Log

➤ **To save the event log**:

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

   The Preferences dialog box appears (see *Figure 5-3*).

2. Click the **Events** 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 alarm log file is to be saved, and click **OK**.
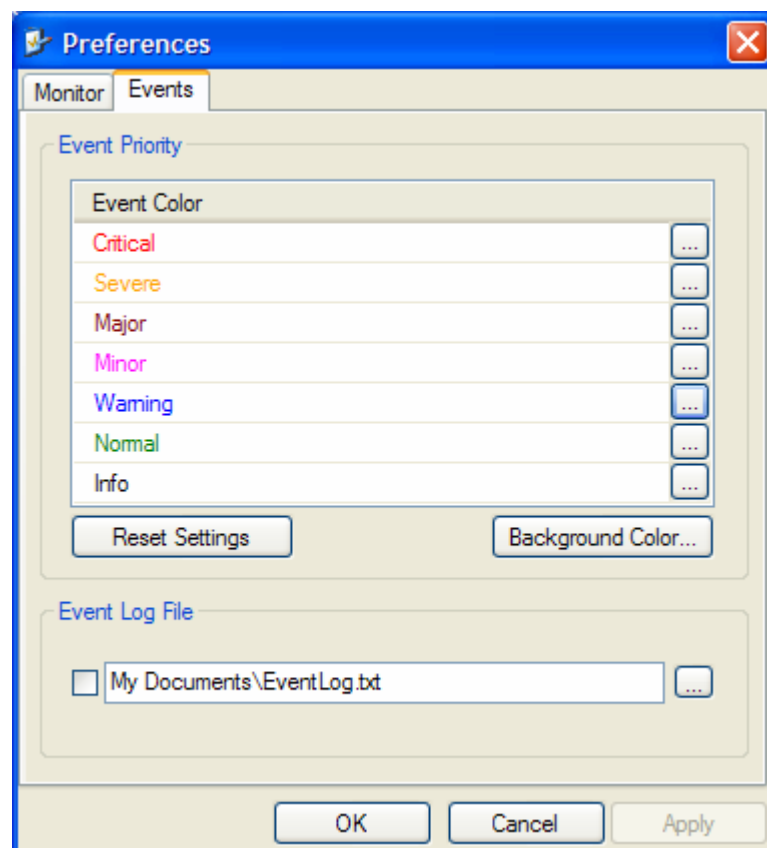
Figure 5-3. Preferences Dialog Box, Event Log Tab

5.3 Viewing Performance Reports

The Performance Monitor Report displays performance views of each of the interfaces[1] (see *Figure 5-4*). Several performance data 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 5-1* and *Table 5-2*.

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.

UAS – This parameter counts the time the air link was not providing any service. There are several potential reasons for this situation; one of the sites has a power failure, high interference, maintenance operation etc.

Radio **BBER** Threshold – This parameter counts the seconds in which the radio performance is below a user specified threshold. The threshold is measured in percent. The threshold can be set from 0.1% up to 50%.
For links with E1/T1 service the recommended value is 1% (system default). Excellent TDM service is expected below the 1% threshold, meaning that for 1% threshold, the expected BBER value should be 0 if there are no problems during the 15 min interval. If the BBER threshold increases some degraded service might be noticed.
For links with Ethernet only service, 8% threshold is recommended and not 1% meaning that for 8% threshold, the recommended BBER value should be 0 if there are no problems during the 15 min interval. Since a loss less Ethernet service is provided, there is throughput degradation in case of interference. The degradation is proportional to the BBER.

Radio RSS Threshold can also be used to indicate problems in the radio channel. After verifying the RSS according to the link budget calculator during the installation. A value of -5dB from the current RSS is recommended as a threshold.

---

[1] Ethernet performance is not collected in PoE systems.
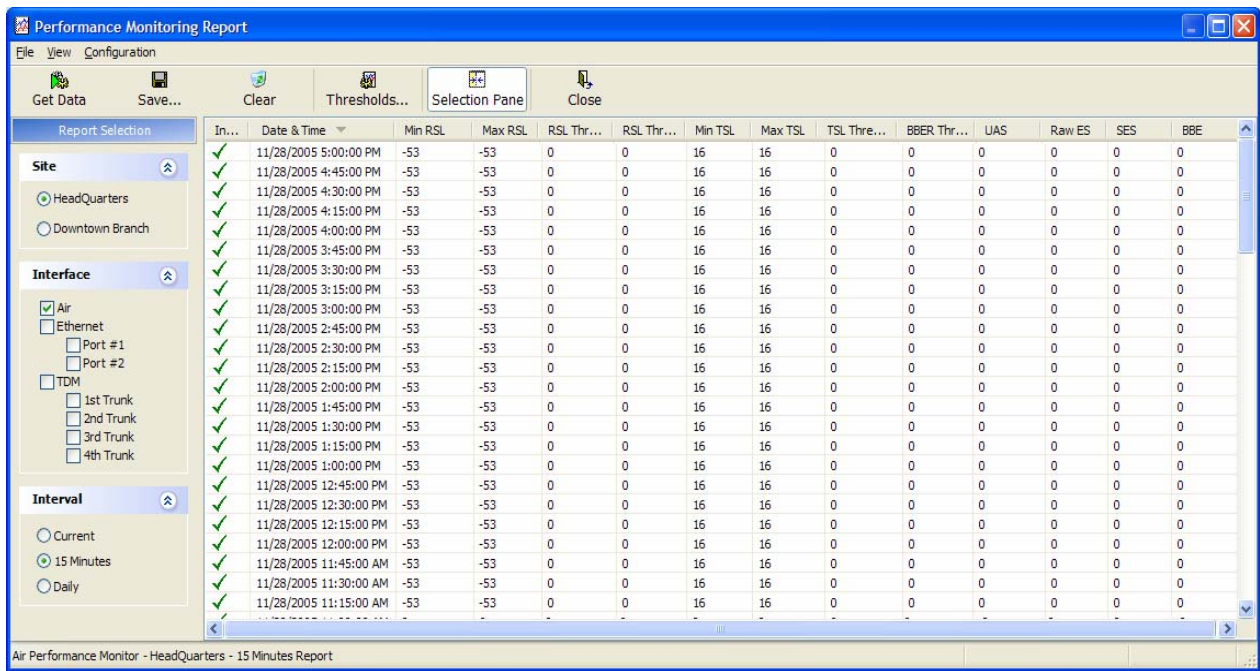
Figure 5-4. Performance Monitoring Report window

Table 5-1. Explanation of performance data

Data type	Reported value	Explanation
Generic PM Data	UAS – Unavailable Seconds	Seconds in which the interface was out of service.
	ES – Error Second	The number of seconds in which there was at least an error block. Note that notation of an error block is different per interface.
	SES – Severe Error Second	The number of seconds in which the service quality is low (the actual BBER ratio varies per interface).
	BBE – Background Block Error	The number of error block in an interval.
	Integrity	A flag indicating that the data is valid. Note that the PM data is not valid if not all the values were stored[2].
Air Interface PM Data	Max RSL	The maximum of the receive signal level (measured in dBm).
	Min RSL	The minimum of the receive signal level (measured in dBm).
	Max TSL	The maximum of the transmit signal level (measured in dBm)[3].
	Min TSL	The minimum of the transmit signal level (measured in dBm).
	RSL Threshold 1	This parameter counts the number of seconds in which the RSL is below the specified threshold.
	RSL Threshold 2	This parameter counts the number of seconds in which the RSL is below the specified threshold.

---

[2] Possible reasons are: Clock changes within the interval and Power up reset

[3] The transmit power is fixed. The value can be changed only by user configuration

Data type	Reported value	Explanation
	TSL Threshold 1	This parameter counts the number of seconds in which the RSL is above the specified threshold.
	BBER Threshold	The BBER Threshold value counts the number of seconds in which the Background Block Error Ratio (BBER) exceeds the specified threshold. Note, that the system is design for excellent quality of service with BBER of less then 1%. (at 1% BBER expected TDM BER is less than 1E-6.
Ethernet Interface PM Data	Received Bytes	The number of Mega bytes received in the specified port within the interval
	Transmitted Bytes	The number of Mega bytes received in the specified port within the interval.

Table 5-2. Action of the tool bar button commands

Button	Action
Get Data	Uploads the selected report from the ODU.
Save	Saves the data in a CSV or Text format for additional analysis.
Clear	Removes the current data from the window.
Selection pane	Selects the site, interface, and interval to be displayed.
Threshold	Opens the threshold configuration dialog box (Figure 5-5) to set the Air Interface thresholds. Note that threshold change is effected immediately, but it does not change any historical data.
Close	Closes the Performance Monitor Report window.
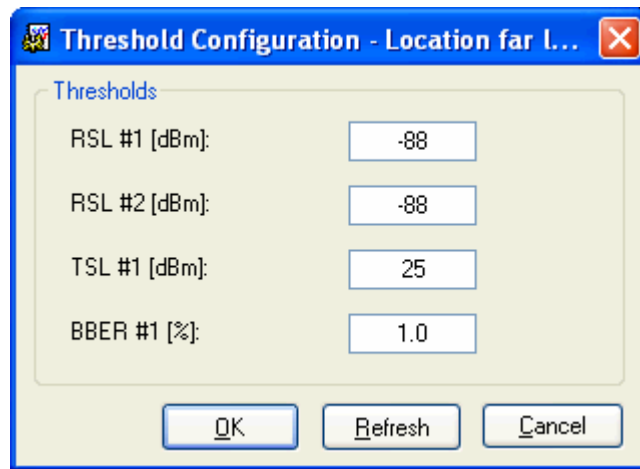
Figure 5-5. Threshold configuration dialog box

5.4 Error Detection and Alarms

Compatibility problems, fault conditions of the radio or user links are detected, and alarms initiated to alert the user.

Note   *To store the Event Log, first define the IP address, subnet mask, default gateway and trap address of the management PC, see* Chapter 4 *for details.*

Alarms (traps) are displayed in the Event Log in the lower panel of the Main Menu screen. The event log may be saved as a TXT file.

The event log includes the following fields:

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

Table 5-3. Alarms and Information Messages

Message	Description
Radio Link – Sync	Radio link is synchronized
Radio Link – Out Of Sync	Radio link lost synchronization
Link Has Been Reset	ODU was reset due to internal problem
TDM Interface – Normal	TDM interface is operating properly
TDM Interface – LOS	Loss of Synchronization is reported by TDM interface
TDM Interface – LOS	Loss of Signal is reported by TDM interface
TDM Interface – AIS	Alarm Indication Signal is reported by TDM interface
TDM Interface – Loopback	A loopback is active on TDM interface
Link Resetting	Wireless link reset from the management station. This alarm is caused by automatic reset after link configuration.
Local ODU Resetting	The local ODU reset from the management station.
Monitor was stopped since no connection to the link	No ODU-to-IDU traffic was detected during the last 20 minutes.
TDM Service – Normal	TDM service is operating properly
TDM Service – Alarm	Error has been detected on a TDM line
Configuration problem detected	The link needs to be reinstalled
Channel Scanning in progress	The ODU is scanning the channels for the remote ODU
Transmitting on <frequency> GHz	The ODU is transmitting on the frequency channel listed
Radar activity was detected in <site>, on channel <frequency> GHz	For DFS versions only. Radar is detected; the channel is prohibited for 30 minutes.
Monitoring fo Radar activity on channel <frequency> GHz	For DFS versions only. ODU is looking for Radar activity.
Bit Failed indication	Indicates ODU hardware problem. Send error code to Technical Support.
Link Status	Indicates incorrect connection or incompatibility between versions. Available in 1.620 versions and above.
Site Status	Indicates incorrect connection or operation at the site. Available in 1.620 versions and above.

➤ **To view summary of saved alarms**

- From the Tools menu, choose **Active Alarm Summary**.

    The Active Alarms Summary window opens. See *Table 5-4*; for an explanation of the command buttons.
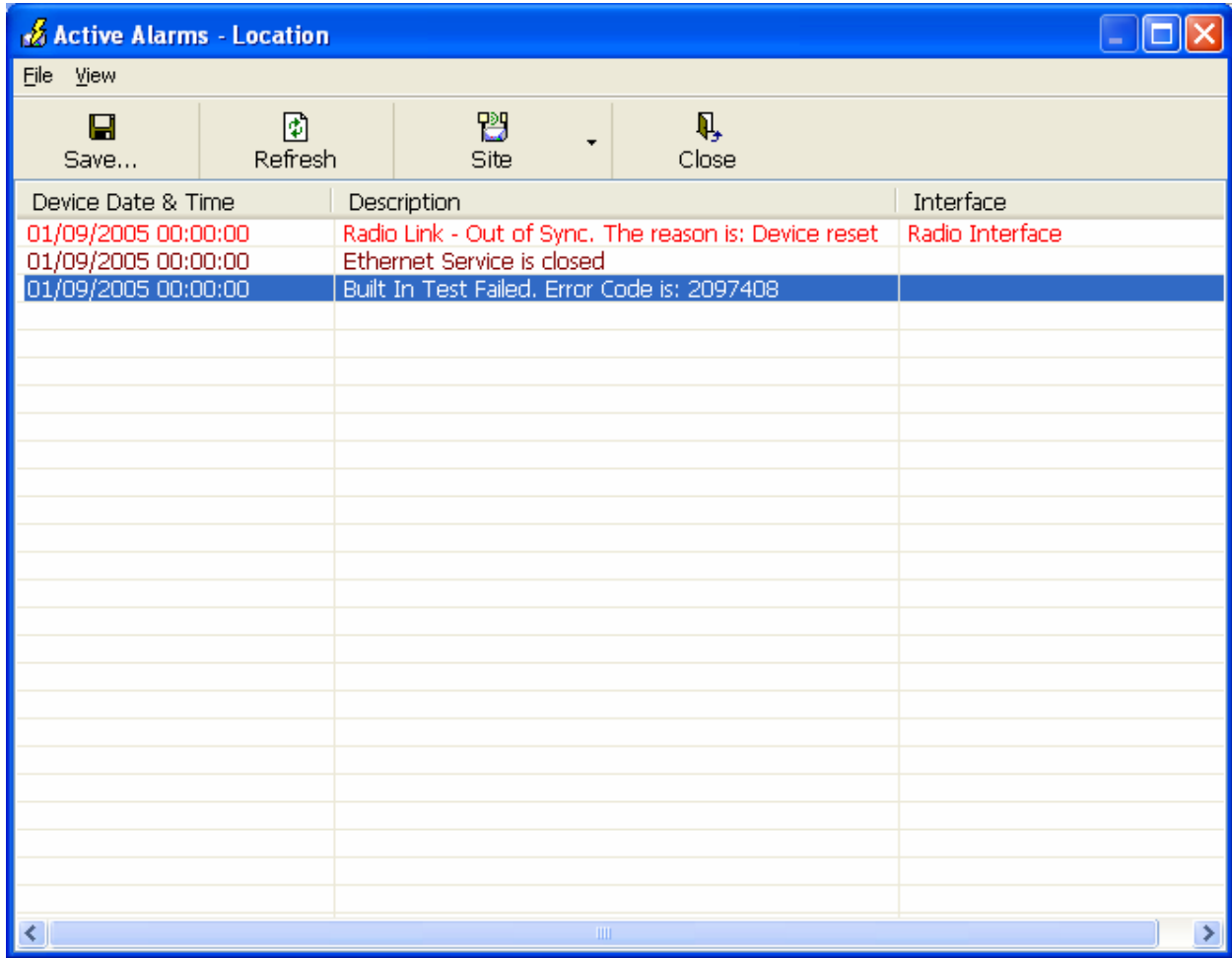
Figure 5-6. Active Alarms Summary

Table 5-4. Active Alarms command buttons

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

5.5 Remote Power Fail Indication

Remote power fail indication indicates to one side that the other side has had 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 IDU crash, during that interval a message notifying the power failure is sent to the remote end.

Alarm output number 4 indicates link loss due to power failure at the remote end.

5.6 Link Compatibility

The system indicates the version compatibility via software traps. As new hardware is added to existing networks compatibility issues may arise. An incompatibility issue is indicated to the user via a change of color of the Link Status box on the Main Menu screen. Trap messages in the Event Log indicate the problems or limitations and suggest upgrades when appropriate.

The following Link Status messages are given:

fullCompatibility - different software versions that are fully compatible. Message indicates that upgrade is available.

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

softwareUpgradeRequired - different software versions with limited operation. The link will operate as Ethernet only; a full service will not be available. The message is software upgrade required.

versionsIncompatibility - different software versions that are not compatible. User needs to perform local upgrades.

Table 5-5. Link Compatibility Trap Messages

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

5.7 Testing the System

The sytsem supports activation of the internal and external loopbacks on the local and remote units.

➤ **To activate a loopback**:

1. From the Maintenance menu, choose **Set Loopbacks**.

     The Loopbacks dialog box appears (see *Figure 5-7*).

2. From the Local or Remote drop-down box, select a loopback that you intend to run, and click **OK**.

     A confirmation message appears.

3. Click **OK** to activate a loopback.

     A loopback status arrow in the Main menu turns green to indicate an active loopback.

➤ **To deactivate a loopback**:

• From the Local or Remote drop-down box of the Loopbacks dialog box, select **None** and click **OK**.

     A loopback is deactivated and the corresponding status arrow in the Main menu becomes dimmed.
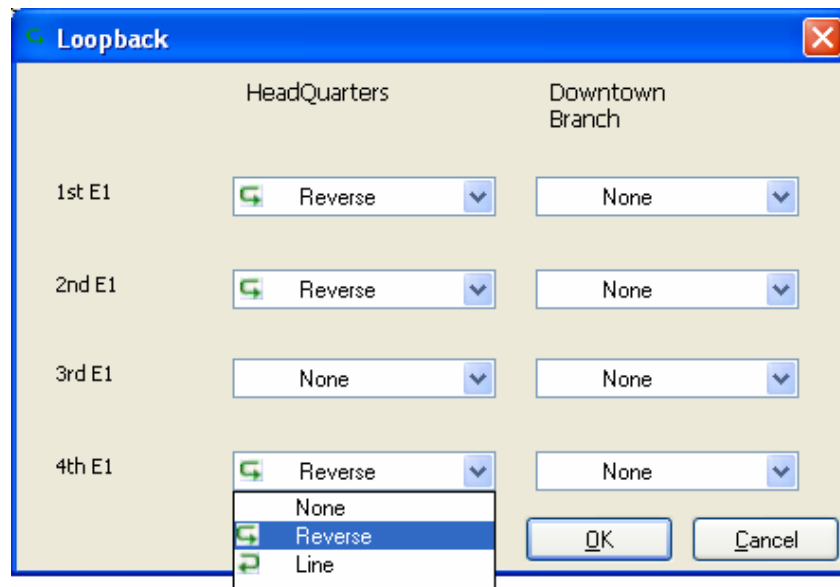
Figure 5-7. Loopbacks Dialog Box

Local External Loopback

The local unit can be set to an external loopback to test the local E1/T1 port and its connection to the local side user equipment. In this mode, data coming from the local user equipment is looped back to it (see *Figure 5-8*). This loopback is initiated from a management station connected to the local unit.
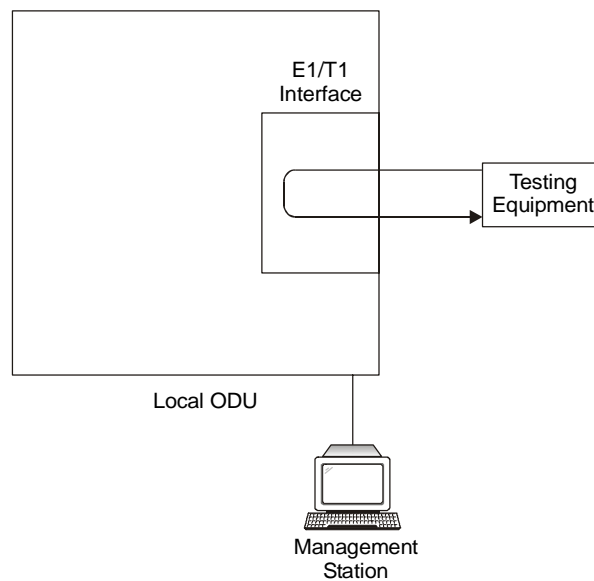
Figure 5-8. Local External Loopback

Remote Internal Loopback

The remote unit can be set to an internal loopback to test connection between the local and remote units, the local E1/T1 port and its connection to the local side user equipment. In this mode, data coming from the local unit is looped back to it (see *Figure 5-9*). This loopback is initiated from a management station connected to the local unit.
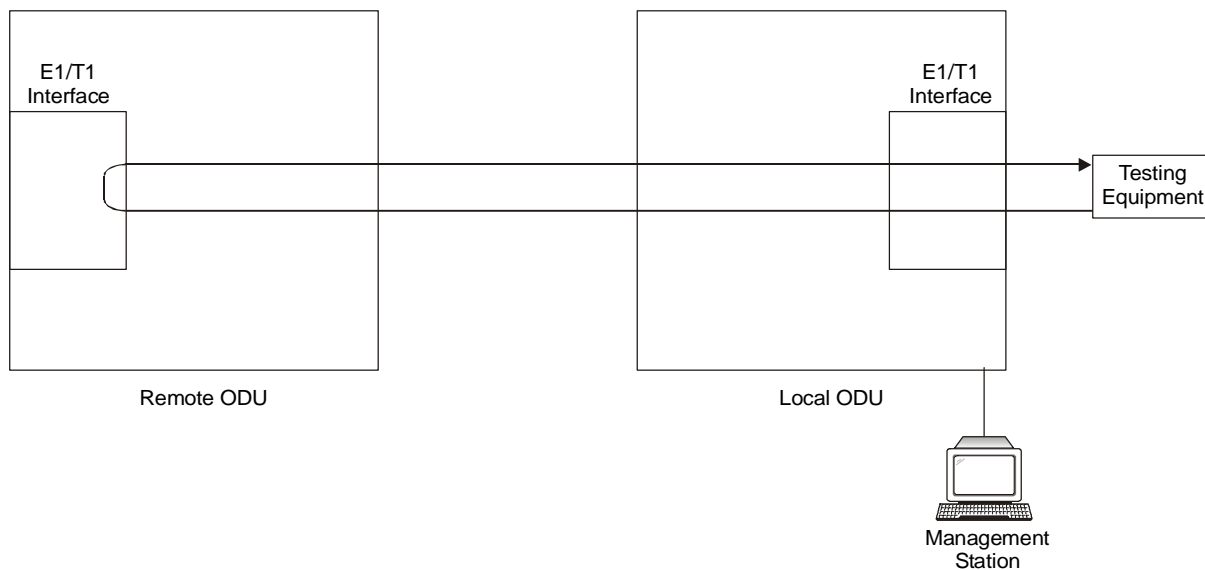
Figure 5-9. Remote Internal Loopback

Remote External Loopback

The remote unit can be set to an external 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 (see *Figure 5-10*). This loopback is initiated by an inband command sent from a management station connected to the local unit.
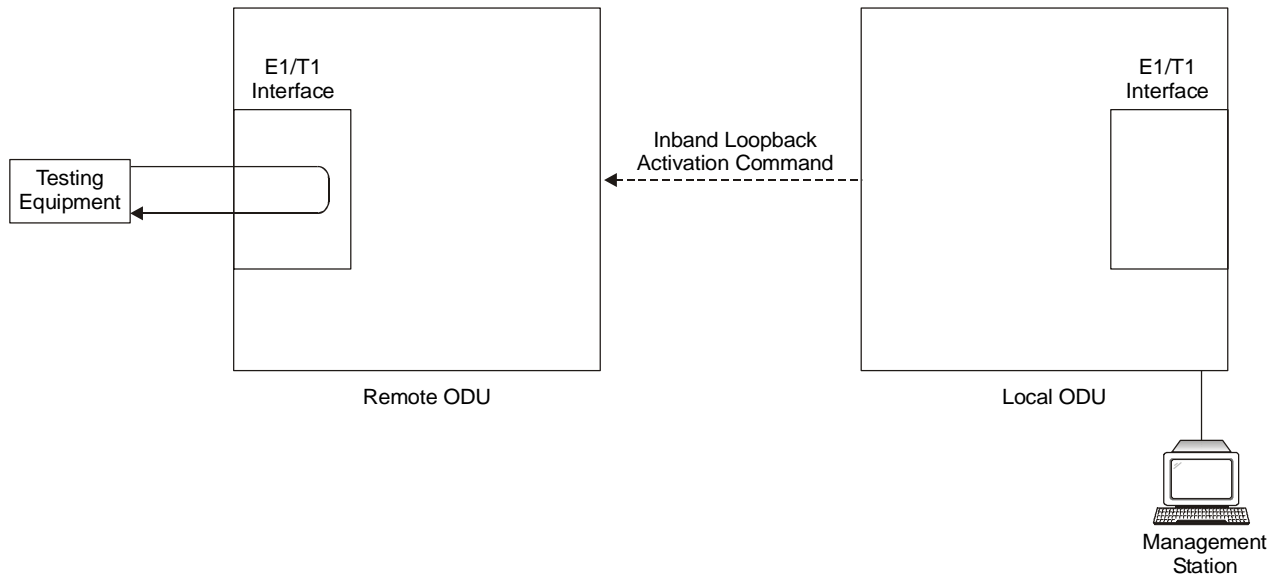
Figure 5-10. Remote External Loopback

Local Internal Loopback

The local unit can be set to close an internal loopback to test connection between the local and remote units, 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 (see *Figure 5-11*). This loopback is initiated by an inband command sent from a management station connected to the local unit.
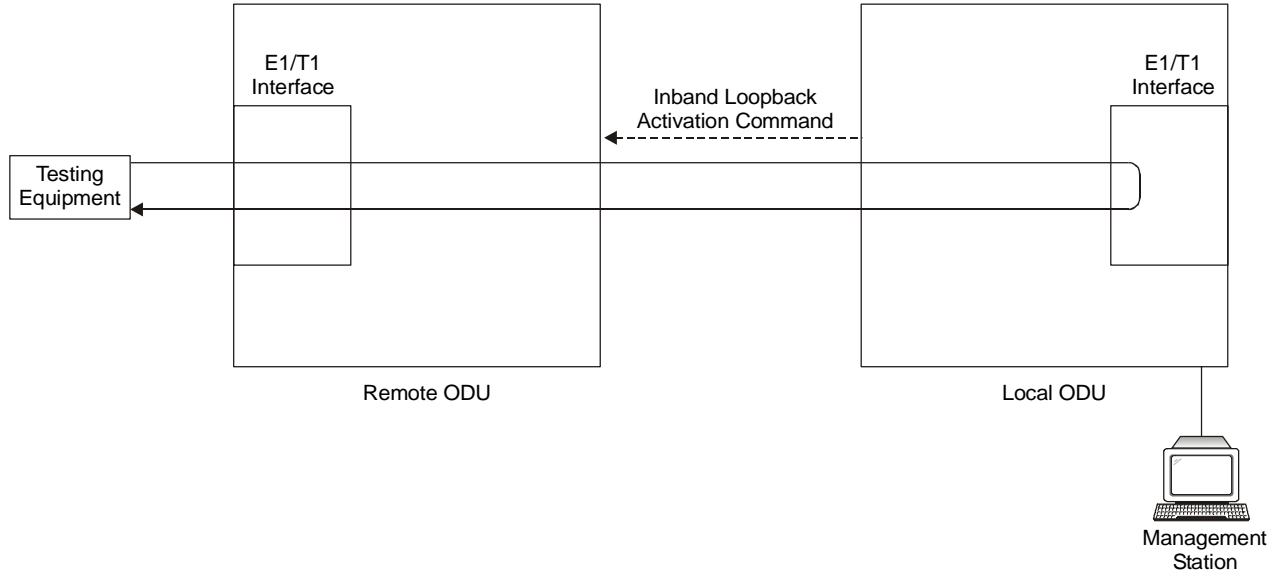
Figure 5-11. Local Internal Loopback

5.8 Troubleshooting

Use *Table 5-7* and *Table 5-7* to diagnose any faults in the system.

Table 5-6. Troubleshooting

Symptom	Remedy
No power	Verify that AC power is connected to the IDU.
	Verify that the ODU cable is properly wired and connected.
No signal	Complete the installation procedure from the management software.
	Verify the ODU alignment. Check that the radio configuration of both site A and site B units are the same (channel and SSID).
Weak signal	Verify the ODU alignment, reconfigure the link.
	Verify the beeper sounds the Best Signal sequence.

The LEDs show faults in the system or the link.

Table 5-7. Troubleshooting with LEDs

LED	Status	Remedy
PWR	Off	Check that AC adapter is connected to the IDU-E and the AC power outlet.
IDU	Orange	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 management software.
	Red	Check the ODU Antenna alignment. Check that the radio configuration of both site A and site B units are the same (channel and SSID).
SERVICE	Off	Check the TDM service configuration in the NMS.
	Orange	Check that the system is not in loopback mode. Check the site B IDU ports and cables and site B external equipment.
	Red	Check the site A IDU ports, cables and external equipment.

5.9 Replacing an ODU

Prior to any action verify that both ODUs have the same software version (Configuration > Configure site >Inventory). If one ODU has an old software version, perform a software upgrade. It is important to configure the new ODU exactly the same as the old ODU to avoid configuration mismatches, which will disrupt the link.

An ODU may be replaced with a new ODU in one several ways.

- Use the backup
  If a backup of the configuration is available, restore that configuration using Configuration > Configure site > Restore.

- Manual Configuration
  The new ODU can be configured manually according to the link configuration, remember to use the same settings for SSID, channels, link password, IP addresses, and names.

- Restore Factory Setup
  From version 1.6xx the feature of Restore Factory Setup is available. Using this feature we recommend putting the remaining ODU back to factory setup Configuration>Configure site>Advance option, and then activate the second ODU reconfiguring the link from scratch.

Option number 3 is the recommended option preventing configuration mismatches.

5.10   Frequently Asked Questions

Q: What performance issues will arise due to environmental conditions?

A: The system is not sensitive to environmental conditions. However if heavy rain or snowfall is expected ensure the performance by allowing a higher fade margin in the link budget planning calculations.

Q: When using the over-the-air system, what is the potential for interference between our system and other cellular or wireless Networks devices?

A: Since it may be operated in unlicensed bands there maybe some interference. Nevertheless, the fact that we can manually or automatically change the transmission frequency gives us the flexibility to find a clear channel. In addition each link uses a unique user configurable SSID code.

Q: What protocol does the system use, i.e. 802.11?

A: A proprietary protocol is used; this protocol contains improved options that more efficiently support the clock reconstruction from the TDM services.

Q: What type of security is offered?

A: Three levels of security:

1. vAES hardware mechanism

2. Each unit uses a unique SSID link-specific code (up to 24 alphanumeric characters)

3. Proprietary protocol protects from eavesdropping from other systems.

Q: Can we use horizontal and vertical polarization on the same frequency to double the number of wireless links?

A: Installing two systems in the same band with cross polarization provides 20–25 dB separations. Nevertheless, since there are reflections, the cross polarization separation is decreased and spatial separation is recommended.

Q: Can we mange the system using SNMPc other than the supplied management software that comes with the units?

A: Yes. The Manager is SNMP-based. The system can be managed when using other SNMP software after implementing our MIB's.

Q: Can I use any vendor's external antenna?

A: Yes. The external ODU is supplied with an N-type typical connector. Any vendor's external antenna that can be cascaded to our external unit can be used without problem. Note that dB losses in the cascading cable between the external ODU and antenna should be taken into consideration. (In the supplied cascading cable of one meter we have 1 dB loss)

Q: Do we need to add external arrestors on the cables?

A: The ODU includes arrestors and lightning protection. Therefore there is no need to add additional arrestors.

Q: What is the actual Ethernet data rate and maximum throughput?

A: The maximum net throughput is full duplex 18 Mbps.

Note   *The system is symmetrical.*

Q: What is the sensitivity for each rate?

A: The rate sensitivities are:

Rate [Mbps]	Sensitivity [dB]
12	-84
18	-81
36	-74
48	-68

Q: Are any MAC Addresses withheld?

A: The system is a layer 2 Bridge (VLAN transparent). The built-in switch contains a MAC Address table up to 2047.

Q: Can I use any category 5e cable in order to connect the IDU and ODU?

A: The cable should be suitable for outdoor use, and shielded Category 5e.

Q: What are the BER values expected in the link?

A: 10-11 (according to BER sensitivity threshold)

Q: Does the system use DSSS technique?

A: No, the advanced OFDM technique is used.

Q: What are the main advantages of the solution (e.g., wireline, wireless, etc.) over other possible alternatives?

A:

- Easy and intuitive installation using audio indication.

- Easy configuration using the management software of overall link site-to-site, there is no need to travel between the two sites in order to change the configuration.

- Easy migration between transition channels site-to-site.

- Full backup option – backup and restore using ini files.

- Very light ODU (1.5 kg).

- No RF loses between IDU and ODU.

- Robust Air Interface Layer 2 ARQ insures "error-free" Ethernet service even in harsh conditions. Retransmit mechanism for TDM esures low BER.

- Integrated up to 4 E1/T1 and Ethernet radio over one single product.

- Supports a variety of applications Voice and Data over single radio – no need for external mediation device.

- Smooth migration to VoIP applications.

- Carrier class compliant with ITU standards for E1 and T1.

- Low and constant TDM latency (8 msec).

- Extremely accurate recovered clock low cost replacement to PDH radios.

5.11   Technical Support

Technical support for this product can be obtained from the local distributor from whom it was purchased.

Appendix A

Wiring Specifications

A.1 ODU-IDU Cable

The ODU-IDU cable is standard CAT-5, 4 twisted-pair 24 AWG FTP, terminated with RJ-45 connectors on both ends. It is covered by a cable gland on the ODU side for hermetic sealing.

Table A-1 shows the connector pinout.

Table A-1. ODU-IDU Cable Connector Pinout

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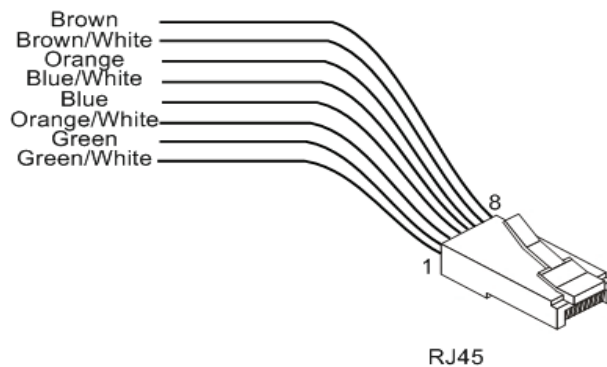
Figure A-1. RJ-45 wiring for IDU-ODU cable

A.2 User Port Connectors

The IDU includes ports for connecting E1/T1 and 10/100BaseT Ethernet user devices.

Trunk Port

The Trunk (E1/T1) interface terminates in an 8-pin RJ-45 balanced connector, wired in accordance to *Table A-2*.

Table A-2. E1/T1 Connector Pinout

Pin	Function
4,5	Receive (input)
1,2	Transmit (output)

LAN Port

The LAN 10/100BaseT interface terminates in an 8-pin RJ-45 connector, wired in accordance to *Table A-3*.

Table A-3. Fast Ethernet Connector Pinout

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

A.3 IDU-C Connectors

IDU-C DC Power Terminal

Table A-4. Terminal Block 3-pin -48VDC

Pin	Connection
Right	+
Center	Chassis
Left	–

IDU-C Alarm Connector

Table Table A-5 lists the alarm connector pinout.

Table A-5. Alarm Connector (Dry-Contact)

Pin	Description	
1	Input 1	Positive
6	Input 1	Negative
2	Input 2	Positive
7	Input 2	Negative
3	Output 1	Normally Closed
8	Output 1	Common
4	Output 1	Normally Open
9	Output 2	Common
5	Output 2	Normally Open
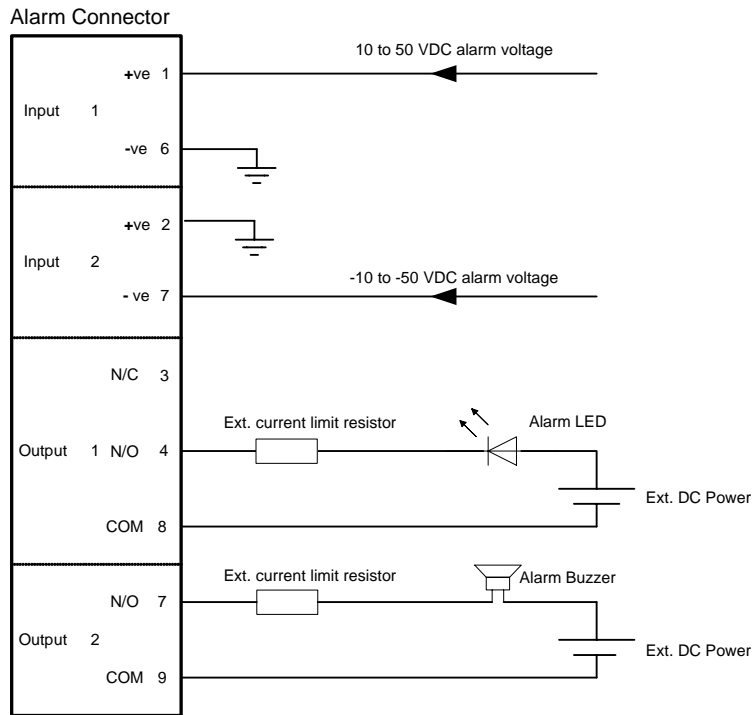
Figure A-2. Example for connecting the alarm connector

Appendix B

Mast and Wall Installation

B.1   Mounting the ODU or O-PoE

The ODU or O-PoE can be mounted on a mast or a wall.

ODU Mounting Kit Contents

The mounting kit includes the following items:

- One Large Clamp (see figure B-1)
- One Small Clamp (see figure B-2)
- One Arm (see figure B-3)
- Four Screw hex head M8x40
- Two Screw hex head M8x70
- Four Washer flat M8
- Three Washer spring M8
- Two M8 Nuts.
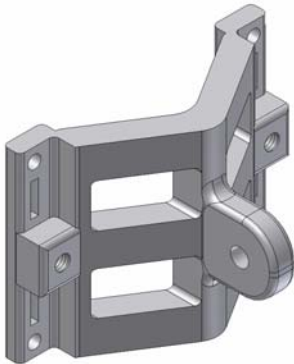
Figure B-1. Large Clamp
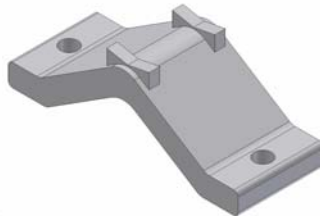
Figure B-2. Small Clamp

Figure B-3. Arm

Mounting on a Mast
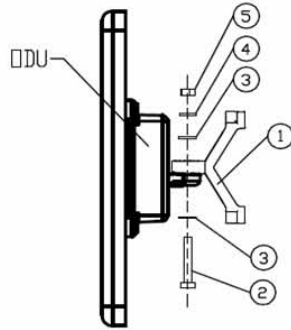
Installation Kit

ITEM	DESCRIPTION	QTY
1	Clamp	1
2	Screw hex head M8x40	1
3	Washer flat M8	4
4	Washer spring M8	3
5	Nut M8	1
6	Clamp	1
7	Screw hex head M8x40 (for 1 3/4" dia mast)	2
8	Screw hex head M8x70 (for greater size of mast)	2
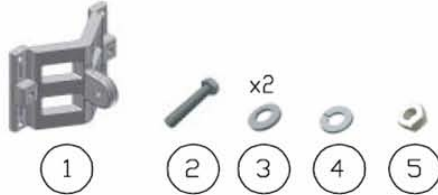
STEP 1

Attach item 1 to the base (mate knurled surfaces) using items 2 ,3 ,4 ,5 as shown Use tightening torque of 24 N/m.
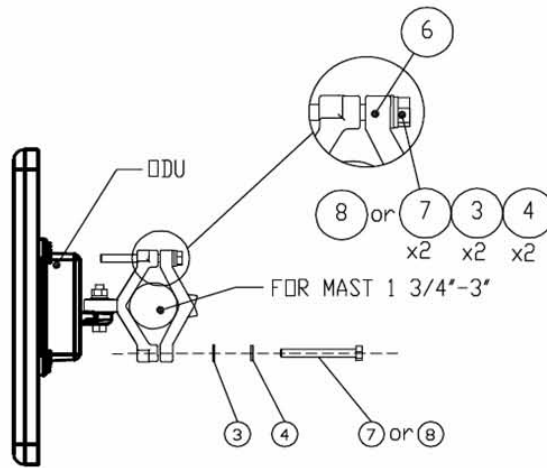
STEP 2

Tighten the antenna to the mast , using item 6, screws, and washers items 7 ,3 ,4 as shown. Use tightening torque of 14 N/m.

FOR MAST 1 3/4"-3"

FOR MAST 1"- 1 3/4"
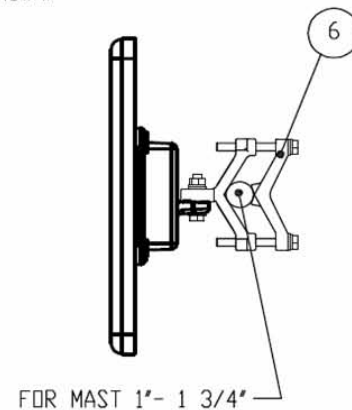
Mounting on a Wall
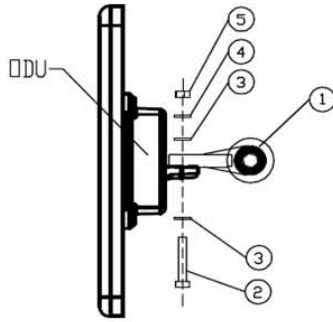
Installation Kit		
ITEM	DESCRIPTION	QTY
1	Arm	1
2	Screw hex head M8x40	2
3	Washer flat M8	4
4	Washer spring M8	2
5	Nut M8	2
6	Base wall	1

STEP 1
Attach item 1 to the base
(mate knurled surfaces)
using items 2, 3, 4, 5 as shown.
Use tightening torque of 24 N/m.
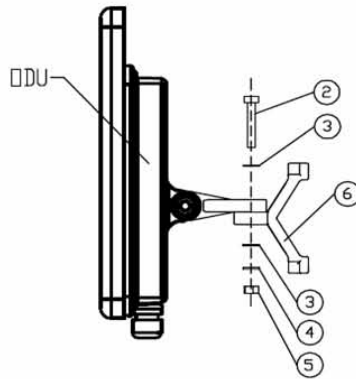
STEP 2
Attach item 6 to the arm
(mate knurled surfaces)
using items 2 ,3 ,4 ,5 as shown.
Use tightening torque of 24 N/m.

STEP 3
Install ant. to wall
(hardware supplied by customer)
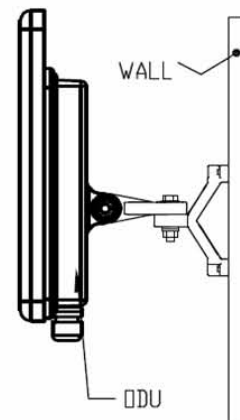
B.2   Mounting an External Antenna

The optional external antenna can be mounted on a mast.

External Antenna Mounting Kit Contents

The external antenna mounting kit includes the following items:

- Twelve flat washers
- Eight spring washers
- Eight hex nuts
- Four bolts
- One U-bracket
- One pivoting bracket
- Two metal strap clamps.

➤ **To install external antenna on the mast:**

1. Attach the U-bracket to the back of the antenna using four flat washers, four spring washers and four hex nuts.

2. Attach the pivoting bracket to the U-bracket using eight flat washers, four spring washers, four hex nuts and four bolts.

3. Pass both strap clamps through the vertical slots in the pivoting bracket.

4. Attach the antenna to the mast using the two strap clamps.

5. Adjust the required tilt using the angular scale and tighten all bolts and nuts at the required position.

Appendix C

Link Budget Calculator

C.1   Overview

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

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

The Link Budget Calculator is supplied on the Manager CD. After installation, it is also accessed from the Help menu of the Manager.

➤ **To open the Link Budget Calculator:**

- From the Help Menu, select **Link Budget Calculator.**

C.2   Description of Parameters

The parameters described in this section are indicated in *Figure C-1*.

A   Fade Margin (FM) the margin taken in consideration as part of the parameters needed as spare for high availability. Min level accepted by the LBC is 6dB.

B   EIRP Tx Power + Antenna Gain (*) – in some products they are limited to a max value due to local regulation and type approval.

Example 1:

10 x Log (Value in mW) = (Value in dBm)

1W is the maximum EIRP (Tx Power + Antenna Gain (*)) that is allowed in 5.4 GHz ETSI products by ETSI regulation, (*) considering cable loss.

Note: 3 dB = 2 x Power

1W = 1000 mW → 10 x Log (1000) = 30 dBm

2W = 2000 mW → 10 x Log (2000) =33 dBm

C   Max/ Min range (distance) sensitivity threshold in -60dB range

(-30 dBm < RSS (sensitivity) <-90 dBm, in addition Propagation Delay is also considered 3.3uS / 1 km (refer to Throughput vs Distance guideline

Example 2:

RSS = Tx(power) + Ant(Tx) + Ant(Rx) – loss

loss = 32.5 + 20 Log (D) + 20 Log (f);

D = Distance in km, f = Center Frequency

D   Climate/Terrain Factor see *Figure C-2* and *Figure C-3*

E   Expected FM and RSS, refer to A and B

F   Required Antenna Height, this is the required antenna height considering the Fresnel Zone, see *Figure C-4*. Refer to site-survey guideline.

- based on antenna beam
- Considering LOS (clear *Line of Site*)

G   Required Channel Bandwidth.

Figure C-1. Link Budget Screen

Figure C-2. Climate and Terrain Factor
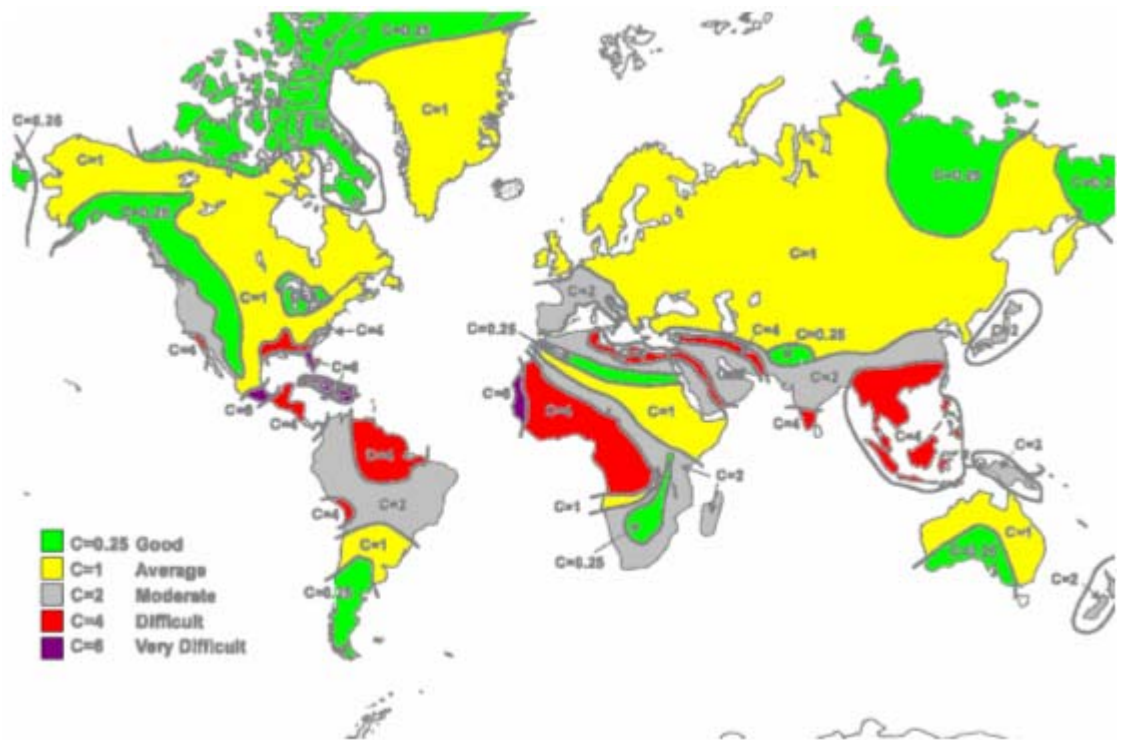
Figure C-3. Geographical Conditions
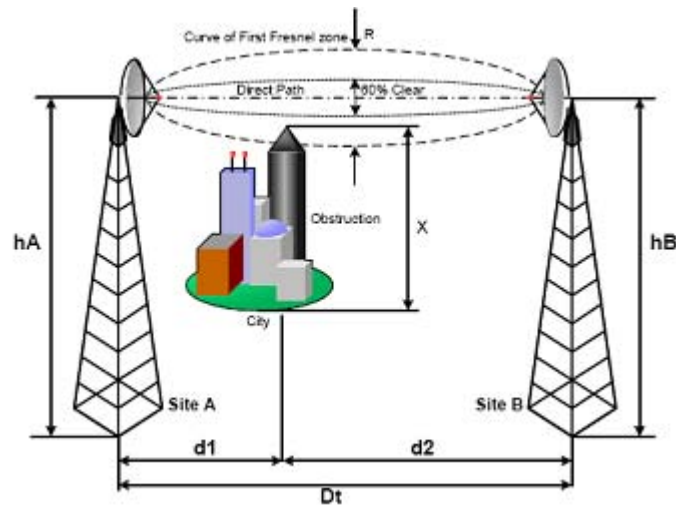
Figure C-4. Fresnel Zone

C.3   Using the Link Budget Calculator

The Link Budget Calculator comprises of one table where all the link parameters are defined.

➤ **To calculate the link budget**

1. Select your system product from the dropdown list of products.

2. Select the Channel Bandwidth and the RFP if applicable (HSS systems).

3. Select the rate from the dropdown list. The rate defines the air-interface rate in Mbps. The system operates in TDD mode and has overhead of the air-interface protocol and therefore the accurate actual throughput is provided in the 'Service' Row and the effective Ethernet throughput is provided in the 'Ethernet Rate'.

Note   *Throughput can be decreased as a function of range due to propagation delay.*

The remaining fields are completed automatically depending on the product selected in the product field. Standard system parameters are entered as default. Fields in blue boxes may be edited if non-standard antennas and cables are used.

The Fade margin is the minimum margin that is required for LOS conditions. For degraded link conditions, a larger fade margin should be taken into account.

The Tx power EIRP for the system is given in dBm and Watts.

4. Type the required link distance and select units of distance, kilometers or miles.

5. Select the general conditions

6. Select the services required

7. Click **Calculate**.

The Expected Performance parameters are calculated and displayed in the lower part of the table.

- Expected RSS – this is the number that the Manager software shows when the ODUs are best aligned.
- Ethernet Rate – Maximum throughput available with the chosen system.

If the expected performance is not suitable for your application, select a different data rate and re-calculate.

Appendix D

AIND Antenna Alignment Procedure

Use this procedure when using the all indoor system ANID or manually aligning two units.

To achieve the best benefit and link budget from the installation, the link antennas must be aligned; the two antennas should exactly face each other.

In order to achieve the best performance, the line of sight must be as clear as possible with no obstructions between the two sites.

Prior to attempting alignment, install the hardware and software in accordance with the Installation and Operation Manual. *Figure D-1* shows the link setup. At least two people are needed to perform the alignment procedures.

Once the alignment is complete, you are able to evaluate the quality of the link.
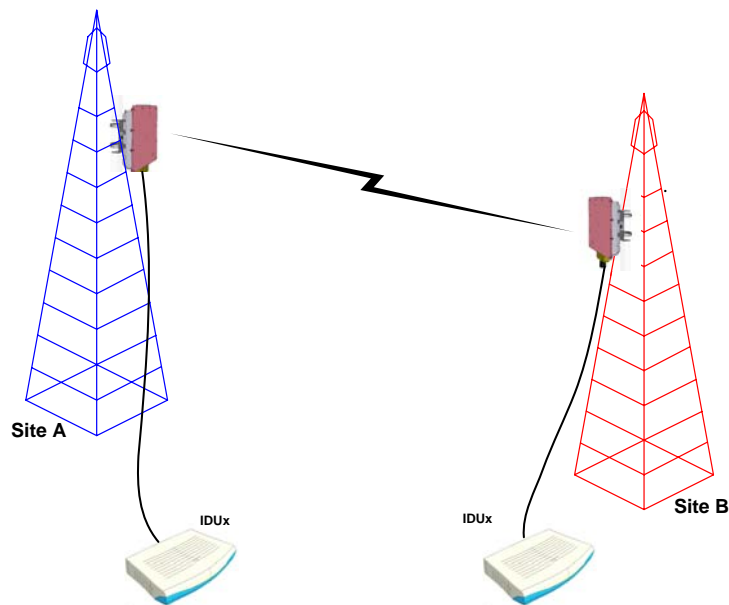
Figure D-1. Link Setup

D.1   Expected Signal Level

Based on the link budget parameters of the actual sites, you need to calculate the expected signal level that will be received by the receiving site.

Use the Link Budget Calculator utility supplied on the Manager Software CD-ROM to calculate the expected performance of the wireless link. The utility allows you to determine the RSS of the link, and find the number of E1/T1 services available at various data rates, with the minimum and maximum distance.

D.2   Performing AIND Alignment

The supervisor of the antenna alignment is situated at the receive site with the Spectrum Analyzer.

Equipment Setup

➤   **To set up the antenna alignment equipment:**

1. Coarsely align the two antennas. Use the compass readings taken during the Site Survey to point the antennas in the correct direction.

2. Connect the equipment as shown in *Figure D-1* but connect a spectrum analyzer in place of the remote AIND.

3. Turn on the CW transmit signal from site A (from the NMS).

4. At site B, tune the SA to the frequency transmitted.

5. Increase the SA sensitivity according to the expected receive signal.

Align the antennas:

Note
* *When one antenna is moved, the opposite site is passive*
* *Move the antennas very slowly*

1. Slowly move the site B antenna azimuth axis (the elevation axis should be locked) until you see the best signal on the SA Lock the azimuth axis.

2. Slowly move the site A antenna azimuth axis (the elevation axis should be locked) until you see the best signal on the SA.
    Lock the azimuth axis.

3. Slowly move the site B antenna elevation axis (the azimuth axis should be locked) until you see the best signal on the SA.
    Lock the elevation axis.

4. Slowly move the site A antenna elevation axis (the azimuth axis should be locked) until you see the best signal on the SA.
    Lock the elevation axis.

5. Repeat steps 1 to 4 until the reading on the SA is equal or as close as possible to the calculated receive signal (for Rx Power Level see *Expected Signal Level*).

When the SA reads the expected receive signal, the antennas are aligned and there is an indication of a good link between the sites.

6. Tighten the antenna azimuth axis and elevation axis.

7. Stop the CW function. The NMS will restart the system.

8. Connect AIND unit to external antenna. See the Installation and Operation Manual for details. The operational link is shown in *Figure 2-3*.

9. Configure the NMS at both sites to operate at the pure channel frequency found in the RF survey. The system is now ready for operation.

D.3   Configuring the Link

1. Run the **Installation Wizard** in the Manager Software to set the initial configuration of the link. Configure the link in accordance with the parameters calculated in the Link Budget Calculator.

2. Each side of the link looks for its partner with the same unique identification number, the SSID. Therefore both sides of the link must be configured with the same SSID.

3. The link is now ready for operation.

D.4   Evaluating the Link

With the link operating at a pure channel as determined by the RF survey procedure, the recommended performance threshold of a link is the following:

RSS: –84 dBm minimum

There are cases when there is no line of sight, but still the link is of an acceptable quality.

If the link is not within the acceptable limit, see *Troubleshooting*.

D.5   Troubleshooting

If the link is not within the acceptable limit as defined in *Evaluating the Link*, check the following:

- Verify that both antennas have the same polarization (horizontal/vertical).
- Check all the AIND cable connectors for faulty connections.
- Verify that there are no obstacles in the Fresnel zone of the antenna path such as large buildings, trees, etc.
- Use a spectrum analyzer with suitable sensitivity to measure the signal at the distance between the sites.

If nothing improves the receive power level, check the overall link.

- Reduce the distance of the link–move the equipment from one site closer to the other site–where it is possible to actually see the antennas with the naked eye.
- If you now get the expected receive signal level, you can assume that the equipment is operational, and the problem arises from interference between the sites.

Appendix E
Antenna Characteristics

An antenna is the radiating and receiving element from which the radio signal, in the form of RF power, is radiated to its surroundings and vice versa. The transmission range is a function of the antenna gain and transmitting power. These factors are limited by country regulations.

The system may be operated with an integrated antenna attached to the ODU unit, or with an external antenna wired to the ODU via an N-type connector. All cables and connections must be connected correctly to reduce losses. The required antenna impedance is 50Ω.

Table E-1. **Antenna Characteristics**

	Type	Gain [dBi]	Max Range [km]	[miles]	Beam [degrees]	Dimensions [mm]	[in]	Weight [kg]	[lb]	Connector	Lightning Protection
5.8, 5.4, 5.3 GHz											
Integrated	Flat panel	22	40	25	9.0	305×305×58	12×12×2.3	0.5	1.1	NR	Yes
External	Flat panel	28	80	50	4.5	600×600×51	23.6×23.6×2	5.0	11.0	N-type	No
5.8 GHz only											
External	Dish	32.5	80	50	4.5	Dia 900	Dia 35.4	10	22	N-type	No
4.9 GHz											
External	Flat panel	21	24	15	9.0	305×305×58	12×12×2.3	0.5	1.1	N-type	Yes
External	Dish	27	80	50	5	Dia 600	Dia 23.6	5.0	11.0	N-type	Yes
2.4 GHz											
Integrated	Flat panel	17	40	25	20	305×305×58	12×12×2.3	0.5	1.1	NR	Yes
External	Grid	24	80	50	7.5	600×997×380	23.5×39.2×15	2.0	4.6	N-type	No

The Parabolic dish antenna is a high-gain, reflector antenna used for radio, television, and data communications. The relatively short wavelength of electromagnetic (radio) energy at these frequencies allows reasonably sized reflectors to exhibit the very desirable highly directional response for both receiving and transmitting.

Parabolic Dish Antenna

Used for 2.4 GHz applications. Due to the large size, the grid design minimizes weight and windloading.

Grid Antenna

Appendix F

Hub Site Synchronization

F.1   Introduction

HSS is an ordering option. ODU units are supplied with special hardware for the collocation of several units, using a method called Hub Site Synchronization (HSS). HSS uses an external cable connected to all collocated radios. This cable carries pulses sent to each radio, which synchronize their transmission with each other.

This pulse synchronization ensures that the transmission of packets occurs at the same time for all collocated units. This synchronized transmission also results in all of the hub 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. HSS supports installation of up to eight collocated units.

Figure F-1 shows interference caused by non-synchronized collocated units.
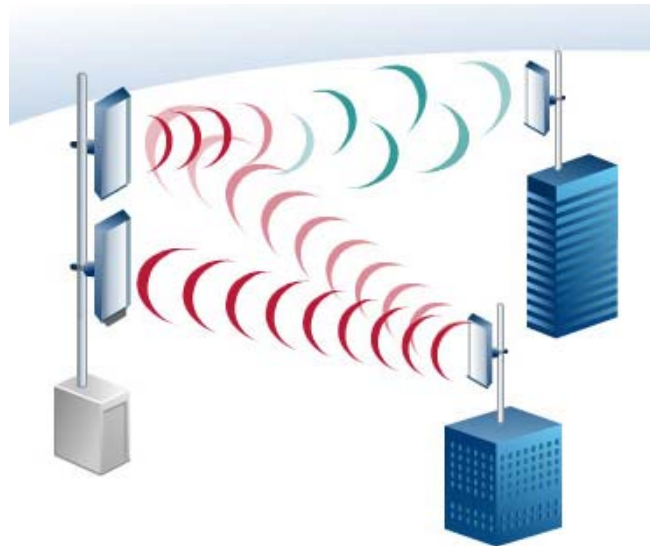
Figure F-1. Interference caused by collocated units
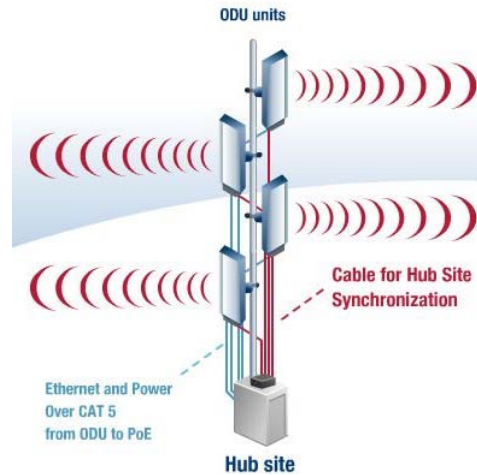
Figure F-2. Collocated units using Hub Site Synchronization

F.2   Hardware Installation

HSS supports installation of up to eight collocated units. 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 via CAT 5e cable. Prepared lengths are available for purchase.

The HSS is supplied with ten protective covers; any port not in use must be closed with a protective cover.
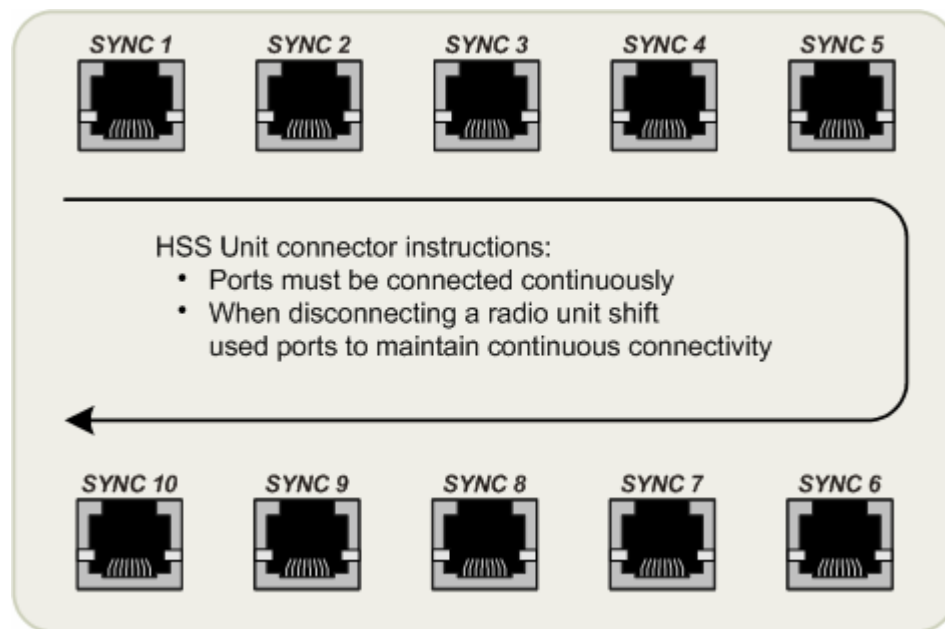
Figure F-3. HSS Interconnection Unit

<div>

Note

Ensure that the collocated units are connected in sequence from SYNC 1. If an ODU is removed form the hub site, then all remaining ODUs must be reconnected to maintain the connectivity.

</div>

➤ **To connect an ODU to the HSS**

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 to SYNC 2, followed by SYNC 3 and so on.

F.3   Architecture

One of the collocated ODUs at the hub site acts as the Hub Sync Master (HSM); all the other collocated units are Hub Sync Clients. The Hub Sync Master generates the pulses that synchronize the timing of the Hub Sync Clients.

A Hub Sync Client can be configured to be two different types:

Hub Sync Client–Continue Transmission (HSC-CT): In the event that the unit loses synchronization with the Hub Sync Master, the link remains active. However, without synchronization pulses, it is possible that this unit will cause interference.

Hub Sync Client–Disable Transmission (HSC-DT): In the event that the unit loses synchronization with the Hub Sync 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 and do not require HSS hardware.
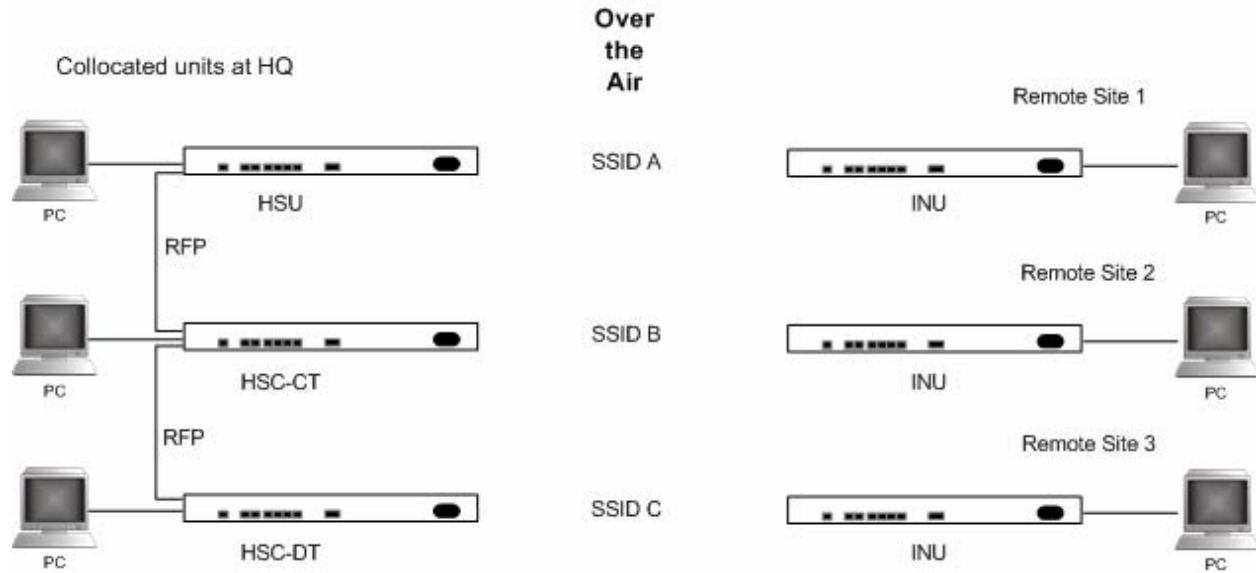
Figure F-4. HSS Typical Application

F.4   Radio Frame Pattern Table

The synchronization pulse is termed Radio Frame Pattern (RFP). Four RFP pulses are available. The RFP is selected depending on the type of services that the complete system is to provide see *Table F-1*. Select the RFP that gives you the Best Fit for the system services and select the Channel Bandwidth accordingly.

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

Table F-1. Radio Frame Pattern Table

	Channel Bandwidth				
	20 MHz	**10 MHz**		**5 MHz**	
RFP	TDM & EDO	TDM	EDO	TDM	EDO
A	Best fit	Non Optimal		Not Available	
B	Not Available	Best fit	Non Optimal	Best fit	Non Optimal
C	Not Available	Not Available	Best fit	Not Available	Non Optimal
D	Not Available	Not Available		Not Available	Best fit

F.5   HSS Link Configuration

For HSS-enabled units, the Hub Site Synchronization Settings dialog box appears in the Link Configuration Wizard.

Figure F-5. Hub Site Synchronization Settings dialog box

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

- External Pulses: The status of the pulses running through the HSS cable. The Master generates such pulses. The severity of each of these states is indicated by green, yellow or red text color. Possible states are described in *Table F-2*.

Table F-2. External Pulse Status

Status	Description	Text Color
Not Detected	Sync pulses not detected	Green
Generating	Unit is HSM and is generating RFP pulses	Green
Generating and Detected	Unit is HSM and generating RFP pulses and is also receiving pulses from another unit. Incorrect configuration.	Red
Generating and Improper Detected	Unit is HSM and generating RFP pulses and is also receiving incorrect pulses from another unit. Incorrect configuration.	Red
Detected	HSC detecting pulses	Green
Improper Detected	Incorrect RFP and BW configuration	Red
Multiple Sources Detected	More than one HSM generating pulses. Incorrect configuration.	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. Because only the relevant options are displayed according to the hardware configuration of each unit, usually the remote site will have only the Independent Unit option available.

4. Select the appropriate RFP radio button. Some RFP options may be disabled depending on the BW previously selected.

Note   *Take care to avoid incorrect configuration of bandwidth, RFP or to set multiple Hub Sync Masters, as system interference can occur. gives error messages and tool tips if the system is configured with mismatches.*
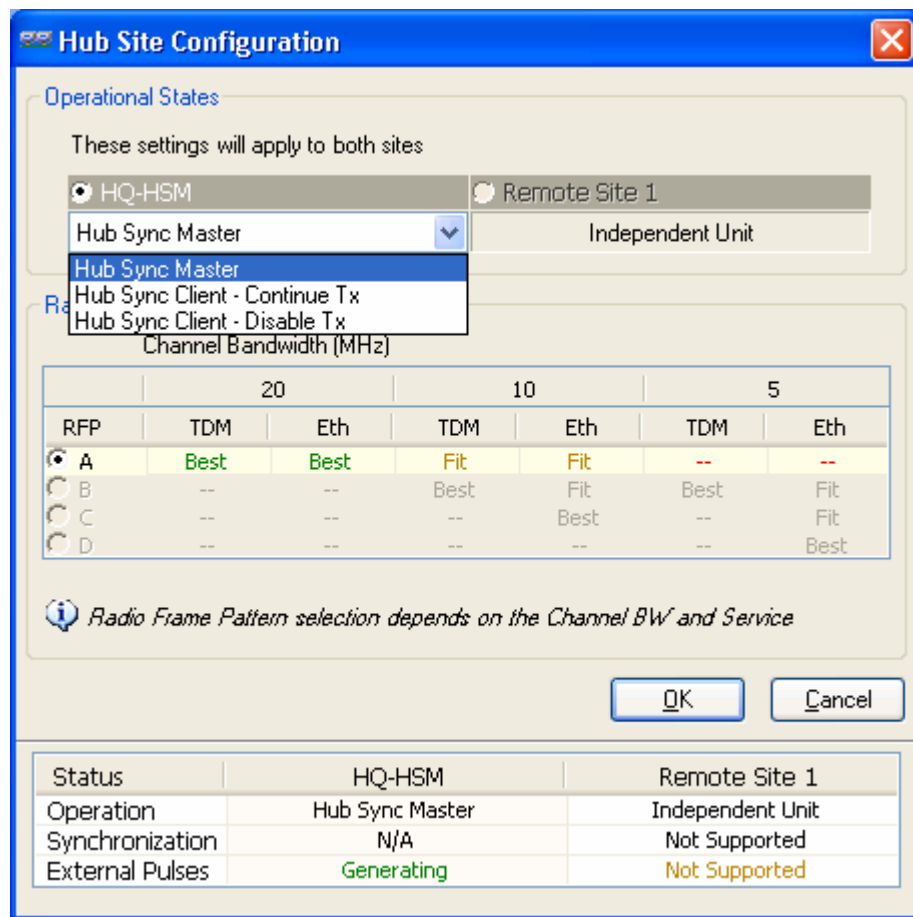
Figure F-6. Hub Site Configuration dialog box

F.6   Site Configuration

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.
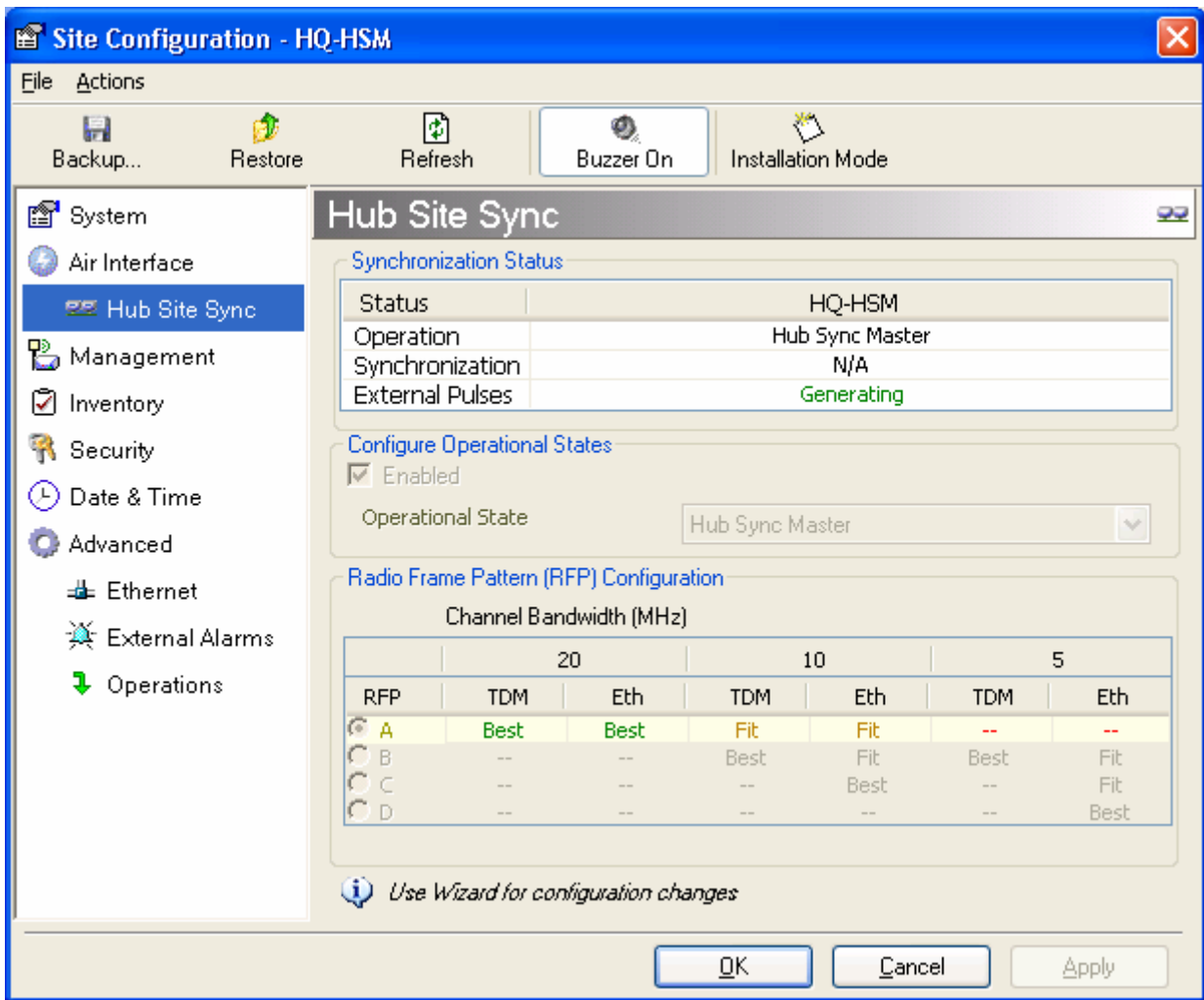
Figure F-7. Site Configuration – Hub Site Sync dialog box

Figure F-8 is displayed when the hardware does not support HSS. These units may be used as independent remote units.
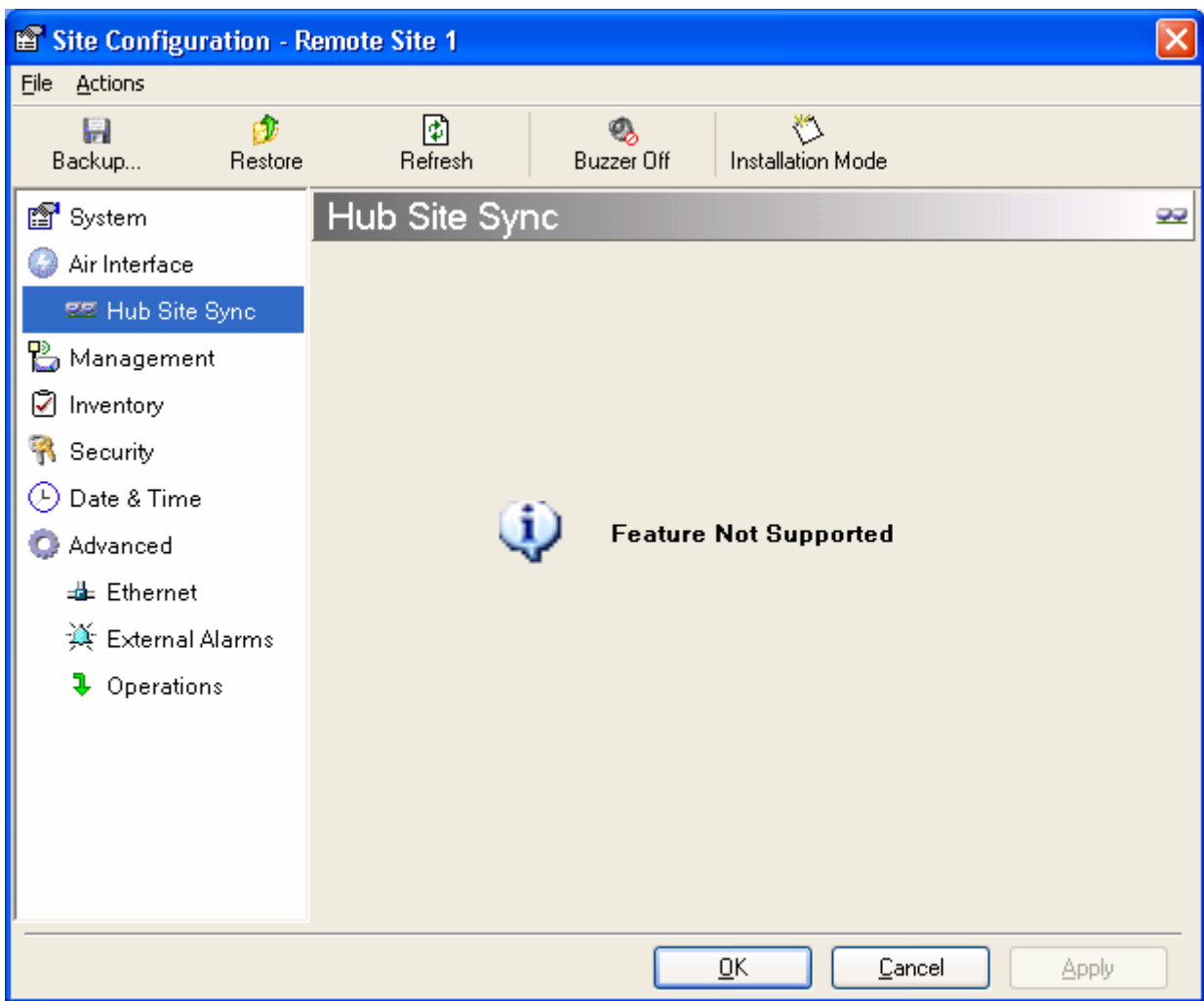
Figure F-8. HSS Not Supported

Appendix G

BRS Installation Procedure

G.1　BRS Link Activation

In accordance with 2.5 GHz standard, BRS systems links must be activated before use. This is done at both ODUs independently before installation on site. Both ODUs must be configured the same.

➤ **To Activate a BRS Link**

1. Install the Manager software as usual.

2. When the Manager Main Screen is displayed it appears with the Link Status label red and showing Inactive. The Link Configuration and Link installation buttons are disabled.

Figure G-1. Inactive Manager Screen

3. Click **Configuration>Configure Location**
   The Air Interface dialog box opens, *Figure G-2*.
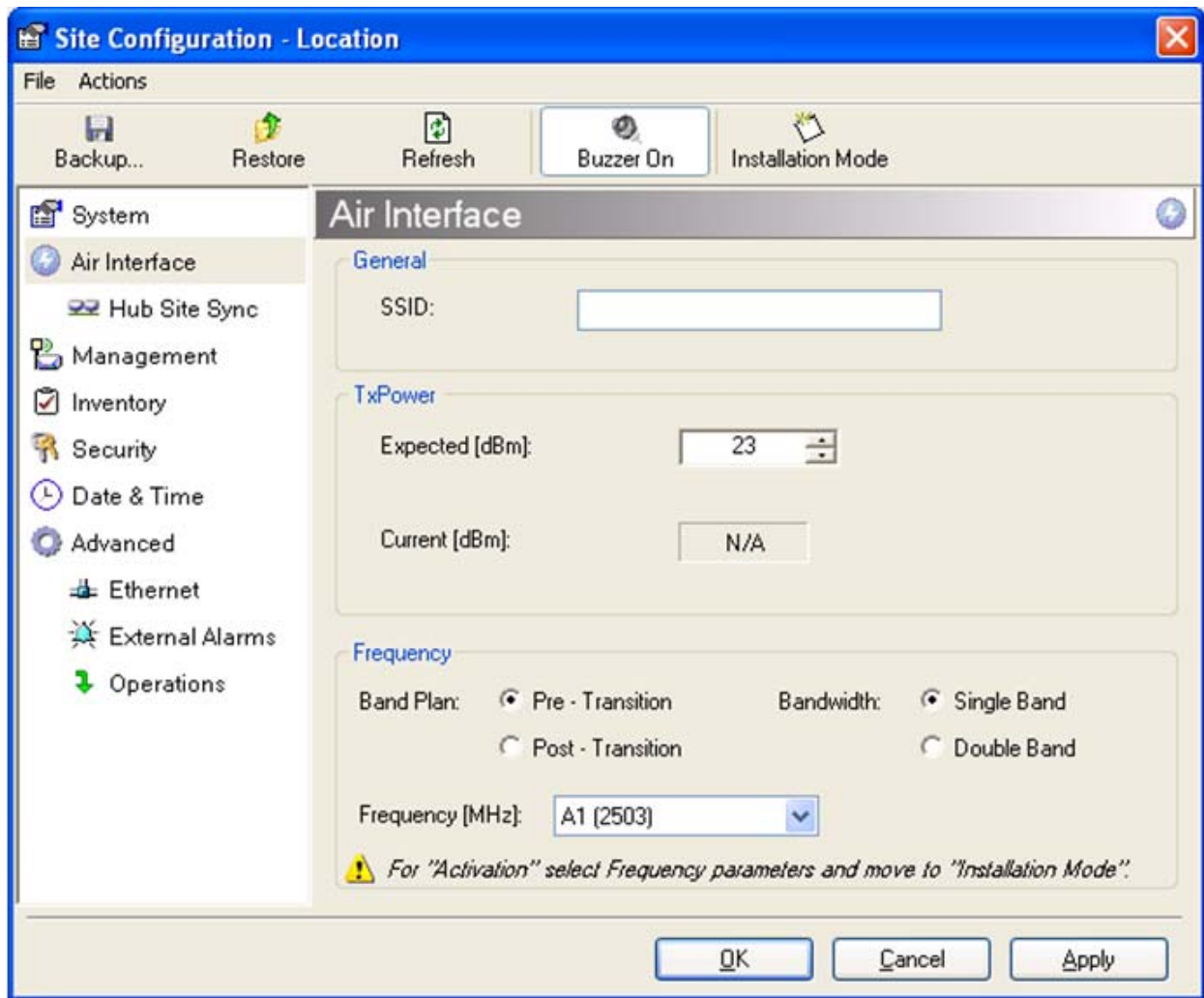
Figure G-2. BRS Air Interface dialog box

4. Set the appropriate Frequency Band Plan and Bandwidth.

5. Select the required frequency band, and click **Apply**.

6. Click **Installation Mode**

7. Repeat for the remote ODU.
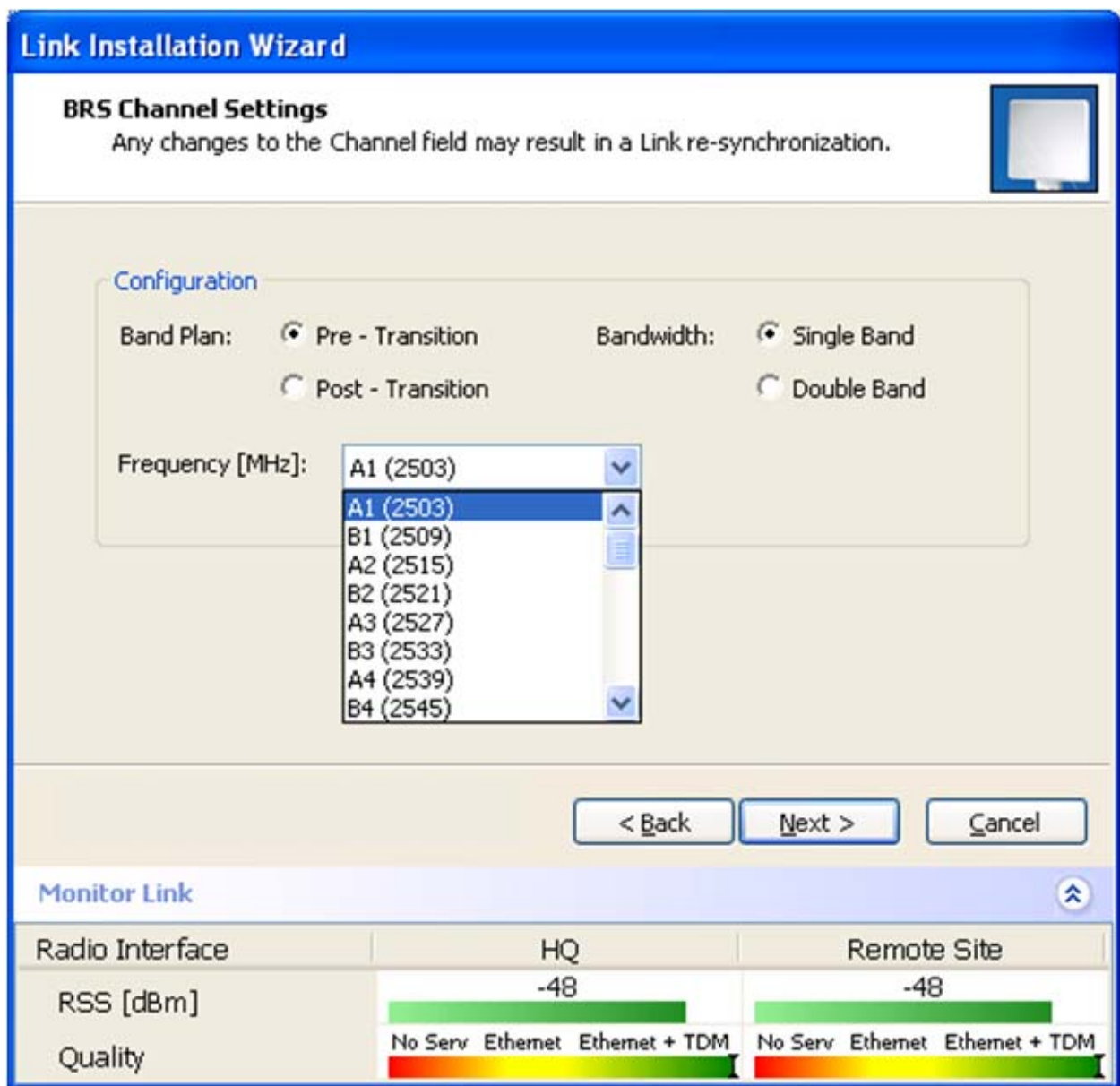
Figure G-3. BRS Channel Settings Pre-Transition

8. Perform the remainder of the Installation procedure as defined in the Installation section.

G.2   BRS Link Configuration

The BRS link is reconfigured during the Link Installation or the Link Configuration wizards, or from the Air Interface screen.

Note

Both sites in a BRS Link must be configured identically.
Any changes to the frequency settings cause the link to re-synchronize. A short loss of service will occur during re-synchronization.

➤ **To Configure BRS Channel Settings**

1. Set the Band Plan.

2. Select the Bandwidth required,
   Single Band
   Double Band

3. Select the Frequency from the pull-down menu.

4. Click Next. The system is re-synchronized to the changes.
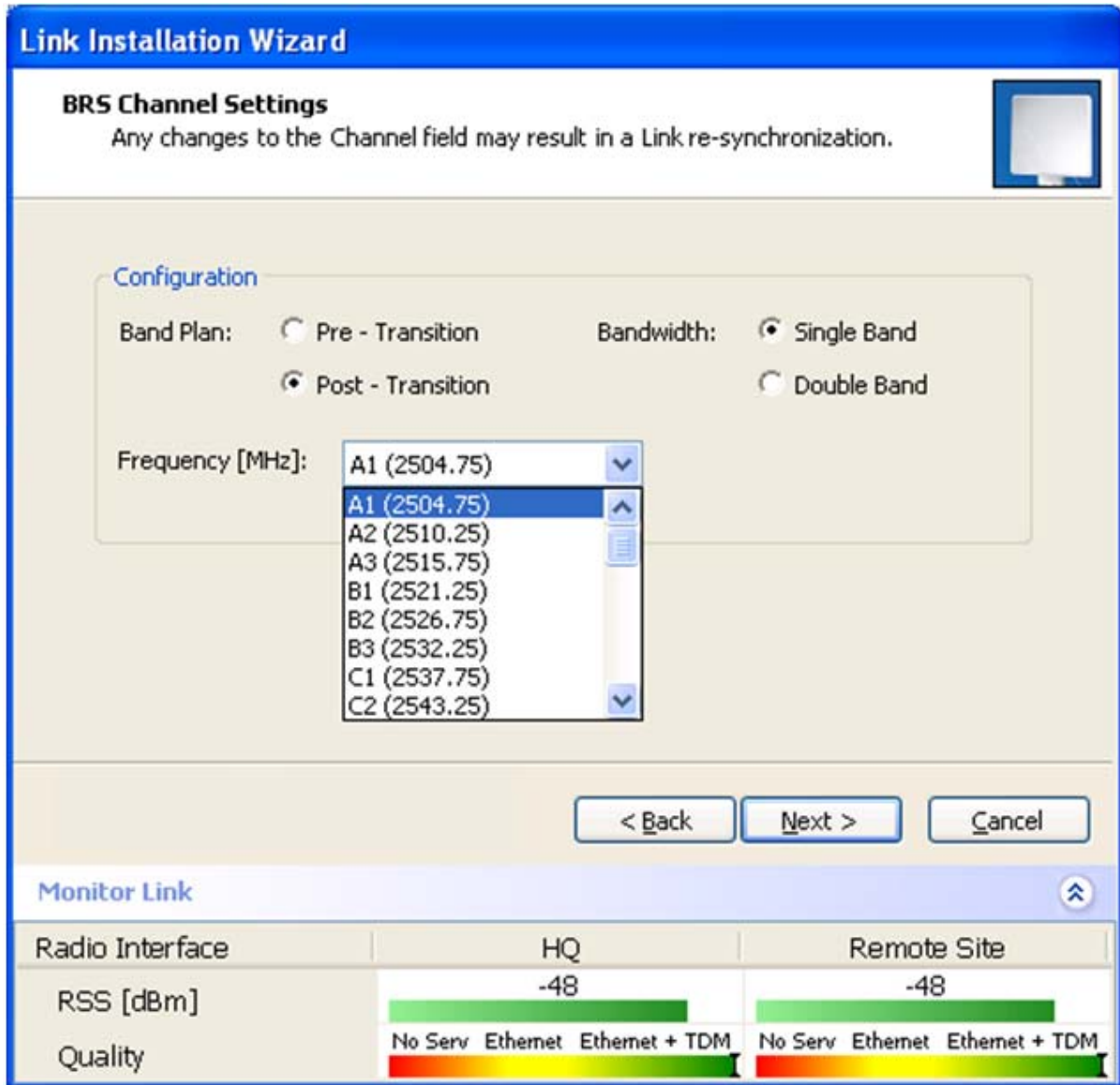
Figure G-4. BRS Channel Settings Post-Transition

Appendix H

RF Exposure

The antennas used for the following transmitters must be installed to provide a separation distance as specified. They must not be co-located or operated in conjunction with any other antenna or transmitter.

Product	FCC ID	Antenna gain [dBi]	Min. Safety Distance [cm]
F58A/HE/FCC	Q3KAMWL1580	22	109
F58A/HE/FCC	Q3KAMWL1580	28	217
F58A/HE/FCC F58A/FCC/AIND	Q3KAMWL1580	32.5	364
F24A/FCC	Q3KAMWL1240	16	16
F24A/FCC	Q3KAMWL1240	24	40
F24A/HE/FCC	Q3KAMWL1240H	24	71
F24A/HE/FCC	Q3KAMWL1240H	15.2	37

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