USER MANUAL

RADWIN 5000 HPMP POINT TO MULTIPOINT BROADBAND WIRELESS

Release 3.4.00

RADWIN

RADWIN 5000 HPMP

User Manual

Notice

For further information contact RADWIN at one of the addresses under **Worldwide Contacts** below or contact your local distributor.

Disclaimer

The parameters quoted in this document must be specifically confirmed in writing before they become applicable to any particular order or contract. RADWIN reserves the right to make alterations or amendments to the detail specification at its discretion. The publication of information in this document does not imply freedom from patent or other rights of RADWIN, or others.

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Regulatory Compliance

General Note

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

FCC - Compliance

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

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

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

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

Warning

It is the responsibility of the installer to ensure that when using the outdoor antenna kits in the United States (or where FCC rules apply), only those antennas certified with the product are used. The use of any antenna other than those certified with the product is expressly forbidden by FCC rules 47 CFR part 15.204.

Warning

It is the responsibility of the installer to ensure that when configuring the radio in the United States (or where FCC rules apply), the Tx power is set according to the values for which the product is certified. The use of Tx power values other than those, for which the product is certified, is expressly forbidden by FCC rules 47 CFR part 15.204.

Caution

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

Warning

- Where Outdoor units are configurable by software to Tx power values other than those for which the product is certified, it is the responsibility of the Professional Installer to restrict the Tx power to the certified limits.
- This product was tested with special accessories - indoor unit (IDU or PoE), FTP CAT-5e shielded cable with sealing gasket, 10 AWG grounding cable - which must be used with the unit to insure compliance.

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

(1) These devices may not cause harmful interference.

(2) These devices must accept any interference received, including interference that may cause undesired operation.

Canadian Emission Requirements for Indoor Units

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

Cet appareil numėrique de la classe B est conforme å la norme NMB-003 du Canada.

China MII

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

India WPC

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

Unregulated

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

Safety Practices

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

NOTES:

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

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

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

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

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RADWIN 5000 HPMP POINT TO MULTIPOINT BROADBAND WIRELESS

Release 3.4.00

Part 1: Basic Installation

RADWIN

Chapter 1

Introduction

Welcome to RADWIN 5000 HPMP!

RADWIN 5000 HPMP delivers up to 250Mbps and is the ideal choice for last mile enterprise connectivity and high-end applications that demand assured performance with guaranteed bandwidth per subscriber.

RADWIN 5000 HPMP sector base station delivers up to 250Mbps, providing the highest end user capacity in the market to best support data and high resolution video applications, today and tomorrow. By delivering high capacity over a single radio unit, RADWIN solution saves valuable tower space, eases maintenance efforts and reduces the total cost of ownership per megabit. Offering a variety of powerful subscriber units (HSUs), RADWIN 5000 HPMP enables service capacity of up to 50Mbps for enterprise customers.

RADWIN 5000 HPMP subscriber units may now be

- set at fixed locations
- nomadic - move about within and across contiguous sectors covering a specific area such as an airport or sport complex. Service is provided when the vehicle is stationary.
- mobile - set on railway carriages with extremely fast hand-over across successive track sectors

RADWIN 5000 HPMP Highlights

- High capacity Sector Base Station
- 250 Mbps aggregate throughput
- Ethernet connectivity
- High capacity end user equipment - 5, 10, 20, 25, 50Mbps
- Up to 32 Subscriber Units per sector
- Guaranteed SLA and capacity per Subscriber Unit
- Small and constant latency - 4 to 20msec typical under full sector load
- Wide range of frequency bands - 4.9 to 6.4 GHz
- Mobility and Nomadic functionality

Some Terminology

A **Point to Multipoint** network is typically abbreviated to PtMP. The PtMP networks described in this Manual are of course, radio links.

A PtMP link consists of at least one **Base Station** radio linked to several **Subscriber Unit** radios. The SUs are sometimes called **Customer Premises Equipment** (CPEs). The terminology comes from the field of telephony.

The RADWIN 5000 HPMP product suite supports considerably higher capacity than other current technologies (such as Wi-Max). We distinguish between generic BSs and SUs and RADWIN units, relabeling the latter, **HBS**s and HSUs (H = high capacity).

The radio links are effected by using a **sector antenna** with the HBS. The HSUs use directional antennas aligned to the HBS.

A **Sector** consists of a HBS and a group of HSUs within the angular sector covered by the HBS antenna. A Sector is typically 60°, 90° or 120° depending of course on the choice of antenna.

HBSs may be collocated to provide sectorial coverage up to 360°.

The RF characteristics of a Sector will be common to each radio: Frequency (regulation), band and channel bandwidth. Adjacent Sectors in a PtMP network will typically use different frequencies and non-overlapping bands to mitigate HBS self interference.

A HSU may be defined as **fixed**, **nomadic** or **mobile**.

A **fixed** HSU is just that - installed at a fixed location.

A **nomadic** HSU is attached to a vehicle that moves about within a sector and across sectors inside a well defined area. Service is provided when the vehicle is stationary.

A **mobile** HSU (HMU) provides service while the vehicle to which it is attached is moving or stationary. The vehicle is typically a railway carriage, a car (automobile) or a ship.

What’s New in Release 3.4.00

The main changes in GA release 3.4.00 since the last GA release, 3.3.00 are:

New Radio Products

- New economical small form factor subscriber unit, with AC power feeding, integrated antenna, a LAN port and a PoE-out port for connection to a video camera. Designed for video surveillance applications.

Additional Bands

- Universal 6.4 GHz band
- Support for **licensed products** in the 2.5 and 3.x GHz bands

New IDU

- New IDU-H: The IDU-H aggregates Ethernet traffic for up to six ODUs (all RADWIN ODU products). It delivers their traffic to two high speed uplink Ethernet ports and two SFP ports.

Accessories

- ODU-PoE (not GbE) cable repeater to extend the cable distance beyond 100 m.

Additional Antenna Support

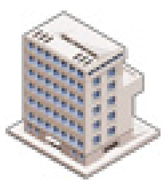
- Antennas available to support all new bands (See the RADWIN Catalog)

General (May be Model Specific)

- Enhanced VLAN support - ODU VLAN for use with PoE devices
- Spectrum View for licensed bands
- User preferred channels for ACS, preserved under reset
- Telnet enhancement: resync
- Incremental product price/performance improvements (See the RADWIN Catalog)
- HSU capacity license upgrade from 5 to 10 Mbps, 5 to 25 Mbps and 10 to 25Mbps
- VLAN QnQ enhancement - configurable TPID value
- Increased capacity to 250Mbps
- Small form factor HBS of 5, 10 and 25Mbps with integrated antenna
- Enhanced robustness by Adaptive Interference Sensitivity
- Split Sector ID to differentiate between fixed and Mobility/Nomadic HSUs
- A single HSU may be assigned up to 63 time slots.
- FIPS 197 for all RADWIN 5000 HPMP products
- New distinctive icons for map view

Note

The new icons representing the HSU types for the Map view (only) are more indicative of what they are:



fixed HSU

nomadic HSU

HMU

Key features of RADWIN 5000 HPMP

- 250 Mbps aggregate throughput
- Separate uplink and downlink configurable Maximum Information Rate (MIR) per HSU
- Advanced OFDM & MIMO 2x2 for nLOS performance
- Enhanced interference mitigation capability
- Inter & intra site sync to reduce self interference
- Long range – up to 40 km/25 miles

- Dedicated traffic bandwidth allocation ensuring SLA & latency
- Low and constant latency – min < 3ms, typical 4 to 20ms
- Channel bandwidth – 5/10/20/40 MHz
- Regulation - FCC/ETSI/WPC/MII/Universal
- Multi band HBSs and HSUs
- Simple to deploy
- Web Interface for sector management
- Fully integrated with RADWIN Legacy solutions:
    - Coexists with RADWIN 2000 and WinLink 1000 products
    - Common RADWIN Manager
    - Common RNMS
- SFP support when connecting to a IDU-H in place of a PoE device
- Mobility and Nomadic support

RADWIN 5000 HPMP Components

RADWIN 5000 HBS High Capacity Base Station

The HBS consists of RADWIN 5000 ODU, a sector dual-pole antenna and a PoE device, which provides a LAN interface to user equipment.

A single HBS supports up to 32 HSUs.

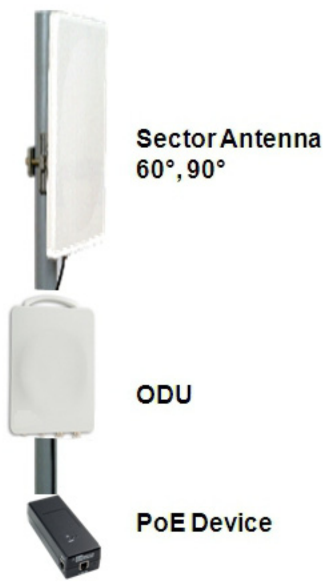


Figure 1-1: Single Sector Base Station

RADWIN 55xx HSU High Capacity Subscriber Units

Figure 1-2: Small form factor antenna in connectorized HSU

Figure 1-3: High gain integrated antenna

Figure 1-4: Connectorized HSU

A standard HSU is a RADWIN 55xx HSU ODU. It may be a small form factor (SFF) model with a built in antenna, or a regular integrated or connectorized unit. The latter should use a dual pole antenna for best performance.

An AC power feeding version is also available:

Figure 1-5: Small form factor HSU with AC power feeding

This HSU has an integrated 24.1 cm x 19.7 cm (9.75″x7.7″) flat panel antenna. The HSU contains both the radio and the antenna as a single unit housed in a weatherproof case.

The ports are (from lower left to upper right) AC power line, LAN in, PoE out (to peripheral such as a video camera). Highlights of the unit are:

- High capacity (up to 10 Mbps aggregate net throughput)
- Advanced air-interface based on MIMO and OFDM technologies
- High Tx power of 25 dBm
- Support for 5 MHz, 10 MHz, 20 MHz and 40 MHz channel bandwidths
- Direct AC power inlet
- Complies with FCC, IC, ETS, WPC and MIII regulations (not FCC certified)

Note the FCC/IC cautionary notice on page 3-5.

IDU-H

The IDU-H provides aggregation for multiple RADWIN links and HBSs at a hub location. It supports all RADWIN ODUs. It features -

- Up to 6 PoE Interfaces (PoE legacy mode / RADWIN PoE)
- Up to 25W per PoE port
- 2 LAN Interfaces 10/100/1000 Mbps; auto-negotiation
- SFP Interfaces: 2 x SFP ports of 1000 Mbps (standard MSA)

It is 19” rack mounted, 1U and half width.Power feeding is 44VDC - 56VDC, Dual redundant inputs through standard IDU-C type adapters. They may be mounted in single or double configuration. See for **Chapter 3** for details.

Figure 1-6: IDU-H front view - single configuration

Figure 1-7: IDU-H front view - double configuration

GSU

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

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

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

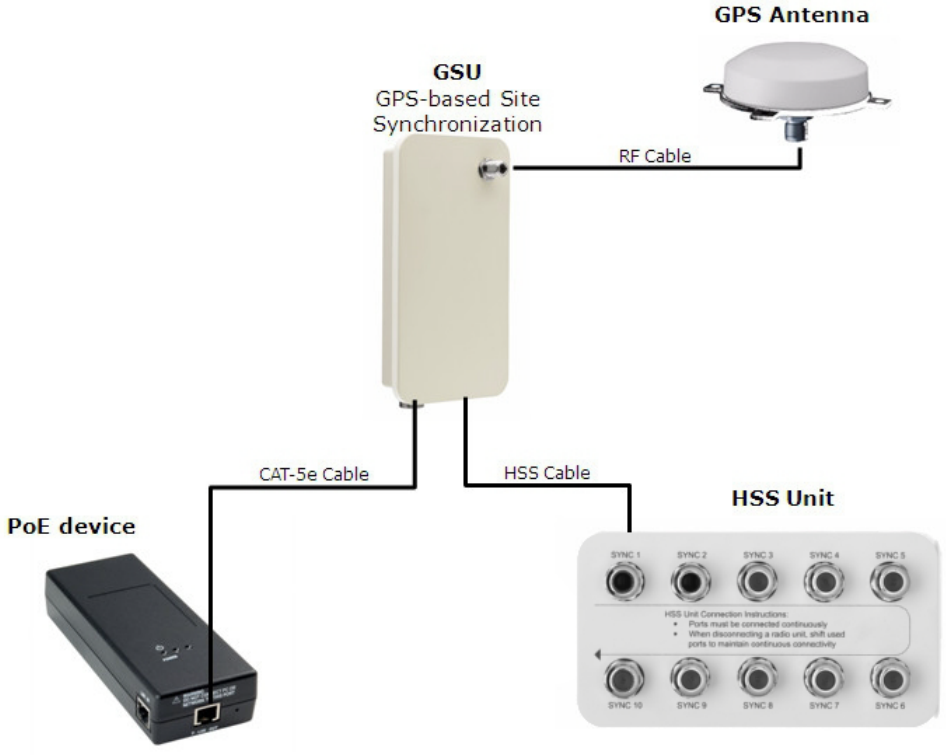


Figure 1-8: General GSU configuration

For further details about the HSS unit, see **Chapter 10**.

For further details about the GSU, see **Chapter 11**.

Lightning Protector

Lightning protection is mandatory for radio links. RADWIN supplies a lightning protector device designed for use with RADWIN products.

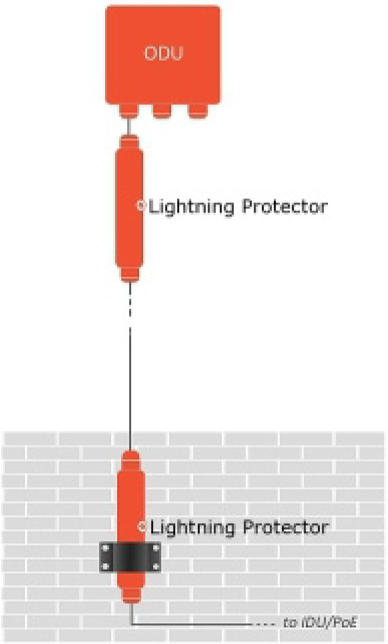


Figure 1-9: Left: RADWIN Lightning Protector Right: *Using* RADWIN *lightning protectors*

See **Chapter 18** for details about this device.

Ethernet Repeater

The RADWIN Ethernet repeater enables you to extend the PoE to ODU cable beyond the 100m limit (but no more than 200m). The unit looks physically like the lightning protection device in **Figure 1-18**. It’s use is very simple as shown in the following schematic:

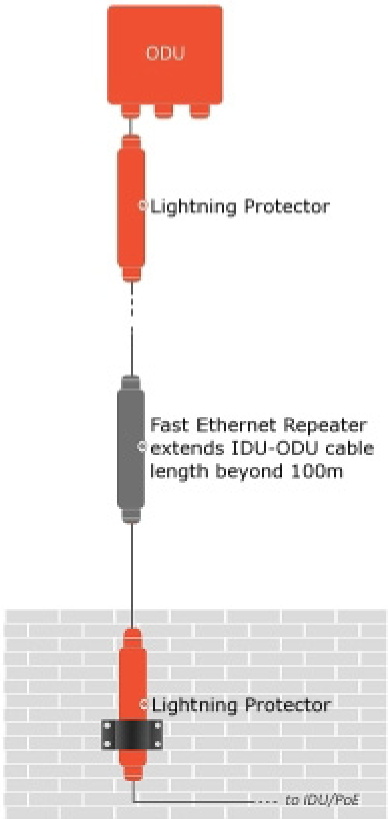


Figure 1-10: Using an Ethernet repeater with lightning protectors.

Note

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

RADWIN Manager

The RADWIN Manager is an SNMP-based management application which manages a complete sector over a single IP address. It can also manage HSUs separately.

The intuitive, easy-to-use RADWIN Manager has a graphical Microsoft Windows interface.

Conventions Used in this Manual

Notifications

Notifications consist of Notes, Cautions and Warnings.

Note

The purpose of a **Note** is to

- Draw your attention to something that may not be obvious or counter-intuitive
- Emphasize a special feature or peculiarity of the RADWIN 5000 HPMP
- Offer an external reference for additional information
- Add a caveat that would not qualify as a full Caution or Warning (see below)
- Provide additional background to what follows
- Offer a recommendation
- Highlight an indication of something to watch out for
- Advise you if an action has "side effects" i.e. it may disturb something else that would be best left undisturbed
- Remind you of something that should be kept in mind

Caution

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

Warning

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

Typographical conventions

General

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

Software

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

Viewing and Printing

This manual is optimized for viewing online as a PDF file. To this end it uses an 11 point Tahoma typeface for main text. Tables for most part, use 7 or 8 point fonts. Here are a few pointers for hard-copy printing:

- The text and table typefaces used are large enough to print the manual at two pages per sheet
- For good legibility, use a commercial grade laser printer. A color printer is of course best, however a monochrome printer set to use gray-scale gives acceptable results
- Better quality ink jet printers also give good output

Chapter 2

Site Preparation

Planning the Sector Site

Overview

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

A Site Survey consists of three stages:

1. **Preliminary survey** - The proposed sector is analyzed **in the office** using a topographic map. You should use additional tools such as the Link Budget Calculator or the Radio Planner.
2. **Physical survey** - The locations of the indoor and outdoor equipment are determined **on-site**.
3. **Radio Frequency (RF) survey** - It is recommended that the installation area be scanned with a spectrum analyzer, to identify RF interference so as to determine a clear channel for radio installation (**on-site**).

The Site Survey

Introduction

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

RADWIN 5000 HPMP offers a wide operating frequency range. A free frequency channel must be determined within the operating range, for optimum performance.

Recommended Equipment

Stage 1: Preliminary Survey

- Topological map of the area
- Urban map of the area
- Compass
- Link Budget Calculator and/or Radio Planner

Stage 2: Physical Survey

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

Stage 3: RF Survey

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

Stage 1: Preliminary Survey

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

To perform a preliminary survey:

1. Mark the designated installation sites on a topographic map of the area.
2. Measure the distance between the sites; check that it is within the specified range of the equipment.
3. On the urban map, check for developed areas situated between the installation sites. Pay attention to these areas when performing the physical site survey; there may be tall buildings, RF towers, or transmitters, which could cause interference to a sector.
4. Check the area between the two sites for obstructions such as:
   - High ground - hills or mountains
   - Lakes or large bodies of water. Water has a reflection effect on RF signals like a building. This type of reflection causes the received amplitude to be reduced. As a rule of thumb, the presence of a large body of water between sector sites may double the required antenna height.
5. Determine and record the compass bearings between HBS and fixed HSUs, relative to north.
6. If there are obstructions between the two sites, calculate the Fresnel Zone (see Chapter 20 for details).
7. If the sites chosen do not meet requirements, consider alternative sites.
8. Use the Link Budget Calculator (on the CD supplied with the equipment or using the RADWIN Manager) to determine the expected performance.

Stage 2: Physical Survey

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

Note

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

In what follows, ODU may be an HBS or a fixed HSU:

To perform a physical survey:

1. From the compass readings taken in the preliminary survey, find the azimuth (horizontal position) that each fixed HSU should face towards the HBS.
2. Using binoculars, locate any obstructions such as tall trees, high buildings, hills or mountains. Look for other RF towers between the two sites. Mark the locations of the obstructions on the map.
3. Determine the location for the ODUs (having regard for existing rooftop installations and tower space). They should be above any obstructions, considering the Fresnel zone (see **Chapter 20**).
4. If you need to install any type of ODU on a tower, make sure that the tower is far enough from overhead electric power lines.
5. Determine a location for the indoor equipment; it should be as close as possible to the ODU. At an existing site, there is probably an equipment room with cable-routing channels.

Note

Outdoor CAT-5e; Maximum cable length: 100m for 10/100BaseT and 75m for 1000BaseT (GbE PoEs)

6. Measure and record the path length of the cable from each ODU position to the indoor equipment room.
7. Determine the ground and lightning connection points of the installation. The ODU and PoE must both be grounded.
8. Using the Ohmmeter, measure and record the resistance of the required installation to the grounding point. The resistance must be less than 1O ohm.
9. Review the results of the physical site survey. Decide if the site is suitable for the wireless network installation.
   - If the site is suitable, continue with stage 3, the RF survey
   - If the site is not suitable, survey another site

Additional Outdoor Site Requirements

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

Additional Indoor Site Requirements

The ambient operating temperature should be 0 to 50°C (32 to 122 °F) at a humidity of up to 90%, non condensing

Stage 3: RF Survey

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

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

You should perform the RF survey at each of the proposed sector sites.

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

RF Planning for Dense Installations and Collocated Sites

Interference may arise from

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

To avoid or minimize interference, follow these recommendations:

- For collocated RADWIN units, use an HSS unit to synchronize between them. Select a different operating channel for each collocated RADWIN unit.
- If one or more collocated units are not RADWIN units, ensure that there is a physical separation of at least three meters between a RADWIN unit and any other collocated radio on the site.
- Use the largest possible frequency gap between these units
- Choose the best frequency channel (as clear as possible from interference). You may be able to change the band used for the sector - depending on HBS model and regulations.
- Decreasing the Tx Power of a sector will reduce collocation interference

Note

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

Chapter 3

Hardware Installation

This chapter sets out the requirements and procedures for the hardware installation and alignment of a RADWIN 5000 HPMP sector in accordance with the prior planning as set out in **Chapter 2**. It is intended to guide qualified field technicians.

Note

The material in this chapter is generic to all RADWIN radio products unless stated otherwise. ODU may be an HBS or any fixed HSU.

Warning

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

Warning

When installing the SU2-AC: 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)

Safety Practices

Preventing overexposure to RF energy

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

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

Grounding

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

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

  RADWIN 5000 HPMP ODUs must be properly grounded to protect against lightning. It is the user's responsibility to install the equipment in accordance with Section 810 of the National Electric Code, ANSI/NFPA No.70-1984 or Section 54 of the Canadian Electrical Code. These codes describe correct installation procedures for grounding outdoor units, masts, lead-in wiring and discharge units. It also lays down the size of grounding conductors and connection requirements for grounding electrodes.

  RADWIN 5000 HPMP ODUs must be grounded to a Protective Earth as described in **Chapter 19** and in accordance with the Local Electrical Regulations.

Further, you should -

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

More detailed guidelines are supplied in **Chapter 19**.

Protection against Lightning

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

See **Chapter 19** for detailed installation instructions of lightning protection devices.

General

- It is recommended that installation of the outdoor unit be contracted to a professional installer.
- Before working on equipment connected to power lines or telecommunication lines, you should remove jewelry or any other metallic object that may come into contact with energized parts.
- Use extreme care when installing antennas near power lines.
- Use extreme care when working at heights.
- When using an AC power source for RADWIN 5000 HPMP PoEs always use the AC power adapter supplied by RADWIN.
- Use the right tools. In addition to standard tools required for any kind of ODU or antenna installation, RADWIN 5000 HPMP ODUs require additional specific tools detailed on **page 3-11** below.

Package Contents

The RADWIN 5000 HPMP packages include the following items:

HBS and Standard HSU Package Contents

The ODU package contains:

- One HBS or HSU- see **Figure 3-4** below for front and rear view
- An ODU mounting kit - see **Figure 3-1** below
- A CD containing -
  - the RADWIN Manager
  - Quick Start Guide
  - User Manual - the document you are reading
  - Link Budget Calculator
- Label showing the MAC address and the alternative Community string. The label is self-adhesive. You should keep this label safe
- Cable glands (to be used with the ODU-PoE cable)

Figure 3-1: ODU Mounting kit

The small form factor HSUs use a mounting kit adapter or metal ties:

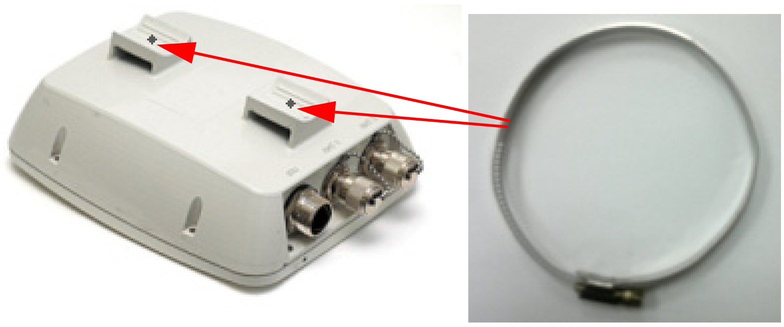


Figure 3-2: RADWIN 5505 HSU - Rear and metal tie

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

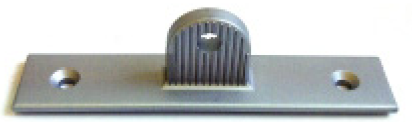
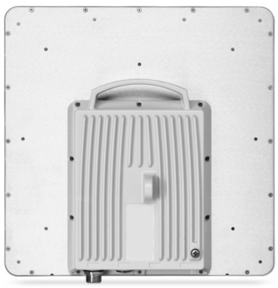


Figure 3-3: Mounting adapter

The ODUs come in the basic form factors as shown in **Figure 3-4** below:

	Front	Rear
Connectorized		
Integrated Antenna		

	Front	Rear
Connectorized		
Integrated Antenna		

Figure 3-4: ODU Form Factors: Top - Standard ODU package, Bottom - Small form factor HSU

- **Integrated Antenna ODU**

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

- **Connectorized ODU**

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

- **HSU only - SFF (Connectorized) ODU**

  The SFF ODU is slightly "fatter" and heavier than a regular connectorized ODU since it requires extra space for the built-in antenna.

Caution

For operation of the RADWIN 5505 HSU under FCC/IC Regulations:

When operating the device with certain 29 dBi dish antennas, the Tx power may be no more than 23 dBm in the frequency channel 5845 MHz for 5 and 10 MHz channel bandwidth. Please check with RADWIN Customer Service for antenna models subject to this requirement.

All other frequencies may operate using maximum Tx power of 25 dBm.

External Antenna Package Contents

The HBS requires a dual pole sector antenna. HSUs may use any suitable dual pole directional antenna.

External antennas are available for the RADWIN 5000 HPMP radios, varying in operating frequencies, form factor, size and gain.

Figure 3-5: External Antennas for use with RADWIN 5000 HBS - Left: 60° or 90° flat external; Right: 120° integrated

Figure 3-6: External Antennas for use with RADWIN 55xx HSU - Left: Standard integrated; center and right, parabolic, different sizes and gains.

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

Antenna kits contain -

- An antenna
- Two RF cables 1.2 m (3.1′) long
- Mounting kit

Power Over Ethernet (PoE) Devices

GbE PoE

RADWIN’s Gigabit Power over Ethernet (GbE PoE) device provides data and power to RADWIN 5000 outdoor units. The PoE device is available with a variety of AC cables with different plug types.

This is the recommended unit for use with a HBS.

Figure 3-7: GbE PoE device

Outdoor (Ruggedized) DC PoE Device

This unit may be used or both the HBS and the HSUs. It will not support Gigabit performance on the HBS.

Figure 3-8: Ruggedized DC-PoE Device: Input is -20 to -60 VDC (single input)

IDU-H Aggregation Unit

Package Contents

The IDU-H package contains four items as shown in **Figure 3-9**:

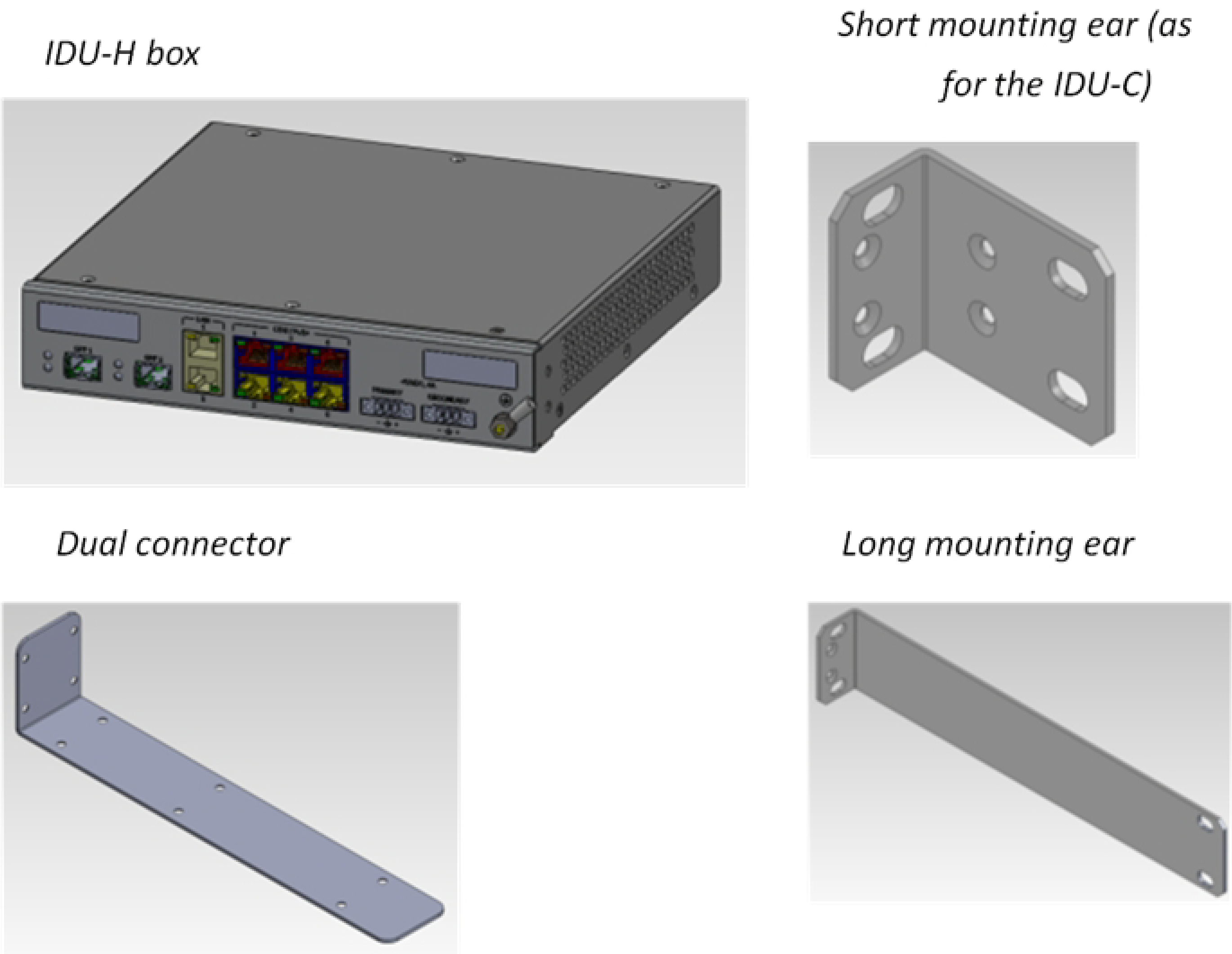


Figure 3-9: IDU-H kit contents

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

Figure 3-10: IDU-H front view - single configuration

Figure 3-11: IDU-H front view - double configuration

IDU-H - Functional Overview

Front Panel

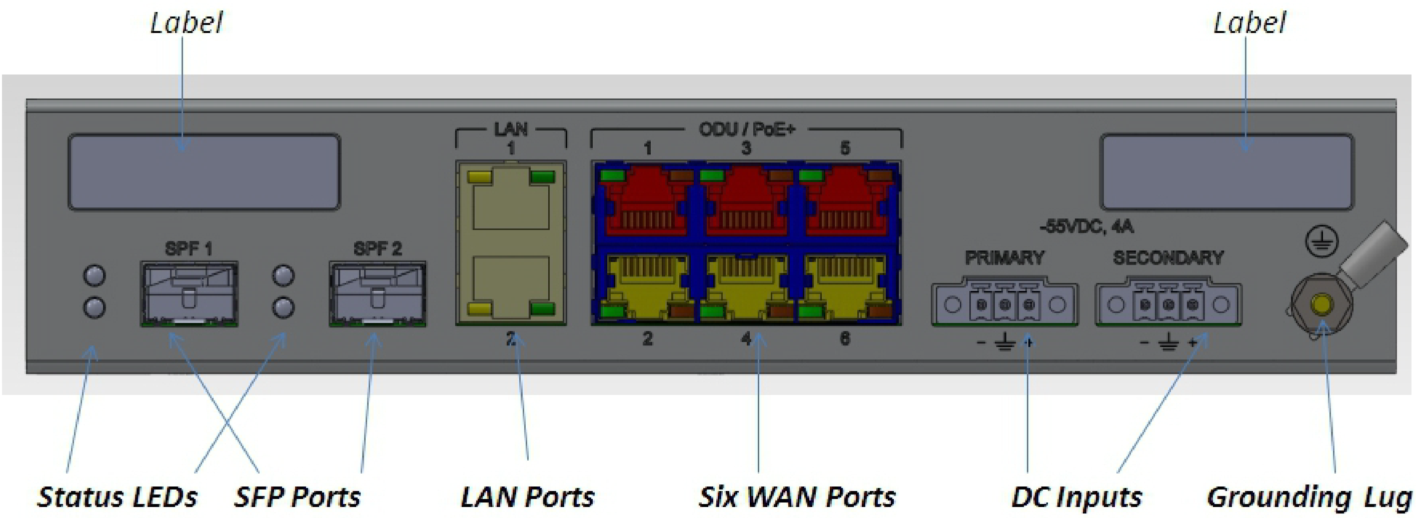


Figure 3-12: IDU-H front panel

The front panel is very straight forward: Elements common to the IDU-C function identically to the latter - specifically, SFP ports, LAN ports, power sockets and the grounding lug. The six ODU ports function identically to the P-LAN Out or Radio port on a PoE device.

IDU-H LEDs

IDU-H LED Indicators

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

Connecting power to the IDU-H

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

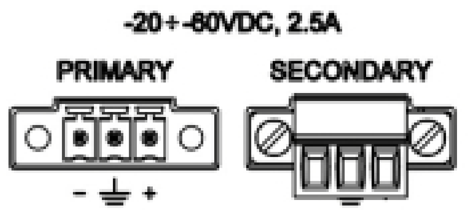


Figure 3-13: IDU-H Power connectors

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

Hub Site Synchronization (HSS) Unit

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

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

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

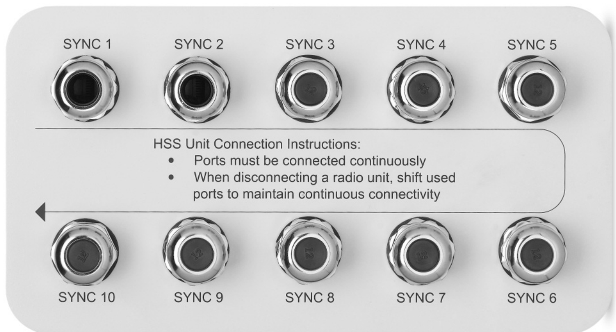


Figure 3-14: HSS Interconnection Unit

See **Chapter 10** for further details about the use of HSS.

RADWIN GSU

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

The RADWIN GSU is an outdoor unit consisting of a standard WinLink 1000 enclosure, a GPS antenna and a PoE device.

The RADWIN GSU is connected to the HSS Unit using a standard HSS cable. It synchronizes the transmission timing of multiple Hub-Sites to the same clock source thus eliminating self interference (see **Chapter 11**).

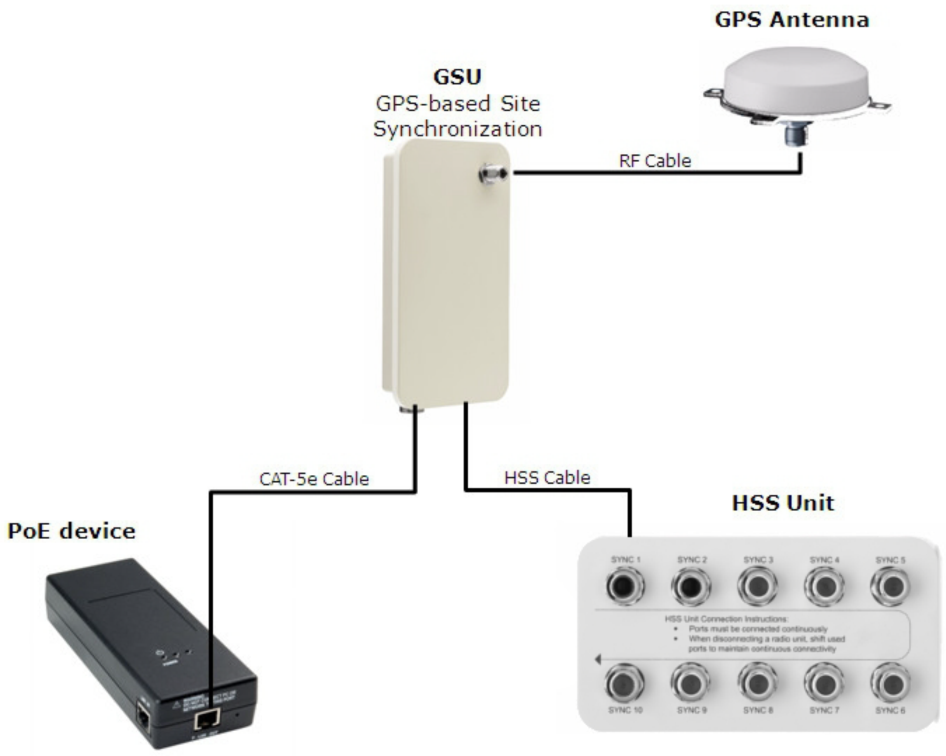


Figure 3-15: General GSU configuration

See **Chapter 11** for further details about the use of RADWIN GSU.

Additional Tools and Materials Required

The following is a list of the equipment and materials required to install RADWIN 5000 HPMP hardware.

Tools and Materials

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

Cables and connectors

- ODU grounding cable 10 AWG
- ODU-PoE cable (outdoor class, CAT-5e, 4 twisted pairs, 24AWG), up to 100 m. for 100BaseT connection. For a 1000BaseT connection (HBS only) use an ODU-PoE cable no longer than 75m.

Note

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

Hardware Installation Sequence

The following steps are required to install a RADWIN 5000 HPMP sector:

1. Mounting the ODUs, **page 3-13**.
2. Mounting the external antennas (if used), **page 3-13**.
3. Mounting the Lightning Protection devices (if used), **page 3-14**.
4. Outdoor connections, **page 3-14**.
5. Connecting the PoEs, **page 3-15**.
6. Other Indoor connections, **page 3-15**.
7. Aligning the HSUs to the HBS, **page 3-19**.

See **Figure 3-16** below, which illustrates a typical installation of a RADWIN 55xx HSU with an external antenna.

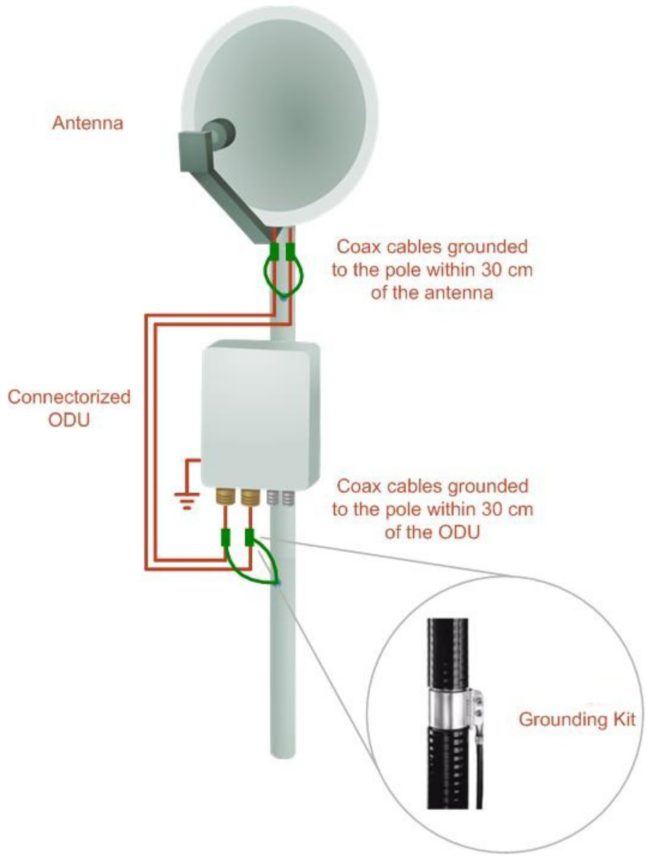


Figure 3-16: Typical HSU installation with external antenna

The HBS installation differs only in the antenna type: It uses a sector antenna.

The installation steps are detailed in the following sections.

Outdoor installation

Preparing the ODU before Deployment

Each ODU should be pre-loaded with an IP address. This may be done prior to deployment in the field, or on-site using a Laptop computer. The process is quite straight-forward and described in **Chapter 4**.

Mounting the ODU

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

Note

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

Warning

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

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

To mount the ODU on a pole or a wall:

1. Ensure that the ODU is properly grounded.
2. Mount the ODU onto the pole or wall. Ensure that the unit is oriented so that the cable connectors are at the bottom. **(If they are on top, water may penetrate into the unit causing damage.)** It is possible to mount an ODU horizontally. See **Chapter 18** for details.
3. Refer also to **Chapter 18** for detailed ODU mounting kit contents and schematics.

Note

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

Mounting external antennas

If you are using ODU with an integrated antenna, skip to **Mounting the Lightning Protection Devices** below.

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

Warning

Never stand in front of a live antenna!

To mount an external antenna:

1. To mount an external antenna, ensure that the antenna is properly grounded and then mount the antenna onto the pole. Refer to **Chapter 18** for detailed antenna mounting instructions.

2. Follow the mounting instructions supplied with the antenna.

Special Considerations for Mounting an HSU-610 (AC Powered HSU)

The LAN and PoE cables must be fitted with lightning protection devices. See below and **Chapter 19** for detailed installation instructions of lightning protection devices.

The HSU had a rear grounding lug. Ensure that it is grounded using a wire with diameter of at least **10 AWG.**

Caution

In respect of the AC connection:

- Wiring must be done by qualified personnel
- Never handle the power plug under wet conditions
- Connect the ground-wire prior to connecting the line-wires
- An external AC surge suppression device is recommended for use with this product. It is recommended that you use an AC line surge suppression unit that meets the standard IEC 801-5 (EN6100-4-5) Class 5 at +/- 6Kvolts on AC power source ground-wire and +/- 4Kvolts on line-wires

In respect of the PoE port:

- Do not connect a power supply to the PoE port of this product as it will cause damage to the device

Mounting the Lightning Protection Devices

The use of lightning protection is dependent on regulatory and end user requirements. The RADWIN 5000 HPMP ODU is designed with surge limiting circuits to minimize the risk of damage due to lightning strikes. RADWIN recommends the use of additional surge arrestor devices to protect the equipment from nearby lightning strikes.

See below and **Chapter 19** for detailed installation instructions of lightning protection devices.

Outdoor Connections

To complete the outdoor connections:

1. Connect the ground cable to the ODU chassis as marked on the ODU.
2. Connect the lightning protection device to the ODU (see **Chapter 19**).
3. Attach the ODU-PoE cable to the ODU RJ-45 connector (see **Appendix B** for the connector pinout)
4. Screw in the cable glands to ensure hermetic sealing of the ODU.
5. Secure the cables to the pole, mast or brackets using UV-rated cable ties.

Installing a Sector using PoE Devices

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

➢ To prepare a sector using PoE devices:

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

Connecting User Equipment

➢ To connect user equipment to a PoE device:

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

Mounting the Lightning Protection Devices

The use of lightning protection is dependent on regulatory and end user requirements. The RADWIN 5000 HPMP ODU is designed with surge limiting circuits to minimize the risk of damage due to lightning strikes. RADWIN recommends the use of additional lightning protector devices to protect the equipment from nearby lightning strikes.

Figure 3-17: RADWIN Lightning Protector Right: *Using RADWIN lightning protectors*

Refer to **Chapter 18** for detailed installation instructions for use of lightning protection devices.

Mounting the Ethernet Repeater

The RADWIN Ethernet repeater enables you to extend the PoE to ODU cable beyond the 100m limit (but no more than 200m). The unit looks physically like the lightning protection device in **Figure 3-17**. It's use is very simple as shown in the following schematic:

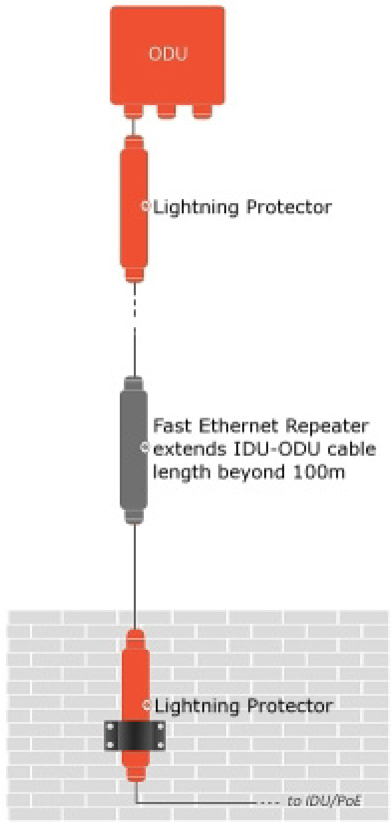


Figure 3-18: sing an Ethernet repeater with lightning protectors

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

Additional Waterproofing for the Lightning Protection Unit and the Repeater

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

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

1. Obtain a high quality sealing material such as Scotch 23 Tape ¾" wide, from 3M to ensure IP-67 compliant protection against water and dust.
2. Cut two pieces each 25 cm long, of Scotch 23 splicing tape. Remove the plastic cover to expose the tacky side of the sealing tape as shown in **Figure 3-19**.

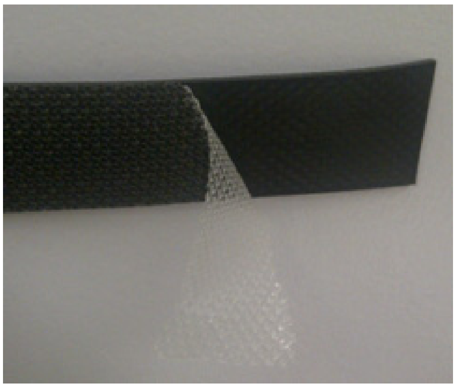


Figure 3-19: Exposing the tacky side of the sealing tape

3. After connecting the short CAT-5 IDU/ODU cable (provided in the box) from the ODU to the unit, tighten the cable gland cap firmly and use the insulation tape scotch 23 to fully cover both of the cable glands.

4. Connect the tape with tacky side up on the cable gland cap and the CAT-5 cable. Start at **Start Point** at the bottom of the cable gland as shown in **Figure 3-20**. Finish at **End Point** of the CAT-5 cable, 2.5cm after the end of the shrink tubing. Stretch the tape and apply half-overlapped to form gap-free joint.

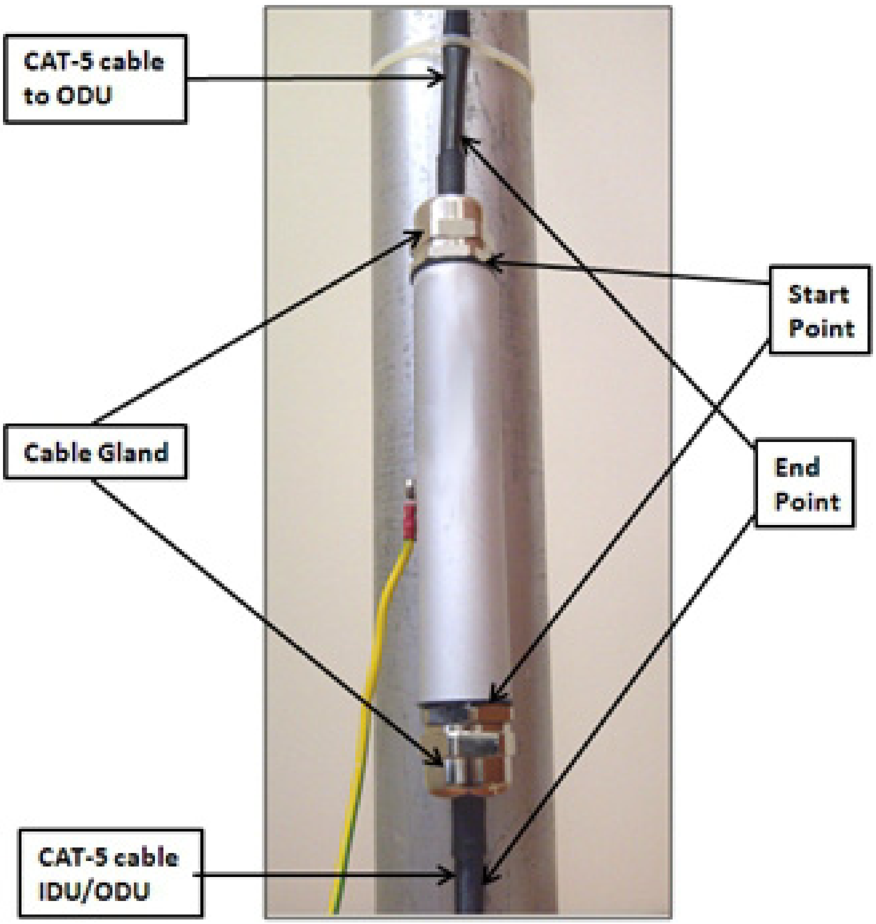


Figure 3-20: Start and End points for protective-taping the unit

5. Wrap two layers of any scotch vinyl plastic electrical type (e.g Scotch Super 88 Vinyl Plastic Tape from 3M) to protect the joints as shown in **Figure 3-21**. Ensure that the

bottom of the cable gland and the end of the CAT-5 cable are covered with the sealing splicing tape and with vinyl plastic tape.

Figure 3-21: Protecting the unit joints with vinyl tape

6. Mount the unit on the pole using the mounting ring as shown in **Figure 3-22**. Ground the unit using the GND screw. For lightning protection, repeat the same procedure to install the second unit connected to the IDU.

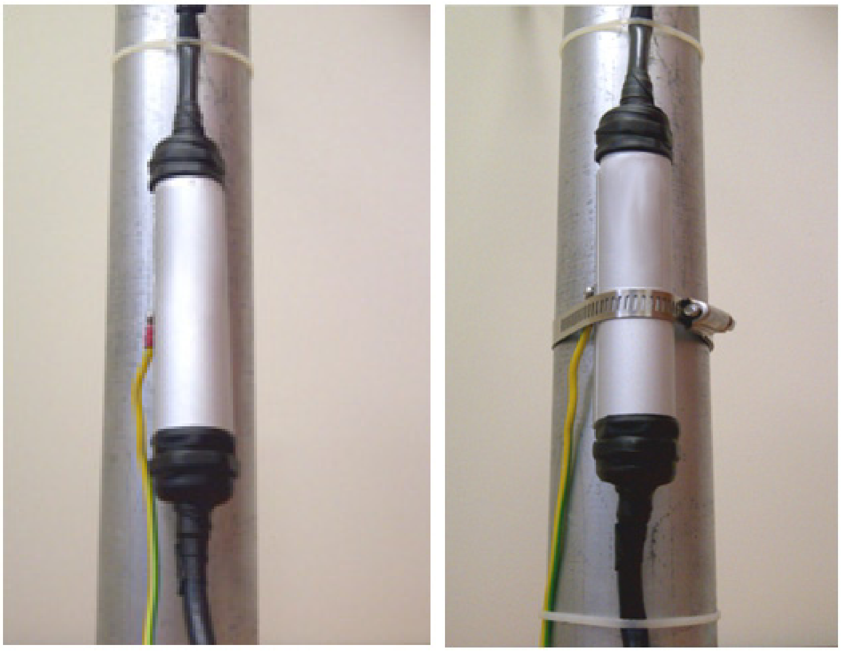


Figure 3-22: Mounted and strapped to the pole

Outdoor Connections

➢ **To complete the outdoor connections:**

1. Connect the ground cable to the ODU chassis as marked on the ODU.

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

Aligning HSUs to a HBS

You perform HSU antenna alignment to a HBS using the HSU ODU's audible tone.

To align an HSU to its HBS:

1. Ensure that the sector antenna of the HBS is aligned precisely to the sector it is intended to cover. Use a compass and topographical maps to do this.
2. For both the HBS and HSUs: Using a coax cable with N-Type connectors, connect the vertical polarization connector of the antenna to the ANT 1 connector of the ODU. Then, using a second coax cable with N-Type connectors, connect the horizontal polarization connector of the antenna to the ANT 2 connector of the ODU.

Note

There is no particular reason to use ANT 1 and ANT 2 in that order: They just have to be the same for each ODU in the sector. Further, adopting a convention like "ANT 1 is always vertical" avoids mistakes across a large sector.

3. Ensure that power is connected to the site PoEs across the sector.
4. Provided that a HSU detects the signal from the HBS, the ODU starts beeping 20 seconds after power up, and continues beeping until the HSU is aligned to the HBS, and the alignment is complete.

   The details are described in the next two steps. "Antenna" refers both to an external antenna and an integrated antenna. The two steps should be carried out for each HSU in the sector.

Warning

Never stand in front of a live antenna!

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

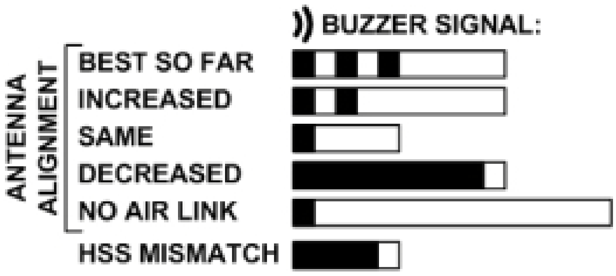


Figure 3-23: Beep Sequence for antenna alignment

Note

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

7. Secure the HSU antenna to the pole/wall.

USER MANUAL

RADWIN 5000 HPMP POINT TO MULTIPOINT BROADBAND WIRELESS

Release 3.4.00

Part 2: Sector Installation

Chapter 4

Getting Started with the RADWIN Manager

What we will do here

This chapter is a quick "hands-on" tour of a running sector. We show you how to install the RADWIN Manager software on your managing PC, connect it to an operating base station and then log on. We then explain the use of the various objects on the RADWIN Manager main window.

The background acquired here will enable you to understand the direction and purpose of the detailed procedures (described in later chapters), required to build a RADWIN 5000 HPMP sector from the ground up.

Installing the RADWIN Manager Application

Minimum System Requirements

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

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

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

Requirements common to all systems are:

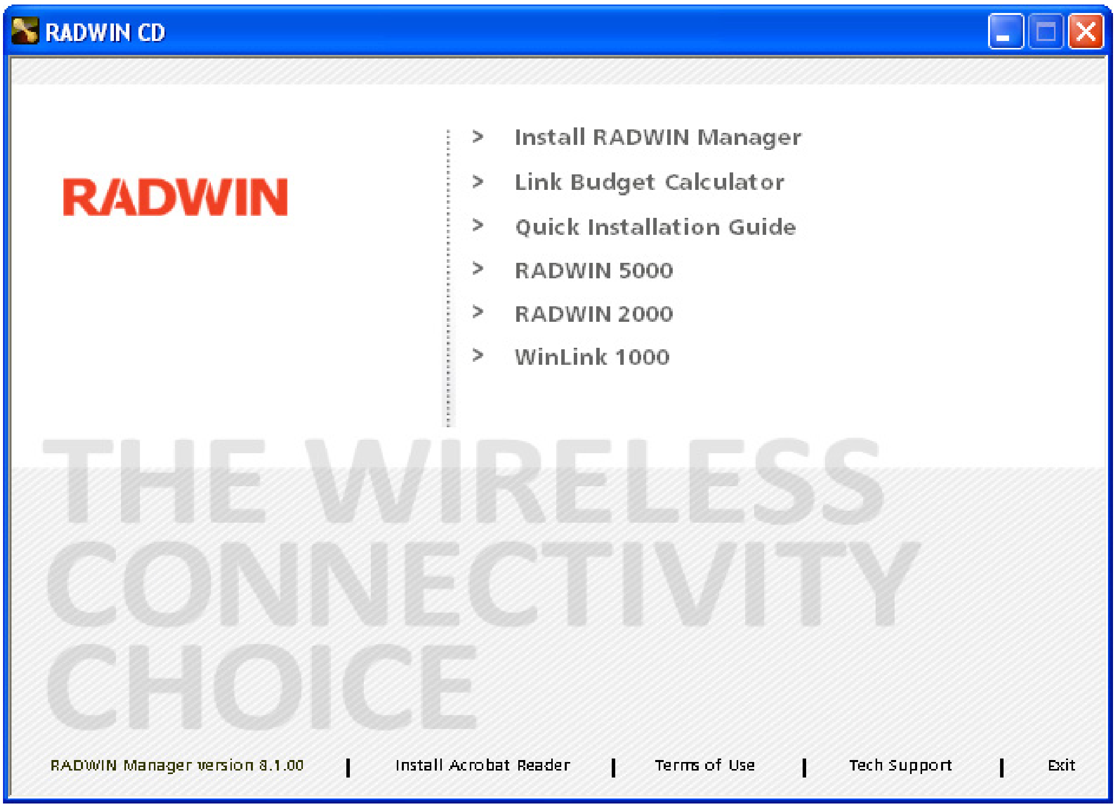
- Hard disk: 1 GB free space
- Network: 10/100BaseT NIC
- Graphics: 1024x768 screen resolution with 16 bit color
- Any modern Web browser to view additional material, use the Web Interface or get help from the RADWIN Web site.

Installing the Software

Any PC running the RADWIN Manager application can be used to configure a RADWIN 5000 HPMP sector.

To install the RADWIN Manager application:

1. Insert the CD into the CD/DVD drive of your computer.
2. The CD opening window appears:



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

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

Getting Started with the RADWIN Manager

We will look at a pre-configured fixed sector, setup as follows::

Table 4-2: Preconfigured setup

<table>
<tr><th>Unit</th><th>Location</th><th>Attribute</th><th>Value</th><th>Remark</th></tr>
<tr><td rowspan="15">HBS</td><td rowspan="15">HBS.01</td><td>IP Address</td><td>10.104.50.200</td><td rowspan="3">All communicating HSUs and HBS in the same subnet</td></tr>
<tr><td>Net Mask</td><td>255.255.0.0</td></tr>
<tr><td>Default Gateway</td><td>10.104.10.21</td></tr>
<tr><td>Sector ID</td><td>EBGX20560334</td><td>Inherited by all communicating HSUs</td></tr>
<tr><td>Contact</td><td>Bach</td><td>Optional</td></tr>
<tr><td>Name</td><td>Bach@HBS.01</td><td>Location of Contact - optional</td></tr>
<tr><td>Band</td><td>5.730 - 5.845 GHz FCC/IC</td><td>Inherited by all communicating HSUs</td></tr>
<tr><td>Channel Bandwidth</td><td>20MHz</td><td>Inherited by all communicating HSUs</td></tr>
<tr><td colspan="3">Geographic location</td></tr>
<tr><td>Latitude</td><td>-37.8148</td><td></td></tr>
<tr><td>Longitude</td><td>144.9630</td><td></td></tr>
<tr><td>Azimuth (deg)</td><td>0</td><td rowspan="2">Used for initial default placement of HSUs</td></tr>
<tr><td>Beamwidth (deg)</td><td>90</td></tr>
<tr><td>Antenna height (m)</td><td>130</td><td>From RF plan, not used</td></tr>
</table>

Table 4-2: Preconfigured setup (Continued)

Unit	Location	Attribute	Value	Remark
HSU	HFU.01.01	IP Address	10.104.50.1	All communicating HSUs and HBS in the same subnet
		Net Mask	255.255.0.0	
		Default Gateway	10.104.10.21	
		HSU type	Fixed	8 time slots
		Contact	Haydn	
		Name	Haydn@HFU.01.01	
		Geographic location		
		Latitude	-37.8762	
		Longitude	145.0437	
		Antenna height (m)	10	From RF plan, not used
	HFU.01.02	IP Address	10.104.50.2	All communicating HSUs and HBS in the same subnet
		Net Mask	255.255.0.0	
		Default Gateway	10.104.10.21	
		HSU type	Fixed	8 time slots
		Contact	Mozart	
		Name	Mozart@HFU.01.02	
		Geographic location		
		Latitude	-37.4018	
		Longitude	145.0086	
		Antenna height (m)	60	From RF plan, not used
	HNU.01.01	IP Address	10.104.50.3	All communicating HSUs and HBS in the same subnet
		Net Mask	255.255.0.0	
		Default Gateway	10.104.10.21	
		HSU type	Nomadic	6 time slots
		Contact	Brahms	
		Name	Brahms@HNU.01.01	
		Geographic location		
		Latitude		Depends on location
		Longitude		
		Antenna height (m)		
	1	HSU type	Nomadic	6 time slots
	2	HSU type	Nomadic	4 time slots
	3	HSU type	Nomadic	4 time slots
	4	HSU type	Nomadic	2 time slots

We have also add place-holders for a further four nomadic HSUs. That is, up to four more vehicles equipped to work in this way, may simultaneously enter the sector.

Tip

Choose your unit locations carefully. For example, for three collocated HBSs each with 32 HSUs covering 360°, matters get out of hand very quickly if units are poorly named. They can always be identified by their IP addresses, but that is a poor substitute for effective naming. A URL-like naming pattern based on HBS_n.HSU_y is clear and familiar to all Internet users. Keeping the names IP address independent enables you to copy the entire sector setup to a different geographic location without IP address duplication.

To start the RADWIN Manager:

1. Connect the managing computer to the HBS PoE LAN port.
2. Check that you have connectivity to the HBS. You can do this by opening up a command line session (**Start|Run** and then type, **cmd**). At the command prompt, type

   ping 10.104.50.200

   You should see something like this:

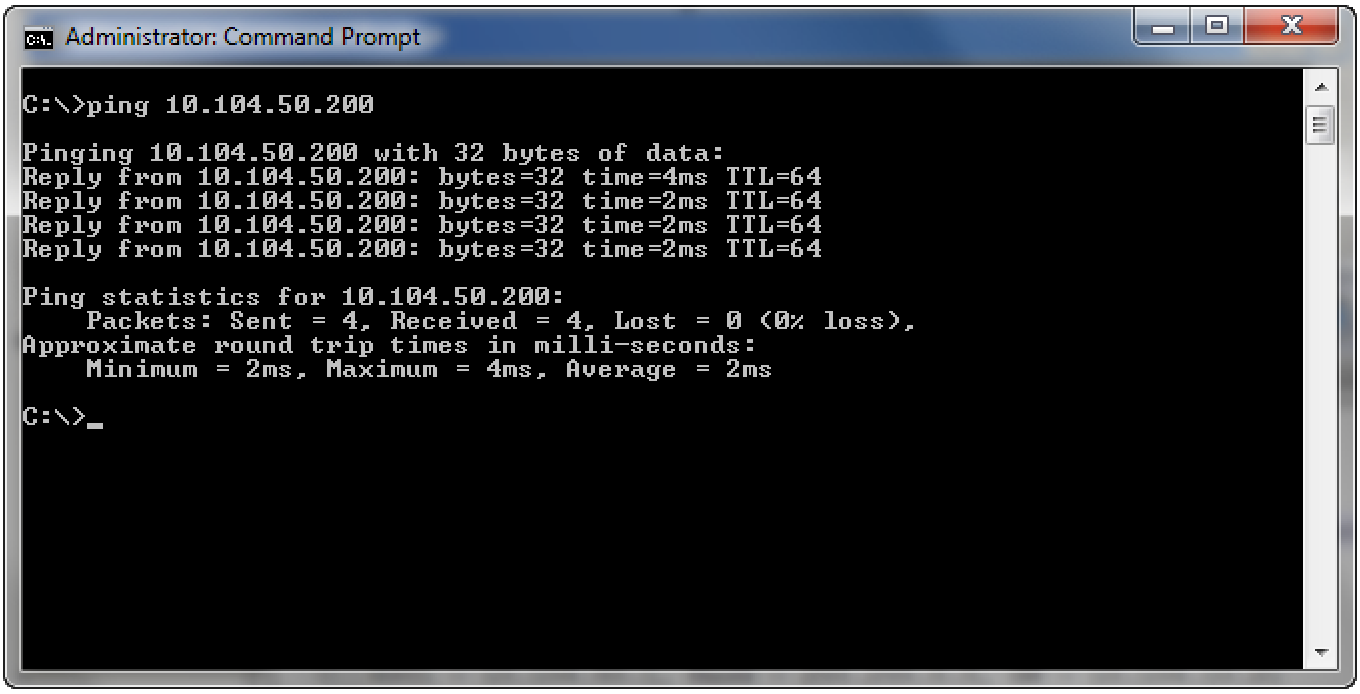


Figure 4-1: Pinging the base station.

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

   Pinging the HSUs should yield similar responses.

3. Dismiss the command line session.
4. Open the RADWIN Manager from the desktop icon, or click **Start|Programs|**RADWIN Manager|RADWIN Manager**.**

The Log-on dialog box appears.

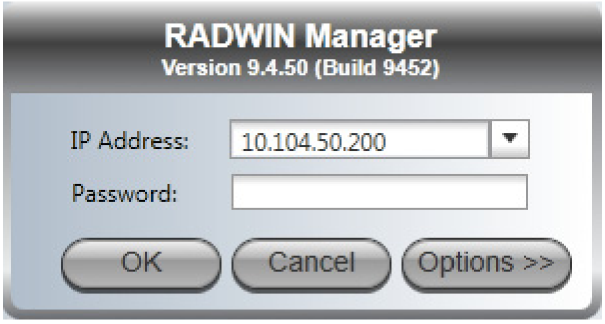


Figure 4-2: Log-on window

The RADWIN Manager log-on Concept

The RADWIN Manager provides three levels of access in one of two entry modes. To see them, click **Options** at any time in the Log on window (**Figure 4-2** above). You are offered an *extended* log-on window:

Figure 4-3: Extended log-on window

At the User Type field, click the list button:

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

There are three user types:

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

If you are connecting through the RNMS server check the RMNS connect button and enter your server IP address.

The following table summarizes these options:

Table 4-3: User types, default passwords and function

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

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

➢ Continuing the log-on procedure:

5. If your User Type is not Operator, then choose it now.
6. Enter the password.

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

Note

- Leave the default Community passwords, ***netman*** for read-write, and ***public*** for read-only.
- If you are a user with read-only permission, then you may only log on as Observer.

Log-on Errors and Cautions

Unsupported Device

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

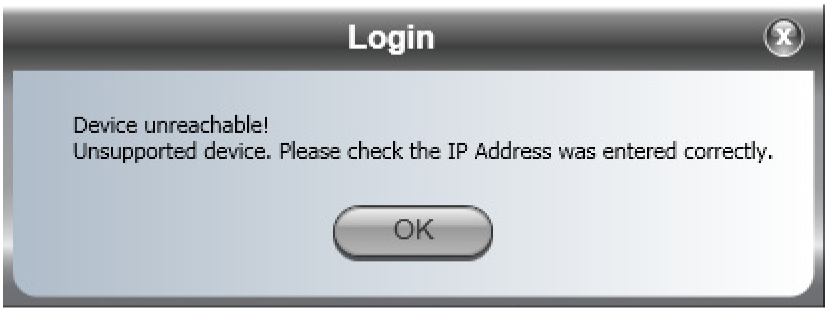


Figure 4-5: Unsupported device message

Incorrect IP Address

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

Figure 4-6: Unreachable device message

Incorrect Password

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

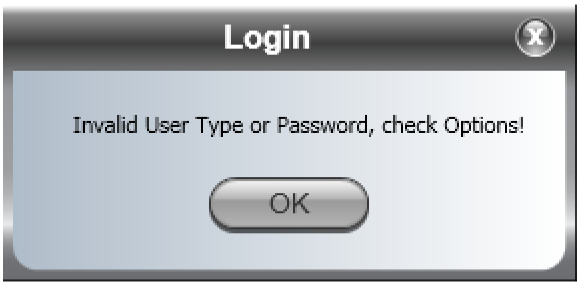


Figure 4-7: Invalid user type or password

Invalid Read/Write Community String

This will result in the same message as shown in **Figure 4-6**.

➢ **To deal with lost or forgotten Community Strings:**

1. Send an email request for to RADWIN Customer Support for an alternative key. Your email must include the ODU serial number shown on the adhesive sticker on rear of one of your ODUs.
2. The reply will contain an alternative key, which functions as a temporary master Community String. Copy/paste the supplied alternative key to both the Read-Only and Read-Write fields in the log-on window (**Figure 4-3**). This gets you to the RAD-WIN Manager main window.
3. Use the procedure on **page 6-10** to enter new Community Strings.

Three Sector Display Views

Table View

The RADWIN Manager offers three sector display views. The default view for a freshly installed sector is **Table view** and looks like this:

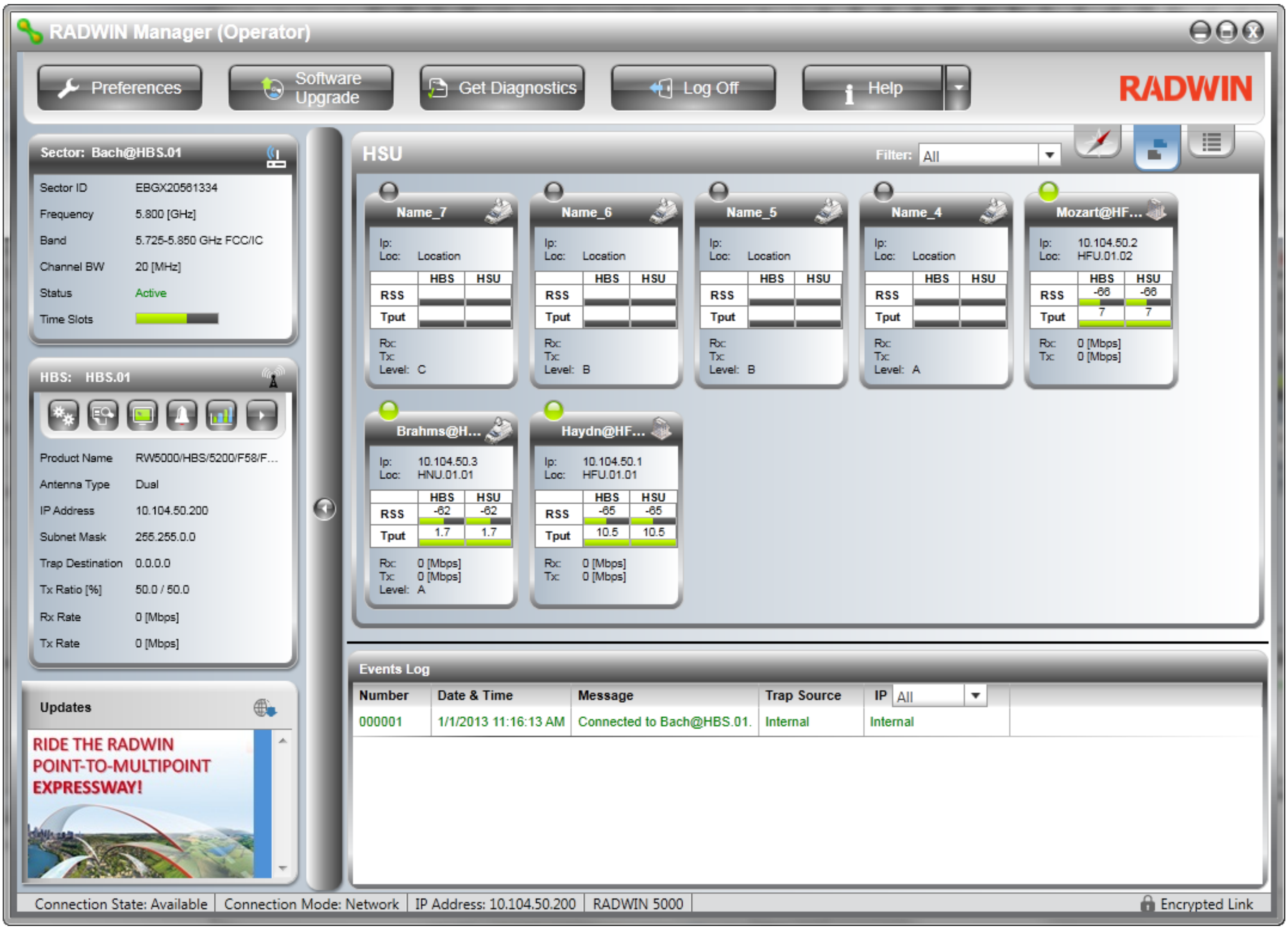


Figure 4-8: Default Sector display - Table view

Map View

If you have an Internet connection, you may use **Map view**. The default RADWIN Manager main window looks like this:

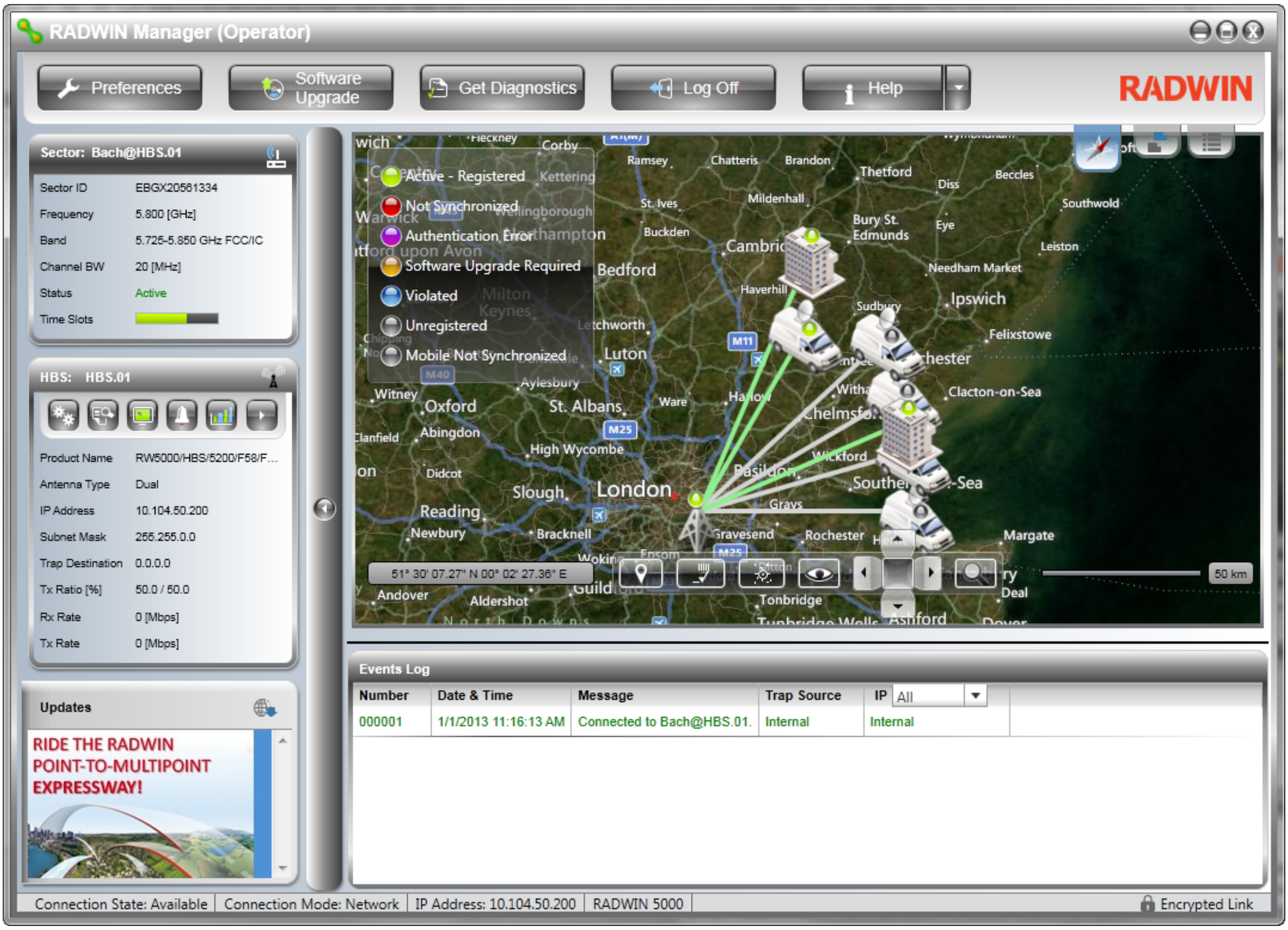


Figure 4-9: Sector display - Map view

A new sector with default values for element map coordinates is shown centred on Greenwich (**Figure 4-9**). The sector is centered on the HBS azimuth (configurable). The HSUs distributed evenly within the sector beam width (configurable) without regard for geographic considerations.

If you do not have an Internet connection, the display background will be solid gray.

For this demonstration, we use a sector centered on Melbourne, Australia. The location of the HBS and two fixed HSUs is based on a Radio Plan shown in **Table 4-4**.

The nomadic HSUs, having no predefined coordinates are "in the middle of nowhere". Later we show you how to change the positions of the HSU icons on the map.

List View

The third sector display type is List view. It looks like this:

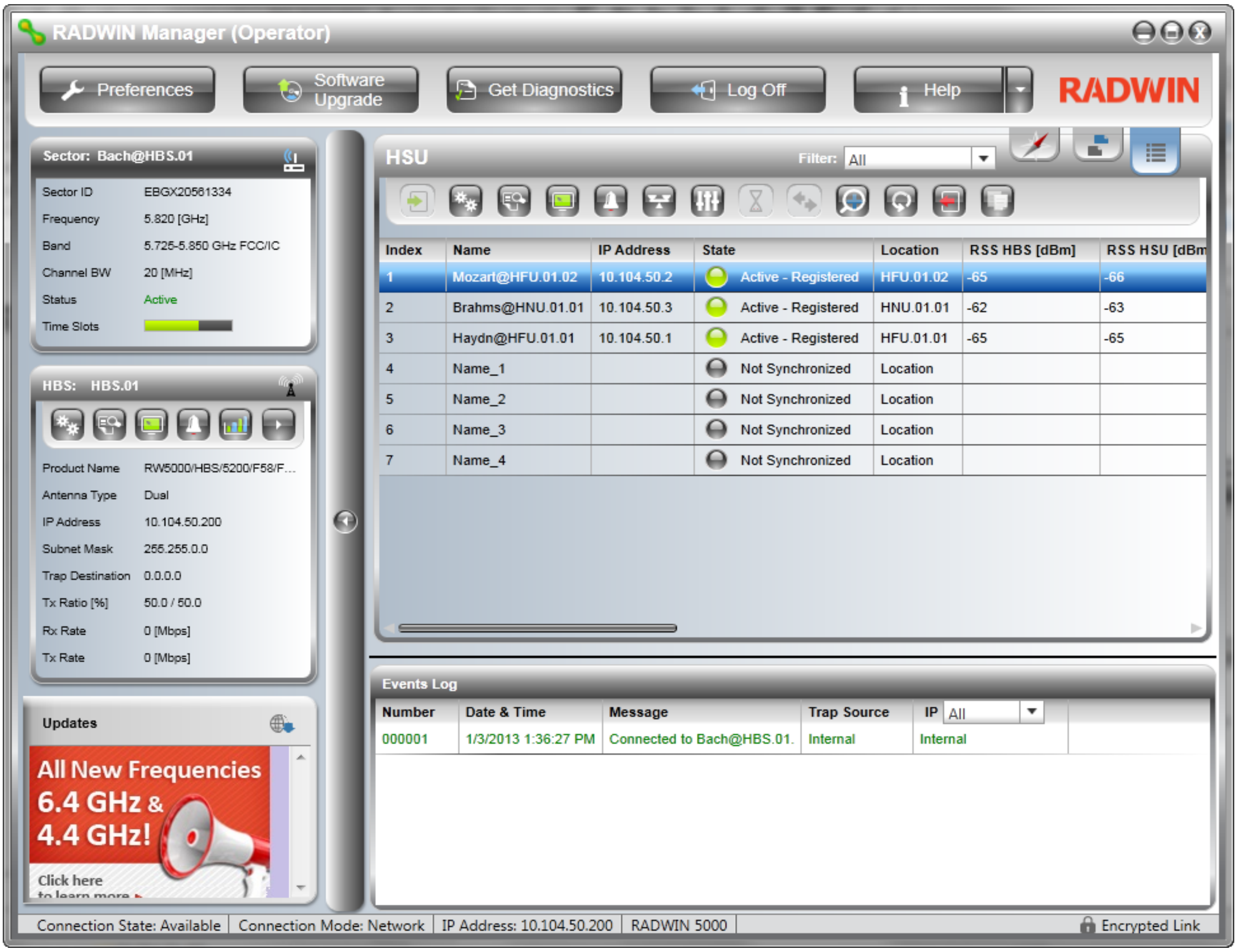
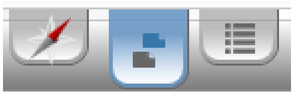


Figure 4-10: Sector display - List view

At the bottom of the HSU display panel, there is a thin horizontal scroll bar. Use it to see further details about the displayed HSUs. The Index and Name fields are protected so you always know to which HSUs the data belongs.

Switching Between Views

To switch between displays:

- Click the relevant  tab. From left to right, the tabs are, Map view, Table view and List view. The active tab (Table view in the illustration) is shown enlarged.

Display View Persistence

The last display view used will be that opened at your next restart or log on to the RADWIN Manager.

Which Display View Should I Use?

Your preferred view is clearly application dependent. For a geographically localized sector - say, video surveillance of a plant or a sports center with a small number of cameras, Table or List view might be adequate. Our own example is based on a backhaul situation for which the Maps view is very helpful.

Continuing with our Example Sector

Using the Map View

To set up a new sector or to carry out substantial changes to an existing sector, you should have a Radio Plan from your Site Survey. The minimum requirement is a list of locations and their coordinates. Here is our plan:

Table 4-4: Radio Plan for a small sector

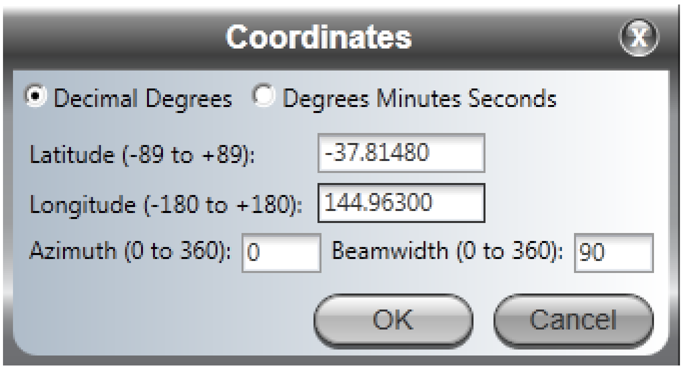
Unit Type	Site Name	Latitude	Longitude	Antenna height (m)
fixed HSU	Mozart@HFU.01.02	-37.4018	145.0086	60
fixed HSU	Haydn@HFU.01.01	-37.8762	145.0437	10
nomadic HSU	Brahms@HNU.01.03	n/a	n/a	n/a
HBS	Bach@HBS.01	-37.8148	144.9630	130

Note

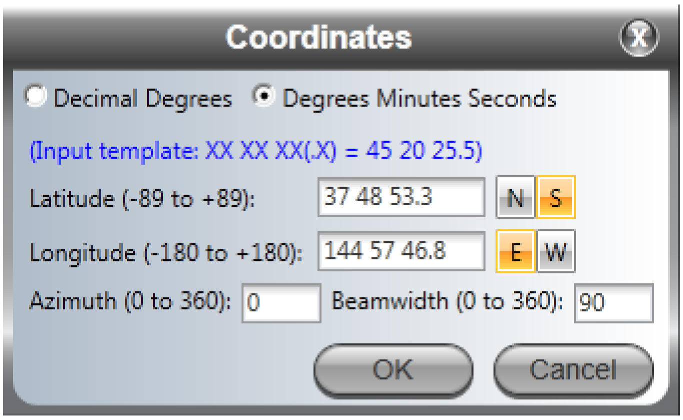
A plan of this type may be prepared by hand, or by using a suitable Radio Planning tool. The method used here allowed us to specify antenna height as well so as to guarantee LOS. While it is not of direct use in what follows, antenna height is required to carry out physical installation as set out in **Chapter 3**.

➢ To relocate a HBS or HSU by setting latitude and longitude coordinates:

1. Right click the HBS (Bach@HBS.01) to open its Context menu and then **Configure**.
2. Click the **Coordinates** button to open the Coordinates window and enter the required latitude and longitude.

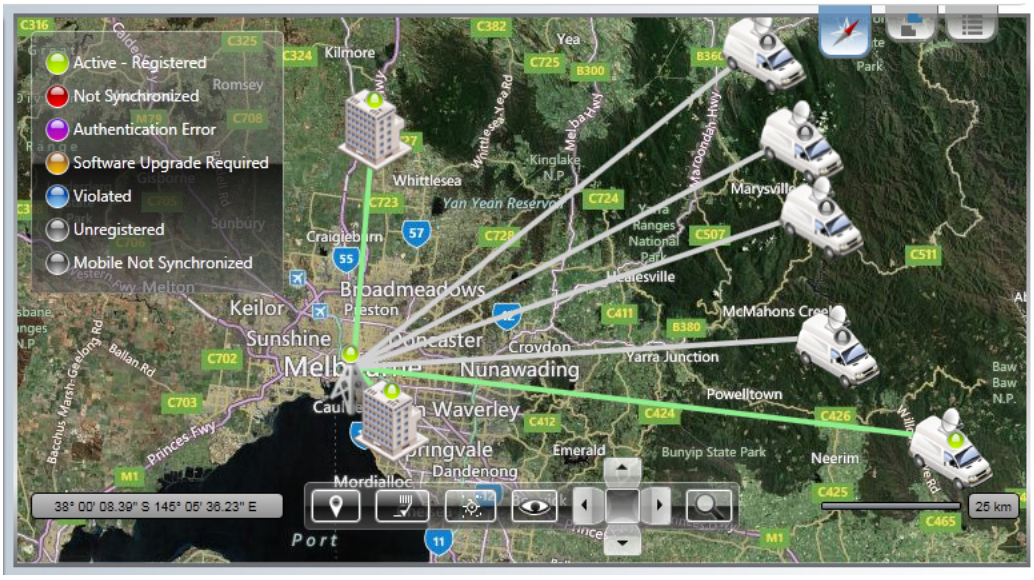


You may enter the coordinates in decimal or degrees/minutes/seconds using the input template shown below:



3. HBS only: The Azimuth and Beam Width determine the sector center-line direction and angle They are only used for initial default distribution of HSUs on the map.
4. Click **OK**. The unit is moved to the new location (possibly off-screen).
5. Repeat the previous four steps for each HSU in the sector. If at the end of the process, the HBS is off-screen, click the Center on Sector button to “fly” to the sector.

Using the example in **Table 4-4**, here is the outcome:



We have located the entire sector to Melbourne, Australia in accordance with our Radio Plan. The grey lines and icons are pre-registered place-holders for additional nomadic HSUs.

You can make manual location adjustments using the GUI.

➤ **To relocate a HBS or HSU using the GUI:**

1. Select the unit to move by clicking it. It is surrounded by a brown box.
2. Mouse-over the top edge of the box to get a context button bar as shown in.

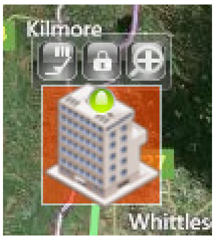


Figure 4-11: Selected HBS or HSU with context button bar

The functions of three buttons (from left to right) are as follows:

Table 4-5: Unit Context Button bar functions

Button	Tool tip	Purpose
Left	Show/Hide details	Show/Hide the status window
Center	Unlock / Lock Item	Unlock to drag on map, lock to secure position
Right	Zoom in	Show more background detail. Also displays the unit status window if not already visible[a]

a. You can also zoom in/out using the mouse scroll wheel in the standard way

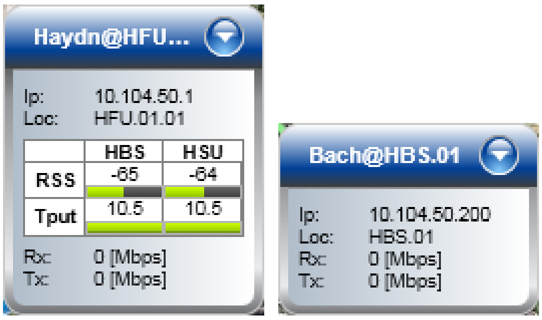
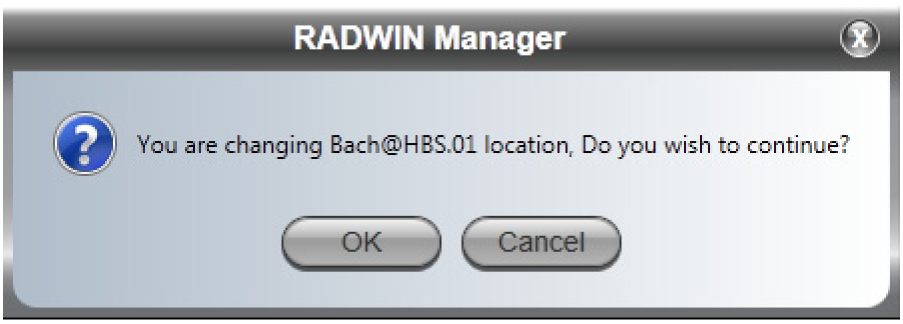


Figure 4-12: Unit Status Windows: left HSU, right HBS

3. Click the **Unlock** button. Drag the tower icon to its new location. You must confirm the change:



The change is then carried out.

Note

The foregoing change confirmation is important: There is no "undo" function. If you inadvertently move the unit to a wrong place, you will have to restore its position by hand.

Exploring the RADWIN Manager Main Window - HBS

The following sections describe the panels of main window shown in **Figure 4-8**.

HBS Main Button Menu

Figure 4-13: HBS main button menu

Table 4-6: HBS main button bar functions

Menu Item	Purpose	Reference
Preferences	Monitor - File location, interval and throughput units	**page 4-30**
	Events - Color coding for events log and events log file location	**page 4-31**
	Advanced - Enable/disable check for updates, Monitoring interval and timeout, map view background mode	**page 4-32**
Software Upgrade	Perform software upgrade for a sector	**Chapter 12**
Get Diagnostics	Run and store diagnostics for all or some members of a sector	**Chapter 9**
Log Off	Return to log-on window	
Help side arrow	Link Budget Calculator	**Chapter 20**
	Check Updates	
	About	
Help Button	View this User Manual	

Sector Status Panel

The sector level information is shown here. There is nothing that can be changed for an active sector. The parameters are set before the base station is activated and are duplicated for each HSU in the sector.

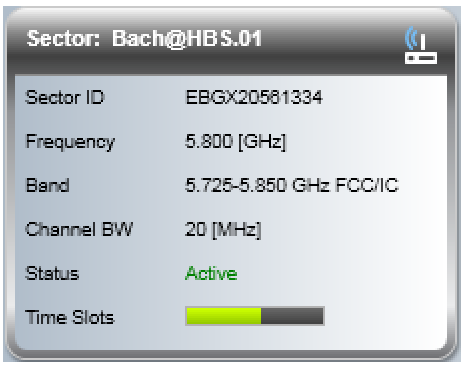


Figure 4-14: Sector Status panel

The last two items are of special interest: The **Status** (shown as Active) indicates whether the HBS has been activated or not. The **time slots** bar indicates how many out of 64 time slots, have been allocated to HSUs. Allocation of time slots between HSUs provides a basic form of prioritization between them. Normally you would not leave unallocated time slots unless you intended to add more HSUs. Every HSU requires at least one time slot.

Base Station Panel

The displayed items in the Base Station panel are straight forward.

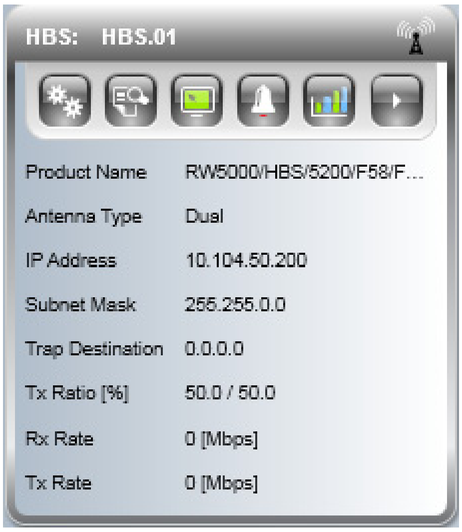


Figure 4-15: Base Station detail Panel

The **Tx Ratio** shows the allocation of throughput between downlink and uplink traffic at the HBS. Here it is set to 70% downlink and 30% uplink. The Tx Ratio is not only sector-wide: If you use HSS (**Chapter 10**) to collocated several HBSs (to cover adjacent sectors), they must all use the same Tx Ratio.

The **Rx Rate** and **Tx Rate** are the traffic receive and transmit rates through the HBS under load.

The button bar provides the necessary functionality to configure and manage the HBS.

Table 4-7: HBS Detail Panel button bar functions

Menu Icon	Purpose	Reference
	HBS Configuration	**Chapter 6**
	Recent Events Log	**page 9-7**
	Performance Monitor	**page 9-9**
	Active Alarms	**page 9-15**
	Spectrum View	**Chapter 21**

Table 4-7: HBS Detail Panel button bar functions (Continued)

Menu Icon	Purpose	Reference
	Estimated Throughput	page 9-5
	Change Band [a]	page 6-37
	HSU Connection Table	page 6-21
	Locate On Map	
	Reset	
	Deactivate	page 5-31

a. Installer only

The foregoing description relates to an activated HBS. The Detail Panel title bar for an inactive HBS looks like this:

Clicking the Activate button initiates an activation Wizard. The Activate button in the title bar is hidden, leaving it looking like this:

The Activation process is covered in detail in **Chapter 5**.

At any time, the current status of the HBS is shown in the Sector Status Panel, **Figure 4-14**.

HBS Events Log

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

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

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

The Events Log includes the following fields:

- **Sequential number (ID)**
- **Date and time stamp**
- **Message**
- **Trap source**

» **IP address of the ODU that initiated alarm.**

For complete information about internal traps and alarms see **Chapter 9**.

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

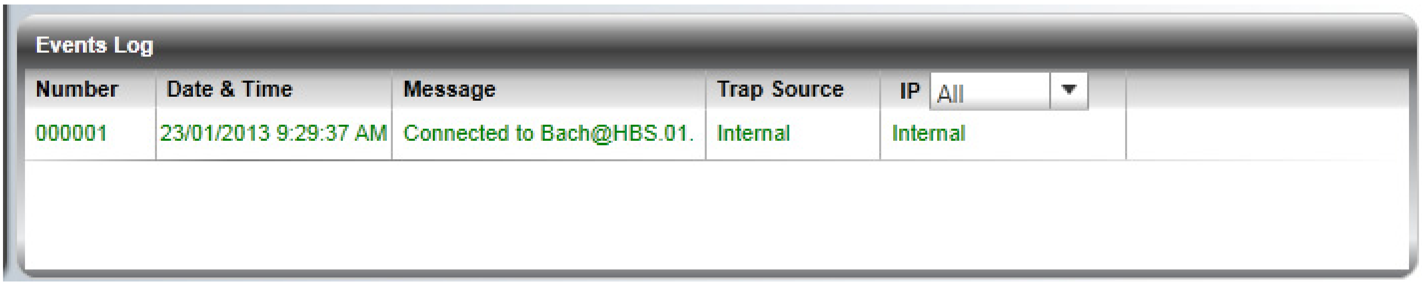


Figure 4-16: Events Log panel

The events log provides a color coded event list. Blue items (like the one in **Figure 4-16**) are informational. You can set the color coding for critical, cautionary and informational messages from the **Preferences** button.

The Events Log is horizontally scrollable if it is too wide for your computer display.

Use the top left drop-down list to filter the messages:

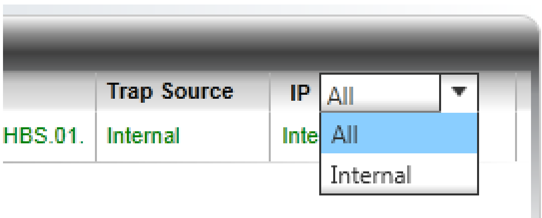


Figure 4-17: Events Log filter selection

HBS Main Window - HSUs Panel

Table View

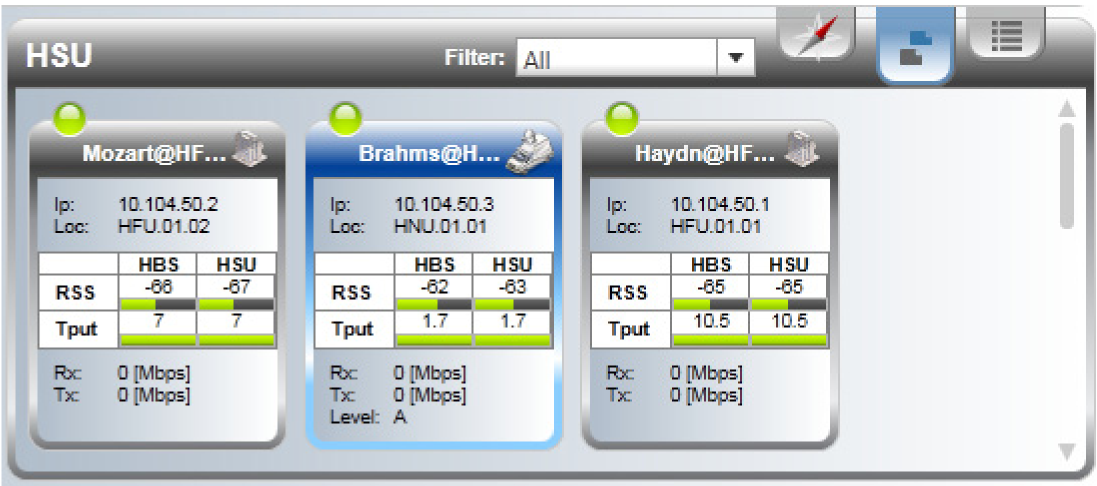
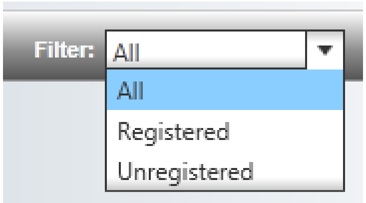


Figure 4-18: HBS Main Window (Reduced) - up to 32 HSUs

If you have a large number of HSUs in the sector, it may be helpful to filter the display. You have the following choices:



The following case has colored fields indicating a problem requiring your attention:

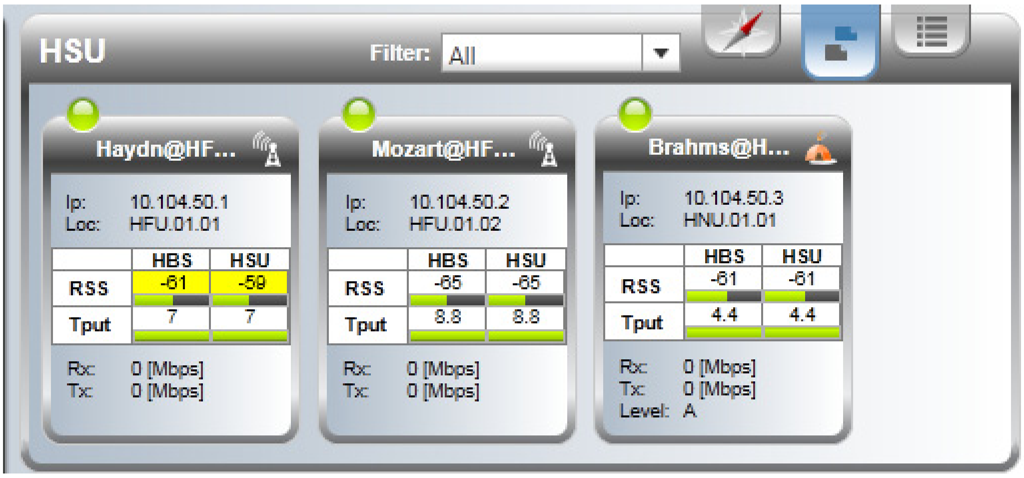


Figure 4-19: HBS Main Window (Reduced) - indicating a problem

If you mouse-over the colored RSS area, you will receive a tool tip telling you that RSS for Radio 1 is higher than for Radio 2, or something similar. We will provide further detail about these color codes below.

Right click a HSU to get its context menu:

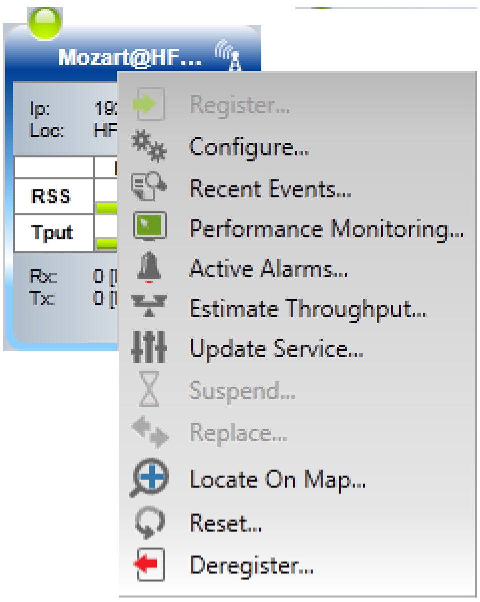


Figure 4-20: HSU display - context menu (right click)

Map View

Here again is the Map view of the HBS Main Window:

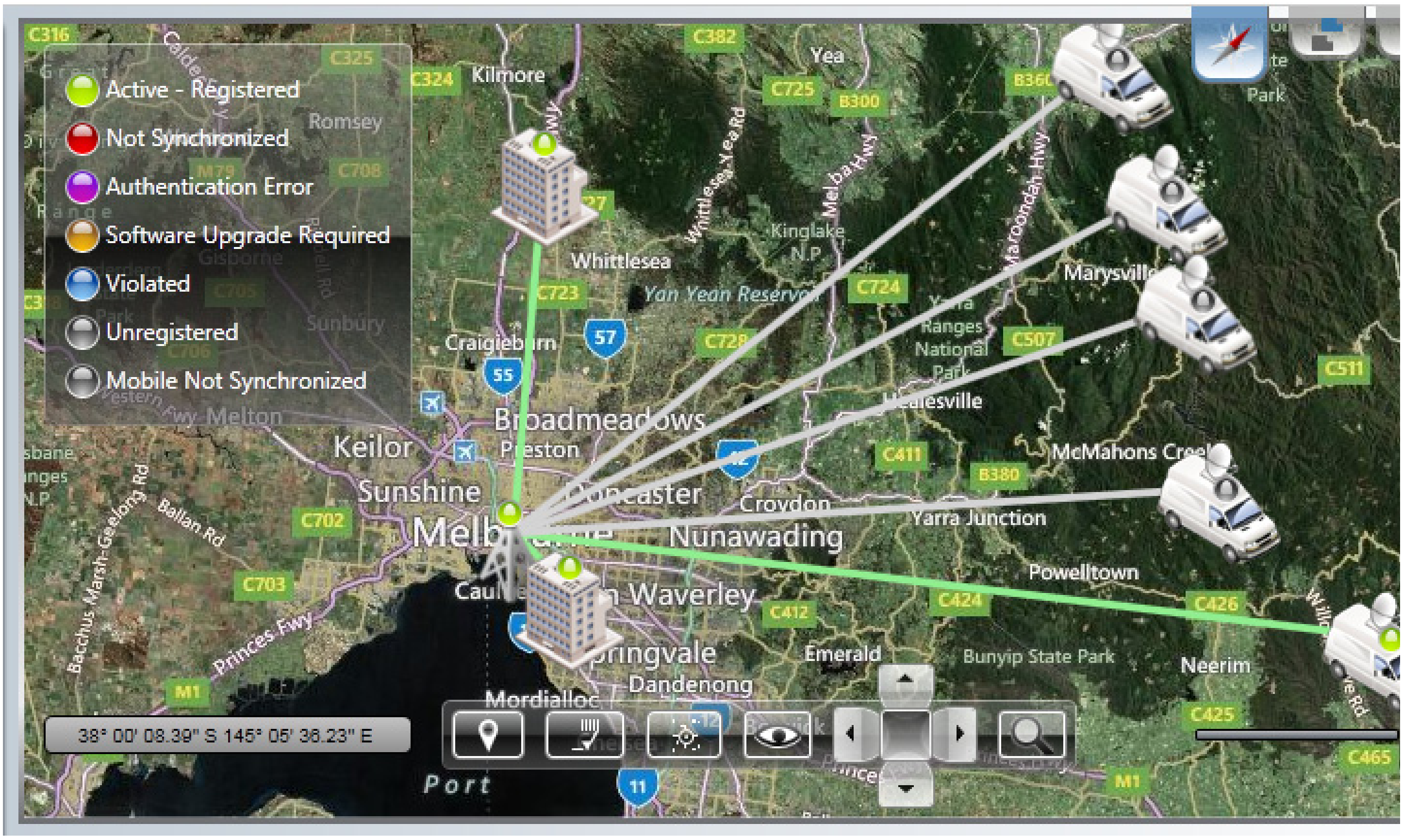


Figure 4-21: HBS Main Window - Map view

HBS/HSU Status Lights

HBS/HSU Status light appear on the tower graphic,  and the HSU detail (for example, **Figure 4-19**).

The meaning of the Status lights is as follows:

Table 4-8: HBS/HSU Status light color codes

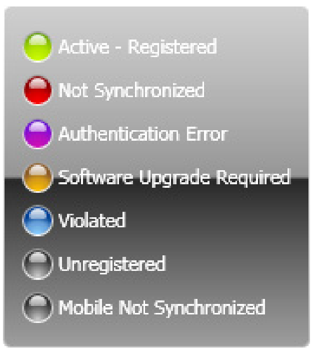


Figure 4-22: HBS/HSU Status lights

Color	Description	
	HBS	**HSU**
Green	Active	Registered, in sync
Red	Inactive	Registered, no sync
Purple	N/A	Authentication error
Brown	N/A	Software Upgrade required
Blue	N/A	Belongs to another sector
Gray	N/A	Static: Unregistered Mobile: Not synchronized

Navigation Tool bar

The left hand display box shows the latitude and longitude of the point on the map under the tip of the mouse cursor.

The right hand bar is the distance scale as defined by the numeric label - 25 km in the example.

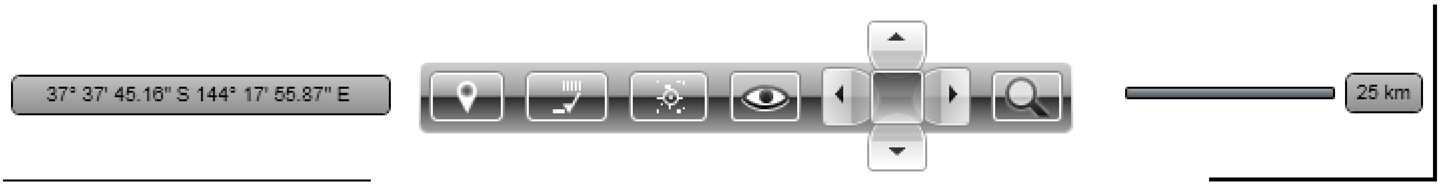
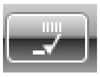
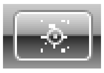
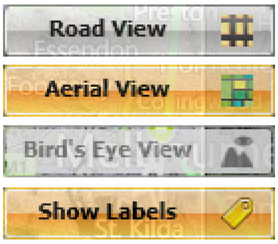
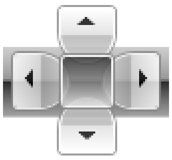
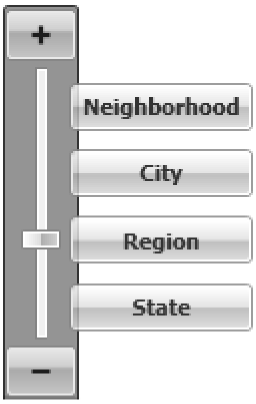


Figure 4-23: Navigation Tool bar

Table 4-9: Navigation tool bar button unctions

Menu Icon	Purpose
	Show/Hide the HBS/HSU Status lights (**Figure 4-22**)
	Show/Hide the HBS/HSU Status boxes
	Center on the sector
	 Shows different map views. **Aerial View** and **Show Labels** are set by default.
	Navigation buttons: Moves the sector about on the displayed map.
	 Shows different levels of map detail

The zoom item  is a convenience function. The four side buttons show the detail level associated with the zoom slider position. Alternatively, you may click one of the side buttons to get directly to the indicated zoom level. The default level is "Region" corresponding roughly to an area sufficient to display the whole sector.

Other Mouse Navigation Functions

- Double clicking the mouse or rotating the scroll wheel forward causes the view to zoom in (become larger, more detailed)
- Rotating the scroll wheel back causes the view to zoom out (become smaller, less detailed)
- Moving the mouse over the map with the right button depressed drags the sector (centered on the HBS) in the direction of movement
- Right clicking anywhere on the map opens up this 

close to the mouse location. Clicking this button copies the mouse cursor location as a coma separated text mode latitude-longitude pair to the clipboard. Here is a copy/ pasted example: -37.58896, 145.69000.

The HSU Status box

The following case has colored fields indicating a problem requiring your attention:

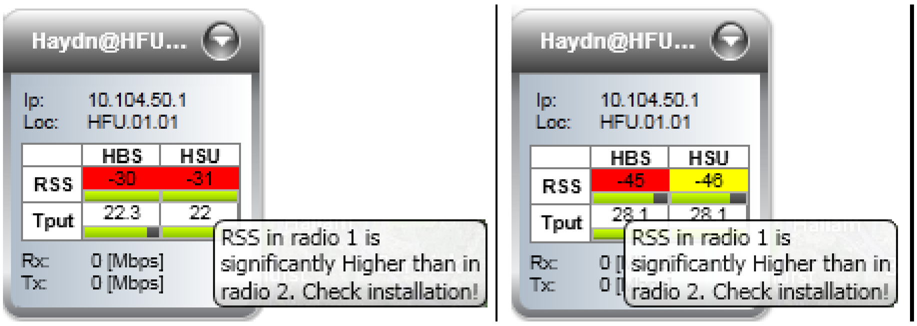


Figure 4-24: HSU status boxes - detail, indicating problems

If you mouse-over the colored RSS area, you will receive a tool tip telling you that RSS for Radio 1 is higher than for Radio 2, or something similar. The color codes have the following meanings:

- Normal white/green together with a consistent RSS imbalance may be caused by different TX Power settings at each site. There is no warning indicator but it may be easily corrected using **Configure | Tx & Antenna** or by rerunning the Configuration wizard.
- A yellow warning color will be displayed for an RSS difference of more than 8 dBm between the two polarizations on the same site (the RSS display is the combination of both polarizations on this site)
- A red warning color indicates an RSS difference of more than 16 dBm between the two polarizations on the same site

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

- Interference
- Antenna polarity problem

- ODU malfunction

This is a normal situation:

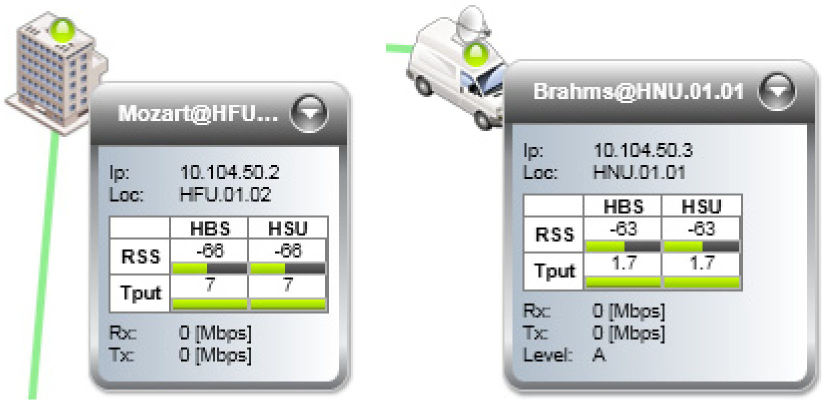


Figure 4-25: HSU status boxes - detail, normal operation. Left: fixed HSU Right: nomadic HSU

The arrow on the top right hand corner can be used to minimize or restore full detail. Here is the HSU status box minimized: 

This device is useful for a large sector with a small display.

Right click an HSU image to get its context menu:

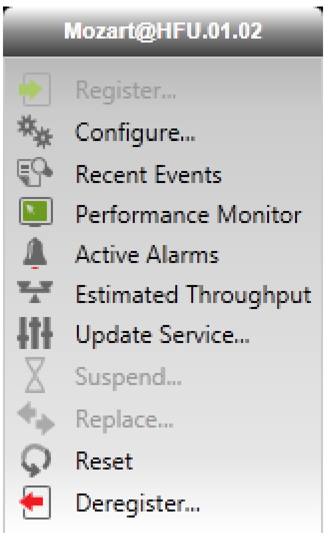
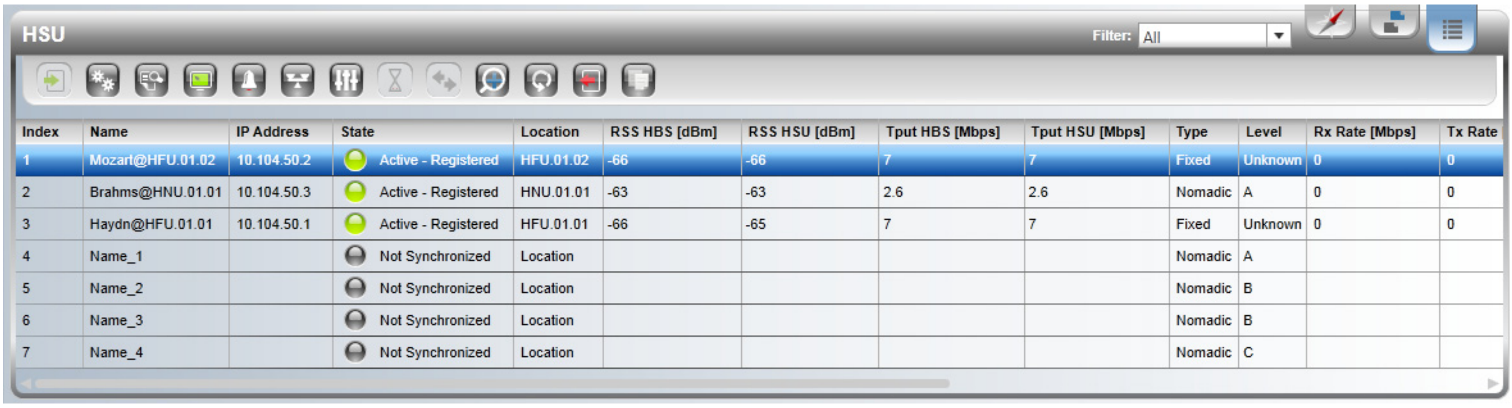


Figure 4-26: HSU display - context menu (right click). Same as **Figure 4-20**

List View

List view functionality is obtained ny selecting a HSU and using the top button bar to configure it.

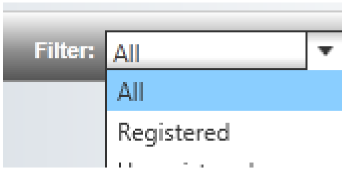


HSU Filter: All

Index	Name	IP Address	State	Location	RSS HBS [dBm]	RSS HSU [dBm]	Tput HBS [Mbps]	Tput HSU [Mbps]	Type	Level	Rx Rate [Mbps]	Tx Rate
1	Mozart@HFU.01.02	10.104.50.2	Active - Registered	HFU.01.02	-66	-66	7	7	Fixed	Unknown	0	0
2	Brahms@HNU.01.01	10.104.50.3	Active - Registered	HNU.01.01	-63	-63	2.6	2.6	Nomadic	A	0	0
3	Haydn@HFU.01.01	10.104.50.1	Active - Registered	HFU.01.01	-66	-65	7	7	Fixed	Unknown	0	0
4	Name_1		Not Synchronized	Location					Nomadic	A		
5	Name_2		Not Synchronized	Location					Nomadic	B		
6	Name_3		Not Synchronized	Location					Nomadic	B		
7	Name_4		Not Synchronized	Location					Nomadic	C		

*Figure 4-27: HSU On HBS display - extract. **Scroll right for more** HSU **fields***

If you have a large number of HSUs in the sector, it may be helpful to filter the display. You have the following choices:



The button bar in **Figure 4-27** follows the same pattern as the context menus in **Figure 4-20**..

Table 4-10: HBS main window list display context menu and button bar functions

Menu Item	Menu Icon	Purpose	Reference
Register		Register a HSU to a sector	**page 5-24**
Configure		Site configuration for the HSU	**page 6-22**
Recent Events		Recent events log per HSU	**page 9-7**
Performance Monitoring		Performance Monitoring per HSU	**page 9-9**
Active Alarms		Display Active Alarms	**page 9-15**
Estimate Throughput		Estimate throughput per HSU	**page 9-5**
Update Service		Service evaluation and time slot allocation per HSU; also MIMO/Diversity selection	**page 6-36**
Suspend ...		Suspend Service	**page 6-36**
Replace		Replace a HSU	**page 6-34**
Locate on Map		Fly to this HSU on the Map Display	

Table 4-10: HBS main window list display context menu and button bar functions (Continued)

Menu Item	Menu Icon	Purpose	Reference
Reset		Reset the HSU	
Deregister		Deregister the HSU	**page 5-32**
Copy HSUList		Copies HSU List (showing serial no). to clipboard	**Chapter 17**

Exploring the RADWIN Manager Main Window - HSU

You may log on to a HSU over the air from a HBS or by directly connecting a Managing Computer to the HSU whether through a switch or directly to its PoE. You can log on over the air to any registered HSU. The HSU main window is different from the HBS main window, however it uses the same GUI and the same labels for common entry fields.

Logging on to a HSU

You can log on to a HSU of an established sector. The log on procedure is the same as for a HBS. Suppose we log on to HSU with IP address 10.104.50.1: We initially receive the following caution:

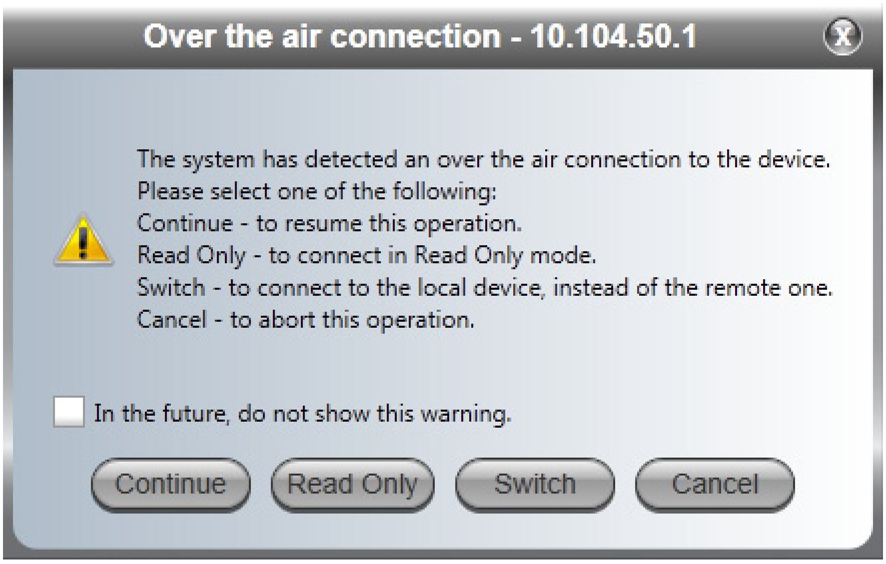


Figure 4-28: Logging on to a HSU

Upon clicking **OK** to dismiss the caution, we get a variation of the previous main window:

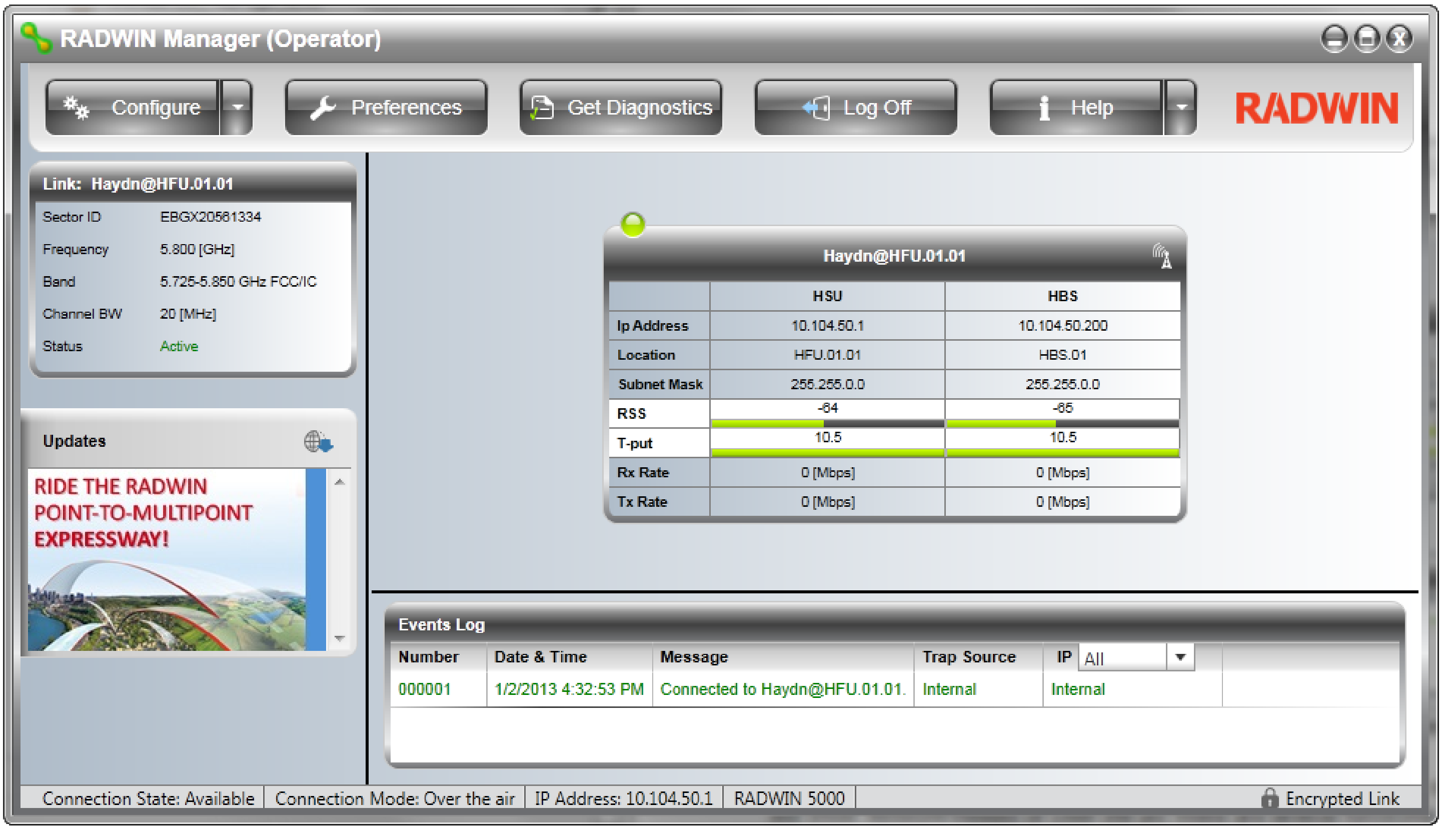


Figure 4-29: Opening RADWIN Manager window - HSU

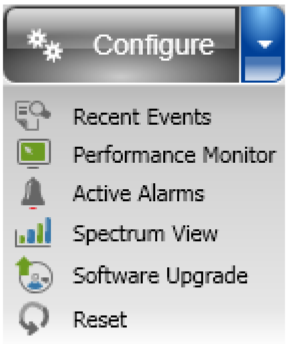
The direct log on window differs only in the bottom status bar where the Connection Mode will show *Network* instead of *Over the air*. There are several functional differences between the log on modes, which we will explain in the following chapters.

HSU Main Button Menu

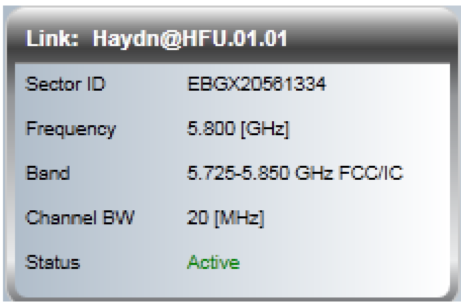
The HSU main button menu is similar to the HBS main button menu. The only new item is in the **Configure** button.

Figure 4-30: HSU main button menu

Table 4-11: HSU main button bar functions

Menu Item	Purpose
Configure	The Configure button opens HSU site configuration. The additional functions in the detail menu work in the same way as the corresponding functions for the HBS. 
Preferences	Monitor - File location, interval and throughput units
	Events - Color coding for events log and events log file location
	Advanced - Enable/disable check for updates, Monitoring interval and timeout
Get Diagnostics	Run and store diagnostics for all or some members of a sector
Log Off	Return to log-on window
Help	Link Budget Calculator
	Check for updates
	About
Help Button	View this User Manual

HSU Link Status



HSU Events Log

The HSU events display is functionally identical to that of the HBS.

Events Log

Number	Date & Time	Message	Trap Source	IP All
000001	1/2/2013 4:32:53 PM	Connected to Haydn@HFU.01.01.	Internal	Internal

HSU Link Performance

Haydn@HFU.01.01

	HSU	HBS
Ip Address	10.104.50.1	10.104.50.200
Location	HFU.01.01	HBS.01
Subnet Mask	255.255.0.0	255.255.0.0
RSS	-64	-65
T-put	10.5	10.5
Rx Rate	0 [Mbps]	0 [Mbps]
Tx Rate	0 [Mbps]	0 [Mbps]

The HSU Link Performance panel shows the same fields as in **Figure 4-25**. For convenience we also display the corresponding parameters for the HBS.

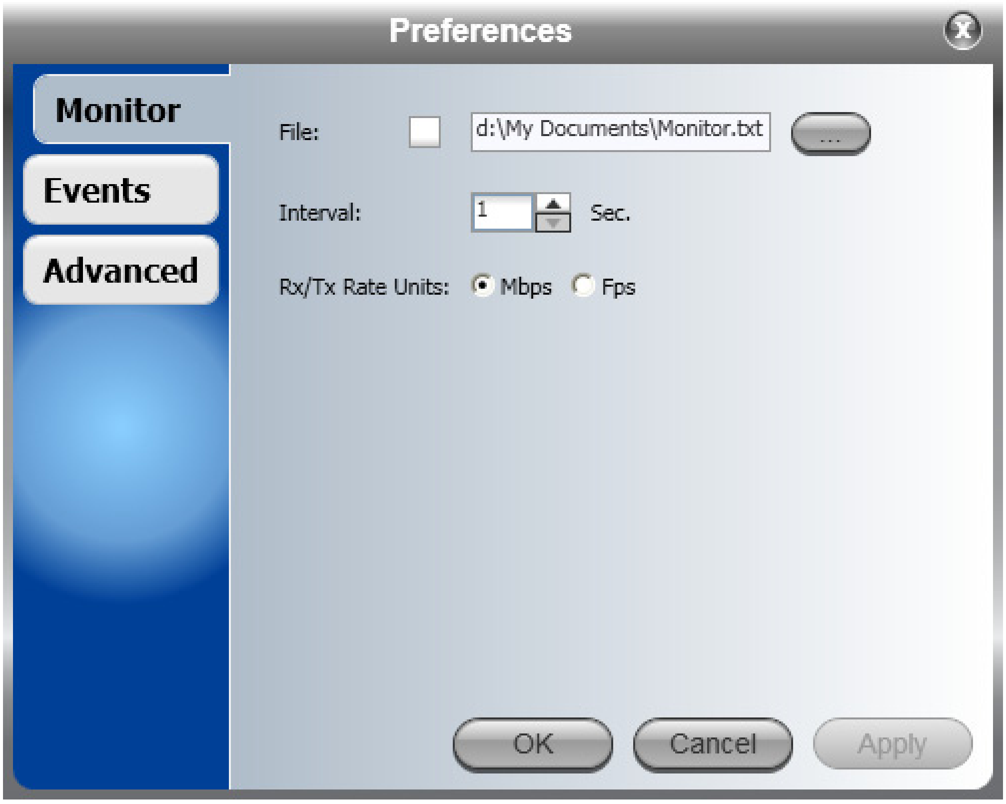
Setting RADWIN Manager Preferences

The Preferences tabs appearing on both the HBS and HSU relate entirely to the way the Manager displays certain items for the connected unit. They are completely local to the managing computer. They are also functionally identical for both the HBS and HSUs.

Note

Each technician servicing a sector will need to set up his managing computer (typically a laptop) with his own preferences.

Monitor



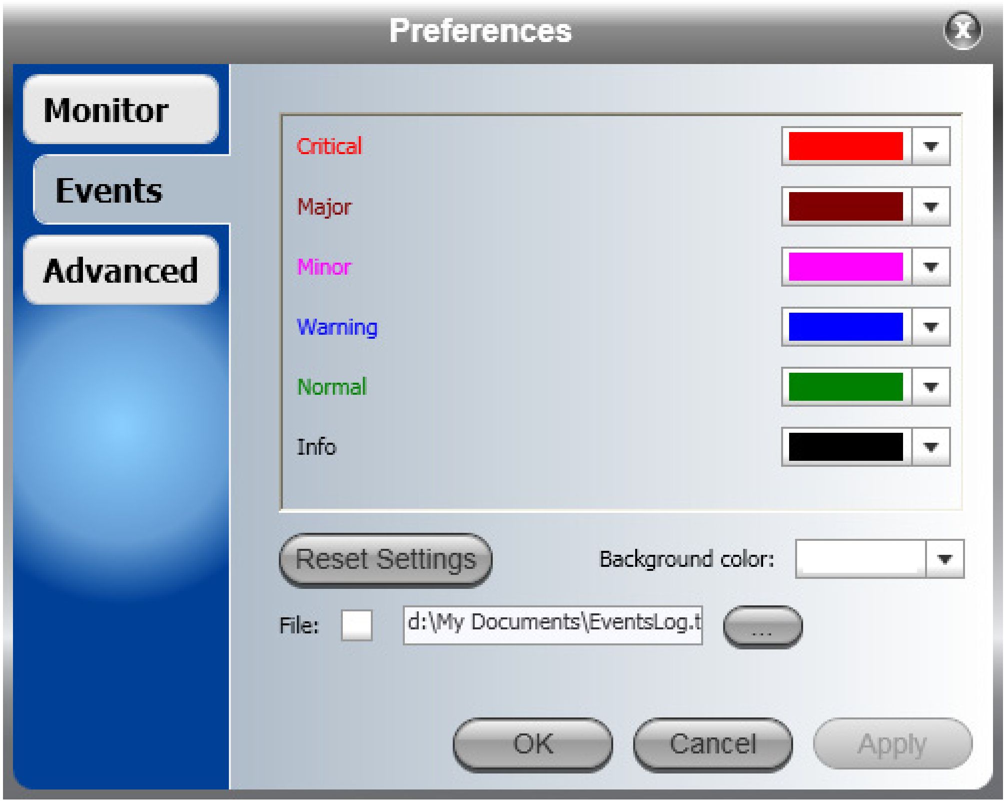
The Monitor file contains a vast amount of information and can become inordinately large very quickly. You should therefore choose a longer sampling interval if you intend to store this information for a lengthy duration.

For the HBS, it will show details for the HBS itself and all registered HSUs.

For a HSU, it will record the information just for that HSU. You should use distinctive file names for HBS and HSU Monitor files.

The content of the Monitor file will be discussed in more detail in **Chapter 9**.

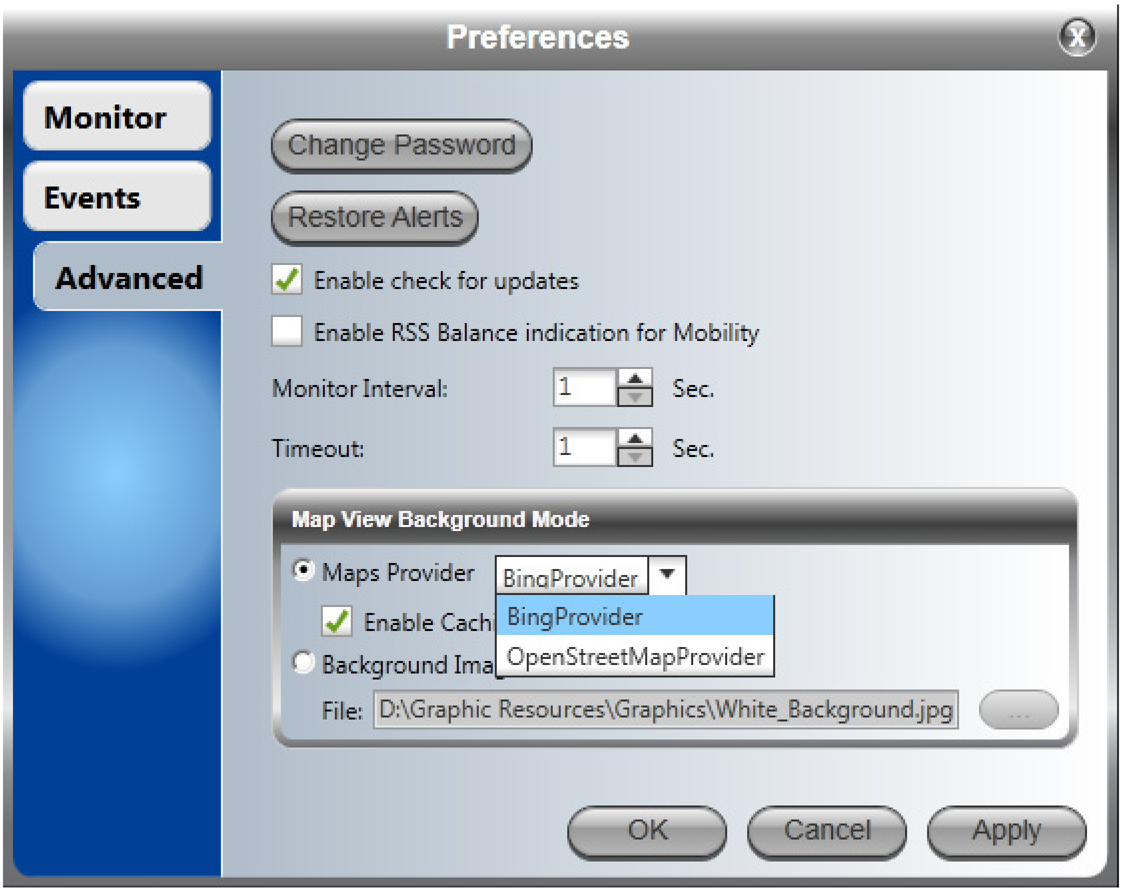
Events



Here you may choose your own color coding for the Recent Event display (see **Chapter 9**).

You may also choose a location and file name for the events log for storage. These settings are again, per HBS or HSU. To avoid over-writing, you should use file names reflecting their source ODU.

Advanced

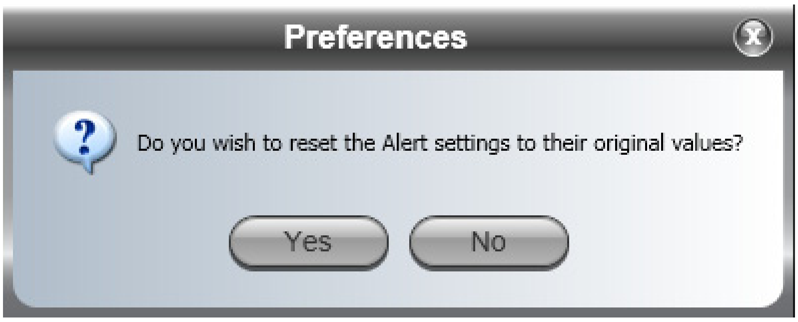


Change Password

You may change your log-on password here from the default, **admin**.

Restore Alerts

Many alert messages in the RADWIN Manager have an option of the form "Do not show this message again". These alert messages can be reverted to their default state (shown) by clicking the **Restore Alerts** button. You will be asked to confirm:



Check for Updates

If you are not connected to the Internet, disable the **Check for updates** check box.

Monitoring and Timeout Intervals

The monitoring interval determines the lowest interval between request to the ODU for status updates. The timeout (default 1 sec, maximum 5 sec) may have to be increased if you are on a slow network.**Setting the Map View Background Mode**

You have a choice of two map providers, a default or a self-chosen background. If you log on without an Internet connection, you will get a default gray background or, if you have caching enabled, your last used map.

What Comes Next?

The purpose of this chapter was to offer an overview of a running RADWIN 5000 HPMP a sector. The next three chapters will cover respectively, detailed sector setup considerations, sector management and monitoring and diagnostics. The foregoing background should provide sufficient "signposts" to ensure that you do not become lost in the plethora of details required to commission and manage a fully operational sector.

Chapter 5

Installing the Sector

Scope of this Chapter

Chapter 4 offered an overview of a running Sector as motivation for the technical installation details set out below.

Assuming that the Sector equipment is in place as described in earlier chapters, sector installation has two phases:

- Configuring and activating the HBS
- Bringing up the HSUs - configuration and registration

The same RADWIN Manager program is used for both the HBS and the HSUs. Much of the process is common to both types of ODU. We will cover the HBS in detail; for the HSUs we will concentrate on those items which are different. In any event, where setup procedures are common we will point them out.

This chapter covers fixed and nomadic HSU configurations. Mobile HSUs are covered in **Chapter 8**.

Concepts

A HBS out of the box, must be configured with

- Basic RF parameters such as frequency band, channel bandwidths and Sector ID
- Networking parameters such as IP address, subnet mask and default gateway

At this point, the HBS is in an **inactive** state, powered up, configurable but not transmitting anything.

Upon **activation**, the HBS will commence transmitting and receiving packets related to sector management only - that is no service. Activation and Deactivation are effected quite simply by clicking a toggle button.

Assuming that the Sector HSUs are mounted aligned and powered up, the HSUs will **discover** the HBS establishing links for management only. At this point the HSUs may be managed over the air.

As soon as the HSUs are configured to your satisfaction, you must **register** them on the HBS. Registration of an HSU enables service traffic between the HSU and the HBS. The HBS keeps track of registered HSUs by maintaining a table of their MAC addresses. Registered fixed HSUs set an internal flag so that they cannot register simultaneously to more than one HBS.

During the registration process, you assign **time slots** to each HSU. A total of 64 time slots are available to each HBS to be distributed among the HSUs in the sector. The relative number of time slots determines the relative amount of service each HSU will receive. Each HSU receives at least two time slots. To disable an HSU you must deregister it. (A **suspend** mechanism is also available, to suspend service on an HSU for a limited period.)

For each registered HSU, you can set separately, the uplink and downlink **Maximum Information Rate** (MIR) in Mbps or leave it at **Best Effort**.

You may also manage an HSU **Connection table** to enable and disable connectivity between HSUs in a sector.

HSUs may be **fixed** or **nomadic**. The latter may be move around within and across sectors. Mobile HSUs (HMUs) may also move around within and across sectors. They are covered in **Chapter 8**.

Working with Nomadic HSUs

Each nomadic HSU is allocated to one of four HBS levels labelled A, B, C and D. Some operating parameters for each level (such as VLAN, MIR, QoS, time slots, fixed rate, MIMO/Diversity antenna mode) can be different for each level allowing for broad prioritization of service between different types of nomadic units. This requires that each nomadic HSU be assigned a level to join a sector.

A nomadic HSU may only send and receive service traffic while stationary. A nomadic HSU detects that it is time to seek the another HBS upon sync loss. Upon entering and stopping in a new sector, it may take several seconds to establish sync with the sector HBS.

Changing any of VLAN, MIR, QoS, fixed rate, MIMO/Diversity antenna mode for one configured HSU at a given level, changes all other HSUs at that level. If you add a new HSU to a sector (by direct connection) at a given level, at sync time, it will acquire the existing parameters for that level.

Workflow

In this chapter, we assume that you are familiar with the graphical user interface described in **Chapter 4**, including Geographic location. We will concentrate here on sector radio setup workflow. To this end, the installation will be carried out against a blank white background. At the end of the process we will complete the sector by opening the map to reflect our Geographic positioning data.

Prior to commencing, you should have a written sector plan along the lines of **Table 5-2**.

Default RADWIN 5000 HPMP Settings

The default settings of the RADWIN 5000 HPMP configuration parameters are listed in **Table 5-1** below.

Table 5-1: Default settings

Unit	Parameter	Default Value
HBS	IP Address	10.0.0.120
	Net Mask	255.0.0.0
	Default Gateway	0.0.0.0
	Location	Location
	Contact	Person
	Name	Contact
	Factory default band	Product dependent
	Channel Bandwidth	20MHz
	RADWIN Manager log-on passwords	
	Observer	admin
	Operator	admin
	Installer	wireless
	Link Password	wireless-p2mp
	Geographic location	
	Latitude	51.47885
	Longitude	0.01060
	Antenna height (m)	130
HSU	IP Address	10.0.0.120
	Net Mask	255.0.0.0
	Default Gateway	0.0.0.0
	Location	Location
	Contact	Person
	Name	Name
	RADWIN Manager log-on passwords	
	Observer	admin
	Operator	admin
	Installer	wireless
	Link Password	wireless-p2mp

For convenience, we repeat the table of parameters used in our demonstration sector. Parameters not listed are left at their default values::

Table 5-2: Preconfigured setup

<table>
<tr><th>Unit</th><th>Location</th><th>Attribute</th><th>Value</th><th>Remark</th></tr>
<tr><td rowspan="14">HBS</td><td rowspan="14">HBS.01</td><td>IP Address</td><td>10.104.50.200</td><td rowspan="3">All communicating HSUs and HBS in the same subnet</td></tr>
<tr><td>Net Mask</td><td>255.255.0.0</td></tr>
<tr><td>Default Gateway</td><td>10.104.10.21</td></tr>
<tr><td>Sector ID</td><td>EBGX20560334</td><td>Inherited by all communicating HSUs</td></tr>
<tr><td>Contact</td><td>Bach</td><td>Optional</td></tr>
<tr><td>Name</td><td>Bach@HBS.01</td><td>Location of Contact - optional</td></tr>
<tr><td>Band</td><td>5.730 - 5.845 GHz FCC/IC</td><td>Inherited by all communicating HSUs</td></tr>
<tr><td>Channel Bandwidth</td><td>20MHz</td><td>Inherited by all communicating HSUs</td></tr>
<tr><td colspan="3">Geographic location</td></tr>
<tr><td>Latitude</td><td>-37.8148</td><td></td></tr>
<tr><td>Longitude</td><td>144.9630</td><td></td></tr>
<tr><td>Azimuth (deg)</td><td>0</td><td rowspan="2">Used for initial default placement of HSUs</td></tr>
<tr><td>Beamwidth (deg)</td><td>90</td></tr>
<tr><td>Antenna height (m)</td><td>130</td><td>From RF plan, not used</td></tr>
</table>

Table 5-2: Preconfigured setup (Continued)

Unit	Location	Attribute	Value	Remark
HSU	HFU.01.01	IP Address	10.104.50.1	All communicating HSUs and HBS in the same subnet
		Net Mask	255.255.0.0	
		Default Gateway	10.104.10.21	
		HSU type	Fixed	8 time slots
		Contact	Haydn	
		Name	Haydn@HFU.01.01	
		Geographic location		
		Latitude	-37.8762	
		Longitude	145.0437	
		Antenna height (m)	10	From RF plan, not used
	HFU.01.02	IP Address	10.104.50.2	All communicating HSUs and HBS in the same subnet
		Net Mask	255.255.0.0	
		Default Gateway	10.104.10.21	
		HSU type	Fixed	8 time slots
		Contact	Mozart	
		Name	Mozart@HFU.01.02	
		Geographic location		
		Latitude	-37.4018	
		Longitude	145.0086	
		Antenna height (m)	60	From RF plan, not used
	HNU.01.01	IP Address	10.104.50.3	All communicating HSUs and HBS in the same subnet
		Net Mask	255.255.0.0	
		Default Gateway	10.104.10.21	
		HSU type	Nomadic	6 time slots
		Contact	Brahms	
		Name	Brahms@HNU.01.01	
		Geographic location		
		Latitude		Depends on location
		Longitude		
		Antenna height (m)		
	1	HSU type	Nomadic	6 time slots
	2	HSU type	Nomadic	4 time slots
	3	HSU type	Nomadic	4 time slots
	4	HSU type	Nomadic	2 time slots

We have also add place-holders for a further four nomadic HSUs. That is, up to four more vehicles equipped to work in this way, may simultaneously enter the sector.

Tip

Choose your unit locations carefully. For example, for three collocated HBSs each with 32 HSUs covering 360°, matters get out of hand very quickly if units are poorly named. They can always be identified by their IP addresses, but that is a poor substitute for effective naming. A URL-like naming pattern based on HBS_n.HSU_y is clear and familiar to all Internet users. Keeping the names IP address independent enables you to copy the entire sector setup to a different geographic location without IP address duplication.

Configuring the Sector out of the Box - IP Addresses

The default log-on IP address for all ODUs in the sector is the same: 10.0.0.120, subnet mask 255.0.0.0 and default gateway 0.0.0.0. To get the process started, set up the IP address on the network card on the managing computer to something like 10.0.0.100, subnet mask 255.255.255.0 and Default Gateway 0.0.0.0.

Ensure that you have a direct LAN connection to the HBS, run the RADWIN Manager and log-on to it.

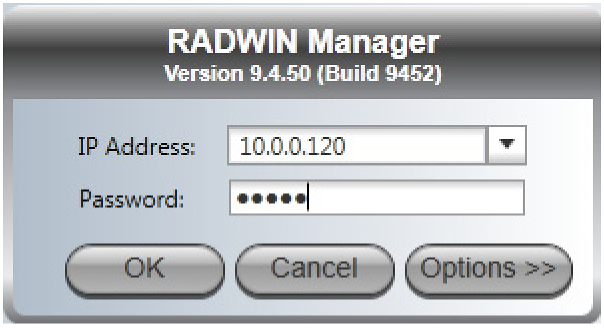


Figure 5-1: Logging on with factory default IP address

Alternatively, you can log on using Local Connection without need to change your Network Interface Card address:

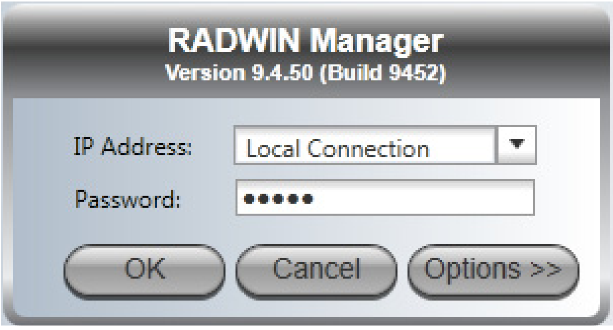
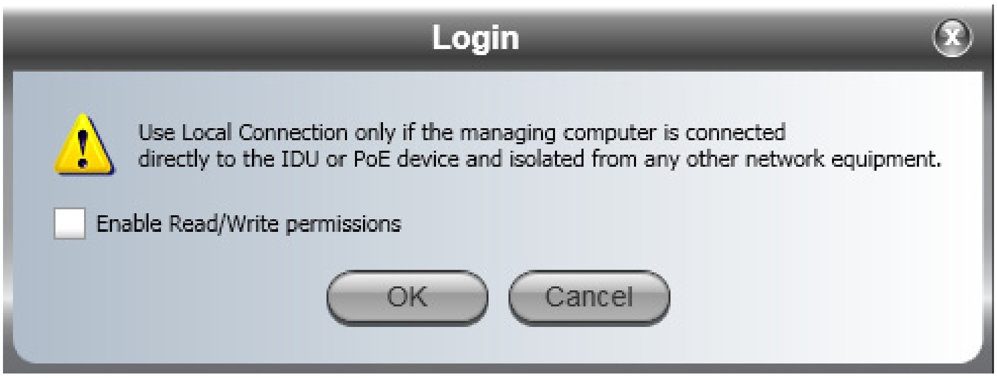


Figure 5-2: Logging on with Local Connection

- The **Local Connection** method uses broadcast packets to “discover” the attached ODU
- If you log on using **Local Connection**, but your physical connection is not local (i.e. anything other than a direct connection between the managing computer and the PoE device), then any configuration you carry out may affect other links in the network. **Do not do this!**
- Do **not** carry out this procedure using a multi homed managing computer also connected to a network. It will flood the network with broadcast packets. Further, it will throw any other links on the network into Installation or Inactive mode.

Warning



- In any event, as a precaution, default log-on over Local Connection is read-only mode. Check the Read/Write enable box to carry out installation procedures.
- **Network log on (IP address to the ODU) is recommended.**

Here is the initial main display using Local Connection:

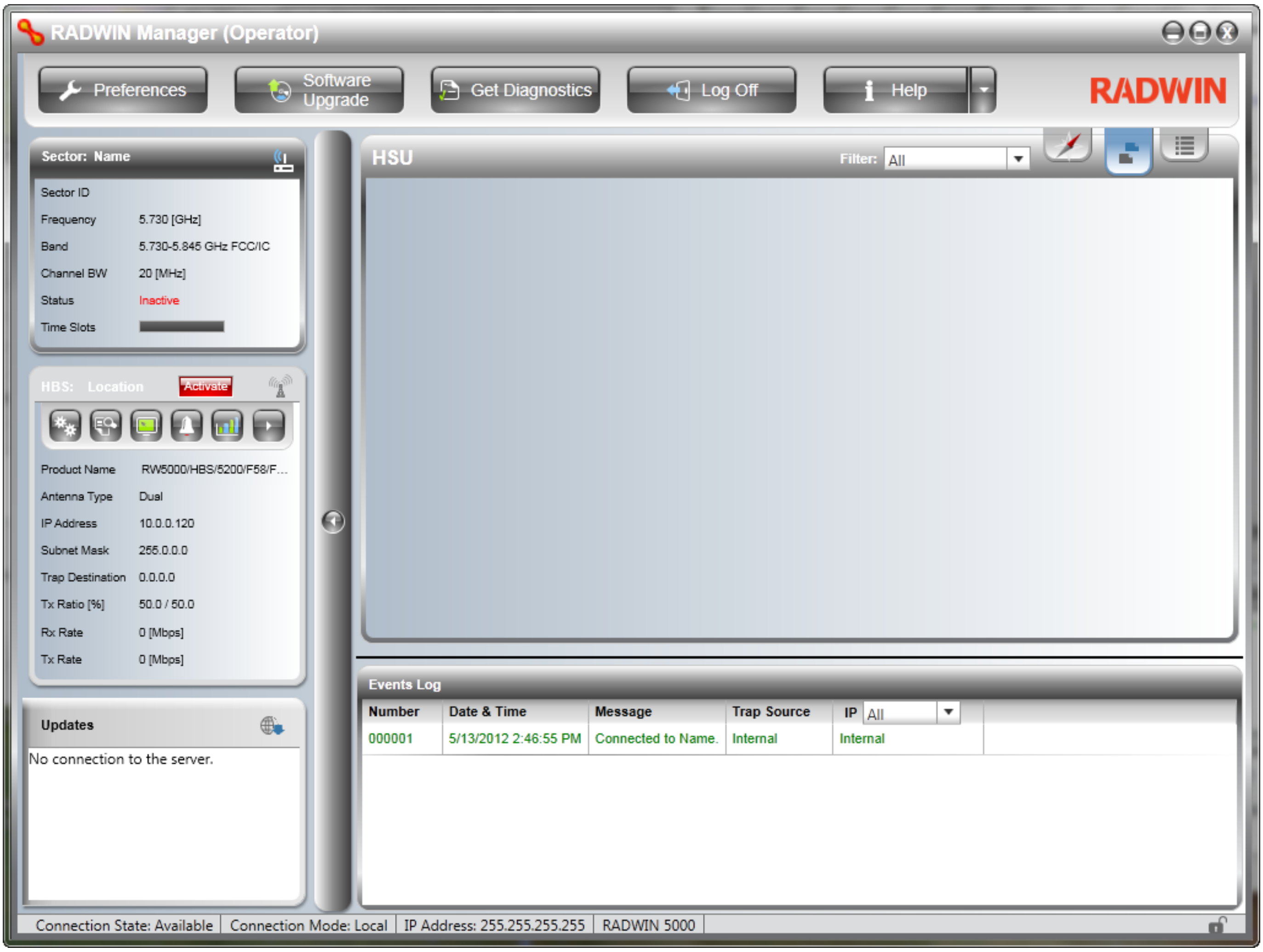


Figure 5-3: Main window for un-configured HBS ODU

Notice the red icon on the top left corner of the window. It will change to green as soon as the HBS is configured and activated. Here is the work-flow:

1. Activate the HBS which includes setting its IP address. It will then “see” the deployed HSUs regardless of their IP address.
2. Configure the HSUs
3. Register the HSUs to the HBS for traffic
4. Complete HSU configuration including HSU Connection Table and any other required fine tuning.

➢ To activate a HBS:

1. Click the **Activate** button. The Activation Wizard opens.

2. Click **Next**:

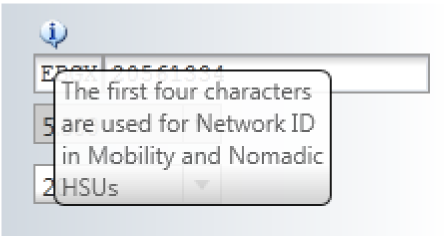
Enter the Sector ID, Name and Location. All fields are mandatory. Here are entries in accordance with **Table 5-2**.

About the Sector ID:

Any unregistered HSU will establish a link with the first HBS it detects and inherit the Sector ID from the HBS. As soon as the HSU is registered for service with the HBS, the HSU's inherited Sector ID can no longer be changed while linked: It is "locked" into the HBS. This mechanism prevents an HSU close to a sector boundary from "drifting" between HBSs for adjacent sectors.

Notice that the Sector ID is split into two parts as shown in the previous figure. For a network consisting of sectors with fixed HSUs only, the split is immaterial. If the sector is part of a network having non-fixed HSUs, then each Sector ID for each participating sector should have the same four character Network ID. The remaining part is ignored when an HBS establishes a link with a non-fixed HSU. This feature enables non-fixed HSUs to establish a link with any HBS in the network.

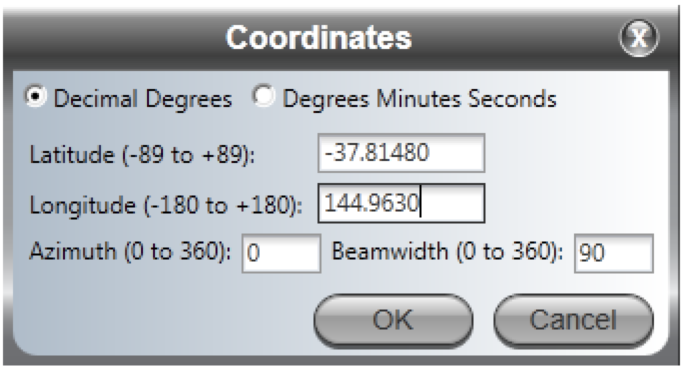
The Sector ID is split into a four character Network ID (EBGX) and the remaining part (20561334).



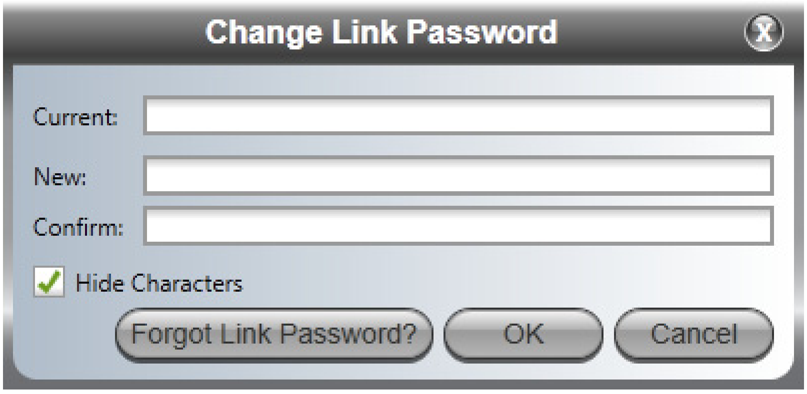
For fixed HSUs you may ignore the split. For non-fixed HSUs, the use of the split Sector ID is explained on **page 7-4**.

Choose your Sector ID it carefully particularly if you are using collocated HBSs for extra coverage. The Sector Name and Location are convenience items but should be chosen to ensure that the sector is documented and easily identifiable in your RF planning.

3. Open the Coordinates dialog to set the location of the HBS in accordance with **Table 5-2**:



4. The Link Password may also be changed by clicking **Change**:

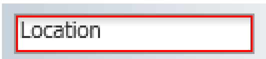


Full details for changing the Link Password may be found on **page 6-10**.

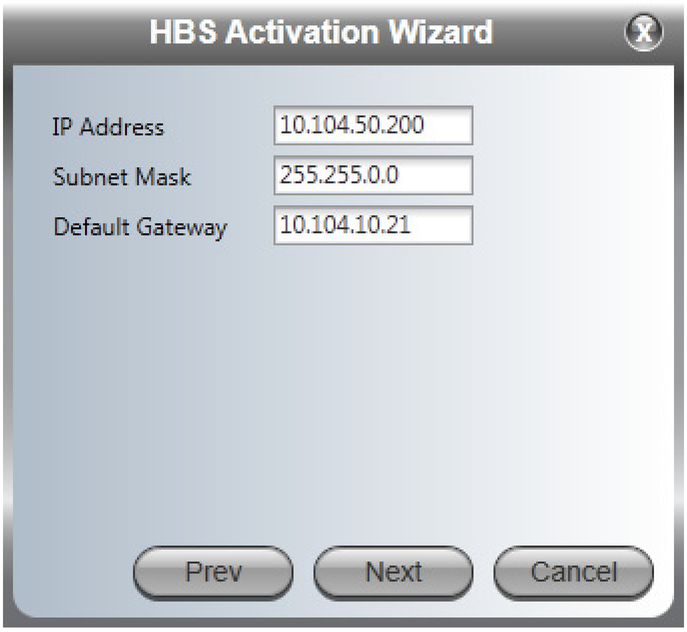
It is best left as is if there is no pressing need to change it.

Note

If you skipped an entry, it will be framed in red like this:



5. From the previous Activation Wizard window, click **Next**.

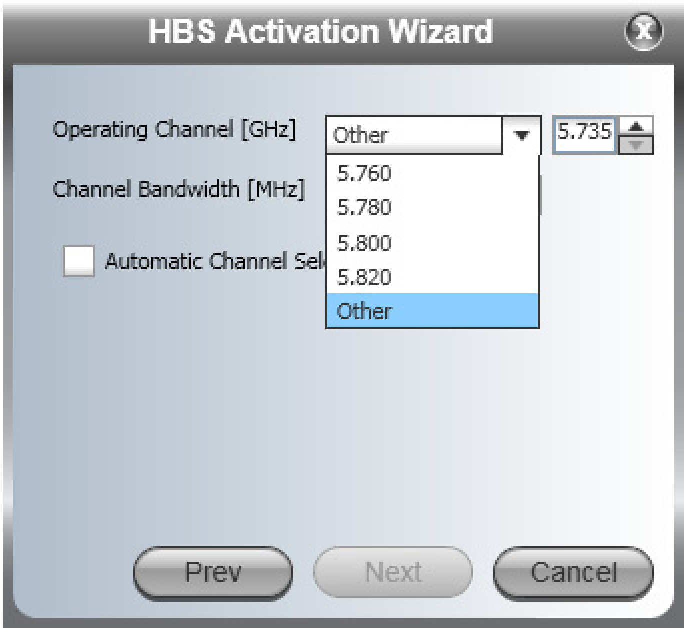


Here you may enter the IP details if didn’t do it earlier. Click **Next**.

6. The next window is used to set the frequency and channels.

The default frequency is the lowest available (5.735 GHz) in the operating band, here, 5.730 - 5.845 GHz FCC/IC.

7. Click **Other** to see other available bands for this HBS.



8. For our purposes, we choose 5.820 GHz:

Observe that the right hand spin-wheel 

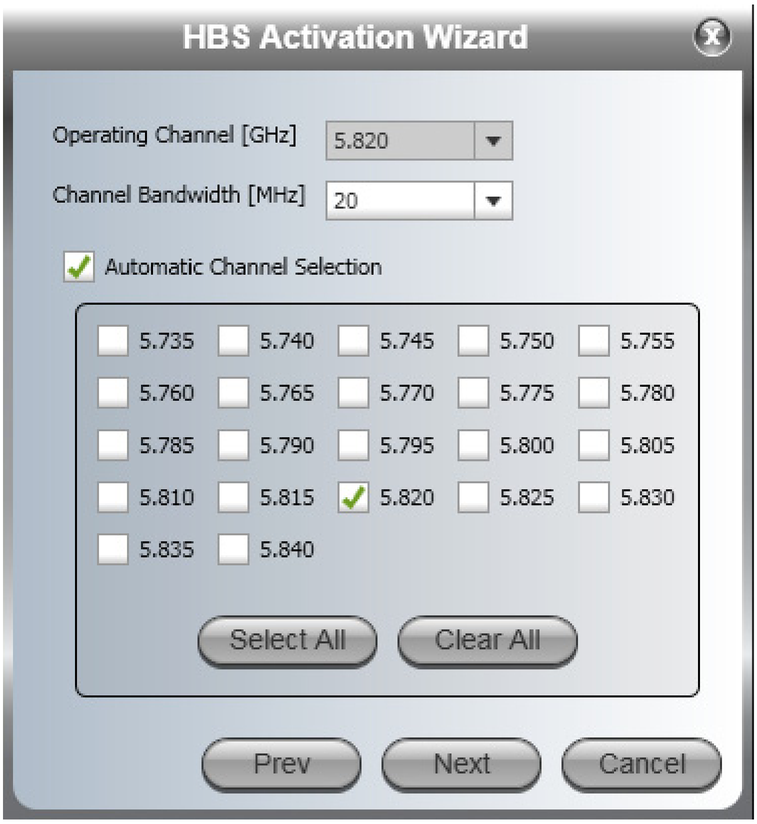
is no longer displayed. Had you left **Other** enabled, you could have chosen a frequency by working through those available in 5MHz increments.

9. Choose the required Channel Bandwidth:

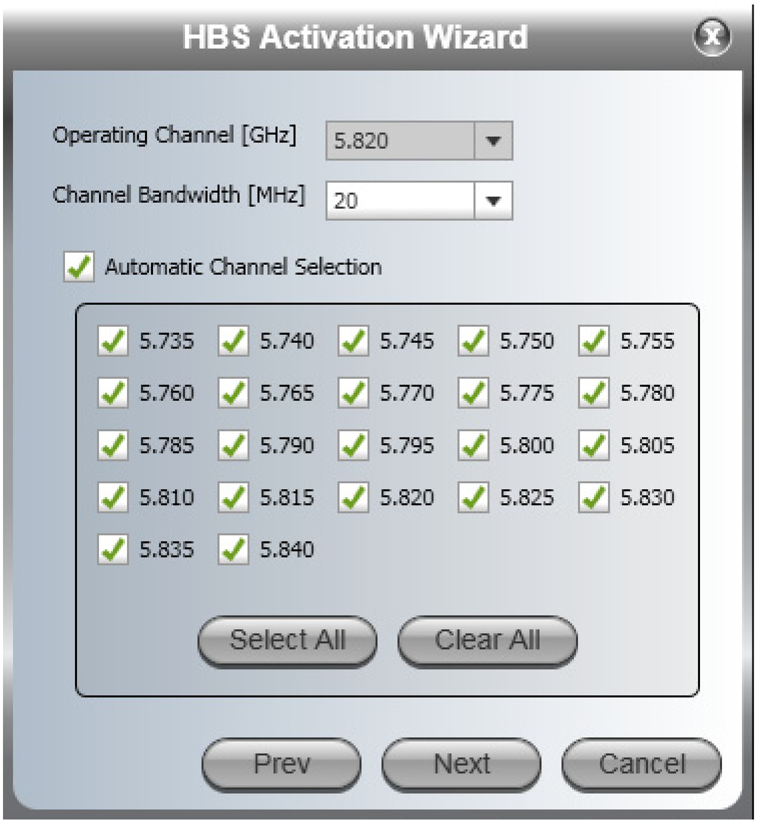
Note

If your hardware supports 200 Mbps net aggregate capacity, you should chose 40 MHz Channel Bandwidth to enable it.

10. To use ACS, check the Automatic Channel Selection box:

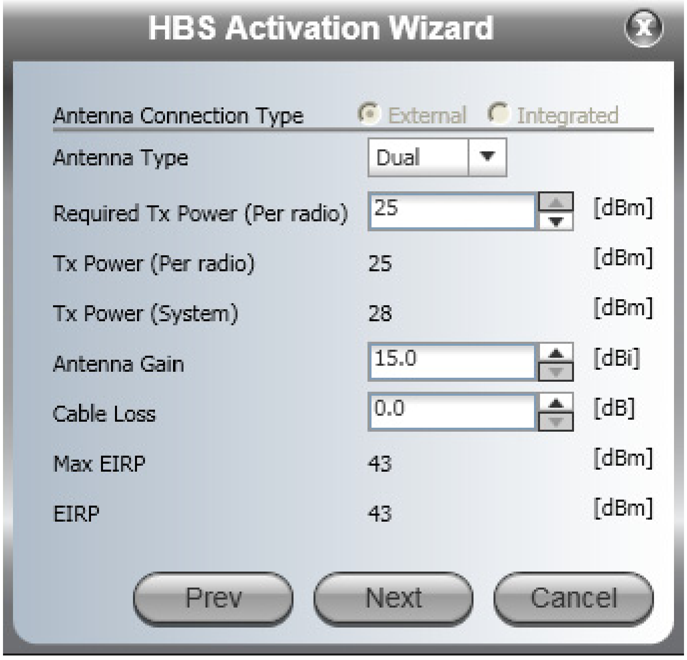


You can perform a customized channel selection or click **Select All** to check all the channel boxes as shown:



Automatic channel selection at the HBS makes little sense beyond configuration time. You may leave all or several of the channels selected for now. In practice, after having fully configured the sector you would disable all but the actual operating channel.

11. Click **Next**. The Antenna type and Tx Power window is presented:



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

Before completing antenna installation, you might like to consider the background information about setting antenna parameters, in **Appendix E**:

Warning

When setting Required Tx Power, it is your responsibility to chose a value in compliance with your local regulations.

Choose your Antenna Type, Required Tx Power, Antenna Gain and Cable Loss. We will set Required Tx Power to 5 dBm for our example. Click **Next**.

12. The Summary window of the Wizard is displayed.

Check that all information showed is correct and click **Activate**. After a few moments the sector HSUs will be displayed in the Manager HSU panel.

The field-installed HSUs appear ina Table view:

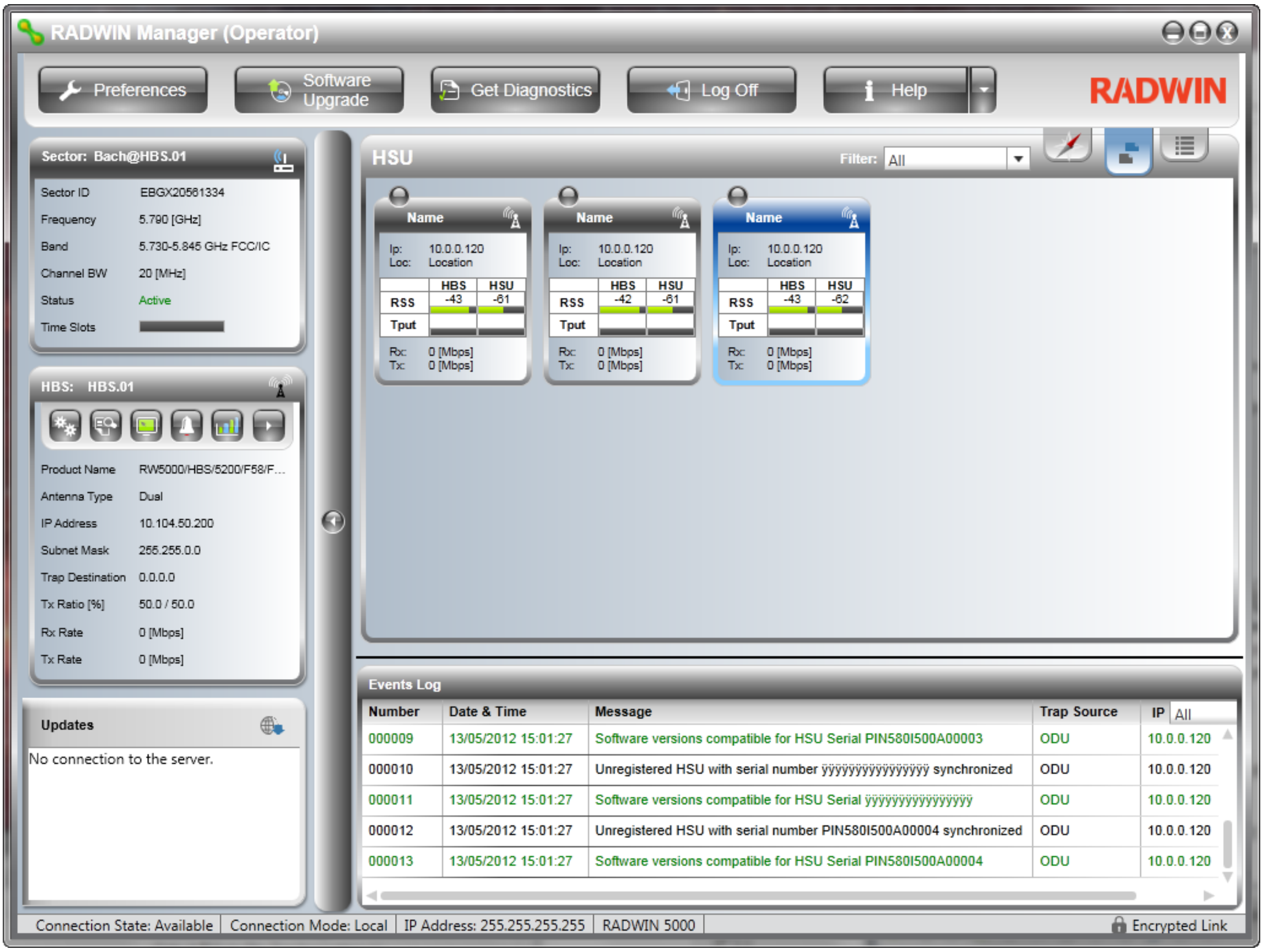


Figure 5-4: Activated HBS recognizing installed but unconfigured HSUs

If there are too many HSUs for the Table view, switch to the scrollable List view.

13. If you are using Local Connection, log out and log back in to the HBS on its IP address.

At this point, you are able to configure the HSUs for service.

You may have observed that operating frequency 5.790 GHz shown, is not what we chose (5.820 GHz). The HBS tries to optimize the frequency to minimize interference effects.

We next configure and register the HSUs. For fixed HSUs you can do this in either order. For nomadic HSUs you must define the HSU as Nomadic prior to registration. We will show the method below. Our preference is to carry out configuration first for all HSUs.

Configuring a fixed HSU From the HBS

The HSU activities described in this section, may be carried out any time - regardless of whether or not the HSU is registered for service or not. These activities include among other things, setting the Location, Contact, Name and IP address.

The procedures in this section should be carried out for each fixed HSU in the sector.

➢ **To configure a fixed HSU from the HBS:**

1. Right click an HSU to get its context menu:

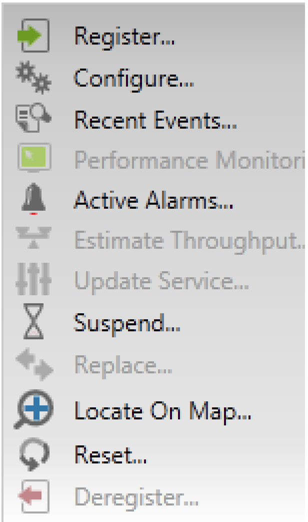
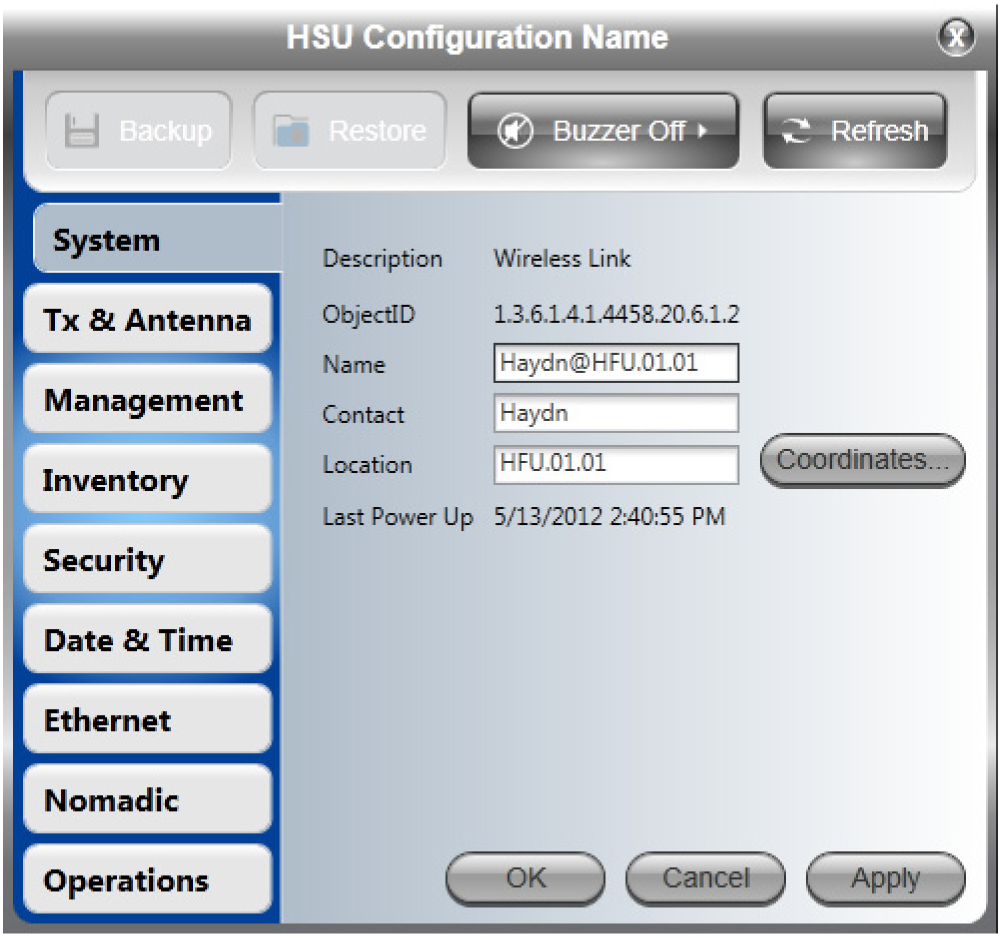


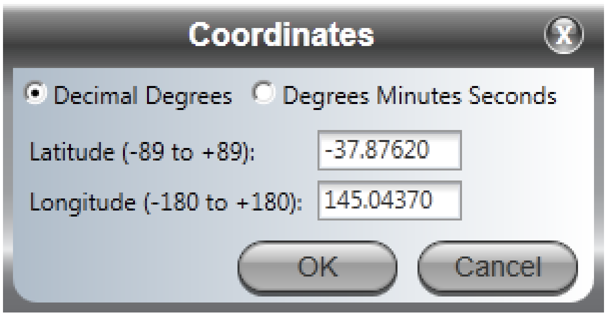
Figure 5-5: HSU Context menu

2. Click **Configure**. The Configuration dialog is displayed. If you have not already, enter a Name Contact and Location:

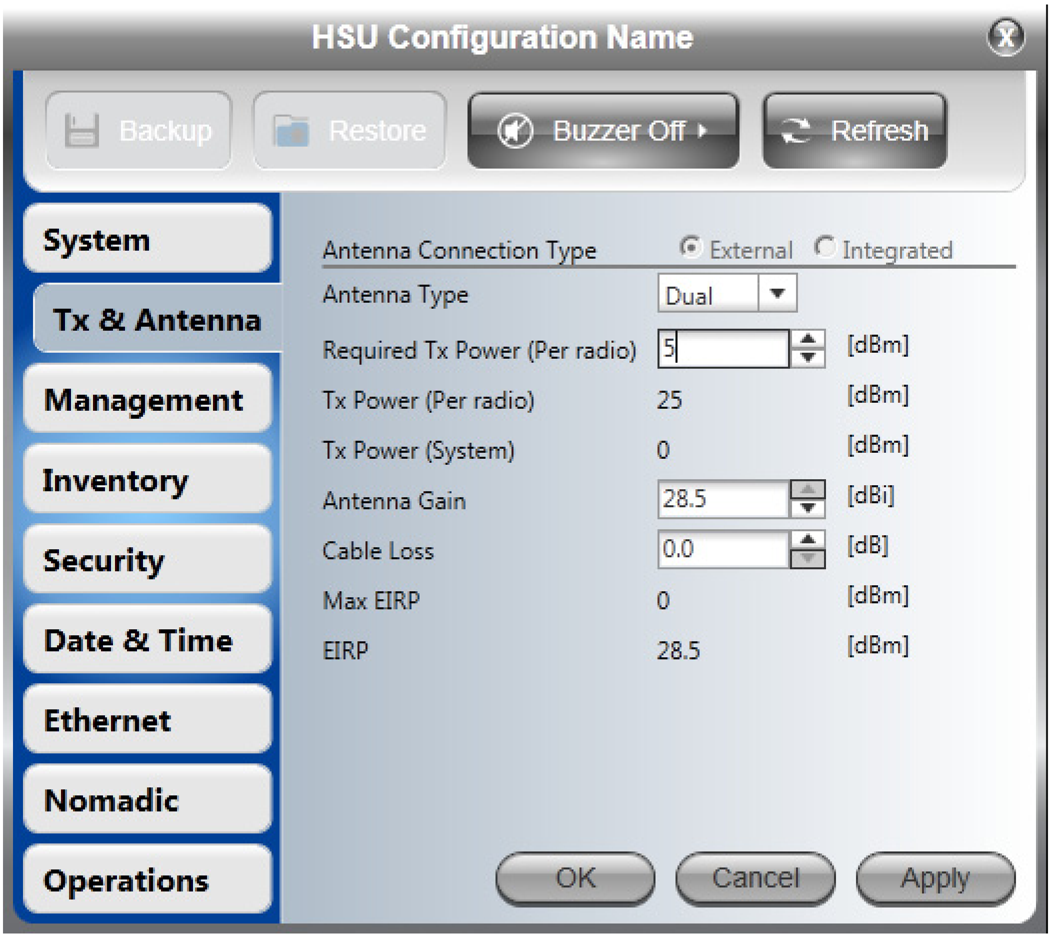
Location is a site name - typically a building or tower name. **Contact** is the contact person at that Location and **Name** is the Contact location. It might be just a telephone number. Here are our entries:



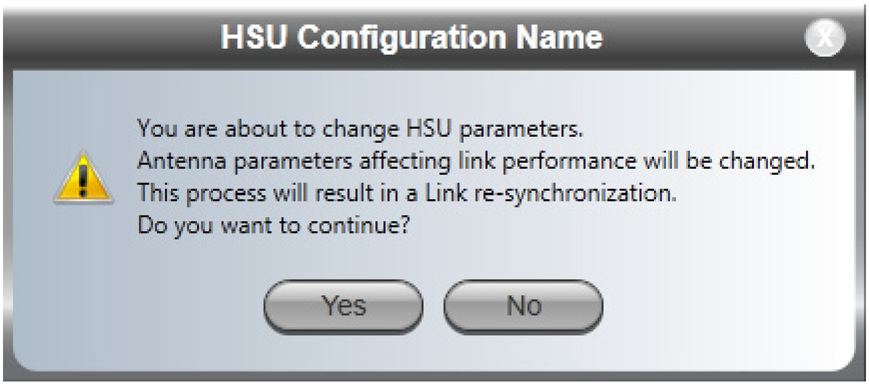
3. Set the Coordinates (latitude and longitude) for the HSU as shown in the Sector Plan:



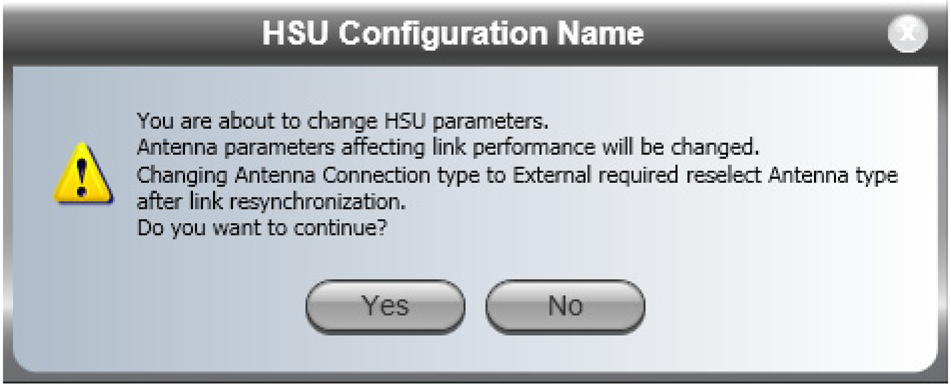
4. Set the HSU Tx Power (possibly as required by regulations). Click **Tx & Antenna**. The following dialog is displayed:



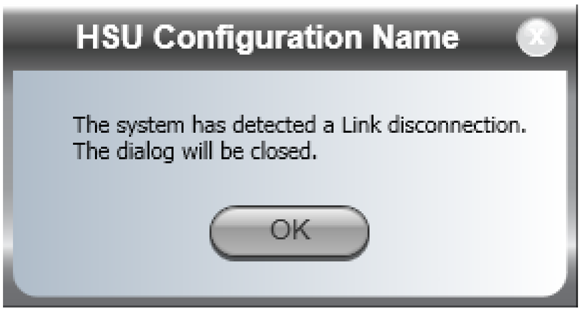
Set the Antenna Connection Type, Antenna Type, Required Tx Power, Antenna Gain and Cable Loss as required. For our example, we use external antennas and we set Tx Power to 5 dBm. If you click apply, you receive a confirmation request like this:



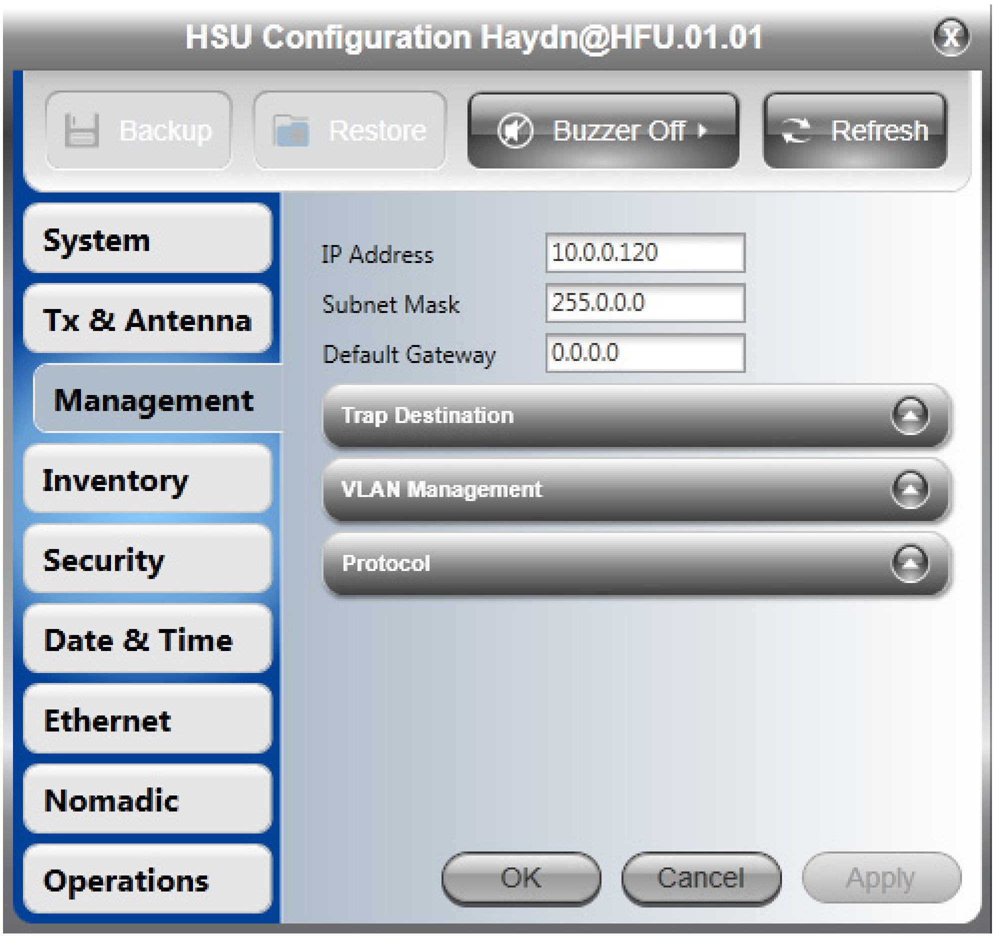
There are several variations of this message window, depending on what you change:



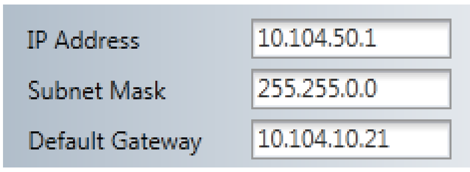
5. In any event, clicking **Yes** results in a further message appearing:



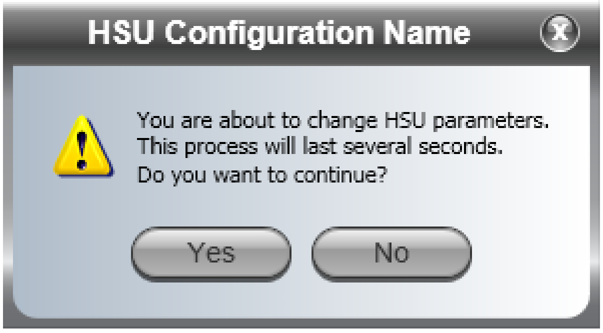
6. Click **OK**. The HSU display area refreshes with the newly configured HSU in its new location in the sector.
7. Reopen the Configuration dialog for the HSU and then open the **Management** tab.



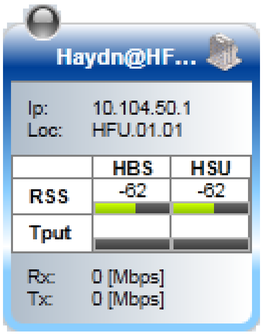
Change the default HSU IP Address, Subnet mask and Default Gateway as shown:



8. For now, we will leave the remaining fields. Click **OK** to exit the Configuration window. You will be offered a cautionary message:



Click **Yes**. The newly entered parameters for the HSU will be displayed following the next sync loss/restore to the HSU. You can achieve the same thing by issuing a rest to the HSU from its context menu.

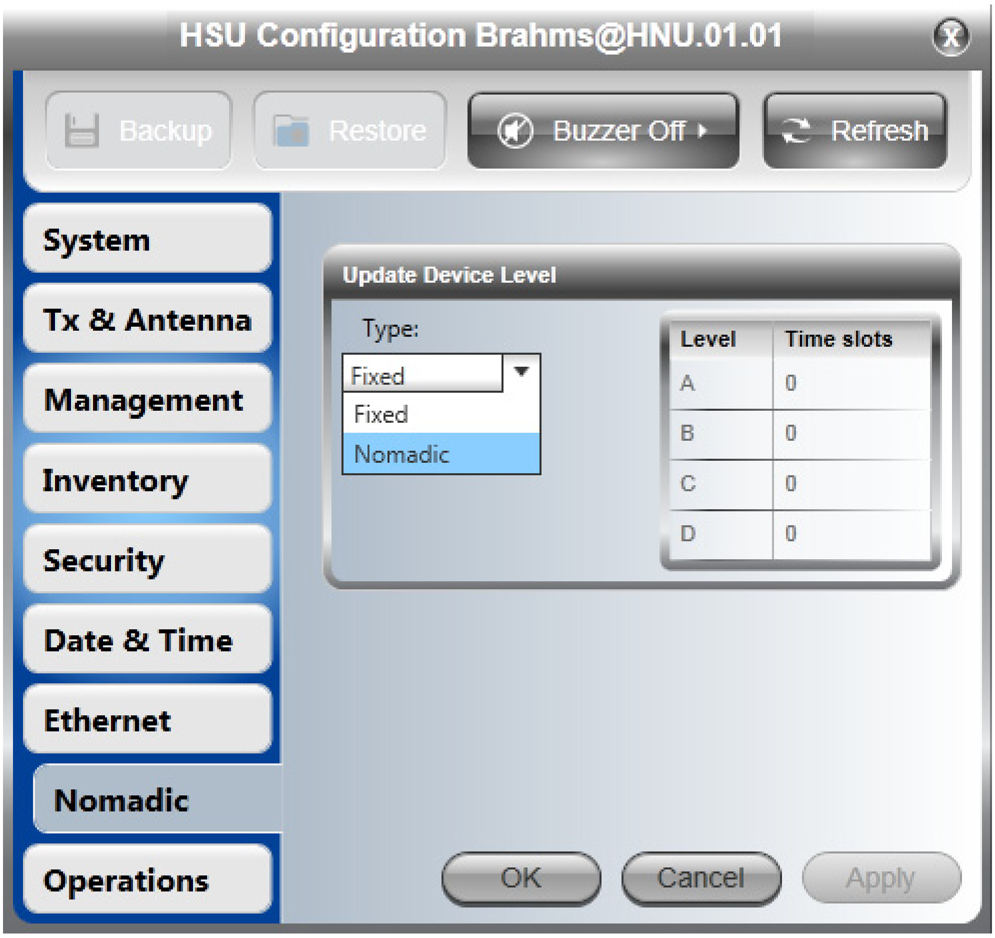


9. Repeat steps 1 to 8 for one more HSU.

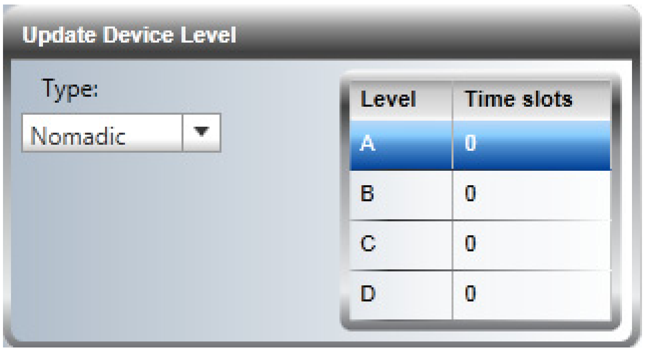
Configuring a nomadic HSU From the HBS

➢ To configure a nomadic HSU from the HBS:

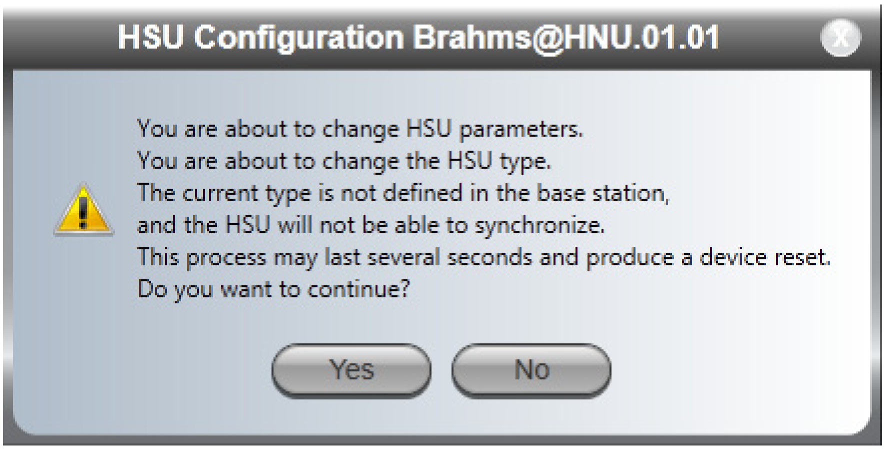
1. Carry out steps 1 to 7 as in the previous section for a fixed HSU.
2. Open the **Nomadic** tab:



3. From the Type list, choose **Nomadic**. The right hand Level list is enabled:



4. The four levels enable you to split nomadic HSUs into up to four service groups with (for example) different QoS parameters. Choose level A and then **OK.** The number of time slots allocated to the HSU will be updated during the registration process. You are offered the following confirmation message:



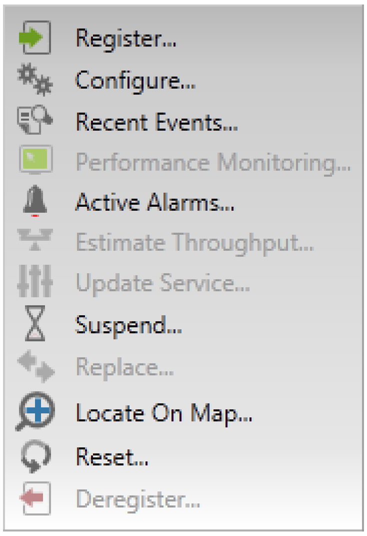
The HSU no longer appears on the HBS Table view. It will return following registration, to which we now turn.

Registering a fixed HSU for service

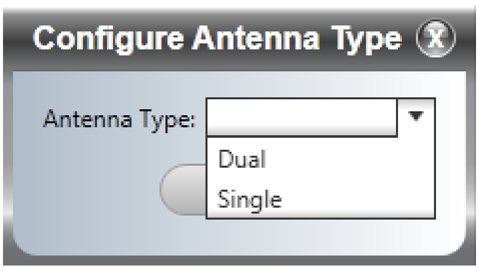
We continue our illustration using the HSU, HFU.10.101.

To register an fixed HSU for service:

1. Right click a fixed HSU to get its context menu:

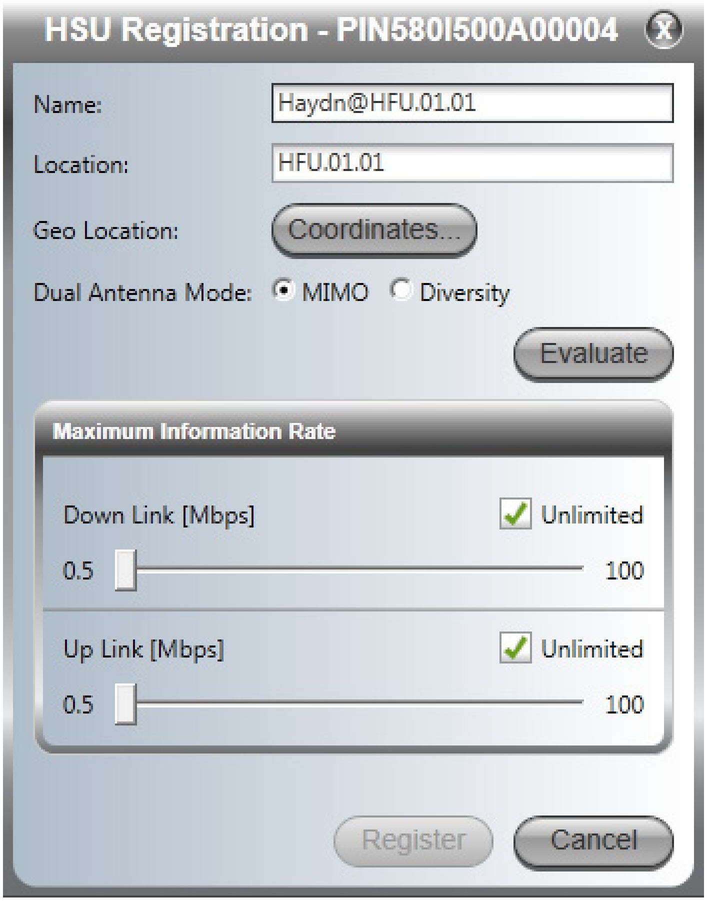


2. Click **Register...** If you did not configure the antenna type for the HSU, you are asked to do so now:



Choose the required type and click **OK**.

The Registration window opens:

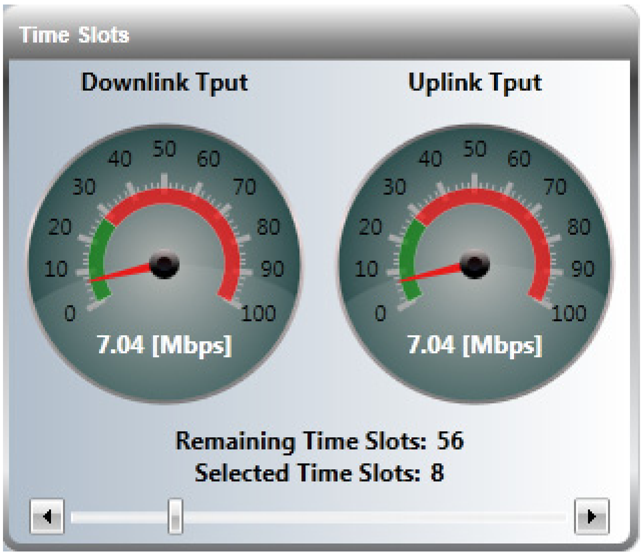


3. You may edit or add the site **Name, Location** and **Coordinates**.
4. If you are using Dual Antennas, you may check the MIMO or Diversity antenna mode. The choice is HSU specific. For further details about MIMO/Diversity antenna mode, see **Appendix E**.
5. Click the **Evaluate** button. Service evaluation takes a few seconds during which the window is darkened and inactive. Upon completion you may assign time slots to the HSU:

Figure 5-6: HSU Registration dialog

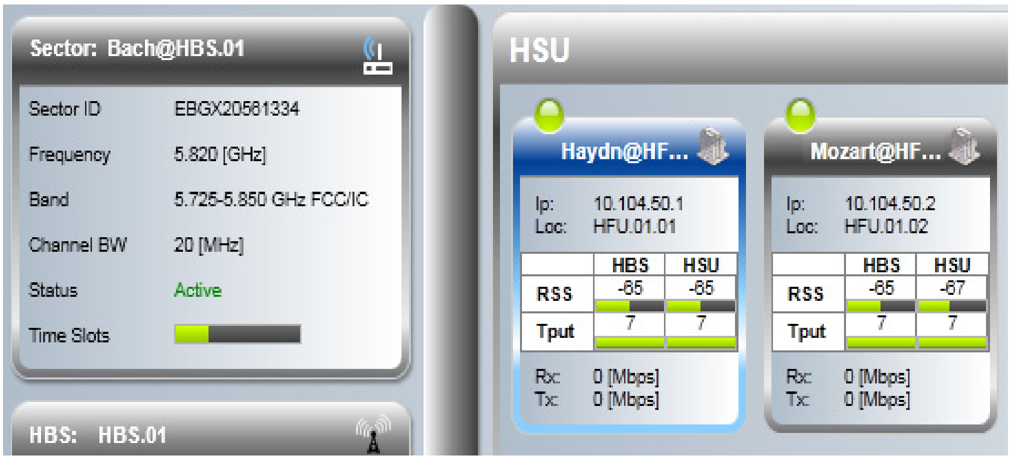
Notice that the Evaluating activity icon continues to rotate after completion of the evaluation. The Manager maintains dynamic monitoring of the sector for injection into the sector of HSUs elsewhere and accordingly reduces the available time slots.

6. Use the slider to choose the number of time slots to be allocated to the HSU.



The **Register** button is now enabled.

7. Use the sliders to set uplink and downlink MIR. You may defer this and carry it out using the HSU **Configure** option. The MIR acts as a "throttle".
8. Click **Register** it to complete the process. Here is the result for our example:



Observe that the registered HSU icon LED is now green and that the time slots bar on the left reflects the proportion of time slots allocated.

9. Repeat steps 1 to 8 for other fixed HSUs.

Registering a nomadic HSU for service

Although we only have one nomadic HSU in our demonstration sector, in practice we would make provision for a larger number to enable movement between sectors. By way of example, we will pre-register three HSU slots to levels A, B and C and time slots to each level as shown:

To configure nomadic HSUs from the HBS:

1. Open the HBS Configuration window and then its Nomadic Tab:

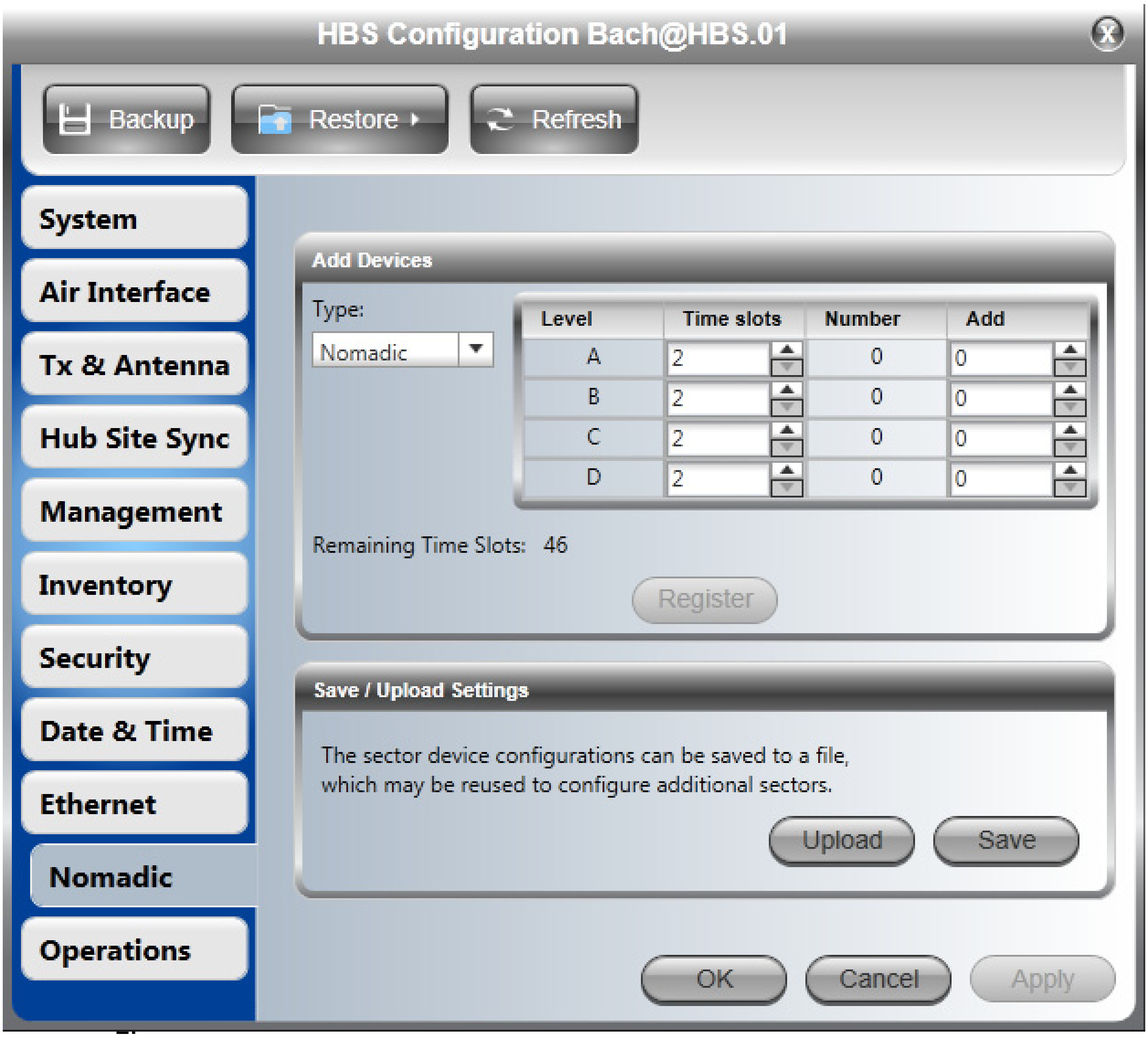
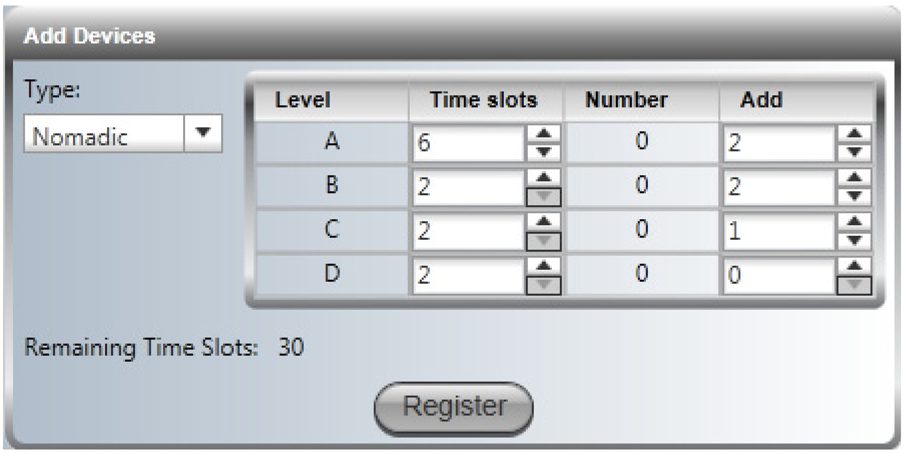


Figure 5-7: HBS Nomadic Configuration

3. In the **Add Devices** window, click the Add spin wheel buttons and the time slots spin-wheels as shown.



The **Register** button is enabled.

4. Click the **Register** button to register the HSUs. Note that you may use the bottom dialog to save or upload a saved HBS configuration. We will demonstrate uploading a saved configuration at the end of this chapter.
5. Exit the Configuration dialog.

The Final Outcome

Here is the outcome for our example:

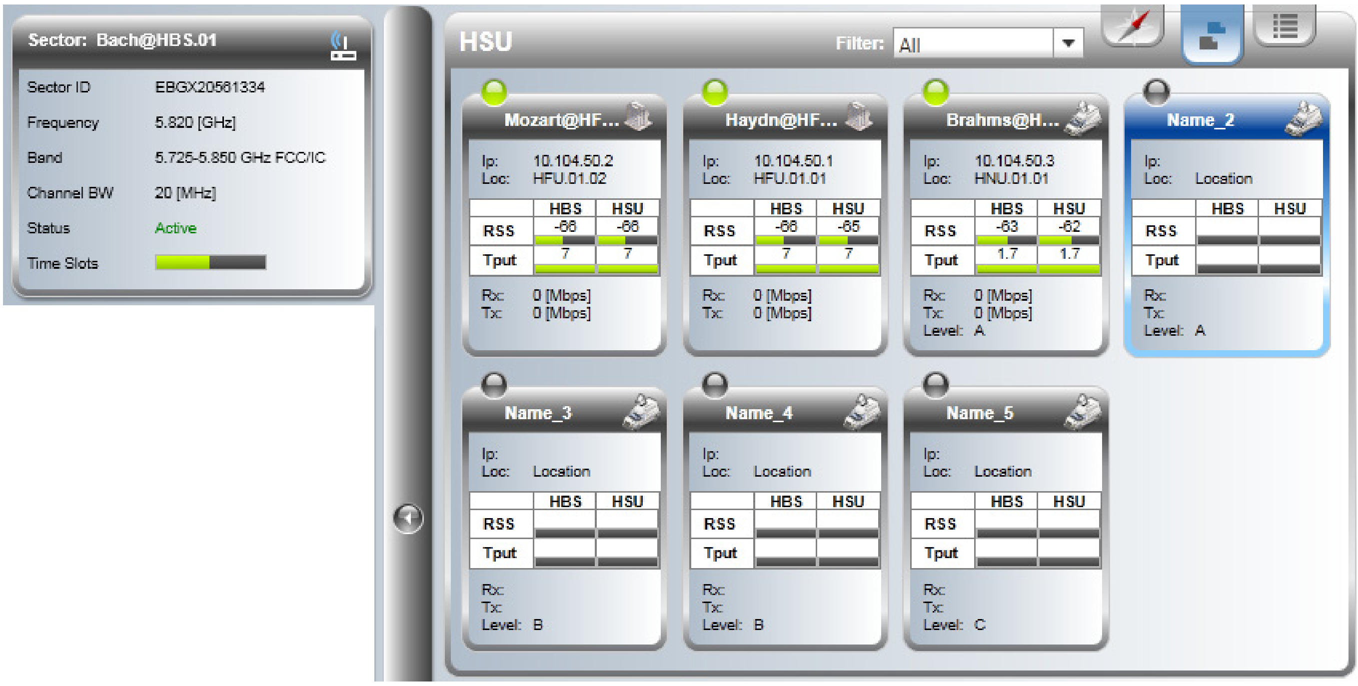


Figure 5-8: Fully functional mixed fixed and nomadic sector - Table view

Here is a Map view of a fixed sector:

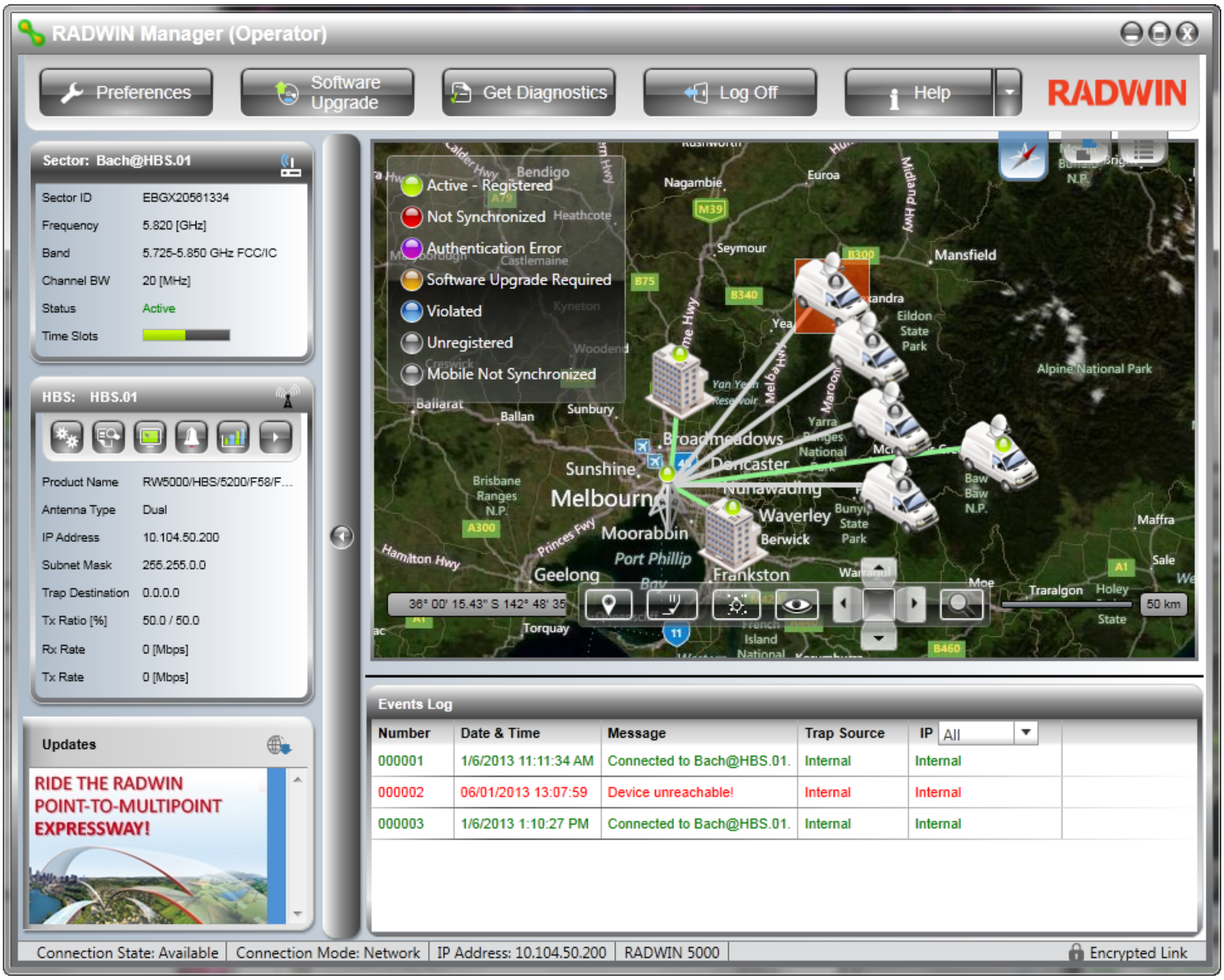


Figure 5-9: Fully functional mixed fixed and nomadic sector - Map view

You may now carry out any other adjustments to the HSUs from the HBS or by direct connection. Notice that we adjusted the Tx Power for all elements in the sector to keep the RSS at a reasonable level.

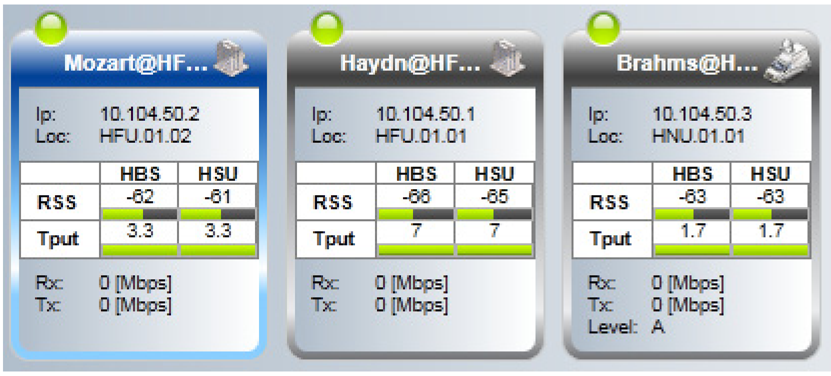
As a partial alternative method, you may enter the HSU **Name** and **Location** fields during Registration.

Note

If you do not see the changes as shown, a hard reset of the HSUs will cause them to appear.

Choosing Diversity Antenna Mode During Registration

Suppose that in **Figure 5-8** for HFU.10.102 we had chosen Diversity mode, the outcome would look like this:

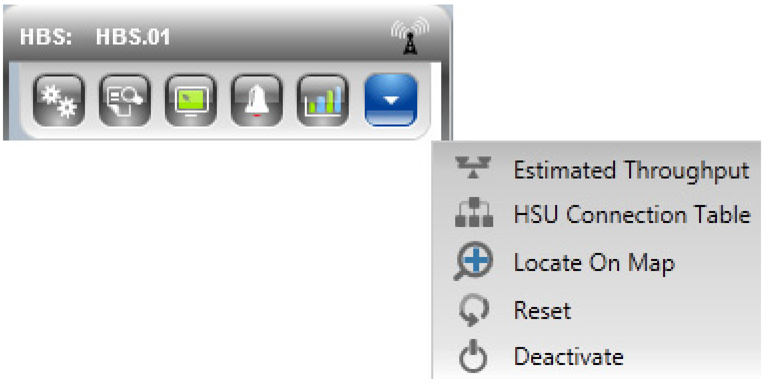


The throughput on this HSU has dropped to about half of its previous value. The other HSUs are left unchanged.

This underlines the flexibility of the RADWIN 5000 HPMP system which enables HSUs to be independently configured depending on their particular location.

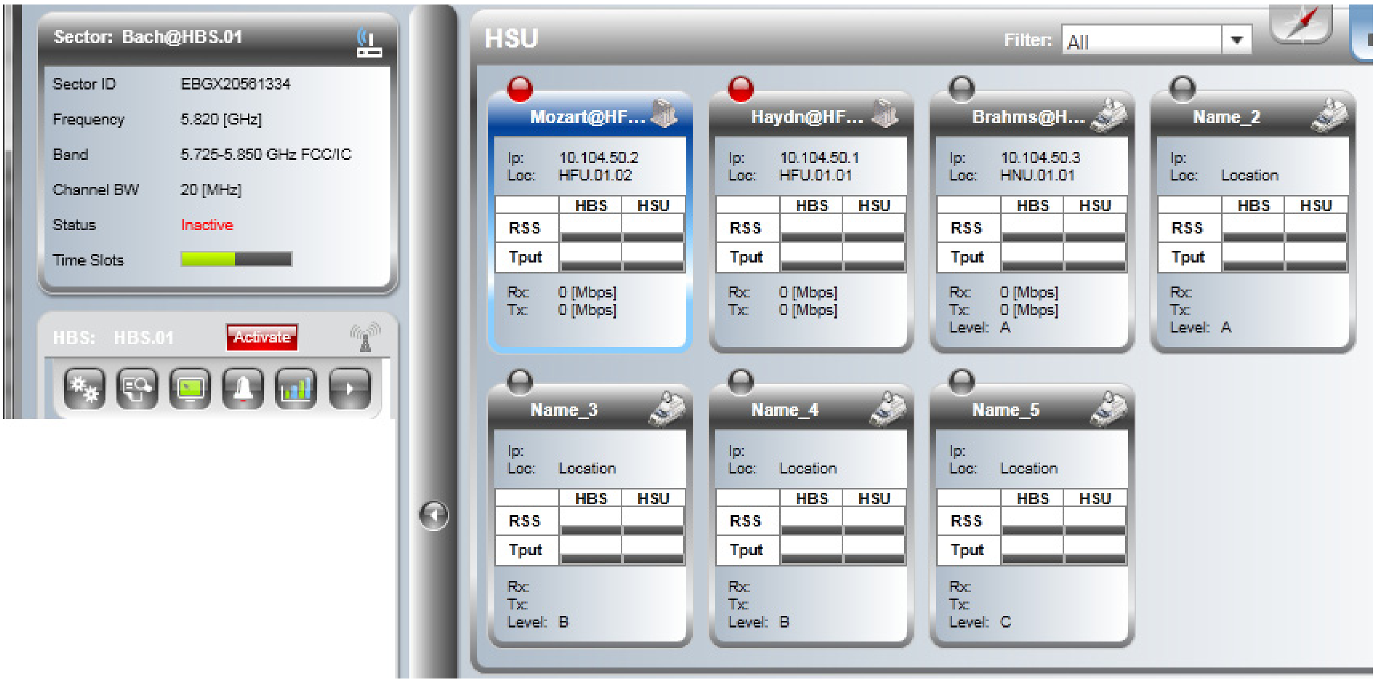
Deactivating the HBS

From the HBS button bar, click the right hand button followed by **Deactivate**.



You are offered a cautionary message:

If you proceed, the HBS display will change to reflect the deactivated state:



Notice that the HSUs remain registered, and will return to full service after the HBS is re-activated.

Deregistering an HSU

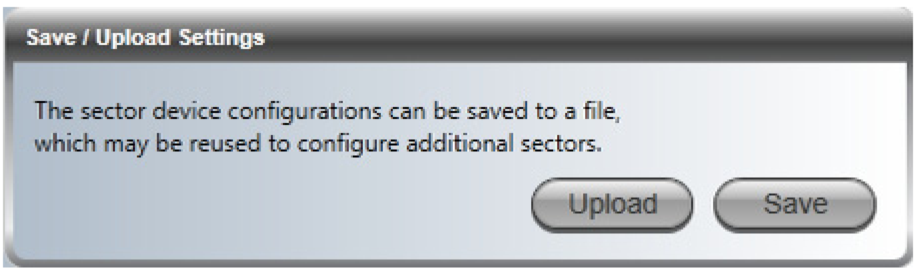
A HSU may be deregistered by using the Deregister entry in an HSU context menu or using the  button from an HSU button bar.

Where has my HSU gone?

Suppose that you installed two collocated HBSs with contiguous sectors. It is possible that an HSU located close to the common sector boundary may "discover" the wrong HBS. A HSU can be "forced" across to another HBS by changing its Sector ID to that of the required HBS. The method for doing this is covered in **Chapter 7**.

Saving the HBS Settings for Reuse as a Template

Refer to **Figure 5-7** of which the following is an excerpt:



Following any further fine tuning, open up the HBS Nomadic tab, and click **Save**. You are offered the standard Save File dialog. Save the HBS Nomadic settings file (MobilitySettings.mob) to a convenient location. For our example we changed the file name to NomadicSettings.mob.

Creating Nomadic Entries for a Sector from a HBS Template

The saved settings file may be used as a template for further sectors.

➢ To create a sector from a HBS Nomadic settings file:

1. Starting with a new HBS and HSUs, log on to the HBS.
2. Activate the HBS in the usual way.
3. Open the Nomadic tab in the Configuration window. In the Save / Upload Settings window, click **Upload**.

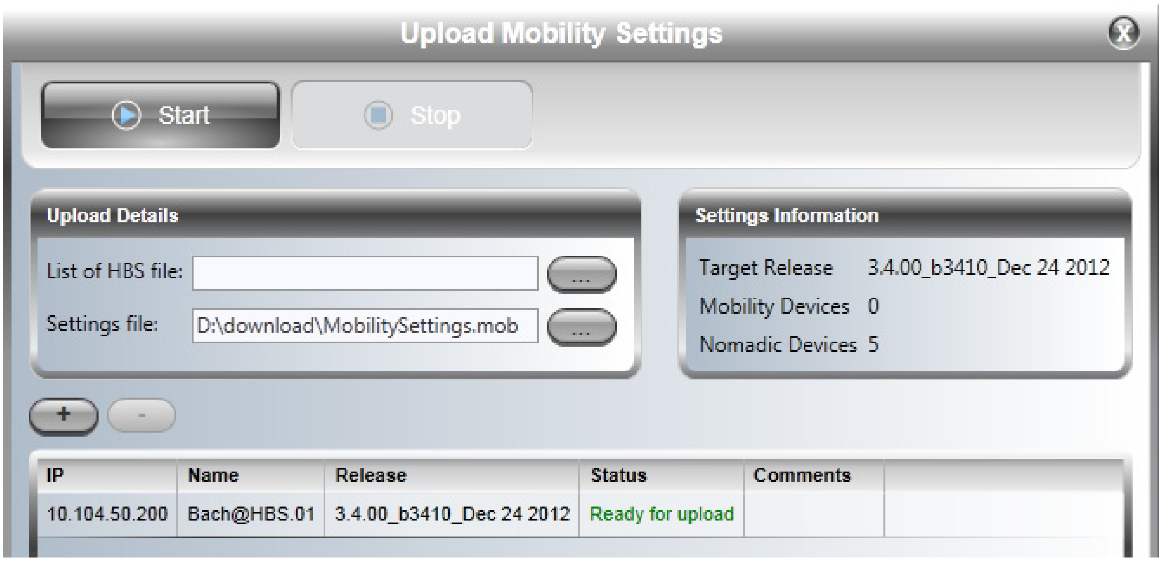
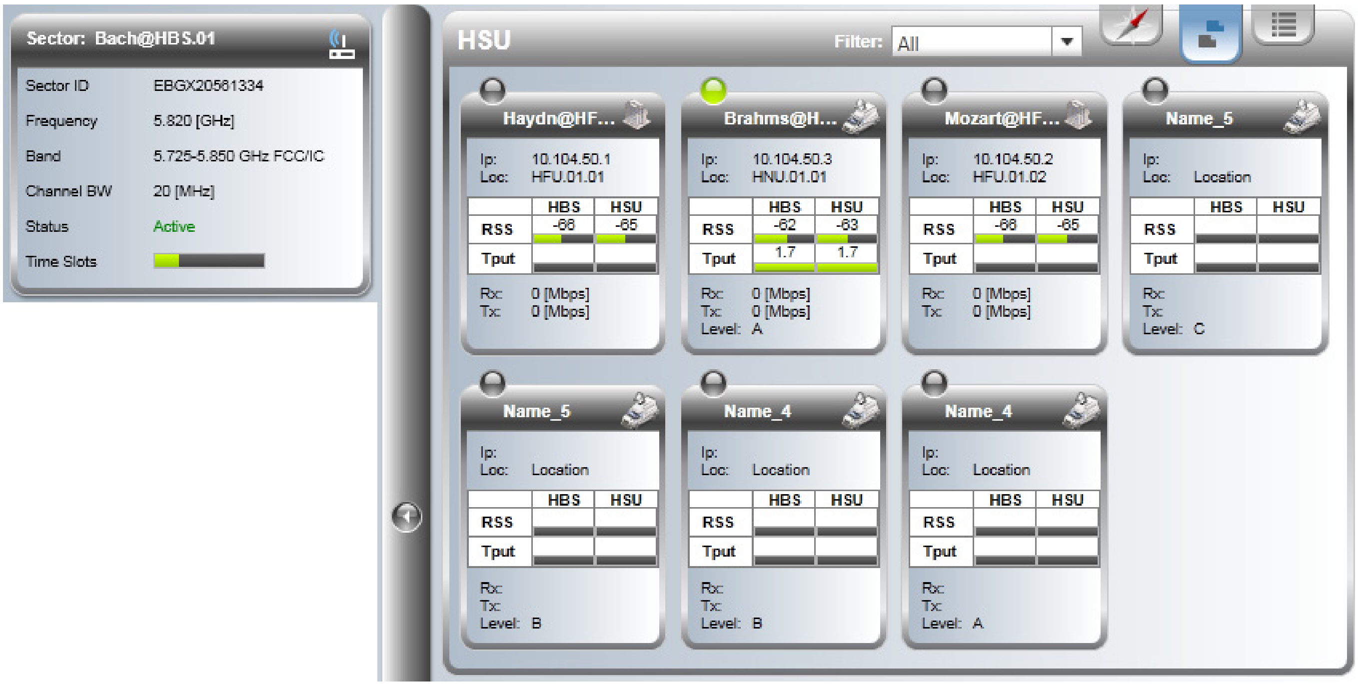


Figure 5-10: Preparing to upload the Nomadic file

4. In our case we have one HBS, so it is sufficient to enter the Nomadic file as shown and then click **Start**. After a few moments, the Status field indicates Done.

IP	Name	Release	Status	Comments
10.104.50.200	Bach@HBS.01	3.4.00_b3410_Dec 24 2012	Done	

The result is as expected:



Notice that our one "real" nomadic HSU has come up configured and registered. The fixed HSUs must be registered by hand.

To create a sector from a HBS IP list and a Nomadic settings file:

1. In the window of **Figure 5-10**, enter a HBS list file. The format of the file is lines of

   <IP address> <Read-Write community>

   For example,

   10.104.50.200 netman

   All of the HBSs need to activated and accessible (via a switch) to the managing computer. They need not be on the same sub-net.

   Alternatively, enter them one by one using the Plus button.

   Any un-activated HBSs will be shown as unavailable:

IP	Name	Release	Status	Comments
10.104.50.200			Device is not ready	HBS is in inactive state.

2. Make any further changes to the displayed list using the Plus/Minus buttons.
3. Click **Start** to commence the process.
4. The list window will indicate the success or otherwise of the upload for each HBS.

USER MANUAL

RADWIN 5000 HPMP POINT TO MULTIPOINT BROADBAND WIRELESS

Release 3.4.00

Part 3: Sector Management

RADWIN

Chapter 6

Managing the Sector

Scope of this Chapter

This chapter deals with managing the sector from the HBS. It covers HBS Configuration and HSU Configuration from the HBS. HSU direct or over-the-air configuration is a little different and is covered in **Chapter 7**.

A Configuration window is available for both the HBS and the HSUs to change setting without necessarily dropping service. Nevertheless care must be exercised when changing them. By way of example, changing antenna parameters for a HSU results in a HSU reset. It is necessary however to have this function in the Configuration window since it is required to initially set up the unit.

The HBS itself may be configured over-the-air: A scenario for this is where the sector is backhauled by on of the HSUs. There are no significant differences between the two methods, however some care is required. If for example, you deactivate the HBS over-the-air, you will lock yourself out of the sector.

Running Spectrum View from the HBS manager over-the-air, will lock you out for the duration of the Spectrum View timeout period.

Configuring a HBS

Configuration Menu Buttons

Open the Configuration window.

The **Backup** and **Restore** buttons provide for backup and restore of the HBS software.

Note

A backup (full or configuration) may be restored to another HBS provided that the product IDs and revision levels of the source and target HBSs are identical.

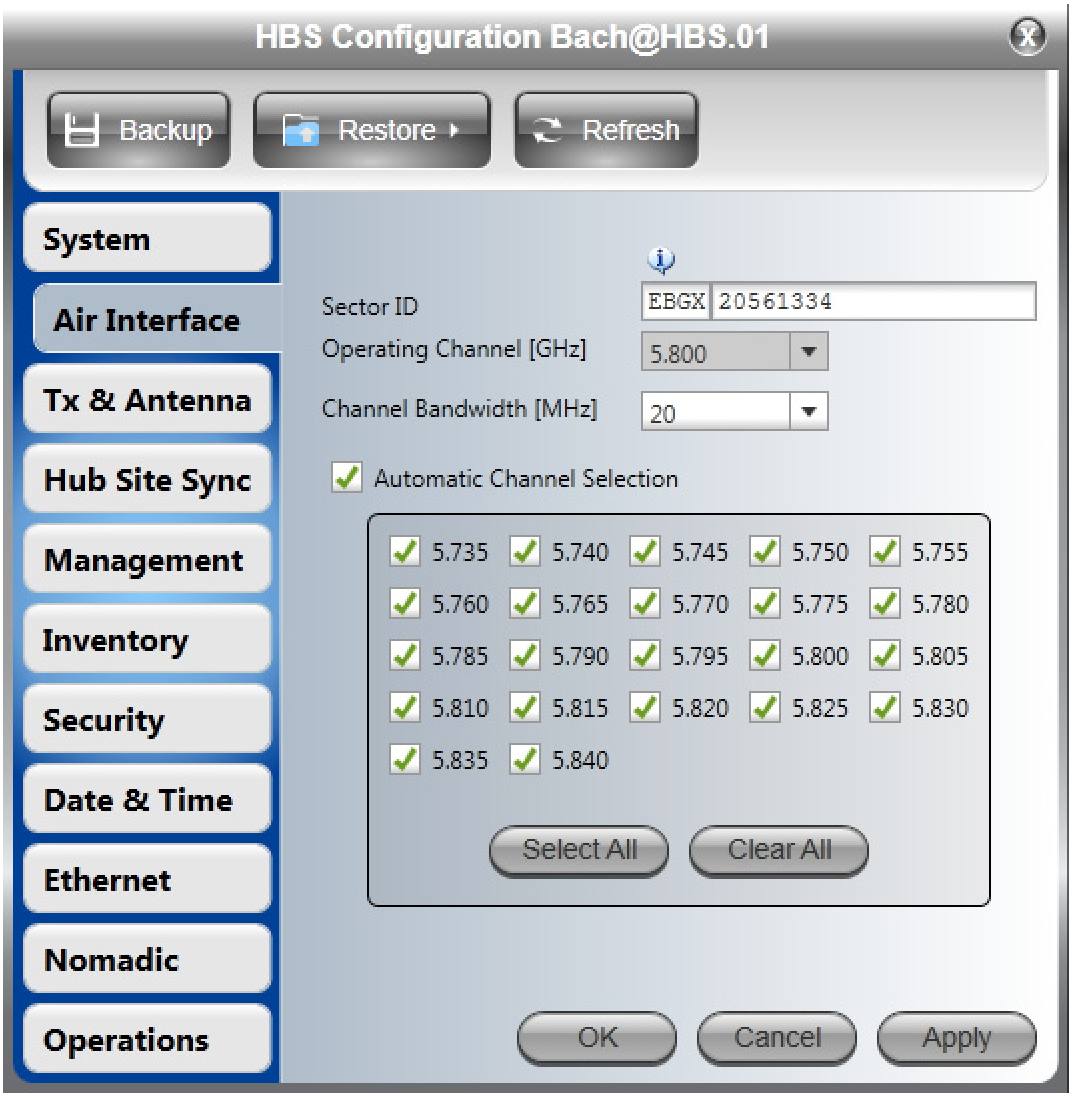
The **Refresh** button restores the current window to its previous state abandoning any changes you made, provided that you did not click **Apply** or **OK**.

We will work through each of the Configuration tabs in turn with emphasis on tabs or features not encountered in the previous chapters.

System

These items are convenience fields. **Name** and **Location** are typically entered during HBS activation. You may like to change **Contact** here, not set during activation. The **Coordinates** button opens the same window as used during activation.

Air Interface

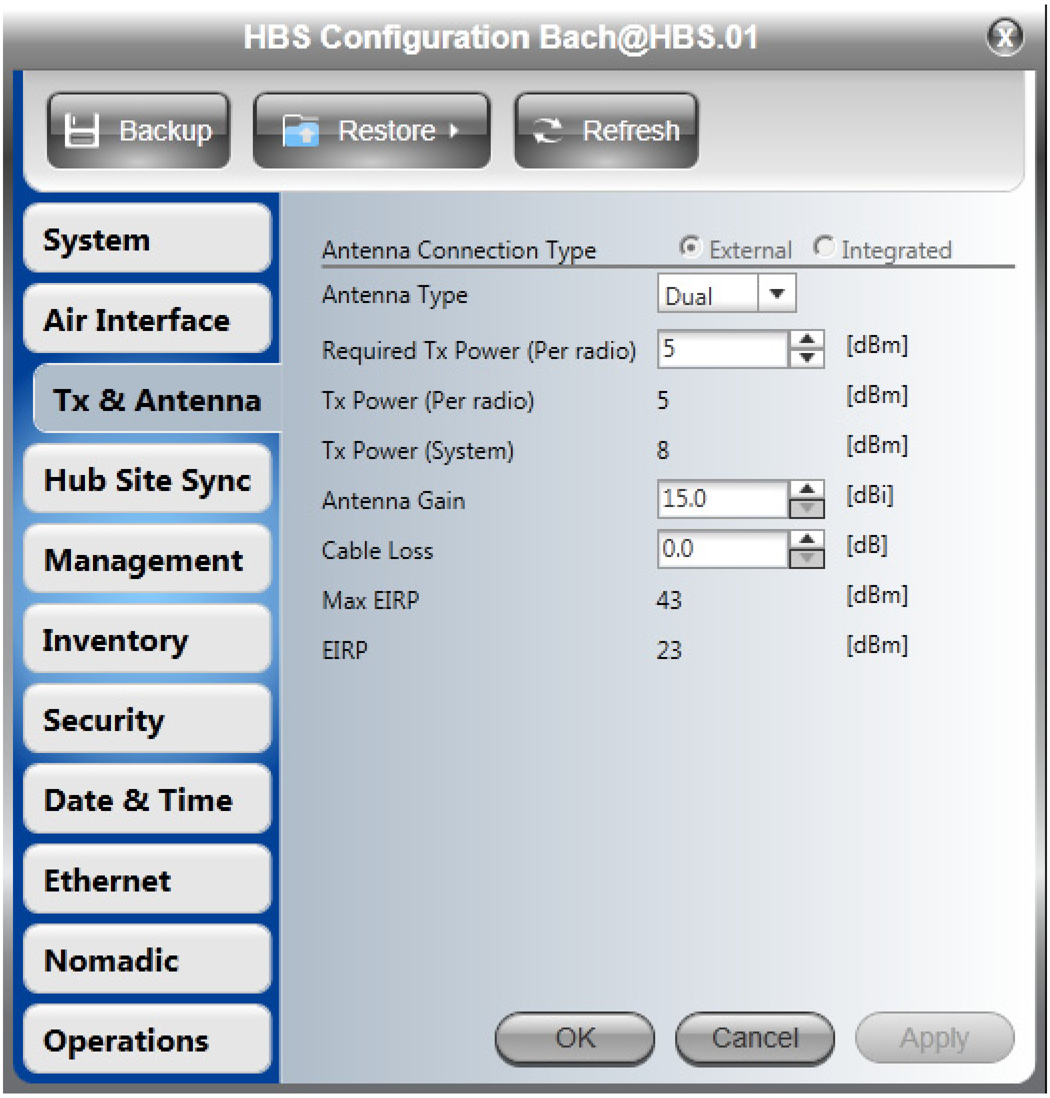


This panel has the same functionality as the corresponding window in the Activation Wizard (see **Chapter 5**). Changing the Sector ID will "percolate" to all registered HSUs. It will of course, be "picked up" by newly installed and registered HSUs.

- The only way to change the Operating Channel is by deactivation and reactivation.
- Channel Bandwidth and Channel Selection changes will all be sector-wide.
- Use of Automatic Channel Selection only makes sense at configuration time. Choose a single channel based on what ACS shows. Use the Spectrum View tool (**Chapter 21**) to help you make your choice.

Tx and Antenna

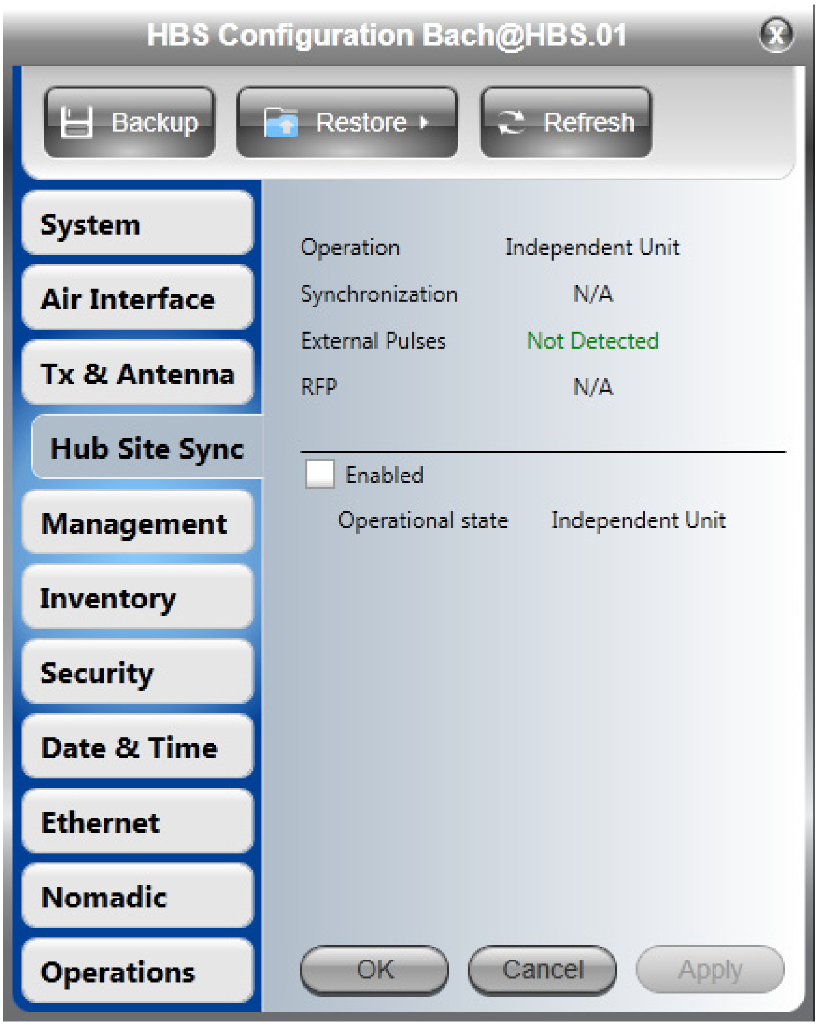
This tab is available for both the HBS and HSUs. It has the same meaning in both cases.



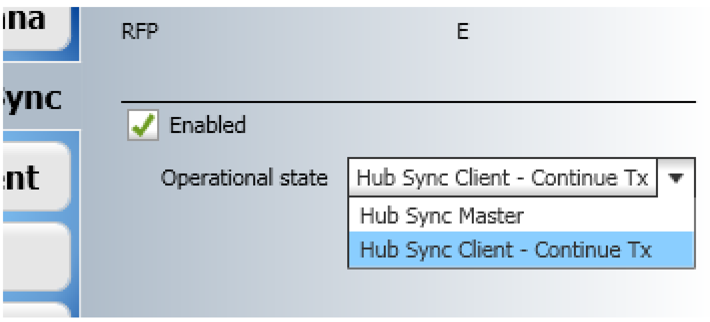
For the HBS, changes made here may affect link quality and in the case of antenna type, cause a sector re-sync.

Changing the antenna type for an HSU will cause a re-sync to that site only.

Hub Site Sync [HSS]



The External Pulses which might be detected, may come from a collocated HBS, a RADWIN 2000 ODU or a RADWIN GSU configured as Hub Sync Master. To enable HSS, check the **Enabled** check box.



Ensure that the correct Operational state is selected - in our example, **Hub Site Client - Continue Tx**. Click **Apply** or **OK** to enable HSS.

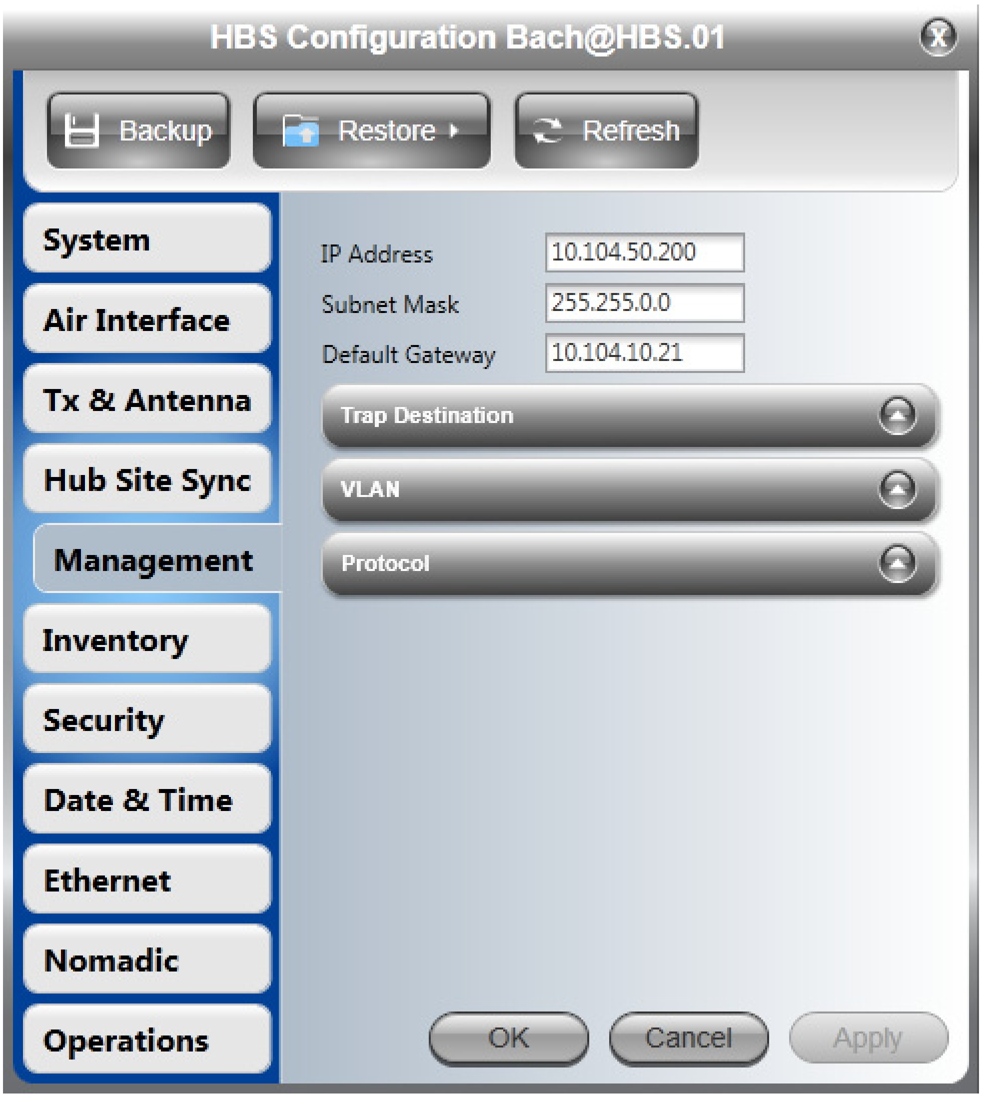
Note

HSS support for RADWIN 5000 HBSs is model dependent

.See **Chapter 10** for further detail about HSS.

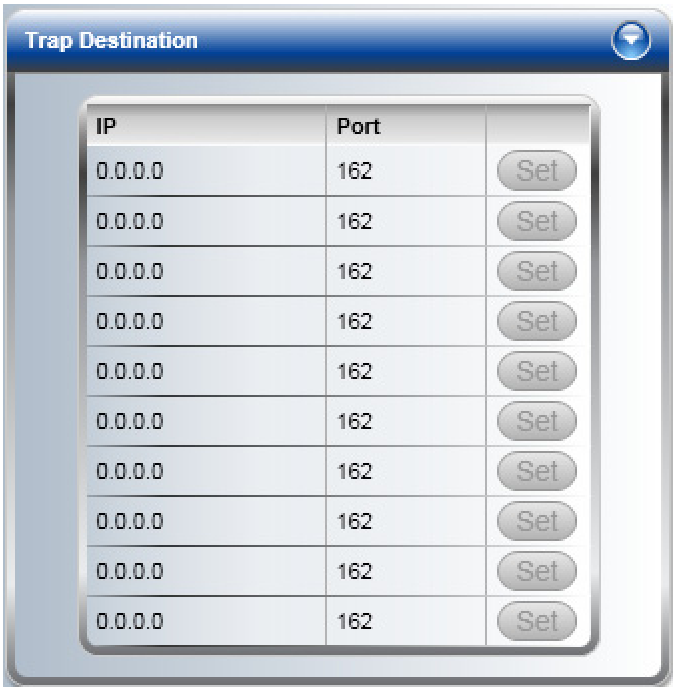
Management

If you set the IP and related addresses correctly, there should be little to change here.



The three sub-windows, Trap Destinations, VLAN Management and Protocol dialogs are generic to the HBS nad the HSUs (direct or over-the-air) and are discussed below.

Trap Destinations



Enter the Trap Destinations. They could include the IP address of the managing computer. The events log will be stored at the addresses chosen.

VLAN for Management

Management VLAN Configuration

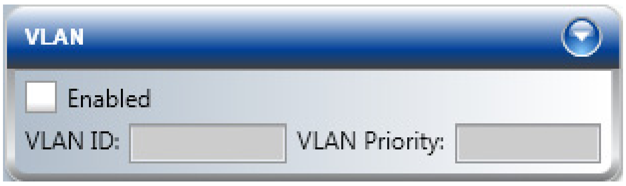


Figure 6-1: VLAN for Management

Caution

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

VLAN Management enables separation of user traffic from management traffic whenever such separation is required. It is recommended that each member of a sector be configured with different VLAN IDs for management traffic. (This reduces your chances of accidentally locking yourself out of the sector.)

➢ **To enable VLAN for management:**

1. In the window of **Figure 6-1**, check the **Enabled** box.
2. Enter a VLAN ID. Its value should be between 2 and 4094.

   After entering the VLAN ID, only packets with the specified VLAN ID are processed for management purposes by the HBS/HSU ODU. This includes all the protocols supported by the ODU (ICMP, SNMP, Telnet and NTP). Using VLAN for management traffic affects all types of management connections (local, network and over the air).

3. Enter a Priority number between 0 and 7.

   The VLAN priority is used for the traffic sent from the ODU to the managing computer.

4. Change the VLAN ID and Priority of the managing computer NIC to be the same as those of steps 2 and 3 respectively.

5. Click **Apply** or **OK**.

Lost or forgotten VLAN ID

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

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

Supported Protocols

For a sector managed as part of a network, direct access to a HBS/HSU using Telnet is considered to be a security breach. Telnet access may be enabled or disabled by clicking the Protocol tab and enabling/disabling Telnet access using the Telnet check-box. Similar considerations apply to access via the Web Interface.

- For further details about Telnet access see **page 6-44**.
- For further details about the Web Interface, see **Chapter 22**.

Note

SNMP access is on by default for RADWIN 5000 HPMP and cannot be disabled.

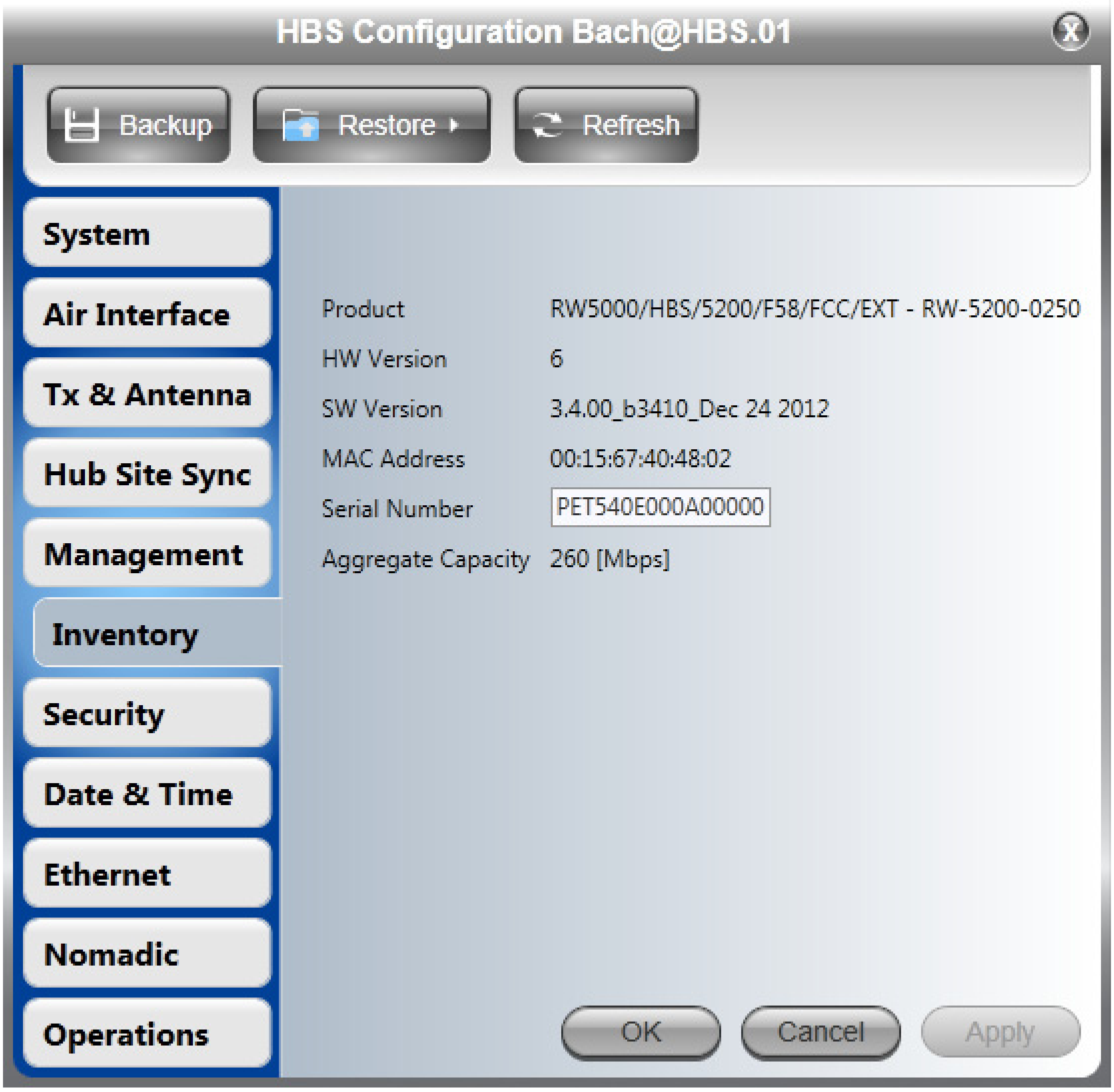
Telnet and Web Interface access modes when available, are site specific. If for example, you want Telnet access from specific sector members, you should enable it for these sites and disable it elsewhere.

Note

If Telnet or Web Interface access mode poses a general security risk, you must disable them for each sector member separately.

Inventory

You might like to capture or copy the information here:



The Inventory information will be required by Customer Support should you require assistance.

Security

This section applies to both the HBS and HSUs unless stated otherwise.

Figure 6-2: Sector Security settings

The Security dialog enables you to change the Link Password and the SNMP Community strings.

Changing the Link Password

This item is available as follows:

- At an isolated HBS (No active HSUs)
- At an isolated HSU
- Never for an active HSU

Here are the details:

The default password is ***wireless-p2mp***. Optionally, you can change the link password as explained here.

➢ To change the link password:

1. Open the **Security** tab (**Figure 6-2**).

The Change Link Password dialog box opens.

Note

Use the Hide characters check box for maximum security

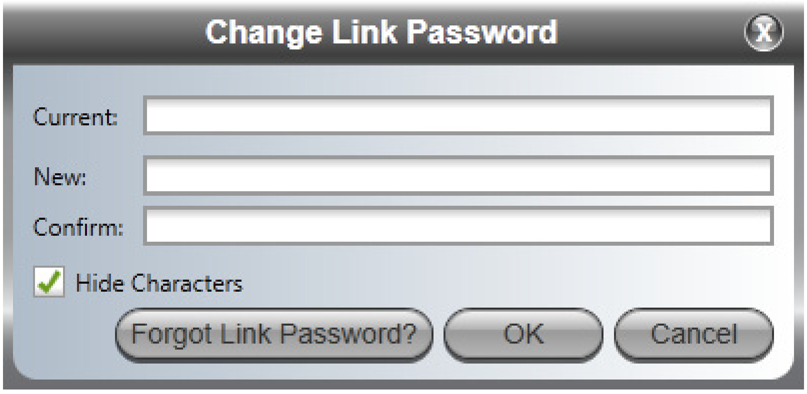


Figure 6-3: Change Link Password dialog box

2. Enter the current link password (The default link password for a new ODU is ***wire-less-p2mp***).

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

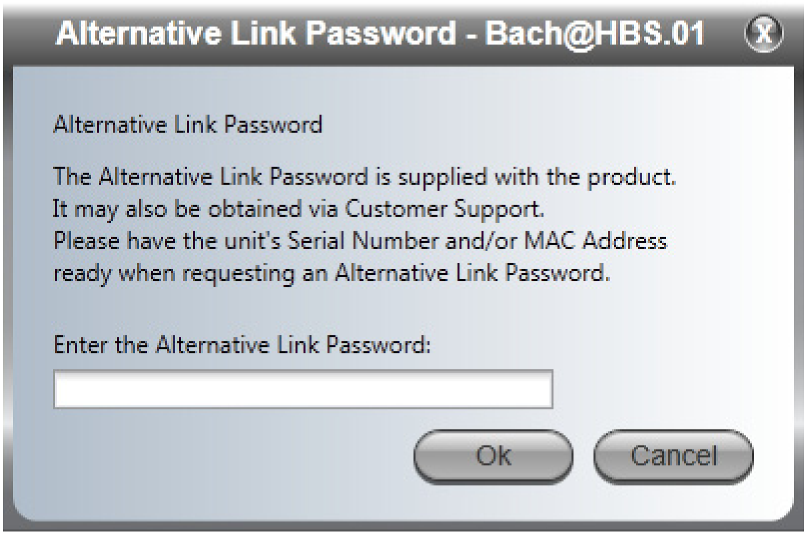


Figure 6-4: Lost or forgotten Link Password recovery

   Follow the instructions to use the Alternative Link Password, and click **OK** to finish. You are returned to the window in **Figure 6-3** above. Continue with the next step.

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

7. Click **OK** at the *Password changed* success message.

Note

- A link password must contain at least eight but no more than 16 characters excluding SPACE, TAB, and any of ">#@|*?;."
- Restoring Factory Defaults returns the Link Password to ***wireless-p2mp***.

RADWIN Manager Community Strings

Note

In this section, "ODU" may be either an HBS or an HSU.

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

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

The Community string must be entered at log on. You must know the password and the correct Community string to gain access to the system. You may have read-only privileges. It is not possible to manage the ODU if the read-write or the read Community values are forgotten. A new Community value may be obtained from RADWIN Customer Support for the purpose of setting new Community. You must also have available the serial number or the MAC address of the ODU.

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

Editing Community Strings

When editing these strings, both read-write and read-only communities must be defined.

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

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

➢ To change a Community string:

1. Type the current read-write Community (default is ***netman***).
2. Choose the communities to be changed by clicking the check box.
3. Type the new Community string and re-type to confirm. A community string must contain at least five and no more than 32 characters excluding SPACE, TAB, and any of ">#@|*?;."
4. Click **OK** to save.

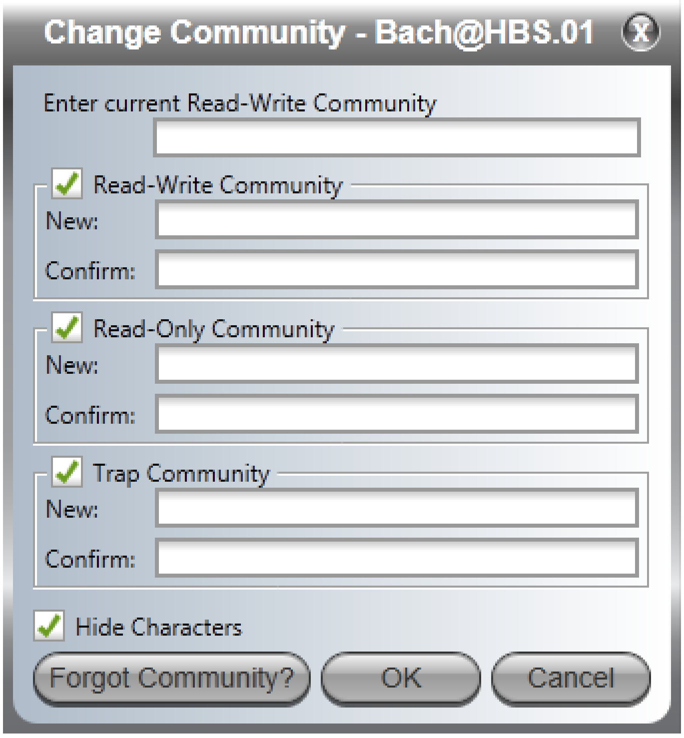


Figure 6-5: Changing the Community String

Forgotten Community string

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

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

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

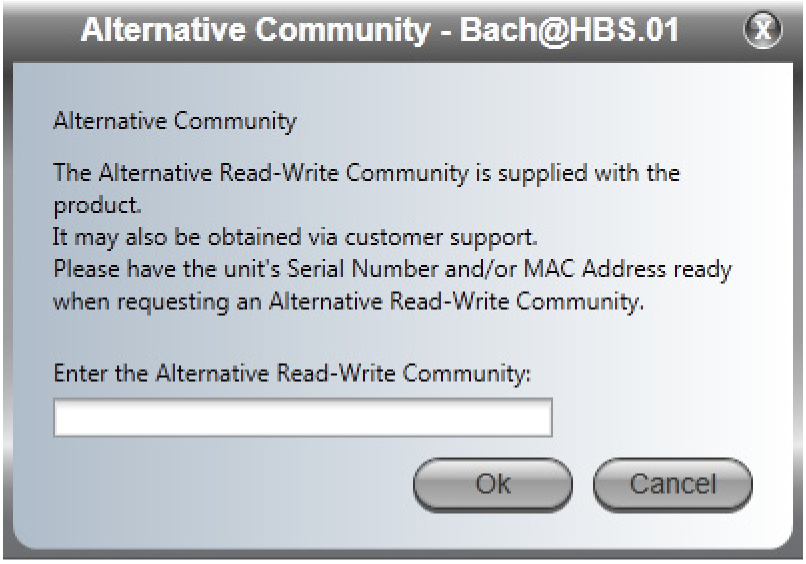


Figure 6-6: Alternative Community Dialog box

Date and Time

Setting the Date and Time

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

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

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

Note

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

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

➢ To set the date and time:

1. Determine the IP address of the NTP server to be used.
2. Test it for connectivity using the command (Windows XP and 7), for example:

   w32tm /stripchart /computer:216.218.192.202

Figure 6-7: Date and Time Configuration

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

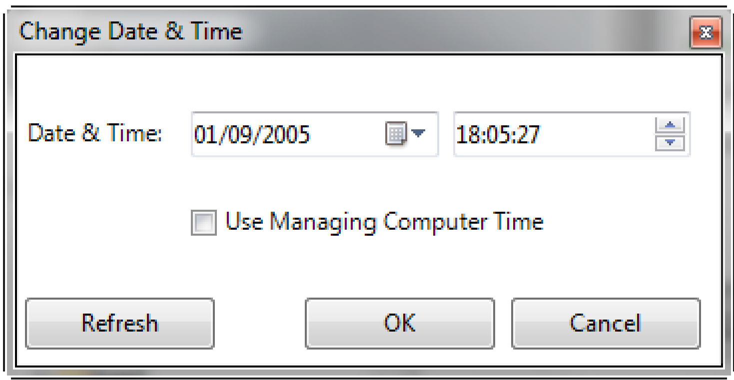


Figure 6-8: Change Date and Time

1. Greenwich Mean Time

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

Ethernet Service Configuration

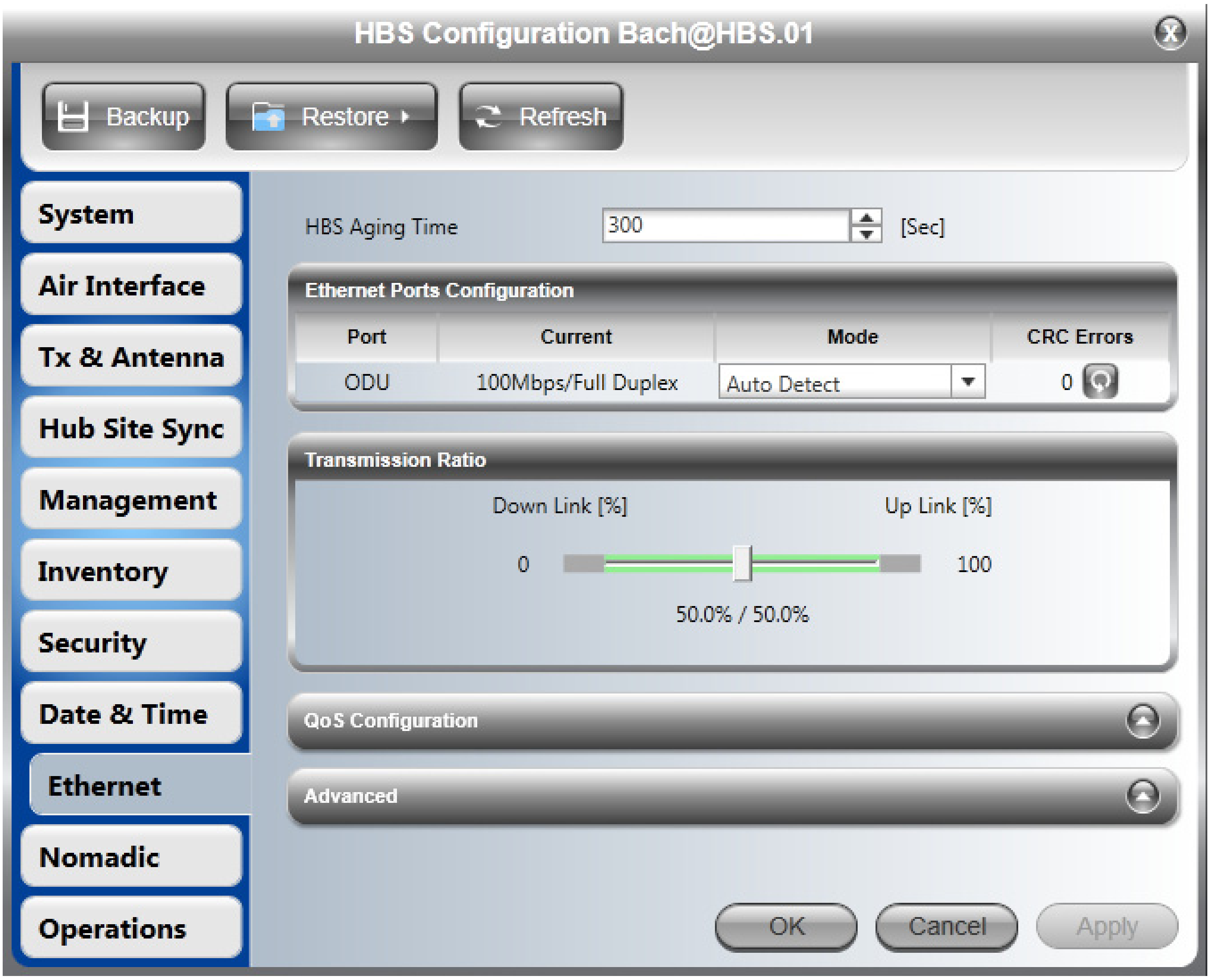


Figure 6-9: Setting Ethernet services

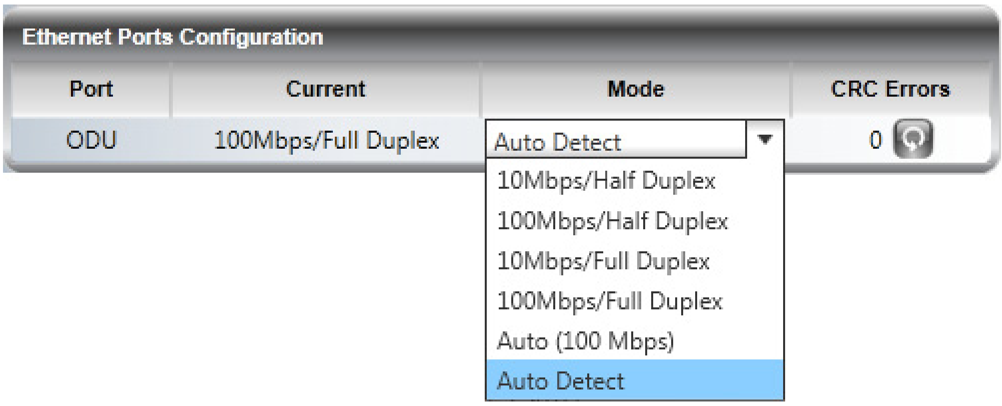
HBS Aging Time

The HBS works in **Bridge Mode.** In Bridge mode the ODU performs both learning and aging, forwarding only relevant packets over the sector. The aging time of the ODU is by default, 300 seconds.

Ethernet Ports Configuration

The ODU Ethernet port mode is configurable for line speed (10/100/1000BaseT) and duplex mode (half or full duplex).

Line speed 1000BaseT is only available if the HBS is connected to A GbE PoE device.



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

The icon next to the CRC error count may be clicked to reset the counter to zero.

Caution

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

➢ To configure the Ethernet Mode:

- In the Ethernet Ports Configuration pane, use the drop-down menu to choose the required mode.

Transmission Ratio (Tx Ratio, Asymmetric Allocation))

The **Transmission Ratio** shows the allocation of throughput between downlink and uplink traffic at the HBS. The Transmission Ratio is not only sector-wide: If you use HSS (**Chapter 10**) to collocated several HBSs (to cover adjacent sectors), they must all use the same Transmission Ratio.

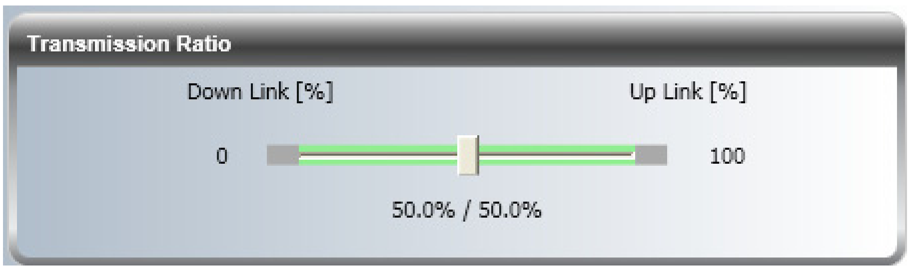


Figure 6-10: HBS Collocated client or independent unit

If it is an HSS master, you will see something like this:

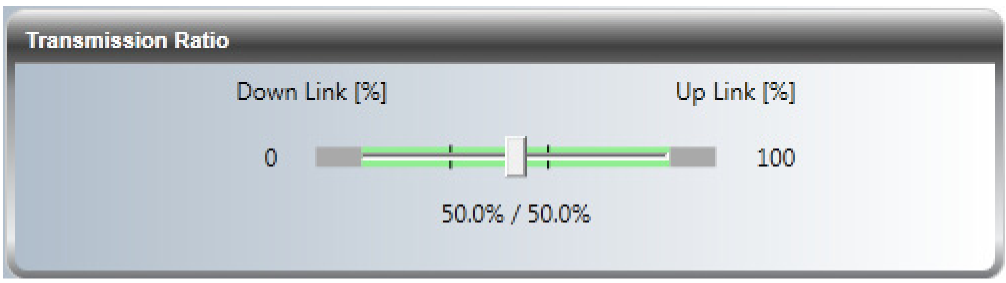
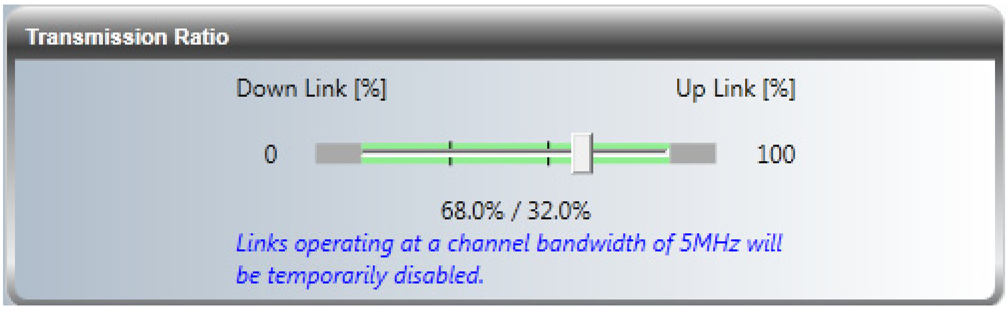
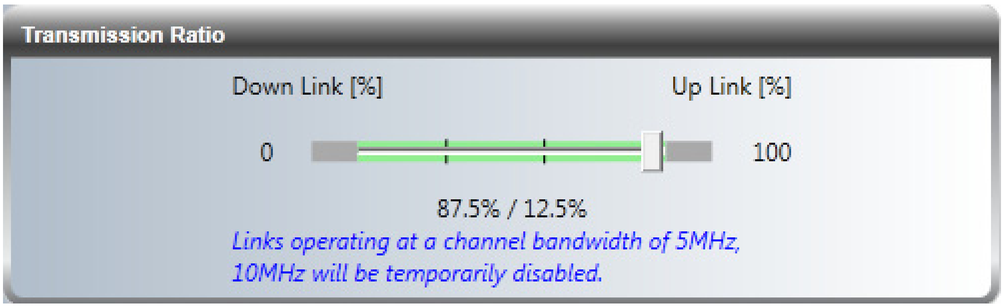


Figure 6-11: HBS Collocated master

Moving the slider to the right in stages, yields the following:





The effective available range for Asymmetric allocation is determined by channel bandwidth as shown as well as link distance. In this context, "link" is a collocated HBS or RADWIN 2000 ODU.

QoS Configuration

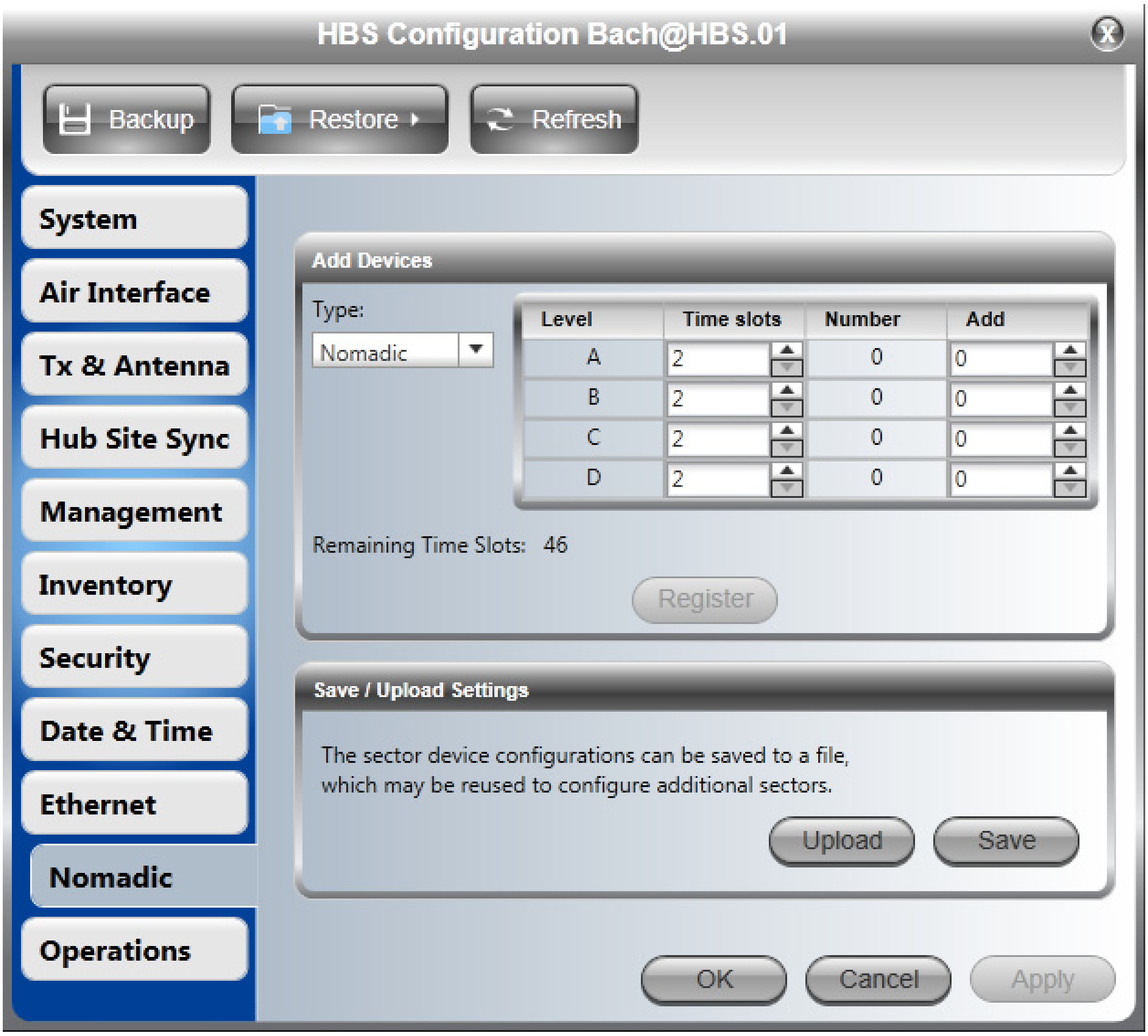
To install and use the Ethernet QoS feature, see **Chapter 16**.

Advanced: Broadcast/Multicast Flooding Protection

Broadcast/Multicast Flooding Protection provides a measure of protection by limiting multicast and broadcast packets to mo more than 12.5% of available capacity.

You may wish to un-check this item if your application is based on multicast/broadcast packets - for example, video surveillance using multicast downlink, or video conferencing using multicast uplink.

Nomadic



See **page 5-24**.

Operations

This section applies to both HBSs and HSUs.

Reverting to Factory Settings

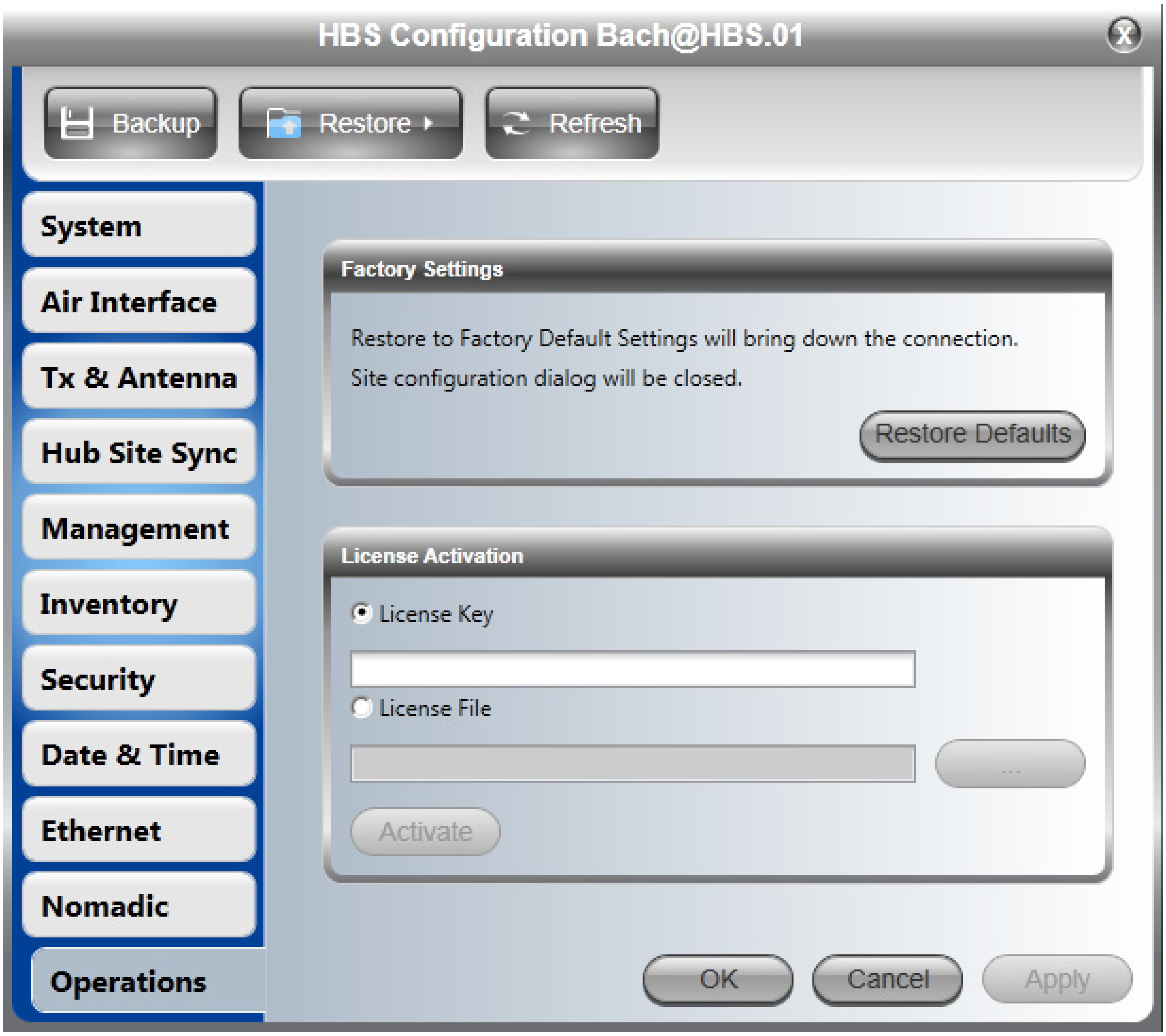
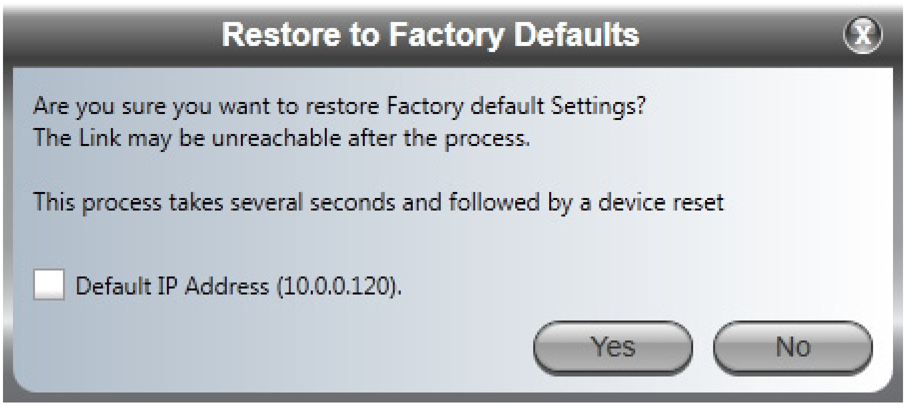


Figure 6-12: Restore Factory Settings and License Activation

Clicking the Restore Defaults button opens the following self explanatory dialog:



License Activation

You may add additional bands using the license Activation facility. Additional bands (if available) are obtained using the Change Band function, described below.

For a single band, just enter the supplied license Key and click **Activate**. If you have a list of them (a text file) you will need to use the **License File** option.

In some instances it may involve purchasing the relevant license from RADWIN. You should contact Customer Service for details. You will find the technical steps required to obtain and install extra bands on **page 6-41**.

Advanced: False Radar Mitigation for HBS

This tab is only visible if

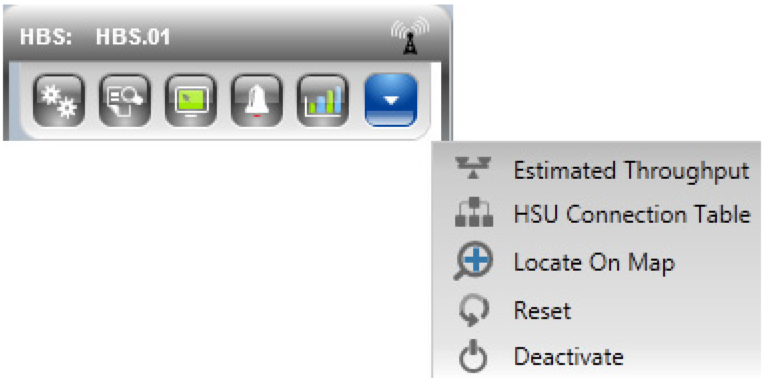
- You are using a Regulation requiring Radar Channel Avoidance and
- You are logged on as Installer

For this release, this feature at the HBS, is only relevant to the 5.3 GHz ETSI band.

Configuration of False Radar Mitigation is covered in **Chapter 14**.

HSU Connection Table

From the HBS button bar, click the right hand button followed by HSU **Connection Table**.



The following table is displayed:

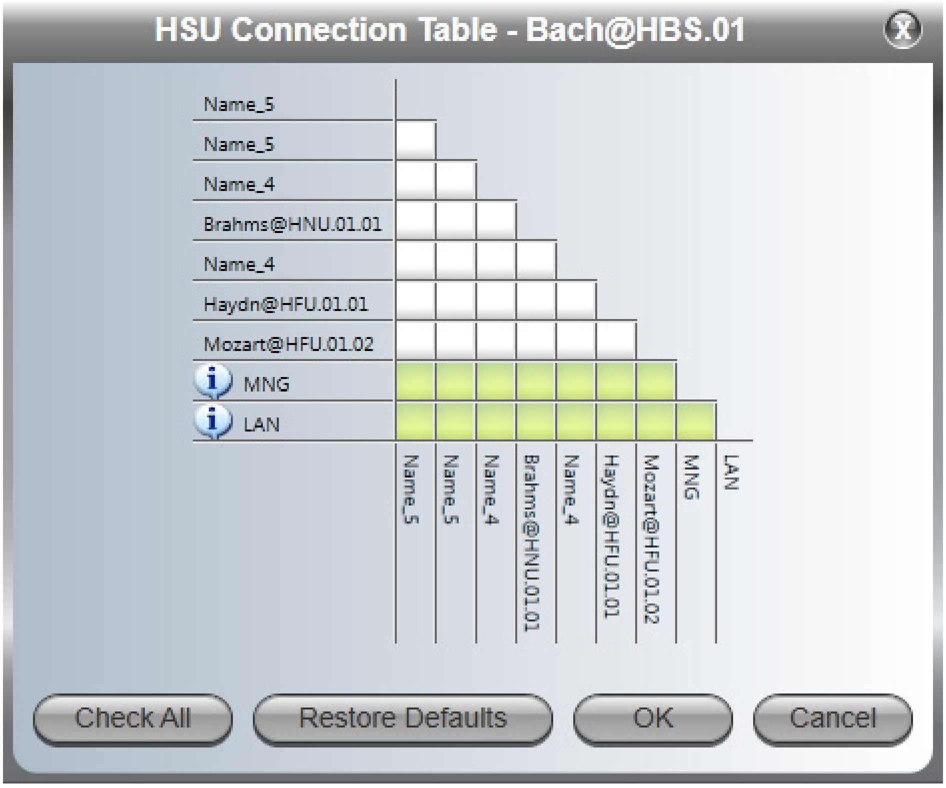


Figure 6-13: HSU Intercommunication - Connection Table

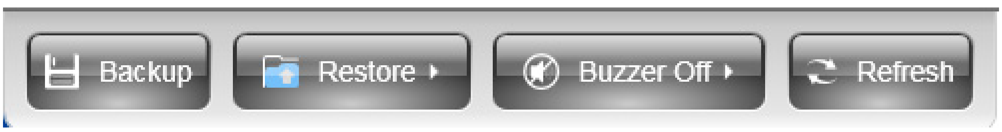
The green shaded squares show intercommunicating elements within the sector. MNG refers to management traffic which should always be open between HSUs and the HBS. LAN refers to service traffic between the HBS and the HSUs. As shown, the two HSUs may not communicate between themselves. Clicking the top white square would enable communication (via the HBS) between them.

You may in fact disable all traffic between the HBS and the HSUs and restore it using this device.

Configuring an HSU from the HBS Main Window

Right click an HSU for its context menu and click **Configure** to open the HSU Configuration window.

Configuration Menu Buttons

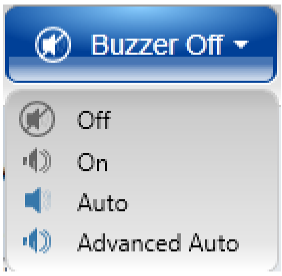


The **Backup** and **Restore** buttons have the same functionality as the corresponding buttons for the HBS. They provide for backup and restore of the HSU software.

Note

A backup (full or configuration) may be restored top another HSU provided that the product IDs and revision levels of the source and target HSUs are identical.

The **Buzzer** button may set or mute the buzzer.



The Auto position means that the Buzzer will give the beeps set out on page 3-19 during installation or upon sync loss.

The Advanced Auto position means that in addition, the buzzer will beep continuously at different rates upon sync loss, antenna mis-alignment and other events for up to two minutes following restoration of sync.

Recall that the main use of the buzzer tone is for HSU antenna alignment.

The **Refresh** button restores the current window to its previous state abandoning any changes you made, provided that you did not click **Apply** or **OK**.

We will work through each of the Configuration tabs in turn:

System

Figure 6-14: HSU Configuration window (HBS)

These items are convenience fields. They are typically entered during registration.

Tx & Antenna

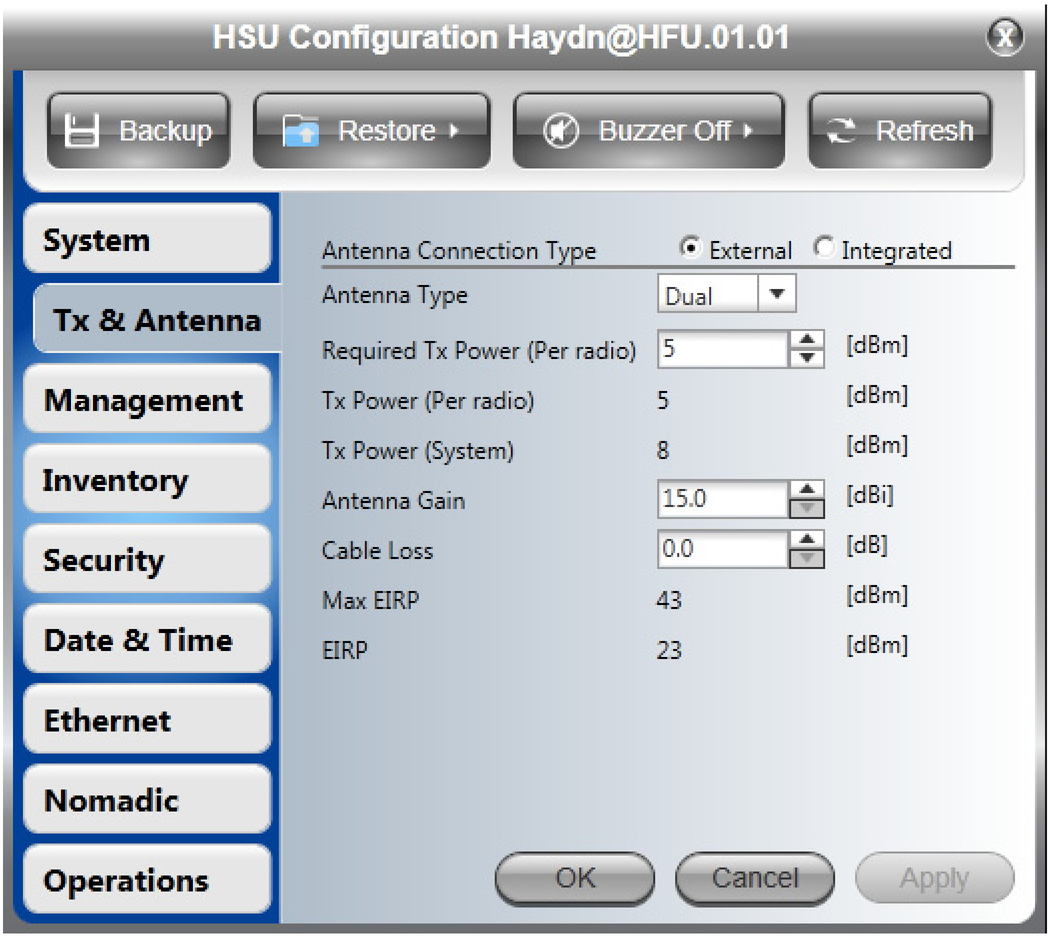


Figure 6-15: HSU Configuration - Setting antenna type and parameters

The remarks about changing the HBS parameters also apply here. Changing the antenna type will cause a re-sync between the HSU and the HBS.

Management

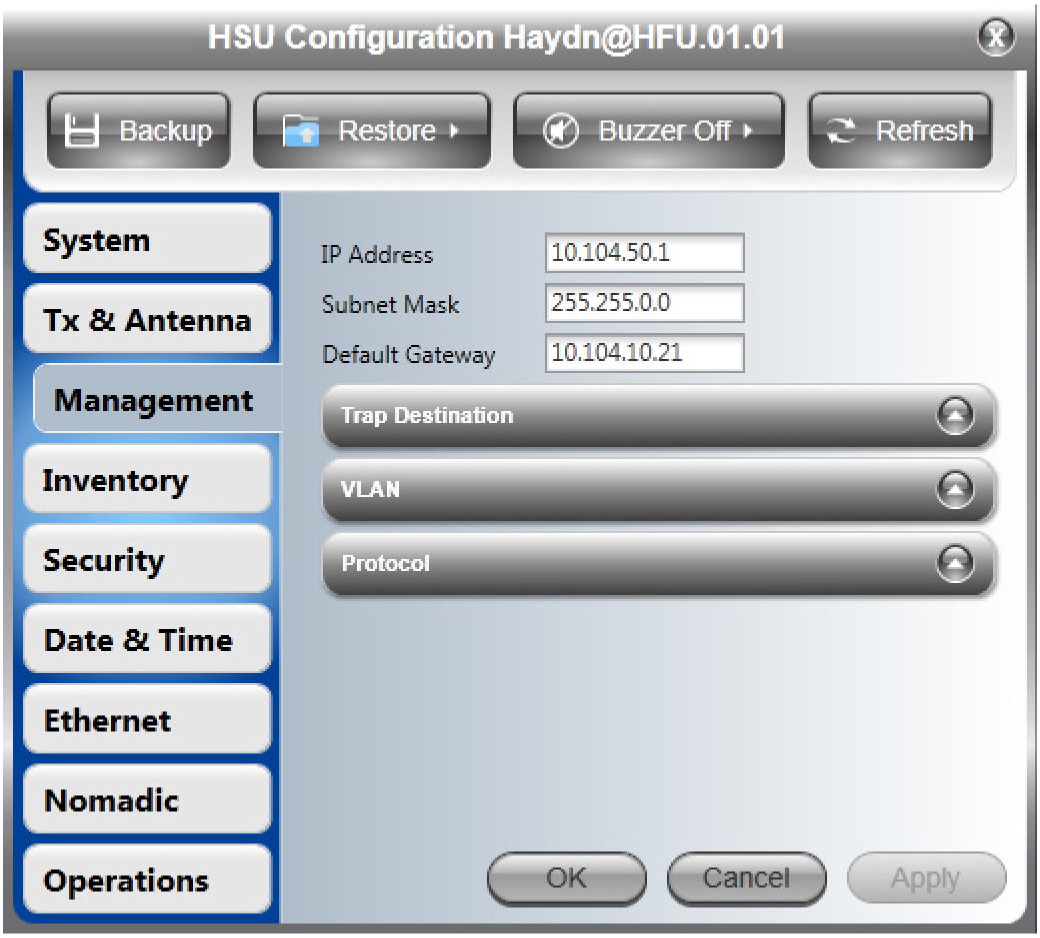


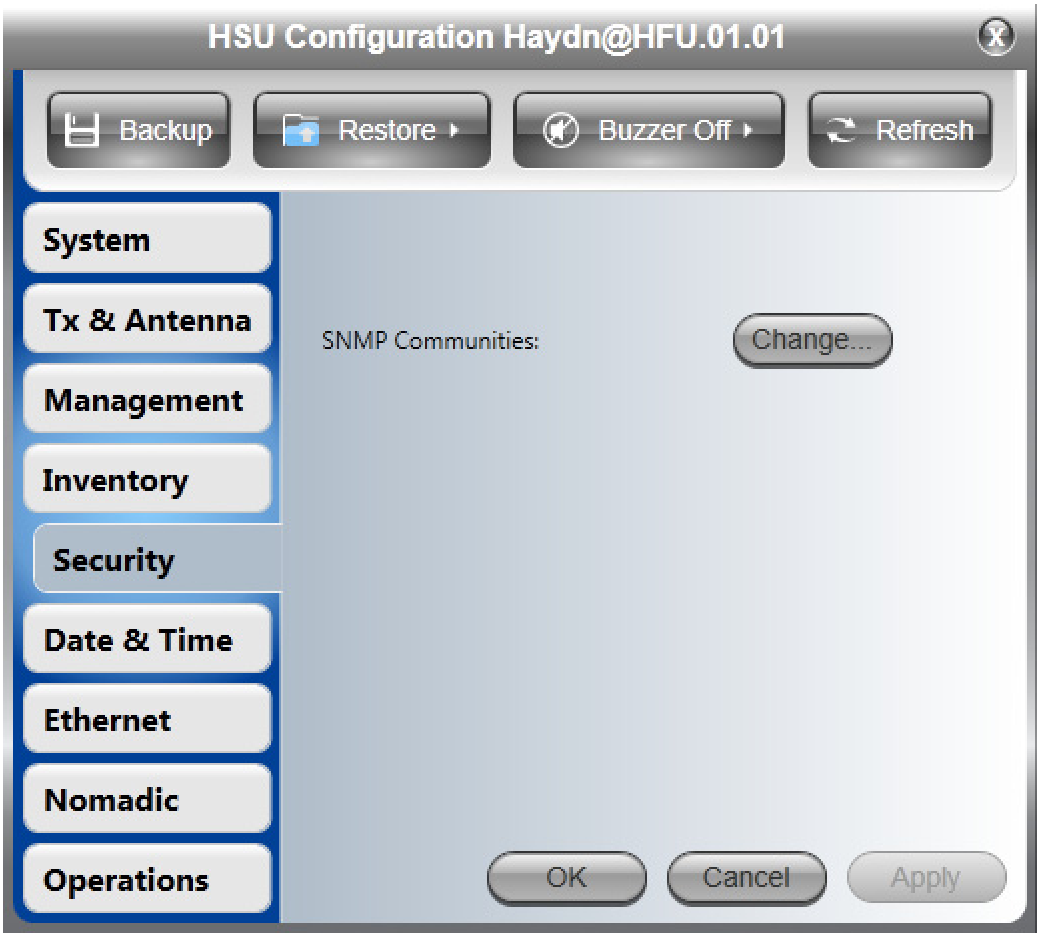
Figure 6-16: HSU Configuration - IP addresses

The functionality is identical as that for the HBS.

Inventory

You should note the details for each HSU.

Security



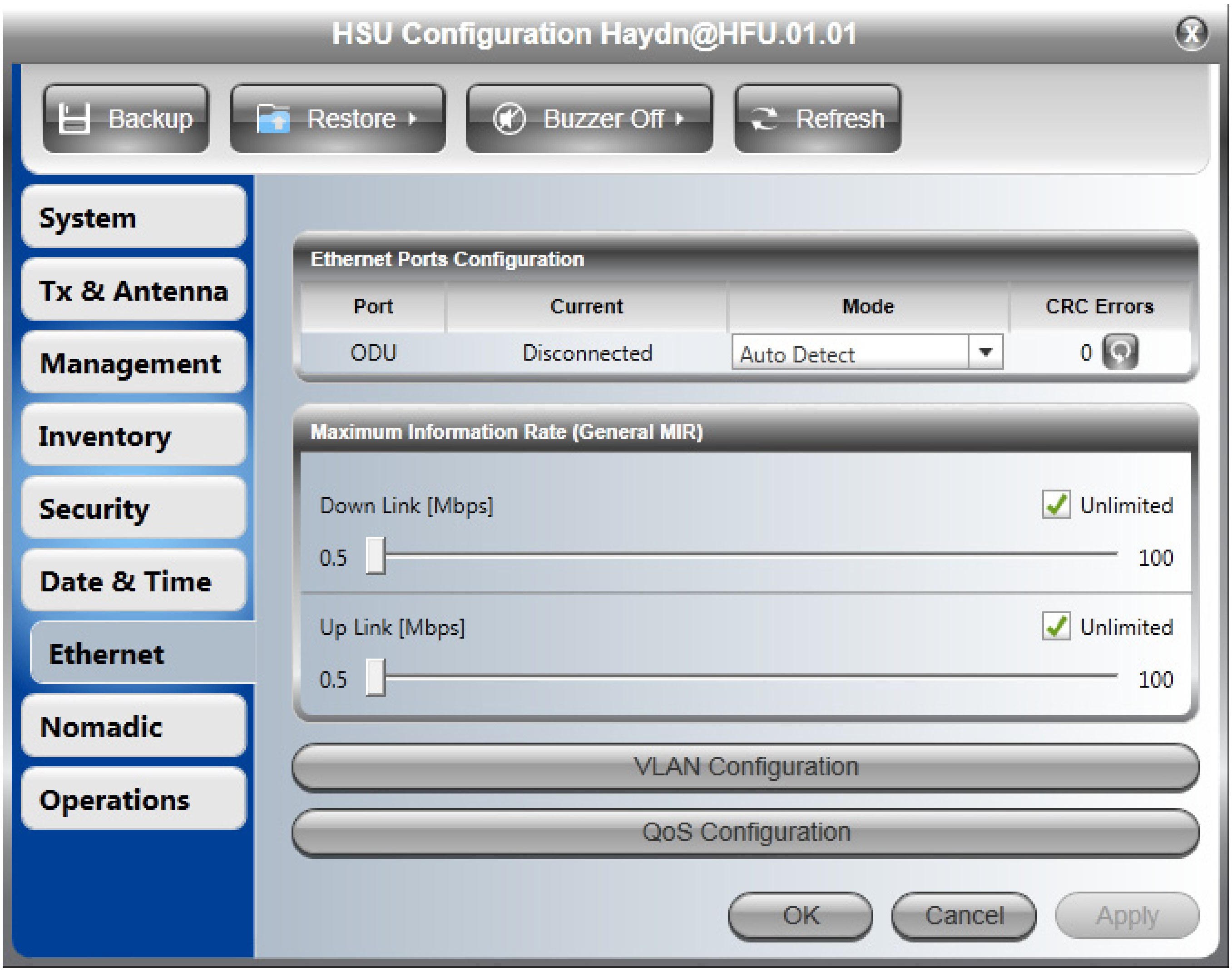
You may change the SNMP community strings only for the HSU from here. You cannot change the Link password from an HSU.

Date & Time

The functionality is identical as that for the HBS.

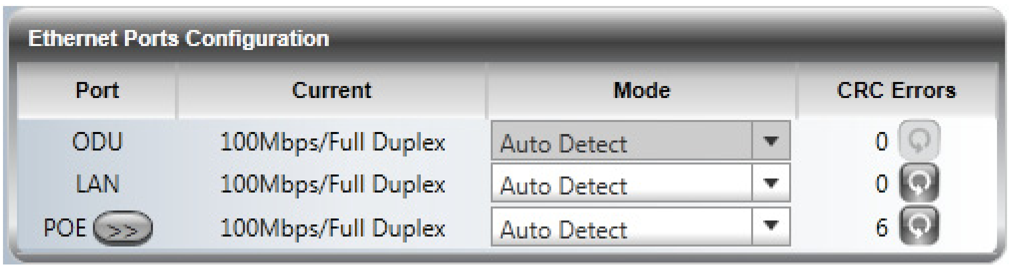
Ethernet

Ethernet configuration for a HSU follows the same general pattern as the corresponding tab for the HBS but with important differences.



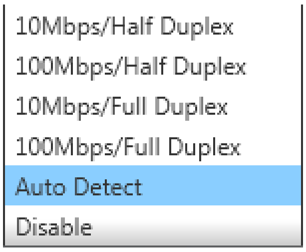
Ethernet Ports Configuration

This item is same for all PoE powered HSUs and the HBS. See **page 6-16**. For the SU2-ACs (AC powered HSUs) Ethernet Ports Configuration panel is different:

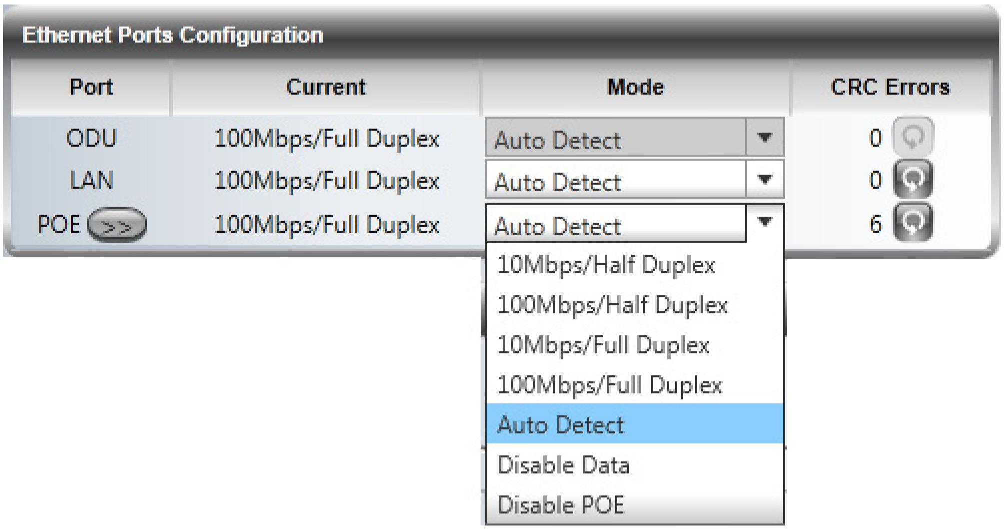


The ODU entry is disabled; only the LAN and PoE (out) ports are available for configuration:

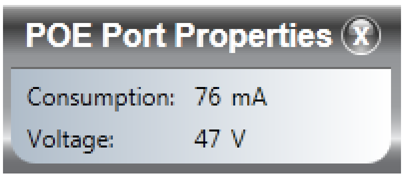
The LAN port has these options:



The PoE port offers the following options:



Typically, a video camera is attached to the PoE port. The last two option provide basic camera management functions. The  button next to the POE label offers basic PoE performance information:



Maximum Information Rate

The Maximum Information Rate (MIR) was initially set during HSU Registration. You may change it here.

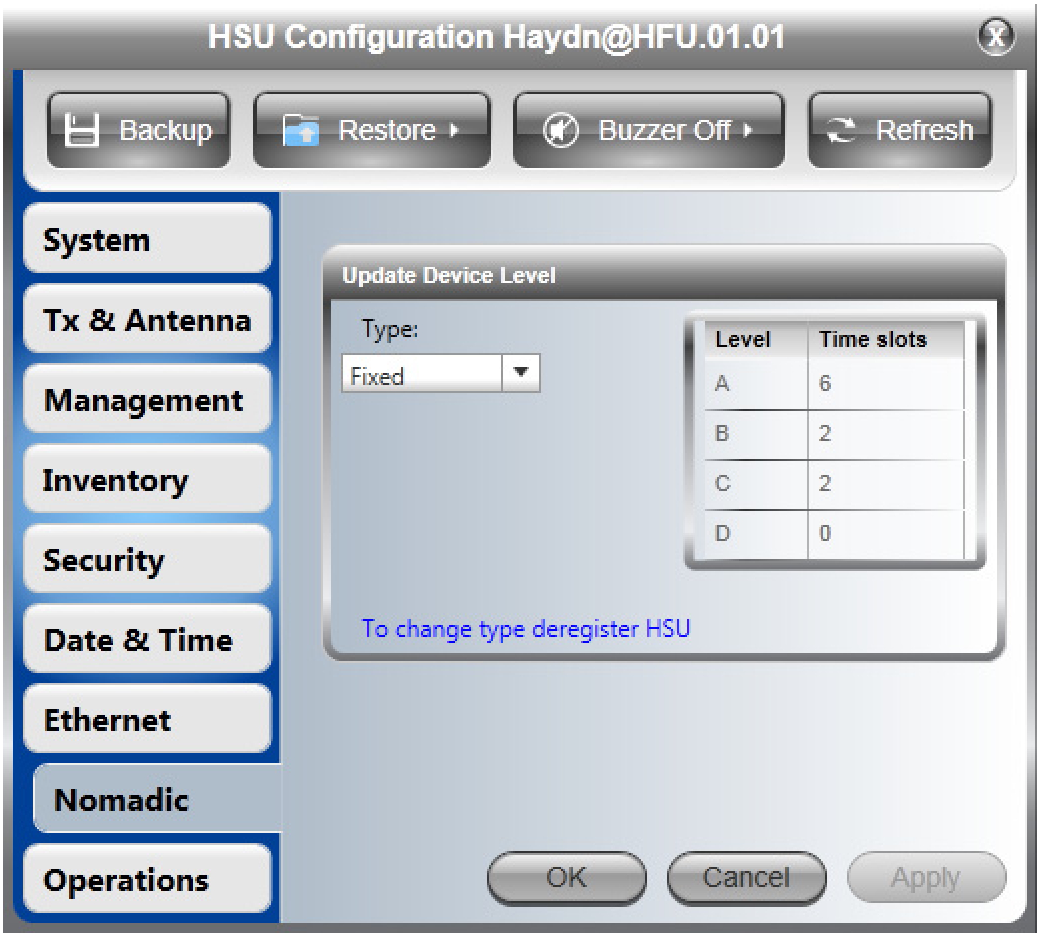
VLAN Configuration

For Traffic VLAN configuration, see **Chapter 13**.

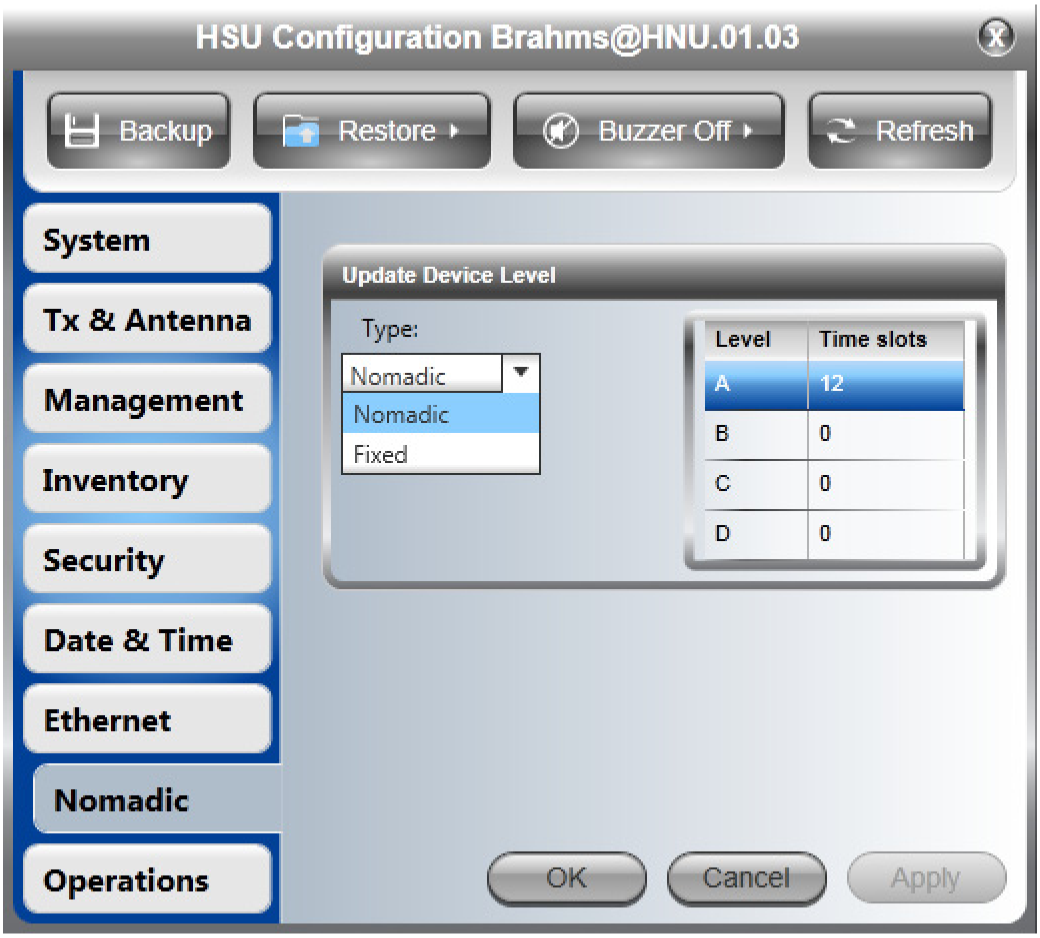
QoS Configuration

QoS configuration is described in **Chapter 16**.

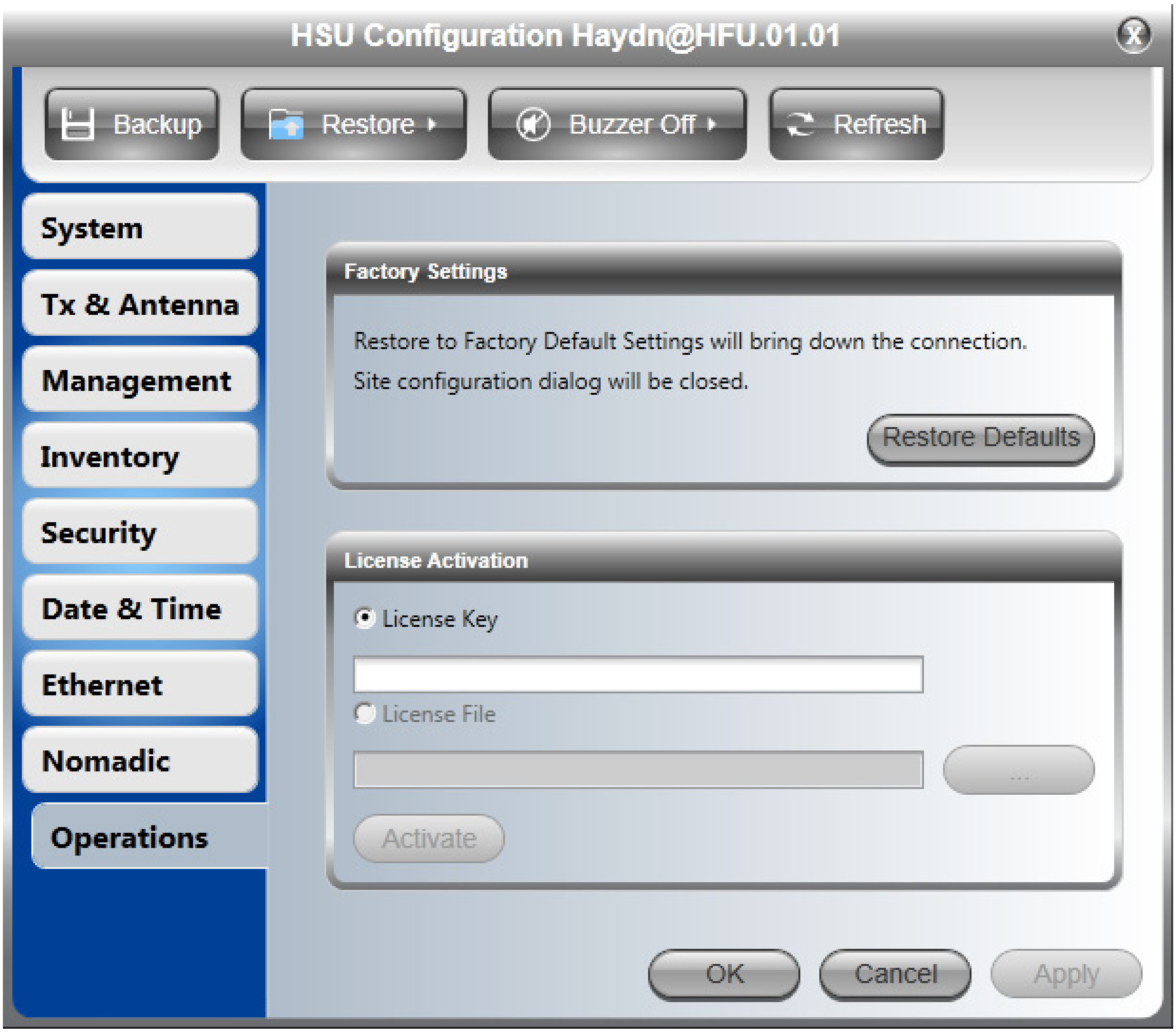
Nomadic



You cannot change a fixed HSU to a nomadic HSU here without prior deregistration. For a nomadic HSU, you may change its operating level or even revert it to a fixed HSU.


HSU Configuration Brahms@HNU.01.03
Backup
Restore
Buzzer Off
Refresh
System
Tx & Antenna
Management
Inventory
Security
Date & Time
Ethernet
Nomadic
Operations
Update Device Level
Type:
Nomadic
Nomadic
Fixed
Level
Time slots
A
12
B
0
C
0
D
0
OK
Cancel
Apply

Operations



This functionality is identical to that for the HBS.

Advanced: False Radar Mitigation

This tab is only visible if

- You are using a Regulation requiring Radar Channel Avoidance **and**
- You are logged on as Installer

For this release, this feature for HSUs, is relevant to the 5.3 GHz ETSI and the 5.4 GHz FCC/ IC bands.

Configuration of False Radar Mitigation is covered in **Chapter 14**.

Replacing an HSU

A defective HSU may be replaced by another HSU belonging to the sector provided that the replacement is not registered. Here is a typical scenario:

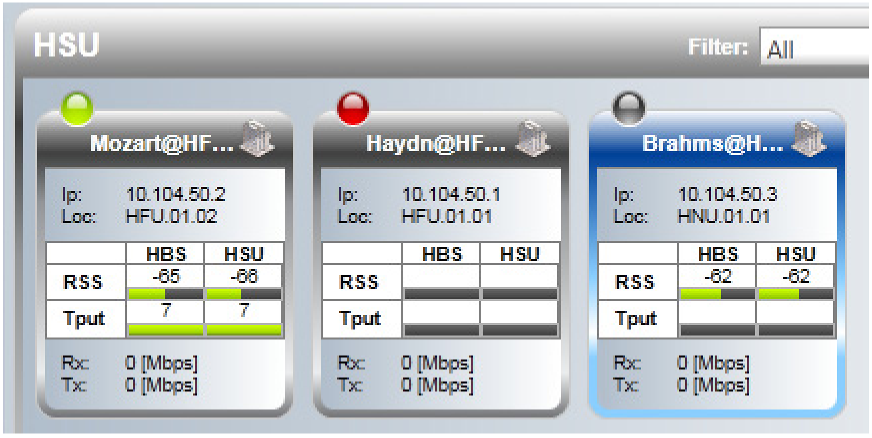
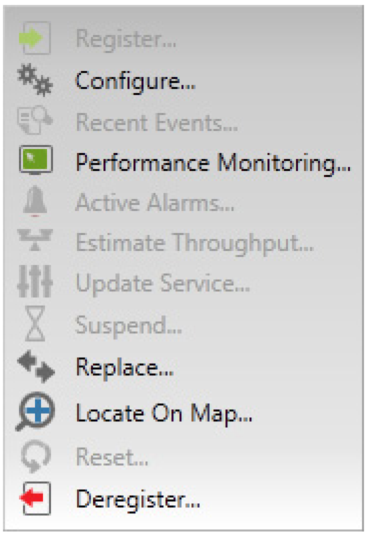


Figure 6-17: Unit 10.104.50.1 is down and unit 10.104.50.3 is available and not registered

Since the replacement procedure is a rather delicate process, we will step through it with a detailed example based on the scenario in **Figure 6-17**.

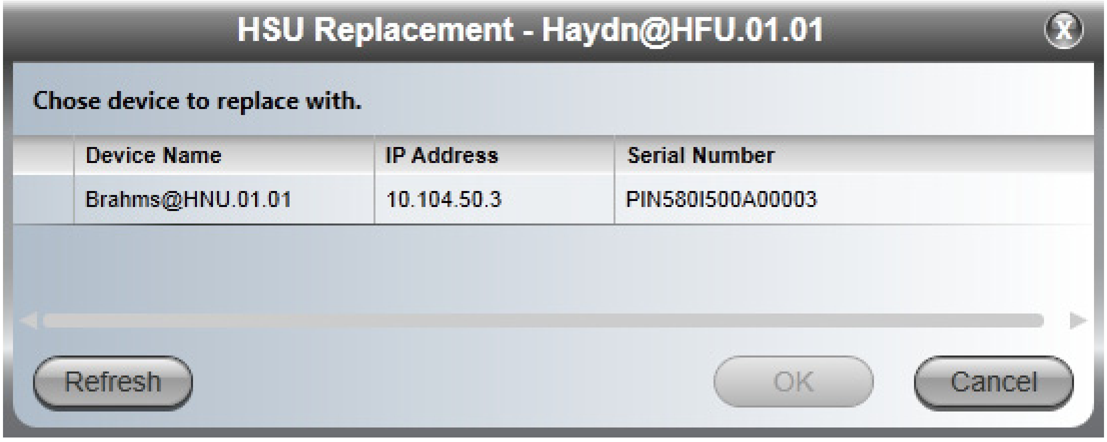
To replace a defective HSU:

1. Right click the defective unit for its context menu:

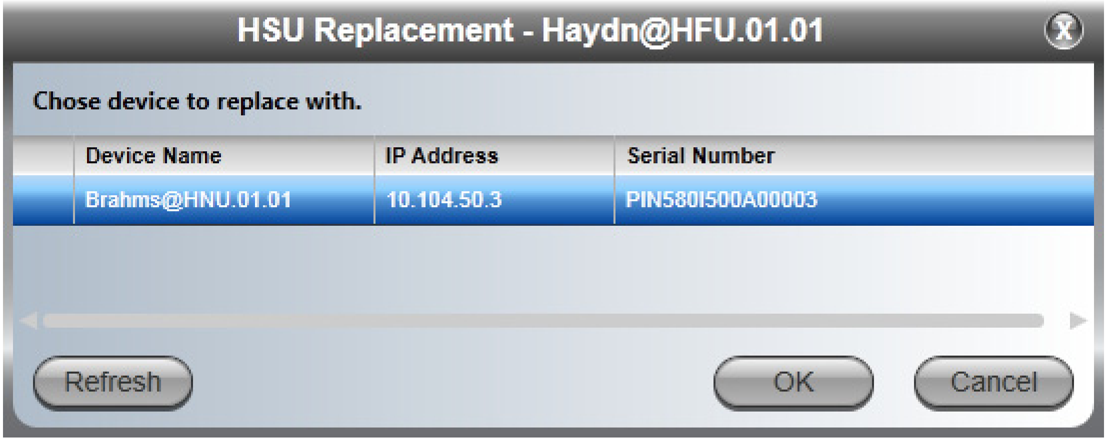


   It has a new item: **Replace**.

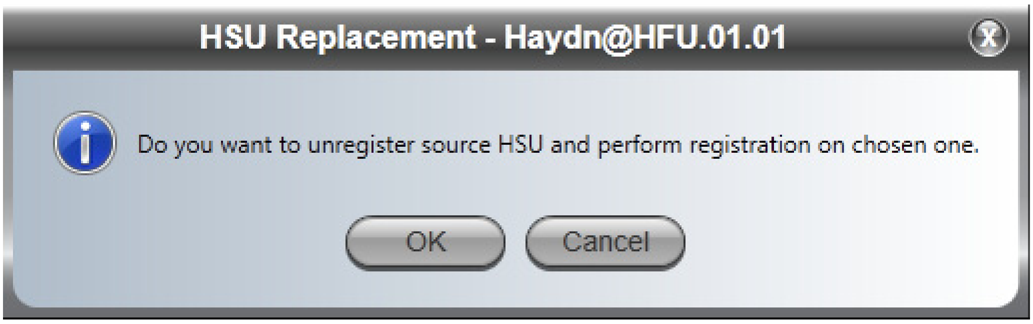
2. Click **Replace**. Your are offered a list of HSUs available as replacements. In our example there is one: 10.104.50.3



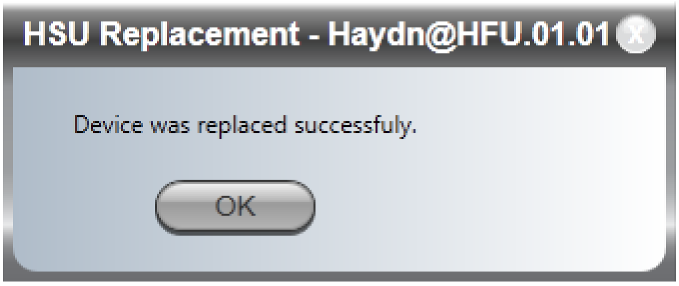
3. Select the required unit by clicking on it.



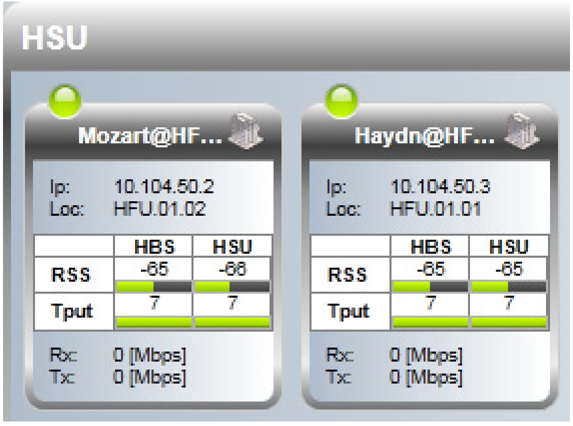
4. Click **OK**. You are asked to confirm before proceeding:



5. Click **OK** again. You receive further confirmation:



Here is the final outcome:



Notice that 10.104.50.3 has replaced 10.104.50.1 inheriting most of its settings. It may not inherit the Tx and Antenna settings, which you should check.

Note

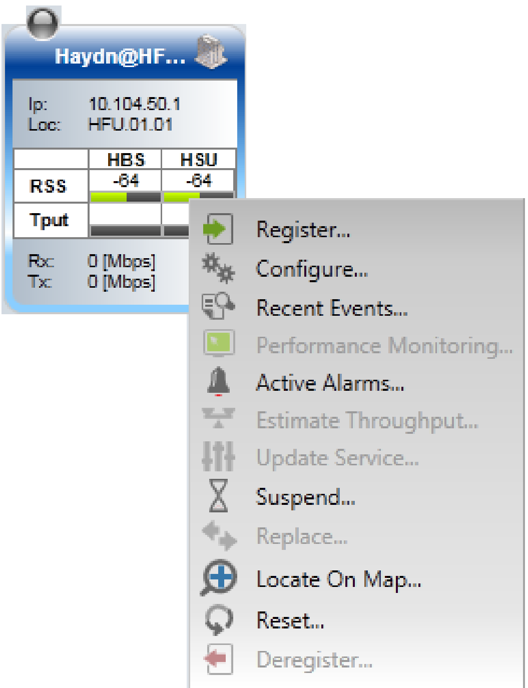
The IP address of the replacement unit is not changed. To ensure that all 10.104.50.1 traffic actually gets to the new unit, you should also change its IP address to that of the original unit, 10.104.50.1.

Updating HSU Services

Choosing **Update Services** from an HSU context menu or clicking from the HSU button bar opens the Registration window. You may use this to switch the HSU between MIMO and Diversity mode and change the HSU time slot allocation.

Suspending an HSU

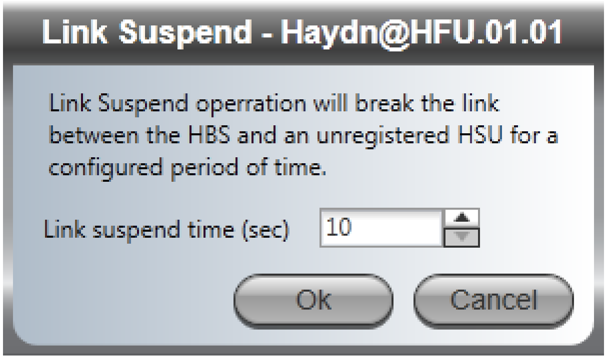
You may break the link (cause a sync loss) to an un-registered HSU for a fixed amount of time. Here is the scenario:



HSU 10.104.50.1 is not registered.

To suspend an un-registered HSU:

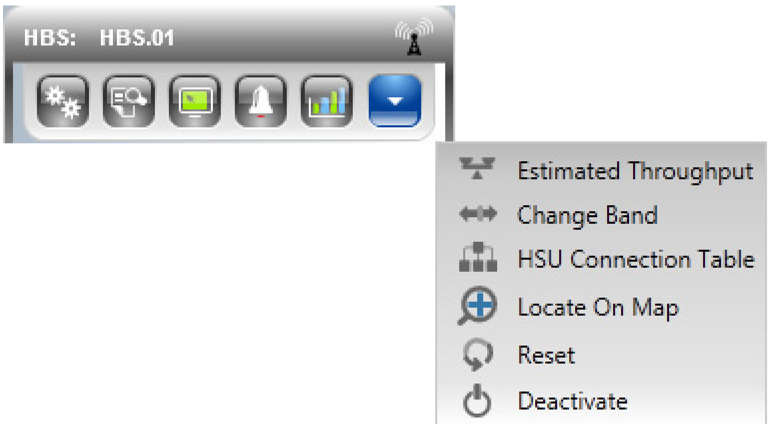
1. Click **Suspend** in its context menu. You are requested to enter a suspend duration.



2. Choose a suspend time and click **OK**. During the suspend duration, the HSU will be deleted from the HBS Main Window HSU panel. The HSU returns to the main display with resumption of sync.

Changing the Sector Band

Changing the Band in use is always carried out at the sector level (not per installed ODU). To the Sector Band you must be logged on to the HBS as Installer. In Installer mode, the right hand button,  on the Base Station button bar has an extra function, **Change Band**.



To change the Sector Band:

1. Click **Change Band**. A list of available Bands is displayed:

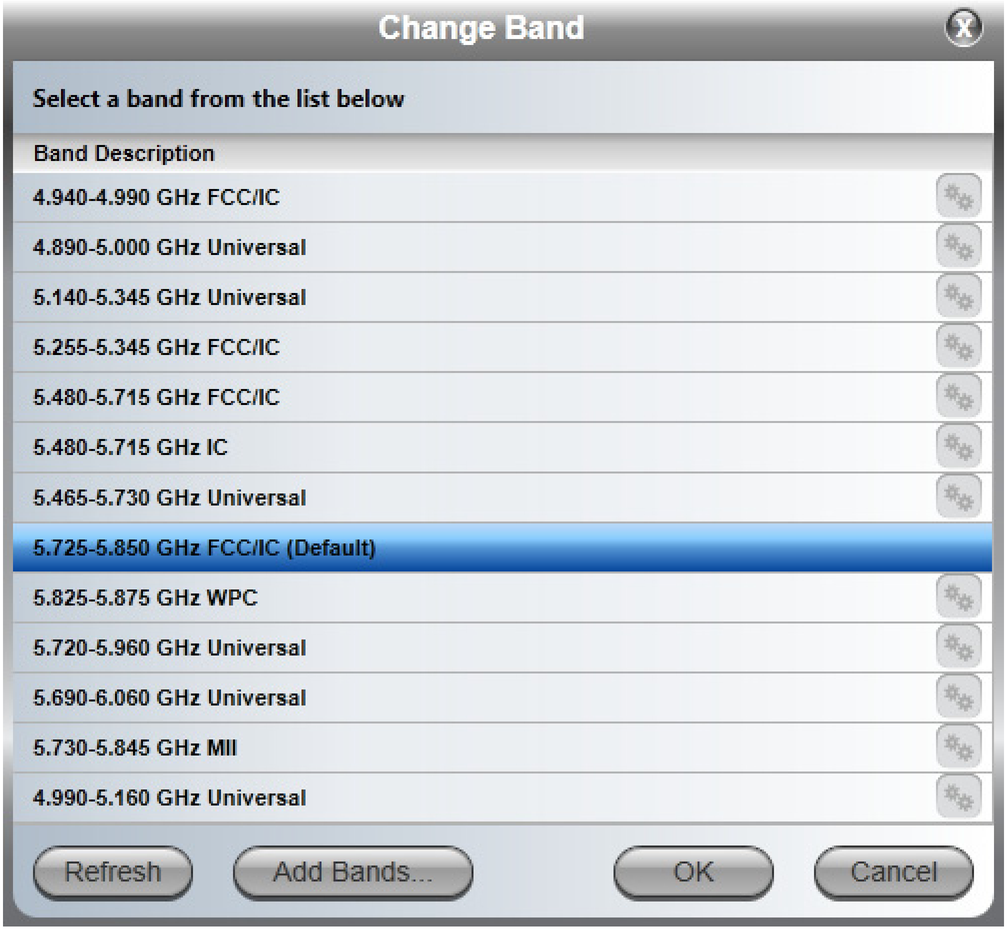


Figure 6-18: Change or Add Bands

2. Select the required Band and click **OK**. For our purposes, we choose 5.720-5.960 GHz Universal. The band is highlighted and right button is enabled.

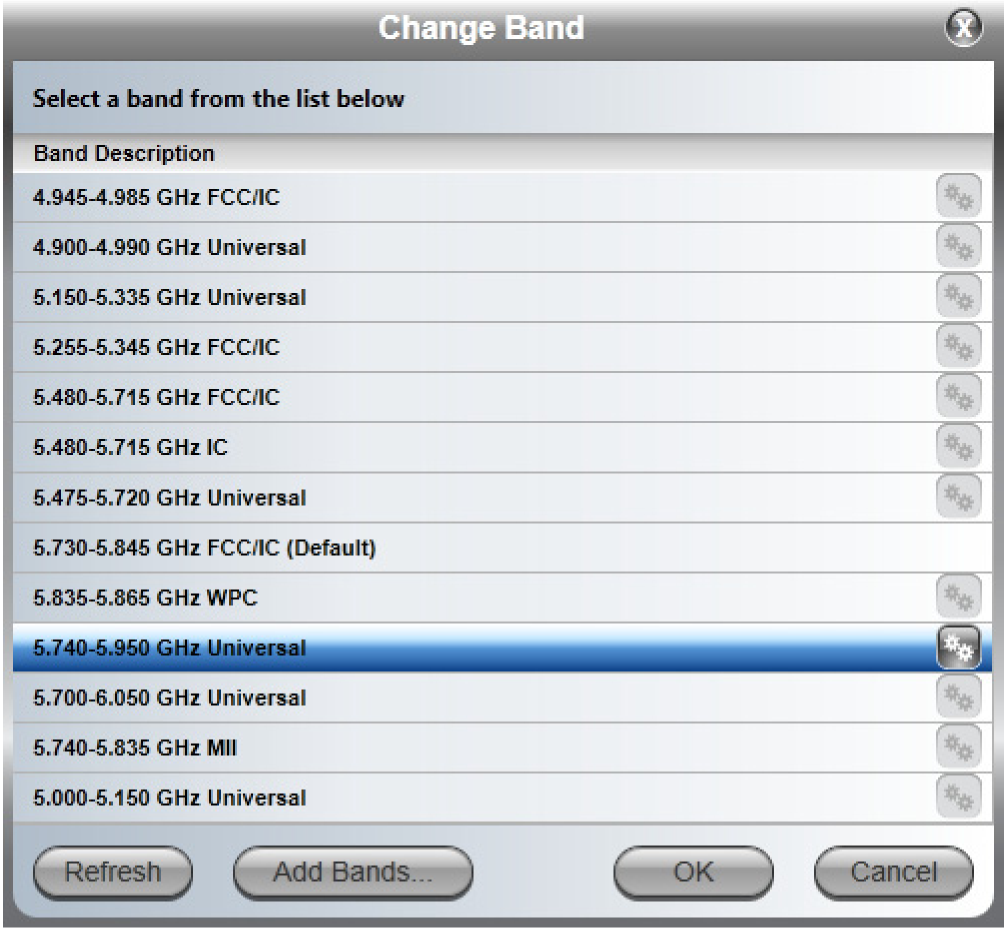
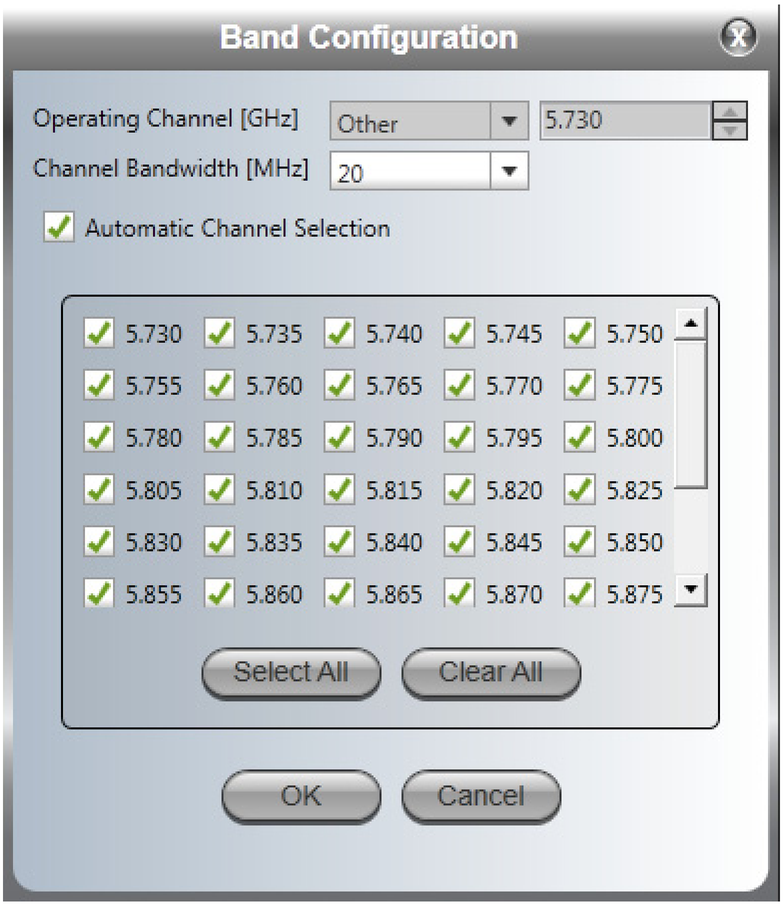
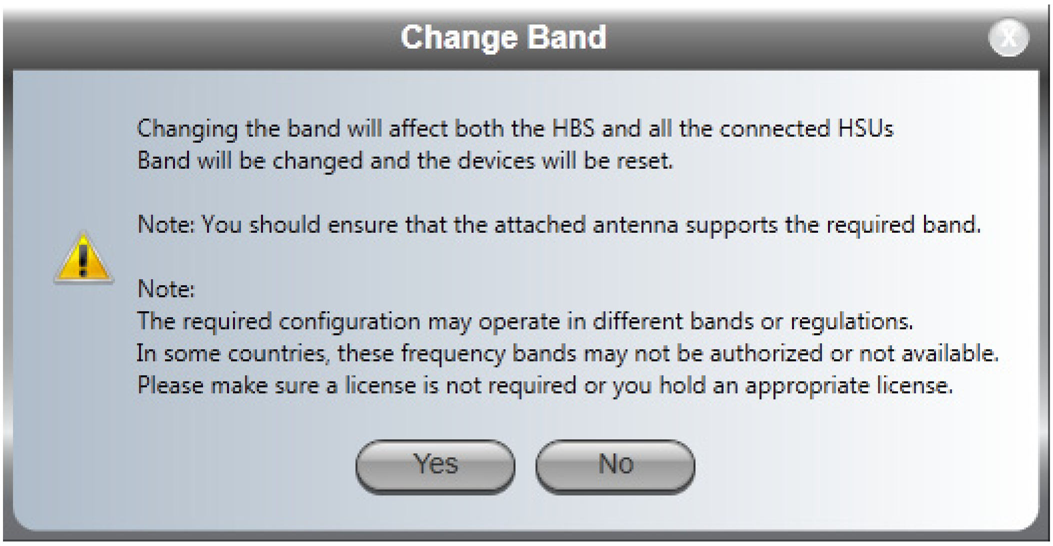


Figure 6-19: Add/Change Band dialog

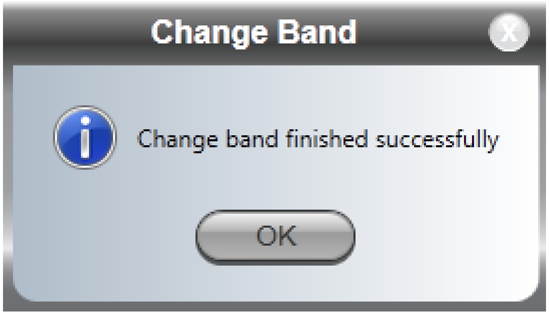
3. Click the right button. The following window opens:



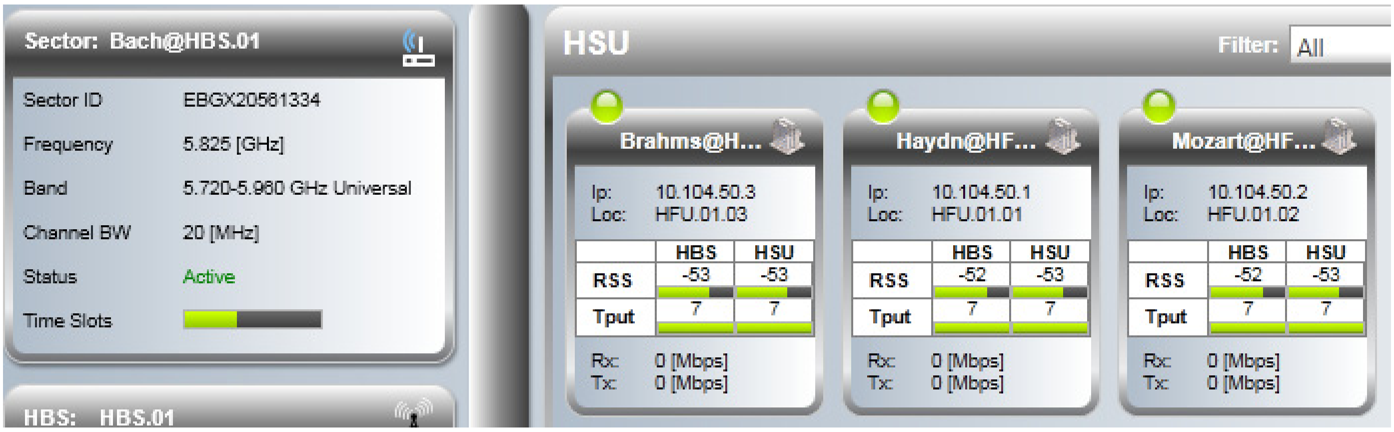
4. Here you may chose the working channel bandwidth and channel selection as in the activation process. Click **OK** to accept your choice. You are returned to the display in **Figure 6-19**.
5. Click **OK** again. The following cautionary message is displayed:



6. Click **Yes** to continue. After a short delay, you are offered a final confirmation:



7. Click **OK**. A sector re-sync follows. Here is the final result:



Having set the channel bandwidth and operating channels earlier, there is no need for deactivation and reactivation.

You may also add new Bands by clicking the Add Bands button. There are several provisos to this:

- Additional Bands must be available for your hardware
- Such additional Bands must be available within the framework of your local regulations

The foregoing applies to both regulated and unregulated Bands.

➢ To obtain and install additional bands:

1. Make a list of ODU serial numbers for all HBSs and all HSUs to receive additional bands. The list should be a simple text file, one serial number per line. (The serial numbers are located on the stickers on the ODUs.)
2. As Installer, open the window of **Figure 6-18** above, and click Add Bands. The following instruction panel is displayed:

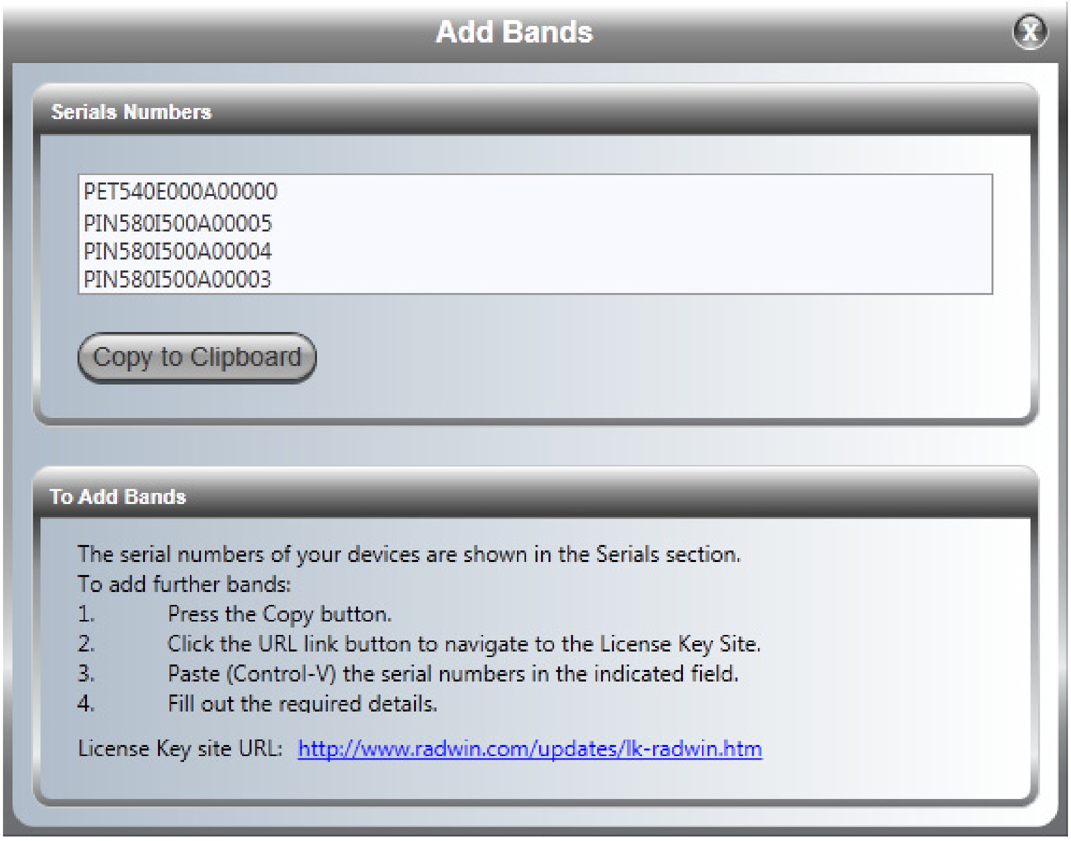


Figure 6-20: Add Bands Instructions Panel

The serial numbers displayed relate to the ODUs in the sector. Click **Copy to Clipboard**.

3. This step applies only if you have additional un-installed units:

   Before proceeding to step 2 in **Figure 6-20**, open your own list in a plain text editor. If the displayed serial numbers are in the list, select your list and copy it all to the clipboard. Otherwise append the clipboard contents to your list. Select the whole list and save it to the clipboard.

4. Now carry out steps 2 to 5 in **Figure 6-20**. Step 2 will take you to a Web page, which looks **something** like this:

Fill out the form below to generate your License Key. After submitting the form you will receive an email with the new License Key. License Key generation is per serial number, you may enter several serial numbers. Required fields are marked with *. The Reference field is for your own records.

Personal details

End-User Full Name:*

Address:*

End-User Email Address:*

Reference:

Company:*

Phone:*

Confirm Email:*

Enter Code (7310):*

Link details

Required Band:* ? 2.4 GHz FCC/IC

Installation Country:* Please Select...

Serial Numbers:* ?

Get Key

5. Fill out the requested details. Remember to terminate the dialog by clicking the **Get Key** button.

6. The results of your request will be displayed with further instructions.

No.	Serial	Status
1	PET540E000A00000	Serial Found
2	PIN580I500A00005	Serial Found
3	PIN580I500A00004	Serial Found
4	PIN580I500A00003	Serial Found

Close

You will receive an automated email during the next few minutes. If it does not arrive, please check that it was not caught by your junk/spam filter.

A few minutes later, you should receive an email, containing in its body, a list of license keys.

Note: You may see error messages in the Status Column such as **Band not supported** or **Serial not found**. Supported bands typically reflect your local regulations. Check missing serial numbers with RADWIN Customer Support.

7. Copy and Paste the license keys into a plain text file and save it to a safe known place.
8. Open the **Configure | Operations** tab (**Figure 6-12**). Check the License File button, navigate to the file you save in the last step.
9. Upon completion of the process, click **Activate**. The next time you enter the Change Bands tab, the new bands will be available.

Configuration with Telnet

Telnet Access to the HBS

A Telnet terminal can be used to configure and monitor the RADWIN 5000 HPMP.

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

For example, if you run Telnet as follows,

telnet 10.104.50.200

you will be asked for a user name and password.

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

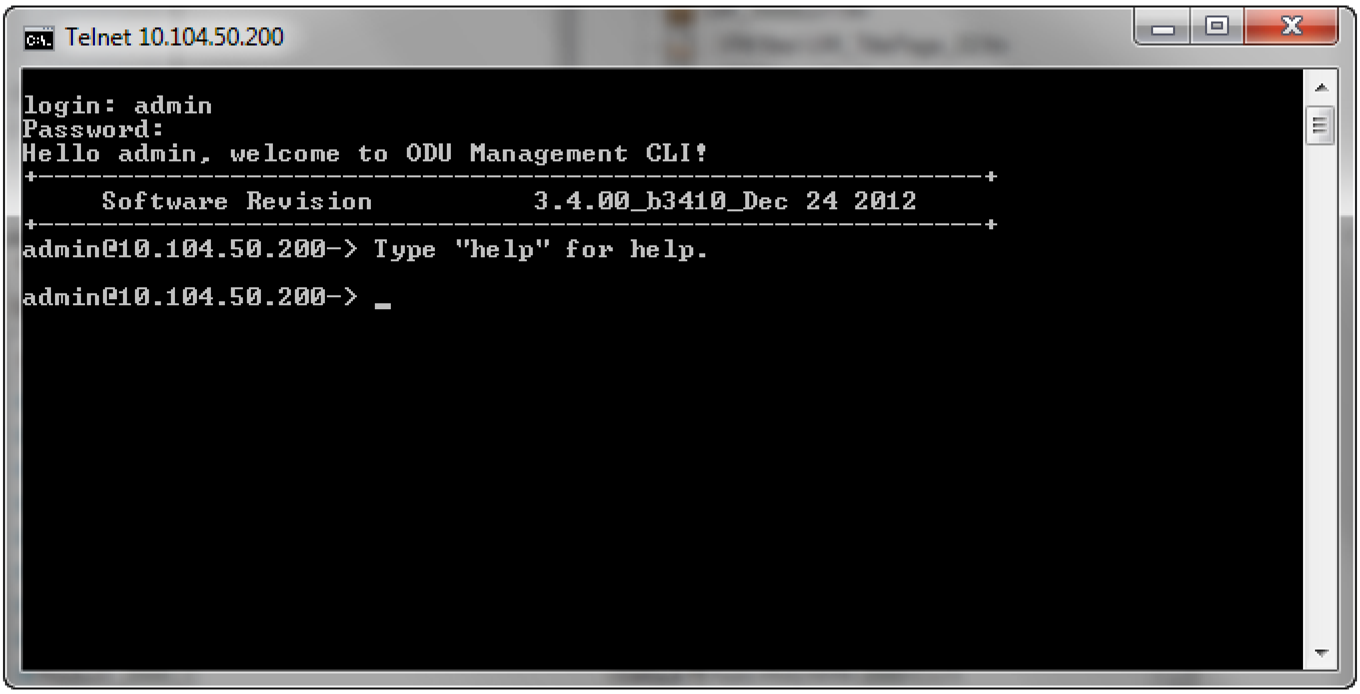


Figure 6-21: Telnet session log on to the HBS

A Read-Only Community string allows you to use **display** commands only whereas a Read-Write Community string allows you to use **display** commands and execute **set** commands.

Supported HBS Telnet commands are shown in **Table 6-1** to **Table 6-3**.

Table 6-1: HBS Telnet - Display Commands

Command	Explanation
display inventory	Displays ODU product name, Name, Location, hardware and software revisions, uptime, MAC address.
display management	Displays IP, subnet, Gateway, Traps table
display link <param:all,reg,unreg>	Displays all static details about the sector or HSU
display ethernet	Displays Port table (State, Status and action)
display ethernet_errors	Displays Cable statistics
display ntp	Displays Time, Server and Offset
display PM <interface:AIR,LAN1> <interval:current,day,month>	Shows the performance monitor tables for each interface according to user defined monitoring intervals
display bands	Displays available bands

Table 6-2: HBS Telnet - Set Immediate Commands

Command	Explanation
set ip <ipaddr> <subnetMask> <gateway>	Set the ODU IP address, subnet mask and gateway. The user must reset the ODU after the command completion
set trap <index:1-10> <ipaddr> <port:0-65535>	Set a specific trap from the traps table (e.g. set trap 3 192.168..101 162)
set readpw <oldpasswd> <passwd>	Set the read access password (Read Community)
set writepw <oldpasswd> <passwd>	Set the read-write access password (Read-Write Community)
set trappw <oldpasswd> <passwd>	Set the trap Community string
set tpc<power:Value between minimal Tx power, and maximal Tx power>	Set the ODU Tx Power. If a wrong value is entered, both min and max values shall be displayed in the error reply
set name <new name>	Set the name of the link
set location <new location>	Set the name of the location
set contact <new contact>	Set the name of the site manager
set ethernet <port:LAN1> <mode:AUTO,10H,10F,100H,100F,DISABLE>	Set the mode and speed of the Ethernet port
reboot	Resets the ODU. The user is warned that the command will reset the ODU. A new Telnet session to the ODU may be opened after the reset is complete.
help	Displays the available commands

Table 6-3: HBS Telnet - Set Commands requiring Reset

Command	Explanation
set secId <SectorID>	Set new sector ID - Reset required.

Telnet Access to the HSU

The procedure is the same as for the HBS.

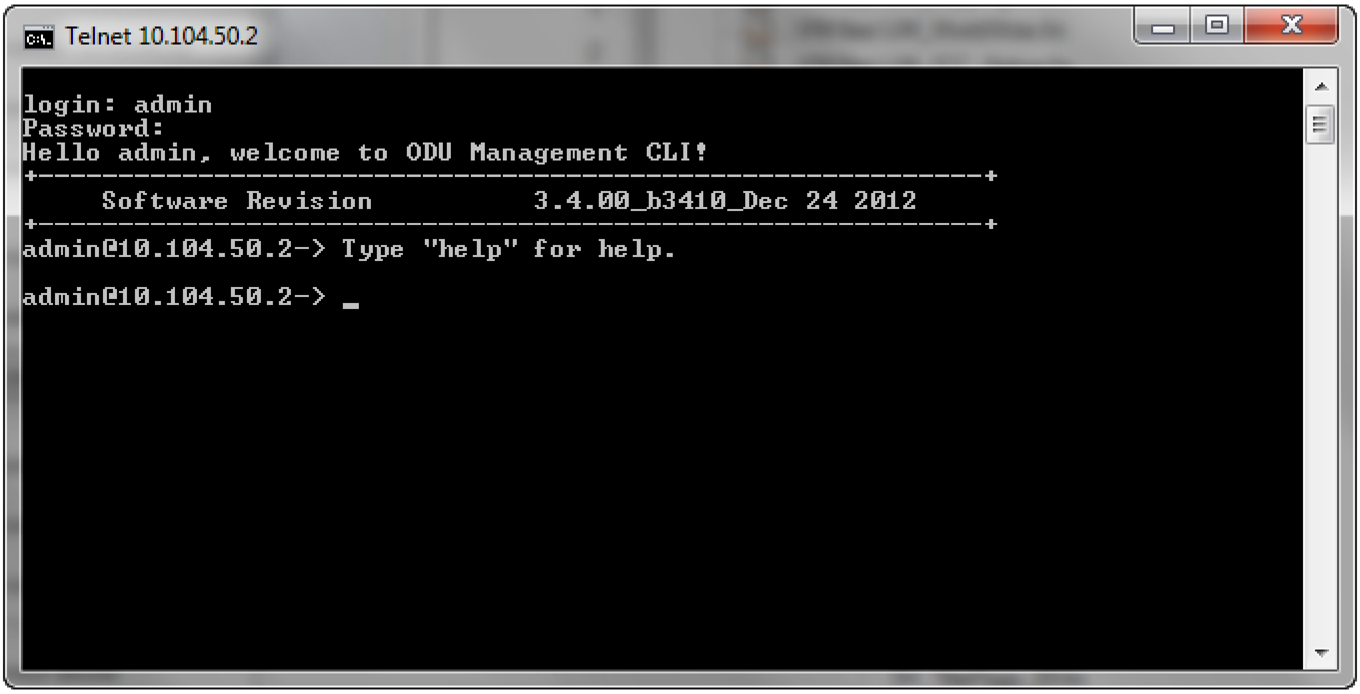


Figure 6-22: Telnet Management window - HSU

Supported HSU Telnet commands are shown in **Table 6-4** to **Table 6-6**.

Table 6-4: HSU Telnet - Display Commands

Command	**Explanation**
display inventory	Displays ODU product name, Name, Location, hardware and software revisions, uptime, MAC address.
display management	Displays IP, subnet, Gateway, Traps table
display link	Displays all static details about the HSU
display ethernet	Displays Port table (State, Status and action)
display ethernet_errors	Displays Cable statistics
display ntp	Displays Time, Server and Offset
display PM <interface:AIR,LAN1> <interval:current,day,month>	Shows the performance monitor tables for each interface according to user defined monitoring intervals
display bands	Displays available bands

Table 6-5: HSU Telnet - Set Immediate Commands

Command	**Explanation**
set ip <ipaddr> <subnetMask> <gateway>	Set the ODU IP address, subnet mask and gateway. The user must reset the ODU after the command completion
set trap <index:1-10> <ipaddr> <port:0-65535>	Set a specific trap from the traps table (e.g. set trap 3 192.168..101 162)
set readpw <oldpasswd> <passwd>	Set the read access password (Read Community)

Table 6-5: HSU Telnet - Set Immediate Commands (Continued)

Command	Explanation
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=AUTO,2=ON>	Set the buzzer mode
set tpc<power:Value between minimal Tx power, and maximal Tx power>	Set the ODU Tx Power. If a wrong value is entered, both min and max values shall be displayed in the error reply
set name <new name>	Set the name of the link
set location <new location>	Set the name of the location
set contact <new contact>	Set the name of the site manager
set ethernet <port:LAN1> <mode:AUTO,10H,10F,100H,100F,DISABLE>	Set the mode and speed of the Ethernet port
reboot	Resets the ODU. The user is warned that the command will reset the ODU. A new Telnet session to the ODU may be opened after the reset is complete.
help	Displays the available commands

Table 6-6: HSU Telnet - Set Commands requiring Reset

Command	Explanation
set secId <SectorID>	Set new sector ID - Reset required.

Chapter 7

Direct HSU Configuration

Scope of this Chapter

Direct management of an HSU may be carried out by a direct LAN connection to a managing computer (on-site) or over-the-air (from the HBS site).

There are several differences in the configuration functionality for a directly managed HSU compared to the method of **Chapter 6** depending on whether the HSU is registered to a HBS, unregistered or not a member of any sector.

Where configuration function is identical under direct connection and through the HBS, we will not repeat the details, which may be seen in **Chapter 6**.

Configuring an HSU

Log on to the HSU either directly or over-the-air as shown in **Chapter 4**. For a registered HSU, you will see a display like this:

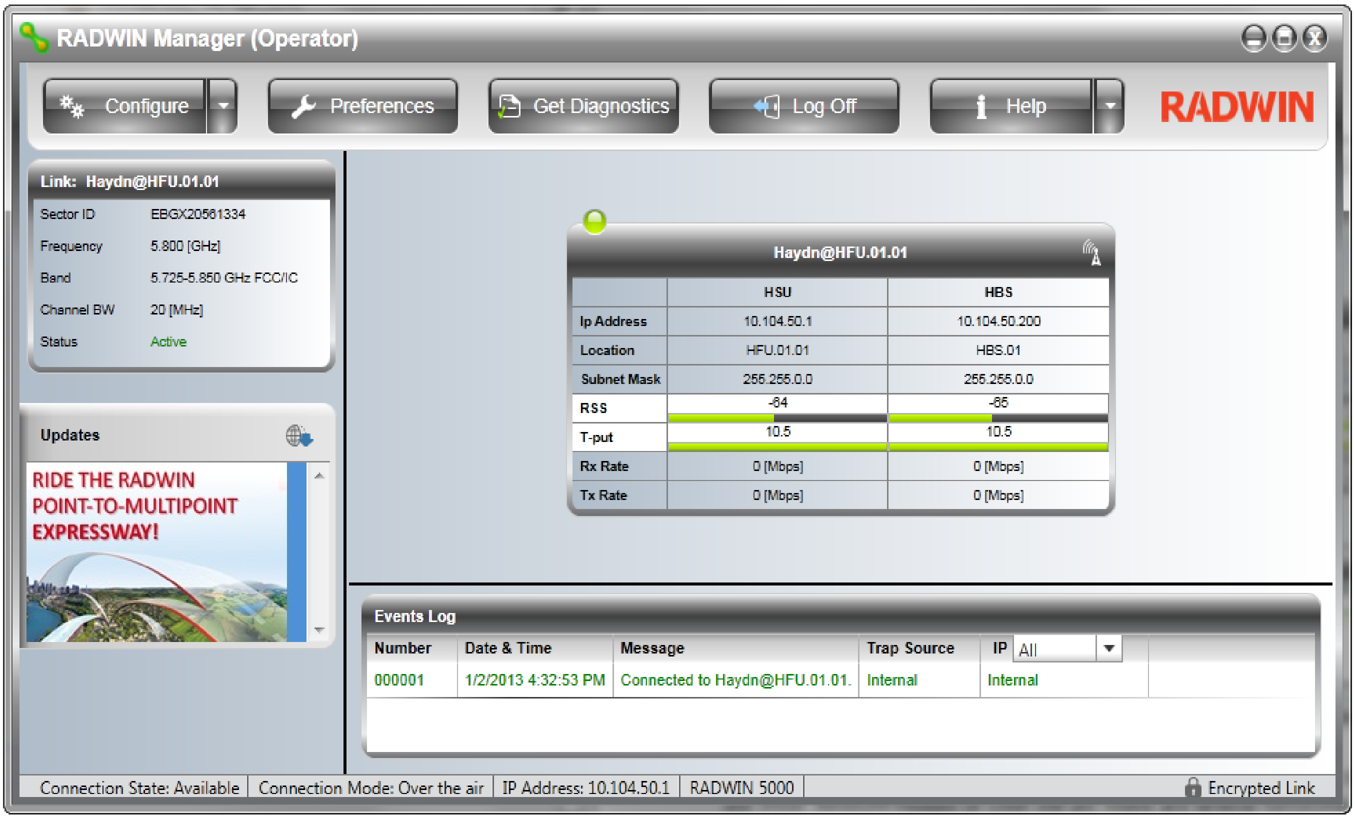


Figure 7-1: Direct or over the air connection to a registered HSU

For an unregistered HSU, the throughput (T-put) fields and the Sector ID field would be empty.

If the HBS is deactivated, or the HSU is stand-alone you will see a display like this:

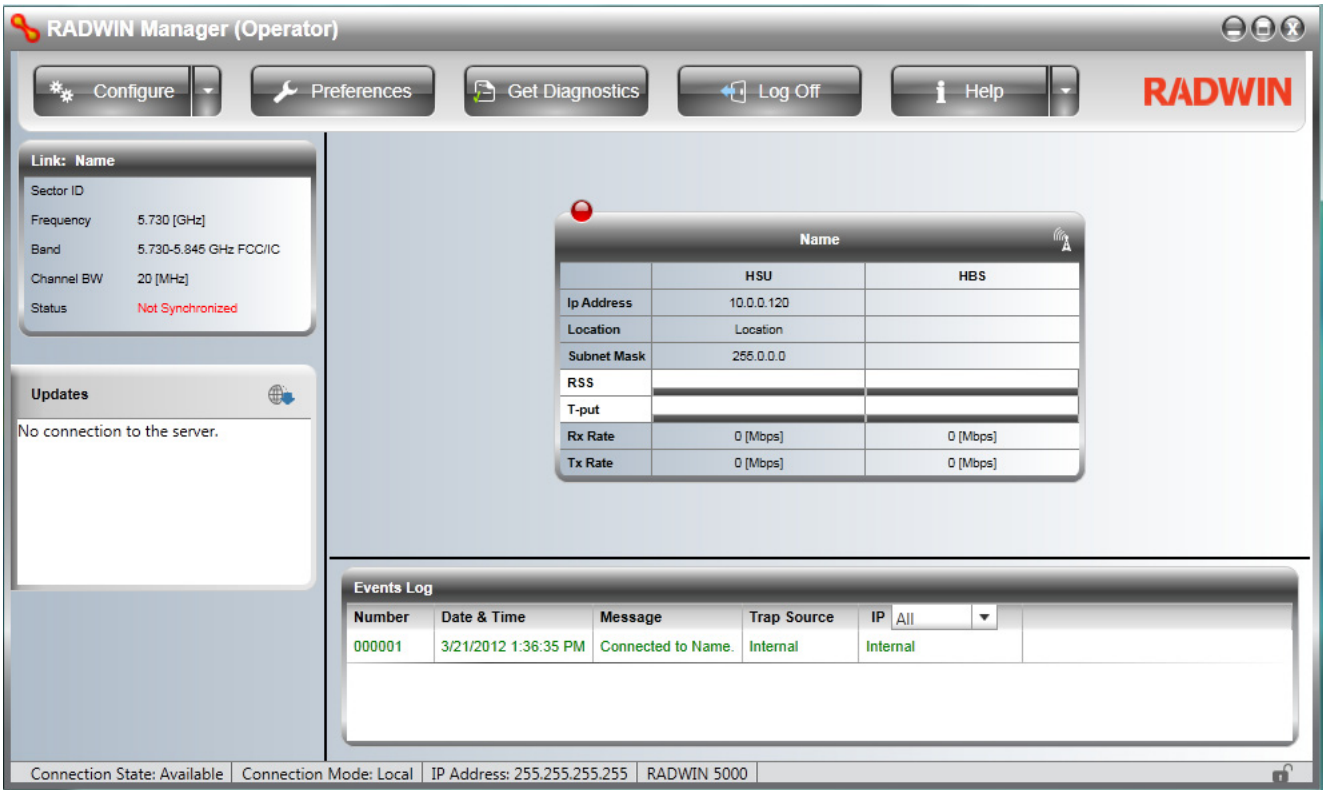
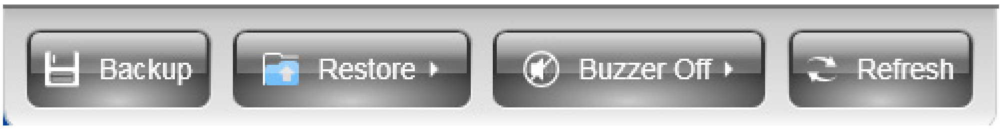


Figure 7-2: Direct connection to a stand-alone HSU out of the box

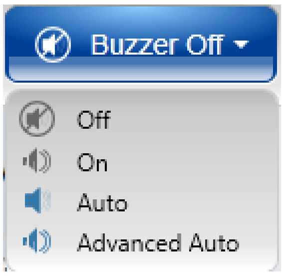
In what follows, we configure a registered HSU unless specifically specified otherwise.

Configuration Menu Buttons



The **Backup** and **Restore** buttons have the same functionality as the corresponding buttons for the HBS. They provide for backup and restore of the HSU software.

The **Buzzer** button may set or mute the buzzer.



Recall that the buzzer tone is primarily used for HSU antenna alignment.

The **Refresh** button restores the current window to its previous state abandoning any changes you made, provided that you did not click **Apply** or **OK**.

The configuration tabs here differ from the HSU configuration tabs under the HBS Table view in one respect: There is an Air Interface tab, which varies in functionality, depending on whether the HSU is registered or not.

Air Interface

Figure 7-3: HSU Configuration - Air Interface for Registered fixed HSU

For a registered HSU this window is for information only. For an unregistered or unsynchronized fixed HSU, the Sector ID field will be blank or the last Sector ID used and editable and the Channel Bandwidth field will be set to default and active:

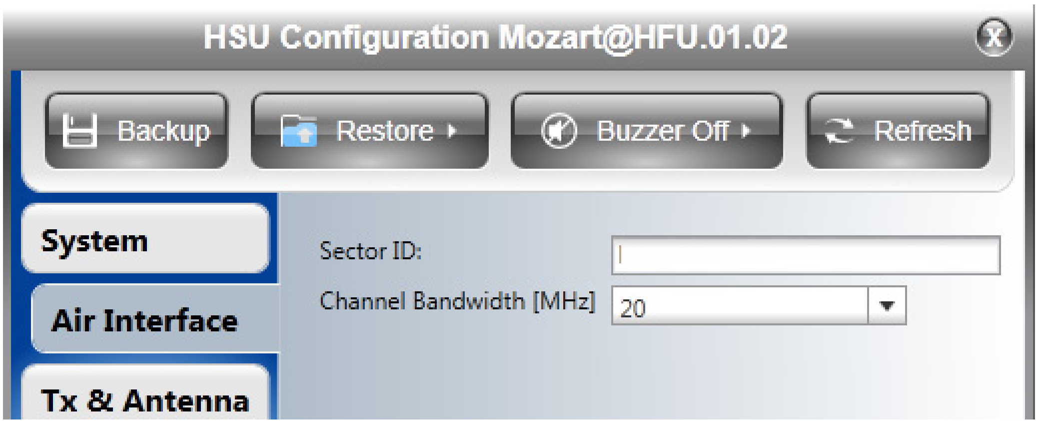


Figure 7-4: HSU Configuration - Air Interface for stand-alone fixed HSU

For a nomadic HSU or a HMU, the Air Interface display is different. First, the Sector ID is replaced by the Network ID. For a registered HSU, neither the Network ID or CBW can be touched:

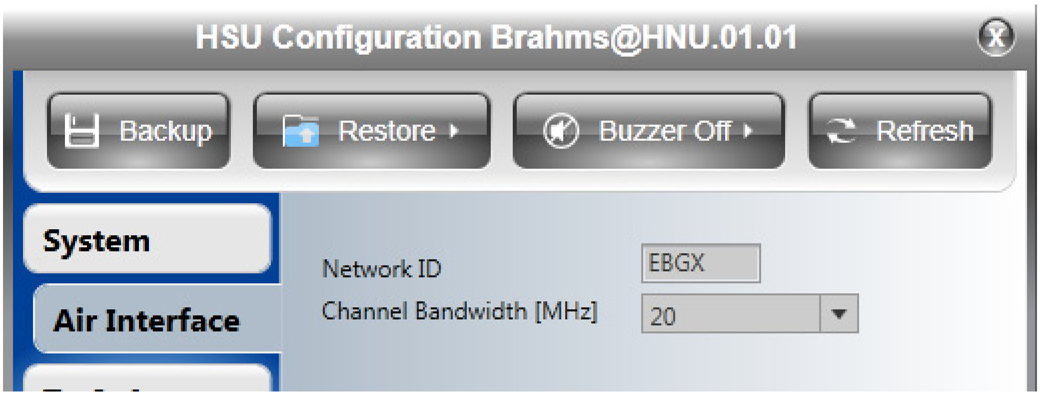


Figure 7-5: HSU Configuration - Air Interface for Registered nomadic HSU or *HMU*

For an unregistered or unsynchronized HSU, you may edit both of these fields:

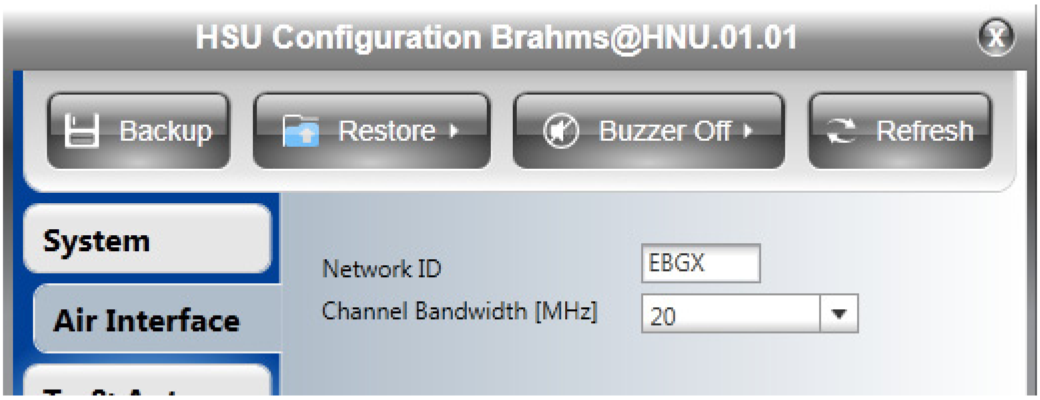


Figure 7-6: HSU Configuration - Air Interface for a stand-alone nomadic HSU or *HMU*

Use this feature to switch a nomadic HSU or HMU to a different network.

Where has my HSU gone?

Suppose that you installed two collocated HBSs with contiguous sectors. It is possible that an HSU located close to the common sector boundary may "discover" the wrong HBS. A HSU can be "forced" across to another HBS by changing its Sector ID to that of the required HBS. To switch an HSU to another HBS, make sure that it is unregistered. You will need to log on to it directly and get to the Air Interface window:

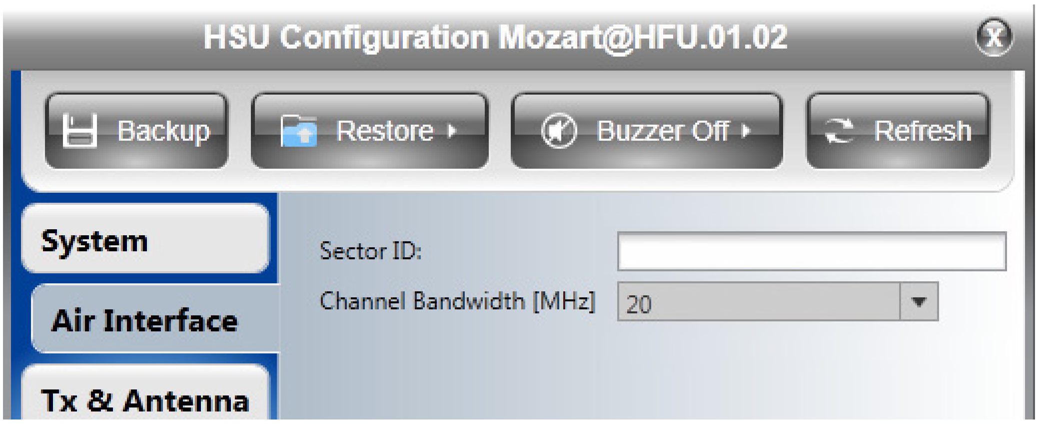
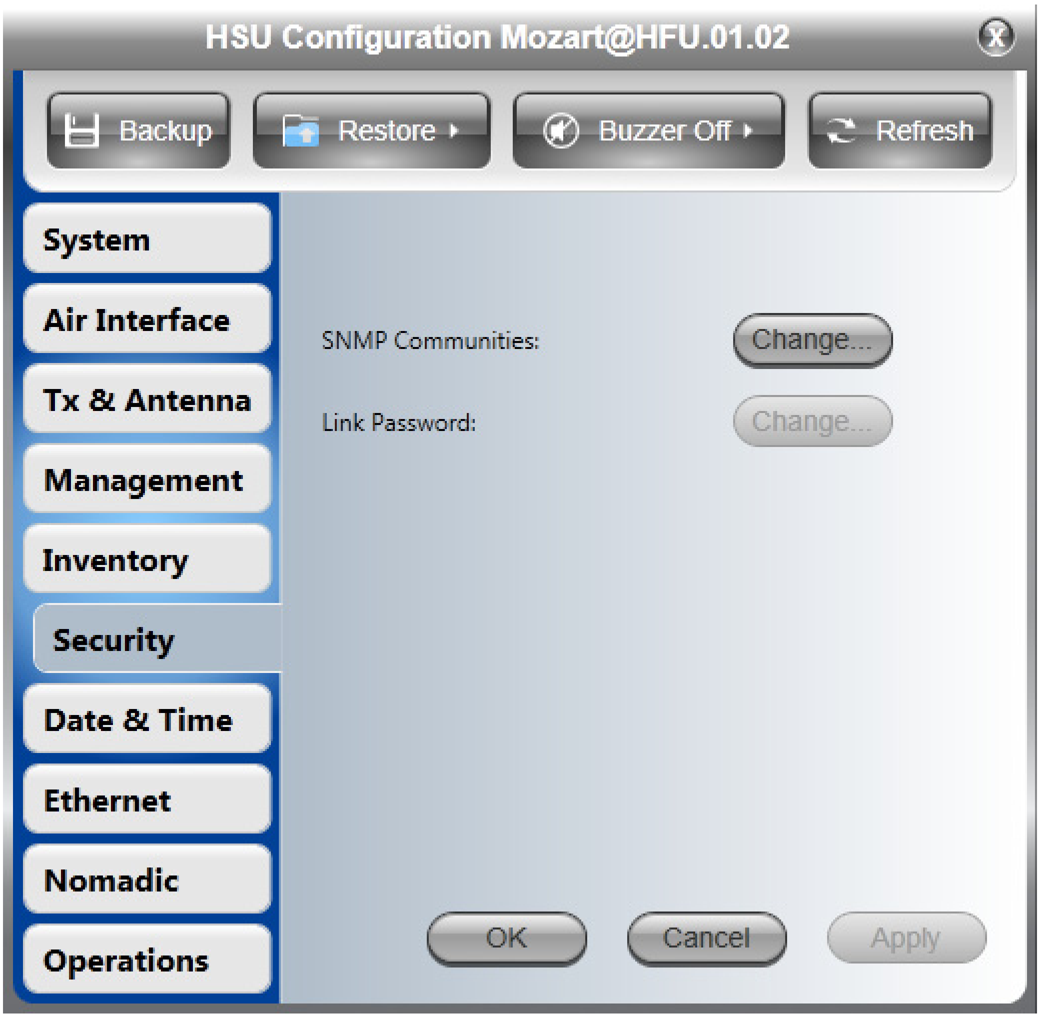


Figure 7-7: HSU Configuration - Air Interface Unregistered HSU

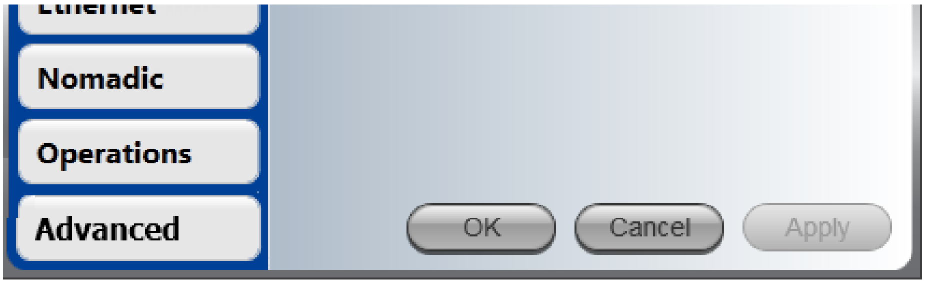
Enter the Sector ID of the required HBS and click **OK**. The HSU should then "discover" the required HBS.

Security



You may only change the SNMP community strings over a direct or over-the-air connection. You can change the Link Password for an un-synchronized HSU. Otherwise the functionality is the same as in **page 6-27**.

Advanced: False Radar Mitigation



This tab is only visible if

- You are using a Regulation requiring Radar Channel Avoidance **and**
- You are logged on as Installer

For this release, this feature for HSUs, is relevant to the 5.3 GHz ETSI and the 5.4 GHz FCC/IC bands.

Configuration of False Radar Mitigation is covered in **Chapter 14**.

Chapter 8

Bringing Up a Mobility Sector

Scope of this Chapter

Mobility solutions offers powerful, easy to deploy base stations that guarantee high capacity connectivity to ruggedized mobile units mounted on vehicles, trains and ships.

RADWIN 5000 HPMP Mobility enables:

- Perimeter security - two way video transmission between patrol vehicles
- On-board video surveillance and Internet access for public transportation
- Oil rig to ship - video and data connectivity
- Unmanned vehicle operation – remote control of heavy machinery for mines and ports

RADWIN 5000 HPMP is designed to ensure that HMUs attain continuous service within a sector and seamless service when crossing into a new sector.

Mobility applications are typically large scale projects. A railway application for example, requires a chain of overlapped sectors along hundreds or thousands of kilometers of railway track.

The detailed use of RADWIN 5000 HPMP elements in a Mobility application is beyond the scope of this manual. The purpose of this chapter is to demonstrate the use of RADWIN Manager in bringing up and managing a physically installed Mobility sector. In practice, one sector would be built by hand (as we will do below). The complete sector configuration can be saved and uploaded to further sectors.

For Mobility project management questions, please consult RADWIN Customer Service.

Concepts

Each HMU is allocated to one of four HBS levels labelled A, B, C and D. The operating parameters for each level (such as VLAN, MIR, QoS, time slots, fixed rate, MIMO/Diversity antenna mode) can be different for each level allowing for broad prioritization of service between different types of mobile units. This requires that each HMU be assigned a level to join a sector. The actual joining process is quite dynamic since the HSU will typically move from sector to sector at high speed.

Changing any of VLAN, MIR, QoS, fixed rate, MIMO/Diversity antenna mode for one configured HSU at a given level, changes all other HSUs at that level. If you add a new HSU to a sector (by direct connection) at a given level, at sync time, it will acquire the existing parameters for that level.

A HMU must be able to send and receive service traffic while moving. To avoid service "glitches" while switching between successive HBSs, the HBS hand-over time must be very small. For RADWIN 5000 HPMP HBSs it is typically less than 500 ms, depending on selection of Mobility channels.

A HMU detects that it is time to seek the next HBS when its rate drops below a predefined minimum capacity threshold based on a minimum supported rate. The HBS chosen will be the first found offering an RSS level above a minimum threshold (by default -60 dBm), which you can configure for each HMU. If no HBS can be found satisfying the latter criterion, then the HSU will sync with the HBS that has the highest RSS level (even though it is below the RSS Threshold).

It is up to the Mobility Project RF planners to ensure that HBSs are spaced with coverage overlap so that on the one hand the HSU RSS level does not fall so low that it loses synchronization between HBSs and on the other hand, successive HBSs do not interfere with one another.

In a Mobility project, it is fairly typical to use a fixed channel at each HBS and to have the HSUs configured to use the group of channels used by the HBSs so as to minimize hand-over time.

What You Need

The RADWIN 5000 HPMP Mobility products are different from the fixed/nomadic products. They have different part numbers. Ensure that your HBS and HSUs as delivered are the Mobility models.

Each sector comes with a pre-installed operating band. You can change it in the usual way. If you do ensure than each of the HSUs is changed. Alternatively (better), bring up the sector as-is and change the band sector-wide.

Getting Started

We will create a sector with three HMUs. There is no difference in the log-on procedure to the HBS. To avoid needless repetition and issues not really relevant to this chapter, we will start out with the HBS and the HMUs set to there factory defaults except for the IP addresses. We will maintain the IP addresses used in the previous chapters. In practice, the IP addresses of sector element may well be configured using Direct or Local Connection prior to reproduction of sector parameters from a "template" sector (such as we are creating) and most likely before deployment in the field.

Further we will not make any use of the Map view in this chapter. Once again, in practice, a Mobile system would be managed from a NOC using an enterprise standard NMS.

The Table view after logging on to the HBS looks like this:

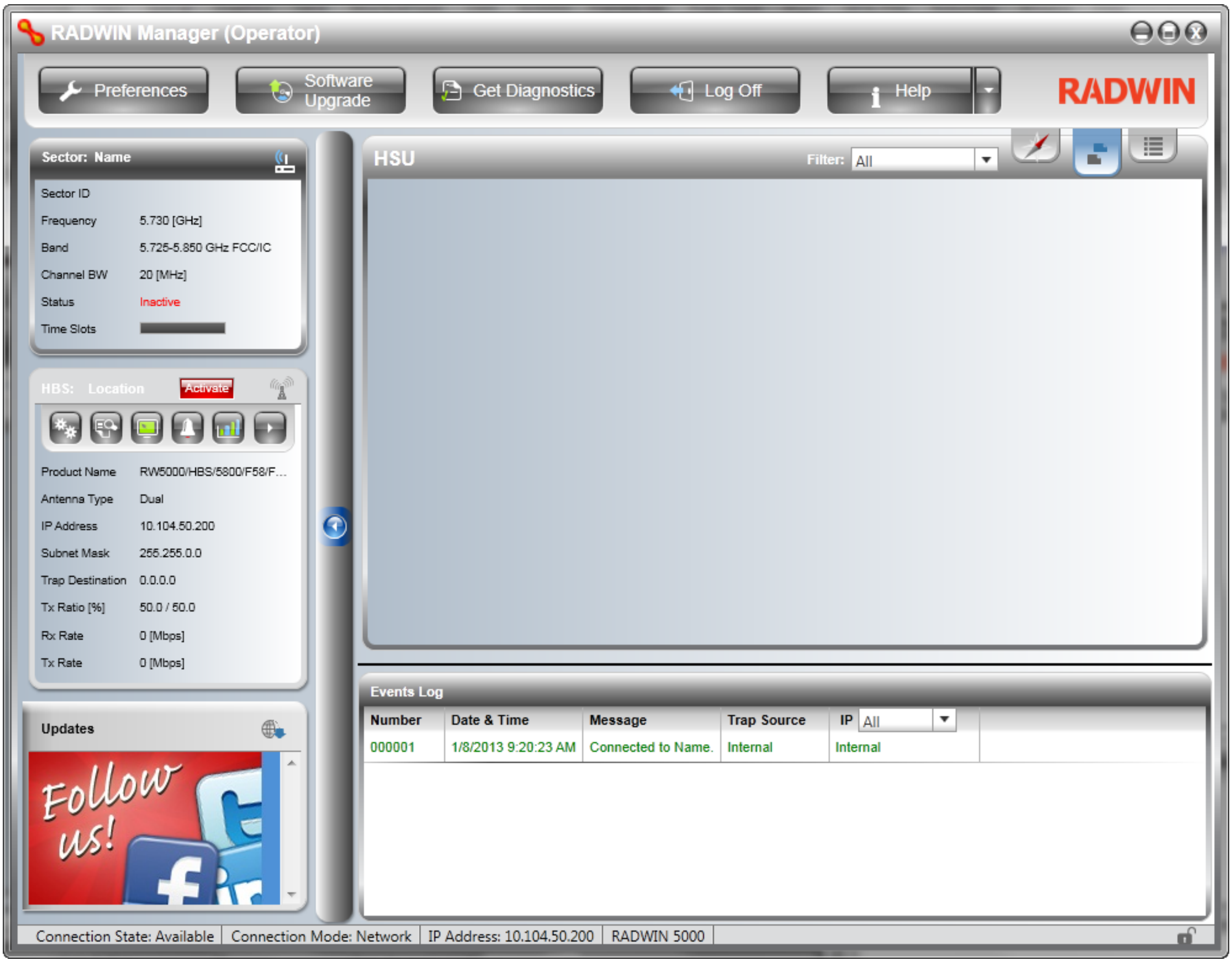


Figure 8-1: Mobile HBS after initial log-on

You activate the HBS in the usual way. Be aware that use of fixed versus automatic channel selection is part of your RF planning.

We will maintain the naming scheme used in earlier chapters, but our HSUs will have names like HMU.01.01 and so on (instead of HFU and HNU for fixes and nomadic types). The activation wizard pages are identical to those used for a fixed sector.

The first difference between a new activated mobile and fixed sector is that the HSUs do not appear in the Table view.

Preparing the HBS

Open the Configuration window and then the Mobility tab:

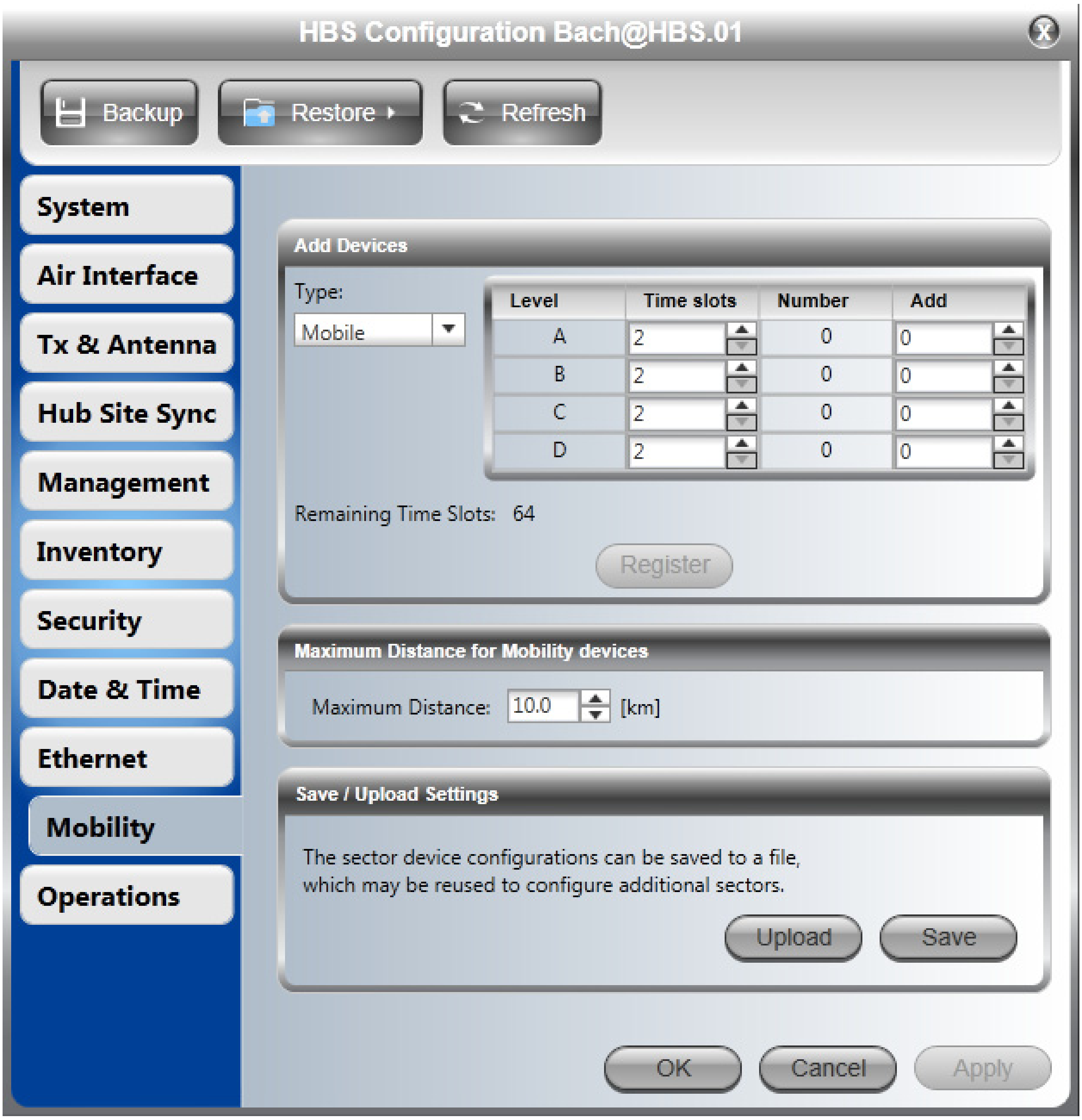
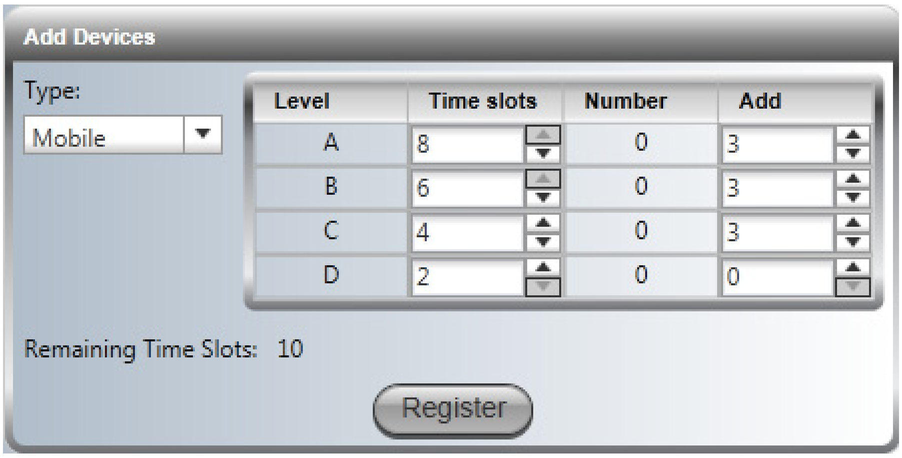


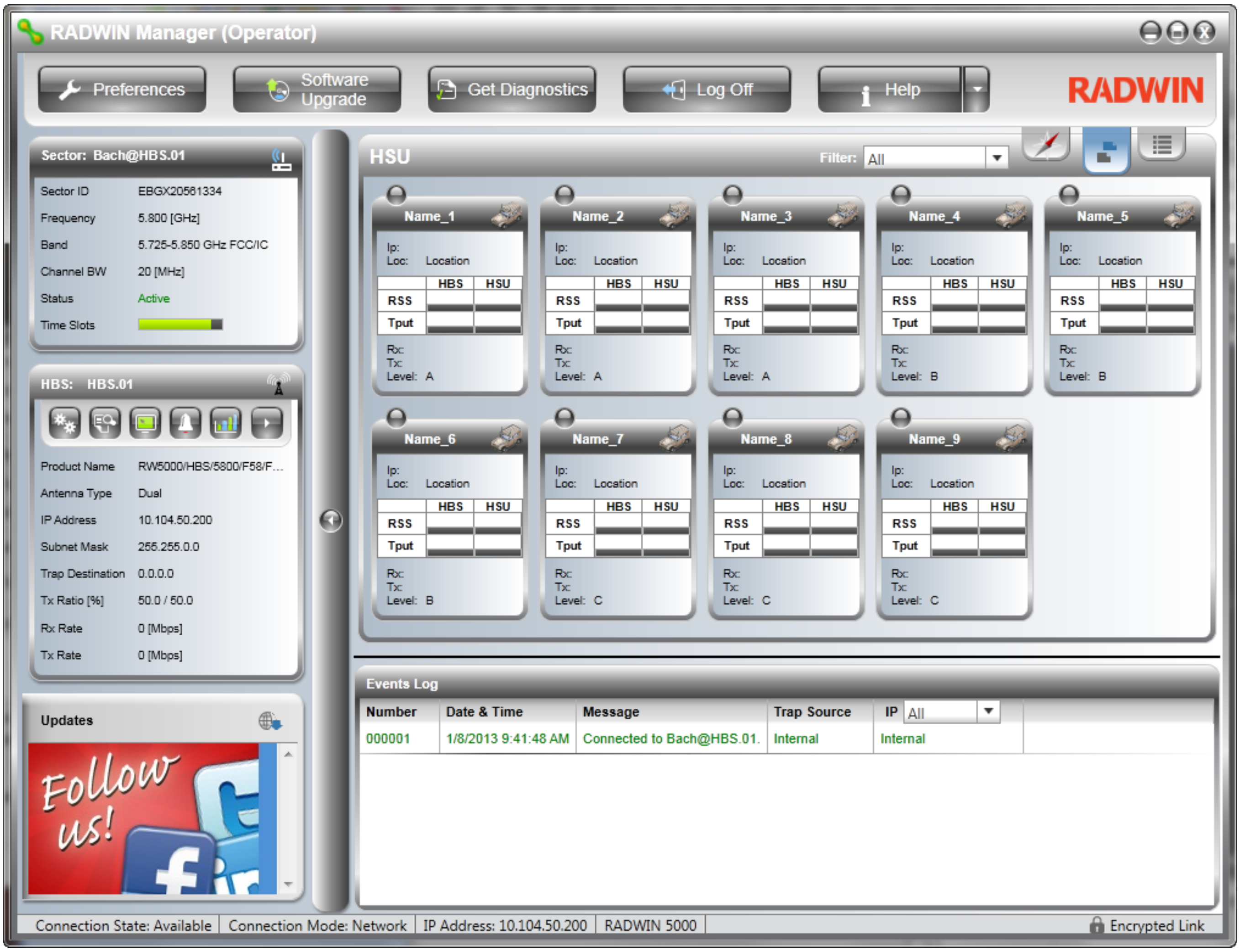
Figure 8-2: HBS Mobility Configuration

The maximum distance is a nominal common distance assumed by the HBS for all HMUs in its sector. It is taken as the maximum distance any HSU can be from a HBS. (It effectively guarantees an identical propagation delay for all HSUs in the sector to compensate for rapid HSU movement.) If the distance is set too small, there is a risk of sync loss for distant HSUs; if it is set too large it will reduce performance across the sector. The choice is part of RF planning for Mobility projects and is beyond the scope of this manual.

We will pre-register three HSU slots to levels A, B and C and time slots to each level as shown:



The time slots as shown mean 8 per unit X 3 units at level A, 6 per unit X 3 units at level B and so on up to 64 time slots. Click **Register**, leave the maximum distance as is and click OK to leave the configuration window. Here is the result:



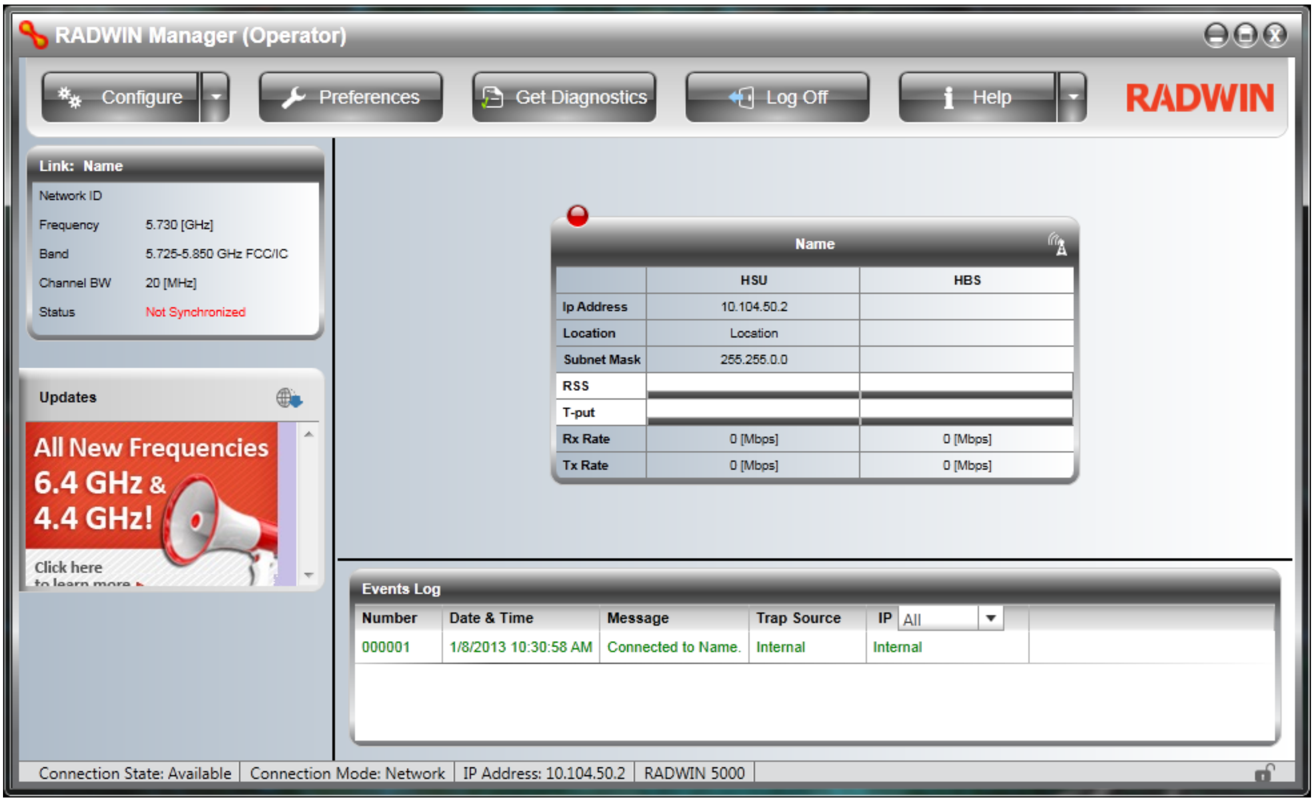
We have "place holders" for the maximum allowable HMUs in the sector.

Registering HMUs

Registration of actual HMUs is accomplished by direct connection. You assign each one to one of the our levels. At the same time, you may configure other parameters such as Air Interface, IP address (though not strictly necessary).

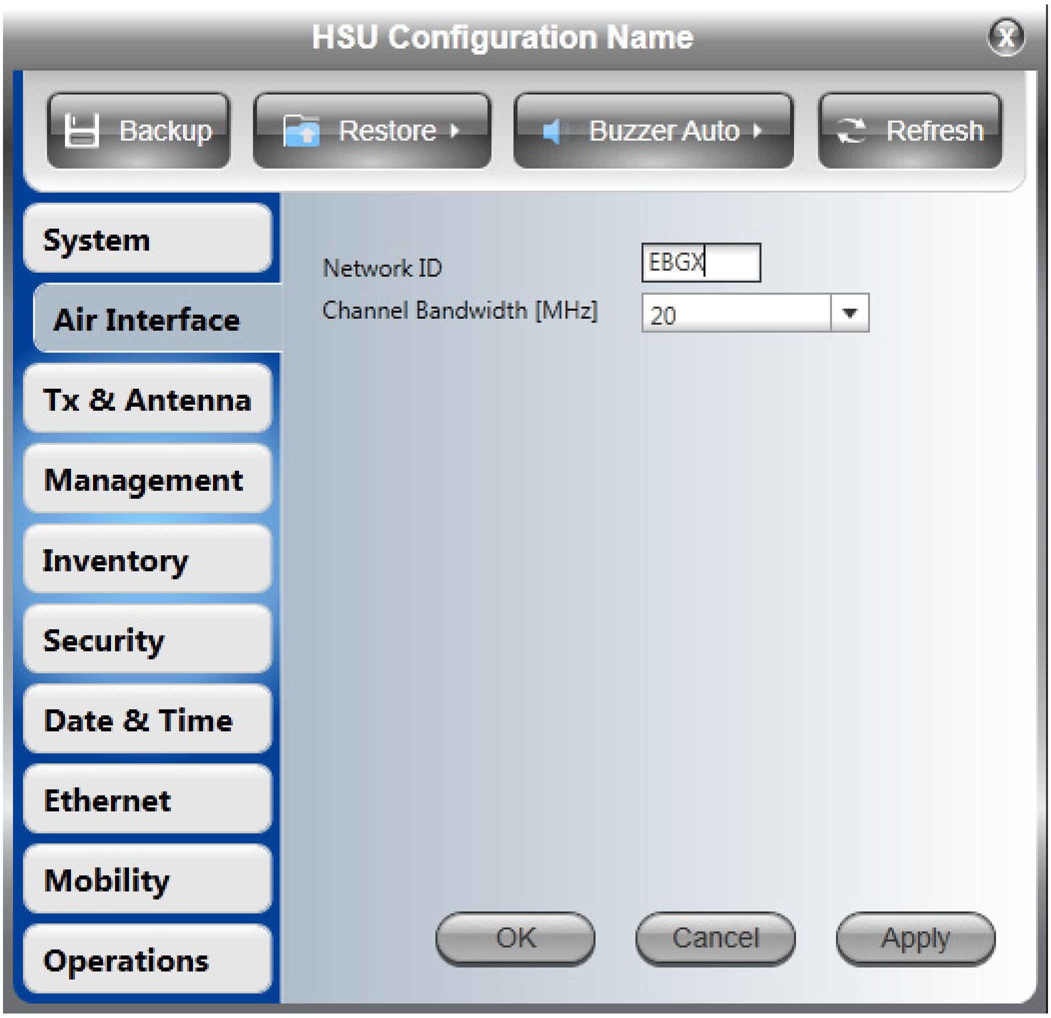
To assign a HMU to a level by direct connection:

1. Log on to a HMU in the usual way. Here is the opening window:

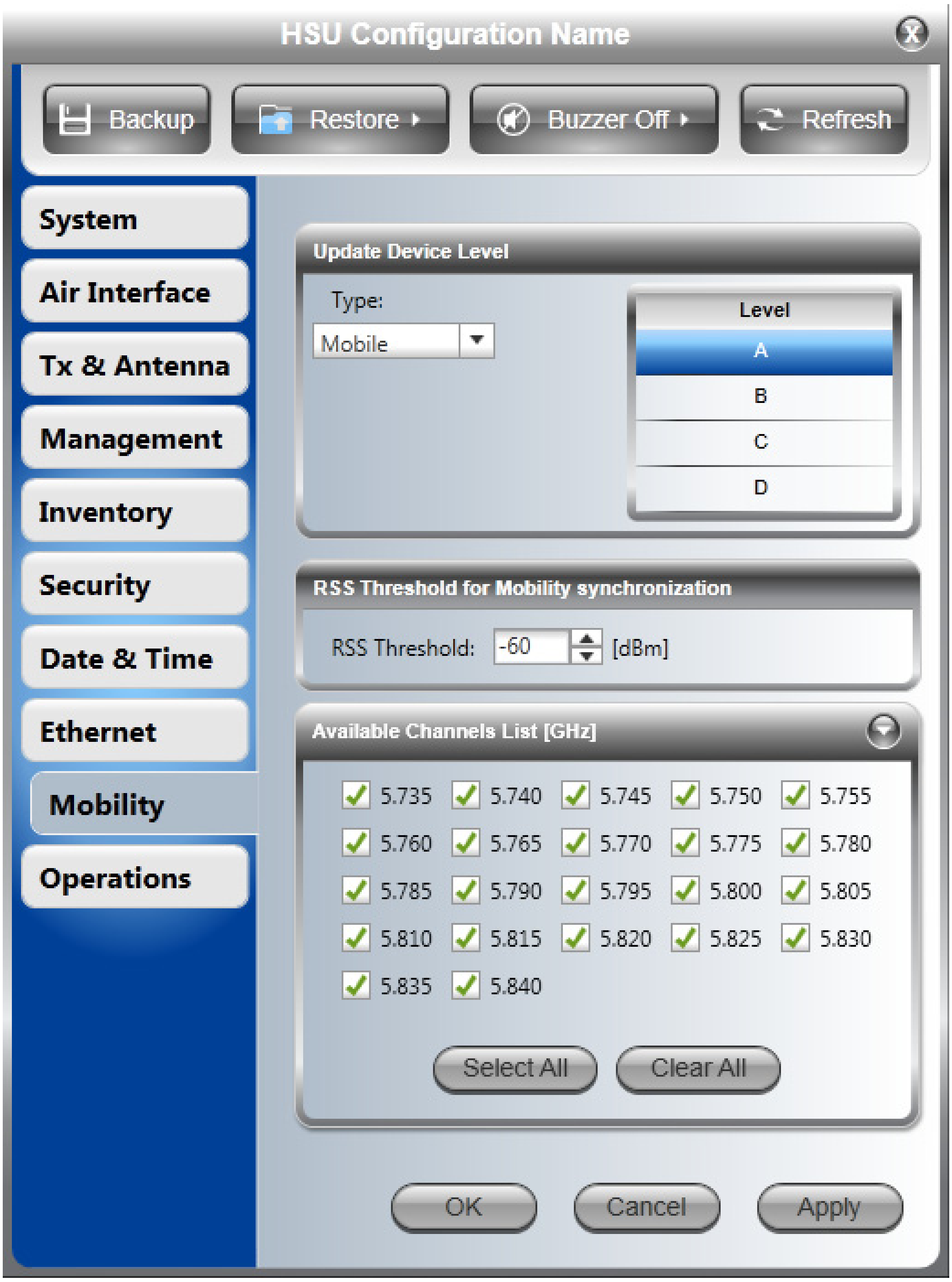


2. Open the Configuration window. Update the system parameters.

3. Open the Air Interface tab.



4. Enter the sector ID (EBGX20561334 in our example) and if necessary, change the Channel Bandwidth.
5. Open the Tx & Antenna tab and ensure that the antenna type is correct. You may change any other antenna parameters as well. We set Tx Power for our example to 5 dBm.
6. (Optional) Open the Management tab and set the HSU IP address.
7. Open the Mobility tab. Click the required level. We leave this HSU on A. We will place our other two HSUs in level B.



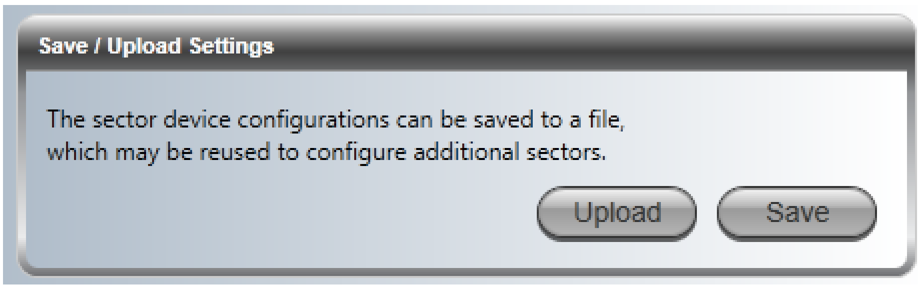
8. Set the RSS threshold parameter.
9. Chose the required Available Channels from the list.
10. Click **OK** to accept your changes and close the window.
11. Repeat steps 1 to 9 for each HMU.

For our example, we assign one HSU each to levels A, B and C. Here then, is the final result:

From this point, you may use the configuration and reporting facilities in the usual way.

Saving the HBS Settings for Reuse as a Template

Refer to **Figure 8-2** of which the following is an excerpt:



Following any further fine tuning, open up the HBS Mobility tab, and click **Save**. You are offered the standard Save File dialog. Save the HBS Mobility settings file (MobilitySettings.mob) to a convenient location.

Creating a Sector from an HBS Template

The saved settings file may be used as a template for further sectors.

To create a sector from a HBS Mobility settings file:

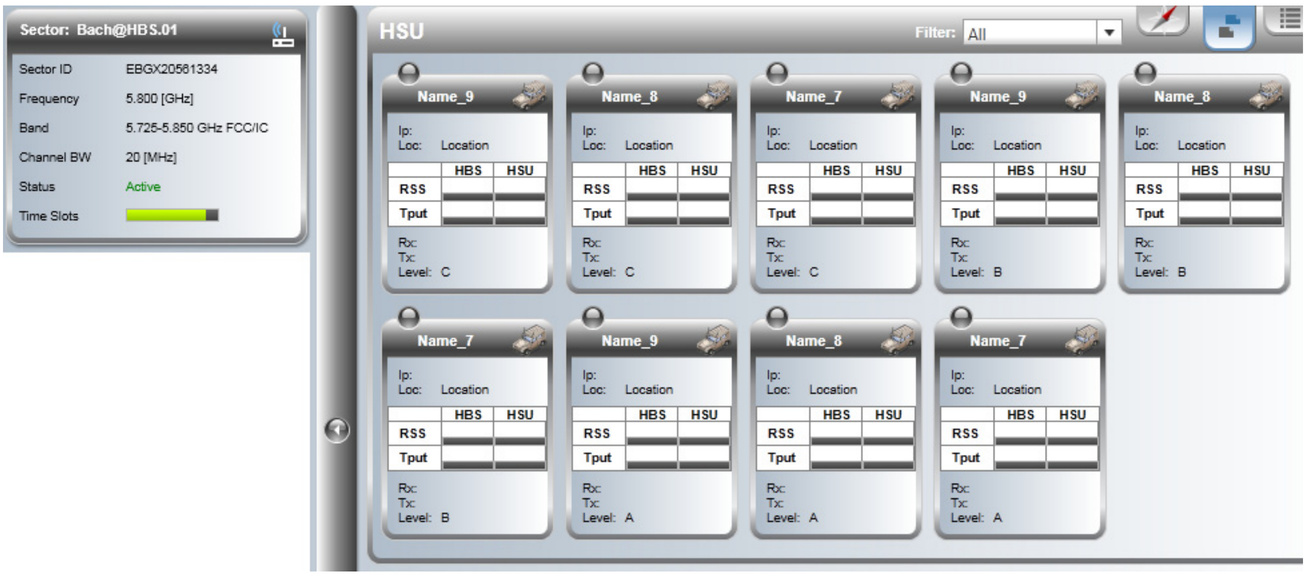
1. Starting with a new HBS and HSUs, log on to the HBS.
2. Activate the HBS in the usual way.
3. Open the Mobility tab in the Configuration window. In the Save / Upload Settings window, click **Upload**.

Figure 8-3: Preparing to upload the Mobility file

4. In our case we have one HBS, so it is sufficient to enter the Mobility file as shown and then click **Start**. After a few moments, the Status field indicates Done.

IP	Name	Release	Status	Comments
10.104.50.200	Bach@HBS.01	3.4.00_b3410_Dec 24 2012	Done	

The result is as expected:



You will of course need to separately configure the participating HSUs. If we connect our three configured HMUs, we revert to our original sector.

Creating a Sector from an HBS Template and an HBS List

To create a sector from a HBS IP list and a Mobility settings file:

1. In the window of **Figure 8-3**, enter a HBS list file. The format of the file is lines of

   <IP address> <Read-Write community>

   For example,

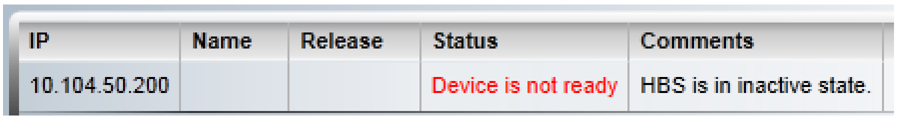
   10.104.50.200 netman

   All of the HBSs need to activated and accessible (via a switch) to the managing computer. They need not be on the same sub-net.

   Alternatively, enter them one by one using the Plus button.

   Any unactivated HBSs will be shown as unavailable:

IP	Name	Release	Status	Comments
10.104.50.200			Device is not ready	HBS is in inactive state.

2. Make any further changes to the displayed list using the Plus/Minus buttons.
3. Click **Start** to commence the process.
4. The list window will indicate the success or otherwise of the upload for each HBS.

Chapter 9

Monitoring and Diagnostics

The RADWIN Manager application enables you to monitor the sector, as well as perform basic diagnostic operations such as throughput testing.

This chapter covers:

- Retrieving link information
- Throughput checking
- Recent events
- Performance monitoring
- Active Alarms
- Link Budget Calculator
- Online Help
- Obtaining support

Retrieving Link Information (Get Diagnostics)

The Get Diagnostics feature collects and writes link and Manager information from selected sites into a text file. The file information can be used for diagnostics and should be sent to RADWIN Customer Support to expedite assistance.

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

Table 9-1: Get Diagnostics Data and Description

Data	Description
System Data	General information about the system
Events Log	• List of system events including those from other sites if this site is defined as the trap destination • Last 256 events from all sites
Sector Information	Information about the HBS and HSU settings
Site Configuration	Data about the site parameters
Monitor	Detailed event data record

Table 9-1: Get Diagnostics Data and Description (Continued)

Data	Description
Restriction Table	This is the Connection Table from **Figure 6-13**
Active Alarms	Active Alarms are raised for any event affecting availability or quality of service
Performance Monitor	Network performance data over defined time periods - - every 15 minutes for 30 days
Spectrum Analysis	For HBS, selected HSUs and general inter fence statistics for the sector

To get diagnostics:

1. Click the **Get Diagnostics** button:

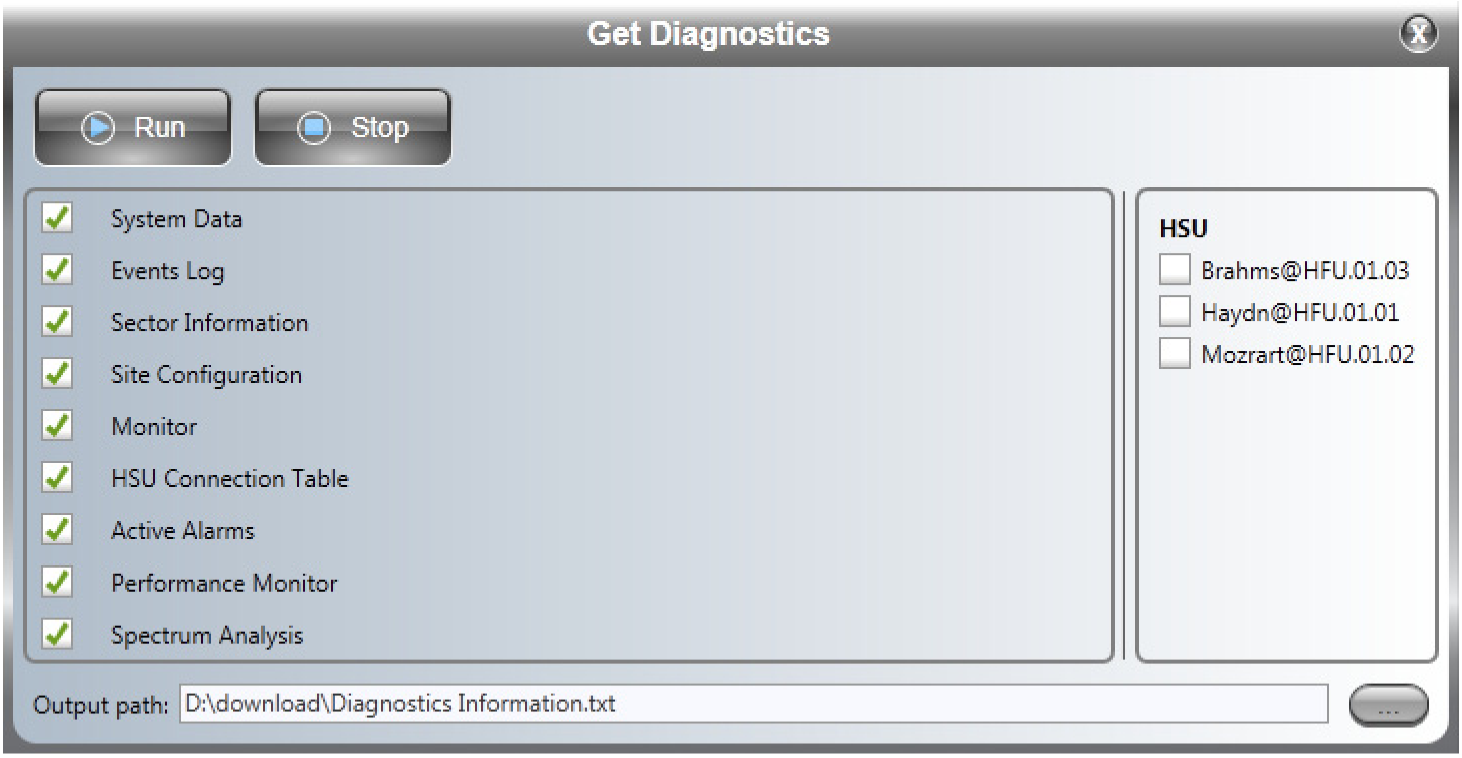


Figure 9-1: Get Diagnostics Dialog Box - HBS

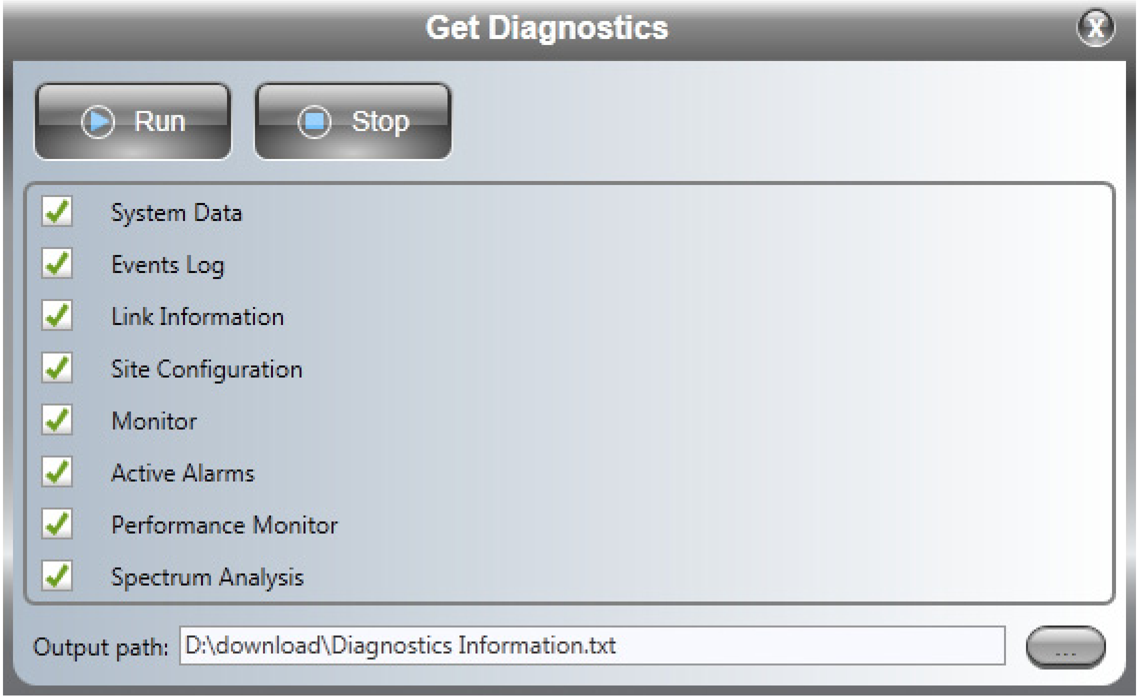
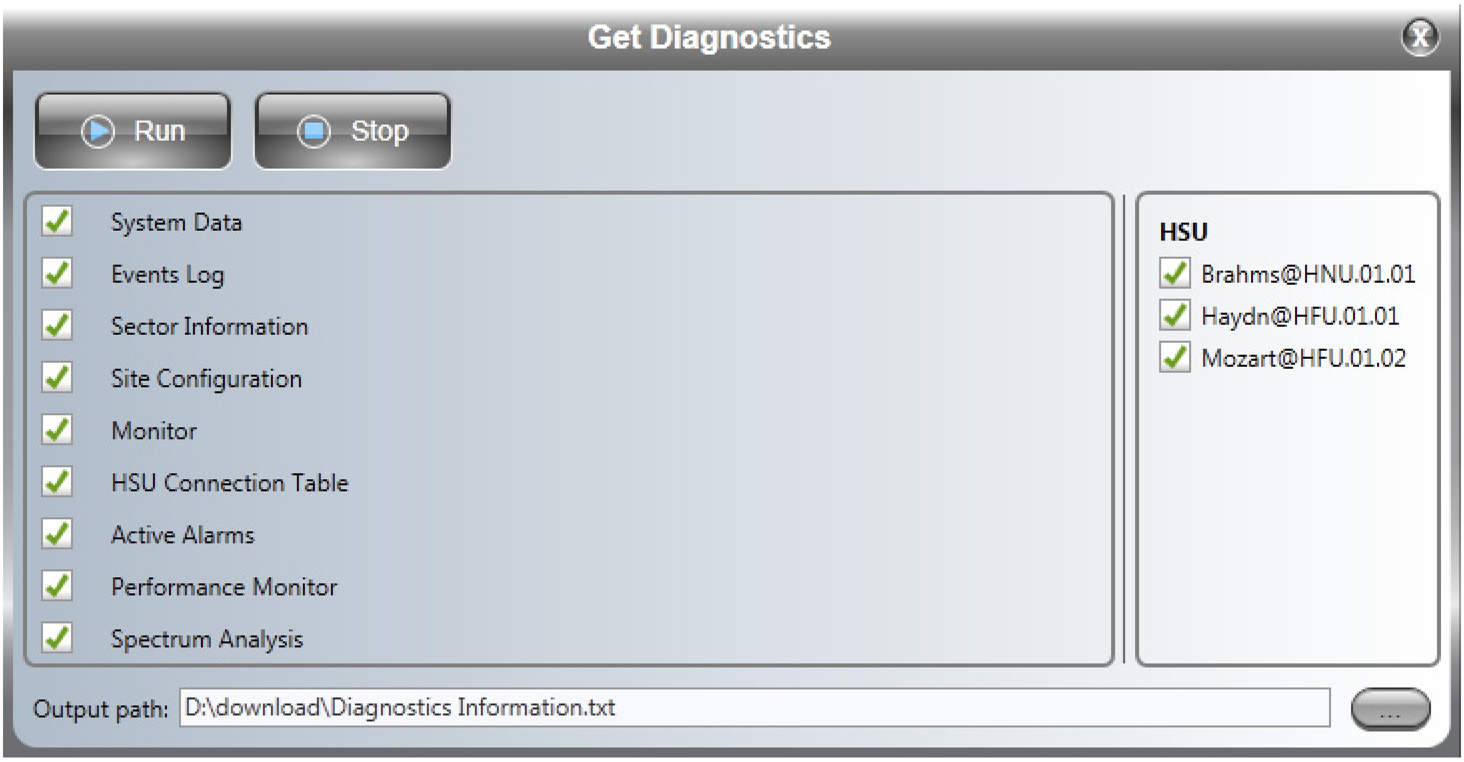


Figure 9-2: Get Diagnostics Dialog Box - HSU

2. Select or deselect the data options. If the file is to be sent to RADWIN Customer Support leave all options checked.
3. HBS only: Choose HSUs to be included.
4. Click **File Path** to specify the file name and older in which you want to save the file and then click **Run** to save the information.

   On completion, the status of the checked items is confirmed:



The content of the Diagnostics report is an aggregate of all the more specific reports discussed below. It is primarily intended for use by RADWIN Customer support.

Note

The Spectrum Analysis output is available directly from the Spectrum View utility as a CSV file (see **Chapter 21**). The format in the Diagnostics report is intended for use by RADWIN Customer support.

The Spectrum Analysis section of the Diagnostics report is based on the last available spectrum analysis (if any). If you are submitting a support request involving interference issues, or if you are specifically asked by Customer support to submit a Diagnostics report containing a recent spectrum analysis, you should carry out the analysis in accordance with the instructions in **Chapter 21** prior to using the Get Diagnostics facility.

Link Compatibility

Compatibility between the HBS and an HSU is primarily determined by the software level of each element. Advisory messages are typically displayed as follows:

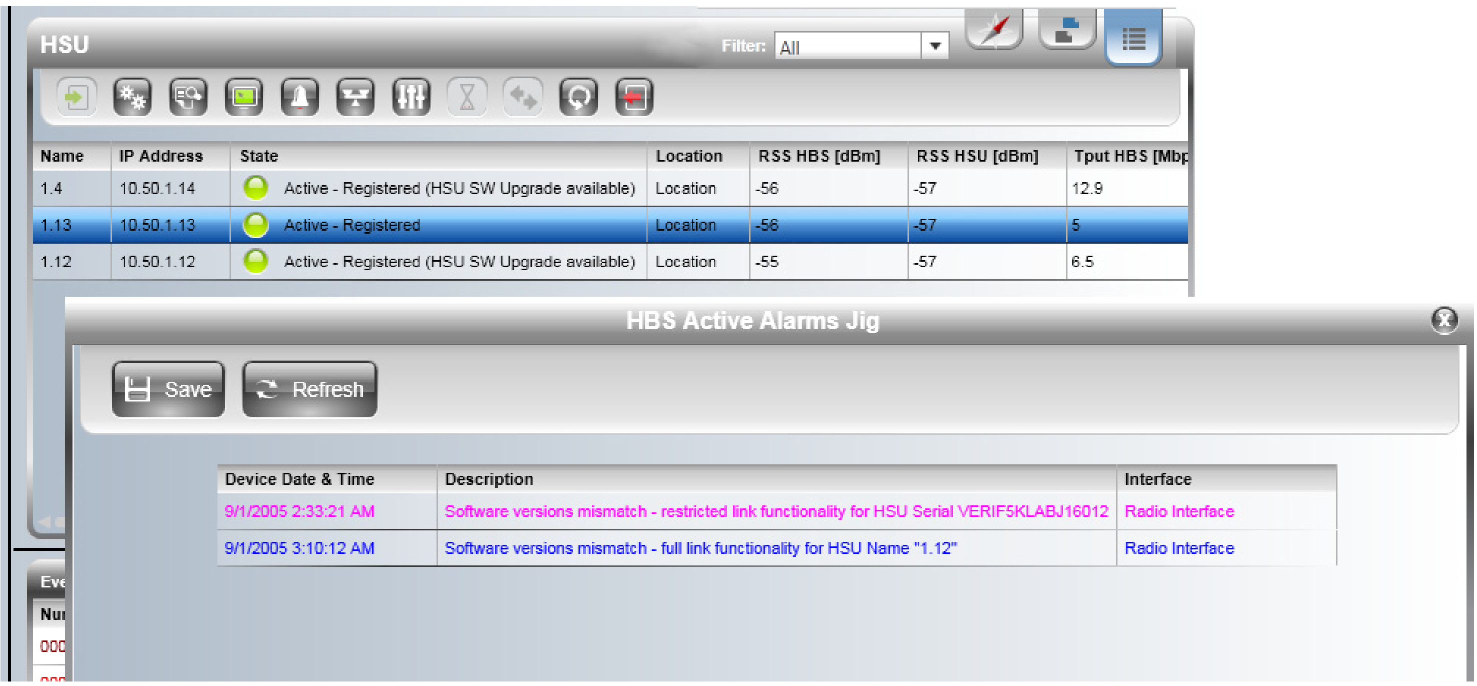


Figure 9-3: Typical incompatibly messages for HSUs on HBS display

On the HBS window, these messages can only be seen in HSU list mode, and in the HBS Active Alarms log.

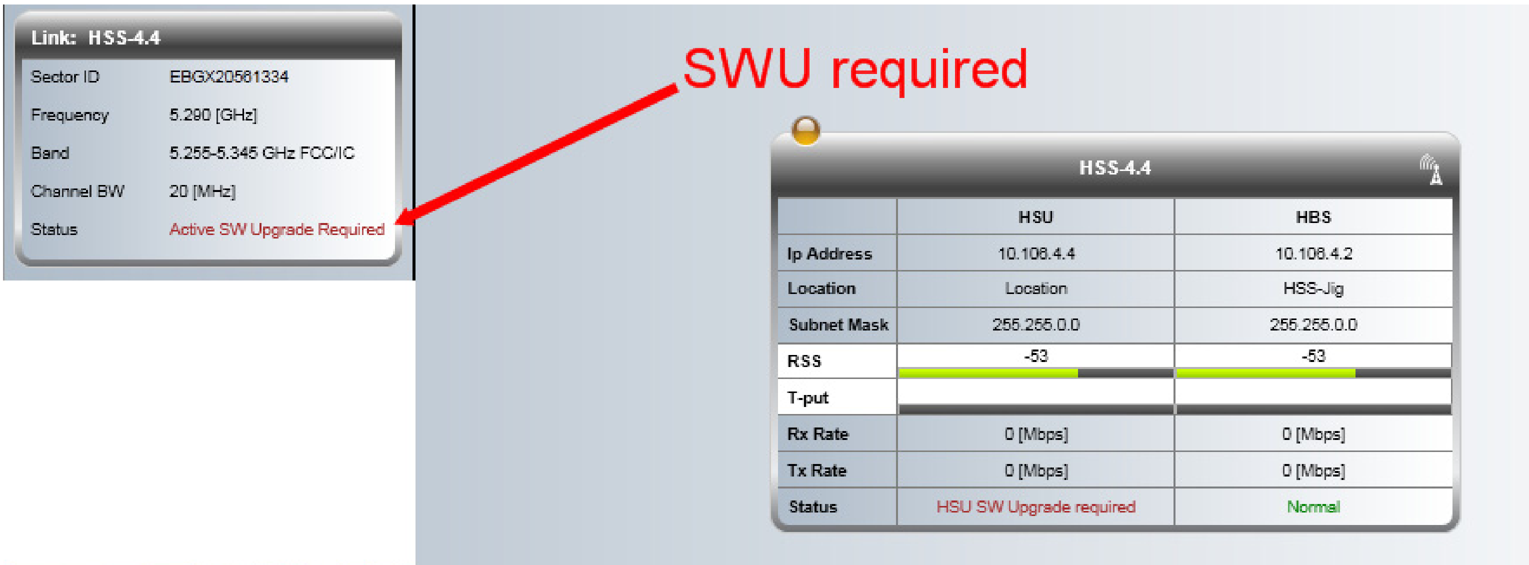


Figure 9-4: This HSU requires a software upgrade

On the HSU window, these messages appear as shown in **Figure 9-4**.

The messages are as follows:

Software Upgrade available

This is an advisory message. If the upgrade is not carried out, then corrections in the upgrade will not be available. This message may appear for an active HBS or any HSU in the sector, registered or not.

Software Upgrade recommended

This is also an advisory message. It typically occurs with a new HBS or new HSUs added to a sector.

If the upgrade is not carried out, then the HBS or HSU (s) will ope rate with limited or degraded functionality. This message may appear for an active HBS or any HSU in the sector, registered or not.

Software Upgrade required

This message will be displayed if a product band ID mismatch is detected.

Thus for a HBS, it cannot occur unless one or more HSUs are registered. Affected HSUs will always show it as depicted above in **Figure 9-4** above.

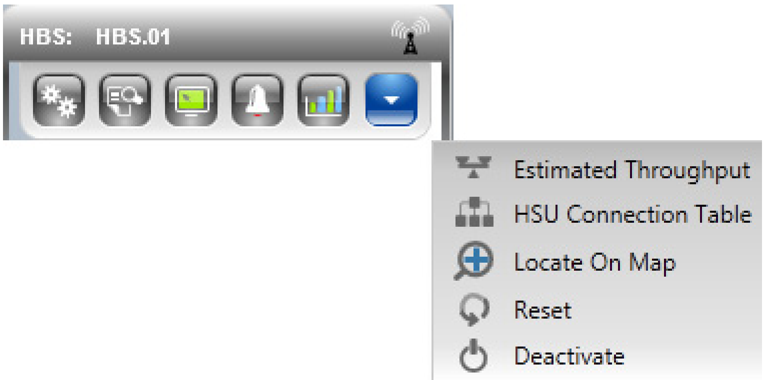
For such HSUs, traffic is disabled and the only services available are **Change Band** and **Software Upgrade**.

Throughput Checking

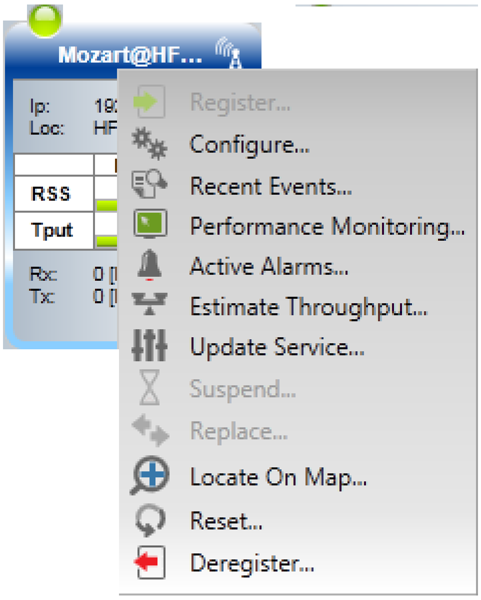
In this mode, RADWIN 5000 HPMP estimates Ethernet throughput by filling frames over the air to maximum for 30 seconds. This mode should not influence service. The test may be carried out for the HBS or an HSU.

To use Throughput Checking:

1. **HBS:** Chose Estimated Throughput as shown:

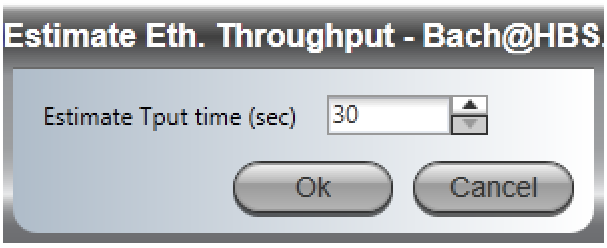


HSU **from HBS:** Chose Estimated Throughput as shown:

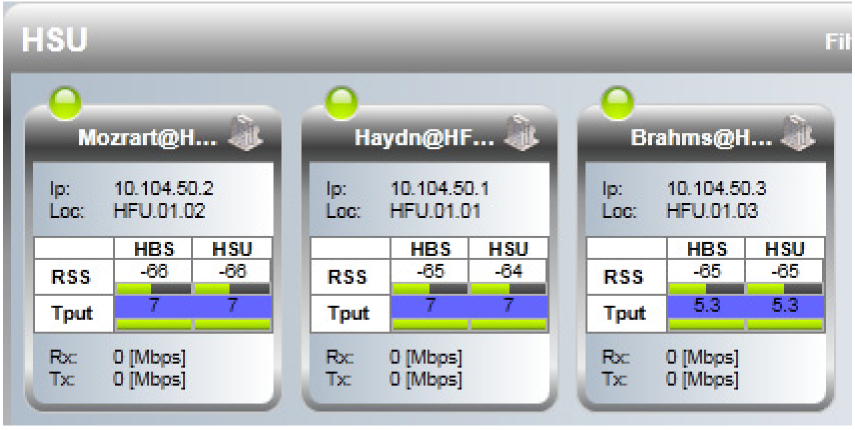


HSU **direct or over the air:** Unavailable.

2. In either case, you are asked to enter the testing period:



3. Enter the required time and click **OK** to continue. The Ethernet services area changes appearance and the estimated throughput is displayed:



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

Recent Events

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

Note

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

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

The Events Log includes the following fields:

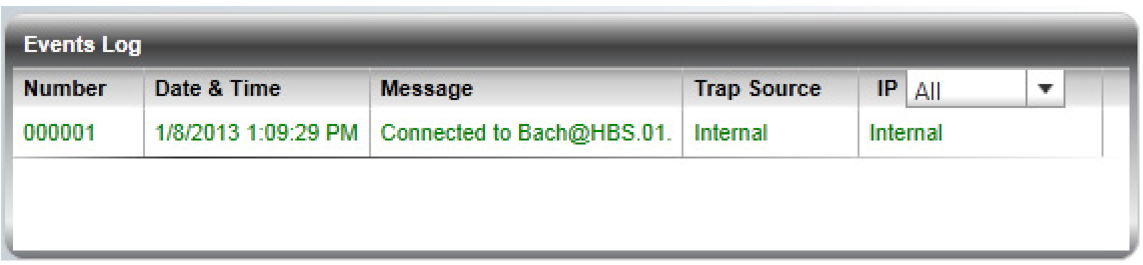
» **Sequential number (ID)**

» **Date and time stamp**

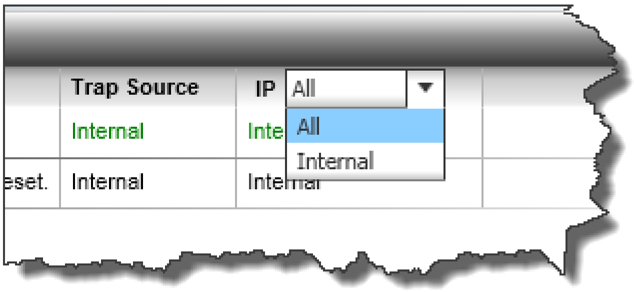
» **Message**

» **Trap source**

» **IP address of the ODU that initiated alarm.**



You may filter the events shown by choosing All or Internal.



A full report may be seem by clicking **Recent Events**:

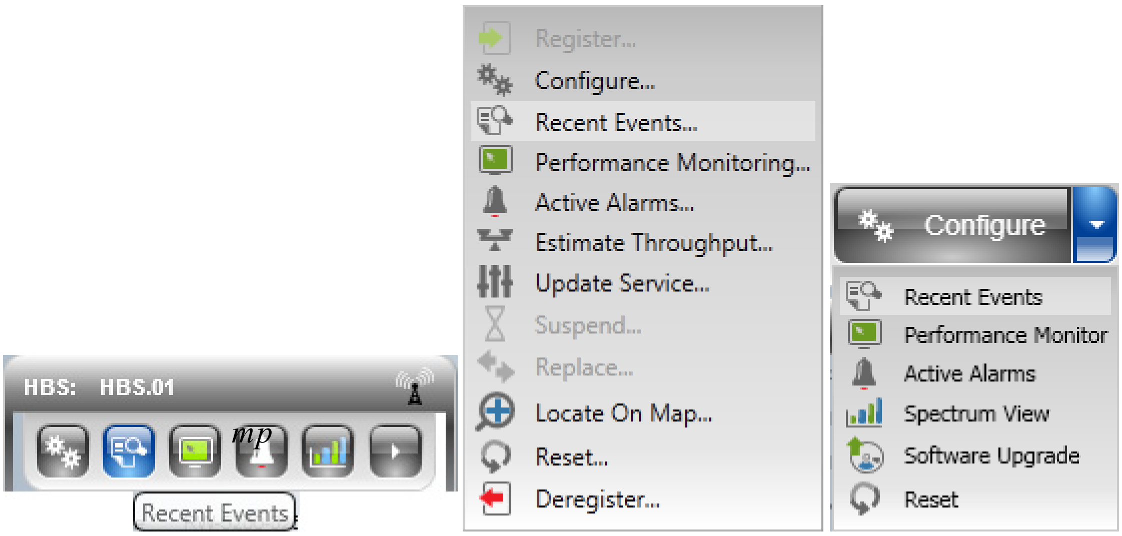
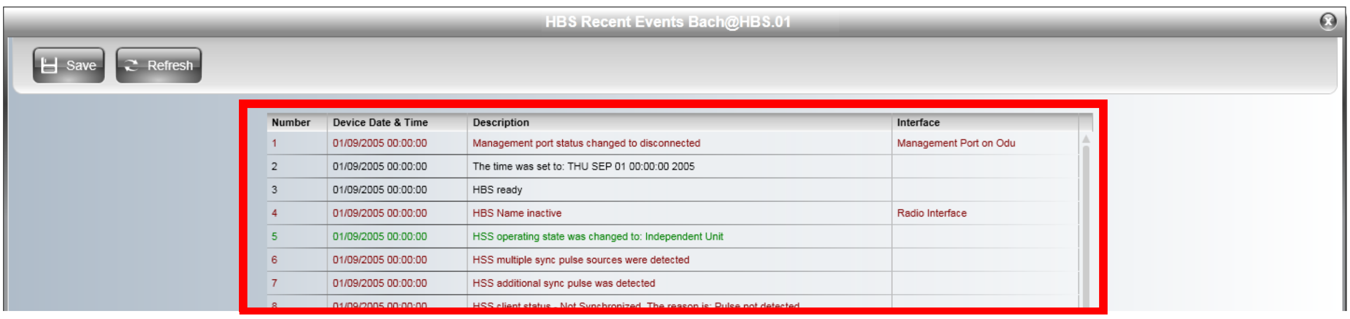


Figure 9-5: Recent Events: Left- HBS, Center HSU from HBS, Right HSU direct

In each case the report has the same format:



Here is a more readable enlargement of the table area:

Number	Device Date & Time	Description	Interface
1	01/09/2005 00:00:00	Management port status changed to disconnected	Management Port on Odu
2	01/09/2005 00:00:00	The time was set to: THU SEP 01 00:00:00 2005	
3	01/09/2005 00:00:00	HBS ready	
4	01/09/2005 00:00:00	HBS Name inactive	Radio Interface
5	01/09/2005 00:00:00	HSS operating state was changed to: Independent Unit	
6	01/09/2005 00:00:00	HSS multiple sync pulse sources were detected	
7	01/09/2005 00:00:00	HSS additional sync pulse was detected	
8	01/09/2005 00:00:00	HSS client status - Not Synchronized. The reason is: Pulse not detected	

The left button may be used to save the report to a file.

Performance Monitoring

RADWIN 5000 HPMP Performance Monitoring constantly monitors traffic over the radio link and collects statistics data for the air interface and Ethernet ports. It does so continuously, even when the RADWIN Manager is not connected.

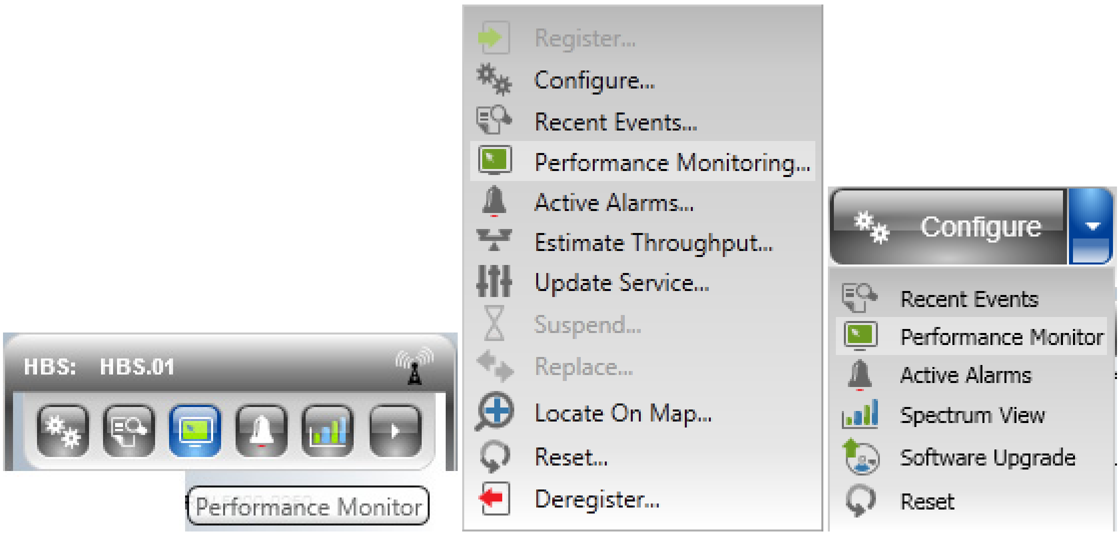
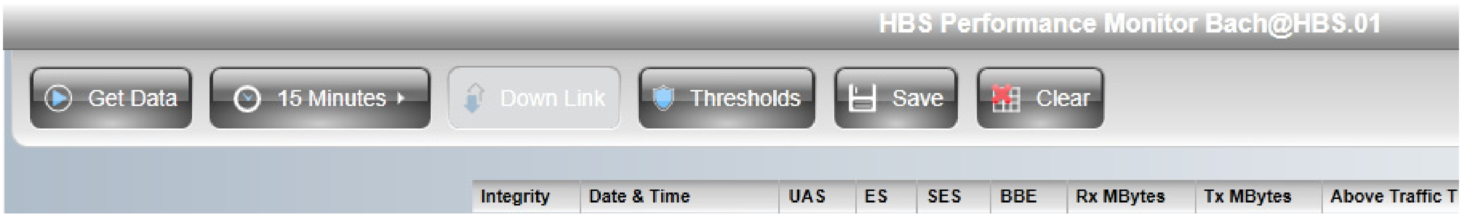


Figure 9-6: Performance Monitoring: Left- HBS, Center HSU from HBS, Right HSU direct

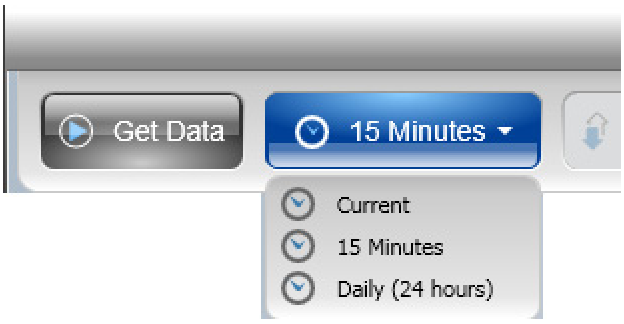
The on-screen and generated reports have the same general formats, but there are differences in what is reported.

HBS

The HBS Performance Monitoring window offers the following button menu:



Choose the data period required with the **15 Minutes** button.



- **Current** gives you the latest entry.
- **15 Minutes** provides data in a scroll down list in 15 minute intervals
- **Daily (24 hours)** shows results for the last 30 days at midnight.

The Threshold button enables you to set the upper traffic threshold for reporting. Traffic conditions above the threshold indicate congestion and probably lost frames.

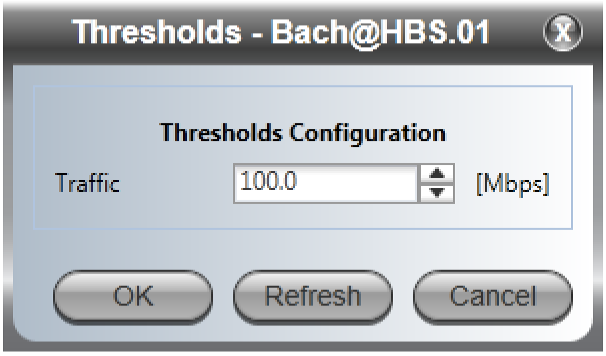
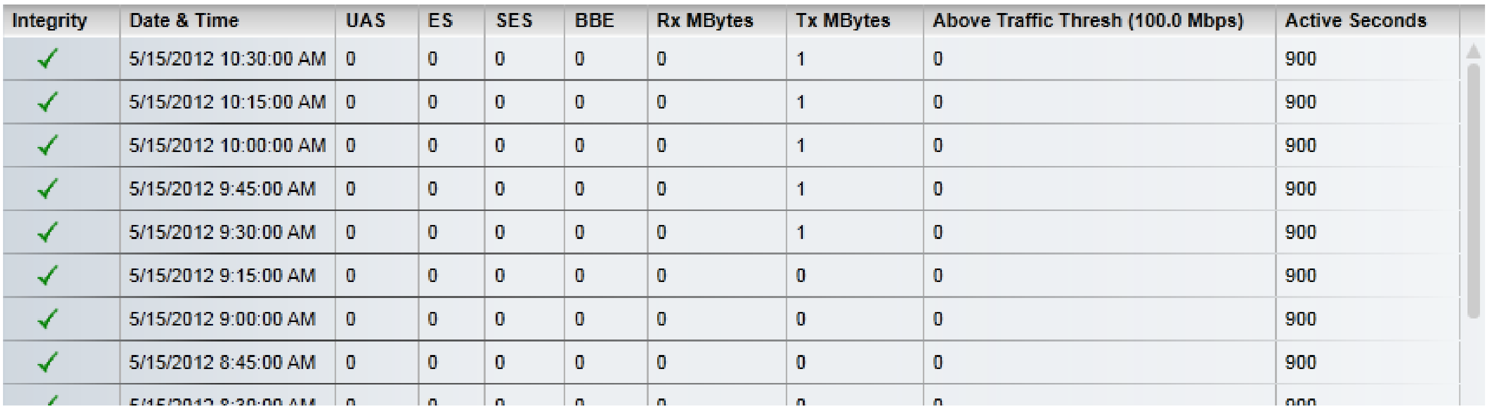


Figure 9-7: Setting the upper traffic threshold

To get data for display, click **Get Data**. The process may take a few seconds.

Here is an extract Performance Monitoring report based on 15 minutes recording:



Integrity	Date & Time	UAS	ES	SES	BBE	Rx MBytes	Tx MBytes	Above Traffic Thresh (100.0 Mbps)	Active Seconds
✓	5/15/2012 10:30:00 AM	0	0	0	0	0	1	0	900
✓	5/15/2012 10:15:00 AM	0	0	0	0	0	1	0	900
✓	5/15/2012 10:00:00 AM	0	0	0	0	0	1	0	900
✓	5/15/2012 9:45:00 AM	0	0	0	0	0	1	0	900
✓	5/15/2012 9:30:00 AM	0	0	0	0	0	1	0	900
✓	5/15/2012 9:15:00 AM	0	0	0	0	0	0	0	900
✓	5/15/2012 9:00:00 AM	0	0	0	0	0	0	0	900
✓	5/15/2012 8:45:00 AM	0	0	0	0	0	0	0	900

Figure 9-8: HBS - Performance Monitoring report - Valid data

The meaning of the column headings is shown in the following table:

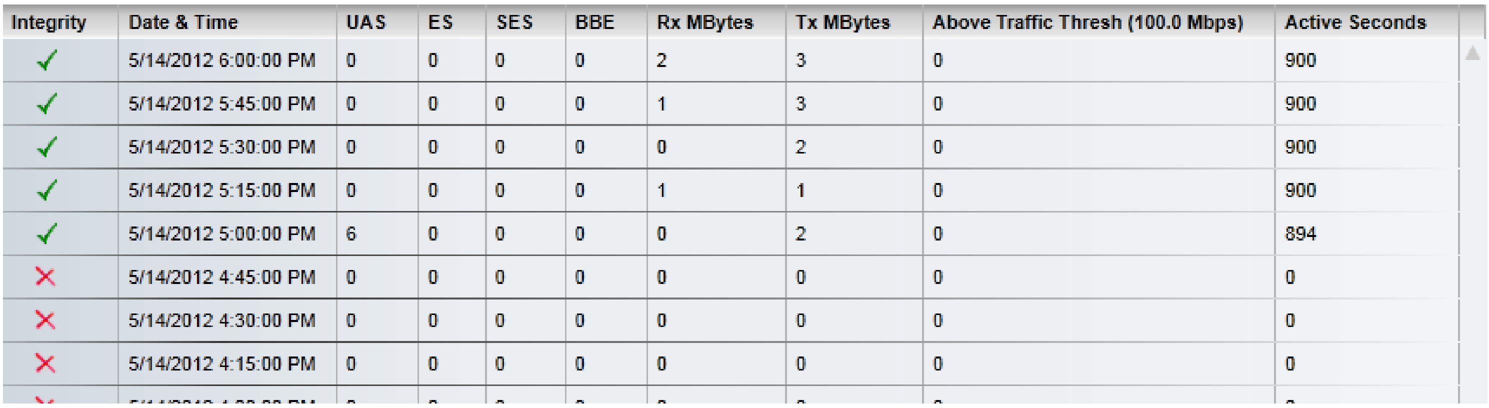
Table 9-2: HBS Performance Monitoring Fields

Column Heading	Abbreviation Meaning	Description
Integrity	Valid data flag	Green tick for current and valid; Red cross for invalidated data (See example below). Note that the Performance Monitoring data is not valid if not all the values were stored (e.g., due to clock changes within the interval or power up reset)
Date & Time	Time stamp	Data are recorded every 15 minutes; the last 30 days of recordings are maintained. Roll-over is at midnight.
UAS	Unavailable Seconds	Seconds in which the interface was out of service.
ES	Errored seconds	The number of seconds in which there was at least one error block.
SES	Severe Errored Seconds	The number of seconds in which the service quality was low as determined by the BBER threshold.
BBE	Background Block Error	The number of errored blocks in an interval.
Rx MBytes	Received Mbytes	The number of Megabytes received at the specified port within the interval
Tx MBytes	Transmitted Mbytes	The number of Megabytes transmitted at the specified port within the interval.

Table 9-2: HBS Performance Monitoring Fields (Continued)

Column Heading	Abbreviation Meaning	Description
Above Traffic Thresh	Threshold set in **Figure 9-7**	Seconds count when actual traffic exceeded the threshold
Active Seconds		The number of seconds that the configured Ethernet service is active

Data becomes invalidated following a reset. In the example below, the HBS was reset shortly after 11:00. All data prior to that time becomes invalidated. The only valid item is the first recording after re-sync.



Integrity	Date & Time	UAS	ES	SES	BBE	Rx MBytes	Tx MBytes	Above Traffic Thresh (100.0 Mbps)	Active Seconds
✓	5/14/2012 6:00:00 PM	0	0	0	0	2	3	0	900
✓	5/14/2012 5:45:00 PM	0	0	0	0	1	3	0	900
✓	5/14/2012 5:30:00 PM	0	0	0	0	0	2	0	900
✓	5/14/2012 5:15:00 PM	0	0	0	0	1	1	0	900
✓	5/14/2012 5:00:00 PM	6	0	0	0	0	2	0	894
✗	5/14/2012 4:45:00 PM	0	0	0	0	0	0	0	0
✗	5/14/2012 4:30:00 PM	0	0	0	0	0	0	0	0
✗	5/14/2012 4:15:00 PM	0	0	0	0	0	0	0	0

Figure 9-9: HBS - Performance Monitoring report - Showing invalid data

Use the **Save** button to store the current data to file and the **Clear** button to delete currently stored performance data.

HSU

The Performance Monitoring window for the HSU is slightly different depending on whether you access it from the HBS or directly:

From the HBS

You may chose between an uplink or downlink report. The remaining buttons have the same functionality as they do for the HBS. (There is no significance in monitoring period button label, **Daily**. The options are as for the HBS.)

Direct or Over the Air

Here, only a downlink report is available. Otherwise the buttons have the same functionality as they do for the HBS.

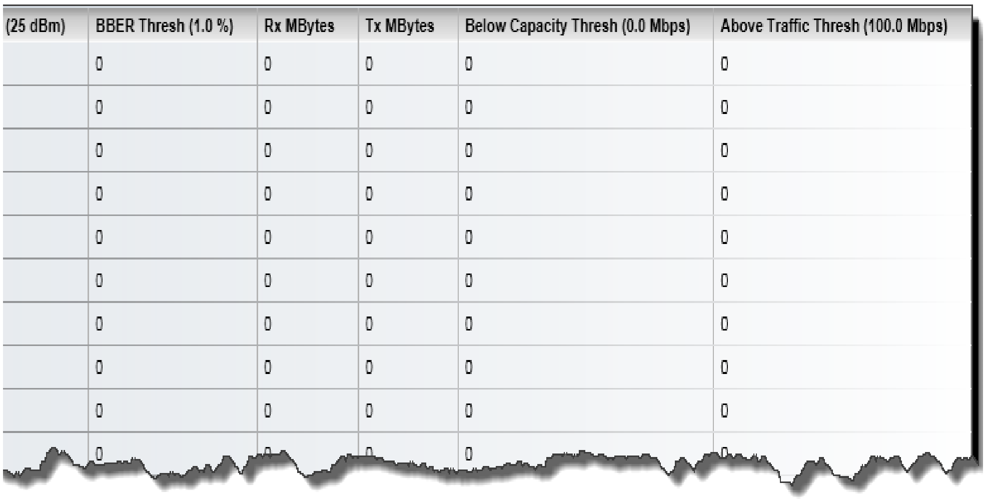
Here is an extract from a 15 minute report. We have broken it into three pieces so that it is legible:

Integrity	Date & Time	UAS	ES	SES	BBE	Min RSL (dBm)	Max RSL (dBm)	RSL Thresh 1 (-88 dBm)	RSL Th
✓	20/06/2011 13:15:00	0	0	0	0	-58	-57	0	0
✓	20/06/2011 13:00:00	0	0	0	0	-58	-58	0	0
✓	20/06/2011 12:45:00	0	0	0	0	-58	-58	0	0
✓	20/06/2011 12:30:00	0	0	0	0	-58	-58	0	0
✓	20/06/2011 12:15:00	0	0	0	0	-58	-58	0	0
✓	20/06/2011 12:00:00	0	0	0	0	-58	-58	0	0
✓	20/06/2011 11:45:00	0	0	0	0	-58	-58	0	0
✓	20/06/2011 11:30:00	0	0	0	0	-58	-58	0	0
✓	20/06/2011 11:15:00	6	0	0	0	-58	-54	1	1
✗	20/06/2011 11:00:00	0	0	0	0	0	0	0	0
✗	20/06/2011 10:45:00	0	0	0	0	0	0	0	0

Figure 9-10: HSU - Performance Monitoring report - Both valid and invalid data (1 of 3)

RSL Thresh 2 (-88 dBm)	Min TSL (dBm)	Max TSL (dBm)	TSL Thresh (25 dBm)	BBER Thre
0	5	5	0	0
0	5	5	0	0
0	5	5	0	0
0	5	5	0	0
0	5	5	0	0
0	5	5	0	0
0	5	5	0	0
0	5	5	0	0
0	5	5	0	0
1	5	5	0	0

Figure 9-11: HSU - Performance Monitoring report - Both valid and invalid data (2 of 3)



(25 dBm)	BBER Thresh (1.0 %)	Rx MBytes	Tx MBytes	Below Capacity Thresh (0.0 Mbps)	Above Traffic Thresh (100.0 Mbps)
	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0

Figure 9-12: HSU - Performance Monitoring report - Both valid and invalid data (3 of 3)

The HSU report contains many more fields than the HBS. Here is their meaning::

Table 9-3: HSU Performance Monitoring Fields

Column Heading	**Abbreviation Meaning**	**Description**
Integrity	Valid data flag	Green tick for current and valid; Red cross for invalidated data (See example below). Note that the Performance Monitoring data is not valid if not all the values were stored (e.g., due to clock changes within the interval or power up reset)
Date & Time	Time stamp	Data are recorded every 15 minutes; the last 30 days of recordings are maintained. Roll-over is at midnight
UAS	Unavailable Seconds	Seconds in which the interface was out of service
ES	Errored seconds	The number of seconds in which there was at least one error block.
SES	Severe Errored Seconds	The number of seconds in which the service quality was low as determined by the BBER threshold
BBE	Background Block Error	The number of errored blocks in an interval
Min RSL (dBm)		The minimum of the receive signal level (measured in dBm)
Max RSL (dBm)		The maximum of the receive signal level (measured in dBm)
RSL Thresh 1 (-88dBm)		The number of seconds in which the Receive Signal Level (RSL) was below the specified threshold.
RSL Thresh 2 (-88dBm)		The number of seconds in which the RSL was below the specified threshold.
Min TSL (dBm)		The minimum of the transmit signal level (measured in dBm)
Max TSL (dBm)		The maximum of the transmit signal level (measured in dBm)
TSL Thresh (25 dBm)		The number of seconds in which the Transmit Signal Level (TSL) was above the specified threshold
BBER Thresh (1.0%)		The number of seconds in which the Background Block Error Ratio (BBER) exceeded the specified threshold
Rx MBytes	Received Mbytes	The number of Megabytes received at the specified port within the interval
Tx MBytes	Transmitted Mbytes	The number of Megabytes transmitted at the specified port within the interval.

Table 9-3: HSU Performance Monitoring Fields (Continued)

Column Heading	Abbreviation Meaning	Description
Below Capacity Thresh	(0.0 Mbps)	Seconds count when throughput fell below the threshold set in **Figure 9-7**
Above Traffic Thresh	Threshold set in **Figure 9-7**	Seconds count when actual traffic exceeded the threshold

As for the HBS, use the **Save** button to store the current data to file and the **Clear** button to delete currently stored performance data.

More on the Thresholds

RSL Thresholds

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

TSL Threshold

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

BBER Threshold

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

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

Ethernet Thresholds - Capacity

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

Ethernet Thresholds - Traffic

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

RADWIN Manager Traps

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

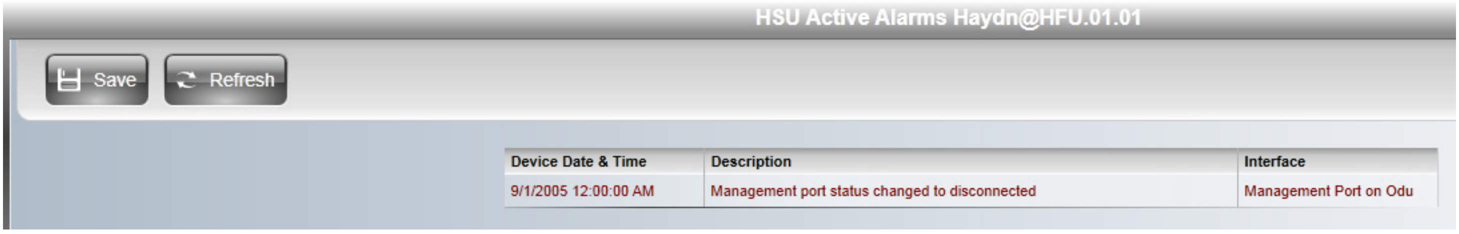
Table 9-4: RADWIN Manager Trap Messages

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

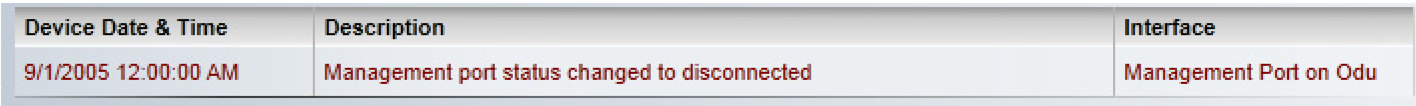
Active Alarms

Active Alarms are raised for any event affecting availability or quality of service.

The Active Alarms button,  is available for the HBS and the HSUs.Her is an example:



Here is the table part in more detail:



Device Date & Time	Description	Interface
9/1/2005 12:00:00 AM	Management port status changed to disconnected	Management Port on Odu

Current Active Alarms may be saved to a file. The list displayed will not be updated unless you click **Refresh**.

Other Diagnostic Aids

Link Budget Calculator

The Link Budget Calculator is part of the RADWIN Manager software and is found in the Help menu. This useful utility enables you to calculate the expected performance of the wireless link and the possible configurations for a specific link range including antenna size, cable loss and climate conditions. For full details, see **Chapter 20**.

➢ **To run the Link Budget Calculator from the Windows Start Menu:**

- Go to **Start | Programs |** RADWIN Manager **| Link Budget Calculator**

Online Help

Online help can be accessed from the Help menu on the main window of the RADWIN Manager. Using most common Web browsers, it may also be run going to

Start | Programs | RADWIN Manager | User Manual RADWIN 5000 HPMP

Customer Support

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

For further information, please contact the RADWIN distributor nearest to you or one of RADWIN's offices worldwide.

USER MANUAL

RADWIN 5000 HPMP POINT TO MULTIPOINT BROADBAND WIRELESS

Release 3.4.00

Part 4: Site Synchronization

RADWIN

Chapter 10

Hub Site Synchronization

What is Hub Site Synchronization?

When several radios are collocated at a common hub site, interference may occur from one unit to another. RADWIN ODU units support the collocation of more than two units at a central site. Like any other RF deployment, the wireless operation is highly dependent on factors such as available frequencies, the physical spacing between radios, other interfering radios, and whether WinLink 1000, RADWIN 2000 or RADWIN 5000 HPMP units are installed.

Note

- HSS does not eliminate the need for careful RF planning to ensure the design will work as planned. See **Chapter 2** for information on installation site survey.
- HSS support for RADWIN 5000 HBSs is model dependent

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

Figure 10-1 illustrates interference caused by non-synchronized collocated units.

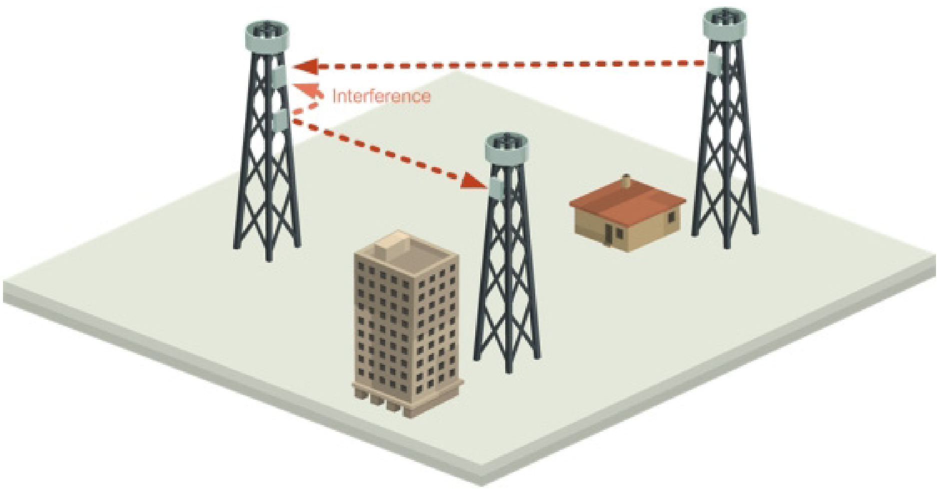


Figure 10-1: Interference caused by collocated units

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

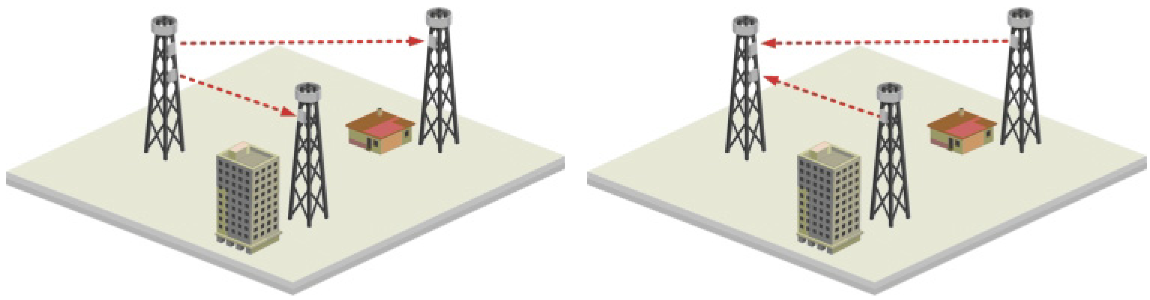


Figure 10-2: Collocated units using Hub Site Synchronization (1)

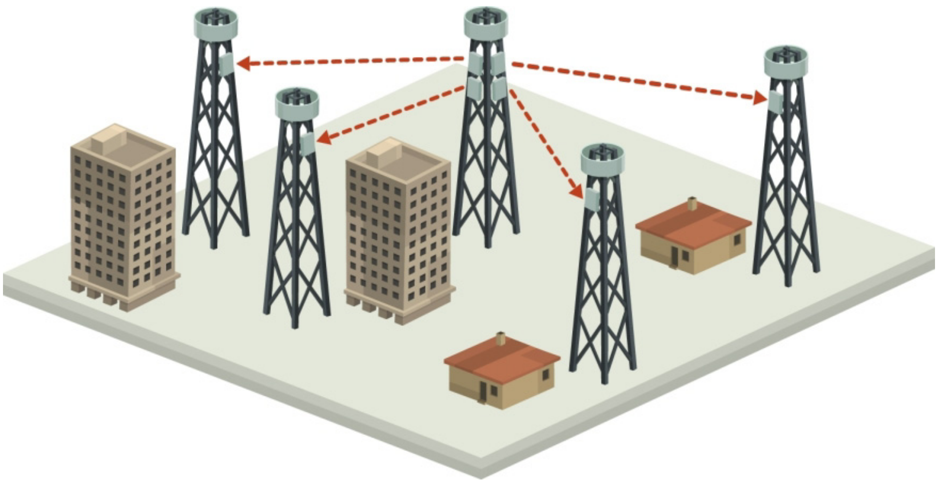


Figure 10-3: Collocated units using Hub Site Synchronization (2)

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

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

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

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

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

Hardware Installation

Connecting an HSS Unit

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

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

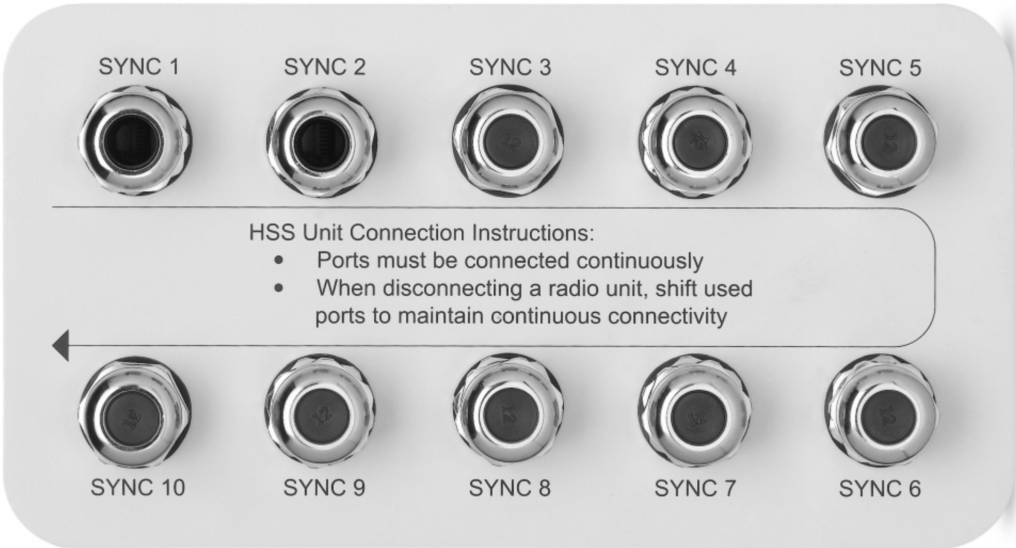


Figure 10-4: HSS Interconnection Unit

Note

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

To connect an ODU to an HSS unit:

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

Using a Single HSS Unit

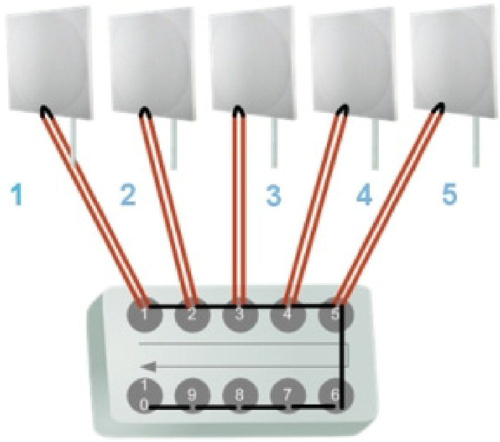


Figure 10-5: HSS Wiring schematic

The wiring, as shown in **Figure 10-5** is self explanatory. The Sync signal path is less self-evident. If we set ODU 1 (on SYNC 1) to HSS Master, then the Sync signal path is as shown in **Figure 10-6**. The signal travels from ODU 1 to SYNC 1, from SYNC 1 to SYNC 2, from SYNC 2 to ODU 2 and back again. The back and forth paths repeat for the second to fourth ODU, from left to right. The signal exits the HSS unit at SYNC 5 and terminates in ODU 5.

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

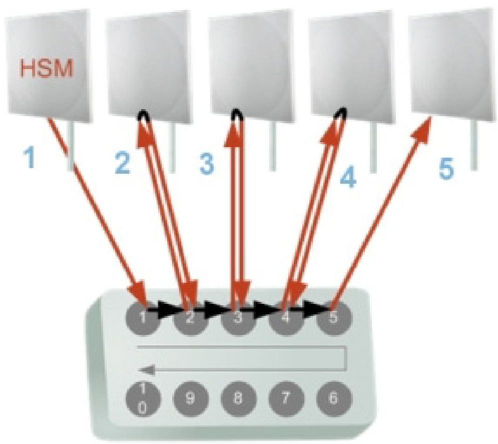


Figure 10-6: HSS sync signal path with ODU 1 as HSS Master

Using More than One HSS Unit

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

Condition 1: Cabling Sequence

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

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

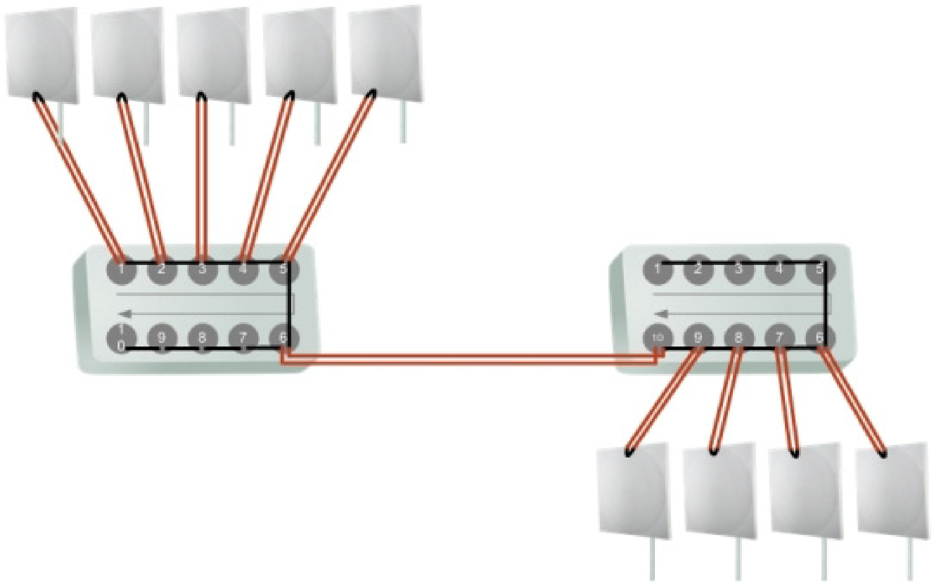


Figure 10-7: Cascading two HSS units

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

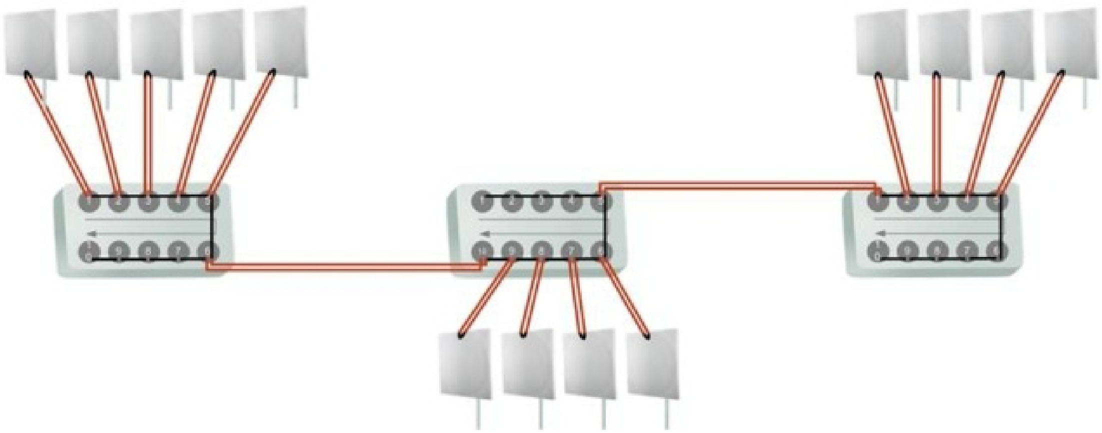


Figure 10-8: Cascading three HSS units

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

Note

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

Condition 2: Total HSS Cable Length

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

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

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

One HSS unit with five collocated ODUs

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

Two cascaded HSS units as shown in **Figure 10-7**

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

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

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

ODU/HSS Unit Connection Pinout

Table 10-1: ODU/HSS Unit Connection Pinout

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

Radio Frame Pattern (RFP)

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

Without HSS

When selecting Ethernet services, the system automatically and transparently chooses the optimal RFP.

RFP and HSS

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

RADWIN 5000 HPMP radios use the Time Division Duplex (TDD) mechanism.

Under HSS, TDD enables synchronization of transmission for the collocated units as shown in **Figure 10-9**:

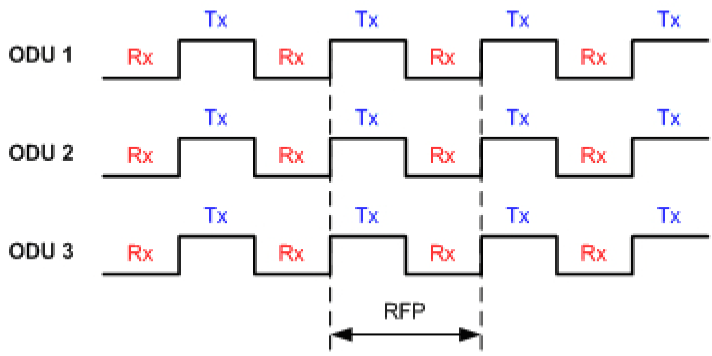


Figure 10-9: Radio Frame Pattern

Five RFP types (A to E) are available. Under HSS the RFP must be configured by the user depending on the type of the radio products, services and channel bandwidth in accordance with the **Table 10-3** and **Table 10-4**.

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

Table 10-2: Radio Frame Pattern Table - RADWIN 5000 HBS

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

Table 10-3: Radio Frame Pattern Table - RADWIN 2000

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

Table 10-4: Radio Frame Pattern Table - WinLink 1000

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

Table 10-5: Legend for Radio Frame Pattern Tables

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

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

Note

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

RFP: General Radio Frame Pattern

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

- When synchronizing RADWIN 5000 HBS units you must use RFP E
- When synchronizing RADWIN 5000 HBS with RADWIN 2000 or WinLink 1000 units you must use RFP E
- RFP influences capacity and latency.
- Using the Link Budget Calculator, you can see the effect of the RFP on the Ethernet throughput.

Sector Configuration and HSS

The Hub Site Synchronization Settings dialog box appears in the HBS Site Configuration window.

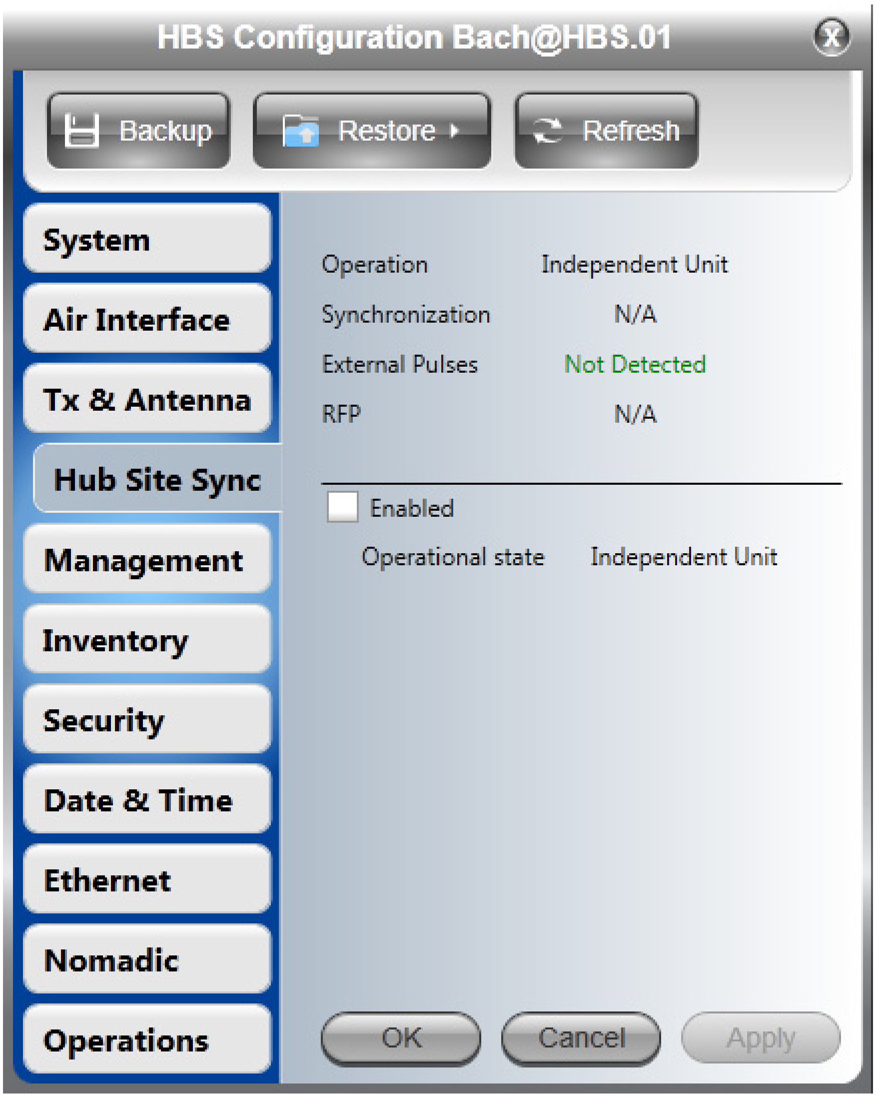


Figure 10-10: HSS Settings window

If you click the Enabled box, the central display (with **Operational state** opened) will look like this:

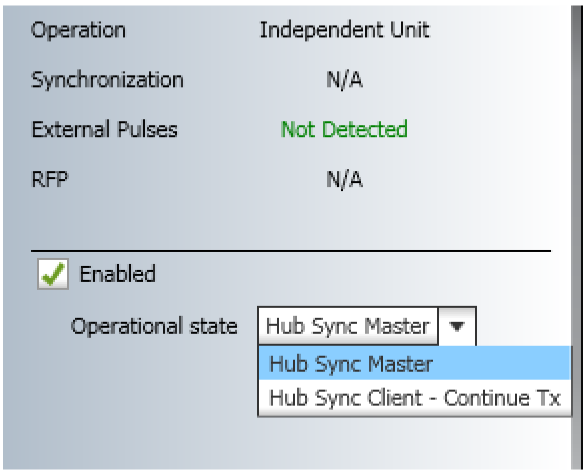


Figure 10-11: Setting HBS as HSM or HSC

Continue Tx means that the HBS as a client to continue to work if there is no HSM pulse.

If you select **Hub Sync Master** and click **Apply**, the display changes again:

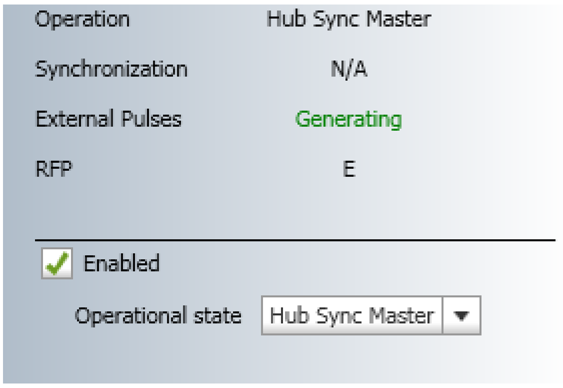


Figure 10-12: HBS as HSM

The possible External Pulses conditions are shown in the following table:

Table 10-6: External Pulse Status

<table>
<tr><th>HSS Sync Status</th><th>Meaning</th><th>Color code</th></tr>
<tr><td>Generating</td><td>ODU is HSM and generates the sync pulse</td><td rowspan="3">Green</td></tr>
<tr><td>Detected</td><td>ODU is HSC and detects the sync pulse</td></tr>
<tr><td>Not detected</td><td>ODU is independent</td></tr>
<tr><td>Generating and detected</td><td>HSM, but other HSM present</td><td rowspan="3">Orange</td></tr>
<tr><td>Generating and Improperly Detected</td><td>RADWIN 5000 HBS is HSM, but detects a WinLink 1000 or RRADWIN 2000 HSM signal that is not RFP E</td></tr>
<tr><td>Not detected</td><td>HSC but no HSM present</td></tr>
<tr><td>Improperly detected</td><td>HSC but HSM pulse doesn’t fit the HSC as configured. Occurs only for RADWIN 5000 HBS, which stops transmitting.</td><td>Red</td></tr>
</table>

Chapter 11

Using the RADWIN GSU

What is it for

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

The RADWIN GSU (or just GSU for short) is an outdoor unit consisting of a standard WinLink 1000 enclosure, a GPS antenna and a PoE device.

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

RADWIN GSU Functionality

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

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

Typical GSU Scenarios

Independent Distributed Sites

In the scenario of **Figure 11-1**, we have multiple independent collocated sites, which may interfere with each other. To meet this situation, we coordinate all of them using the GSU as shown.

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

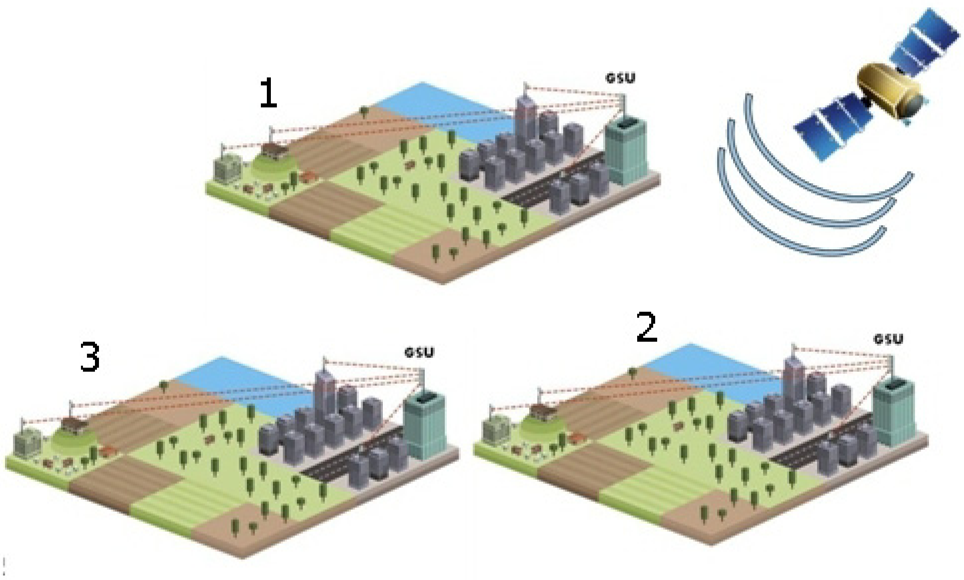


Figure 11-1: GSU Scenario - Independent distributed sites

Multiple Distributed Sites with Communication

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

Consider GSU 1 and GSU 2: Both collocated towers transmit and receive simultaneously. However, the radios communicating at GSU 1 and GSU 2 must transmit and receive in turn according to the scheme in marked "Normal Phase" in **Figure 11-3**. This is an impossible situation, if all the links must send and receive together. It is further complicated by adding a third and further sites as shown.

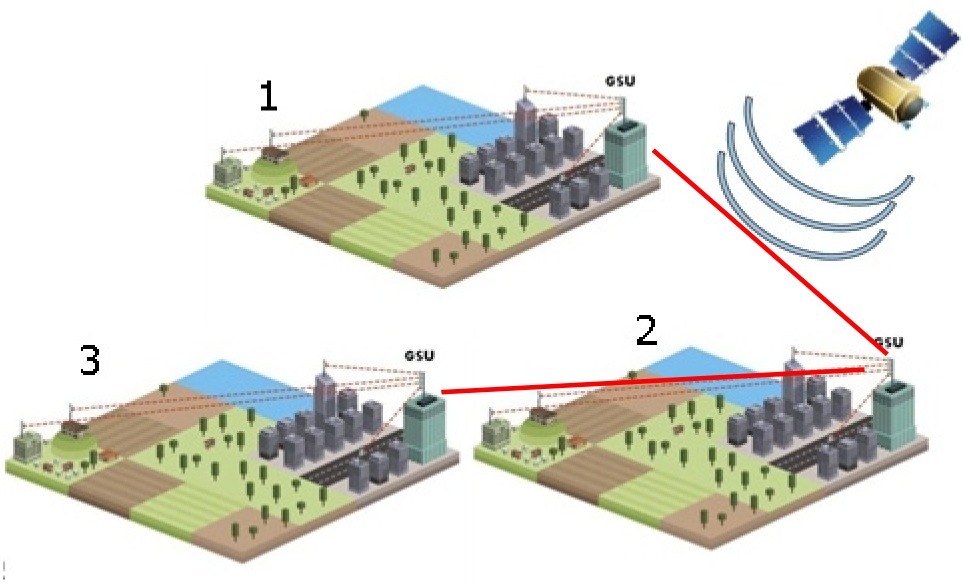


Figure 11-2: GSU Scenario - Communicating distributed sites

Cascaded Sites using Shifted Phase Transmission

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

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

To see how it works, we use **Figure 11-2**. The GSU towers are numbered and marked for cascading, 1-2 and 2-3. There should ***not*** be a link between 1 and 3.

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

To use cascading, the TDD timing of the even-ordered links (GSU 2 above) must be "shifted" (Shifted Phase) and odd-ordered links (GSU 1 and GSU 3 above) must be "unshifted" (Normal Phase). The phase shift is half of the Radio Frame Duration (RFD) from the chosen RFP. The scheme is shown in **Figure 11-3**.

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

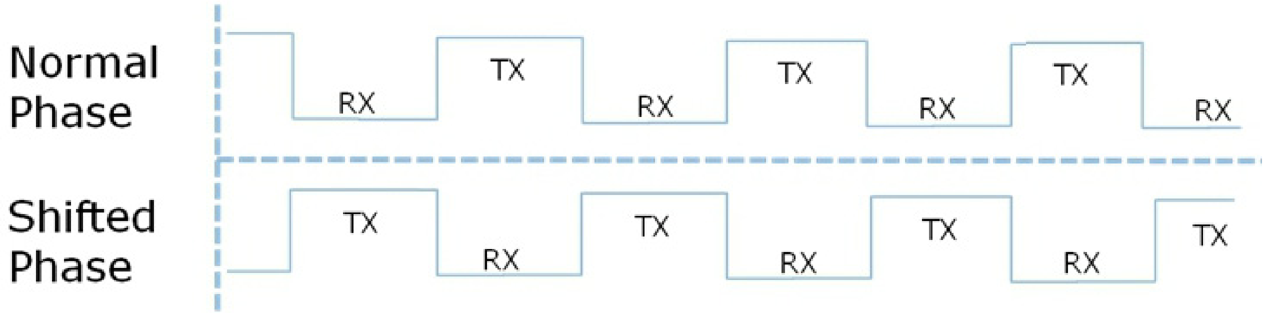


Figure 11-3: Phase shifted transmission - phase shift is 1/2 the RFD

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

GSU Redundancy

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

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

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

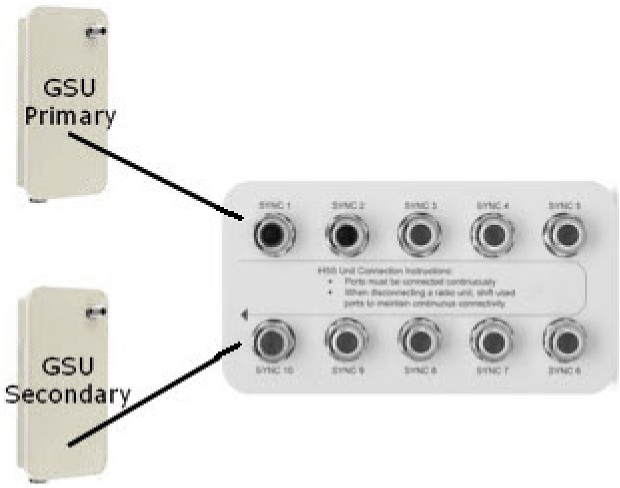


Figure 11-4: Make the GSUs the first two collocated units

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

RADWIN GSU Kit Contents

The RADWIN GSU package includes:

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

RADWIN GSU Installation

Overview

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

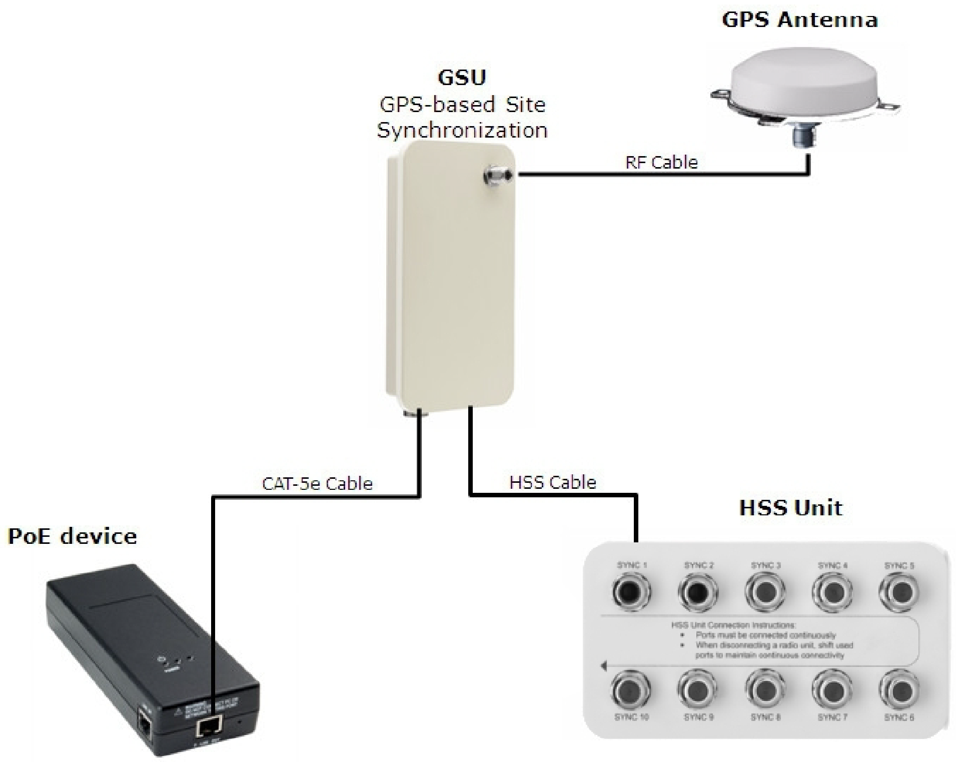


Figure 11-5: General GSU configuration

In that respect, all of the considerations of **Chapter 3**, **Chapter 18** and **Chapter 19** of the use Manual apply to the GSU.

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

Preparing the GSU for Use

Log on to the unit using the default IP address, 10.0.0.120 or Local Connection (See the cautions in **Chapter 5** about using Local Connection). Use Site Configuration and then the Management tab as shown on **page 11-11** below. Enter the required IP information, click **OK** and then disconnect the unit for transportation to its site.

Mounting the GSU

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

Configuring the GSU

Getting Started

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

The GSU Main Window

Here is the main window for GSU configuration:

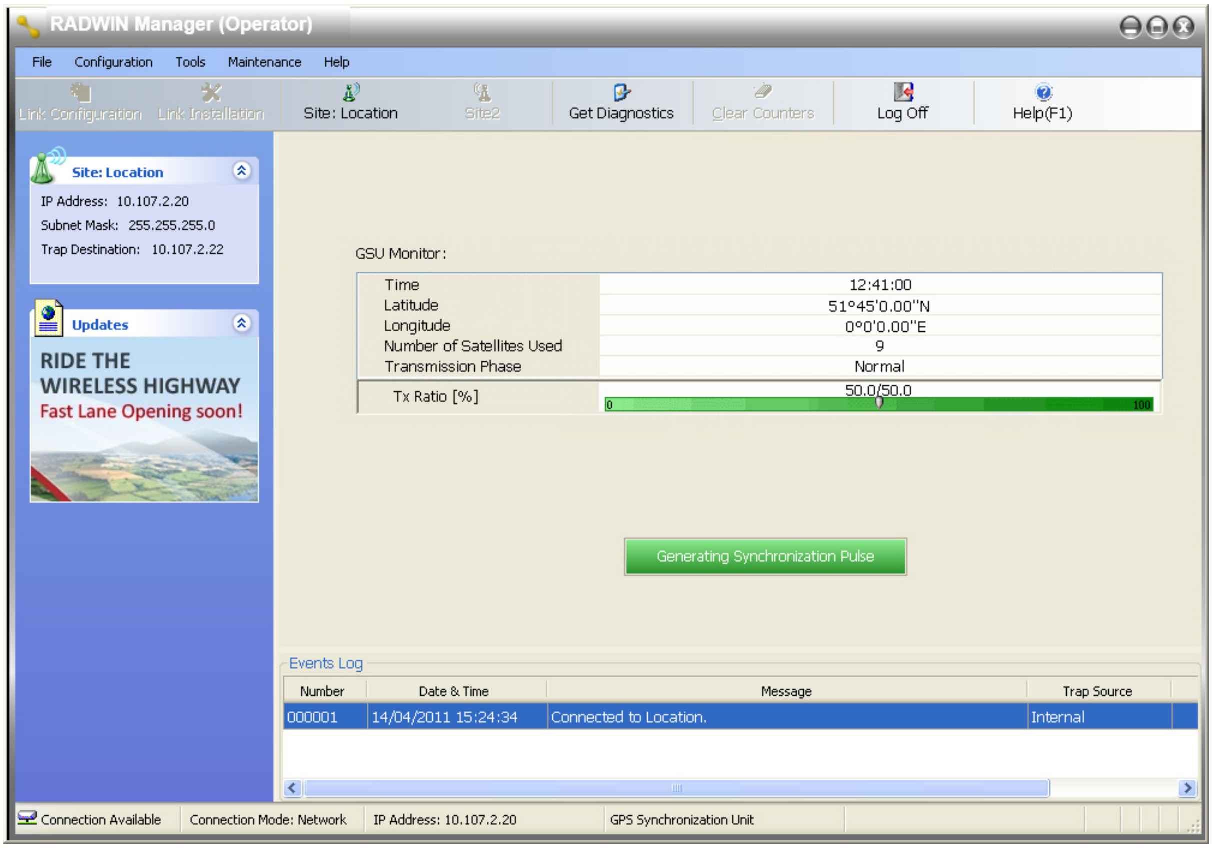


Figure 11-6: GSU Main widow at startup

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

The Status Box

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

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

Using Site Configuration for the GSU

Site Configuration: System

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

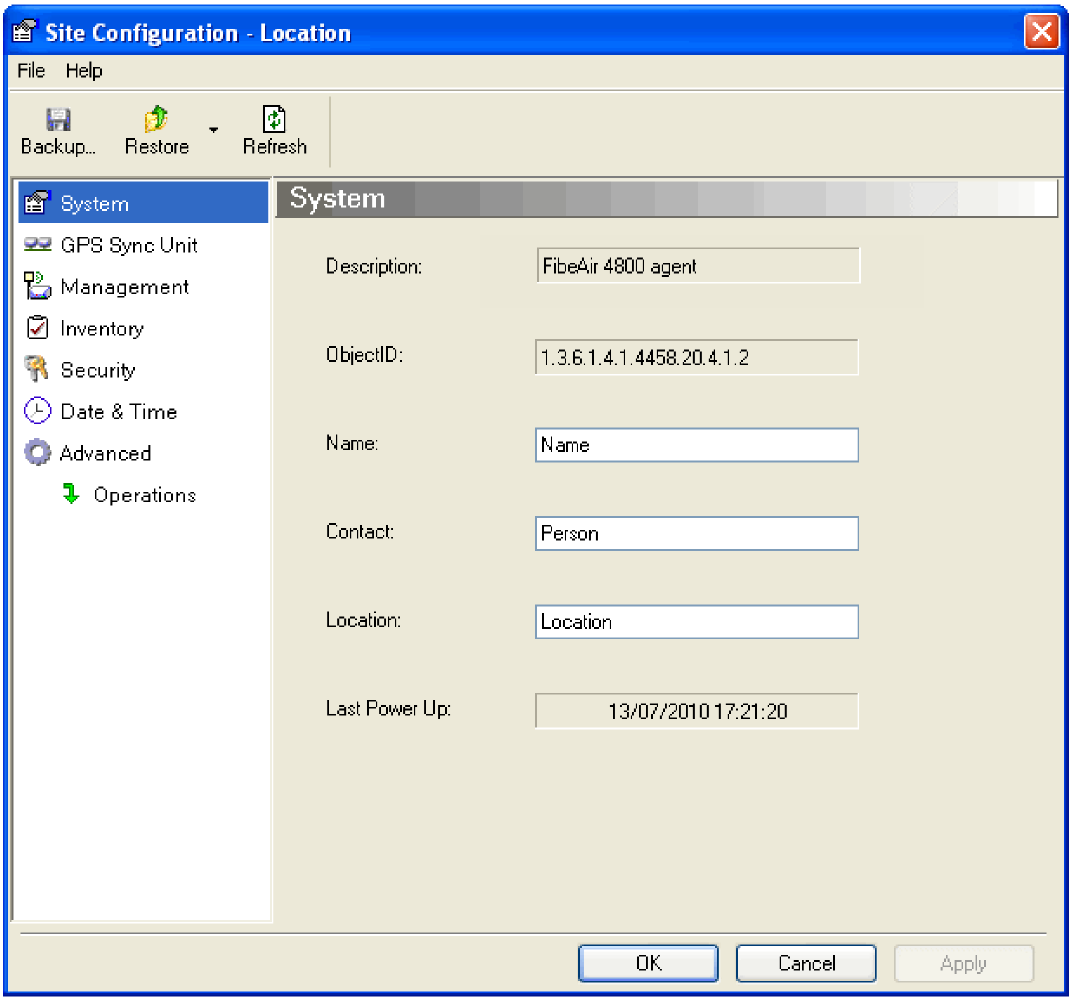


Figure 11-7: Site Configuration: System

It is similar to that of the WinLink 1000.

Site Configuration: GPS Sync Unit

This window is the main GSU configuration tool:

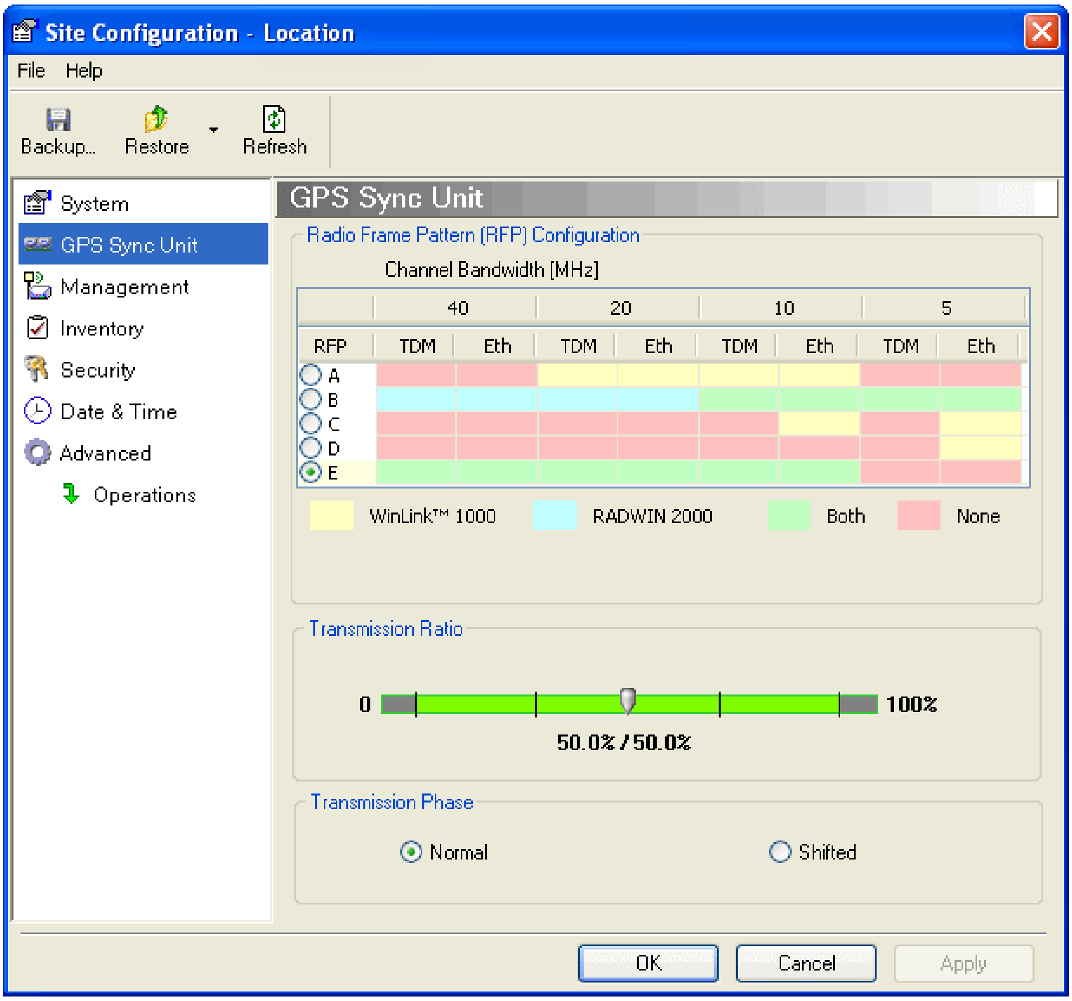


Figure 11-8: Site Configuration: GPS Sync Unit

Note

Recall that RADWIN 5000 HBS can only use RFP E. In what follows below, references to RADWIN 2000 also apply to RADWIN 5000 HBS unless otherwise specified.

1. Setting the RFP for HSS

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

Note

Ensure that no other collocated ODU is configured as HSM.

If the hub site consists only of WinLink 1000 units, then any suitable RFP may be chosen. If there are one or more RADWIN 2000 units, you must use RFP B or E. If there are one or more RADWIN 5000 HBS units, you must use RFP E.

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

You May use RFP/Channel Bandwidth combinations with this color	**For these collocated radios**
	WinLink 1000 only
	RADWIN 2000 only
	WinLink 1000 and RADWIN 2000 together, RADWIN 5000 HBS with anything
	None - unavailable

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

Two GSU managed sites transmitting with shifted transmission phase and using the same RFP, transmit one half a RFD apart (see **Figure 11-3** above).

2. Setting the Tx Transmission Ratio

Since the GSU is always HSM, it must be able to cater for any combination of collocated RADWIN 5000 HBSs and RADWIN 2000 ODUs. (See **Chapter 10**). If you use asymmetric allocation, shifted transmission phase becomes unavailable and you cannot "cascade" links as described in step 1.

There is a further issue arising from changing the Tx Transmission Ratio for a sector.

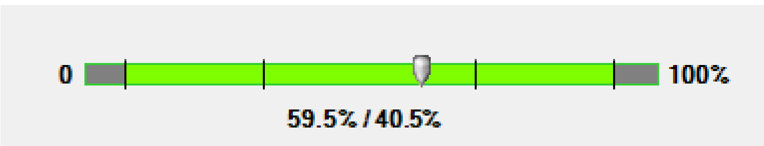
The GSU always operates at 20 MHz CBW. Nevertheless, you may operate the sector using a different CBW.

If you use a different sector CBW and set the GSU downlink transmission ratio too high, it may cause the HBS to cease transmitting. The reason for this is that the HBS translates the GSU transmission ratio to a higher uplink value, which may fall out of the allowable range for the HBS CBW even though it looks normal at the GSU. This is a perfectly normal situation.

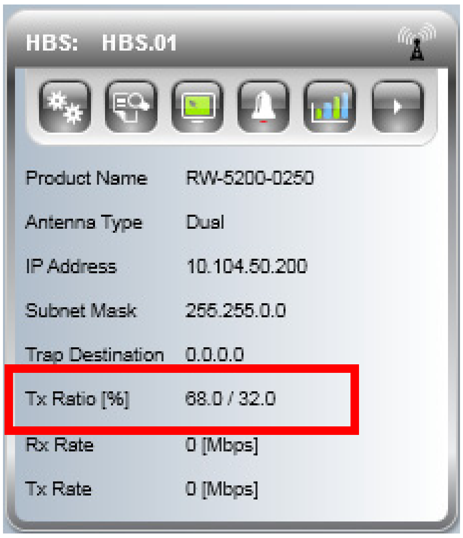
It is quite easy to find the downlink limit empirically. Here is an example, based on the setup used in **Chapter 4** and later.

To locate the maximum downlink limit for a sector:

1. Set the HBS CBW to 5 MHz.
2. Set the GSU transmission ratio to favour downlink like this:

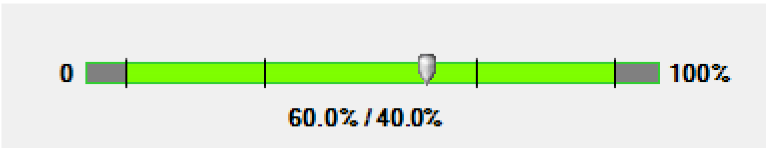


At the HBS, it translates to this:



The sector works correctly.

3. Move the slider a little to the right as follows:



The HBS stops transmitting.

Note

- Beyond the right most check mark on the green bar, no collocated client link will operate at 5MHz CBW. A similar procedure may be used for 10MHz CBW.
- You may need to repeat this procedure to establish the precise limit for your sector.
- We do not offer precise values for the limit since it will be affected by other collocated HBSs or ODUs.

3. Choosing the Transmission Phase

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

Site Configuration: Management

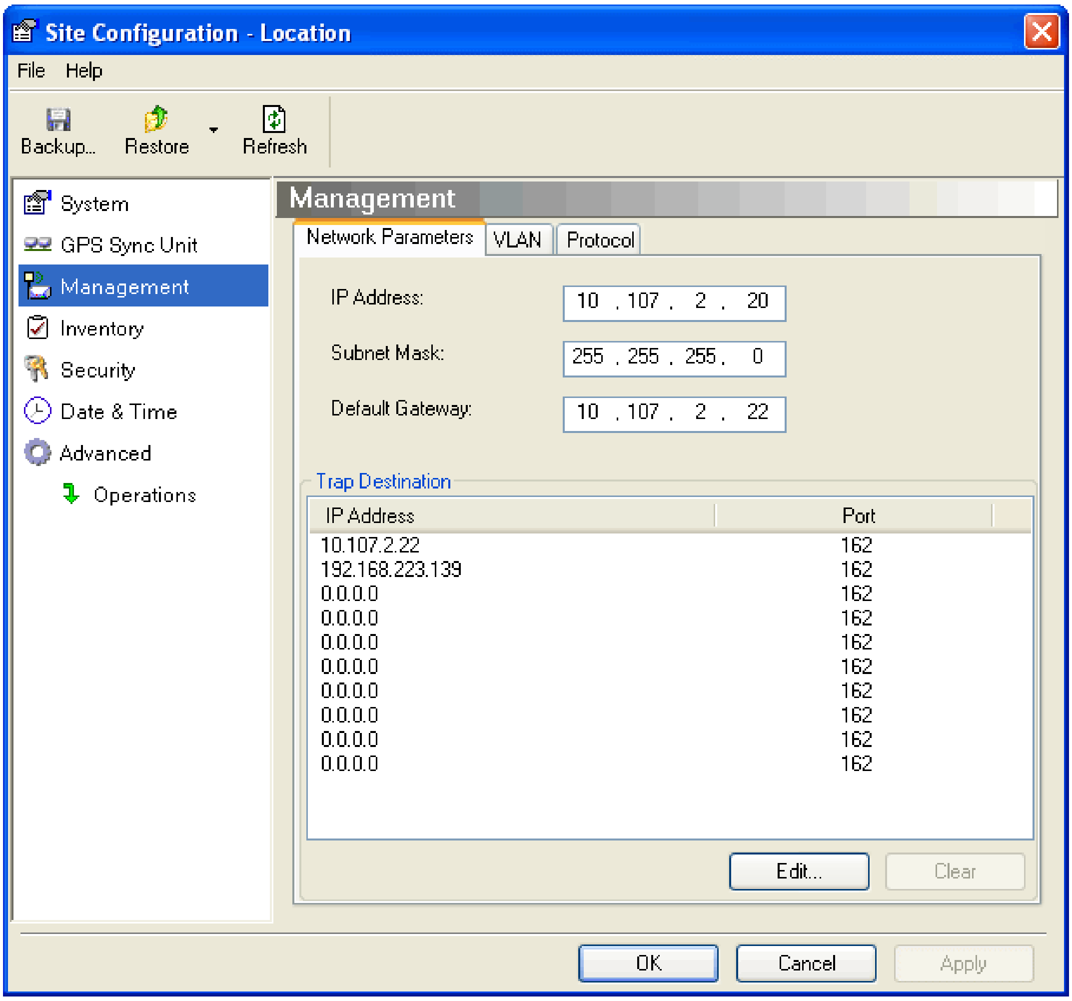


Figure 11-9: Site Configuration: Management

Here you set the GSU IP address, subnetsubnet mask mask and gateway. You also set trap addresses here. It is identical to the corresponding panel for WinLink 1000.

Site Configuration: Inventory

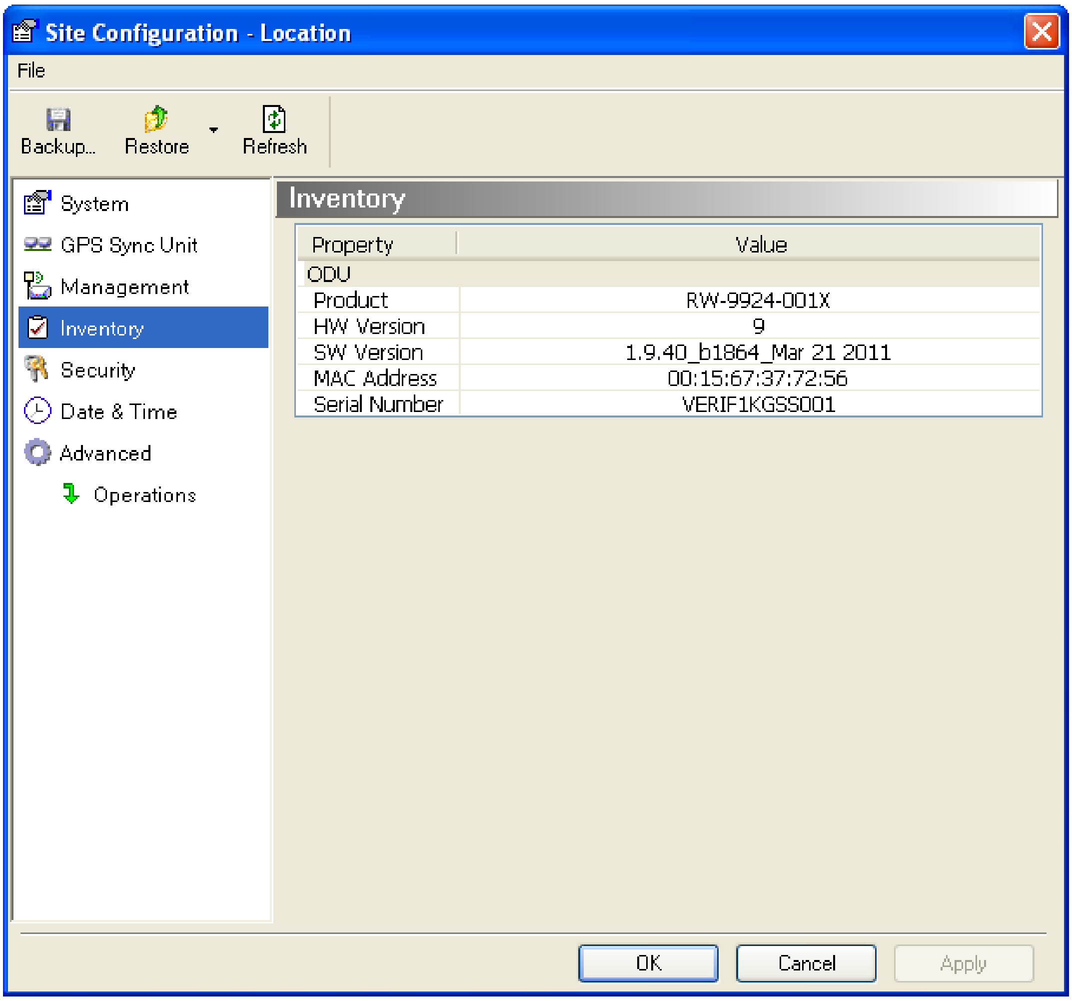


Figure 11-10: Site Configuration: Inventory

Site Configuration: Security

You can only change the SNMP Community stings:

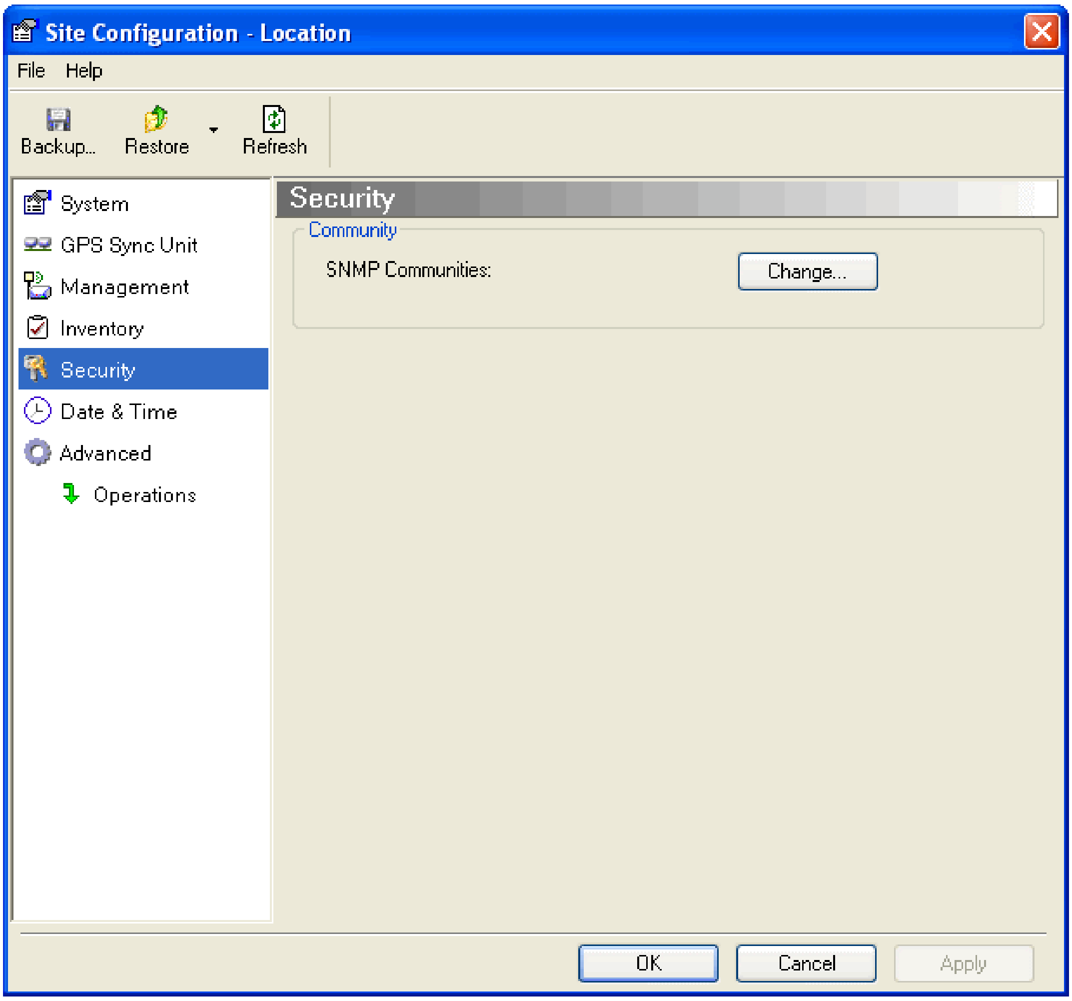


Figure 11-11: Site Configuration: Security

Site Configuration: Date and Time

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

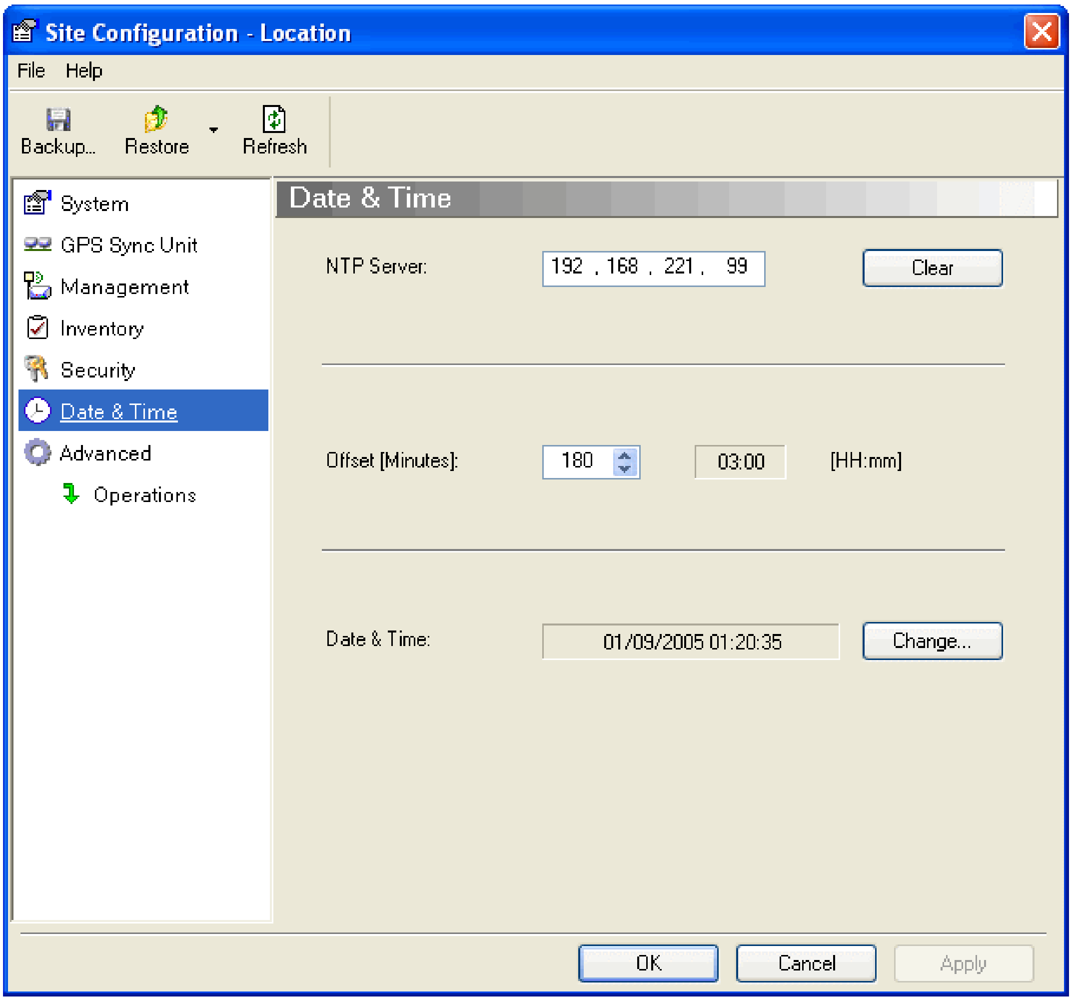


Figure 11-12: Setting the date and time for trap reporting

Site Configuration: Operations

The only available action here is Restore System Defaults:

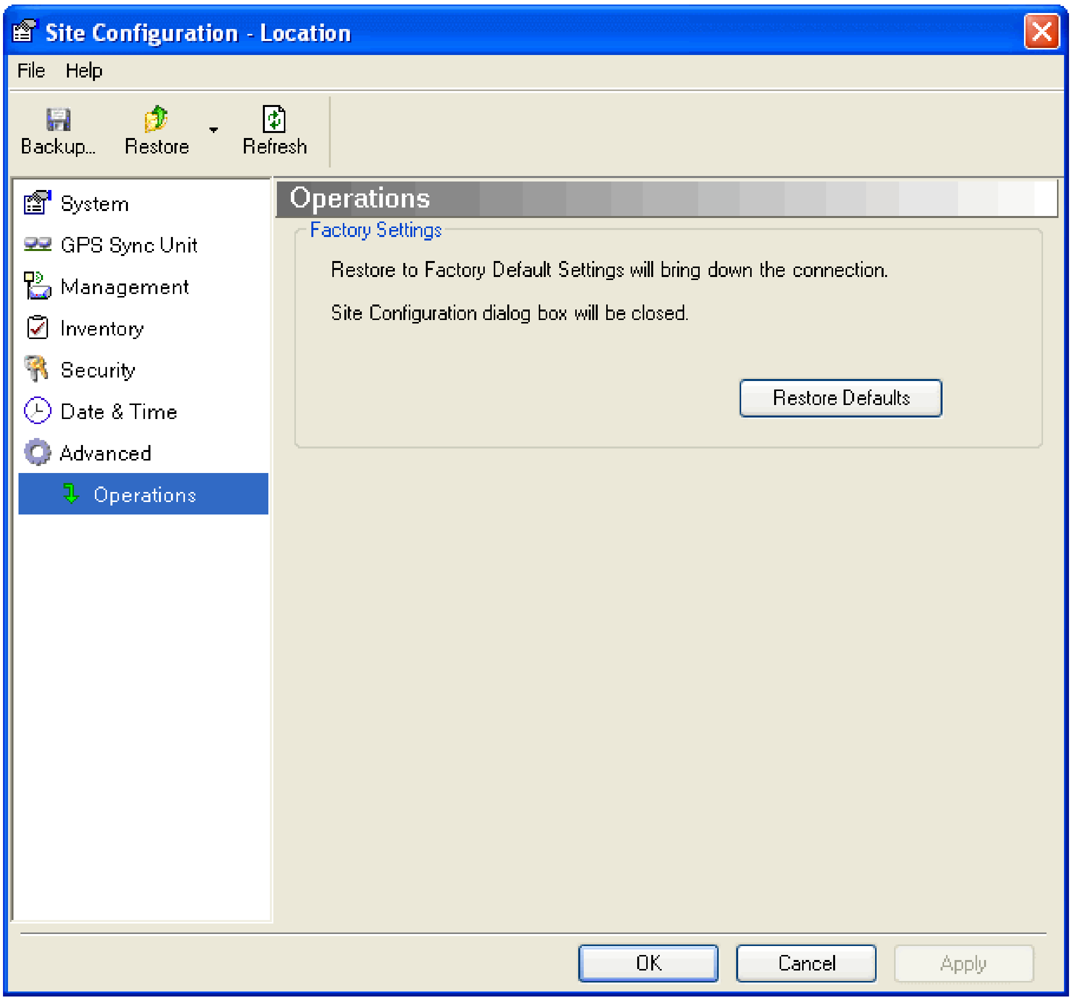


Figure 11-13: Site Configuration: Operations

GSU Preferences

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

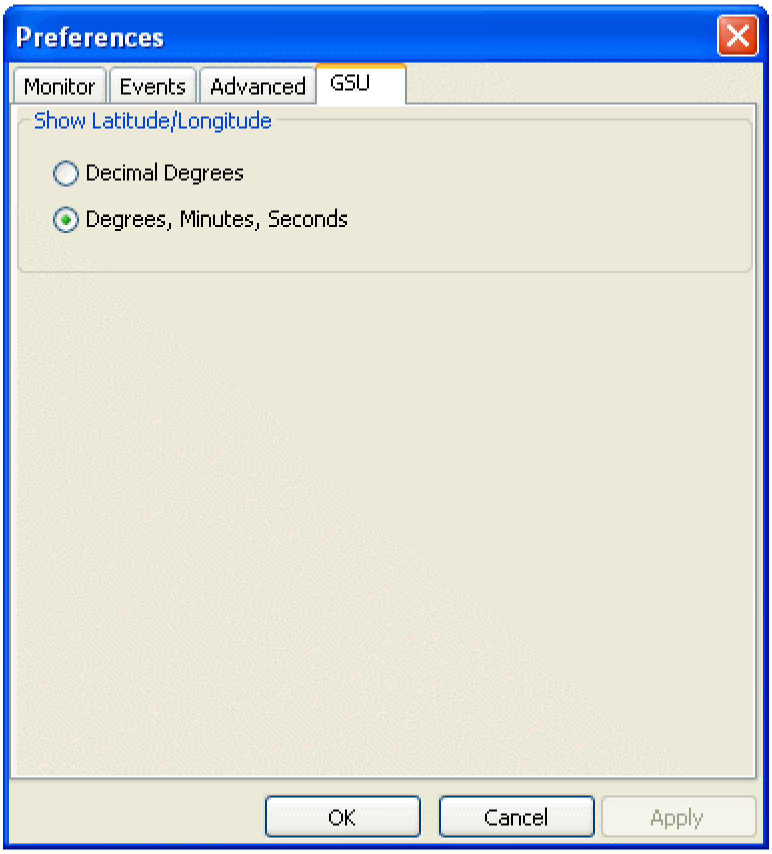


Figure 11-14: Site Configuration: Operations

You may chose the units for latitude/longitude coordinates.

GSU Monitoring and Diagnostics

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

GSU Telnet Support

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

telnet <GSU_ipaddr>.

For example, if you run Telnet as follows,

telnet 10.107.2.20

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

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

The additional **display** commands are

display rfp

display ratio

display tx_phase

display gpsinfo

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

admin@10.107.2.20-> display gpsinfo

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

Command "display gpsinfo" finished OK.

The three additional **set** commands are

set rfp <index> (2-6) [Must be 6 for RFP E]

set ratio <ratio> [Leave as is]

set tx_phase <mode:1=normal,2=shifted> [See above]

Software Update for GSUs

All GSUs in a distributed site can be updated simultaneously. Use an IP list as described in **Chapter 12**.

USER MANUAL

RADWIN 5000 HPMP POINT TO MULTIPOINT BROADBAND WIRELESS

Release 3.4.00

Part 5: Advanced Installation Topics

RADWIN

Chapter 12

Software Upgrade

What is the Software Upgrade Utility?

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

The SWU provides for:

- Prior backup of the current files prior to upgrade
- Upgrade from a list
- Delayed upgrade
- Various ODU reset options

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

Upgrading an Installed Sector

➢ To upgrade software for a link:

1. In the RADWIN Manager, click the **Software Upgrade** button.The following detached window appears:

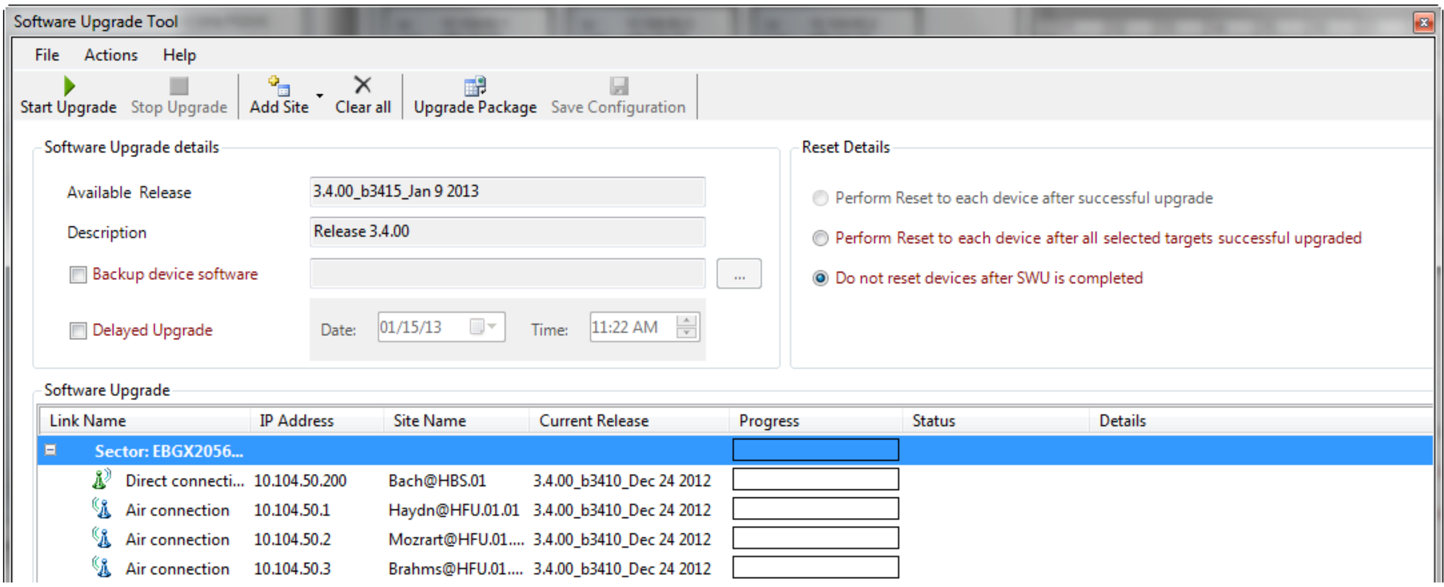


Figure 12-1: Software Upgrade Utility - Main window

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

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

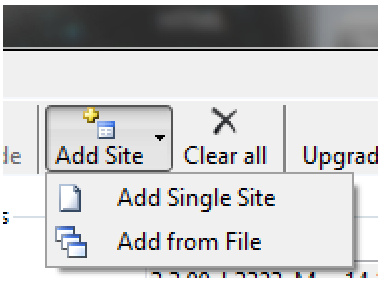


Figure 12-2: Add site options

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

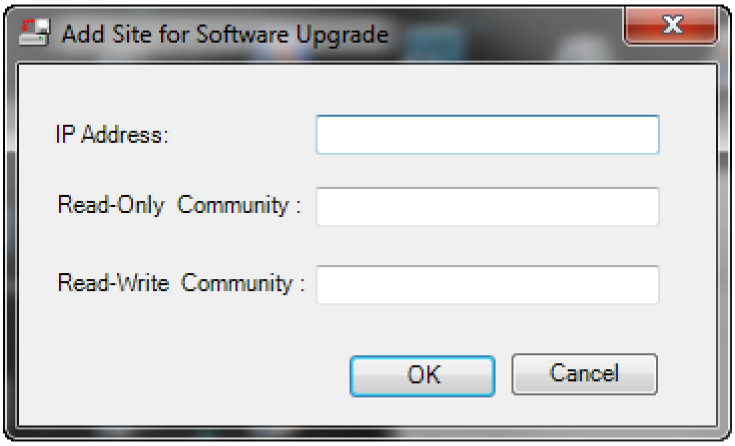


Figure 12-3: Adding a single site for upgrade

Enter the IP address of the site, the Community strings (Default: ***public*** and ***netman***, respectively) and then click **OK**. The site will appear in the Software Upgrade list box. The list can be cleared using the **Clear All** button.

As an alternative to adding sites one at a time, you can add sites from a prepared list using the **Add from File** option in **Figure 12-2**. The list has the following format:

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

3. Having created an update list, click **Upgrade Package** to chose the relevant files. The default files are located in the **SWU** subdirectory in the RADWIN Manager installation area. You may see one or more of the following SWU files:

Table 12-1: SWU Files by product

File name	Product
SWU_1k.swu	WinLink 1000
SWU_2k.swu	RADWIN 2000
SWU_5k.swu	**RADWIN 5000 HPMP**
SWD_5k.swu	**RADWIN 5000 HPMP HSU downgrade**
SWU_gs.swu	RADWIN GSU

For RADWIN 5000 HPMP, always choose SWU_5k.swu.

4. You make limited changes to the list by right-clicking any line:

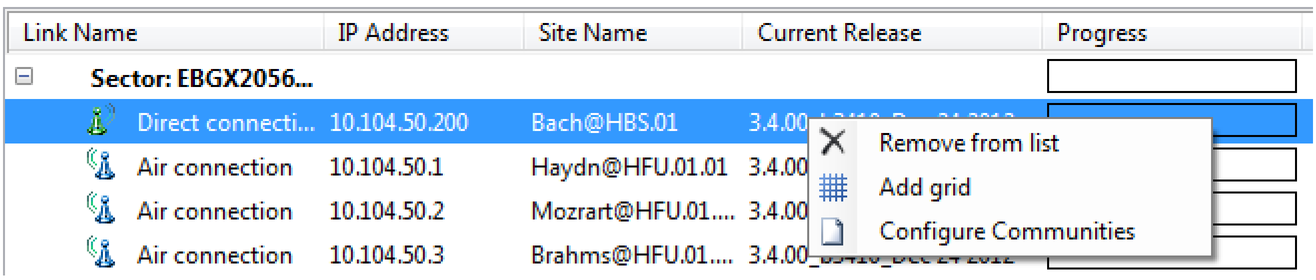


Figure 12-4: Software Upgrade site options

5. To back up your existing system, check **Backup device software** check-box. Then click the  button for a standard file dialog. The default location is the My Documents directory on the managing computer or the last backup directory you used.

Note

The backup here is the same as that on page 6-1, and serves the same purpose. It provides a fallback if the upgrade proves problematic.

6. In addition to the previous step, you may opt to perform a delayed upgrade. Check the Delayed Upgrade box, and enter the date and time for the delayed upgrade.
7. The radio buttons on the right determines how your HSUs should be reset. Bear in mind that on the one hand, a reset involves a service interruption, but on the other hand, the software upgrade will not become effective until after the reset is carried out.
8. Click **Start Upgrade** to commence the process. For an immediate upgrade you will be able to observe the upgrade progress from the green progress bars:

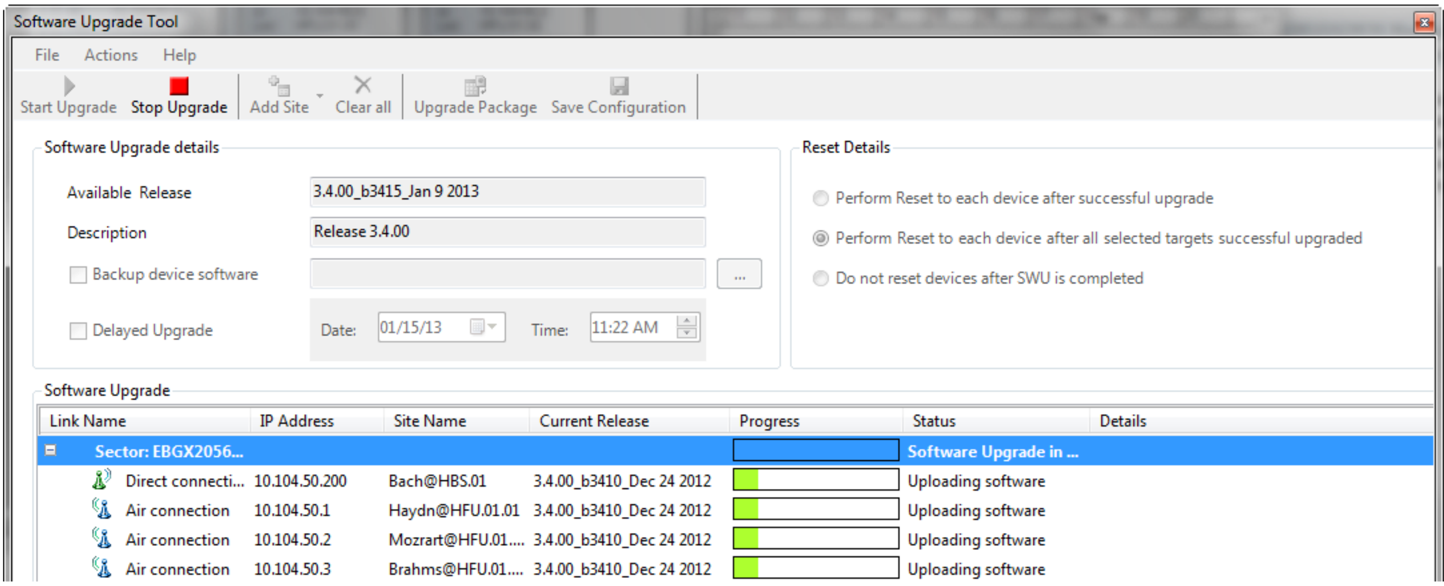


Figure 12-5: Software upgrade in progress - Note the stop button

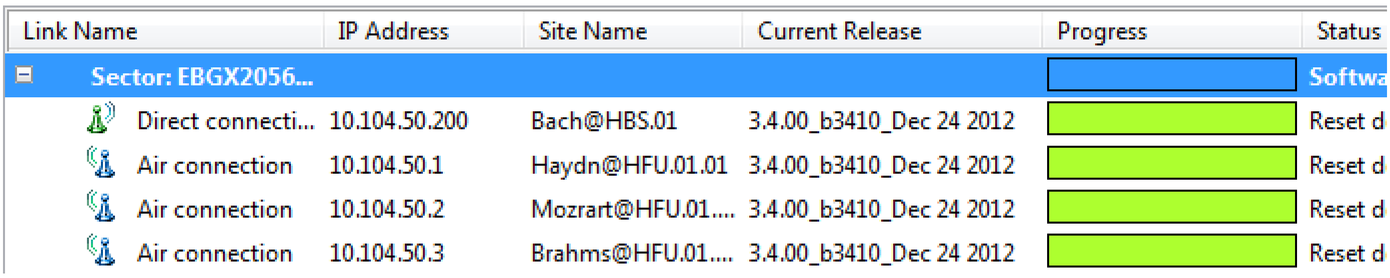


Figure 12-6: Software upgrade completed successfully

9. Click **Close** to exit.

Caution

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

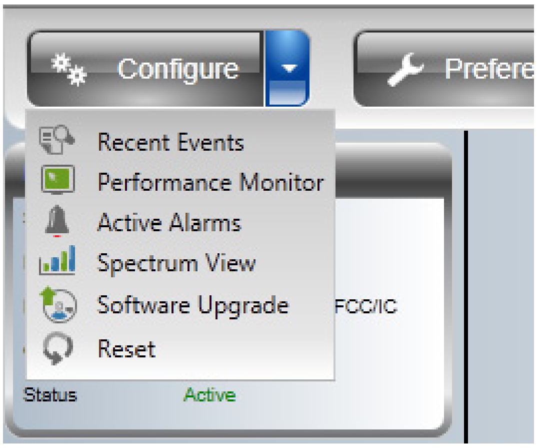
If one or more sites of a sector update fails, you should correct the problem and update the failed sites as soon as possible. If you do not, following the next reset of the updated sites, you could experience a link software mismatch which may affect service.

Downgrading HSU Software

If you take delivery of a new HSU for a sector configured under an older software release (up to 3.2.50) you will need to downgrade the HSU so it can operate correctly. The method is very straight forward:

To downgrade a HSU:

1. Log on to the new HSU by Local Connection.
2. Run Software Upgrade from here:



3. Choose the software package named SWD_5k.swu and click **Start**. On completion, disconnect your new HSU and install it to the sector in the usual way.

Chapter 13

VLAN Functionality with RADWIN 5000 HPMP

VLAN Tagging - Overview

VLAN Terminology

Both the technical literature and the RADWIN Manager use the terms VLAN ID and VID interchangeably to denote a VLAN identification number.

VLAN Background Information on the Web

The standards defining VLAN Tagging are IEEE_802.1Q and extensions.

For general background about VLAN see **http://en.wikipedia.org/wiki/Virtual_LAN**.

Background information about **Double Tagging** also known as **QinQ** may be found here: **http://en.wikipedia.org/wiki/802.1QinQ**.

Scope of this Chapter

This chapter describes how the components of a RADWIN 5000 HPMP sector deal with tagging and untagging.

Requirements

It is assumed that you are familiar with VLAN usage and terminology.

VLAN Tagging

VLAN tagging enables multiple bridged networks to transparently share the same physical network link without leakage of information between networks:

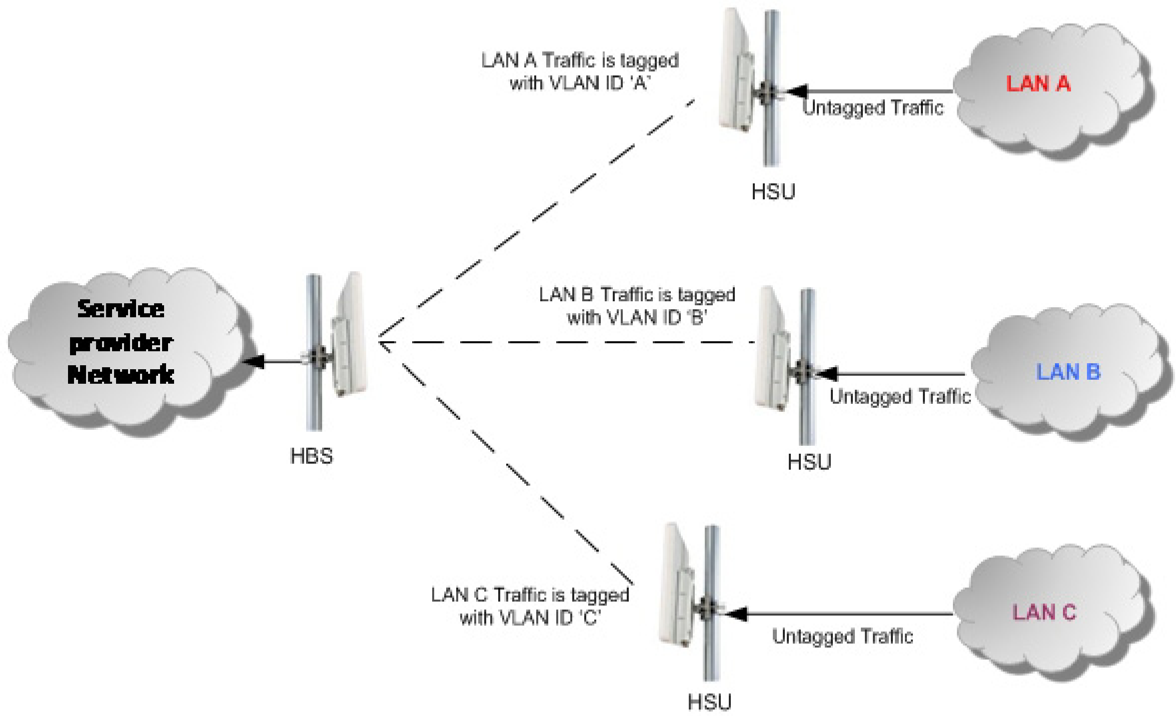


Figure 13-1: VLAN scenarios handled by RADWIN 5000 HBS

IEEE 802.1Q is used as the encapsulation protocol to implement this mechanism over Ethernet networks.

QinQ (Double Tagging) for Service Providers

QinQ is useful for Service Providers, allowing them to use VLANs internally in their "transport network" while mixing Ethernet traffic from clients that are already VLAN-tagged.

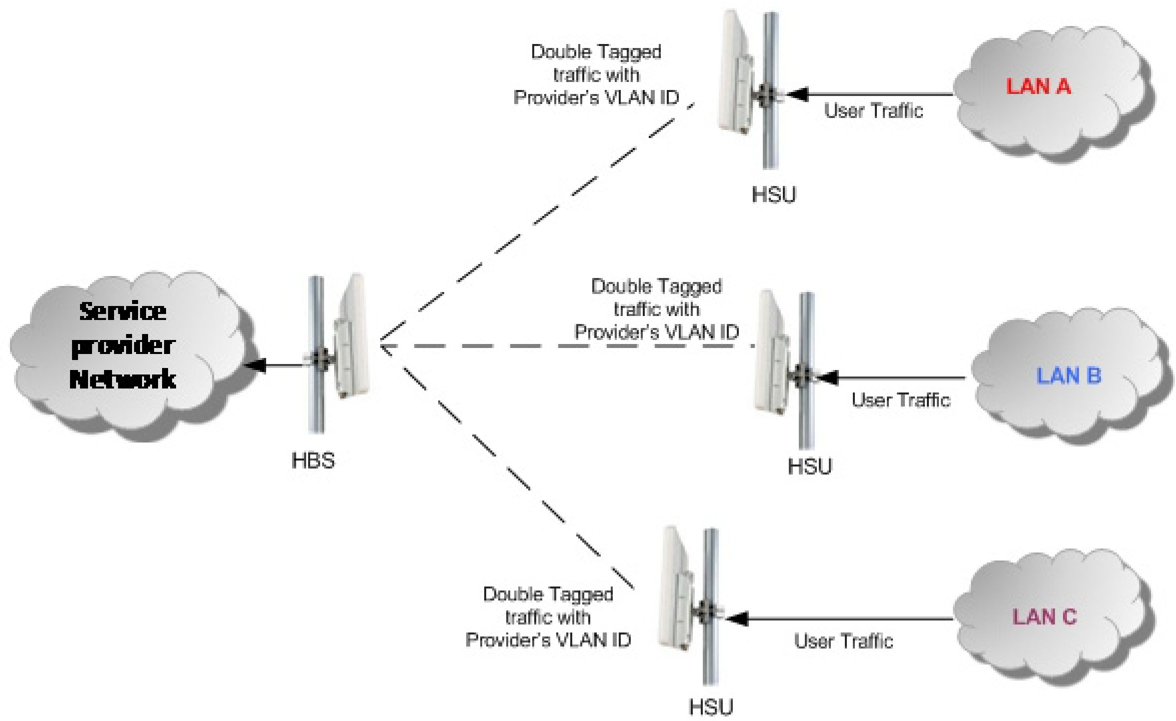


Figure 13-2: Separating client data streams using double tagging

The outer tag (representing the Provider VLAN) comes first, followed by the inner tag. In QinQ the EtherType = 0x9100. VLAN tags may be stacked three or more deep.

When using this type of "Provider Tagging" you should keep the following in mind:

- Under Provider Tagging, the system double-tags egress frames towards the Provider's network. The system adds a tag with a VLAN ID and EtherType = 0x9100 to all frames, as configured by the service provider (Provider VLAN ID).
- The system always adds to each frame, tags with VLAN ID and EtherType = 0x9100. Therefore,
    - For a frame without a tag – the system will add a tag with VLAN ID and EtherType = 0x9100 so the frame will have one tag
    - For a frame with a VLAN tag – the system will add a tag with VLAN ID and EtherType = 0x9100 so the frame will be double-tagged

For a frame with a VLAN tag and a provider tag – the system will add a tag with VLAN ID and EtherType = 0x9100 so the frame will be triple-tagged and so on.

At the egress side, the HSU removes the QinQ tag with EtherType = 0x9100 no matter what the value of its VLAN ID.

VLAN Untagging

VLAN Untagging means the removal of a VLAN or a Provider tag.

Port Functionality

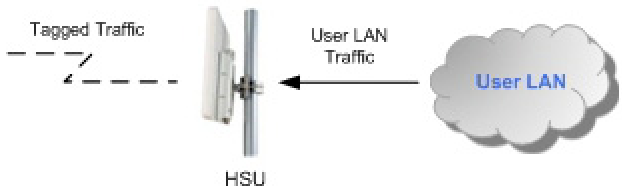
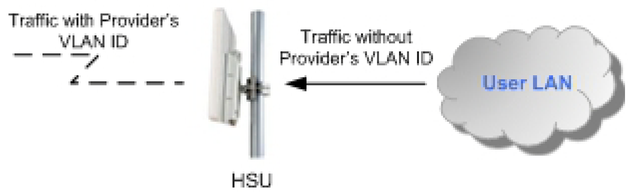
In a RADWIN 5000 sector, all VLAN activity is configured and supported from the HSUs.

To this end, VLAN functionality is supported at the MNG port of the HSU.

The HSU MNG port can be configured to handle Ethernet frames at the **ingress direction** (where frames enter the HSU) and at the **egress direction** (where frames exit the HSU).

Ingress Direction

Table 13-1: Port settings - Ingress direction

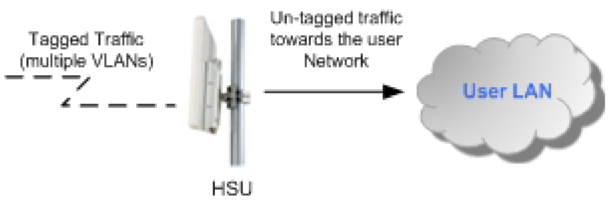
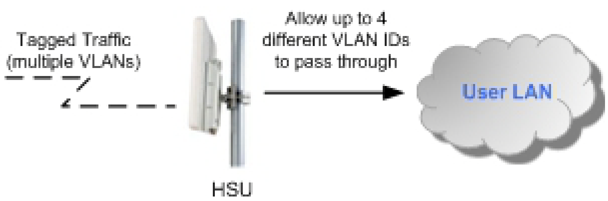
<table>
<tr><td>Transparent</td><td>The port 'does nothing' with regard to VLANs - inbound frames are left untouched.</td></tr>
<tr><td>Tag</td><td>Frames entering the HSU port without VLAN or QinQ tagging are tagged with VLAN ID and Priority[a], which are pre-configured by the user. Frames which are already tagged at ingress are not modified and pass through.

</td></tr>
<tr><td>Provider tag</td><td>Frames entering the HSU port are tagged with provider's VLAN ID and Priority which are pre-configured by the user. Frame.s which are already tagged with Provider tagging at the ingress are not modified and passed through


.</td></tr>
</table>

a. Priority Code Point (PCP) which refers to the IEEE 802.1p priority. It indicates the frame priority level from 0 (lowest) to 7 (highest), which can be used to prioritize different classes of traffic (voice, video, data, etc).

Egress Direction

Table 13-2: Port settings - Egress direction

<table>
<tr><td>Transparent</td><td>The port 'does nothing' with regard to VLANs - outbound frames are left untouched.</td></tr>
<tr><td>Untag all</td><td>Port configured to untag user VLAD tags for all frames.

</td></tr>
<tr><td>Filter</td><td>
</td></tr>
</table>

VLAN Configuration Using the RADWIN Manager

Disclaimer

If you are **not** a VLAN expert, please be aware that incorrect VLAN configuration may cause havoc on your network. The facilities described below are offered as a service to enable you to get best value from your RADWIN 5000 HPMP links and are provided "as is". Under no circumstances does RADWIN accept responsibility for network system or financial damages arising from incorrect use of these VLAN facilities.

Management Traffic and Ethernet Service Separation

You can define a VLAN ID for management traffic separation. You should configure the system to prevent conflicts as detailed below.

When configured for the default operational mode, a "Provider port" will handle ingress traffic as follows:

- Filters frames that are not tagged with the Provider VLAN ID
- Removes the Provider double tag

Therefore, if a port is configured for management traffic separation by VLAN and as 'Provider port', then the received management frames must be double tagged as follows:

- The outer tag has to be the Provider's tag (so the frame is not filtered)
- The internal tag has to be management VLAN ID

To avoid mix-ups, best practice is to:

- Separate the management and data ports
- Define only a data port with Provider function

Managing the HBS over the Air from an HSU

If traffic VLAN tagging is in force for the HSU ingress direction and management VLAN is in use at the HBS, then the VLAN ID at the HSU ingress direction must be the same as the VLAN ID for management at the HBS.

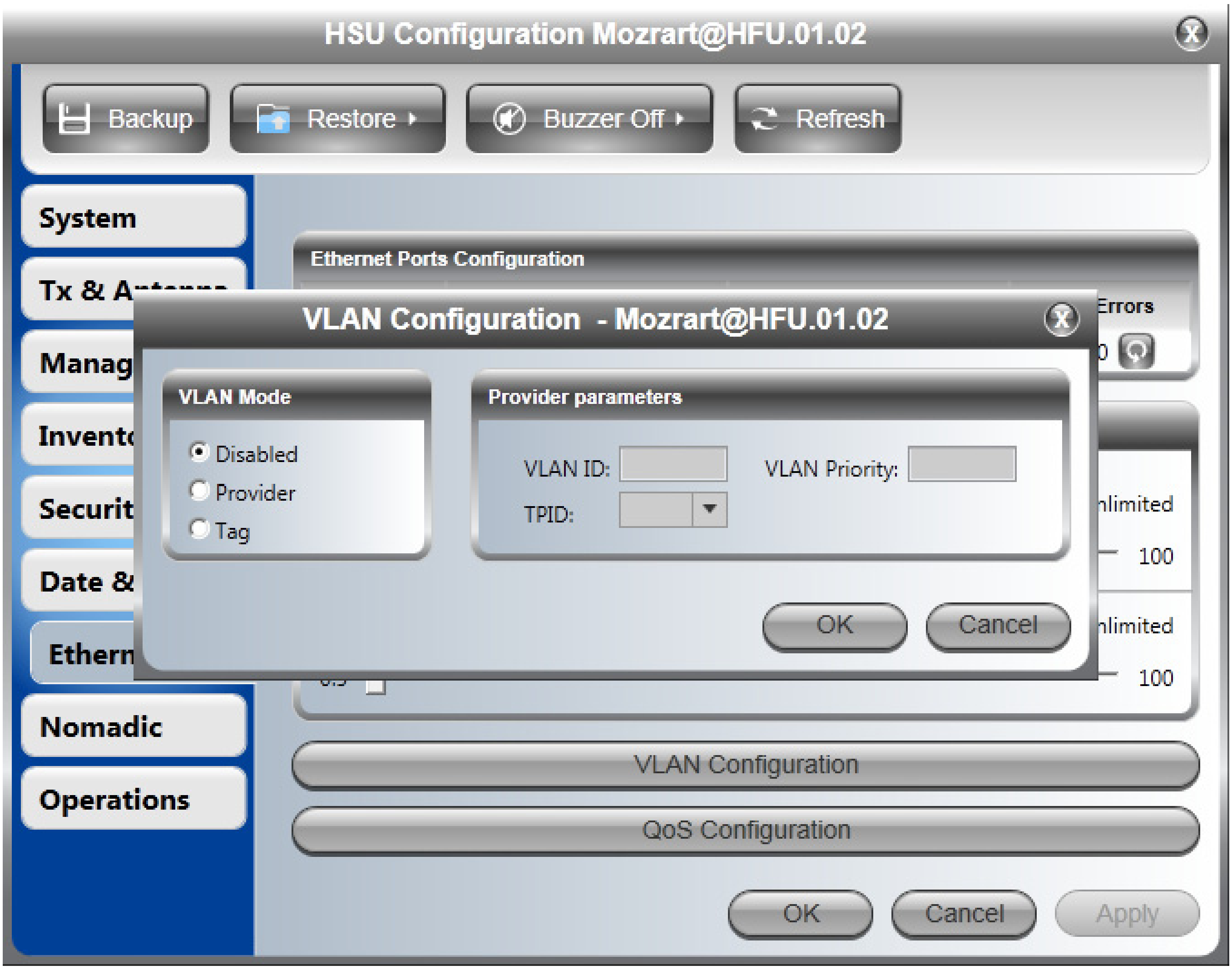
Configuration of VLAN Tagging for Ethernet Service

VLAN configuration is carried out per HSU. It is up to you to ensure consistency between the HSUs.

HSU VLAN tagging can only be configured from one of the HSU views from the HBS. You can not log on to an HSU directly and do it from the HSU main window. The reason is that the HSU maintains the HSU tagging information in its internal per HSU configuration record.

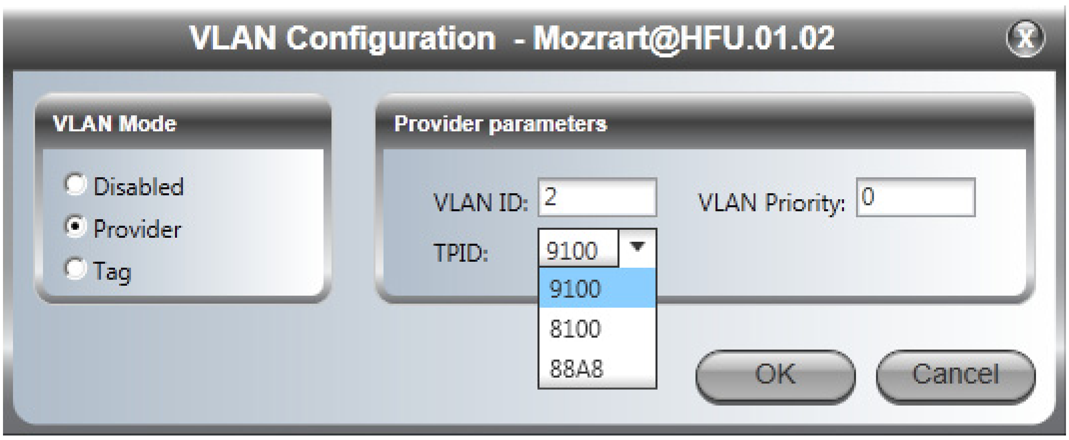
➢ **To set up an HSU for VLAN tagging:**

1. Right click an HSU on the HBS window, and then click **Configure | Ethernet | VLAN Configuration**. The VLAN Configuration window is displayed:



In **Disabled** mode, Ethernet frames pass transparently over the radio links.

2. For Provider tagging, click the Provider Radio button:



In **Provider** mode, Ethernet frames are tagged with the provider's VLAN ID before they enter into the provider's network/backbone.

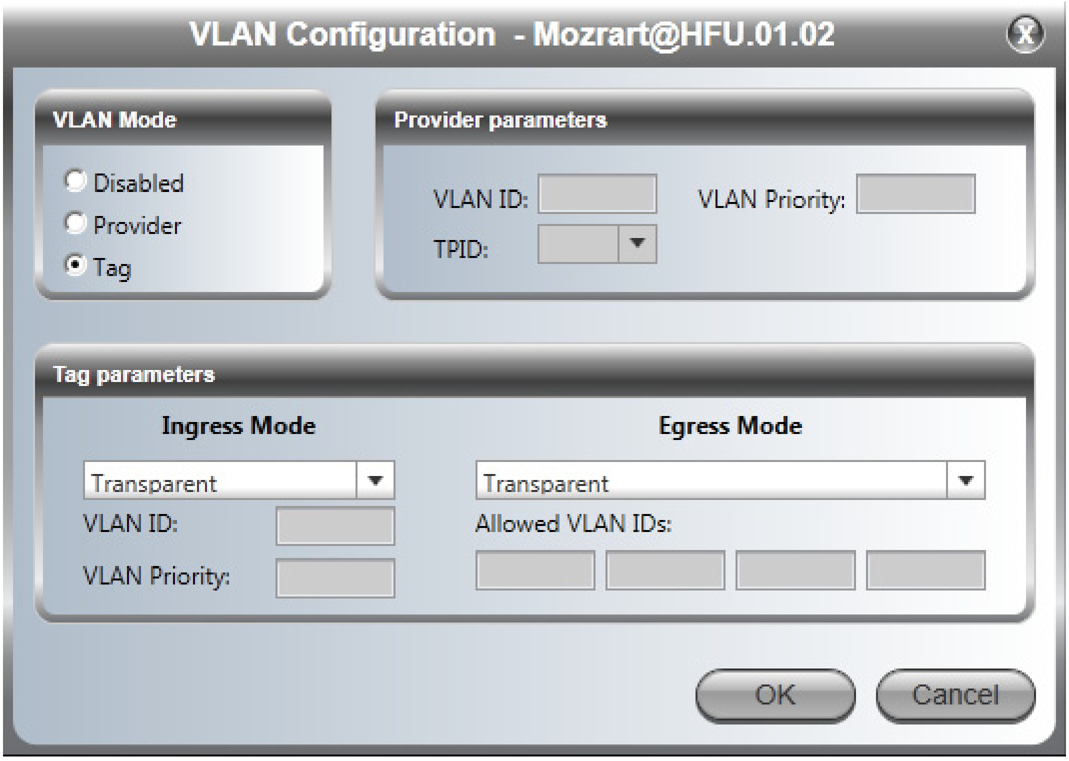
3. Enter a Provider VLAN ID and Priority. The VLAN ID must be in the range 2 to 4094. The VLAN Priority must be in the range 0 to 7. You may also change the TPID from the default as shown.

Note

This facility is provided to enable connection through legacy switches requiring it. Otherwise, there is no need to change the TPID.

4. Click **OK** to accept.

5. For user VLAN tagging, click the Tag Radio button:



In **Tag** mode Ethernet frames are tagged or untagged to distinguish between different networks.

6. For completely transparent passage of tagged frames, there is nothing further to do. The following table shows the possible settings for each combination of Ingress and Egress modes:

7. Click **OK**.

Table 13-3: Further VLAN Configuration options and results by Tag mode

Ingress	**Egress**			
	Transparent	**Untag All**	**Untag Filtered**	**Filter**
Transparent	Frames are not modified and are forwarded transparently	All frames with VLAN tag are untagged	**Allow VLAN IDs:** Allow up to 4 VIDs to be passed through. **Untag VLAN IDs:** Untag the VLAN tag of the selected VLAN IDs.	Allow up to 4 VIDs to be passed through.
Tag: Enter a **VID** (1-4094) and **Priority** (0-7)	Frames are not modified and are forwarded transparently	All frames with VLAN tag are untagged	Allow up to 4 VIDs to be passed through	Allow up to 4 VIDs to be passed through

Chapter 14

False Radar Mitigation Facilities

Who needs it

If you are using DFS frequency bands 5.3/5.4 GHz FCC and 5.4/5.8GHz ETSI you should use this facility.

DFS and False Radar Mitigation

About DFS

Under DFS frequency bands, it must be ensured that radio links do not interfere with certain radar systems in the 5 GHz band. If radar is detected, the radio link should move automatically to a frequency that does not interfere with the detected radar.

What is False Radar Mitigation

False Radar Mitigation capability is an advanced method to reduce or eliminate false radar detection and DFS triggering ("False positives").

False radar detection can be caused by other radios transmissions or external interference that can be interpreted as true radar.

This option is active only in DFS frequency bands, 5.3/5.4 GHz FCC (HBS only) and 5.4/5.8GHz ETSI (HBS & HSU).

In what follows **false radar** means any source of radar-like signals which are **not** real radar.

False Radar Mitigation has two components:

1. Reduction of false positive radar detection by reduction of the probability of detecting any kind of false radars, while allowing the system to detect real radar signals.
2. Elimination of detection of specific false radar types by blocking detection of false radars of a specific type. There are three types of radars:
    - **Fixed:** False radars with fixed pulse width having fixed repetition frequency
    - **Variable:** False radars with variable pulse width having variable repetition frequency

- **Staggered:** False radars with variable repetition frequency within a burst period (Applies to 5.4 GHz ETSI only)

Configuring False Radar Mitigation

The configuration method for the HBS (ETSI and FCC/IC) is the same as for the HSUs (ETSI only). We will demonstrate the HBS for a sector using the 5.3 GHz FCC/IC band:

To configure False Radar Mitigation:

1. Log on to the HBS as Installer.
2. Enter the Configuration window and open the Advanced tab.

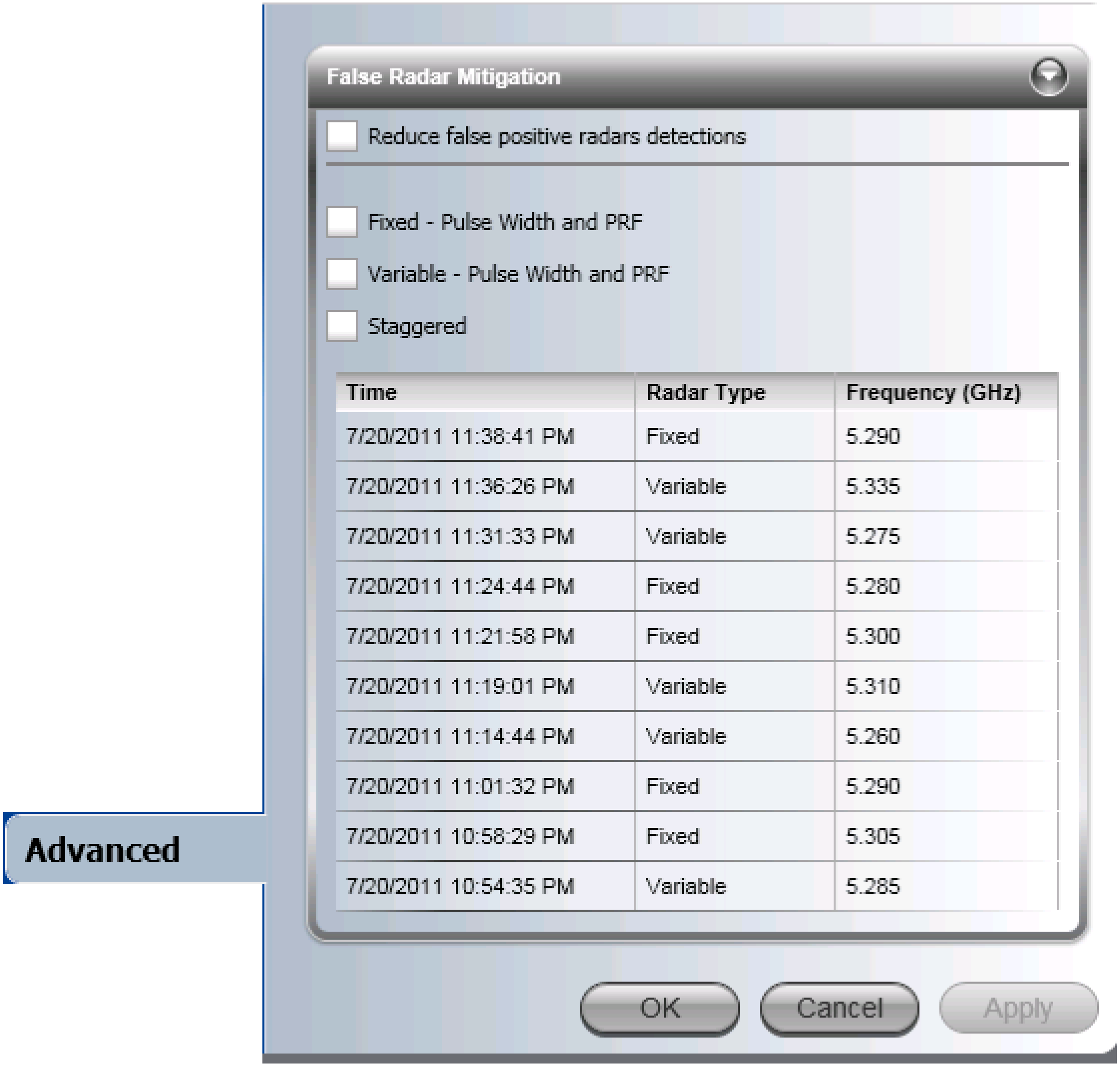


Figure 14-1: False Radar Mitigation

3. The DFS Frequency Status Table at the bottom of **Figure 14-1** shows the time, type and frequency of the last radars detected. This table should be used to select the best option(s) to reduce or eliminate false radar detection without completely blocking out real radar detection.
4. Check the mitigation features to be used.

5. When you are satisfied with your configuration parameters, click **OK** to save them and dismiss the Configuration window.

FCC/IC Considerations

The FCC requires that devices installed within 35 km of any Terminal Doppler Weather Radars (TDWR) location should be registered in the voluntary WISPA sponsored database.For convenience, we supply guidelines about the way this is done in **Chapter 15**.

Chapter 15

FCC/IC DFS Considerations

FCC 5.4GHz Device Registration

The FCC requires that devices installed within 35 km of any TDWR location should be registered in the voluntary WISPA sponsored database.

The FCC has published a TDWR Location Information table that lists the exact location of all TDWR towers (see **Table 15-1** at the end of the chapter).

1. When installing a 5.4 GHz device define your exact location (latitude and longitude)
2. Use the TDWR Location Information table to determine if the distance between the device and any TDWR tower is less than 35 km.
3. If the distance is less than 35 km then register the device in the voluntary WISPA sponsored database (following section)
4. Disable the frequencies between 5570 – 5680 MHz from the available channels list.
5. The frequency range between 5.600 to 5.650 GHz is not included in the available channels list.

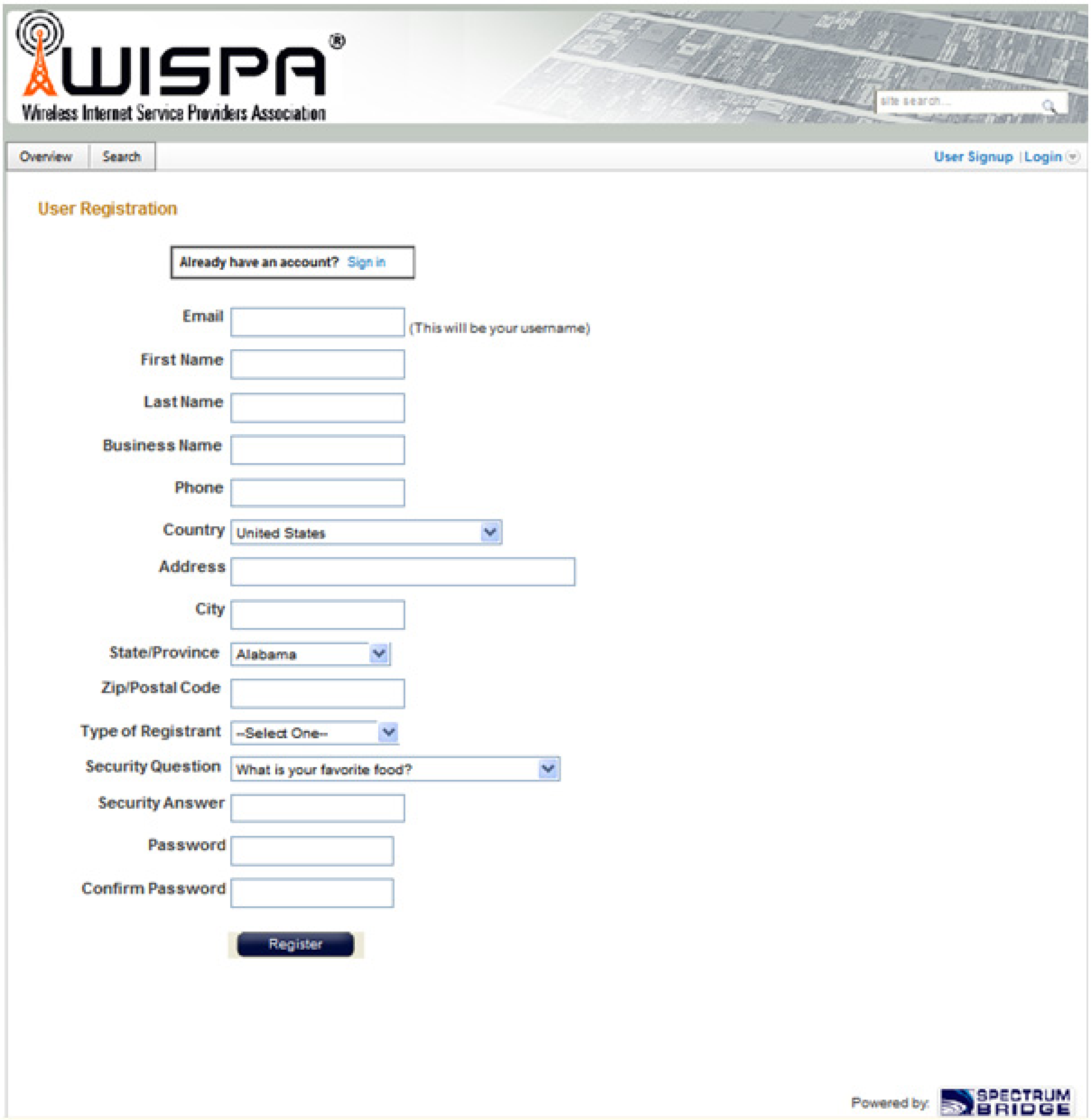
Registering the Device

➢ To register a device:

1. Enter the website http://www.spectrumbridge.com/udia/home.aspx and follow the instructions.

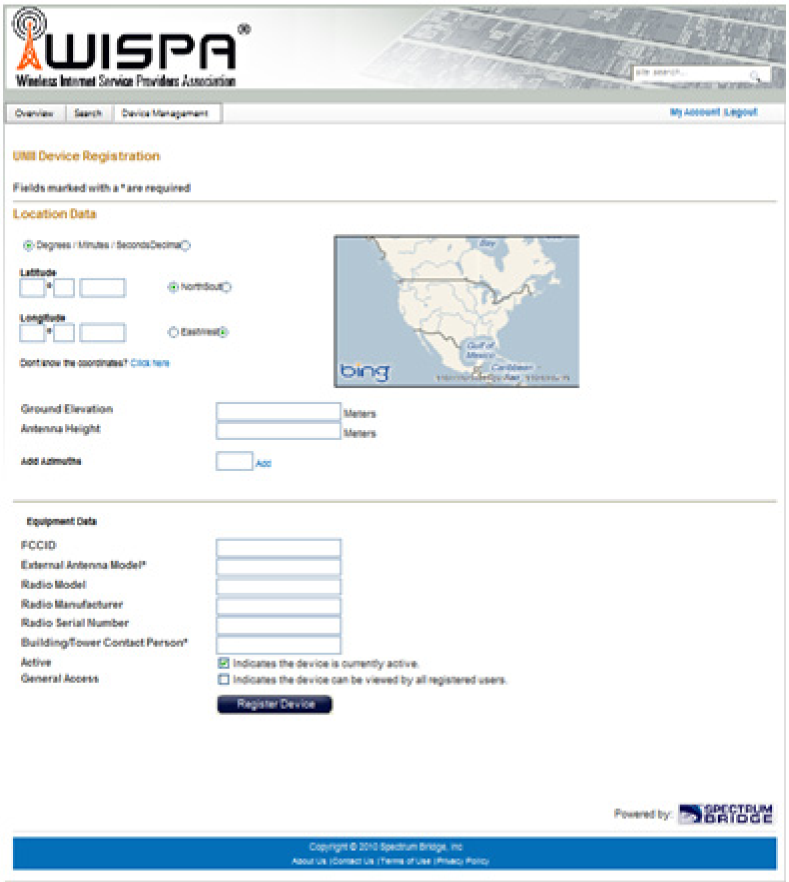
   At your first entry into the site, you will be required to register as a user:

2. Click the **User Registration** button to enter the registration page.



3. Fill in the registration page and click **Register**.
4. To complete device registration enter the Register Device tab as shown:

You are offered this:



5. Fill in the required information in the preceding web page and click the **Register Device** button.

TDWR Table

The following table contains the latitude and longitude locations of Terminal Doppler Weather Radars (TDWR). Use this table to determine if the Master or Client device installed is within 35 km radius of a TDWR location. If one of the installed devices is within 35 km radius of any TDWR location then disable all frequencies between 5570 – 5680 MHz from the available channels list.

Table 15-1: Latitude and longitude locations of TDWRs

STATE	CITY	LONGITUDE	LATITUDE	FREQUENCY	TERRAIN ELEVATION (MSL) [ft]	ANTENNA HEIGHT ABOVE TERRAIN [ft]
AZ	PHOENIX	W 112 09 46	N 33 25 14	5610 MHz	1024	64
CO	DENVER	W 104 31 35	N 39 43 39	5615 MHz	5643	64
FL	FT LAUDERDALE	W 080 20 39	N 26 08 36	5645 MHz	7	113
FL	MIAMI	W 080 29 28	N 25 45 27	5605 MHz	10	113
FL	ORLANDO	W 081 19 33	N 28 20 37	5640 MHz	72	97
FL	TAMPA	W 082 31 04	N 27 51 35	5620 MHz	14	80
FL	WEST PALM BEACH	W 080 16 23	N 26 41 17	5615 MHz	20	113
GA	ATLANTA	W 084 15 44	N 33 38 48	5615 MHz	962	113
IL	MCCOOK	W 087 51 31	N 41 47 50	5615 MHz	646	97
IL	CRESTWOOD	W 087 43 47	N 41 39 05	5645 MHz	663	113
IN	INDIANAPOLIS	W 086 26 08	N 39 38 14	5605 MHz	751	97
KS	WICHITA	W 097 26 13	N 37 30 26	5603 MHz	1270	80
KY	COVINGTON CINCINNATI	W 084 34 48	N 38 53 53	5610 MHz	942	97
KY	LOUISVILLE	W 085 36 38	N 38 02 45	5646 MHz	617	113
LA	NEW ORLEANS	W 090 24 11	N 30 01 18	5645 MHz	2	97
MA	BOSTON	W 070 56 01	N 42 09 30	5610 MHz	151	113
MD	BRANDYWINE	W 076 50 42	N 38 41 43	5635 MHz	233	113
MD	BENFIELD	W 076 37 48	N 39 05 23	5645 MHz	184	113
MD	CLINTON	W 076 57 43	N 38 45 32	5615 MHz	249	97
MI	DETROIT	W 083 30 54	N 42 06 40	5615 MHz	656	113
MN	MINNEAPOLIS	W 092 55 58	N 44 52 17	5610 MHz	1040	80
MO	KANSAS CITY	W 094 44 31	N 39 29 55	5605 MHz	1040	64
MO	SAINT LOUIS	W 090 29 21	N 38 48 20	5610 MHz	551	97
MS	DESOTO COUNTY	W 089 59 33	N 34 53 45	5610 MHz	371	113
NC	CHARLOTTE	W 080 53 06	N 35 20 14	5608 MHz	757	113
NC	RALEIGH DURHAM	W 078 41 50	N 36 00 07	5647 MHz	400	113
NJ	WOODBRIDGE	W 074 16 13	N 40 35 37	5620 MHz	19	113
NJ	PENNSAUKEN	W 075 04 12	N 39 56 57	5610 MHz	39	113
NV	LAS VEGAS	W 115 00 26	N 36 08 37	5645 MHz	1995	64

Table 15-1: Latitude and longitude locations of TDWRs (Continued)

STATE	CITY	LONGITUDE	LATITUDE	FREQUENCY	TERRAIN ELEVATION (MSL) [ft]	ANTENNA HEIGHT ABOVE TERRAIN [ft]
NY	FLOYD BENNETT FIELD	W 073 52 49	N 40 35 20	5647 MHz	8	97
OH	DAYTON	W 084 07 23	N 40 01 19	5640 MHz	922	97
OH	CLEVELAND	W 082 00 28	N 41 17 23	5645 MHz	817	113
OH	COLUMBUS	W 082 42 55	N 40 00 20	5605 MHz	1037	113
OK	AERO. CTR TDWR #1	W 097 37 31	N 35 24 19	5610 MHz	1285	80
OK	AERO. CTR TDWR #2	W 097 37 43	N 35 23 34	5620 MHz	1293	97
OK	TULSA	W 095 49 34	N 36 04 14	5605 MHz	712	113
OK	OKLAHOMA CITY	W 097 30 36	N 35 16 34	5603 MHz	1195	64
PA	HANOVER	W 080 29 10	N 40 30 05	5615 MHz	1266	113
PR	SAN JUAN	W 066 10 46	N 18 28 26	5610 MHz	59	113
TN	NASHVILLE	W 086 39 42	N 35 58 47	5605 MHz	722	97
TX	HOUSTON INTERCONTL	W 095 34 01	N 30 03 54	5605 MHz	154	97
TX	PEARLAND	W 095 14 30	N 29 30 59	5645 MHz	36	80
TX	DALLAS LOVE FIELD	W 096 58 06	N 32 55 33	5608 MHz	541	80
TX	LEWISVILLE DFW	W 096 55 05	N 33 03 53	5640 MHz	554	31
UT	SALT LAKE CITY	W 111 55 47	N 40 58 02	5610 MHz	4219	80
VA	LEESBURG	W 077 31 46	N 39 05 02	5605 MHz	361	113
WI	MILWAUKEE	W 088 02 47	N 42 49 10	5603 MHz	820	113

Chapter 16

Quality of Service

Prerequisites

To use the facility you must be familiar with the use of VLAN (802.1p) or Diffserv.

QoS - Overview

QoS is a technique for prioritization of network traffic packets during congestion.

RADWIN 5000 HPMP sectors support two classification criteria, VLAN based or Diffserv based. You may choose which of them to use.

Table 16-1: Default priorities an d allocation by VLAN ID and Diffserv

Quality queue	Priority	
	Diffserv	**VLAN**
Real time	48-63	6-7
Near real time (responsive applications)	32-47	4-5
Controlled load	16-31	2-3
Best effort	0-15	0-1

Based upon the classification criterion chosen, received packets will be mapped into one of four quality groups: Real time, Near real time, Controlled load and Best effort.

You may partition the total link capacity across the four Quality queues. The default weights as percentages are shown in **Table 16-1**.

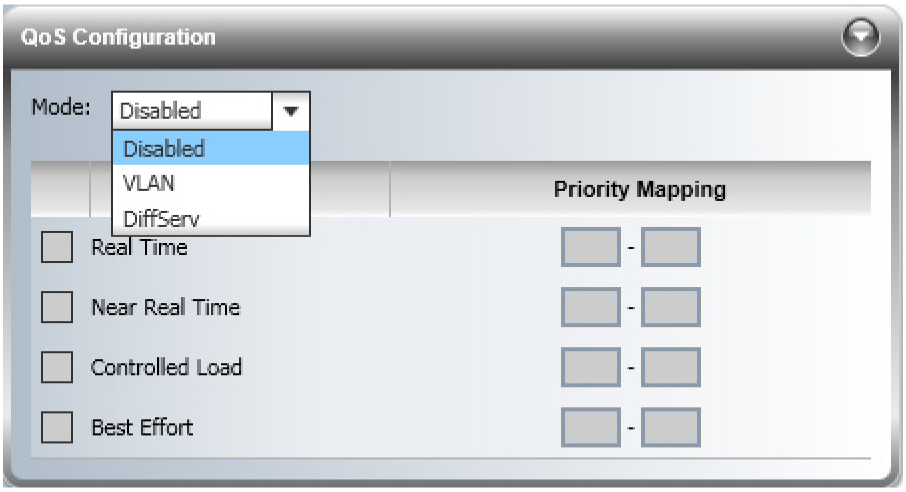
Setting up QoS

QoS for RADWIN 5000 HPMP is set up in two phases:

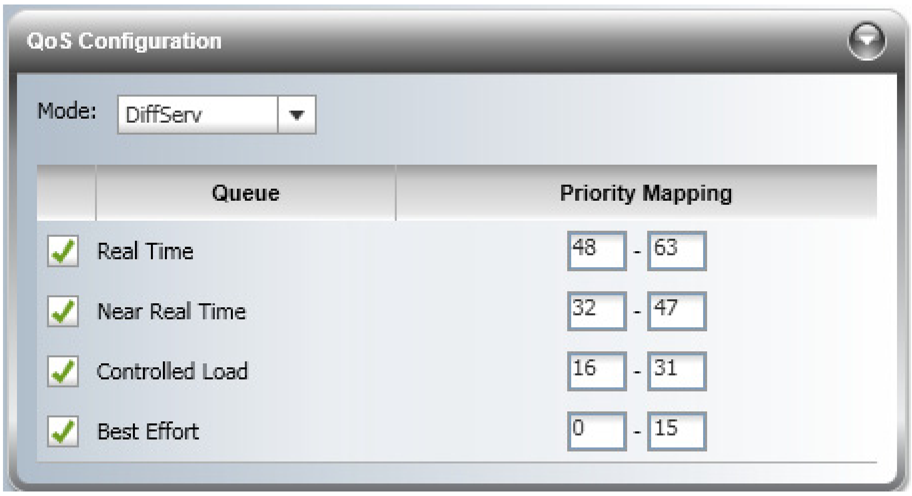
1. The required queues for the sector and their respective priority mappings must be chosen.
2. For each HSU you must configure the required queues, queue weights and queue Maximum Information Rate (MIR). The latter must be done for both the Uplink and Downlink directions.

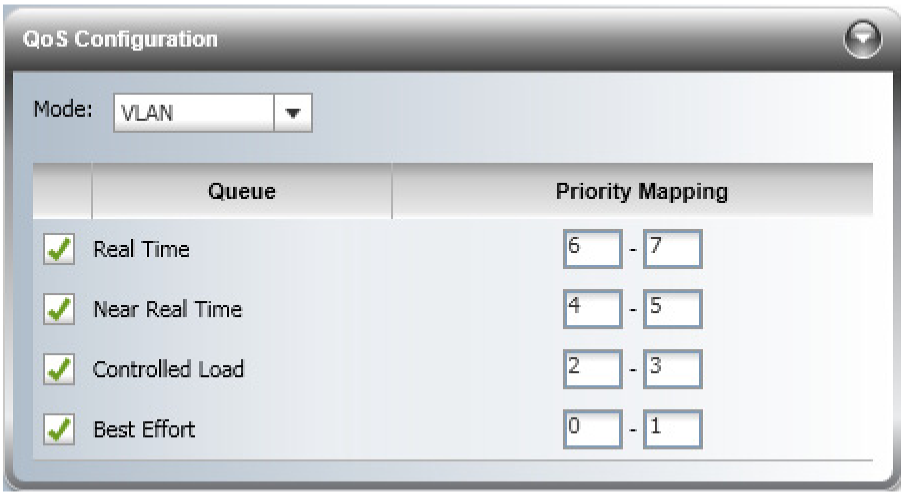
Setting up the HBS for QoS

From the HBS manager, enter Configuration, open the Ethernet tab and then QoS configuration. QoS is disabled by default. You may choose between the VLAN (802.1p) and Diffserv methods.



The default settings for Diffserv and VLAN are as shown in the next two figures:





If you un-check a queue, it will be disabled for the sector. It will not prevent the HSU from configuring it as “live”. The purpose behind this is to avoid the necessity of reconfiguring QoS for each HSU, should the queue be reinstated.

Setting up an HSU for QoS

QoS setup for an HSU is carried out from the HBS.

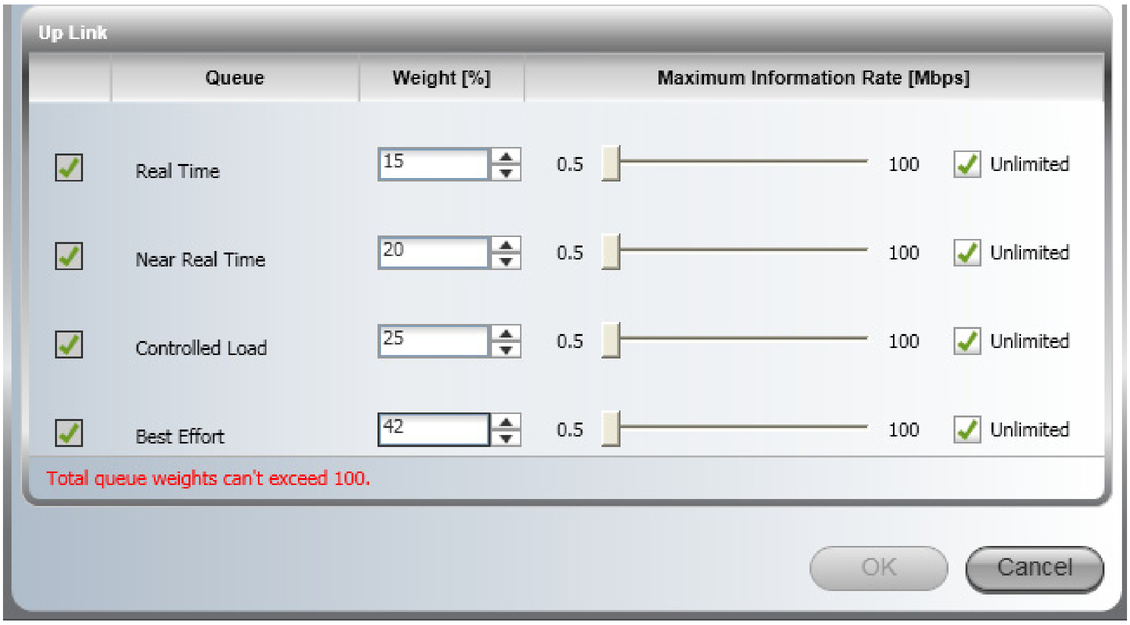
To configure an HSU for QoS:

1. Right click an HSU in the HBS manager HSU window, and choose **Configuration**.
2. Open the **Ethernet** tab and click QoS Configuration. The following window is displayed:

3. Ensure that the Mode field is Enabled. If you already configured the HBS (sector) for Diffserv or VLAN, then it will be enabled by default. If you need to change the mode, then you probably did not set the sector wide QoS type - but you can go back and do it later.

4. For each queue, both downlink and uplink (from the HSU) enter the required weight and MIR. The latter may be left unlimited. in which case the system will use a "best effort" method.

   If you exceed 100% total weight, you will receive an error message.



   You will be required to correct this before leaving the window other than by cancellation.

   If you are under-booked, for example by setting a queue to zero, the unused weight will be distributed to the remaining queues. The effect of doing this will only become apparent under congestion. In particular, a queue set to zero weight will become nearly blocked under congestion with packets passing through on a best effort basis.

5. When you complete your entries, click **OK** to save them and continue.

Chapter 17

Capacity Upgrade

What is Capacity Upgrade

An HSU may have its capacity increased by application of an upgrade license key. The currently available upgrade paths are 5 Mbps to 10 Mbps, 5 Mbps to 25 Mbps and 10 Mbps to 25 Mbps. The capacity upgrade process consists of three steps:

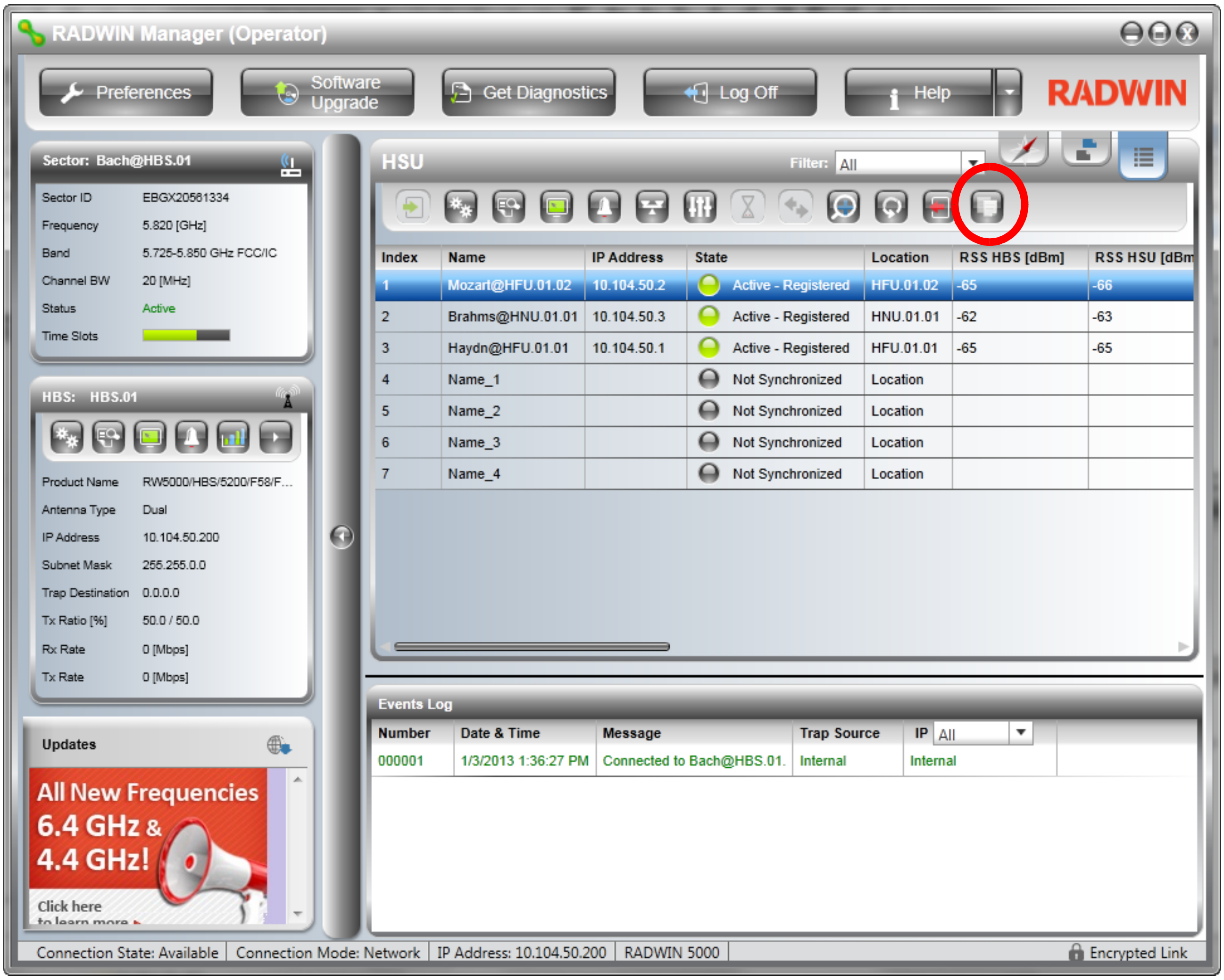
- Data Gathering - preparation of a list of HSUs for upgrade by serial number
- Acquisition - purchasing the upgrade license keys
- Application - activating the capacity upgrade using the RADWIN Manager

Applicability

Capacity upgrade is only available for fixed HSUs and nomadic HSUs. (HMUs always operate at the maximum possible capacity for the hardware.)

Data Gathering

Open the sector list view:



Select all of the HSUs and then click the circled button. A sector list showing details of the HBS and all of the HSUs is saved to the clipboard. You may recover it as a text file in any text editor. The best view is obtained by saving it to a an empty spreadsheet. Here for example, is our demonstration configuration (with irrelevant columns "squashed" to save space):

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	Name	IP Address	State	Location	RSS	RSS	Tput	Tput	Type	Level	Rx Ra	Tx Ra	Rx Ra	Tx Rat	Rang	Time	Aggrega	Serial Number
2	Bach@HBS.01	10.104.50.200	Active	HBS.01							0	0	2	2		30	260	PET540F000A00000
3	Brahms@HNU.01.01	10.104.50.3	Active - R	HNU.01.01	-62	0	2.6	2.6	Nomac	A	0	0	0	0	0	6	1	PIN580I500A00003
4	Haydn@HFU.01.01	10.104.50.1	Active - R	HFU.01.01	-65	0	7	7	Fixed	Unkno	0	0	0	0	0	8	1	PIN580I500A00004
5	Mozart@HFU.01.02	10.104.50.2	Active - R	HFU.01.02	-66	0	7	7	Fixed	Unkno	0	0	0	0	0	8	1	PIN580I500A00005
6	Name_2		Not Synch	Location		0									0	6		
7	Name_3		Not Synch	Location		0									0	2		
8	Name_4		Not Synch	Location		0									0	2		
9	Name_5		Not Synch	Location		0									0	2		

Extract a sub-table consisting of the relevant HSUs (in our example, the red rectangles):

Prepare a table similar to **Table 17-1**:

Table 17-1: HSU Capacity Upgrade List

HSU Name (1)	HSU Serial Number (2)	Capacity Upgrade Key (3)
Brahms@HNU.01.01	PIN580I500A00003	
Haydn@HFU.01.01	PIN580I500A00004	
Mozart@HFU.01.02	PIN580I500A00005	

Columns 1 is for your own convenience. Later you will copy/paste the capacity upgrade key into column 3 as a permanent convenient record.

Acquisition

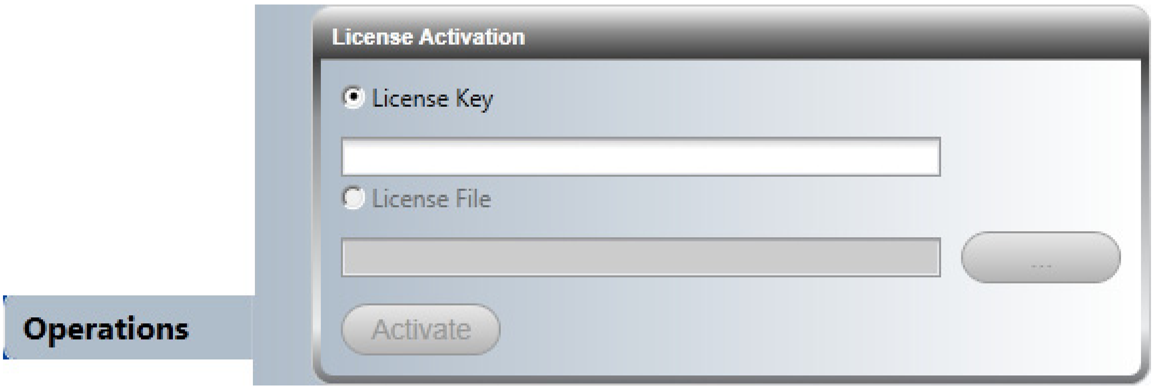
Send the supplier of your equipment a Purchase Order for your Capacity Upgrade List (Use either the original text/spreadsheet file or column 2 of **Table 17-1**). Ensure that you include a current email address for receipt of the key list. Upon completion of the order, you will receive an email with an attached list consisting of serial numbers and a licence key per serial number. The licence keys are quite long and it is important that you receive them in electronic format for subsequent copy/pasting.

Application

Individual HSU Capacity Upgrade

The following procedure can be carried out by direct connection to an HSU (typically not active in a sector) or from the HBS.

Using your completed Capacity Upgrade table (or the supplied email) and for each HSU in turn, open the **Configuration | Operations** window. (You may do this from the HBS or by direct connection - whatever is most convenient.) Copy paste the license key to the License Key field. Click the **Activate** button (will becomes enabled).



You will receive a confirmatory message if the activation succeeded or an error message if not. In the latter case, you will need to be in contact with equipment supplier to solve the problem.

Bulk (Sector) HSU Capacity Upgrade

If all the HSUs are part of a sector (registered or not), you may “bulk” upgrade all of the member HSUs from the supplied text file attached to the email you received from your supplier. Save it to a convenient location for later use.

Go to he **Configuration | Operations** window for the HBS itself (rather than each HSU separately). Use the **License File option** to navigate to your text file. Click the **Activate** button, which is now enabled.

Again, pay careful attention to the confirmation or error messages.

Completing the Capacity Upgrade

To make the upgrade effective, each upgraded HSU must be reset.

Persistency of the Capacity Upgrade

The upgrade is persistent across an HSU reset. If however, you restore a capacity upgraded HSU to factory defaults, you will need to apply the capacity upgrade to it again. This further underlines the importance of saving the license keys attachment file in a safe place and maintaining a record like **Table 17-1**.

USER MANUAL

RADWIN 5000 HPMP POINT TO MULTIPOINT BROADBAND WIRELESS

Release 3.4.00

Part 6: Field Installation Topics

RADWIN

Chapter 18

Pole and Wall Installation

ODU Mounting Kit Contents

Table 18-1: Bill of Materials: ODU mounting kit

Item	Qty
Large Clamp (see **Figure 18-1**)	1
Small Clamp (see **Figure 18-2**)	1
Arm (see **Figure 18-3**)	1
Screw hex head M8x40	4
Screw hex head M8x70	2
Washer flat M8	4
Washer spring M8	3
M8 Nuts	2

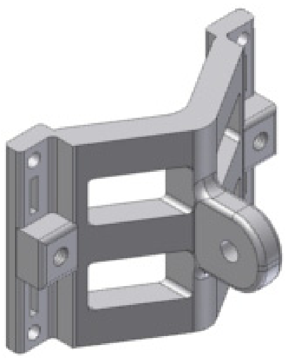


Figure 18-1: Large Clamp

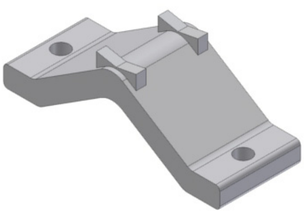


Figure 18-2: Small Clamp

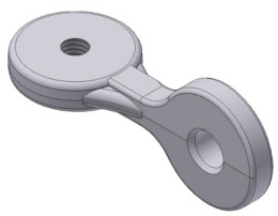


Figure 18-3: Arm

Mounting an ODU on a Pole

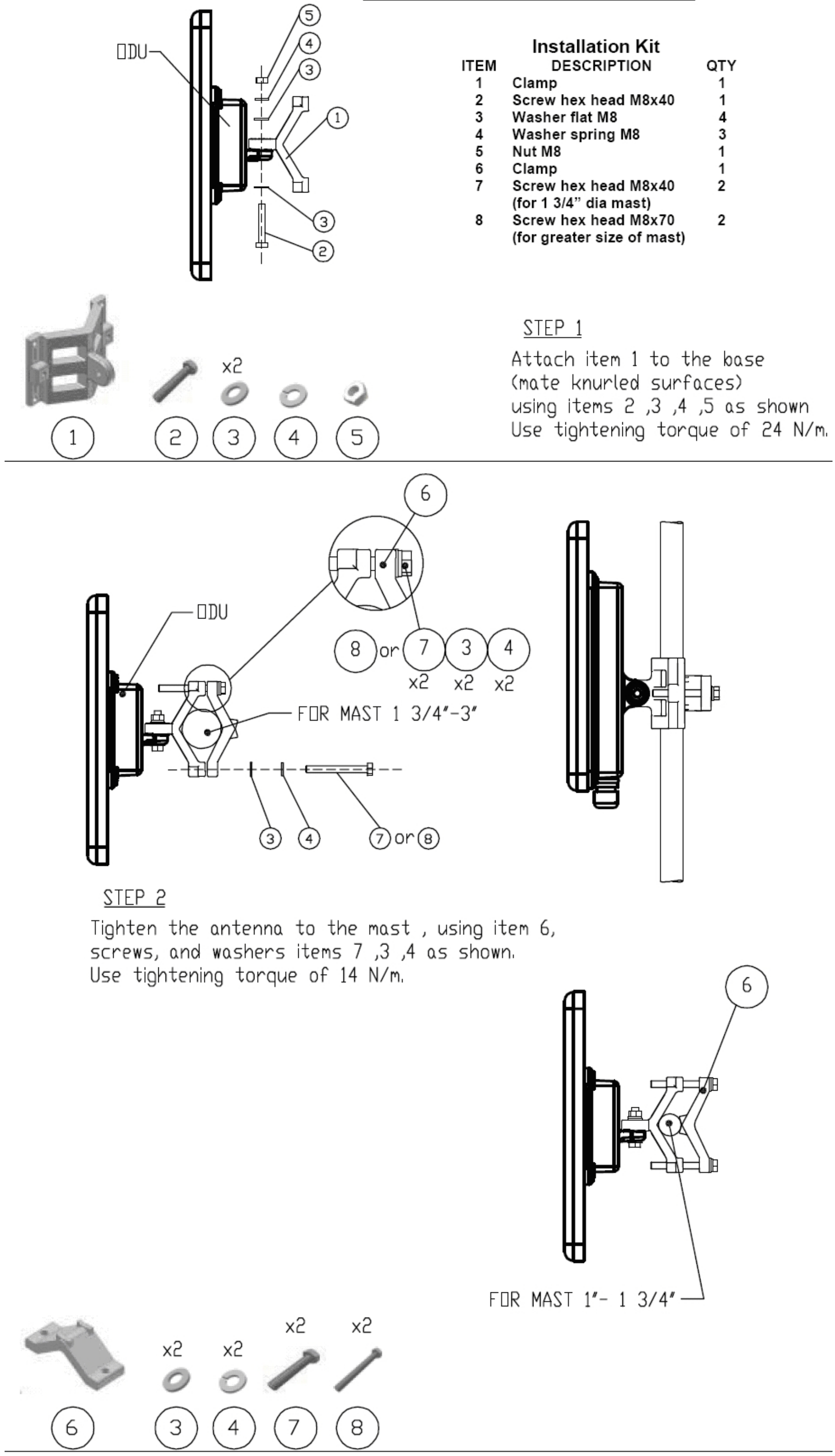


Figure 18-4: Mounting on a pole

Mounting an ODU on a Wall

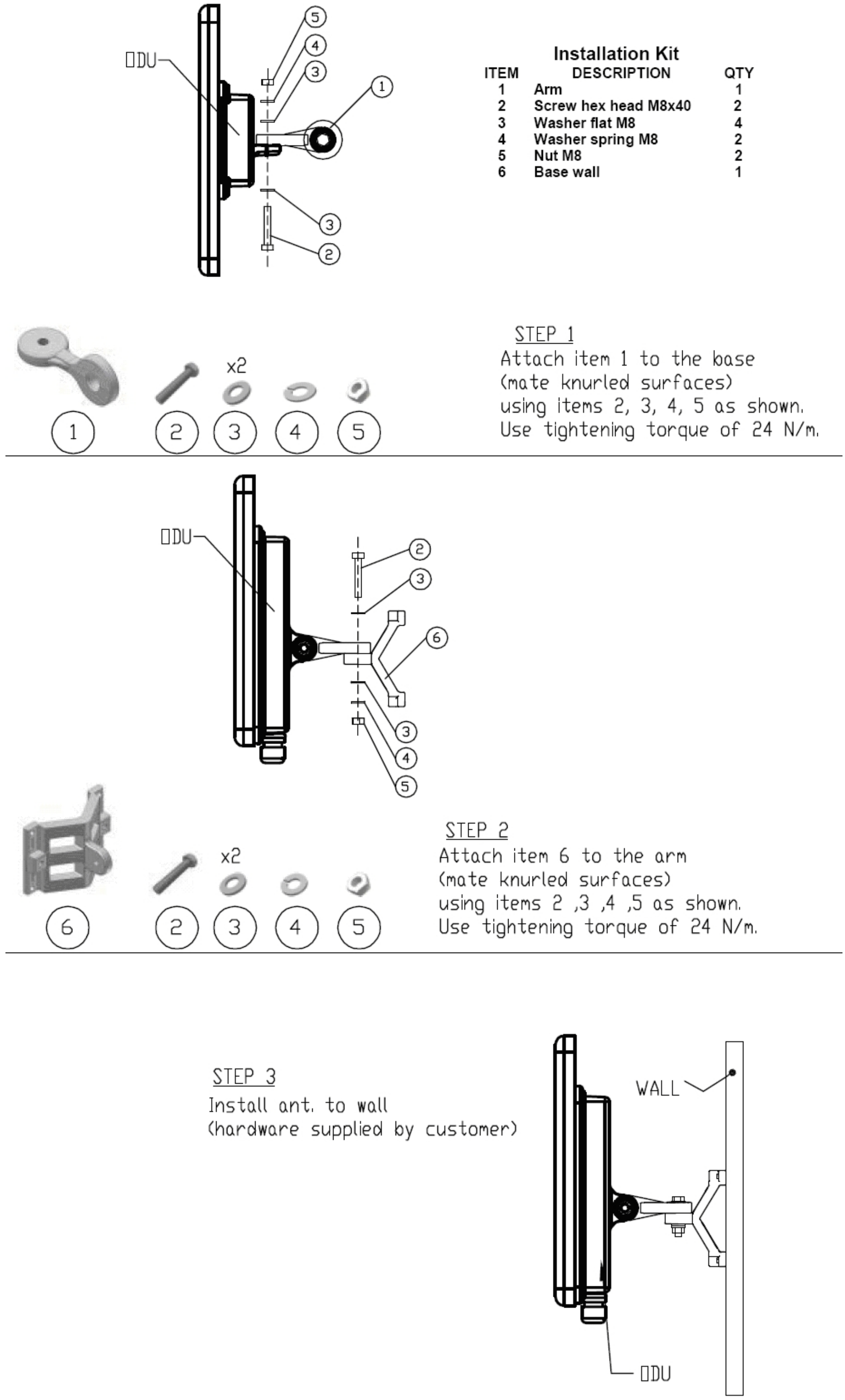


Figure 18-5: Mounting on a Wall

Mounting a Small Form Factor HSU

Using Metal Ties

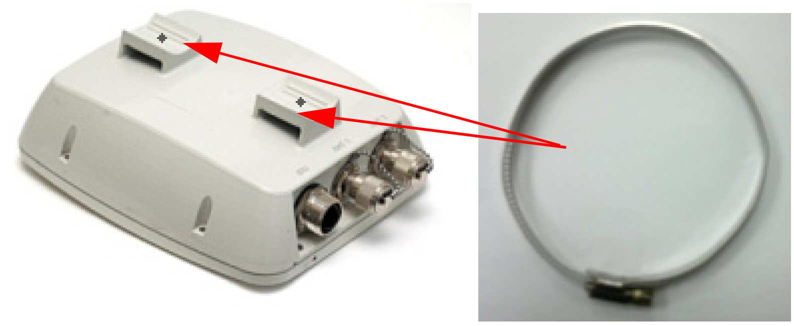


Figure 18-6: RADWIN 5505 HSU - Rear and metal tie

Thread the mounting ties through the mounting slots provided and mount the unit on a pole.

Using the Mounting Kit Adapter

Mounting Adapter- Bill of Materials

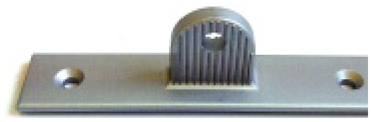


Figure 18-7: Mounting adapter

Table 18-2: Mounting adapter kit for RADWIN 5505 HSU

Item No.	Description	Quantity
1	Mounting Kit (as for standard ODU)	1
2	HSU (**Figure 18-6**)	1
3	Mounting adapter (**Figure 18-7**)	1
4	Screw M5x10, CSK, Phillips, stainless steel	2

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

1. Referring to **Figure 18-8** below: Secure the adapter (3) to the rear of the HSU (2) using the two screws provided (4). Use a Philips screwdriver set to a torque of 2.0 NM.

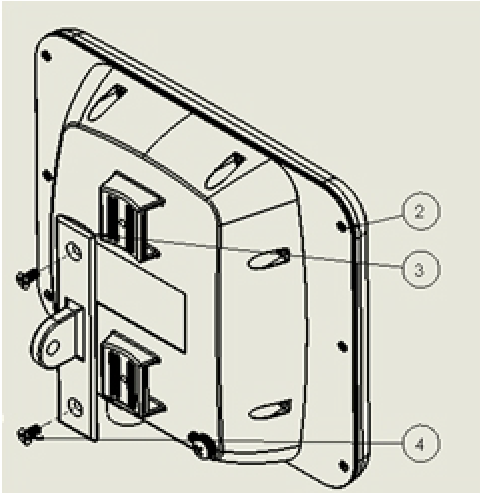


Figure 18-8: Securing the mounting adapter

2. Referring to **Figure 18-9** below: Attach the ODU mounting kit (1) to the mounting adapter ear (4) and proceed as above, for a standard ODU.

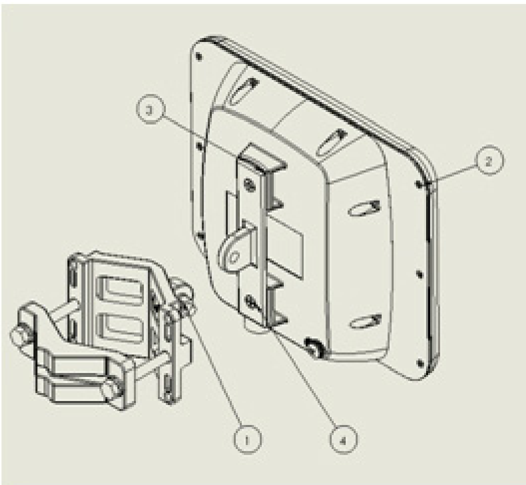


Figure 18-9: Attaching the mounting kit

Mounting an External Antenna

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

Mounting a Connectorized ODU Horizontally

This method is deprecated for all RADWIN radio ODUs. The use of horizontal mounting may void you product warranty.

Chapter 19

Lightning Protection and Grounding Guidelines

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

Warning

100% protection is neither implied nor possible.

Note

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

The RADWIN Lightning Protection System consists of the following components:

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

Grounding for Antenna Cable

A Grounding Kit must be connected to the coax antenna cable and reliably grounded. The grounding kit is an Andrew Type 223158-2 (**www.andrew.com**). See **Figure 19-1** below.

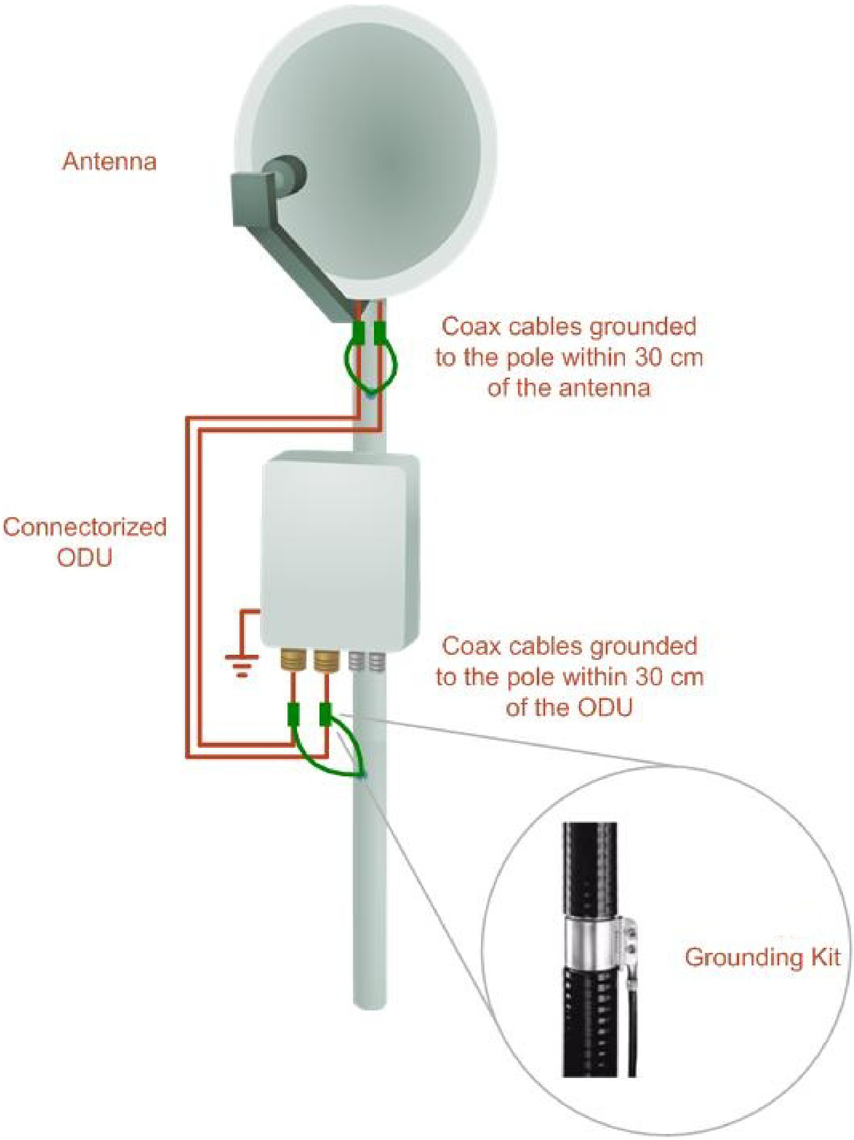


Figure 19-1: Grounding antenna cables

Grounding for Indoor/Outdoor Units

ODU Grounding

RADWIN Lightning Protection System uses a Shielded CAT 5e cable to interconnect the Outdoor (ODU) units.

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

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

The device must be permanently connected to ground.

PoE Grounding

The PoE uses a three wire AC cable. You must ensure that the wall socket is also correctly grounded.

The RADWIN Lightning Protection Kit

The RADWIN lightning protection kit contains the items as shown in **Figure 19-2**:

Figure 19-2: RADWIN Lightning Protection Kit

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

Using Lightning Protectors and Grounding

A Grounding Kit and lightning protector Unit must be located near the ODU and properly grounded as illustrated in Figures **19-3** and **19-4** below:

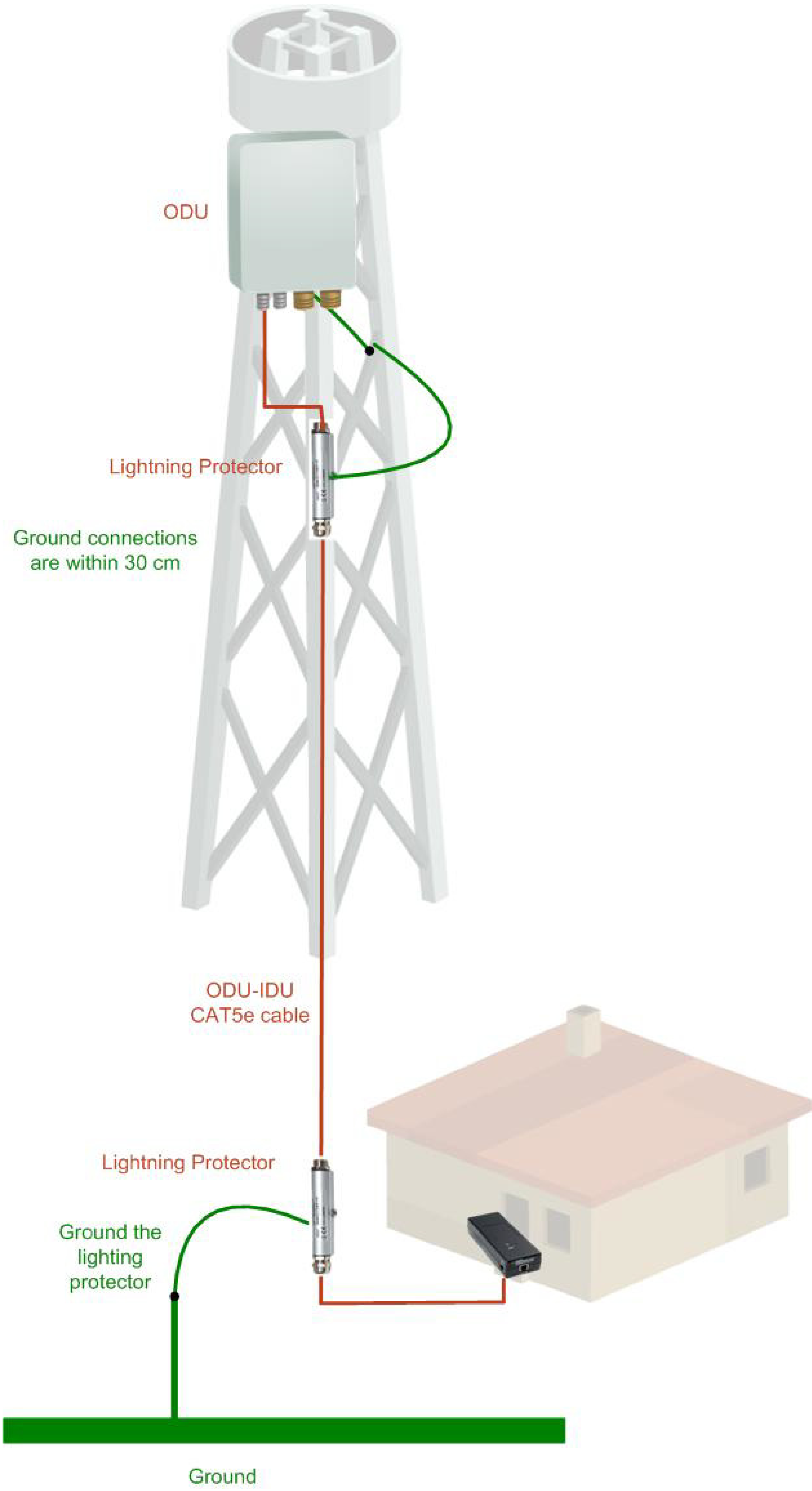


Figure 19-3: Grounding a typical pole installation

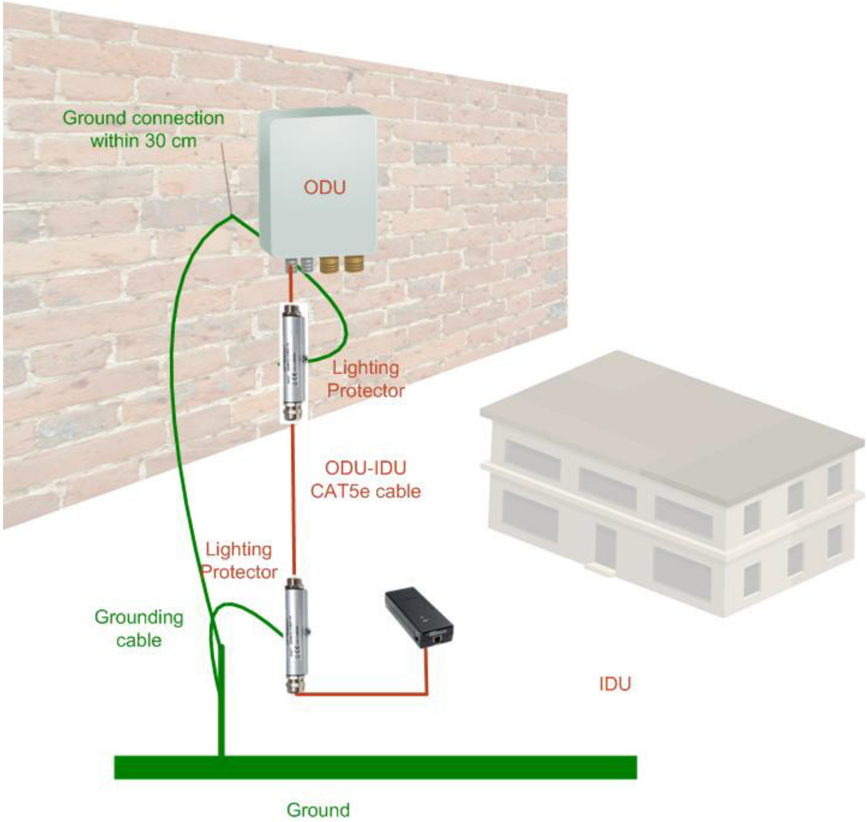


Figure 19-4: Grounding a typical wall installation

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

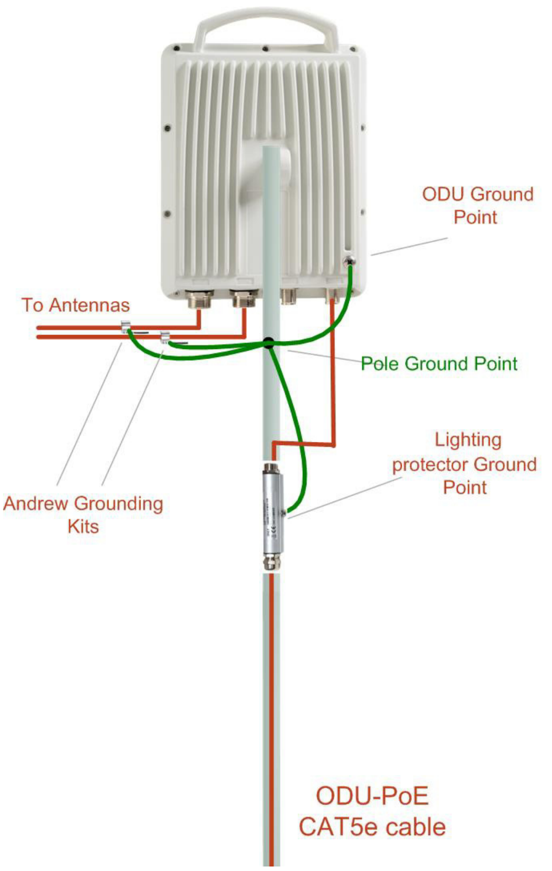


Figure 19-5: ODU Lightning Protector and grounding

Mounting RADWIN Lighting Protection unit

To mount a lightning protection device:

1. Mount the device as close to the ODU as possible.
2. Mount the unit to on the pole using the supplied band.
3. Connect the ODU-PoE cable using the RJ-45 jack.
4. Connect one cable between the ODU and the protector using an RJ-45 jack.
5. Connect the protector's ground stud to a grounding point. Use the appropriate wire gauge and type, keeping the wire as short as possible, less than 1m (3'), between the stud and the site grounding point.

Note

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

A second lightning protector Unit must be mounted at the building entry point and must be grounded, as shown in **Figure 19-4** above.

To mount the lightning protection at the building entry point:

1. Mount the device outside the building, located as near as possible to the entrance of the CAT 5e ODU-PoE cable.
2. Mount the unit to on the pole using the supplied band.
3. Connect the ODU-PoE cable using the RJ-45 jack.
4. Connect one cable between the PoE and the protector using an RJ-45 jack.
5. Connect the protector's ground stud to a grounding point. Use the appropriate wire gauge and type, keeping the wire as short as possible, less than 1m (3'), between the stud and the site grounding point.

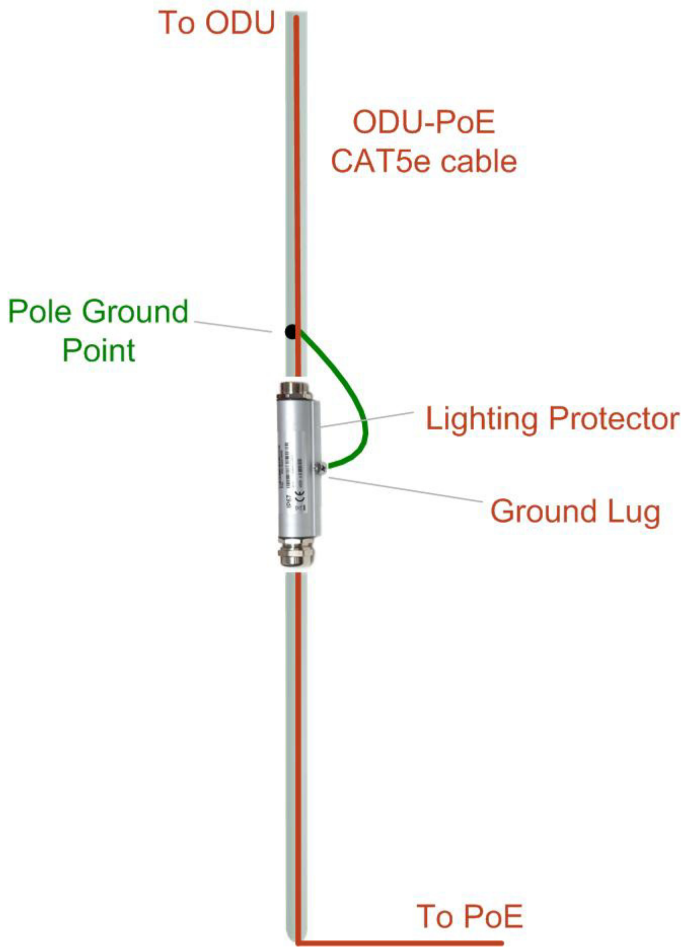


Figure 19-6: Lightning protector and grounding at building entry point

Internal ESD Protection circuits

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

Chapter 20

Link Budget Calculator

Overview

The Link Budget Calculator is a utility for calculating the expected performance of the RADWIN 5000 HPMP wireless link within a sector and the possible configurations for a specific link range.

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

User Input

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

- Band, which determines frequency and regulation
- HSU series used
- Channel Bandwidth (currently 10 and 20MHz)
- Tx Power (maximum Tx power per modulation is validated)
- Antenna Type (currently dual; cannot be changed for ODU with integrated antenna)
- Antenna Gain per site (cannot be changed for integrated antenna)
- Cable Loss per site (cannot be changed for integrated antenna)
- Fade Margin (currently 6dB)
- Rate
- Required Range and climate type

Link Budget Calculator Internal Data

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

- Maximum Transmit power (per modulation)
- Receiver Sensitivity (per modulation) for Ethernet service
- Maximum linear input power (used to calculate minimum distance)
- Antenna gain and cable loss for ODU with integrated antenna
- Available Channel Bandwidths

Calculations

EIRP

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

Expected RSS and Fade Margin

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

where:

Site A is the transmitting site

Site B is the receiving site

PathLoss is calculated according to the free space model,

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

$$ExpectedFadeMargin = ExpectedRSS - Sensitivity$$

where Sensitivity is dependent on air-rate.

Min and Max Range

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

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

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

Service

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

Availability

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

$$Availability = 1 - 6 \times 10^{-7} \times Cfactor \times frequency_{GHz} \times (RequiredRange_{KM})^3 \times 10^{\frac{-ExpectedFadeMargin}{10}}$$

Antenna Height

The recommended antenna height required for line of sight is calculated as the sum the Fresnel zone height and the boresight height. See **About the Fresnel Zone** below. Using the notation of **Figure 20-1** below, splitting *ExpectedRange* into $d_1 + d_2$, the ***Fresnel zone height*** at distance d_1 from the left hand antenna, is given by

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

For the most conservative setting, we take the mid-point between the antennas, setting

$$d_1 = d_2 = \frac{ExpectedRange}{2}$$

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

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

The ***boresight clearance height*** is calculated as: $\sqrt{R^2{}_{Mean} + \left[\frac{ExpectedRange}{2}\right]^2} - R_{Mean}$

where $R_{Mean} = 6367.4425Km$.

About the Fresnel Zone

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

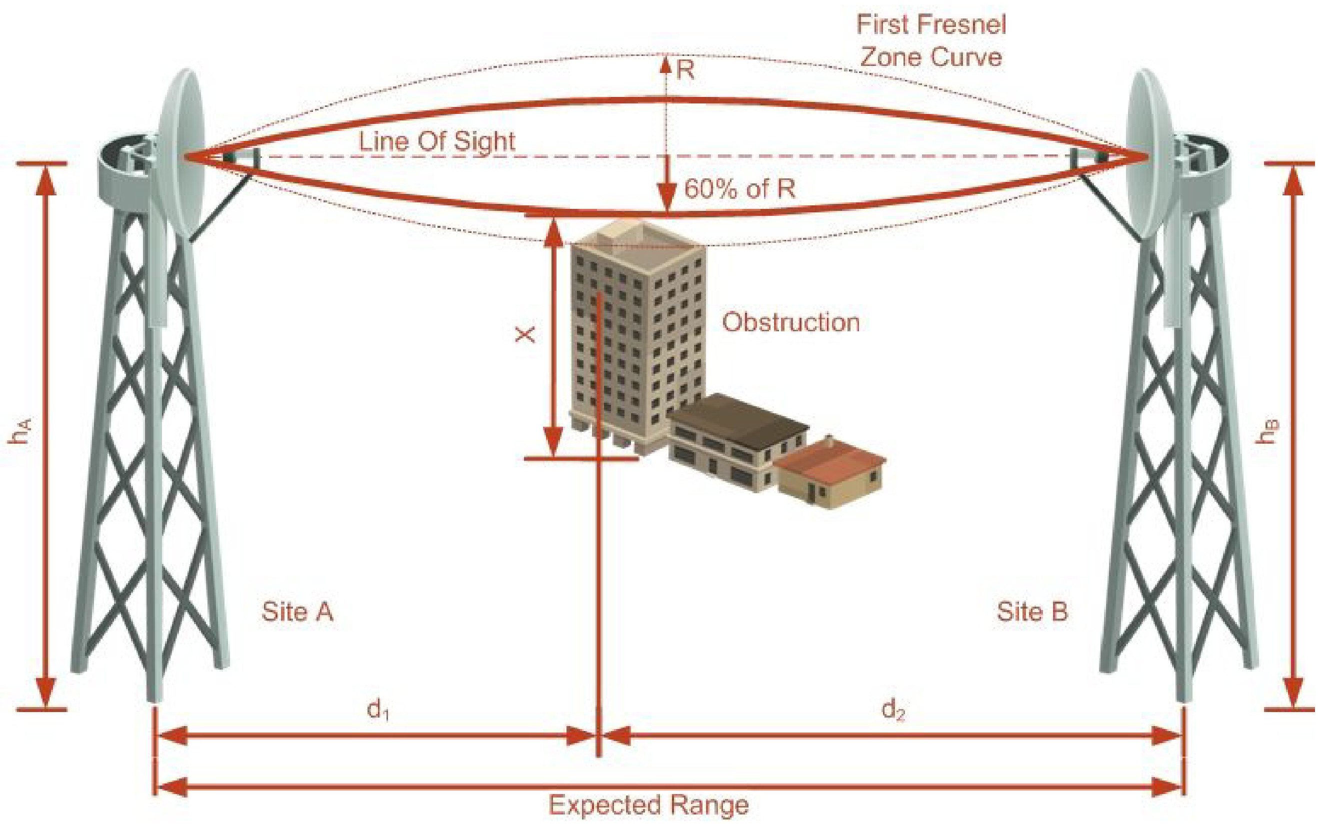


Figure 20-1: Fresnel zone

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

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

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

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

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

The concept of the Fresnel zone is shown in **Figure 20-1** above. The top of the obstruction does not extend far into the Fresnel zone, leaving 60% of the Fresnel zone clear; therefore, the signal is not significantly attenuated.

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

Running the Link Budget Calculator

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

➢ To run the Link Budget Calculator from the CD:

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

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

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

➢ To run the Link Budget Calculator from the RADWIN Manager:

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

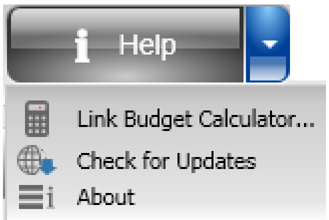


Figure 20-2: Accessing the Link Budget Calculator

➢ To run the Link Budget Calculator from the Windows Start Menu:

- Go to **Start | Programs |** RADWIN Manager **| Link Budget Calculator**

However invoked, your browser displays the following page:

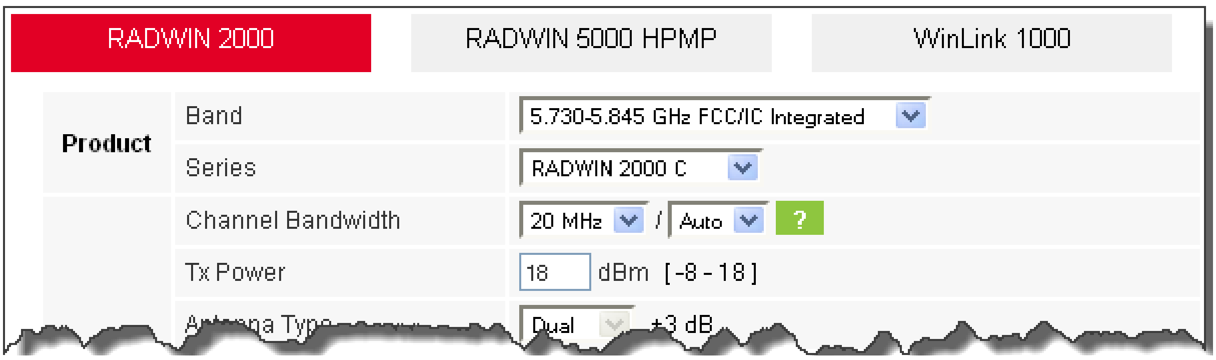


Figure 20-3: Link Budget window - startup

Note

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

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

➢ To use the Link Budget Calculator for RADWIN 5000 HPMP:

1. Click the RADWIN 5000 HPMP tab.

Figure 20-4: RADWIN 5000 HPMP LBC main window

2. Chose the required RADWIN 5000 HPMP band.

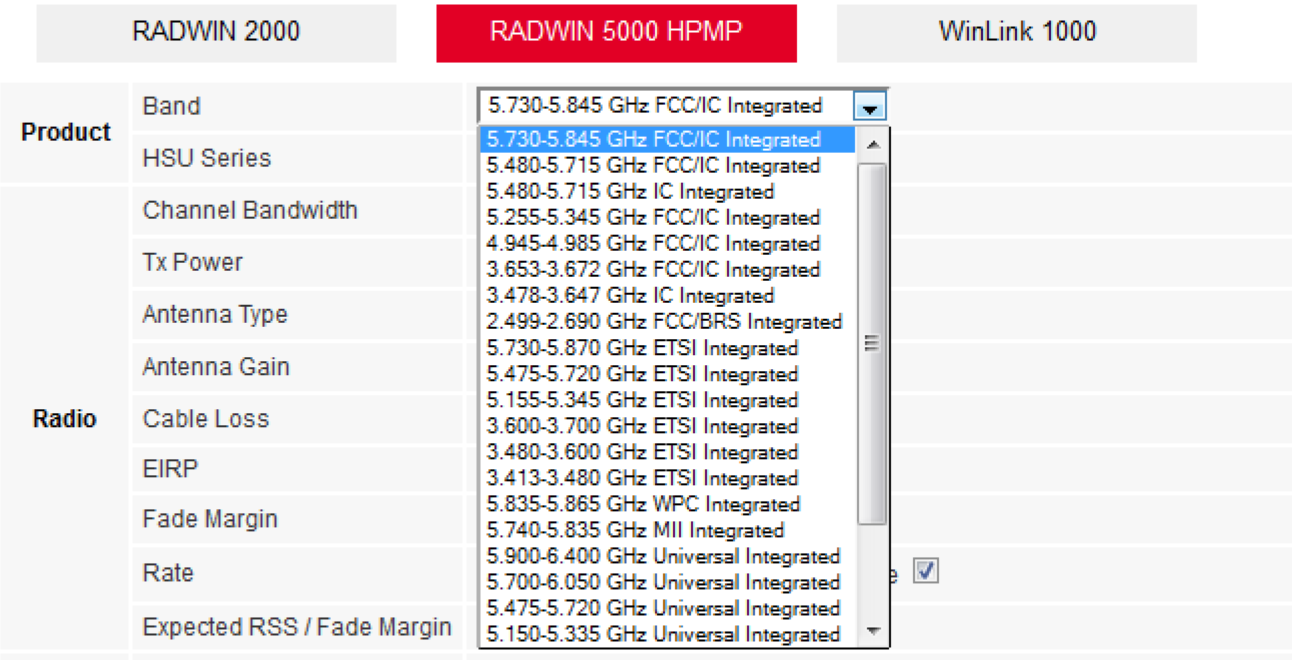


Figure 20-5: Band selector

For the purposes of our example, we will use 5.730-5.845 GHz FCC/IC Connectorized.

Note

- This release supports 5/10/20/40MHz Channel Bandwidths
- Collocated HBSs use RFP E so there is no HSS entry

3. Enter the radio details.

   The Fade margin is the minimum required for line-of-sight (LOS) conditions. For degraded link conditions, a larger Fade margin should be used.

   The EIRP is given in dBm and Watts.

4. The Rate item may be used for calculating the Link Budget under best and worst scenarios. In practice, HBSs are configured for Adaptive rate which may not be disabled.

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

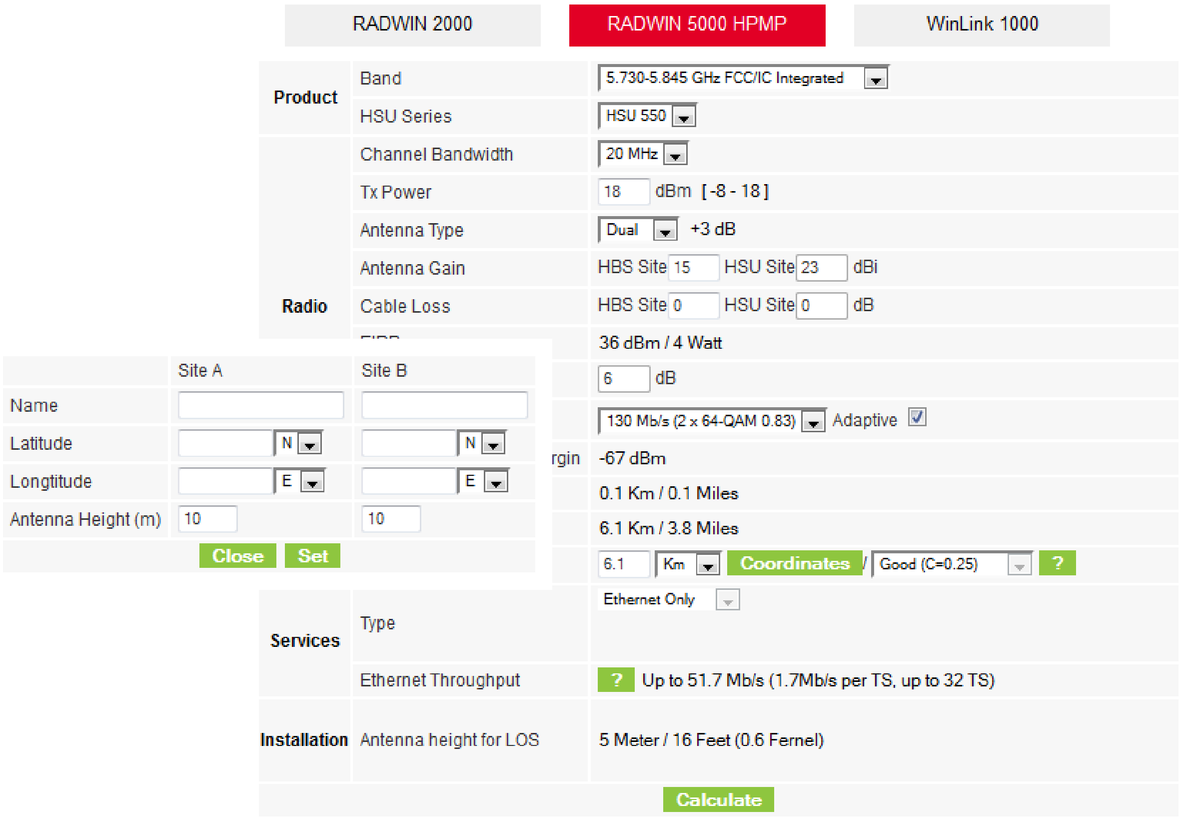


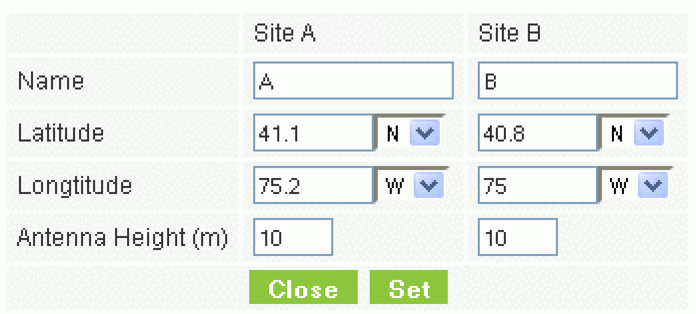
Figure 20-6: Calculation of distance from site coordinates

If for example, we enter:

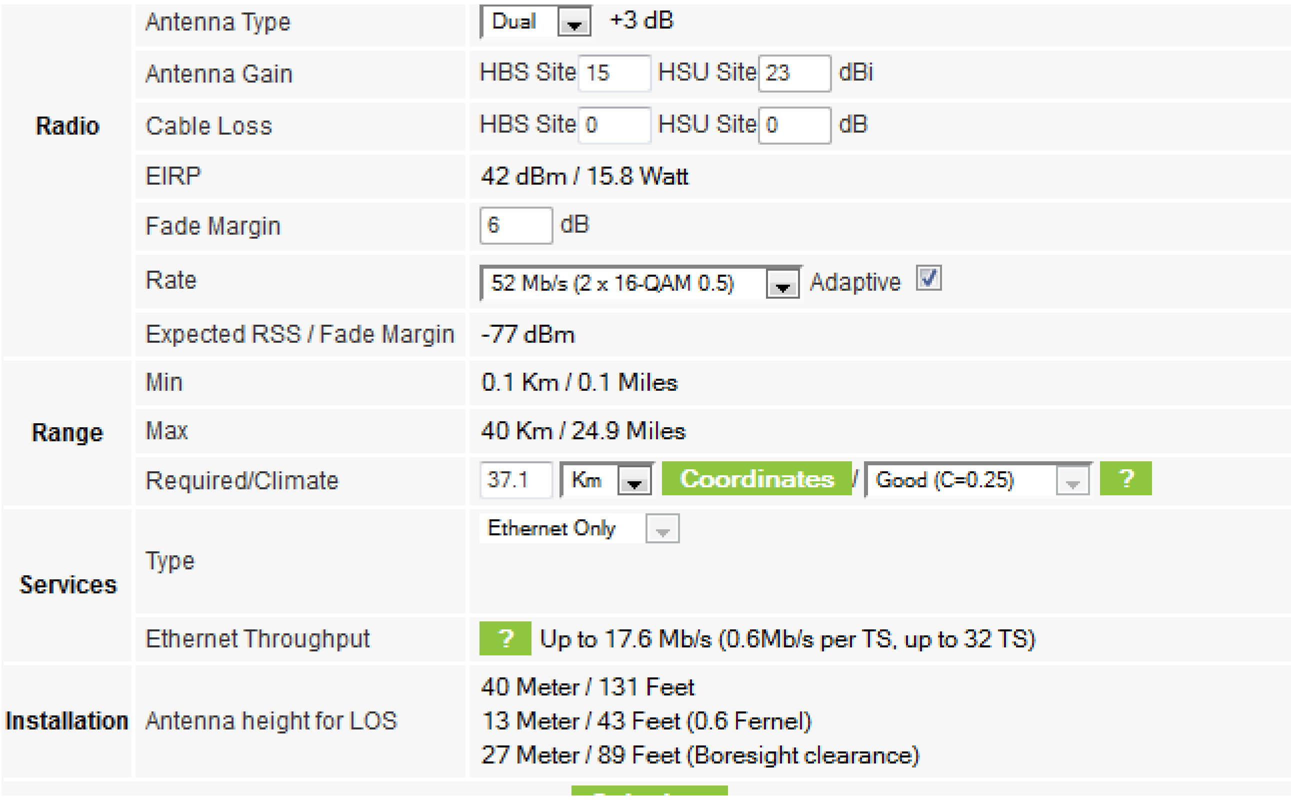
Site A: 41.1°N lat 75.2°W Long

Site B: 40.8°N lat 75.0°W Long

and press **Set**,



the range will be calculated and displayed:



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

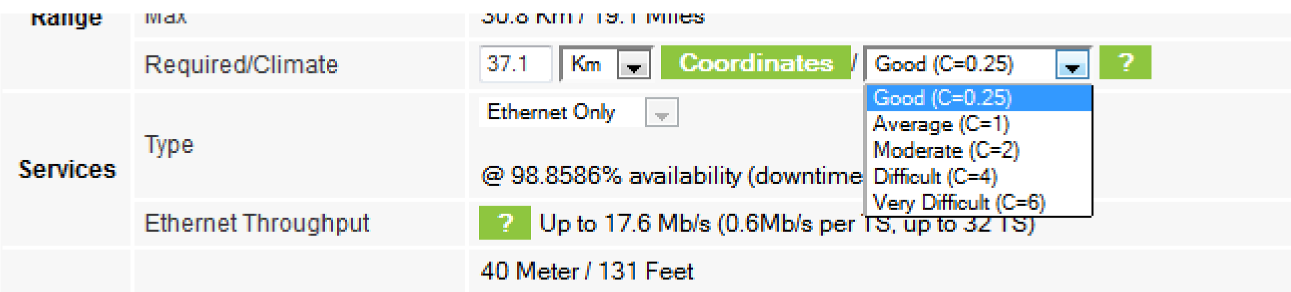


Figure 20-7: Climactic C Factors

For help about what these mean, click the **?** button to the right of the list in **Figure 20-7**.

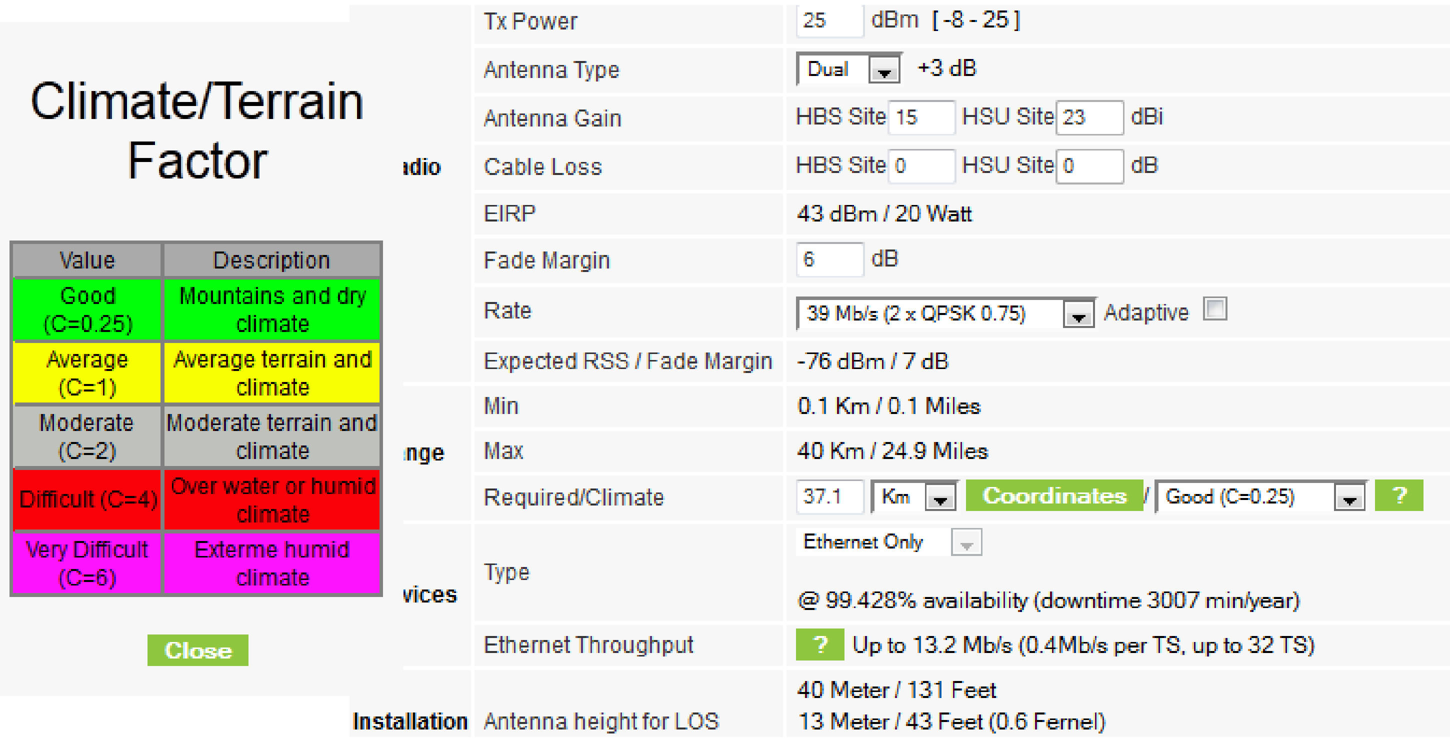


Figure 20-8: Climactic C Factor description

In **Figure 20-9** we display a map of the world showing C Factor contours:

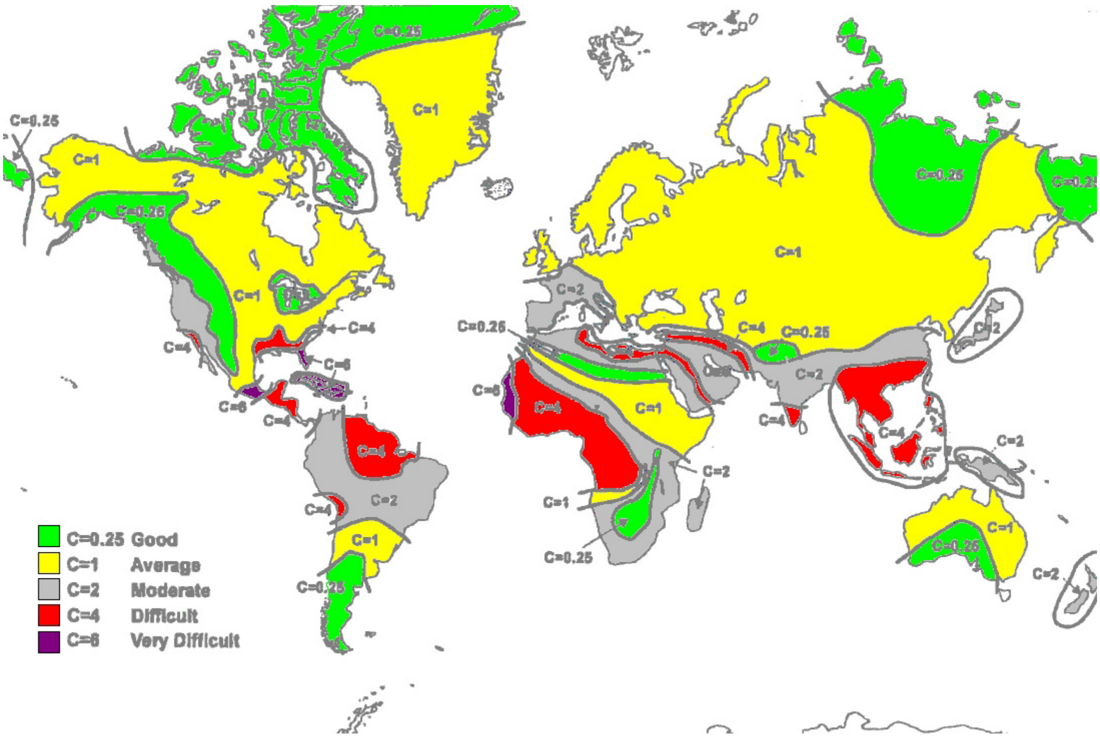


Figure 20-9: World map showing C Factor contours

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

Note

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

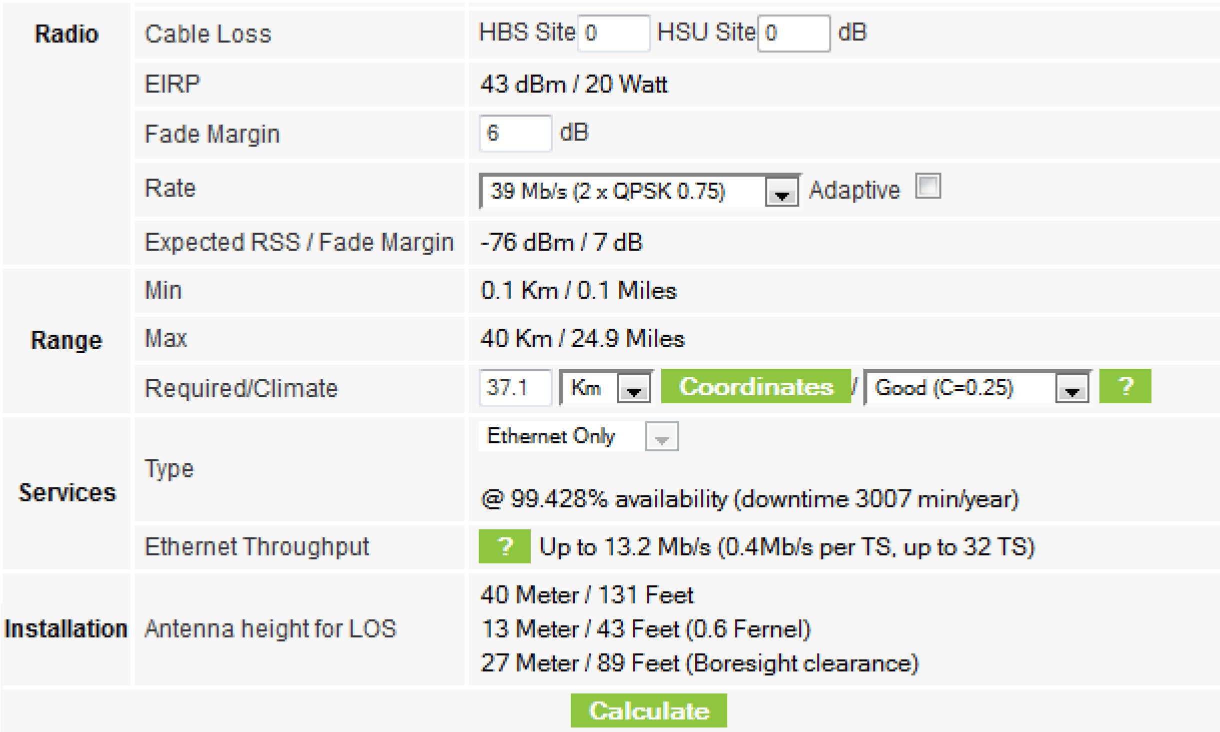


Figure 20-10: LBC - Results section

The Expected Performance parameters are calculated and displayed:

- **Expected RSS** - the expected RSS that the RADWIN Manager shows when the RADWIN 5000 HPMP ODUs are optimally aligned
- **Services Type** - Ethernet only
- **Ethernet Rate** - maximum throughput available for the chosen parameter combination
- **Antenna height for LOS** – the minimum antenna height required for line-of-sight operation. It is the sum of the height required for boresight clearance due to the earth’s curvature plus the height required to clear the Fresnel zone

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

Chapter 21

Spectrum View

What is Spectrum View

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

You can view real-time spectrum information, save the spectral information and view retrieved spectral information from historic spectrum scans.

Separate information is generated for the HBS and HSUs - all by selection. A general sector level Highest Interference view is also provided.

RADWIN's spectrum measurement and estimation algorithms are designed to show accurate information accommodating variations in frequency, temperature and interference power and at the same time overcoming anomalies that tend to occur in high interference environments.

Who needs it

As indicated in the previous paragraph, Spectrum View is primarily a professional tool for the technician. The Spectrum View reports may be generated as images, CSV files or text files as part of the Get Diagnostics feature. All of these are intended for use by to RADWIN Customer Services to assist with diagnosing interference related problems.

Scope of this Chapter

In view of the nature of the intended audience, we assume that the reader knows about RF Spectrum Analysis. This chapter therefore, is not a tutorial on RF Spectrum Analysis and is restricted to showing how to use the Spectrum View tool without any further theoretical explanations.

Two Ways to Run Spectrum View

Spectrum View may be run from the HBS in which case you have a choice of analyzing all sites in the sector in one run, or making a selection.

Spectrum View may also be run on a managing computer directly connected to an HSU. Remember that in such a case the results will be quite different if the HSU is part of a sector (registered or not) or if it is completely stand-alone, for example using a different spectral range and operating Band from the HBS. In the former case, expect a "noise hump" around the channels used by the sector, due to the duty signals from the HBS.

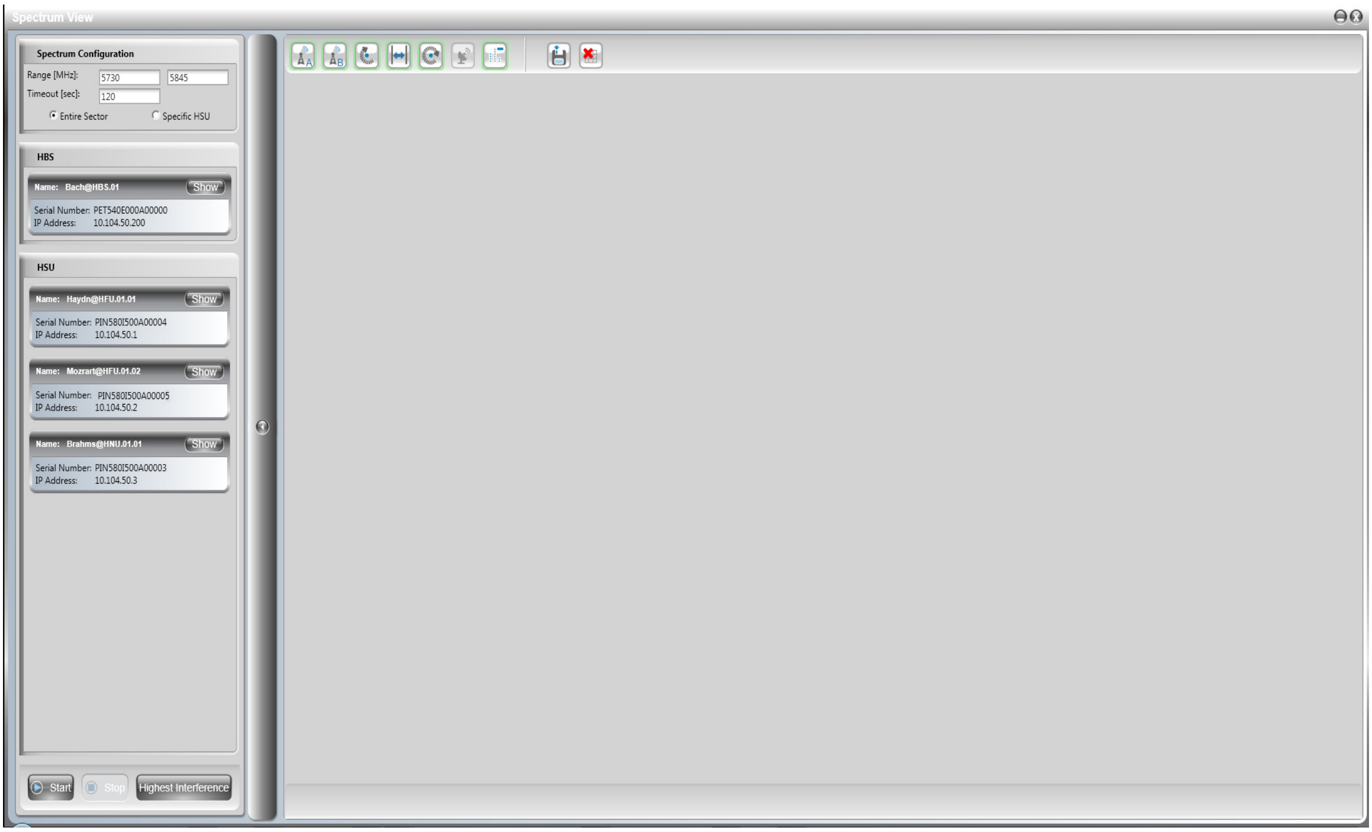
Where is the Spectrum View Data stored

Spectrum View data is always stored in the ODU originating the analysis. The HBS maintains the last Spectrum View analysis data for all members of the sector. If you run Spectrum View from a directly connected HSU, it stores its own data, which may be quite different from the analysis obtained for the same HSU from the HBS.

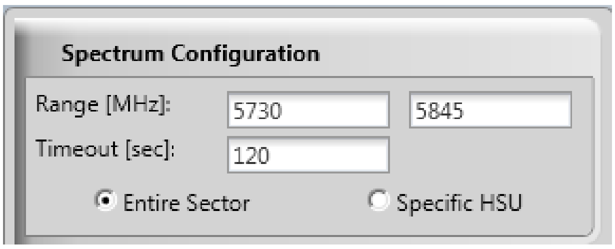
Spectrum View Main Window: HBS

In this section we review the main window management controls.

Click the **Spectrum View** button . The Spectrum View main window opens in full screen mode:



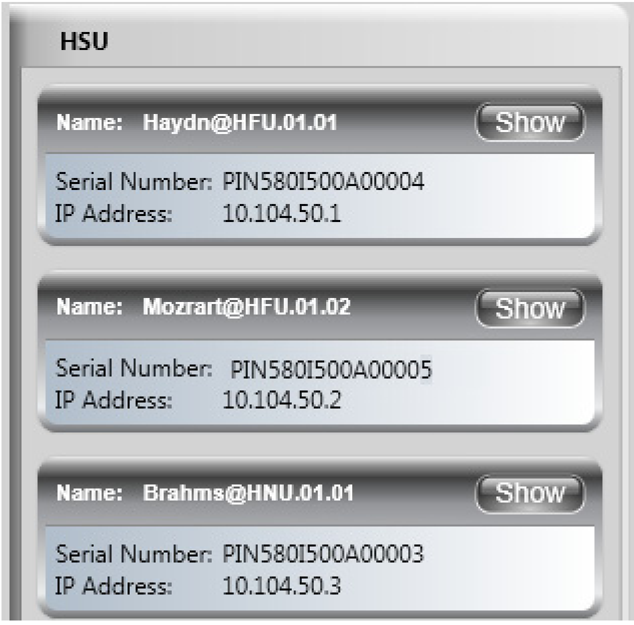
Use the top left panel to set the Spectrum View configuration parameters and choose an analysis type - **Entire Sector** or **Specific** HSU.



The settings are "sticky" for the HBS and will be reused. The analysis range is limited from 4900 to 6050 MHz with a maximum difference of 500MHz. Erroneous entries will be shown with a red border like this: 

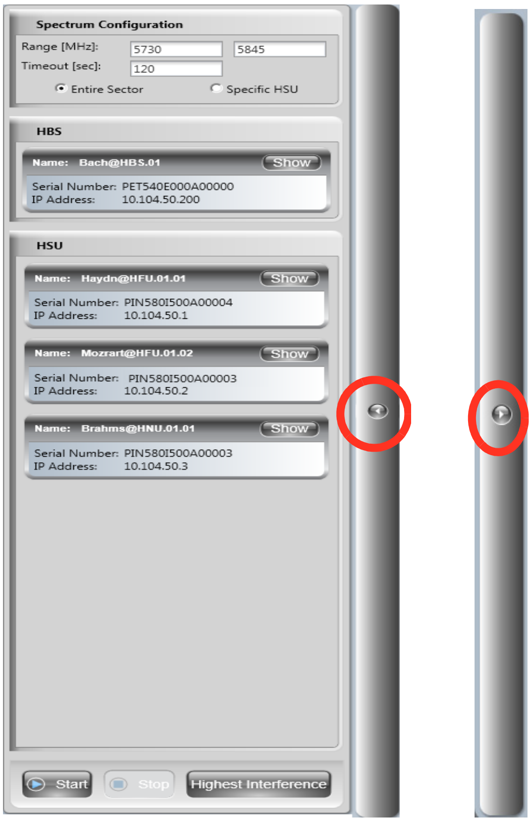
The timeout is the maximum analysis time per site. Use the bottom button bar to start an analysis, to stop a running analysis or run a Highest Interference profile for the sector:

If you choose to run the analysis for specific HSUs, The left hand HSU panel will change:



Check the required HSUs and then **Start**.

Since a large sector will clutter up the right hand display area, you may selectively Show, minimize or remove a sector member. Another way of freeing up more space for analysis displays is to hide the left hand panel using the circled arrow:



If for example you click **Show** on the HBS, the following view will open in the right panel:

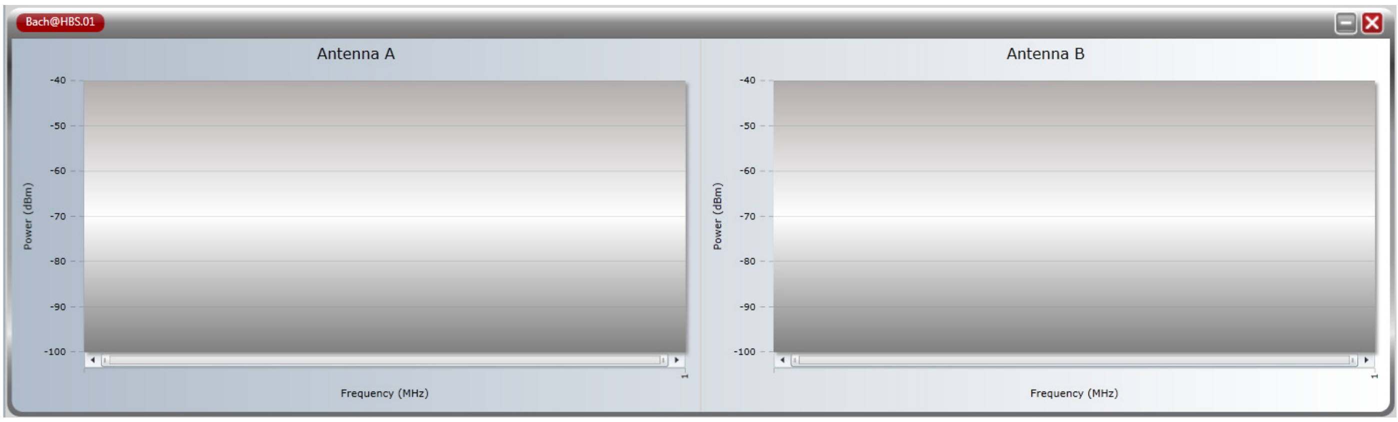
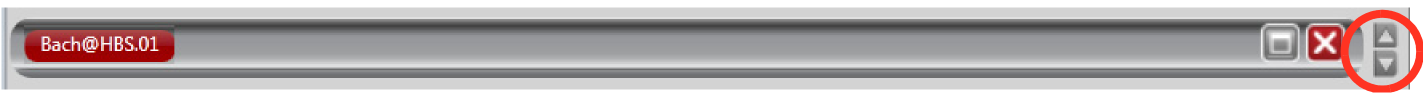


Figure 21-1: Spectrum View data panel for the HBS, ready for data

The standard **X** button closes the window completely (but does not loose data). The **-** button collapses the view to look like this:

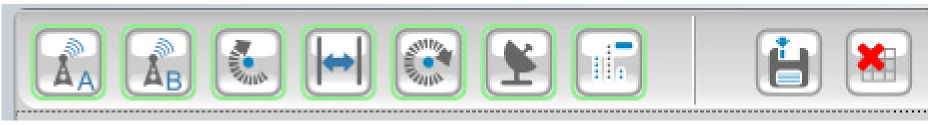


The two side arrows (circled) are used to reorder a stack of such view on the display area:

The remaining controls on the Spectrum View main window relate to Spectrum View data manipulation. We will cover them in the next section using a live analysis.

Spectrum View Display Function Buttons

Spectrum View data manipulation functions are provide on the top button bar:



Note Each button function applies to all of the sector members at once.

Table 21-1: Spectrum View Analysis Display Buttons functionality

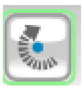
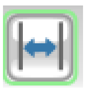
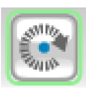
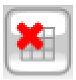
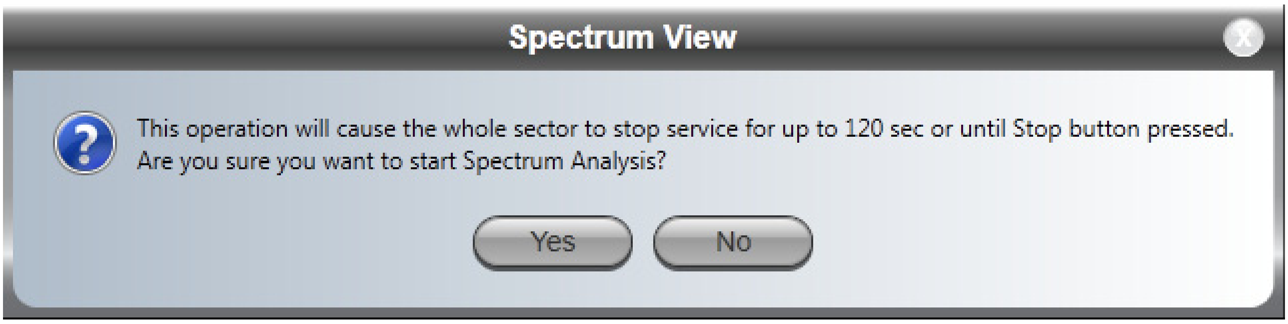
Button	Purpose
	Show/Hide Antenna A
	Show/Hide Antenna B
	Show/Hide average
	Show/Hide current channel (HSUs only)
	Show/Hide maximum
	Show/Hide DFS information

Table 21-1: Spectrum View Analysis Display Buttons functionality (Continued)

Button	Purpose
	Show/Hide point values
	Save the analysis to a CSV file
	Clear all sector member analyses from the display (They can be shown again)

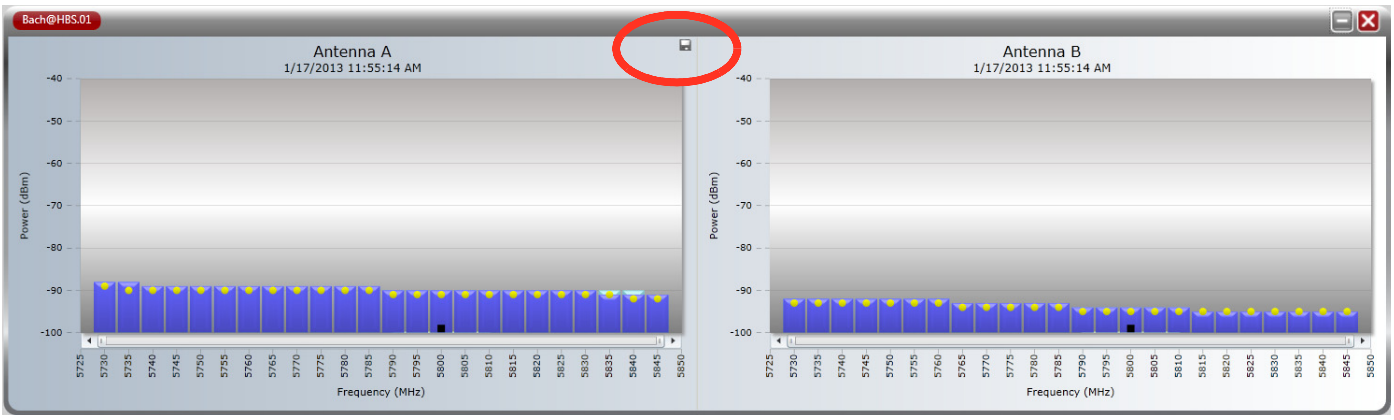
Running Spectrum View from the HBS

Choose **Entire sector** and click **Start.** You are offered the following cautionary message:



If it is acceptable to drop the service click **Yes**. The processing may appear to have stopped - but it is not complete until all of the **Show** buttons for selected HSUs are enabled.

Here is the result for the HBS:



The keys to the color coding is permanently displayed at the bottom of the main window:

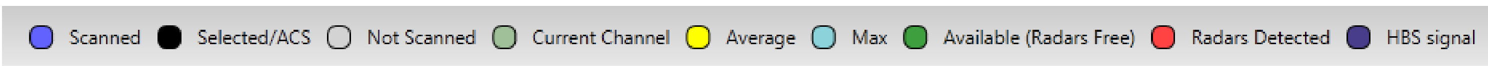
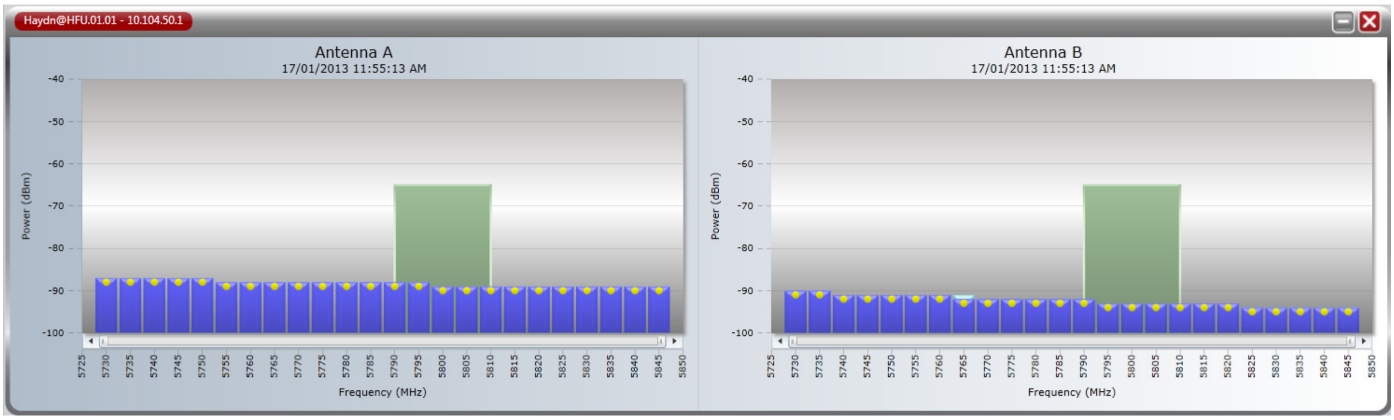


Figure 21-2: Spectrum View Analysis color codes

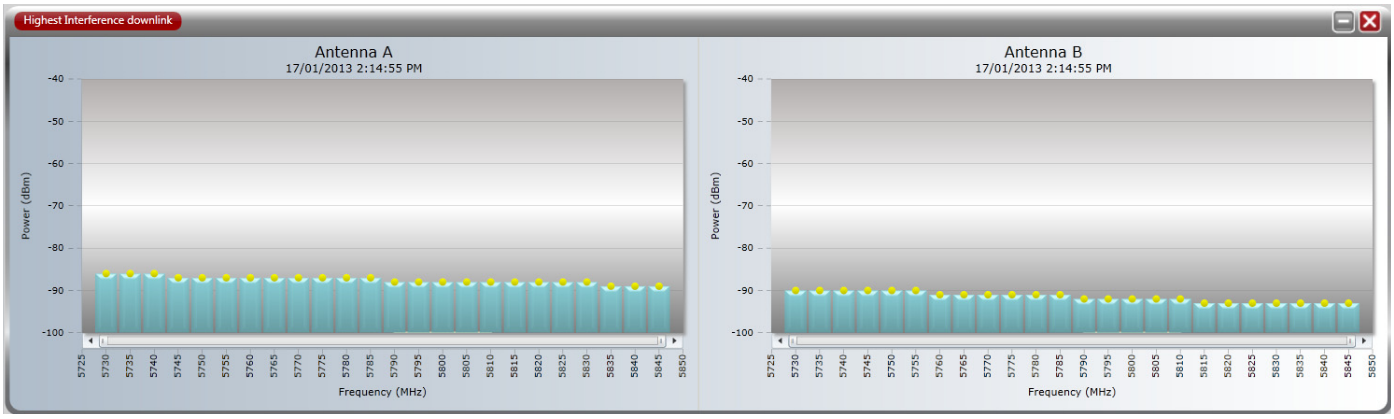
The green band reflects the current HBS operating frequency. Notice also the small fly-over diskette icon (circled) to the upper left of either graph. Clicking it opens a Windows File-Save dialog allowing you to save the graph to disk as a jpg file.

Here is the analysis for one of the HSUs. It is a bit different:



The light green rectangle in the background of both antenna displays reflects actual channel (20 MHz wide here) being used by the HSU. The title bar also contains the HSUs IP address.

There is a further display of interest: Highest Interference for all HSUs in the sector:



See **Figure 21-2** for the color coding.

Running Spectrum View from a HSU

There is no difference in principle between running a Spectrum View analysis for a HSU and running it for a HBS. There is a major difference between running Spectrum View on an active HSU (registered or not) or in total isolation from the sector. Here is what happens in total isolation:

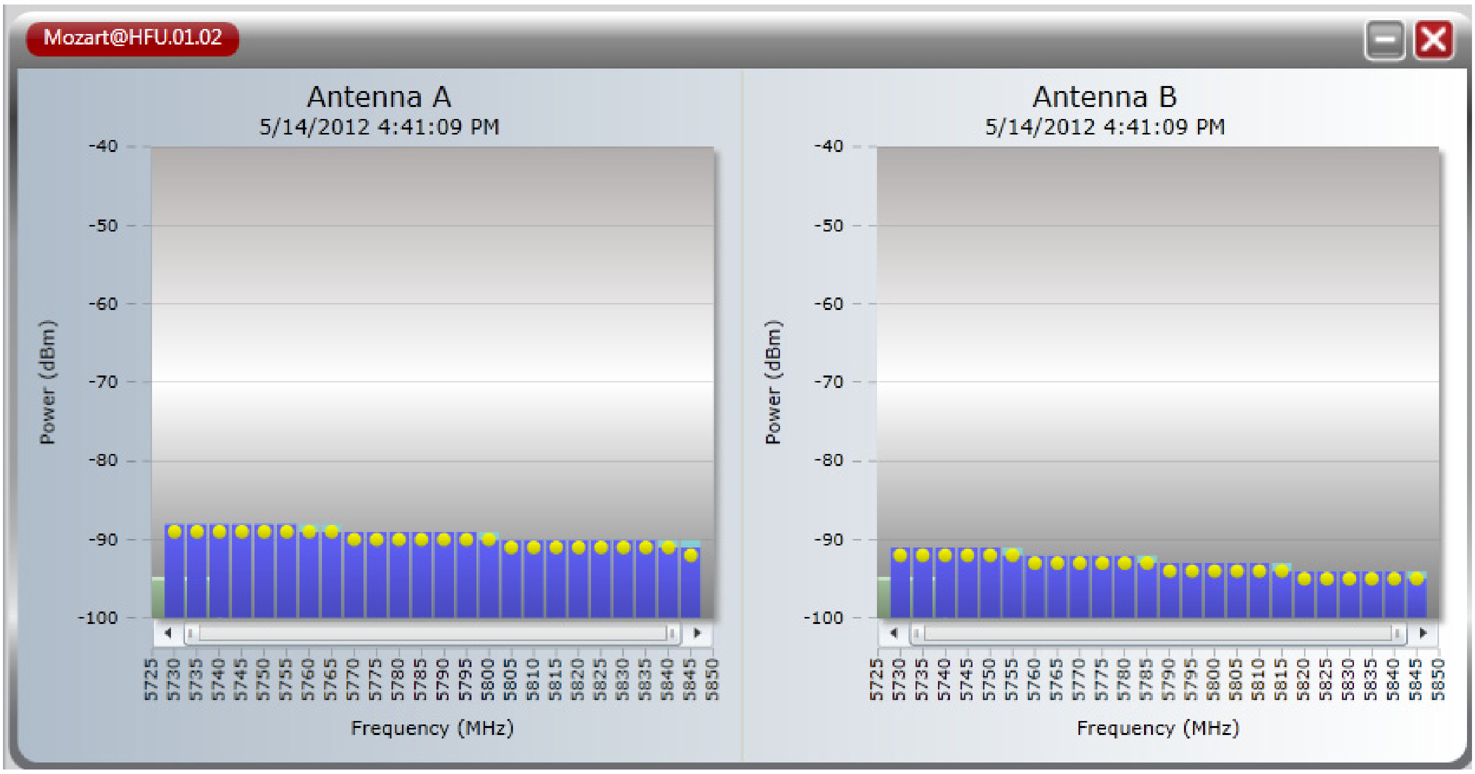


Figure 21-3: HSU spectrum analysis in complete isolation from the sector

Now we return the HSU to the sector:

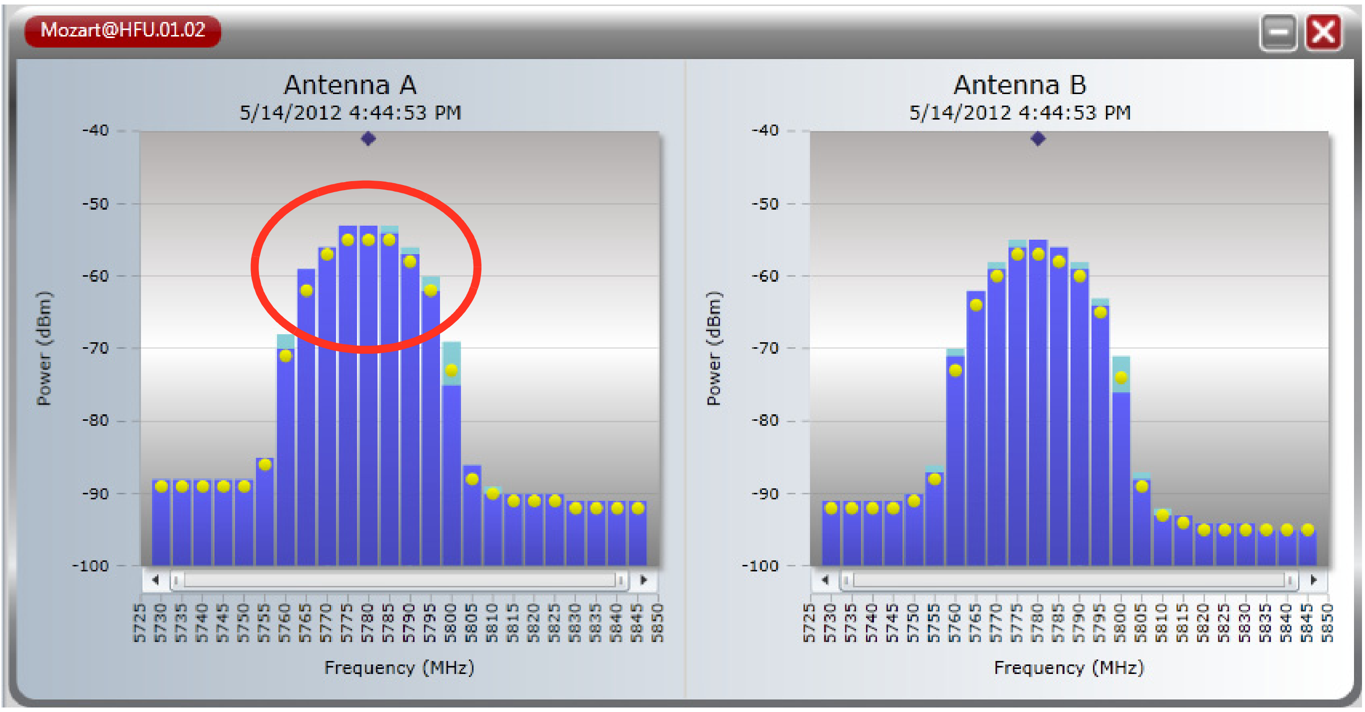
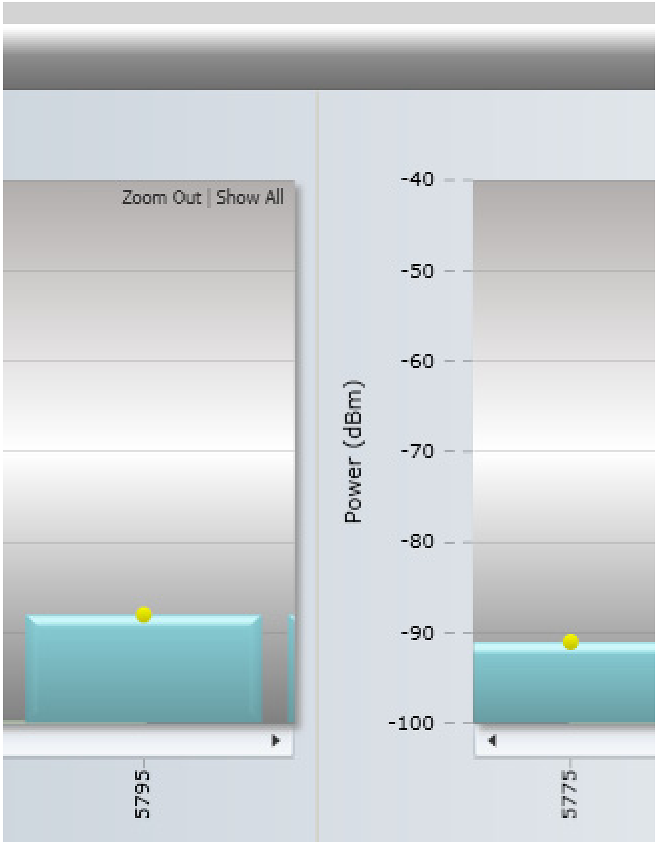


Figure 21-4: HSU spectrum analysis within the sector

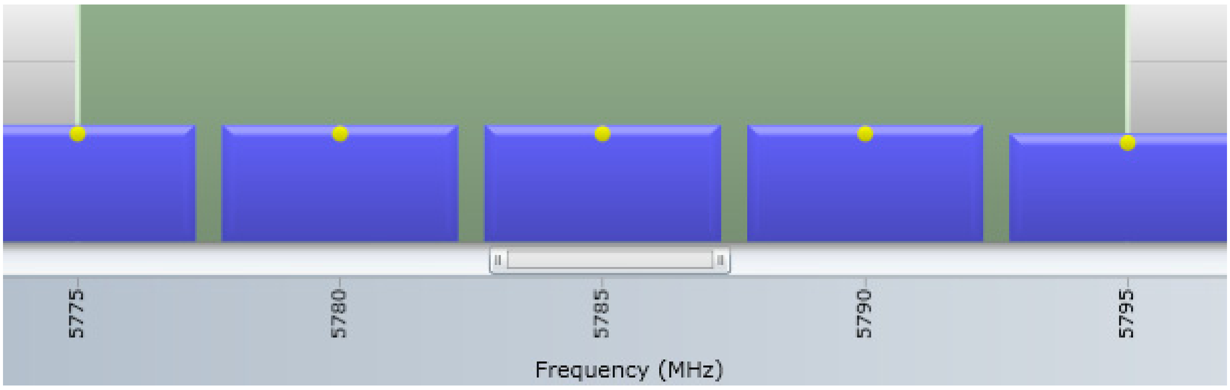
The hump in **Figure 21-4** reflects the duty cycle signal from the HBS centered on the current channel (circled).

Zooming in and out

You may zoom in on a range of interest and enlarge it. Use the mouse to swipe the range from left to right or reverse and then click.The swiped range is zoomed in. You may repeat this several times. The zoom applies to all charts for all element in the analysis. An indicator is provided at the top right of each chart:



Zoom Out returns you to the previous zoom state; **Show all** reverts you to the original display. In a zoomed state, a horizontal scroll bar enables you to view other areas of the displayed frequency range.



Chapter 22

Using the Web Interface

What is it For

The Web Interface (WI) enables you to carry out basic sector management functions using a Web browser.

It may be used to -

- Monitor a sector on a minimal basis
- Check sector parameters and make limited changes
- View the link Inventory
- Inspect the Recent Events logs

Who Needs it

The WI is a tool for technicians to “quick-install” a HSU in a link with minimum effort.

It may also be employed by a user for a quick look at current operating parameters and the Recent Events logs.

How it Works

Assume the sector setup, which we used in **Chapter 4** and later. We repeat it here for convenience::

Table 22-1: Preconfigured setup

<table>
<tr><th>Unit</th><th>Location</th><th>Attribute</th><th>Value</th><th>Remark</th></tr>
<tr><td rowspan="15">HBS</td><td rowspan="15">HBS.01</td><td>IP Address</td><td>10.104.50.200</td><td rowspan="3">All communicating HSUs and HBS in the same subnet</td></tr>
<tr><td>Net Mask</td><td>255.255.0.0</td></tr>
<tr><td>Default Gateway</td><td>10.104.10.21</td></tr>
<tr><td>Sector ID</td><td>EBGX20560334</td><td>Inherited by all communicating HSUs</td></tr>
<tr><td>Contact</td><td>Bach</td><td>Optional</td></tr>
<tr><td>Name</td><td>Bach@HBS.01</td><td>Location of Contact - optional</td></tr>
<tr><td>Band</td><td>5.730 - 5.845 GHz FCC/IC</td><td>Inherited by all communicating HSUs</td></tr>
<tr><td>Channel Bandwidth</td><td>20MHz</td><td>Inherited by all communicating HSUs</td></tr>
<tr><td colspan="3">Geographic location</td></tr>
<tr><td>Latitude</td><td>-37.8148</td><td></td></tr>
<tr><td>Longitude</td><td>144.9630</td><td></td></tr>
<tr><td>Azimuth (deg)</td><td>0</td><td rowspan="2">Used for initial default placement of HSUs</td></tr>
<tr><td>Beamwidth (deg)</td><td>90</td></tr>
<tr><td>Antenna height (m)</td><td>130</td><td>From RF plan, not used</td></tr>
</table>

Table 22-1: Preconfigured setup (Continued)

Unit	Location	Attribute	Value	Remark
HSU	HFU.01.01	IP Address	10.104.50.1	All communicating HSUs and HBS in the same subnet
		Net Mask	255.255.0.0	
		Default Gateway	10.104.10.21	
		HSU type	Fixed	8 time slots
		Contact	Haydn	
		Name	Haydn@HFU.01.01	
		Geographic location		
		Latitude	-37.8762	
		Longitude	145.0437	
		Antenna height (m)	10	From RF plan, not used
	HFU.01.02	IP Address	10.104.50.2	All communicating HSUs and HBS in the same subnet
		Net Mask	255.255.0.0	
		Default Gateway	10.104.10.21	
		HSU type	Fixed	8 time slots
		Contact	Mozart	
		Name	Mozart@HFU.01.02	
		Geographic location		
		Latitude	-37.4018	
		Longitude	145.0086	
		Antenna height (m)	60	From RF plan, not used
	HNU.01.01	IP Address	10.104.50.3	All communicating HSUs and HBS in the same subnet
		Net Mask	255.255.0.0	
		Default Gateway	10.104.10.21	
		HSU type	Nomadic	6 time slots
		Contact	Brahms	
		Name	Brahms@HNU.01.01	
		Geographic location		
		Latitude		Depends on location
		Longitude		
		Antenna height (m)		
	1	HSU type	Nomadic	6 time slots
	2	HSU type	Nomadic	4 time slots
	3	HSU type	Nomadic	4 time slots
	4	HSU type	Nomadic	2 time slots

On the managing computer, point your browser to10.104.50.200 and log on as shown below. You can also log on over the air to registered HSUs in the same way.

For stand-alone or unregistered HSUs, you must connect a managing computer directly to the HSU and again log on as shown below.

What it Provides

The WI is a developing technology. It is possible that the current distributed release may have additional or slightly different features from those shown here. The description below, should nevertheless give you a good idea of how to use the WI.

Prerequisites

Hardware

You need a regular LAN connection between a managing computer and one of the sector ODUs. The WI can be used directly opposite the HBS any of its HSUs. It can also be used over the air from the HBS to any registered HSU.

The WI is available for RADWIN 2000 C and Airmux-400 L ODUs at release level 2.6.00 or later along with RADWIN 5000 HPMP ODUs, this release and later.

Software

Your computer should have at least version 6 of MS Internet Explorer. The Web interface also works with other browsers such as Mozilla Firefox version 3 and later.

Technical Background

You should be familiar with the concepts underlying the RADWIN Manager and preferably with the Manager itself.

Special Considerations Working with the WI

Advanced Configurations

For setup configurations using features such as HSS, VLAN and QoS, you will need to use the RADWIN Manager.

Operational Effects

Several WI functions cause temporary sync loss. Typically, changing the number of antennas falls into this category. These cases will be pointed out in **Warning** messages.

Some Working Tips

You can:

- Log on to a ODU on the default IP address of 10.0.0.120/8, set the Link ID and IP address instead of using the RADWIN Manager as in **Chapter 5**. Unlike the Local Connection method, you need to reset the ODU to see the change in the Web Interface.

- Change the operating Band of an HSU instead of using the RADWIN Manager as in Chapter 6. You can revert it the same way or by a direct connection, logged on as Installer. You cannot change the operating Band of the HBS in this way.
- Look at Recent Events for either site

You cannot:

- Change default Tx power
- Configure MIMO/Diversity
- Manage other features such as GSU (when supported), VLAN, QoS
- Perform Software upgrade

Be very careful:

- Using this tool if your link is providing customer service which may not be interrupted with sync-losses

Scope of this Chapter

The remainder of this chapter is divided into three sections: Logging on, HBS Configuration and HSU Configuration.

Logging on

To use the Web interface, simply point your browser to the IP address of the site to which you are connected.

Figure 22-1: Web interface - Log on

The User Name and Password are respectively, ***admin*** and ***netman*** as used for Telnet access. You must click the **Log In** button to effect entry to the WI. The foregoing applies to both the HBS and the HSUs.

HBS Management

The Main Window

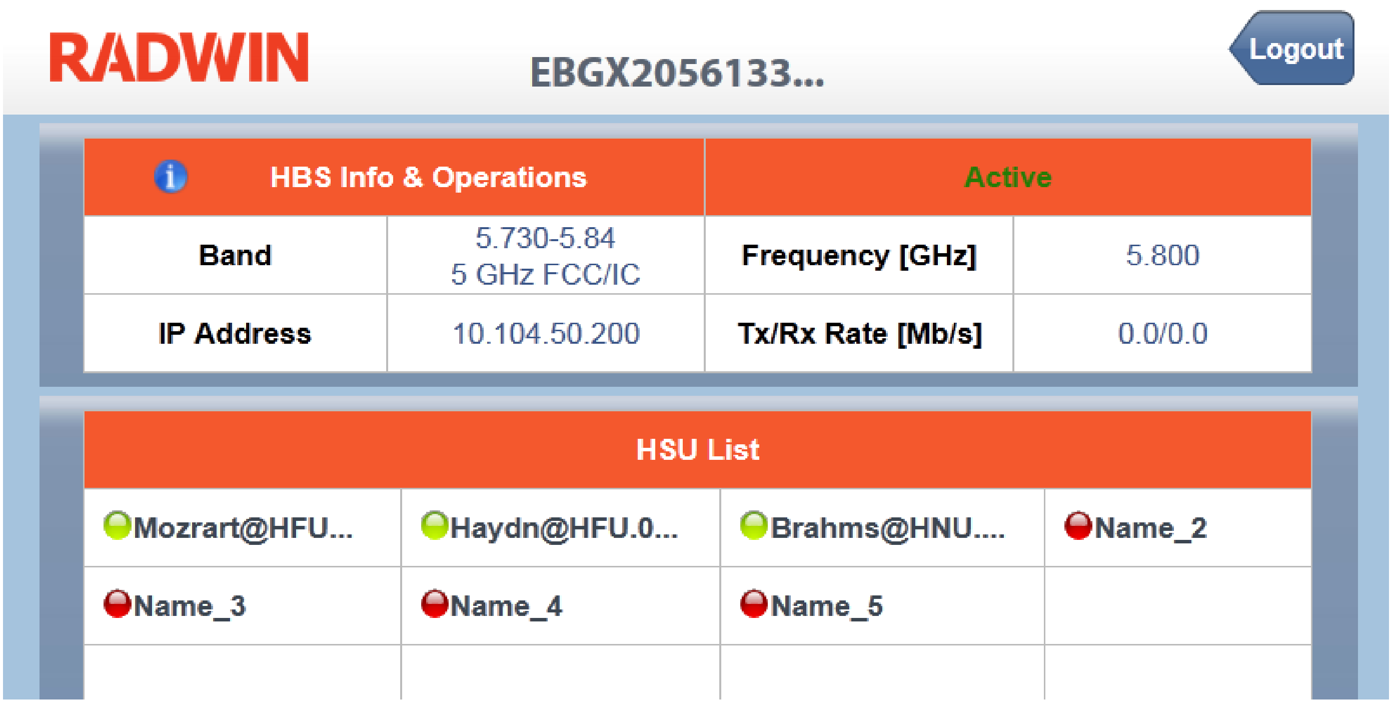


Figure 22-2: Web interface - Main window, HBS

The Sector ID (EBGX20561334) appears all or in part as the heading. The HBS Info panel is self explanatory. The green Active indicator will vary according to the status of the HSU shown by the RADWIN Manager.

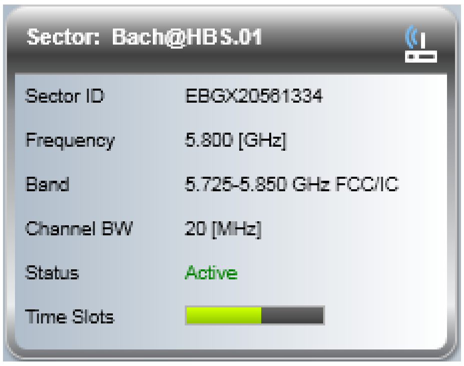


Figure 22-3: Sector Status panel

(it will typically be Active, Inactive, Probing etc.)

The bottom panel shows all member HSUs. The green LED icons will change color to reflect the status of HSUs. For example, deregistering an HSU will change it to black as in the RADWIN Manager.

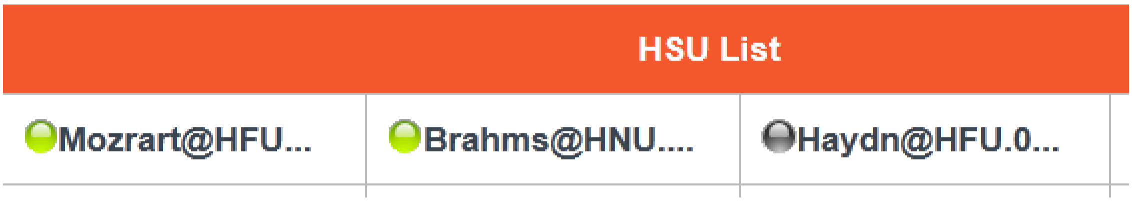
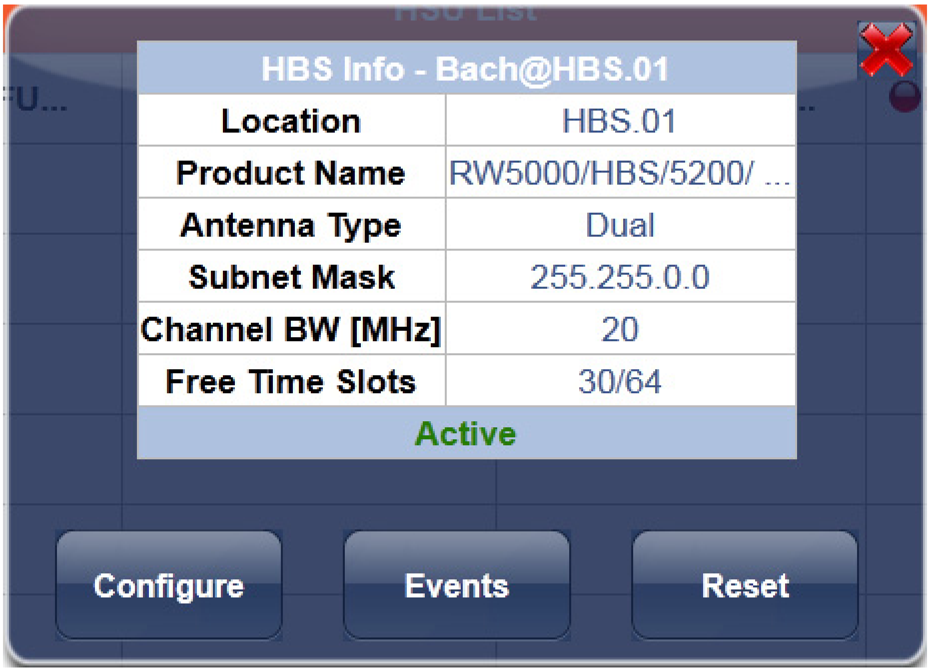


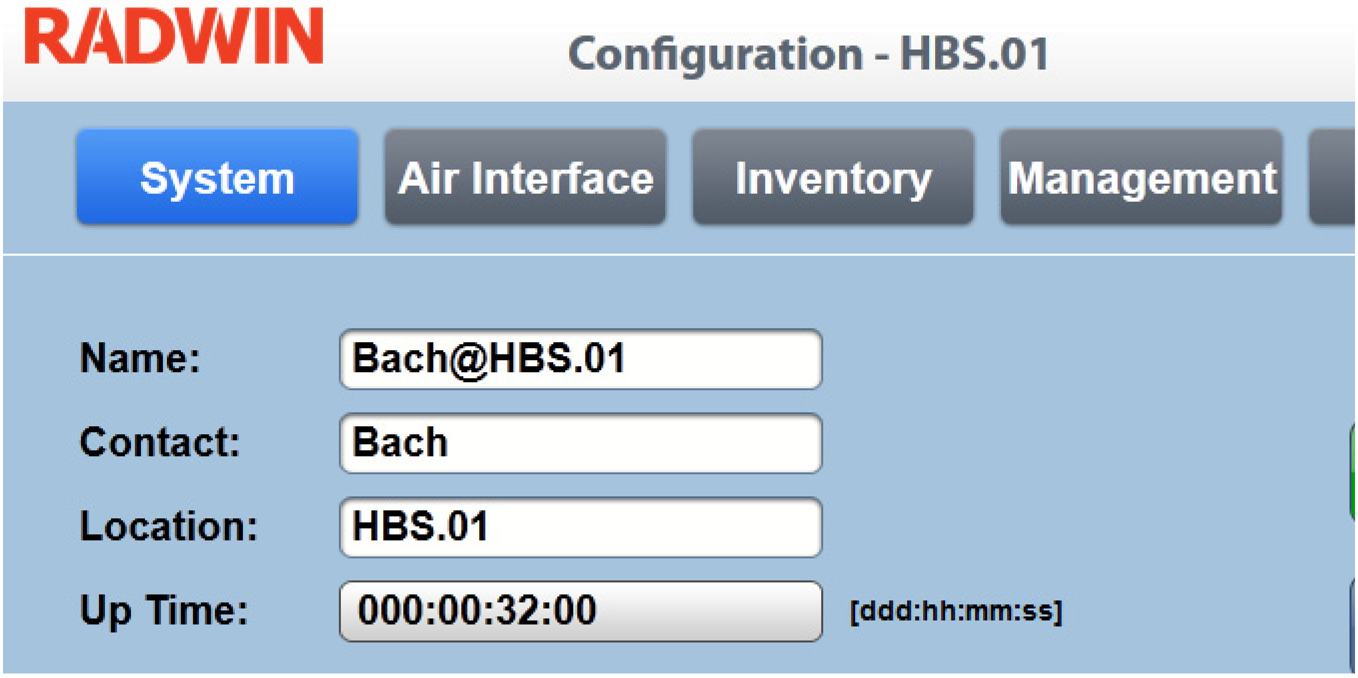
Figure 22-4: HSU Haydn deregistered

Now, click anywhere on the HBS Info panel:



Configure

The Configure button opens the following display:

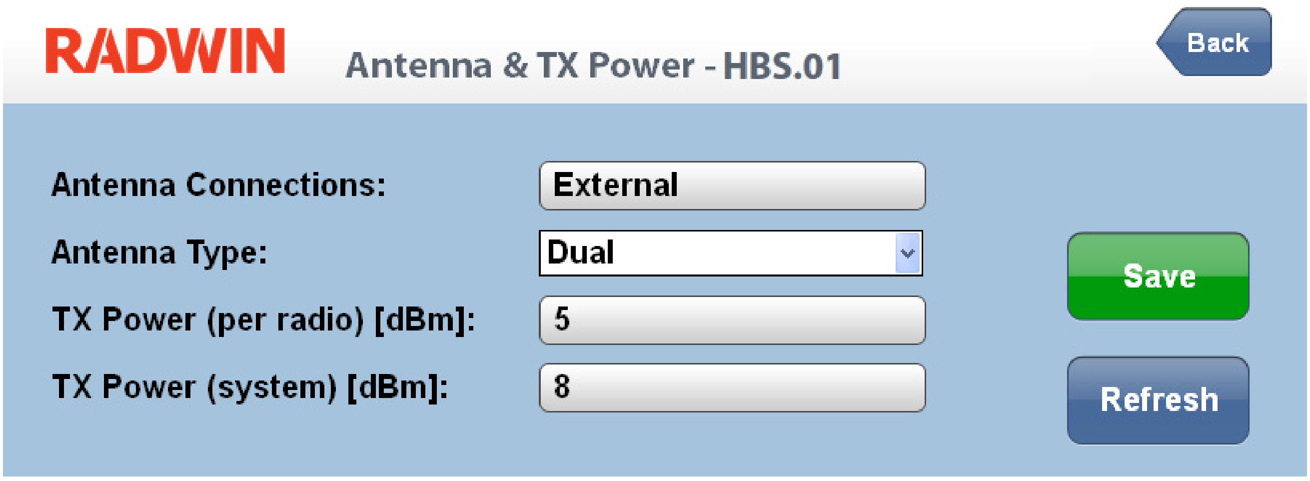


System

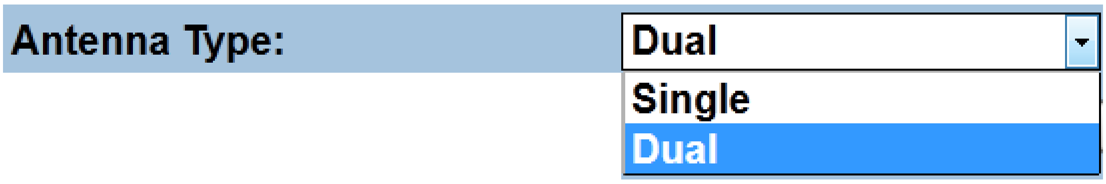
The **Name**, **Contact** and **Location** field may be changed. Clicking **Save** commits them. Clicking **Refresh** reverts the fields to their last Saved values.

Air Interface

There is nothing that can be changed on this panel. Clicking the Antenna & Tx Power button opens up the following window:



The only item that can be changed is the Antenna Type:



Caution

Changing Antenna Type will call a sector-wide sync loss.

Inventory

The Inventory display is for information only.

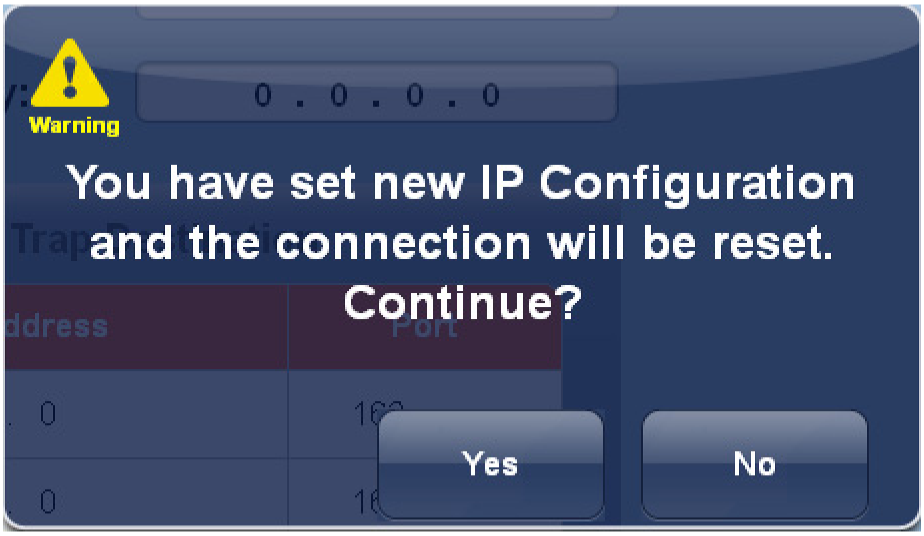
ODU

Property	Value
Product:	RW5000/HBS/5200/F58 /FCC/EXT - RW-5200-0250
HW Version:	6
SW Version:	3.4.00_b3415_Jan 9 2013
MAC Address:	00:15:67:40:48:02
Serial Number:	PET540E000A00000

Management

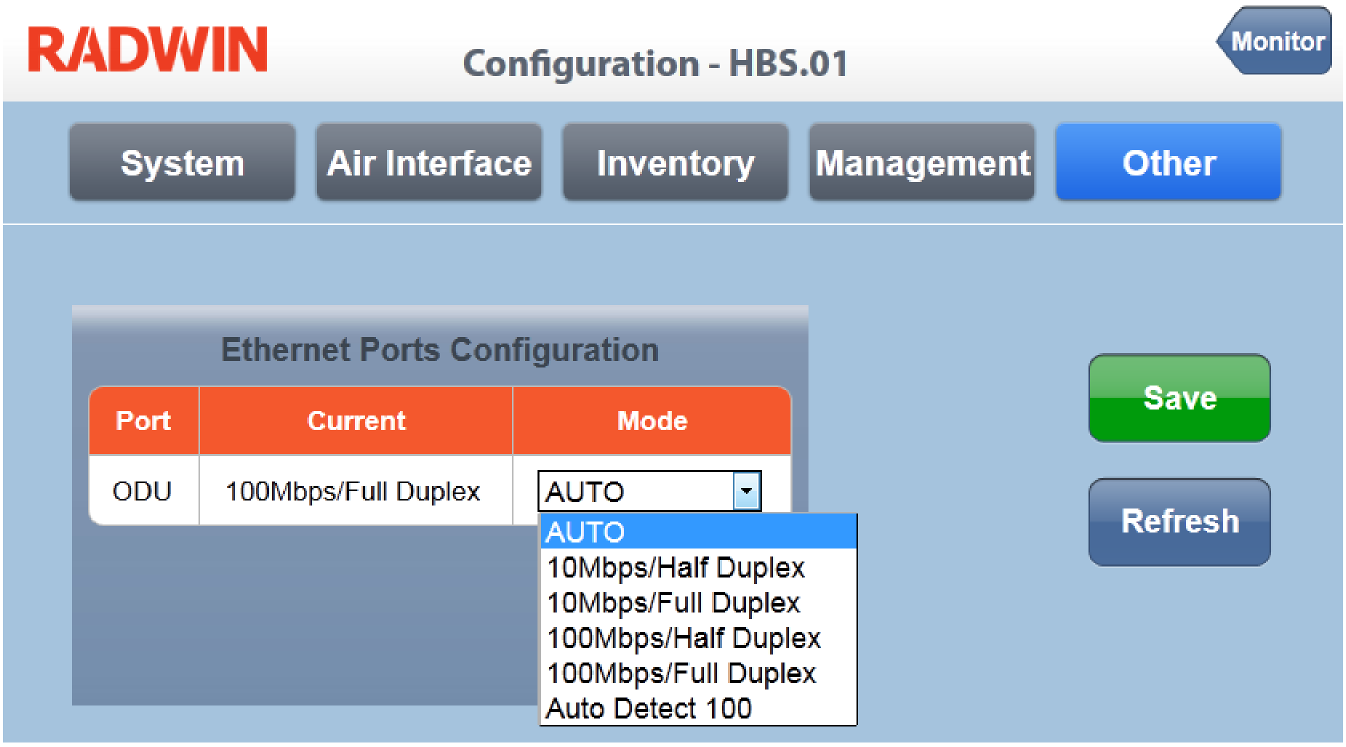
The Management fields are all fully editable:

If you change any of these fields, you will cause a HBS reset:

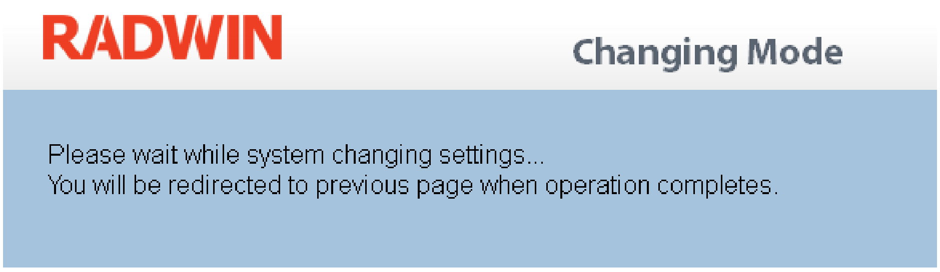


Other

You may change the HBS LAN port configuration:



You will receive the following notification:



This action of course, has no bearing on the sector.

Events

The Recent Event List is displayed:

#	Severity	Date & Time	Description	Interface
1	Major	09/01/2005 00:00:00	Management port status changed to disconnected	Management Port on Odu
2	Event	09/01/2005 00:00:00	The time was set to: THU SEP 01 00:00:00 2005	
3	Event	09/01/2005 00:00:00	HBS ready	
4	Normal	09/01/2005 00:00:00	HSS operating state was changed to: Independent Unit	
		09/01/2005	HSS multiple sync pulse	

Reset

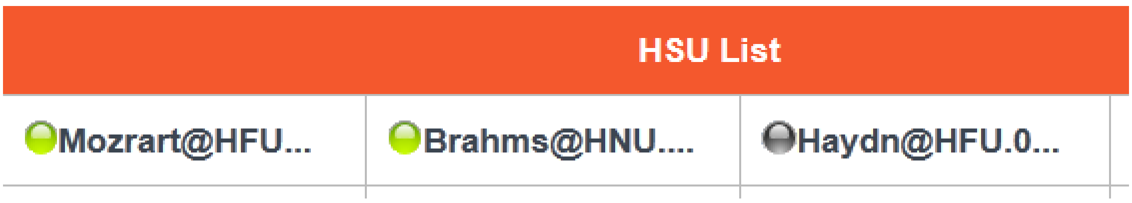
Use this button to reset the HBS.

HSU Management

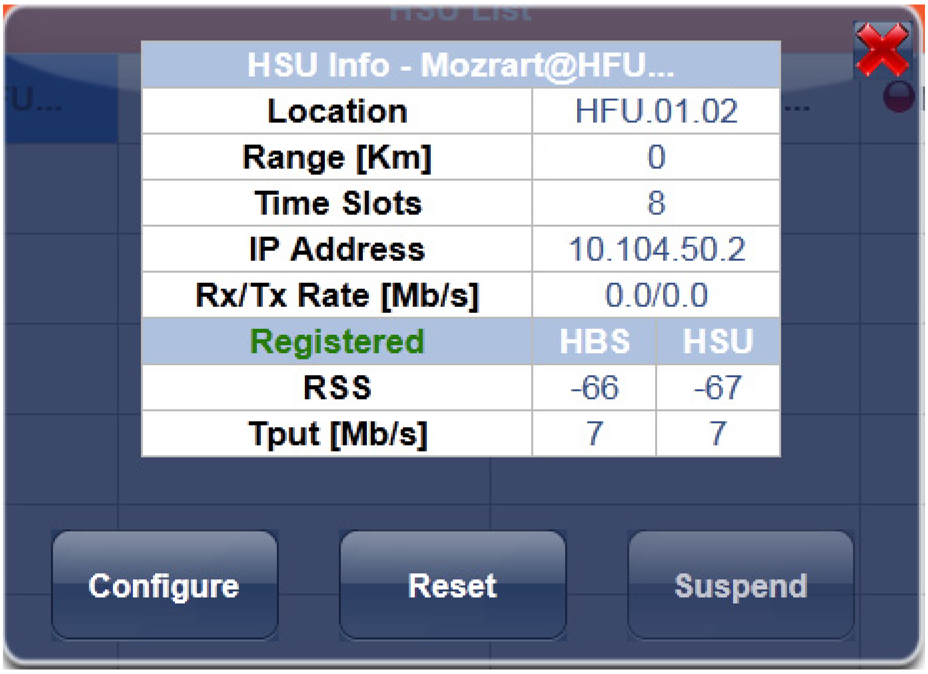
HSU management follows the same pattern as that for the HBS. To avoid tedious repetition, We will only point out significant differences.

The Main Window

HSU configuration is accomplished by clicking the required HSU in the bottom panel of **Chapter 22**. For the purposes of this section, we have deregistered Haydn so the panel looks like this:

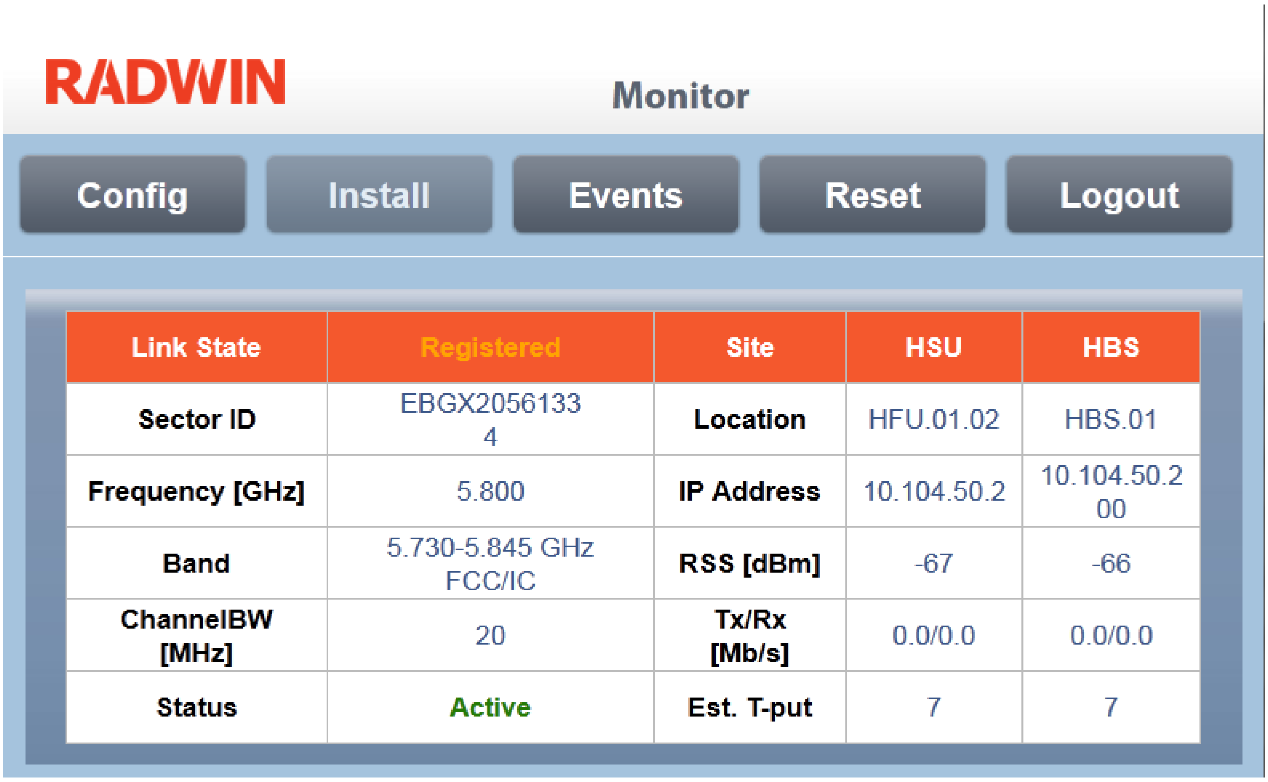


Click Mozart. Here is what you see:



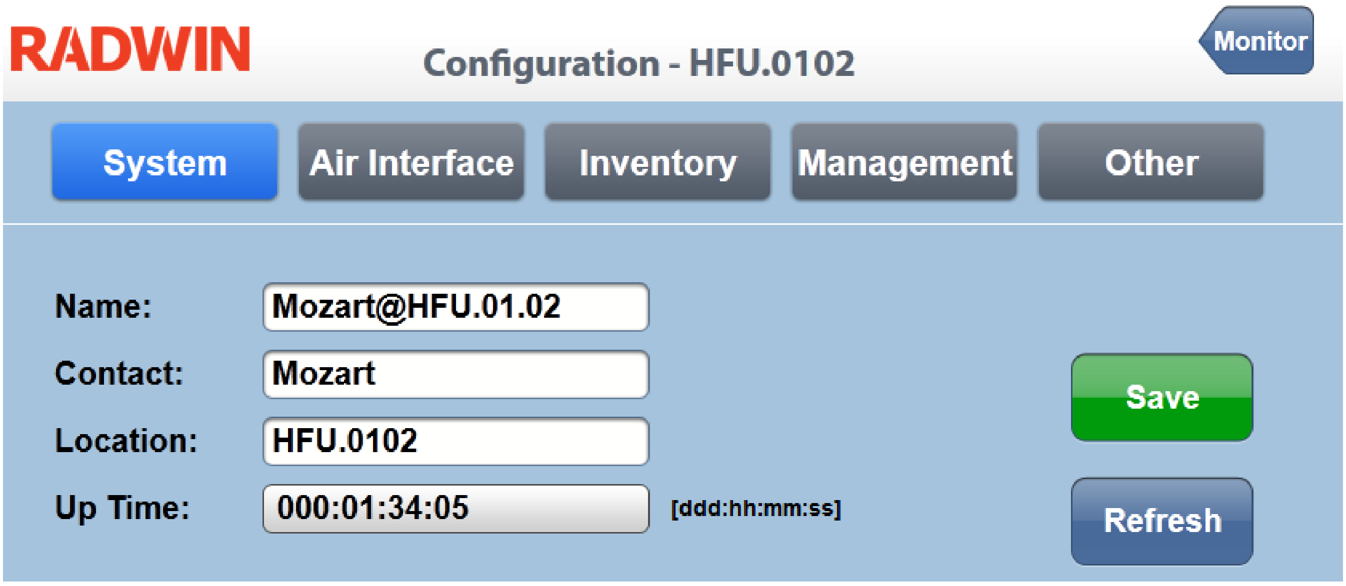
Clicking Configure, opens up a new tab in you browser, pointing to Mozart:

Here is the HSU main window:

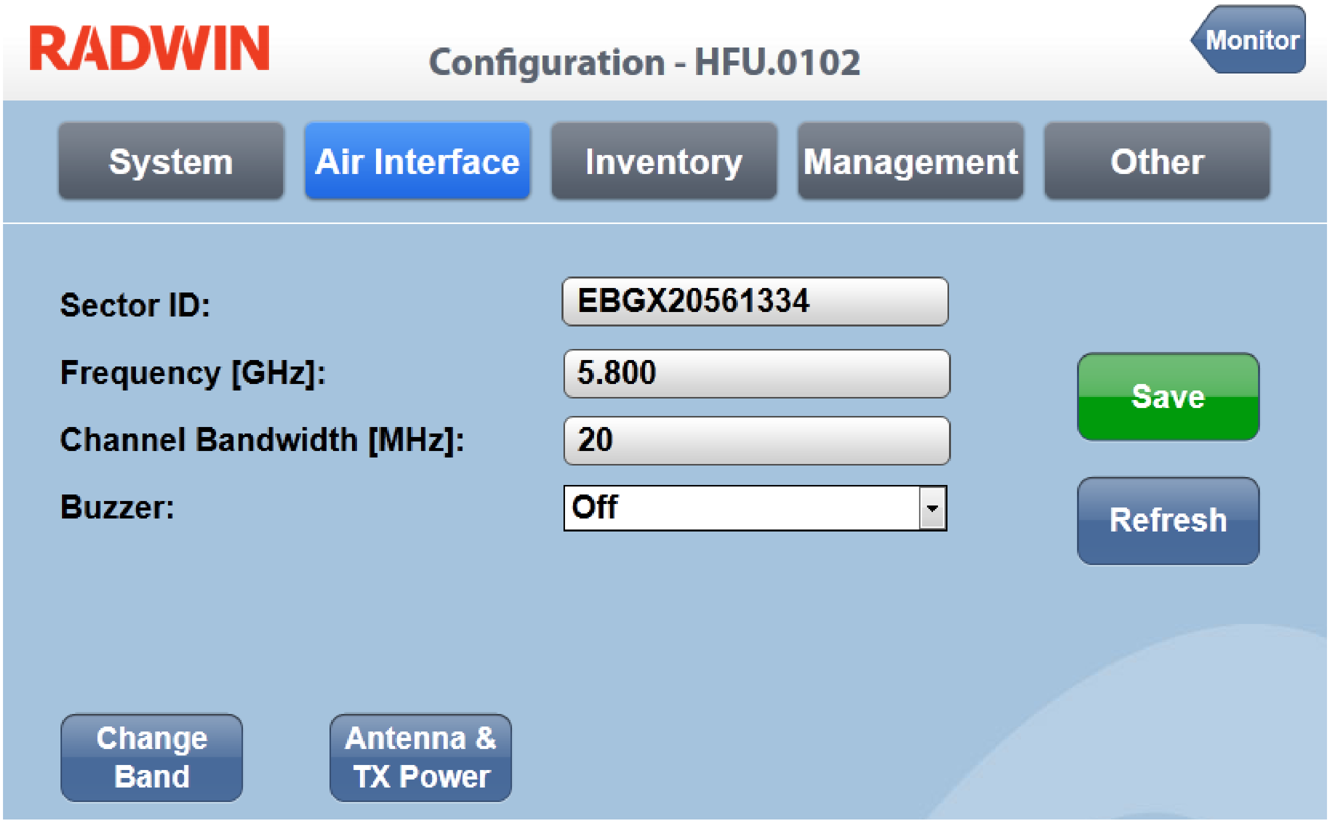


The only item here requiring comment is the **Configure** button. **Install** is disabled and the remaining three buttons are the same as for the HBS.

Here is the **Configure** display:



The only function here, which differs from the corresponding HBS function, is the **Air Interface** tab.



In addition to the **Antenna & Tx Power** button, you may also change operating Band:

Warning

There are two strict caveats to using this function:

- It is intended as a tool for the field technician, replacing an HSU in the field.
- If you change the operating Band of a registered HSU, you will "loose" it from the sector. The only remedy is to log on to the HSU with a **direct connection** and either reverse the above process, or log on as Installer and using the regular Change Band.

USER MANUAL

RADWIN 5000 HPMP POINT TO MULTIPOINT BROADBAND WIRELESS

Release 3.4.00

Part 7: Product Reference

RADWIN

Appendix A

Technical Specifications

Scope of these Specifications

This appendix contains technical specifications for the major link components appearing in this User Manual. They are correct at the date of publication, but are intended for general background only. The latest authoritative and most up to date technical specifications are available as Data Sheets obtainable from RADWIN Customer Service.

In any event, RADWIN reserves the right to change these specifications without notice.

ODU - HBS and HSU

Configuration

Architecture	ODU: Outdoor Unit with Integrated Antenna, Connectorized for External Antenna or Embedded Uses RADWIN PoE type device for Ethernet only
ODU to PoE Interface	HBS: • Outdoor RADWIN CAT-5e cable. maximum cable length: 100m for 10/100BaseT. • Outdoor RADWIN CAT-5e cable. maximum cable length: 75m for 1000BaseT. HSU: Outdoor CAT-5e cable; maximum cable length: 100 m (10/100BaseT)

Radio

Capacity	HBS: Up to 250Mbps aggregate net throughput depending on model and regulation HSU: Up to 50 Mbps aggregate net throughput depending on model and regulation
HSU support	Up to 32 HSUs per HBS (varies with HBS model)
Coverage	Up to 40 km / 25 miles
Radio Modulation	2x2 MIMO-OFDM (BPSK/QPSK/16QAM/64QAM)
Adaptive Modulation & Coding	Supported
Automatic Channel Selection	Supported
DFS	Supported
Diversity	Supported
Spectrum View	Supported

QoS	Supported Packet classification to 4 queues according to 802.1p and Diffserv
VLAN	Supported 802.1Q, 802.1P, QinQ
TDD Intrasite Synchronization	Supported using HSS
TDD Inter Site Synchronization	Supported through common GPS receiver per site
Duplex Technology	TDD
Error Correction	FEC k = 1/2, 2/3, 3/4, 5/6

Rate – Dual Antenna [Mbps] at 20 MHz CBW	13	26	39	52	78	104	117	130
Rate – Single Antenna [Mbps] at 10 MHz CBW	6.5	13	19.5	26	39	52	58.5	65
Modulation	BPSK	QPSK		16QAM		64QAM		
FEC [k=]	1/2	1/2	3/4	1/2	3/4	2/3	3/4	5/6
Max Tx Power [dBm] for 4.8 – 6 GHz	25			24	21	19	18	
Sensitivity (dBm) @BER <10e-11 at 20 MHz CBW **For 10 MHz CBW, deduct 3 dBm**	-88	-86	-83	-81	-77	-72	-70	-67
Encryption	AES 128							

Supported Bands

Band (GHz)	Regulation	Occupied Frequency Range (GHz)	Supported Channel Bandwidth (MHz)	Compliance
2.5	**FCC BRS(*)**	2.495- 2.690	5, 10, 20	FCC 47CFR, Part 27, Subpart M (BRS/EBS)
3.5	**ETSI(†)**	3.4105 – 3.7025	5, 10, 20	ETSI EN 302 326-2
	IC	3.475 – 3.650	5, 10, 20	IC RSS-192
	Universal	3.300 – 3.800	5, 10, 20	N/A
3.6	**FCC/IC**	3.650 – 3.675	5, 10, 20	FCC Part 90 Subpart Z and IC RSS-197 (Restricted)
4.9	**FCC/IC**	4.940 – 4.990	5, 10, 20	FCC 47CFR, Part 90, Subpart Y and IC RSS-111
	Universal	4.900 - 4.990	5, 10, 20, 40	N/A
5.0	**Universal**	4.990 – 5.160	5, 10, 20, 40	N/A
5.3	**ETSI**	5.150 – 5.350	10, 20	ETSI EN 301 893
	FCC/IC	5.260 – 5.340	5,10, 20, 40	FCC 47CFR, Part 15, Subpart E and IC RSS-210
	Universal	5.140 – 5.345	5, 10, 20, 40	N/A
5.4	**ETSI**	5.475 – 5.720	10, 20, 40	ETSI EN 301 893
	FCC/IC	5.480 - 5.590 5.660 - 5.715	5, 10, 20, 40	FCC 47CFR, Part 15, Subpart E and IC RSS-210
	Universal	5.465 – 5.730	5, 10, 20, 40	N/A
5.8	**ETSI**	5.725 – 5.875	10, 20	ETSI EN 302 502
	FCC/IC	5.725 – 5.850	5, 10, 20, 40	FCC 47CFR, Part 15, Subpart C and IC RSS-210
	MII China	5.730 – 5.845	5, 10, 20, 40	MII China
	WPC India	5.825 – 5.875	5, 10, 20, 40	GSR-38
5.9	**Universal**	5.720 – 5.960	5, 10, 20, 40	N/A
6.0	**Universal**	5.690 – 6.060	5, 10, 20, 40	N/A
6.4	**Universal**	5.900 – 6.400	10, 20	N/A

Management

Management Application (per sector)	RADWIN Manager
Protocol	SNMP and Telnet
NMS	RADWIN NMS - RNMS

Environmental

Operating Temperatures	HBS/HSU: -35°C to +60°C / -31°F to +140°F
Humidity	HBS/HSU: Up to 100% non-condensing, IP67
Storage	-40° to 85°C / -40°F to 185°F

Mechanical

HBS with Integrated Antenna	37.1/14.84(W) x 37.1/14.84(H) x 9.00/3.6(D) cm/in; 3.5 kg / 7 lbs
HBS/HSU Connectorized	19.5/7.7(W) x 27.0/10.8(H) x 5.5/2.2(D) cm/in; 1.8 kg / 3.6 lbs
HSU SFF with Embedded antenna)	19.5/7.7(W) x 27.0/10.8(H) x 7/2.8(D) cm/in; 1.8 kg / 3.6 lbs
RADWIN 5505 HSUConnectorized	19.5/7.7(W) x 27.0/10.8(H) x 5.5/2.2(D) cm/in; 1.1 kg / 2.4 lbs
RADWIN 5505 HSUwith Integrated Antenna, also HSU AC	24.1/9.4(W) x 19.7/7.7(H) x 7.7/3(D) cm/in; 1.3 kg / 2.8 lbs

Power

Power Feeding	Power provided over ODU-IDU cable using PoE
Power Consumption - alone	HBS: <25W, HSU: <20W, HSU-505/510/525<10W

Safety

TUV	UL 60950-1, UL 60950-22, CAN/CSA C22.2 60950-1, CAN/CSA C22.2 60950-22
ETSI/IEC	EN/IEC 60950-1, EN/IEC 60950-22

EMC

FCC	47CFR Class B, Part15, Subpart B
ETSI	EN 300 386, EN 301 489-1, EN 301 489-4
CAN/CSA-CEI/IEC	CISPR 22 Class B
AS/NZS	CISPR 22 Class B

HSU-610 - HSU with AC Power Feeding

Configuration

Architecture	ODU: Outdoor Unit with Integrated Antenna
ODU to LAN and PoE Interface	Outdoor RADWIN CAT-5e cable. Maximum cable length: 100m for 10/100BaseT.

Radio

Capacity	10 Mbps net aggregate throughput
Range	Up to 40 km / 25 miles

Channel Bandwidth	Configurable: 5,10,20 and 40 MHz
Modulation	2x2 MIMO-OFDM (BPSK/QPSK/16QAM/64QAM)
Bandwidth allocation	Symmetric and Asymmetric
DFS	Supported
Adaptive Modulation & Coding	Supported
Automatic Channel Selection	Supported
Diversity	Supported
Spectrum Viewer	Supported
Max Tx Power	25 dBm
Duplex Technology	TDD
Error Correction	FEC k = 1/2, 2/3, 3/4, 5/6
Encryption	AES 128
Ethernet Interface	10/100BaseT
PoE port	10/100BaseT, IEEE 802.3af
Layer 2	Hub Mode
QoS	Packet classification to 4 queues according to 802.1p and Diffserv, Dynamic scheduling according to air interface changes
VLAN	Supported 802.1Q, 8021.P, QinQ

Mechanical

Dimensions	24.1(w) x 19.7(h) x 7.7(d) cm
Weight	1.3 kg / 2.8 lbs
Integrated Antenna	19.7/7.7(W) x 24.1/9.5(H) x 9.0/3.6(D) cm/in; 1.3 kg / 2.8 lbs

Power

Power Feeding	Direct AC power feeding 85-265VAC
Power Consumption - alone	<10W

Environmental

Operating Temperatures	-35°C to +60°C / -31°F to +140°F
Humidity	100% condensing, IP67 (totally protected against dust and against immersion up to 1m)

Safety

TUV	UL 60950-1, UL 60950-22, CAN/CSA C22.2 60950-1, CAN/CSA C22.2 60950-22
ETSI/IEC	EN/IEC 60950-1, EN/IEC 60950-22

EMC

FCC	47CFR Part15, Subpart B, Class B
ETSI	EN 300 386, EN 301 489-1, EN 301 489-4

CAN/CSA	CISPR 22 Class B
AS/NZS	CISPR 22 Class B

IDU-H (Aggregation Unit)

Ethernet Interface

PoE Interfaces	6 x legacy mode PoE ports(10/100/1000Mbps), up to 25W per port
Ethernet Ports	2 x RJ-45 PHY ports of 10/100/1000 Mbps Based-T Ethernet
LAN Interface Framing/Coding	IEEE 802.3/U
LAN Interface Line Impedance	100Ω
LAN Interface Ethernet Mode	Auto-negotiation 10/100/1000
SFP Interfaces	2 x SFP ports of 1000 Mbps (standard MSA)
MAC Address Entries	Up to 1K MAC Address entries
Maximal Frame Size	2048 bytes
Ethernet Latency	3 ms

Mechanical

Dimensions	1U 19” Rack mounted, half width
Weight	0.8Kg

Power

Internal Power Consumption	< 15W @ Maximal Power feeding
Power Feeding	44VDC - 56VDC, Dual redundant inputs. 3 pin female DC connector
Grounding	Front panel grounding lug
Protection	- DC input Line & Reverse Polarity protection - PoE Ports over/under Current & over/under Voltage protections

Environmental

Operating Temperatures	-40°C to 55°C / -40°F to 131°F
Humidity	90% non-condensing
Storage	-40° to 70°C / -40°F to 158°F Humidity 95%

Safety

TUV	UL60950-1, CAN/CSA-C22.2 No. 60950-1
ETSI/IEC	EN/IEC 60950-1

EMC

FCC	47CFR Part 15, Subpart B, Class B
ETSI	EN 300 386; 301 489-4; 301 489-1
CAN/CSA- AS/NZS	CISPR 22 Class B

GbE PoE Device - Indoor, AC

Electrical

AC Input Voltage	100 - 240 VAC nominal, 90 - 264 VAC max range
Input Frequency	47 - 63 Hz
Input Current	2.0 A (rms) 115 VAC at Max. load 1.2 A (rms) 230 VAC at Max. load
Max. In-rush Current	30A for 115VAC at Max. load 60A for 230VAC at Max. load
Standby Power	0.5W (Max) at 240Vac
DC Output Voltage	56 VDC
Protection	• Short circuit protection • Auto recovery • Over voltage protection
Indication	Green led for normal operation

Interfaces

PoE output	RJ-45 connector
PoE to ODU Interface	Outdoor CAT 5e; Maximum cable length: 75m for 1000BaseT or 100m for 10/100BaseT.
Ethernet input	RJ-45 connector
AC input on device	Standard socket IEC320 C14 type
AC cable	Variety of AC plugs available (see below)
Ethernet / ODU	RADWIN RJ-45 connector
Ethernet LAN interface type	RJ-45, 10/100/1000BaseT Interface (Line Impedance -100Ω)

Mechanical

Case	Plastic
Dimensions	16cm(W) x 6.3cm(D) x 3.33cm(H)
Weight	250g

Environmental

Operating Temperatures	0°C to 40°C/32°F to 104°F
Humidity	90% non-condensing

Safety

ULCSA	60950-1, C22.2 No. 60950-1
ETSI/IEC	IEC/EN 60950-1

EMC

ESD	61000-4-2
RS	61000-4-3

EFT	61000-4-4
Surge	61000-4-5
CS	61000-4-6
DIPS	61000-4-11
EMI	FCC part 15 class B, CISPR Pub 22 class B, AS/NZS CISPR 22 class B

PoE Device - Outdoor, DC

Electrical

Input voltage range	-20 to -60 VDC (single input)
Output voltage	48VDC / 0.6A
Power Consumption	0.5W (not including radio)
Protections	Differential - 15KW Common – 3KW

Interfaces

Ethernet LAN interface type	RJ-45, 10/100BaseT Interface (Line Impedance -100Ω)
DC input	2 pins connector
ODU (PoE Port)	RJ-45

Mechanical

Enclosure	All weather cases
Dimensions	24.5cm(H) x 13.5cm(W) x 4.0cm(D)
Weight	1.0kg/2.2lbs

Environmental

Operating Temperatures	-35° C to 60° C / -31° F to 140° F
Humidity	Up to 100% non-condensing
Standards	IEC 60721-3-4 Class 4M5 IP67

Safety

FCC/IEC/ CAN/CSA	Designed to meet 60950-1, 60950-22

EMC

ETSI	Designed to meet EN 300 386; EN 301 489-1
FCC	Designed to meet 47CFR Part 15, Subpart B, Class B
CAN/CSA	Designed to meet ICES-003 Class B
AS/NZS	Designed to meet CISPR 22 class B

GSU

Configuration

Architecture	Outdoor Synchronization Unit; Including External GPS Antenna, HSS cable and PoE device
GSU to PoE Interface	Outdoor CAT 5e cable; Maximum cable length: 100 m

Mechanical

Dimensions	24.5cm(H) x 13.5cm(W) x 4.0cm(D)
Weight	1.0kg/2.2lbs

Power

Power Feeding	Power provided by PoE device
Max Power Dissipation	10Watt

Environmental

Operating Temperature Range	-35°C to 60°C / -13°F to 140°F
Humidity	Up to 100% non-condensing

Safety

EN/IEC	Designed to meet EN/IEC 60950-1, 60950-22

EMC

FCC	Designed to meet 47CFR Class B, Part 15, Subpart B
ETSI	Designed to meet EN 300 386; EN 301 489-4; EN 301 489-1
CAN/CSA-CEI/IEC	Designed to meet CISPR 22-02
AS/NZS	Designed to meet CISPR22 Class B

Lightning Protector

Electrical

Compatible Interfaces	10/100/1000BaseT
Data Rates	Up to 1000Mbps
Nominal Operational Voltage	48 VDC
Maximum Operational Voltage	60 VDC - 650 mA
Maximum Continuous current	1 A
Impedance	90 to 110 Ohm
Connection type	RJ45 CAT 5e STP (shielded)
Pin-out	8 wires + shielding
Pins Protected	All pins protected
Response time	<5 microseconds (with ODU)

Nominal discharge currents

Line to Line	500 A @ 8/20µs
Line to Ground	2000 A @ 8/20µs

Impulse Discharge Current

20000 A, 8/20 µs	1 operation minimum
10000 A, 8/20 µs	> 10 operations
2000 A, 10/350 µs	1 operation
200 A, 10/1000 µs	> 300 operations
200 A, 10/700 µs	> 500 operations

Impulse Spark-over

DC Spark-over ±20 % @ 100 V/s	150 V
100 V/µs	350 V
1000 V/µs	500 V
Capacitance	< 2 pF
DC Holdover Voltage	80V

Mechanical

Enclosure	Metal
Connection to bonding Network	Screw
Dimensions	150mm
Weight	220 gram (0.22Kg)

Environmental

Operating temperature	-40°C to 60°C
Storage temperature	-50°C to 70°C
Enclosure rating	IP67
Humidity	100% non condensing

Fast Ethernet CAT-5e cable repeater

Electrical

Compatible Interfaces	100BaseT
Data Rates	Up to 1000Mbps
Nominal Operational Voltage	48 VDC
Maximum Operational Voltage	60 VDC - 650 mA
Current consumption	0.5 A

Impedance	90 to 110 Ohm
Connection type	RJ45 CAT 5e STP (shielded)
Pin-out	8 wires + shielding

Mechanical

Enclosure	Metal
Connection to bonding Network	Screw
Dimensions	150mm
Weight	220 gram (0.22Kg)

Environmental

Operating temperature	-40°C to 60°C
Storage temperature	-50°C to 70°C
Enclosure rating	IP67
Humidity	100% non condensing

Safety

TUV	UL 60950-1, UL 60950-22, CAN/CSA C22.2 60950-1, CAN/CSA C22.2 60950-22
ETSI/IEC	EN/IEC 60950-1, EN/IEC 60950-22

EMC

FCC	CFR47 Class B, Part 15, Subpart B
ETSI	EN 300 386, EN 301 489-4, EN 301 489-1
CAN/CSA-AS/NZS	CISPR 22 Class B

Antenna Characteristics

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

The RADWIN 5000 HPMP may be operated with an integrated antenna attached to the ODU unit, or with an external antenna wired to the ODU via a N-type connectors. All cables and connections must be connected correctly to reduce losses. The required antenna impedance is 50Ω.

Appendix B

Wiring Specifications

ODU-PoE Cable (HBS and HSU)

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

The following table shows the connector pinout:

Table B-1: ODU-PoE RJ-45 Connector Pinout

Function	Color	PoE	ODU
Ethernet (RxN)	White/Green	1	1
Ethernet (RxT)	Green	2	2
Ethernet (TxT)	White/Orange	3	3
Ethernet (TxN)	Orange	6	6
Power (+)	Blue	4	4
Power (+)	White/Blue	5	5
Power (–)	White/Brown	7	7
Power (–)	Brown	8	8

HBS/HSS Unit Connection Pinout

Table B-2: HBS/HSS Unit Connection Pinout

<table>
<tr><th>Color</th><th>ODU RJ-45</th><th>HSS UNIT RJ-45</th></tr>
<tr><td>White/Green</td><td>1</td><td>1</td></tr>
<tr><td>Green</td><td colspan="2" rowspan="2">Not connected</td></tr>
<tr><td>White/Orange</td></tr>
<tr><td>Orange</td><td>6</td><td>6</td></tr>
<tr><td>Blue</td><td>4</td><td>4</td></tr>
<tr><td>White/Blue</td><td>5</td><td>5</td></tr>
</table>

Table B-2: HBS/HSS Unit Connection Pinout (Continued)

Color	ODU RJ-45	HSS UNIT RJ-45
White/Brown	7	7
Brown	8	8

User Port Connectors

LAN Port

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

Table B-3: Fast Ethernet Connector Pinout

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

DC Power Terminals

DC PoE

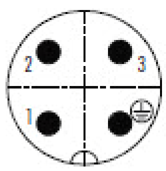
Table B-4: Terminal Block 2-pin -48VDC

Function	Pin
+	Right
–	Left

SU2-AC Power Terminal

The SU2-AC power port is a four pin male socket with pin assignments as follows:

Table B-5: SU2-AC power pin assignments



Pin	Wire Color	Function
1	Red	Line
2		Not used
3	Black	Neutral
4	Green or Green-Yellow	Ground

Appendix C

MIB Reference

Introduction

About the MIB

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

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

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

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

Terminology

The following terms are used in this appendix.

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

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

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

Interface API

Control Method

The RADWIN Manager application provides all the means to configure and monitor a RADWIN 5000 HPMP link, communicating with the SNMP agent in each ODU. Each SNMP agent contains data on each of the PoEs and ODUs in the link. Both agents communicate with each other over the air using a proprietary protocol.

Note

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

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

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

Community String

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

See **Table 4-3** for default Community strings.

Private MIB Structure

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

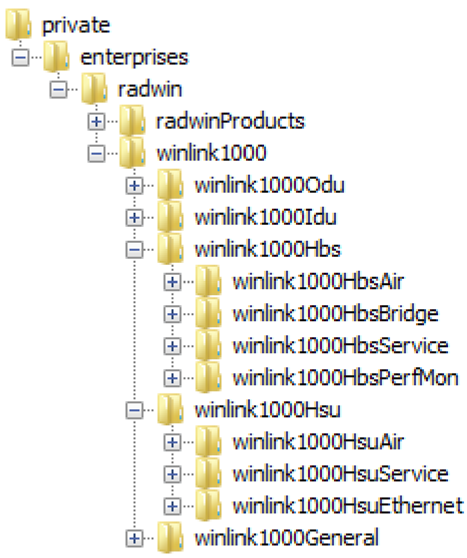


Figure C-1: Top Level Sections of the private MIB

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

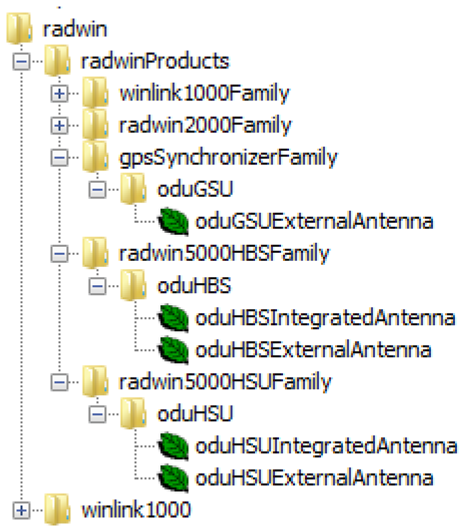


Figure C-2: Product MIB

The GpsSynchronizerFamily MIB defines the GSU.

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

MIB Parameters

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

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

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

Supported Variables from the RFC 1213 MIB

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

Name	OID	Type	Access	Description
ifIndex	.1.3.6.1.2.1.2.2.1.1.x[a]	Integer	RO	A unique value for each interface.Its value ranges between 1 and the value of ifNumber.The value for each interface must remain constant at least from one re-initialization of the entity's network management system to the next re-initialization.
ifDescr	.1.3.6.1.2.1.2.2.1.2	DisplayString	RO	A textual string containing information about the interface.This string should include the name of the manufacturer, the product name and the version of the hardware interface.
ifType	.1.3.6.1.2.1.2.2.1.3	Integer	RO	The type of interface, distinguished according to the physical/link protocol(s) immediately `below' the network layer in the protocol stack.

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

Name	OID	Type	Access	Description
ifSpeed	.1.3.6.1.2.1.2.2.1.5	Gauge	RO	An estimate of the interface's current bandwidth in bits per second.For interfaces which do not vary in bandwidth or for those where no accurate estimation can be made, this object should ontain the nominal bandwidth.
ifPhysAddress	.1.3.6.1.2.1.2.2.1.6	Phys-Address	RO	The interface's address at the protocol layer immediately `below' the network layer in the protocol stack. For interfaces which do not have such an address (e.g., a serial line), this object should contain an octet string of zero length.
ifAdminStatus	.1.3.6.1.2.1.2.2.1.7	Integer	RW	The desired state of the interface. The testing(3) state indicates that no operational packets can be passed.
ifOperStatus	.1.3.6.1.2.1.2.2.1.8	Integer	RO	The current operational state of the interface. The testing(3) state indicates that no operational packets can be passed.
ifInOctets	.1.3.6.1.2.1.2.2.1.10.x	Counter	RO	The total number of octets received on the interface, including framing characters.
ifInUcastPkts	.1.3.6.1.2.1.2.2.1.11.x	Counter	RO	The number of subnetwork-unicast packets delivered to a higher-layer protocol.
ifInNUcastPkts	.1.3.6.1.2.1.2.2.1.12.x	Counter	RO	The number of non-unicast (i.e., subnetwork-broadcast or subnetwork-multicast) packets delivered to a higher-layer protocol.
ifInErrors	.1.3.6.1.2.1.2.2.1.14.x	Counter	RO	The number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.
ifOutOctets	.1.3.6.1.2.1.2.2.1.16.x	Counter	RO	The total number of octets transmitted out of the interface, including framing characters.
ifOutUcastPkts	.1.3.6.1.2.1.2.2.1.17.x	Counter	RO	The total number of packets that higher-level protocols requested be transmitted to a subnetwork-unicast address, including those that were discarded or not sent.
ifOutNUcastPkts	.1.3.6.1.2.1.2.2.1.18.x	Counter	RO	The total number of packets that higher-level protocols requested be transmitted to a non-unicast (i.e., a subnetwork-broadcast or subnetwork-multicast) address, including those that were discarded or not sent.

a. x is the interface ID

Private MIB Parameters

Table C-2: Private MIB Parameters (Sheet 1 of 24)

Name	OID	Type	Access	Description
winlink1000OduAdmProductType	1.3.6.1.4.1.4458.1000.1.1.1	DisplayString	RO	ODU configuration description.
winlink1000OduAdmHwRev	1.3.6.1.4.1.4458.1000.1.1.2	DisplayString	RO	ODU Hardware Version.
winlink1000OduAdmSwRev	1.3.6.1.4.1.4458.1000.1.1.3	DisplayString	RO	ODU Software Version.
winlink1000OduAdmLinkName	1.3.6.1.4.1.4458.1000.1.1.4	DisplayString	RW	Link Name. A change is effective immediately.
winlink1000OduAdmResetCmd	1.3.6.1.4.1.4458.1000.1.1.5	Integer	RW	Reset Command. A set command with a value of 3 will cause a device reset. HBS only: A set command with a value of 4 will cause a device reset for the entire sector. The read value is always 0.
winlink1000OduAdmAddres	1.3.6.1.4.1.4458.1000.1.1.6	IPAddress	RW	ODU IP address. A change is effective after reset. The parameter is kept for backward compatibility. Using the alternative parameter: winlink1000OduAdmIpParamsCnfg is recommended.
winlink1000OduAdmMask	1.3.6.1.4.1.4458.1000.1.1.7	IPAddress	RW	ODU Subnet Mask. A change is effective after reset. The parameter is kept for backward compatibility. Using the alternative parameter: winlink1000OduAdmIpParamsCnfg is recommended.
winlink1000OduAdmGateway	1.3.6.1.4.1.4458.1000.1.1.8	IPAddress	RW	ODU default gateway. A change is effective after reset. The parameter is kept for backward compatibility. Using the alternative parameter: winlink1000OduAdmIpParamsCnfg is recommended.
winlink1000OduAdmBroadcast	1.3.6.1.4.1.4458.1000.1.1.10	Integer	RW	This parameter is reserved for the Manager application provided with the product.
winlink1000OduAdmHostsTable			N/A	Trap destinations table. Each trap destination is defined by an IP address and a UDP port. Up to 10 addresses can be configured.
winlink1000OduAdmHostsEntry			N/A	Trap destinations table entry. INDEX { winlink1000OduAdmHostsIndex }
winlink1000OduAdmHostsIndex			RO	Trap destinations table index.
winlink1000OduAdmHostsIp	1.3.6.1.4.1.4458.1000.1.1.12.1.2	IPAddress	RW	Trap destination IP address. A change is effective immediately.
winlink1000OduAdmHostsPort	1.3.6.1.4.1.4458.1000.1.1.12.1.3	Integer	RW	UDP port of the trap destination. A change is effective immediately.
winlink1000OduBuzzerAdminState	1.3.6.1.4.1.4458.1000.1.1.13	Integer	RW	This parameter controls the activation of the buzzer while the unit is in install mode. A change is effective immediately. The valid values are: disabled (0) enabledAuto (1) enabledConstantly(2) advancedAuto (3).
winlink1000OduProductId	1.3.6.1.4.1.4458.1000.1.1.14	DisplayString	RO	This parameter is reserved for the Manager application provided with the product.
winlink1000OduReadCommunity	1.3.6.1.4.1.4458.1000.1.1.15	DisplayString	RW	Read Community String. This parameter always returns ***** when retrieving its value. It is used by the Manager application to change the Read Community String. The SNMP agent accepts only encrypted values.
winlink1000OduReadWriteCommunity	1.3.6.1.4.1.4458.1000.1.1.16	DisplayString	RW	Read/Write Community String. This parameter always returns ***** when retrieving its value. It is used by the Manager application to change the Read/Write Community String. The SNMP agent accepts only encrypted values.
winlink1000OduTrapCommunity	1.3.6.1.4.1.4458.1000.1.1.17	DisplayString	RW	Trap Community String. This parameter is used by the Manager application to change the Trap Community String. The SNMP agent accepts only encrypted values.
winlink1000OduAdmSnmpAgentVersion	1.3.6.1.4.1.4458.1000.1.1.18	Integer	RO	Major version of the SNMP agent.

Table C-2: Private MIB Parameters (Sheet 2 of 24)

Name	OID	Type	Access	Description
winlink1000OduAdmRemoteSiteName	1.3.6.1.4.1.4458.1000.1.1.19	DisplayString	RO	Remote site name. Returns the same value as sysLocation parameter of the remote site.
winlink1000OduAdmSnmpAgentMinorVersion	1.3.6.1.4.1.4458.1000.1.1.20	Integer	RO	Minor version of the SNMP agent.
winlink1000OduAdmLinkPassword	1.3.6.1.4.1.4458.1000.1.1.21	DisplayString	RW	Link Password. This parameter always returns ***** when retrieving its value. It is used by the Manager application to change the Link Password. The SNMP agent accepts only encrypted values.
winlink1000OduAdmSiteLinkPassword	1.3.6.1.4.1.4458.1000.1.1.22	DisplayString	RW	Site Link Password. This parameter always returns ***** when retrieving its value. It is used by the Manager application to change the Link Password of the site. The SNMP agent accepts only encrypted values.
winlink1000OduAdmDefaultPassword	1.3.6.1.4.1.4458.1000.1.1.23	Integer	RO	This parameter indicates if the current Link Password is the default password.
winlink1000OduAdmConnectionType	1.3.6.1.4.1.4458.1000.1.1.24	Integer	RO	This parameter indicates if the Manager application is connected to the local ODU or to the remote ODU over the air. A value of 'unknown' indicates community string mismatch.
winlink1000OduAdmBackToFactorySettingsCmd	1.3.6.1.4.1.4458.1000.1.1.25	Integer	RW	Back to factory settings Command. A change is effective after reset. The read value is always 0.
winlink1000OduAdmIpParamsCnfg	1.3.6.1.4.1.4458.1000.1.1.26	DisplayString	RW	ODU IP address Configuration. The format is: <IP_Address>|<Subnet_Mask>|<Default_Gateway>|
winlink1000OduAdmVlanID	1.3.6.1.4.1.4458.1000.1.1.27	Integer	RW	VLAN ID. Valid values are 1 to 4094. Initial value is 0 meaning VLAN unaware.
winlink1000OduAdmVlanPriority	1.3.6.1.4.1.4458.1000.1.1.28	Integer	RW	VLAN Priority. 0 is lowest priority 7 is highest priority.
winlink1000OduAdmSN	1.3.6.1.4.1.4458.1000.1.1.29	DisplayString	RO	ODU Serial Number
winlink1000OduAdmProductName	1.3.6.1.4.1.4458.1000.1.1.30	DisplayString	RO	This is the product name as it exists at EC
winlink1000OduAdmActivationKey	1.3.6.1.4.1.4458.1000.1.1.31	DisplayString	RW	Activates a general key.
winlink1000OduAdmRmtPermittedOduType	1.3.6.1.4.1.4458.1000.1.1.32	DisplayString	RW	Mobile Application: permitted partner OduType.
winlink1000OduAdmCpuID	1.3.6.1.4.1.4458.1000.1.1.33	Integer	RO	CPU ID
winlink1000OduSrvMode	1.3.6.1.4.1.4458.1000.1.2.1	Integer	RW	System mode. The only values that can be set are installMode and slaveMode; normalMode reserved to the Manager application provided with the product. A change is effective after link re-synchronization.
winlink1000OduSrvBridging	1.3.6.1.4.1.4458.1000.1.2.3	Integer	RO	Bridging Mode. Valid values are: disabled (0) enabled (1).
winlink1000OduSrvRingLinkMode			RW	Mode of the link regarding ring topology.
winlink1000OduSrvRingTopologySupported			RO	Ring Topology options are: supported not supported
winlink1000OduSrvRingVlanIdTable			N/A	Ring VLAN IDs table.
winlink1000OduSrvRingVlanIdEntry			N/A	VLAN ID of the internal ring messages. Valid values are 1 to 4094. Initial value is 0 meaning VLAN unaware. INDEX { winlink1000OduSrvRingVlanIdIndex }
winlink1000OduSrvRingVlanIdIndex			RO	Index of VLAN ID of the internal ring messages.
winlink1000OduSrvRingVlanId			RW	VLAN ID of the internal ring messages. Valid values are 1 to 4094. Initial value is 0 meaning VLAN unaware.
winlink1000OduSrvRingEthStatus			RO	Represents the Ethernet service blocking state of a Rings link
winlink1000OduSrvRingMaxAllowedTimeFromLastRpm			RW	Defines the minimal time (in ms) required for determination of ring failure.
winlink1000OduSrvRingWTR			RW	Defines the minimal time (in ms) required for ring recovery.
winlink1000OduSrvQoSMode			RW	Mode of QoS feature.

Table C-2: Private MIB Parameters (Sheet 3 of 24)

Name	OID	Type	Access	Description
winlink1000OduSrvQoSConfTable			N/A	QoS configuration table.
winlink1000OduSrvQoSConfEntry			N/A	QoS configuration table. INDEX { winlink1000OduSrvQoSConfIndex }
winlink1000OduSrvQoSConfIndex			RO	Index of QoS Configuration.
winlink1000OduSrvConfVlanQGroups			RO	Frames classification according to VLAN Priority IDs.
winlink1000OduSrvConfDiffservQGroups			RO	Frames classification according to Diffserv.
winlink1000OduSrvConfQueMir			RW	Desired Private MIR.
winlink1000OduSrvConfQueWeight			RW	QoS queueu's weights in percent.
winlink1000OduSrvQoSVlanQGroupsSetStr			RW	Frames classification according to VLAN IDs string for set.
winlink1000OduSrvQoSDiffservQGroupsSetStr			RW	Frames classification according to Diffserv IDs string for set.
winlink1000OduSrvQoSMaxRTQuePercent			RO	Maximal percent for RT & NRT queues.
winlink1000OduSrvVlanSupport			RO	ODU Ethernet port VLAN support and configuration availability indication. 1 - ODU VLAN Functionality Not Supported 2 - ODU VLAN Functionality Supported 3 - ODU VLAN Functionality Supported and Available
winlink1000OduSrvVlanIngressMode			RW	ODU Ethernet port ingress VLAN mode.
winlink1000OduSrvVlanEgressMode			RW	ODU Ethernet port egress VLAN mode.
winlink1000OduSrvEgressTag			RW	ODU ethernet port egress VLAN tag. Right most digit is Vlan priority (0-7) other digits compose Vlan Id (2-4094)
winlink1000OduSrvEgressProviderTag			RW	ODU ethernet port egress Provider VLAN tag. Right most digit is Vlan priority (0-7) other digits compose Vlan Id (2-4094)
winlink1000OduSrvVlanIngressAllowedVIDs			RW	ODU ethernet port VLAN IDs that will not be filtered on ingress. w|w|w|w|w|w|w|w| (where w = {0-4094} and w != 1)
winlink1000OduSrvVlanDisable			RW	Disable VLAN functionality. The following values can be set: 3 - Disable ODU & IDU VLAN Configurations.
winlink1000OduEthernetRemainingRate	1.3.6.1.4.1.4458.1000.1.3.1	Integer	RO	Current Ethernet bandwidth in bps.
winlink1000OduEthernetIfTable			N/A	ODU Ethernet Interface table.
winlink1000OduEthernetIfEntry			N/A	ODU Ethernet Interface table entry. INDEX { winlink1000OduEthernetIfIndex }
winlink1000OduEthernetIfIndex	1.3.6.1.4.1.4458.1000.1.3.2.1.1	Integer	RO	ODU Ethernet Interface Index.
winlink1000OduEthernetIfAddress	1.3.6.1.4.1.4458.1000.1.3.2.1.5	DisplayString	RO	ODU MAC address.
winlink1000OduEthernetIfAdminStatus	1.3.6.1.4.1.4458.1000.1.3.2.1.6	Integer	RW	Required state of the interface.
winlink1000OduEthernetIfOperStatus	1.3.6.1.4.1.4458.1000.1.3.2.1.7	Integer	RO	Current operational state of the interface.
winlink1000OduEthernetIfFailAction	1.3.6.1.4.1.4458.1000.1.3.2.1.8	Integer	RW	Failure action of the interface.
winlink1000OduEthernetNumOfPorts	1.3.6.1.4.1.4458.1000.1.3.3	Integer	RO	Number of ODU network interfaces.
winlink1000OduEthernetGbeSupported	1.3.6.1.4.1.4458.1000.1.3.4	Integer	RO	
winlink1000OduBridgeBasePortTable			N/A	ODU Bridge Ports table.
winlink1000OduBridgeBasePortEntry			N/A	ODU Bridge Ports table entry. INDEX { winlink1000OduBridgeBasePortIndex }
winlink1000OduBridgeBasePortIndex			RO	ODU Bridge Port Number.
winlink1000OduBridgeBaseIfIndex			RO	IfIndex corresponding to ODU Bridge port.
winlink1000OduBridgeTpMode	1.3.6.1.4.1.4458.1000.1.4.4.101	Integer	RW	ODU bridge mode. A change is effective after reset. Valid values: hubMode (0) bridgeMode (1).
winlink1000OduBridgeTpPortTable			N/A	ODU Transparent Bridge Ports table.
winlink1000OduBridgeTpPortEntry			N/A	ODU Transparent Bridge Ports table entry. INDEX { winlink1000OduBridgeTpPortIndex }
winlink1000OduBridgeTpPortIndex			RO	ODU Transparent Bridge Port Number.
winlink1000OduBridgeTpPortInFrames	1.3.6.1.4.1.4458.1000.1.4.4.3.1.3	Counter	RO	Number of frames received by this port.

Table C-2: Private MIB Parameters (Sheet 4 of 24)

Name	OID	Type	Access	Description
winlink1000OduBridgeTpPortOutFrames	1.3.6.1.4.1.4458.1000.1.4.4.3.1.4	Counter	RO	Number of frames transmitted by this port.
winlink1000OduBridgeTpPortInBytes	1.3.6.1.4.1.4458.1000.1.4.4.3.1.101	Counter	RO	Number of bytes received by this port.
winlink1000OduBridgeTpPortOutBytes	1.3.6.1.4.1.4458.1000.1.4.4.3.1.102	Counter	RO	Number of bytes transmitted by this port.
winlink1000OduBridgeConfigMode	1.3.6.1.4.1.4458.1000.1.4.4.102	Integer	RO	ODU bridge configuration mode
winlink1000OduAirFreq	1.3.6.1.4.1.4458.1000.1.5.1	Integer	RW	Installation Center Frequency. Valid values are product dependent. A change is effective after link re-synchronization.
winlink1000OduAirDesiredRate	1.3.6.1.4.1.4458.1000.1.5.2	Integer	RW	Deprecated parameter actual behavior is read-only. Required Air Rate. For Channel Bandwidth of 20 10 5 MHz divide the value by 1 2 4 respectively.
winlink1000OduAirSSID	1.3.6.1.4.1.4458.1000.1.5.3	DisplayString	RW	Reserved for the Manager application provided with the product. The Sector ID in Point-To-Multi-Point systems.
winlink1000OduAirTxPower	1.3.6.1.4.1.4458.1000.1.5.4	Integer	RW	Required Transmit power in dBm . This is a nominal value while the actual transmit power includes additional attenuation. The min and max values are product specific. A change is effective immediately.
winlink1000OduAirSesState	1.3.6.1.4.1.4458.1000.1.5.5	Integer	RO	Current Link State. The value is active (3) during normal operation.
winlink1000OduAirMstrSlv	1.3.6.1.4.1.4458.1000.1.5.6	Integer	RO	This parameter indicates if the device was automatically selected into the radio link master or slave. The value is undefined if there is no link. The value is relevant only for point to point systems.
winlink1000OduAirResync	1.3.6.1.4.1.4458.1000.1.5.8	Integer	RW	Setting this parameter to 1 will cause the link to restart the synchronization process.
winlink1000OduAirRxPower	1.3.6.1.4.1.4458.1000.1.5.9.1	Integer	RO	Received Signal Strength in dBm. Relevant only for point to point systems.
winlink1000OduAirTotalFrames	1.3.6.1.4.1.4458.1000.1.5.9.2	Counter	RO	Total number of radio frames.
winlink1000OduAirBadFrames	1.3.6.1.4.1.4458.1000.1.5.9.3	Counter	RO	Total number of received radio frames with CRC error. The value is relevant only for point to point systems .
winlink1000OduAirCurrentRate	1.3.6.1.4.1.4458.1000.1.5.9.4	Integer	RO	Deprecated parameter. Actual rate of the air interface in Mbps. For Channel Bandwidth of 20 10 5 MHz divide the value by 1 2 4 respectively.
winlink1000OduAirCurrentRateIdx	1.3.6.1.4.1.4458.1000.1.5.9.5	Integer	RO	Index of current air rate.
winlink1000OduAirTxPower36	1.3.6.1.4.1.4458.1000.1.5.10	Integer	RW	Deprecated parameter. Actual behavior is read-only.
winlink1000OduAirTxPower48	1.3.6.1.4.1.4458.1000.1.5.11	Integer	RW	Deprecated parameter. Actual behavior is read-only.
winlink1000OduAirCurrentTxPower	1.3.6.1.4.1.4458.1000.1.5.12	Integer	RO	Current Transmit Power in dBm. This is a nominal value while the actual transmit power includes additional attenuation.
winlink1000OduAirMinFrequency	1.3.6.1.4.1.4458.1000.1.5.13	Integer	RO	Minimum center frequency in MHz.
winlink1000OduAirMaxFrequency	1.3.6.1.4.1.4458.1000.1.5.14	Integer	RO	Maximum center frequency in MHz.
winlink1000OduAirFreqResolution	1.3.6.1.4.1.4458.1000.1.5.15	Integer	RO	Center Frequency resolution. Measured in MHz if value < 100 otherwise in KHz.
winlink1000OduAirCurrentFreq	1.3.6.1.4.1.4458.1000.1.5.16	Integer	RO	Current Center Frequency. Measured in MHz if center frequency resolution value < 100 otherwise in KHz.
winlink1000OduAirNumberOfChannels	1.3.6.1.4.1.4458.1000.1.5.17	Integer	RO	Number of channels that can be used.
winlink1000OduAirChannelsTable			N/A	Table of channels used by automatic channels selection (ACS).
winlink1000OduAirChannelsEntry			N/A	ACS channels table entry. INDEX { winlink1000OduAirChannelsIndex }
winlink1000OduAirChannelsIndex			RO	Channel Index.
winlink1000OduAirChannelsFrequency			RO	Channel frequency in MHz.

Table C-2: Private MIB Parameters (Sheet 5 of 24)

Name	OID	Type	Access	Description
winlink1000OduAirChannelsOperState			RW	Channel state. Can be set by the user. Automatic Channel Selection uses channels that are AirChannelsOperState enabled and AirChannelsAvail enabled. A change is effective after link re-synchronization. Valid values: disabled (0) enabled (1). Rewriteable only in Point-To-Point products.
winlink1000OduAirChannelsAvail			RO	Channel state. Product specific and cannot be changed by the user. Automatic Channel Selection uses channels that are AirChannelsOperState enabled and AirChannelsAvail enabled. Valid values: disabled (0) enabled (1).
winlink1000OduAirChannelsDefaultFreq			RO	Default channel's availability for all CBWs. The valid values are: forbidden (0) available (1).
winlink1000OduAirDfsState	1.3.6.1.4.1.4458.1000.1.5.19	Integer	RO	Radar detection state. Valid values: disabled (0) enabled (1).
winlink1000OduAirAutoChannelSelectionState	1.3.6.1.4.1.4458.1000.1.5.20	Integer	RO	Deprecated parameter. Indicating Automatic Channel Selection availability at current channel bandwidth. Valid values: disabled (0) enabled (1).
winlink1000OduAirEnableTxPower	1.3.6.1.4.1.4458.1000.1.5.21	Integer	RO	Indicating Transmit power configuration enabled or disabled.
winlink1000OduAirMinTxPower	1.3.6.1.4.1.4458.1000.1.5.22	Integer	RO	Minimum Transmit power in dBm.
winlink1000OduAirMaxTxPowerTable			N/A	Table of Maximum transmit power per air rate in dBm.
winlink1000OduAirMaxTxPowerEntry			N/A	Maximum Transmit power table entry. INDEX { winlink1000OduAirMaxTxPowerIndex }
winlink1000OduAirMaxTxPowerIndex	1.3.6.1.4.1.4458.1000.1.5.23.1.1	Integer	RO	Air interface rate index.
winlink1000OduAirMaxTxPower	1.3.6.1.4.1.4458.1000.1.5.23.1.2	Integer	RO	Maximum Transmit power in dBm.
winlink1000OduAirChannelBandwidth	1.3.6.1.4.1.4458.1000.1.5.24	Integer	RW	Channel bandwidth in KHz. A change is effective after reset.
winlink1000OduAirChannelBWTable			N/A	Channel Bandwidths table.
winlink1000OduAirChannelBWEntry			N/A	Channel Bandwidth table entry. INDEX { winlink1000OduAirChannelBWIndex }
winlink1000OduAirChannelBWIndex	1.3.6.1.4.1.4458.1000.1.5.25.1.1	Integer	RO	Channel Bandwidth index.
winlink1000OduAirChannelBWAvail	1.3.6.1.4.1.4458.1000.1.5.25.1.2	Integer	RO	Channel Bandwidth availability product specific. Options are: Not supported supported with manual channel selection supported with Automatic Channel Selection.
winlink1000OduAirChannelsAdminState	1.3.6.1.4.1.4458.1000.1.5.25.1.3	DisplayString	RO	Channels' availability per CBW.
winlink1000OduAirChannelBWHSSATDDConflictPerCBW	1.3.6.1.4.1.4458.1000.1.5.25.1.4	Integer	RO	Indication for possible Link drop per CBW due to conflict between HSS and ATDD.
winlink1000OduAirChannelBWMinRatioForSupporting	1.3.6.1.4.1.4458.1000.1.5.25.1.5	Integer	RO	Minimal TX ratio that may be used by the HSM and still enable proper operation of the aforementioned CBW.
winlink1000OduAirChannelBWMaxRatioForSupporting	1.3.6.1.4.1.4458.1000.1.5.25.1.6	Integer	RO	Maximal TX ratio that may be used by the HSM and still enable proper operation of the aforementioned CBW.
winlink1000OduAirRFD	1.3.6.1.4.1.4458.1000.1.5.26	Integer	RO	Current radio frame duration in microseconds.
winlink1000OduAirRatesTable			N/A	Air Rate indexes table for current channel bandwidth.
winlink1000OduAirRatesEntry			N/A	Air Rate indexes table entry. INDEX { winlink1000OduAirRatesIndex }
winlink1000OduAirRatesIndex			RO	Air Rate index.
winlink1000OduAirRatesAvail			RO	Air Rate availability depending on air interface conditions.

Table C-2: Private MIB Parameters (Sheet 6 of 24)

Name	OID	Type	Access	Description
winlink1000OduAirDesiredRateIdx	1.3.6.1.4.1.4458.1000.1.5.28	Integer	RW	Required Air Rate index. 0 reserved for Adaptive Rate. A change is effective immediately after Set operation to the master side while the link is up.
winlink1000OduAirLinkDistance	1.3.6.1.4.1.4458.1000.1.5.29	Integer	RO	Link distance in meters. A value of -1 indicates an illegal value and is also used when a link is not established.
winlink1000OduAirLinkWorkingMode	1.3.6.1.4.1.4458.1000.1.5.30	Integer	RO	Link working mode as a result of comparing versions of both sides of the link. Possible modes are: Unknown - no link Normal - versions on both sides are identical with full compatibility with restricted compatibility or versions on both sides are different with software upgrade or versions incompatibility.
winlink1000OduAirMajorLinkIfVersion	1.3.6.1.4.1.4458.1000.1.5.31	Integer	RO	Major link interface version
winlink1000OduAirMinorLinkIfVersion	1.3.6.1.4.1.4458.1000.1.5.32	Integer	RO	Minor link interface version
winlink1000OduAirHssDesiredOpState	1.3.6.1.4.1.4458.1000.1.5.40.1	Integer	RW	Required Hub Site Synchronization operating state.
winlink1000OduAirHssCurrentOpState	1.3.6.1.4.1.4458.1000.1.5.40.2	Integer	RO	Current Hub Site Synchronization operating state.
winlink1000OduAirHssSyncStatus	1.3.6.1.4.1.4458.1000.1.5.40.3	Integer	RO	Hub Site Synchronization sync status.
winlink1000OduAirHssExtPulseStatus	1.3.6.1.4.1.4458.1000.1.5.40.4	Integer	RO	Hub Site Synchronization external pulse detection status. In GSS mode: if generating then 1PSP is auto generated by the GSS Unit. if generatingAndDetecting then 1PSP is generated by GPS satellites signal.
winlink1000OduAirHssExtPulseType	1.3.6.1.4.1.4458.1000.1.5.40.5	Integer	RO	Hub Site Synchronization external pulse type.
winlink1000OduAirHssDesiredExtPulseType	1.3.6.1.4.1.4458.1000.1.5.40.6	Integer	RW	Hub Site Synchronization required external pulse type. Valid values for read write: {typeA(2) typeB(3) typeC(4) typeD(5) typeE(6) typeF(7)}. Valid value for read only: {notApplicable(1)}.
winlink1000OduAirHssRfpTable			N/A	ODU Radio Frame Patterns (RFP) Table.
winlink1000OduAirHssRfpEntry			N/A	ODU RFP Table entry. INDEX { winlink1000OduAirHssRfpIndex }
winlink1000OduAirHssRfpIndex	1.3.6.1.4.1.4458.1000.1.5.40.7.1.1	Integer	RO	ODU RFP Table index. The index represent the Radio Frame Pattern: typeA(2) typeB(3) typeC(4) typeD(5) typeE(6).
winlink1000OduAirHssRfpEthChannelBW5MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.2	Integer	RO	Represents the compatibility of Ethernet service under Channel BW of 5MHz in the specific Radio Frame Pattern.
winlink1000OduAirHssRfpTdmChannelBW5MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.3	Integer	RO	Represents the compatibility of TDM service under Channel BW of 5MHz in the specific Radio Frame Pattern.
winlink1000OduAirHssRfpEthChannelBW10MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.4	Integer	RO	Represents the compatibility of Ethernet service under Channel BW of 10MHz in the specific Radio Frame Pattern.
winlink1000OduAirHssRfpTdmChannelBW10MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.5	Integer	RO	Represents the compatibility of TDM service under Channel BW of 10MHz in the specific Radio Frame Pattern.
winlink1000OduAirHssRfpEthChannelBW20MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.6	Integer	RO	Represents the compatibility of Ethernet service under Channel BW of 20MHz in the specific Radio Frame Pattern.
winlink1000OduAirHssRfpTdmChannelBW20MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.7	Integer	RO	Represents the compatibility of TDM service under Channel BW of 20MHz in the specific Radio Frame Pattern.
winlink1000OduAirHssRfpEthChannelBW40MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.8	Integer	RO	Represents the compatibility of Ethernet service under Channel BW of 40MHz in the specific Radio Frame Pattern.
winlink1000OduAirHssRfpTdmChannelBW40MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.9	Integer	RO	Represents the compatibility of TDM service under Channel BW of 40MHz in the specific Radio Frame Pattern.

Table C-2: Private MIB Parameters (Sheet 7 of 24)

Name	OID	Type	Access	Description
winlink1000OduAirHssRfpStr	1.3.6.1.4.1.4458.1000.1.5.40.8	DisplayString	RO	Hub Site Synchronization supported patterns
winlink1000OduAirHSSHsmID	1.3.6.1.4.1.4458.1000.1.5.40.9	Integer	RO	A unique ID which is common to the HSM and all its collocated ODUs
winlink1000OduAirHssTime	1.3.6.1.4.1.4458.1000.1.5.40.10	DisplayString	RO	Hub Site Synchronization GPS time
winlink1000OduAirHssLatitude	1.3.6.1.4.1.4458.1000.1.5.40.11	DisplayString	RO	Hub Site Synchronization GPS Latitude
winlink1000OduAirHssNSIndicator	1.3.6.1.4.1.4458.1000.1.5.40.12	DisplayString	RO	Hub Site Synchronization GPS N/S Indicator
winlink1000OduAirHssLongitude	1.3.6.1.4.1.4458.1000.1.5.40.13	DisplayString	RO	Hub Site Synchronization GPS Longitude
winlink1000OduAirHssEWIndicator			RO	Hub Site Synchronization GPS E/W Indicator
winlink1000OduAirHssNumSatellites			RO	Hub Site Synchronization GPS Number of satellites
winlink1000OduAirHssAltitude			RO	Hub Site Synchronization GPS Altitude
winlink1000OduAirHssRfpPhase			RW	Hub Site Synchronization GPS RFP phase
winlink1000OduAirLockRemote	1.3.6.1.4.1.4458.1000.1.5.41	Integer	RW	This parameter enables locking the link with a specific ODU. The following values can be set: Unlock (default) - The ODU is not locked on a specific remote ODU. Unlock can only be performed when the link is not connected. Lock - The ODU is locked on a specific remote ODU. Lock can only be performed when the link is active.
winlink1000OduAirAntennaGain	1.3.6.1.4.1.4458.1000.1.5.42	Integer	RW	Current Antenna Gain in 0.1 dBi resolution. User defined value for external antenna. Legal range: MinAntennaGain<AntennaGain<MaxAntennaGain.
winlink1000OduAirFeederLoss	1.3.6.1.4.1.4458.1000.1.5.43	Integer	RW	Current Feeder Loss in 0.1 dBm resolution. User defined value for external antenna.
winlink1000OduAirMaxAntennaGain	1.3.6.1.4.1.4458.1000.1.5.44	Integer	RO	Maximum allowed Antenna Gain in 0.1 dBi resolution.
winlink1000OduAirMinAntennaGain	1.3.6.1.4.1.4458.1000.1.5.45	Integer	RO	Minimum allowed Antenna Gain in 0.1 dBi resolution.
winlink1000OduAirMaxEIRP	1.3.6.1.4.1.4458.1000.1.5.46	Integer	RO	Maximum EIRP value as defined by regulation in 0.1 dBm resolution.
winlink1000OduAirAntennaGainConfigSupport	1.3.6.1.4.1.4458.1000.1.5.47	Integer	RO	Antenna Gain Configurability options are product specific: supported not supported.
winlink1000OduAirAntennaType	1.3.6.1.4.1.4458.1000.1.5.48	Integer	RW	External Antenna Type: Monopolar or Bipolar.
winlink1000OduAirRssBalance	1.3.6.1.4.1.4458.1000.1.5.49	Integer	RO	RSS balance. Relation between RSS in radio 1 and RSS in radio 2.
winlink1000OduAirTotalTxPower	1.3.6.1.4.1.4458.1000.1.5.50	Integer	RO	Total Transmit Power in dBm. This is a nominal value While the actual transmit power includes additional attenuation.
winlink1000OduAirInstallFreqAndCBW	1.3.6.1.4.1.4458.1000.1.5.51	DisplayString	RW	Installation frequency Channel BW. Relevant in point to point systems.
winlink1000OduAirDFStype	1.3.6.1.4.1.4458.1000.1.5.52	Integer	RO	DFS regulation type.
winlink1000OduAirComboSubBandTable			N/A	ODU Multi-band Sub Bands Table.
winlink1000OduAirComboSubBandEntry			N/A	ODU Multi-band Sub Bands Table entry. INDEX { winlink1000OduAirComboSubBandIndex }
winlink1000OduAirComboSubBandIndex	1.3.6.1.4.1.4458.1000.1.5.53.1.1.1	Integer	RO	ODU Multi-band sub bands table index.
winlink1000OduAirComboSubBandId	1.3.6.1.4.1.4458.1000.1.5.53.1.1.2	DisplayString	RO	Represents the Multi-band sub band ID.
winlink1000OduAirComboSubBandDescription	1.3.6.1.4.1.4458.1000.1.5.53.1.1.3	DisplayString	RO	Multi-band sub band description.
winlink1000OduAirComboSubBandInstallFreq	1.3.6.1.4.1.4458.1000.1.5.53.1.1.4	Integer	RO	Represents the Multi-band sub band installation frequency in KHz.
winlink1000OduAirComboSubBandAdminState	1.3.6.1.4.1.4458.1000.1.5.53.1.1.5	Integer	RO	Represents the Multi-band sub band administrative state.
winlink1000OduAirComboSubBandInstallationAllowed	1.3.6.1.4.1.4458.1000.1.5.53.1.1.6	Integer	RO	Reflects if the Multi-band sub band allowes installtion.
winlink1000OduAirComboFrequencyBandId	1.3.6.1.4.1.4458.1000.1.5.53.1.1.7	Integer	RO	Reflects the frequency band Id.
winlink1000OduAirComboSubBandChannelBW5AdminState	1.3.6.1.4.1.4458.1000.1.5.53.1.1.8	DisplayString	RO	Reflects the CBW 5MHz admin state vector.
winlink1000OduAirComboSubBandChannelBW10AdminState	1.3.6.1.4.1.4458.1000.1.5.53.1.1.9	DisplayString	RO	Reflects the CBW 10MHz admin state vector.

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Name	OID	Type	Access	Description
winlink1000OduAirComboSubBandChannelBW20AdminState	1.3.6.1.4.1.4458.1000.1.5.53.1.1.10	DisplayString	RO	Reflects the CBW 20MHz admin state vector.
winlink1000OduAirComboSubBandChannelBW40AdminState	1.3.6.1.4.1.4458.1000.1.5.53.1.1.11	DisplayString	RO	Reflects the CBW 40MHz admin state vector.
winlink1000OduAirComboSubBandAllowableChannels	1.3.6.1.4.1.4458.1000.1.5.53.1.1.12	DisplayString	RO	Reflects the allowable channels vector.
winlink1000OduAirComboSubBandChannelBWAvail	1.3.6.1.4.1.4458.1000.1.5.53.1.1.13	DisplayString	RO	Reflects the available CBWs vector.
winlink1000OduAirComboSubBandChannelBandwidth	1.3.6.1.4.1.4458.1000.1.5.53.1.1.14	Integer	RO	Reflects the sub-band default channel bandwidth.
winlink1000OduAirComboSubBandMinFreq	1.3.6.1.4.1.4458.1000.1.5.53.1.1.15	Integer	RO	Reflects the sub-band default minimal frequency.
winlink1000OduAirComboSubBandMaxFreq	1.3.6.1.4.1.4458.1000.1.5.53.1.1.16	Integer	RO	Reflects the sub-band default maximal frequency.
winlink1000OduAirComboSubBandFrequencyResolution	1.3.6.1.4.1.4458.1000.1.5.53.1.1.17	Integer	RO	Reflects the sub-band frequency resolution.
winlink1000OduAirComboSubBandDefaultChannelList	1.3.6.1.4.1.4458.1000.1.5.53.1.1.18	DisplayString	RO	Reflects the default channel list vector.
winlink1000OduAirComboSubBandDfsState	1.3.6.1.4.1.4458.1000.1.5.53.1.1.19	Integer	RO	Reflects the sub-band DFS state.
winlink1000OduAirComboNumberOfSubBands	1.3.6.1.4.1.4458.1000.1.5.53.2	Integer	RO	Represents the number of Multi-band sub bands.
winlink1000OduAirComboSwitchSubBand	1.3.6.1.4.1.4458.1000.1.5.53.3	DisplayString	RW	Switch sub band operation with a given sub band ID. The get operation retrieves the current sub band ID.
winlink1000OduAirComboCurrentSubBandDesc	1.3.6.1.4.1.4458.1000.1.5.53.4	DisplayString	RO	Current Sub Band description.
winlink1000OduAirInternalMaxRate	1.3.6.1.4.1.4458.1000.1.5.54	Integer	RO	Max Ethernet throughput of the site (in Kpbs).
winlink1000OduAirCapacityDirection	1.3.6.1.4.1.4458.1000.1.5.55	Integer	RW	Capacity direction of the site.
winlink1000OduAirSpectrumAnalysisOperState	1.3.6.1.4.1.4458.1000.1.5.56.1	Integer	RW	Spectrum Analysis operation state. The configurable values are Spectrum Analysis Stop Start and Restart. Not Supported value indicates that the feature is not supported on the device. Not Supported is not a configurable state.
winlink1000OduAirRxPowerAntennaA	1.3.6.1.4.1.4458.1000.1.5.56.2	Integer	RO	Received Signal Strength in dBm of Antenna A.
winlink1000OduAirRxPowerAntennaB	1.3.6.1.4.1.4458.1000.1.5.56.3	Integer	RO	Received Signal Strength in dBm of Antenna B.
winlink1000OduAirNumberOfSpectrumChannels	1.3.6.1.4.1.4458.1000.1.5.56.4	Integer	RO	Represents the number of Spectrum Channels.
winlink1000OduAirSpectrumChannelTable			N/A	ODU Spectrum Analysis Channel Table.
winlink1000OduAirSpectrumChannelTableEntry			N/A	ODU Spectrum Analysis Channel Table entry. INDEX { winlink1000OduAirSpectrumChannelIndex }
winlink1000OduAirSpectrumChannelIndex	1.3.6.1.4.1.4458.1000.1.5.56.5.1.1	Integer	RO	ODU Spectrum Channel index.
winlink1000OduAirSpectrumChannelFrequency	1.3.6.1.4.1.4458.1000.1.5.56.5.1.2	Integer	RO	ODU Spectrum Channel frequency in MHz.
winlink1000OduAirSpectrumChannelScanned	1.3.6.1.4.1.4458.1000.1.5.56.5.1.3	Integer	RO	
winlink1000OduAirSpectrumChannelScanningTimestamp	1.3.6.1.4.1.4458.1000.1.5.56.5.1.4	TimeTicks	RO	Channel last scan timestamp in hundredths of a second since device up time. If the channel was not scanned than the return value will be 0.
winlink1000OduAirSpectrumChannelLastNFAntennaA	1.3.6.1.4.1.4458.1000.1.5.56.5.1.5	Integer	RO	Normalized Noise Floor value in dBm - of Antenna A - (including 2 neighbor frequencies).
winlink1000OduAirSpectrumChannelLastNFAntennaB	1.3.6.1.4.1.4458.1000.1.5.56.5.1.6	Integer	RO	Normalized Noise Floor value in dBm - of Antenna B - (including 2 neighbor frequencies).
winlink1000OduAirSpectrumChannelAverageNFAntennaA	1.3.6.1.4.1.4458.1000.1.5.56.5.1.7	Integer	RO	Average normalized Noise Floor value in dBm - of Antenna A - over all dwells.
winlink1000OduAirSpectrumChannelAverageNFAntennaB	1.3.6.1.4.1.4458.1000.1.5.56.5.1.8	Integer	RO	Average normalized Noise Floor value in dBm - of Antenna B - over all dwells.
winlink1000OduAirSpectrumChannelMaxNFAntennaA	1.3.6.1.4.1.4458.1000.1.5.56.5.1.9	Integer	RO	Max normalized Noise Floor value in dBm - of Antenna A - over all dwells.
winlink1000OduAirSpectrumChannelMaxNFAntennaB	1.3.6.1.4.1.4458.1000.1.5.56.5.1.10	Integer	RO	Max normalized Noise Floor value in dBm - of Antenna B - over all dwells.
winlink1000OduAirSpectrumChannelCACPerformed	1.3.6.1.4.1.4458.1000.1.5.56.5.1.11	Integer	RO	

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Name	OID	Type	Access	Description
winlink1000OduAirSpectrumChannelLastCACTimestamp	1.3.6.1.4.1.4458.1000.1.5.56.5.1.12	TimeTicks	RO	Last CAC performed timestamp in hundredths of a second since device up time. If no CAC has performed on the channel the return value will be 0.
winlink1000OduAirSpectrumChannelRadarDetected	1.3.6.1.4.1.4458.1000.1.5.56.5.1.13	Integer	RO	
winlink1000OduAirSpectrumChannelRadarDetectionTimestamp	1.3.6.1.4.1.4458.1000.1.5.56.5.1.14	TimeTicks	RO	Last Radar Detection timestamp in hundredths of a second since device up time. If no Radar has detected on the channel the return value will be 0.
winlink1000OduAirSpectrumChannelAvailable	1.3.6.1.4.1.4458.1000.1.5.56.5.1.15	Integer	RO	
winlink1000OduAirSpectrumChannelMaxBeaconRss	1.3.6.1.4.1.4458.1000.1.5.56.5.1.16	Integer	RO	The max RSS value of a received beacon on the specific channel in dBm.
winlink1000OduAirSpectrumChannelCompressed	1.3.6.1.4.1.4458.1000.1.5.56.5.1.17	OctetString	RO	Compress all the Spectrum data per channel into one variable. Frequency (4 bytes) Scanned (1 byte) Timestamp (4 bytes) Last NF Antenna A (1 byte) Last NF Antenna B (1 byte) Avg NF Antenna A (1 byte) Avg NF Antenna B (1 byte) Max NF Antenna A (1 byte) Max NF Antenna B (1 byte) CAC Performed (1 byte) Last CAC Timestamp (4 bytes) Radar Detected (1 byte) Radar Detected Timestamp (4 bytes) Channel Available (1 byte) Max Beacon RSS (1 byte).
winlink1000OduAirChipMinMaxFreq	1.3.6.1.4.1.4458.1000.1.5.56.6	DisplayString	RO	The minimum and maximum frequencies in MHz which the chip supports.
winlink1000OduAirSpectrumAnalysisTimeout		Integer	RW	Spectrum analysis timeout in seconds.
winlink1000OduAirAntConfAndRatesStatus	1.3.6.1.4.1.4458.1000.1.5.57	Integer	RO	Description: Antenna configuration and Rates status (1 = Single antenna with single data stream 2 = Dual antenna with single data stream 3 = Dual antenna with dual data stream).
winlink1000OduAirDualAntTxMode	1.3.6.1.4.1.4458.1000.1.5.58	Integer	RW	Description: Transmission type when using Dual radios (MIMO or AdvancedDiversity using one stream of data).
winlink1000OduAirTxOperationMode	1.3.6.1.4.1.4458.1000.1.5.59	Integer	RW	This parameter controls the Operation mode of frames sent over the air. The Operation mode is either normal (1) for regular transmission where frame size is determined by the traffic or throughput test (2) when the user requests an actual over the air throughput estimation using full frames. The latter lasts no more than a predetermined interval (default 30 sec).
winlink1000OduAirDesiredNetMasterTxRatio	1.3.6.1.4.1.4458.1000.1.5.60.1	Integer	RW	This parameter is reserved to the element manager provided with the product.
winlink1000OduAirCurrentNetMasterTxRatio	1.3.6.1.4.1.4458.1000.1.5.60.2	Integer	RO	Represents the actual Net Master Tx RAtio.
winlink1000OduAirMinUsableMasterTxRatio	1.3.6.1.4.1.4458.1000.1.5.60.3	Integer	RO	Represents the minimal value the user can configure for Desired net mAster Tx Ratio.
winlink1000OduAirMaxUsableMasterTxRatio	1.3.6.1.4.1.4458.1000.1.5.60.4	Integer	RO	Represents the maximal value the user can configure for Desired net mAster Tx Ratio.
winlink1000OduAirAccumulatedUAS	1.3.6.1.4.1.4458.1000.1.5.61	Integer	RO	Accumulates the Unavailable seconds of the Air Interface. Relevant for point to point systems.
winlink1000OduAirDistStr	1.3.6.1.4.1.4458.1000.1.5.62	DisplayString	RO	Possibilities of the link according to RFP and CBW
winlink1000OduAirChannelsDefaultFreqStr	1.3.6.1.4.1.4458.1000.1.5.63	DisplayString	RO	A string representing the channels available. Each character represents one frequency when '1' means its available and '0' means its not.
winlink1000OduAirAntConnectionType	1.3.6.1.4.1.4458.1000.1.5.64	Integer	RW	Antenna connection type (External(1) Integrated(2) Embedded_External(3) Embedded_Integrated(4)).
winlink1000OduAirAllowableChannelsStr	1.3.6.1.4.1.4458.1000.1.5.65	DisplayString	RW	A string representing the allowable channels. Each character represents one channel when '1' means its available and '0' means its not.

Table C-2: Private MIB Parameters (Sheet 10 of 24)

Name	OID	Type	Access	Description
winlink1000OduAirDfsAlgorithmTypeState	1.3.6.1.4.1.4458.1000.1.5.66.1	Integer	RW	Bitmap for state of Radar Algorithm Type. Filters by bit's position: 0 = Zero PW 1 = Fixed 2 = Variable 3 = Staggered 4 = Long.
winlink1000OduAirDfsLastDetectedTbl			N/A	Last detected radars table.
winlink1000OduAirDfsLastDetectedEntry			N/A	ODU Multi-band Sub Bands Table entry. INDEX { winlink1000OduAirDfsLastDetectedIndex }
winlink1000OduAirDfsLastDetectedIndex	1.3.6.1.4.1.4458.1000.1.5.66.2.1.1	Integer	RO	Dfs Last Detected Radars Table Index.
winlink1000OduAirDfsLastDetectedTime	1.3.6.1.4.1.4458.1000.1.5.66.2.1.2	TimeTicks	RO	Dfs time of the last detected radar.
winlink1000OduAirDfsLastDetectedAlgorithmType	1.3.6.1.4.1.4458.1000.1.5.66.2.1.3	Integer	RO	Dfs type of the last detected radar.
winlink1000OduAirDfsLastDetectedFrequency	1.3.6.1.4.1.4458.1000.1.5.66.2.1.4	Integer	RO	Dfs frequency of the last detected radar.
winlink1000OduAirPreferredChannelsStr			RW	A string representing the preferred channels. Each character represents one channel when '1' means its preferred and '0' means its not.
winlink1000OduAirSyncLossThreshold			RW	When the current throughput is below this threshold (in Kbps) sync loss will occur.
winlink1000OduAirGeoLocation	1.3.6.1.4.1.4458.1000.1.5.69	DisplayString	RW	Geographic device location in format: latitude longitude.
winlink1000OduPerfMonCurrTable			N/A	This table defines/keeps the counters of the current 15 min interval.
winlink1000OduPerfMonCurrEntry			N/A	This is an entry in the Current Interval Table. INDEX {ifIndex }
winlink1000OduPerfMonCurrUAS	1.3.6.1.4.1.4458.1000.1.6.1.1.1	Gauge	RO	The current number of Unavailable Seconds starting from the present 15 minutes period.
winlink1000OduPerfMonCurrES	1.3.6.1.4.1.4458.1000.1.6.1.1.2	Gauge	RO	Current number of Errored Seconds starting from the present 15 minutes period.
winlink1000OduPerfMonCurrSES	1.3.6.1.4.1.4458.1000.1.6.1.1.3	Gauge	RO	Current number of Severely Errored Seconds starting from the present 15 minutes period.
winlink1000OduPerfMonCurrBBE	1.3.6.1.4.1.4458.1000.1.6.1.1.4	Gauge	RO	Current number of Background Block Errors starting from the present 15 minutes period.
winlink1000OduPerfMonCurrIntegrity	1.3.6.1.4.1.4458.1000.1.6.1.1.5	Integer	RO	Indicates the integrity of the entry.
winlink1000OduPerfMonCurrCompressed	1.3.6.1.4.1.4458.1000.1.6.1.1.6	OctetString	RO	Holds a compressed string of all data per interface. Compressed Air Interface Structure (size in brackets): UAS (4) ES (4) SES (4) BBE (4) Integrity (1) MinRSL (1) MaxRSL (1) RSLThresh1Exceeded (4) RSLThresh2Exceeded (4) MinTSL (1) MaxTSL (1) TSLThresh1Exceed (4) BBERThresh1Exceed (4) RxMBytes (4) TxMBytes (4) EthCapacityThreshUnder (4) HighTrafficThreshExceed (4) Compressed Etherent ODU interface (size in brackets): UAS (4) ES (4) SES (4) BBE (4) Integrity (1) RxMBytes (4) TxMBytes (4) EthCapacityThreshUnder (4) HighTrafficThreshExceed (4) ActiveSeconds (4)
winlink1000OduPerfMonIntervalTable			N/A	This table defines/keeps the counters of the last day (in resolution of 15 min intervals).
winlink1000OduPerfMonIntervalEntry			N/A	This is an entry in the Interval Table. INDEX {ifIndex winlink1000OduPerfMonIntervalIdx }
winlink1000OduPerfMonIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.
winlink1000OduPerfMonIntervalUAS			RO	The current number of Unavailable Seconds per interval.
winlink1000OduPerfMonIntervalES			RO	Current number of Errored Seconds per interval.
winlink1000OduPerfMonIntervalSES			RO	Current number of Severely Errored Seconds per interval.
winlink1000OduPerfMonIntervalBBE			RO	Current number of Background Block Errors per interval.

Table C-2: Private MIB Parameters (Sheet 11 of 24)

Name	OID	Type	Access	Description
winlink1000OduPerfMonIntervalIntegrity			RO	Indicates the integrity of the entry per interval.
winlink1000OduPerfMonIntervalCompressed			RO	Holds a compressed string of all data per interface. Compressed Air Interface Structure (size in brackets): UAS (4) ES (4) SES (4) BBE (4) Integrity (1) MinRSL (1) MaxRSL (1) RSLThresh1Exceeded (4) RSLThresh2Exceeded (4) MinTSL (1) MaxTSL (1) TSLThresh1Exceed (4) BBERThresh1Exceed (4) RxMBytes (4) TxMBytes (4) EthCapacityThreshUnder (4) HighTrafficThreshExceed (4) Compressed Etherent ODU interface (size in brackets): UAS (4) ES (4) SES (4) BBE (4) Integrity (1) RxMBytes (4) TxMBytes (4) EthCapacityThreshUnder (4) HighTrafficThreshExceed (4) ActiveSeconds (1)
winlink1000OduPerfMonDayTable			N/A	This table defines/keeps the counters of the last month (in resolution of days).
winlink1000OduPerfMonDayEntry			N/A	This is an entry in the Days Table. INDEX {ifIndex winlink1000OduPerfMonDayIdx }
winlink1000OduPerfMonDayIdx			RO	This table is indexed per interval number. Each interval is of 24 hours and the oldest is 30.
winlink1000OduPerfMonDayUAS			RO	The current number of Unavailable Seconds per interval of 24 hours.
winlink1000OduPerfMonDayES			RO	Current number of Errored Seconds per interval of 24 hours.
winlink1000OduPerfMonDaySES			RO	Current number of Severely Errored Seconds per interval of 24 hours.
winlink1000OduPerfMonDayBBE			RO	Current number of Background Block Errors per interval of 24 hours.
winlink1000OduPerfMonDayIntegrity			RO	Indicates the integrity of the entry per interval of 24 hours.
winlink1000OduPerfMonDayCompressed			RO	Holds a compressed string of all data per interface. Compressed Air Interface Structure (size in brackets): UAS (4) ES (4) SES (4) BBE (4) Integrity (1) MinRSL (1) MaxRSL (1) RSLThresh1Exceeded (4) RSLThresh2Exceeded (4) MinTSL (1) MaxTSL (1) TSLThresh1Exceed (4) BBERThresh1Exceed (4) RxMBytes (4) TxMBytes (4) EthCapacityThreshUnder (4) HighTrafficThreshExceed (4) Compressed Etherent ODU interface (size in brackets): UAS (4) ES (4) SES (4) BBE (4) Integrity (1) RxMBytes (4) TxMBytes (4) EthCapacityThreshUnder (4) HighTrafficThreshExceed (4) ActiveSeconds (1)
winlink1000OduPerfMonAirCurrTable			N/A	This table defines/keeps the air counters of the current 15 min interval.
winlink1000OduPerfMonAirCurrEntry			N/A	This is an entry in the Current Interval Table. INDEX {ifIndex }
winlink1000OduPerfMonAirCurrMinRSL	1.3.6.1.4.1.4458.1000.1.6.4.1.1	Integer	RO	Current Min Received Level Reference starting from the present 15 minutes period.
winlink1000OduPerfMonAirCurrMaxRSL	1.3.6.1.4.1.4458.1000.1.6.4.1.2	Integer	RO	Current Max Received Level Reference starting from the present 15 minutes period.
winlink1000OduPerfMonAirCurrRSLThresh1Exceed	1.3.6.1.4.1.4458.1000.1.6.4.1.3	Gauge	RO	Number of seconds Receive Signal Level exceeded the RSL1 threshold in the last 15 minutes.
winlink1000OduPerfMonAirCurrRSLThresh2Exceed	1.3.6.1.4.1.4458.1000.1.6.4.1.4	Gauge	RO	Number of seconds Receive Signal Level exceeded the RSL2 threshold in the last 15 minutes.

Table C-2: Private MIB Parameters (Sheet 12 of 24)

Name	OID	Type	Access	Description
winlink1000OduPerfMonAirCurrMinTSL	1.3.6.1.4.1.4458.1000.1.6.4.1.5	Integer	RO	Current Min Transmit Signal Level starting from the present 15 minutes period.
winlink1000OduPerfMonAirCurrMaxTSL	1.3.6.1.4.1.4458.1000.1.6.4.1.6	Integer	RO	Current Max Transmit Signal Level starting from the present 15 minutes period.
winlink1000OduPerfMonAirCurrTSLThresh1Exceed	1.3.6.1.4.1.4458.1000.1.6.4.1.7	Gauge	RO	Number of seconds Transmit Signal Level exceeded the TSL1 threshold in the last 15 minutes.
winlink1000OduPerfMonAirCurrBBERThresh1Exceed	1.3.6.1.4.1.4458.1000.1.6.4.1.8	Gauge	RO	Number of seconds Background Block Error Ratio exceeded the BBER1 threshold in the last 15 minutes.
winlink1000OduPerfMonAirIntervalTable			N/A	This table defines/keeps the air counters of the last day (in resolution of 15 min intervals).
winlink1000OduPerfMonAirIntervalEntry			N/A	This is an entry in the Interval Table. INDEX {ifIndex winlink1000OduPerfMonAirIntervalIdx }
winlink1000OduPerfMonAirIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.
winlink1000OduPerfMonAirIntervalMinRSL			RO	Current Min Received Level Reference per interval.
winlink1000OduPerfMonAirIntervalMaxRSL			RO	Current Max Received Level Reference per interval.
winlink1000OduPerfMonAirIntervalRSLThresh1Exceed			RO	Number of seconds Receive Signal Level exceeded the RSL1 threshold per interval.
winlink1000OduPerfMonAirIntervalRSLThresh2Exceed			RO	Number of seconds Receive Signal Level exceeded the RSL2 threshold ACCESS read-only per interval.
winlink1000OduPerfMonAirIntervalMinTSL			RO	Current Min Transmit Signal Level per interval.
winlink1000OduPerfMonAirIntervalMaxTSL			RO	Current Max Transmit Signal Level per interval.
winlink1000OduPerfMonAirIntervalTSLThresh1Exceed			RO	Number of seconds Transmit Signal Level exceeded the TSL1 threshold per interval.
winlink1000OduPerfMonAirIntervalBBERThresh1Exceed			RO	Number of seconds Background Block Error Ratio exceeded the BBER1 threshold per interval.
winlink1000OduPerfMonAirDayTable			N/A	This table defines/keeps the air counters of the last month (in resolution of days).
winlink1000OduPerfMonAirDayEntry			N/A	This is an entry in the Days Table. INDEX {ifIndex winlink1000OduPerfMonAirDayIdx }
winlink1000OduPerfMonAirDayIdx			RO	This table is indexed per Day number. Each Day is of 15 minutes and the oldest is 96.
winlink1000OduPerfMonAirDayMinRSL			RO	Current Min Received Level Reference per Day.
winlink1000OduPerfMonAirDayMaxRSL			RO	Current Max Received Level Reference per Day.
winlink1000OduPerfMonAirDayRSLThresh1Exceed			RO	Number of seconds Receive Signal Level exceeded the RSL1 threshold per Day.
winlink1000OduPerfMonAirDayRSLThresh2Exceed			RO	Number of seconds Receive Signal Level exceeded the RSL2 threshold per Day.
winlink1000OduPerfMonAirDayMinTSL			RO	Current Min Transmit Signal Level per Day.
winlink1000OduPerfMonAirDayMaxTSL			RO	Current Max Transmit Signal Level per Day.
winlink1000OduPerfMonAirDayTSLThresh1Exceed			RO	Number of seconds Transmit Signal Level exceeded the TSL1 threshold per Day.
winlink1000OduPerfMonAirDayBBERThresh1Exceed			RO	Number of seconds Background Block Error Ratio exceeded the BBER1 threshold per Day.
winlink1000OduPerfMonEthCurrTable			N/A	This table defines/keeps the ethernet counters of the current 15 min interval.
winlink1000OduPerfMonEthCurrEntry			N/A	This is an entry in the Current Interval Table. INDEX {ifIndex }
winlink1000OduPerfMonEthCurrRxMBytes	1.3.6.1.4.1.4458.1000.1.6.7.1.1	Gauge	RO	Current RX Mega Bytes starting from the present 15 minutes period.
winlink1000OduPerfMonEthCurrTxMBytes	1.3.6.1.4.1.4458.1000.1.6.7.1.2	Gauge	RO	Current Transmit Mega Bytes starting from the present 15 minutes period.

Table C-2: Private MIB Parameters (Sheet 13 of 24)

Name	OID	Type	Access	Description
winlink1000OduPerfMonEthCurrEthCapacityThreshUnder	1.3.6.1.4.1.4458.1000.1.6.7.1.3	Gauge	RO	The number of times throughput was below threshold in the present 15 minutes period. Relevant for point to point systems.
winlink1000OduPerfMonEthCurrHighTrafficThreshExceed	1.3.6.1.4.1.4458.1000.1.6.7.1.4	Gauge	RO	The number of times actual traffic was above threshold in the present 15 minutes period.
winlink1000OduPerfMonEthCurrActiveSeconds	1.3.6.1.4.1.4458.1000.1.6.7.1.5	Gauge	RO	The number of seconds in which RPL Ethernet swervice was not blocked in the present 15 minutes period.
winlink1000OduPerfMonEthIntervalTable			N/A	This table defines/keeps the ethernet counters of the last day (in resolution of 15 min intervals).
winlink1000OduPerfMonEthIntervalEntry			N/A	This is an entry in the Interval Table. INDEX {ifIndex winlink1000OduPerfMonEthIntervalIdx }
winlink1000OduPerfMonEthIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.
winlink1000OduPerfMonEthIntervalRxMBytes			RO	Current RX Mega Bytes per interval.
winlink1000OduPerfMonEthIntervalTxMBytes			RO	Current Transmit Mega Bytes per interval.
winlink1000OduPerfMonEthIntervalEthCapacityThreshUnder			RO	The number of times throughput was below threshold in the each interval. Relevant for point to point systems.
winlink1000OduPerfMonEthIntervalHighTrafficThreshExceed			RO	The number of times actual traffic was above threshold in the each interval.
winlink1000OduPerfMonEthIntervalActiveSeconds			RO	The number of seconds in which RPL Ethernet service was not blocked in the each interval.
winlink1000OduPerfMonEthDayTable			N/A	This table defines/keeps the ethernet counters of the last month (in resolution of days).
winlink1000OduPerfMonEthDayEntry			N/A	This is an entry in the Days Table. INDEX {ifIndex winlink1000OduPerfMonEthDayIdx }
winlink1000OduPerfMonEthDayIdx			RO	This table is indexed per Day number. Each interval is of 15 minutes and the oldest is 96.
winlink1000OduPerfMonEthDayRxMBytes			RO	Current RX Mega Bytes per day.
winlink1000OduPerfMonEthDayTxMBytes			RO	Current Transmit Mega Bytes per day.
winlink1000OduPerfMonEthDayEthCapacityThreshUnder			RO	The number of times throughput was below threshold each day. Relevant for point to point systems.
winlink1000OduPerfMonEthDayHighTrafficThreshExceed			RO	The number of times actual traffic was above threshold each day.
winlink1000OduPerfMonEthDayActiveSeconds			RO	The number of seconds in which RPL Ethernet service was not blocked each day.
winlink1000OduPerfMonTdmCurrTable			N/A	This table defines/keeps the TDM counters of the current 15 min interval.
winlink1000OduPerfMonTdmCurrEntry			N/A	This is an entry in the Current Interval Table. INDEX {ifIndex }
winlink1000OduPerfMonTdmCurrActiveSeconds	1.3.6.1.4.1.4458.1000.1.6.10.1.1	Gauge	RO	Parameter indicating whether the TDM service was active. Under TDM backup link the parameter indicates whether the backup link was active.
winlink1000OduPerfMonTdmIntervalTable			N/A	This table defines/keeps the TDM counters of the last day (in resolution of 15 min intervals).
winlink1000OduPerfMonTdmIntervalEntry			N/A	This is an entry in the Interval Table. INDEX {ifIndex winlink1000OduPerfMonTdmIntervalIdx }
winlink1000OduPerfMonTdmIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.
winlink1000OduPerfMonTdmIntervalActiveSeconds			RO	Parameter indicating whether the TDM service was active. Under TDM backup link the parameter indicates whether the backup link was active.
winlink1000OduPerfMonTdmDayTable			N/A	This table defines/keeps the TDM counters of the last month (in resolution of days).
winlink1000OduPerfMonTdmDayEntry			N/A	This is an entry in the Days Table. INDEX {ifIndex winlink1000OduPerfMonTdmDayIdx }

Table C-2: Private MIB Parameters (Sheet 14 of 24)

Name	OID	Type	Access	Description
winlink1000OduPerfMonTdmDayIdx			RO	This table is indexed per Day number. Each interval is of 15 minutes and the oldest is 96.
winlink1000OduPerfMonTdmDayActiveSeconds			RO	Parameter indicating whether the TDM service was active. Under TDM backup link the parameter indicates whether the backup link was active.
winlink1000OduPerfMonTxThresh1	1.3.6.1.4.1.4458.1000.1.6.20	Integer	RW	When the Transmit power exceeds this threshold a performance monitoring TSL1 counter is incremented.
winlink1000OduPerfMonRxThresh1	1.3.6.1.4.1.4458.1000.1.6.21	Integer	RW	When the RX power exceeds this threshold a performance monitoring RSL1 counter is incremented.
winlink1000OduPerfMonRxThresh2	1.3.6.1.4.1.4458.1000.1.6.22	Integer	RW	When the RX power exceeds this threshold a performance monitoring RSL2 counter is incremented.
winlink1000OduPerfMonBBERThresh1	1.3.6.1.4.1.4458.1000.1.6.23	Integer	RW	When the BBER exceeds this threshold a performance monitoring BBER counter is incremented. The units are 1/10 of a percent.
winlink1000OduPerfMonEthCapacityThreshKbps	1.3.6.1.4.1.4458.1000.1.6.24	Integer	RW	When the current throughput is below this threshold the corresponding counter is incremented
winlink1000OduPerfMonHighTrafficThreshKbps	1.3.6.1.4.1.4458.1000.1.6.25	Integer	RW	When the current traffic is above this threshold then corresponding counter is incremented.
winlink1000OduAgnGenAddTrapExt	1.3.6.1.4.1.4458.1000.1.7.1.1	Integer	RW	If 'yes' is chosen the ifIndex Unit Severity Time_T and Alarm Id from the winlink1000OduAgnCurrAlarmTable will be bind to the end of each private trap.
winlink1000OduAgnGenSetMode	1.3.6.1.4.1.4458.1000.1.7.1.2	Integer	RW	This parameter is reserved to the element manager provided with the product.
winlink1000OduAgnNTPCfgTimeServerIP	1.3.6.1.4.1.4458.1000.1.7.2.1	IPAddress	RW	IP address of the server from which the current time is loaded.
winlink1000OduAgnNTPCfgTimeOffsetFromUTC	1.3.6.1.4.1.4458.1000.1.7.2.2	Integer	RW	Offset from Coordinated Universal Time (minutes). Possible values: -1440..1440.
winlink1000OduAgnRealTimeAndDate	1.3.6.1.4.1.4458.1000.1.7.2.3	OctetString	RW	This parameter specifies the real time and date Format'YYYY-MM-DD HH:MM:SS'(Hexadecimal). A date-time specification: field octets contents range ----- ------ -------- ----- 1 1-2 year 0..65536 2 3 month 1..12 3 4 day 1..31 4 5 hour 0..23 5 6 minutes 0..59 6 7 seconds 0..60 (use 60 for leap-second) 7 8 deci-seconds 0..9 For example Tuesday May 26 1992 at 1:30:15 PM EDT would be displayed as: 07 c8 05 1a 0d 1e 0f 00 (1992 -5 -26 13:30:15)
winlink1000OduAgnCurrAlarmLastChange	1.3.6.1.4.1.4458.1000.1.7.3.1	Integer	RO	This counter is initialized to 0 after a device reset and is incremented upon each change in the winlink1000OduAgnCurrAlarmTable (either an addition or removal of an entry).
winlink1000OduAgnCurrAlarmTable			N/A	This table includes the currently active alarms. When a RAISED trap is sent an alarm entry is added to the table. When a CLEAR trap is sent the entry is removed.
winlink1000OduAgnCurrAlarmEntry			N/A	Entry containing the details of a currently RAISED trap. INDEX { winlink1000OduAgnCurrAlarmCounter }
winlink1000OduAgnCurrAlarmCounter			RO	A running counter of active alarms. The counter is incremented for every new RAISED trap. It is cleared after a device reset.
winlink1000OduAgnCurrAlarmSeverity			RO	Current Alarm severity.

Table C-2: Private MIB Parameters (Sheet 15 of 24)

Name	OID	Type	Access	Description
winlink1000OduAgnCurrAlarmId			RO	Unique Alarm Identifier (combines alarm type and interface). The same AlarmId is used for RAISED and CLEARED alarms.
winlink1000OduAgnCurrAlarmIfIndex			RO	Interface Index where the alarm occurred. Alarms that are not associated with a specific interface will have the following value: 65535.
winlink1000OduAgnCurrAlarmUnit			RO	Unit associated with the alarm.
winlink1000OduAgnCurrAlarmTrapID			RO	ID of the raised trap that was sent when this alarm was raised.
winlink1000OduAgnCurrAlarmTimeT			RO	Timestamp of this alarm. This number is in seconds from Midnight January 1st 1970.
winlink1000OduAgnCurrAlarmText			RO	Alarm display text (same as the text in the sent trap).
winlink1000OduAgnLastEventsNumber	1.3.6.1.4.1.4458.1000.1.7.4.1	Integer	RO	This counter indicates the size of the winlink1000OduAgnLastEventsTable
winlink1000OduAgnLastEventsTable			N/A	This table includes the last events. When a trap is sent an event entry is added to the table.
winlink1000OduAgnLastEventsEntry			N/A	Entry containing the details of last traps. INDEX { winlink1000OduAgnLastEventsIndex }
winlink1000OduAgnLastEventsIndex	1.3.6.1.4.1.4458.1000.1.7.4.2.1.1	Integer	RO	The index of the table
winlink1000OduAgnLastEventsSeverity	1.3.6.1.4.1.4458.1000.1.7.4.2.1.2	Integer	RO	Current Trap severity.
winlink1000OduAgnLastEventsIfIndex	1.3.6.1.4.1.4458.1000.1.7.4.2.1.3	Integer	RO	Interface Index where the event occurred. Traps that are not associated with a specific interface will have the following value: 65535.
winlink1000OduAgnLastEventsTimeT	1.3.6.1.4.1.4458.1000.1.7.4.2.1.4	Integer	RO	Timestamp of this trap. This number is in seconds from Midnight January 1st 1970.
winlink1000OduAgnLastEventsText	1.3.6.1.4.1.4458.1000.1.7.4.2.1.5	DisplayString	RO	Trap display text (same as the text in the sent trap).
winlink1000IduAdmProductType			RO	IDU configuration description.
winlink1000IduAdmHwRev			RO	IDU Hardware Revision.
winlink1000IduAdmSwRev			RO	IDU Software Revision.
winlink1000OduAdmNumOfExternalAlarmIn			RO	Indicates the number of currently available External Alarm Inputs.
winlink1000OduAdmExternAlarmInTable			N/A	This is the External Alarm Inputs table.
winlink1000OduAdmExternAlarmInEntry			N/A	Entry containing the elements of a single External Alarm Input. INDEX { winlink1000OduAdmExternAlarmInIndex}
winlink1000OduAdmExternAlarmInIndex	1.3.6.1.4.1.4458.1000.2.1.5.1.1	Integer	RO	This value indicates the index of the External Alarm Input entry.
winlink1000OduAdmExternAlarmInText			RW	This field describes the External Alarm Input. It is an optional string of no more than 64 characters which will be used in the event being sent as a result of a change in the status of the External Alarm Input. DEFVAL {Alarm Description}
winlink1000OduAdmExternAlarmInAdminState	1.3.6.1.4.1.4458.1000.2.1.5.1.3	Integer	RW	This value indicates if this External Alarm Input is enabled or disabled.
winlink1000OduAdmExternAlarmInStatus	1.3.6.1.4.1.4458.1000.2.1.5.1.4	Integer	RO	This value indicates the current status of the External Alarm Input.
winlink1000IduAdmSN			RO	IDU Serial Number
winlink1000IduAdmIduDetectionMode			RW	The parameter defines whether to send Ethernet frames to detect an IDU. The valid writable values are: userDisabled (3) userEnabled (4). A change requires a reset and is effective after reset.
winlink1000IduAdmMountedTrunks			RO	Number of mounted trunks in the IDU
winlink1000IduAdmLicensedTrunks			RO	Number of Licensed Trunks in the IDU
winlink1000IduAdmVlanSupported			RO	Identifies if the local IDU supports VLAN tag/untag
winlink1000IduAdmVlanEgressMode			RW	VLAN tag/untag egress values
winlink1000IduAdmVlanIngressMode			RW	VLAN tag/untag ingress values

Table C-2: Private MIB Parameters (Sheet 16 of 24)

Name	OID	Type	Access	Description
winlink1000IduAdmVlanDefaultPortVIDs			RW	VLAN tag/untag default VLAN ids for each port - Right most digit is Vlan priority (0-6) other digits compose Vlan Id (1-4094)
winlink1000IduAdmVlanLan1UntaggedVIDs			RW	VLAN untagged VIDs for LAN1 port
winlink1000IduAdmVlanLan2UntaggedVIDs			RW	VLAN untagged VIDs for LAN2 port
winlink1000IduAdmVlanSfpUntaggedVIDs			RW	VLAN untagged VIDs for Sfp port
winlink1000IduAdmVlanLan1FilteredVIDs			RW	VLAN filtered VIDs for LAN1 port
winlink1000IduAdmVlanLan2FilteredVIDs			RW	VLAN filtered VIDs for LAN2 port
winlink1000IduAdmVlanSfpFilteredVIDs			RW	VLAN filtered VIDs for Sfp port
winlink1000IduAdmPortsConnection			RW	IDU ports connection bitmap. bit 0 - LAN1-LAN2 bit 1 - SFP-LAN1 bit 2 - SFP-LAN2 bit values: 0 - ports are disconnected. 1 - ports are connected.
winlink1000IduAdmVlanMode			RW	Local IDU Vlan Mode.
winlink1000IduAdmVlanMembershipVIDs			RW	VLAN Membership VLAN IDs list.
winlink1000IduAdmVlanMembershipPortsCode			RW	VLAN Membership ports code. Each value represent the relation (bitmap) Between the suitable VID to the IDU ports. bit 0 - LAN1 bit 1 - LAN2 bit 2 - SFP bit value 0 - not member of appropriate VID bit value 1 - member of appropriate VID
winlink1000IduAdmVlanMembershipUntaggedHandle			RW	VLAN Membership Untagged frames handling. The 3 values representing LAN1 LAN2 and SFP accordingly. For each port the optional values are: 1 - Discard 2 - Tag 3 - Leave Unmodified
winlink1000IduAdmVlanMembershipTagUntagged			RW	VLAN Membership Untagged frames tagging. The 3 values representing LAN1 LAN2 and SFP accordingly. The value on each port entry represent the tagging value which is built of: VLAN ID & VLAN Priority.
winlink1000IduSrvDesiredTrunks			RW	Required trunks bitmap. Note that the number of possible trunks that can be configured may vary based on the IDU hardware configuration the selected air interface rate and the range of the installation. The provided Manager application enables the user to select only available configurations. A change is effective immediately if applied to a master unit and the link is in service mode.
winlink1000IduSrvServices			RO	This parameter is reserved to the Manager application provided with the product.
winlink1000IduSrvActiveTrunks			RO	A bitmap describing the currently open TDM trunks.
winlink1000IduSrvAvailableTrunks			RO	A bitmap describing the number of TDM trunks that can be opened in the current configuration. The values take into account the IDU hardware configuration the air rate and the installation range.
winlink1000IduSrvPossibleServicesTable			N/A	IDU Possible Services table.
winlink1000IduSrvPossibleServicesEntry			N/A	IDU Services table entry. INDEX { winlink1000IduSrvPossibleServicesIndex }
winlink1000IduSrvPossibleServicesIndex			RO	Table index Rate index of the air interface.
winlink1000IduSrvPossibleTdmServices			RO	Deprecated parameter. A bitmap describing the TDM trunks that can be opened in the corresponding Air Rate.
winlink1000IduSrvPossibleEthServices			RO	Deprecated parameter. This parameter describes if the Ethernet Service can be opened in the corresponding Air Rate. The valid values are: disabled (0) enabled (1).
winlink1000IduSrvRemainingRate			RO	Current Ethernet bandwidth in bps per air rate.

Table C-2: Private MIB Parameters (Sheet 17 of 24)

Name	OID	Type	Access	Description
winlink1000IduSrvTrunkCost			RO	Cost of the TDM Service in bps.
winlink1000IduSrvAvailServicesTable			N/A	ODU Possible TDM Services table.
winlink1000IduSrvAvailServicesEntry			N/A	ODU TDM Services table entry. INDEX { winlink1000IduSrvAvailServicesIndex }
winlink1000IduSrvAvailServicesIndex			RO	Table index. The index is the bit mask of the TDM service.
winlink1000IduSrvAvailServicesState			RO	Represents the TDM service availability.
winlink1000IduSrvAvailServicesMinRateIdx			RO	Minimum rate index of the air interface which make the service possible.
winlink1000IduSrvAvailServicesMaxRateIdx			RO	Maximum rate index of the air interface which make the service possible.
winlink1000IduSrvAvailServicesReason			RO	Information about the TDM Service availability. - Not Applicable if the service is available. The reasons for TDM Service unavailability: - The available throughput isn't sufficient for Service demands; - The IDU HW doesn't support the service; - A Link Password mismatch was detected; - The external pulse type detected is improper for TDM services; - A Software versions mismatch was detected. - A-Symetric TDD Mode Is Obligated.
winlink1000IduSrvEthActive			RO	Represents the Ethernet service activation state.
winlink1000IduSrvEthAvailable			RO	Represents the Ethernet service availability state.
winlink1000IduSrvEthThroughput			RO	Current available Ethernet service throughput in bps.
winlink1000IduSrvEthMaxInfoRate			RW	Holds the maximum bandwidth (kbps) to be allocated for Ethernet service. Value of zero means that Ethernet service works as best effort. The maximum value is product specific. Refer to the user manual.
winlink1000IduSrvAvailableTrunksT1			RO	A bitmap describing the TDM trunks that can be opened under T1 configuration. The values take into account the IDU hardware configuration the air rate and the installation range.
winlink1000IduEthernetIfTable			N/A	IDU Ethernet Interface table.
winlink1000IduEthernetIfEntry			N/A	IDU Ethernet Interface table entry. INDEX { winlink1000IduEthernetIfIndex }
winlink1000IduEthernetIfIndex			RO	If Index corresponding to this Interface.
winlink1000IduEthernetIfAddress			RO	IDU MAC address.
winlink1000IduEthernetNumOfLanPorts			RO	Number of LAN interfaces in the IDU.
winlink1000IduEthernetNumOfSfpPorts			RO	The number of SFP interfaces in the IDU.
winlink1000IduEthernetSfpProperties			RO	SFP venfor properties : Vendor Name PN and Revision.
winlink1000IduEthernetGbeSupported			RO	
winlink1000IduEthernetOduInErrors			RO	The number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.
winlink1000IduBridgeTpAging			RW	Timeout in seconds for aging. Note that for this parameter to be effective the ODU must be configured to HUB mode. A change is effective immediately.
winlink1000IduTdmTxClockAvailStates			RO	Available states of the TDM Transmit Clock Control each input status is represented by a bit. When the state is available the bit value is 1. When the state is unavailable the bit value is 0. The available states are: bit 2 = Transparent bit 3 = Local Loop Timed bit 4 = Remote Loop Timed bit 5 = Local Internal bit 6 = Remote Internal

Table C-2: Private MIB Parameters (Sheet 18 of 24)

Name	OID	Type	Access	Description
winlink1000IduTdmTxClockDesiredState			RW	Required state of the TDM Transmit Clock Control. A change is effective after re-activation of the TDM service.
winlink1000IduTdmTxClockActualState			RO	Actual state of the TDM Transmit Clock Control.
winlink1000IduTdmMasterClockAvailOptions			RO	Available options of the TDM Master Clock Control each input status is represented by a bit. When the option is available the bit value is 1. When the option is unavailable the bit value is 0. The available options are: bit 2 = Automatic bit 3 = Trunk #1 bit 4 = Trunk #2 bit 5 = Trunk #3 bit 6 = Trunk #4 When no options are available the returned value is: 1
winlink1000IduTdmMasterClockDesired			RW	Required TDM Master Clock. A change is effective after re-activation of the TDM service.
winlink1000IduTdmMasterClockActual			RO	Actual Trunk used for TDM Master Clock.
winlink1000IduTdmConfigTable			N/A	IDU TDM Links Configuration table.
winlink1000IduTdmConfigEntry			N/A	IDU TDM Links Configuration table entry. INDEX { winlink1000IduTdmConfigIndex }
winlink1000IduTdmConfigIndex			RO	Table index.
winlink1000IduTdmIfIndex			RO	Link index in the interface table.
winlink1000IduTdmLineCoding			RW	This parameter applies to T1 trunks only. The parameter controls the line coding. Setting the value to each of the indices applies to all. A change is effective after the next open of the TDM service.
winlink1000IduTdmLoopbackConfig			RW	Loop back configuration table. Each of the trunks can be set Normal Line loop back or Reverse line loop back. A change is effective immediately.
winlink1000IduTdmLineStatus			RO	Line status.
winlink1000IduTdmCurrentTable			N/A	IDU TDM Links Statistics table.
winlink1000IduTdmCurrentEntry			N/A	IDU TDM Links Statistics table entry. INDEX { winlink1000IduTdmCurrentIndex }
winlink1000IduTdmCurrentIndex			RO	Table index (Same as winlink1000IduTdmLineIndex).
winlink1000IduTdmCurrentBlocks			RO	Number of correct blocks transmitted to the line.
winlink1000IduTdmCurrentDrops			RO	Number of error blocks transmitted to the line.
winlink1000IduTdmCurrentTxClock			RW	TDM Transmit Clock. A change is effective after re-activation of the TDM service.
winlink1000IduTdmCurrentBlocksHigh			RO	High part of the 64 bits counter Current Blocks
winlink1000IduTdmRemoteQual			RO	Estimated average interval between error second events. The valid values are 1-2^31 where a value of -1 is used to indicate an undefined state.
winlink1000IduTdmRemoteQualEval			RO	Estimated average interval between error second events during evaluation process. The valid values are 1-2^31 where a value of -1 is used to indicate an undefined state.
winlink1000IduTdmSrvEval			RW	Evaluated TDM service bit mask. Setting this parameter to value that is bigger than the activated TDM service bit mask will execute the evaluation process for 30 seconds. Setting this parameter to 0 will stop the evaluation process immediately.
winlink1000IduTdmBackupAvailableLinks			RO	Number of TDM backup trunks.
winlink1000IduTdmBackupTable			N/A	IDU TDM Links Statistics table.
winlink1000IduTdmBackupEntry			N/A	IDU TDM Links Statistics table entry. INDEX { winlink1000IduTdmBackupIndex }
winlink1000IduTdmBackupIndex			RO	Table index.

Table C-2: Private MIB Parameters (Sheet 19 of 24)

Name	OID	Type	Access	Description
winlink1000IduTdmBackupMode			RW	TDM backup mode: Enable or Disable where the main link is the air link or the external link. Changes will be effective immediatly.
winlink1000IduTdmBackupCurrentActiveLink			RO	TDM backup current active link: N/A air link is active or external link is active.
winlink1000IduTdmJitterBufferSize			RW	TDM Jitter Buffer Size. The value must be between the minimum and the maximum TDM Jitter Buffer Size. The units are 0.1 x millisecond.
winlink1000IduTdmJitterBufferDefaultSize			RO	TDM Jitter Buffer Default Size. The units are 0.1 x millisecond.
winlink1000IduTdmJitterBufferMinSize			RO	TDM Jitter Buffer Minimum Size. The units are 0.1 x millisecond.
winlink1000IduTdmJitterBufferMaxSize			RO	TDM Jitter Buffer Maximum Size. The units are 0.1 x millisecond.
winlink1000IduTdmJitterBufferSizeEval			RW	TDM Jitter Buffer Size for evaluation. The value must be between the minimum and the maximum TDM Jitter Buffer Size. The units are 0.1 x millisecond.
winlink1000IduTdmType			RW	TDM Type (The value undefined is read-only).
winlink1000IduTdmTypeEval			RW	TDM Type for evaluation.
winlink1000IduTdmLineStatusStr			RO	Line status.
winlink1000IduTdmHotStandbySupport			RO	Indicates if Hot Standby is supported.
winlink1000IduTdmDesiredHotStandbyMode			RW	Desired Hot Standby Mode.
winlink1000IduTdmHotStandbyOperationStatus			RO	The Link Actual Status.
winlink1000IduTdmBackupLinkConfiguration			RW	The current configuration of the backup link.
winlink1000IduTdmLineInterfaceConfiguration			RW	TDM Line interface configuration.
winlink1000IduTdmLineImpedanceConfiguratio n			RW	TDM line impedance configuration (standardT1 - 100Ohm nonStandardT1 - 110Ohm) Applicable only for T1 TDM type.
winlink1000HbsAirState	1.3.6.1.4.1.4458.1000.3.1.1	Integer	RO	Holds the state of the HBS.
winlink1000HbsAirOpMode	1.3.6.1.4.1.4458.1000.3.1.2	Integer	RW	Holds the operation mode of the HBS.
winlink1000HbsAirAvailTimeSlots	1.3.6.1.4.1.4458.1000.3.1.3	Integer	RO	This parameter holds the number of available timeslots (not in use) in the air interface.
winlink1000HbsAirSectorCbwSupportedStr	1.3.6.1.4.1.4458.1000.3.1.4	DisplayString	RO	Represents the channel bandwidth which is supported by the HBS and all connected HSUs.
winlink1000HbsAirCompressedMon	1.3.6.1.4.1.4458.1000.3.1.5	OctetString	RO	Holds HBS monitor data in compressed format: HBS Traffic Monitor In Bytes(4) Out Bytes(4) In Frames(4) Out Frames(4) HBS State (1) HBS Freq (4) Number of Links (2) EC Change Counter (4) Current Ratio (2) Total Air Frames (4) HBS Rx Rate in Kbps (4) HBS Tx Rate in Kbps (4) HBS Rx Rate in Fps (4) HBS Tx Rate in Fps (4) HBS Set Mode (1).
winlink1000HbsAirConfChanges	1.3.6.1.4.1.4458.1000.3.1.6.1	OctetString	RO	16 characters that represent 16 HSUs. Each time a configuration is been changed increment the relevant character.
winlink1000HbsAirConfTable			N/A	Holds the table for all registered HSUs in the sector (16 entries).
winlink1000HbsAirConfEntry			N/A	HSUs configuration table entry. INDEX { winlink1000HbsAirConfIndex }
winlink1000HbsAirConfIndex	1.3.6.1.4.1.4458.1000.3.1.6.2.1.1	Integer	RO	HSUs configuration table index.
winlink1000HbsAirConfUpMir	1.3.6.1.4.1.4458.1000.3.1.6.2.1.2	Integer	RW	Uplink MIR towards specific HSU in units of kbps.
winlink1000HbsAirConfDownMir	1.3.6.1.4.1.4458.1000.3.1.6.2.1.3	Integer	RW	Downlink MIR towards specific HSU in units of kbps.
winlink1000HbsAirConfHsuName	1.3.6.1.4.1.4458.1000.3.1.6.2.1.4	DisplayString	RW	HSU name.
winlink1000HbsAirConfHsuLocation	1.3.6.1.4.1.4458.1000.3.1.6.2.1.5	DisplayString	RW	HSU location.
winlink1000HbsAirConfDualAntTxMode	1.3.6.1.4.1.4458.1000.3.1.6.2.1.6	Integer	RW	Spatial multiplexing: MIMO (1) or Diversity (2)

Table C-2: Private MIB Parameters (Sheet 20 of 24)

Name	OID	Type	Access	Description
winlink1000HbsAirConfNumOfTs	1.3.6.1.4.1.4458.1000.3.1.6.2.1.7	Integer	RW	Number of timeslot which are allocated to specific HSU.
winlink1000HbsAirConfGeoLocation	1.3.6.1.4.1.4458.1000.3.1.6.2.1.8	DisplayString	RW	Geographic device location in format: latitude longitude.
winlink1000HbsAirConfHsuType	1.3.6.1.4.1.4458.1000.3.1.6.2.1.9	Integer	RW	HSU type (1 = Fixed 2 = Stationary 3 = Mobile)
winlink1000HbsAirConfHsuLevel	1.3.6.1.4.1.4458.1000.3.1.6.2.1.10	Integer	RW	HSU level (1 .. 4)
winlink1000HbsAirConfDesiredRateIndex	1.3.6.1.4.1.4458.1000.3.1.6.2.1.11	Integer	RW	The rate index of both sides of the link to this HSU.
winlink1000HbsAirLinkNumOfLinks	1.3.6.1.4.1.4458.1000.3.1.7.1	Integer	RO	Number of links in the links table.
winlink1000HbsAirLinkTable			N/A	Holds the table for all links in the sector.
winlink1000HbsAirLinkEntry			N/A	Link table entry. INDEX { winlink1000HbsAirLinkIndex }
winlink1000HbsAirLinkIndex	1.3.6.1.4.1.4458.1000.3.1.7.2.1.1	Integer	RO	HSUs configuration table index.
winlink1000HbsAirLinkHsuId	1.3.6.1.4.1.4458.1000.3.1.7.2.1.2	Integer	RO	HSU ID of specific link (if registered). Unregistered links have -1.
winlink1000HbsAirLinkState	1.3.6.1.4.1.4458.1000.3.1.7.2.1.3	Integer	RO	Holds the state of specific link.
winlink1000HbsAirLinkWorkingMode	1.3.6.1.4.1.4458.1000.3.1.7.2.1.4	Integer	RO	Indicates the sub-state within the version compatibility.
winlink1000HbsAirLinkSessionId	1.3.6.1.4.1.4458.1000.3.1.7.2.1.5	Integer	RO	Holds the Session ID of the link.
winlink1000HbsAirLinkHbsEstTput	1.3.6.1.4.1.4458.1000.3.1.7.2.1.6	Integer	RO	Holds the Estimated throughput from the HBS to the HSU.
winlink1000HbsAirLinkHsuEstTput	1.3.6.1.4.1.4458.1000.3.1.7.2.1.7	Integer	RO	Holds the Estimated throughput from the HSU to the HBS.
winlink1000HbsAirLinkRange	1.3.6.1.4.1.4458.1000.3.1.7.2.1.8	Integer	RO	Holds the range of specific link.
winlink1000HbsAirLinkHbsRss	1.3.6.1.4.1.4458.1000.3.1.7.2.1.9	Integer	RO	Holds the RSS of specific link (HBS side).
winlink1000HbsAirLinkHbsRssBal	1.3.6.1.4.1.4458.1000.3.1.7.2.1.10	Integer	RO	Holds the RSS Balance of specific link (HBS side).
winlink1000HbsAirLinkHsuRss	1.3.6.1.4.1.4458.1000.3.1.7.2.1.11	Integer	RO	Holds the RSS of specific link (HSU side).
winlink1000HbsAirLinkHsuRssBal	1.3.6.1.4.1.4458.1000.3.1.7.2.1.12	Integer	RO	Holds the RSS Balance of specific link (HSU side).
winlink1000HbsAirLinkHsuSerial	1.3.6.1.4.1.4458.1000.3.1.7.2.1.13	DisplayString	RO	Holds the serial number for specific HSU.
winlink1000HbsAirLinkTxOperMode	1.3.6.1.4.1.4458.1000.3.1.7.2.1.14	Integer	RO	Holds the TX operation mode.
winlink1000HbsAirHsuInBytes	1.3.6.1.4.1.4458.1000.3.1.7.2.1.15	Integer	RO	Number of frames received in the HSU Lan port.
winlink1000HbsAirHsuOutBytes	1.3.6.1.4.1.4458.1000.3.1.7.2.1.16	Integer	RO	Number of frames transmitted from the HSU Lan port.
winlink1000HbsAirHsuInFrames	1.3.6.1.4.1.4458.1000.3.1.7.2.1.17	Integer	RO	Number of bytes received in the HSU Lan port.
winlink1000HbsAirHsuOutFrames	1.3.6.1.4.1.4458.1000.3.1.7.2.1.18	Integer	RO	Number of bytes transmitted from the HSU Lan port.
winlink1000HbsAirHsuMacAddress	1.3.6.1.4.1.4458.1000.3.1.7.2.1.19	DisplayString	RO	HSU MAC Address.
winlink1000HbsAirMaxTputDown	1.3.6.1.4.1.4458.1000.3.1.7.2.1.20	Integer	RO	Max Throughput Downlink.
winlink1000HbsAirMaxTputUp	1.3.6.1.4.1.4458.1000.3.1.7.2.1.21	Integer	RO	Max Throughput Uplink.
winlink1000HbsAirLinkCompressedMon	1.3.6.1.4.1.4458.1000.3.1.7.2.1.22	OctetString	RO	Holds all the link information in compressed binary (Bytes/octets). Fields included (size in bytes): Link State(1) Link Working Mode(1) Session Id(4) HBS Est. Tput(4) HSU Est. Tput(4) HBS Rss(1) HBS Rss Balance(1) HSU Rss(1) HSU Rss Balance(1) Tx Operation Mode(1) HSU In Bytes(4) HSU Out Bytes(4) HSU In Frames(4) HSU Out Frames(4) HSU ID (1 bytes) HSU Rx Rate In Kbps (4) HSU Tx Rate In Kbps (4) HSU Rx Rate In Fps (4) HSU Tx Rate In Fps (4).

Table C-2: Private MIB Parameters (Sheet 21 of 24)

Name	OID	Type	Access	Description
winlink1000HbsAirLinkCompressedStatic	1.3.6.1.4.1.4458.1000.3.1.7.2.1.23	DisplayString	RO	Holds all the configuration data of this link in compressed format. Helps the NMS to get info regarding new Unregistered links. Fields Included: SessionID (4 bytes) HSU IP address (4 bytes) HSU Name (32 bytes) HSU Location (32 bytes) HSU Serial number (16 bytes) HSU MAC Address (12 bytes) Air Link Range Max Throughput Down (4 bytes) Max Throughput Up. (4 bytes) Cpacity Limit (4 bytes) HSU Antenna type (1 byte)
winlink1000HbsAirCpeCapacityLimit	1.3.6.1.4.1.4458.1000.3.1.7.2.1.24	Integer	RO	Capacity Limit in Kilo bit per second.
winlink1000HbsAirLinkAntennaType	1.3.6.1.4.1.4458.1000.3.1.7.2.1.25	Integer	RO	HSU External Antenna Type: Monopolar or Bipolar.
winlink1000HbsAirHsuRxRateInKbps	1.3.6.1.4.1.4458.1000.3.1.7.2.1.26	Integer	RO	HSU Rx Rate in Kbps.
winlink1000HbsAirHsuTxRateInKbps	1.3.6.1.4.1.4458.1000.3.1.7.2.1.27	Integer	RO	HSU Tx Rate in Kbps.
winlink1000HbsAirHsuRxRateInFps	1.3.6.1.4.1.4458.1000.3.1.7.2.1.28	Integer	RO	HSU Tx Rate in Fps.
winlink1000HbsAirHsuTxRateInFps	1.3.6.1.4.1.4458.1000.3.1.7.2.1.29	Integer	RO	HSU Tx Rate in Fps.
winlink1000HbsAirComboSwitchSectorFreqBandId	1.3.6.1.4.1.4458.1000.3.1.8	Integer	RW	Switch Frequency band for the whole sector.
winlink1000HbsAirGeoAzimuth	1.3.6.1.4.1.4458.1000.3.1.9	Integer	RW	Geographic sector azimuth in degrees * 10.
winlink1000HbsAirGeoBeamwidth	1.3.6.1.4.1.4458.1000.3.1.10	Integer	RW	Geographic sector beamwidth in degrees * 10.
winlink1000HbsAirMaxDistanceMetersMobility	1.3.6.1.4.1.4458.1000.3.1.11	Integer	RW	Maximum distance in meters. Used by Mobility links only.
winlink1000HbsAirComboSwitchSectorFreqBandIdStr	1.3.6.1.4.1.4458.1000.3.1.12	DisplayString	RW	Switch Frequency band for the whole sector overriding some of the Combo parameters.
winlink1000HbsBridgeAgingTime	1.3.6.1.4.1.4458.1000.3.2.1	Integer	RW	Timeout in seconds for aging.
winlink1000HbsBridgeVlanTable			N/A	Holds the bridge Vlan operations towards all the registered HSUs.
winlink1000HbsBridgeVlanEntry			N/A	HBS bridge Vlan table entry. INDEX { winlink1000HbsBridgeVlanIndex }
winlink1000HbsBridgeVlanIndex			RO	HBS bridge Vlan table index.
winlink1000HbsBridgeVlanIngress			RW	HBS bridge Vlan ingress.
winlink1000HbsBridgeVlanEgress			RW	HBS bridge Vlan egress.
winlink1000HbsBridgeVlanFilterIn			RW	HBS bridge Vlan filter in.
winlink1000HbsBridgeVlanFilterOut			RW	HBS bridge Vlan filter out.
winlink1000HbsBridgeVlanDoubleTag			RW	HBS bridge Vlan double tag.
winlink1000HbsBridgeVlanDefaultId			RW	HBS bridge Vlan default id.
winlink1000HbsBridgeMembershipTable			N/A	Holds the bridge membership relations for all the registered HSUs.
winlink1000HbsBridgeMembershipEntry			N/A	HBS bridge membership table entry. INDEX { winlink1000HbsBridgeMembershipIndex }
winlink1000HbsBridgeMembershipIndex	1.3.6.1.4.1.4458.1000.3.2.3.1.1	Integer	RO	HBS bridge membership table index.
winlink1000HbsBridgeMembershipState	1.3.6.1.4.1.4458.1000.3.2.3.1.2	Gauge	RW	HBS bridge membership state bitmap. Each bit represents Blocked/Opened relation (membership) between two HSUs. Blocked=0 (bit) Opened=1 (bit). This object holds the relation to 32 HSUs.
winlink1000HbsBridgeMembershipState2nd	1.3.6.1.4.1.4458.1000.3.2.3.1.3	Gauge	RW	HBS bridge membership state bitmap. Each bit represents Blocked/Opened relation (membership) between HSU and LAN/Stack port of the HBS. Blocked=0 (bit) Opened=1 (bit). Only 2 bits are used.
winlink1000HbsBridgeFloodOverloadProtect	1.3.6.1.4.1.4458.1000.3.2.4	Integer	RW	Flood overload protection 1- Enabled 2- Disabled.
winlink1000HbsServiceCommandStr	1.3.6.1.4.1.4458.1000.3.3.1	DisplayString	RW	Ability to perform special command in the HBS. Format (string): Operation Index Session Param1 Param2 ....| ParamN The index and SessionID can be uniting to one parameter. On registered HSU it is HSU-ID and on Unregistered it is Session-ID.

Table C-2: Private MIB Parameters (Sheet 22 of 24)

Name	OID	Type	Access	Description
winlink1000HbsServiceVlanTable			N/A	Holds the Vlan operations towards all the registered HSUs.
winlink1000HbsServiceVlanEntry			N/A	HBS service Vlan table entry. INDEX { winlink1000HbsServiceVlanIndex }
winlink1000HbsServiceVlanIndex	1.3.6.1.4.1.4458.1000.3.3.2.1.1.1	Integer	RO	HBS service Vlan table index.
winlink1000OduServiceVlanTblTag	1.3.6.1.4.1.4458.1000.3.3.2.1.1.2	Integer	RW	The VID to be used when adding TAG or adding Provider
winlink1000OduServiceVlanTblPri	1.3.6.1.4.1.4458.1000.3.3.2.1.1.3	Integer	RW	The Vlan priority 0-7 to be used when adding TAG or adding Provider
winlink1000OduServiceVlanTblMajorMode	1.3.6.1.4.1.4458.1000.3.3.2.1.1.4	Integer	RW	The Vlan major mode
winlink1000OduServiceVlanTblEgressMode	1.3.6.1.4.1.4458.1000.3.3.2.1.1.5	Integer	RW	The Vlan mode in the Egress direction
winlink1000OduServiceVlanTblIngressMode	1.3.6.1.4.1.4458.1000.3.3.2.1.1.6	Integer	RW	The Vlan mode in the Ingress direction
winlink1000OduServiceVlanTblEgressFilter1	1.3.6.1.4.1.4458.1000.3.3.2.1.1.7	Integer	RW	VLAN Filter1 VID
winlink1000OduServiceVlanTblEgressFilter2	1.3.6.1.4.1.4458.1000.3.3.2.1.1.8	Integer	RW	VLAN Filter2 VID
winlink1000OduServiceVlanTblEgressFilter3	1.3.6.1.4.1.4458.1000.3.3.2.1.1.9	Integer	RW	VLAN Filter3 VID
winlink1000OduServiceVlanTblEgressFilter4	1.3.6.1.4.1.4458.1000.3.3.2.1.1.10	Integer	RW	VLAN Filter4 VID
winlink1000OduServiceVlanTblUntagFilteredBitmap	1.3.6.1.4.1.4458.1000.3.3.2.1.1.11	Integer	RW	Represents (in bitmap) if to Untag a frame after it is filtered (Egress direction) [4 bits represent 4 filters].
winlink1000HbsServiceQoSMode	1.3.6.1.4.1.4458.1000.3.3.3.1	Integer	RW	Quality of Service mode.
winlink1000HbsServiceQoSVlanQGroupsStr	1.3.6.1.4.1.4458.1000.3.3.3.2	DisplayString	RW	Frame classification according to VLAN priority (all 4 groups separated by comma).
winlink1000HbsServiceQoSDiffservQGroupsStr	1.3.6.1.4.1.4458.1000.3.3.3.3	DisplayString	RW	Frame classification according to Diffserv (all 4 groups separated by comma).
winlink1000HbsServiceQoSMaxRtQuePct	1.3.6.1.4.1.4458.1000.3.3.3.4	Integer	RO	Maximal percent for RT and NRT queues.
winlink1000HbsServiceQoSTable			N/A	Holds the QoS operations towards all the registered HSUs.
winlink1000HbsServiceQoSEntry			N/A	HBS service QoS table entry. INDEX { winlink1000HbsServiceQoSIndex }
winlink1000HbsServiceQoSIndex	1.3.6.1.4.1.4458.1000.3.3.3.5.1.1	Integer	RO	HBS service QoS table index.
winlink1000HbsServiceQoSConfAdminState	1.3.6.1.4.1.4458.1000.3.3.3.5.1.2	Integer	RW	QoS administrative state. The valid values are: enabled (1) disabled (2).
winlink1000HbsServiceQoSConfUpQueMir	1.3.6.1.4.1.4458.1000.3.3.3.5.1.3	DisplayString	RW	Private MIR for each QoS group of the Uplink direction (4 values separated by comma).
winlink1000HbsServiceQoSConfUpQueWeight	1.3.6.1.4.1.4458.1000.3.3.3.5.1.4	DisplayString	RW	Weight in percent for each QoS group of the Uplink direction (4 values separated by comma).
winlink1000HbsServiceQoSConfDownQueMir	1.3.6.1.4.1.4458.1000.3.3.3.5.1.5	DisplayString	RW	Private MIR for each QoS group of the Downlink direction (4 values separated by comma).
winlink1000HbsServiceQoSConfDownQueWeight	1.3.6.1.4.1.4458.1000.3.3.3.5.1.6	DisplayString	RW	Weight in percent for each QoS group of the Downlink direction (4 values separated by comma).
winlink1000HbsServiceMobilitySupported	1.3.6.1.4.1.4458.1000.3.3.4	Integer	RO	Mobility Support (1 = Not supported 2 = Supported)
winlink1000HbsServiceMaxNumOfHSUs	1.3.6.1.4.1.4458.1000.3.3.5	Integer	RO	Holds the maximum number of registered HSUs in the HBS.
winlink1000HbsPerfMonThreshTable			N/A	Holds the performance monitor thresholds towards all the registered HSUs.
winlink1000HbsPerfMonThreshEntry			N/A	HBS performance monitor threshold table entry. INDEX { winlink1000HbsPerfMonThreshIndex }
winlink1000HbsPerfMonThreshIndex			RO	HBS performance monitor threshold table index.
winlink1000HbsPerfMonTxThresh1	1.3.6.1.4.1.4458.1000.3.4.1.1.2	Integer	RW	HBS performance monitor transmit power threshold.
winlink1000HbsPerfMonRxThresh1	1.3.6.1.4.1.4458.1000.3.4.1.1.3	Integer	RW	HBS performance monitor receive power threshold 1.
winlink1000HbsPerfMonRxThresh2	1.3.6.1.4.1.4458.1000.3.4.1.1.4	Integer	RW	HBS performance monitor receive power threshold 2.
winlink1000HbsPerfMonBBERThresh1	1.3.6.1.4.1.4458.1000.3.4.1.1.5	Integer	RW	HBS performance monitor BBER threshold.
winlink1000HbsPerfMonEstThroughputThreshKbps	1.3.6.1.4.1.4458.1000.3.4.1.1.6	Integer	RW	HBS performance monitor estimated throughput Threshold.
winlink1000HbsPerfMonHighTrafficThreshKbps	1.3.6.1.4.1.4458.1000.3.4.1.1.7	Integer	RW	HBS performance monitor high traffic threshold.

Table C-2: Private MIB Parameters (Sheet 23 of 24)

Name	OID	Type	Access	Description
winlink1000HbsPerfMonAirGenCurrTable			N/A	This table defines/keeps the ethernet counters of the current 15 min interval.
winlink1000HbsPerfMonAirGenCurrEntry			N/A	This is an entry in the Current Interval Table. INDEX {ifIndex }
winlink1000HbsPerfMonAirGenCurrRxMBytes	1.3.6.1.4.1.4458.1000.3.4.2.1.1	Gauge	RO	Current RX Mega Bytes starting from the present 15 minutes period. (Represents the LAN traffic RX direction toward the HSU)
winlink1000HbsPerfMonAirGenCurrTxMBytes	1.3.6.1.4.1.4458.1000.3.4.2.1.2	Gauge	RO	Current Transmit Mega Bytes starting from the present 15 minutes period. (Represents the LAN traffic TX direction from the HSU)
winlink1000HbsPerfMonAirGenCurrEthCapacityThreshUnder	1.3.6.1.4.1.4458.1000.3.4.2.1.3	Gauge	RO	The number of times throughput was below threshold in the present 15 minutes period. Relevant for point to point systems.
winlink1000HbsPerfMonAirGenCurrHighTrafficThreshExceed	1.3.6.1.4.1.4458.1000.3.4.2.1.4	Gauge	RO	The number of times actual traffic was above threshold in the present 15 minutes period.
winlink1000HbsPerfMonAirGenCurrActiveSeconds	1.3.6.1.4.1.4458.1000.3.4.2.1.5	Gauge	RO	The number of seconds in which RPL Ethernet swervice was not blocked in the present 15 minutes period.
winlink1000HbsPerfMonAirGenIntervalTable			N/A	This table defines/keeps the ethernet counters of the last day (in resolution of 15 min intervals).
winlink1000HbsPerfMonAirGenIntervalEntry			N/A	This is an entry in the Interval Table. INDEX {ifIndex winlink1000HbsPerfMonAirGenIntervalIdx }
winlink1000HbsPerfMonAirGenIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.
winlink1000HbsPerfMonAirGenIntervalRxMBytes			RO	Current RX Mega Bytes per interval. (Represents the LAN traffic RX direction toward the HSU).
winlink1000HbsPerfMonAirGenIntervalTxMBytes			RO	Current Transmit Mega Bytes per interval. (Represents the LAN traffic TX direction from the HSU)
winlink1000HbsPerfMonAirGenIntervalEthCapacityThreshUnder			RO	The number of times throughput was below threshold in the each interval. Relevant for point to point systems.
winlink1000HbsPerfMonAirGenIntervalHighTrafficThreshExceed			RO	The number of times actual traffic was above threshold in the each interval.
winlink1000HbsPerfMonAirGenIntervalActiveSeconds			RO	The number of seconds in which RPL Ethernet service was not blocked in the each interval.
winlink1000HbsPerfMonAirGenDayTable			N/A	This table defines/keeps the ethernet counters of the last month (in resolution of days).
winlink1000HbsPerfMonAirGenDayEntry			N/A	This is an entry in the Days Table. INDEX {ifIndex winlink1000HbsPerfMonAirGenDayIdx }
winlink1000HbsPerfMonAirGenDayIdx			RO	This table is indexed per Day number. Each interval is of 15 minutes and the oldest is 96.
winlink1000HbsPerfMonAirGenDayRxMBytes			RO	Current RX Mega Bytes per day. (Represents the LAN traffic RX direction toward the HSU)
winlink1000HbsPerfMonAirGenDayTxMBytes			RO	Current Transmit Mega Bytes per day. (Represents the LAN traffic TX direction from the HSU)
winlink1000HbsPerfMonAirGenDayEthCapacityThreshUnder			RO	The number of times throughput was below threshold each day. Relevant for point to point systems.
winlink1000HbsPerfMonAirGenDayHighTrafficThreshExceed			RO	The number of times actual traffic was above threshold each day.
winlink1000HbsPerfMonAirGenDayActiveSeconds			RO	The number of seconds in which RPL Ethernet service was not blocked each day.
winlink1000HsuAirState			RO	Holds the state of the HSU.
winlink1000HsuAirLinkState			RO	Holds the state of the HSU link.
winlink1000HsuAirHsuId			RO	Holds the HSU ID as sent by the HBS.

Table C-2: Private MIB Parameters (Sheet 24 of 24)

Name	OID	Type	Access	Description
winlink1000HsuAirLocalDeregister			RW	Performs Local HSU Deregistration when - only when the link is off.
winlink1000HsuAirRemoteCompressedMon			RO	Holds all the configuration data of The HBS in compressed format. Fields Included: Rss (1 byte) Rss Balance (1 byte) Est. Tput (4 bytes) In Bytes of the whole sector (4 bytes) Out Bytes of the whole sector (4 bytes) In Frames of the whole sector (4 bytes) Out Frames of the whole sector (4 bytes) Max Throughput DownLink (4 bytes) Max Throughput UpLink (4 bytes) Rx Rate In Kbps of the whole sector (4 bytes) Tx Rate In Kbps of the whole sector (4 bytes) Rx Rate In Fps of the whole sector (4 bytes) Tx Rate In Fps of the whole sector (4 bytes)
winlink1000HsuAirRemoteCompressedStatic			RO	Holds all the configuration data of the HBS in a compressed format. Helps the NMS to get info regarding new Unregistered links. Fields Included: Location (32 bytes) IP address (8 bytes in 4458) Subnet mask (8 bytes in 4458) HBS Antenna type (1 byte) HBS Agent Version (4 bytes)
winlink1000HsuAirRssThreshSync			RW	HSUs will be synchronized immediately if RSS is better than threshold.
winlink1000HsuServiceCommandStr			RW	Ability to perform special command in the HSU. Format (string): Operation Param1 Param2 ....| ParamN.
winlink1000HsuServiceHsuType			RW	HSU type (1 = Fixed 2 = Stationary 3 = Mobile)
winlink1000HsuServiceHsuLevel			RW	HSU level (1 .. 4)
winlink1000HsuEthernetPoESupported			RO	
winlink1000HsuEthernetPoETemperature			RO	Holds the temperature (Celsius) of the POE component.
winlink1000HsuEthernetPoEEquConsumption			RO	Holds the consumption of the connected equipment (milliampere).
winlink1000HsuEthernetPoEEquVoltage			RO	Holds the voltage of the connected equipment (Volt).
winlink1000GeneralTrapDescription	1.3.6.1.4.1.4458.1000.100.1	DisplayString	RO	Trap's Description. Used for Trap parameters.
winlink1000GeneralTrapSeverity	1.3.6.1.4.1.4458.1000.100.2	Integer	RO	Trap's Severity. Used for Trap parameters.
winlink1000GeneralCookie	1.3.6.1.4.1.4458.1000.100.3	DisplayString	RW	Reserved for the Manager application provided with the product used for saving user preferences affecting ODU operation.
winlink1000GeneralEcChangesCounter	1.3.6.1.4.1.4458.1000.100.4	Integer	RO	This counter is initialized to 0 after a device reset and is incremented upon each element constant write operation via SNMP or Telnet.
winlink1000GeneralTelnetSupport	1.3.6.1.4.1.4458.1000.100.5	Integer	RW	Enable/Disable Telnet protocol.
winlink1000GeneralWISupport	1.3.6.1.4.1.4458.1000.100.6	Integer	RW	Enable/Disable Web Interface protocol. Mandatory Disabled - No option to enable the feature. Mandatory Enabled - No option to disable the feature.

MIB Traps

General

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

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

Each trap contains a trap description and additional relevant information such as alarm severity, interface index, time stamp and additional parameters.

Trap Parameters

Table C-3: MIB Traps (Sheet 1 of 6)

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

Table C-3: MIB Traps (Sheet 2 of 6)

Name	ID	Severity	Description
hssOpStateChangedToINU	19	normal	Indicates that the HSS operating state was changed to INU type. Contains a single parameter which is its description: 1 - Description: HSS operating state was changed to: INU.
hssOpStateChangedToHSM	20	normal	Indicates that the HSS operating state was changed to HSM type. Contains a single parameter which is its description: 1 - Description: HSS operating state was changed to: HSM.
hssOpStateChangedToHSC	21	normal	Indicates that the HSS operating state was changed to HSC type. Contains a single parameter which is its description: 1 - Description: HSS operating state was changed to: HSC_DT/HSC_CT.
vlanModeActive	22	normal	Indicates to non-VLAN PC that after 2 minutes the system will support only VLAN tag on management interface. Contains a single parameter which is its description: 1 - Description: VLAN Mode is active. Non-VLAN traffic will be blocked in 2 minutes.
spectrumAnalysis	23	normal	Indicates that the ODU is in Spectrum Analysis mode. Contains a single parameter which is its description: 1 - Description: Spectrum analysis in progress.
hbsHsuDeregisteredOffline	24	normal	Indicates that a HSU was deregistered offline (out of link)
hbsHsuDeregisteredSuccessfully	25	normal	Indicates that a HSU was deregistered successfully
hbsHsuRegisteredSuccessfully	26	normal	Indicates that a HSU was registered successfully
hbsHsuRegistrationFailed	27	normal	Indicates that registration has failed
hbsHsuViolatedState	28	normal	Indicates (on the HBS side) that a HSU is is violated state
hsuViolatedState	29	normal	Indicates (on the HSU side) that the HSU is is violated state
hbsUnregisteredSynchronizedHsu	30	normal	Indicates an unregistered HSU has been synchronized.
hbsUnregisteredUnsynchronizedHsu	31	normal	Indicates an unregistered HSU lost synchronization.
cableQuality	32	normal	1Gbps rate is not supported due to bad line quality.
httpAuthentication	33	normal	HTTP Authentication Failure.
telnetAuthentication	34	normal	Telnet Authentication Failure.
tdmServiceAlarm	100	major	Indicates that TDM Service is in alarm state. Contains a single parameter which is its description: 1 - Description: TDM Service - Alarm.
ethServiceClosed	101	major	Indicates that Ethernet Service is closed. Contains a single parameter which is its description: 1 - Description: Ethernet Service is closed.
ethServiceNotPermitted	102	major	Indicates that Ethernet Service is not permitted. Contains a single parameter which is its description: 1 - Description: A valid IDU could not be detected at %s. Please check your configuration. %s - Is the Local Site name or Remote Site name or both sides of the Link.
encryptionAlarm	103	major	Indicates an encryption key mismatch. Contains a single parameter which is its description: 1 - Description: Encryption Status - Failed. No Services are available.
changeLinkPasswordAlarm	104	major	Indicates that a failure has occurred while attempting to change the Link Password. Contains a single parameter which is its description: 1 - Description: Failed to change the Link Password at/on: %s. %s - Is the Local Site name or Remote Site name or both sides of the Link.
externalAlarmInPort1Alarm	105	major	The trap is sent every time an alarm occurs in the External Alarm Input of port #1. Contains a single parameter which is its description: 1 - Description: External Alarm 1 - <User Text> - Alarm.
externalAlarmInPort2Alarm	106	major	The trap is sent every time an alarm occurs in the External Alarm Input of port #2. Contains a single parameter which is its description: 1 - Description: External Alarm 2 - <User Text> - Alarm.
bitFailedAlarm	107	major	The trap is sent if there is no way to recover from the situation.Contains two parameters: 1 - Description: ODU power up built in test failed. Error code is: %n 2 - %n number
wrongConfigurationLoadedAlarm	108	major	The trap is sent if there is a way to recover from the situation.Contains two parameters: 1 - Description: Wrong configuration loaded. Error code is: %n 2 - %n number

Table C-3: MIB Traps (Sheet 3 of 6)

Name	ID	Severity	Description
lanPort1DisconnectedAlarm	109	major	Indicates the LAN port 1 status changed to disconnected.Contains a single parameter which is its description: 1 - Description: LAN port 1 status changed to disconnected.
lanPort2DisconnectedAlarm	110	major	Indicates the LAN port 2 status changed to disconnected.Contains a single parameter which is its description: 1 - Description: LAN port 2 status changed to disconnected.
mngPortDisconnectedAlarm	111	major	Indicates the management port status changed to disconnected.Contains a single parameter which is its description: 1 - Description: Management port status changed to disconnected.
externalAlarmInPort3Alarm	112	major	The trap is sent every time an alarm occurs in the External Alarm Input of port #3. Contains a single parameter which is its description: 1 - Description: External Alarm 3 - <User Text> - Alarm.
externalAlarmInPort4Alarm	113	major	The trap is sent every time an alarm occurs in the External Alarm Input of port #4. Contains a single parameter which is its description: 1 - Description: External Alarm 4 - <User Text> - Alarm.
swVersionsMismatchFullCompatibilityAlarm	114	warning	The trap is sent if SW versions mismatch with full link functionality. Contains a single parameter which is its description: 1 - Description: Software versions mismatch - full link functionality
swVersionsMismatchRestrictedCompatibilityAlarm	115	minor	The trap is sent if SW versions mismatch with restricted link functionality. Contains a single parameter which is its description: 1 - Description: Software versions mismatch - restricted link functionality
swVersionsMismatchSoftwareUpgradeRequired	116	major	The trap is sent if SW versions mismatch and SW upgrade is required. Contains a single parameter which is its description: 1 - Description: Software versions mismatch - Software upgrade required
swVersionsIncompatible	117	critical	The trap is sent if SW versions are incompatible. Contains a single parameter which is its description: 1 - Description: SW Versions incompatible
hssMultipleSourcesDetectedAlarm	118	major	Indicates that multiple sync pulse sources were detected. Contains a single parameter which is its description: 1 - Description: HSS multiple sync sources were detected.
hssSyncToProperSourceStoppedAlarm	119	major	Indicates that synchronization to a proper sync pulse source was stopped. Contains a single parameter which is its description: 1 - Description: HSS sync pulse - Down. The reason is: %s. %s - Is the reason for the sync down.
hssSyncPulseDetectedAlarm	120	major	Indicates that HSS additional sync pulse was detected. Contains a single parameter which is its description: 1 - Description: HSS additional sync pulse was detected.
tdmBackupAlarm	121	major	Indicates that the TDM backup link was activated. Contains a single parameter which is its description: 1 - Description: TDM backup alarm - backup link was activated.
linkLockUnauthorizedRemoteODU	122	major	Indicates that the remote ODU is unauthorized. Contains a single parameter which is its description: 1 - Description: Unauthorized remote ODU connection rejected.
linkLockUnauthorizedODU	123	major	Indicates that the ODU is unauthorized. Contains a single parameter which is its description: 1 - Description: Unauthorized ODU connection rejected.
hotStandbyAlarm	124	major	Indicates that the hot standby secondary link was activated. Contains a single parameter which is its description: 1 - Description: Secondary Link Is Active.
sfpInsertion	126	normal	Indicates that a device was inserted to SFP Port
sfpPort1DisconnectedAlarm	127	major	Indicates the SFP port 1 status changed to disconnected.Contains a single parameter which is its description: 1 - Description: SFP port 1 status changed to disconnected.
ringRplStateActiveAlarm	128	major	RPL state changed to Active.
desiredRatioCanNotBeAppliedAlarm	129	normal	Indicates Desired UL/DL RAtio Can Not Be Applied.

Table C-3: MIB Traps (Sheet 4 of 6)

Name	ID	Severity	Description
cbwMismatch	130	major	Indicates that a Channel Bandwidth mismatch was detected.Contains two parameters: 1 - Description: Channel Bandwidth Mismatch: one side is %n0 MHz and the other is %n1 MHz. %n0 is the local Channel Bandwidth value in MHz. %n1 is the remoet Channel Bandwidth value in MHz.
gpsNotSynchronized	131	major	Indicates that the GPS is not synchronized with satellites. Pulses are self generated.
pdTooHighDueCbwLimitations	132	major	Indicates that link cannot be established because link range is too large for channel bandwidth.
hbsEncryptionAlarm	133	major	Indicates an encryption key mismatch. Contains a single parameter which is its description including the HSU's name
hbsEhServiceClosedToHsu	134	major	Indicates an encryption key mismatch. Contains a single parameter which is its description including the HSU's name
hbsUnsynchronizedHsuAlarm	135	warning	Indicates a registered HSU lost synchronization.
hbsInactiveHbsAlarm	136	major	Indicates HBS is InActive.
incompatibleHsu	137	critical	Indicates that the HSU is not compatible to HBS. Contains a single parameter which is its description: 1 - Description: Incompatible ODUs.
hsuUnsupportedBeacon	138	warning	Indicates an unsupported beacon has arrived at HSU
tdmServiceClear	200	major	Indicates that TDM Service fault is cleared. Contains a single parameter which is its description: 1 - Description: TDM Service - Normal.
ethServiceOpened	201	normal	Indicates that Ethernet Service has been opened. Contains a single parameter which is its description: 1 - Description: Ethernet Service has been opened.
encryptionClear	203	normal	Indicates that encryption is OK. Contains a single parameter which is its description: 1 - Description: Encryption Status - Normal.
changeLinkPasswordClear	204	normal	Indicates that the Link Password was changed successfully. Contains a single parameter which is its description: 1 - Description: Link Password has been changed at/on: %s. %s - Is the Local Site name or Remote Site name or both sides of the Link.
externalAlarmInPort1Clear	205	normal	This Trap is sent every time an External Alarm Input fault of port # 1 is cleared. Contains a single parameter which is its description: 1 - Description: External Alarm 1 - <User Text> - Alarm Cleared.
externalAlarmInPort2Clear	206	normal	This Trap is sent every time an External Alarm Input fault of port # 2 is cleared. Contains a single parameter which is its description: 1 - Description: External Alarm 2 - <User Text> - Alarm Cleared.
lanPort1Clear	209	normal	Indicates the LAN port 1 status changed to connected. Contains two parameters: 1 - Description: LAN port 1 status changed to connected - %s 2 - %s Is the Eth. mode (speed & duplex)
lanPort2Clear	210	normal	Indicates the LAN port 2 status changed to connected. Contains two parameters: 1 - Description: LAN port 2 status changed to connected - %s. 2 - %s Is the Eth. mode (speed & duplex).
mngPortClear	211	normal	Indicates the management port status changed to connected. Contains two parameters: 1 - Description: Management port status changed to connected - %s 2 - %s Is the Eth. mode (speed & duplex)
externalAlarmInPort3Clear	212	normal	This Trap is sent every time an External Alarm Input fault of port # 3 is cleared. Contains a single parameter which is its description: 1 - Description: External Alarm 3 - <User Text> - Alarm Cleared.
externalAlarmInPort4Clear	213	normal	This Trap is sent every time an External Alarm Input fault of port # 4 is cleared. Contains a single parameter which is its description: 1 - Description: External Alarm 4 - <User Text> - Alarm Cleared.
swVersionsMatchFullCompatibilityClear	214	normal	The trap is sent if SW versions match. Contains a single parameter which is its description: 1 - Description: Software Versions compatible
swVersionsMatchRestrictedCompatibilityClear	215	normal	The trap is sent if SW versions match and link functionality is not restricted. Contains a single parameter which is its description: 1 - Description: Software Versions compatible

Table C-3: MIB Traps (Sheet 5 of 6)

Name	ID	Severity	Description
swVersionsMatchSoftwareUpgradeRequiredClear	216	normal	The trap is sent if SW versions match and SW upgrade is successful. Contains a single parameter which is its description: 1 - Description: Software Versions compatible
swVersionsCompatibleClear	217	normal	The trap is sent if SW versions compatible Contains a single parameter which is its description: 1 - Description: Software Versions compatible
hssMultipleSourcesDisappearedClear	218	normal	Indicates that multiple sync pulse sources disappeared. Contains a single parameter which is its description: 1 - Description: HSS multiple sync pulse sources disappeared.
hssSyncToProperSourceAchievedClear	219	normal	Indicates that synchronization to a proper Sync source was achieved. Contains a single parameter which is its description: 1 - Description: HSS sync pulse - Up.
hssSyncPulseDisappearedClear	220	normal	Indicates that HSS additional sync pulse disappeared. Contains a single parameter which is its description: 1 - Description: HSS additional sync pulse was disappeared.
tdmBackupClear	221	normal	Indicates that the TDM main link was activated. Contains a single parameter which is its description: 1 - Description: TDM main link was activated.
linkLockAuthorizedRemoteODU	222	normal	Indicates that the remote ODU is authorized. Contains a single parameter which is its description: 1 - Description: Authorized remote ODU connection accepted.
linkLockAuthorizedODU	223	normal	Indicates that the ODU is authorized. Contains a single parameter which is its description: 1 - Description: Authorized ODU connection permitted.
linkAuthenticationDisabled	224	normal	Indicates that the Link Lock is disabled. Contains a single parameter which is its description: 1 - Description: Link Authentication has been disabled.
hotStandbyClear	225	normal	Indicates that the Primary Link Was Activated. Contains a single parameter which is its description: 1 - Description: Primary Link Is Active.
sfpExtraction	226	normal	Indicates that a device was extracted from SFP Port
sfpPort1Clear	227	normal	Indicates the SFP port 1 status changed to connected. Contains two parameters: 1 - Description: SFP port 1 status changed to connected - %s 2 - %s Is the Eth. mode (speed & duplex)
compatibleIdus	228	normal	Indicates that the ODU has identified compatible Idus on both sides of the link.
desiredRatioCanNotBeAppliedClear	229	normal	Indicates Current UL/DL Ratio Is Equal To Desired Ratio.
cbwMatch	230	normal	Indicates that a Channel Bandwidth match was detected. Contains a single parameter which is its description: 1 - Channel Bandwidth value in MHz.
switchCbwAndChannel	231	normal	Indicates that the system is switching Channel Bandwidth and channel frequency. Contains two parameters: 1 - Switching to Channel Bandwith %n0 MHz and to channel %n1 GHz.
ringRplStateIdle	232	normal	RPL state changed to Idle.
ringEthServiceStatus	233	normal	Indicates Ethernet service's state - blocked \ unblocked. Contains a single parameter: 1 - Description: Ethernet's state (blocked \ unblocked)
ringFirstRpmReceived	234	normal	Ring application: in non-RPL link indicates first from a specific RPL was received. Contains a single parameter: 1 - Description: RPM's VLAN ID
ringEthernetSrviceUnblockedTO	235	normal	Ring application: in non-RPL link Ethernet service is unblocked due to RPM timeout.
gpsSynchronized	236	normal	Indicates that the GPS is synchronized with satellites.
hbsEncryptionClear	237	normal	Indicates that encryption is OK. Contains a single parameter which is its description including the HSU's name
hbsEhServiceOpenedToHsu	238	normal	Indicates that encryption is OK. Contains a single parameter which is its description including the HSU's name
hbsSynchronizedHsuAlarm	239	normal	Indicates a registered HSU is synchronized.
hbsActiveHbs	240	normal	Indicates when HBS has been activated.

Table C-3: MIB Traps (Sheet 6 of 6)

Name	ID	Severity	Description
switchCBW	241	normal	Switching Channel Bandwidth.
changeRatio	242	normal	HBS Tx ratio has changed.
lanPortClear	243	normal	Indicates the LAN port status changed to connected. Contains two parameters: 1 - Description: LAN port status changed to connected - %s 2 - %s Is the Eth. mode (speed & duplex)
poePortClear	244	normal	Indicates the POE port status changed to connected. Contains two parameters: 1 - Description: POE port status changed to connected - %s 2 - %s Is the Eth. mode (speed & duplex)
poePowerConsumptionClear	245	normal	Indicates the POE power consumption is valid. Contains two parameters: 1 - Description: POE consumption within limits. port is opened. 2 - %s Is the Eth. mode (speed & duplex)
incompatibleHbsHsu	246	normal	Incompatible HBS/HSU software versions - no service.
mobilityLinkOff	247	normal	Mobility - Link cannot be established due to: 1 - The HBS does not support Mobility 2 - Lack of resources in the HBS for HSU level

RADWIN Manager Traps

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

A list of Trap Messages as displayed by the RADWIN Manager is shown in **Table 9-4**.

Appendix D

RF Exposure

The antennas used for the following transmitters must be installed so as to provide a minimum separation distance from bystanders as specified in the following tables:

Table D-1: Safety Distances for RADWIN 5000 HPMP FCC and IC Products

Frequency Band [GHz]	FCC ID	IC ID	Antenna gain [dBi]	Min. Safety Distance [cm]
5.8	Q3KRW2058	5100A-RW2054	28	223
5.8	Q3KRW2058	5100A-RW2054	24	141
5.8	Q3KRW2058	5100A-RW2054	17	63
5.3/5.4	Q3KRW2054	5100A-RW2054	23.5 / 28	20
4.9	Q3KRW2049	5100A-RW2054	28	225
4.9	Q3KRW2049	5100A-RW2054	21	113
4.9	Q3KRW2049	5100A-RW2054	15	57
2.4	Q3KRW2024	5100A-RW2054	19	39
2.4	Q3KRW2024I	5100A-RW2024I	17.5	40
3.5	N/A	5100A-RW2030	25	92
3.6/3.7	Q3KRW2030	5100A-RW2030	25	86

Table D-2: Safety Distances for RADWIN 5000 HPMP ETSI Products

Frequency Band [GHz]	Antenna gain [dBi]	Min. Safety Distance [cm]
5.8	24 / 28	20
5.4	23.5 / 28	20
5.3	23.5 / 28	20
2.4	19 / 17.5	20
3.5	25	200

Appendix E

Setting Antenna Parameters

Antenna Issues

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

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

About Single and Dual Antennas

Each RADWIN 5000 HPMP ODU is made of two radio transceivers (radios). The radios make use of algorithms that utilize both MIMO and Diversity resulting in enhanced capacity, range and link availability. The number of antennas (i.e. radios) used is determined by user configuration and by automatic system decisions, explained below.

Dual Antennas at the HBS and an HSU

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

MIMO Mode

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

For example with a dual antenna RADWIN 5000 HPMP can transmit at modulation of 64QAM and FEC of 5/6 and get an air rate of 130 Mbps, compared to 65 Mbps with single antenna.

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

Upon selecting Antenna Type as Dual, RADWIN 5000 HPMP automatically selects MIMO mode and doubles the air rates.

RADWIN Manager indicates a case of unbalanced RSS between the two antennas in the HBS panels.

Diversity Mode

Diversity Mode uses two antennas to improve the quality and reliability of the link. Often, there is not a clear line-of-sight (LOS) between transmitter and receiver. Instead the signal is reflected along multiple paths before if-ally being received.

Each such “bounce” can introduce phase shifts, time delays, attenuations, and even distortions that can destructively interfere with one another at the aperture of the receiving antenna. Antenna diversity is especially effective at mitigating these multi-path situations.

This is because multiple antennas afford a receiver several recordings of the same signal. Each antenna will be exposed to a different interference envy-remnant. Thus, if one antenna is undergoing a deep fade, it is likely that another has a sufficient signal. Collectively such a system can provide a robust link.

Antenna diversity requires antenna separation which is possible by using a dual-polarization antenna or by two spatially separated antennas.

Use Diversity instead of MIMO in the following situations:

- When the system cannot operate in MIMO Mode
- When one of the receivers has high interference compared to the second receiver (i.e. the system is “unbalanced”)
- When you achieve higher capacity in Diversity Mode than in MIMO Mode
- When high robustness is of importance and the capacity of Diversity Mode is sufficient (up to 25 Mbps full duplex)

Single Antennas at Both Sites

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

Single at One Site, Dual Antennas at the Other

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

The advantages in this mode in comparison to using a single antenna in both sites are doubled total Tx Power and additional polarization and/or space diversity (depending on the polarization of installed antennas).

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

Table E-1 summarizes the situation:

Table E-1: MIMO - Diversity settings

Number of Antennas		Mode	Max Full Duplex Capacity
Site A	Site B		
2	2	MIMO	50 Mbps
		Diversity	25 Mbps
2	1		25 Mbps
1	2		25 Mbps
1	1		25 Mbps

Site A and B may be HBS or HSU.

The rates used by RADWIN 5000 HPMP are shown in Table E-2 below:

Table E-2: RADWIN 5000 HPMP Air rates

Antenna	Modulation	FEC	Air-Rate [Mbps]	
			20 MHz CBW	40 MHz CBW
Single	BPSK	1/2	6.5	13.5
Single	QPSK	1/2	13	27
Single	QPSK	3/4	19.5	40.5
Single	16QAM	1/2	26	54
Single	16QAM	3/4	39	81
Single	64QAM	2/3	52	108
Single	64QAM	3/4	58.5	121.5
Single	64QAM	5/6	65	135
Dual	BPSK	1/2	13	27
Dual	QPSK	1/2	26	54
Dual	QPSK	3/4	39	81
Dual	16QAM	1/2	52	108
Dual	16QAM	3/4	78	162
Dual	64QAM	2/3	104	216
Dual	64QAM	3/4	117	243
Dual	64QAM	5/6	130	270

Considerations for Changing Antenna Parameters

Let:

max Available Tx Power denote the maximum Tx Power practically available from an ODU. (It appears as **Tx Power per Radio**.)

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

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

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

Then, the following relationship must be satisfied:

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

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

Notes

- To see the relationship between Tx Power (radio) and Tx Power (system), note that $dBm = 10 \times \log_{10} milliWatt$ so that if you double the power in milliWatts (for two radios) then dBm will increase by $10 \times \log_{10} 2 \approx 3$.
- The Max EIRP level will be automatically set according to the selected band and regulation.
- The EIRP level is the sum of the System Tx Power and the Antenna Gain minus the Cable Loss.
- The Max EIRP level will be automatically set according to the selected band and regulation.
- The EIRP level is the sum of the System Tx Power and the Antenna Gain minus the Cable Loss.

The inequality **(*)** above is always satisfied by the system in accordance with the relevant regulation.

The precise relationship between the items in inequality **(*)** is as follows:

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

Appendix F

Regional Notice: French Canadian

Procédures de sécurité

Généralités

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

Mise à la terre

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

- La cosse de masse sur l'IDU-C doit être constamment connectée à la protection de terre, par un câble de diamètre de 18 AWG ou plus. Le matériel monté sur rack doit être installé seulement sur des racks ou armoires reliés à la terre
- Une ODU doit mise à la terre par un câble de diamètre de 10 AWG ou plus
- Il ne doit pas y avoir de fusibles ou d'interrupteurs sur la connection à la terre

De plus:

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

Protection contre la foudre

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

Matériel supplémentaire requis

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

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

Précautions de sécurité pendant le montage de ODU

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

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

➢ **Pour monter l'ODU:**

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

Prudence

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

Connecter la terre à IDU-C

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

Prudence

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

Installation sur pylône et mur

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

Contenu du kit de montage ODU

Le kit de montage ODU comprend les pièces suivantes:

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

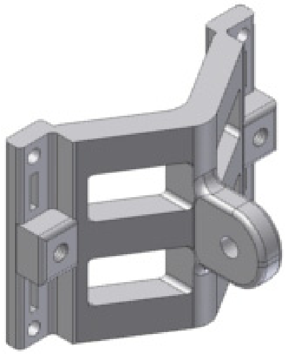


Figure F-1: grande clame

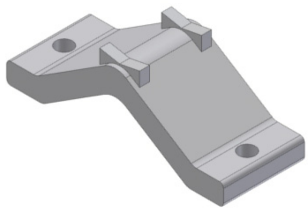


Figure F-2: petite clame

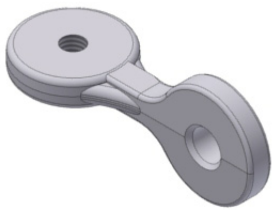
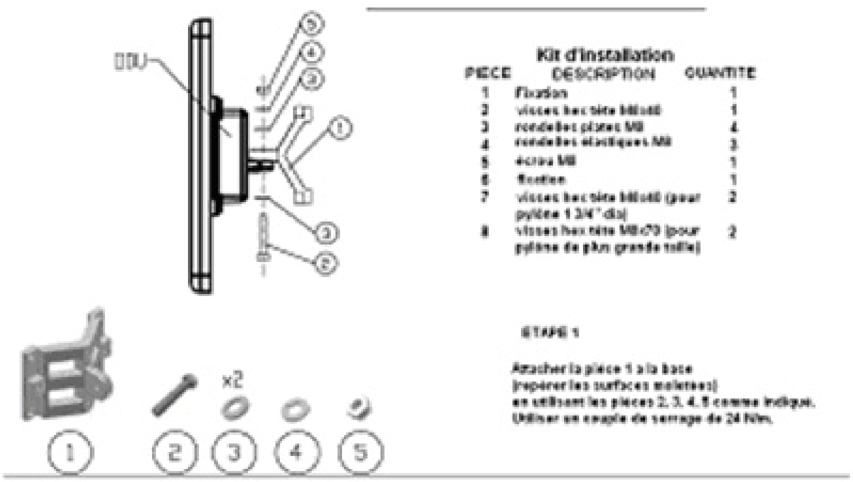


Figure F-3: bras

Montage sur un pylône



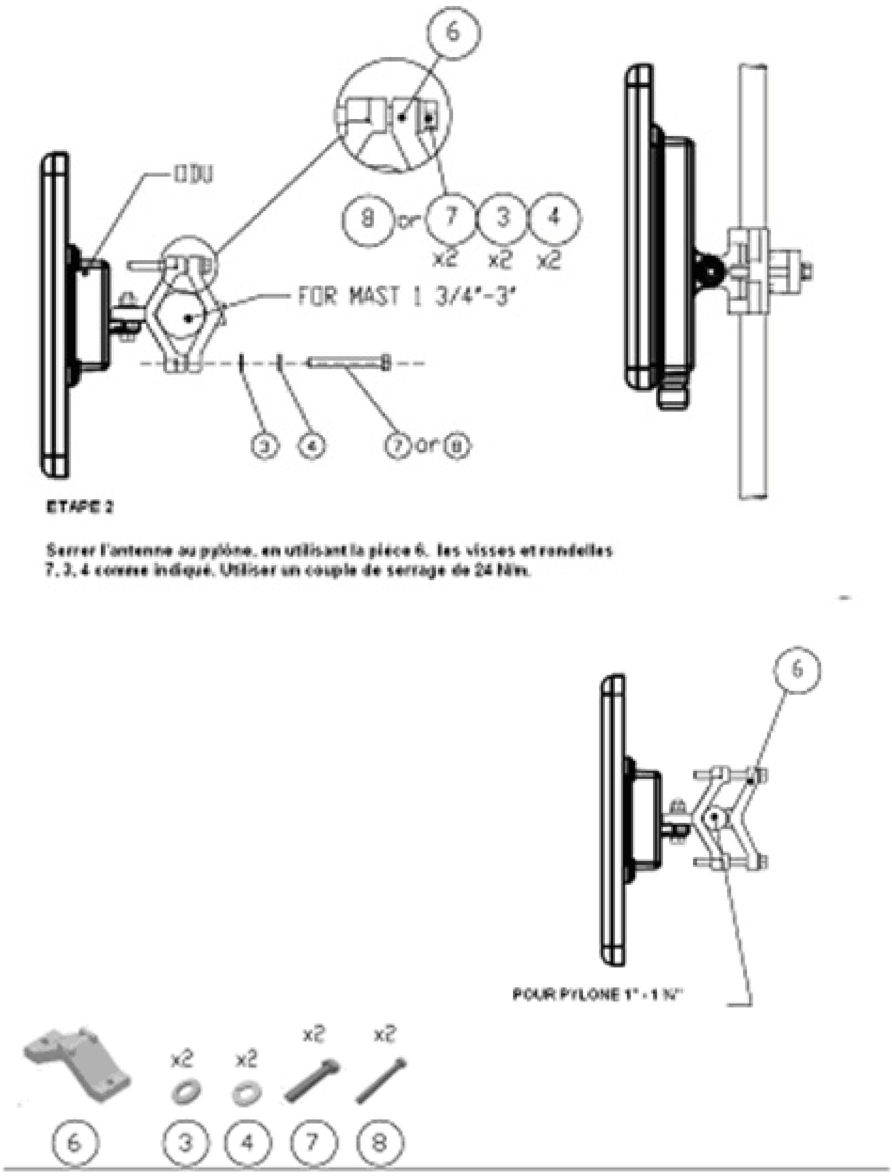


Figure F-4: Montage sur un pylône

Montage sur un mur

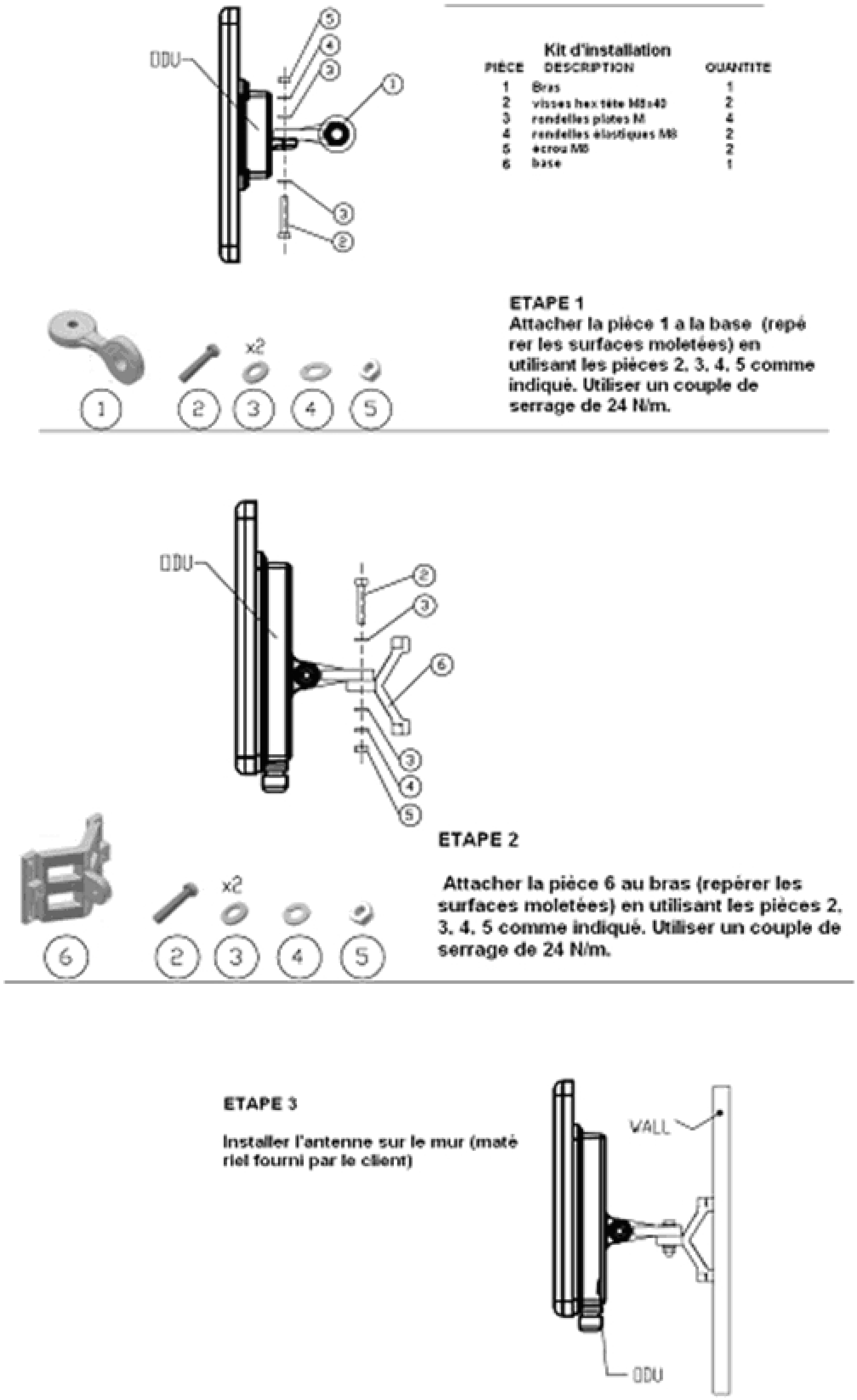


Figure F-5: Montage sur un mur

Montage d'une antenne externe

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

Contenu du kit de montage d'une antenne externe

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

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

➢ **Pour installer une antenne externe sur un pylône:**

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

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

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RADWIN