

StarMAX™ 2100 Series Subscriber Station

User Guide

Version 1.0



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Preface

This book serves as the user manual for the StarMAX™ 2100 subscriber station, providing basic system overview, commissioning information, and system operational details.

Audience

This book will be useful for all subscriber station users, especially the support staff of the service provider.

Related Information

For more information, refer to the following:

- *StarMAX™ 2100 Quick Installation Guide.*

Contact Us

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You can also send us your comments by mail at:

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Conventions

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

Convention	Usage	Example
Bold	The following screen elements: Button List Drop-down menu	Click OK .
<i>Italic</i>	Book titles and emphasis	Refer to <i>Concepts Guide</i> for more information.
monospace	Code samples and commands	To run the installer, enter the following command: C:\runinstaller.bat
<i>monospace italic</i>	Variable in a command or code that you may replace with other values, as required	To make a new directory, enter: prompt> mkdir <i>new_directory_name</i>
[]	Optional parameters	C:\runinstaller.bat [-p]
	Mutually exclusive choices in a command or code	C:\runinstaller.bat [-p -r]

Abbreviations and Definitions

The following abbreviations are used in the document.

Item	Definition
BE	Best Effort
Base Station	IDU plus one or two ODUs
CIR	Committed Information Rate
CINR	Carrier-to-Interference plus Noise Ratio
CLI	Command Line Interface
EMS	Element Management System
IDU	InDoor Unit, StarMAX™ 4100
MAC	Medium Access
Nrt-PS	Non Real Time Polling Services
ODU	OutDoor Unit, StarMAX™ 4100
POST	Power On Self Test
RSSI	Received Signal Strength Indication
RoHS	Restriction of Hazardous Substance

Item	Definition
SNMP	Simple Network Management Protocol
Subscriber Station	Subscriber Station StarMAX™ 2100
WEEE	Waste Electronic Electric Equipment

Overview of StarMAX™ Subscriber Station

This chapter gives you an overview of the StarMAX™ 2100 range. This chapter covers the following topics:

- [Section 1.1, “Introducing StarMAX™”](#)
- [Section 1.2, “Brief description of the StarMAX™ Subscriber Station”](#)
- [Section 1.3, “Element Management System for StarMAX™ Subscriber Station”](#)
- [Section 1.4, “Specifications”](#)

1.1 Introducing StarMAX™

Telsima's StarMAX™ 2100 series of Subscriber Stations (SS) are fully compliant and certified with the 802.16-2004 standards. They are matched to the frequencies and WiMAX-enhanced features supported by Telsima StarMAX™ Base Station (BS) system. When deployed in networks based on the StarMAX™ BS, they provide optimal performance in line-of-sight (LOS), near line-of-sight (NrLOS) as well as non-line-of-sight (NLOS) applications. The StarMAX™ SS offers market leading performance through the use of intelligent antenna systems and advanced WiMAX features.

The system uses OFDM 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 achieve a balance between robustness and efficiency, based on the prevailing link conditions.

StarMAX™ 2100 subscriber station supports a wide range of network services, including Internet Access and Voice over IP.

StarMAX™ 2100 is currently available in the 2.6, 3.3 and 3.5 GHz frequency bands. The actual operating frequencies used by the system can be configured according to applicable radio regulations, license conditions, and specific deployment.

1.2 Brief description of the StarMAX™ Subscriber Station

The Subscriber Station installed at the customer premises provides data connectivity through the base station. The Subscriber station provides the data bridging functionality, traffic shaping, and classification through the 10/100BaseT Ethernet port that connects to the data equipment.

The Subscriber station equipment provides high reliability and provides a platform for wide range of services. The system also acts as an access device for IP-based communication, providing a throughput of maximum 10 Mbps operation over a 3.5 MHz channel.

StarMAX™ 2140 has an outdoor antenna and an indoor unit. The indoor unit and the outdoor antenna are connected through a coaxial cable. The Indoor unit connects to the data equipment through the Ethernet port.

StarMAX™ 2130 is complete Indoor unit which has an integrated dynamically switching 4 sector antenna. This type of subscriber station is typically used in dense urban/suburban environments where cell sizes are smaller to accommodate higher density of subscribers.

StarMAX™ 2150 is an Outdoor Subscriber Station consisting of the modem and antenna in one unit. The customer equipment connects directly via an Ethernet cable to the Subscriber station for data communication. Power is supplied to the Subscriber station through the same Ethernet cable using power-over-ethernet.

1.3 Element Management System for StarMAX™ Subscriber Station

You can use IP based connectivity to manage the subscriber station through a remote Java-based Element Management system (EMS) for remote configuration.

StarMAX™ EMS is a standalone management application to manage Subscriber stations; it is designed to manage a single subscriber station. It provides all the required tools for managing the subscriber station on the element-management layer.

1.4 Specifications

This section details the specifications of the StarMAX™ system.

The radio specifications for StarMAX™ are shown in [Table 1.1](#).

Table 1.1 Radio Specifications

Feature	Description
RF PHY	OFDM
Frequency bands	3.3-3.4 GHz, 3.4-3.6 GHz, 2.5-2.69 GHz
Channel Size	3/3.5/6/7 MHz <ul style="list-style-type: none">• Software configurable• Bandwidth configurable in 250 KHz steps
Duplex Method	TDD

The WiMax specifications for StarMAX™ are shown in [Table 1.2](#).

Table 1.2 WiMAX specifications

Feature	Description
WiMAX specification	IEEE 802.16-2004
Adaptive modulation	64QAM $\frac{3}{4}$, 64QAM $\frac{2}{3}$, 16QAM $\frac{3}{4}$, 16QAM $\frac{1}{2}$, QPSK $\frac{3}{4}$, QPSK $\frac{1}{2}$, BPSK $\frac{1}{2}$
Tx Power Maximum	+20 dBm

Feature	Description
Rx Sensitivity	-100 dBm
Uplink subchannelization Support	No
Configurable Cyclic Prefix	1/4, 1/8, 1/16, 1/32

The antenna and indoor unit specifications for StarMAX™ are shown in [Table 1.3](#).

Table 1.3 Subscriber Station - Outdoor Antenna and Indoor Unit specification

Feature	Description
Antenna	Subscriber Station (Complete Indoor) 12 dBi gain integrated 4 sector switched antenna
	Subscriber Station (Semi Outdoor) 15 dBi external (outdoor) antenna (optionally for 21 dBi or other)
	Subscriber Station (Complete Outdoor) 18 dBi gain outdoor antenna
Connector for External antenna	Subscriber Station (Complete Indoor) NO
	Subscriber Station (Semi Outdoor) YES
	Subscriber Station (Complete Outdoor) NO

The services and provisioning specifications for StarMAX™ are shown in [Table 1.4](#).

Table 1.4 Services and Provisioning

Feature	Description
Service flows	Up to 6 service flows per Subscriber station
QOS priorities	Up to 4 classifiers per Subscriber Station
Classes of service	BE, nrt-PS
Access control lists	Yes (up to layer 4)
Data rate control	CIR, data rate limiting
Portability and Mobility	Yes, TRUFLE™ enabled
Security	Data: DES, AES, 3DES

The data communication specifications for StarMAX™ are shown in [Table 1.5](#).

Table 1.5 Data Communication Specifications

Feature	Description
IP Protocol	IPv4

Feature	Description
Bridging/Routing	Transparent L2 switch, Bridging
Packet handling	802.1Q VLAN

The management and configuration specifications for StarMAX™ are shown in [Table 1.6](#).

Table 1.6 Management and Configuration Specifications

Feature	Description
Software upgrade	Yes, software upgradable "over the air", Fail safe
NMS remote management and provisioning	Yes
Configuration Management - GUI	Java-based EMS

The physical and electrical specifications for StarMAX™ are shown in [Table 1.7](#).

Table 1.7 Subscriber Station Physical and Electrical Specifications

Feature	Description
User Interface	10/100 BaseT on RJ-45
Voltage	110-240V AC, 6V DC
Power Consumption	10 W
Dimensions (h-w-d)/mm	SS (Complete Indoor) 190 X 90 X 200 SS (Semi Outdoor) 30 X 190 X 200 SS (Complete Outdoor) 320 X 320 X 80
Weight (indoor/outdoor)	SS (Complete Indoor) 0.8 Kg/- SS (Semi Outdoor) 0.60 kg/1.0 kg SS (Complete Outdoor) 2.9 Kg
Temperature (indoor/ outdoor)	SS (Complete Indoor) 0 C to + 55 C SS (Semi Outdoor) 0 C to + 55 C / -40 C to 55 C SS (Complete Outdoor) -40 C to +55 C
Humidity (indoor/outdoor)	SS (Complete Indoor) 10% to -90% (Non Condensing) SS (Semi Outdoor) SS (Complete Outdoor) 0% - 100% (Condensing)
Regulatory compliances	CE mark, RoHS/WEEE

Subscriber Commissioning

This chapter covers the following topics:

- [Section 2.1, “Configuring Basic Parameters”](#)
- [Section 2.2, “Aligning Subscriber Unit Antenna”](#)
- [Section 2.3, “Operational Verification of the Subscriber Station”](#)
- [Section 2.4, “Required Information”](#)

2.1 Configuring Basic Parameters

On subscriber station power up, the following stages occur before the Subscriber station is synchronized with the Base station:

1. Complete Power On Self Test. (The LED indications are provided in [Table 2.1](#))
2. Subscriber station scans the configured connection channel and synchronizes with the Base station with best RSSI or CINR value. To configure the new channels, refer to [Chapter 3, “Configuring the Element Management System”](#).

2.2 Aligning Subscriber Unit Antenna

Note: This section is only applicable to Semi Outdoor Subscriber Station unit. There is no antenna alignment required for Complete Indoor Subscriber Station unit. Please refer to the Complete Outdoor installation guide for complete Outdoor Subscriber Station antenna alignment.

The link quality measurement can be obtained using the Java-based EMS. 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 unit:

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 is flashing; this indicates that the subscriber station is synchronized with base station. If the signal LED is **off**, check the basic configuration of the subscriber station.
4. Check the Signal LED is **on** after flashing green for few seconds. If the signal LED continues flashing, try changing the direction of the antenna or by placing the antenna at a higher or alternate location.
5. Use the Java-based EMS to ascertain the best link quality.

2.3 Operational Verification of the Subscriber Station

Note: This section is not applicable to Complete Outdoor Subscriber Station unit.

Table 2.1 is useful in understanding the visual signals that are provided through LEDs on the station.

Table 2.1 Subscriber Station LED verification

Name	Functionality	Description
Power LED (RED)	Power indicator for the Subscriber Station	OFF - No Power ON (Stable) - System powered
Signal LED (GREEN)	RF Indicator	OFF - RF Inactive Flash - During ranging (For ever if no signal is found) Stable - Subscriber station ranging complete and Subscriber connected
Link LED (GREEN)	IP connectivity indicator	OFF - No IP connection initiated yet Flash - IP Network entry ON(Stable) - SS is provisioned (DHCP IP address assigned)
Data LED (GREEN)	Data flow indicator	OFF - No data passed Flash - Ethernet data passed through station
All LEDs will blink except the Power LED in the POST failed scenario		
All LEDs will blink except the Link LED in the Subscriber Station provisioning failed scenario		

2.3.1 Verifying Data connectivity

To verify data connectivity, try to connect to the Internet from the end-user's PC.

2.4 Required Information

Table 2.2 lists parameters required to bring the Subscriber station to minimal operational state.

Table 2.2 Information needed to get Subscriber Station operational

Item	Parameters	What to update
Management Port (mandatory)	IP Address	192.168.1.1
	Subnet Mask	255.255.255.0

Item	Parameters	What to update
RF Interface (mandatory)	Frequency (in KHz)	Sample 3350000, 3360000
	Bandwidth (in KHz)	3500



Configuring the Element Management System

This chapter describes how to configure the Element Management System (EMS) for the StarMAX™ Subscriber Station 2100. This chapter has the following sections:

- [Section 3.1, “Installation Prerequisites”](#)
- [Section 3.2, “Configuring TCP/IP Properties on Your PC”](#)
- [Section 3.3, “Installing the EMS”](#)
- [Section 3.4, “Using the EMS”](#)

3.1 Installation Prerequisites

To install the EMS on a computer successfully, the pre-requisites are:

- JRE 5.0 Update 6
- Recommended monitor resolution: 1024x768 or more
- Recommended RAM: 512MB or more
- Any OS with JRE 5.0 update 6 available

3.2 Configuring TCP/IP Properties on Your PC

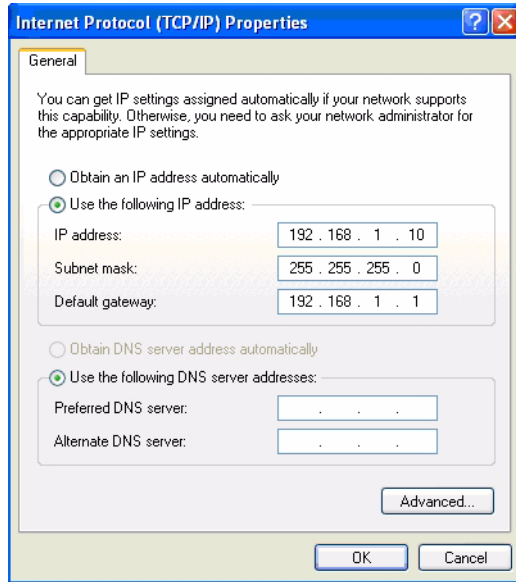
To configure the your network parameters:

1. Click **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**.

As shown in the [Figure 3.1](#), enter the following:

- IP address: 192 . 168 . 1 . 10
- Subnet mask: 255 . 255 . 255 . 0
- Gateway: 192 . 168 . 1 . 1

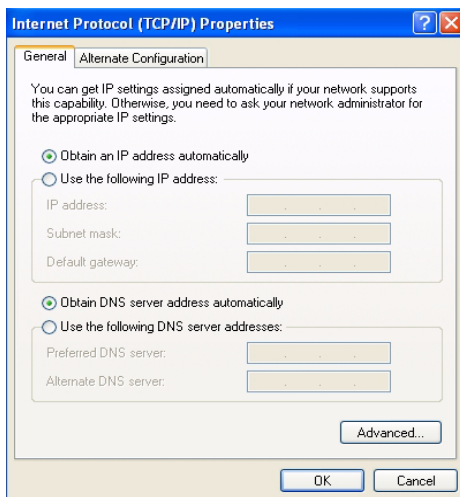
Figure 3.1 Pre-configuration Network Connections IP Properties



Once the Subscriber station configuration is done from the PC and the Subscriber Station is provisioned, access the Internet by re-configuring the TCP/IP properties. To do so:

1. Click **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**.
As shown in the [Figure 3.2](#), select the following options:
 - Obtain an IP address automatically
 - Obtain DNS server address automatically

Figure 3.2 Post-configuration Network Connections IP Properties

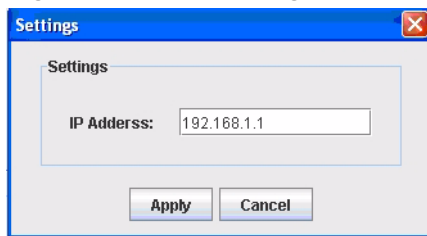


3.3 Installing the EMS

To install the Java-based Subscriber Station Element Management System:

1. Copy the `ssems.zip` file provided as part of the Subscriber Station Installation CD, to the computer on which you wish to install the EMS.
2. Create a new installation directory, for example, `C:\Telsima_SS_EMS`.
3. Extract the `ssems.zip` to the directory `C:\Telsima_SS_EMS`.
4. Navigate to the `C:\Telsima_SS_EMS` directory and look for the file `ssems_run.bat`.
5. Double-click `ssems_run.bat`. The EMS GUI starts up.
6. Specify the Subscriber Station IP address through **File>Settings** to which EMS needs to be connected. The Subscriber station connect screen is displayed as shown in [Figure 3.3](#).

Figure 3.3 Connecting from EMS to Subscriber Station



3.4 Using the EMS

With the EMS, you can:

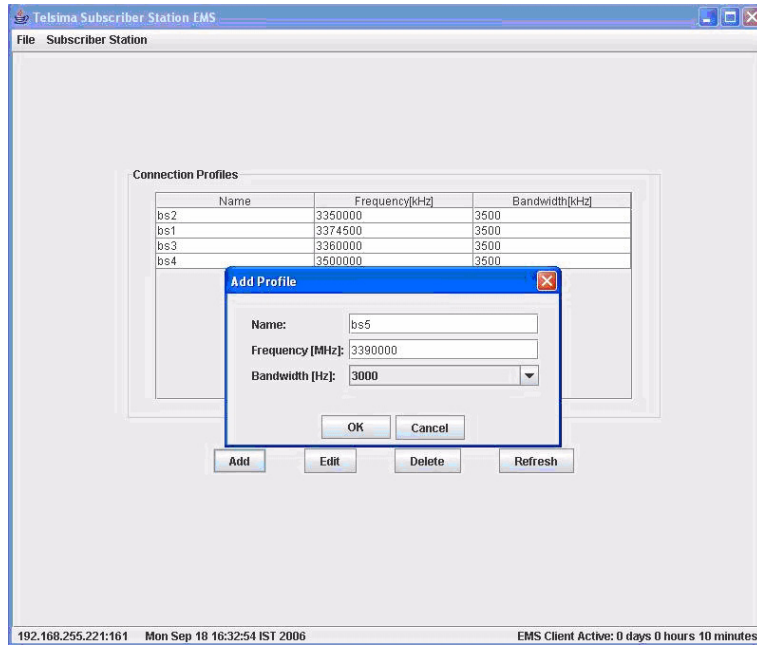
- Configure the Connection profile
- Display the connection profile status

3.4.1 Configuring the Connection Profile

To configure the connection profile,

1. Click **Subscriber Station** on the main menu of the EMS window.
2. The EMS displays the list of existing profiles as shown in [Figure 3.4](#).
3. Click **Add** to create a profile. The Connection profile parameters are:
 - Profile Name - Name of the Connection profile
 - Frequency - [In KHz] Frequency of the channel selected for connecting the SS
 - Bandwidth - [In KHz] Bandwidth of the channel selected for connecting the SS

Figure 3.4 Configuring the Connection Profile



3.4.2 Displaying the Connection Profile Status

The Connection Profile Status for all configured connection profiles are provided with the following information for each profile:

- Profile Name
- Frequency [KHz]
- Bandwidth [KHz]
- BS MAC Address
- RSSI [dBm]
- CINR [dB]

Figure 3.5 is an example of the Connection Profile Status screen.

Figure 3.5 Connection Profile Status

The screenshot shows the 'Telsima Subscriber Station EMS' window. The title bar includes 'File' and 'Subscriber Station'. The main content is divided into several sections:

- Connection Status:** A form with fields for Frequency [kHz] (3350000), Bandwidth [kHz] (3500), Cnr [dB] (26.76), Rssi [dBm] (-22.74), Connectivity Status (Operational), and BS Mac Address (00 02 73 84 01 a3).
- Connection Profiles:** A table with columns: Name, Frequency[kHz], Bandwidth[kHz], BS MAC Addr..., Rssi[dBm], Cnr[dB], and Manual conn... The table contains four rows labeled bs2, bs1, bs3, and bs4.
- Connection type:** Radio buttons for 'Auto connection' (selected) and 'Manual connection'.
- Buttons:** 'Connect', 'Disconnect', 'Resync', and 'Refresh' buttons.
- Status Bar:** Displays '192.168.255.221:161 Mon Sep 18 16:32:54 IST 2006 EMS Client Active: 0 days 0 hours 5 minutes'.

Name	Frequency[kHz]	Bandwidth[kHz]	BS MAC Addr...	Rssi[dBm]	Cnr[dB]	Manual conn...
bs2	3350000	3500	00:02:73:84:...	-22.77	26.83	<input type="checkbox"/>
bs1	3374500	3500	00:00:00:00:...	0.0	-0.07	<input type="checkbox"/>
bs3	3360000	3500	00:00:00:00:...	0.0	-0.08	<input type="checkbox"/>
bs4	3500000	3500	00:00:00:00:...	0.0	-0.09	<input type="checkbox"/>

