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StarMAX™

3100 SERIES SUBSCRIBER STATION USER MANUAL

StarMAX™ 3100 Series Subscriber Station User Manual
Release 4.1.1

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StarMAX™ 3100 Series Subscriber Station User Manual

260-668104-001 December 2009

This manual incorporates features and functions provided with the StarMAX™ 3100 Series, Release 4.1.1, (GA Preliminary Draft).

Safety Recommendations

The following safety recommendations must be considered to avoid injuries to persons and/or damage to the equipment:

1. *Installation and Service Personnel:* Installation and service must be carried out by authorized personnel who have the technical training and experience necessary to be aware of any hazardous operations during installation and service, and of measures to avoid any danger to themselves, to any other personnel, and to the equipment.

2. *Access to the Equipment:* Access to the equipment in use must be restricted to service personnel only.

3. *Safety Norms:* Local safety regulations must be used if mandatory. Safety instructions in this document should be used in addition to the local safety regulations. In the case of conflict between safety instructions stated in this manual and those indicated in local regulations, mandatory local norms will prevail.

4. *Service Personnel Skill:* Service personnel must have received adequate technical training on telecommunications and in particular on the equipment this manual refers to.

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Or you can contact your local Harris Stratex Networks office. Contact information is available on our website at: **www.harrisstratex.com/support/customer/.**

FCC Notices

1. The StarMAX Subscriber Station must be professionally installed and maintained.

2. 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.

3. Notes specific to the $3.65 - 3.675$GHz band:

   •The StarMAX 3160-37 Subscriber Station complies with FCC CFR47, Part 90, Subpart Z.
   •For FCC CFR47, Part 90, Subpart Z, StarMAX operation is restricted to the 25MHz band 3.65GHz $- 3.675$GHz.
   •To ensure compliance with the FCC RF exposure requirements, a minimum distance of 25cm must be maintained between the subscriber station antenna and any persons whilst the unit is operational at 5MHz and 34cm for 10MHz operation. This calculation is based on the EIRP limits within Part 90, Subpart Z.
   •The 3160-37 Subscriber Station has been tested and certified to FCC CFR47, Part 90, Subpart Z with an integral antenna with a gain of 14dBi.
   •FCC CFR47, Part 90, Subpart Z, applies strict limitations on EIRP. 5MHz operation has an EIRP limit of 5W and 10MHz operation has an EIRP limit of 10W. The StarMAX Subcriber Station is not field programmable so the power is set during production. Model 3160-37-14-05 should be used for all installations within the United States.

WARNING

Making adjustments and/or modifications to this equipment that are not in accordance with the provisions of this instruction manual or other supplementary documentation may result in personal injury or damage to the equipment, and may void the equipment warranty.

AVERTISSEMENT

Tout réglage ou modification faits à cet équipement hors du cadre édicté par ce guide d'utilisation ou par toute autre documentation supplémentaire pourraient causer des blessures ou endommager l'équipement et peut entraîner l'annulation de sa garantie.

WARNUNG

Die an diesen Geräten gemachte Einstellungen und/oder Änderungen, welche nicht gemäß dieser Bedienungsanleitung, oder gemäß anderen zusätzlichen Anleitungen, ausgeführt werden, können Verletzungen oder Materialschäden zur Folge haben und eventuell die Garantie ungültig machen.

ATENCIÓN

Llevar a cabo ajustamientos y/o modificaciones a este equipo, sin seguir las instrucciones provistas por este manual u otro documento adicional, podría resultar en lesiones a su persona o daños al equipo, y anular la garantía de este último.

警告

不按该说明书有关条例或其它补充文件对该设备所做的调整和／或改型可能会引起人身伤害或损坏设备，并且设备保修也将失效。

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CHAPTER 7, NETWORK ADDRESS TRANSLATION (NAT)

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Chapter 1. Overview of the StarMAX™ 3100 Series Subscriber Stations

This chapter gives you an overview of the StarMAX™ 3100 Series Stationary Subscriber Stations. It covers the following topics:

- Introducing the StarMAX™ 3100 Series
- Brief description of the StarMAX™ 3100 Series Stationary Subscribers
- Subscriber Station HTML GUI management

Abbreviations & Definitions

Abbreviations	Description
ACB	ATCA carrier board
BE	Best Effort
BS	Base Station
CINR	Carrier-to-Interface plus Noise Ratio
CIR	Committed Information Rate
CLI	Command Line Interface
CPE	Customer Premises Equipment
DC	Direct Current
DHCP	Dynamic Host Configuration Protocol
DMZ	De-Militarized Zone
EIRP	Equivalent Isotropic Radiated Power
EMS	Element Management System
FEC	Forward Error Correction
GND	Ground
GPS	Global Positioning System
IDU	Indoor Unit
IF	Intermediate Frequency
IPMI	Intelligent Platform Management Interface

Abbreviations	Description
LED	Light Emitting Diode
LVDS	Low Voltage Data Signal
MAC	Medium Access Control
MIB	Management Information Base
MPU	Main Processor Unit
NAPT	Network Address Port Translation
NAT	Network Address Translation
NMS	Network Management System
Nrt-PS	Non Real Time Polling Services
ODU	Outdoor Unit
PLL	Phase Locked Loop
PMP	Point To Multipoint
POE	Power Over ethernet
POST	Power On Self Test
PPS	Pulses Per Second
PS	Provisioning Server
PSU	Power Supply
RF	Radio Frequency
RO	Read Only
R/W	Read/Write
RSSI	Receive Signal Strength Indicator
SELV	Safety Extra Low Voltage
SFP	Small Form-factor Pluggable
SNMP	Simple Network Management Protocol
SoC	System on Chip
SS	Subscriber Station
STC/MRC	Space Time Coding / Max. Ratio Combining
TDM	Time Division Multiplexing
TTL	Transistor-Transistor Logic
VEE	Virtual End-to-End
VLAN	Virtual Local Area Network
WEEE	Waste Electronic Electric Equipment

Conventions

The following conventions are used in the document to help you to identify special terms.

Convention	Usage	Example
Bold	The following screen elements: Button List Drop-down menu	Click **OK**.
Courier New	Computer output text	HSX_bs#configure access-list 2 permit 11:22:33:44:55:66 00:00:00:00:00:00 22:33:44:55:66:77 00:00:00:00:00:00
Courier Bold	User input text	**>HSX_bs#exit**
Courier Italic	Variable in command that you may replace with other values, as required	To make a new directory, enter: prompt> mkdir *new_directory_name*
Italic	Description of figures and tables, Book title and emphasis, Cross References	*ProductCodes* Refer to *User Manual* for more information.
< >	Mandatory parameters	HSX_bs# show card <unit number>
[ ]	Optional parameters	HSX_bs# configure ip address <ip-address> [subnet mask]
|	Mutually exclusive choices in a command or a code	HSX_bs#reboot 1|2|3

The Note format is used for clarification or to point out specific text or instructions in the procedure or description.

The Caution format is used for a Warning or a Caution. The information that follows alerts personnel to possible damage to equipment or interruption of service, or a violation of a legal requirement.

The Stop format indicates a pause in the procedure to perform some other task. The procedure continues once you have completed the other task.

Introducing the StarMAX™ 3100 Series

Harris Stratex Networks' StarMAX™ 3100 Series Subscriber Stations (SS) are fully compliant and certified with the IEEE 802.16e-2005 standards and conform to WiMAX forum Wave 2 inter-operability specifications. They are matched to the frequencies and WiMAX enhanced features supported by the Harris Stratex Networks Base Station (BS) system. When deployed in networks based on the StarMAX™ Base Station, they provide optimal performance in line-of-sight (LOS), near line-of-sight (NrLOS) as well as non-line-of-sight (NLOS) applications. The Subscriber Station offers market leading performance through the use of intelligent antenna systems and advanced WiMAX features.

The system uses S-OFDMA radio technology, which is robust in adverse channel conditions and enables NLOS operation. This helps in easy installation, improves coverage, and maintains a high level of spectral efficiency. Modulation and coding can be adapted per burst, helping to achieve the balance of robustness and efficiency, based on the prevailing link conditions.

StarMAX™ 3100 Series Subscriber Stations support a wide range of network services, including Internet Access and Voice over IP. A variety of other choices are also available to meet the requirements of different environments, including residential, SOHO, SME, large enterprise and multi-tenant customers while able to support fixed, nomadic and mobile services.

The StarMAX™ 3100 Series of Subscriber Stations is currently available in the 2.3-2.4, 2.5-2.7 GHz, 3.4-3.6 GHz, and 3.6-3.8 GHz frequency bands, and also of various signal send/receive strengths. The actual operating frequencies used by the system can be configured by software according to the applicable radio regulations, license conditions and specific deployments.

3160 CPE must be professionally installed. It is up to the installer to set the Frequency of the CPE (frequency scanning list).   For NA market, we do not have to define a SKU that limits the frequency but we do need a FRU that limits the power.   In Canada, we need to limit both the frequency and power.   Both NA and Canada follow the same EIRP limits across the 50 MHz frequency band (1 watt per MHz).

About the StarMAX™ 3100 Series Stationary Subscriber Stations

The Subscriber Station installed at the customer premises provides data connectivity through the Base Station. Equipment provides high reliability and provides a platform for wide range services. Subscriber side WiMAX functionality on PHY and MAC layer is implemented. The Subscriber Station provides the data bridging functionality, traffic shaping and classification through the 10/100 BaseT Ethernet ports.

Figure 1-1. Model of SS

StarMAX™ 3160
WiMAX 16e outdoor SS with an integrated antenna

- The **StarMAX™ 3160 Subscriber Station** is an outdoor version, designed for a full outdoor operation. It comes with an integrated antenna which is located under the cover of the unit. The Subscriber Station has an installed beeper and only a CAT5e cable to the rooftop outdoor unit for effortless installation and alignment. The Subscriber Station is cost-effective and high performance solution for business and residential users, requiring a longer range and throughput of an outdoor unit.

Subscriber Station Features

- IEEE 802.16e Wave 2 ready, MIMO 2x2 A/B Mobile WiMAX compliant Subscriber Station.

- DHCP – IP address assignment for Subscriber Station for remote provisioning.

- Automatic Scanner Channel application. This feature helps the Subscriber Station to connect to the Base Station with the best RSSI and CINR values among the available Base Stations.

- Over-the-air fail-safe download of software upgrades.

- Automatic Software upgrade over the TFTP and FTP server on a Subscriber Station synchronizing with the Base Station after a reboot, software running on the Subscriber Station is checked with the software available on the TFTP server. Software upgrade is done if the TFTP server software is different.

- Remote Software upgrade over the TFTP or FTP. Subscriber station software upgrade can be performed from the CLI over the TFTP. The Subscriber Station software is obtained from the TFTP server.

- Post-Power on Self test is done to check the basic Subscriber Station system integrity in terms of on-board hardware components (e.g. memory).

- Packet classification (data, voice) based on VLANs. Subscriber Station provides functionality to classify the traffic based on a Virtual LAN for Security, QoS etc.

- Packet Filtering based on L2, L3 and L4 parameters.

- CLI (via Telnet) access for debugging and configuration. Command Line Interface provides standard system command parsing and execution for configuration and monitoring purposes.

- Transparent VLAN tagging at the Subscriber station in the uplink direction to the base station and untagging in the downlink direction to the CPE devices.

- Subscriber Station HTML GUI provides the Web service for the Subscriber Station configuration with respect to the scanner channel, the IP address, a display of the Subscriber Station radio parameters, and the antenna status.

Subscriber Station HTML GUI Manager

The Subscriber Stations with software revisions 4.0 and newer can be managed through a web based application called the Subscriber Station HTML GUI (see Subscriber Station HTML GUI on page 6-1 for details). It enables management of the Subscriber Station as well as monitoring of the RF signal levels (RSSI and CINR).

Chapter 2. Quick Installation of the StarMAX™ 3100 Series Stationary Subscriber Stations

This chapter covers the quick installation of the StarMAX™ 3100 Series Subscriber Stations:

- StarMAX™ 3160

To install and start using the StarMAX™ 3100 Series Subscriber Station quickly you, will need the following items:

- A StarMAX™ 3100 Series Subscriber Station.
- A longer Ethernet cable (straight) in cases where the enclosed cable is too short.
- For the StarMAX™ 3160 - a screwdriver, a pair of tongs, a spanner, a pole, drilling equipment and other accessories.
- A PC that is configured with the following:
    - An Ethernet interface
    - Microsoft Windows®

Unit must be supplied by Power over Ethernet adapter complying with Limited Power Source requirements according IEC 60950-1 with rated output voltage 48Vdc.

Installation of the StarMAX™ 3160 Subscriber Station

Ensure that the package contains the items shown in the following figure:

Figure 2-1. The StarMAX™ 3160 Package Contents

a) The 3160 outdoor Subscriber Station

b) Mounting kit

c) Power over Ethernet Injector (PHIHONG PSA 16U-480)

d) RJ-45 Network Cable

Mounting the Subscriber Station on a Pole

This section provides the installation process guidelines for the existing pole installation outside of the customer premises. The most suitable location for a pole is such that the Subscriber Station can be rotated 360 degrees in a horizontal direction and aligned for about +/- 5 degrees in the vertical direction (when the pole is vertical and vice versa when the pole is horizontal), to be able to align the antenna correctly. If the best direction towards the closest Base Station is already known, such a wide angle for the alignment is not needed. Recommended pole diameter is 40 mm and the required pole length is 1.25 m.

There are two possibilities of mounting a Subscriber Station on a pole:

• Vertical mounting on a pole (two diameters)

• Horizontal mounting on a pole (two diameters)

Make sure that the pole is mounted firmly enough. If the pole is mounted at the highest point of the building, a proper grounding must be installed for the pole and at least 30 cm of the pole should be left above the top of the Subscriber Station. That ensures that in case of a lightning strike electric discharge hits the pole and is taken directly to the ground.

The antenna can be mounted on a pole with a diameter of 40-65 mm.

Mounting Bracket Attachment

There are several options of mounting the Subscriber Station (wall mounting, thick and thin pole mounting, grid mounting etc.). For installing the Subscriber Station on a pole, please follow the steps described below.

1. Attach the bracket transition to the base bracket of the enclosure as shown in Figure 2-2.

2. Mate the knurled surfaces so that both items are tightened together.

3. The bolt head should be positioned in the socket of the base bracket, while the nut, the spring washer and the flat washer should be placed on the flat surface of the bracket transition. Tighten up the screw with a torque of 24 Nm. Attach the wall mounting flange on the other side of the transition bracket by using the same method as the above.

Figure 2-2. Subscriber Station mounting assembly

Mounting the StarMAX™ 3160 on a Wall

This section provides guidelines for the installation of the Subscriber Station on a wall outside of the customer premises. At first an appropriate location on a wall has to be chosen. It has to be easily accessible and located as high as possible, the surface has to be flat and firm, and orientated approximately in the direction of the base station. Usually the vertical movement of a SS on a wall is very limited.

When mounted on the wall, the mounting kit provides the antenna with up to a 40° tilting possibility in a horizontal and in a vertical direction.

The procedure for fixing the Subscriber Station on a wall is similar to the procedure described above, except that the upper part is not necessary.

Connecting the Equipment

The unit should be mounted with the female RJ45 connector pointed downwards and never upwards. If it is necessary to mount the ODU where the RJ45 connector has to be mounted parallel to the ground, a service loop needs to be added when attaching the cable to the RJ45 connector.

1. Connect the Network Cable to the RF+DC port on the POE Module.

2. Connect the RJ-45 Network Cable to the RF port on the POE Injector.

3. Connect the other end of the RJ-45 Network Cable to the RJ-45 port of your computer's Ethernet card or adapter or the network equipment.

4. Connect the POE Injector to a standard electrical outlet.

The POE cable is not provided with the Subscriber Station so you should take care of the proper connector pinout when preparing the cable.

Figure 2-3. Connecting the Equipment

Take care of the proper order of the sealing parts.

POE Injector (POE upper left cable is data & power leads to the Subscriber Station; lower left RF cable leads to the computer, the right cable goes to the electric outlet).

When assembling the connector part, it should be ensured that the gaskets are aligned correctly before tightening the whole assembly and attaching it to the ODU RJ45 connector to prevent any water ingress problems.

POE Injector/Splitter

The StarMAX™ 3160 Subscriber Station is powered via a POE device, consisting of a POE Injector and a POE Splitter. The Injector takes 110-240V AC power and converts it to a DC voltage to transfer it through the CAT5 cable along with data. The Injector is typically installed in the "wiring closet" near a CPE or Ethernet switch/hub. The POE Splitter takes the output of the Injector (data + electric current), picks-off the DC Voltage that has been injected into the Ethernet cable by the Injector and makes it available to the equipment through the regular DC power jack. The data separated from the DC voltage is forwarded to the device through a separate data jack. The splitters are typically installed near the equipment running on a POE supply.

⚠️

You have to ensure a proper grounding for all installations!

⚠️

To prevent damage of the equipment it is recommended to use splitters and injectors of the same make!
The POE should be placed in a cool and dry place. The 110-240V AC power connector should be connected firmly to the socket!
The grounding point and the POE connector of the Full Outdoor Subscriber Station have to be oriented downwards to avoid any water leakage into the unit!

⚠️

The network (Cat5) cable must have both ends terminated with properly crimped RJ45 connectors by using one type of the T658A or T568B wiring standard, tested with the Network (Cat5) tester/ analyzer. The LTW cap must be installed as well. The POE circuitry at the Subscriber Station might fail or the Ethernet port might fail as well or it might not work properly. Additionally the POE injector would detect an error and wouldn't establish any voltage.

Precaution Guidelines

In order to prevent damage of the equipment please follow the precautions described below before powering the equipment on.

• Test the Subscriber Station on the ground before installation (connect both cables to the Ethernet ports by using short Cat5 cables.
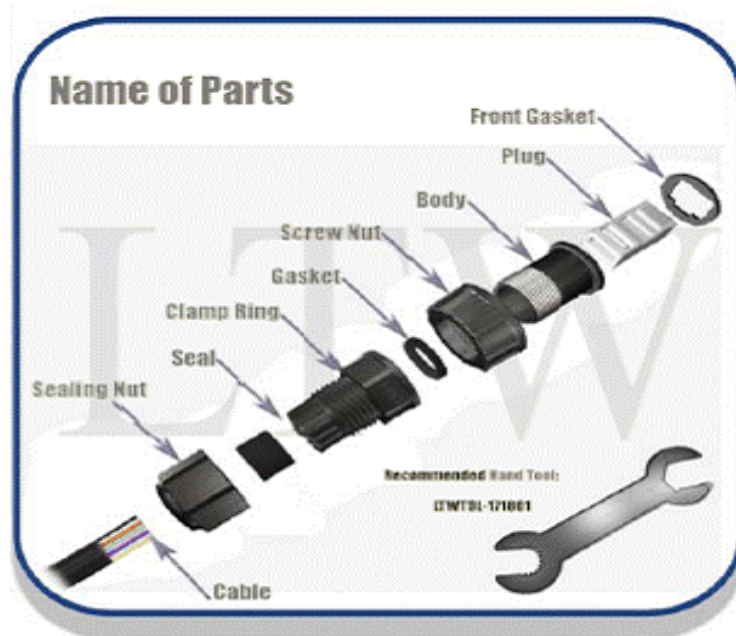
• Turn the notebook on.

- Connect the 110-240V power voltage to the POE injector (this should be connected the last. Wait for a few seconds and check whether the green lights from the POE are coming up: first the power green light next to the POE green light. If the LED is blinking there is no voltage delivered and something is wrong).

- Verify that the modem is reaching Operational status (that means it is connected to the Base Station and it can pass the ping traffic); if operational status has been reached then proceed to the next step. If not then check once more the steps described above; in case of failure for the second time, send the modem back to the factory.

- For modems that have reached the Operational status ping and start short traffic tests to verify the web connectivity.

- For modems that have reached the web connectivity, continue with the field unstable Cat5 cable testing.

⚠️

Important! It is essential that the main voltage (110-240V) is disconnected before disconnecting any other cable!

- Disconnect the power first!

- Remove the Cat5 cable from the SS-ODU to the POE injector;

- Replace with the Cat5 cable that the Subscriber Station is going to be installed with (since this cable may be crimped in the field, the Cat5 cable must have both ends terminated with properly crimped RJ45 connectors by using one type T568A or T568B wiring standards and tested with Cat5 tester/analyzer; the LTW cap must be installed as well – see the description in the table below).

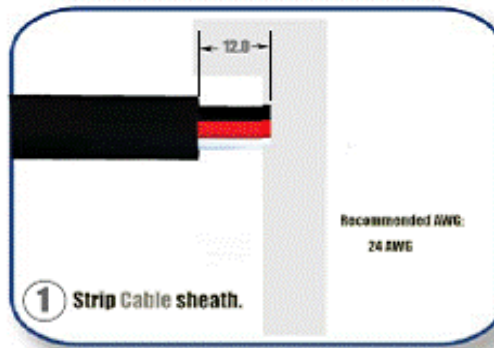**Figure 2-4.** LTW Parts

Step by step istructions:

1 Strip Cable sheath.

Recommended AWG:
24 AWG

2 Insert Seal into the back end of Clamp Ring.

3 Insert Gasket into the front end of Clamp Ring.

4 Insert Body, Nut, Sealing Nut and Clamp Ring into stripped end Cable.

⑤ Crimp the stripped Cable to Plug.

⑥ Insert Front Gasket to the front end of Connector and put the Screw Nut on the back.

⑦ Connect Clamp Ring and Sealing Nut to the back end of Connector and Clamp Ring, respectively. Tighten using Hand Tool (optional) or your hand while holding assy.

Table 2-1. EIA/TIA 568B connector pinout

Pin	Name	Description	EIA/TIA 568A cable colors	EIA/TIA 568B or AT&T 258A cable colors
1	TX+	Tranceive Data+	White with green stripe	White with orange stripe
2	TX-	Tranceive Data-	Green with white stripe or solid green	Orange with white stripe or solid orange
3	RX+	Receive Data+	White with orange stripe	White with green stripe
4	n/c	Not connected	Blue with white stripe or solid blue	Blue with white stripe or solid blue
5	n/c	Not connected	White with blue stripe	White with blue stripe
6	RX-	Receive Data-	Orange with white stripe or solid orange	Green with white stripe or solid green
7	n/c	Not connected	White with brown strip or solid brown	White with brown strip or solid brown
8	n/c	Not connected	Brown with white stripe or solid brown	Brown with white stripe or solid brown

It is better that the Cat5 cables are properly prepared and tested before going into the field!
If the Cat5 cable that is crimped in the field is not properly wired or the wires are not following one of the T568A or T568B wiring standards, the POE circuitry at the SS-outdoor unit may fail or the Ethernet port might fail as well or might not work properly. Additionally, the POE injector will detect an error and won't establish voltage.

Troubleshooting Guidelines

For Subscriber Stations that have already been installed and fail to work properly check the following:

- Are the POE lights both green? If yes, the POE is working properly; if not disconnect the 110-240V and reconnect then wait for a few seconds and check that the green lights are on.

- If no green lights are present, then the POE circuitry is detecting a failure in the Cat5 cabling or the SS-ODU circuitry. Check the Cat5 first for proper connection or damage. Eventually test with a new Cat5 cable.

- If the green lights are on, test that the modem reaches Operational Status: ping and make a traffic test. If this is failing, then remove the SS-ODU.

- If one or the other green lights is not on, then replace the POE injector and repeat the procedure to check for green lights, operation, ping, traffic; if OK, then the POE injector is failing.

- If still failing with the new POE injector, then remove the SS-ODU, the original Cat5 cable, and the original POE injector; pack them all and ship all of the items TOGETHER for failure analysis to RMA and describe the failure.

Sealing the StarMAX™ 3160 POE Injector

The sealing on the bottom side of the Subscriber Station should be closed tightly to prevent any water leakage into the unit. For details see Figure 2-3.

The StarMAX™ 3160 Subscriber Station has a built-in panel antenna. Use the 4-LED display to see the measured signal strength in order to place the unit in the optimal position.

Chapter 3. Antenna Alignment

Using wireless data communications involves signal transmission and reception in various environments, where building configurations can sometimes interfere with the transmitted signals. Therefore you have to optimize the placement and the direction of the StarMAX™ Subscriber Station and/or its optional external antenna.

It is advisable that you try to find the optimal location for placing the Subscriber Station and/or the antenna prior to fixing the Subscriber Station and/or antenna to any fixed objects, such as poles or walls (installations described in Chapter 2).

To do this you can use the built-in SS HTML GUI, described in Chapter 6 of this manual. Under the Antenna Graph option you can read out the CINR and RSSI values and you can read out the signal quality and strength parameters. RSSI and CINR thresholds are specified as RSSI/CINR @ 3MHz: - 84dB/12dB; RSSI/CINR @ 6MHz: - 82dB/12dB. CINR values lower than 12 dB should not be acceptable.

For professional installations a specialized Alignment Tool application can be used to evaluate the receive signal strength values (RSSI) and to adjust the Subscriber Station accordingly.

If using the SS HTML GUI to find the optimal space for positioning the SS, please refresh the Antenna Graph every time you reposition the equipment.

When finding the optimal position for your outdoor antennas please follow these guidelines:

- Ensure that the outdoor unit of the antenna provides direct line of sight (LOS) or near line of sight (NrLOS) conditions to the Base Station antenna.
- In the no line of sight (NLOS) conditions direct the antenna to the open space and not directly towards the nearest obstructions such as tall buildings, hills, trees etc.
- To achieve a better link quality, place the Subscriber Station antenna as high as possible.
- Ensure that the location of the antenna is easily accessible for a safe installation and testing.
- When deciding about the location of the Subscriber Station, take into account the location of the power outlet and of your data equipment.

To make a fine antenna alignment in the horizontal direction (left-right) or in the vertical direction (up-down), you should slightly loosen the corresponding nut to enable the movement of the antenna in the desired direction.

When precise positioning is required (with the Outdoor units), there is also an optional Alignment Tool available, which enables optimal location search. More information on obtaining the Alignment Tool is available at the Harris Stratex Networks Customer Support site - www.support.harrisstratex.com.

Chapter 4. Subscriber Commissioning

This section covers the following topics:

- Required Information
- Configuring Basic Parameters
- Aligning the Subscriber Unit Antenna
- Operational Verification of the Subscriber Station

Required Information

Table 4-1 lists the parameters required for bringing the Subscriber Station to the minimal operational state.

Table 4-1. Information needed to get Subscriber Station operational

Item	Parameters	What should be updated
Management Port (mandatory)	IP Address	192.168.1.1
	Subnet Mask	255.255.255.0
RF Interface (mandatory)	Frequency (in kHz)	Sample 2500000, 2585000
	Bandwidth (in kHz)	10000

Configuring Basic Parameters

During the Subscriber Station power-up, the following stages occur before the Subscriber Station is synchronized with the Base Station:

1. Complete Power On Self Test.

2. The Subscriber Station scans the configured connection channel and synchronizes with the Base Station with the best RSSI or CINR values. To configure new channels, refer to Subscriber Station HTML GUI on page 6-1.

Aligning the Subscriber Unit Antenna

> This section is applicable only to the Outdoor Subscriber Station.

The link quality measurement can be obtained using the web based SS HTML GUI management interface (see Subscriber Station HTML GUI on page 6-1 for details). The Signal LED on the Subscriber Station flashes when the registration process is in progress and is on when the Subscriber Station is registered.

To align the outdoor antenna, please follow these steps:

1. Point the antenna towards the general direction of the base station.

2. Verify that the power LED of the Subscriber Station is on.

3. Check the signal LED- flashing indicates that the Subscriber Station is synchronized with the Base Station. If the signal LED is off, check the basic configuration of the Subscriber Station.

4. Check whether the Signal LED is on after flashing green for few seconds. If the signal LED continues to flash, try to change the direction of the antenna or position the antenna at a higher or an alternate location.

5. Use the SS HTML GUI to ascertain the best link quality (see Subscriber Station HTML GUI on page 6-1 for details).

Verifying Data connectivity

To verify data connectivity, try to connect to the Internet from the end-user's PC (see Configuring Your Computer (MS Windows) on page 5-1 for details).

Chapter 5. Configuring Your Computer (MS Windows)

This chapter describes how to configure computers for the StarMAX™ 3100 Series Subscriber Station. Topics include:

Setting the IP Address

The quickest way to start using the correctly installed StarMAX™ 3100 Series Subscriber Station is to configure your computer network port for a fixed IP address that is in the same subnet as the default IP address of the Subscriber Station which is 192.168.1.1. The computer's IP address should be in the range 192.168.1.2. through 192.168.1.254. Follow these steps to configure a computer for a static IP:

1. Click on **Start** > **Settings** > **Control Panel**.
2. Double click **Network Connections**.
3. Find the LAN connection that is connected to the Subscriber Station, right-click the connection and check the **Status**. It should be connected.
4. Then right-click on the **Properties/General** tab and select **Internet Protocol** (TCP/IP) and click **Properties**.
5. As shown in Figure 5-1, select the following options:
   a. Use the following IP address
   b. Subnet mask

Figure 5-1. Fixed IP address
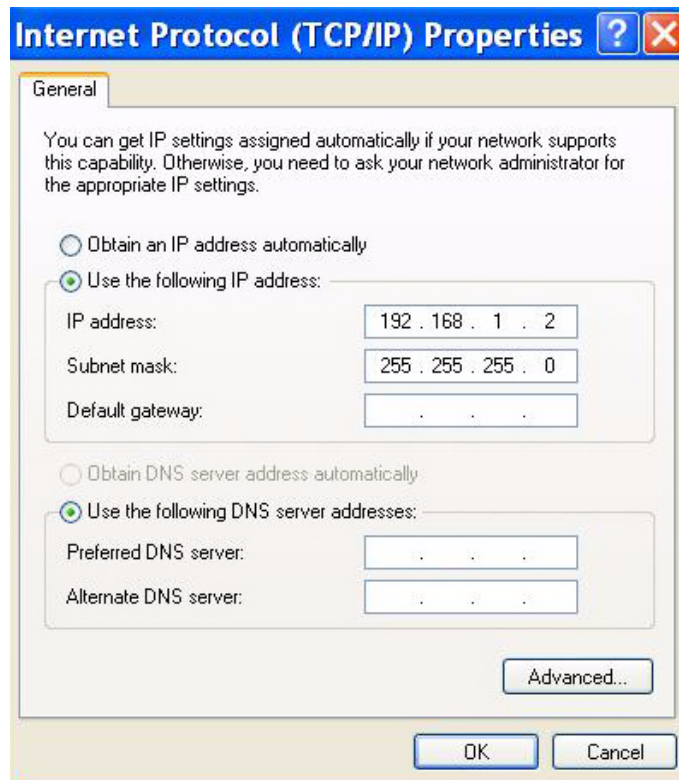
After the IP address of the computer has been set you can configure the scanning conditions by the web based application described in Subscriber Station HTML GUI on page 6-1 and start scanning for the best signal. The Subscriber Station is usually able to connect to the Base Station of the network in a couple of minutes (it usually takes about 0.5-2 minutes, which depends on the configuration of the Subscriber Station) after the Subscriber Station has been powered on. Once the Subscriber Station is operational (as shown in Subscriber Station HTML GUI on page 6-1), you should configure your computer in accordance with the settings of the operator (DHCP, PPPoE or static IP). Please follow the instructions given by the operator.

The following example shows the case of dynamic IP address assignment.

1. Click on **Start** > **Settings** > **Control Panel.**

2. Double click **Network Connections**.

3. Find the LAN connection that is connected to the Subscriber Station, right-click the connection and select **Properties**.

4. In the **General** tab, select **Internet Protocol** (TCP/IP) and click **Properties**.

5. As shown in Figure 5-2, select the following options:

    a. Obtain IP address automatically

    b. Obtain DNS server address automatically

Figure 5-2. Automatic IP assignment
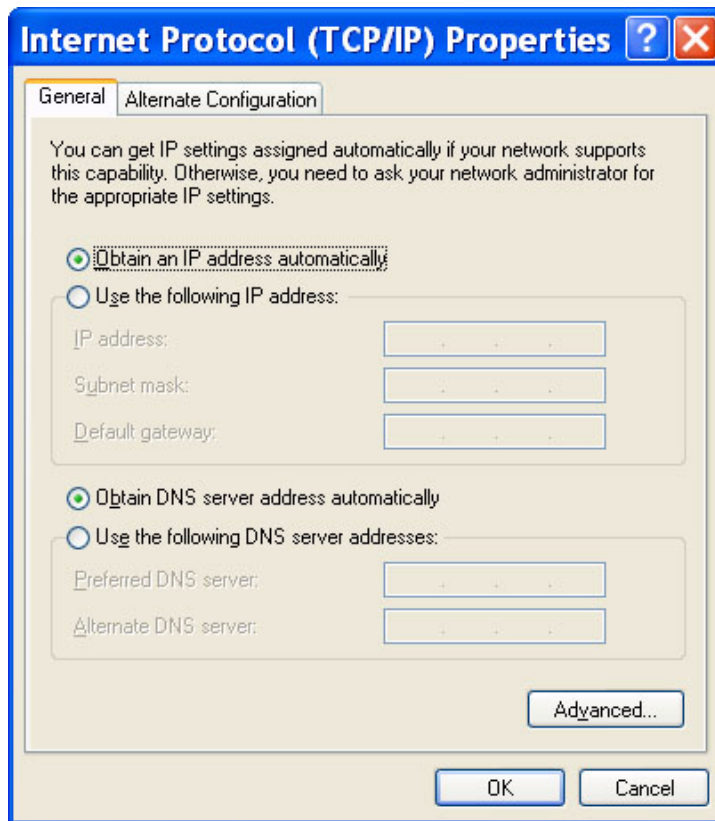
Verifying the Connection

To check whether the PC is connected to the WiMAX network, check the status of the LAN interface which is connected to the Subscriber Station.

Dynamic IP address and 1:N NAT

1. Click on **Start** > **Settings** > **Control Panel**.

2. Double click **Network Connections**.

3. Find the LAN connection that is connected to the Subscriber Station.

4. Right-click the connection and select **Status**; it should be **Connected**.

5. In the same window select the **Support** tab; it should be **Assigned by DHCP**.

   If another status is observed, then right-click the connection and select the **Repair** option. Perform the upper check if any change. Check the cabling.

Static IP address and N:N NAT

To check whether the PC is connected to the WiMAX network, check the status of the LAN interface which is connected to the Subscriber Station.

1. Click on **Start** > **Settings** > **Control Panel**.
2. Double click **Network Connections**.
3. Find the LAN connection that is connected to the Subscriber Station.
4. Right-click the connection and select **Status**; it should be **Connected**.
5. In the same window select the **Support** tab; it should be **Manually Configured.**
6. Use the **Details** button to check if the IP settings are the same as given by the operator.

If another status is observed, check the cabling; if wrong IP settings are defined, change the IP settings under the TCP/IP settings.

PPPoE

Check the documentation given by the Operator. In most cases the physical state of the interface will be as mentioned above (1 or 2) with additional Dial-Up connection defined in the Network Connections window.

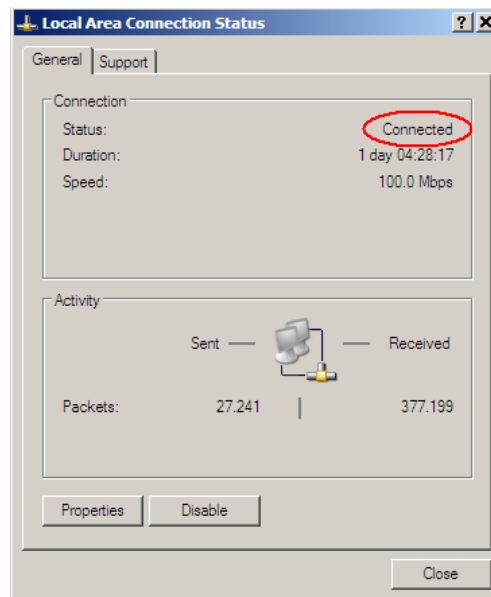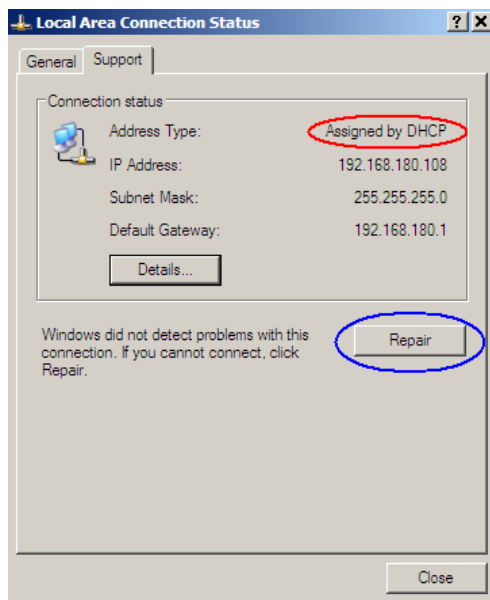**Figure 5-3.** Connection Status

Figure 5-4. Support Tab

Setting the Password

You can login to a Subscriber Station by using the telnet and the IP address of the Subscriber Station.

Example: `telnet 192.168.185.61`

A `login` and `password` dialog appears. There are different privileges with respect to the user logged in. A password can also be set when logged on the Subscriber Station.

The support password logic has been changed to provide better security for the Subscriber Station. There are several options to login to the Subscriber Station.

• For users with limited access you can use the following combination:

  Login: **root**
  Password: **telsimawl**

• For advanced users dynamic password logic has been created:

  • If the startupconfig *is not present* in the SS (modem), the default password for the Login: `support` is `starmax<SS>TS<D><HH>` where

    <SS> is the last two digits of the box's serial # (if the FRU is not in the Subscriber Station, then the serial number will be "TW")
    TS are just letters that stand for Telsima
    <D> is the first letter of the day of the week
    <HH> is the two digit hour in military time

- If the `startupconfig` *is present* in the Subscriber Station (modem) and no user has modified the support user password (default generated for the `startupconfig`), the password in the startupconfig for the Login: `support` is `support<SS>TS<D><HH>`.

- If the `startupconfig` has got any other password set for the user: `support`, then the password for the user: `support` will be that. If the password is `Telsima`, then the password would be: `telsima<SS>TS<D><HH>`.

The following logic has been applied for the default/user changed password for support user:

Example: `starmaxTWTSW05`
`<actual password> <SS>TS<D><HH>`
`<actual password>` is the current support password `starmax`

To assist the user to arrive to the <SS> serial number, <D> day of the week and <HH> hour, the telnet logic for the Subscriber Station has been modified as below:

```
System Time and Date: THU DEC 27 00:00:20 1990

Serial Number: Z00000000

Login:
Password:
Telsima_ss#
Telsima_ss#
```

Chapter 6. Subscriber Station HTML GUI

The Subscriber Station HTML GUI is a web based application, designed for management of the StarMAX™ Subscriber Stations and for monitoring the incoming RF signal levels (RSSI, CINR). HTTP servers basically provide access to monitoring and configuration of the device. The HTTP server is supported by both the Base Stations and the Subscriber Stations. The Subscriber Station HTTP server supports HTML pages mainly for configuration and monitoring of various aspects of the Subscriber Station. The following functionalities can be configured and/or monitored at the Subscriber Station:

- IP address related configuration
- Downlink radio measurement information
- Scanner channel configuration
- Miscellaneous configuration, such as Subscriber Station reset etc.
- Network Address Translation information and configuration
- IP and MAC filtering information and configuration

The HTTP server in the Subscriber Station consists of standalone modules that are primarily used for enabling the JAVA Web Start technology. They access the JAVA Web Start files present in the system, and send them back to the HTTP Client when they are requested.

The HTTP Server in the Subscriber Station is serving traditional HTML pages to the web browser, and is used for configuring and monitoring the system.

Ethernet Link Down

During the Subscriber Station power-up process the Ethernet link can be enabled or disabled by default, thus enabling/disabling the user of the station to access the Subscriber Station while the station is in the RF offline mode. The administrators can modify the behavior of the Ethernet link when the Subscriber Station goes from non-operational state to the operational state and vice-versa on the RF link.

By default, this feature is disabled to provide Ethernet access to the Subscriber Station for configuration and management reasons.

This feature is active only when the Ethernet link is configured for power down mode. The Subscriber Station will bring up the Ethernet interface and the link will be active during the power cycle. The Ethernet will not be in power down mode by default.

The power down mode can be enabled or disabled (see the StarMAX™ 3100 Series Subscriber Station Support Manual for details).

HTML GUI Introduction

The Subscriber Station HTML GUI is accessed through the web browser at the default address of the Subscriber Station. The **user/administrator** needs to open the web browser and type in the Subscriber Station's default IP address (default IP is: http://192.168.1.1); then the username and password need to be provided to access the configuration and management options of the StarMAX™ 3100 Series Subscriber Station through the Subscriber Station HTML GUI.

Authentication (Login/Password)

The authentication tab is used to accept the HTML client user name and password and validate further access to the user for the Subscriber Station configuration. The default username/password pair for an ordinary user is **admin/admin**. The administrator's username/password will be delivered by the operator for security reasons. The administrator has more privileges then an ordinary user. This manual is intended for both kinds of users, so some screenshots presented in the manual can be seen only by an administrator who has full privileges.

Figure 6-1. Login to the Subscriber Station HTML GUI
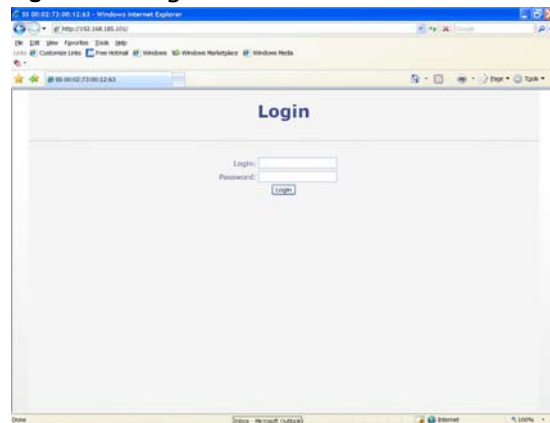
System Info Tab

The System Info tab contains the key information about the Subscriber Station including the Ethernet connection, the IP Address of the Subscriber Station, the Subnet mask, the WiMAX acquired IP Address, Gateway and Subnet IP. The Ethernet Power down mode can be enabled/disabled in this tab (see Ethernet Link Down on page 6-1 for a description). The current Running Configuration can be shown in this tab as well as the application version, MAC address of the board and serial number of the board. An administrator can modify the Ethernet IP address whereas the WiMAX IP address is read only.
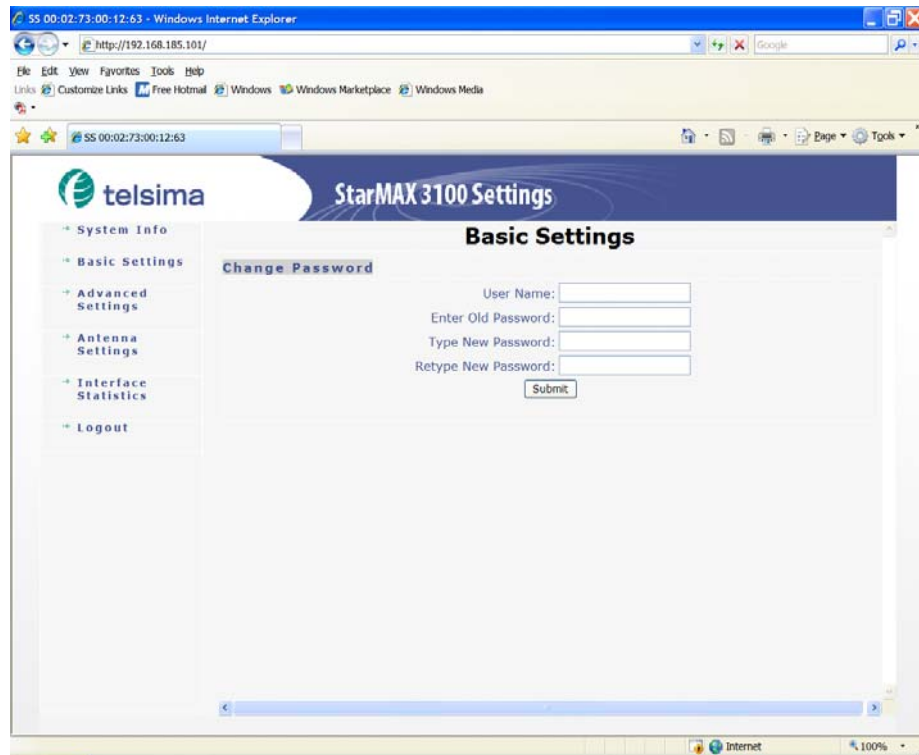
Figure 6-2. The System Info tab
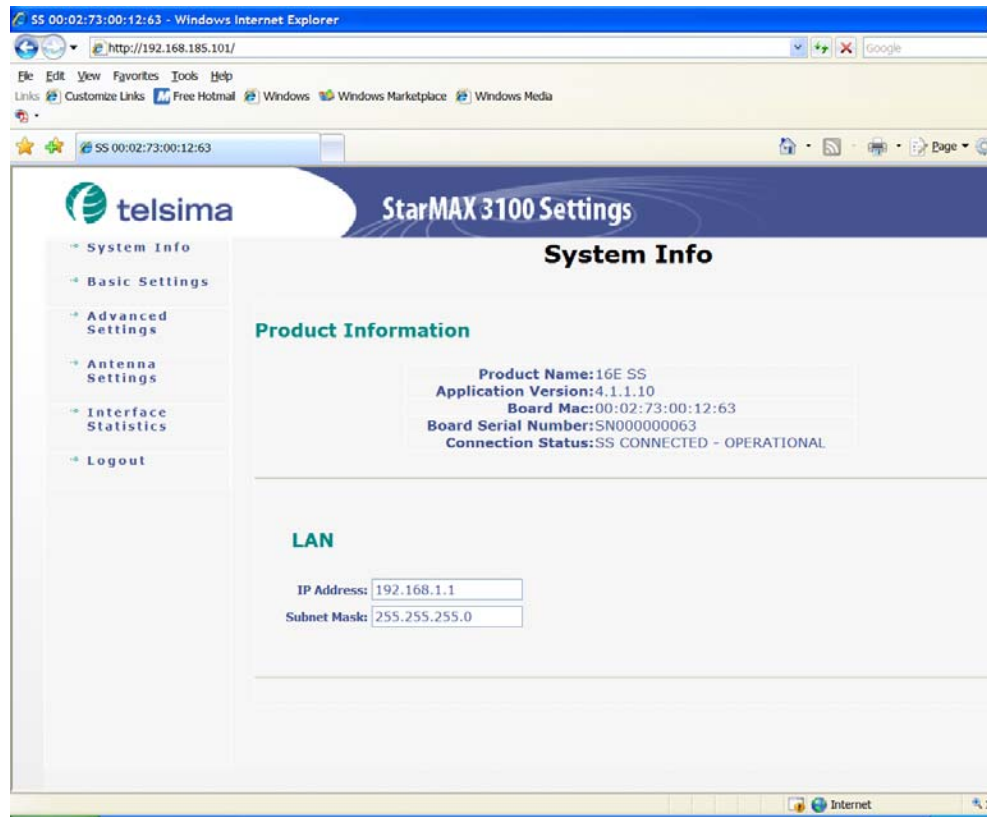
Basic Settings

In this tab the password can be changed for a different user name.

**Figure 6-3.** The Basic Settings tab

Advanced Settings Tab

The Advanced Setting tab displays the following sub-tabs: Radio Parameters, Scanner Channel, Mac Address Table, NAT and Firewall Filtering. The **Radio Parameters** sub-tab displays information on the radio connection status and working attributes. The Subscriber Station administrator can set values for Hystersis, Modulation and Protection and see the active Connection status – the Frequency, Bandwidth, CINR, RSSI, Connectivity Status, Sector-ID, Subchannelization and STC values.

**Figure 6-4.** Radio Parameters sub-tab
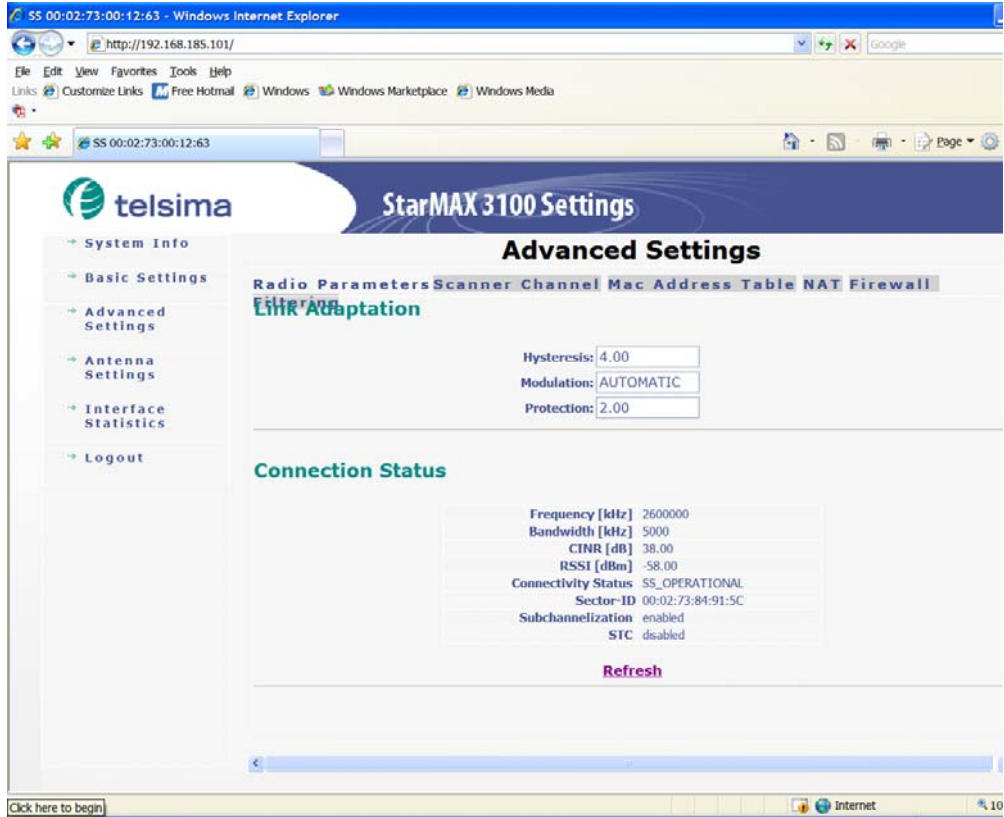
In the **Scanner Channel** sub-tab scanner information can be added or removed by clicking on the **Add-Scanner** or **Remove-Scanner** button (first selecting the Scanner to be removed). This tab also enables connecting, disconnecting and re-synchronizing of the connection and setting it to the automatic or manual connection. All these options as permitted only to an administrator.

Figure 6-5. Scanner channel sub-tab
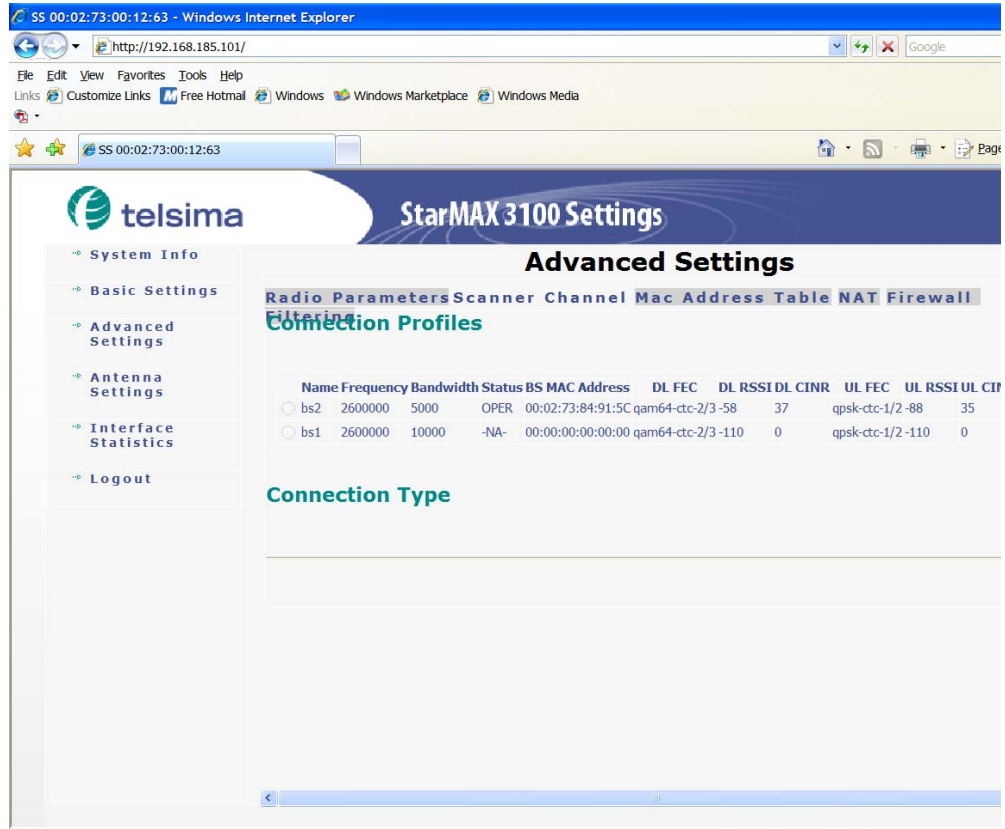
The **Mac Address Table** sub-tab enables listing of the Subscriber Station from the MAC address table (Dynamic entries and Static entries) (press the **clearMAC Address Table** button to clear the table) or adding a new MAC Address (**addMAC** button) to give the network administrator a better overview of the connected users.

**Figure 6-6.** MAC Address Table sub-tab
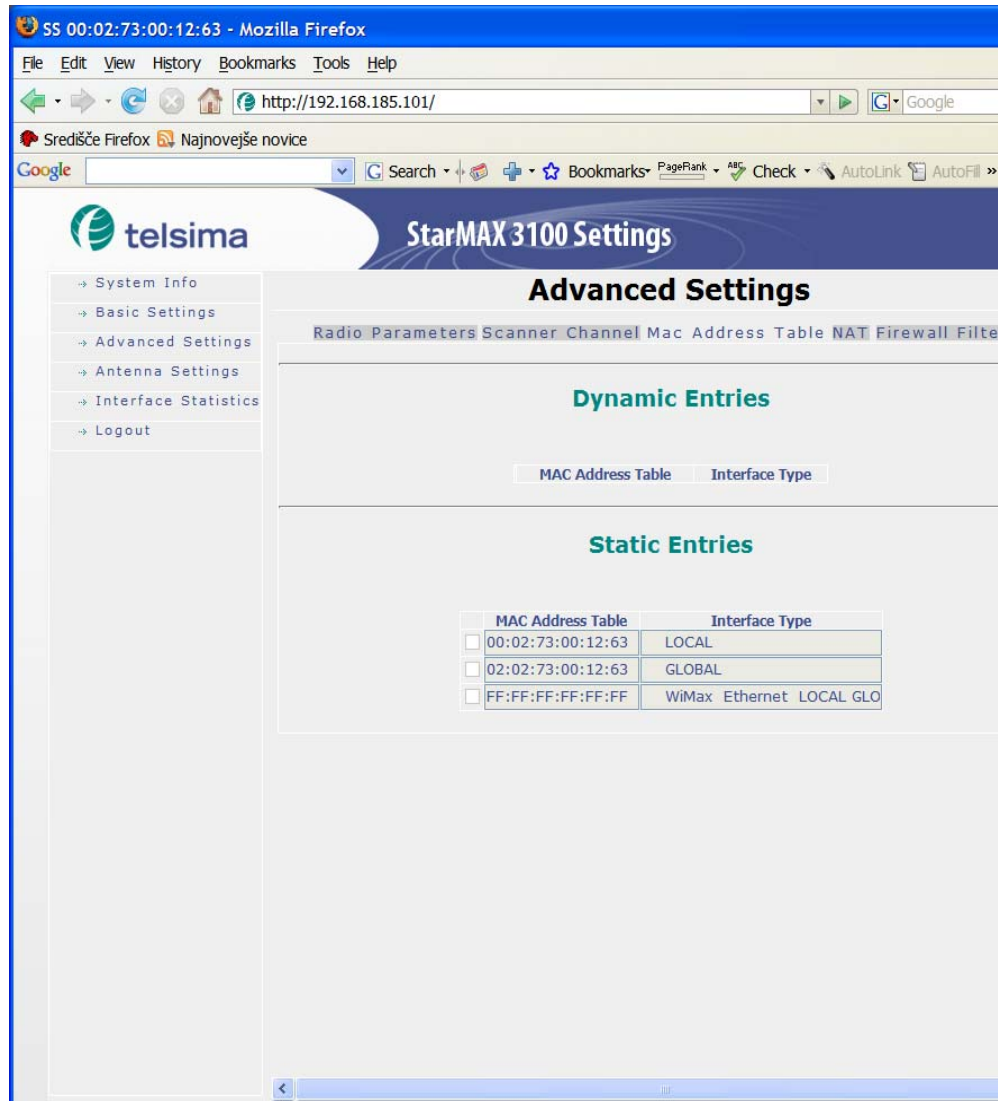
The **NAT** sub-tab shows the current operation mode. The Network Address Translation (NAT, also known as Network Masquerading, Native Address Translation or IP Masquerading) method enables the Subscriber Station to act as a traditional layer 3 NAT device, possibly in conjunction with an external or an internal Ethernet switch. With NAT enabled the Subscriber Station will not forward the VLAN tagged packets. Tagged packets received at any interface will be dropped by the Subscriber Station, thus allowing greater security of the network users and the network itself. MVLAN and VoIP classifications are not supported in the NAT mode. (see the Network Address Translation (NAT) on page 7-1 for details).

NAT N:N related parameter configurations – Primarily the N:N entry has to be added with a local IP address and local subnet mask, global IP address and global subnet mask, and gateway before setting the NAT operation mode to N:N.

NAT 1: N Global IP address set to Static IP scenario – DHCP server configuration with Base and End IP address and DHCP lease time are necessary. The Global IP address, Global IP address subnet mask, Global IP gateway address and Global IP DNS address are required before configuring the 1:N NAT mode. The 1:N entry is dynamically configured by the NAT module. If DMZ (see Chapter 7) is enabled then the DMZ IP address must be configured. These are the configurations provided from the Subscriber Station HTML GUI for the 1:N NAT scenario.

NAT 1:N Global IP address set to the DHCP scenario – DHCP server configuration with a Base and End IP address and DHCP lease time are required before configuring the 1:N NAT mode. If DMZ is enabled then the DMZ IP address must be configured. These are the configurations provided from the Subscriber Station HTML GUI for the 1:N NAT scenario.

Figure 6-7. Nat Oper Mode
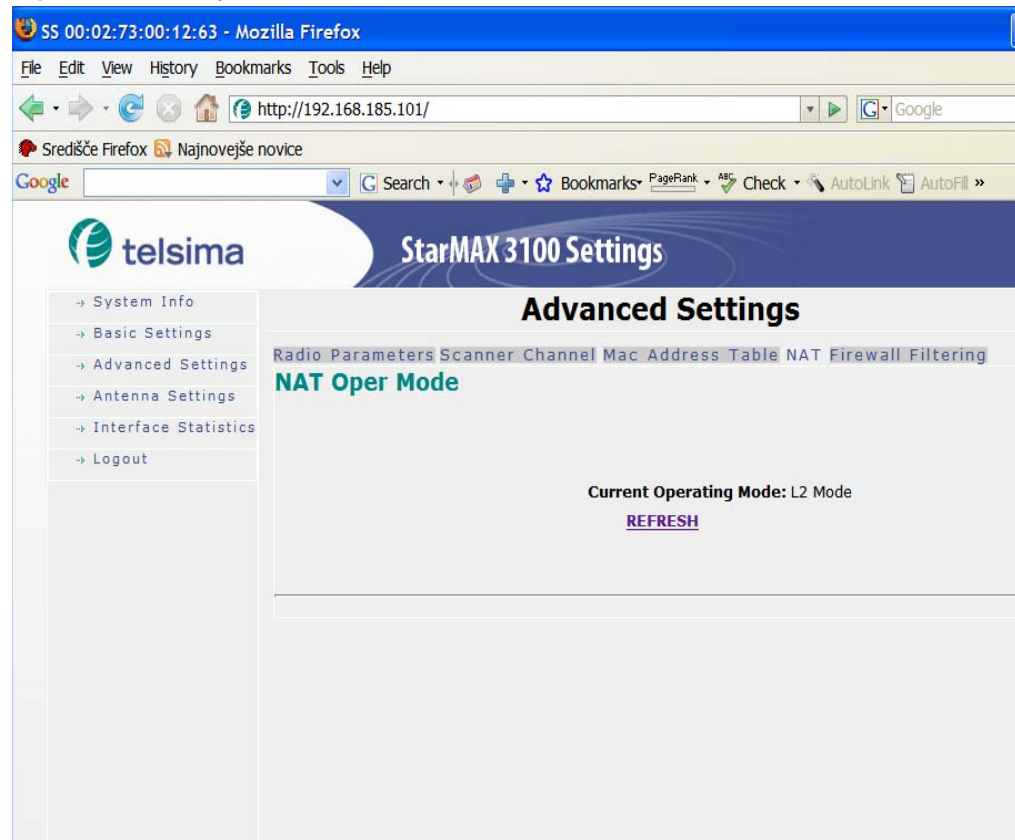
The **Firewall Filtering** sub-tab enables the administrator to set the firewall protection and traffic filtering settings. The white-list can include explicitly allowed MAC Addresses or obtained IP addresses of the network interfaces and the black-list is used to exclude the network interfaces from the network. MAC/IP addresses can be filtered in both ways or separately as a source or destination or both (Src, Dest, Both).

IP Filters – Maximum of 16 IP firewall filter entries can be added from the Subscriber Station HTML GUI specifying the IP address, IP subnet mask and the direction of the firewall filtering (Ingress or Egress).

MAC filters – Maximum of 16 MAC firewall filter entries can be added from the Subscriber station HTML GUI specifying the MAC address, MAC netmask and the direction of the MAC firewall filters (Ingress or Egress).

Figure 6-8. Firewall Filtering sub-tab
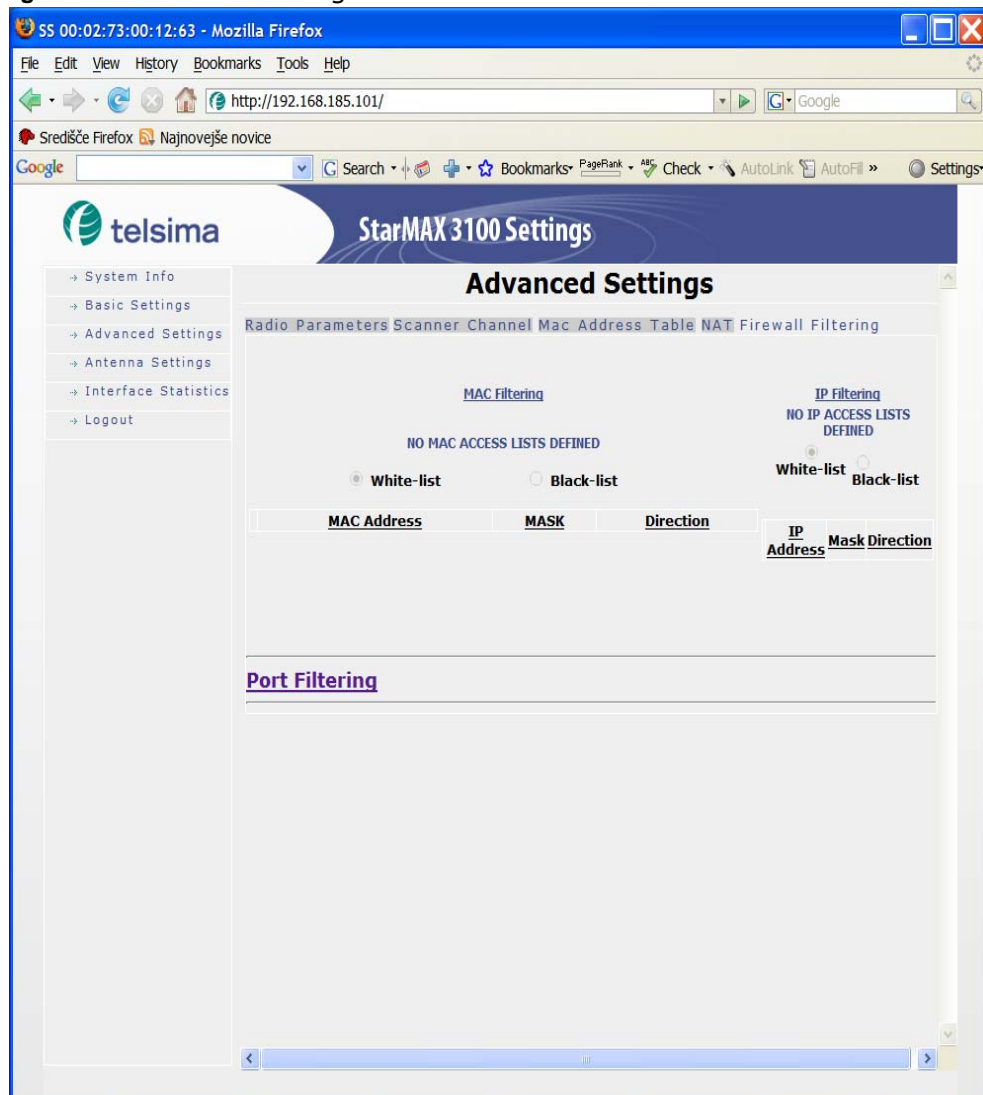
Antenna Status Tab

This tab shows the actual antenna transmission/reception signal parameters. The CINR, MAX CINR, RSSI and MAX RSSI graphs can be seen. The image is not dynamically updated – to update the new value (when repositioning the unit/antenna for optimal reception, for example) press the **Refresh** button.

Figure 6-9. The Antenna reception signal quality status
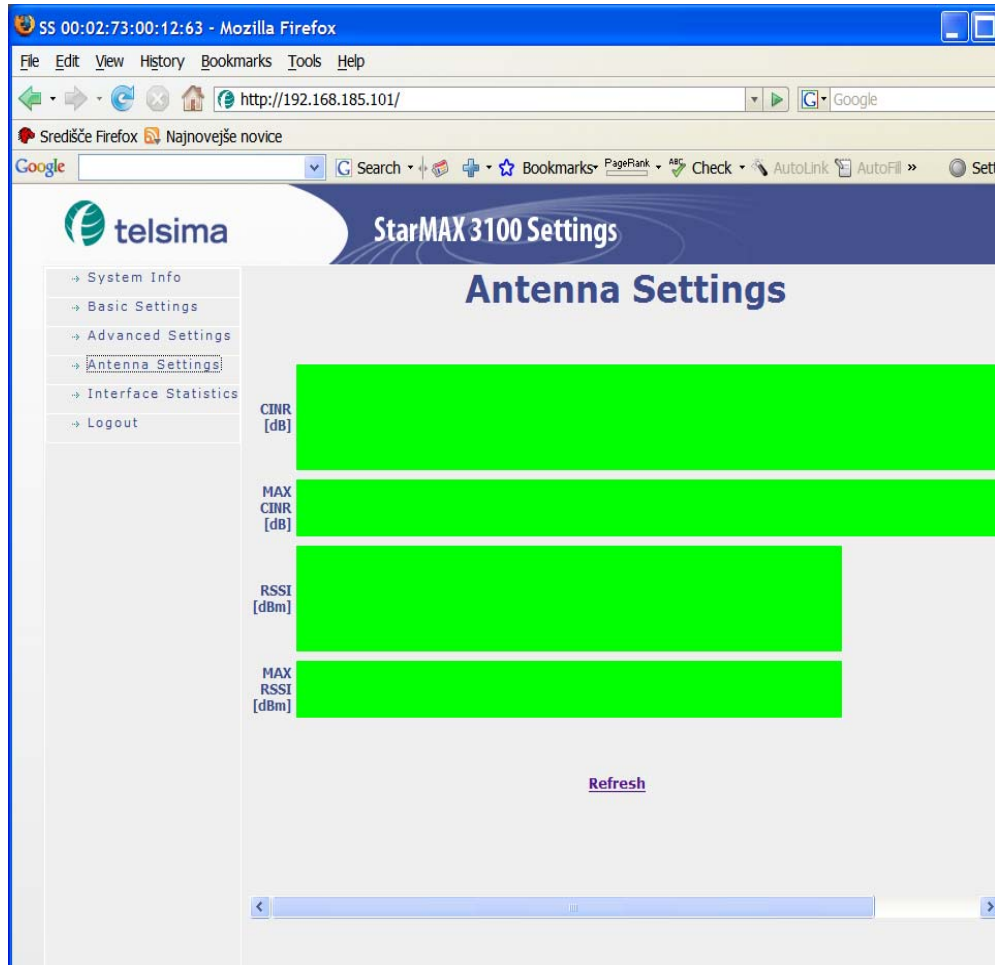
Interface Statistics Tab

This tab enables viewing the counters for Subscriber Station WiMAX and Subscriber Station Ethernet Interfaces. The following counters are displayed: InOctets, OutOctets, InUCastPkts, OutUCastPkts, InDiscards, OutDiscards, InErrors and OutErrors for WiMAX and Ethernet interfaces respectively. All these counters show real-time values when refresh is clicked or the first time the page is open, except the WiMax OutErrors. The WiMax OutErrors displays the last 15 minutes total count.

Figure 6-10. Interface Statistics

Logout Tab

This tab enables to logout from the HTML GUI.

Figure 6-11. Logout tab
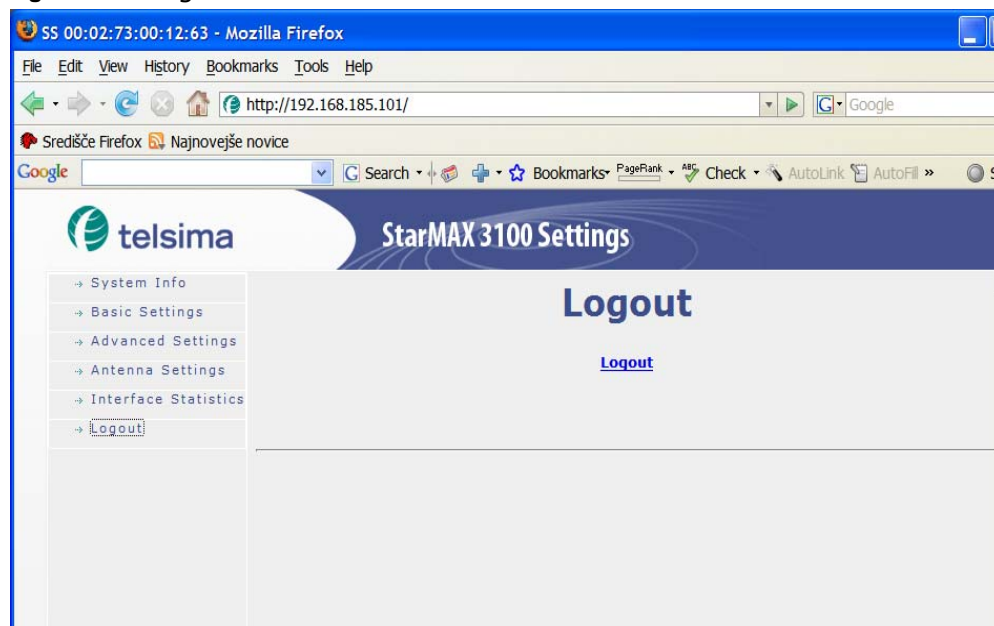
Chapter 7. Network Address Translation (NAT)

The Network Address Translation (NAT, also known as Network Masquerading, Native Address Translation or IP Masquerading) method enables the Subscriber Station to act as a traditional layer 3 NAT device, possibly in conjunction with an external or internal Ethernet switch. With NAT enabled the Subscriber Station will not forward VLAN tagged packets. Tagged packets received at any interface will be dropped by the Subscriber Station, thus allowing greater security of the network users and the network itself. MVLAN and VOIP classifications are not supported in NAT mode.

The various VLAN features do not interact with the L3 forwarding of the NAT module otherwise.

The Subscriber Station NAT module can be configured through the following modules:

- Command Line interface
- Subscriber Station HTML GUI
- SNMP agent for communication with remote NMS servers

Figure 7-1. NAT management options
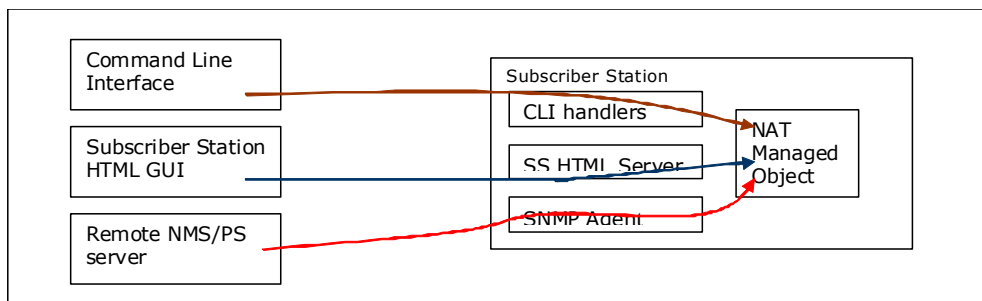
This chapter includes the following topics:

Enabling NAT

If the Subscriber Station is configured for NAT operation, then once the public IP address mode has been configured (DHCP or static) the NAT module is initialized.

Operating Modes (L2, 1:N, N:N)

The Provisioning Server configures the Subscriber Station for its network operating mode: L2, 1:N NAT, or N:N NAT. The Subscriber Station must first obtain its management IP address; this is assigned via DHCP unless you manually configure a static IP address, network mask and gateway IP address for the station.

After the management IP has been established, the Provisioning Server configures the network operating mode. Note that the Subscriber Station will operate in L2 mode until this configuration is received (the provisioning server cannot configure the Subscriber Station until after the management IP has been established).

L2 Mode

The L2 Mode is the default mode of operation. This is the mode currently supported in the Subscriber Station.

1:N NAT

In 1:N NAT mode (also referred to as NAPT - Network Address and Port Translation), the Provisioning Server will also configure the global IP allocation mode, one of DHCP or static. In the case of static addressing, the Provisioning Server will also configure the global IP address, network mask and gateway IP address.

PPPoE is not supported for global IP in this release.

N:N NAT

In N:N NAT mode, the Provisioning Server will configure a set of address translation pairs (local IP, global IP): the global network mask and gateway IP, and the local IP address and local network mask.

The Subscriber Station's local IP address will be the gateway for the network side PCs. All local IP addresses must belong to the network defined by the local IP address and network mask. All global IP addresses must belong to the same network defined by the gateway IP address and global network mask.

Operating Mode Switching

The StarMAX™ supports switching of operating modes between L2 or 1:N or N:N. The Subscriber Station comes up by default in the L2 mode and then, during the initialization process, switches from L2 to NAT mode. The other mode changes (NAT to L2, or 1:N to N:N) require a reboot of the Subscriber Station.

L2 to NAT Operating Mode

The Subscriber Station will always begin operation in L2 mode. If the provisioning server configures the Subscriber Station for NAT operation, the second interface seqnet1 must be configured. In the interest of simplicity, the seqnet1 interface can be enabled and registered with no IP address established. Only when NAT operating mode is requested should an IP address be assigned to it.

If the CPE has already received a global IP address from the DHCP server while in L2 mode, then the CPE IP address has to be renewed manually once the mode is changed to NAT.

NAT to L2 Operating Mode

When the Subscriber Station is in NAT mode and you change the mode of operation to L2, the Subscriber Station will reset/reboot and start operating in the newly set mode. The reset/reboot will be initiated in the Subscriber Station when it receives the new configuration information from the PS.

If the CPE has already received a local IP address while in NAT mode, then the CPE IP address has to be renewed manually once the mode is changed to L2.

Provisioning Server Changes

Any change to a Subscriber Station's operating mode in the provisioning server (an operator may switch an account and hence a particular modem from L2 to NAT mode) causes the modem to reset its network interfaces. Any existing IP connections are broken and the Subscriber Station user needs to reestablish them. The Subscriber Station user may also be required to re-initialize any attached PC's network connections to acquire a new IP address. (See Configuring Your Computer (MS Windows) on page 5-1 for details).

Interfaces and IP Address Assignment

The Subscriber Station in NAT mode has 3 (or more) IP addresses: the management IP, local IP and global IP(s). The management IP and local IP are the same as used when in L2 mode (configured to seqnet0). When the Subscriber Station is in NAT mode, seqnet1 is configured with the global IP address(es).

When operating in 1:N NAT mode there is just one global IP address assigned and in the case of N:N NAT there are be multiple global IP addresses assigned to the seqnet1 interface.

N:N NAT Translations

In N:N NAT mode (also called "basic NAT"), the local/global translations can be set in the NAT configuration string. The entries are labeled "NAT Static Entry Local Address" and "NAT Static Entry Global Address". Dynamic changing of the N:N mappings is not a requirement.

Incoming connections are supported for N:N NAT mode as this is simple IP translation and the mapping from global IP addresses to local IP addresses is one-to-one.

DHCP Server Configuration

Enabling and disabling the local DHCP server (for using in NAPT mode) is done via the Subscriber Station HTML GUI (see Subscriber Station HTML GUI on page 6-1) or via the CLI (See the StarMAX™ 3100 Series Support Manual). By default the DHCP server is enabled.

The range of addresses can be specified by a starting and ending IP address, or by a starting IP address and count of the number of addresses. The manner used can be selected through the Subscriber Station HTML GUI (see Subscriber Station HTML GUI on page 6-1).

The Subscriber Station in NAT mode supports up to 50 DHCP clients.

The default local IP address of the Subscriber Station is 192.168.1.1/24, with a DHCP range of 192.168.1.100 to 192.168.1.150.

DHCP can technically change an interface IP upon renewal. In practice this is quite rare, but it is possible. In such case the NAT module must be reconfigured (e.g. any existing NAT connections will no longer be valid).

Access Control

The StarMAX™ 3100 Series Subscriber Station utilizes an IP forwarding logic which does not NAT-translate any packets with the source IP addresses that do not belong to the local subnet; however, it forwards any packet with a valid source IP address for the local subnet.

Specifically, the Subscriber Station will not limit access to just those IP addresses handed out by the DHCP server - a subscriber may always connect CPE devices with static IP addresses as long as they belong to the local subnet.

Additionally, the DHCP server performs duplicate address detection when handing out leases.

DMZ

The Demilitarized Zone (DMZ) entry creates a forwarding rule in 1:N NAT mode for forwarding of any packets addressed to the global IP address to a single local IP address. This is essentially the same as an entry for a static Global to Local translation as used in N:N mode.

Any port forwarding rules or dynamic NAT translation entries take priority over a DMZ configuration.

DMZ mode does not apply until DMZ has been enabled and a local DMZ IP address has been configured.

VLAN traffic

Forwarding of VLAN-tagged packets incoming to or outgoing from the Subscriber Station is not supported when the Subscriber Station is operating in NAT mode. The typical use case for the VLAN-tagged traffic is deployed in enterprises with QinQ support and this usage case normally does not require NAT operation.

VLAN packets received by the Subscriber Station are dropped and the interface dropped packet counter is incremented.

Appendix A. Specifications

Subscriber Station Specifications

General

Table A-1. General Specifications

Frequency Range	2300-2400 MHz (StarMAX3160-23)
	2496-2690 MHz (StarMAX3160-25)
Frequency Setting Step Size	125 kHz
Duplexing Method	TDD/HFDD
Modulation	S-ODFMA with adaptive subcarrier modulation: QPSK-CTC-1/2, QPSK-CTC-3/4, QAM16-CTC-3/4, QAM16-CTC-1/2, QAM64-CTC-2/3, QAM64-CTC-3/4, QAM64-CTC-5/6
Air Interface Standard Compliance	IEEE 802.16 - 2005
Bandwidth	3,5 MHz, 5 MHz; 7 MHz; 10 MHz
Frame Length	5ms
Emission Designation	3M50X7W, 5M00X7W, 7M00X7W, 10M0X7W

Transmit

Table A-2. Transmit Specifications

Maximum Output Power at Antenna Port[a]	+25dBm
Output Power Dynamic Range	45dB
Output Power Setting Step Size	1dB
Output Power Tolerance	+ -2dB
TX Signal EVM at Maximum Output Power	< -30dB
Spectrum Emission Mask	EN 302 544-2
Adjacent Channel Leakage Power Ratio	EN 302 544-2
Spurious Emissions at Antenna Port	EN 302 544-2

a. RMS power of data symbols regardless of the modulation used.

Receive

Table A-3. Receive Specifications

Receive Sensitivity@BER<1E-6 [dBm]	QPSK-1/2	QPSK-3/4	QAM16-1/2	QAM16-3/4	QAM64-1/2	QAM64-2/3	QAM64-3/4	QAM64-5/6
3.5MHz								
5MHz	-99	-96	-93	-89	-88	-85	-84	-82
7MHz								
10MHz	-94	-91	-88	-84	-80	-80	-79	-77
Interference Rejection for 3dB								
Degradation @ BER<1E-6 [dB]								
Adjacent Channel C/I	30	27	24	20	19	16	15	13
Alternate Channel C/I	56	53	50	46	45	42	41	39
Receiver Blocking and Intermodulation	EN 302 544-2							
Noise Figure	<6dB							
Max. Level at Antenna Port, BER<1E-6	-30dBm							
Max. Tolerable Level at Antenna Port	0dBm							
Spurious Emissions at Antenna Port	EN 302 544-2							

Integrated Antenna

Table A-4. Integrated Antenna

Gain	12.5 ± 0.5 dBi @ 2.3-2.4GHz / 13.0 ± 0.5 dBi @ 2.5-2.7GHz
3dB Beamwidth (E/H)	35°/35° (±5°)
Cross Polarisation	Meets ETSI DN2, DN3 and DN4
Front-to-Back ratio	≤30 dB
VSWR (Typ or less than)	≤1.5:1 typ., ≤1.7:1 max.
Polarization	Dual linear Polarization

Interface Specifications

Table A-5. Interface Specifications

Power Supply	AC USA Socket on POE adapter; cable shipped per region requirements.
Power over Ethernet Adapter	Via RJ-45, Meets IEEE.802.3af
Ethernet Interface	Single RJ-45
Data Port	10/100BT (RJ-45)

Mechanical and Electrical Specifications

Table A-6. Mechanical & Electrical Specifications

Dimensions (HxWxD) [mm]	190x190x65
Weight (max) [kg]	1.3 With bracket
Power Supply Voltage	36V ÷ 57V DC 400mA (IEEE802.3af)
Power Consumption, max.	11W

Environmental Specifications

Table A-7. Environmental Specifications

Operating Temperature Range	-40°C ÷ +55°C
Operating Humidity Range	10% ÷ 100%
EN 300 019 reference	EN 300 019-2-4, Class 4.1
Storage Temperature Range	-45°C ÷ +70°C
Storage Humidity Range	5% ÷ 95%

Standard Compliance

Table A-8. Standard Compliance

Spectrum Usage	EN 302 544-2; FCC CFR 47 Part 27
EMC	EN 301 489-1, EN 301 489-17 FCC CFR 27 Part 15 Class A
Safety	EN 60950-1; UL 60950-1
Other	EN 300 019-2-1 (storage, Class 1.2); EN 300 019-2,-2 (transportation, Class 2.3); IEC 529 class IP67 (environment protection); RoHS & WEEE

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