



# NetAstra Family

## Broadband Wireless Networking Solutions

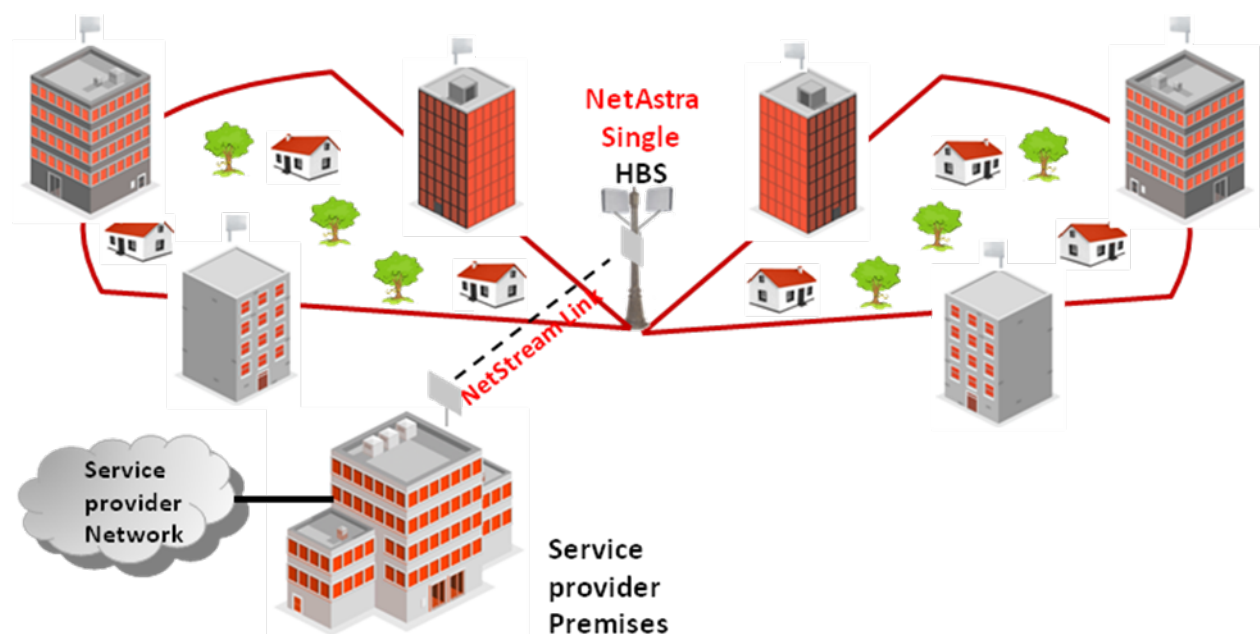
NetAstra AU (HBS) 5x200 / 5x50 / 5x25 / 5x10 / 5x05

NetAstra SU (HSU) 5x50 / 5x20 / 5x10 / 5x05

NetAstra HMU (Mobility Unit) 5x100

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## SYSTEM MANUAL



Version 3.4.70

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### **Information to User**

Any changes or modifications of equipment not expressly approved by the manufacturer could void the user's authority to operate the equipment and the warranty for such equipment.

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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 generate, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

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

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

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



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

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

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

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- Where Outdoor units are configurable by software to Tx power values other than those for which the product is certified, it is the responsibility of the Professional Installer to restrict the Tx power to the certified limits.
  - This product was tested with special accessories - indoor unit (IDU or PoE), FTP CAT 5e shielded cable with sealing gasket, 12 AWG grounding cable - which must be used with the unit to insure compliance.
- 

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

- (1) These devices may not cause harmful interference.
- (2) These devices must accept any interference received, including interference that may cause undesired operation.

### **Canadian Emission Requirements for Indoor Units**

This Class B digital apparatus complies with Canadian ICES-003.  
*Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.*

### **China MII**

Operation of the equipment is only allowed under China MII 5.8 GHz 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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# Part 1

## Basic Installation



# Chapter 1

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## Introduction

### Welcome to NetAstra!

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

NetAstra sector access unit delivers up to 250 Mbps, 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, Netronics solution saves valuable tower space, eases maintenance efforts and reduces the total cost of ownership per megabit. Offering a variety of powerful SUs, NetAstra enables service capacity of up to 100 Mbps for enterprise customers.

NetAstra subscriber units may now be

- **Fixed** - permanently installed at fixed locations
- **Nomadic** - installed in a vehicle that may move from one base station to another. Service is provided when the vehicle is stationary
- **Mobile** - installed in any kind of moving vehicle. Service is continuous and seamless from base stations in the network

### What's new in Release 3.4.70

The main changes in LA release 3.4.70 since the last LA release 3.4.50 are:

- N
- SNMPv3 support
- HBS Throughput Mode may be changed from maximum (default) to a lower rate to minimize latency
- For each HSU, MIMO Mode may now be one of, Diversity (parallel identical streams), Spatial Multiplexing (split streams for maximum throughput) or Auto Selection. The mode is set at HSU registration or when using the HSU Update Service facility.

## Key Features of NetAstra PtMP

### **General**

- Ethernet connectivity
- 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
- Wide range of frequency bands - 2.3 - 2.7 GHz, 3.3-3.8 GHz, 4.9 -6.4 GHz
- Dedicated Bandwidth ensuring SLA & latency
- Low and constant latency – min < 3ms, typical 4 to 20 ms
- Channel bandwidth – 5/10/20/40 MHz
- Regulations supported - FCC/IC/ETSI/WPC/MII/Universal
- Multiband HBSs and HSUs: 2.3-2.4 or 2.5-2.7 or 3.3-3.8 or 4.9-6.0 or 5.9-6.4 GHz in the same unit
- Simple to deploy
- Web Interface for sector management (both HBS and HSU)
- SFP support when connecting to a IDU-DT6 in place of a PoE device

### **Mobility Capabilities**

- Up to 100 Mbps per HBS sector and mobile unit
- High speed - up to 200 Km/h
- Long range coverage of up to 10 Km / 6 miles

### **Base Station**

- High capacity sector HBS
- 250 Mbps aggregate throughput
- Up to 32 Subscriber Units per HBS
- Fully integrated with Netronics Legacy solutions:
  - Coexist and HBS-collocatable with NetStream products
  - Common Link Manager
  - Common NMS
- Smart Bandwidth Management (SBM) using dynamic bandwidth allocation to maximize service provider throughput and adhere to customer SLAs
- Nomadic support (all HBSs)

- Mobility support (Mobility HBSs only)

### Subscriber Units

- High capacity: 5/10/25/50/100 Mbps aggregate throughput
- Supports Customer SLAs by using SBM at the HBS
- Fixed, nomadic, mobility types
- Separate uplink and downlink configurable Maximum Information Rate (MIR) per HSU

## Components of NetAstra PtMP Sector

### Major Components

A NetAstra Point to Multipoint Sector consists of an HBS equipped with a sector antenna, communicating with up to 32 HSUs located within the beam of its antenna.

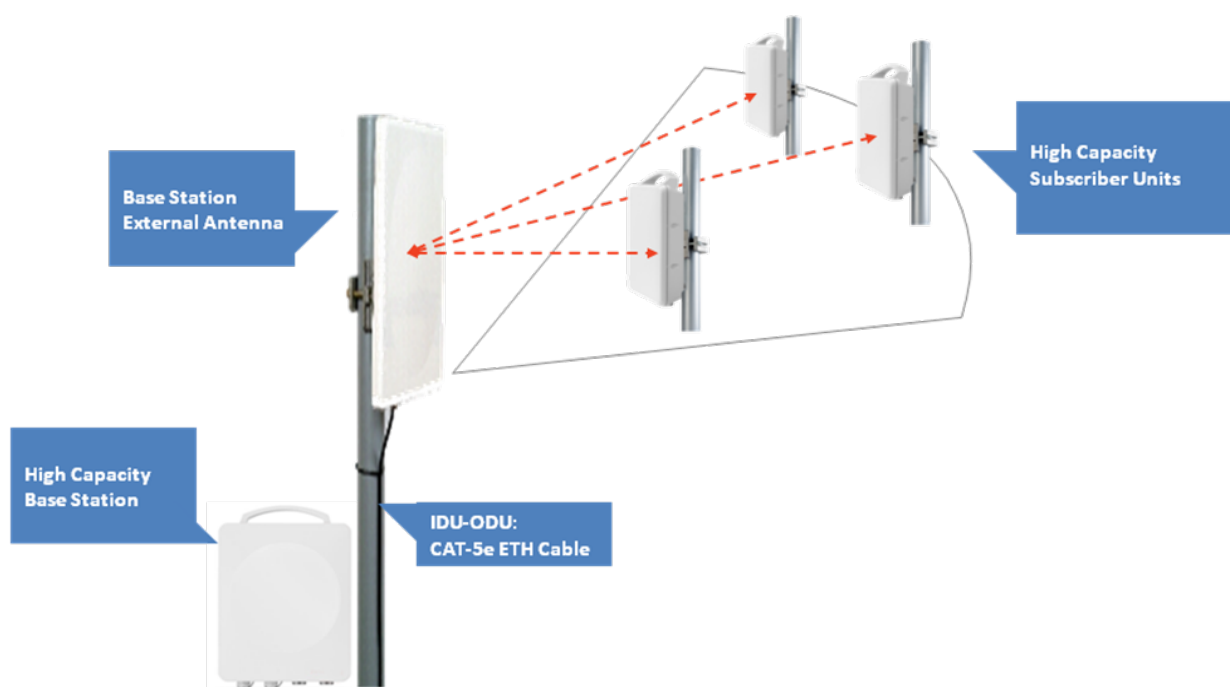


Figure 1-1: Sector Schematic: Main Components

Both the HBS and the HSUs communicate respectively, with the service provider and users through PoE devices. The communication protocol for both the service provider and the users is Ethernet



HBSs may be connected through IDU-DT6 aggregation units.

Extended radial coverage can be achieved by setting up adjacent sectors using collocated HBSs.

## Accessories

To build a NetAstra PtMP sector you will require some of the following accessories:

- PoE devices - Both Gigabit and 100 Mbps
- HSS unit - Collocation unit for intra-site synchronization
- IDU-DT6 Aggregation unit for a collocated hub site instead of multiple PoE devices
- GSU for inter-site synchronization
- Additional HSU types including AC powered units
- Antennas - A wide variety of directional and sector antennas is available
- ODU and antenna mounting kits
- Lightning protector for use with all Ntronics outdoor products
- Ethernet repeater - enables you to extend non-GbE PoE - ODU cables beyond the 100 m limit
- CAT 5e cables of various lengths specifically for use with Ntronics radios and PoE devices
- Grounding cables

## Sector Management Tools

### Link Manager

The Link 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 Link Manager has a rich graphical user interface.

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

It may be used to -

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

Full details are supplied in [Chapter 20](#).

### Netronics Network Management System (NMS)

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

Using NMS, Service Providers can configure and monitor up to 10,000 Netronics links<sup>1</sup>. The intuitive easy-to-use NMS provides a full range of network surveillance, monitoring, configuration and fault management capabilities. It offers users complete visibility and control over their Netronics-based networks.

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1. Depending on license type

## Documentation supplied with NetAstra PtMP

The technical documentation supplied with a NetAstra PtMP, is located on the product CD. It includes the following items:

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

## 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 high **Access Unit** 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 NetAstra product suite supports considerably higher capacity than other current technologies (such as Wi-Max). We distinguish between generic AUs and SUs and NetAstra units, relabeling the latter, **HBSs** 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° 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 provides service while the vehicle to which it is attached is moving or stationary. The vehicle is typically a railway carriage or a ship.
- **Downlink** traffic is data transfer from an HBS to an HSU.
- **Uplink** traffic is data transfer from an HSU to an HBS.
- **Time slots** are assigned to each HSU to prioritize them. 63 time slots are available in each of the uplink and downlink directions.

- For each fixed or nomadic HSU, **Assured throughput** is determined by the actual number of time slots allocated to it in either direction. **Peak throughput** (higher than Assured throughput) may be achieved by allocating unused downlink time slots or unallocated uplink time slots to very busy HSUs. This process is called **Smart Bandwidth Management (SBM)**. SBM takes up one time slot in each direction.

## Conventions Used in this Manual

### Notifications

Notifications consist of Notes, Cautions and Warnings.



**Note**

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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 NetAstra
  - 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**

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

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**Warning**

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

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## ***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 Link 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 Calibri 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

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## Site Survey

### 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 relocation will need to be considered.

A Site Survey consists of three stages:

- **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.
- **Physical survey** - The locations of the indoor and outdoor equipment are determined **on-site**.
- **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*

NetAstra PtMP 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.

NetAstra 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

**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 detailed 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 HSU ODUs, relative to north.
6. If there are obstructions between the two sites, calculate the Fresnel Zone (see [Chapter 18](#) 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 Link 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.



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

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➤ **To perform a physical survey:**

1. From the compass readings taken in the preliminary survey, find the azimuth (horizontal position) that each HSU ODU should face towards the HBS ODU.
2. Using binoculars, locate any obstructions such as tall trees, high buildings, hills or mountains. Look for other RF towers between the two sites. Mark the locations of the obstructions on the map.
3. Determine the location for the ODU (having regard for existing rooftop installations and tower space). It should be above any obstructions, considering the Fresnel zone (see [Chapter 18](#)).
4. If you need to install an 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.



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

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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 10 ohm.
9. Review the results of the physical site survey. Decide if the site is suitable for the wireless network installation.
  - If the site is suitable, continue with stage 3, the RF survey
  - If the site is not suitable, survey another site

### ***Additional Outdoor Site Requirements***

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

### ***Additional Indoor Site Requirements***

The 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 NetAstra radios
- Other collocated radio devices installed on the same site. To avoid or minimize interference, follow these recommendations:
  - For collocated NetAstra units, use an HSS unit to synchronize between them. Select different operating channels for each collocated NetAstra unit.
  - If one or more collocated units are not NetAstra units, ensure that there is a physical separation of at least three meters between a NetAstra 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



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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 NetAstra link in accordance with the prior planning as set out in [Chapter 2](#). It is intended to guide qualified field technicians.



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



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

This chapter covers the following topics:

- Unpacking and checking supplied equipment:
  - Different ODU styles for HBSs and HSUs
  - PoE devices
  - IDU-DT6 aggregation unit
  - Antennas
  - Accessories
- Tools required for installation
- Safety practices
- Mounting an ODU

- Connecting an ODU
- Grounding and lightning protection for an ODU
- Network connection
- Powering up
- Establishing a radio link

## What's in the box

### *Unpacking and Checking*

➤ For each of the items below, do the following:

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

### *Base Station Radios*

The NetAstra PtMP HBS package includes the following items:

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

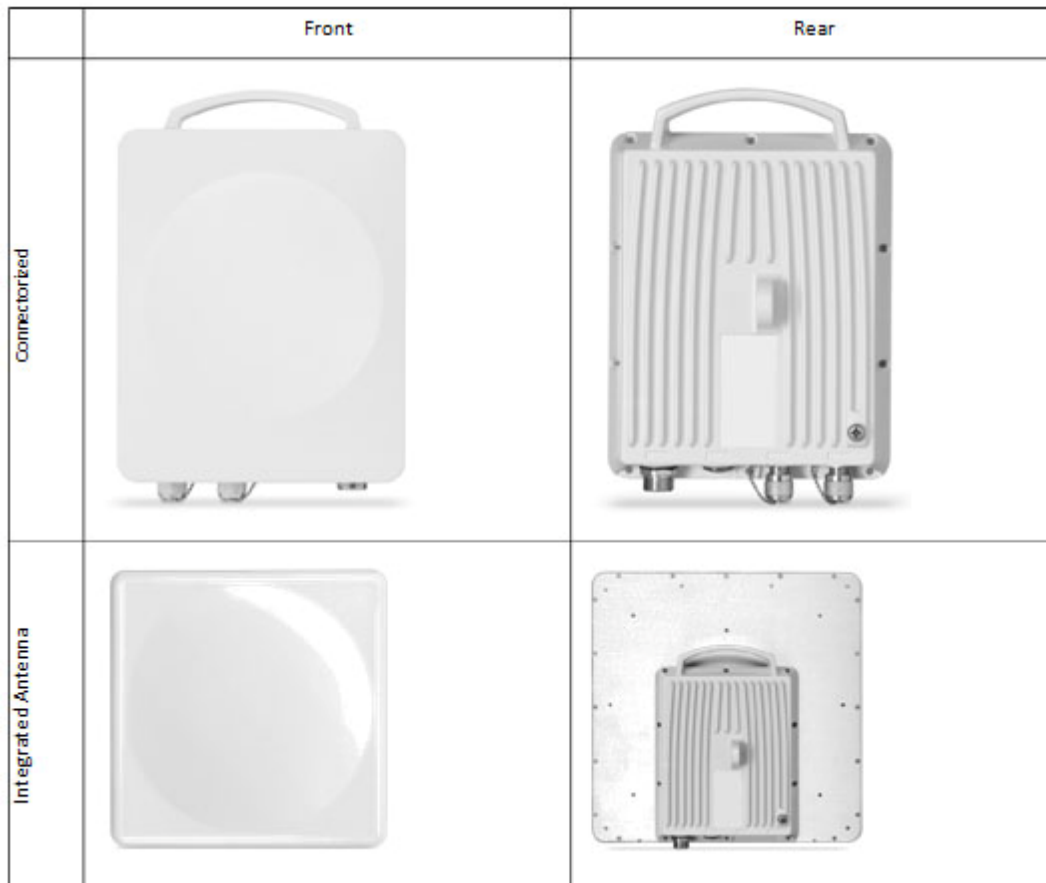


Figure 3-1: Large HBS and HSU Form Factors

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

### ***Subscriber Units***

The NetAstra PtMP HSU package includes the following items:

- One HSU - Large form factor as in [Figure 3-1](#), small form factor as in [Figure 3-2](#).



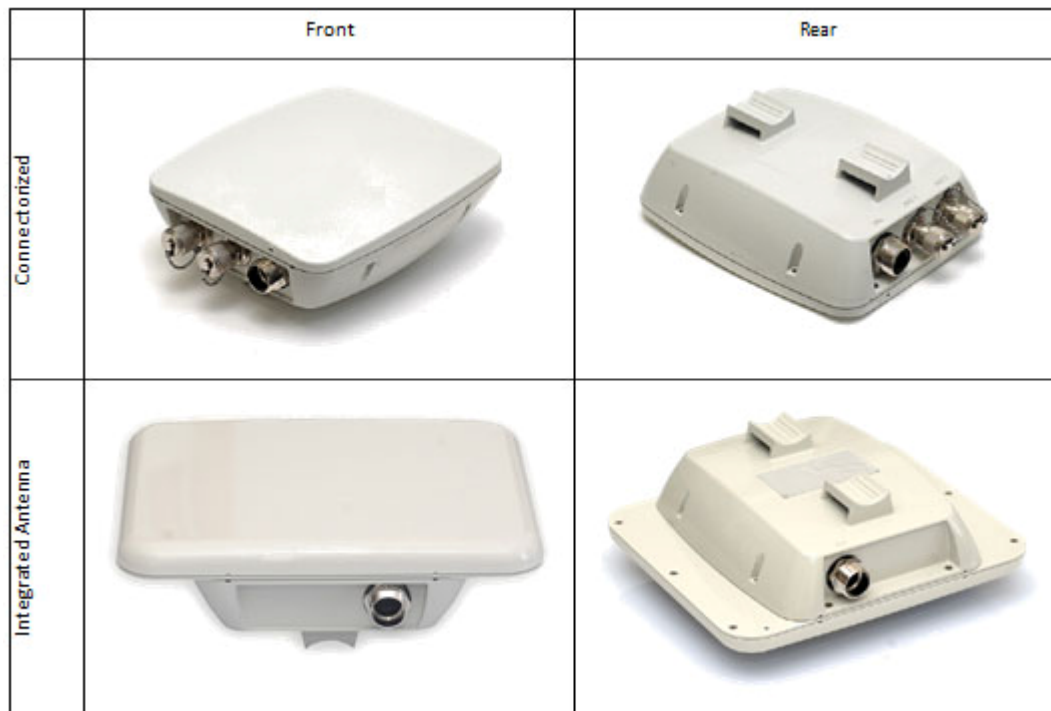


Figure 3-2: Small Form Factors HSU

Further to [Figure 3-2](#) above:

- **Integrated Antenna ODU**

This ODU has an integrated 370 mm (1.2 ft) flat panel antenna. The ODU contains both the radio and the antenna as a single unit housed in a weatherproof (IP67) case.

- **Connectorized ODU**

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

- **Small Form Factor HSU with AC power feeding**

This HSU has an integrated flat panel antenna. It has a direct AC power inlet, a LAN port and a PoE out port to connect to a powered device such as a video camera



Figure 3-3: Small form factor HSU with AC power feeding

- **Embedded (Connectorized) ODU**

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

- A small form factor HSU mounting kit has a mounting kit adapter and two metal ties.
- A CD containing -
  - The Link Manager software
  - 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 HSU-PoE cable)

## Power Over Ethernet (PoE) Devices

### GbE PoE



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

This is the recommended PoE device for use with HBSs and HSUs.

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

Figure 3-4: GbE PoE device

### Outdoor (Ruggedized) DC PoE Device



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

Figure 3-5: Ruggedized DC-PoE Device

## IDU-DT6 Aggregation Unit

The IDU-DT6 provides aggregation for multiple Netronics ODUs and HBSs at a hub site. It supports all Netronics ODUs. It features -

- Six PoE ports (PoE legacy mode / Netronics PoE)
- Up to 25 W 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 44 VDC – 56 VDC, Dual redundant inputs through standard IDU-NetStream RM type adapters.

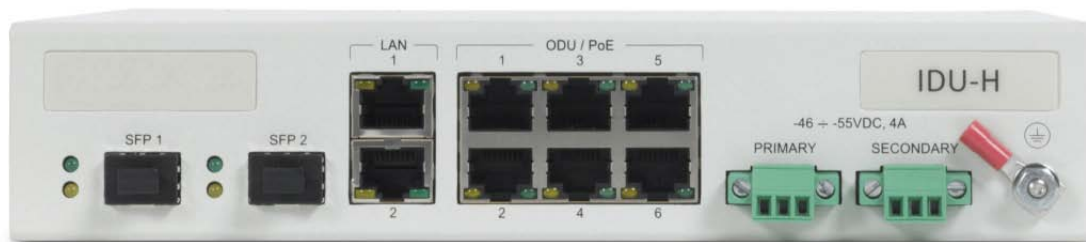


Figure 3-6: IDU-DT6 (formerly IDU-H)

The IDU-DT6 package contains:

- One IDU-DT6
- One short mounting ear
- One long mounting ear
- One dual connector to join two units mounted side by side
- Two DC power plugs for power cables - see [Figure 3-7](#) below



Figure 3-7: DC three pin power plug

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

The IDU-DT6 may be installed in single or double configurations:



Figure 3-8: IDU-DT6 front view - single configuration



Figure 3-9: IDU-DT6 front view - double configuration

## ***External Antennas***

### **HBS: Sector Antennas**

The HBS requires a dual pole sector antenna.



Figure 3-10: External Antennas for HBS 60°, 90° or 120° flat panel

### **HSU: Directional Antennas**

HSUs may use any suitable dual pole directional antenna.



Figure 3-11: Flat Panel antenna - may be external or integrated



Figure 3-12: Parabolic Dish external antenna



Figure 3-13: Parabolic Grid external antenna

### Antenna Kits

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

See the Netronics products catalog for a more detailed offering of external antennas. External A typical antenna kit contains -

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

## Accessories

### Hub Site Synchronization (HSS) Unit

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

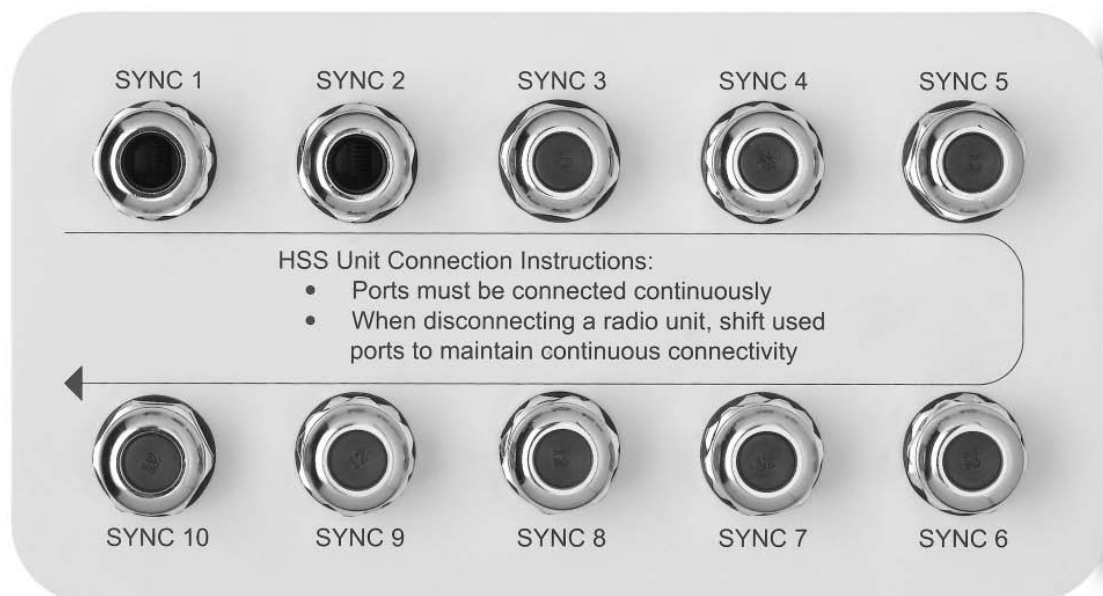


Figure 3-14: HSS Interconnection Unit

See [Chapter 11](#) for further details about the use of HSS.

### GSS-U

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

The GSS-U is an outdoor unit consisting of a standard NetStream 5x36 enclosure, a GPS antenna and a PoE device.

The GSS-U 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 12](#)).

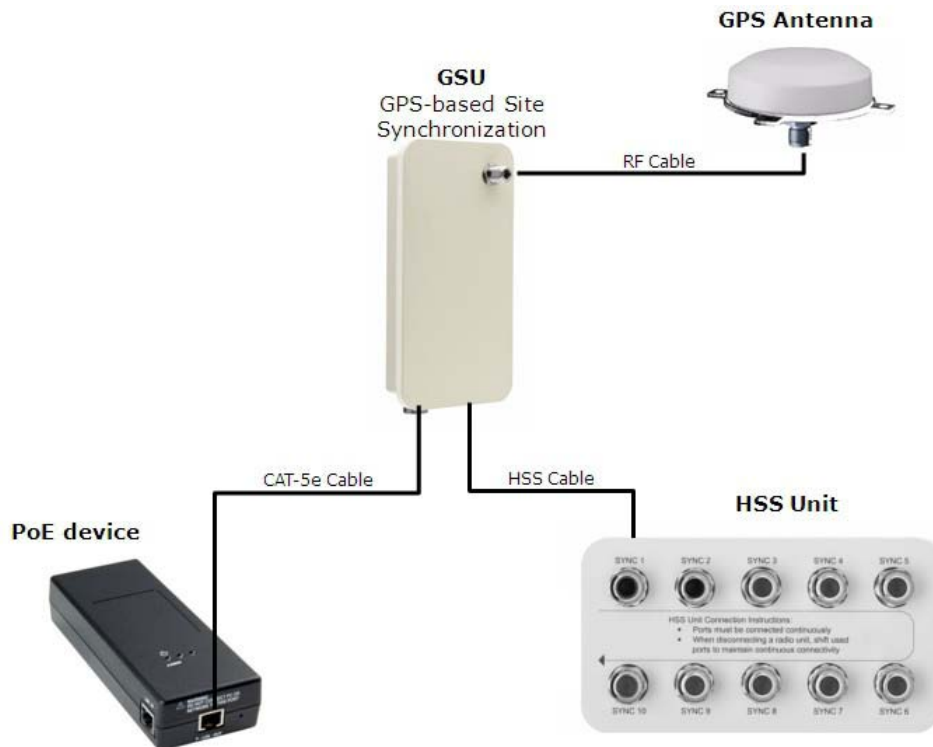


Figure 3-15: General GSU configuration

### ***Lightning Protection Devices***

The use of lightning protection is dependent on regulatory and end user requirements. The NetAstra PtMP ODU is designed with surge limiting circuits to minimize the risk of damage due to lightning strikes. It is designed for use with Netronics products.



Figure 3-16: Netronics Lightning Protector

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

### **Ethernet cable Repeater**

The Netronics Ethernet repeater enables you to extend the PoE to ODU cable beyond the 100 m

limit (but no more than 200 m). The unit looks physically like the lightning protection device in [Figure 3-16](#). Its use is very simple as shown in the following schematic:

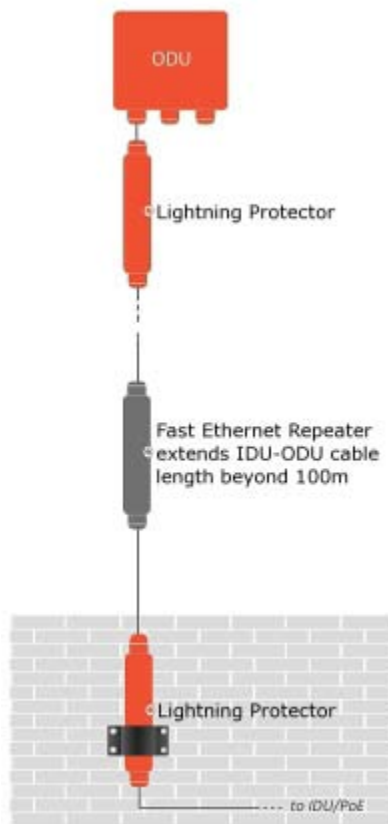


Figure 3-17: Using an Ethernet repeater with lightning protectors



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

## Tools required for installation

The following is a list of the equipment and materials required to install NetAstra PtMP hardware.

### ***Tools and Materials***

- Crimping tool for RJ-45 (if the ODU-PoE cable is without connectors)
- Spanner/wrench 13 mm (½")
- Drill (for wall mounting only)
- Cable ties
- Sealing material
- Waterproofing tape such as Scotch 23 Tape ¾" wide, from 3M to ensure IP-67 compliant protection against water and dust



## Cables and connectors

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



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

---

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

## Safety Practices and Provisions

### 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 Netronics products should be grounded during operation. In addition:

- All ODUs should be earthed by a wire with diameter of at least **10 AWG**.  
NetAstra PtMP 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. NetAstra PtMP ODUs must be grounded to a Protective Earth in accordance with the Local Electrical Regulations.
- The earth lug on an IDU-DT6 should be connected to the protective earth at all times, by a wire with a diameter of **18 AWG** or wider. Rack-mounted equipment should be mounted only in earthed racks and cabinets.

Further, you should -

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

## Protection Against Lightning

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

### General

- It is recommended that installation of outdoor units 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 Netronics devices, always use the AC power adapter supplied by Netronics
- Use the right tools!
- Do not mount an ODU upside down or horizontally. Doing this may void your product warranty.

### Internal ESD Protection Circuits

Netronics 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.

## Regulatory Considerations for HSUs



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When installing an AC powered HCU: 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  $\leq 150$  V, the transient rating is 1500 V; for  $150$  V < mains  $\leq 300$  V, the transient rating is 2500 V; and for  $300$  V < mains  $\leq 600$  V, the transient rating is 4000 V).

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For operation of the NetAstra SU 5xxx 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 Netronics Customer Service for antenna models subject to this requirement.

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

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## Hardware Installation Workflow for a NetAstra PtMP Sector

### *Installing the Base Station*

#### Site Survey

The Site Survey is carried out as described in [Chapter 2](#). Recall that the Site Survey has three main steps:

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

#### Site preparation

Site Preparation includes -

- Obtaining any necessary legal and statutory permits for installation of radio equipment
- Clearing physical obstructions as far as possible
- Erecting a mast or tower if required. A mast-sited ODU typically uses a pole attached to the mast.
- Installing a pole on a building wall if required
- Constructing a weather-proof cabinet to house a PoE device if it is not to be housed indoors
- Ensuring availability of power, typically standard local AC power
- Ensuring that there is a LAN cable in place from the user's switch to the PoE location

#### Mounting the HBS

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

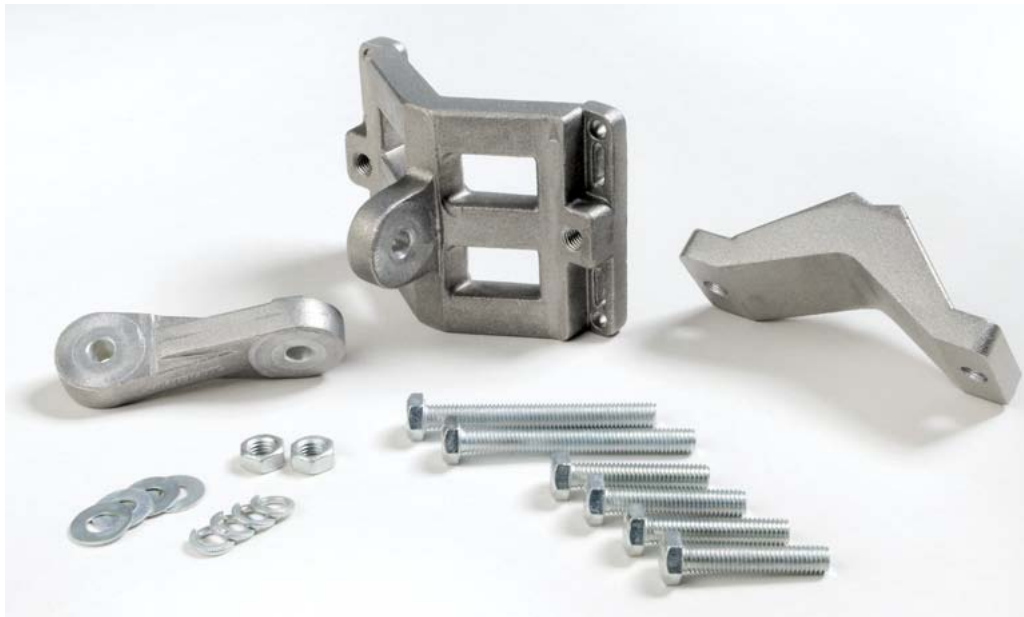


Figure 3-18: Standard form factor Standard Mounting kit

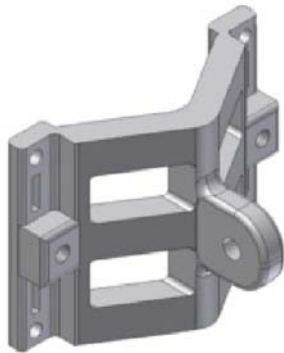


Figure 3-19: Large Clamp

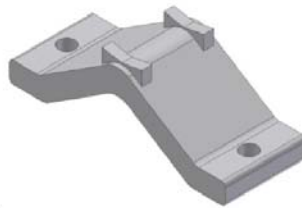


Figure 3-20: Small Clamp



Figure 3-21: Arm

Table 3-1: Bill of Materials: Standard mounting kit

Item No.	Description	Quantity
1	Large Clamp (see <a href="#">Figure 3-19</a> )	1
2	Small Clamp (see <a href="#">Figure 3-20</a> )	1
3	Arm (see <a href="#">Figure 3-21</a> )	1
4	Screw hex head M8x40	4
5	Screw hex head M8x70	2
6	Washer flat M8	4
7	Washer spring M8	3
8	M8 Nuts	2



Figure 3-22: Attaching the mounting kit to the pole



Figure 3-23: Mounting kit in place on the pole



**Note**

- When mounting an HBS on a pole or wall, ensure that the unit is oriented so that the cable connectors are at the bottom.
- Do not mount an HBS horizontally
- Ensure that there are no direct obstructions in front of the HBS or interference from man-made obstacles.



Figure 3-24: Mounted connectorized HBS antenna



Figure 3-25: Mounted HBS: Integrated antenna

The purpose of the arm ( [Figure 3-21](#)), is to enable single-pole antennas (deprecated) to be rotated through 90° for correct vertical alignment or simply to distance the antenna or ODU from the pole.

### Mounting an HBS External Antenna

The HBS requires a sector antenna. Typically, a flat panel antenna such as that show in [Figure 3-10](#) is used. It has four bolts for a mounting kit adapter.



Figure 3-26: Flat panel antenna mounting kit adapter

It is mounted on a pole in exactly the same manner as the HBS itself using the adapter shown in [Figure 3-26](#). The left hand view in shows the knurled surface adjacent to the mounting kit ear. The right hand view shows the recess for the mounting kit holding nut.



Figure 3-27: Flat Panel antenna - rear with mounting kit adapter



Figure 3-28: Flat Panel antenna - mounted

### Grounding an HBS external antenna

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

## Grounding the HBS

There is a grounding lug on the rear of the HBS as shown in [Figure 3-29](#). Connect it to ground using 10 AWG wire. Grounding is often carried out in conjunction with lightning protection.



Figure 3-29: HBS: Grounding lug

## Installing a PoE device

The PoE device ([Figure 3-4](#)) is a very simple piece of equipment. It has a recessed three pin AC power plug, a matching power cable, a LAN-In port (from a switch), a LAN-Out port (to the HBS) and a power LED, green under normal operation. It is typically strapped into a network equipment rack using plastic ties. It may also sit free on a tray or table-top.

## Connecting the HBS to the PoE device

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

## Connecting the PoE Device to a Network

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

## Powering up the HBS from a PoE Device

Connecting the HBS port labelled IDU to a powered up PoE is sufficient. If you have not already closed and weather-sealed the HBS IDU port, then inside it you can see an amber colored power LED which turn green when the HBS is activated. (See [Chapter 4](#).)

## Mounting the Lightning Protection Units

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

In what follows, ODU may be any type of Netronics outdoor radio unit and IDU may be any type of Netronics IDU used with such products (PoEs, IDU-DT6, etc).





Figure 3-30: Netronics Lightning Protection Kit

Table 3-2: LPU Kit contents






Item	Quantity	View/Remarks
LPU (shown wrapped)	1	
U wall clamp	1	
RJ-45 connectors (shown wrapped)	2	
0.5m CAT-5e cable	1	

Table 3-2: LPU Kit contents (Continued)

Item	Quantity	View/Remarks
Metal tie	1	
Quick Installation Guide	1	Pamphlet

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

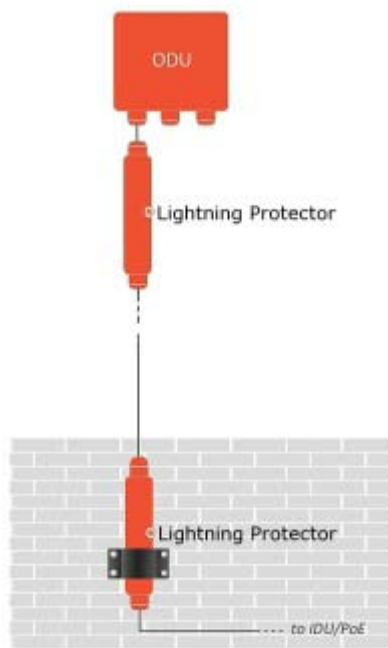
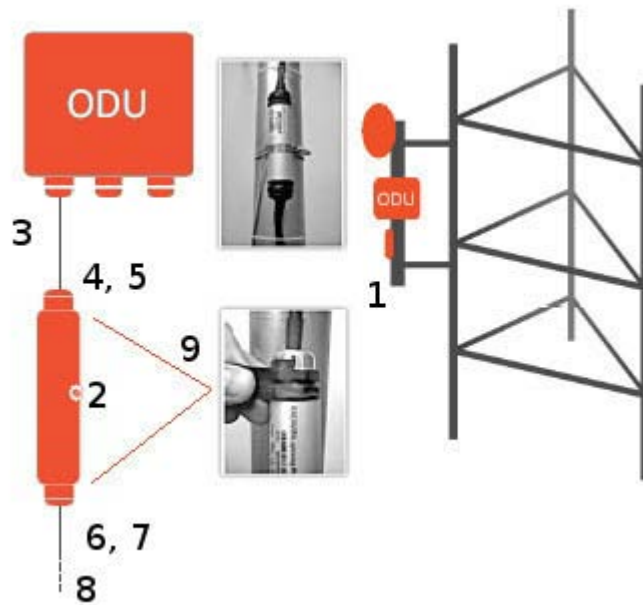


Figure 3-31: Basic use of lightning protectors

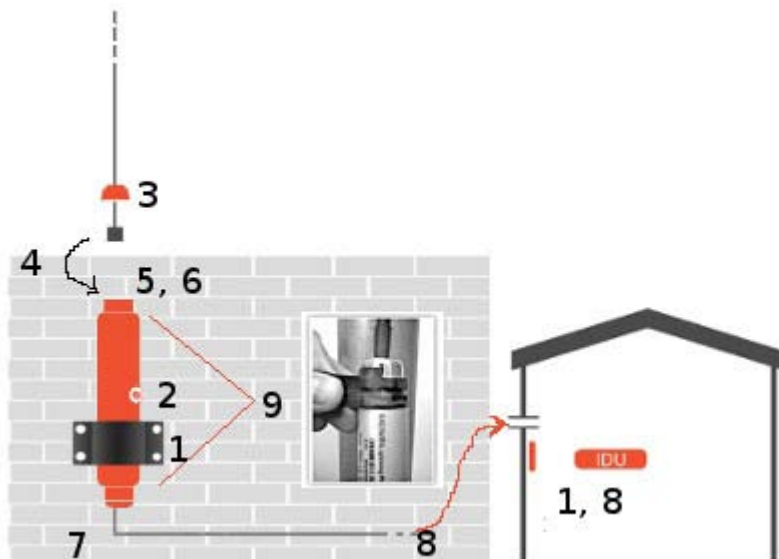
➤ To install a LPU on a pole adjacent to an ODU (HBS or HSU):

1. Mount one LPU on the ODU pole, as close as possible to the ODU.
2. Ground the LPU to the pole using the grounding lug.
3. Connect the 0.5 meter CAT-5e cable to the IDU port of the ODU.
4. Connect the other end of the cable to the top of the LPU.
5. Tighten the top cable LPU gland cap.
6. Connect the main ODU-IDU cable from the IDU to the bottom end of the LPU.
7. Tighten the bottom cable LPU gland cap.
8. Run the main ODU-IDU cable towards the IDU location.
9. Insulate both LPU connections. See the next section, [Additional Consideration for Waterproofing](#) below.



➤ To install a LPU on a wall adjacent to an IDU (PoE or IDU-DT6):

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



7. Connect the 0.5 m CAT-5e cable to the Bottom of the LPU.
8. Connect the other end (via the indoor access point) to the IDU.
9. Insulate both LPU connections. See the next section, [Additional Consideration for Waterproofing](#) below.

### Additional Consideration for Waterproofing

#### *Lightning Protectors and Ethernet Repeaters*

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

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

1. Obtain a high quality sealing material such as Scotch 23 Tape  $\frac{3}{4}$ ” 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 3-32](#).



Figure 3-32: Exposing the tack side of the sealing tape

3. After connecting the short CAT-5 IDU/ODU cable (provided in the box) from the ODU to the unit, tighten the cable gland cap firmly and use the insulation tape scotch 23 to fully cover both of the cable glands.
4. Connect the tape with tacky side up on the cable gland cap and the CAT-5 cable. Start at **Start Point** at the bottom of the cable gland as shown in [Figure 3-33](#). 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.

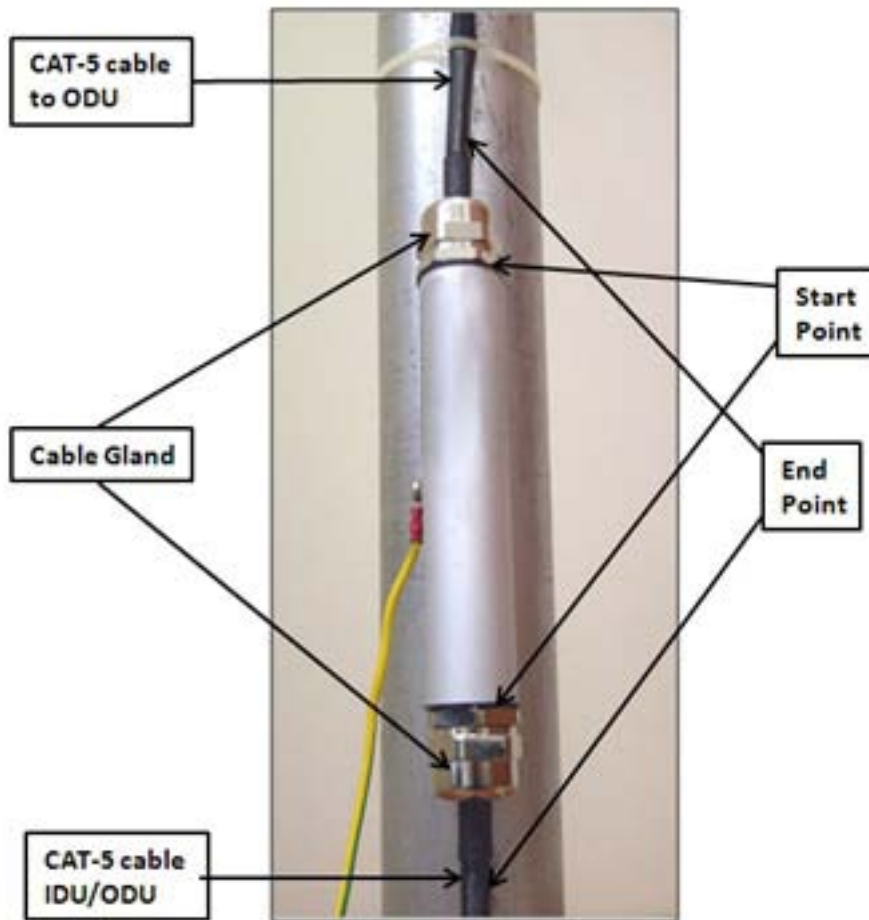


Figure 3-33: Start and End points for protective-taping the unit

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 3-34](#). 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 3-34: Protecting the unit joints with vinyl tape

- 6. Mount the unit on the pole using the mounting ring as shown in [Figure 3-35](#). Ground the unit using the GND screw. For lightning protection, repeat the same procedure to install the second unit connected to the IDU.



Figure 3-35: Mounted and strapped to the pole

**External Ports for CAT-5e Cables**

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

**The IDU-DT6: A Base Station Alternative to PoE Devices**

**Using an IDU-DT6 instead of several PoE devices**

The IDU-DT6 is an aggregation switch with the functionality of six PoE devices. It is ideal for use at a base station having several collocated HSUs or NetAstra PtMP radios.

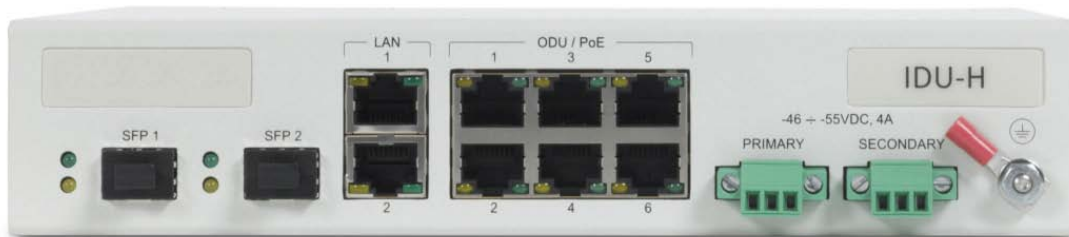


Figure 3-36: IDU-DT6

### Installing an IDU-DT6

The IDU-DT6 can sit on a table top, but is best installed in a rack using the supplied ears as in [Figure 3-8](#) and [Figure 3-9](#).

### Connecting the HBS to an IDU-DT6

Connect the HBS IDU port to any of the six PoE ports of the IDU-DT6.

### Connecting the IDU-DT6 device to a network

The IDU-DT6 has two LAN ports, either of which may be used for network connection.

### Grounding and Powering Up the IDU-DT6

The IDU-DT6 has redundant power connection circuits. An enlarged view of the power connectors is shown in below:



Figure 3-37: IDU-DT6 power connectors, grounding lug and power plug.

- For direct DC connection: The connectors are 3 pin in line female, with polarities (left to right) minus, ground, plus.
- For AC connection: To avoid damage to the IDU-DT6, always use an AC/DC adapter and power plug supplied by Netronics.



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

### IDU-DT6 - Functional Overview

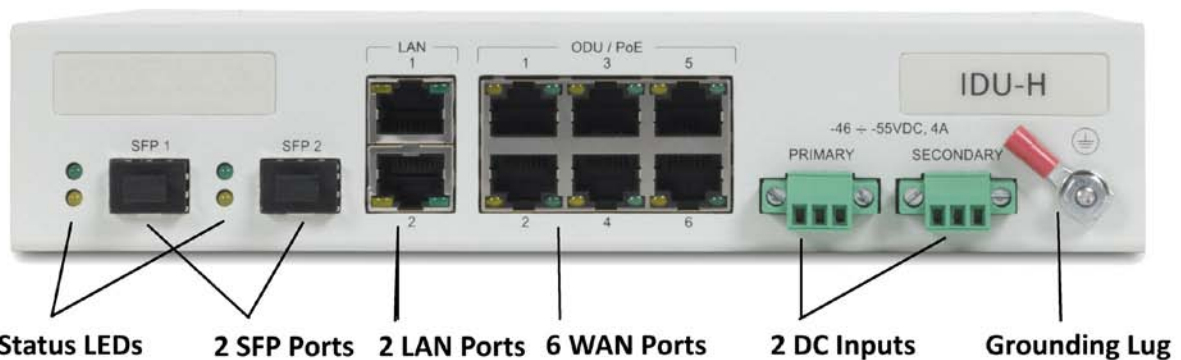


Figure 3-38: IDU-DT6 front panel

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

**The IDU-DT6 LEDs**

Table 3-3: IDU-DT6 LED Indicators

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

**Installing Fixed Subscriber Units**

**Site survey**

The same considerations as for an HBS hold for the HSUs.

**Site preparation**

The same considerations as for an HBS hold for the HSUs.

**Mounting the HSU**

Standard form factor HSUs are mounted in exactly the same way as an HBS. Small form factor HSUs are different:

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



Figure 3-39: Small form factor HSU - Rear, metal tie

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



Figure 3-40: Mounting adapter



Table 3-4: Mounting adapter kit for small form factor HSUs

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

The mounting adapter is used with the standard mounting kit shown in [Figure 3-18](#). It is not included in the HSU package and must be ordered separately.

➤ **To mount the small form factor HSU using a mounting kit:**

1. Referring to [Figure 3-41](#) below: Secure the adapter (3) to the rear of the HSU (2) using the two screws provided (4). Use a Phillips screwdriver set to a torque of 2.0 NM.

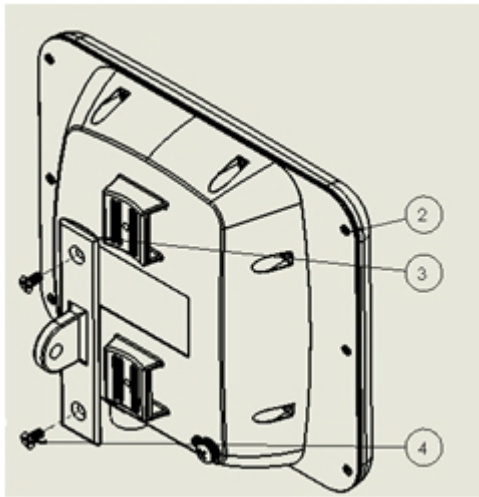


Figure 3-41: Securing the mounting adapter

2. Referring to [Figure 3-42](#) below: Attach the ODU mounting kit (1) to the mounting adapter ear (4) and proceed as above, for a standard ODU.

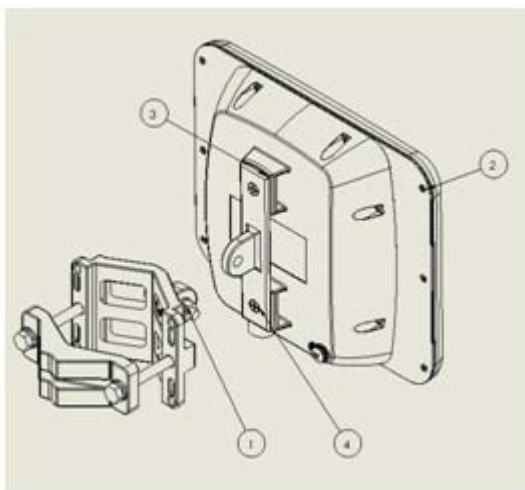


Figure 3-42: Attaching a standard mounting kit



**Note**

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

### Mounting an HSU external antenna

Many of the antennas of the types shown in [Figure 3-11](#) to [Figure 3-13](#) use the standard mounting kit of [Figure 3-18](#). Some third party antennas use pole clamps, similar to those shown below:



Figure 3-43: Pole clamps for external antennas



**Warning**

Do not stand in front of a live antenna.

### Grounding an HSU external antenna

External antennas should be individually grounded using a suitable Grounding Kit such as an Andrew Type 223158-2 ( <http://www.commscope.com>). The same considerations as for the HBS antennas apply here.

### Grounding the HSU

All HSUs have a grounding lug as shown in [Figure 3-44](#). Connect it to ground using 10 AWG wire. Grounding is often carried out in conjunction with lightning protection.



Figure 3-44: HSU: Grounding lug standard and small form factor

### Using AC Powered HSUs

The AC HSU has an integrated flat panel antenna. It has a direct AC power inlet, a LAN port and a PoE out port to connect to a powered device such as a video camera.



Figure 3-45: Small form factor HSU with AC power feeding  
It is mounted and grounded like any other small form factor HSU.

### Installing a PoE device

The same considerations as for an HBS hold for the HSUs.

### Connecting the HSU to the Network

The same considerations as for an HBS hold for the HSUs.

### Powering up the HSU from a PoE device

The same considerations as for an HBS hold for the HSUs.

### Establishing a Radio Link - Aligning HSUs to a HBS

Use the HSUs buzzer to perform HSU antenna alignment to a HBS.

➤ **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.

An unaligned HSU starts beeping 20 seconds after power up, and continues beeping until it is aligned to the HBS.

The alignment 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.

4. Make a horizontal sweep of 180 degrees with the HSU antenna so that the strongest signal from the HBS can be detected.
5. 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.

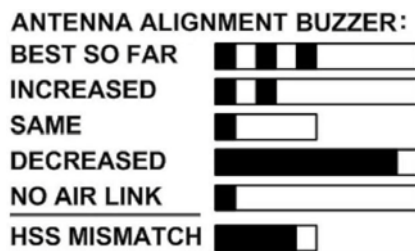


Figure 3-46: Beep Sequence for antenna alignment



**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

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



---

The HSU beeping will stop completely when it is configured using the Link Manager. It may also be unconditionally switched off from the Manager.

---

### **Connecting user equipment**

Typical user equipment includes switches and video cameras. Before connecting user equipment to the HSU through the LAN-In port of the PoE device, ensure that it powered down. If you are using an AC HSU, you may use the PoE Out port to connect and power a video camera. Follow your camera manufacturer's instructions scrupulously to avoid damage to your equipment.

### **Mounting lightning protection devices**

The same considerations as for an HBS hold for the HSUs.

### **Additional consideration for waterproofing**

#### ***Lightning Protectors and Ethernet Repeaters***

The same considerations as for an HBS hold for the HSUs.

#### ***External Ports for CAT-5e Cables***

The same considerations as for an HBS hold for the HSUs.

#### ***HSU AC Power ports***

They should also we waterproofed in the same manner as the other ports.

# Part 2

## Sector Installation



# Chapter 4

---

## Getting started with the Link 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 Link Manager software on your managing PC, connect it to an operating access unit and then log on. We then explain the use of the various objects on the Link 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 NetAstra sector from the ground up.

### Installing the Link Manager Application

#### *Minimum System Requirements*

The Link 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 Link 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 Netronics Web site.

## Installing the Software

Any PC running the Link Manager application can be used to configure a NetAstra PtMP sector.

### ➤ To install the Link Manager application:

1. Insert the CD into the CD/DVD drive of your computer.
2. Choose **Install** Link Manager and follow the on-screen instructions of the installation wizard to complete the setup of the Link 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 Link Manager

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

Table 4-2: Preconfigured setup – HBS

Location	Attribute	Value	Remark	
HBS.01	IP Address	10.104.50.200	All communicating HSUs and HBS in the same subnet	
	Net Mask	255.255.0.0		
	Default Gateway	10.104.10.21		
	Sector ID	EBGX20560334	Inherited by all communicating fixed HSUs.	
	Network ID	EBX	Inherited by all communicating nomadic HSUs.	
	Protocol	SNMPv1	Can be set to SNMPv3 or both v1 and v3	
	Contact	Bach	Optional	
	Name	Bach@HBS.01	Location of Contact - optional	
	Band	5.730 - 5.845 GHz FCC/IC	Inherited by all communicating HSUs	
	Channel Bandwidth	20MHz	Inherited by all communicating HSUs	
	Unit Serial Number	PET540E0A000		
	Geographic location			
	Latitude	-37.8148		
	Longitude	144.9630		
	Azimuth (deg)	0	Used for initial default placement of HSUs	
	Beam width (deg)	90		
Antenna height (m)	130	From RF plan, not used		

Table 4-3: Preconfigured setup - fixed HSUs

Location	Attribute	Value	Remark	
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		
	Protocol	SNMPv1	Can be set to SNMPv3 or both v1 and v3	
	Contact	Haydn	Optional	
	Name	Haydn@HFU.01.01	Location of Contact - optional	
	Time Slots	Downlink	8	May vary with context
		Uplink	2	
	Unit Serial Number	PIN580I500A00004		
	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		
	Protocol	SNMPv1	Can be set to SNMPv3 or both v1 and v3	
	Contact	Mozart	Optional	
	Name	Mozart@HFU.01.02	Location of Contact - optional	
	Time Slots	Downlink	8	May vary with context
		Uplink	2	
	Unit Serial Number	PIN580I500A00005		
	Geographic location			
		Latitude	-37.4018	
		Longitude	145.0086	
	Antenna height (m)	60	From RF plan, not used	

Table 4-4: Preconfigured setup - Level allocation for maximum nomadic HSUs

Level	Number of nomadic HSUs	Time Sots		Remark
		Downlink	Uplink	
A	2	6	2	Includes HNU.0.01 below
B	1	4	2	
C	1	4	2	
D	0	0	0	

Table 4-5: Preconfigured setup - One actual nomadic HSU

Location	Attribute	Value	Remark	
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		
	Protocol	SNMPv1	Can be set to SNMPv3 or both v1 and v3	
	Contact	Brahms	Optional	
	Name	Brahms@HNU.01.01	Location of Contact - optional	
	Level	A	Included in previous table	
	Time Slots	Downlink		6
		Uplink		2
Unit Serial Number	PIN580I500A00003			

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



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 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 Link Manager:**

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

**ping 10.104.50.200**

You should see something like this:

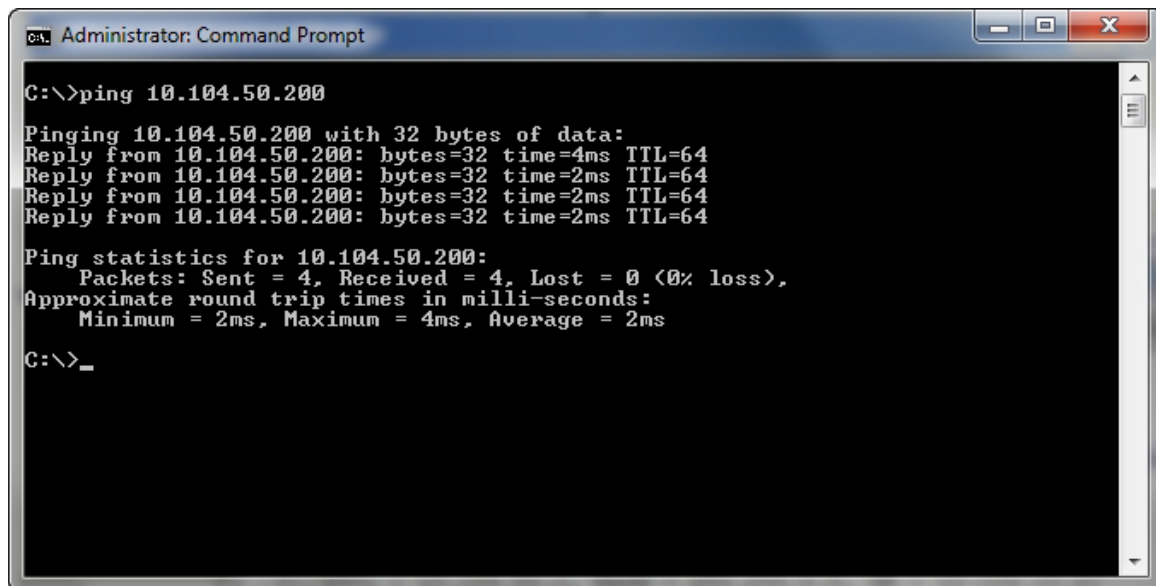


Figure 4-1: Pinging the base station.

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 Netronics Customer Support.

Pinging the HSUs should yield similar responses.

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

The Log-on dialog box appears.



Figure 4-2: Log-on window

## The Link Manager Log-on Concept

NetAstra PtMP supports SNMPv1 and SNMPv3 either separately or together. The log-on procedure differs slightly between operation under SNMPv1 and SNMPv3. In what follows below, we assume that SNMPv1 is in use. In [Table 4-6](#) at end of the section, we show the difference between SNMPv1 and SNMPv3 at log-on time

The Link 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 using Trap Authentication, enter the User and Password. Leaving these fields blank or incorrect, will not prevent you from logging on. You will not be able to see trap messages directed to the trap message address associated with a defined user. The allocation and association of a trap

address with a user is described in [Chapter 6, Management](#).

The following table summarizes these options:

Table 4-6: User types, default passwords and function

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

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

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

5. 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.



- 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 following 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](#).

8. Send an email request for to Netronics 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.

## **Four Sector Display Views**

### ***Table View***

The Link 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

**What’s on the Cards - Table View**

The individual HSU display boxes are called **cards**. They are used with small variations in the Table and Map views.

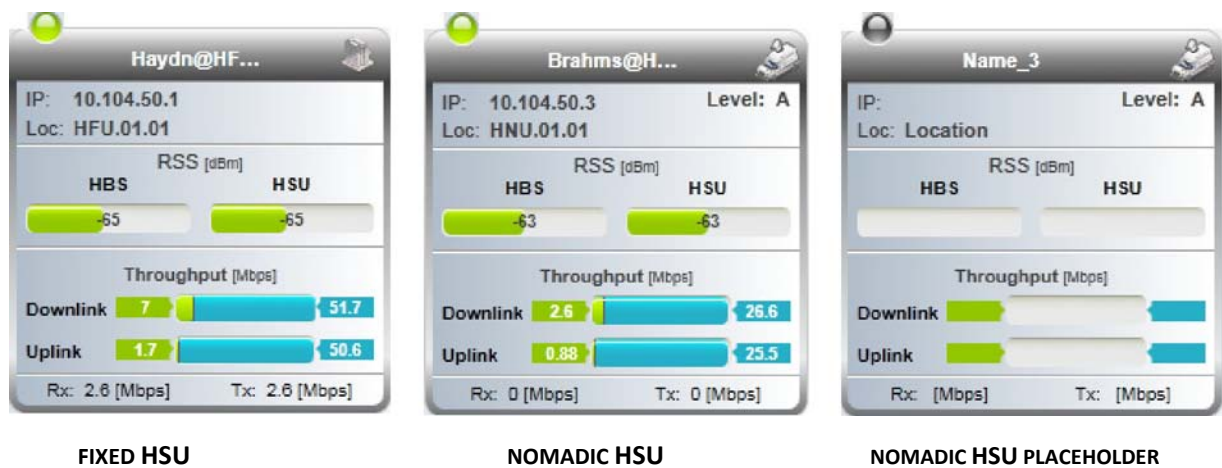


Figure 4-9: HSU Cards

The card title bar holds as much of the HSU name as fits.

- The IP (address) and Loc(ation) are as defined by you during Configuration or Registration



- The RSS for the HSU and HBS are shown as bar graphs for convenience. They should be balanced. If for one HSU there is a consistent imbalance of even 1 dBm or intermittent imbalances of 2-3 dBm you should check its antenna connections and perhaps the unit itself. If several HSUs are out of balance, there may be a problem with the HBS.
- The Level in the nomadic HSU: There are four allowed levels (A to D) allowing a measure of prioritization of nomadic HSUs. We will see how this is done on [page 117](#).
- Downlink and Uplink throughput: The green part of each bar shows the Assured throughput based on the number of time slots allocated to the HSU subject to the current sector traffic load. The light blue bar show the Peak throughput, again subject to traffic conditions. The peak throughput may exceed the assured throughput due to the operation of Smart Bandwidth Management (SBM), discussed in detail in [Chapter 8](#).
- The Rx and Tx rates at the bottom of the card are the Ethernet receive and transmit rates for the HSU
- The little ball on the top left of each card is a status light, which will be explained in [Table 4-11](#) below.

## Map View

If you have an Internet connection, you may use **Map view**. The map view uses distinctive icons to distinguish between different types of HSUs and the HBS:



Figure 4-10: Map view icons

The green "beacon" light on top of the icons changes color according to the unit's status. The below color codes are defined in [Table 4-11](#).

The default Link Manager main window looks like this:

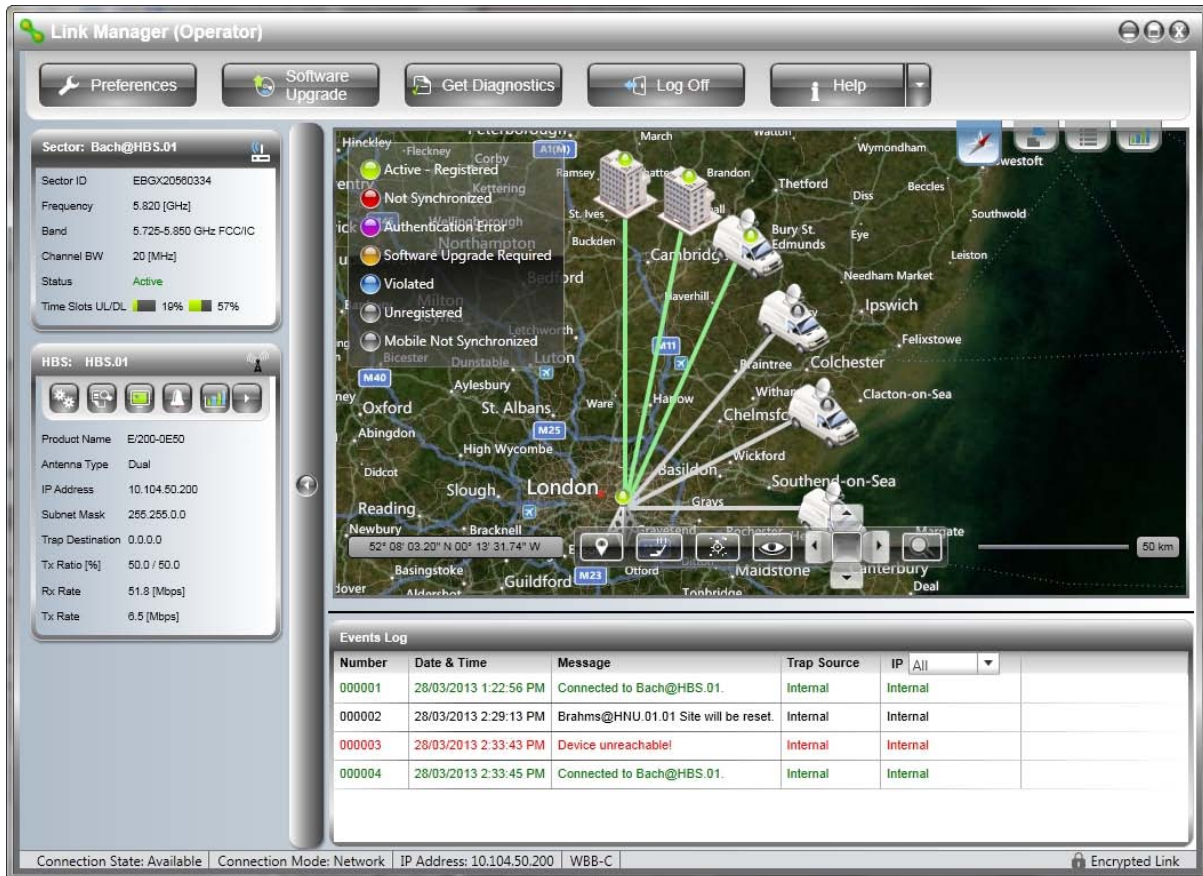


Figure 4-11: Sector display – Default Map view

A new sector with default values for element map coordinates is shown centred on Greenwich (Figure 4-11). 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 4-7.

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:

**Sector: Bach@HBS.01**

Sector ID: EBGX20580334  
 Frequency: 5.820 [GHz]  
 Band: 5.725-5.850 GHz FCC/IC  
 Channel BW: 20 [MHz]  
 Status: Active  
 Time Slots UU/DL: 19% / 57%

**HBS: HBS.01**

Product Name: E/200-DE50  
 Antenna Type: Dual  
 IP Address: 10.104.50.200  
 Subnet Mask: 255.255.0.0  
 Trap Destination: 0.0.0.0  
 Tx Ratio [%]: 50.0 / 50.0  
 Rx Rate: 51.8 [Mbps]  
 Tx Rate: 6.5 [Mbps]

**HSU** Filter: All

Index	Name	IP Address	State	Location	RSS HBS [dBm]	RSS HSU [dBm]
1	Name_4		Not Synchronized	Location		
2	Name_3		Not Synchronized	Location		
3	Name_2		Not Synchronized	Location		
4	Haydn@HFU.01.01	10.104.50.1	Active - Registered	HFU.01.01	-65	-65
5	Mozart@HFU.01.02	10.104.50.2	Active - Registered	HFU.01.02	-67	-66
6	Brahms@HNU.01.01	10.104.50.3	Active - Registered	HNU.01.01	-63	-63

**Events Log**

Number	Date & Time	Message	Trap Source	IP
000001	28/03/2013 2:57:52 PM	Connected to Bach@HBS.01.	Internal	Internal

Connection State: Available | Connection Mode: Network | IP Address: 10.104.50.200 | WBB-C | Encrypted Link

Figure 4-12: 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. The status indicator ball has the same meaning as it does for the HSU cards and map icons. For details, see [Table 4-11](#) below.

### Utilization View

The Utilization view shows how sector resources are allocated between HSUs. It is particularly important since the SBM mechanism can temporarily assign unused downlink time slots to a very busy HSU. It can also temporarily assign unallocated uplink time slots for the same purpose.

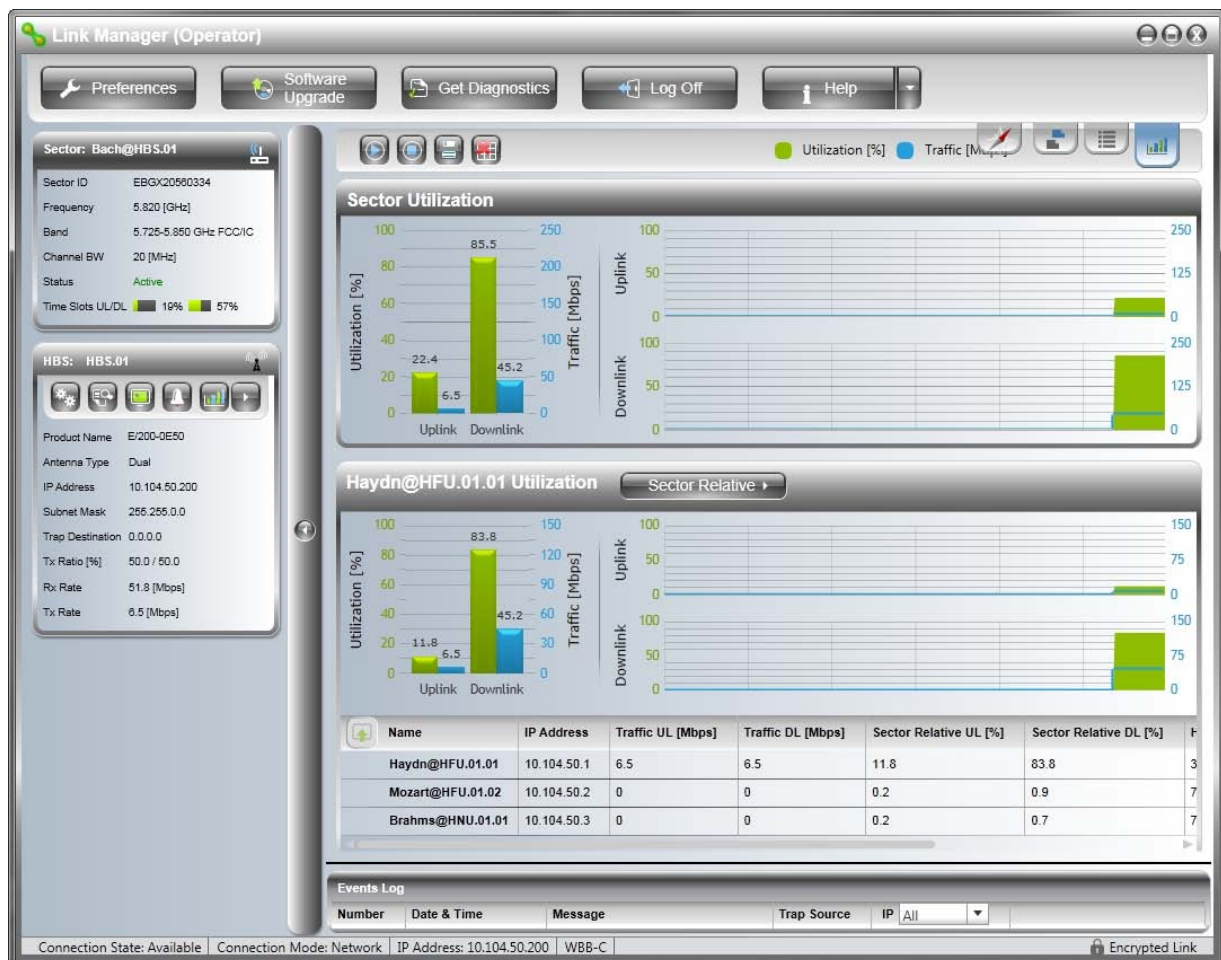


Figure 4-13: Default Sector display - Utilization view

The elements of the Utilization view are explained in detail in [Chapter 8](#) where SBM is discussed.

### Switching Between Views

➤ To switch between displays:



- Click the relevant tab. From left to right, the tabs are: Map view, Table view, List view and Utilization 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 Link 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 extracted from [Table 4-2](#):

Table 4-7: 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



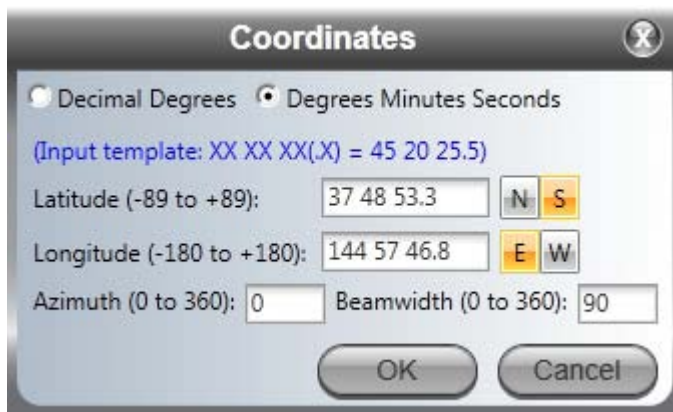
Note

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.

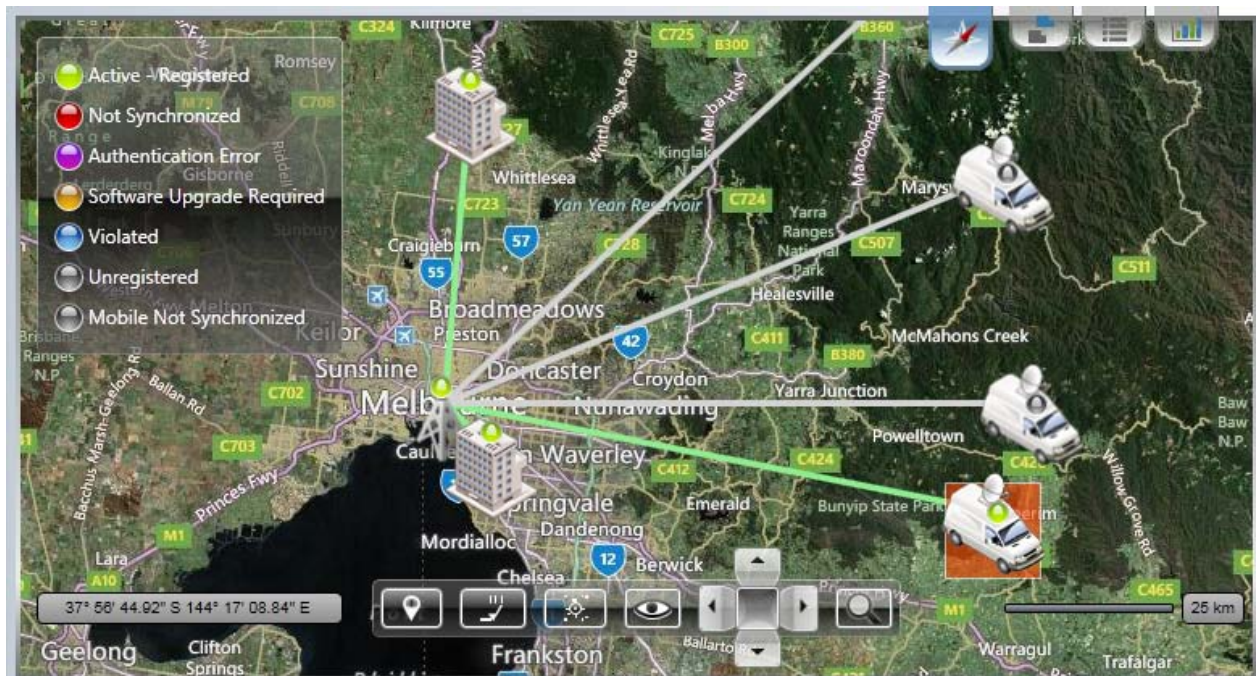
You may enter the coordinates in decimal or degrees/minutes/seconds using the input template shown below:



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 4-7](#), 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 4-14: Selected HBS or HSU with context button bar

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

Table 4-8: 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 <sup>a</sup>

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

The left details button opens a card, similar to those in [Figure 4-9](#):



Figure 4-15: Map Cards

Unlike the Table View cards, the status indicator is on the icon itself.

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 Link Manager Main Window - HBS

The following sections describe the panels of main window shown in [Figure 4-8](#).

### HBS Main Button Menu

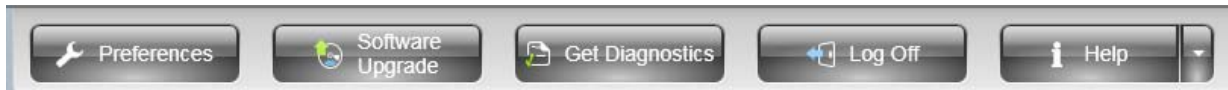


Figure 4-16: HBS main button menu

Table 4-9: HBS main button bar functions

Menu Item	Purpose	Reference
Preferences	Monitor - File location, interval and throughput units	<a href="#">page 86</a>
	Events - Color coding for events log and events log file location	<a href="#">page 87</a>
	Advanced - Enable/disable check for updates, monitoring interval and timeout	<a href="#">page 88</a>
Software Upgrade	Perform software upgrade for a sector	<a href="#">Chapter 13</a>
Get Diagnostics	Run and store diagnostics for all or some members of a sector	<a href="#">Chapter 10</a>
Log Off	Return to log-on window	
Help side arrow	Link Budget Calculator	<a href="#">Chapter 18</a>
	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 access unit is activated and are duplicated for each HSU in the sector.

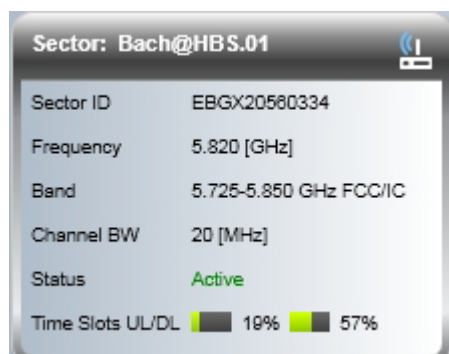


Figure 4-17: Sector Status panel

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** bars indicate how many out of 63 time slots in uplink and downlink directions, 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. Time slot allocation is closely related to SBM performance detailed in [Chapter 8](#).

## Base Station Panel

The displayed items in the Access unit panel are straight forward.

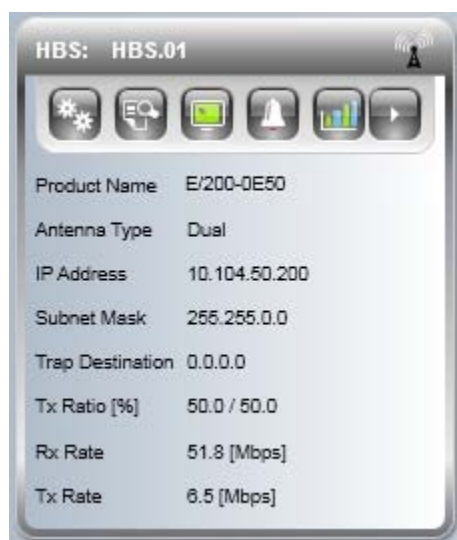














Figure 4-18: Access unit detail Panel

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 11](#)) 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 4-10: HBS Detail Panel button bar functions

Menu Icon	Purpose	Reference
	HBS Configuration	<a href="#">Chapter 6</a>
	Recent Events Log	<a href="#">page 219</a>
	Performance Monitor	<a href="#">page 221</a>
	Active Alarms	<a href="#">page 227</a>
	Spectrum View	<a href="#">Chapter 19</a>
	 Estimated Throughput	<a href="#">page 217</a>
	 Change Band	<a href="#">page 164</a>
	 HSU Connection Table	<a href="#">page 148</a>
	 Locate On Map	
	 Reset	
	 Deactivate	<a href="#">page 120</a>

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 4-17](#).

## HBS Events Log

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



The foregoing event types include events from all links for which this managing computer has been defined as the traps address. Only events from Netronics 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 10](#).

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

Number	Date & Time	Message	Trap Source	IP
000001	23/01/2013 9:29:37 AM	Connected to Bach@HBS.01.	Internal	Internal

Figure 4-19: Events Log panel

The events log provides a color coded event list. Blue items (like the one in [Figure 4-19](#)) 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:

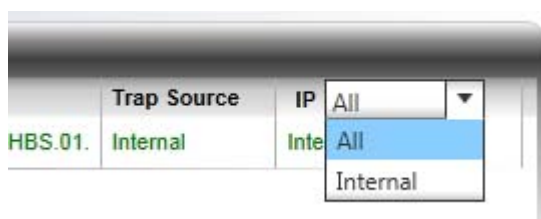
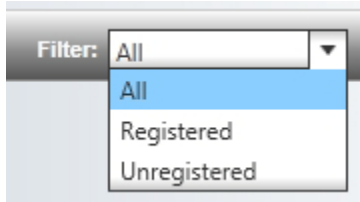


Figure 4-20: Events Log filter selection

### HBS Main Window - HSUs Panel

#### Table View – Further details

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:

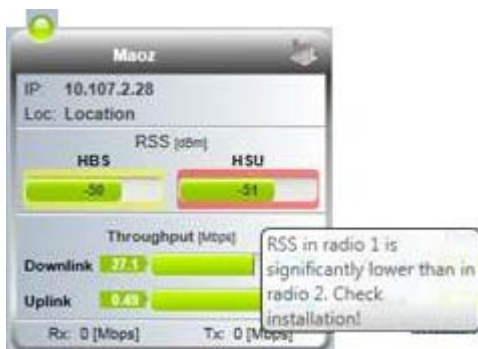


Figure 4-21: HBS card - indicating a problem

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 HBS to get its context menu:

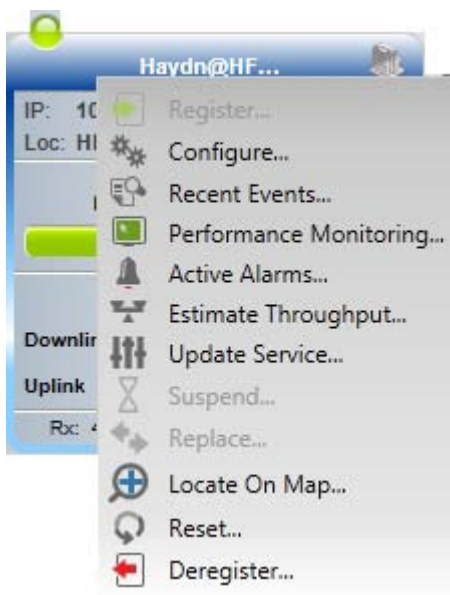


Figure 4-22: HBS display - context menu (right click)

**Map View**

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

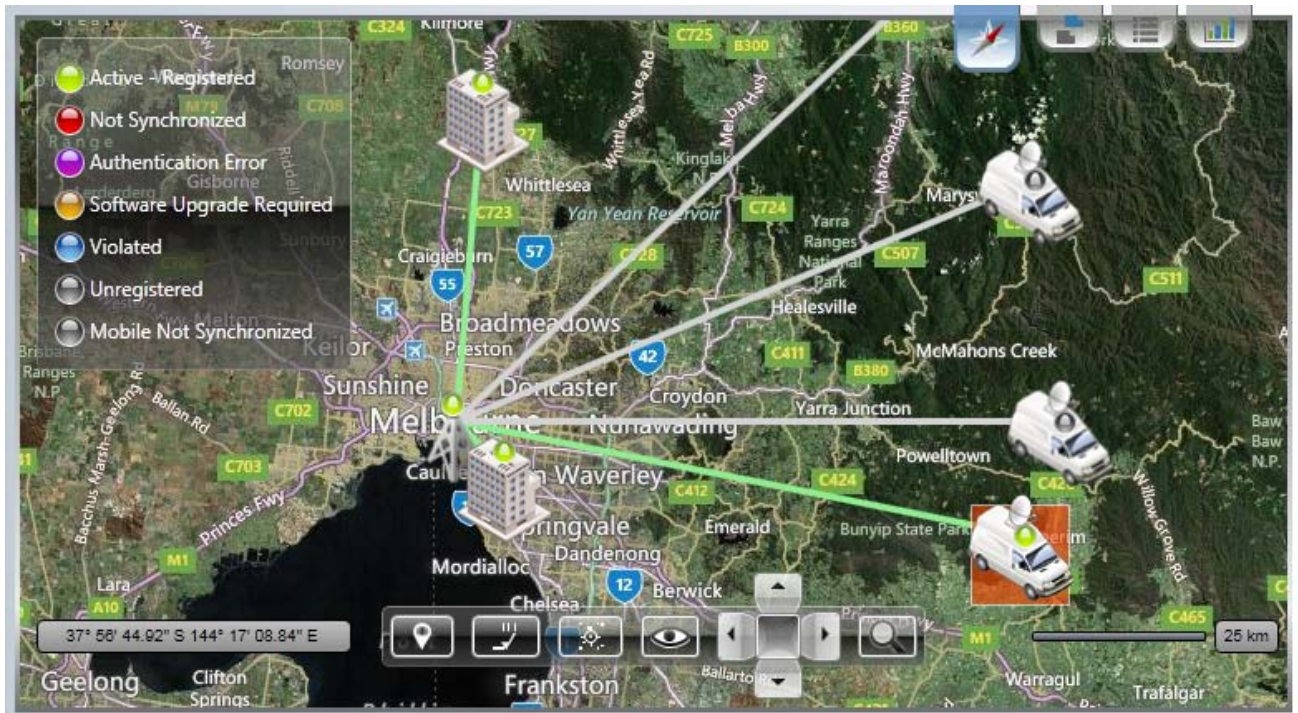


Figure 4-23: HBS Main Window - Map view

**HBS/HSU Status Lights**

HBS/HSU Status light appear on the tower graphic,



and the HSU detail (for example, [Figure 4-21](#)).

The meaning of the Status lights is as follows:

Table 4-11: HBS/HSU Status light color codes



Figure 4-24: 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 4-25: Navigation Tool bar

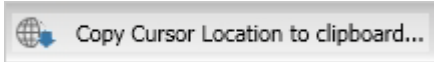
Table 4-12: Navigation tool bar button functions

Menu Icon	Purpose
	Show/Hide the HBS/HSU Status lights ( <a href="#">Figure 4-24</a> )
	Show/Hide the HBS/HSU Status boxes
	Center on the sector
	<p>Shows different map views. <b>Aerial View</b> and <b>Show Labels</b> are set by default.</p>
	Navigation buttons: Moves the sector about on the displayed map.
	<p>Shows different levels of map detail</p>



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 comma 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 4-26: 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:

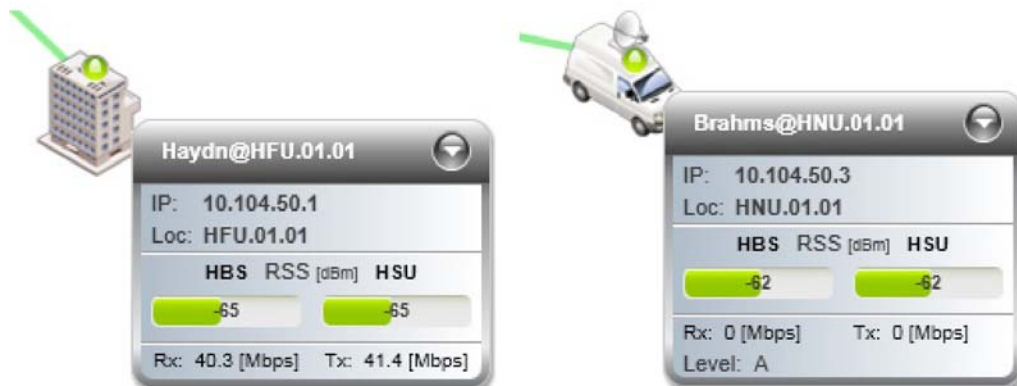


Figure 4-27: HSU status cards: Left: fixed HSU

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:

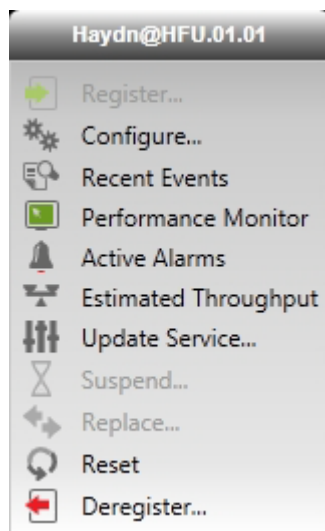


Figure 4-28: HSU display - context menu (right click).



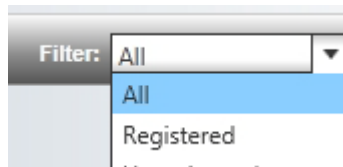
List View

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

Index	Name	IP Address	State	Location	RSS HBS [dBm]	RSS HSU [dBm]	Tput HBS [Mbps]	Tput HSU [Mbps]	Peak Tput DL [Mbps]	Peak Tput UL [Mbps]
1	Mozart@HFU.01.02	10.104.50.2	Active - Registered	HFU.01.02	-65	-66	7	1.8	51.7	50.9
2	Haydn@HFU.01.01	10.104.50.1	Active - Registered	HFU.01.01	-65	-66	7	1.7	51.7	50.7
3	Brahms@HNU.01.01	10.104.50.3	Active - Registered	HNU.01.01	-63	-62	2.6	0.88	26.6	25.5
4	Name_4		Not Synchronized	Location						
5	Name_4		Not Synchronized	Location						
6	Name_3		Not Synchronized	Location						

Figure 4-29: 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 4-29](#) follows the same pattern as the context menus in [Figure 4-22](#).

Table 4-13: HBS main window list display context menu and button bar functions

Menu Item	Menu Icon	Purpose	Reference
Register		Register a HSU to a sector	<a href="#">page 113</a>
Configure		Site configuration for the HSU	<a href="#">page 149</a>
Recent Events		Recent events log per HSU	<a href="#">page 219</a>
Performance Monitoring		Performance Monitoring per HSU	<a href="#">page 221</a>
Active Alarms		Display Active Alarms	<a href="#">page 227</a>
Estimate Throughput		Estimate throughput per HSU	<a href="#">page 217</a>
Update Service		Service evaluation and time slot allocation per HSU; also Spatial Multiplexing/Diversity selection	<a href="#">page 163</a>
Suspend ...		Suspend Service	<a href="#">page 163</a>

Table 4-13: HBS main window list display context menu and button bar functions (continued)

Menu Item	Menu Icon	Purpose	Reference
Replace		Replace a HSU	<a href="#">page 161</a>
Locate on Map		Fly to this HSU on the Map Display	
Reset		Reset the HSU	
Deregister		Deregister the HSU	<a href="#">page 120</a>
Copy HSUList		Copies HSU List (showing serial no). to clipboard	

## Exploring the Link 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 4-30: Logging on to a HSU

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

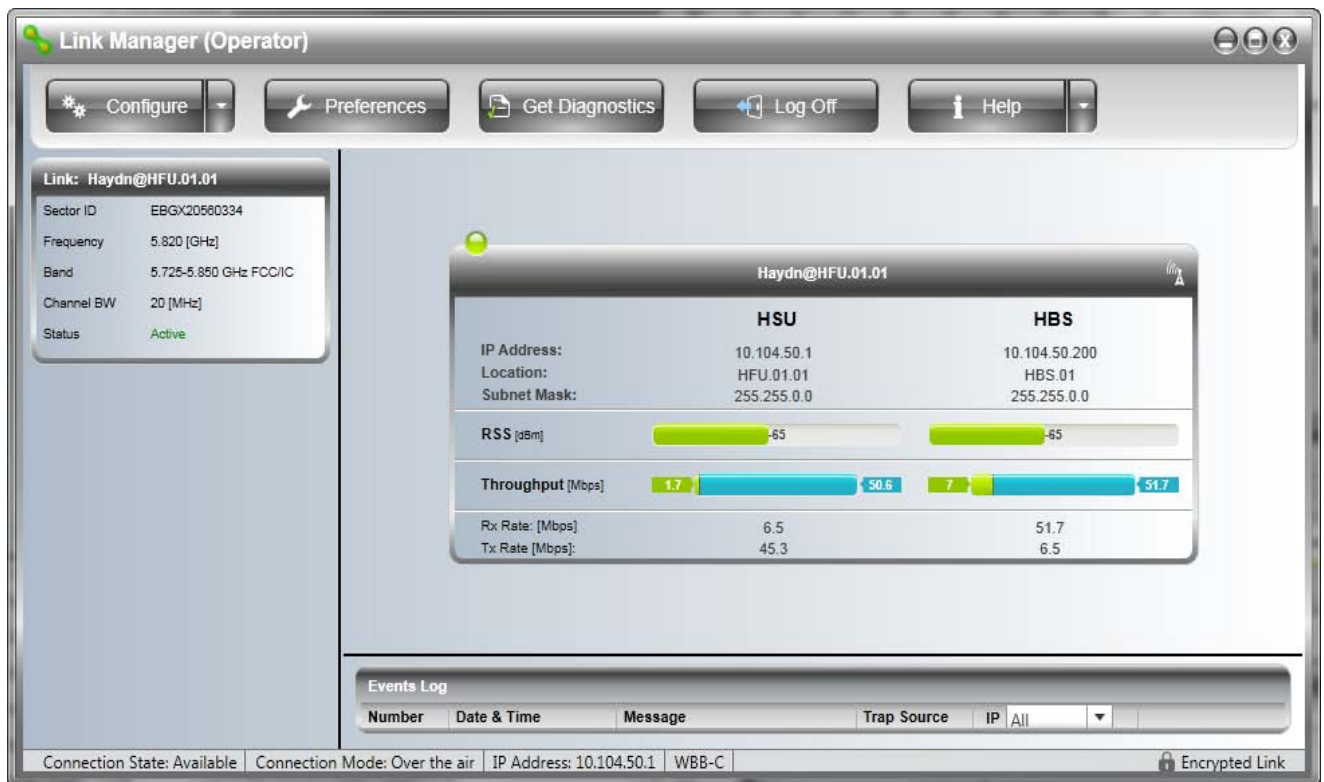


Figure 4-31: Opening Link Manager window - HSU

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.

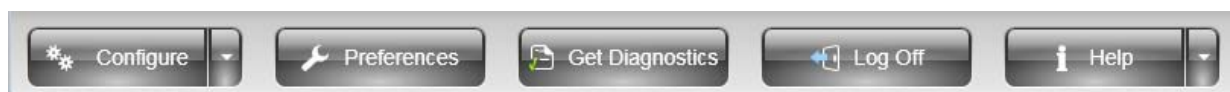
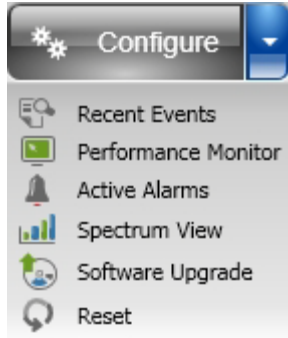


Figure 4-32: HSU main button menu

Table 4-14: HSU main button bar functions

Menu Item	Purpose
Configure	<p>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.</p> 
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 [dBm]	 -65	 -65
Throughput [Mbps]	 1.8	 51.7
Rx Rate: [Mbps]	2.4	41.4
Tx Rate [Mbps]:	41.4	2.3

The HSU Link Performance panel shows the same fields as in [Figure 4-27](#). For convenience we also display the corresponding parameters for the HBS. The throughput bar graphs and labels have the same meaning as the corresponding items on the HSU cards.

## Setting Link 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.



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

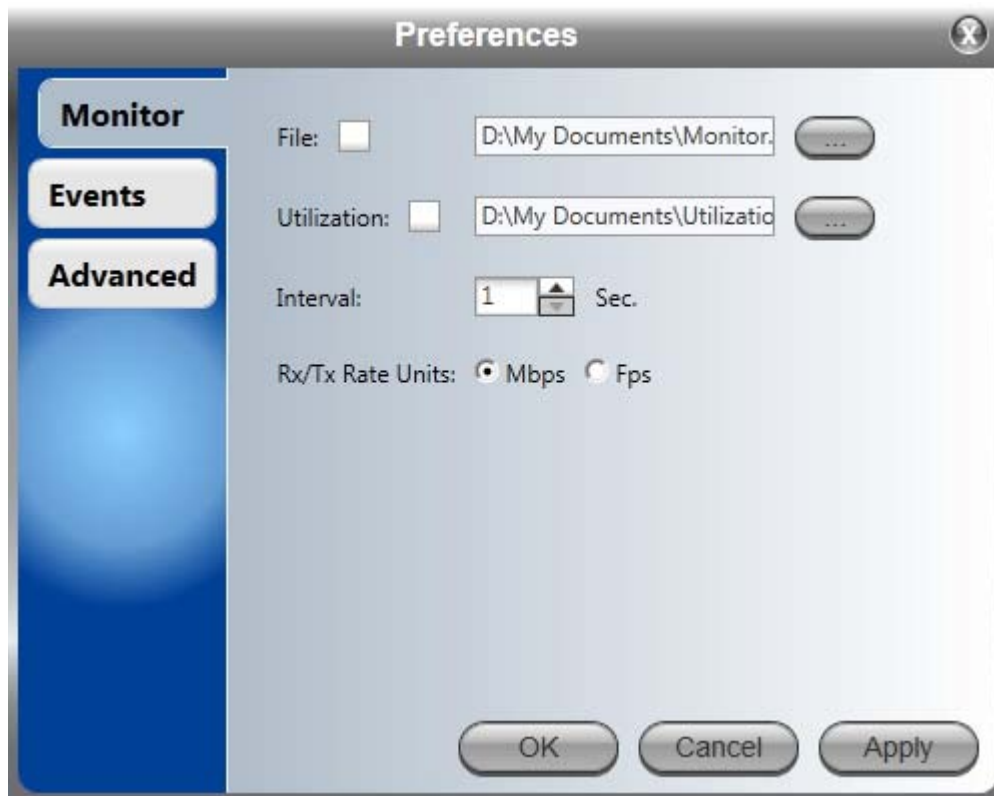
**Monitor**

Figure 4-33: Monitor Preferences - HBS

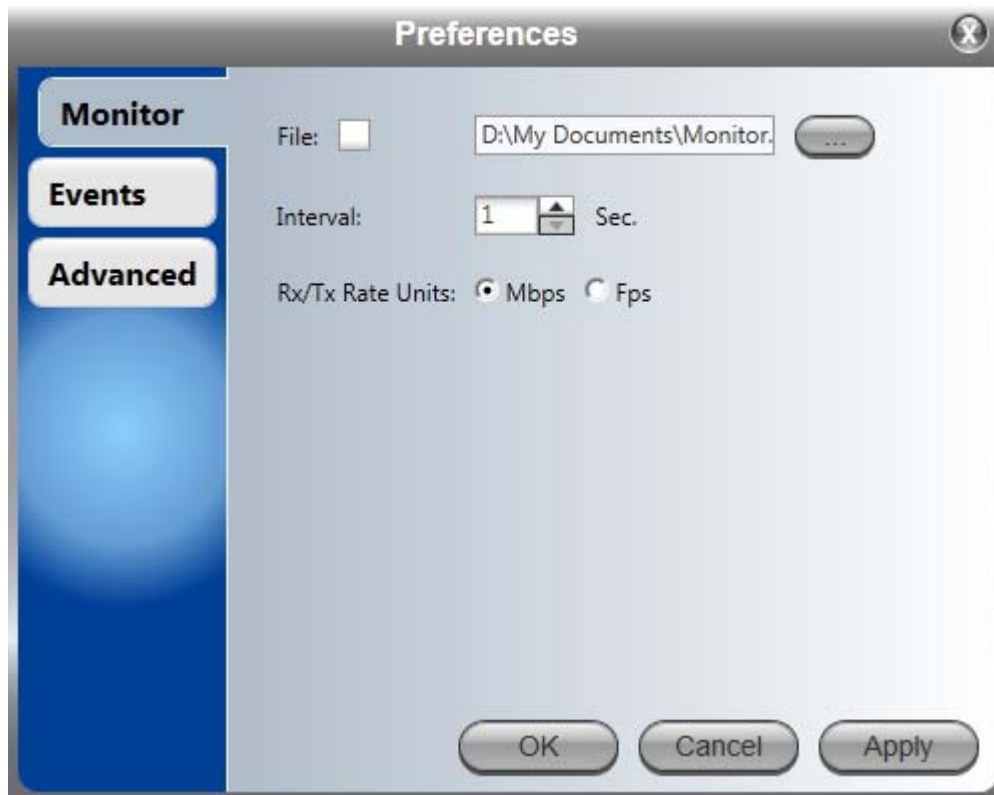


Figure 4-34: Monitor Preferences - HSU

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.

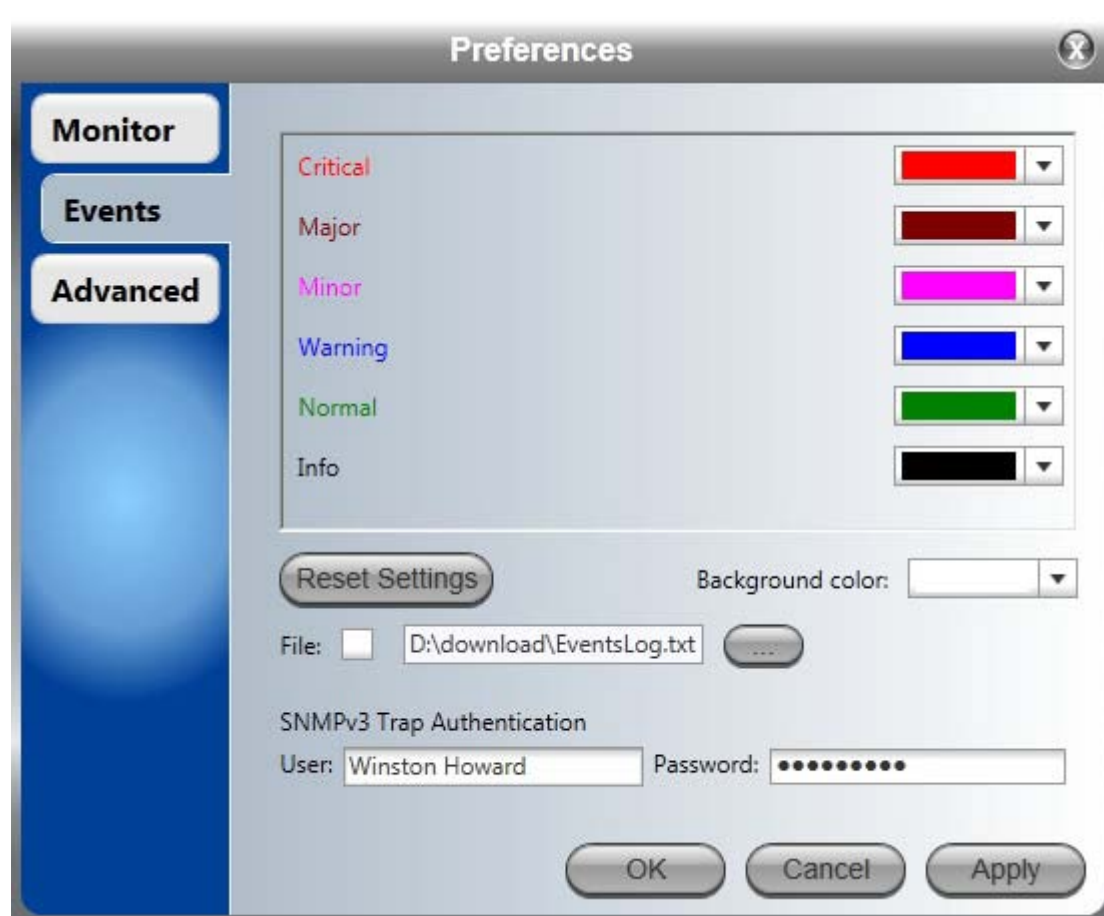
For the HBS, it will show details for the HBS itself and all registered HSUs.

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 10](#).

The Utilization file shows the data at the requested interval appearing at the bottom of [Figure 8-4](#). It also can become very large very quickly.

## Events



Here you may choose your own color coding for the Recent Event display (see [Chapter 10](#)).

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.

The SNMPv3 User and Password are relevant if you are using SNMPv3. In this, case trap messages are keyed to the user name and password and not visible to anyone else. The preferences entered here, relate to trap messages sent to the specified user if specified or to all trap messages, otherwise. For associating a user with a trap address, see [Chapter 6, Management](#).

**Advanced**

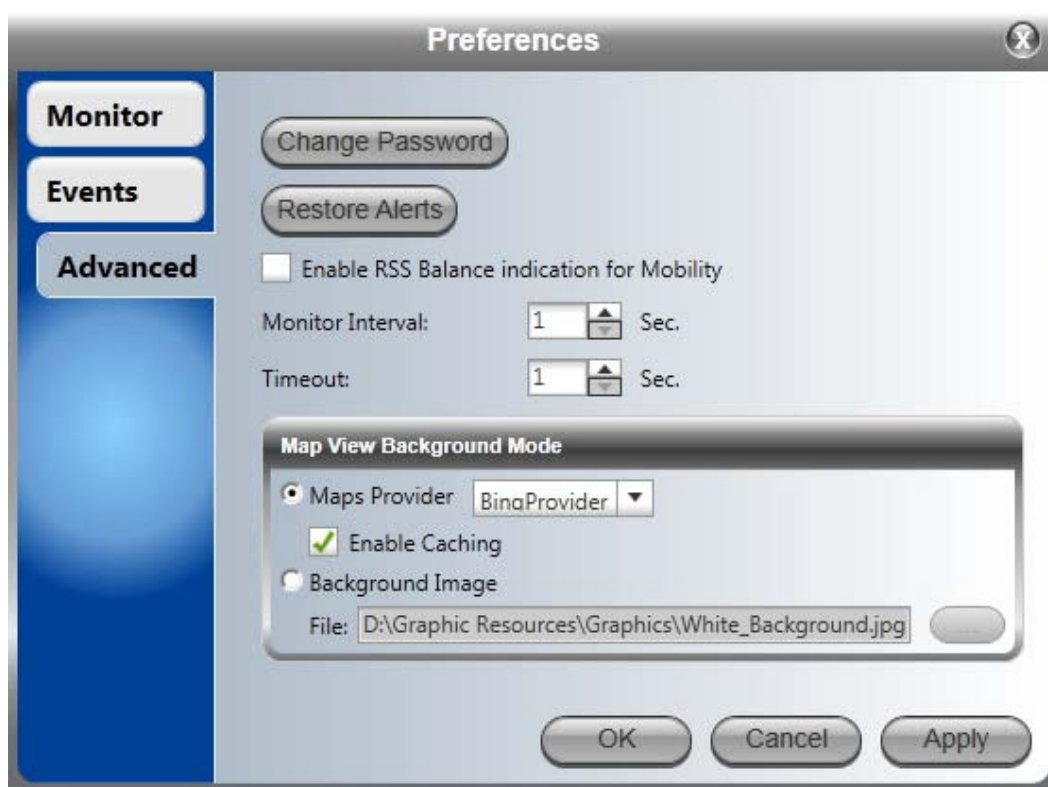


Figure 4-35: Advanced Preferences - HBS

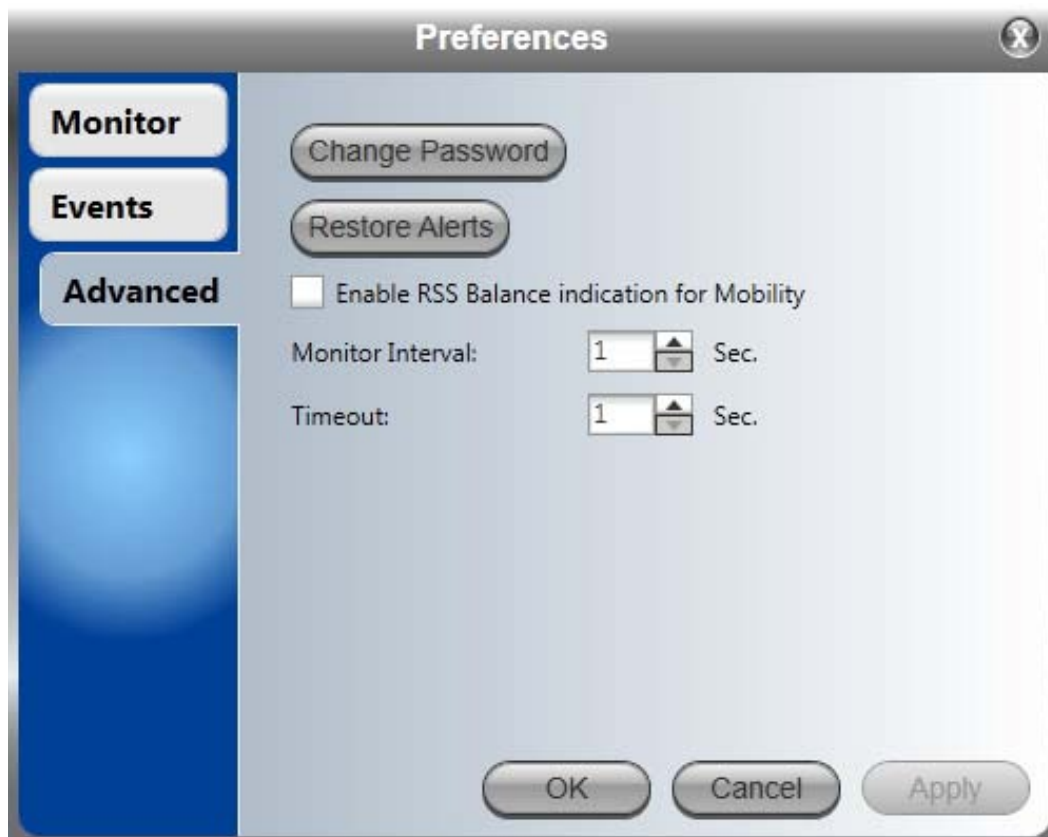


Figure 4-36: Advanced Preferences - HSU



## Change Password

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

## Restore Alerts

Many alert messages in the Link 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:



## 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 NetAstra PtMP 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.

## 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 Link 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 9](#).

### 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 ODU 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.

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 move around within and across sectors. Mobile HSUs (HMUs) may also move around within and across sectors. They are covered in [Chapter 9](#).

## 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 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 NetAstra Settings

The default settings of the NetAstra 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	
	Link 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	
	Link 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 – HBS

Location	Attribute	Value	Remark	
HBS.01	IP Address	10.104.50.200	All communicating HSUs and HBS in the same subnet	
	Net Mask	255.255.0.0		
	Default Gateway	10.104.10.21		
	Sector ID	EBGX20560334	Inherited by all communicating fixed HSUs.	
	Network ID	EBX	Inherited by all communicating nomadic HSUs.	
	Protocol	SNMPv1	Can be set to SNMPv3 or both v1 and v3	
	Contact	Bach	Optional	
	Name	Bach@HBS.01	Location of Contact - optional	
	Band	5.730 - 5.845 GHz FCC/IC	Inherited by all communicating HSUs	
	Channel Bandwidth	20MHz	Inherited by all communicating HSUs	
	Unit Serial Number	PET540E000A00000		
	Geographic location			
	Latitude	-37.8148		
	Longitude	144.9630		
	Azimuth (deg)	0	Used for initial default placement of HSUs	
Beam width (deg)	90			
Antenna height (m)	130	From RF plan, not used		

Table 5-3: Preconfigured setup - fixed HSUs

Location	Attribute	Value	Remark	
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		
	Protocol	SNMPv1	Can be set to SNMPv3 or both v1 and v3	
	Contact	Haydn	Optional	
	Name	Haydn@HFU.01.01	Location of Contact - optional	
	Time Slots	Downlink	8	May vary with context
		Uplink	2	
	Unit Serial Number	PIN580I500A00004		
	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		
	Protocol	SNMPv1	Can be set to SNMPv3 or both v1 and v3	
	Contact	Mozart	Optional	
	Name	Mozart@HFU.01.02	Location of Contact - optional	
	Time Slots	Downlink	8	May vary with context
		Uplink	2	
	Unit Serial Number	PIN580I500A00005		
	Geographic location			
		Latitude	-37.4018	
	Longitude	145.0086		
	Antenna height (m)	60	From RF plan, not used	

Table 5-4: Preconfigured setup - Level allocation for maximum nomadic HSUs

Level	Number of nomadic HSUs	Time Sots		Remark
		Downlink	Uplink	
A	2	6	2	Includes HNU.0.01 below
B	1	4	2	
C	1	4	2	
D	0	0	0	

Table 5-5: Preconfigured setup - One actual nomadic HSU

Location	Attribute	Value		Remark
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		
	Protocol	SNMPv1		Can be set to SNMPv3 or both v1 and v3
	Contact	Brahms		Optional
	Name	Brahms@HNU.01.01		Location of Contact - optional
	Level	A		Included in previous table
	Time Slots	Downlink	6	
		Uplink	2	
Unit Serial Number	PIN580I500A00003			

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



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 Link Manager and log-on to it.

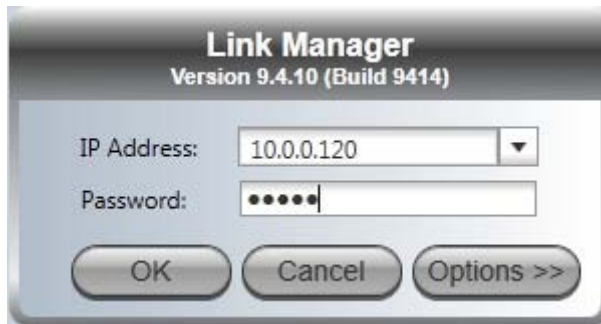


Figure 5-1: Logging on with factory default IP address

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:

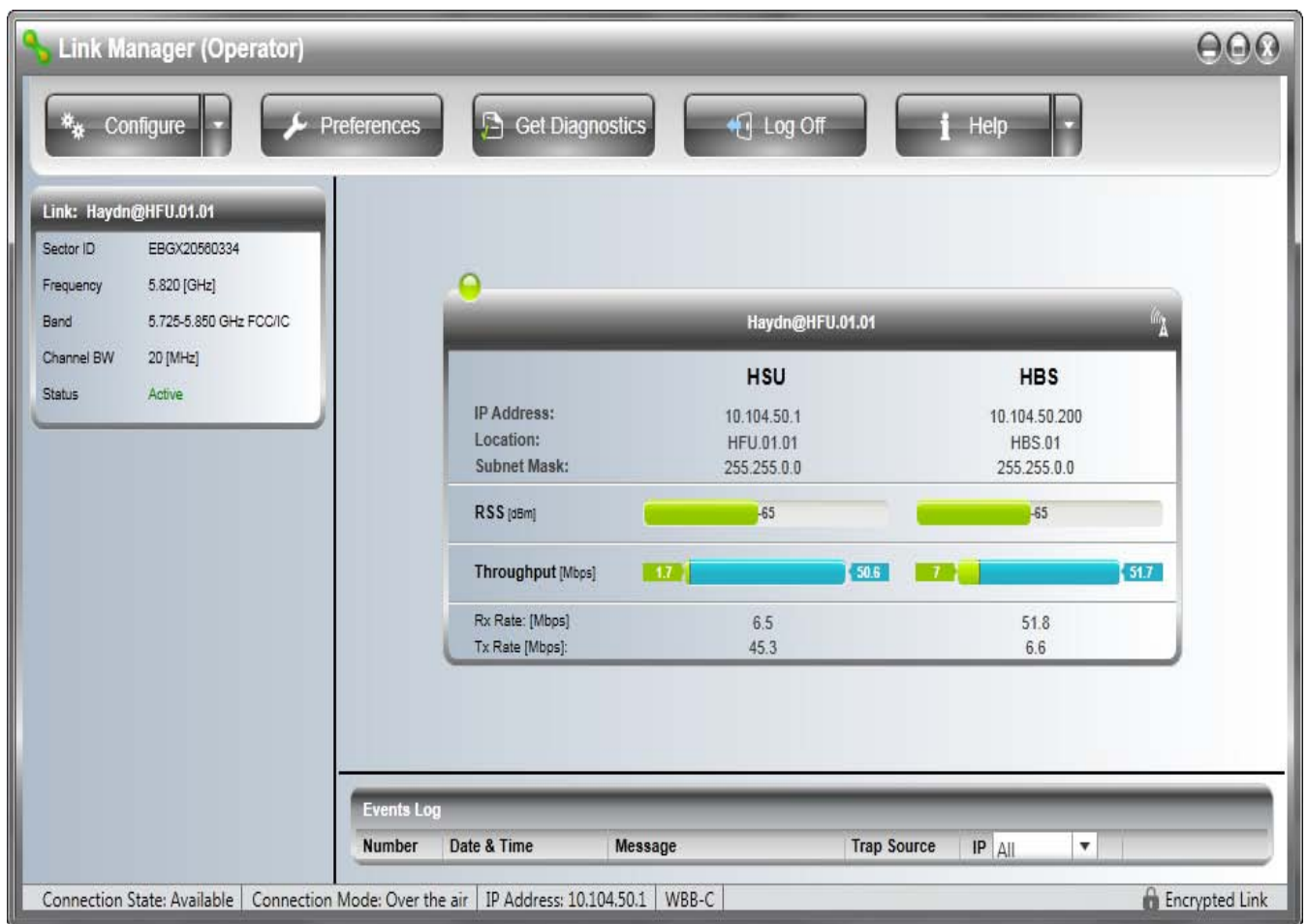


Figure 5-3: Main window for un-configured HBS ODU

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](#):

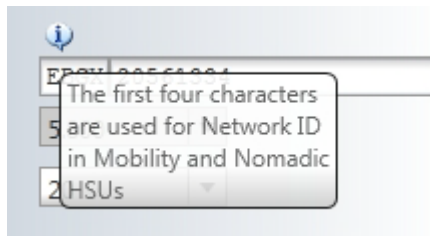
#### **About the Sector ID:**

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.



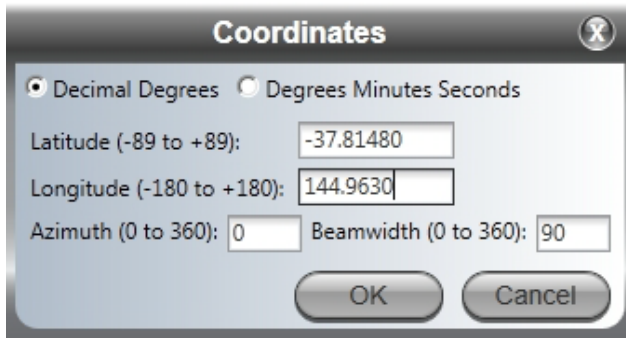
The Sector ID is split into a four character Network ID (EBGX) and the remaining part (20561334).



For fixed HSUs you may ignore the split. For non-fixed HSUs, the use of the split Sector ID is explained on [page 175](#).

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 137](#).

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:



5.735

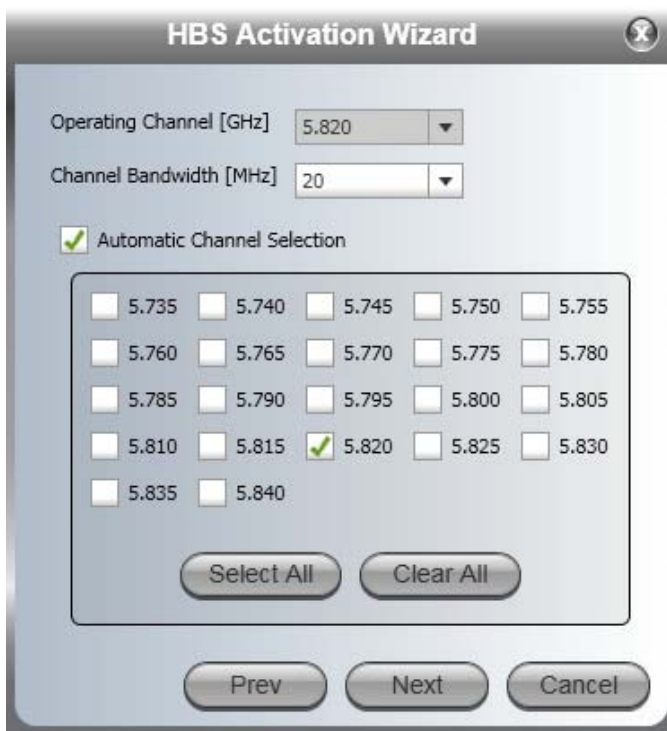
Observe that the right hand spin-wheel is no longer displayed. Had you left **Other** enabled, you could have chosen a frequency by working through those available in 5 MHz increments.

9. Choose the required Channel Bandwidth:



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

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

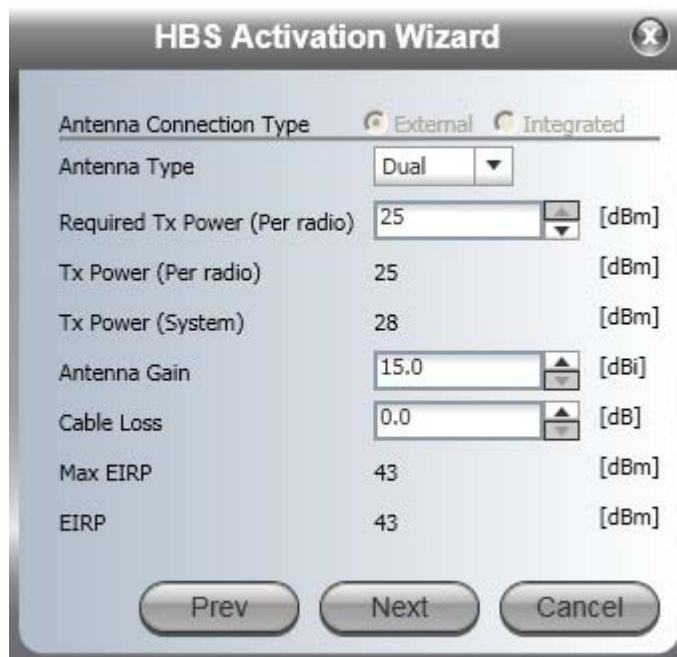


You can perform a customized channel selection or click **Select All** to check all the channel boxes as shown:



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:



Parameter	Value	Unit
Antenna Connection Type	External	
Antenna Type	Dual	
Required Tx Power (Per radio)	25	[dBm]
Tx Power (Per radio)	25	[dBm]
Tx Power (System)	28	[dBm]
Antenna Gain	15.0	[dBi]
Cable Loss	0.0	[dB]
Max EIRP	43	[dBm]
EIRP	43	[dBm]

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 C:

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.



---

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

---

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 in a Table view:

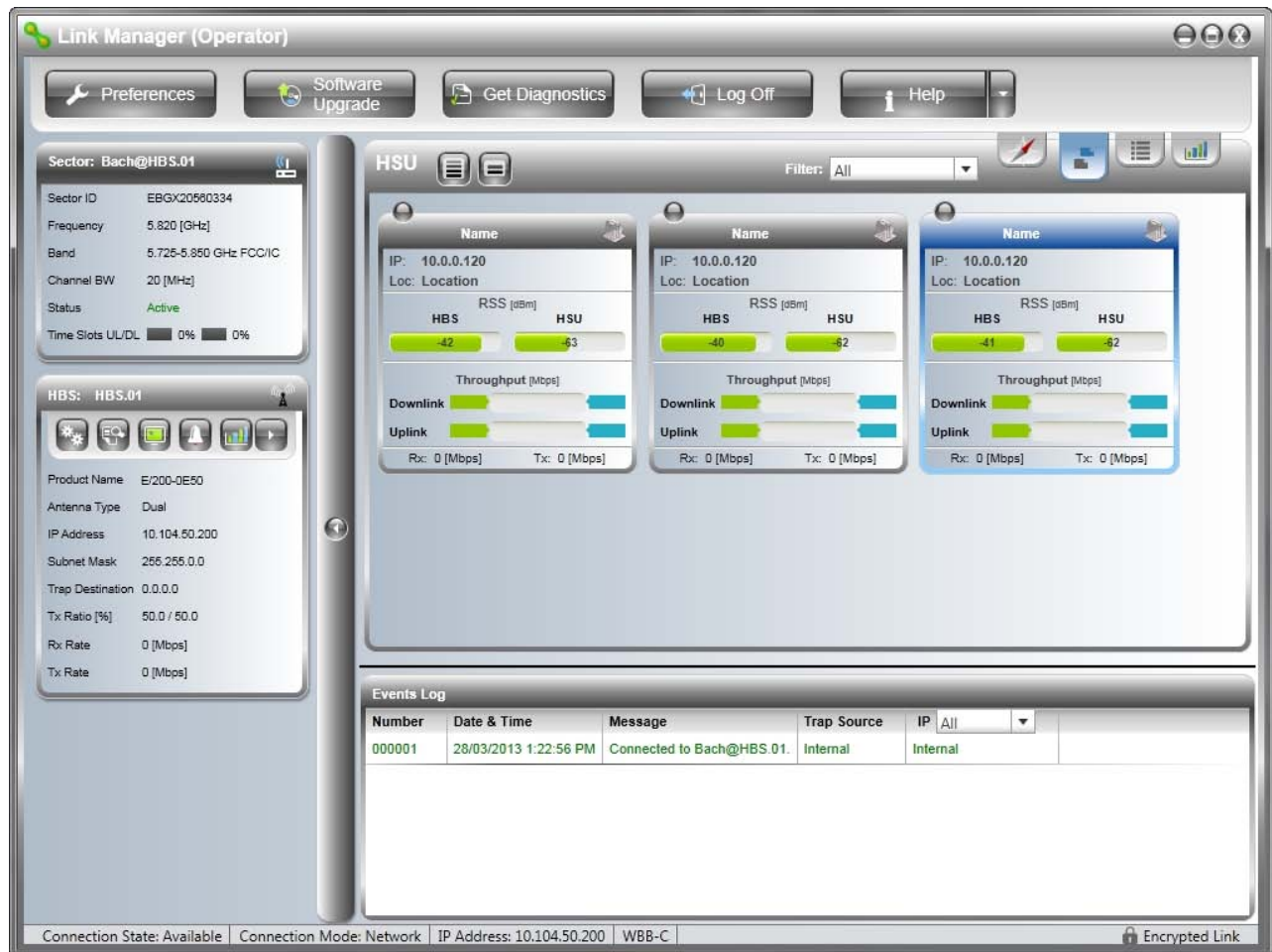


Figure 5-4: Activated HBS recognizing installed but unconfigured HSUs

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 an fixed HSU from the HBS:

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

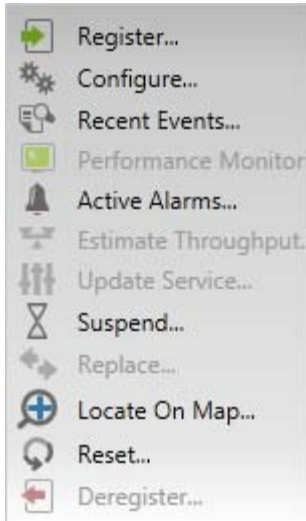


Figure 5-5: HSU Context menu

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

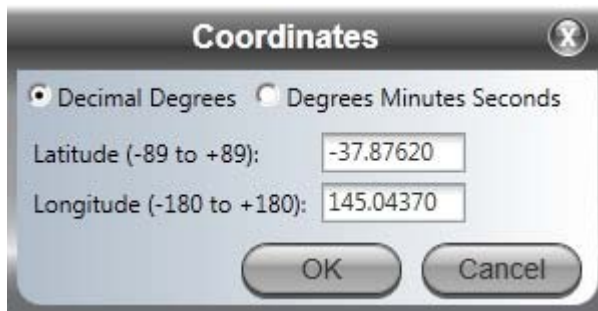


**Location** is a site name - typically a building or tower name. **Contact** is the contact person

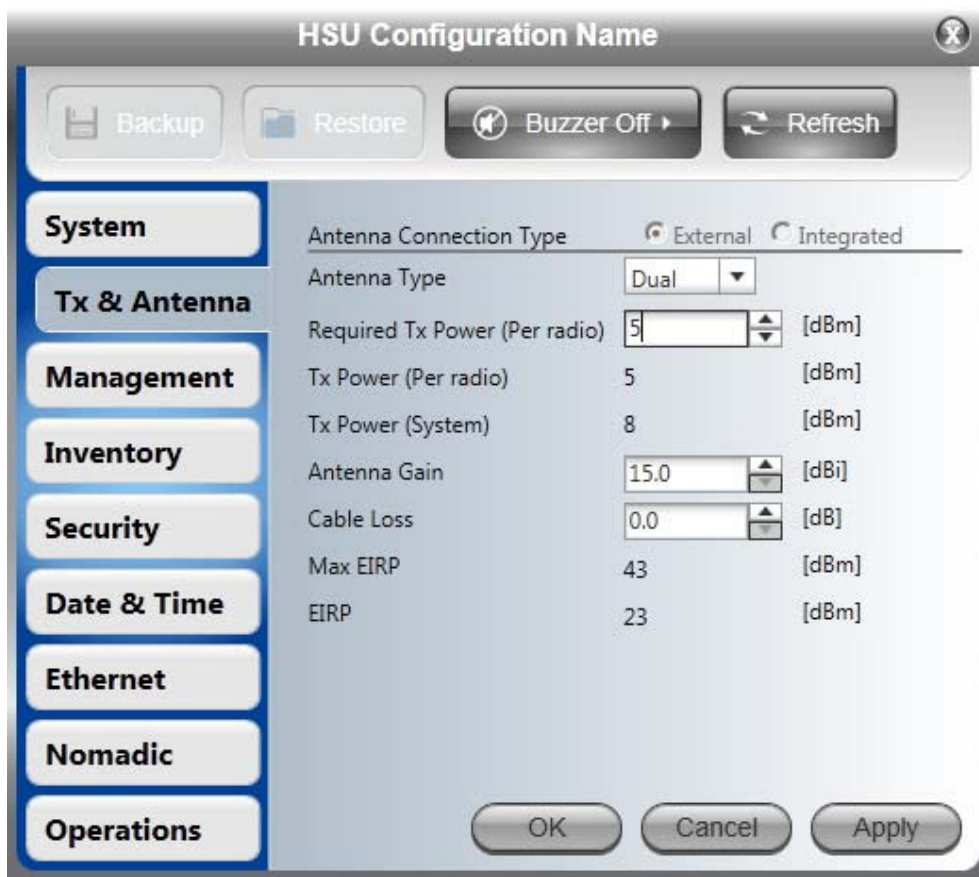
at that Location and **Name** is the Contact location. It might be just a telephone number. Here are our entries:



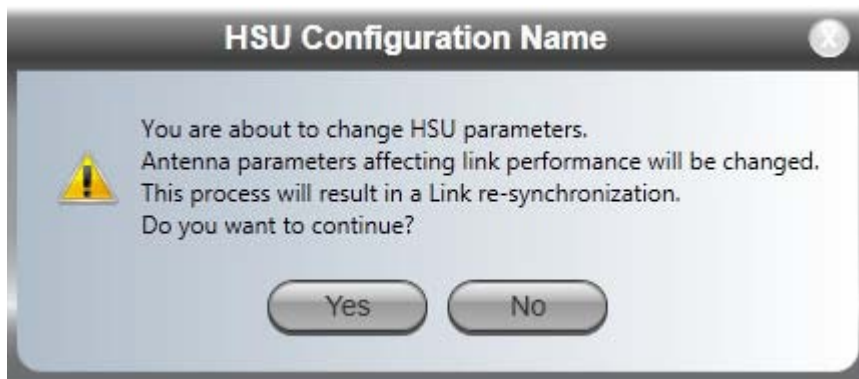
3. Set the Coordinates (latitude and longitude) for the HSU as shown in the Sector Plan:



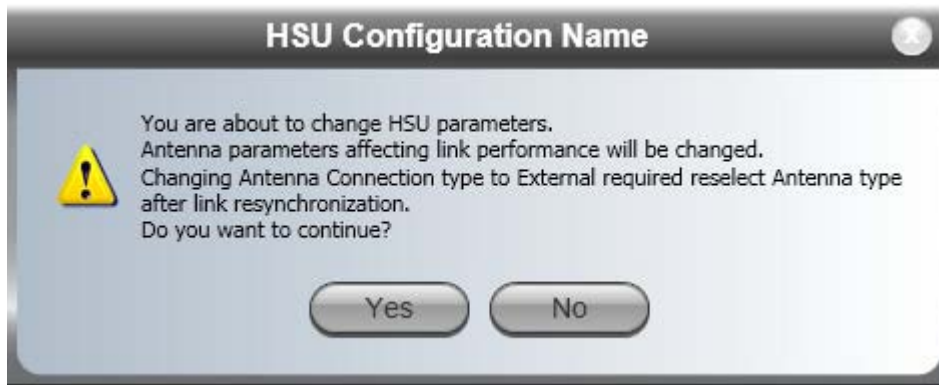
4. Set the HSU Tx Power (possibly as required by regulations). Click **Tx & Antenna**. The following dialog is displayed:



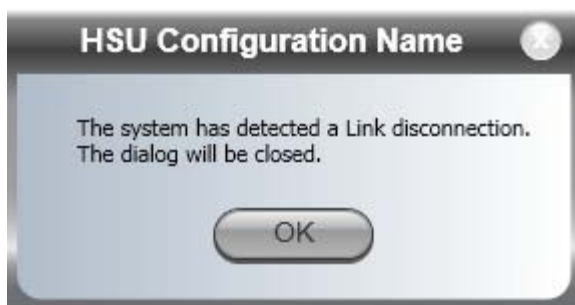
Set the Antenna Connection Type, Antenna Type, Required Tx Power, Antenna Gain and Cable Loss as required. For our example, we use external antennas and we set Tx Power to 5 dBm. If you click apply, you receive the following confirmation request:



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.

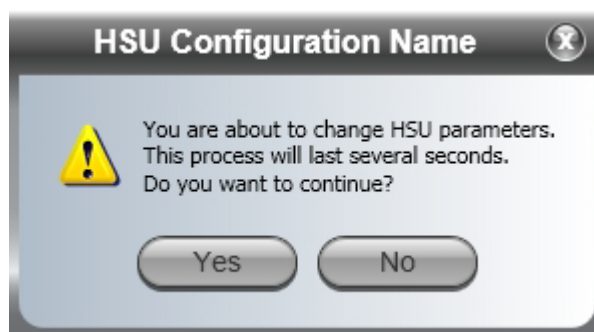
7. Reopen the Configuration dialog for the HSU and then open the **Management** tab.



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

IP Address	192.168.10.101
Subnet Mask	255.255.255.0
Default Gateway	192.168.10.100

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.

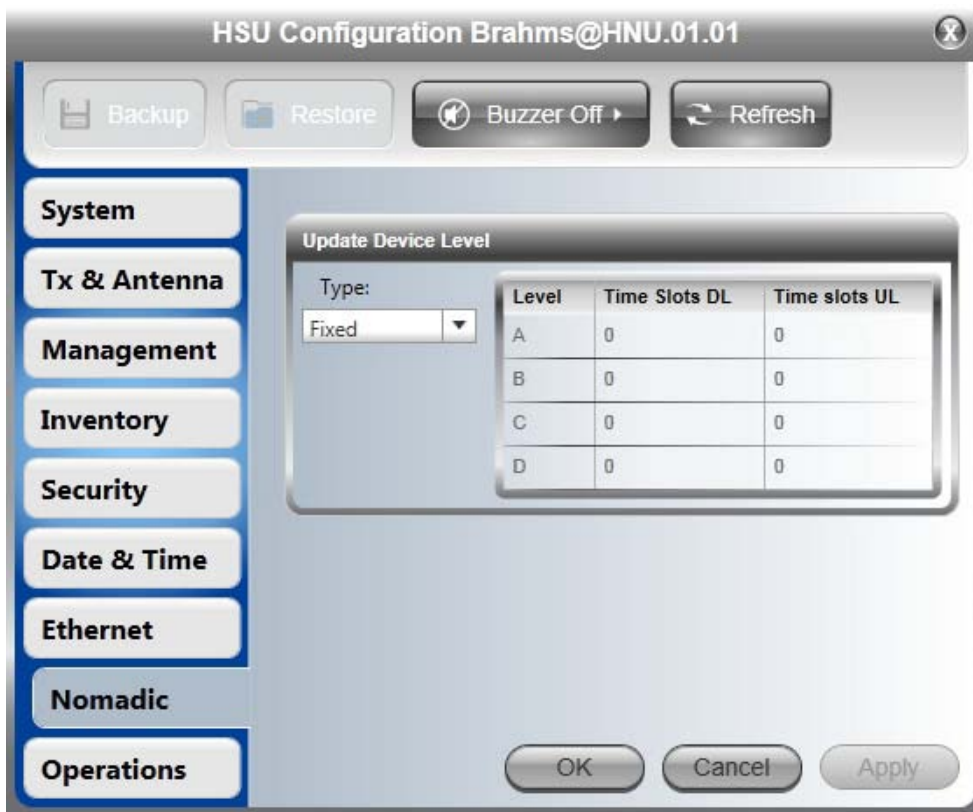


9. Repeat steps 1 to 8 for one more HSU.

## Configuring a nomadic HSU from the HBS

### ➤ To configure an 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:

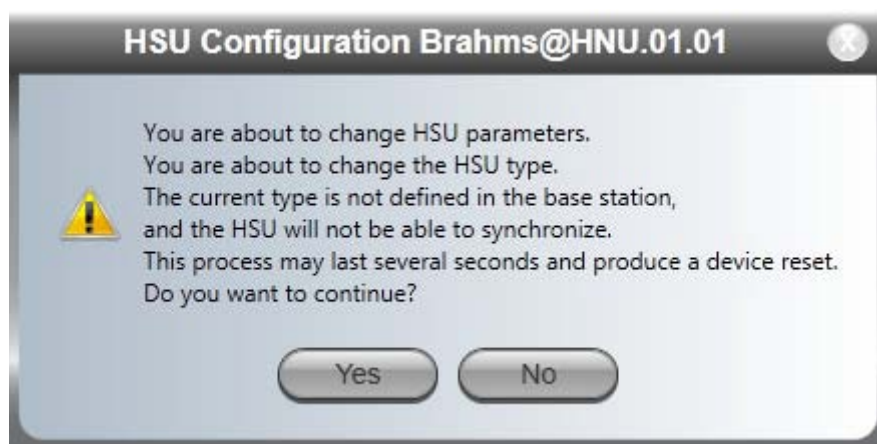


3. From the Type list, choose **Nomadic**. The right hand Level list is enabled:



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:





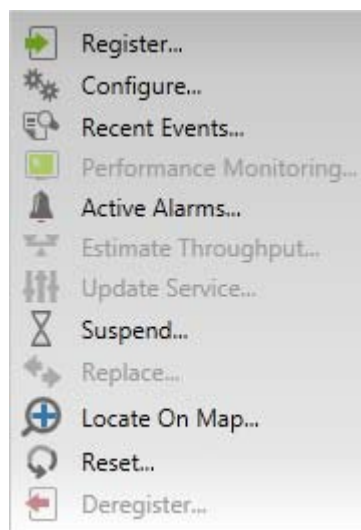
The HSU no longer appears on the HBS Table view. It will return following registration, to which we now turn.

## Registering a fixed HSU for service

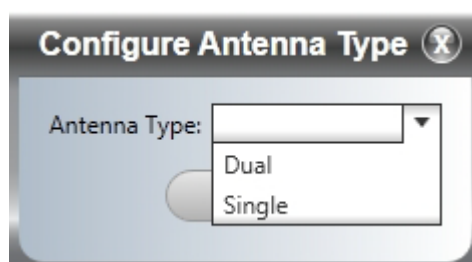
We continue our illustration using the HSU, HFU.10.101.

### ➤ 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:

The screenshot shows a window titled "HSU Registration - PIN580I500A00004". It contains the following fields and controls:

- Name:** Text input field containing "Haydn@HFU.01.01".
- Location:** Text input field containing "HFU.01.01".
- Geo Location:** Button labeled "Coordinates...".
- Dual Antenna Mode:** Radio buttons for "MIMO" (selected) and "Diversity".
- Evaluate:** Button.
- Maximum Information Rate:** A sub-section with two rows:
  - Down Link [Mbps]:** A slider from 0.5 to 100, with a checked checkbox and the text "Unlimited".
  - Up Link [Mbps]:** A slider from 0.5 to 100, with a checked checkbox and the text "Unlimited".
- Register:** Button.
- Cancel:** Button.

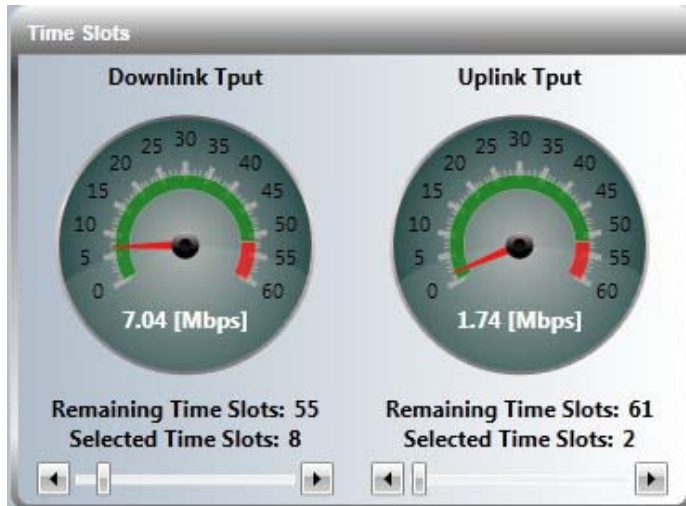
3. You may edit or add the site **Name**, **Location** and **Coordinates**.
4. If you are using Dual Antennas, you may check the MIMO or Diversity antenna mode. The choice is HSU specific. For further details about MIMO/Diversity antenna mode, see [Appendix C](#).
5. Click the **Evaluate** button. Service 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 time slot allocations may be changed later.

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:

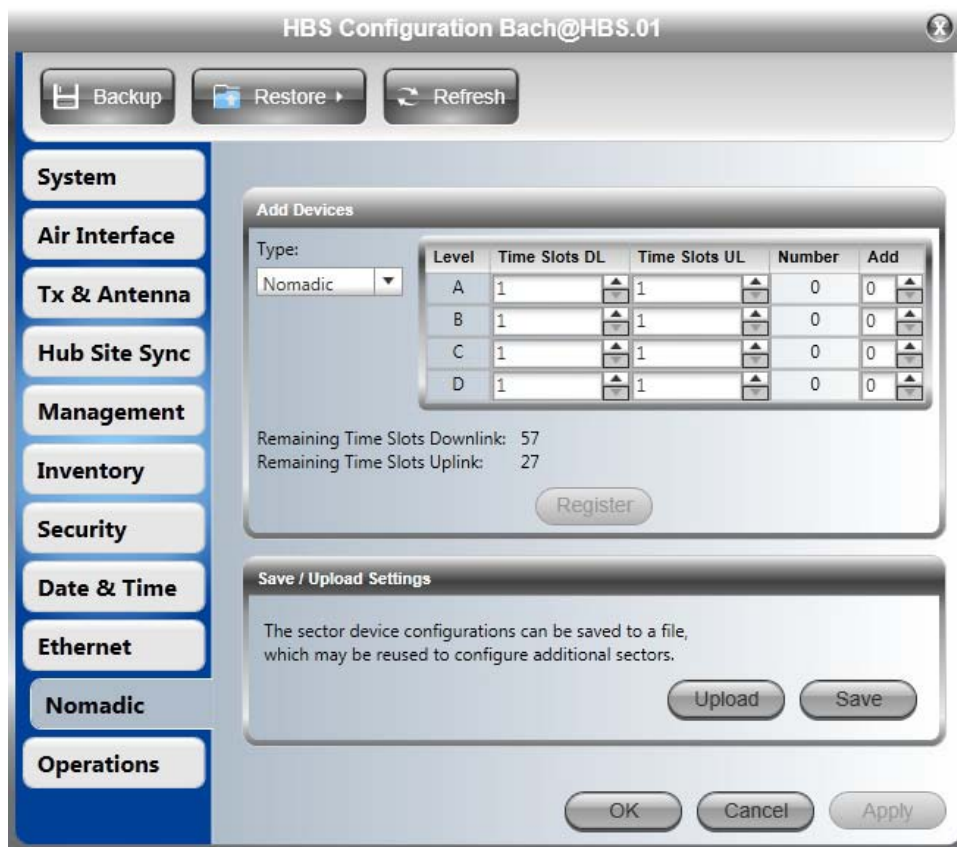


Figure 5-7: HBS Nomadic Configuration

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



The **Register** button is enabled.

3. 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.
4. 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

If you have too many HSUs to fit the table view, you can get a reduced table view by using the right

hand HSU button:  **Figure 5-8** looks like this:



Here is a Map view of the sector:

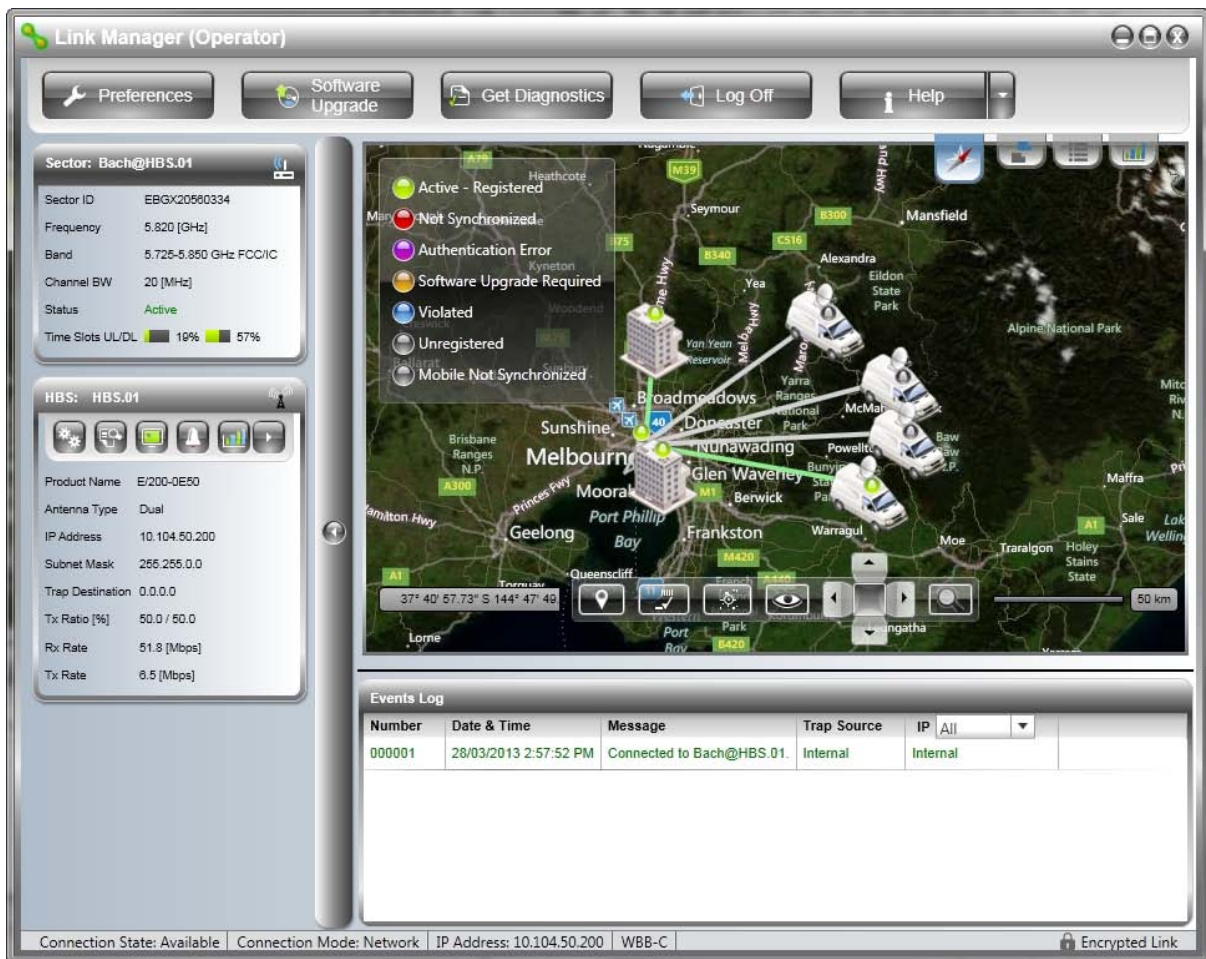


Figure 5-9: Fully functional sector, two fixed one nomadic HSU - Map view

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.

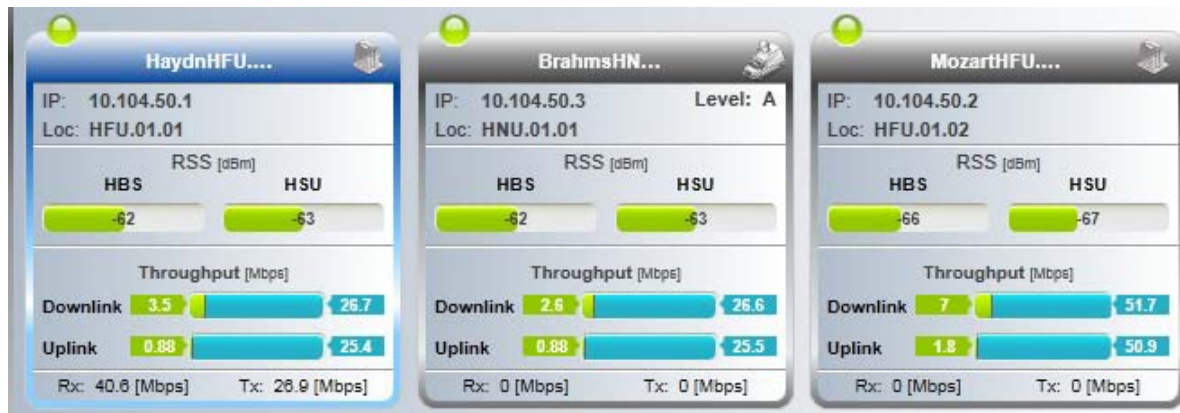
As a partial alternative method, you may enter the HSU **Name** and **Location** fields during Registration.



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.10.101 we had chosen Diversity mode, the outcome would look like this:

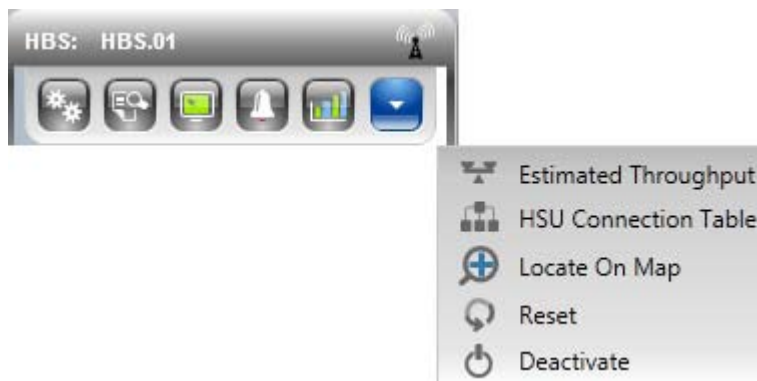


The assured throughput in both directions on this HSU has dropped to about half of its previous value. (The Rx and Tx rates drop slightly. The reason that there is no significant change to the Rx and Tx rates is that the SBM mechanism is allocating additional time slots in both directions. See [Chapter 8](#) for details about the operation of SBM.) The other HSUs are left unchanged.

This underlines the flexibility of the NetAstra PtMP 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

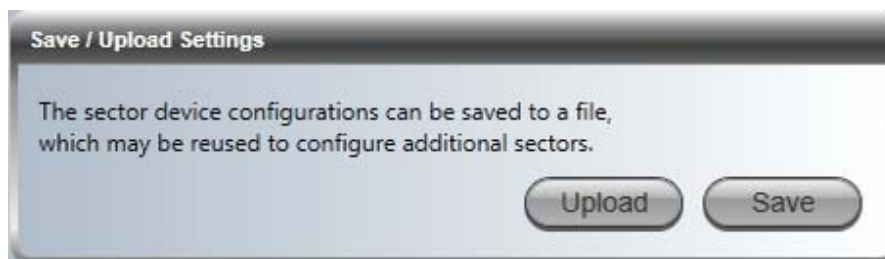
A HSU may be deregistered by using the Deregister entry in an HSU context menu or using the  button from an HSU button bar.

## 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 Nomadic-Settings.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 be 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.

# Part 3

## Sector Management



## 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. They are shown in the HBS Inventory window.

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**.

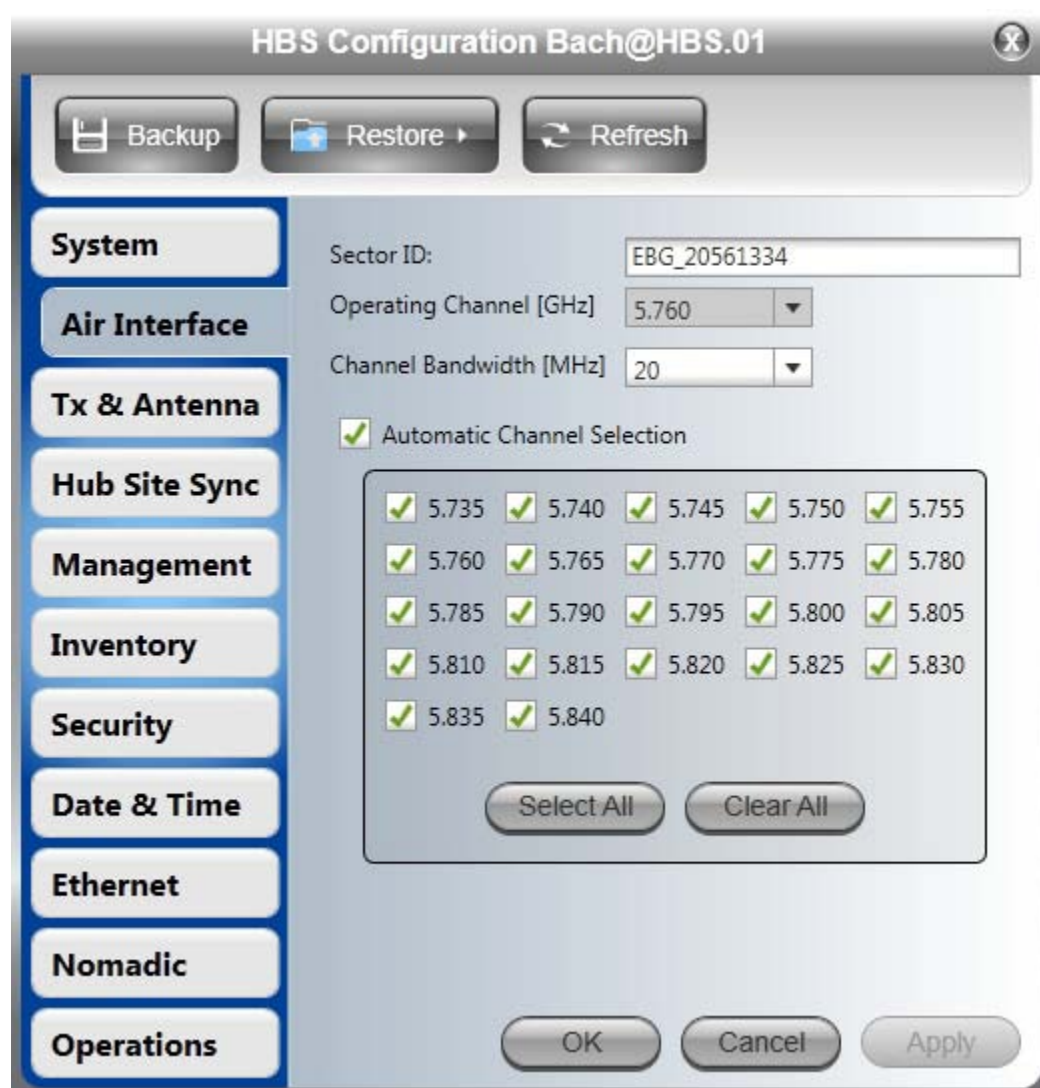
We will work through each of the Configuration tabs in turn with emphasis on tabs or features not encountered in the previous chapters.

## System

Field	Value
Description	Wireless Link
ObjectID	1.3.6.1.4.1.4458.20.5.1.2
Name	Bach@HBS.01
Contact	Person
Location	HBS.01
Last Power Up	5/13/2012 4:17:21 PM

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’ll of course, “picked up” by newly installed and registered HSUs.

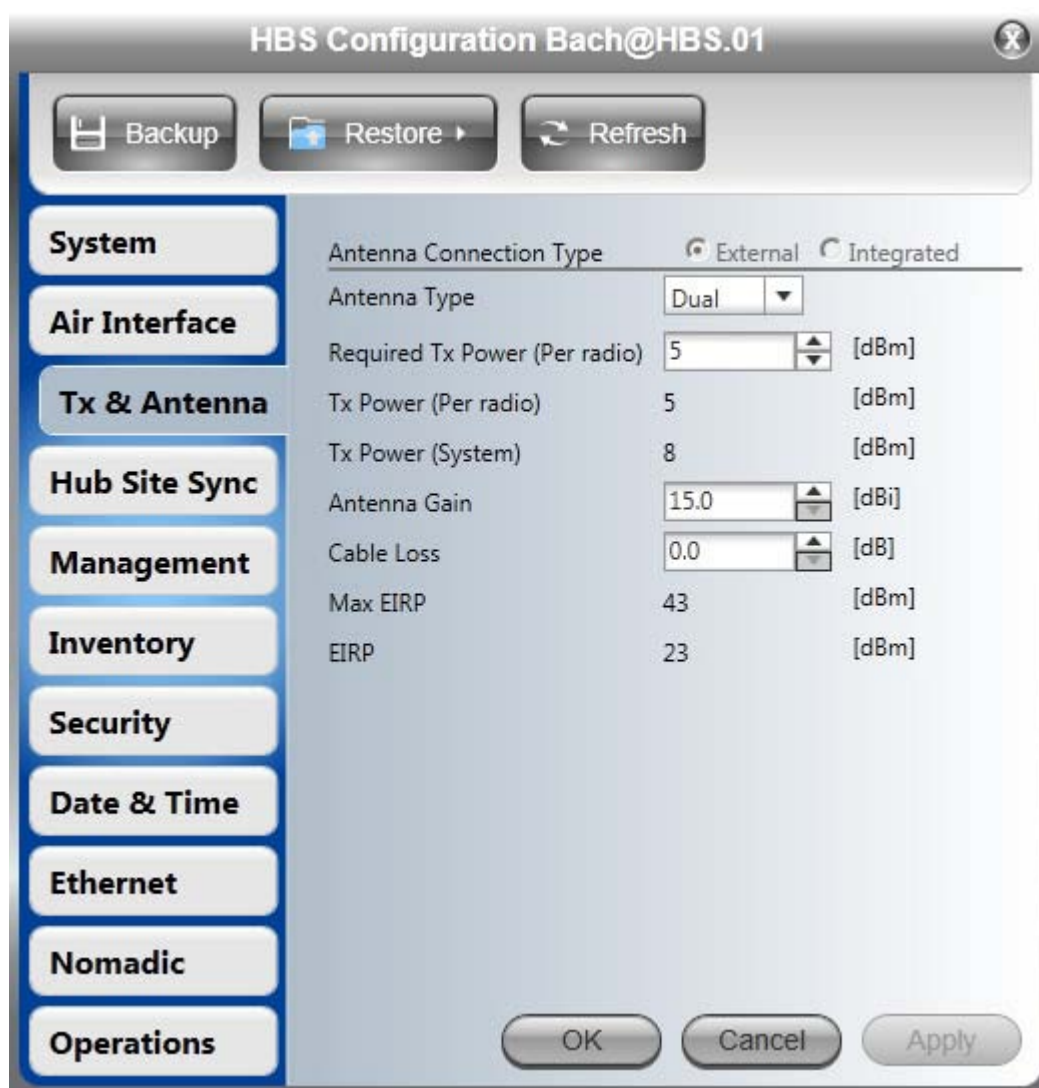
- The only way to change the Operating Channel is by deactivation and reactivation.
- Channel Bandwidth and Channel Selection changes will all be sector-wide.
- Use of Automatic Channel Selection only makes sense at configuration time. Choose a single channel based on what ACS shows. Use the Spectrum View tool ([Chapter 19](#)) to help you make your choice.

The **Advanced** bar (shown open) enables you to choose **Throughput Mode** that determines how the Adaptive Modulation mechanism works. **Maximum Throughput** (default) should be chosen if throughput is more important than higher delay. Conversely, **Reduced Latency** minimizes delay at the expense of lower throughput.



### Tx and Antenna

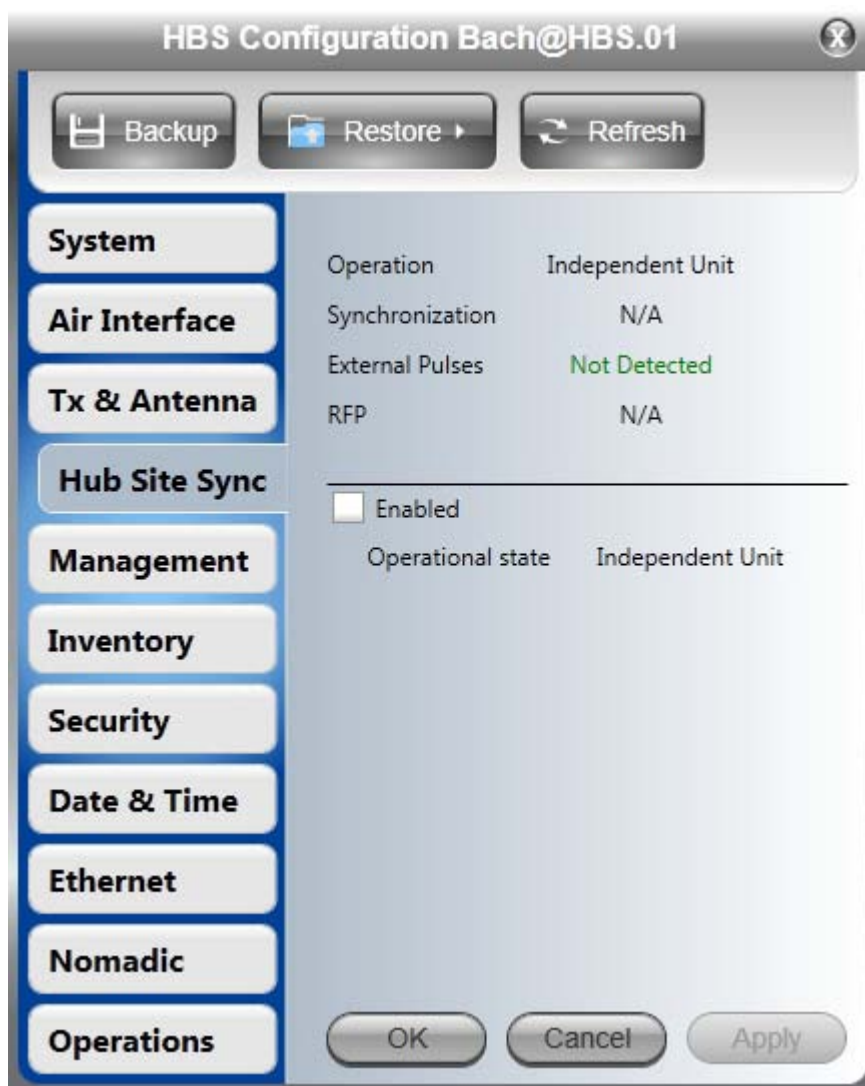
This tab is available for both the HBS and HSUs. It has the same meaning in both cases.



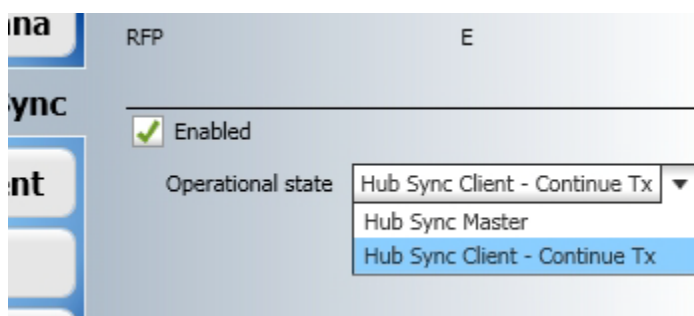
For the HBS, changes made here may affect link quality and in the case of antenna type, cause a sector re-sync.

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 detect, may come from a collocated HBS, a NetAstra ODU or a GSU configured as Hub Sync Master. To enable HSS, check the **Enabled** check box.

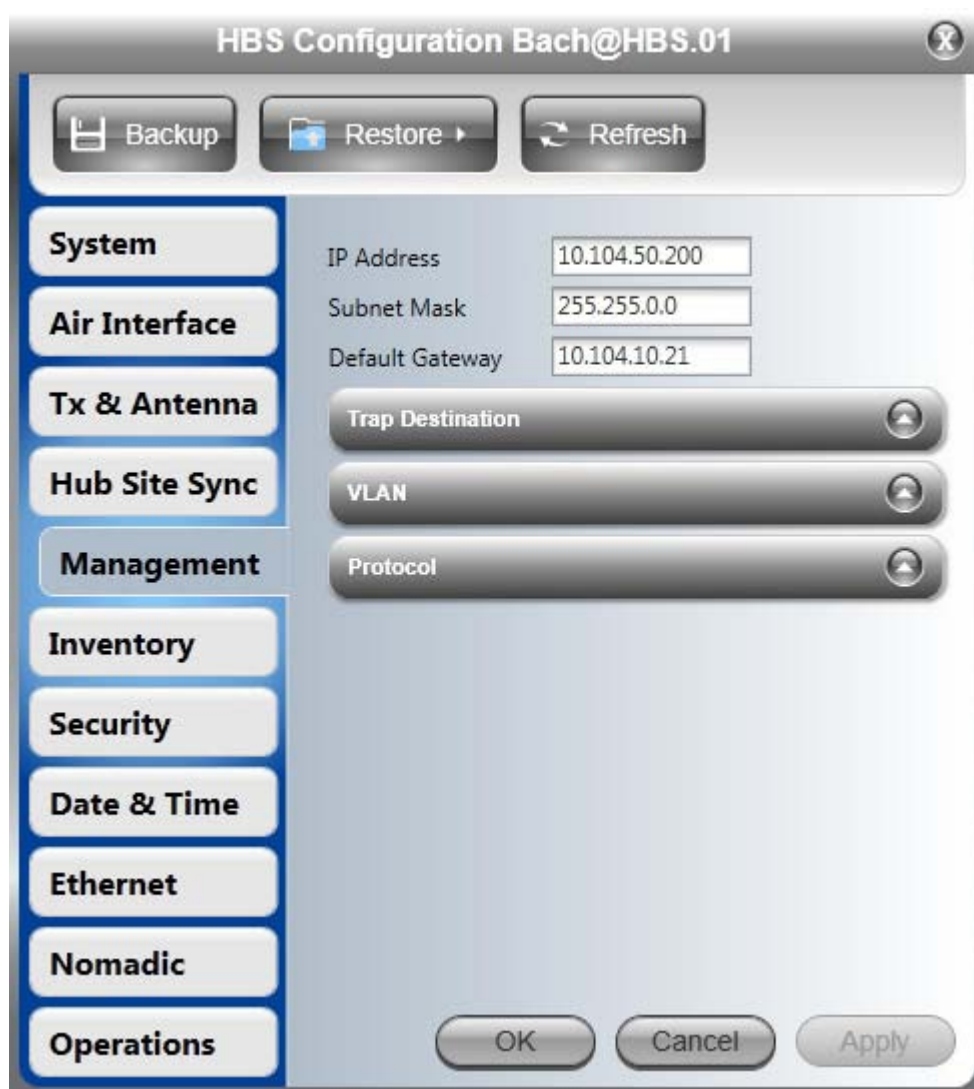


Ensure that the correct Operational state is selected - in our example, **Hub Site Client - Continue Tx**. Click **Apply** or **OK** to enable HSS.

See [Chapter 11](#) for further detail about HSS.

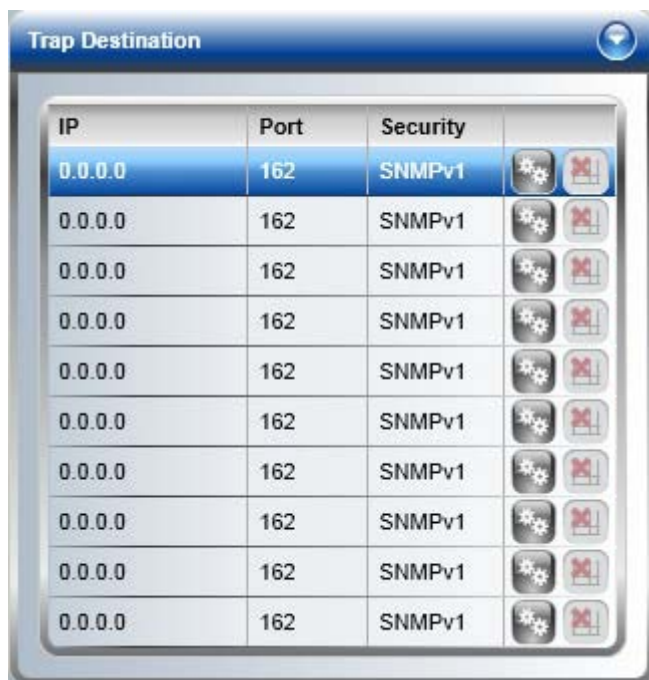
### Management

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 and the HSUs (direct or over-the-air) and are discussed below.

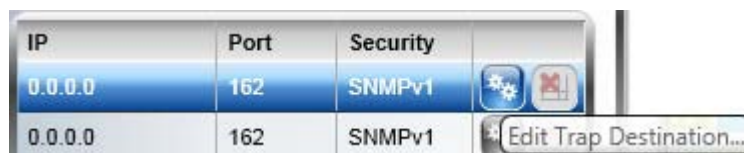
### Trap Destinations



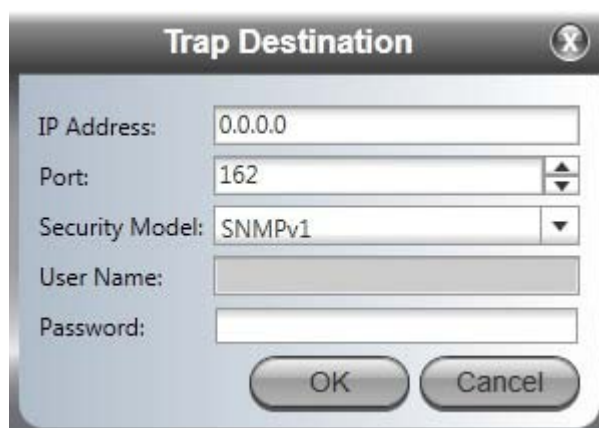
Enter the Trap Destinations. They could include the IP address of the managing computer. The events log will be stored at the addresses chosen.

➤ **To change a trap IP address:**

1. Open an entry with its edit button:

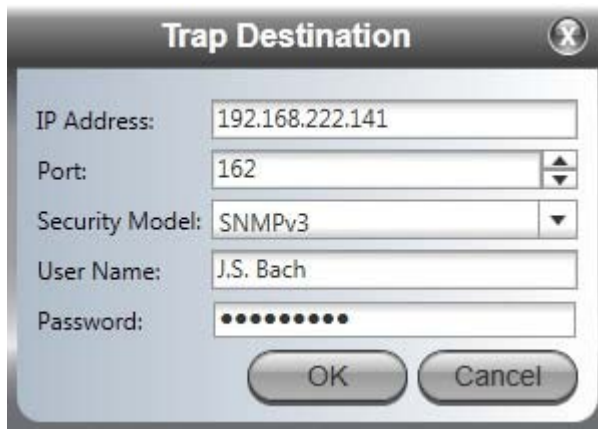


The following entry window is displayed:



2. Enter the Trap Destination IP Address and Port. It could be the IP address of the managing computer. The events log will be stored at the addresses chosen.

- For Security model you may choose between SNMPv1 or SNMPv3. The choice is site dependent. If you choose SNMPv1, you may only enter an IP address and port number. For SNMPv3, you should supply a user name and password:



- Click **OK** to save your choice.

Note that for each active trap destination, the **Clear Trap Destination** button is enabled:



## VLAN for Management

### Management VLAN Configuration

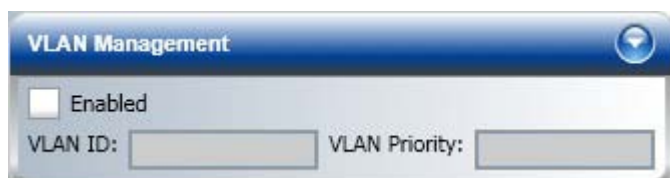


Figure 6-1: VLAN for Management



VLAN IDs are used by NetAstra 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). The VLAN priority is used for the traffic sent from the ODU to the managing computer. Using VLAN for management traffic affects all types of management connections (local, network and over the air).

3. Enter a Priority number between 0 and 7.
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**

Supported protocols are shown in [Figure 6-2](#):

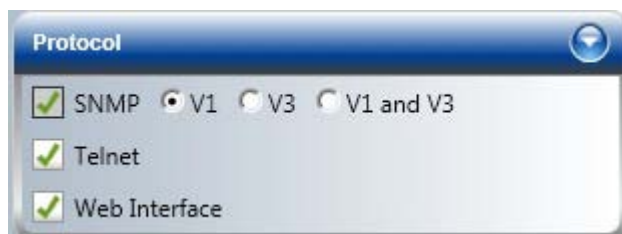
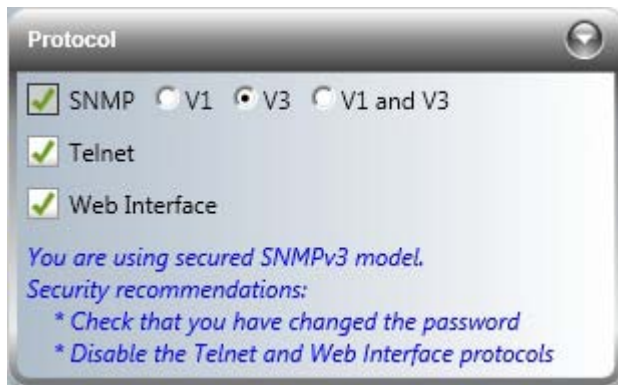


Figure 6-2: Supported protocols

- For further details about Telnet access see [page 170](#).
- For further details about the Web Interface, see [Chapter 20](#).

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



For a 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 170](#).
- For further details about the Web Interface, see [Chapter 20](#).

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.

Conversely, 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 6-3: 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:

- Always at the 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 6-3).

The Change Link Password dialog box opens.



Use the Hide characters check box for maximum security



Figure 6-4: Change Link Password dialog box

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

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

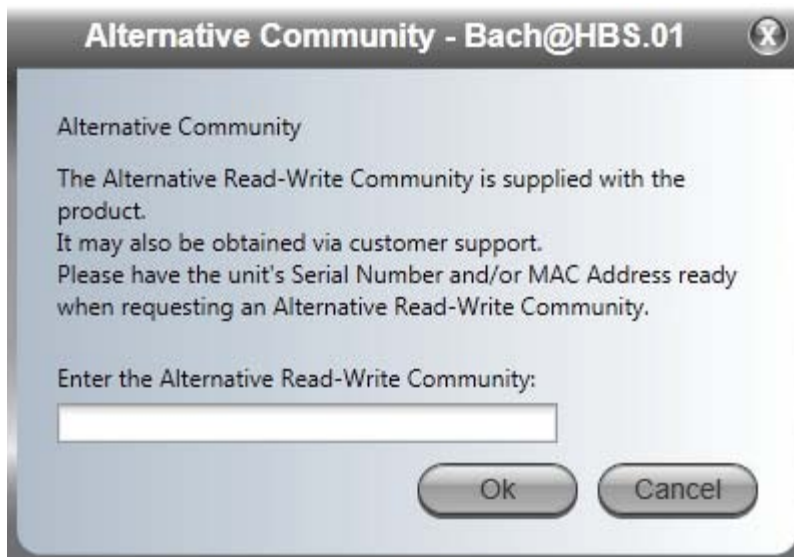


Figure 6-5: Lost or forgotten Link Password recovery

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

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



- 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*.

## Link Manager Community Strings



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

The ODU communicates with the Link 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 Netronics 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 SNMPv1Community 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.

### Editing SNMPv3 Passwords

To commence the process, you must enter the current Read-Write Community password as shown in the first field of [Figure 6-6](#) below. Change the Read-Write and Read-Only passwords as indicated. A password must be between 8 and 31 characters long. The same character restrictions for the SNMPv1 community strings also apply here.

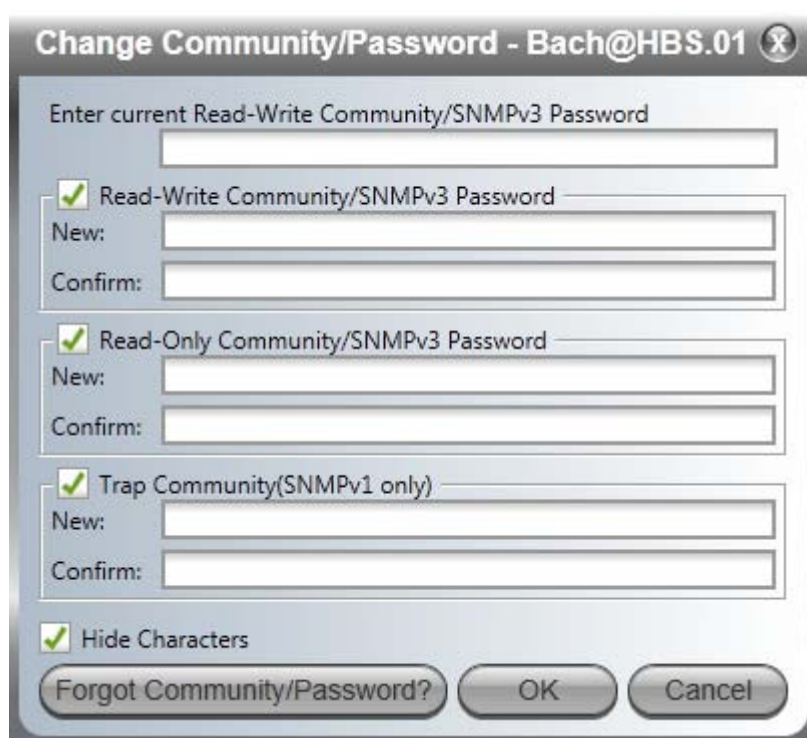


Figure 6-6: Changing the Community String

### 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 Netroncis 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.

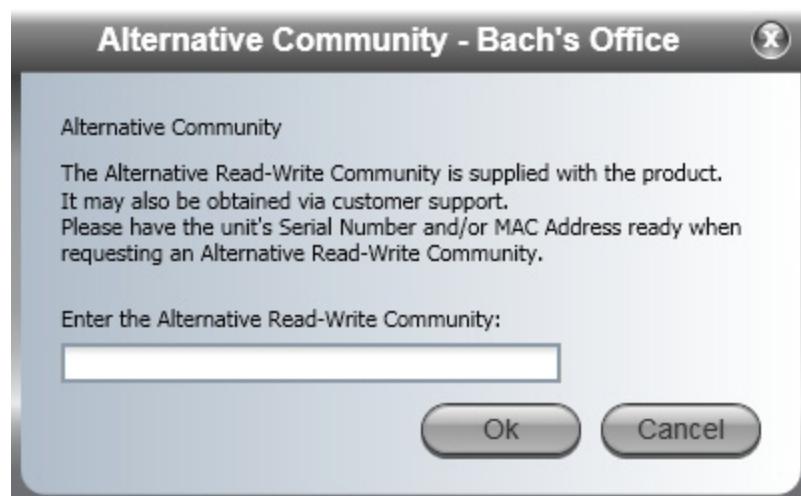


Figure 6-7: Alternative Community Dialog box

## 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.



---

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), for example:

**w32tm /stripchart /computer:216.218.192.202**



Figure 6-8: 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 <sup>1</sup>.
5. To manually set the date and time, click Change and edit the new values.

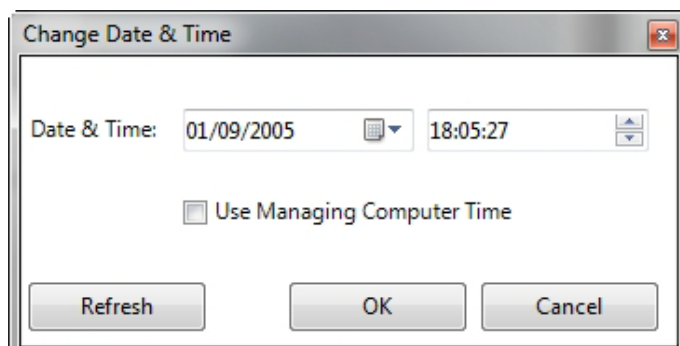


Figure 6-9: Change Date and Time

<sup>1</sup>. Greenwich Mean Time

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

### Ethernet Service Configuration

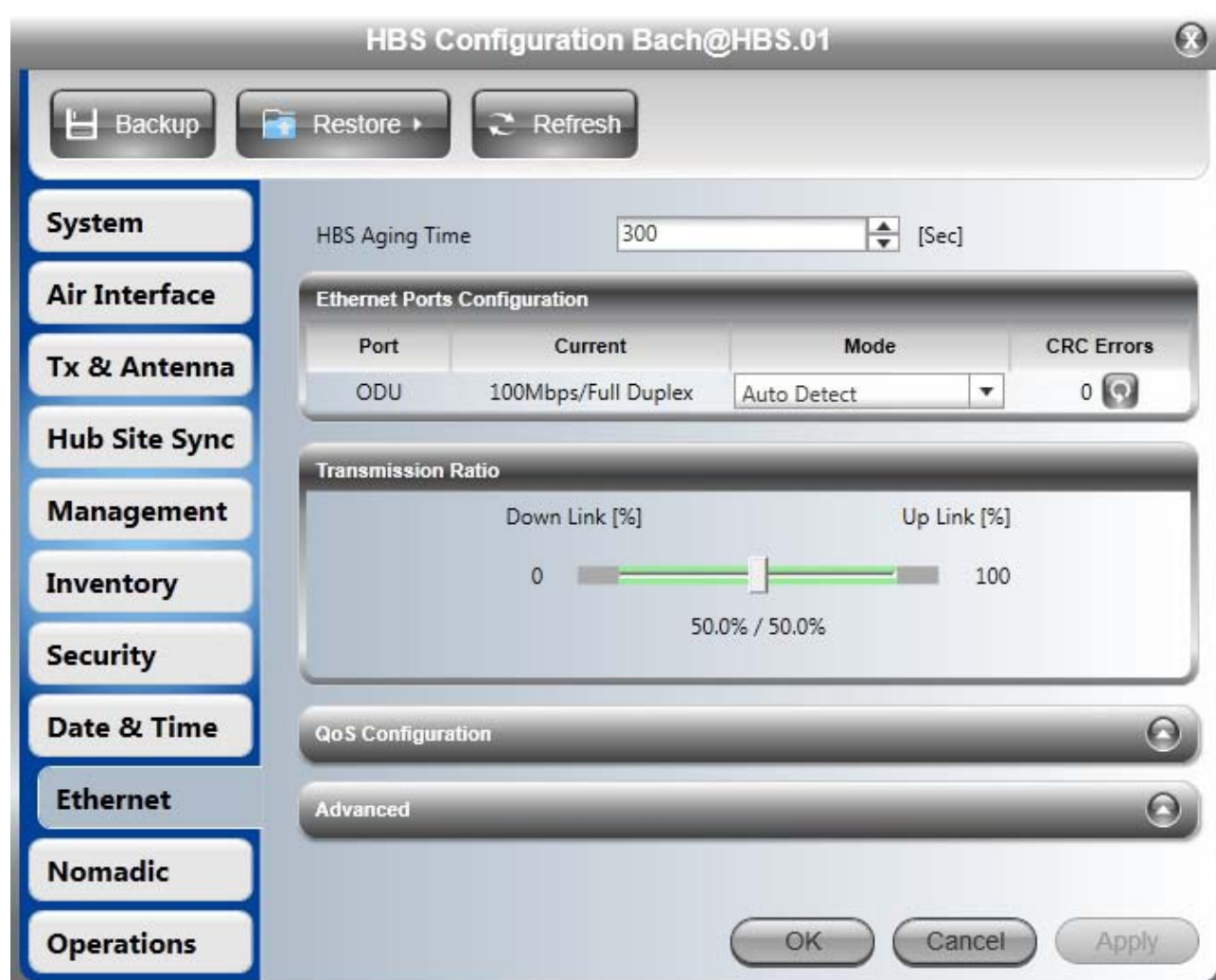


Figure 6-10: Setting Ethernet services

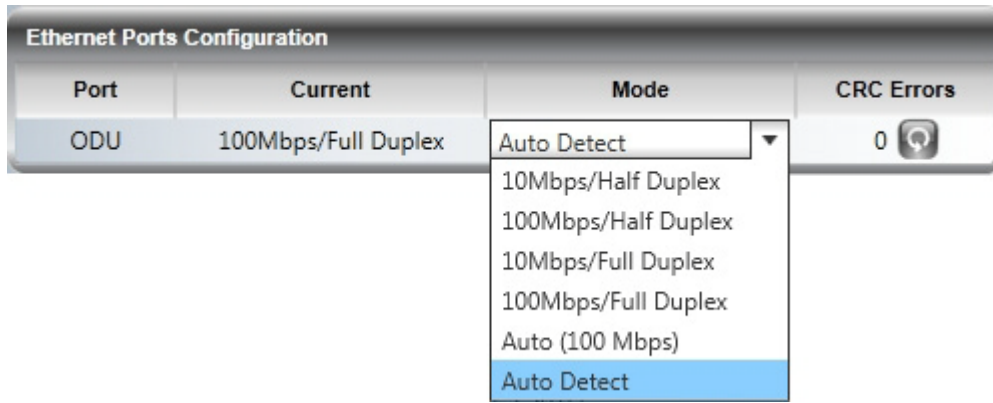
#### HBS Aging Time

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 11](#)) to collocated several HBSs (to cover adjacent sectors), they must all use the same Transmission Ratio.

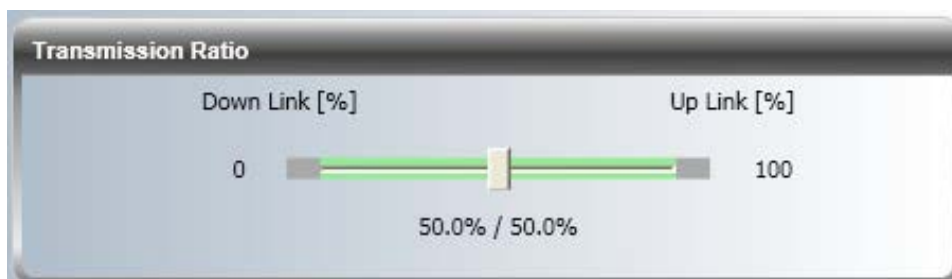


Figure 6-11: HBS Collocated client or independent unit

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



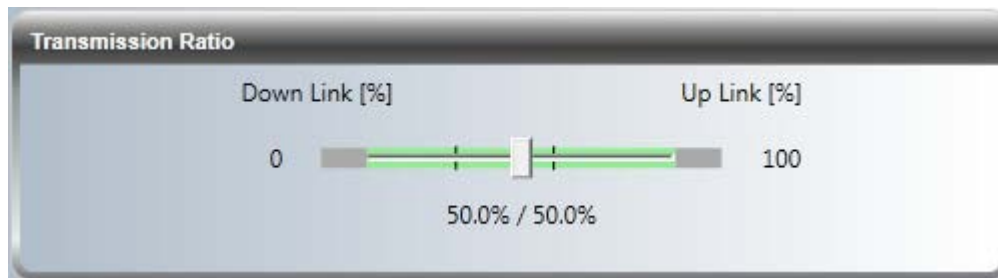
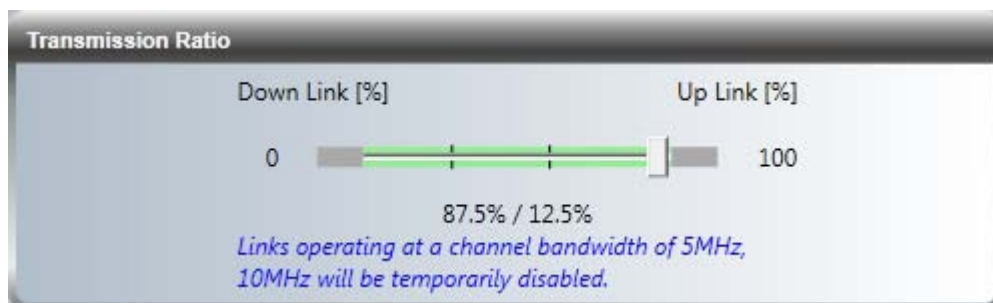
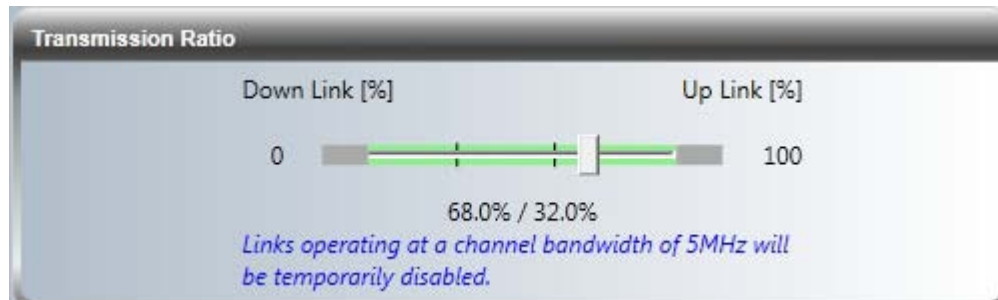


Figure 6-12: HBS Collocated master

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 NetAstra ODU.

### QoS Configuration

To install and use the Ethernet QoS feature, see [Chapter 17](#).

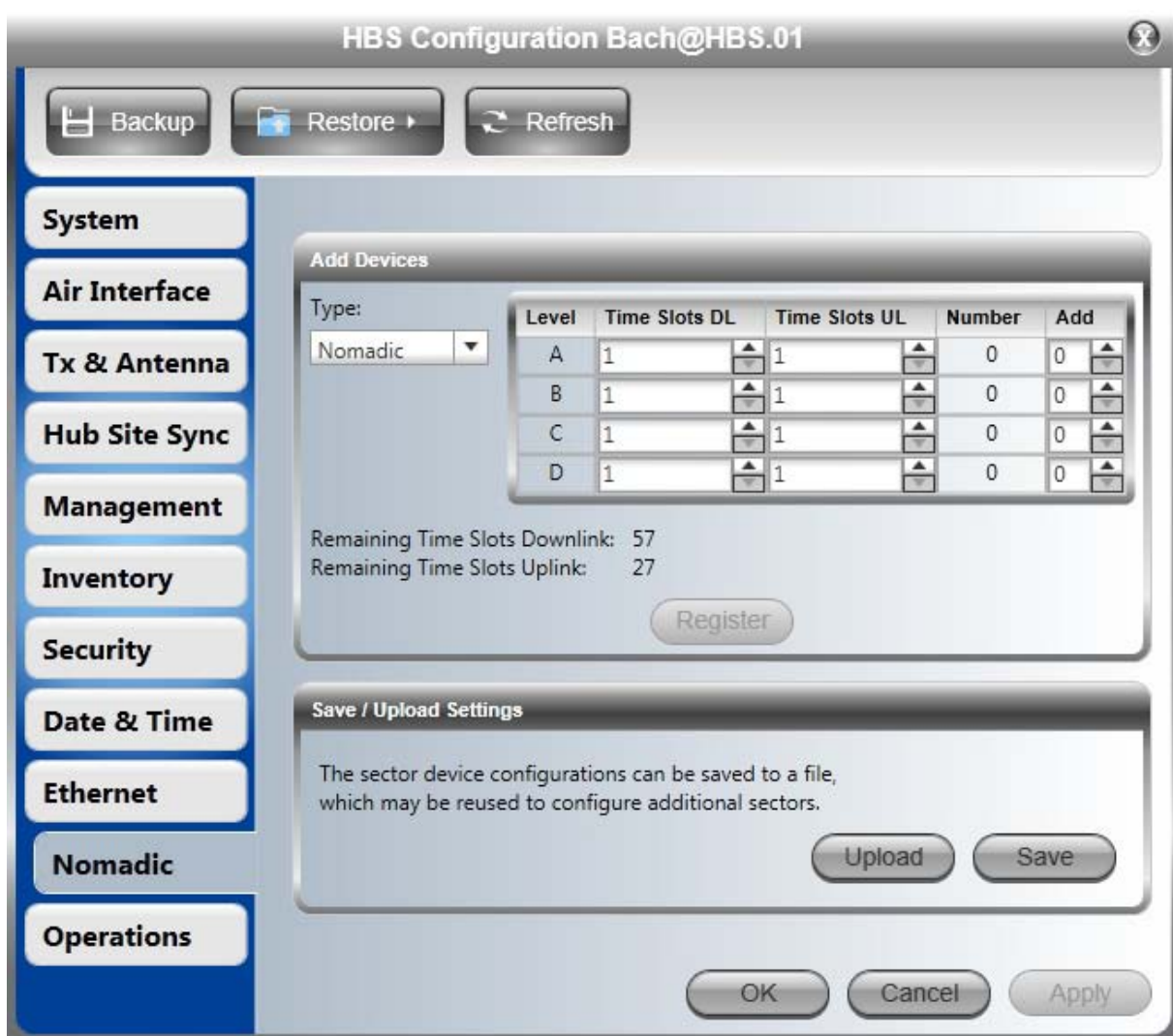
### Advanced: Broadcast/Multicast Flooding Protection

Broadcast/Multicast Flooding Protection provides a measure of protection by limiting multicast and broadcast packets to no more than 12.5% of available capacity.



You may wish to uncheck 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 113](#).

## Operations

This section applies to both HBSs and HSUs.

### Reverting to Factory Settings

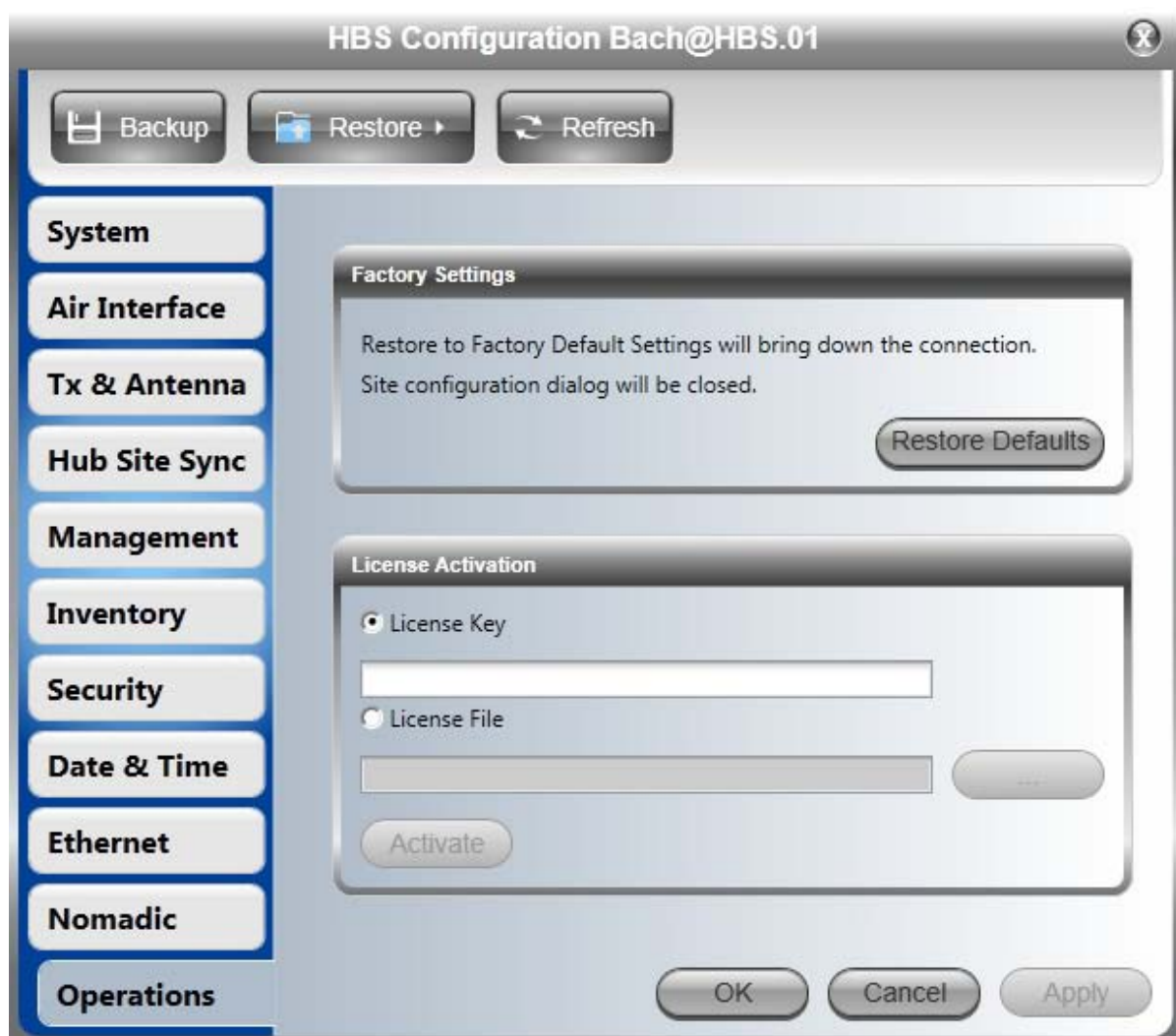


Figure 6-13: Restore Factory Settings and License Activation

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

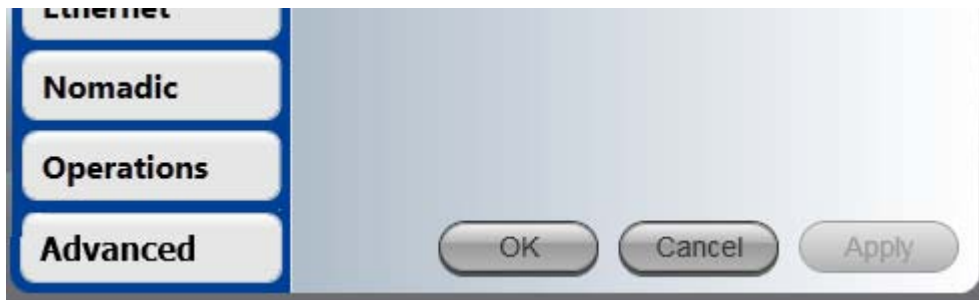


### License Activation

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

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.

### *Advanced: False Radar Mitigation for HBS*



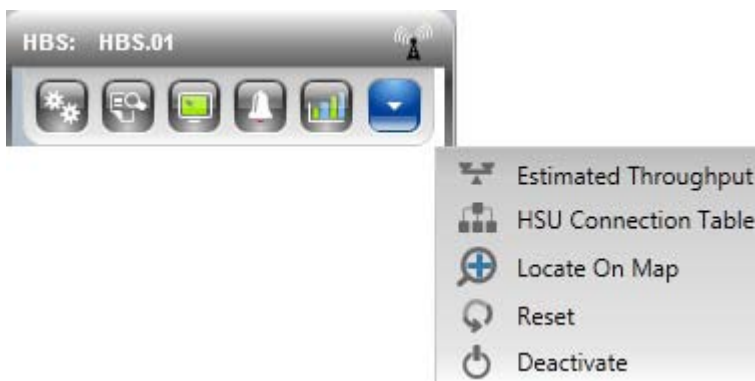
This tab is only visible if

- 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 15](#).

### HSU Connection Table

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



The following table is displayed:

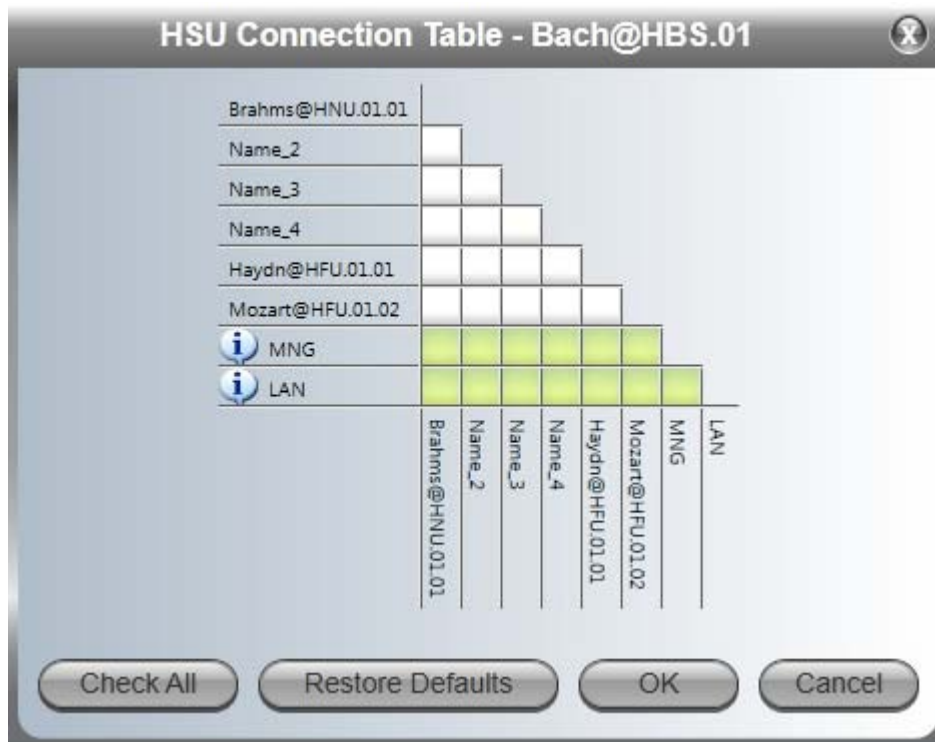


Figure 6-14: HSU Intercommunication - Connection Table

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

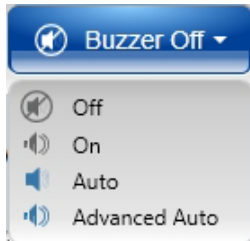


The **Backup** and **Restore** buttons have the same functionality as the corresponding buttons for the HBS. They provide for backup and restore of the HSU software.



A backup (full or configuration) may be restored to 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 [Figure 3-46](#) 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 misalignment 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 6-15: HSU Configuration window (HBS)

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

**Tx & Antenna**

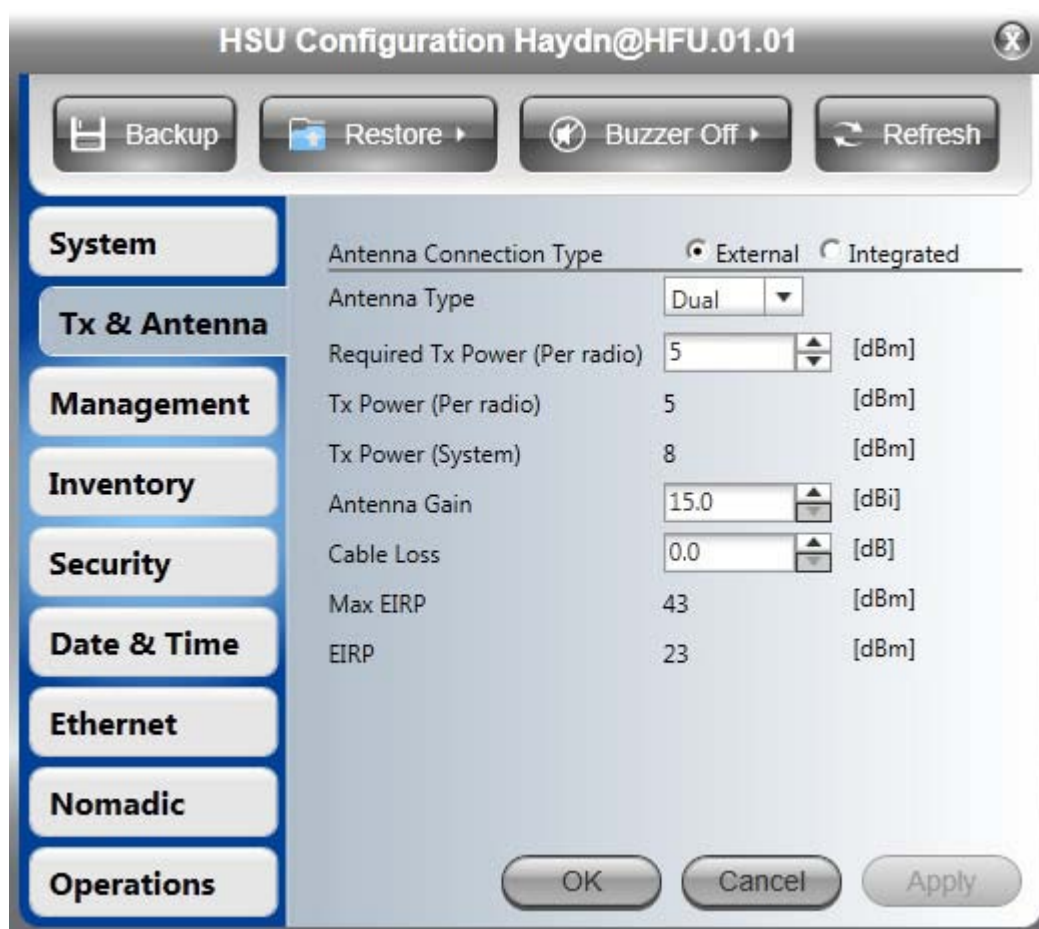


Figure 6-16: HSU Configuration - Setting antenna type and parameters

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**

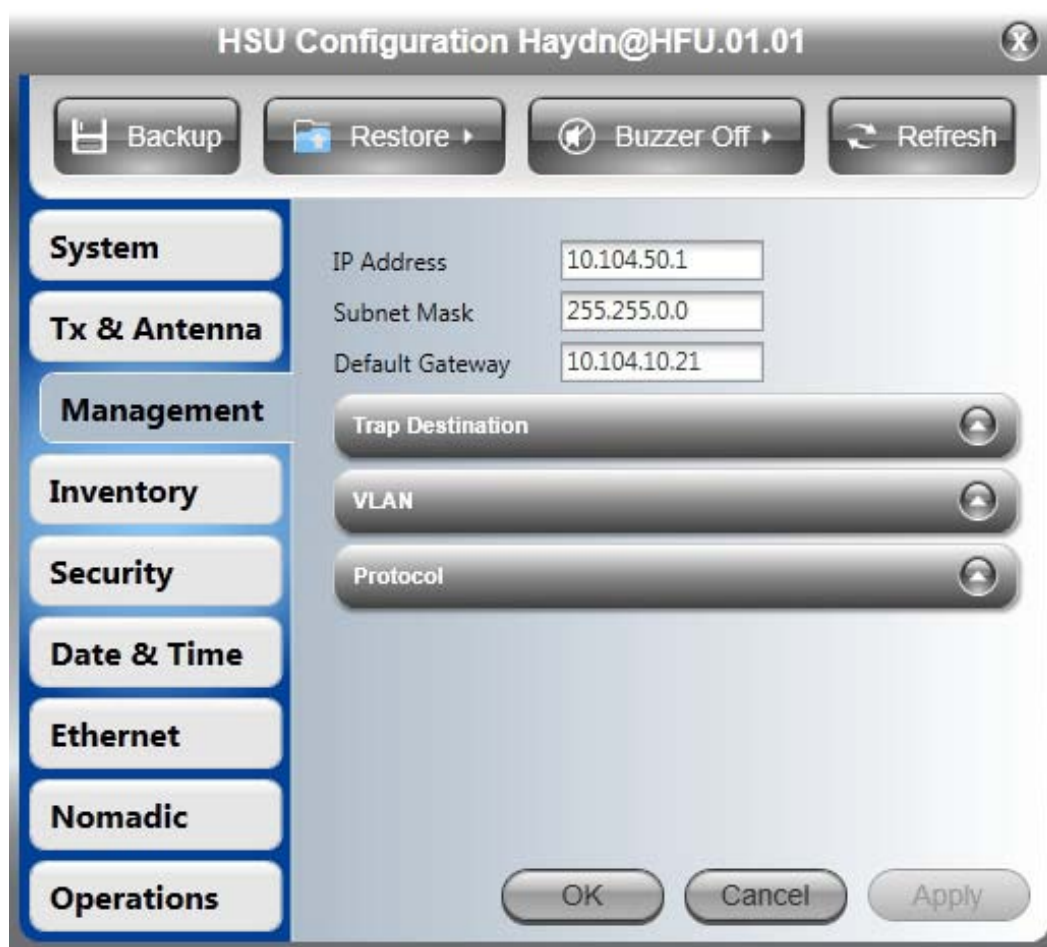


Figure 6-17: HSU Configuration - IP addresses  
 The functionality is identical as that for the HBS.

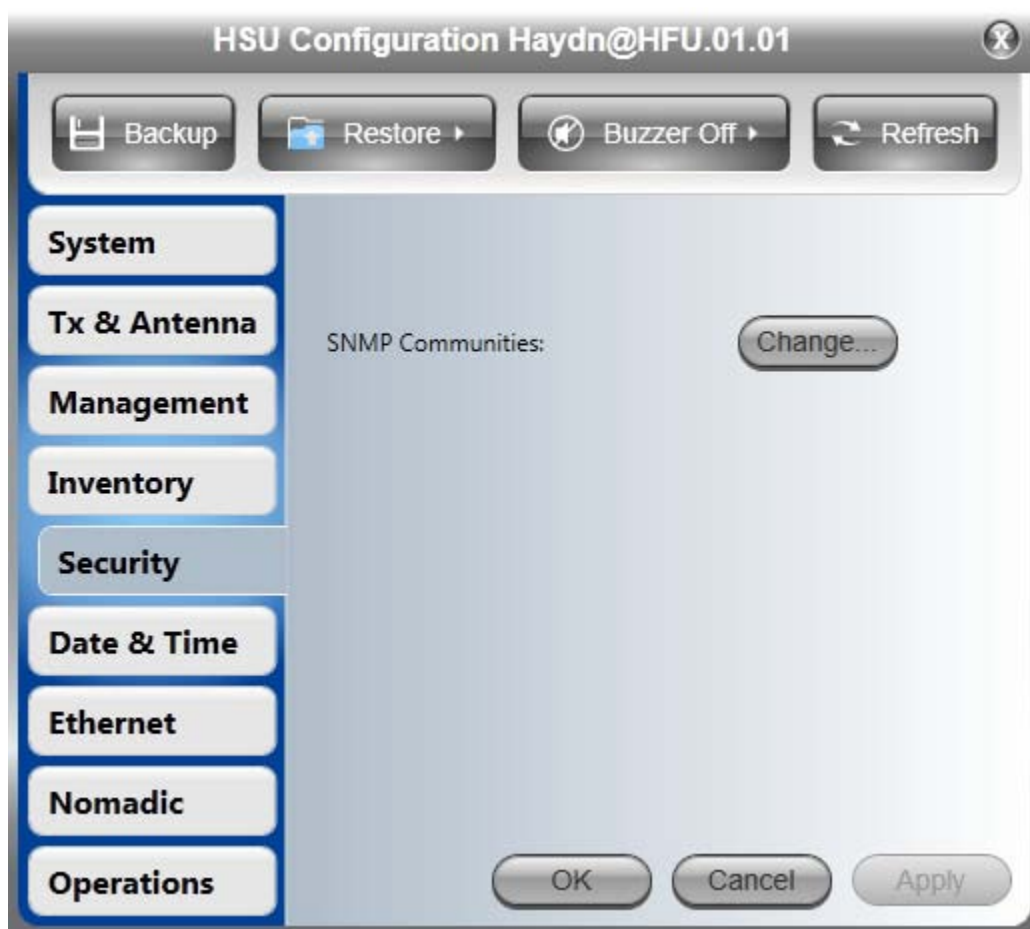


**Inventory**



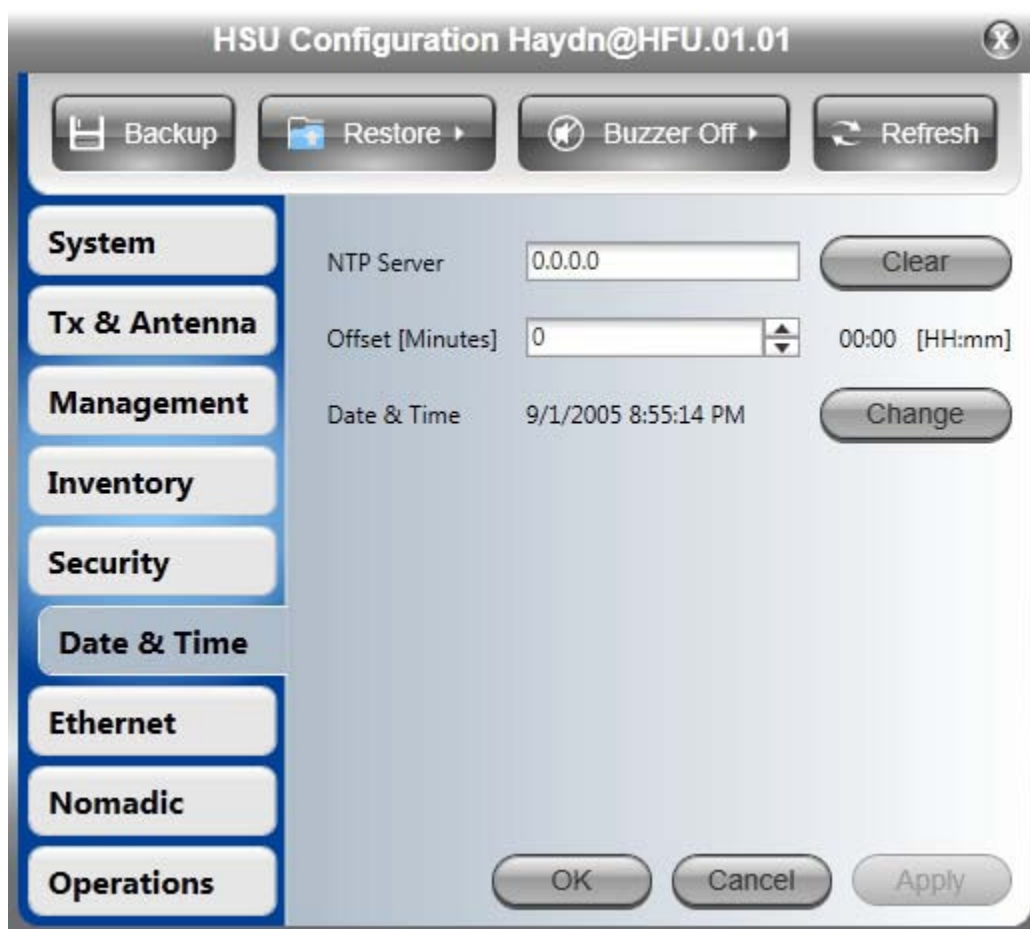
You should note the details for each HSU

**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.

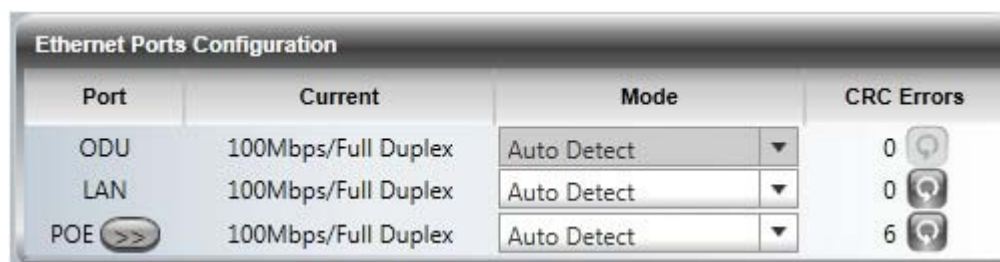
### Ethernet

Ethernet configuration for an 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 143](#). 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:

- 10Mbps/Half Duplex
- 100Mbps/Half Duplex
- 10Mbps/Full Duplex
- 100Mbps/Full Duplex
- Auto Detect
- Disable

The PoE port offers the following options:

Ethernet Ports Configuration			
Port	Current	Mode	CRC Errors
ODU	100Mbps/Full Duplex	Auto Detect	0
LAN	100Mbps/Full Duplex	Auto Detect	0
POE >>	100Mbps/Full Duplex	Auto Detect	6

10Mbps/Half Duplex
100Mbps/Half Duplex
10Mbps/Full Duplex
100Mbps/Full Duplex
Auto Detect
Disable Data
Disable POE

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:

POE Port Properties	
Consumption:	76 mA
Voltage:	47 V

### Maximum Information Rate

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

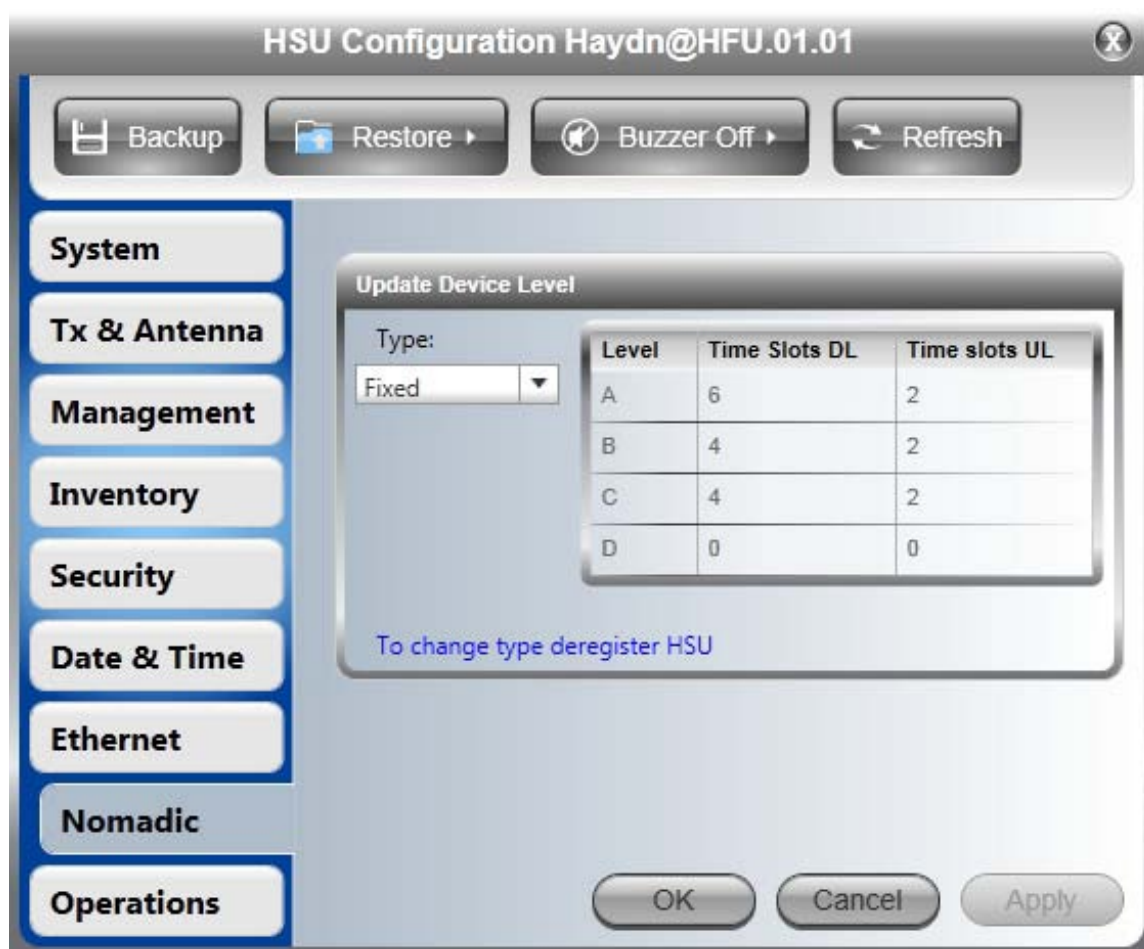
### VLAN Configuration

For Traffic VLAN configuration, see [Chapter 14](#).

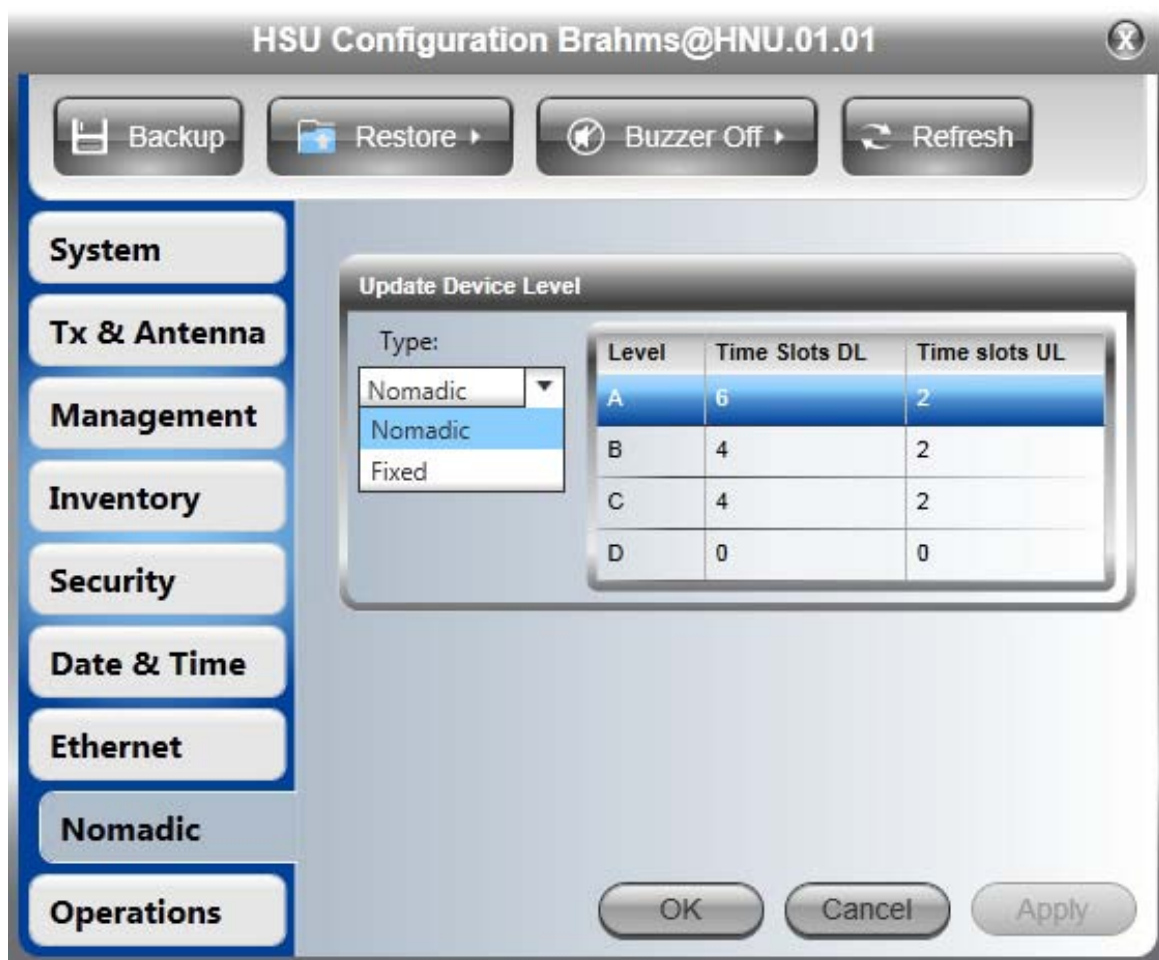
### QoS Configuration

QoS configuration is described in [Chapter 17](#).

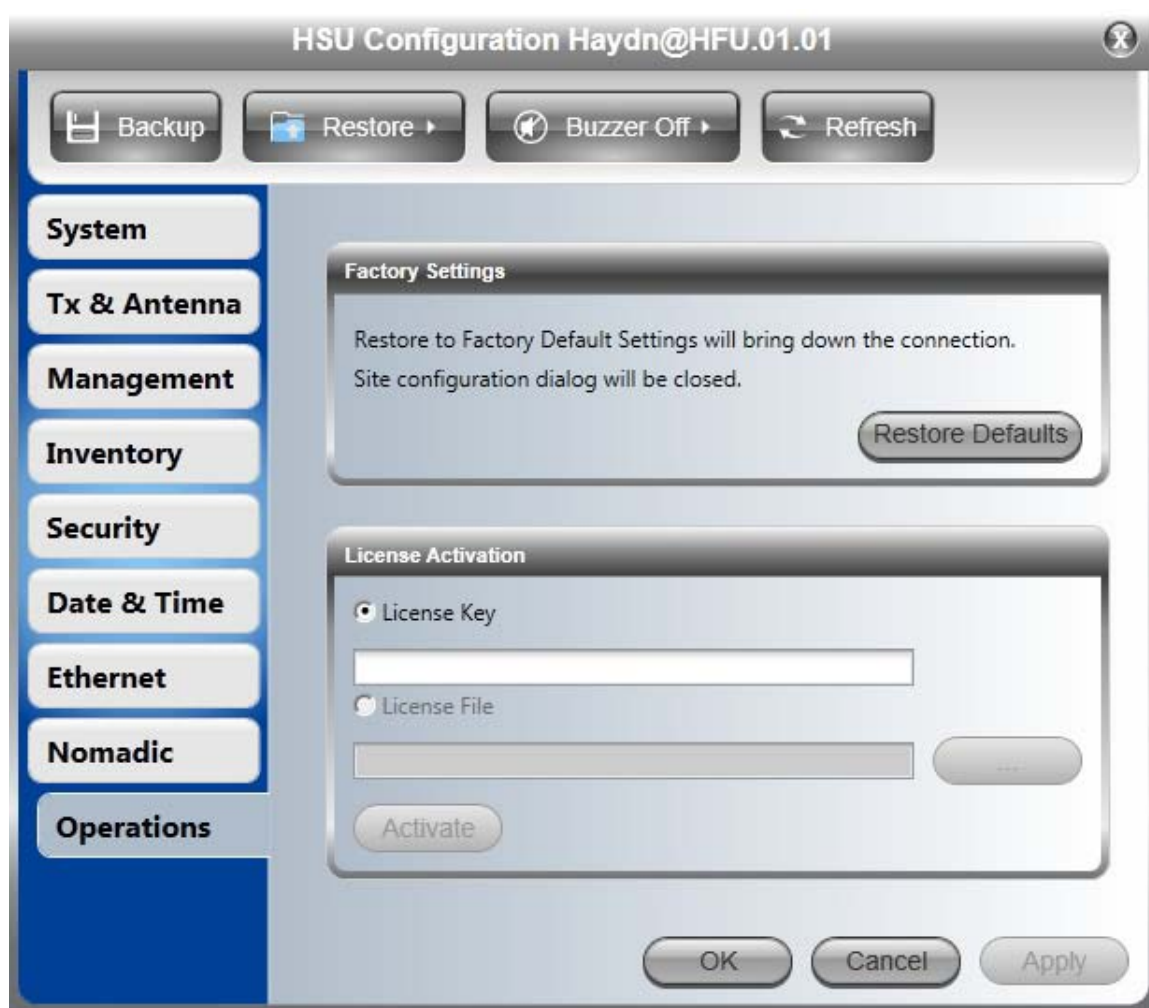
**Nomadic**



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.



## 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 15](#).



## 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:

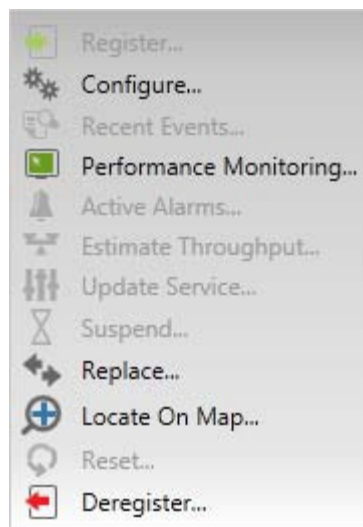


Figure 6-18: Unit 10.105.50.1 is down; unit 10.104.50.2 is available and 10.104.50.3 is not registered

Since the replacement procedure is a rather delicate process, we will step through it with a detailed example based on the scenario in [Figure 6-18](#).

➤ **To replace a defective HSU:**

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



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

2. Click **Replace**. You're 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.



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

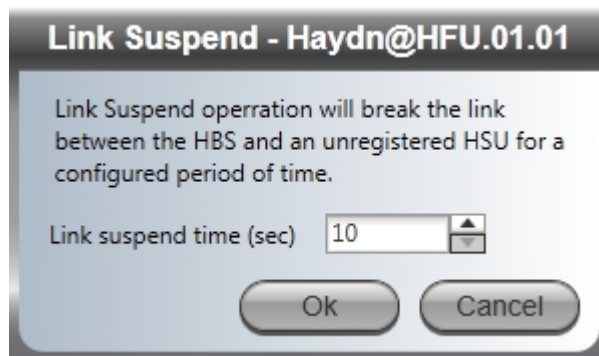
You may break the link (cause a sync loss) to an un-registered HSU for a fixed amount of time. Here is the scenario:



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.

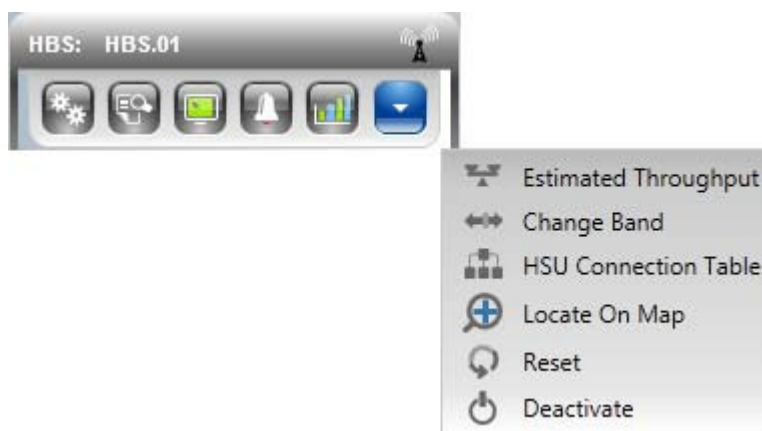


2. Choose a suspend time and click **OK**. During the suspend duration, the HSU will be deleted from the HBS Main Window HSU panel. The HSU returns to the main display with resumption of sync.

## 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 Access unit 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 6-19: Change Bands

2. Select the required Band and click **OK**. For our purposes, we choose 5.740-5.950 GHz Universal. The band is highlighted and right button is enabled.

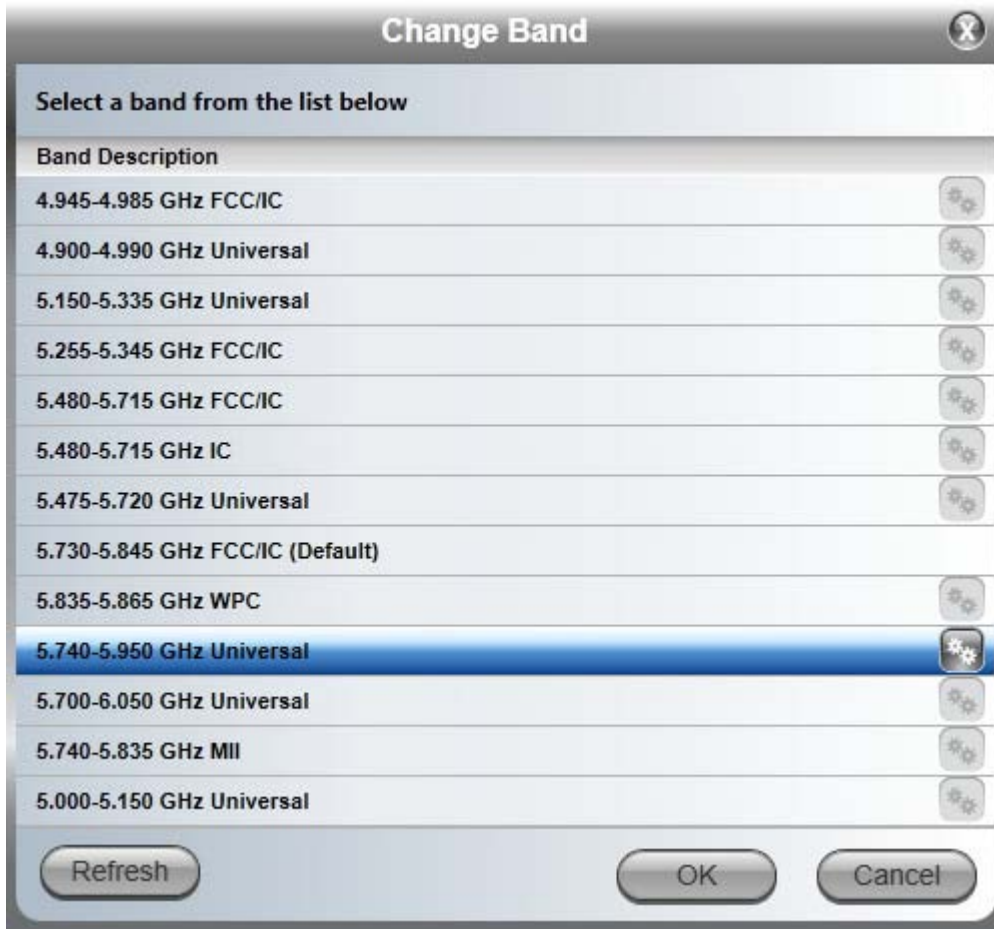
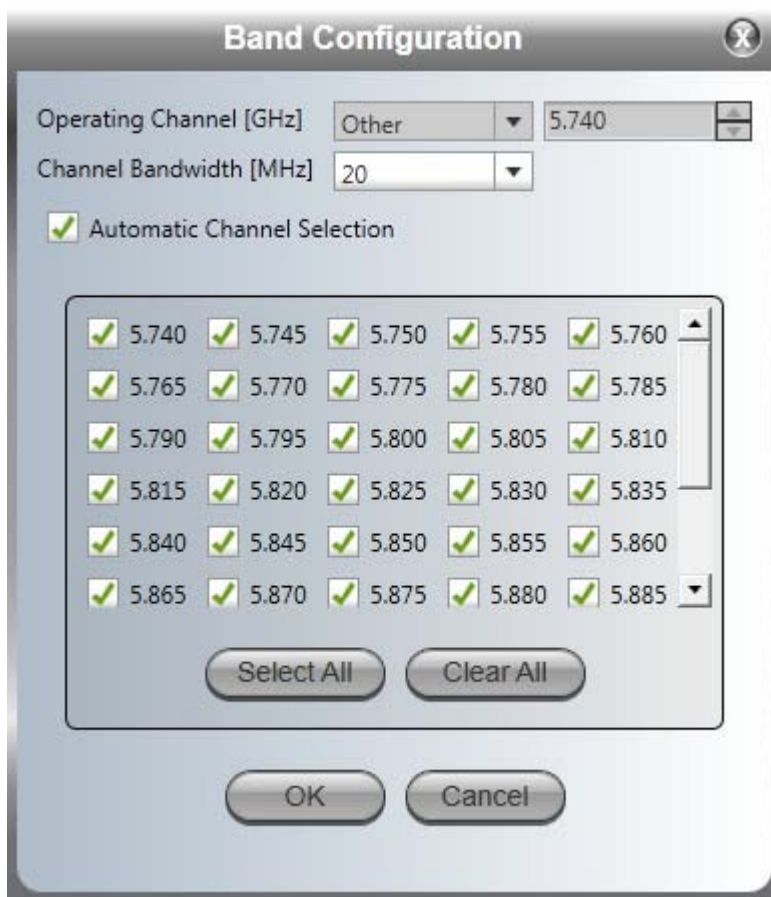
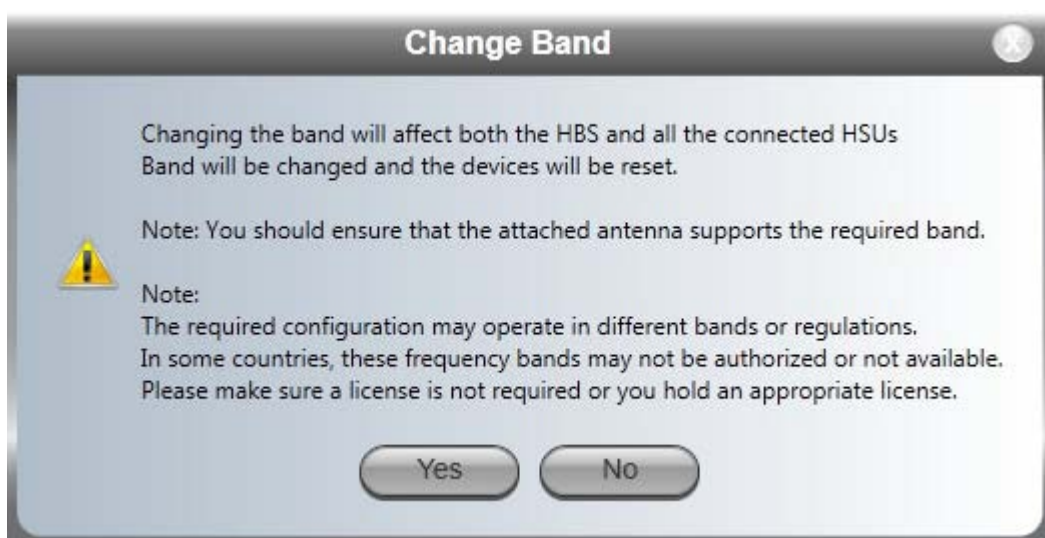


Figure 6-20: Add/Change Band dialog

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 6-20](#).
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.

## HBS Configuration with Telnet

### Telnet Access to the HBS

A Telnet terminal can be used to configure and monitor the NetAstra. 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 Link Manager (for example, the default: **admin**). The Telnet password is the corresponding Community string (default: **netman**).



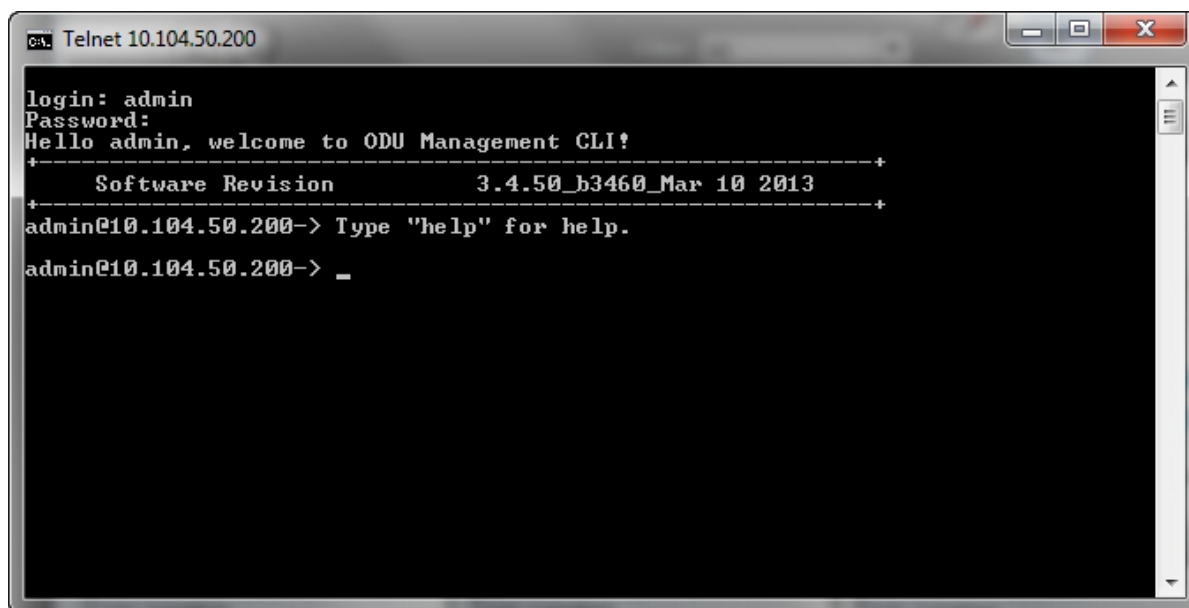


Figure 6-21: Telnet session log on to the HBS

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)

Table 6-2: HBS Telnet - Set Immediate Commands (Continued)

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

### Telnet Access to the HSU

The procedure is the same as for the HBS.

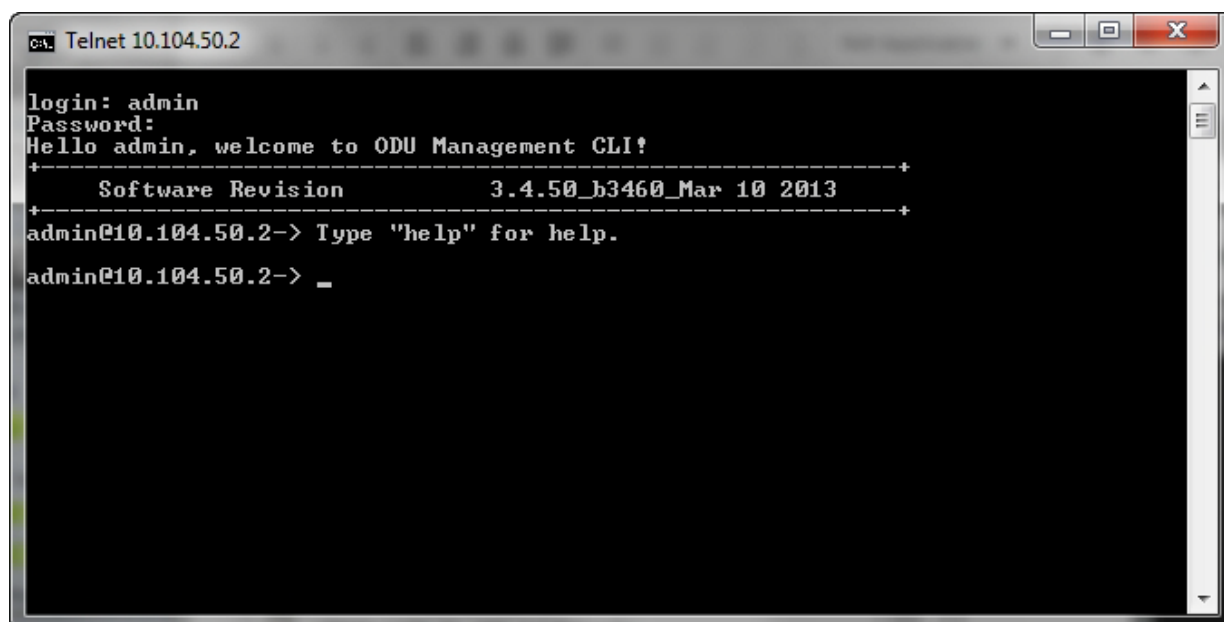


Figure 6-22: Telnet Management window - HSU

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)
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 sectId <SectorID>	Set new sector ID - Reset required.

## 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:

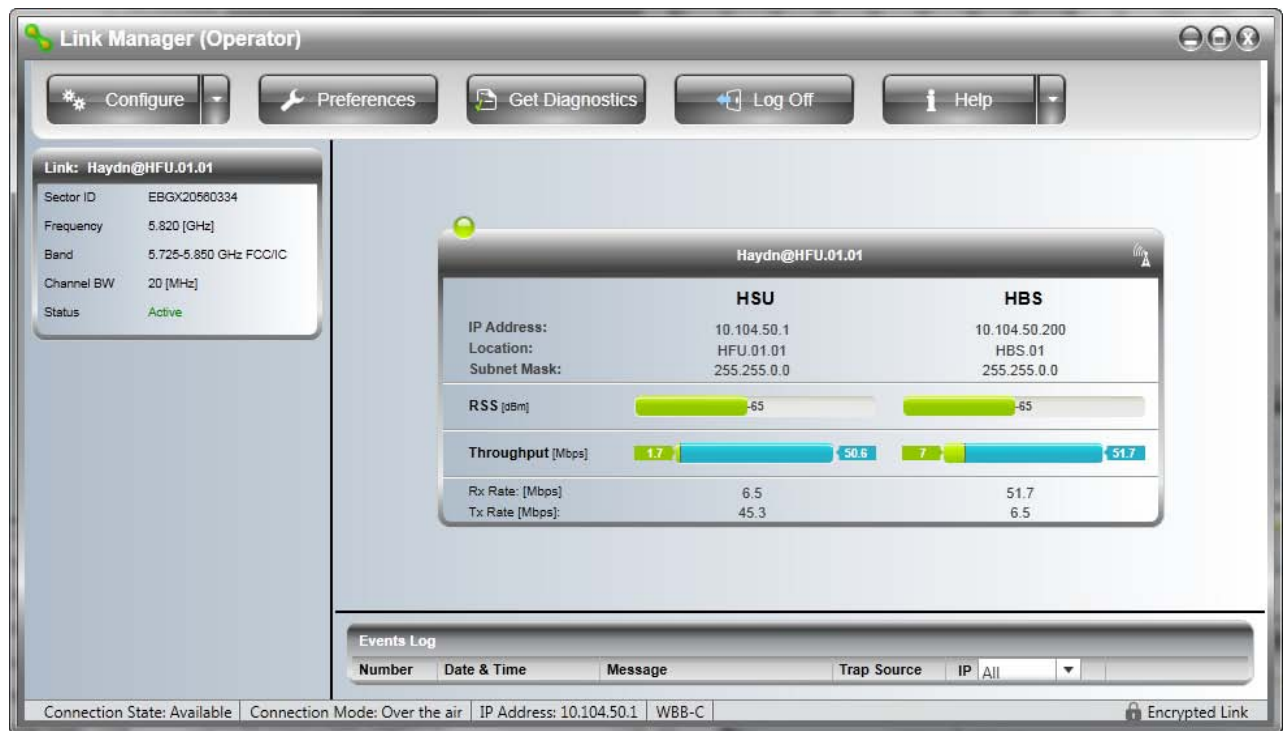


Figure 7-1: Direct or over the air connection to a registered HSU

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:

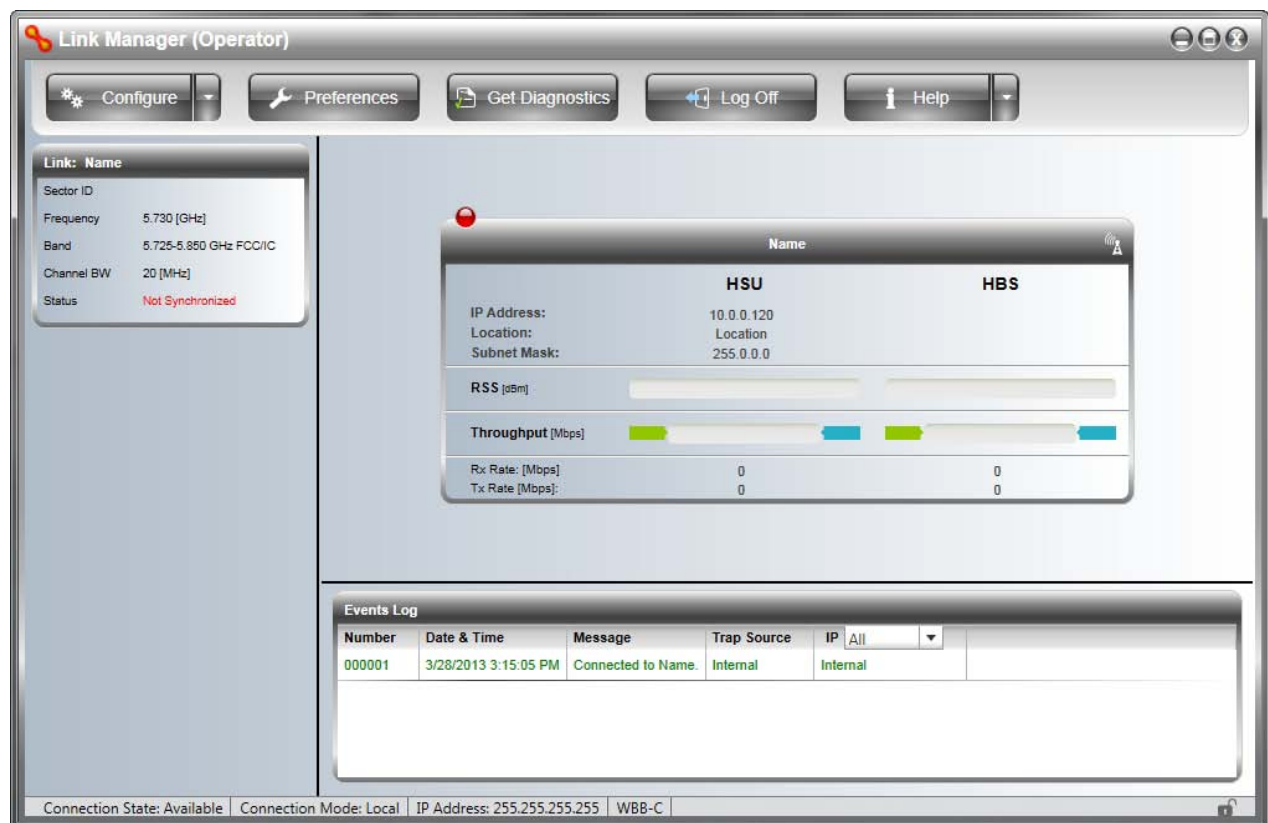


Figure 7-2: Direct connection to a stand-alone HSU out of the box

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

### Configuration Menu Buttons

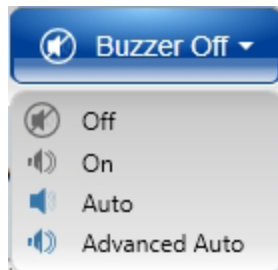


The **Backup** and **Restore** buttons have the same functionality as the corresponding buttons for the HBS. They provide for backup and restore of the HSU software.



A backup (full or configuration) may be restored to another HSU provided that the product IDs, revision levels and capacity of the source and target HSUs are identical. They are shown in the HSU Inventory window.

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 HSU

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



Figure 7-4: HSU Configuration - Air Interface for stand-alone 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 Config. - Air Interface, registered nomadic HSU or HMU

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



Figure 7-6: HSU Config. - Air Interface, 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?

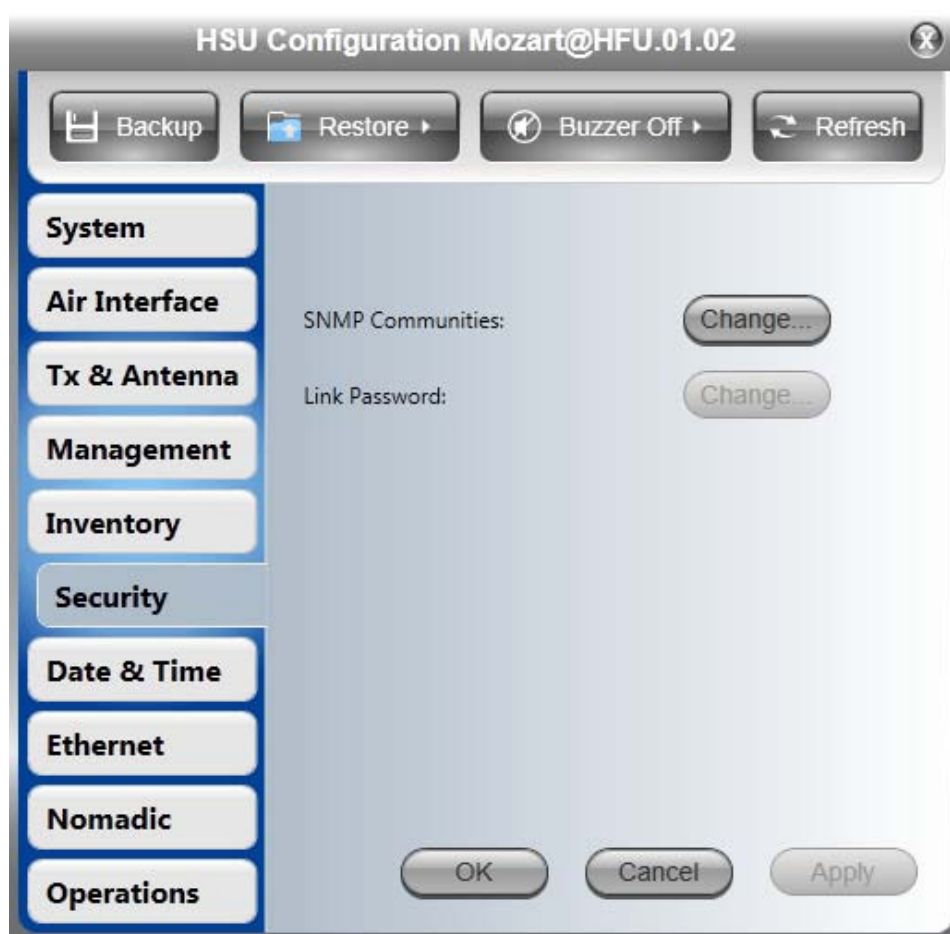
Suppose that you installed two collocated HBSs with contiguous sectors. It is possible that an HSU located close to the common sector boundary may “discover” the wrong HBS. A HSU can be “forced” across to another HBS by changing its Sector ID to that of the required HBS. To switch an HSU to another HBS, 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 154](#).

### **Advanced**

#### **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 15](#).

## Smart Bandwidth Management

### What is Smart Bandwidth Management

Smart Bandwidth Management (SBM) enables busy links to utilize unused time slot resources from relatively idle links. It applies to fixed and nomadic HSUs. It offers -

- Peak rates of over 100% of assured static allocation for busy links
- Enhanced overall sector utilization
- Dynamic bandwidth allocation to maximize service provider throughput and adhere to customer SLAs

To achieve best sector performance, each HSU is allocated separate uplink and downlink time slots.

Downlink traffic is fully under HBS control, so that it can allocate any unused downlink time slots whether allocated or not to a busy link. The busy link may operate at an extremely high peak rates, 1000% utilization not being uncommon.

Uplink traffic is unpredictable. Again, in the case of a busy link with other links relatively idle, the HBS will allocate extra uplink time slots to the busy link from free pool only. If all of the uplink time slots are allocated, then SBM will not operate in the uplink direction.

The allocation of uplink and downlink time slots becomes a network policy issue. For example, if all the HSUs provide regular internet service, it might be advisable to give each one minimum time slots in both directions (subject to the 63 time slot maximum in each direction) and allow traffic to dynamically determine time slot utilization. Alternatively, if the HSUs are used for backhaul, the minimum number of time slots in either direction should be allocated to meet defined service requirements (such as a SLAs).

The Link Manager provides facilities to configure separate uplink and downlink time slots. It further monitors performance, providing tabular and graphic utilization statistics.

## Scope of this Chapter

Use of Smart Bandwidth Management (SBM) as a tool to enhance resource utilization involves network management issues beyond the scope of a User Manual. What we will do here, is show how SBM is configured and demonstrate several basic scenarios. Our intent is to “get you started” with SBM by assisting you to develop your own intuition and networking skills setting up highly resource efficient sectors.

The first point to keep in mind is that the SBM mechanism is always active in the HBS. It’s not something you can switch on or switch off.

The issue here is how to get the best out of it.

## Terminology and Concepts: Recapitulation

It is important both in following the discussion below, and viewing the Link Manager Utilization windows to remember:

- **Downlink** traffic is data transfer from an HBS to an HSU
- **Uplink** traffic is data transfer from an HSU to an HBS
- The HBS allocates **time slots** to sector HSUs in round-robin fashion to effect time-sharing. There are separate sets of 64 time slots for each of the uplink and downlink directions. One time slot in each direction is reserved for SBM management leaving 63 in each direction to be allocated to sector HSUs. The uplink and downlink allocations are independent and therefore separately assignable.
- For each fixed or nomadic HSU, **Assured throughput** is determined by the actual number of time slots allocated to it in either direction. **Peak throughput** (higher than Assured throughput) may be achieved by allocating unused downlink time slots or unallocated uplink time slots to very busy HSUs.
- Time slot allocation is the **only** mechanism available for utilization management.
- **Manual time slot allocation for a fixed HSU** is carried out during registration or Service update:

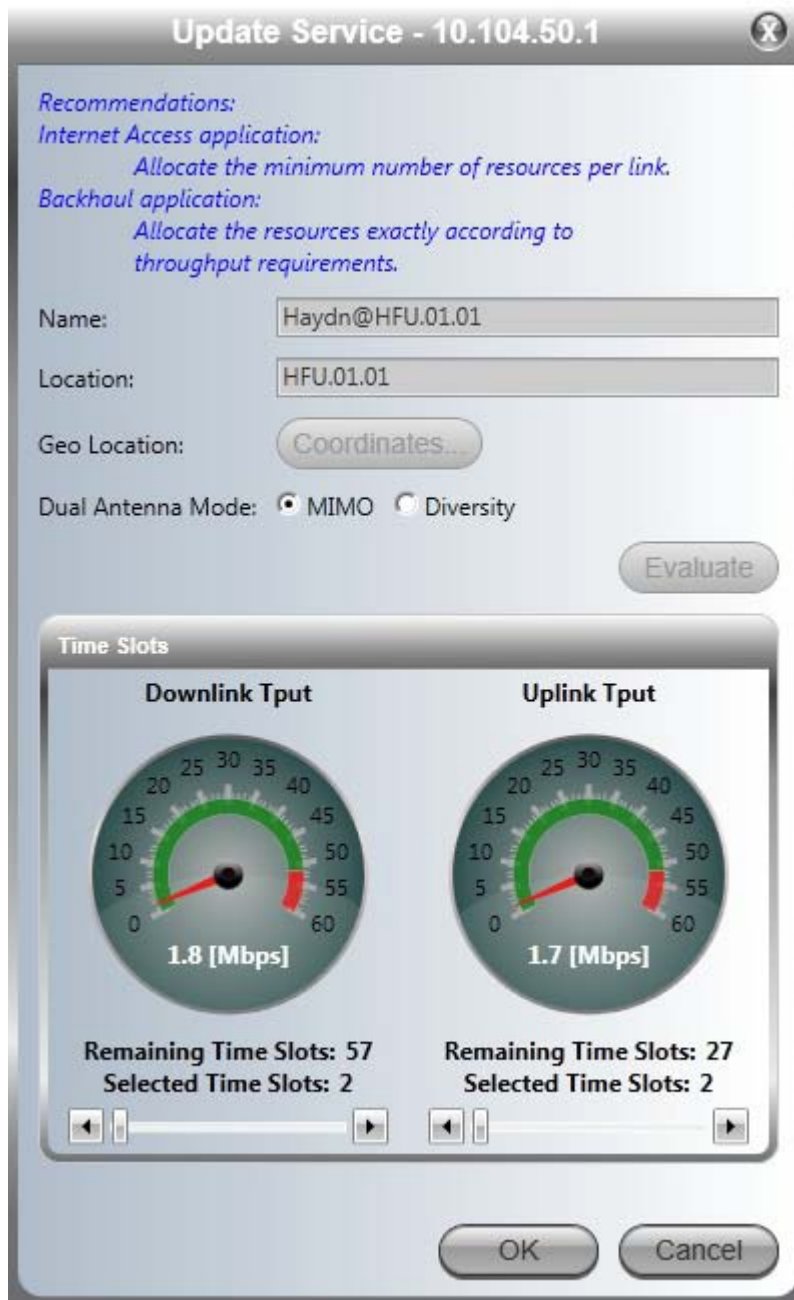


Figure 8-1: Service (Time slots) update for a fixed HSU

- » **Manual time slot allocation** for nomadic HSUs is carried out from the HBS Configuration window:

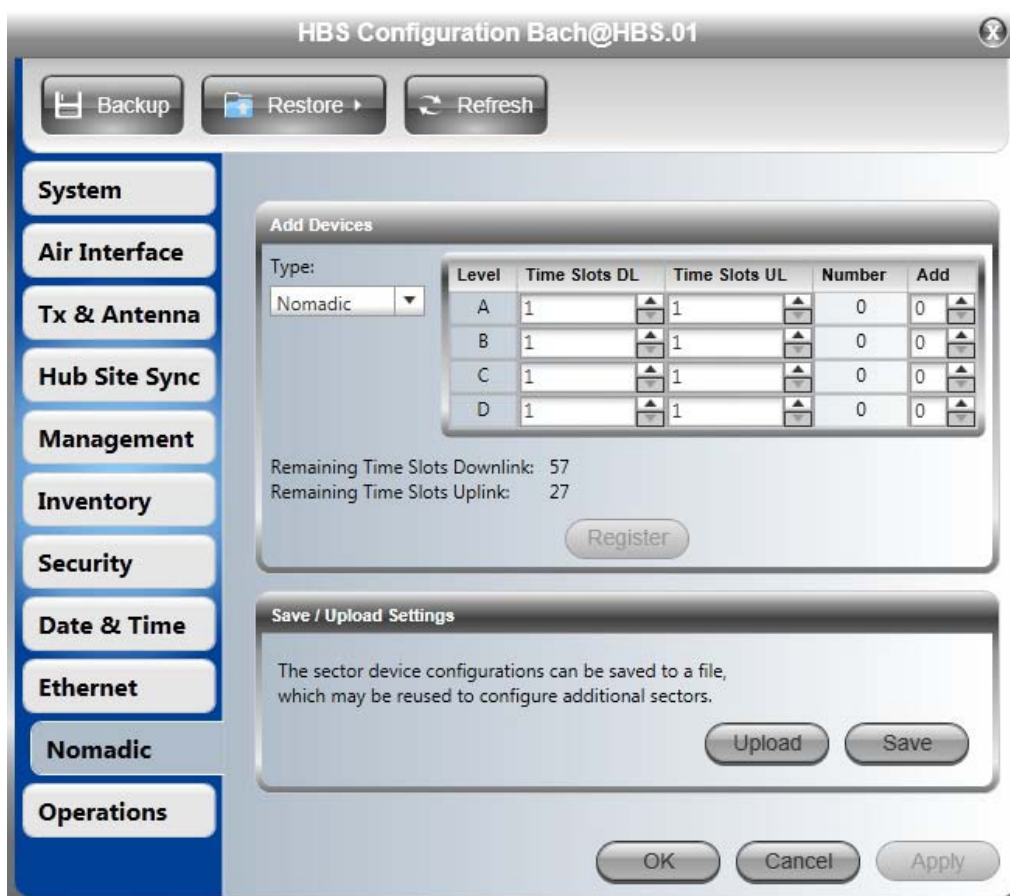


Figure 8-2: Service (Time slots) update for a nomadic HSUs

## How SBM Works

**Downlink traffic** is fully under HBS control, so that it can allocate any unused downlink time slots to a very busy link, whether allocated or in free pool. The busy link may operate at an extremely high throughput, 1000% utilization not being uncommon as will be seen in an example below.

**Uplink traffic** is completely unpredictable. Again, in the case of a very busy link with other links relatively idle, the HBS will allocate extra uplink time slots to the busy link **from free pool only**. If all of the uplink time slots are allocated, then SBM will not operate in the uplink direction.

The Link Manager provides facilities to configure separate uplink and downlink time slots as shown in [Figure 8-1](#) and [Figure 8-2](#) above. It further monitors performance, providing tabular and graphic utilization statistics demonstrated below.

## Traffic Generation Tools

For our examples in this chapter, we used the Iperf traffic generator with its GUI front end, Jperf. These are free open source software packages found here:

Iperf: <http://sourceforge.net/projects/iperf/> Jperf:

<http://sourceforge.net/projects/jperf/>

Jperf includes the lperf executable.

The results below are indicative rather than accurate. Accurate traffic generation and measurement require hardware tools. See for example, <http://www.ixiacom.com/>.

## Traffic Generation Examples and method

Each case demonstrated below is based on a single HBS with three fixed HSUs. Two of them will be idle and one will be heavily loaded (“the busy HSU”) to demonstrate the following cases:

Table 8-1: Traffic generation examples - Time slot (TS) Allocation

Example	Downlink TS allocation	Uplink TS allocation	Purpose
1	All HSUs 2 TS	All HSUs 2 TS	Required downlink BW taken from unused time slots
2	Busy HSU 2 TS, others take all remaining TS	All HSUs 2 TS	Required downlink BW taken from allocated but unused time slots
3	All HSUs 2 TS	Busy HSU 1 TS, others take all remaining TS	Busy HSU “starved” in uplink direction
4	All HSUs 2 TS	Busy HSU 1 TS, others take half remaining TS	Busy HSU takes unallocated uplink time slots

We will look at Example 1 in great detail, to ensure that you understand each item appearing in the SBM Utilization window. Subsequent examples will be explained more briefly, concentrating on utilization issues rather than graphic features.

Traffic generation was accomplished by using two parallel Jperf sessions. One sent traffic at 100 Mbps from the HBS to the HSU. The second sent traffic at 50 Mbps from the HSU to the HBS. Both units were driven at maximum capacity.

### Example 1

Downlink allocation	Uplink allocation	Purpose
All HSUs 2 TS	All HSUs 2 TS	Required downlink BW taken from unallocated time slots

In [Figure 8-3](#) below, observe that the sector is grossly under-allocated. This situation might be appropriate if all the client HSU were supplying Internet service only.



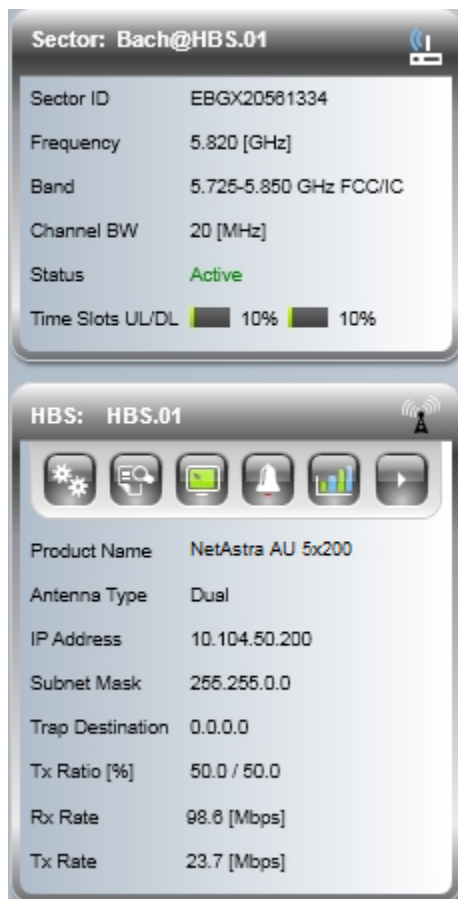


Figure 8-3: Sector status for Example 1

The Rx and Tx Rates for the HBS in themselves do not mean very much. But the changes to them will be noticeable in the next three examples, offering a comparative basis for various time slot allocations.

### Sector Utilization

Sector utilization is displayed by using the right most tab on the main window as seen in the next screen capture:

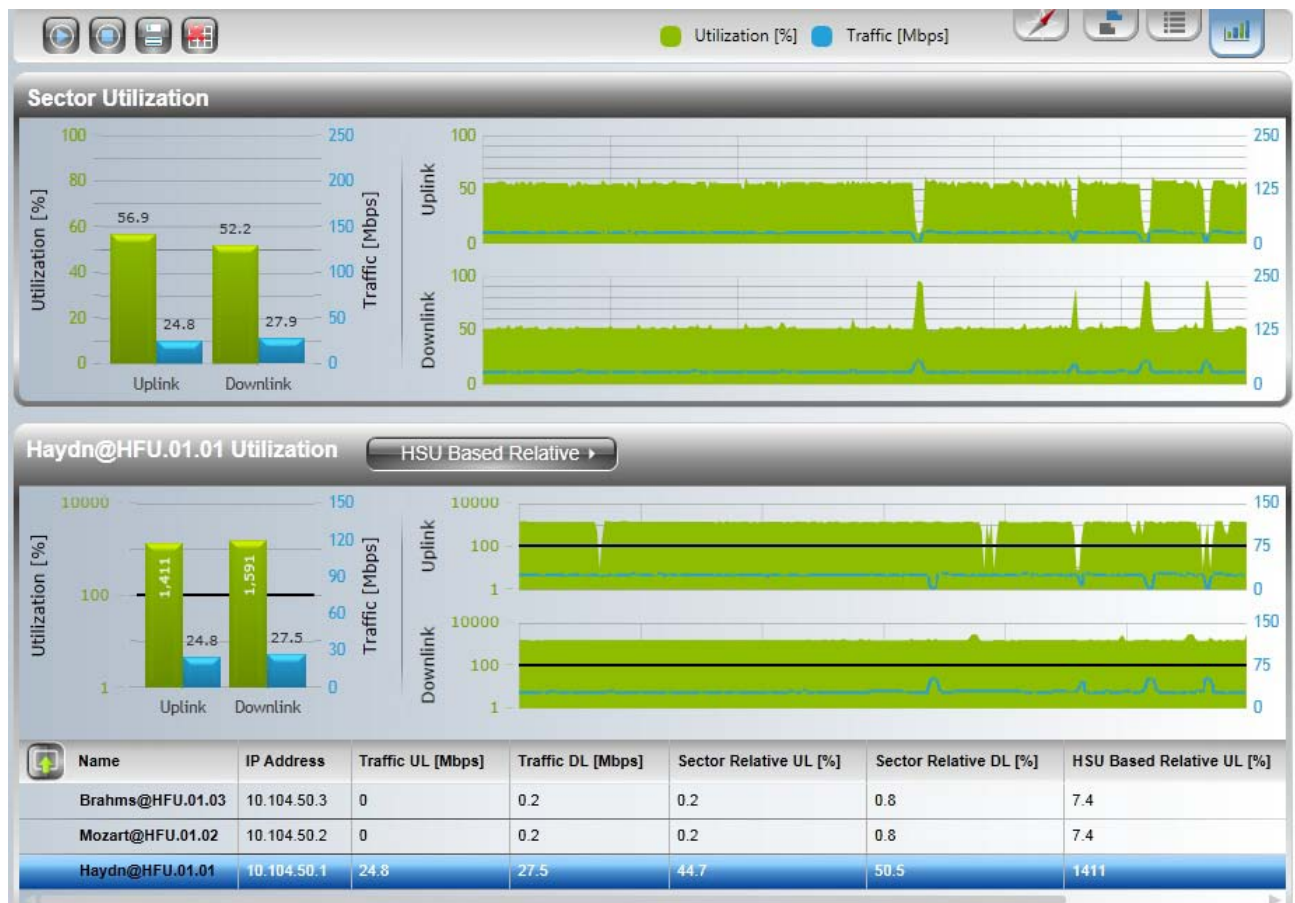


Figure 8-4: Sector Utilization Pane from the main window for Example 1

The current numerical values for each measured field for the selected HSU may be seen by moving the horizontal slider just below the bottom segment. The graphs provide a time-line.

Table 8-2 explains the purpose of each measurement.

Table 8-2: Traffic statistics for each HSU

Field name	Unit	Explanation
Traffic UL	Mbps	Traffic load sent to the HBS
Traffic DL	Mbps	Traffic load received from the HBS
Sector Relative UL	Percentage	Percentage of sector UL time slots utilized for transmission to the HBS. May be over HSU's allocation if there are unallocated UL time slots available.
Sector Relative DL	Percentage	Percentage of sector DL time slots utilized for reception from the HBS. May be over HSU's allocation if there are available UL time slots available, allocated or not
HSU Based Relative UL	Percentage	Percentage of HSU UL time slots utilized for transmission to the HBS. May be over 100% if there are unallocated UL time slots available.
HSU Based Relative DL	Percentage	Percentage of HSU DL time slots utilized for reception from the HBS. May be over 100% if there are available UL time slots available, allocated or not

To get a better idea of what is happening, we will enlarge each section of Figure 8-4 in turn.

The top left hand graph shows sector utilization:

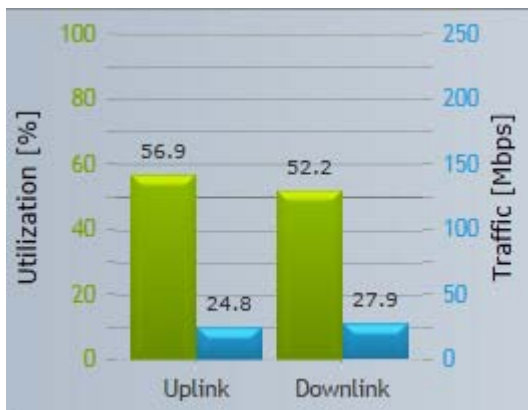


Figure 8-5: Sector Utilization - Example 1

Figure 8-5 shows the overall sector utilization as seen by the HBS. At any point, you can mouse-over any of the graphs to see the current value in a larger more convenient format.



This is useful if you are using a laptop or other device with a small screen.

The values in Figure 8-5 are as expected: The HBS is using a little over half its capacity in the uplink direction. The excess is overhead required to monitor the sector. In the downlink direction, the excess over 50% is incidental as will be seen from the top right graph showing sector utilization as a time line:

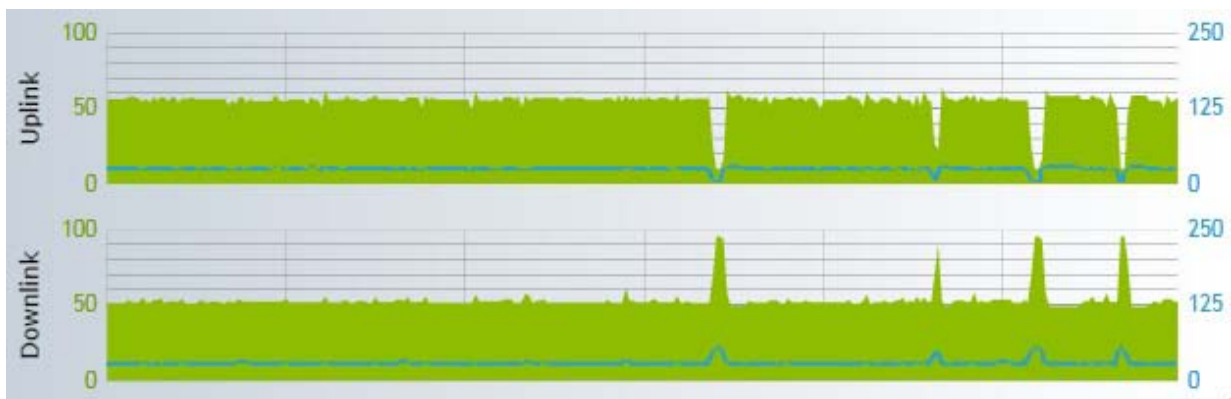
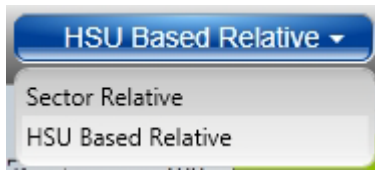


Figure 8-6: Sector Utilization - time line - Example 1

The “glitches” are due to Jperf and host computer limitations.

The lower pair of graphs show utilization of a selected HSU either sector relative or self-relative. Use the selector in the HSU utilization title bar to make a choice.



We first look at the HSU based utilization. (In our view, the Sector relative measurements will make more sense if we first understand what is happening at the HSU level.)

Figure 8-7 shows the HSU relative utilization for the selected HSU. The green percentage bars are easy to understand. They are both well over 100% since the whole sector is grossly under-allocated. Both values are over 1000%! More specifically, if the HSU could only use its two allocated time slots in both directions, it is fairly easy to demonstrate that it would not be able to operate at maximum capacity. Since it is able to “borrow” the unused uplink and downlink time slots, it reaches maximum throughput and operates at over ten times the assured rate define by two time slots in both directions.

The blue uplink and downlink bars reflect the amount of traffic being handled by this HSU. The HSU itself is a 50 Mbps (aggregate) unit, so it is operating at a maximum capacity of about 25 Mbps in both directions. The black figures above each bar show the actual throughput in Mbps and are updated about once per second.

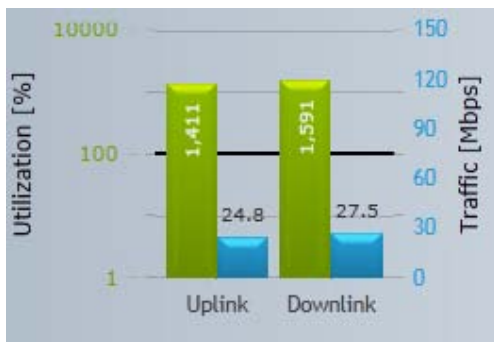


Figure 8-7: HSU Utilization - HSU Relative - Example 1

Here is the time-line for the same HSU:

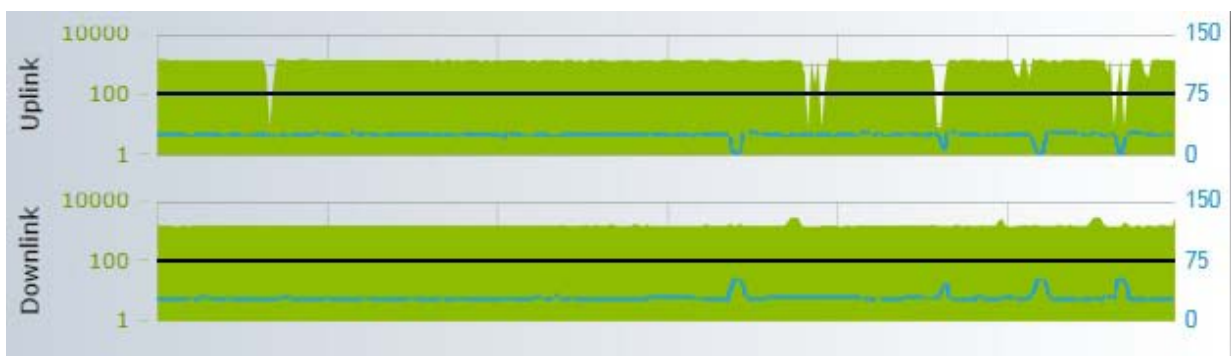


Figure 8-8: HSU Utilization - HSU Relative time line - Example 1

Next, we examine the behavior of this HSU relative to the sector.

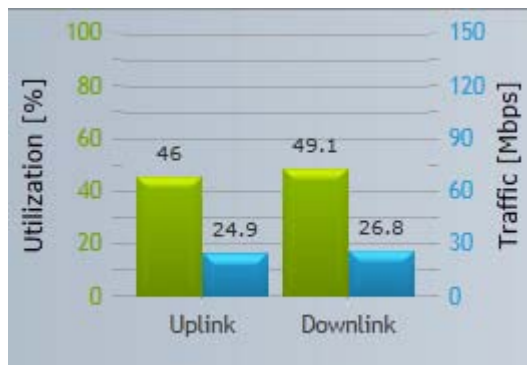


Figure 8-9: HSU Utilization - Sector Relative - Example 1

The HSU utilization across the sector is not very different from [Figure 8-5](#), since have one busy HSU and the rest idle.

The busy HSU receives all the resources it needs, as reflected by the blue throughput bars which are almost the same as those in [Figure 8-6](#).

[Figure 8-10](#) shows the sector relative time line, which is quite steady as to be expected.

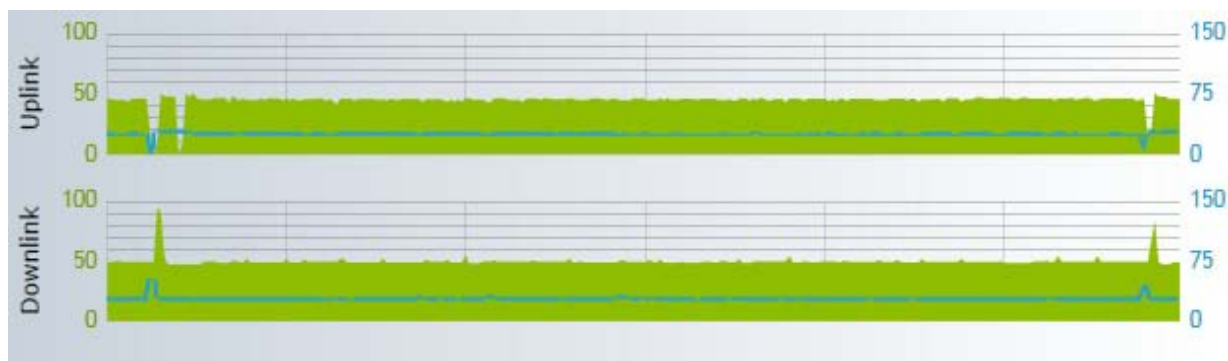


Figure 8-10: HSU Utilization - Sector Relative time line - Example 1

**Example 2**

Downlink allocation	Uplink allocation	Purpose
Busy HSU 2 TS, others take all remaining TS	All HSUs 2 TS	Required downlink BW taken from allocated but unused time slots

In [Figure 8-11](#) below, observe that the sector is fully allocated in the downlink direction.

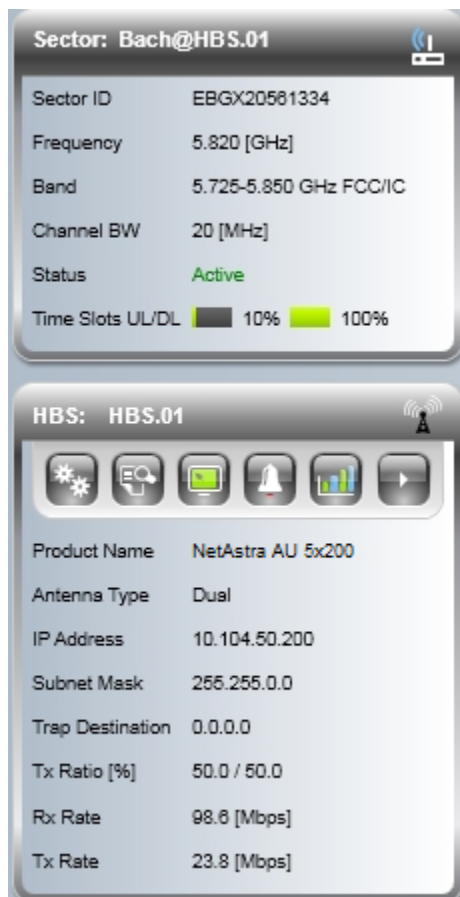


Figure 8-11: Sector status for Example 2 - All DL time slots allocated

Since all unused downlink slots are available to the busy HSU, the utilization graphs for this case are very similar to those of Example 1 and we will not repeat them all. The main difference is in the sector utilization:

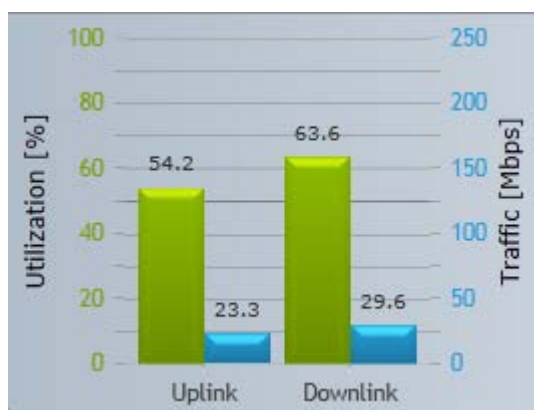


Figure 8-12: Sector Utilization - Example 2

The downlink utilization is higher than for Example 1, reflecting the fact that the HBS must spend proportionally more time checking the inactive HSUs.

Similarly, the Sector relative HSU downlink utilization is higher by the same amount.

**Example 3**

Downlink allocation	Uplink allocation	Purpose
All HSUs 2 TS	Busy HSU 1 TS, others take all remaining TS	Busy HSU “starved” in uplink direction

In this case, we are deliberately “starving” the busy HSU, by allocating it one uplink time slot and dividing the rest between the inactive HSUs. The situation is shown in [Figure 8-13](#).

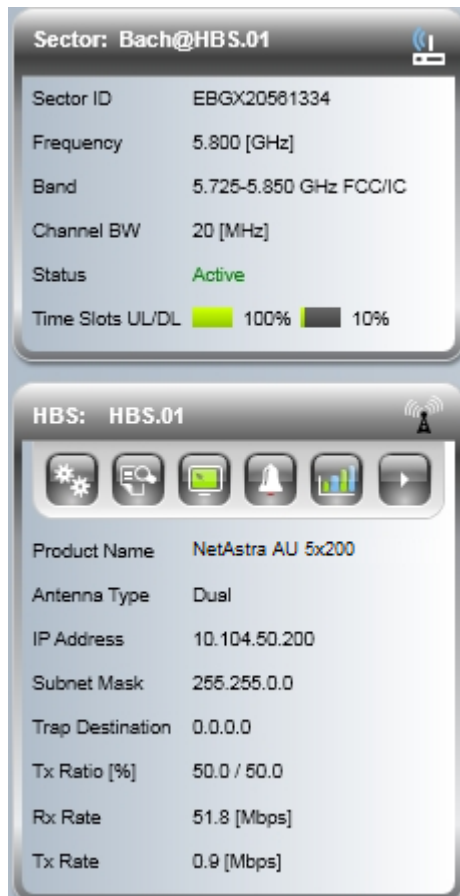


Figure 8-13: Sector status for Example 3 - All UL time slots allocated

The effect on sector utilization is quite dramatic as seen in [Figure 8-14](#) below.

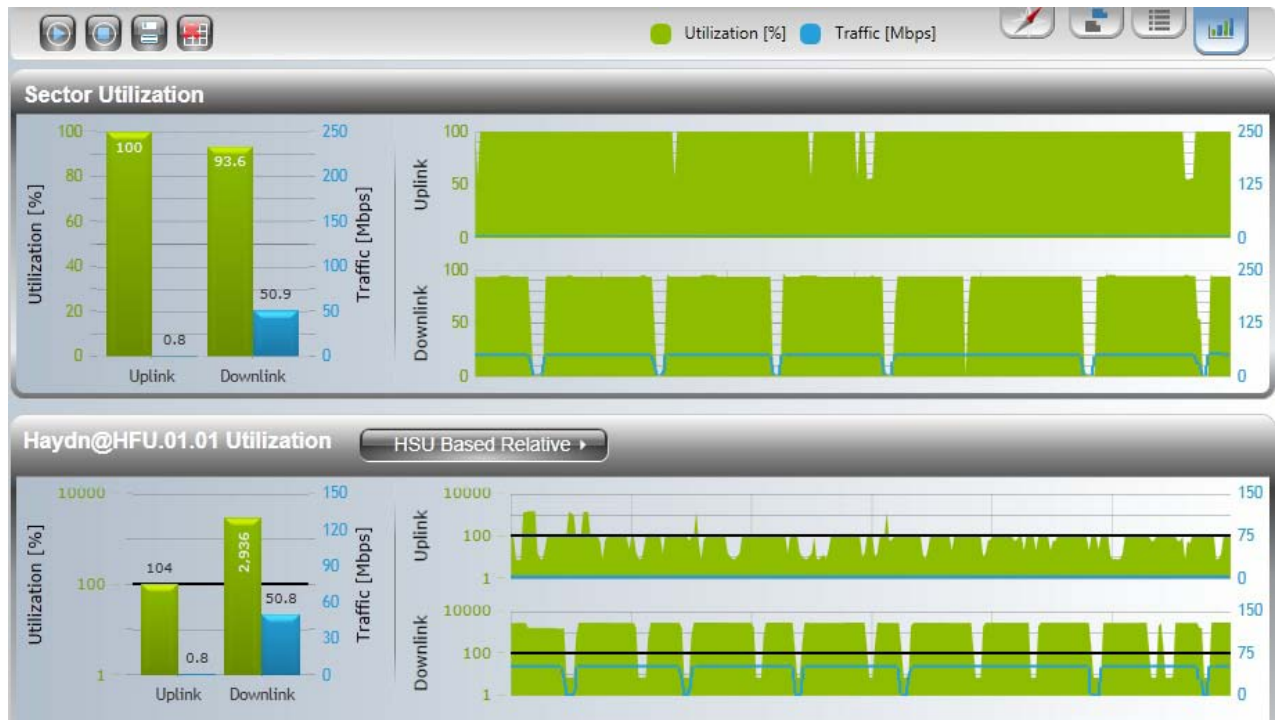


Figure 8-14: Sector Utilization Pane from the main window for Example 3

Uplink utilization is 100% despite almost no traffic getting through from the busy HSU to the HBS as seen in [Figure 8-15](#) and the enlarged left hand bar chart in [Figure 8-16](#) below:

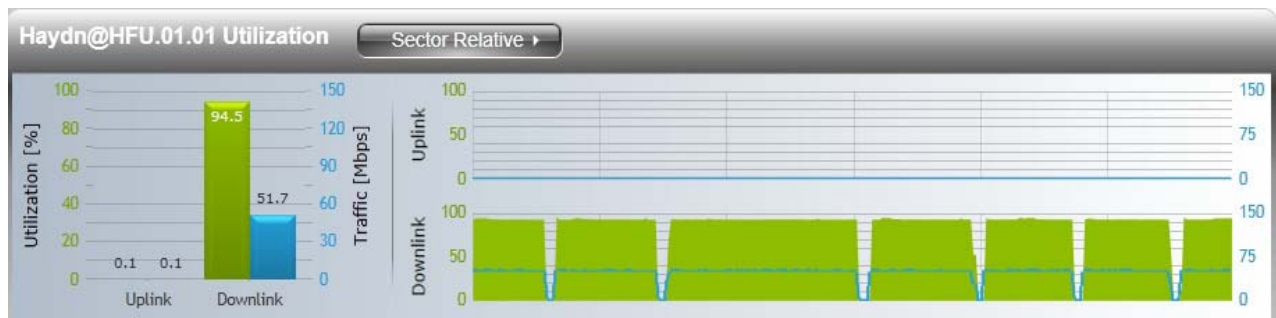


Figure 8-15: HSU Utilization - Sector Relative time line - Example 3

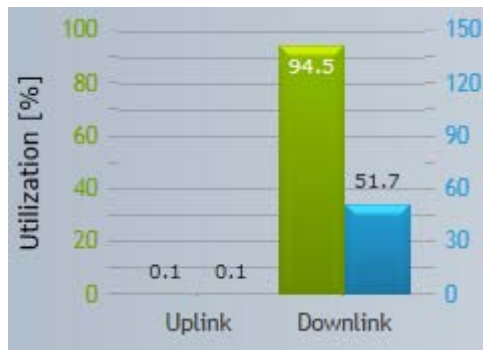


Figure 8-16: HSU Utilization - Sector Relative - Example 3



In all of this, downlink utilization is unaffected and remains as for the first example.

The importance of leaving a “pool “of unallocated uplink time slots (if possible) is illustrated in Example 4, which prevents HSU “starvation”.

**Example 4**

Downlink allocation	Uplink allocation	Purpose
All HSUs 2 TS	Busy HSU 1 TS, others take half remaining TS	Busy HSU takes unallocated uplink time slots

This example, as seen in [Figure 8-17](#) leaves a pool of unallocated UL time slots to avoid busy HSU starvation.

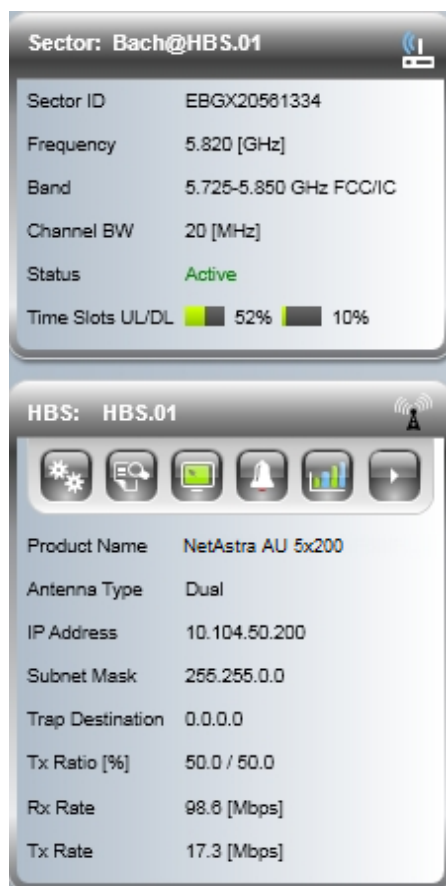


Figure 8-17: Sector status for Example 4 - Half UL time slots allocated

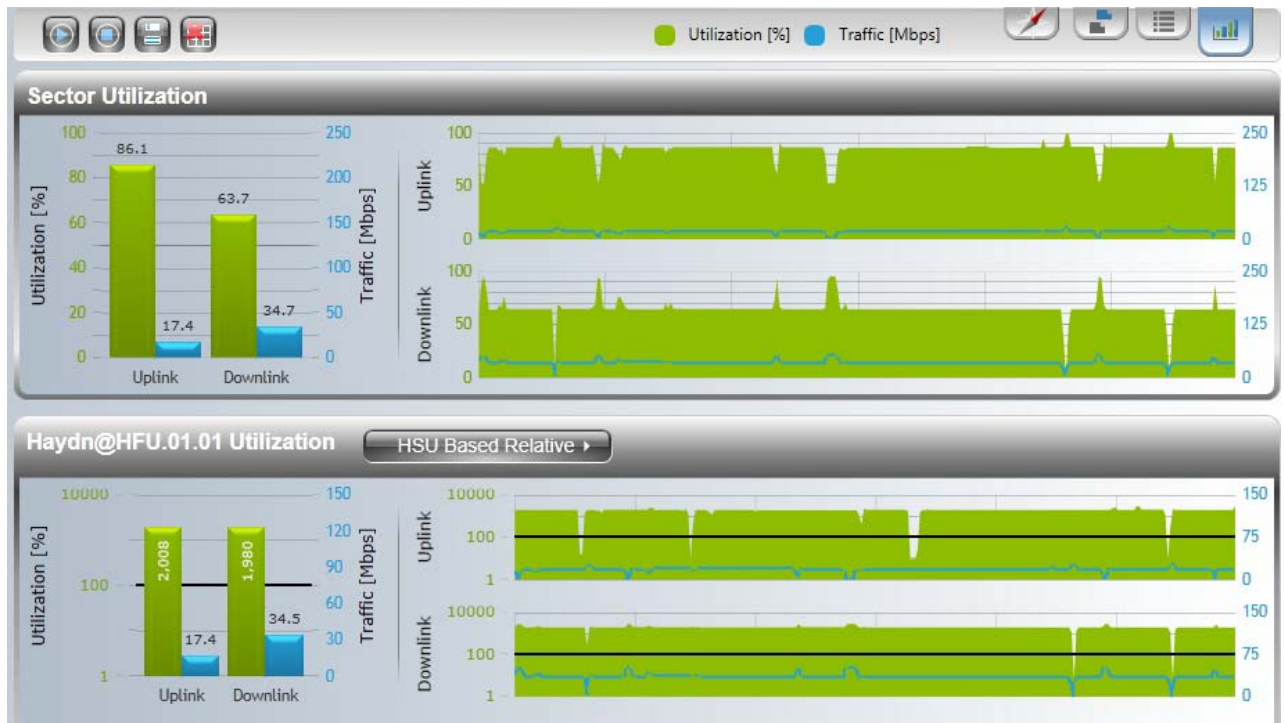


Figure 8-18: Sector Utilization Pane from the main window for Example 4

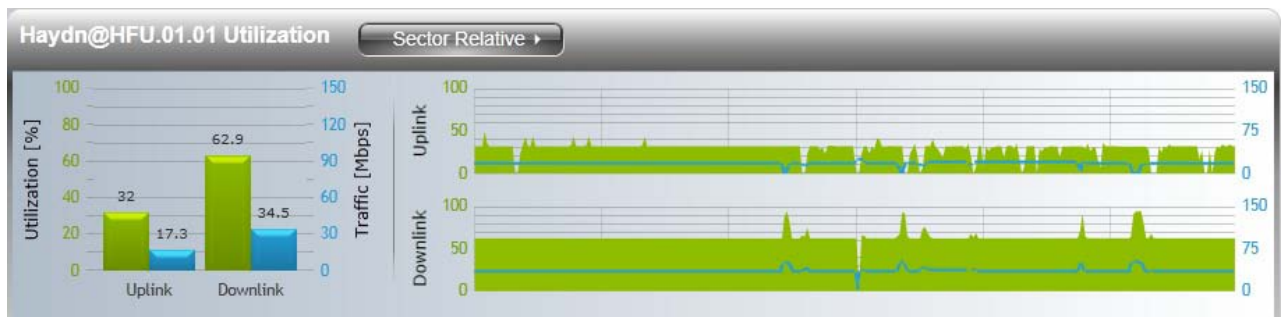


Figure 8-19: HSU Utilization - Sector Relative time line - Example 4

The left hand bar graphs for each section are instructive. Here first, is Sector Utilization:

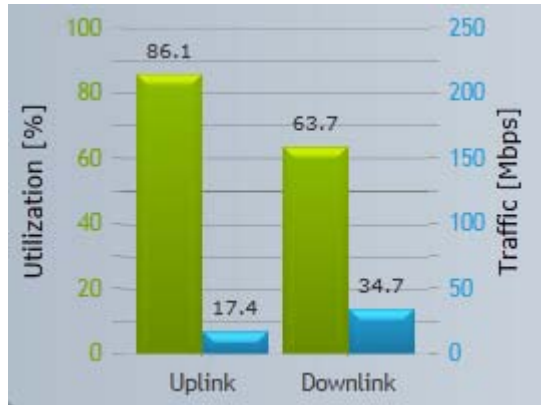


Figure 8-20: Sector Utilization - Example 4

The downlink results reflect both the actual traffic and HBS monitoring of all the HSUs. The uplink figures reflect the same thing. Despite there being more than adequate free uplink time slots, the HBS overhead of taking care of inactive HSUs is noticeable.

Here is HSU self-relative utilization:



Figure 8-21: HSU Utilization - HSU Relative - Example 4

The percentage utilization here is very high - significantly more so than Example 1. The actual traffic throughputs to the busy HSU are slightly lower - for the same overhead reasons.

Similar considerations are reflected in the HSUs sector relative utilization:

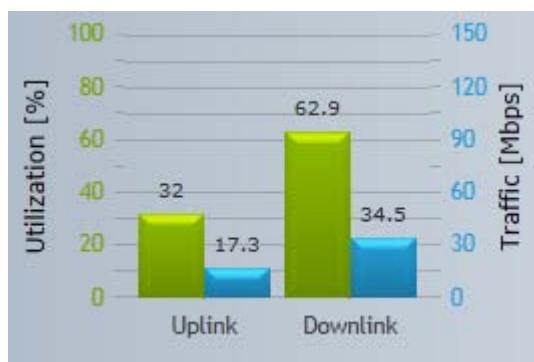


Figure 8-22: HSU Utilization - Sector Relative - Example 4

***Example Summary***

For readability reasons, we will use the left hand bar graphs rather than the time lines to summarize the scenarios. In each case, we have chosen the bar graphs to be as representative as possible.

Table 8-3: Unitization Summary for our four examples

Utilization	Ex.	1	2	3	4																																				
	UL	All HSUs 2 TS	All HSUs 2 TS	Busy HSU 1 TS, others all remaining TS	Busy HSU 1 TS, others half remaining TS																																				
	DL	All HSUs 2 TS	Busy HSU 2 TS, others, remaining TS	All HSUs 2 TS	All HSUs 2 TS																																				
Sector		<table border="1"> <tr><th>Direction</th><th>Utilization [%]</th><th>Traffic [Mbps]</th></tr> <tr><td>Uplink</td><td>56.9</td><td>24.8</td></tr> <tr><td>Downlink</td><td>52.2</td><td>27.9</td></tr> </table>	Direction	Utilization [%]	Traffic [Mbps]	Uplink	56.9	24.8	Downlink	52.2	27.9	<table border="1"> <tr><th>Direction</th><th>Utilization [%]</th><th>Traffic [Mbps]</th></tr> <tr><td>Uplink</td><td>54.2</td><td>23.3</td></tr> <tr><td>Downlink</td><td>63.6</td><td>29.6</td></tr> </table>	Direction	Utilization [%]	Traffic [Mbps]	Uplink	54.2	23.3	Downlink	63.6	29.6	<table border="1"> <tr><th>Direction</th><th>Utilization [%]</th><th>Traffic [Mbps]</th></tr> <tr><td>Uplink</td><td>100</td><td>0.8</td></tr> <tr><td>Downlink</td><td>0.7</td><td>0</td></tr> </table>	Direction	Utilization [%]	Traffic [Mbps]	Uplink	100	0.8	Downlink	0.7	0	<table border="1"> <tr><th>Direction</th><th>Utilization [%]</th><th>Traffic [Mbps]</th></tr> <tr><td>Uplink</td><td>85.1</td><td>17.4</td></tr> <tr><td>Downlink</td><td>63.7</td><td>34.7</td></tr> </table>	Direction	Utilization [%]	Traffic [Mbps]	Uplink	85.1	17.4	Downlink	63.7	34.7
Direction	Utilization [%]	Traffic [Mbps]																																							
Uplink	56.9	24.8																																							
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Downlink	63.7	34.7																																							
HSU self		<table border="1"> <tr><th>Direction</th><th>Utilization [%]</th><th>Traffic [Mbps]</th></tr> <tr><td>Uplink</td><td>1,411</td><td>24.8</td></tr> <tr><td>Downlink</td><td>1,591</td><td>27.5</td></tr> </table>	Direction	Utilization [%]	Traffic [Mbps]	Uplink	1,411	24.8	Downlink	1,591	27.5	<table border="1"> <tr><th>Direction</th><th>Utilization [%]</th><th>Traffic [Mbps]</th></tr> <tr><td>Uplink</td><td>1,411</td><td>24.8</td></tr> <tr><td>Downlink</td><td>1,591</td><td>27.5</td></tr> </table>	Direction	Utilization [%]	Traffic [Mbps]	Uplink	1,411	24.8	Downlink	1,591	27.5	<table border="1"> <tr><th>Direction</th><th>Utilization [%]</th><th>Traffic [Mbps]</th></tr> <tr><td>Uplink</td><td>104</td><td>0.8</td></tr> <tr><td>Downlink</td><td>2,936</td><td>50.8</td></tr> </table>	Direction	Utilization [%]	Traffic [Mbps]	Uplink	104	0.8	Downlink	2,936	50.8	<table border="1"> <tr><th>Direction</th><th>Utilization [%]</th><th>Traffic [Mbps]</th></tr> <tr><td>Uplink</td><td>2,008</td><td>17.4</td></tr> <tr><td>Downlink</td><td>1,980</td><td>34.5</td></tr> </table>	Direction	Utilization [%]	Traffic [Mbps]	Uplink	2,008	17.4	Downlink	1,980	34.5
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HSU sector		<table border="1"> <tr><th>Direction</th><th>Utilization [%]</th><th>Traffic [Mbps]</th></tr> <tr><td>Uplink</td><td>46</td><td>24.9</td></tr> <tr><td>Downlink</td><td>49.1</td><td>26.8</td></tr> </table>	Direction	Utilization [%]	Traffic [Mbps]	Uplink	46	24.9	Downlink	49.1	26.8	<table border="1"> <tr><th>Direction</th><th>Utilization [%]</th><th>Traffic [Mbps]</th></tr> <tr><td>Uplink</td><td>54.2</td><td>23.3</td></tr> <tr><td>Downlink</td><td>63.6</td><td>29.6</td></tr> </table>	Direction	Utilization [%]	Traffic [Mbps]	Uplink	54.2	23.3	Downlink	63.6	29.6	<table border="1"> <tr><th>Direction</th><th>Utilization [%]</th><th>Traffic [Mbps]</th></tr> <tr><td>Uplink</td><td>0.1</td><td>0.1</td></tr> <tr><td>Downlink</td><td>94.5</td><td>51.7</td></tr> </table>	Direction	Utilization [%]	Traffic [Mbps]	Uplink	0.1	0.1	Downlink	94.5	51.7	<table border="1"> <tr><th>Direction</th><th>Utilization [%]</th><th>Traffic [Mbps]</th></tr> <tr><td>Uplink</td><td>32</td><td>17.3</td></tr> <tr><td>Downlink</td><td>62.9</td><td>34.5</td></tr> </table>	Direction	Utilization [%]	Traffic [Mbps]	Uplink	32	17.3	Downlink	62.9	34.5
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Downlink	62.9	34.5																																							

## About HBS Overhead

There is always some overhead on the HBS. Recall that one time slot in each of the uplink and downlink directions is reserved by the HBS for sector management.

In our four examples we noted that the occurrence of HBS overhead increases when allocating time slots even to “idle” HSUs.

As we saw, the percentage point sector load increases as you allocate further downlink time slots, or maintain any unused but allocated uplink time slots.

It is straightforward to demonstrate that overhead is also channel-bandwidth dependent. If you repeat the four examples under 10 and 5 MHz channel bandwidth, the load overhead percentage increases as channel bandwidth decreases. Conversely, if you are able to operate at 40 MHz, the overhead percentage drops.

To illustrate the effect of different channel bandwidths, we show in order, Example 3 at 10, 20 and 40 MHz:

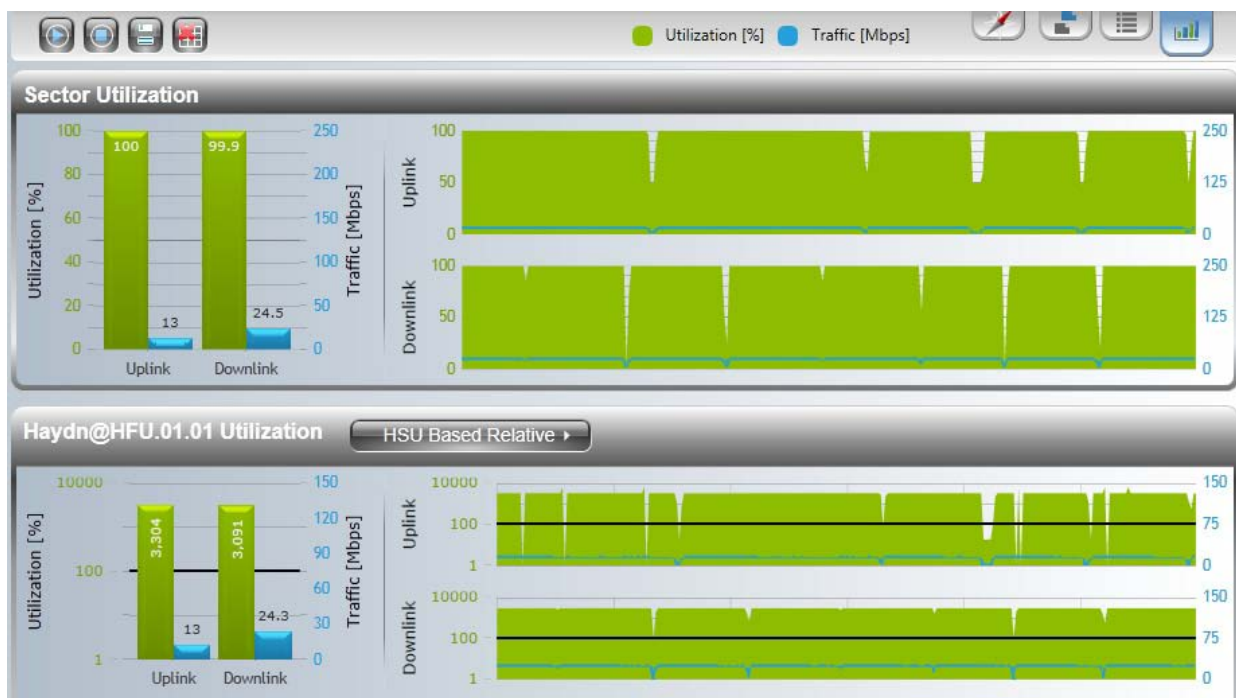


Figure 8-23: Example 3: Half the uplink time slots reserved at 10 MHz CBW

Notice that at 10 MHz channel bandwidth, the sector utilization is 100% in both directions!



Figure 8-24: Example 3: Half the uplink time slots reserved at 20 MHz CBW

At 20 MHz channel bandwidth, the sector utilization is around 80% in the uplink direction and about 63% in the uplink direction.

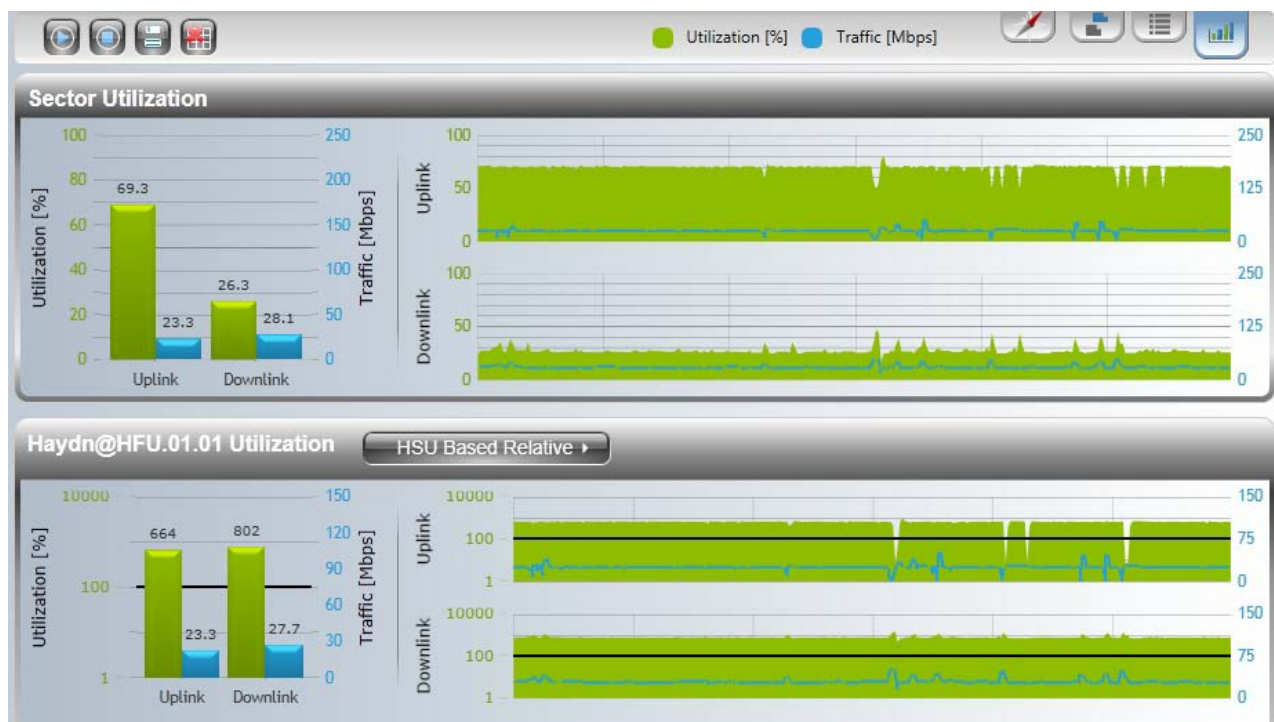


Figure 8-25: Example 3: Half the uplink time slots reserved at 40 MHz CBW

At 40 MHz channel bandwidth, the sector utilization is around 70% in the uplink direction and about 26% in the uplink direction. The percentage sector utilization has dropped dramatically for the same traffic load.

## TCP/IP and other SLA Considerations

The foregoing examples were all based on UDP traffic. If the sector traffic has a heavy TCP/IP content (including dependent protocols such as HTTP/HTTPS) you must allow sufficient time slots particularly in the uplink direction to ensure that TCP/IP ACK messages are transmitted without delay. Some theoretical calculations are possible, but ultimately you will need to use a hardware traffic generator to assist your time slot allocation. This is particularly critical if you are operating a sector with SLA.

The same holds true if you are offering a backhaul service with SLA regardless of the traffic packet composition.



## 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.

NetAstra PtMP 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

NetAstra PtMP 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 NetAstra PtMP elements in a Mobility application is beyond the scope of this manual. The purpose of this chapter is to demonstrate the use of Link 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 Netronics 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, Spatial Multiplexing/ 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, Spatial Multiplexing/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 NetAstra PtMP 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 NetAstra 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 that 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 their 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:

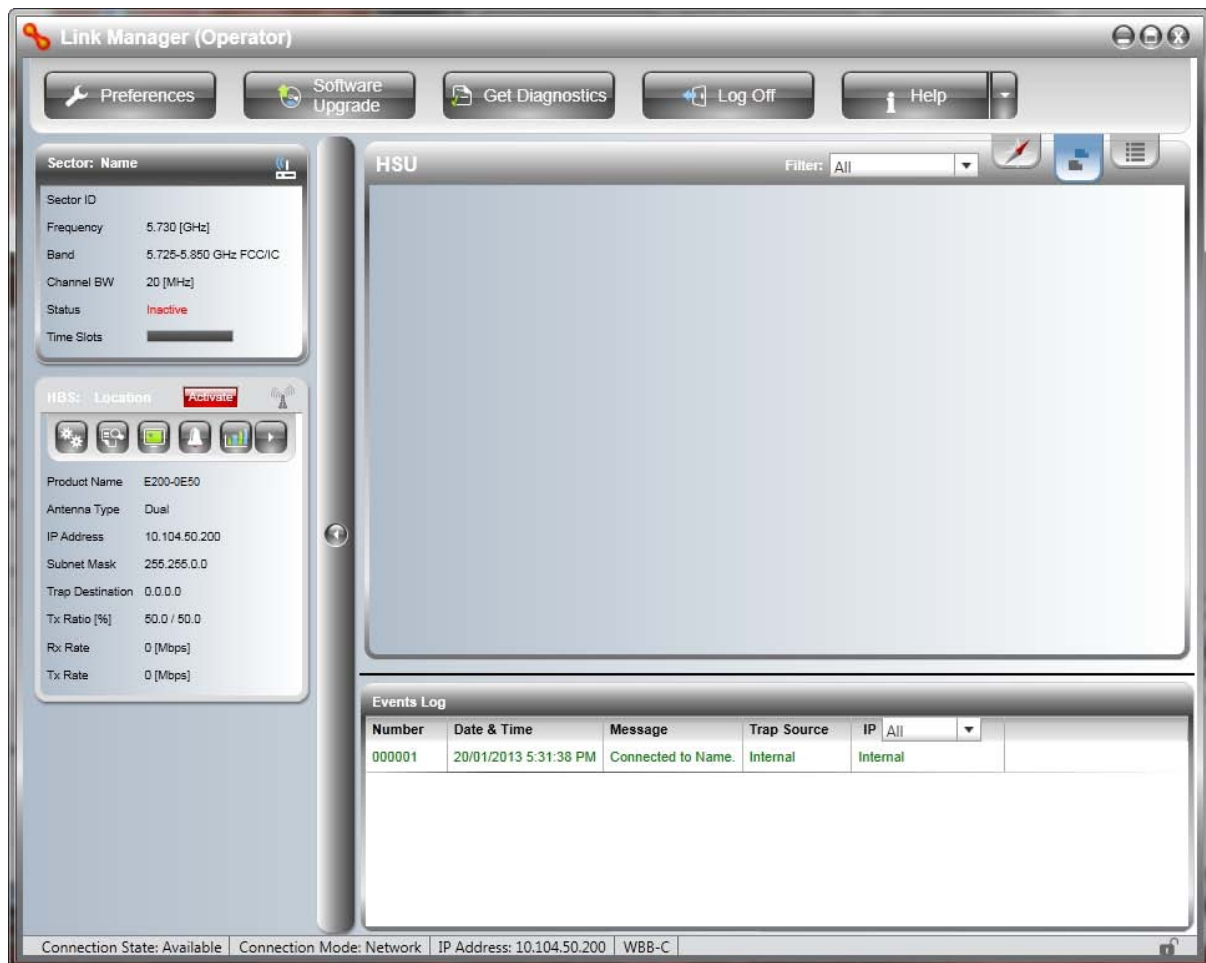


Figure 9-1: Mobile HBS after initial log-on

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:

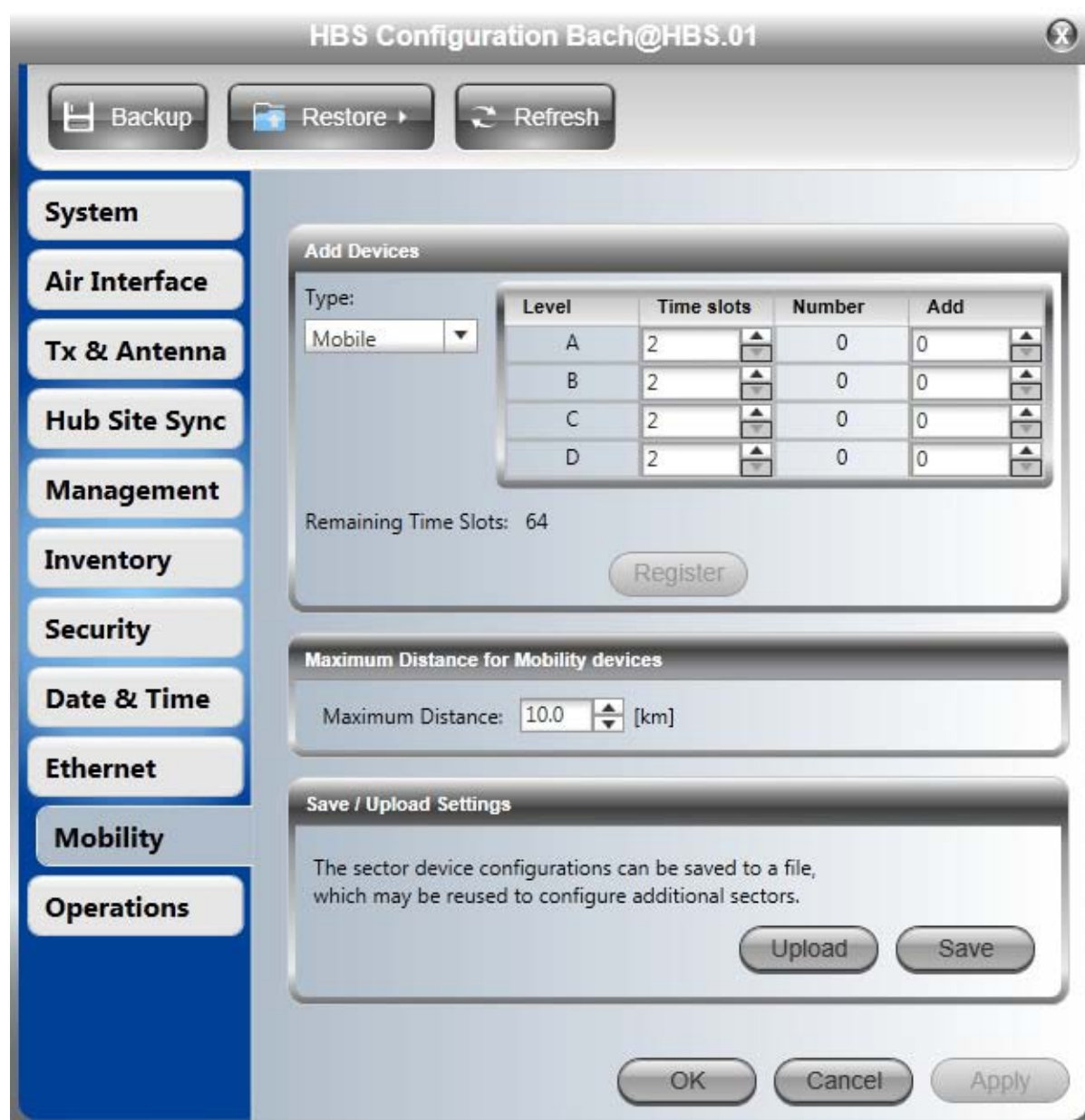
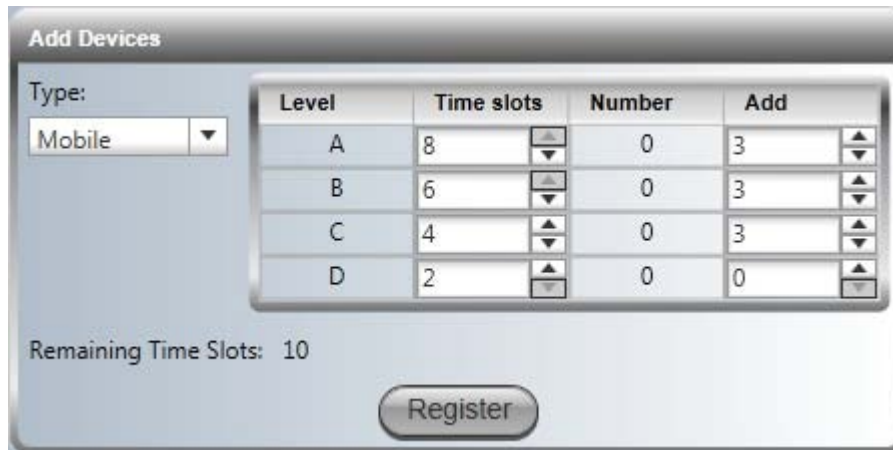


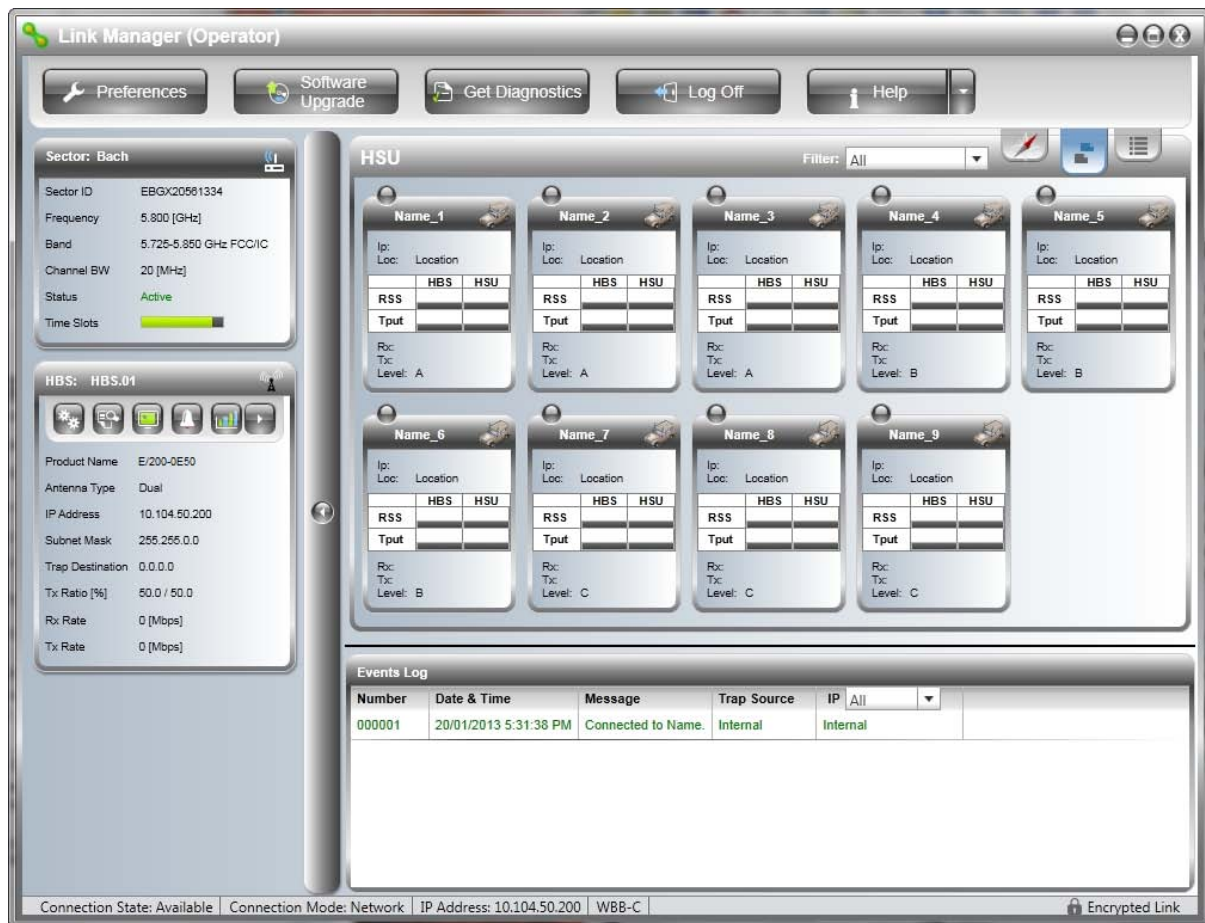
Figure 9-2: HBS Mobility Configuration

The maximum distance is in fact a nominal common distance assumed by the HBS for all mobile HSUs 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 mobile HMUs in the sector.

## Registering HMUs

Registration of actual HMUs is accomplished by direct connection. You assign each one to one of the 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 mobile HMU in the usual way. Here is the opening window:

The screenshot shows the Link Manager (Operator) interface. The main window has a title bar with "Link Manager (Operator)" and standard window controls. Below the title bar are buttons for "Configure", "Preferences", "Get Diagnostics", "Log Off", and "Help".

On the left side, there is a "Link: Name" panel with the following details:

- Network ID
- Frequency: 5.730 [GHz]
- Band: 5.725-5.850 GHz FCC/IC
- Channel BW: 20 [MHz]
- Status: Not Synchronized

In the center, a configuration window titled "Name" is open, showing a table with columns for "HSU" and "HBS". The table contains the following data:

	HSU	HBS
ip Address	10.104.50.2	
Location	Location	
Subnet Mask	255.255.0.0	
RSS		
T-put		
Rx Rate	0 [Mbps]	0 [Mbps]
Tx Rate	0 [Mbps]	0 [Mbps]

At the bottom of the main window, there is an "Events Log" table with the following data:

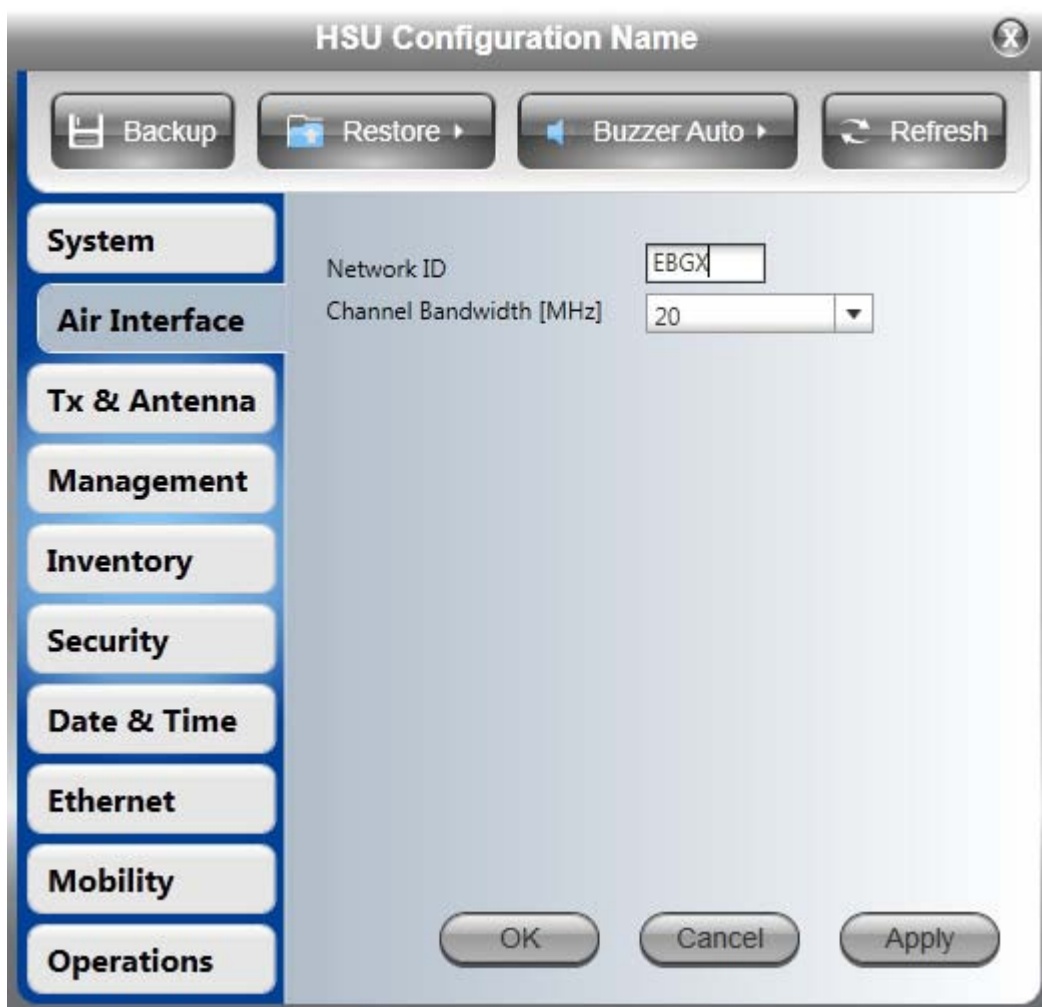
Number	Date & Time	Message	Trap Source	IP
000001	1/8/2013 10:30:58 AM	Connected to Name.	Internal	Internal

The status bar at the bottom of the window displays: "Connection State: Available | Connection Mode: Network | IP Address: 10.104.50.2 | WBB-C".

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

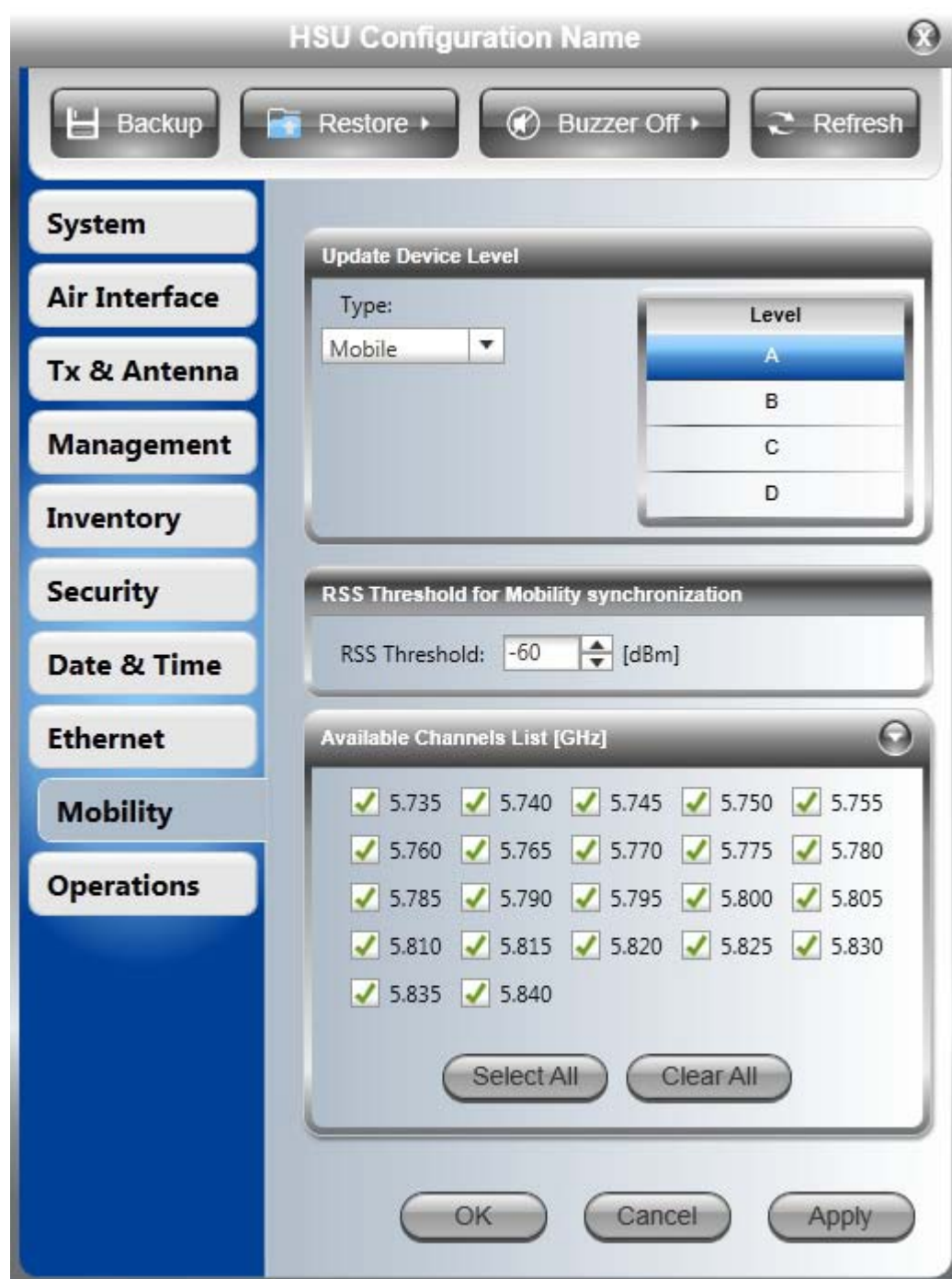


3. Open the Air Interface tab.



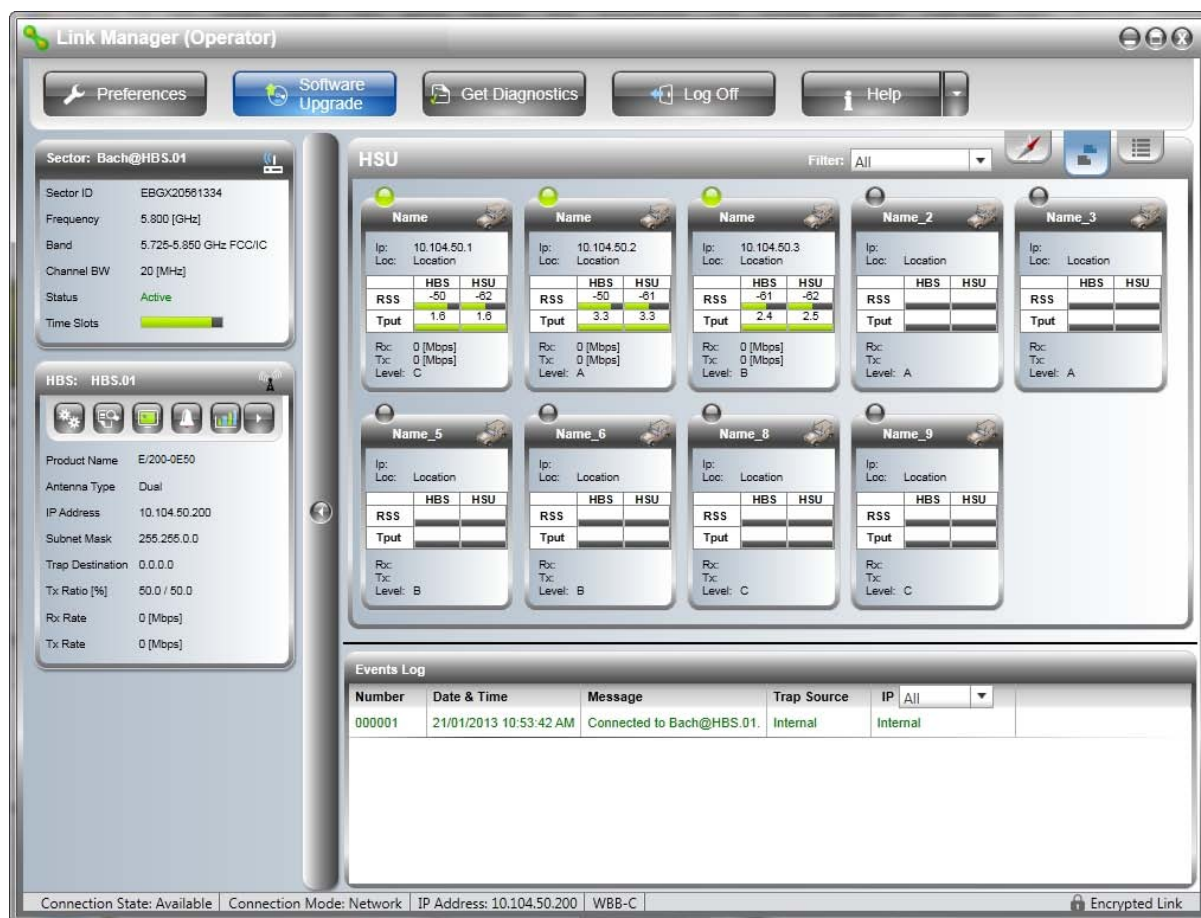
4. Enter the sector ID (EBGX20561334 in our example) and if necessary, change the Channel Bandwidth.
5. Open the Tx & Antenna tab and ensure that the antenna type is correct. You may change any other antenna parameters as well. We set Tx Power for our example to 5 dBm.
6. (Optional) Open the Management 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.

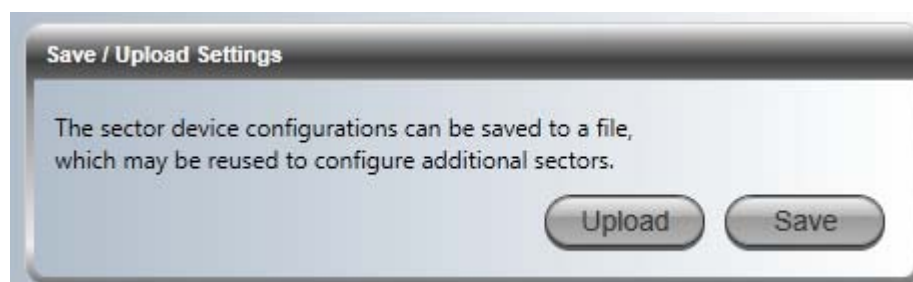
For our example, we assign one HSU each to levels A, B and C. Here then, is the final result:



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 9-2](#) 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 a 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**.

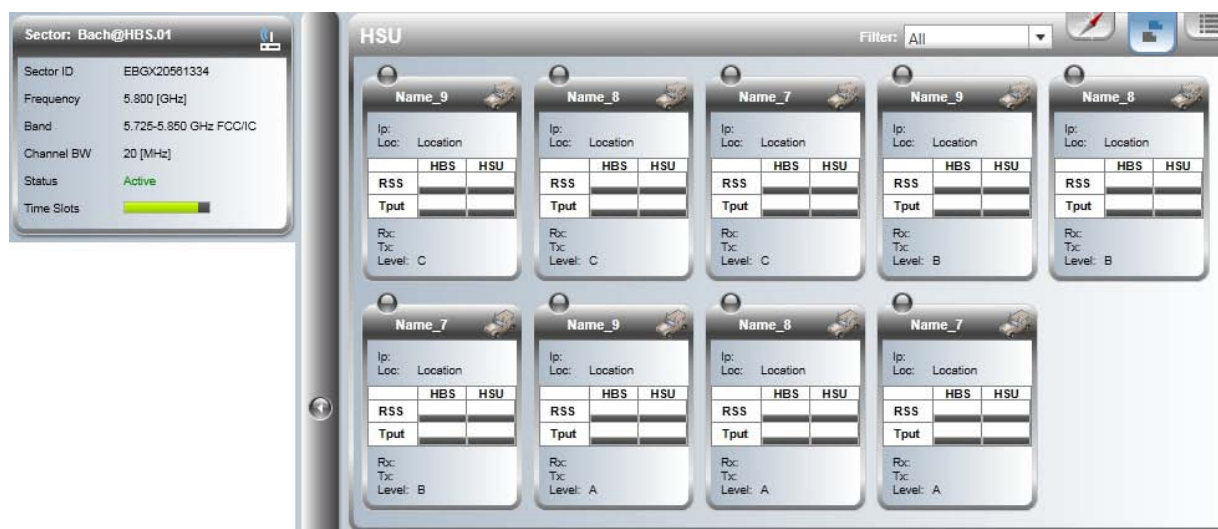


Figure 9-3: Preparing to upload the Mobility file

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 mobile HSUs, we revert to our original sector.

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

1. In the window of [Figure 9-3](#), 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 be activated and accessible (via a switch) to the managing computer. They need not be on the same subnet.

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.

## Monitoring and Diagnostics

The Link 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 Netroncis Customer Support to expedite assistance.

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

Table 10-1: Get Diagnostics Data and Description

Data	Description
System Data	General information about the system
Events Log	<ul style="list-style-type: none"><li>• List of system events including those from other sites if this site is defined as the trap Destination</li><li>• Last 256 events from all sites</li></ul>
Sector Information	Information about the HBS and HSU settings
Site Configuration	Data about the site parameters

Table 10-1: Get Diagnostics Data and Description (Continued)

Data	Description
Monitor	Detailed event data record
Restriction Table	This is the Connection Table from <a href="#">Figure 6-11</a>
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:

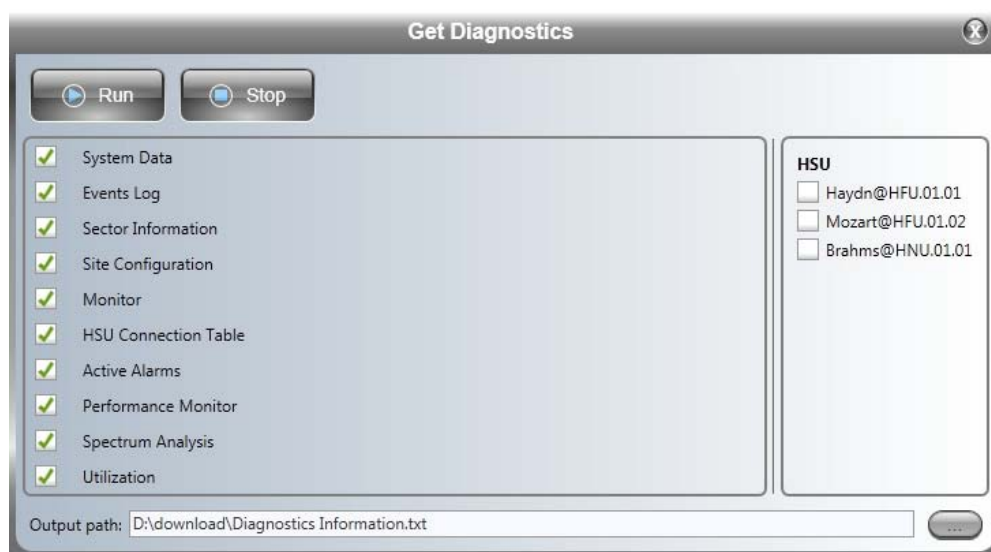


Figure 10-1: Get Diagnostics Dialog Box - HBS

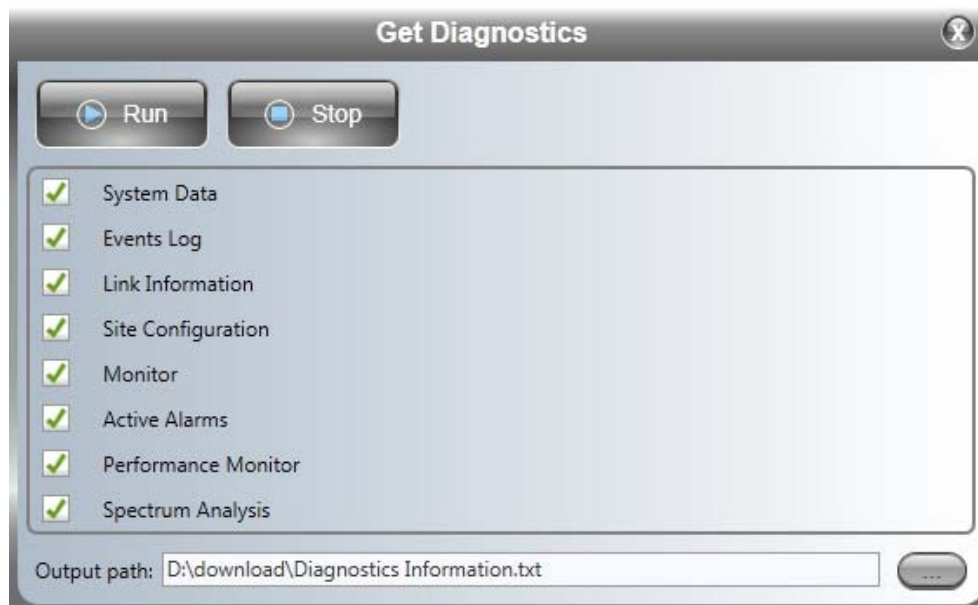
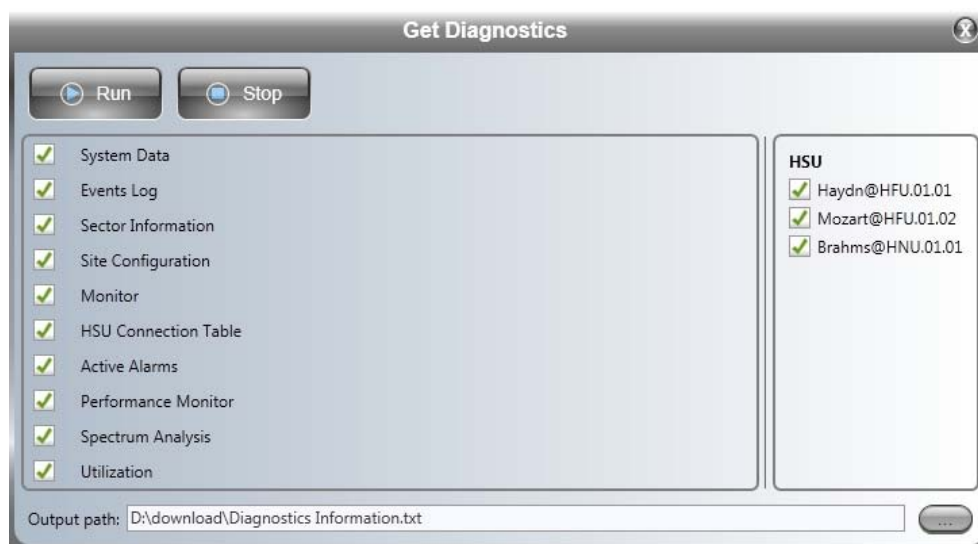


Figure 10-2: Get Diagnostics Dialog Box - HSU

2. Select or deselect the data options. If the file is to be sent to Netronics 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 Netroncis Customer support.



The Spectrum Analysis output is available directly from the Spectrum View utility as a CSV file (see [Chapter 19](#)). The format in the Diagnostics report is intended for use by Netronics 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 19](#) 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:

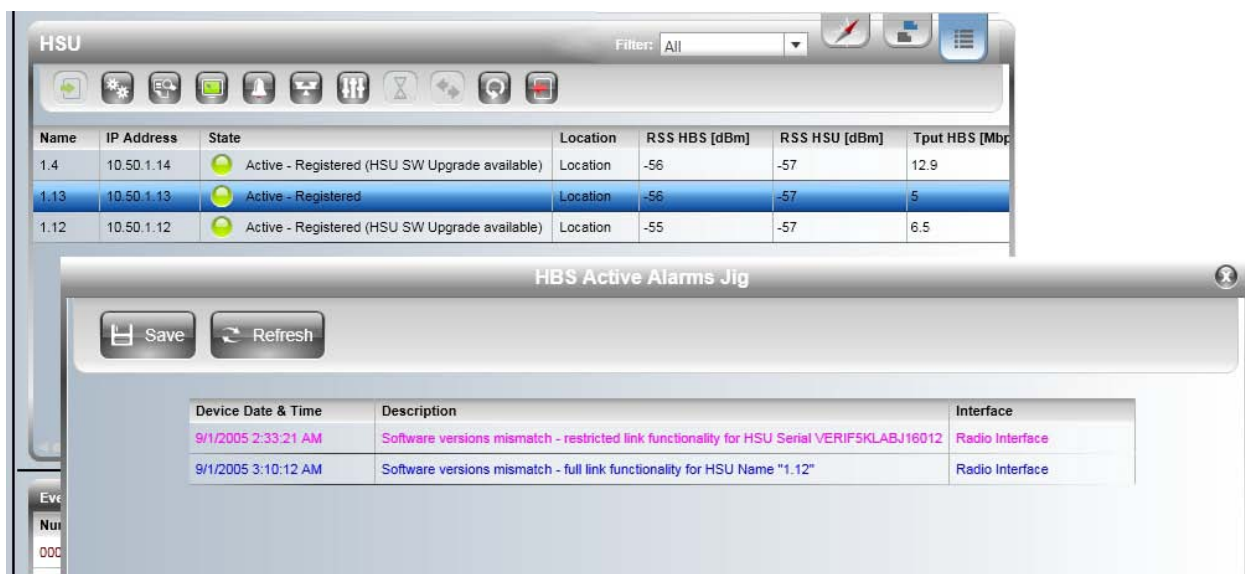


Figure 10-3: Typical incompatibly messages for HSUs on HBS display

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



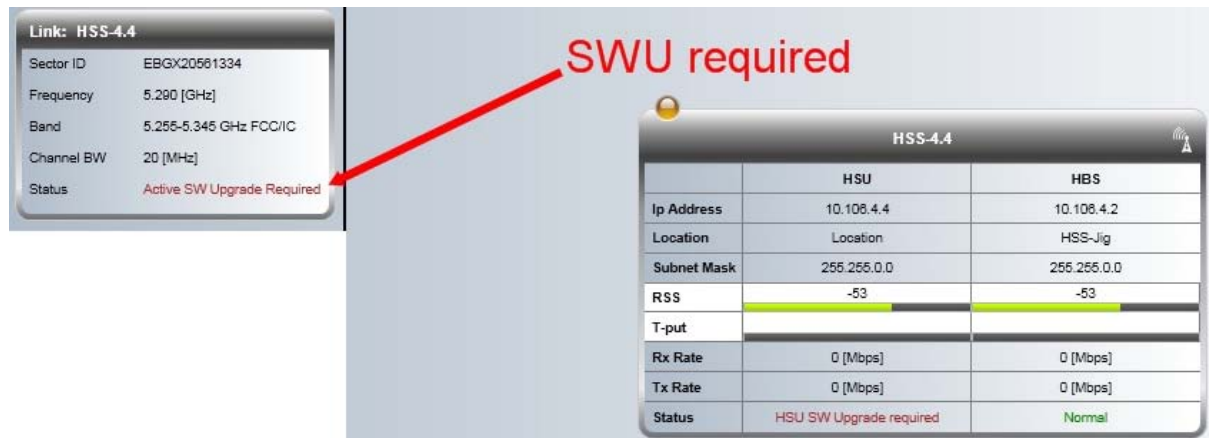


Figure 10-4: This HSU requires a software upgrade

On the HSU window, these messages appear as shown in [Figure 10-4](#). 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 operate 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 10-4](#) above.

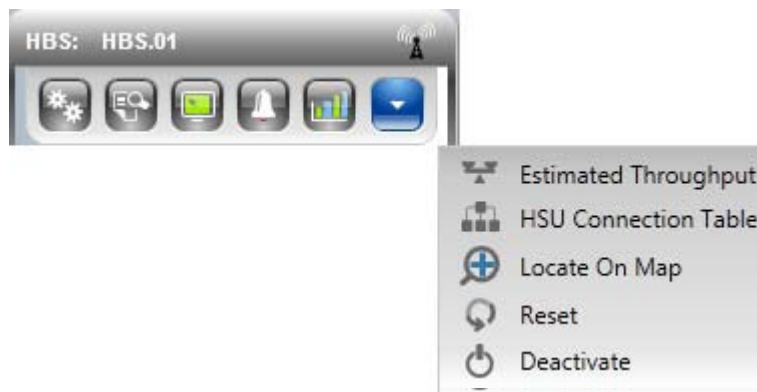
For such HSUs, traffic is disabled and the only services available are **Change Band** and **Software Upgrade**.

## **Throughput Checking**

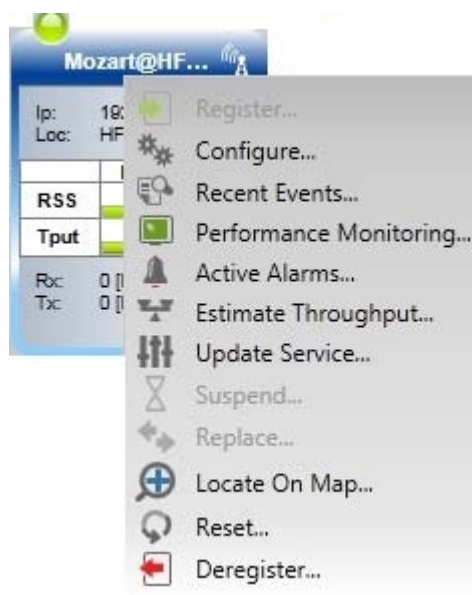
In this mode, NetAstra estimates Ethernet throughput by filling frames over the air to maximum for 30 seconds. This mode should not influence service. The test may be carried out for the HBS or an HSU.

➤ **To use Throughput Checking:**

1. HBS: Chose Estimated Throughput as shown:

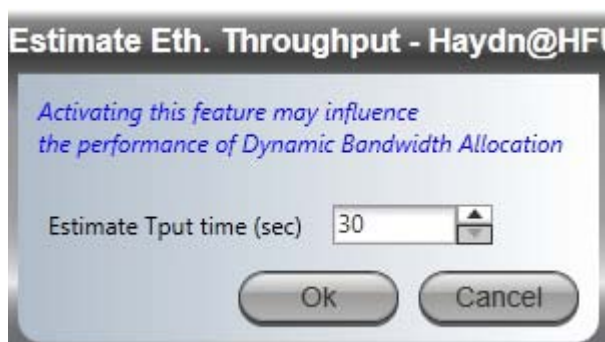


- HSU **from HBS**: Chose Estimated Throughput as shown:



- 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 NetAstra 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.**

Events Log				
Number	Date & Time	Message	Trap Source	IP
000001	1/8/2013 1:09:29 PM	Connected to Bach@HBS.01.	Internal	Internal

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

Trap Source	IP	All
Internal	Inte	All
reset. Internal	Internar	Internal

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

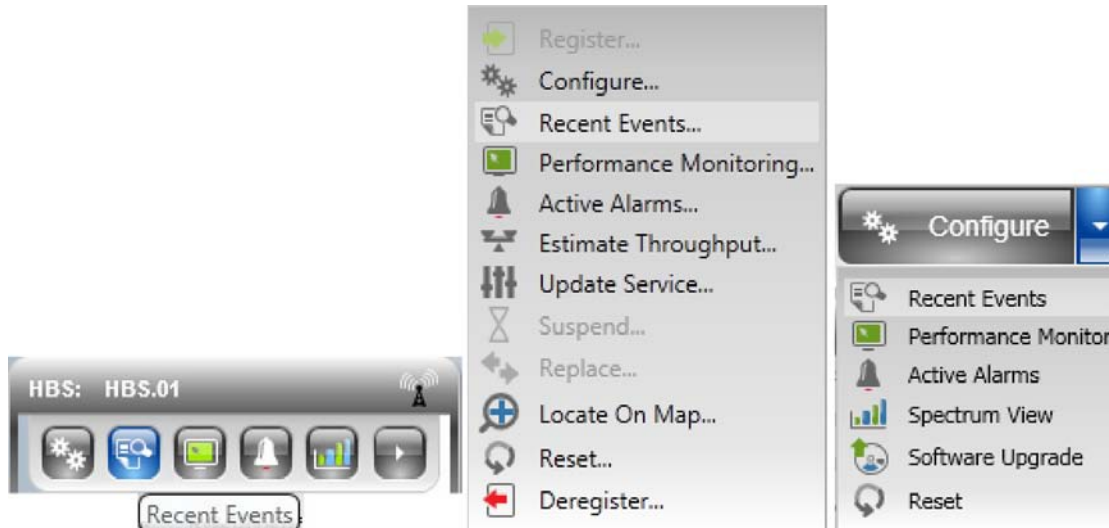


Figure 10-5: Recent Events: Left to right: HBS, HSU from HBS, HSU direct

In each case the report has the same format:

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	

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

NetAstra 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 Link Manager is not connected.

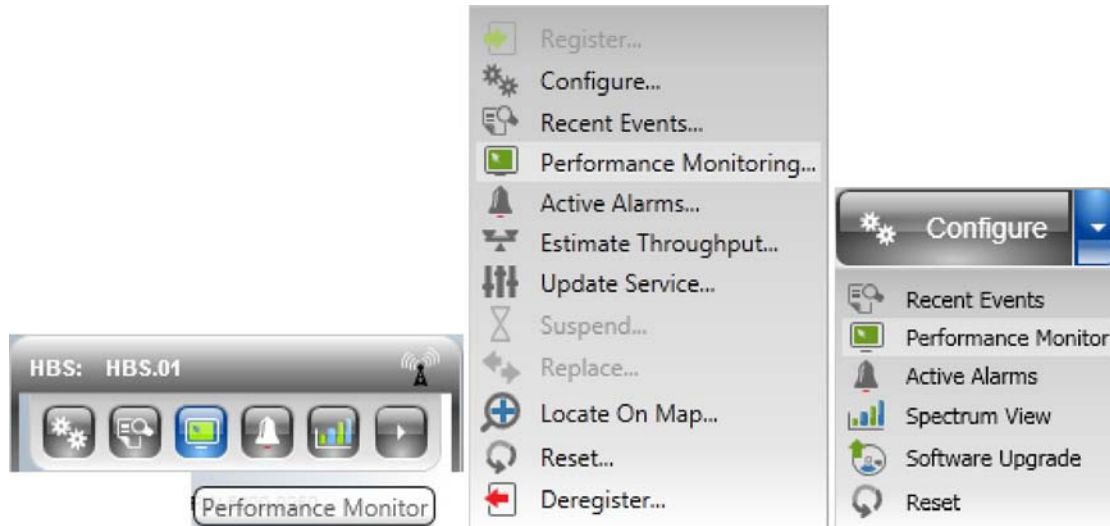


Figure 10-6: Performance Monitoring: Left to right: HBS, HSU from HBS, HSU

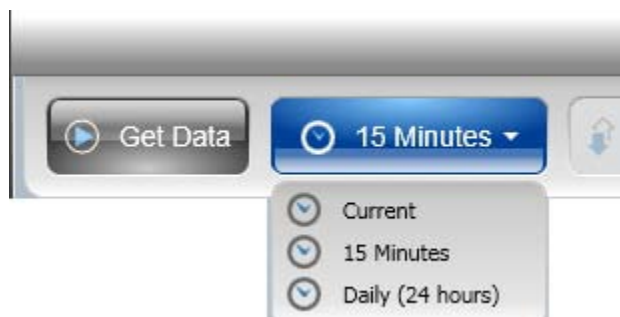
The on-screen and generated reports have the same general formats, but there are differences in what is reported.

### 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 10-7: 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
✓	5/15/2012 8:30:00 AM	0	0	0	0	0	0	0	900

Figure 10-8: HBS - Performance Monitoring report - Valid data

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

Table 10-2: 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

Table 10-2: HBS Performance Monitoring Fields (Continued)

Column Heading	Abbreviation Meaning	Description
Tx MBytes	Transmitted Mbytes	The number of Megabytes transmitted at the specified port within the interval.
Above Traffic Thresh	Threshold set in <a href="#">Figure 10-7</a>	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 10-9: 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 choose 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
✓	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 10-10: 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 Thr
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

Figure 10-11: 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 10-12: 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 10-3: 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 10-3: 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 <a href="#">Figure 10-7</a>
Above Traffic Thresh	Threshold set in <a href="#">Figure 10-7</a>	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 -5 dB and -8 dB 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 below the threshold.

### Ethernet Thresholds - Traffic

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

## Link Manager Traps

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

Table 10-4: Link Manager Trap Messages


Trap Message	Severity	Remarks
Cannot bind to trap service port. Port 162 already in use by ProcessName (pid: ProcessId)	Warning	Link Manager will not catch any traps from the ODU, some other application has grabbed this port.
Device unreachable!	Error	Check connectivity to ODU

Table 10-4: Link Manager Trap Messages (Continued)

Trap Message	Severity	Remarks
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	Link 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 Link Manager release. Wizards are not available. Link Manager will be used just for monitoring. Upgrade the Link 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 Link Manager release. Wizards are not available. Link Manager will be used just for monitoring. Upgrade the Link 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. Here is an example:

HSU Active Alarms Haydn@HFU.01.01		
Device Date & Time	Description	Interface
9/1/2005 12:00:00 AM	Management port status changed to disconnected	Management Port on Odu

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 Link 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 18](#).

➤ **To run the Link Budget Calculator from the Windows Start Menu:**

- Go to **Start | Programs | Link Manager | Link Budget Calculator**

### *Online Help*

Online help can be accessed from the Help menu on the main window of the Link Manager. Using most common Web browsers, it may also be run going to

**Start | Programs | Link Manager | User Manual**

### *Customer Support*

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

# Part 4

## Site Synchronization



## Hub Site Synchronization

### What is Hub Site Synchronization?

When several units are collocated at a common hub site, interference may occur from one unit to another. NetAstra 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 NetStream, NetAstra units are installed.



- 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 NetAstra PtMP HBSs is model dependent
- 

The Netronics 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 11-1](#) illustrates interference caused by non-synchronized collocated units.

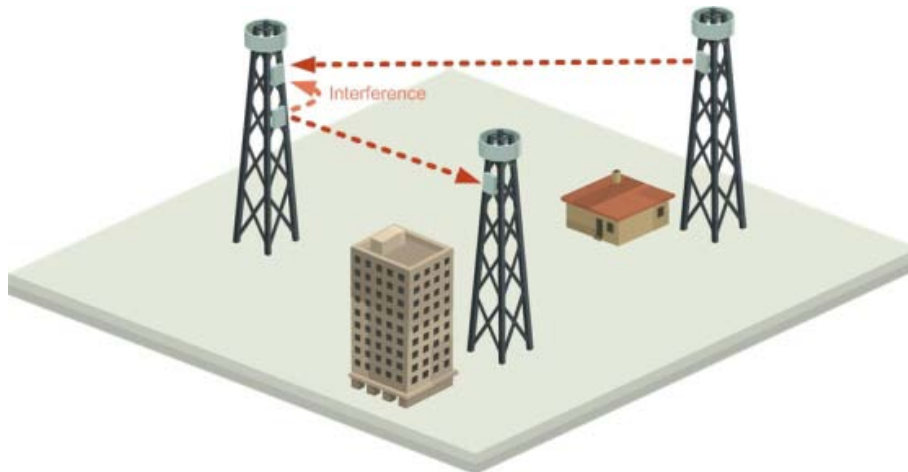


Figure 11-1: Interference caused by collocated units

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

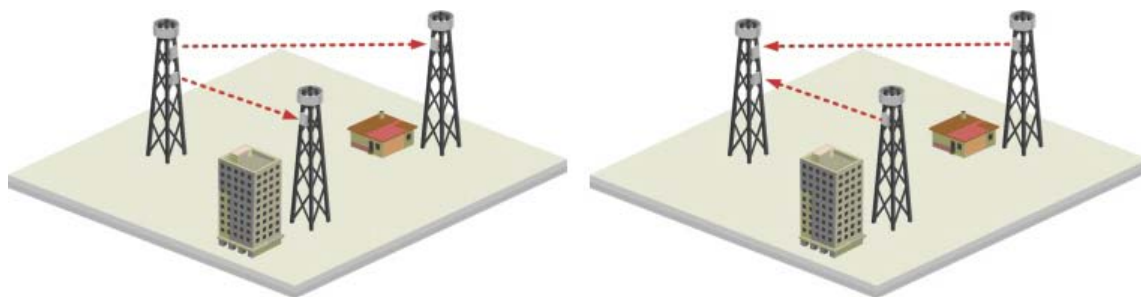


Figure 11-2: Collocated units using Hub Site Synchronization (1)

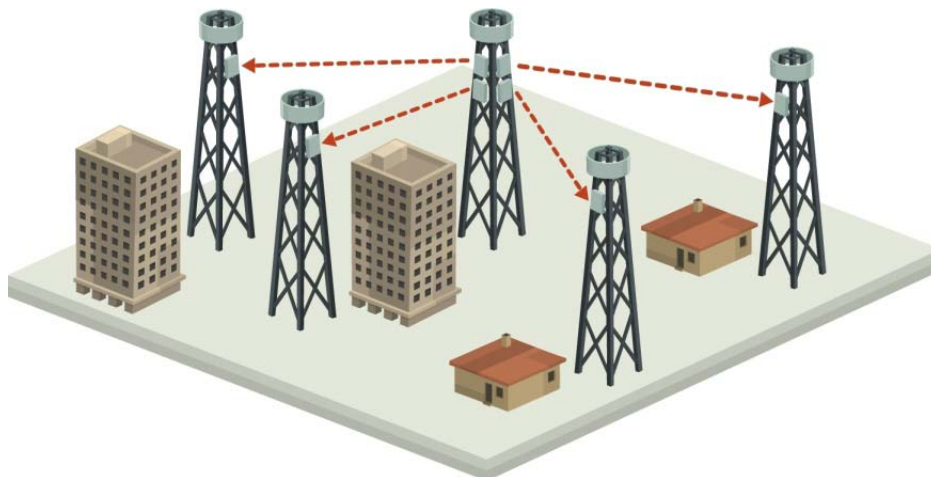


Figure 11-3: Collocated units using Hub Site Synchronization (2)

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

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

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



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

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

## 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.

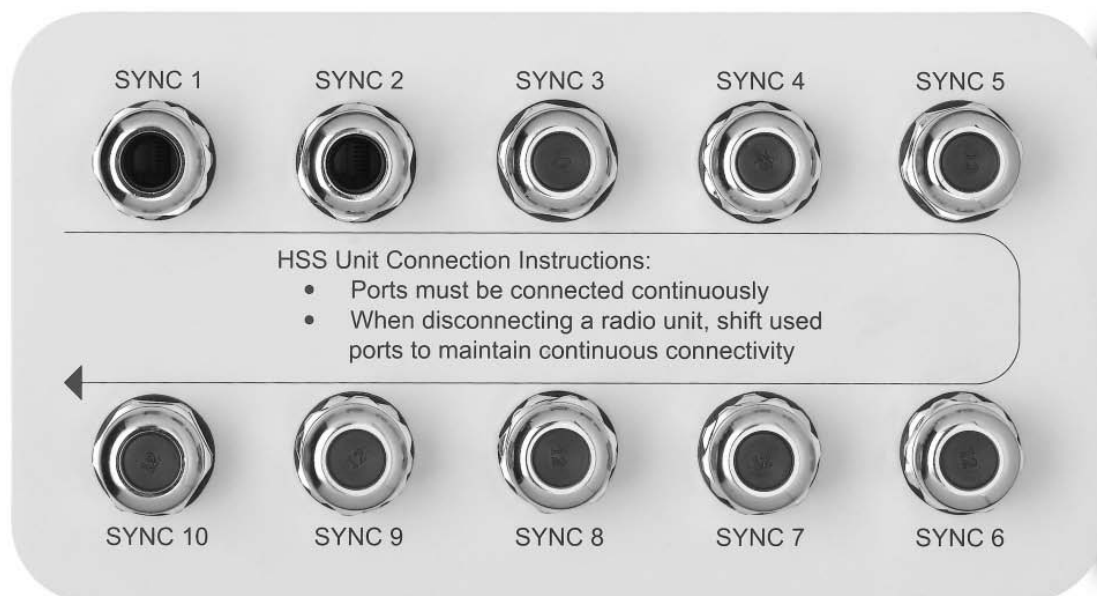


Figure 11-4: HSS Interconnection Unit



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

➤ **To connect an ODU to an HSS unit:**

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

### ***Using a Single HSS Unit***

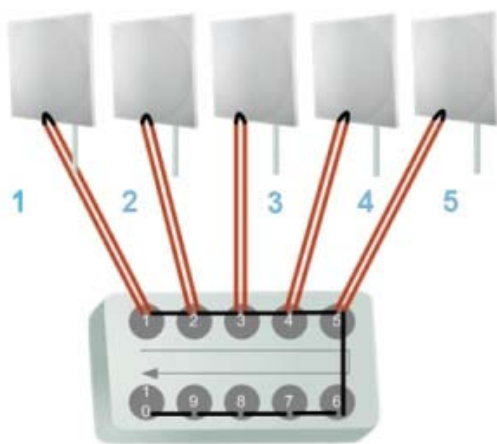


Figure 11-5: HSS Wiring schematic

The wiring, as shown in [Figure 11-5](#) 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 11-6](#). 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.

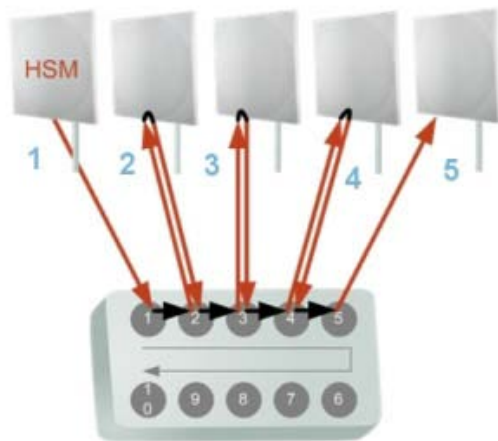


Figure 11-6: HSS sync signal path with ODU 1 as HSS Master

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

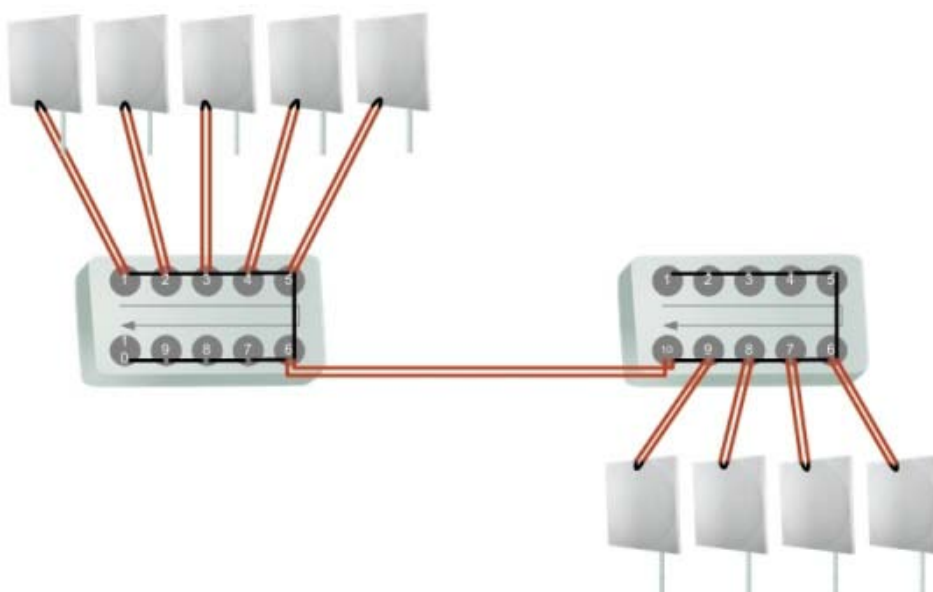


Figure 11-7: Cascading two HSS units

- To add a further HSS unit: Connect the next available SYNC port from the second HSS unit in **descending order** (SYNC 5 in [Figure 11-7](#)) to SYNC 1 of the third HSS unit.
- ODUs are connected to the third HSS unit from SYNC 2 as shown in [Figure 11-8](#), in **ascending order**:

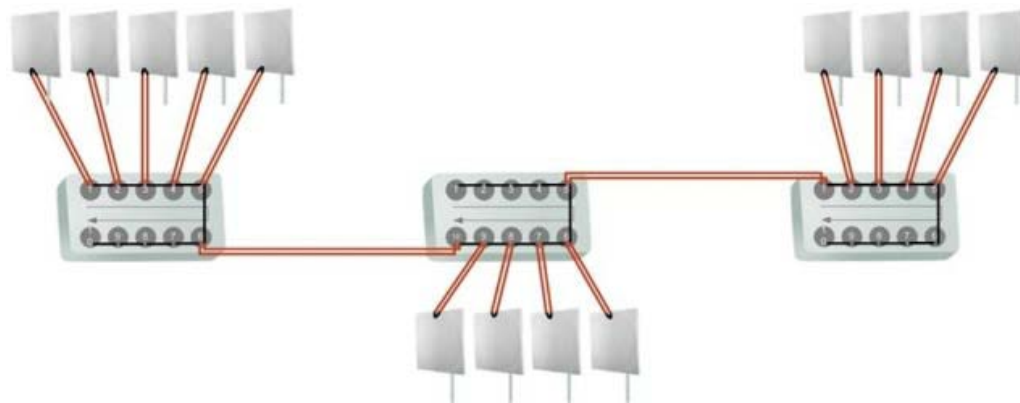


Figure 11-8: Cascading three HSS units

- 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.



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 11-7](#)**

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

Three cascaded HSS units as shown in [Figure 11-8](#)

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

## ODU/HSS Unit Connection Pinout

Table 11-1: 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. NetAstra radios use the Time Division Duplex (TDD) mechanism.

Under HSS, TDD enables synchronization of transmission for the collocated units as shown in [Figure 11-9](#):

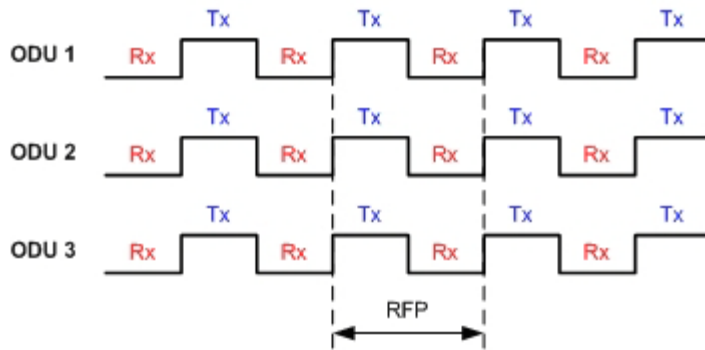


Figure 11-9: Radio Frame Pattern

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 11-2](#) and [Table 11-3](#).

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

Table 11-2: Radio Frame Pattern Table - NetAstra AU

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

Table 11-3: Radio Frame Pattern Table - NetStream

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

Table 11-4: Legend for Radio Frame Pattern Tables

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

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



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

### **RFP: General Radio Frame Pattern**

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

1. When synchronizing NetAstra AU units you must use RFP E
2. When synchronizing NetAstra AU with NetStream units you must use RFP E
3. RFP influences capacity and latency.
4. 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 both the HBS Site Configuration window.

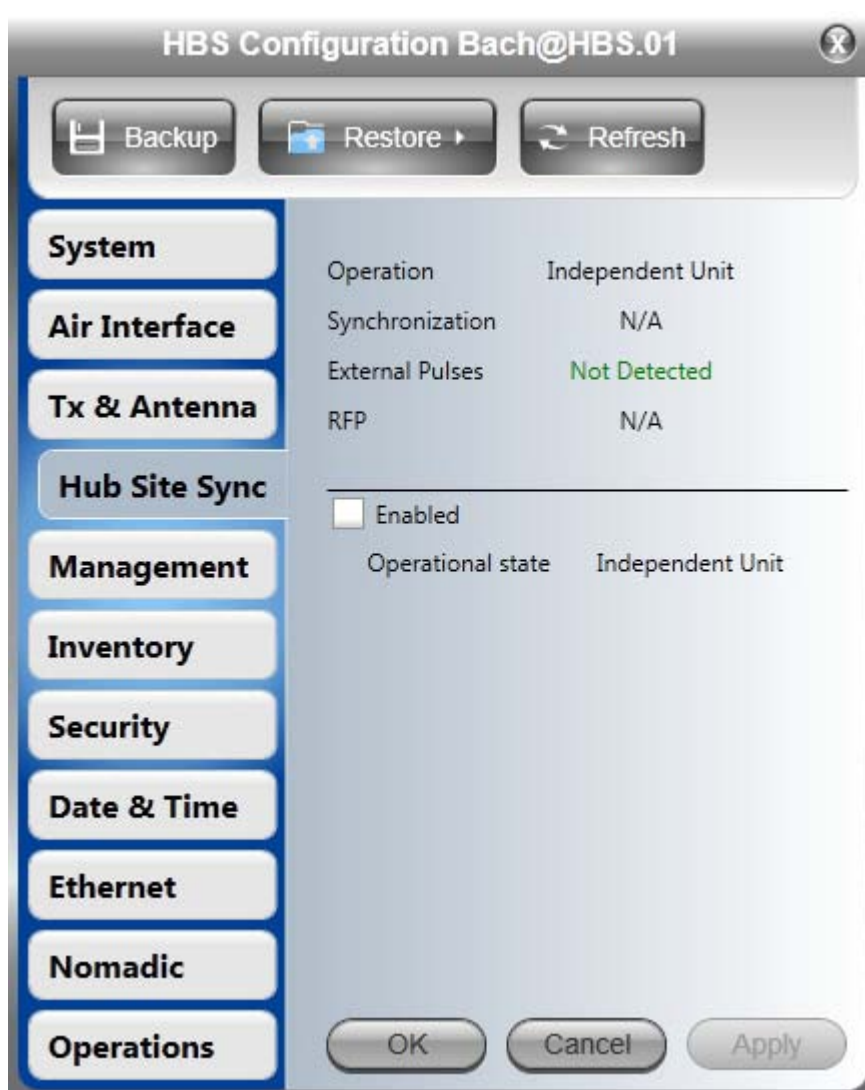


Figure 11-10: HSS Settings window

If you click the Enabled box, the central display (with **Operational state** opened) will look like this:

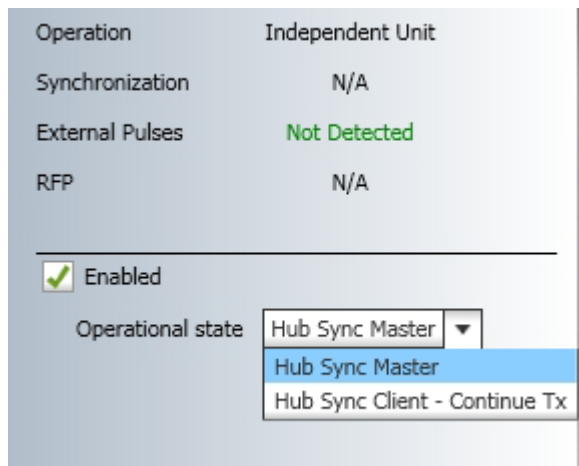


Figure 11-11: Setting HBS as HSM or HSC

**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:

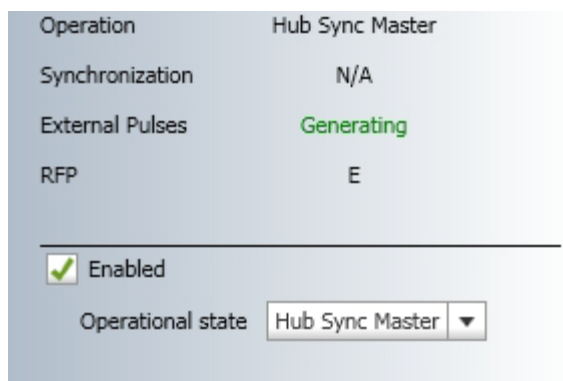


Figure 11-12: HBS as HSM

The possible External Pulses conditions are shown in the following table:



Table 11-5: External Pulse Status

HSS Sync Status	Meaning	Color code
Generating	ODU is HSM and generates the sync pulse	Green
Detected	ODU is HSC and detects the sync pulse	
Not detected	ODU is independent	
Generating and detected	HSM, but other HSM present	Orange
Generating and Improperly Detected	NetAstra AU is HSM, but detects a NetStream 5x36/5x06 or NetStream HSM signal that is not RFP E	
Not detected	HSC but no HSM present	
Improperly detected	HSC but HSM pulse doesn't fit the HSC as configured. Occurs only for NetAstra AU, which stops transmitting.	Red

# Chapter 12

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## Using the GSU

### What is it for

The GPS-based synchronization unit (GSS-U) is designed to handle intersite interferences under large-scale deployment scenarios.

The GSS-U (or just GSU for short) is an outdoor unit consisting of a standard NetStream 5x36 enclosure, a GPS antenna and a PoE device.

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

### GSU Functionality

The GSU receives a synchronization signal from the GPS once per second. It distributes a NetAstra 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 12-1](#), 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.

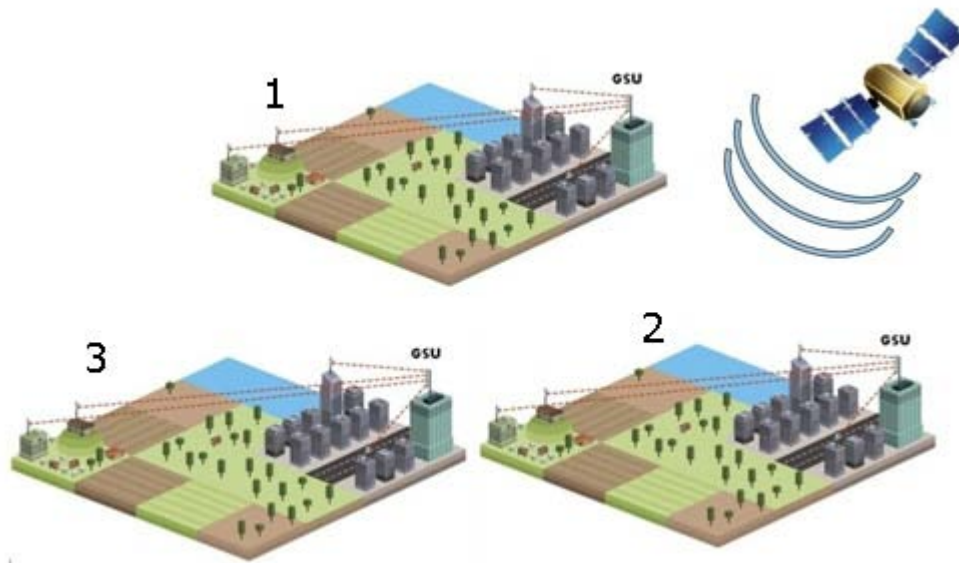


Figure 12-1: GSU Scenario - Independent distributed sites

### ***Multiple Distributed Sites with Communication***

What happens if, in [Figure 12-1](#), the GSU towers themselves have radios communicating as shown in [Figure 12-2](#)?

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 12-3](#). 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.

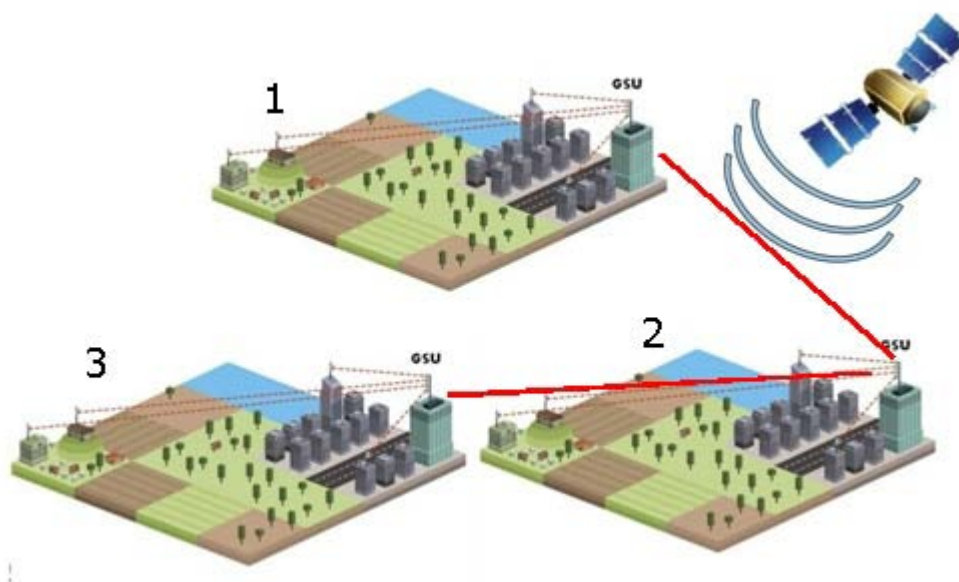


Figure 12-2: GSU Scenario - Communicating distributed sites

### 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 12-2](#). The GSU towers are numbered and marked for be cascading, 1-2 and 2-3. There should **not** 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 12-3](#).

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.

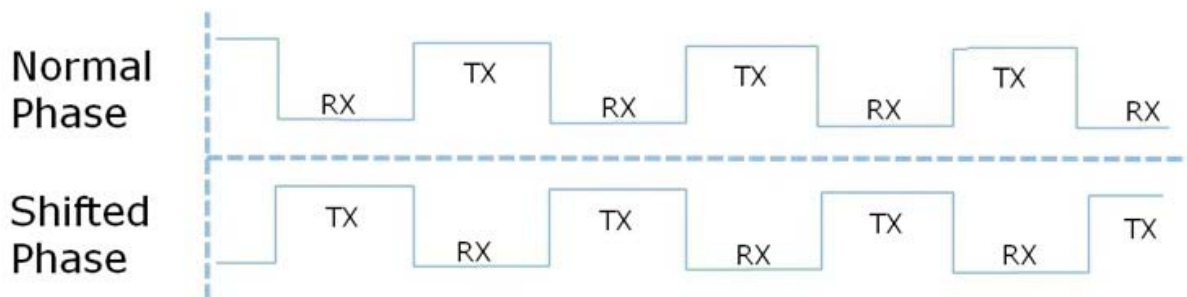


Figure 12-3: Phase shifted transmission - phase shift is 1/2 the RFD

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

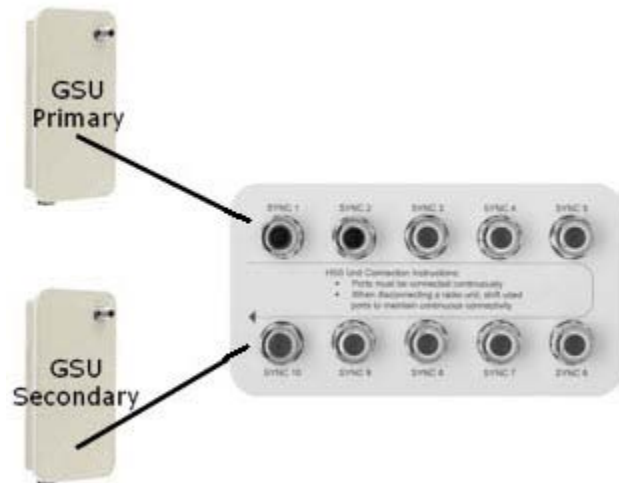


Figure 12-4: Make the GSUs the first two collocated units  
Redundancy switching is completely transparent to the GSU-managed links.

## GSS-U Kit Contents

The GSS-U package includes:

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

## GSS-U Installation

### *Overview*

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

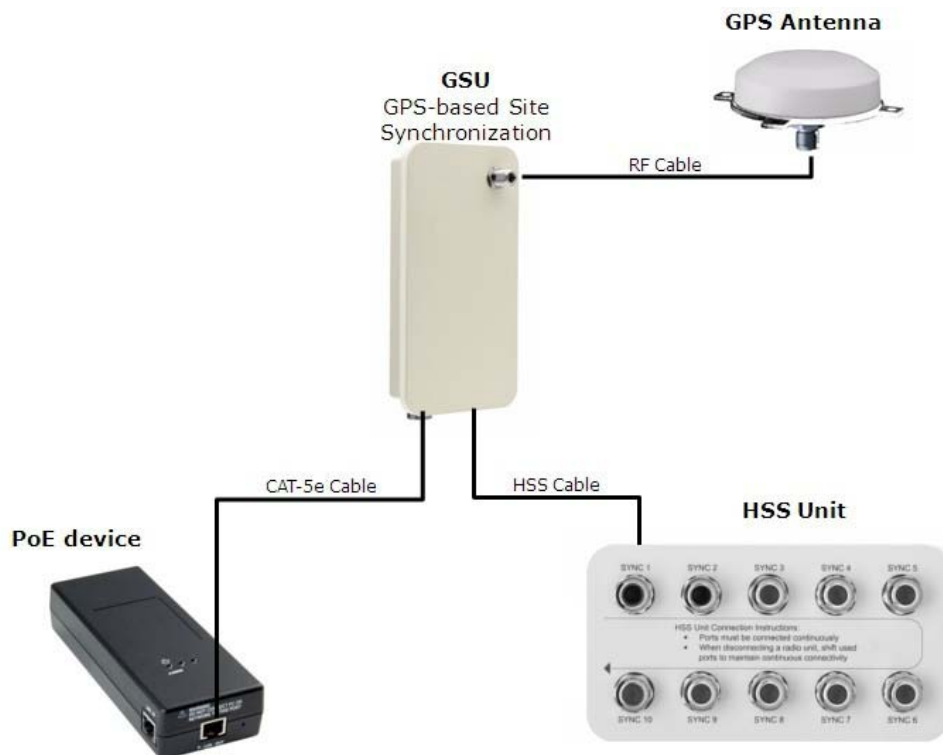


Figure 12-5: General GSU configuration

In that respect, all of the considerations of [Chapter 3](#) of the use Manual apply to the GSU. It may be configured using the regular Link Manager or Telnet.

### ***Preparing the GSU for Use***

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

### ***Mounting the GSU***

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

### ***Configuring the GSU***

#### **Getting Started**

To configure the GSU, you log on to it, exactly as in [Chapter 4](#).

### The GSU Main Window

Here is the main window for GSU configuration:

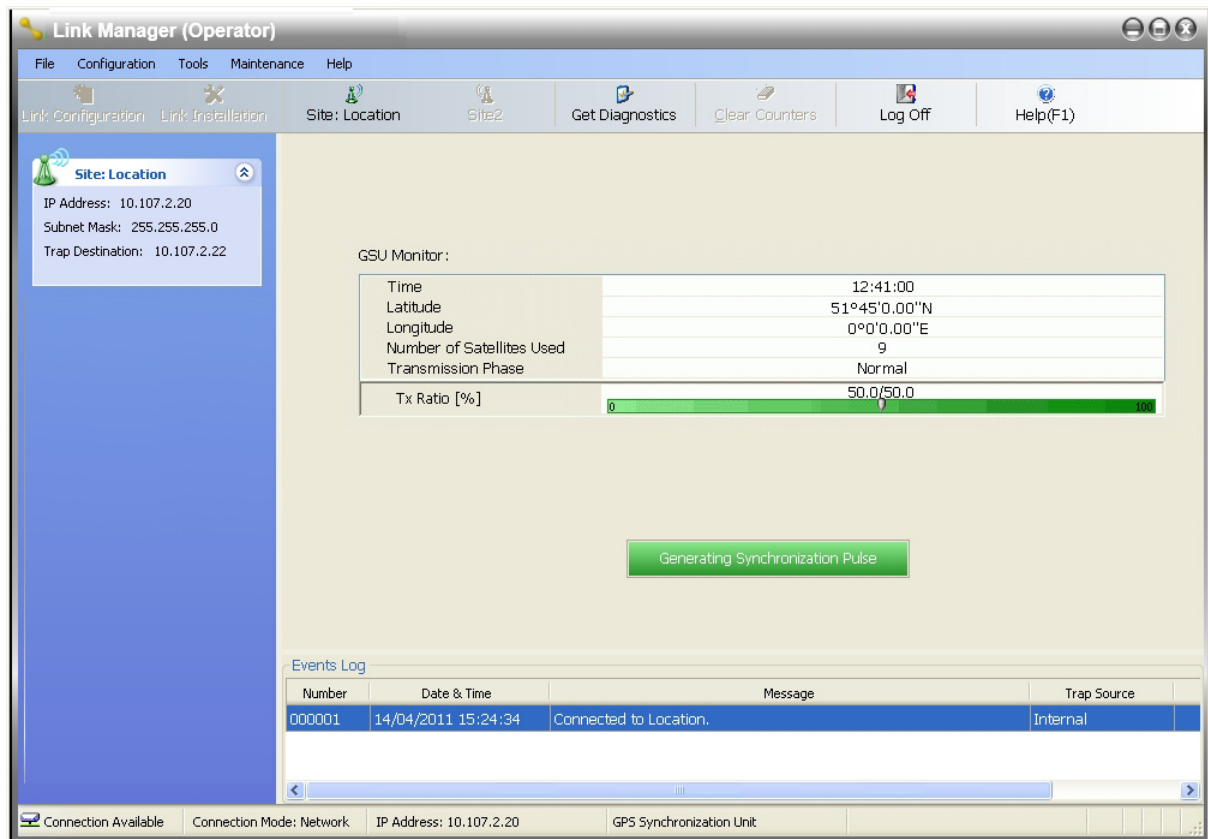


Figure 12-6: GSU Main window at startup

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

#### The Status Box

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



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



#### The Main Menu

The main menu is a subset of the main menu applicable to the NetStream 5x36. Notice that there are no Installation or Configuration wizards. Such configuration as is necessary is carried out using a modified version of Site Configuration for NetStream 5x36.

Similarly, the Tool bar is a subset of that applicable to the NetStream 5x36.

## Using Site Configuration for the GSU

### *Site Configuration: System*

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

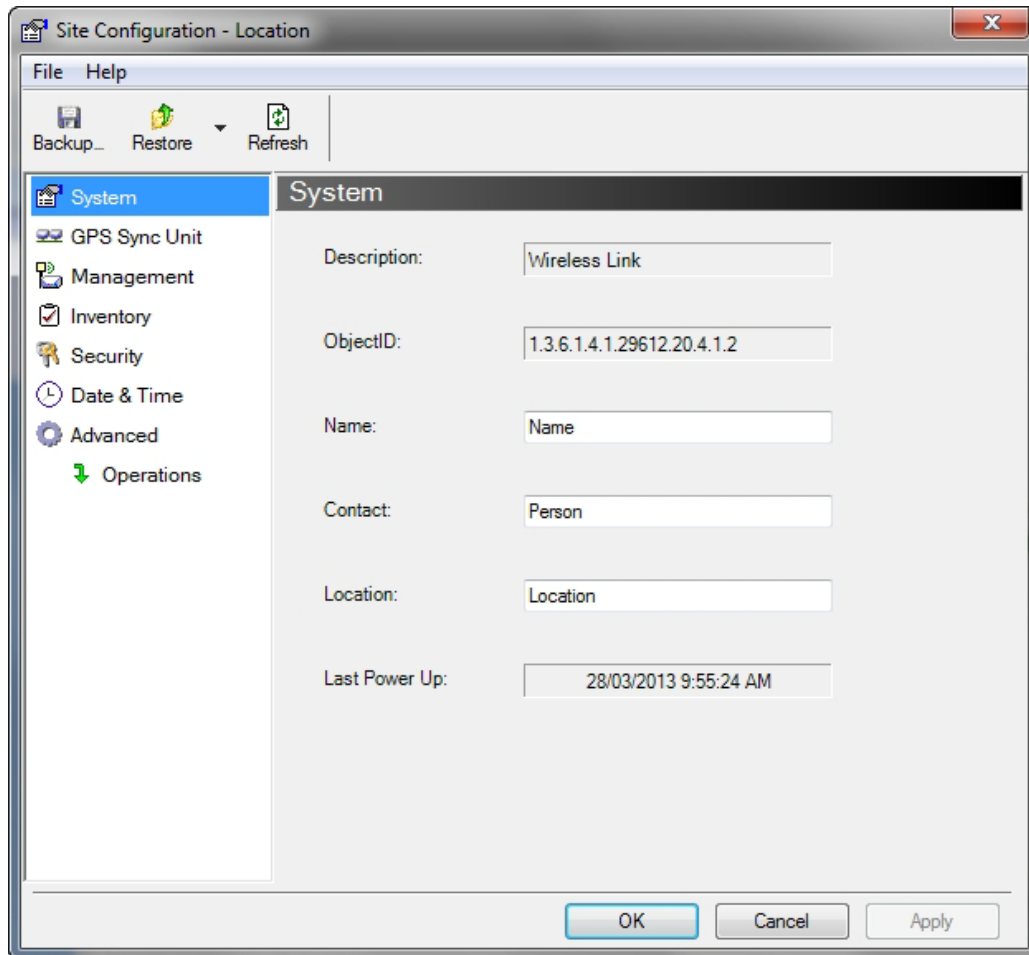


Figure 12-7: Site Configuration: System

It is similar to that of the NetStream 5x36.



**Site Configuration: GPS Sync Unit**

This window is the main GSU configuration tool:

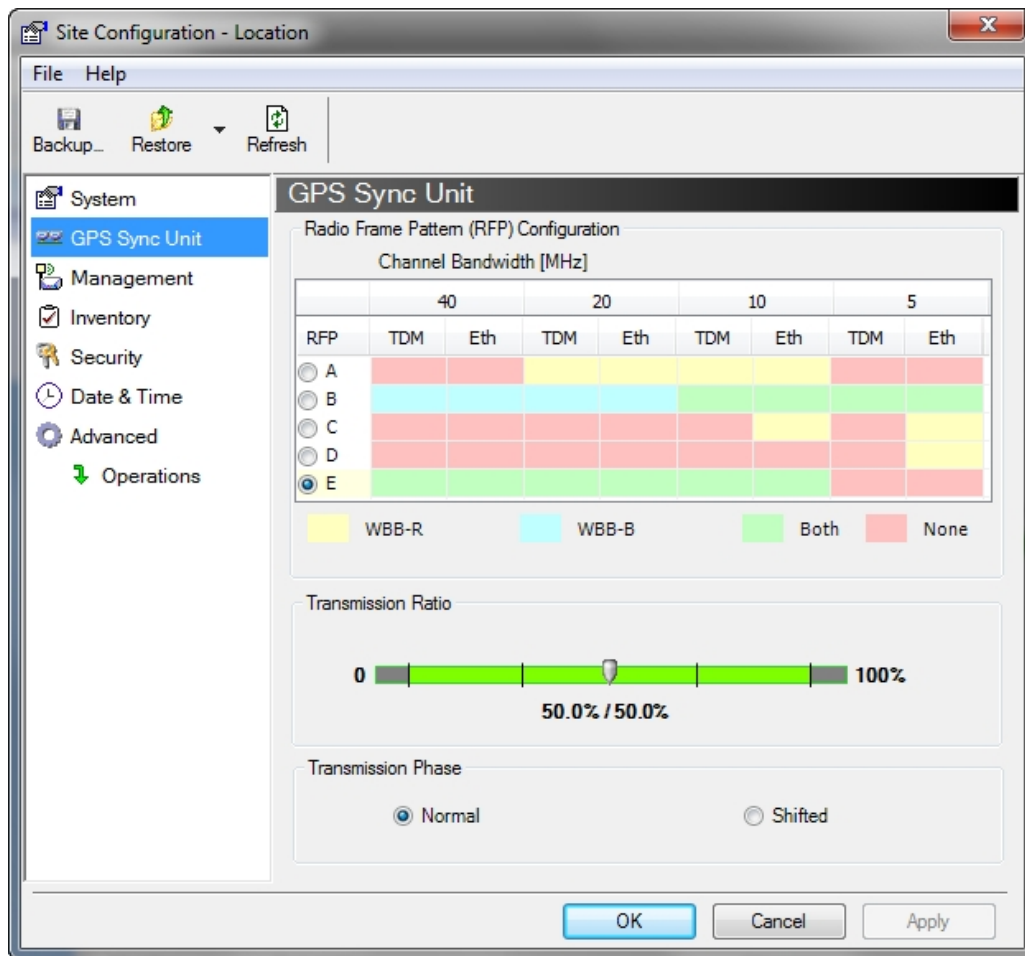


Figure 12-8: Site Configuration: GPS Sync Unit



**Note**

The WBB-R label refers to NetStream 5x36 and 5x06 and WBB-B refer to all other NetStream radios. The actual annotation seen may vary, but the intention should be clear.

### 1. Setting the RFP for HSS

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







**Note**

Ensure that no other collocated ODU is configured as HSM.

If the hub site consists only of NetStream 5x36 and 5x06 units, then any suitable RFP may be chosen. If there are one or more NetStream 5x200/5x50/5x25/5x10/5x05 units, you must use RFP B or E.

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

You May use RFP/Channel Bandwidth combinations with this color	For these collocated radios
	NetStream 5x36 and 5x06 only
	NetStream 5x200, 5x50, 5x25, 5x10 and 5x05 only
	All NetStream, NetAstra AU 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 do 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 12-3](#) above).

## 2. Setting the Tx Transmission Ratio

Since the GSU is always HSM, it must be able to cater for hub site NetStream 5x200 based links. (See the NetStream User Manual). If you use asymmetric allocation, shifted transmission phase becomes unavailable and you cannot “cascade” links as described in step 1.

## 3. Choosing the Transmission Phase

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

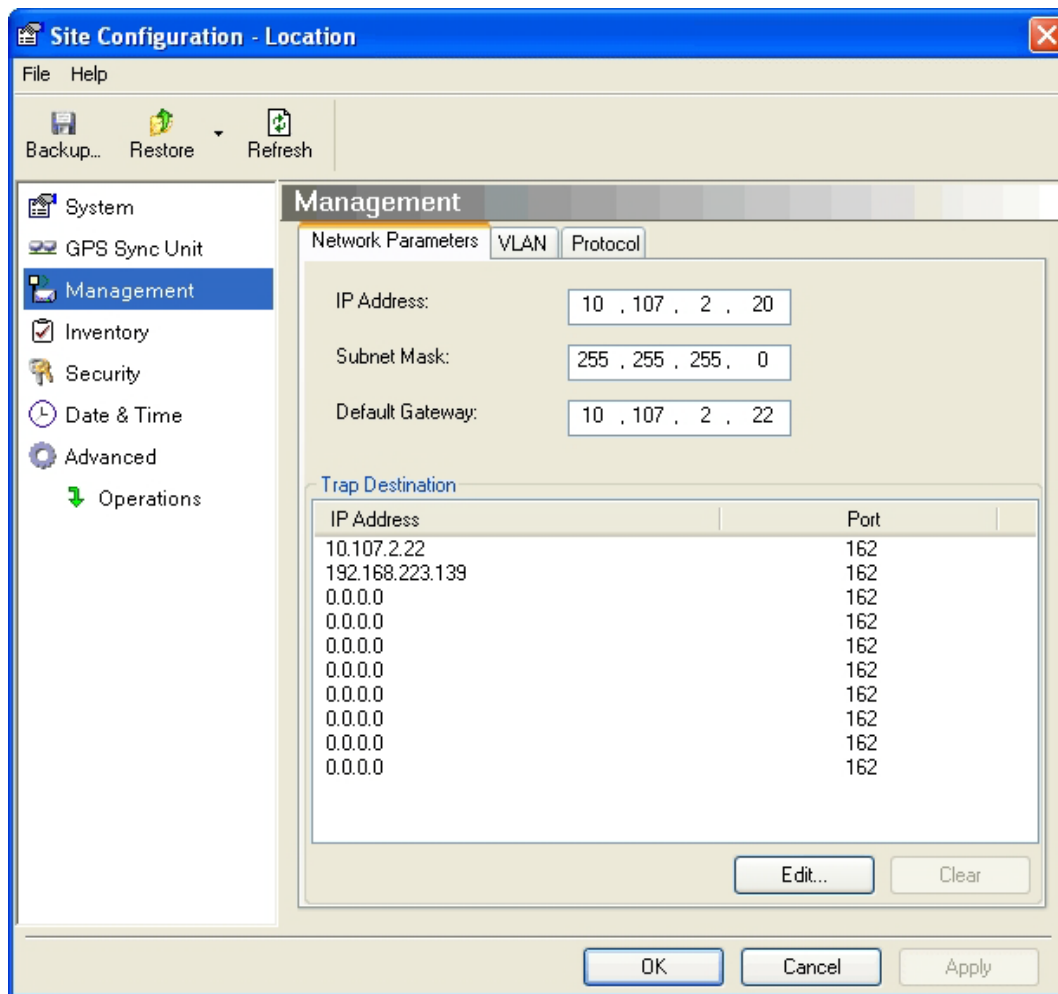
**Site Configuration: Management**

Figure 12-9: Site Configuration: Management

Here you set the GSU IP address, subnet mask and gateway. You also set trap addresses here. It is identical to the corresponding panel for NetStream 5x36 and 5x06.

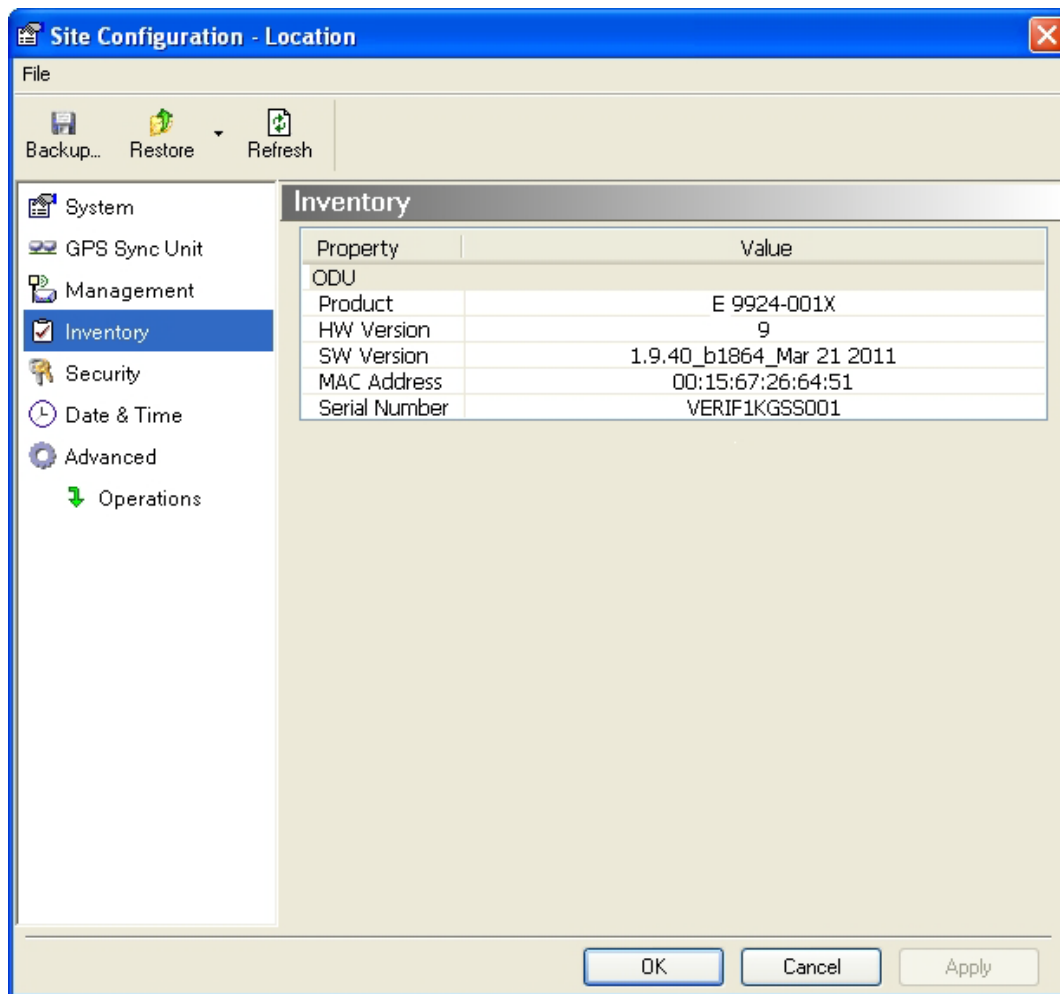
**Site Configuration: Inventory**

Figure 12-10: Site Configuration: Inventory

**Site Configuration: Security**

You can only change the SNMP Community strings:

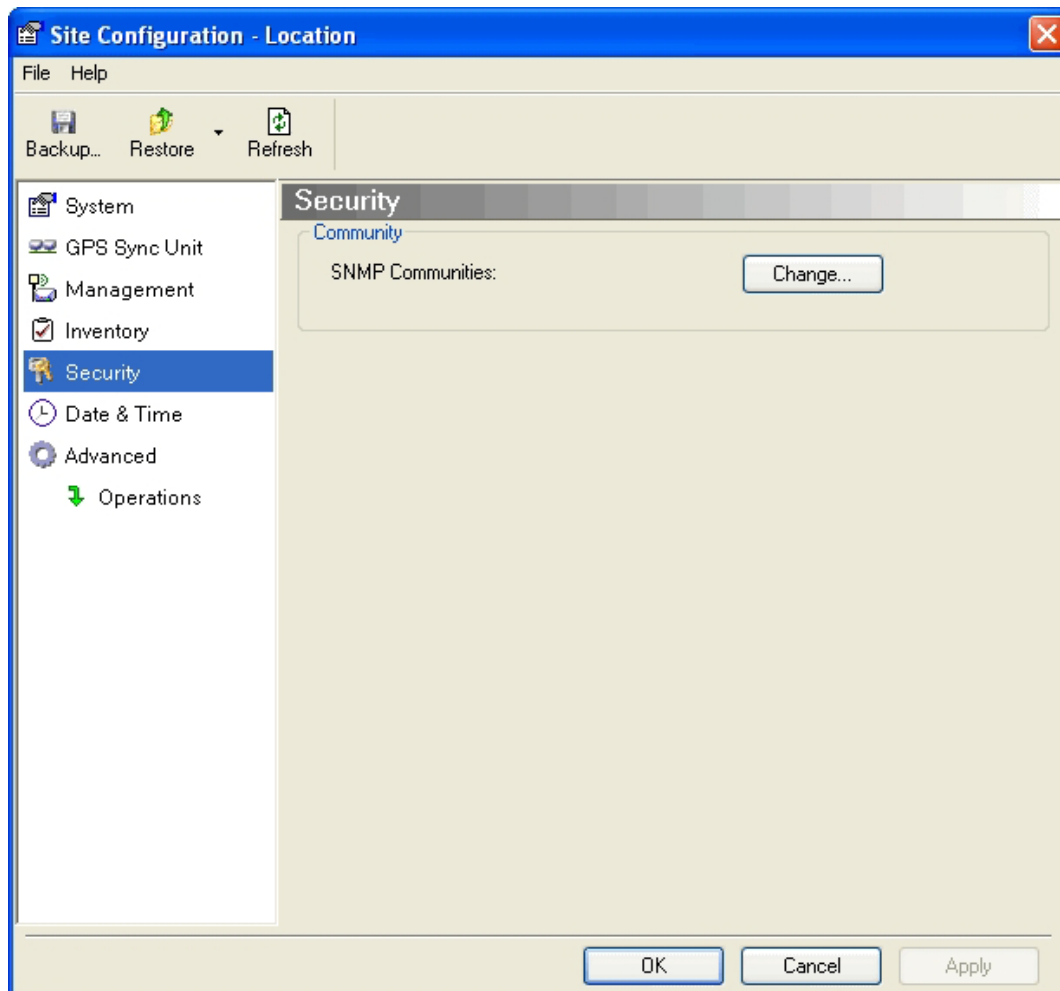


Figure 12-11: Site Configuration: Security

**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).

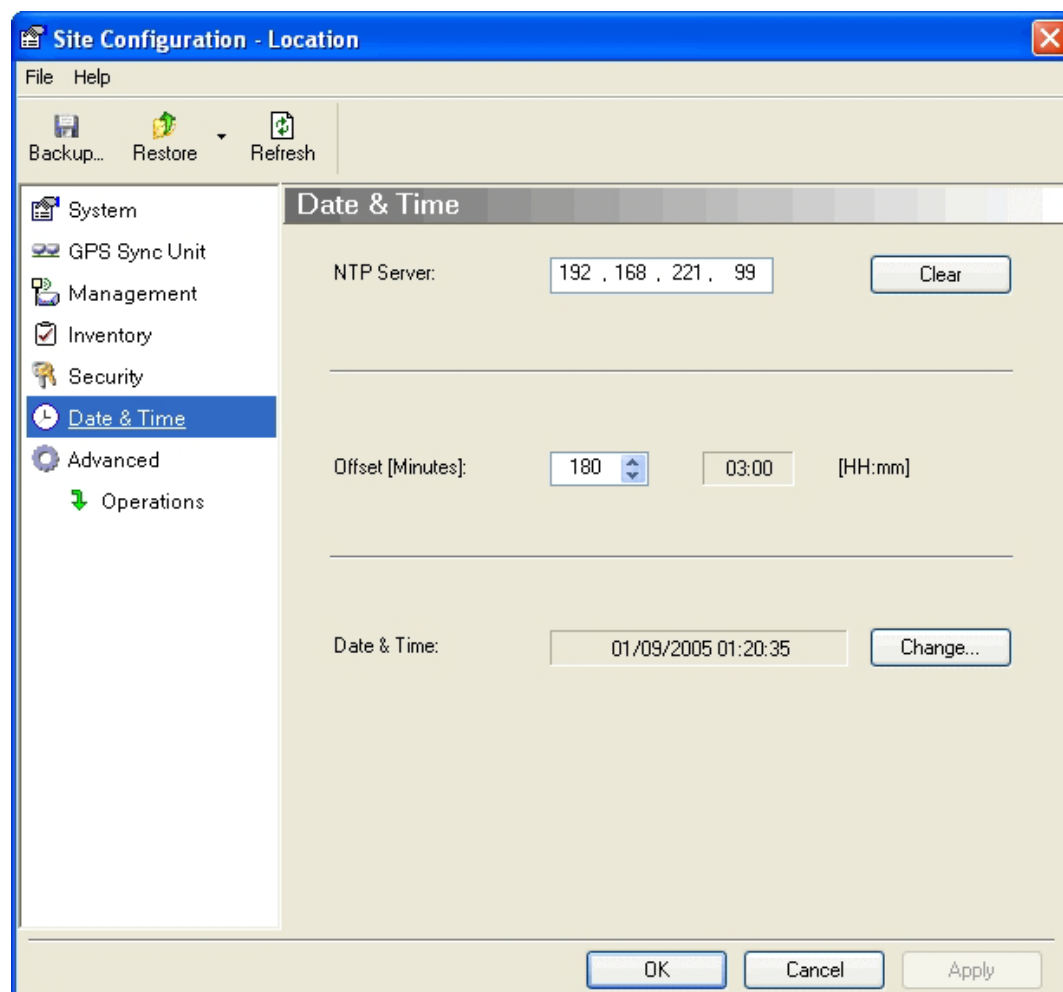


Figure 12-12: Setting the date and time for trap reporting

**Site Configuration: Operations**

The only available action here is Restore System Defaults:

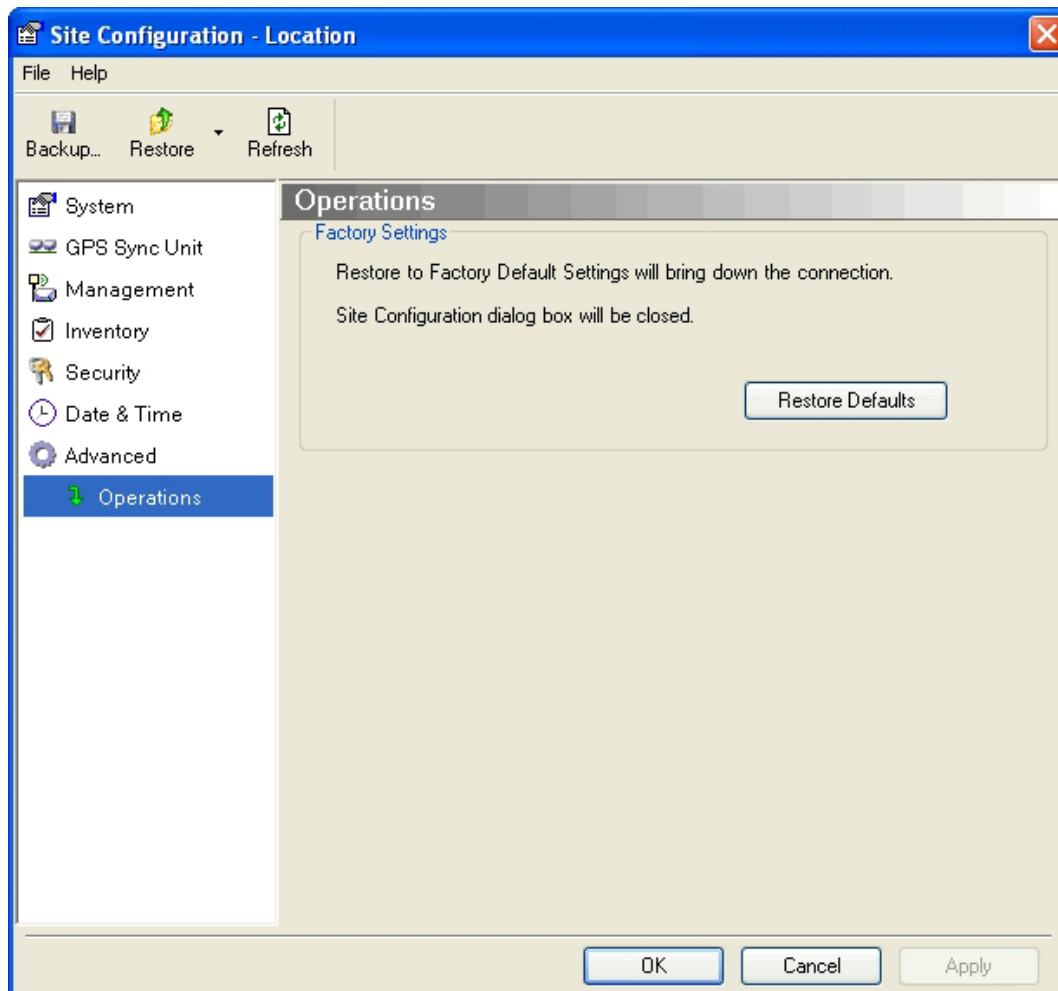


Figure 12-13: Site Configuration: Operations

## GSU Preferences

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

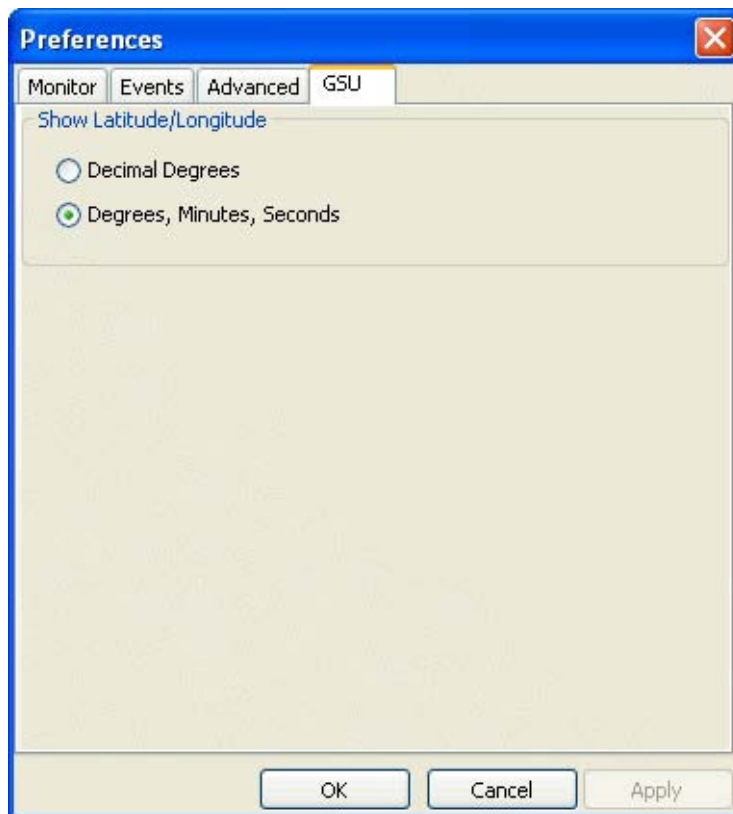


Figure 12-14: Site Configuration: Operations

You may choose the units for latitude/longitude coordinates.

## GSU Monitoring and Diagnostics

The monitoring and diagnostic reports are similar to those of NetStream 5x36 and 5x06.

## 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 NetStream 5x36 and 5x06 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](#).

# Part 5

## Advanced Installation Topics



## Software Upgrade

### What is the Software Upgrade Utility?

The Link 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 Link Manager, click the **Software Upgrade** button. The following detached window appears:

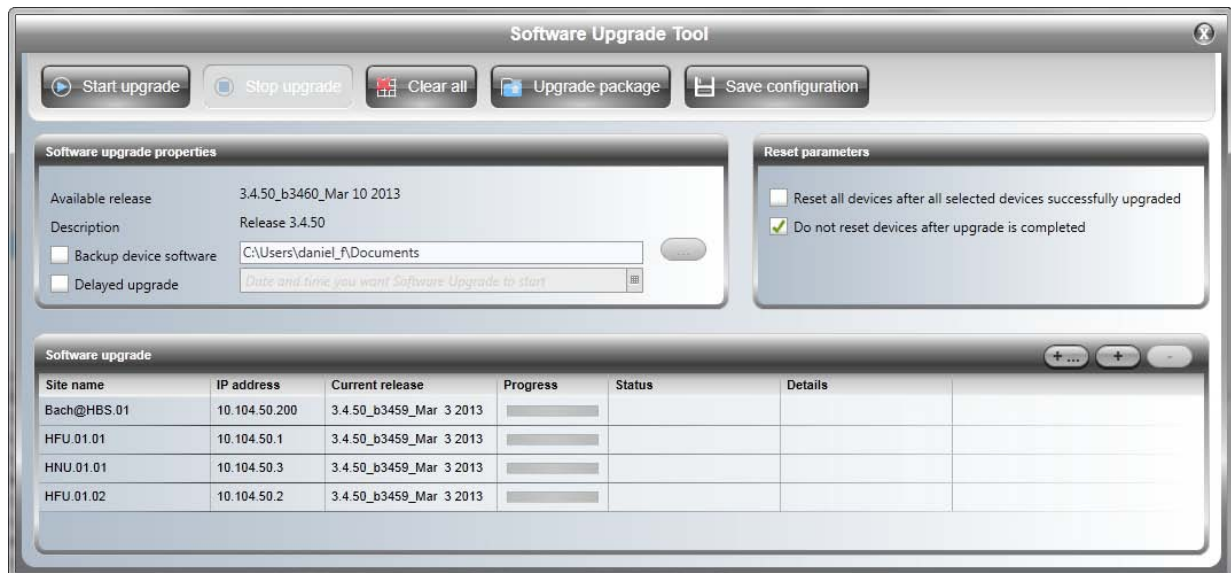


Figure 13-1: Software Upgrade Utility - Main window

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 Link Manager “offline”.

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



Figure 13-2: Add/Remove site buttons

The **left button** opens up a Windows file dialog to locate a list of locations to update. The list has the following format:

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

The list should include HBSs and HSUs able to accept the same upgrade. This is unlikely to be a problem unless you are using equipment prior to the 3.3.00 release of Wireless Mux PtMP. Non-upgradable items will result in an error message. Contact Customer Support about upgrading them.

The **center button** allows you to add a single site:



Figure 13-3: Adding a single site for upgrade

Enter the IP address of the site, the Read-Write Community (Default: *netman*) and then click **OK**. The site will appear in the Software Upgrade list box.


Items from the list can be cleared by selecting them and then using the **right button**:

3. Having created an update list, click **Upgrade Package** to choose the relevant files. The default files are located in the **SWU** subdirectory in the Link Manager installation area. You may see one or more of the following SWU files:

Table 13-1: SWU Files by product

File name	Product
SWU_1k.swu	NetStream 5x36 and 5x06
SWU_2k.swu	NetStream
<b>SWU_5k.swu</b>	<b>NetAstra PtMP</b>
SWU_gs.swu	Netronics GSU

For NetAstra PtMP, always choose SWU\_5k.swu.

4. 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.

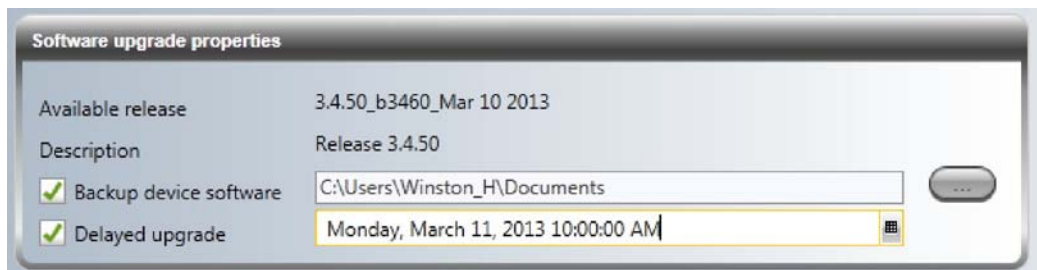


The backup here is the same as that on page 174, and serves the same purpose. It provides a fallback if the upgrade proves problematic.

5. 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. A Calendar dialog box opens



- 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. Here is a typical delayed upgrade scenario:



- 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:

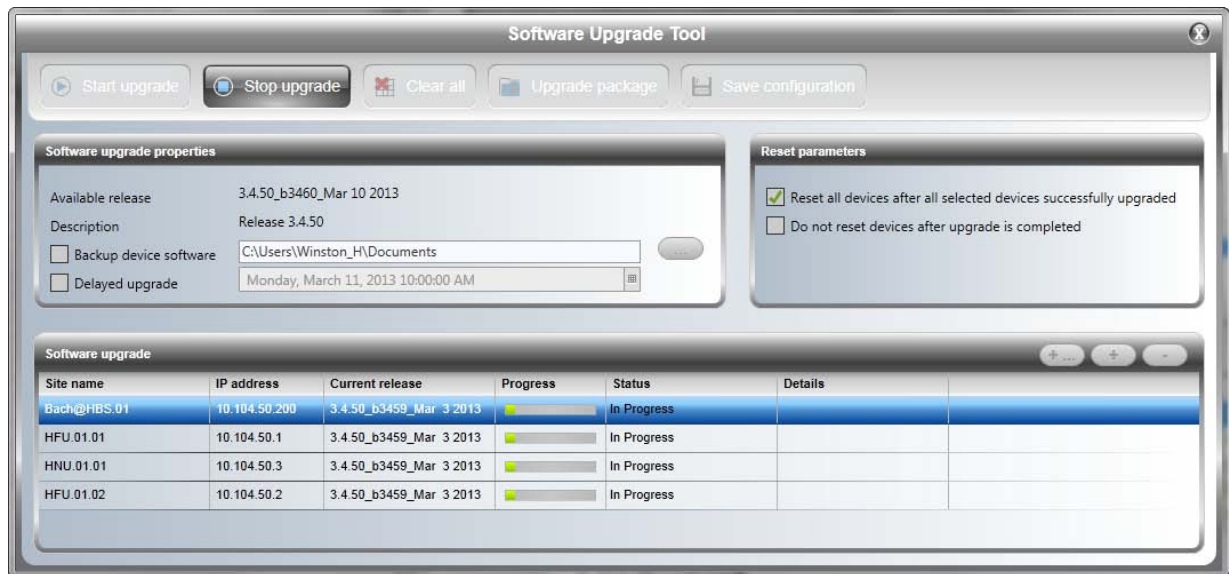


Figure 13-4: Software upgrade in progress - Note the stop button

Site name	IP address	Current release	Progress	Status	Detail
Bach@HBS.01	10.104.50.200	3.4.50_b3459_Mar 3 2013		Reset done	
HFU.01.01	10.104.50.1	3.4.50_b3459_Mar 3 2013		Reset done	
HNU.01.01	10.104.50.3	3.4.50_b3459_Mar 3 2013		Reset done	
HFU.01.02	10.104.50.2	3.4.50_b3459_Mar 3 2013		Reset done	

Figure 13-5: Software upgrade completed successfully

- Use the title bar exit button to dismiss the Software upgrade window.



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.



## VLAN Functionality with NetAstra PtMP

### VLAN Tagging - Overview

#### *VLAN Terminology*

Both the technical literature and the Link 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](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 NetAstra 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:

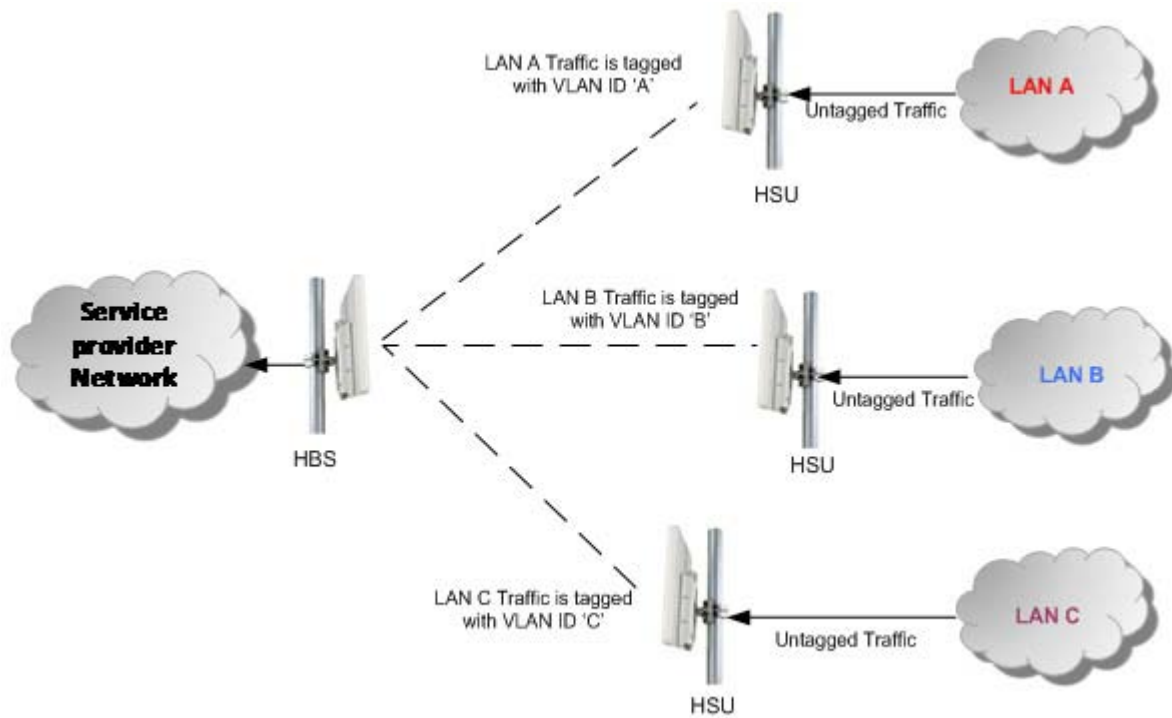


Figure 14-1: VLAN scenarios handle by NetAstra AU

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.

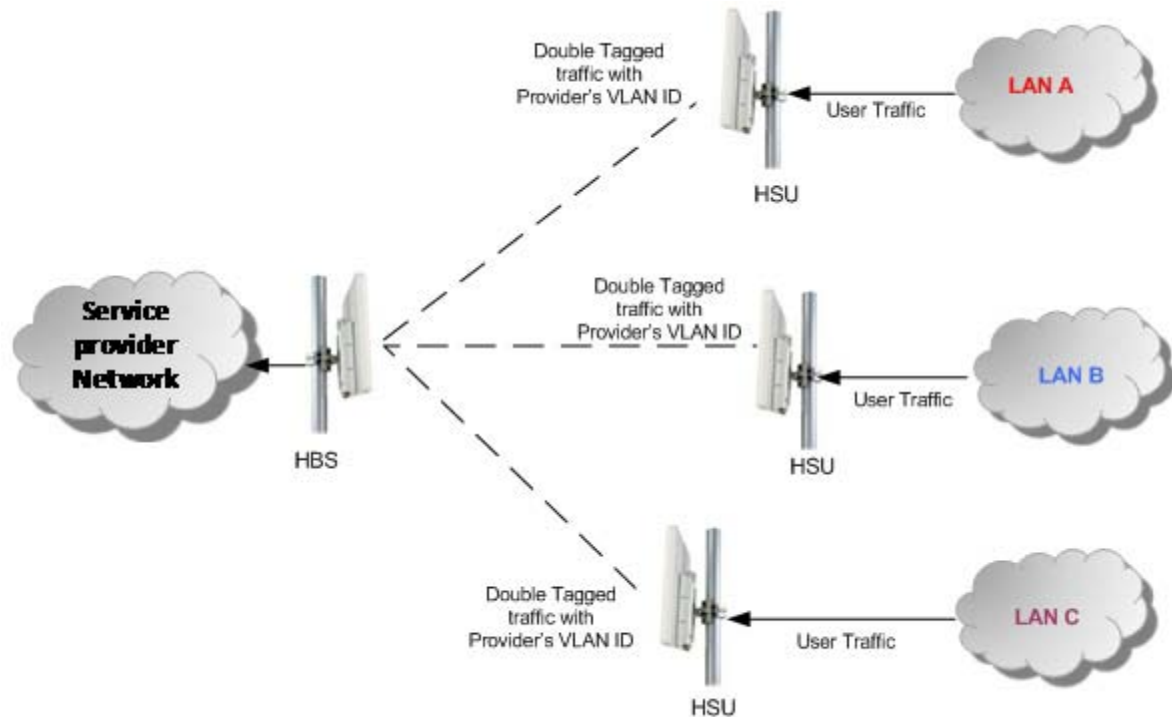


Figure 14-2: Separating client data streams using double tagging

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,
  1. 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
  2. For a frame with a VLAN tag – the system will add a tag with VLAN ID and EtherType = 0x9100 so the frame will be double-tagged

For a frame with a VLAN tag and a provider tag – the system will add a tag with VLAN ID and EtherType = 0x9100 so the frame will be triple-tagged and so on.

### ***VLAN Untagging***

**VLAN Untagging** means the removal of a VLAN or a Provider tag.

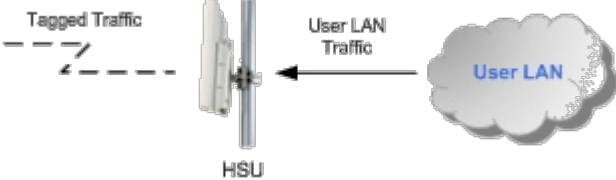
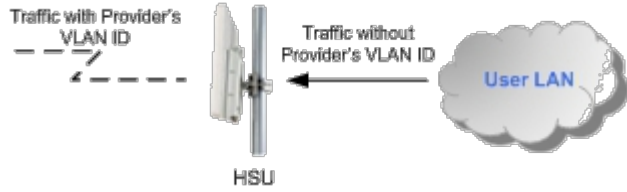
### ***Port Functionality***

VLAN functionality is supported at the MNG port of the HSU.

The HSU MNG port can be configured to handle Ethernet frames at **ingress direction** (where frames enter the HSU) and at **egress direction** (where frame exit the HSU).

### Ingress Direction

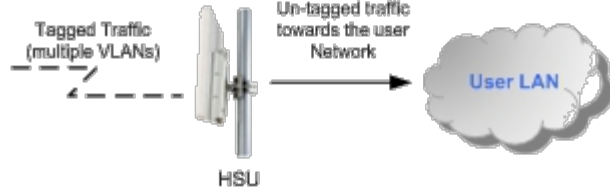
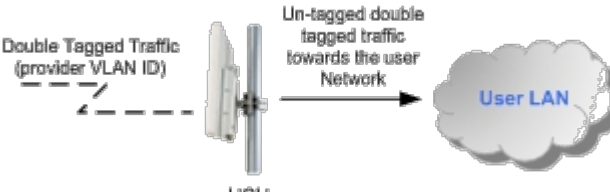
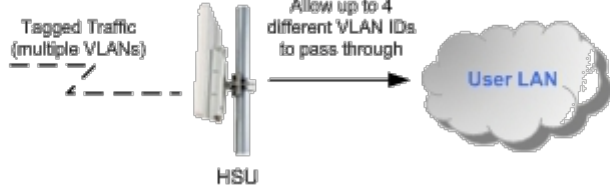
Table 14-1: Port settings - Ingress direction

<b>Transparent</b>	The port 'does nothing' with regard to VLANs - inbound frames are left untouched.
<b>Tag</b>	<p>Frames entering the HSU port without VLAN or QinQ tagging are tagged with VLAN ID and Priority<sup>a</sup>, which are pre-configured by the user. Frames which are already tagged at ingress are not modified and pass through.</p> 
<b>Provider tag</b>	<p>Frames entering the HSU port are tagged with provider's VLAN ID and Priority which are pre-configured by the user. Frames which are already tagged with Provider tagging at the ingress are not modified and pass through</p> 

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 14-2: Port settings - Egress direction

Transparent	The port 'does nothing' with regard to VLANs - outbound frames are left untouched.
Untag all	<p>Port configured to untag user VLAN tags for all frames.</p> 
Untag double tagged	<p>Frames are tagged QinQ with a VLAN ID, which is configured by the service provider (Provider VLAN ID). The QinQ (provider) tags are removed. User tags are passed through.</p> 
Filter	

### VLAN Configuration Using the Link Manager



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 NetAstra links and are provided "as is". Under no circumstances does Netronics accept responsibility for network system or financial damages arising from incorrect use of these VLAN facilities.

## Management Traffic and Ethernet Service Separation

### 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.

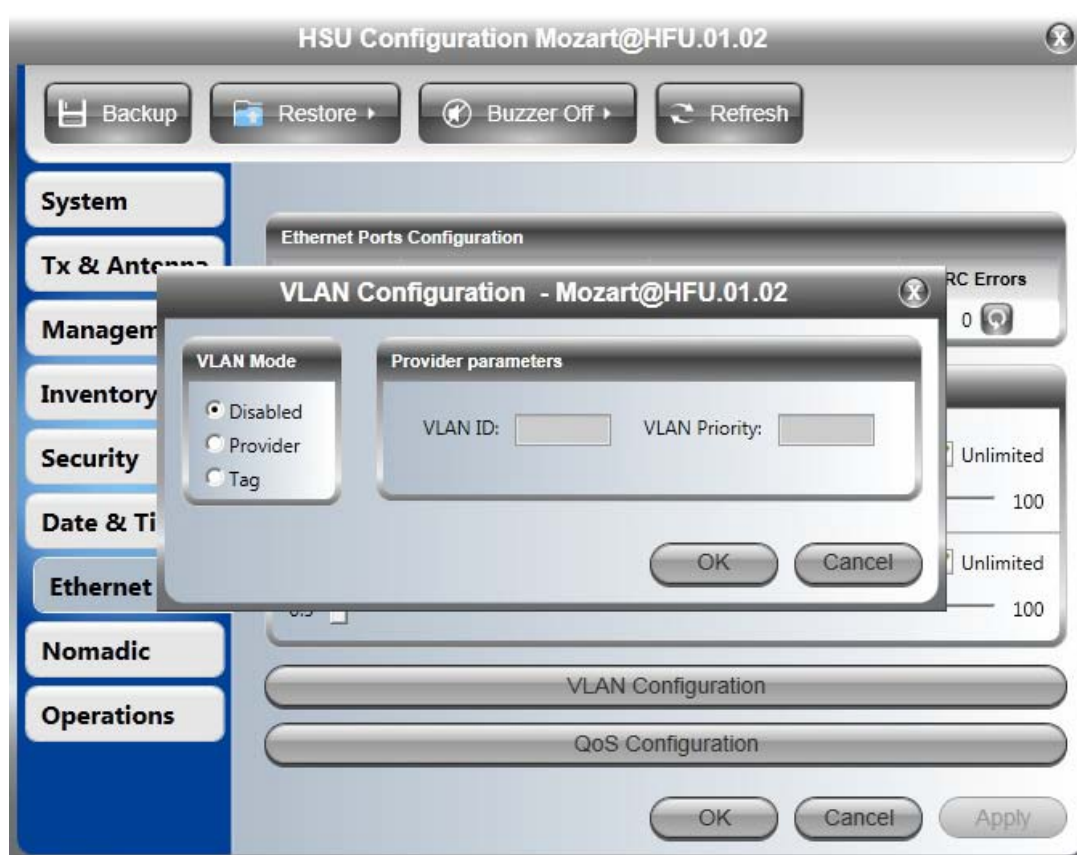
### Configuration of VLAN Tagging for Ethernet Service

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 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.

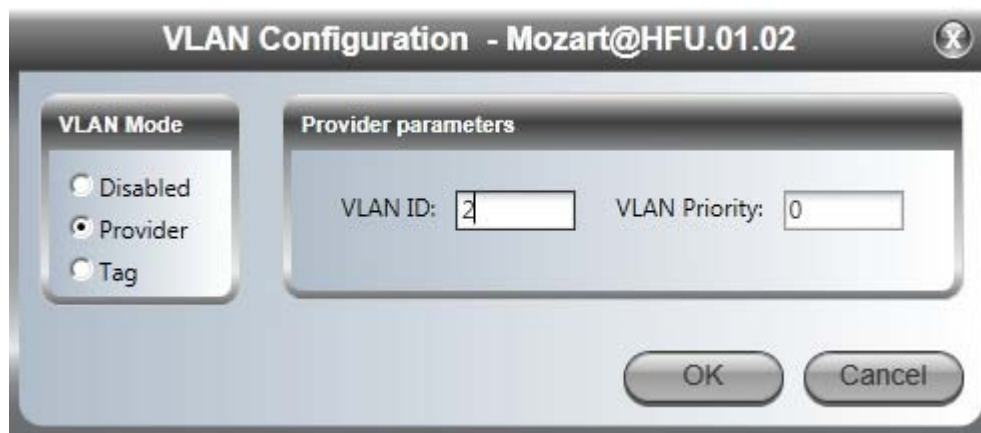
#### ➤ To set up an HSU for VLAN tagging:

1. Right click an HSU on the HBS window, and then click **Configure | Ethernet | VLAN Configuration**. The VLAN Configuration window is displayed:



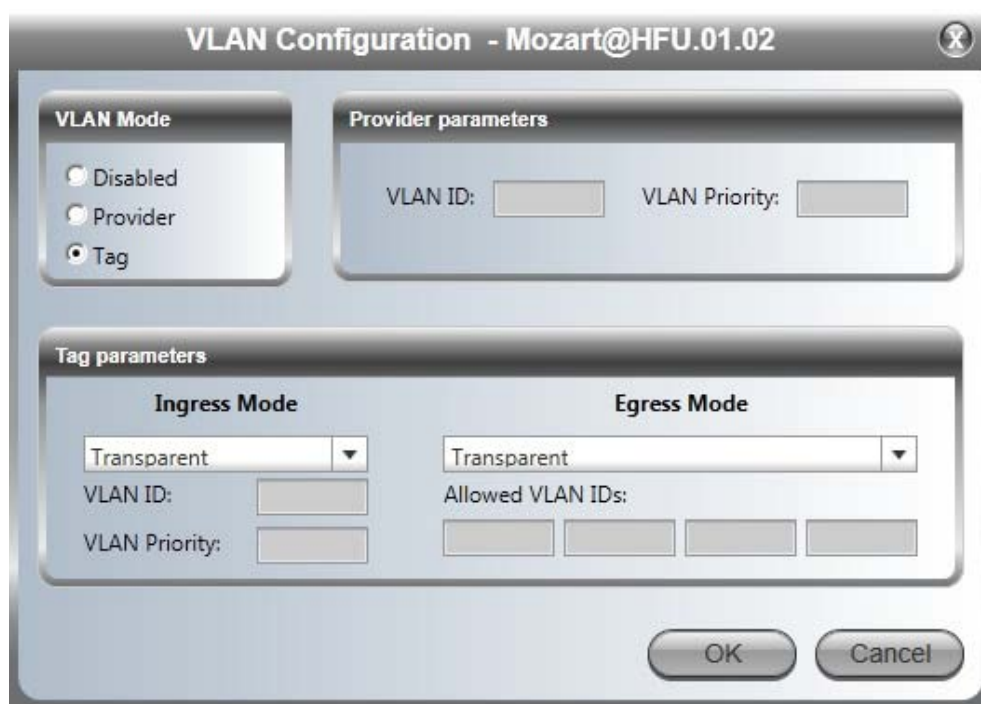
In **Disabled** mode, Ethernet frames pass transparently over the radio links.

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. Click **OK** to accept.
4. For user VLAN tagging, click the Tag Radio button:



In **Tag** mode Ethernet frames are tagged or untagged to distinguish between different networks.

5. 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:

Table 14-3: VLAN Configuration Options - Tag Mode

Ingress	Egress		
	Transparent	Untag All	Filter
Transparent	Nothing further required	Nothing further required	Allow up to 4 VIDs to be passed through
Tag: Enter a VLAN ID and Priority	Nothing further required	Nothing further required	Allow up to 4 VIDs to be passed through

6. Click **OK**.



## False Radar Mitigation Facilities

### Who needs it?

If you are using DFS frequency bands 5.3/5.4 GHz **FCC** and 5.4/5.8 GHz **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/ 5.8 GHz **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.

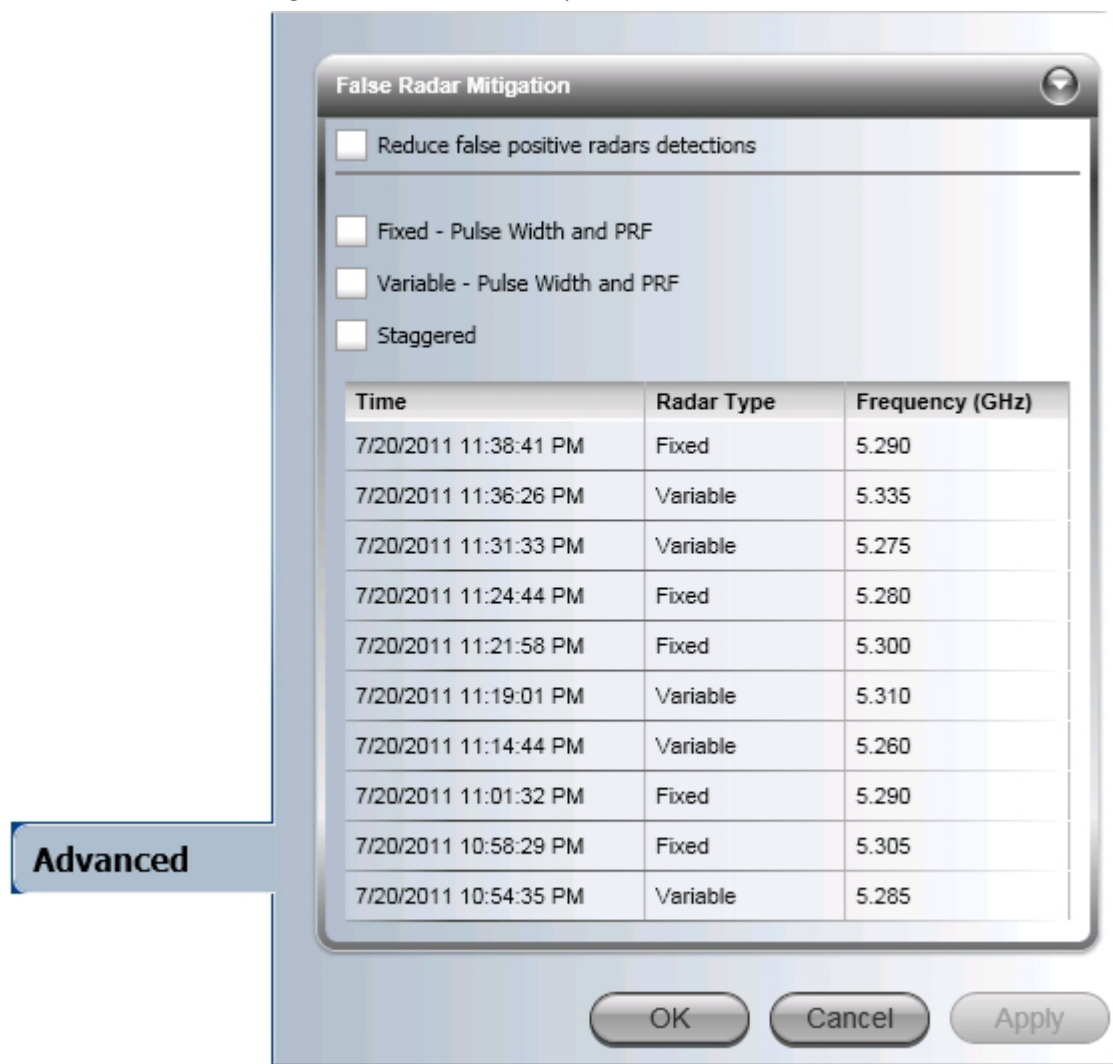


Figure 15-1: False Radar Mitigation

3. The DFS Frequency Status Table at the bottom of [Figure 15-1](#) 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 16](#).

# Chapter 16

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## FCC/IC DFS Considerations

### FCC 5.4 GHz 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 16-1](#) 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:

**WISPA**  
Wireless Internet Service Providers Association

Overview Search User Signup | Login

Powered by: **SPECTRUM BRIDGE**

**UNII Device Interference Advisor (UDIA)**

The UNII Device Interference Advisor (UDIA) is an online database and registry containing detailed information about Terminal Doppler Weather Radar (TDWR) systems and registered UNII devices.

This tool allows a user (network operator or installer) to:

- Search and confirm if their device is operating within 35 km proximity of TDWR site(s)
- Voluntarily register certain technical information into the online database

[User Registration](#)

**Background**

TDWRs are Doppler weather radar systems strategically positioned near 47 major airports to detect wind shear and microbursts associated with thunder storms, to increase the safety of aircrafts landing and departing from airports.

TDWR frequencies (5.60-5.65 GHz) are shared with Unlicensed National Information Infrastructure (UNII) band frequencies (5.47-5.725 GHz) which are used by many Wireless ISPs and other outdoor wireless network operators. As a result, it is essential that systems and policies are effective in mitigating interference issues.

The UDIA database was developed to promote cooperation between the federal agencies including the National Telecommunications and Information Association (NTIA), the Federal Communications Commission (FCC), the Federal Aviation Administration (FAA) and the wireless industry and to ensure safe and effective operation of the FAA's TDWR network.

[Search for Terminal Doppler Weather Radars](#)

FCC Memorandum on UNII Device Operation  
Do Your Part To Share The Air  
UDIA Press Release

Copyright © 2010 Spectrum Bridge, Inc.

2. Click the **User Registration** button to enter the registration page.

WISPA<sup>®</sup>  
Wireless Internet Service Providers Association

Overview Search User Signup | Login

### User Registration

Already have an account? [Sign in](#)

Email  (This will be your username)

First Name

Last Name

Business Name

Phone

Country

Address

City

State/Province

Zip/Postal Code

Type of Registrant

Security Question

Security Answer

Password

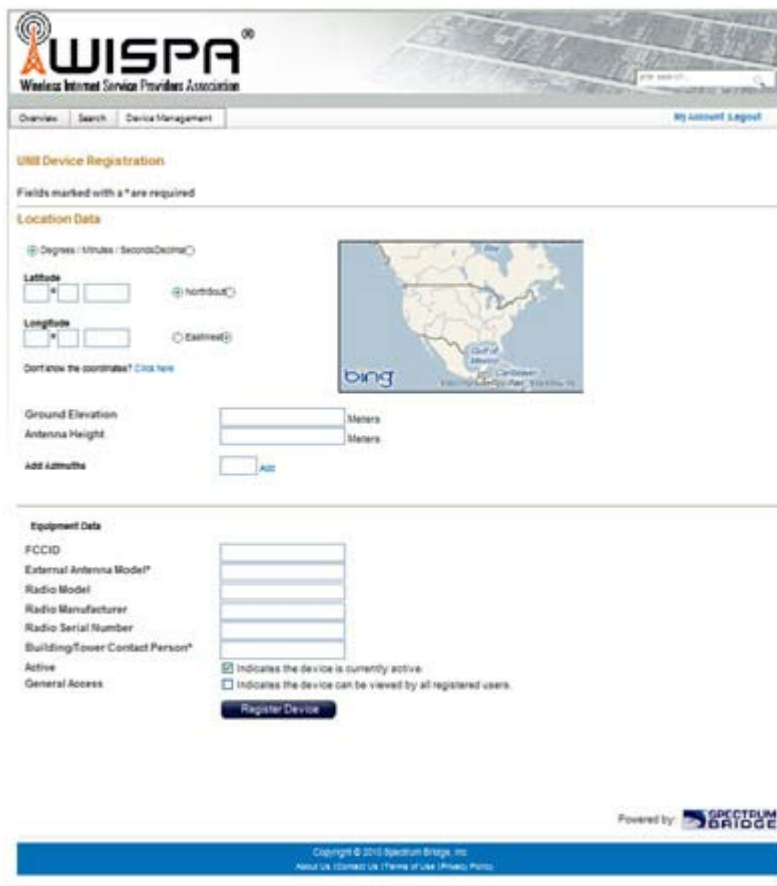
Confirm Password

Powered by: SPECTRUM BRIDGE

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 16-1: 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	WOODBIDGE	W 074 16 13	N 40 35 37	5620 MHz	19	113



Table 16-1: Latitude and longitude locations of TDWRs (Continued)

STATE	CITY	LONGITUDE	LATITUDE	FREQUENCY	TERRAIN ELEVATION (MSL) [ft]	ANTENNA HEIGHT ABOVE TERRAIN [ft]
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
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

## 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.

NetAstra PtMP sectors support two classification criteria, VLAN based or Diffserv based. You may choose which of them to use.

Table 17-1: Default priorities and 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 17-1](#).

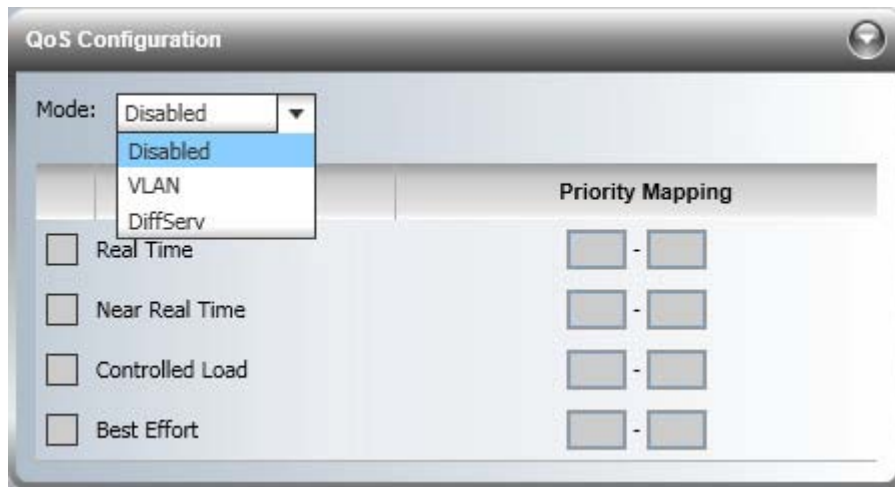
### Setting up QoS

QoS for NetAstra is set up in two phases:

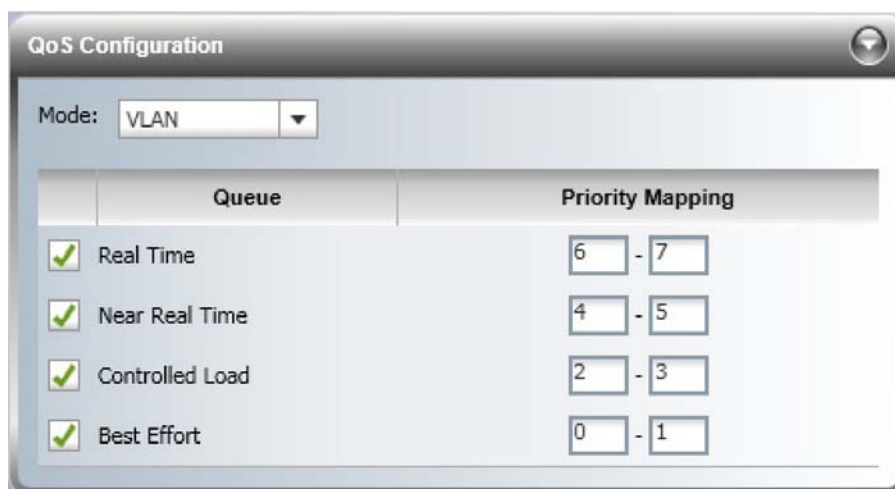
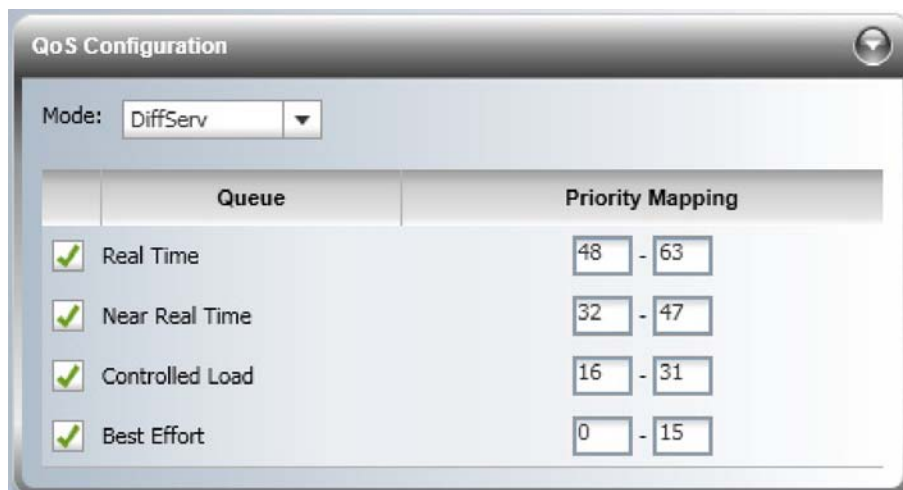
1. The required queues for the sector and their respective priority mappings must be chosen.
2. For each HSU you must configure the required queues, queue weights and queue Maximum Information Rate (MIR). The latter must be done for both the Uplink and Downlink directions.

### 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 uncheck 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:

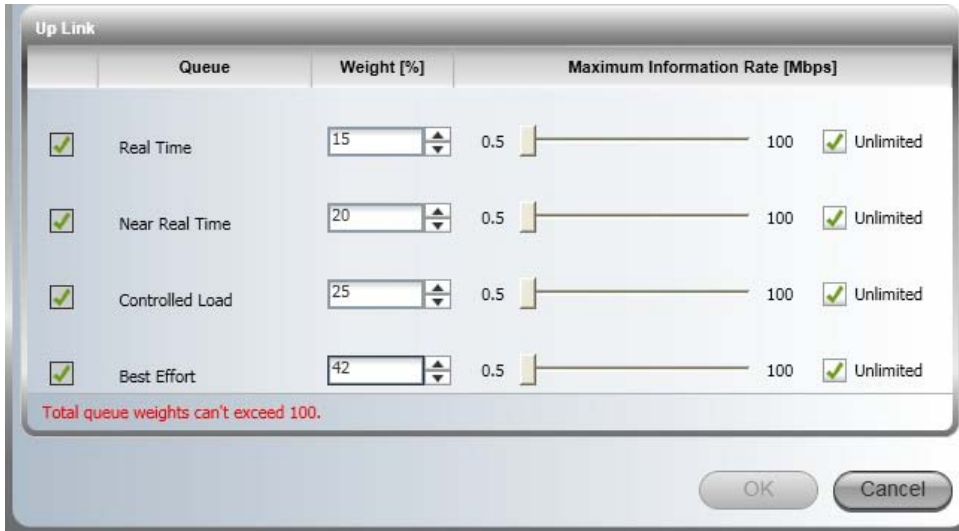


3. Ensure that the Mode field is Enabled. If you already configured the HBS (sector) for Diffserv or VLAN, then it will be enabled by default. If you need to change the mode, then you

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

# Part 6

## Field Installation Topics



## Link Budget Calculator

### Overview

The Link Budget Calculator is a utility for calculating the expected performance of the NetAstra PtMP 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 20 MHz)
- 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 6 dB)
- 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,

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

$$ExpectedFadeMargin = ExpectedRSS - Sensitivity$$

where Sensitivity is dependent on air-rate.

### ***Min and Max Range***

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

MaxRange (with Adaptive checked) is the largest range for which

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

MaxRange (for a given air-rate) is the largest range for which

$ExpectedRSS \geq Sensitivity + RequiredFadeMargin$ .

### ***Service***

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

### ***Availability***

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

Availability

$$= 1 - \frac{6 \times 10^{-7} \times C_{factor} \times frequency_{GHz} \times RequiredRange_{KM}^3}{10^{Expected\ Fade\ Margin}}$$

**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 18-1](#)

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:

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

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.

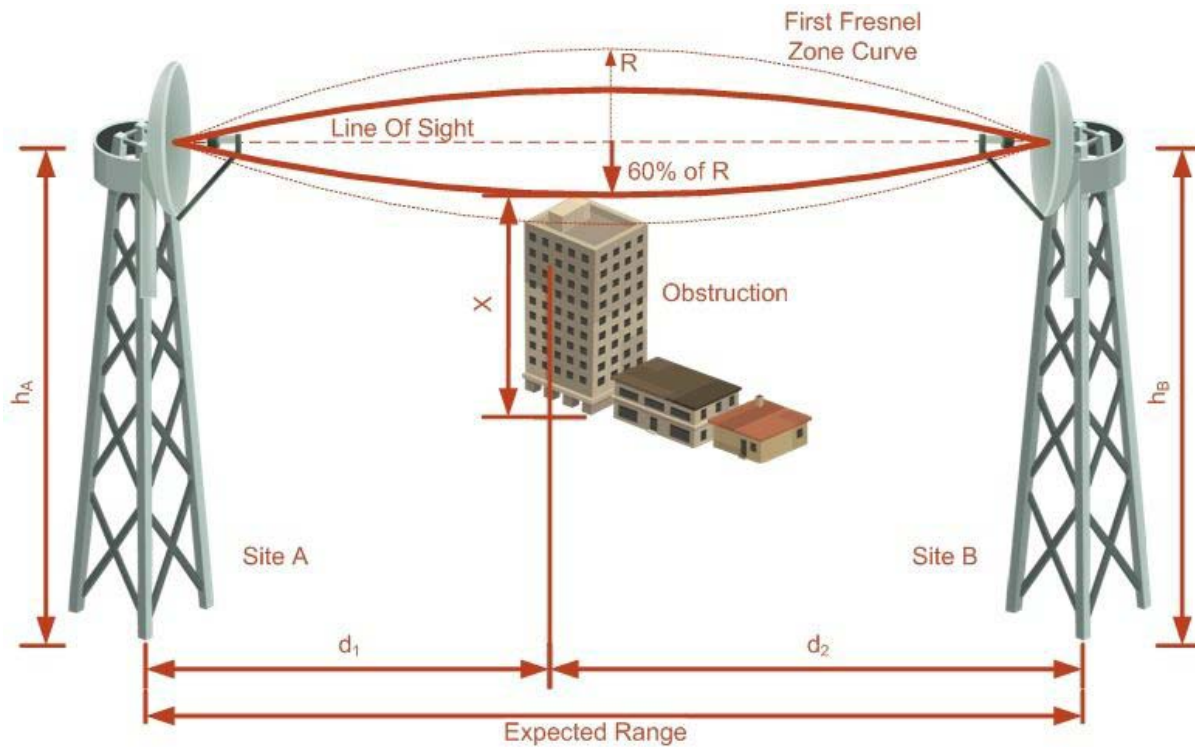


Figure 18-1: Fresnel zone

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 obstruction to ensure that the obstruction 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 ( $1/2 \lambda$ ) of the frequency transmitted longer than the direct path. If the total path distance is one wavelength ( $1 \lambda$ ) 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 obstruction. 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 18-1](#) does above. The top of the obstruction not extend far into the Fresnel zone, leaving 60% of the signal the Fresnel zone clear; therefore, is not significantly attenuated.

For more about Fresnel zone, see [http://en.wikipedia.org/wiki/Fresnel\\_zone](http://en.wikipedia.org/wiki/Fresnel_zone).

## Running the Link Budget Calculator

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

### ➤ To run the Link Budget Calculator from the CD:

1. Insert the Link 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:\WBB\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 Link Manager:

- Choose **Help | Link Budget Calculator** from the main menu of the Link Manager:

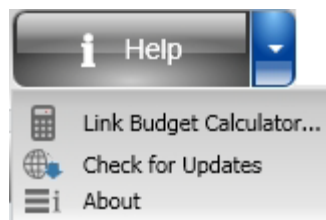


Figure 18-2: Accessing the Link Budget Calculator

### ➤ To run the Link Budget Calculator from the Windows Start Menu:

- Go to **Start | Programs | Link Manager | Link Budget Calculator**

However invoked, your browser displays the following page:

Link B		Link C	Link A
<b>Product</b>	Band	5.730-5.845 GHz FCC/IC Integrated ▾	
	Series	Link B 100 ▾	
	Channel Bandwidth	20 MHz ▾ / Auto ▾ ?	
	Tx Power	18 dBm [-8 - 18]	

Figure 18-3: Link Budget window - startup

- 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 NetAstra PtMP:

1. Click the NetAstra PtMP tab.

Link B		Link C		Link A	
<b>Product</b>	Band	5.730-5.845 GHz FCC/IC Integrated			
	HSU Series	HSU 550			
<b>Radio</b>	Channel Bandwidth	20 MHz			
	Tx Power	18 dBm [-8 - 18]			
	Antenna Type	Dual +3 dB			
	Antenna Gain	HBS Site	15	HSU Site	23 dBi
	Cable Loss	HBS Site	0	HSU Site	0 dB
	EIRP	36 dBm / 4 Watt			
	Fade Margin	6 dB			
	Rate	130 Mb/s (2 x 64-QAM 0.83) Adaptive			
	Expected RSS / Fade Margin	-67 dBm			
	<b>Range</b>	Min	0.1 Km / 0.1 Miles		
Max		6.1 Km / 3.8 Miles			
Required/Climate		6.1	Km	Coordinates	Good (C=0.25)
<b>Services</b>	Type	Ethernet Only			
	Ethernet Throughput	? Up to 49.8 Mb/s (6.2Mb/s per TS, up to 8 TS)			
<b>Installation</b>	Antenna height for LOS	5 Meter / 16 Feet (0.6 Fernel)			
<b>Calculate</b>					

Figure 18-4: NetAstra LBC main window 2.

2. Choose the required NetAstra PtMP band.

Link B		Link C	Link A	
<b>Product</b>	Band	5.730-5.845 GHz FCC/IC Integrated		
	HSU Series	5.730-5.845 GHz FCC/IC Integrated		
<b>Radio</b>	Channel Bandwidth	5.480-5.715 GHz FCC/IC Integrated		
	Tx Power	5.480-5.715 GHz IC Integrated		
	Antenna Type	5.255-5.345 GHz FCC/IC Integrated		
	Antenna Gain	4.945-4.985 GHz FCC/IC Integrated		
	Cable Loss	3.653-3.672 GHz FCC/IC Integrated		
	EIRP	3.478-3.647 GHz IC Integrated		
	Fade Margin	2.499-2.690 GHz FCC Integrated		
	Rate	5.730-5.870 GHz ETSI Integrated		
	Expected RSS / Fade Margin	5.475-5.720 GHz ETSI Integrated		
	Min	5.155-5.345 GHz ETSI Integrated		
			3.600-3.700 GHz ETSI Integrated	

Figure 18-5: Band selector

For the purposes of our example, we will use 5.730-5.845 GHz **FCC/IC** Connectorized.



- This release supports 5/10/20/40 MHz 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.

Link B		Link C	Link A	
<b>Product</b>	Band	5.730-5.845 GHz FCC/IC Integrated		
	HSU Series	HSU 550		
<b>Radio</b>	Channel Bandwidth	20 MHz		
	Tx Power	24 dBm [-8 - 24]		
	Antenna Type	Dual +3 dB		
	Antenna Gain	HBS Site: 15	HSU Site: 23	dB
	Cable Loss	HBS Site: 0	HSU Site: 0	dB
	Power	42 dBm / 15.8 Watt		
<b>Services</b>	Type	Ethernet Only		
	Ethernet Throughput	? Up to 16.4 Mb/s (2.1Mb/s per TS, up to 8 TS)		
	Installation	Antenna height for LOS		
		32 Meter / 105 Feet 12 Meter / 39 Feet (0.6 Fernel) 20 Meter / 66 Feet (Boresight clearance)		
Name		Site A	Site B	
Latitude		41.1 N	40.8 N	
Longitude		75.2 W	75 W	
Antenna Height (m)		10	10	
		<b>Close</b>	<b>Set</b>	
Rate		31.7	Km	Coordinates / Good (C=0.25) ?
3 / Fade Margin		-76 dBm		
Distance		0.1 Km / 0.1 Miles		
Distance		40 Km / 24.9 Miles		
		<b>Calculate</b>		

Figure 18-6: 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**,

	Site A	Site B
Name	A	B
Latitude	41.1 N	40.8 N
Longitude	75.2 W	75 W
Antenna Height (m)	10	10
	<b>Close</b>	<b>Set</b>

the range will be calculated and displayed:

<b>Radio</b>	Antenna Type	Dual <input type="checkbox"/> +3 dB
	Antenna Gain	HBS Site 15 HSU Site 23 dBi
	Cable Loss	HBS Site 0 HSU Site 0 dB
	EIRP	43 dBm / 20 Watt
	Fade Margin	6 dB
	Rate	39 Mb/s (2 x QPSK 0.75) <input type="checkbox"/> Adaptive <input type="checkbox"/>
	Expected RSS / Fade Margin	-76 dBm / 7 dB
<b>Range</b>	Min	0.1 Km / 0.1 Miles
	Max	40 Km / 24.9 Miles
	Required/Climate	37.1 Km <input type="checkbox"/> <b>Coordinates</b> / Good (C=0.25) <input type="checkbox"/> ?
<b>Services</b>	Type	Ethernet Only <input type="checkbox"/>
	Ethernet Throughput	? Up to 25.8 Mb/s (0.4Mb/s per TS, up to 63 TS)
<b>Installation</b>	Antenna height for LOS	40 Meter / 131 Feet 13 Meter / 43 Feet (0.6 Fernel) 27 Meter / 89 Feet (Boresight clearance)

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.

<b>Range</b>	Required/Climate	37.1 Km <input type="checkbox"/> <b>Coordinates</b> / Good (C=0.25) <input type="checkbox"/> ?
	Type	Ethernet Only <input type="checkbox"/>
<b>Services</b>	Ethernet Throughput	? Up to 25.8 Mb/s (0.4Mb/s per TS, up to 63 TS)

Good (C=0.25)  
 Average (C=1)  
 Moderate (C=2)  
 Difficult (C=4)  
 Very Difficult (C=6)

Figure 18-7: Climactic C Factors

For help about what these mean, click the ? button to the right of the list in [Figure 18-7](#).



### Climate/Terrain Factor

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

Close

Tx Power	25 dBm [-8 - 25]
Antenna Type	Dual +3 dB
Antenna Gain	HBS Site 15 HSU Site 23 dBi
Cable Loss	HBS Site 0 HSU Site 0 dB
EIRP	43 dBm / 20 Watt
Fade Margin	6 dB
Rate	39 Mb/s (2 x QPSK 0.75) Adaptive <input type="checkbox"/>
Expected RSS / Fade Margin	-76 dBm / 7 dB
Min	0.1 Km / 0.1 Miles
Max	40 Km / 24.9 Miles
Required/Climate	37.1 Km <span style="background-color: #90ee90;">Coordinates</span> / Good (C=0.25) ?
Type	Ethernet Only
Availability	@ 99.428% availability (downtime 3007 min/year)
Ethernet Throughput	? Up to 25.8 Mb/s (0.4Mb/s per TS, up to 63 TS)

Figure 18-8: Climactic C Factor description

In [Figure 18-9](#) we display a map of the world showing C Factor contours:

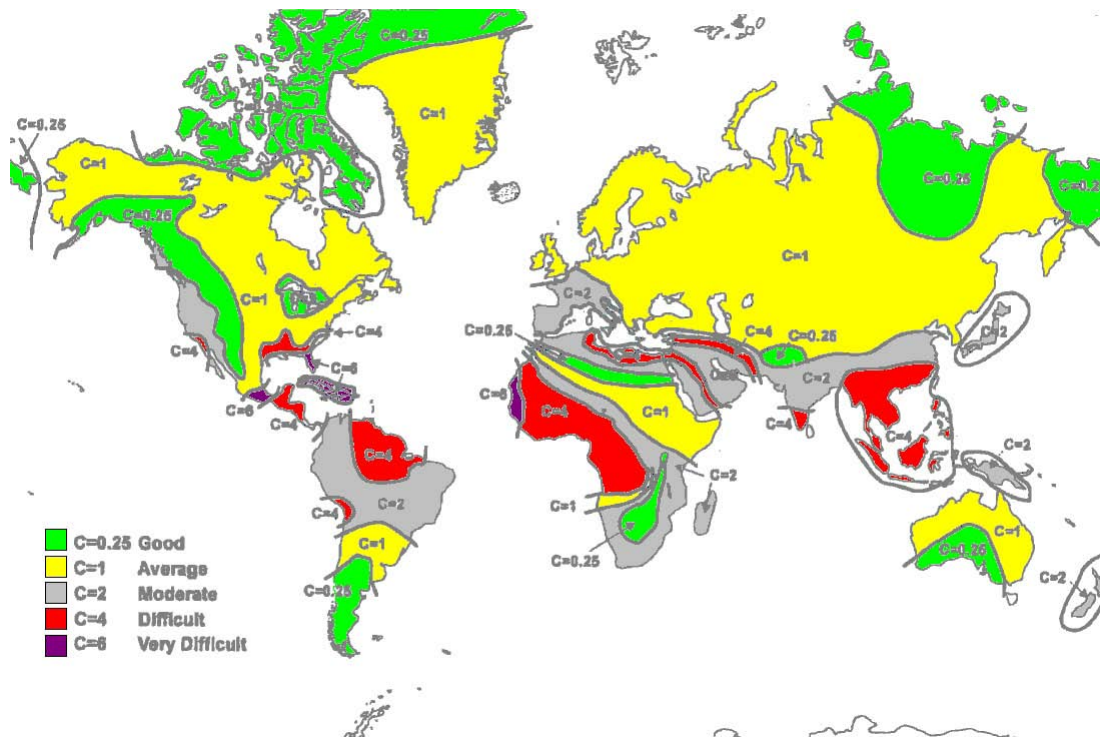


Figure 18-9: World map showing C Factor contours

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



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

<b>Radio</b>	Cable Loss	HBS Site <input type="text" value="0"/> HSU Site <input type="text" value="0"/> dB
	EIRP	43 dBm / 20 Watt
	Fade Margin	<input type="text" value="6"/> dB
	Rate	<input type="text" value="39 Mb/s (2 x QPSK 0.75)"/> <input type="button" value="v"/> Adaptive <input type="checkbox"/>
	Expected RSS / Fade Margin	-76 dBm / 7 dB
<b>Range</b>	Min	0.1 Km / 0.1 Miles
	Max	40 Km / 24.9 Miles
	Required/Climate	<input type="text" value="37.1"/> <input type="button" value="v"/> Km <input type="button" value="v"/> <b>Coordinates</b> / <input type="text" value="Good (C=0.25)"/> <input type="button" value="v"/> <input type="button" value="?"/>
<b>Services</b>	Type	Ethernet Only <input type="button" value="v"/> @ 99.428% availability (downtime 3007 min/year)
	Ethernet Throughput	<input type="button" value="?"/> Up to 25.8 Mb/s (0.4Mb/s per TS, up to 63 TS)
<b>Installation</b>	Antenna height for LOS	40 Meter / 131 Feet
		13 Meter / 43 Feet (0.6 Fernel)
		27 Meter / 89 Feet (Boresight clearance)
<input type="button" value="Calculate"/>		

Figure 18-10: LBC - Results section

The Expected Performance parameters are calculated and displayed:

- **Expected RSS** - the expected RSS that the Link Manager shows when the NetAstra ODU's 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 19

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## Spectrum View

### What is Spectrum View

The Link 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.

NetAstra'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 Netronics 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.

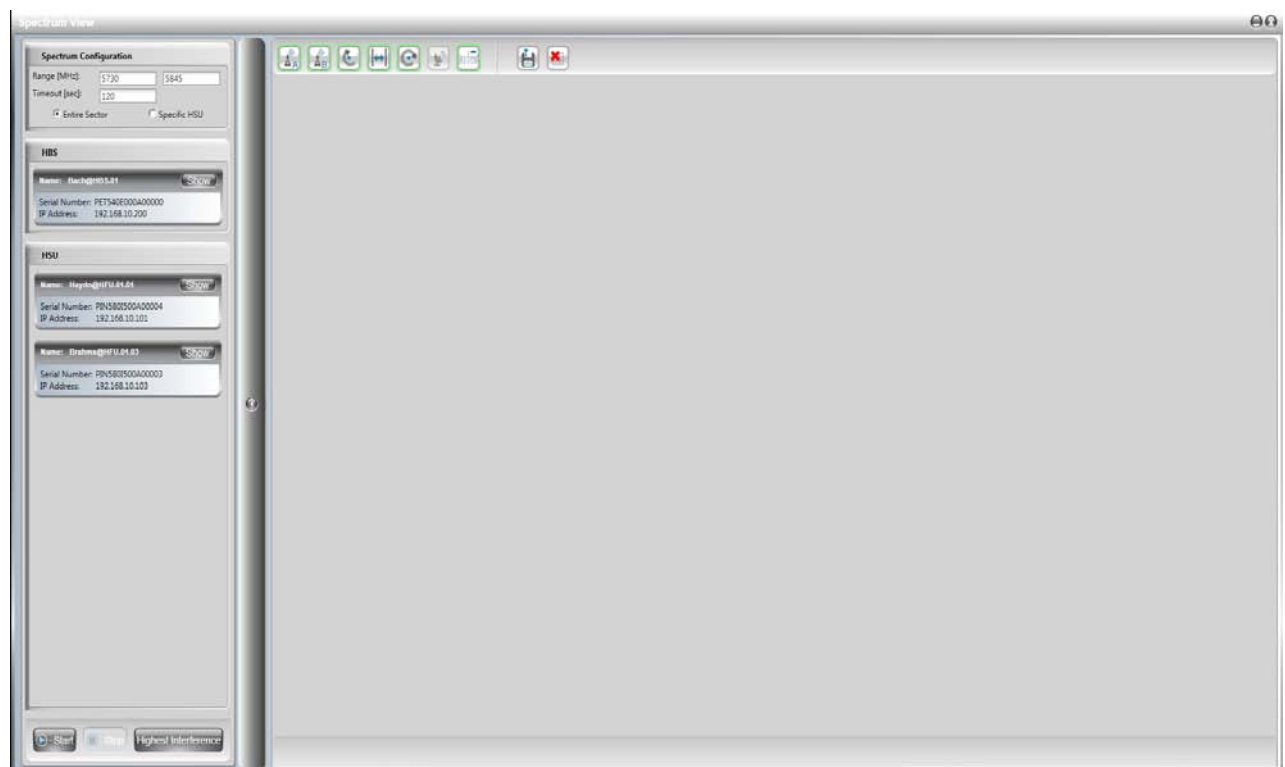
## Where is the Spectrum View Data stored

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**.

**Spectrum Configuration**

Range [MHz]:

Timeout [sec]:

Entire Sector  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 500 MHz. Erroneous entries will be shown

with a red border like this: Range [MHz]:

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:

**HSU**

Name: Haydn@HFU.01.01

Serial Number: PIN580I500A00004  
IP Address: 10.104.50.1

Name: Mozart@HFU.01.02

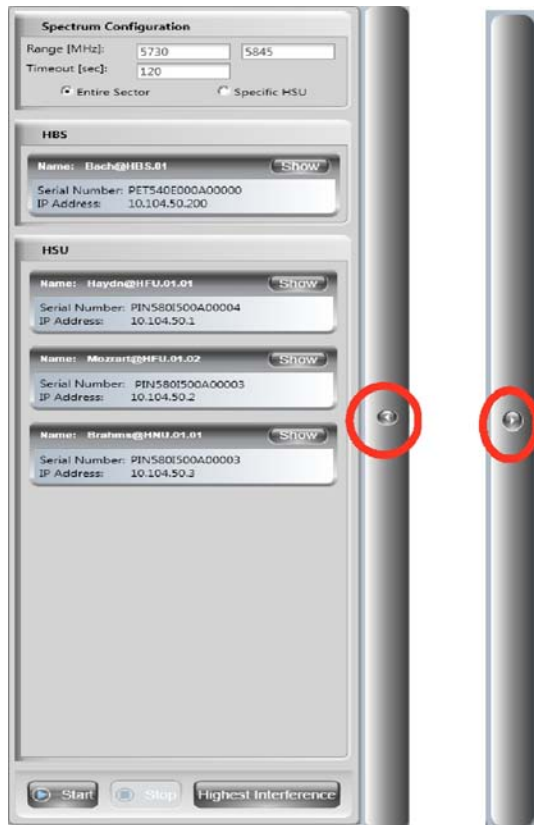
Serial Number: PIN580I500A00005  
IP Address: 10.104.50.2

Name: Brahms@HNU.01.01

Serial Number: PIN580I500A00003  
IP Address: 10.104.50.3

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:

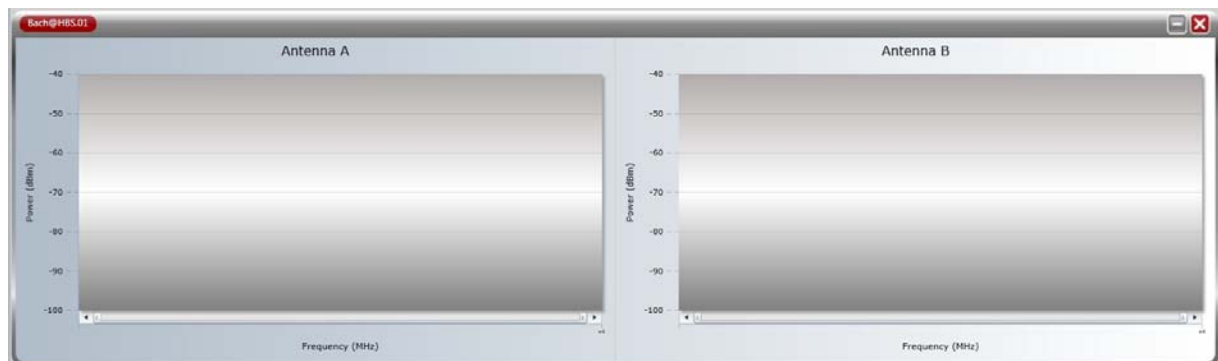
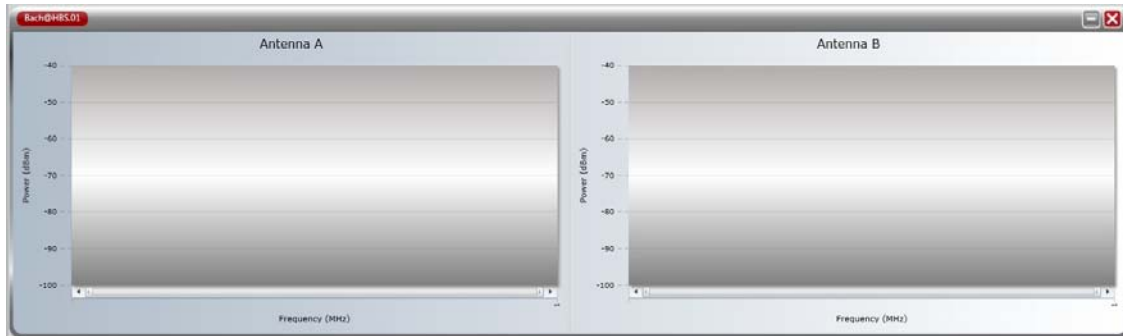


Figure 19-1: Spectrum View data panel for the HBS, ready for data

The standard **X** button closes the window completely (but does not lose 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:



Each button function applies to all of the sector members at once.

Table 19-1: Spectrum View Analysis Display Buttons functionality










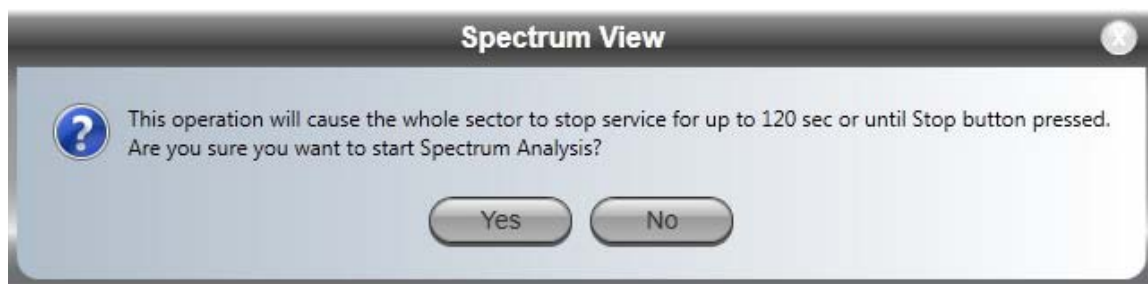
Button	Purpose
	Show/Hide Antenna A
	Show/Hide Antenna B
	Show/Hide average
	Show/Hide current channel (HSUs only)
	Show/Hide maximum

Table 19-1: Spectrum View Analysis Display Buttons functionality (Continued)

Button	Purpose
	Show/Hide DFS information
	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

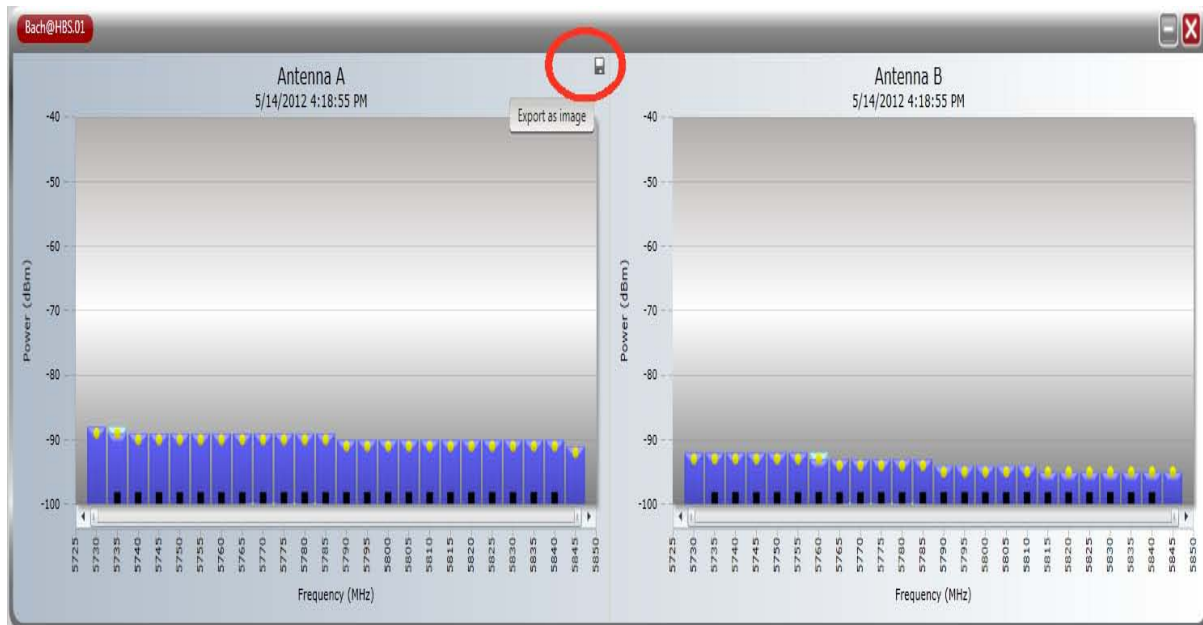
Choose **Entire sector** and click **Start**. You are offered the following cautionary message:



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:

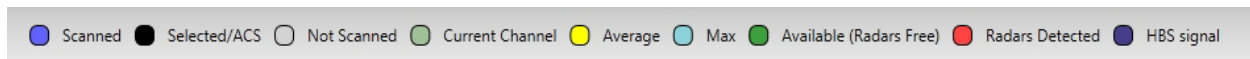
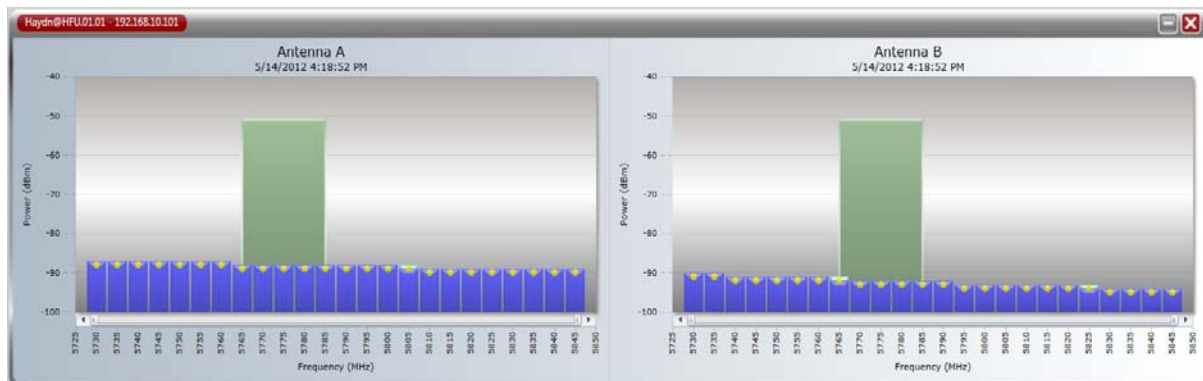


Figure 19-2: Spectrum View Analysis color codes

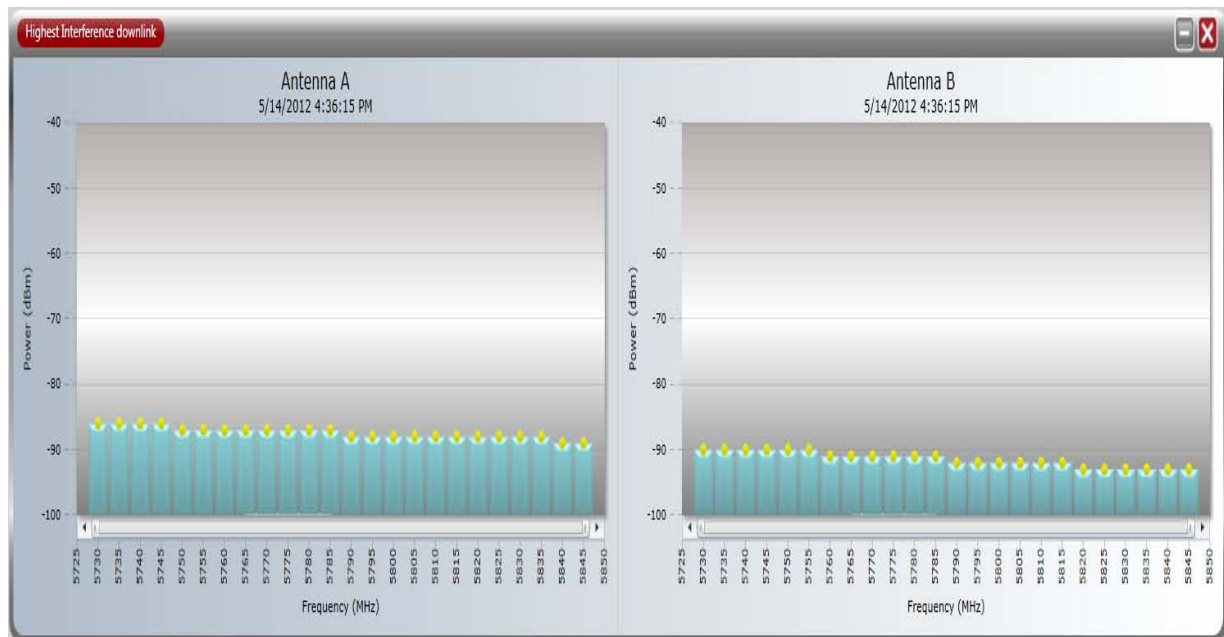
The green band reflects the current HBS operating frequency. Notice also the small fly-over diskette icon (circled) to the upper left of either graph. Clicking it opens a Windows File-Save dialog allowing you to save the graph to disk as a jpg file.

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 19-2](#) 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:

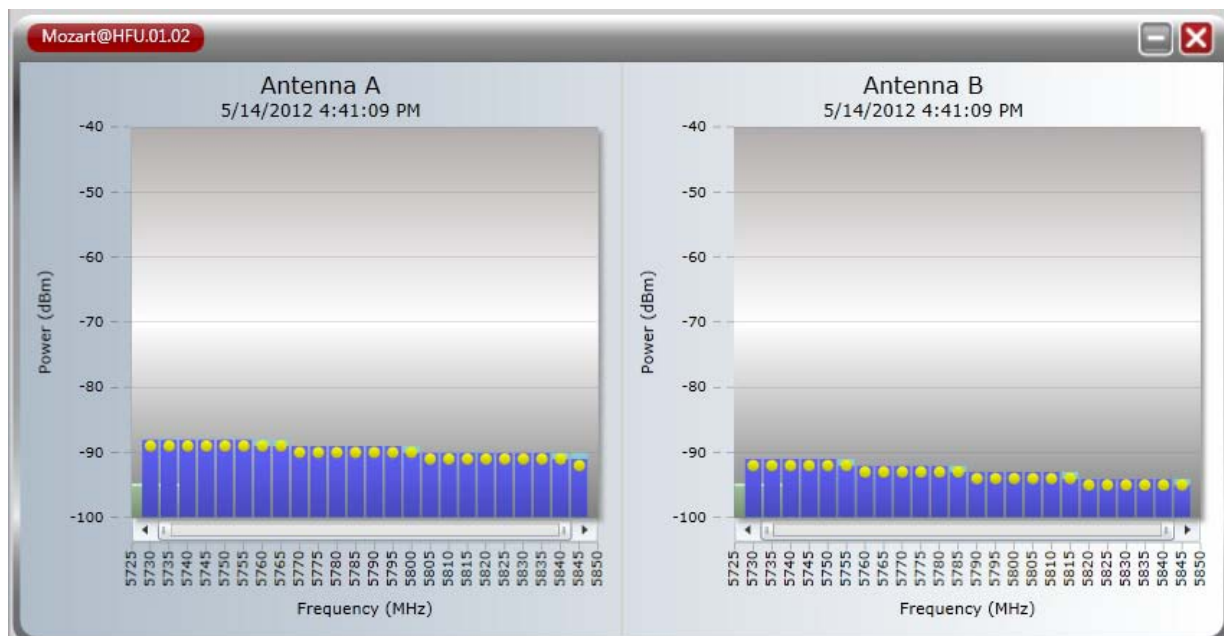


Figure 19-3: HSU spectrum analysis in complete isolation from the sector

Now we return the HSU to the sector:

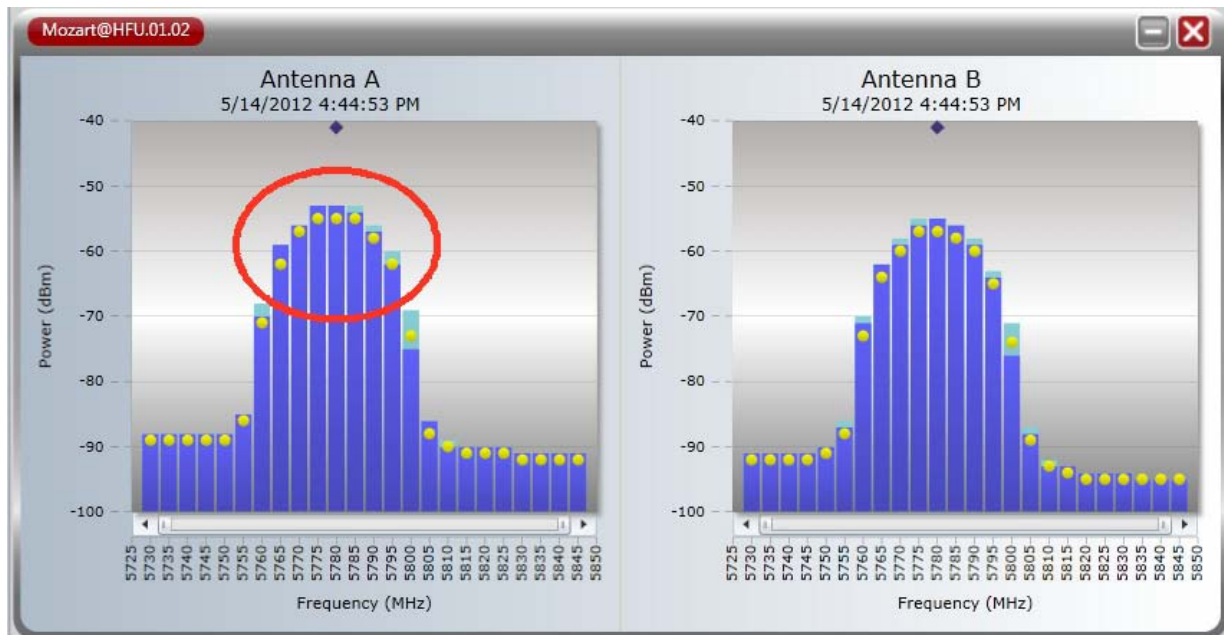
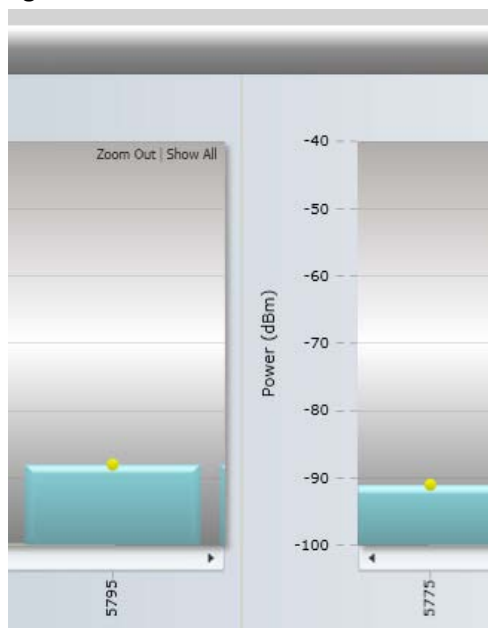


Figure 19-4: HSU spectrum analysis within the sector

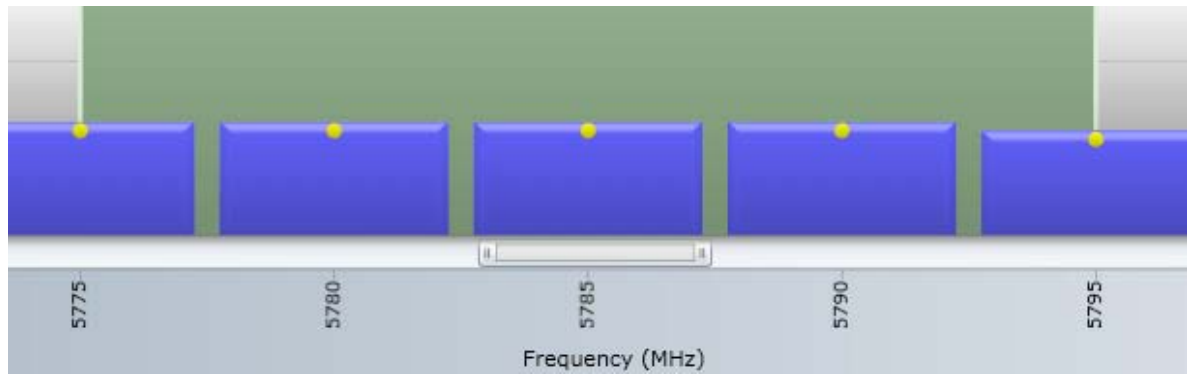
The hump in [Figure 19-4](#) reflects the duty cycle signal from the HBS centered on the current channel (circled).

## 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 elements 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** revert you to the original display. In a zoomed state, a horizontal scroll bar enables you to view other areas of the displayed frequency range.



## 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 Need 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 5](#) and later. We repeat it here for convenience:

Table 20-1: Preconfigured setup – fixed HBS

Location	Attribute	Value	Remark	
HBS.01	IP Address	10.104.50.200	All communicating HSUs and HBS in the same subnet	
	Net Mask	255.255.0.0		
	Default Gateway	10.104.10.21		
	Sector ID	EBGX20560334	Inherited by all communicating fixed HSUs.	
	Network ID	EBX	Inherited by all communicating nomadic HSUs.	
	Protocol	SNMPv1	Can be set to SNMPv3 or both v1 and v3	
	Contact	Bach	Optional	
	Name	Bach@HBS.01	Location of Contact - optional	
	Band	5.730 - 5.845 GHz FCC/IC	Inherited by all communicating HSUs	
	Channel Bandwidth	20MHz	Inherited by all communicating HSUs	
	Unit Serial Number	PET540E000A00000		
	Geographic location			
	Latitude	-37.8148		
	Longitude	144.9630		
	Azimuth (deg)	0	Used for initial default placement of HSUs	
Beam width (deg)	90			
Antenna height (m)	130	From RF plan, not used		

Table 20-2: Preconfigured setup – fixed HSUs

Location	Attribute	Value	Remark	
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		
	Protocol	SNMPv1	Can be set to SNMPv3 or both v1 and v3	
	Contact	Haydn	Optional	
	Name	Haydn@HFU.01.01	Location of Contact - optional	
	Time Slots	Downlink	8	May vary with context
		Uplink	2	
	Unit Serial Number	PIN5801500A00004		
	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		
	Protocol	SNMPv1	Can be set to SNMPv3 or both v1 and v3	
	Contact	Mozart	Optional	
	Name	Mozart@HFU.01.02	Location of Contact - optional	
	Time Slots	Downlink	8	May vary with context
		Uplink	2	
	Unit Serial Number	PIN5801500A00005		
	Geographic location			
		Latitude	-37.4018	
		Longitude	145.0086	
	Antenna height (m)	60	From RF plan, not used	

Table 20-3: Preconfigured setup - Level allocation for maximum nomadic HSUs

Level	Number of nomadic HSUs	Time Sots		Remark
		Downlink	Uplink	
A	2	6	2	Includes HNU.0.01 below
B	1	4	2	
C	1	4	2	
D	0	0	0	

Table 20-4: Preconfigured setup - One actual nomadic HSU

Location	Attribute	Value	Remark	
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		
	Protocol	SNMPv1	Can be set to SNMPv3 or both v1 and v3	
	Contact	Brahms	Optional	
	Name	Brahms@HNU.01.01	Location of Contact - optional	
	Level	A	Included in previous table	
	Time Slots	Downlink		6
		Uplink		2
	Unit Serial Number	PIN580I500A00003		

On the managing computer, point your browser to 192.168.10.200 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 NetStream 5x200 at release level 2.6.00 or later along with NetAstra PtMP 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 Link 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 Link 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 Link Manager as in [Chapter 4](#). 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 Link Manager as in [Chapter 5](#). 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.

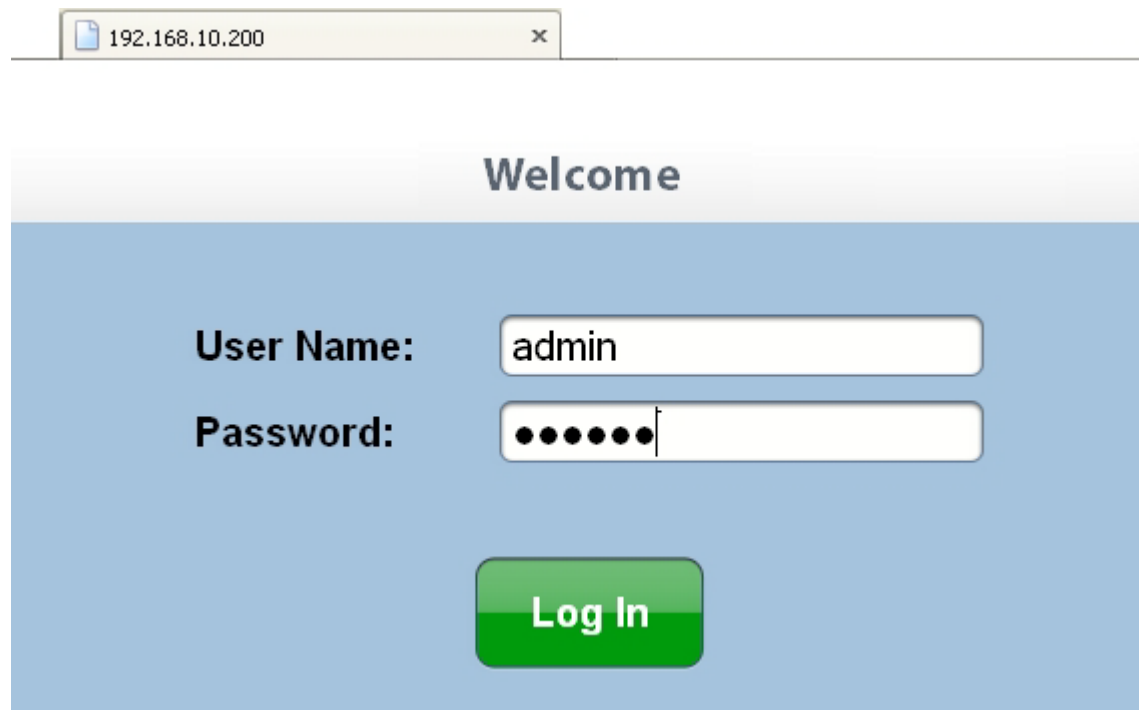


Figure 20-1: Web interface - Log on

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*

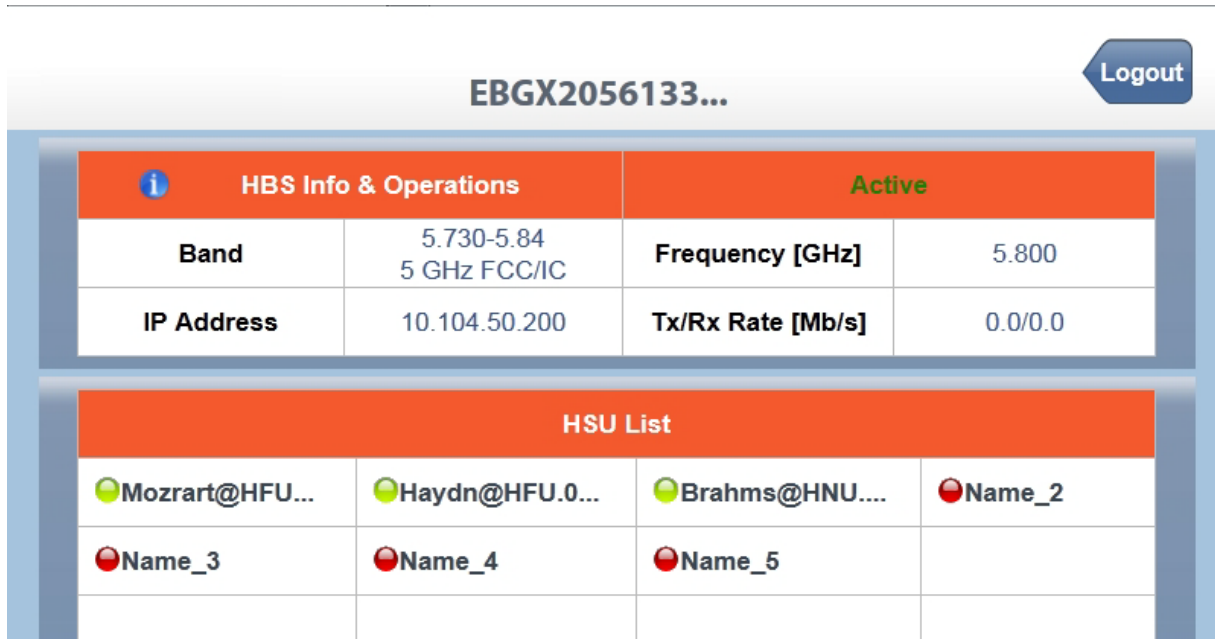


Figure 20-2: Web interface - Main window, HBS

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 Link Manager.

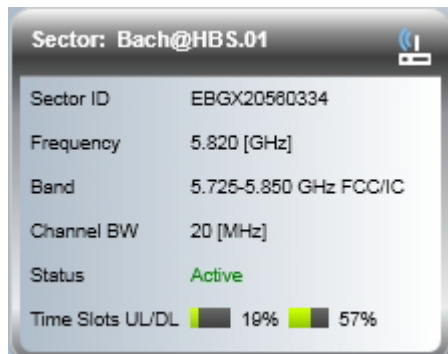


Figure 20-3: Sector Status panel

(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 Link Manager.

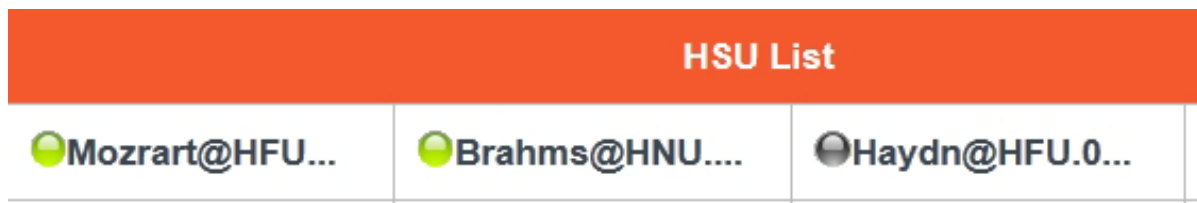


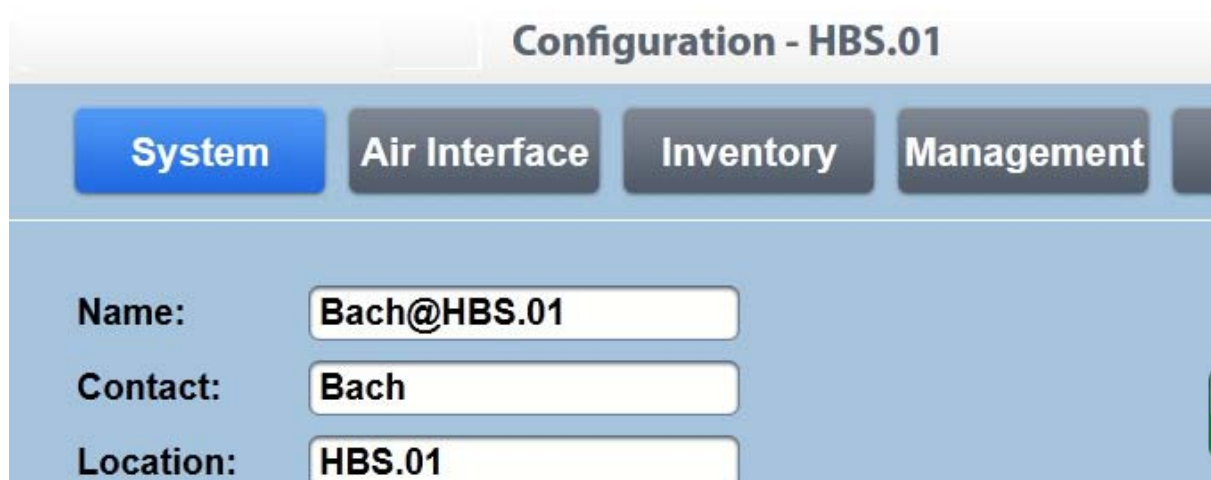
Figure 20-4: HSU Haydn deregistered

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** revert 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:

Back

### Antenna & TX Power - HBS.01

<b>Antenna Connections:</b>	<input type="text" value="External"/>	<div style="background-color: #4a7ebb; color: white; padding: 5px; border-radius: 5px; margin-bottom: 10px;">Save</div> <div style="background-color: #4a7ebb; color: white; padding: 5px; border-radius: 5px;">Refresh</div>
<b>Antenna Type:</b>	<input type="text" value="Dual"/>	
<b>TX Power (per radio) [dBm]:</b>	<input type="text" value="5"/>	
<b>TX Power (system) [dBm]:</b>	<input type="text" value="8"/>	

The only item that can be changed is the Antenna Type:

<b>Antenna Type:</b>	<div style="background-color: #4a7ebb; color: white; padding: 2px 5px; border-radius: 5px; display: flex; justify-content: space-between; align-items: center;"> <span>Dual</span> <span>▼</span> </div> <div style="border: 1px solid black; padding: 2px 5px; margin-top: 2px;"> <div style="background-color: #4a7ebb; color: white; padding: 2px 5px; border-radius: 5px; display: flex; justify-content: space-between; align-items: center;"> <span>Single</span> <span>▼</span> </div> <div style="background-color: #4a7ebb; color: white; padding: 2px 5px; border-radius: 5px; display: flex; justify-content: space-between; align-items: center;"> <span>Dual</span> <span>▼</span> </div> </div>
----------------------	---




---

Changing Antenna Type will call a sector-wide sync loss.

---

### Inventory

The Inventory display is for information only.

ODU	
Property	Value
Product:	E/200-0E50
HW Version:	6
SW Version:	3.3.00_b3323_May 14 2012
MAC Address:	00:15:67:40:48:02
Serial Number:	PET540E000A00000

## Management

The Management fields are all fully editable:

Configuration - HBS.01 Monitor

System Air Interface Inventory **Management** Other

IP Address: 192.168.10.202

Subnet Mask: 255.255.255.0

Default Gateway: 0.0.0.0

Save

Refresh

Trap Destination

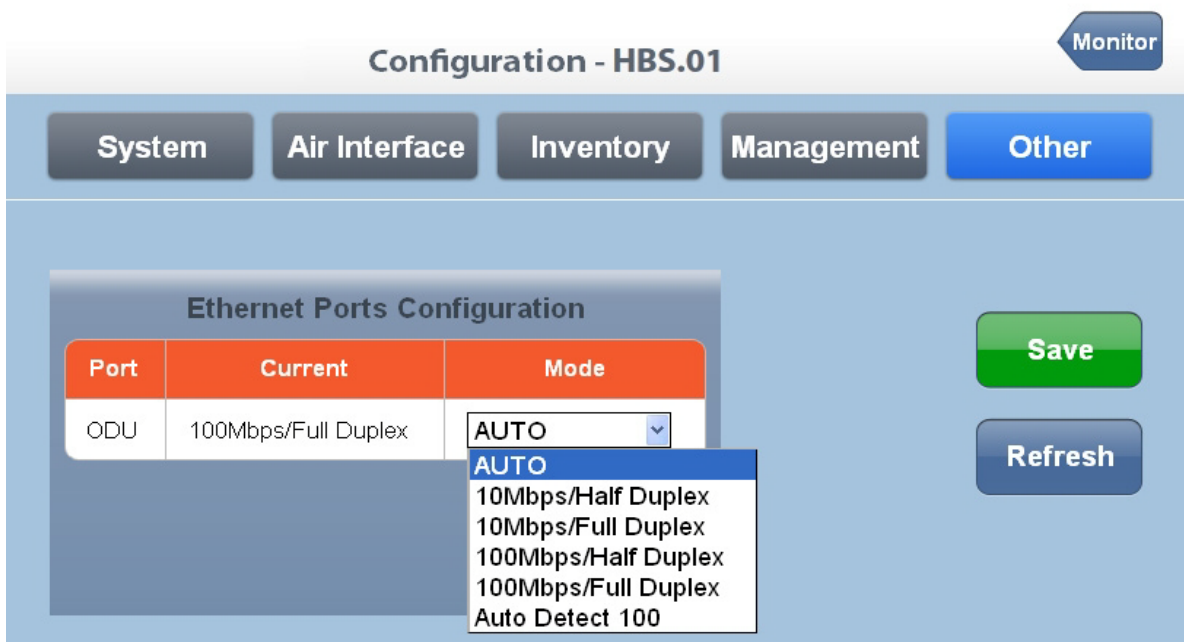
IP Address	Port
0.0.0.0	162
0.0.0.0	162
0.0.0.0	162
0.0.0.0	162
0.0.0.0	162
0.0.0.0	162
0.0.0.0	162
0.0.0.0	162
0.0.0.0	162
0.0.0.0	162

If you change any of these fields, you will causes a HBS reset:

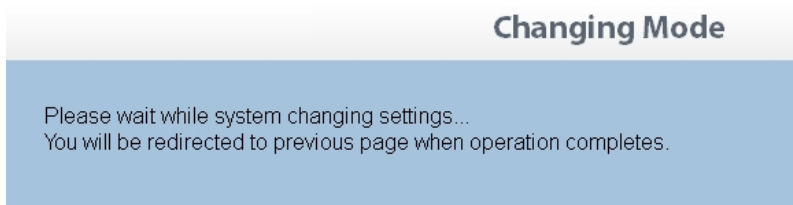


**Other**

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	
5	Major	09/01/2005	HSS multiple sync pulse	

## Reset

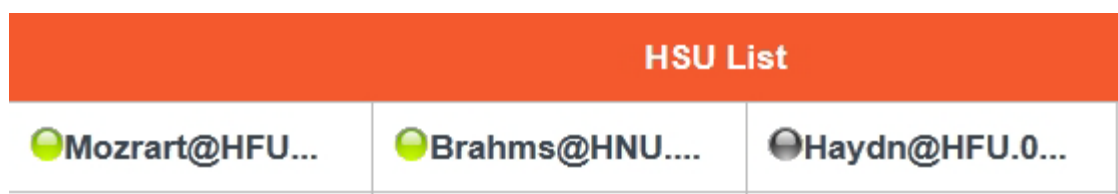
Use this button to reset the HBS.




## 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

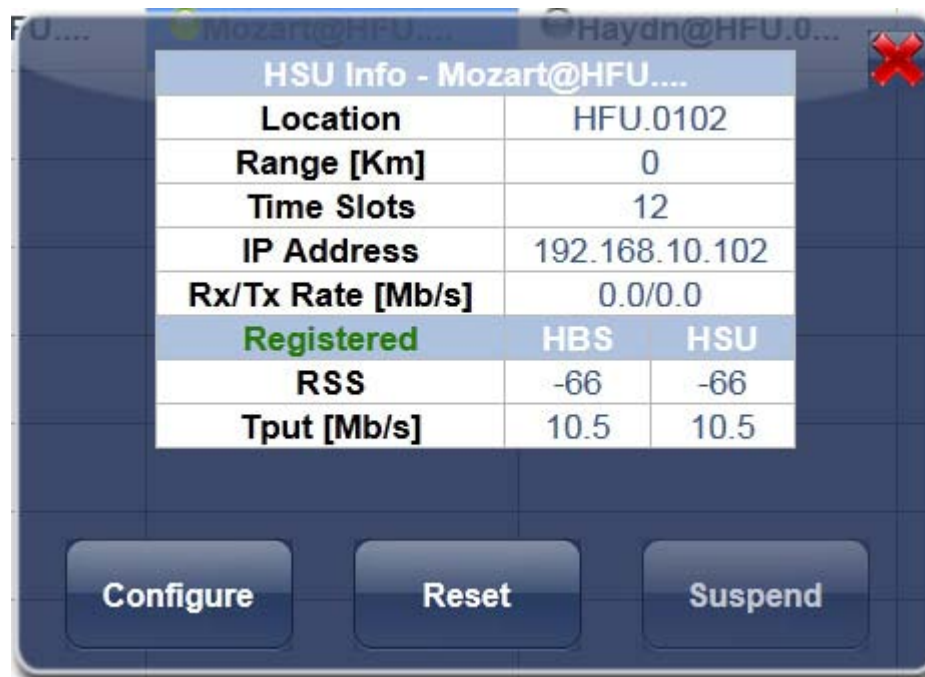
HSU configuration is accomplished by clicking the required HSU in the bottom panel of [Chapter 20](#). For the purposes of this section, we have deregistered Haydn so the panel looks like this:



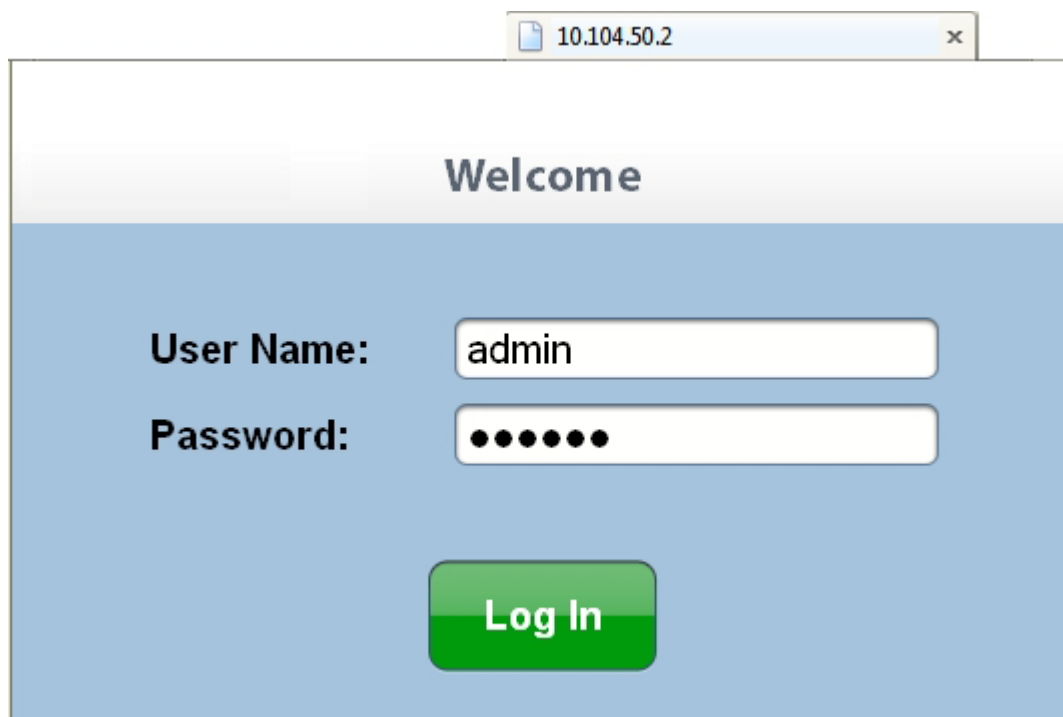
HSU List		
 Mozart@HFU...	 Brahms@HNU....	 Haydn@HFU.0...

Click Mozart. Here is what you see:





Clicking Configure, opens up a new tab in your browser, pointing to Mozart:



Here is the HSU main window:

**Monitor**

Config Install Events Reset Logout

Link State	Registered	Site	HSU	HBS
Sector ID	EBG_2056133 4	Location	HFU.0102	HBS.01
Frequency [GHz]	5.780	IP Address	192.168.10. 102	192.168.10. 200
Band	5.730-5.845 GHz FCC/IC	RSS [dBm]	-67	-65
ChannelBW [MHz]	20	Tx/Rx [Mb/s]	0.0/0.0	0.0/0.0
Status	Active	Est. T-put	1.8	1.8

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:

**Configuration - HFU.0102** Monitor

System Air Interface Inventory Management Other

**Name:**

**Contact:**

**Location:**

**Up Time:**  [ddd:hh:mm:ss]

The only function here, which differs from the corresponding HBS function, is the **Air Interface** tab.

Monitor

### Configuration - HFU.0102

System   **Air Interface**   Inventory   Management   Other

Sector ID:

Frequency [GHz]:

Channel Bandwidth [MHz]:

Buzzer:

In addition to the **Antenna & Tx Power** button, you may also change operating Band:

[Back](#)

### Change Band - HFU.0102

#### Available Bands

Band Description
4.945-4.985 GHz FCC/IC
4.900-4.990 GHz Universal
5.150-5.335 GHz Universal
5.255-5.345 GHz FCC/IC
5.480-5.715 GHz FCC/IC
5.480-5.715 GHz IC
5.475-5.720 GHz Universal
5.730-5.845 GHz FCC/IC
5.830-5.870 GHz WPC
5.730-5.950 GHz Universal
5.700-6.050 GHz Universal
5.740-5.835 GHz MII
5.000-5.150 GHz Universal

[Save](#)

[Refresh](#)

---

There are two strict caveats to using this function:



**Warning**

- 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.

# Part 7

## Product Reference



## 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 Netronics Customer Service.

In any event, Netronics reserves the right to change these specifications without notice.

### ODU - HBS and HSU

Capacity	HBS: Up to 200Mbps aggregate net throughput depending on regulation HSU: Up to 50 Mbps aggregate net throughput depending on model							
Range	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							
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**

The bands shown below are supported by Netronics products. Both the bands and related Channel Bandwidths are product dependent.

Band (GHz)	Regulation	Occupied Frequency Range (GHz)	CBW (MHz)	DFS?	Compliance (Notes)
2.3	Universal	2.3045-2.4745	5	No	N/A (Supported CBW product dependent)
		2.302-2.477	10		
		2.297-2.482	20		
		2.287-2.492	40		
2.4	FCC/IC	2.4095-2.4645	5	No	FCC 47CFR, Part 15, Subpart C and IC RSS-210
		2.407-2.467	10		
		2.402-2.472	20		
		2.392-2.482	40		
2.5	FCC BRS	2.4965-2.6925	5	No	FCC 47CFR, Part 27, Subpart M (BRS/EBS)
		2.494-2.695	10		
		2.489-2.700	20		
3.4	ETSI	3.4105-3.4825	5	No	ETSI EN 302 326-2 (Nominally, 3.5 GHz ETSI)
		3.408-3.485	10		
		3.403-3.490	20		
3.5	ETSI	3.4775-3.6025	5	No	ETSI EN 302 326-2 (Nominally, 3.5 GHz ETSI)
		3.475-3.605	10		
		3.470-3.610	20		
3.6	ETSI	3.5975-3.7025	5	No	ETSI EN 302 326-2 (Nominally, 3.5 GHz ETSI)
		3.595-3.705	10		
		3.590-3.710	20		
3.5	IC	3.4755-3.6495	5	No	IC RSS-192
		3.473-3.652	10		
		3.468-3.657	20		
	Universal	3.2975-3.8025	5	No	N/A
		3.295-3.805	10		
		3.290-3.810	20		
	FCC/IC	3.6505-3.6745	5	No	FCC Part 90 Subpart Z and IC RSS-197 (Restricted)
		3.650-3.675	10		
		3.650-3.675	20		
4.4	Universal	4.3975-5.0025	5	No	N/A
		4.395-5.005	10		
		4.390-5.010	20		



Band (GHz)	Regulation	Occupied Frequency Range (GHz)	CBW (MHz)	DFS?	Compliance (Notes)
4.8	Universal	4.8075-4.9025	5	No	N/A
		4.805-4.905	10		
		4.800-4.910	20		
		4.790-4.920	40		
4.9	FCC/IC	4.9425-4.9875	5	No	FCC 47CFR, Part 90, Subpart Y and IC RSS-111
		4.940-4.990	10		
		4.940-4.990	20		
	Universal	4.8975-5.0025	5	No	N/A
		4.895-5.005	10		
		4.890-5.010	20		
		4.880-5.020	40		
	5.0	Universal	4.9975-5.1525	5	No
4.995-5.155			10		
4.990-5.160			20		
4.980-5.170			40		
5.1	ETSI	5.150 – 5.350	10	Yes	ETSI EN 301 893
		5.150 – 5.350	20		
	Universal	5.1475-5.3375	5	No	N/A
		5.145-5.340	10		
		5.140-5.345	20		
		5.130-5.355	40		
5.2	FCC/IC	5.2525-5.3475	5	Yes	FCC 47CFR, Part 15, Subpart E and IC RSS-210
		5.255-5.345	10		
		5.255-5.345	20		
		5.255-5.345	40		
5.4	ETSI	5.475 – 5.720	10	Yes	ETSI EN 301 893
		5.475 – 5.720	20		
		5.475 – 5.720	40		
	FCC/IC	5.4775-5.7175	5	Yes	FCC 47CFR, Part 15, Subpart E and IC RSS-210
		5.480-5.715	10		
		5.480-5.715	20		
		5.480-5.715	40		
	Universal	5.4725-5.7225	5	No	N/A
		5.470-5.725	10		
		5.465-5.730	20		
5.455-5.740		40			

Band (GHz)	Regulation	Occupied Frequency Range (GHz)	CBW (MHz)	DFS?	Compliance (Notes)	
5.4	IC	5.4775-5.7175	5	Yes	IC RSS-210	
		5.480-5.715	10			
		5.480-5.715	20			
		5.480-5.715	40			
5.8	ETSI	5.725 – 5.875	10	Yes	ETSI EN 302 502	
		5.725 – 5.875	20			
	FCC/IC	5.7275-5.8475	5	No	FCC 47CFR, Part 15, Subpart C and IC RSS-210	
		5.725-5.850	10			
		5.725-5.850	20			
		5.725-5.850	40			
	MII China	5.7375-5.8375	5	No	MII China (Supported CBW product dependent)	
		5.735-5.840	10			
		5.730-5.845	20			
		5.720-5.855	40			
	WPC India	5.8325-5.8675	5	No	GSR-38 (Supported CBW product dependent)	
		5.830-5.870	10			
		5.825-5.875	20			
		5.815-5.885	40			
	5.9	Universal	5.7275-5.9525	5	No	N/A
			5.725-5.955	10		
5.720-5.960			20			
5.710-5.970			40			
6.0	Universal	5.6975-6.0525	5	No	N/A	
		5.695-6.055	10			
		5.690-6.060	20			
		5.680-6.070	40			
6.4	Universal	5.895-6.4050	10	No	N/A (No products in WinPro)	
		5.890-6.410	20			

The following Max Tx Power limitations apply to all products supporting the 3.5 GHz ETSI band:

Occupied Sub-Band GHz	Center Frequency GHz	Mode	Channel Bandwidth MHz	Max Tx Power dBm	Frequency Step KHz
3.403-3.490	3.413-3.480	Inactive	5, 10, 20	17	250
3.470-3.610	3.480-3.600			23(†)	
3.590-3.710	3.600-3.700			25(†)	



(†) The 3.480 GHz frequency is overlapped, occurring in two different bands as shown. If you wish to use the 3.480 GHz frequency, you should set Max TX Power to 17 dBm.

(‡) The 3.600 GHz frequency is overlapped, occurring in two different bands as shown. If you wish to use the 3.600 GHz frequency, you should set Max TX Power to 23 dBm.

**Management**

<b>Management Application (per sector)</b>	Link Manager
<b>Protocol</b>	SNMP and Telnet
<b>NMS</b>	WBB NMS - RNMS

**Environmental**

<b>Operating Temperatures</b>	HBS/HSU: -35°C to +60°C / -31°F to +140°F
<b>Humidity</b>	HBS/HSU: Up to 100% non-condensing, IP67
<b>Storage</b>	-40° to 85°C / -40°F to 185°F

**Mechanical**

<b>HBS with Integrated Antenna</b>	37.1/14.84(W) x 37.1/14.84(H) x 9.00/3.6(D) cm/in; 3.5 kg / 7 lbs
<b>HBS/HSU Connectorized</b>	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
<b>HSU SFF with Embedded antenna)</b>	19.5/7.7(W) x 27.0/10.8(H) x 7/2.8(D) cm/in; 1.8 kg / 3.6 lbs
<b>NetAstra SU 5M Connectorized</b>	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
<b>NetAstra SU 5M with Integrated Antenna, also HSU AC</b>	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**

<b>Power Feeding</b>	Power provided over ODU-IDU cable using PoE
<b>Power Consumption - alone</b>	HBS: <25W, HSU: <20W, HSU-505/510/525<10W

**Safety**

<b>TUV</b>	UL 60950-1, UL 60950-22, CAN/CSA C22.2 60950-1, CAN/CSA C22.2 60950-22
<b>ETSI/IEC</b>	EN/IEC 60950-1, EN/IEC 60950-22

**EMC**

<b>FCC</b>	47CFR Class B, Part15, Subpart B
<b>ETSI</b>	EN 300 386, EN 301 489-1, EN 301 489-4
<b>CAN/CSA-CEI/IEC</b>	CISPR 22 Class B
<b>AS/NZS</b>	CISPR 22 Class B

<b>Architecture</b>	ODU: Outdoor Unit with Integrated Antenna, Connectorized for External Antenna or Embedded PoE device for Ethernet only
<b>ODU to PoE Interface</b>	HBS: <ul style="list-style-type: none"> <li>Outdoor CAT-5e cable. maximum cable length: 100m for 10/100BaseT.</li> <li>Outdoor CAT-5e cable. maximum cable length: 75m for 1000BaseT.</li> </ul> HSU: Outdoor CAT-5e cable; maximum cable length: 100 m (10/100BaseT)

<b>Management Application (per sector)</b>	Link Manager
<b>Protocol</b>	SNMP and Telnet
<b>NMS</b>	Netroncis NMS

<b>Operating Temperatures</b>	HBS/HSU: -35°C to +60°C / -31°F to +140°F
<b>Humidity</b>	HBS/HSU: Up to 100% non-condensing, IP67
<b>Storage</b>	-40° to 85°C / -40°F to 185°F

<b>FCC/IC (cTUVus)</b>	JL 60950-1, UL ?-22, CAN/CSA C22.2 60950-1, CAN/CSA C22.2 60950-22
<b>ETSI/IEC</b>	EN/IEC 60950-1, EN/IEC 60950-22

<b>FCC</b>	47 CFR Class B, Part15, Subpart B
<b>ETSI</b>	EN 300 386, EN 301 489-1, EN 301 489-4
<b>CAN/CSA</b>	CISPR 22-04 Class B
<b>AS/NZS</b>	CISPR 22:2004 Class B

## HSU AC - HSU with AC Power Feeding

### Configuration

<b>Architecture</b>	ODU: Outdoor Unit with Integrated Antenna
<b>ODU to LAN and PoE Interface</b>	Outdoor CAT-5e cable. Maximum cable length: 100m for 10/100BaseT.

### Radio

<b>Capacity</b>	10 Mbps net aggregate throughput
<b>Range</b>	Up to 40 km / 25 miles
<b>Channel Bandwidth</b>	Configurable: 5,10,20 and 40 MHz
<b>Modulation</b>	2x2 MIMO-OFDM (BPSK/QPSK/16QAM/64QAM)
<b>Bandwidth Allocation</b>	Symmetric and Asymmetric
<b>DFS</b>	Supported

**Radio**

<b>Adaptive Modulation &amp; Coding</b>	Supported
<b>Automatic Channel Selection</b>	Supported
<b>Diversity</b>	Supported
<b>Spectrum Viewer</b>	Supported
<b>Max Tx Power</b>	25 dBm
<b>Duplex Technology</b>	TDD
<b>Error Correction</b>	FEC k = 1/2, 2/3, 3/4, 5/6
<b>Encryption</b>	AES 128
<b>Ethernet Interface</b>	10/100BaseT
<b>PoE port</b>	10/100BaseT, IEEE 802.3af
<b>Layer 2</b>	Hub Mode
<b>QoS</b>	Packet classification to 4 queues according to 802.1p and Diffserv, Dynamic scheduling according to air interface changes
<b>VLAN</b>	Supported 802.1Q, 8021.P, QinQ

**Mechanical**

<b>Dimensions</b>	24.1(w) x 19.7(h) x 7.7(d) cm
<b>Weight</b>	1.3 kg / 2.8 lbs
<b>Integrated Antenna</b>	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**

<b>Power Feeding</b>	Direct AC power feeding 85-265VAC
<b>Power Consumption - alone</b>	<10W

**Environmental**

<b>Operating Temperatures</b>	-35°C to +60°C / -31°F to +140°F
<b>Humidity</b>	100% condensing, IP67 (totally protected against dust and against immersion up to 1m)

**Safety**

<b>TUV</b>	UL 60950-1, UL 60950-22, CAN/CSA C22.2 60950-1, CAN/CSA C22.2 60950-22
<b>ETSI/IEC</b>	EN/IEC 60950-1, EN/IEC 60950-22

**Environmental**

<b>FCC</b>	47CFR Part15, Subpart B, Class B
<b>ETSI</b>	EN 300 386, EN 301 489-1, EN 301 489-4
<b>CAN/CSA</b>	CISPR 22 Class B
<b>AS/NZS</b>	CISPR 22 Class B

## IDU-DT6 (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	100 Ohm
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 <u>1K</u> MAC Address entries (same as IDU-NetStream RM)
Maximal Frame Size	2048 bytes
Ethernet Latency	3 ms

### Mechanical

Dimensions	1U 19" Rack mounted, half width
Weight	0.8 Kg

### 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, as for IDU-NetStream RM
Protection	- DC input Line & Reverse Polarity protection - PoE Ports over/under Current & over/under Voltage protections

### Environmental

Operating Temperatures	-40°C - 60°C / -40°F - 140°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
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

<b>AC Input Voltage</b>	100 - 240 VAC nominal, 90 - 264 VAC max range
<b>Input Frequency</b>	47 - 63 Hz
<b>Input Current</b>	2.0 A (rms) 115 VAC at Max. load 1.2 A (rms) 230 VAC at Max. load
<b>Max. In-rush Current</b>	30A for 115VAC at Max. load 60A for 230VAC at Max. load
<b>Standby Power</b>	0.5W (Max) at 240Vac
<b>DC Output Voltage</b>	56 VDC
<b>Protection</b>	<ul style="list-style-type: none"> <li>• Short circuit protection</li> <li>• Auto recovery</li> <li>• Over voltage protection</li> </ul>
<b>Indication</b>	Green led for normal operation

### Interfaces

<b>PoE output</b>	RJ-45 connector
<b>PoE to ODU Interface</b>	Outdoor CAT 5e; Maximum cable length: 75m for 1000BaseT or 100m for 10/100BaseT.
<b>Ethernet input</b>	RJ-45 connector
<b>AC input on device</b>	Standard socket IEC320 C14 type
<b>AC cable</b>	Variety of AC plugs available (see below)
<b>Ethernet / ODU</b>	WBB RJ-45 connector
<b>Ethernet LAN interface type</b>	RJ-45, 10/100/1000BaseT Interface (Line Impedance -100 )

### Mechanical

<b>Case</b>	Plastic
<b>Dimensions</b>	16cm(W) x 6.3cm(D) x 3.33cm(H)
<b>Weight</b>	250g

### Environmental

<b>Operating Temperatures</b>	0°C to 40°C/32°F to 104°F
<b>Humidity</b>	90% non-condensing

### Safety

<b>ULCSA</b>	60950-1, C22.2 No. 60950-1
<b>ETSI/IEC</b>	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 -100 )
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
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**EMC**

<b>ETSI</b>	Designed to meet EN 300 386; EN 301 489-1
<b>FCC</b>	Designed to meet 47CFR Part 15, Subpart B, Class B
<b>CAN/CSA</b>	Designed to meet ICES-003 Class B
<b>AS/NZS</b>	Designed to meet CISPR 22 class B

**GSU**

**Configuration**

<b>Architecture</b>	Outdoor Synchronization Unit; Including External GPS Antenna, HSS cable and PoE device
<b>GSU to PoE Interface</b>	Outdoor CAT 5e cable; Maximum cable length: 100 m

**Mechanical**

<b>Dimensions</b>	24.5cm(H) x 13.5cm(W) x 4.0cm(D)
<b>Weight</b>	1.0kg/2.2lbs

**Power**

<b>Power Feeding</b>	Power provided by PoE device
<b>Max Power Dissipation</b>	10Watt

**Environmental**

<b>Operating Temperature Range</b>	-35°C to 60°C / -13°F to 140°F
<b>Humidity</b>	Up to 100% non-condensing

**Safety**

<b>EN/IEC</b>	Designed to meet EN/IEC 60950-1, 60950-22
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**EMC**

<b>FCC</b>	Designed to meet 47CFR Class B, Part 15, Subpart B
<b>ETSI</b>	Designed to meet EN 300 386; EN 301 489-4; EN 301 489-1
<b>CAN/CSA-CEI/IEC</b>	Designed to meet CISPR 22-02
<b>AS/NZS</b>	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 (0.22 Kg)

**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 NetAstra PtMP may be operated with an integrated antenna attached to the ODU unit, or with an external antenna wired to the ODU via N-type connectors. All cables and connections must be connected correctly to reduce losses. The required antenna impedance is 50  $\Omega$ .

# 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

Table B-2: LAN-GbE PoE RJ-45 Connector Pinout

Function	Color	PoE	LAN
TxRx A	White/Green	1	1
TxRx A	Green	2	2
TxRx B	White/Orange	3	3
TxRx B	Orange	6	6
TxRx C & Power(+)	Blue	4	4
TxRx C & Power(+)	White/Blue	5	5
TxRx D & Power(-)	White/Brown	7	7
TxRx D & Power(-)	Brown	8	8

## HBS/HSS Unit Connection Pinout

Table B-3: HBS/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

## User Port Connectors

### LAN Port

The LAN 10/100BaseT interface terminates in an 8-pin RJ-45 connector, wired in accordance to [Table B-4](#).

Table B-4: 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-5: Terminal Block 2-pin -48 VDC

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-6: 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

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## 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 NetAstra PtMP 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 mono-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 NetAstra 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, NetAstra PtMP automatically selects MIMO mode and doubles the air rates.

Link 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 finally being received.

Each such “bounce” can introduce phase shifts, time delays, attenuations, and even distortions that can destructively interfere with one another at the aperture of the receiving antenna.

Antenna diversity is especially effective at mitigating these multi-path situations.

This is because multiple antennas afford a receiver several recordings of the same signal. Each antenna will be exposed to a different interference environment. Thus, if one antenna is undergoing a deep fade, it is likely that another has a sufficient signal. Collectively such a system can provide a robust link.

Antenna diversity requires antenna separation which is possible by using a dual-polarization antenna or by two spatially separated antennas.

Use Diversity instead of MIMO in the following situations:

- When the system cannot operate in MIMO Mode
- When one of the receivers has high interference compared to the second receiver (i.e. the system is “unbalanced”)
- When you achieve higher capacity in Diversity Mode than in MIMO Mode
- When high robustness is of importance and the capacity of Diversity Mode is sufficient (up to 25 Mbps full duplex)

### ***Single Antennas at Both Sites***

By selecting a single antenna at 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 C-1 summarizes the situation:

Table C-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 NetAstra are shown in Table C-2 below:

Table C-2: NetAstra PtMP Air rates

Antenna	Modulation	FEC	Air-Rate [Mbps]
Single	BPSK	1/2	6.5
Single	QPSK	1/2	13
Single	QPSK	3/4	19.5
Single	16QAM	1/2	26
Single	16QAM	3/4	39
Single	64QAM	2/3	52
Single	64QAM	3/4	58.5
Single	64QAM	5/6	65
Dual	BPSK	1/2	13
Dual	QPSK	1/2	26
Dual	QPSK	3/4	39
Dual	16QAM	1/2	52
Dual	16QAM	3/4	78
Dual	64QAM	2/3	104
Dual	64QAM	3/4	117
Dual	64QAM	5/6	130

## Considerations for Changing Antenna Parameters

Let:

**max Available Tx Power** denote the maximum Tx Power practically available from an ODU. (It appears as **Tx Power per Radio**.)

**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:

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

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



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

## Regional Notice: France 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 NetAstra 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-NetStream RM 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 être 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 NetAstra sont conçues avec des circuits de limitation de surtension afin de minimiser les risques de dommages dus à la foudre. NetAstra 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 ( $\frac{1}{2}$ □)
- 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:

- a. Vérifier que les supports de fixation de l'ODU sont correctement mis à la terre.
- b. Monter l'unité ODU sur le pylône ou sur le mur; se référer à la [Installation sur pylône et mur](#) au dessous.
- c. Connecter la câble de terre au point de châssis sur l'ODU.
- d. Relier le câble ODU-IDU au connecteur ODU RJ-45.
- e. Visser les presses-étoupe de câbles pour assurer le scellement hermétique des unités ODU.
- f. Attacher le *câble au pylône ou aux supports en utilisant des colliers classés UV*.
- g. Répéter la procédure sur le site distant.



**Prudence**

---

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

---

### Connecter la terre à IDU-NetStream RM

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

### Installation sur pylône et mur

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



- 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-NetStream RM doit être fourni par l'intermédiaire d'un disjoncteur bipolaire et le diamètre du câble doit être de 14 mm avec un conduit de 16 mm.

### Contenu du kit de montage ODU

Le kit de montage ODU comprend les pièces suivantes:

8. une grande clame (voir [Figure D-1](#))
9. une *petite clame* (voir [Figure D-2](#))
10. un bras (voir [Figure D-3](#))
11. quatre vis hex tête M8x40
12. deux vis hex tête M8x70
13. quatre rondelles plates M8
14. trois rondelles élastiques M8
15. deux écrous M8.

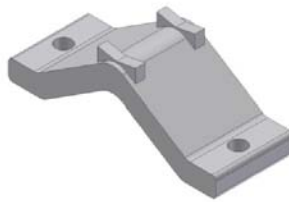
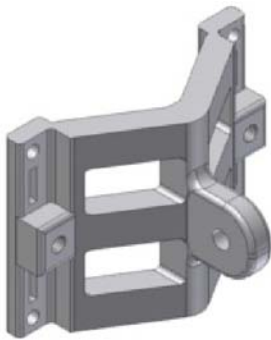


Figure D-1: grande clame

Figure D-2: petite clame

Figure D-3: bras

### Montage sur un pylône

Kit d'installation		
PIECE	DESCRIPTION	QUANTITE
1	Fixation	1
2	vises hex tête M8x40	1
3	rondelles plates M8	4
4	rondelles élastiques M8	3
5	écrou M8	1
6	fixation	1
7	vises hex tête M8x70 (pour pylône 1 3/4" dia)	2
8	vises hex tête M8x70 (pour pylône de plus grande taille)	2

**ETAPE 1**

Attacher la pièce 1 à la base (repérer les surfaces usées) en utilisant les pièces 2, 3, 4, 5 comme indiqué. Utiliser un couple de serrage de 24 Nm.

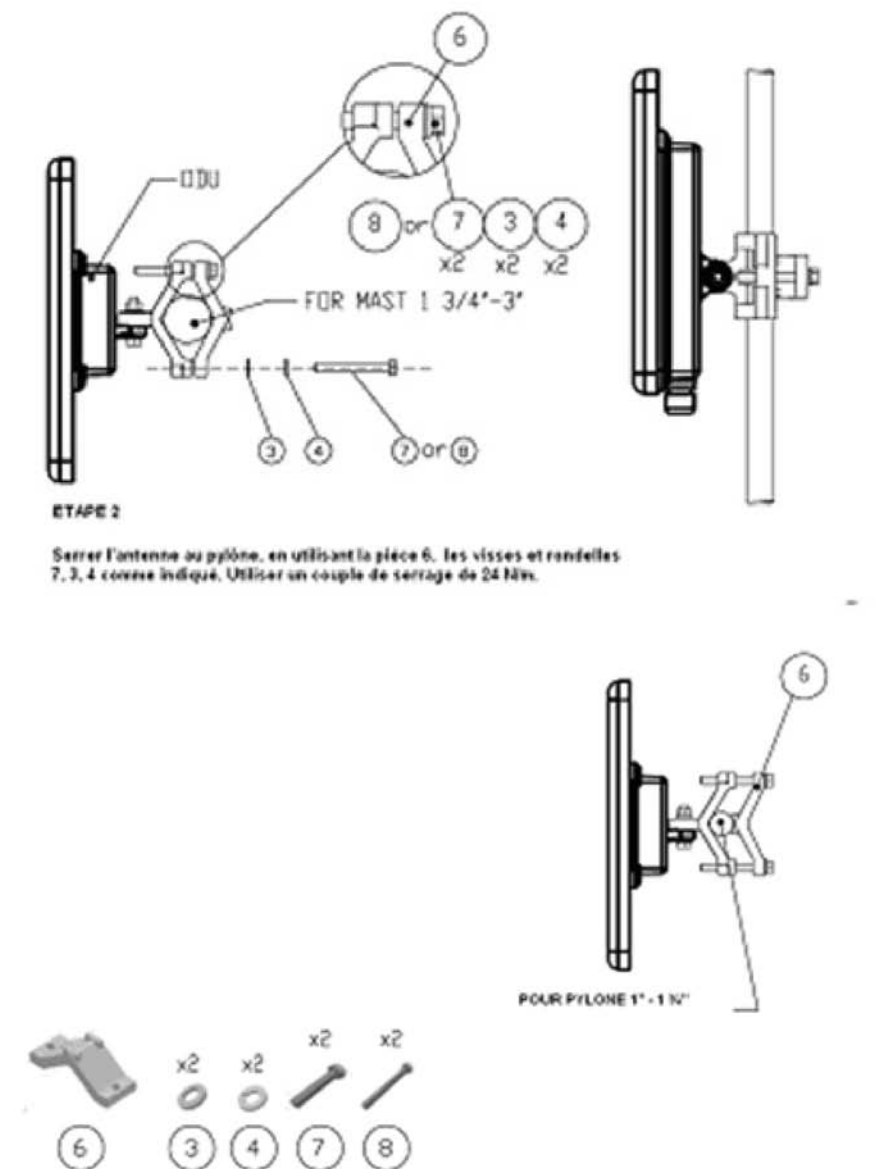
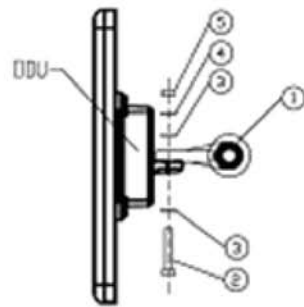
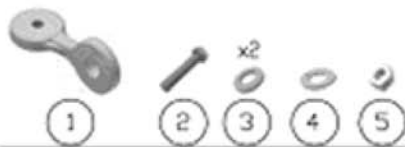


Figure D-4: Montage sur un pylône

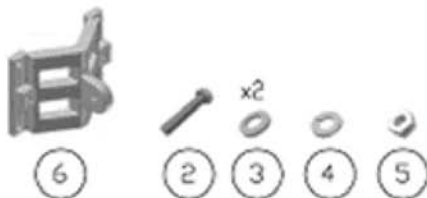
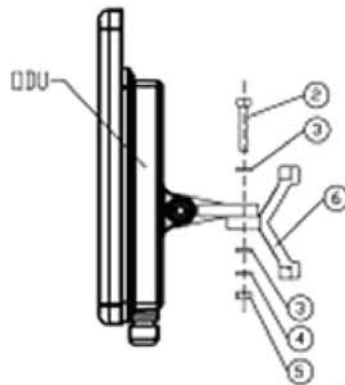
**Montage sur un mur**



Kit d'installation		
PIÈCE	DESCRIPTION	QUANTITE
1	Bras	1
2	vissés hex tête M3x40	2
3	rendelles plates M	4
4	rendelles élastiques M3	2
5	écrou M3	2
6	base	1



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



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

**ETAPE 3**  
 Installer l'antenne sur le mur (matériel fourni par le client)

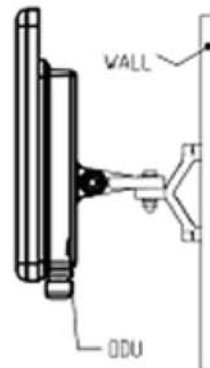


Figure D-5: Montage sur un mur



## ***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

- a. Douze rondelles plates
- b. Huit rondelles élastiques
- c. Huit écrous hex
- d. Quatre boulons
- e. Un support en U
- f. Un support à pivotement
- g. Deux courroies de fixation en métal

#### **Pour installer une antenne externe sur un pylône:**

- i. Attacher le support en U à l'arrière de l'antenne en utilisant quatre rondelles plates, quatre rondelles élastiques et quatre écrous hex.
- ii. Attacher le support à pivotement au support en U en utilisant huit rondelles plates, quatre rondelles élastiques, quatre écrous hex et quatre boulons.
- iii. Passer les deux courroies de fixation par les fentes verticales dans le support à pivotement.
- iv. 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.