The Innovation Behind Broadband Wireless

IP-based
Broadband Wireless Access (BWA) System

605-0000-703 Rev D

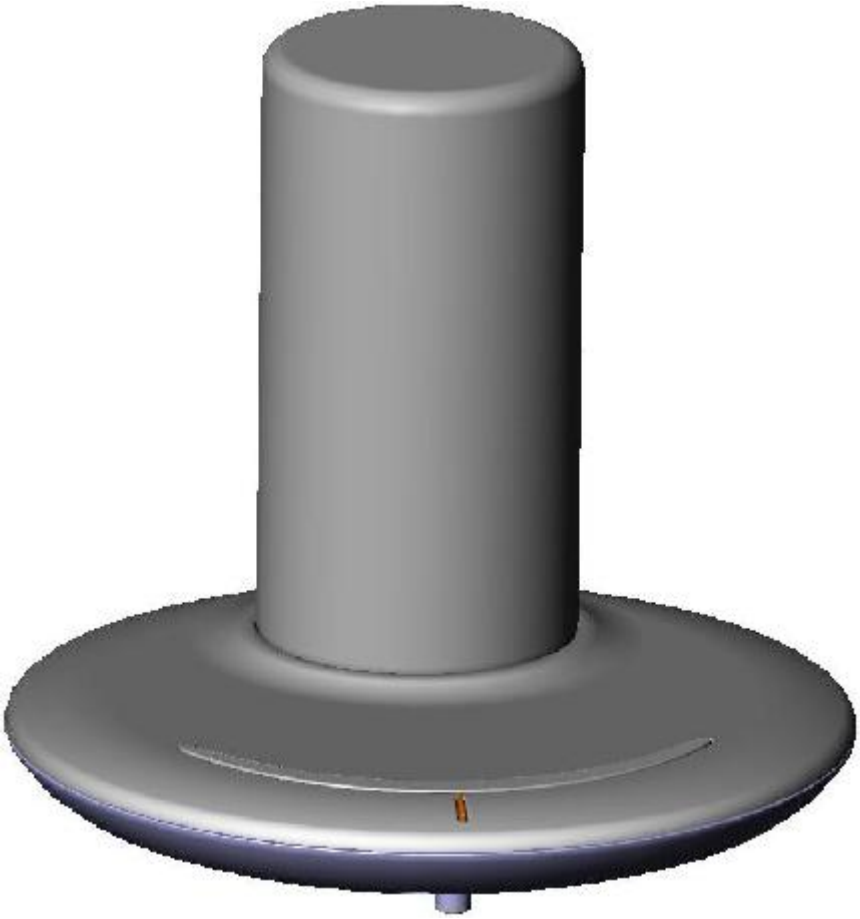
EasyST 4.9

Hardware Installation Guide

Airspan

Connecting the World

Table Of Contents



605-0000-703

EasyST 4.9 Installation Guide

Read the Warnings and Cautions before installing or working on this equipment.

WARNINGS

Human Exposure to Radio Frequencies

The EasyST (or the external antenna, if implemented) should be installed and operated from a minimum distance of 20 cm to your body.

Radio Interference

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

- Reorientate or relocate the receiving antenna
- Increase separation between the equipment and receiver
- Connect the equipment to 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

Avoiding Radio Interference

- This transmitter must not be co-located or operating in conjunction with any antenna or transmitter.
- Ensure a minimum of 1-meter separation between co-located EasySTs.

Modifications

Any changes and modifications to this device that are not expressly approved by Airspan Networks may void the user's authority to operate the equipment.

Manufacturer's Disclaimer Statement

The information in this document is subject to change without notice and does not represent a commitment on the part of the vendor. No warranty or representation, either expressed or implied, is made with respect to the quality, accuracy or fitness for any particular purpose of this document. The manufacturer reserves the right to make changes to the content of this document and/or the products associated with it at any time without obligation to notify any person or organization of such changes. In no event will the manufacturer be liable for direct, indirect, special, incidental or consequential damages arising out of the use or inability to use this product or documentation, even if advised of the possibility of such damages. This document contains materials protected by copyright. All rights are reserved. No part of this manual may be reproduced or transmitted in any form, by any means or for any purpose without expressed written consent of its authors. Product names appearing in this document are mentioned for identification purchases only. All trademarks, product names or brand names appearing in this document are registered property of their respective owners.

DECLARATION OF CONFORMITY

European Community, Switzerland, Norway, Iceland, and Liechtenstein

Declaration of Conformity with Regard to the R&TTE Directive 1999/5/EC

English:

This equipment is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

Deutsch:

Dieses Gerät entspricht den grundlegenden Anforderungen und den weiteren entsprecheneden Vorgaben der Richtlinie 1999/5/EU.

Dansk:

Dette udstyr er i overensstemmelse med de væsentlige krav og andre relevante bestemmelser i Directiv 1999/5/EF.

Español:

Este equipo cumple con los requisitos esenciales asi como con otras disposiciones de la Directive 1999/5/EC.

Greek:

ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ **Airspan** ΔΗΛΩΝΕΙ ΟΤΙ Ο ΕΞΟΠΛΙΣΜΟΣ ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ.

Français:

Cet appareil est conforme aux exigencies essentialles et aux autres dispositions pertinantes de la Directive 1999/5/EC.

Íslenska:

Þessi búnaður samrýmist lögboðnum kröfum og öðrum ákvæðum tilskipunar 1999/5/ESB.

Italiano:

Questo apparato é conforme ai requisiti essenziali ed agli altri principi sanciti dalla Direttiva 1999/5/EC.

Nederlands:

Deze apparatuur voldoet aan de belangrijkste eisen en andere voorzieningen van richtlijn 1999/5/EC.

Norsk:

Dette utstyret er i samsvar med de grunnleggende krav og andre relevante bestemmelser i EU-directiv 1999/5/EC.

Português:

Este equipamento satisfaz os requisitos essenciais e outras provisões da Directiva 1999/5/EC.

Suomalainen:

Tämä laite täyttää direktiivin 1999/5/EY oleelliset vaatimukset ja on siinä asetettujen muidenkin ehtojen mukainen.

Svenska:

Denna utrustning är i överensstämmelse med de väsentliga kraven och andra relevanta bestämmelser i Direktiv 1999/5/EC.

The Declaration of Conformity related to this product can be obtained from product_management@Airspan.com

FCC INTERFERENCE STATEMENT

Federal Communication Commission Interference Statement

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

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

IMPORTANT NOTE:

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

ABOUT THIS GUIDE

Thank you for purchasing Airspan's EasyST 4.9 wireless access device (hereafter referred to as EasyST). The EasyST customer premise equipment (CPE) is part of Airspan'sAS.MAX family of WiMAX-based products.

This section provides a preface by discussing the purpose, audience, organization, conventions, and customer support of this guide.

Purpose

This guide provides a description of the EasyST as well as step-by-step instructions for installing the EasyST.

Targeted Audience

This guide is intended for the end-user installing the EasyST. This device requires no professional installation.

Referenced Documentation

For a detailed description of the Web-based management tool, refer to the *WiMAX Web-based Management User's Guide*.

Conventions

This guide uses the following typographical conventions:

Convention	Meaning	Example
Bold	Command, menu, icon, button, and field	Click the **Next** button.
"**To**" in bold face and at the beginning of a sentence	Introduces a numbered procedure	To download a SW file:
	Warning that provides information that can prevent and avoid bodily or mechanical harm	--
	Note that provides useful information	--

SYSTEM OVERVIEW

EasyST 4.9 (hereafter referred to simply as EasyST) is a revolutionary, self-install, compact, indoor WiMAX subscriber access device. EasyST delivers high-speed Internet services to subscribers' IP-enabled devices through its wireless-based interface with WiMAX networks (i.e. ISP's base station).

EasyST is designed to work with the AS.MAX Base Station. EasyST implements Intel Corporation's Pro/Wireless 5116 broadband interface. EasyST is designed for the residential and small enterprise markets, providing high-speed broadband Internet access and a Fast Ethernet connection to the subscriber's local area network (LAN).

EasyST can be installed (indoors) by end users within minutes without the need for costly professional installations.

EasyST operates in the 4.9 to 5.0 GHz frequency band in time division duplexing (TDD) mode. EasyST supports IP services at uplink and downlink over-the-air speeds of up to 37 Mbps over a channel bandwidth of 10 MHz, and up to 18 Mbps over a channel bandwidth of 5 MHz.

EasyST uses the OFDM signaling format, providing non line-of-sight (NLOS) performance. EasyST utilizes QAM, QPSK, and BPSK modulation technologies by modulating transmitted signals and demodulating the received signals where the original digital message can be recovered. The use of adaptive modulation allows EasyST to optimize throughput, yielding higher throughputs while also covering long distances.

EasyST is deployed with a clip-on antenna for providing the wireless interface with the base station. The antenna is supplied attached to the EasyST's top panel.

The EasyST's compact design allows it to be easily mounted alongside the end-user's PC by simply placing it on a desktop. Easy-to-read radio signal strength LED indicators on the EasyST's top panel enables the end user to position the device in the optimum location, ensuring service availability and reliability, whilst increasing service speed and reducing network load.

EasyST provides 10/100BaseT interface with the subscriber's LAN. In addition, the EasyST provides an interface for adding plug-in expansion modules to provide support for features (**planned for future**) such as: Wi-Fi and LAN switch; VoIP and battery backup.

EasyST is powered by an AC/DC power adapter that is plugged into any standard electrical wall outlet. The power adapter provides interchangeable plug prongs to suit country electrical wall sockets.

EasyST can be managed by **Airspan's**AS.MAX Web-based management system using standard Web browsers that access the Web server located on the EasyST (refer to the *WiMAX Web-based Management User's Guide*), or alternatively, by an SNMP-based network management system (Netspan) using standard and proprietary MIBs. In addition, external third-party management systems such as HP OpenView can also manage the EasyST using these MIBs.

Main Features

The EasyST provides the following main features:

- World's First "Self-Install" WiMAX Subscriber Station
- Full Indoor Non-LOS Deployment -- 256 OFDM
- No professional installation, simply Plug & Play -- user unpacks, plugs in and surfs
- Based on 802.16 ProWireless 5116 Rosedale chip
- Designed to sit next to a computer on a desktop
- Clip-on antenna containing four 90-degree, high-gain directional antennas providing 360 degree coverage (EasyST selects antenna with best RF reception) -- self pointing for easy setup by untrained subscriber
- Over-the-air rate of 37 Mbps (DL/UL) for a 10-MHz channel (18 Mbps for a 5-MHz channel)
- Supports transparent bridging

- Supports QoS (based on IP addresses, protocols, applications, DiffServ/TOS, 802.1p)
- Configuration for Operator Network via integrated Smart Card (SIM) reader -- **planned for future**
- Stackable "CD" Style Design for adding plug-in expansion modules for the following interfaces:
  - Integrated IEEE 802.11b/g Wi-Fi access point and LAN switch -- **planned for future**
  - Integrated VoIP allowing connection of 2 conventional telephones (POTS) and battery backup -- **planned for future**

Customer Benefits

The EasyST offers the following customer benefits:

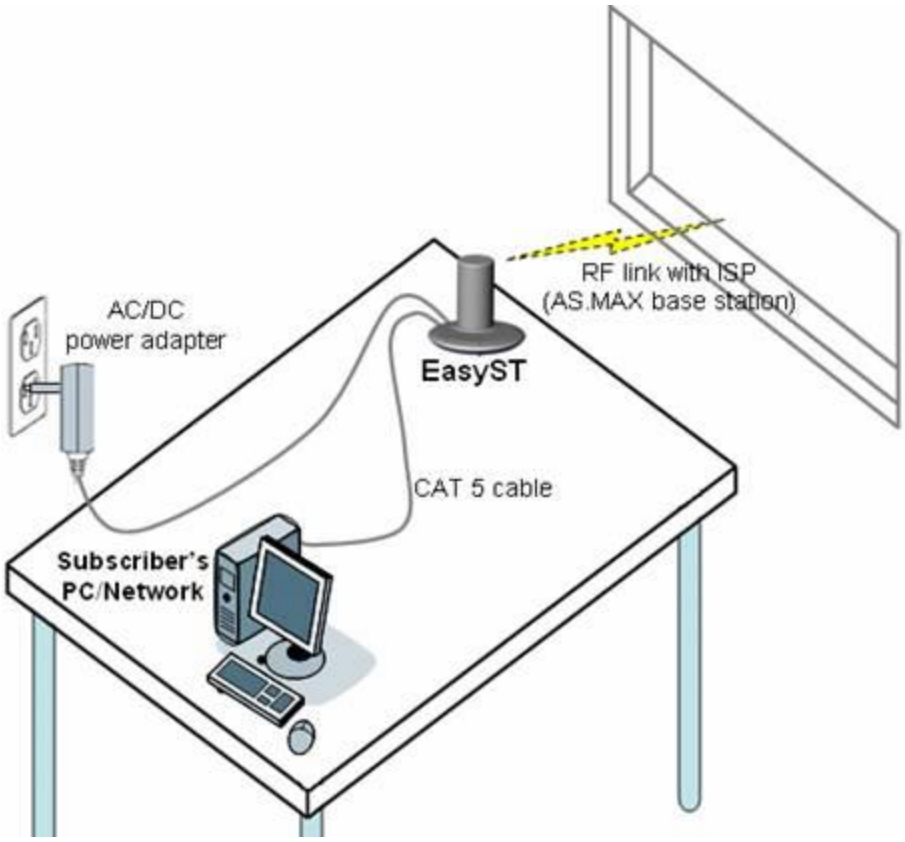
- Self-install -- fast, easy and simple installation
- Provides signal strength LEDs for quick and simple alignment with providers base station
- Compact unit occupying little space
- Based on the latest wireless technology WiMAX IEEE 802.16 standard
- High throughput providing fast access at burst data rates of up to 37 Mbps over a channel bandwidth of 10 MHz, and up to 18 Mbps over a channel bandwidth of 5 MHz
- Low cost

Architecture

The EasyST is a self-install indoor unit requiring no professional installation. The EasyST architecture includes the following components:

- EasyST module with clip-on antenna
- AC/DC power adapter with interchangeable plug prongs -- plugs into a standard electrical wall outlet (110/240 VAC, 50/60 Hz) and supplies the EasyST with 6 VDC power

The EasyST provides a fast and easy mounting method by allowing you to simply place it on a desktop/table, as displayed below.



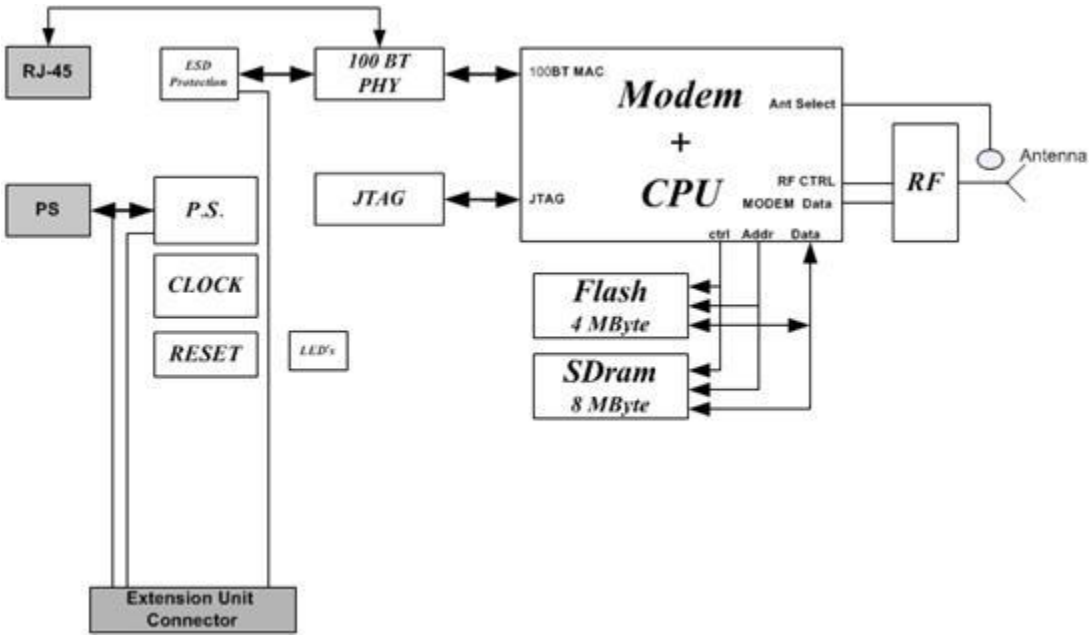
EasyST Models

The EasyST is available in the following optional deployment models:

- EasyST with clip-on antenna containing four high-gain, integrated flat panel, 90-degree directional antennas, providing 360 degree coverage. EasyST selects the antenna with best RF reception with the BS by using the 6-pin Antenna Controller.
- EasyST providing plug-in expansion modules supporting the following interfaces:
  - Wi-Fi and LAN switch (planned for future)
  - VoIP and battery backup (planned for future)

EasyST Block Diagram

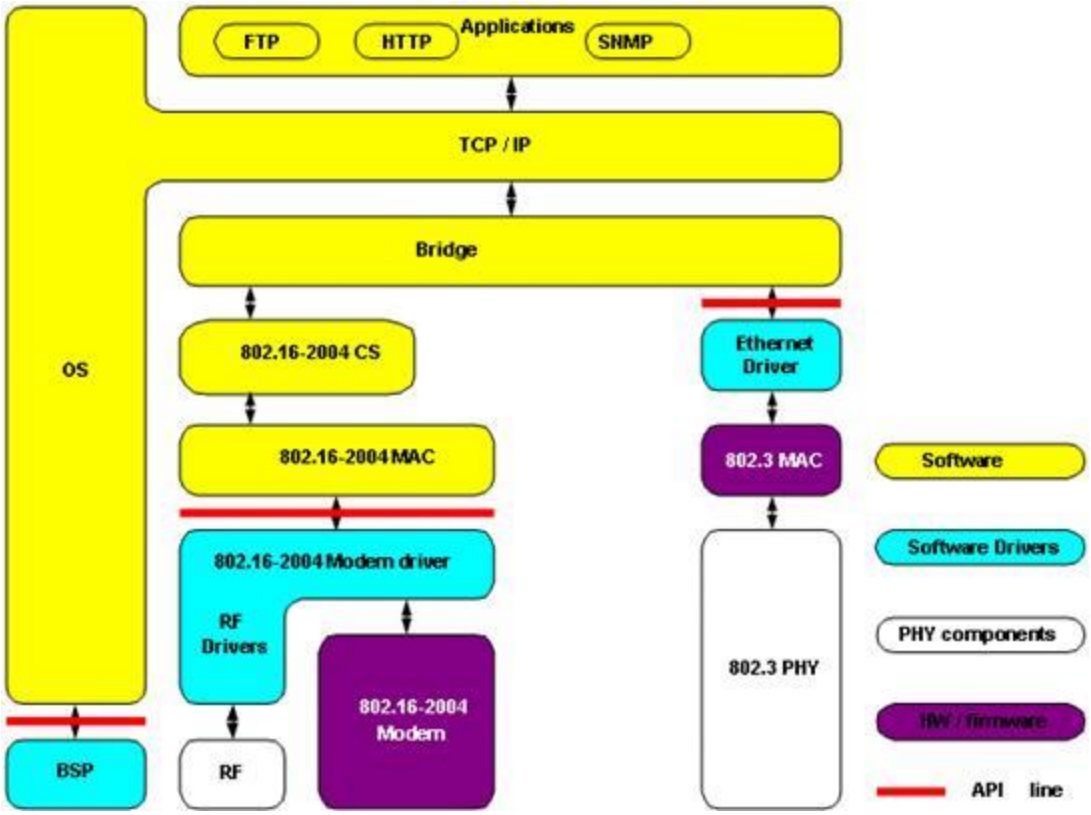
The figure below displays the EasyST block diagram:



Note: EasyST uses the antenna switch to select one of the four 90-degree antennas of the clip-on antenna.

EasyST Protocols Stack

The figure below displays a block diagram of the EasyST's network architecture, designed as a hierarchy of protocols (i.e. protocol stack) implemented in the communication network.



Theory of Operation

For basic operation, the EasyST requires no initial configuration--simply plug and play. Configuration is automatically performed over the air by the BS. The EasyST is preconfigured by the operator at the BS (using Netspan) with service flow parameters such as the maximum information rate, the committed information rate, the maximum latency, and maximum jitter. These configuration parameters are stored in Netspan's database corresponding to the EasyST's MAC address.

Before any communication between EasyST and BS can occur, the EasyST must be positioned in a location that provides sufficient RF reception.

To join a network, the EasyST needs to perform a few tasks. First, the "Network Entry" process (defined in IEEE 802.16-2004) begins with the EasyST scanning for a downlink (DL) signal from the base station, and then synchronizing to the DL channel. Thereafter the EasyST can start the process of initial ranging, which alerts the BS to the presence of the EasyST and establishment of management connections to obtain basic and primary management connection IDs (CID) from the BS. After the CIDs have been obtained, the EasyST commences authorization and key exchange. In the final stage, the EasyST registers at the base station and thereafter obtains the IP address, time of day and the configuration file from the BS.

During Network entry, the EasyST sends the BS its MAC address. The BS then accesses Netspan's database (via SNMP) and checks whether the EasyST's MAC address appears in the database. If it locates the MAC address, the BS retrieves all the EasyST's configuration parameters (service flows) from the database and downloads them to the EasyST device.

See Also:

- EasyST specifications

GETTING STARTED

Before installing your EasyST, read the following sections to ensure that no EasyST items are missing, minimum computer requirements are fulfilled, and you have the required installation tools.

Package Contents

The EasyST kit includes the following items:

- EasyST module with clip-on antenna
- AC/DC power supply adapter
- Category 5 Ethernet LAN cable (1.5 meters)
- *Quick Installation Guide*

Note: Examine the AS.MAX shipping container. If you notice any damage, or missing items as listed in the Packing List, immediately notify the carrier that delivered the unit and contact an **Airspan** representative.

Minimum PC Requirements

Ensure that your computer provides an Ethernet interface such as a Network Interface Card (that provides an RJ-45 port).

PHYSICAL DESCRIPTION

This section describes the EasyST's physical description:

- Physical Dimensions
- Ports
- LEDs
- LED Button (Planned for Future)

Physical Dimensions

The physical dimensions of the EasyST are listed in the table below:

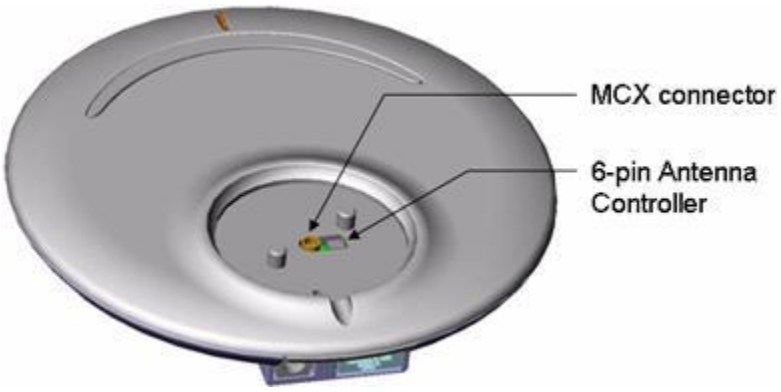
Parameter	Value
Dimensions (height x width x depth)	• With clip-on antenna: 130 x 145 x 145 mm (5.12 x 5.7 x 5.7 inches) • Without clip-on antenna: 30 x 145 x 145 mm (1.18 x 5.7 x 5.7 inches)
Weight	• With clip-on antenna: 0.426 kg (approximate) • Without clip-on antenna: 0.3 kg (approximate)

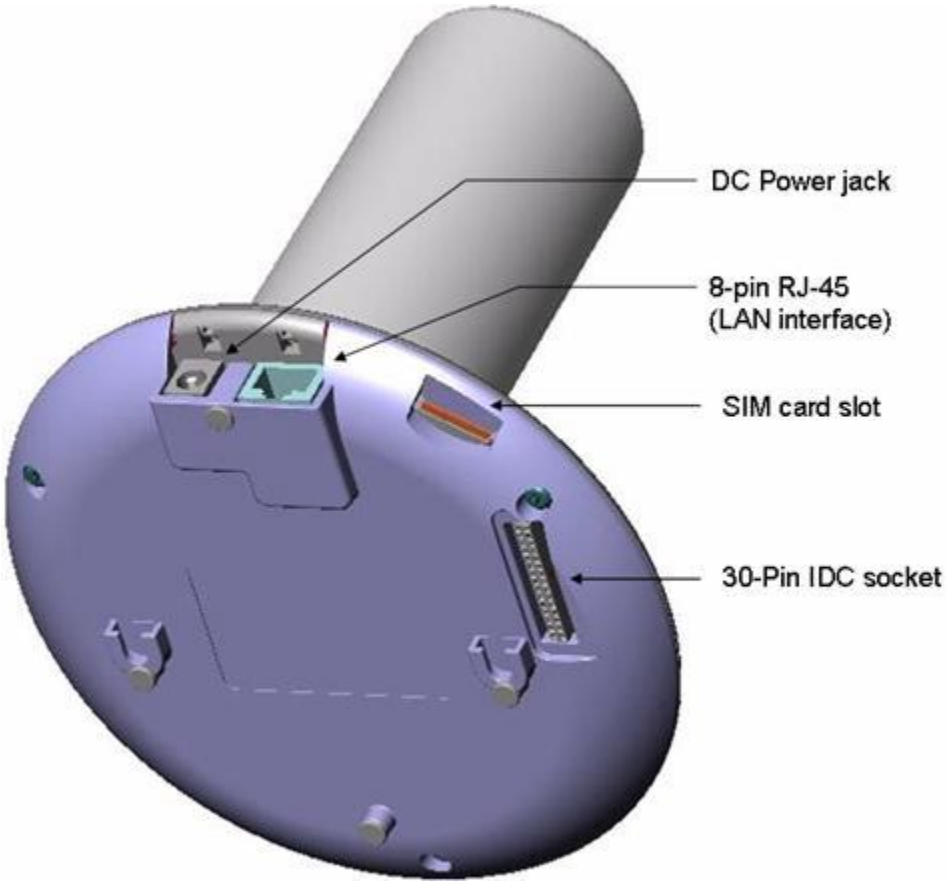
Ports

The EasyST provides various ports on its top, bottom, and side panels, as described in the table below:

Panel	Port	Interface
Side	8-pin RJ-45	10/100BaseT Ethernet LAN
	DC power jack	6 VDC power (supplied by AC/DC power adapter)
Top (cover exposed)	6-pin header	Integrated Antenna Controller for attaching clip-on antenna (determines active antenna--1 out of 4)
	MCX jack	Clip-on antenna
Bottom	30-pin IDC socket	Plug-in extension board for the following interfaces **planned for future**: • 802.11 Wi-Fi and LAN switch • VoIP and Battery Backup (The IDC socket accepts flat cables)
	SIM	Authentication support (planned for future)

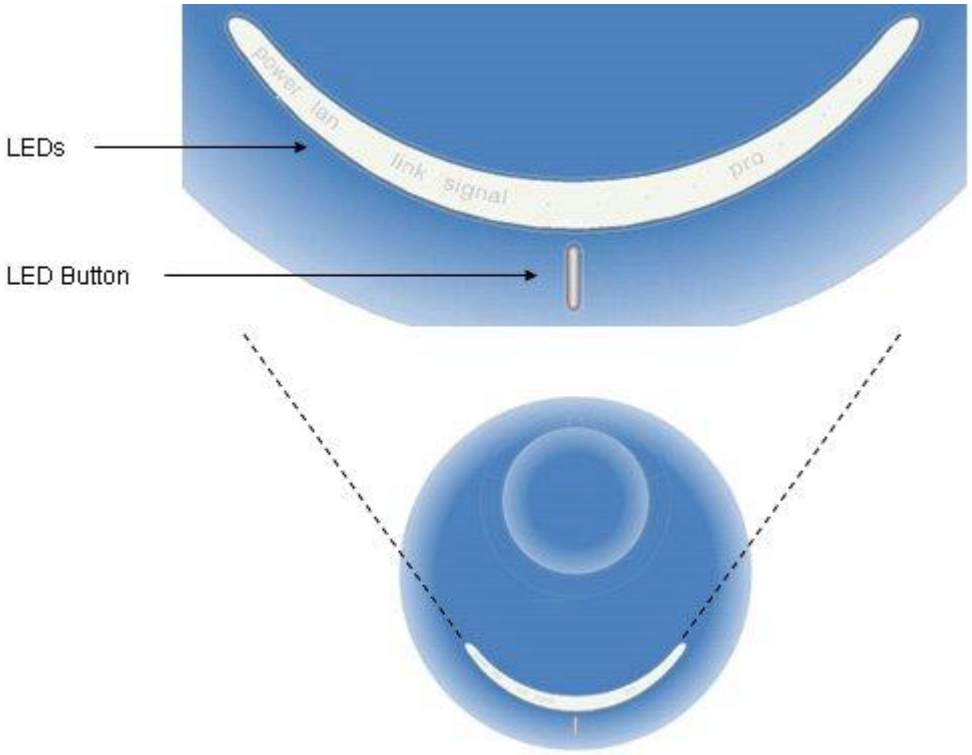
The figures below display the EasyST ports, which are located on the top (with the clip-on antenna removed) and bottom panel respectively.





LEDs

The EasyST provides LEDs for indicating the status of various operations. These LEDs are located on the EasyST's top panel for easy viewing, as shown in the figure below:



The EasyST LEDs are described in the table below:

LED	Color	Mode	Status	Description
power	**Red**		On	EasyST receiving power
			Off	No power received by EasyST
lan	**Green**		On	10/100BaseT network device (e.g. PC) correctly connected to EasyST
			Flashing	Active LAN link (i.e. traffic flow)
			Off	No 10/100BaseT interface connected to EasyST
link	**Green**		On	Active WiMAX link
			Flashing	Undergoing Network Entry
			Off	No WiMAX link
signal	**Customer mode**			
	Average Signal to Noise Ratio (SNR)			
	Green		All LEDs are off	< 5

			First left-most LED is on	5 < = SNR < 9
			Two left-most LEDs are on	9 < = SNR < 12
			Three left-most LEDs are on	12 < = SNR < 16
			Four left-most LEDs are on	16 < = SNR < 22
			Five LEDs are on	22 < =SNR
signal	**PRO mode**			
		Customer mode	Off	
	Red	Professional Mode #1	On	Modulation and FEC
	Green	Professional Mode #2	On	RSSI
	N/A	Professional Mode #3	N/A	N/A

LED Button

The LED button (planned for the future) located below the LED lights provides the following functionality:

- **Toggles between LED modes:** Each time you press the button, the LED mode changes:
  - **Customer** (standard mode): **Signal** LEDs display SNR value as described in the table above
  - **Professional #1:** provides technician with indication of RSSI
  - **Professional #2:** provides technician with an indication of the modulation and FEC used in the uplink (planned for future release)
  - **Professional #3:** provides technician with indication of downlink throughput (planned for future release)
- **Resets EasyST to factory default settings:** To reset to default settings, hold down the button for 10 seconds

Note: When any of the Professional modes are continually active for 30 seconds, the mode returns automatically to the Customer mode.

CONNECTING EASYST TO A PC

EasyST provides 10/100BaseT (Fast Ethernet) interface with the subscriber's network. The connectivity is performed through the supplied Category 5 Ethernet cable consisting of 8-pin RJ-45 connectors on either end.

The EasyST-to-computer cable setup is listed below:

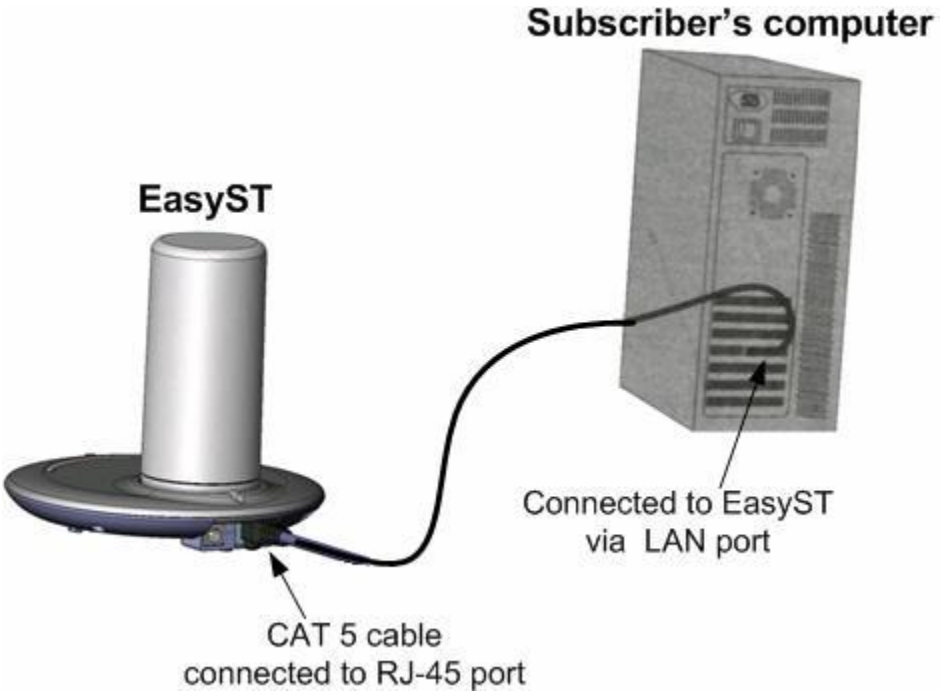
- **Cable:** straight-through CAT 5 STP Ethernet cable
- **Connector:** 8-pin RJ-45
- **Connector pinouts (for both ends):**

Pin	Function
1	Tx+
2	Tx-
3	Rx+
6	Rx-

To connect EasyST to the subscriber's network:

1. Plug the RJ-45 male connector, located at one end of the Category 5 Ethernet cable, into the EasyST's 8-pin RJ-45 port.
2. Plug the RJ-45 male connector, located at the other end of the Category 5 Ethernet cable, into your computer's LAN port.

The figures below illustrate the EasyST-to-computer cable connection:


Subscriber's computer
EasyST
Connected to EasyST
via LAN port
CAT 5 cable
connected to RJ-45 port

CONNECTING EASYST TO POWER

EasyST is powered by an AC/DC power supply adapter which supplies the EasyST with 6 VDC and 4 Amperes. The AC/DC adapter is simply plugged into a standard electrical wall outlet (110/240 VAC; 50/60 Hz).

The power adapter provides interchangeable prongs (e.g. American vs. European) that can be replaced to suit country electrical standards in which the EasyST is being installed. To view the AC/DC power adapter specifications, see AC/DC Power Adapter Specifications.

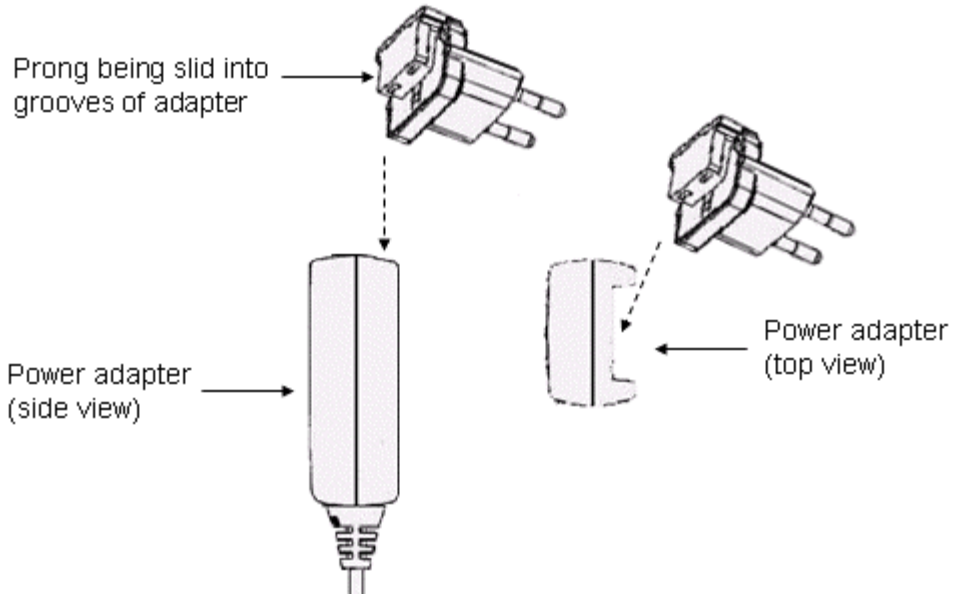
Note: Any AC/DC power adapter complying with Class 2 and LPS, and safety approved according to national regulations, and that provides rated input of 100-240 V, 50/60 Hz, 0.4 A and output of 6 V, 4 A DC, may be used for powering the EasyST.

Changing the AC/DC Power Adapter's Prongs

The AC/DC power adapter provides interchangeable prongs to suit electrical wall outlet sockets in the country in which the EasyST is being installed.

To change the plug prongs:

1. Remove the prongs by first moving (with the help of a pen) the **LOCK/OPEN** switch to **OPEN** position, and then gently sliding the prongs upwards, away from the power cord.
2. Align the desired prongs with the adapter's prong groove, and then slide the prongs onto the adapter in the orientation as shown in the figure below. Ensure that the prongs reach the end of the prong groove.



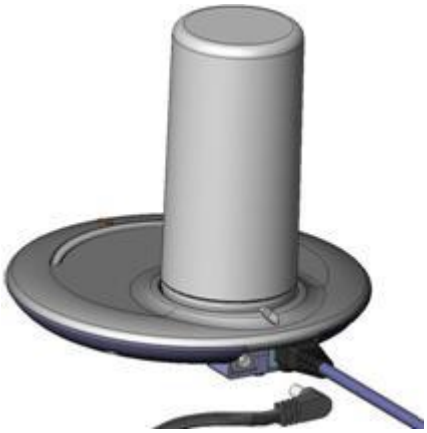
3. Secure the prong in place by moving (with the help of a pen) the **LOCK/OPEN** switch to **LOCK** position.

Connecting EasyST to AC/DC Power Adapter

After you have attached the plug prongs suitable to your country's electrical wall socket, you are ready to connect the EasyST to the electrical wall outlet.

To connect the EasyST to the power supply:

1. Before plugging the power cord into the electrical wall outlet, plug the AC/DC power adapter's power cable (i.e. DC power jack) into the EasyST's DC power socket.
2. Plug the prongs of the AC/DC power adapter into the electrical wall outlet.



MOUNTING EASYST

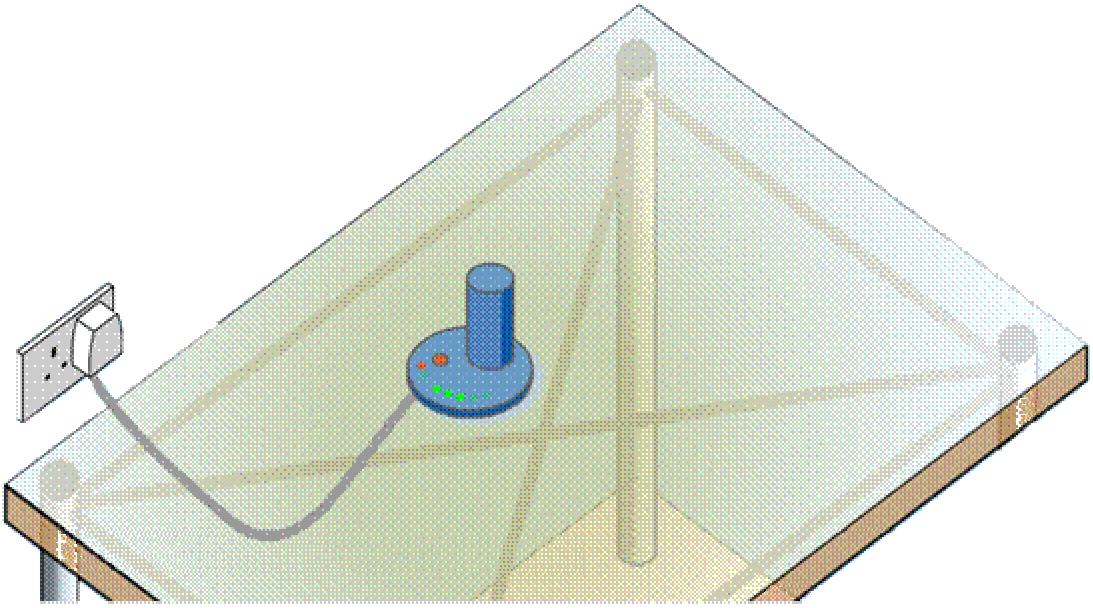
Warning: The EasyST must be mounted indoors.

Warning: To prevent a fire hazard caused by overheating, do not place the EasyST on a carpeted surface where airflow is restricted.

EasyST is a self-install indoor unit, requiring no professional technician. EasyST must be mounted indoors in a location that provides:

- High quality RF reception with the Internet service provider (i.e. base station)
- Accessibility to power supply and LAN network with regards to cable lengths

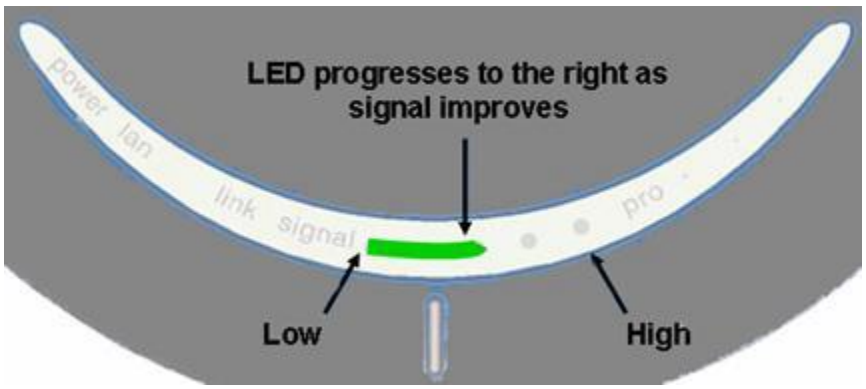
The EasyST offers quick and easy mounting by allowing you to simply place it horizontally on a desktop (as shown in the figure below). The EasyST radio contains integrated rubber feet (pads) on the bottom panel, which provide cushioning as well as insulation from static electricity.



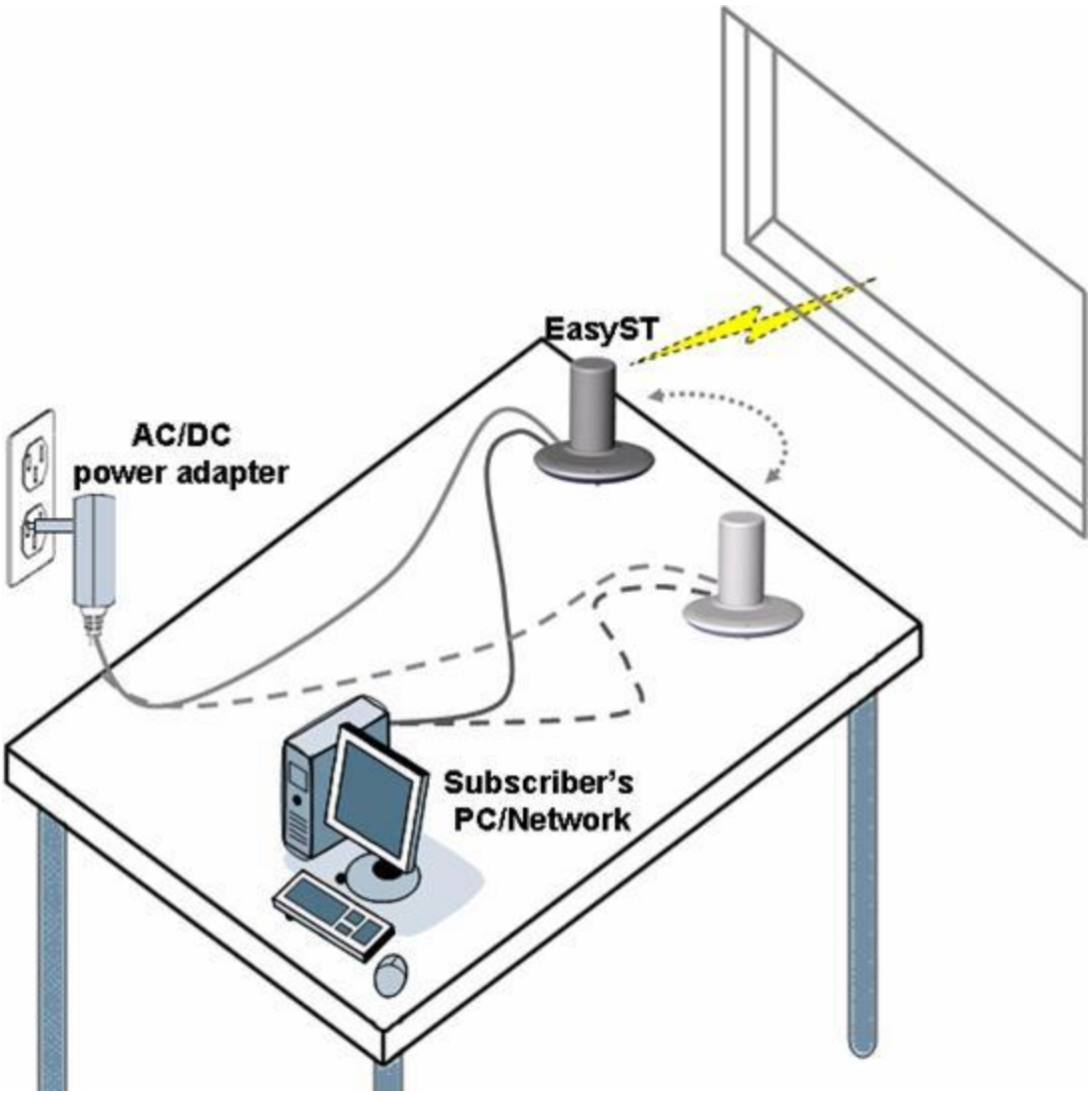
OPTIMIZING PERFORMANCE

To ensure a reliable, secure, and fast connection with your Internet Service Provider (ISP), you need to place your EasyST in a position that provides the best RF reception with the ISP (i.e. base station). To help you locate the best position, EasyST provides you with a LED indicator that indicates the strength of the RF signal with your ISP. This LED is labeled **signal** and is located on the EasyST's top panel.

As the signal strength increases, so the **signal** LED line progresses to the right, as illustrated below.



Therefore, for optimal reception, simply move your EasyST to the position that produces the longest **signal** LED line.



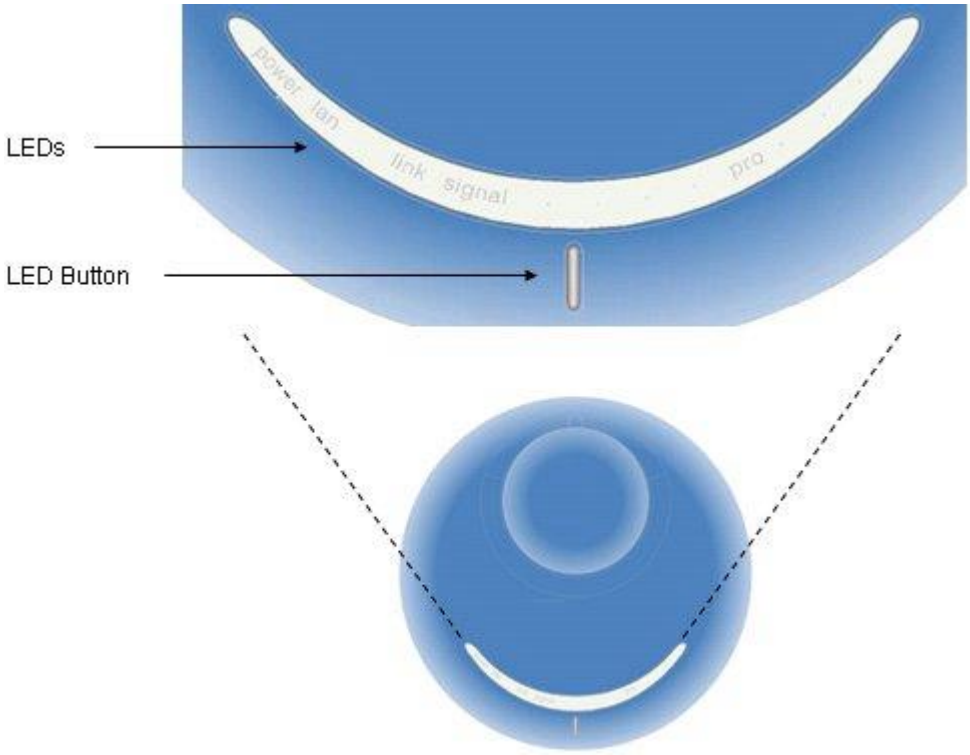
The **signal** LED indicates the strength of the signal by measuring the signal-to-noise ratio (SNR). SNR indicates received signal strength relative to background noise. The ratio is usually measured in decibels (dB). The higher the SNR ratio--the better the communication.

The table below describes the EasyST **signal** LED with regards to SNR values:

LED	Color	Status	Average SNR (dB)
signal	**Green**	All LEDs are off	Avg. SNR < 5
		First left-most LED is on	5 < = Avg. SNR < 9
		Two left-most LEDs are on	9 < = Avg. SNR < 12
		Three left-most LEDs are on	12 < = Avg. SNR < 16
		Four left-most LEDs are on	16 < = Avg. SNR < 22
		Five LEDs are on	22 < = Avg. SNR

RESETTING TO DEFAULT SETTINGS

A future release of the EasyST will allow you to apply factory default configuration settings to the EasyST. This is performed by pressing the LED button (located below the LED lights on the top panel) continuously for at least 10 seconds.



ATTACHING CLIP-ON ANTENNA

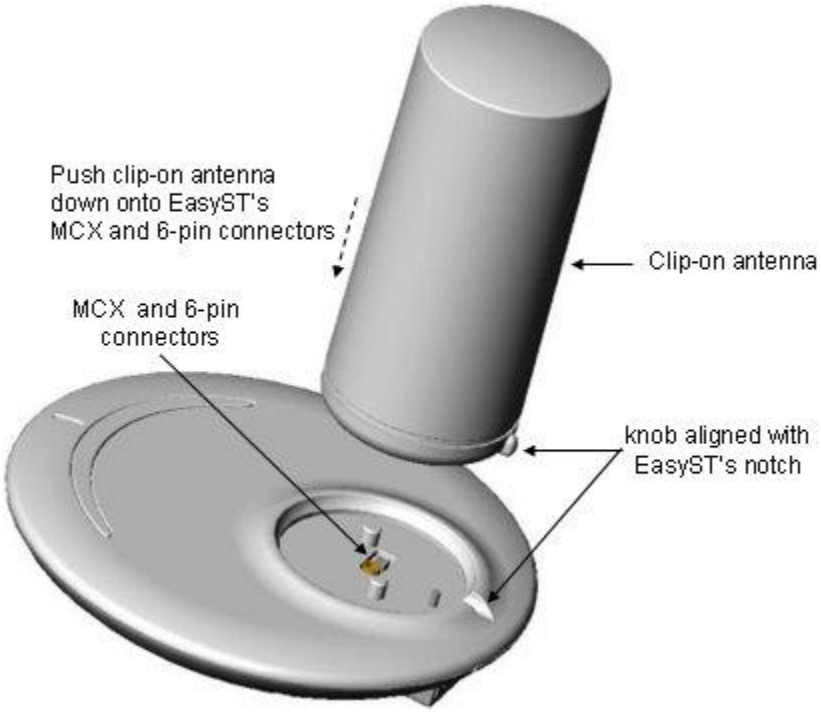
Warning: Before attaching the clip-on antenna, ensure that the EasyST is **not** connected to the power source. Do not connect and disconnect antenna while the power is on. This can cause irreversible damage to the EasyST.

The EasyST is supplied with the clip-on antenna already attached to the EasyST. However, in cases where it may have accidentally being removed, you can re-attach it by following the procedure described below.

Note: Later EasyST models provide a screw for securing the antenna to the EasyST.

To replace the clip-on antenna:

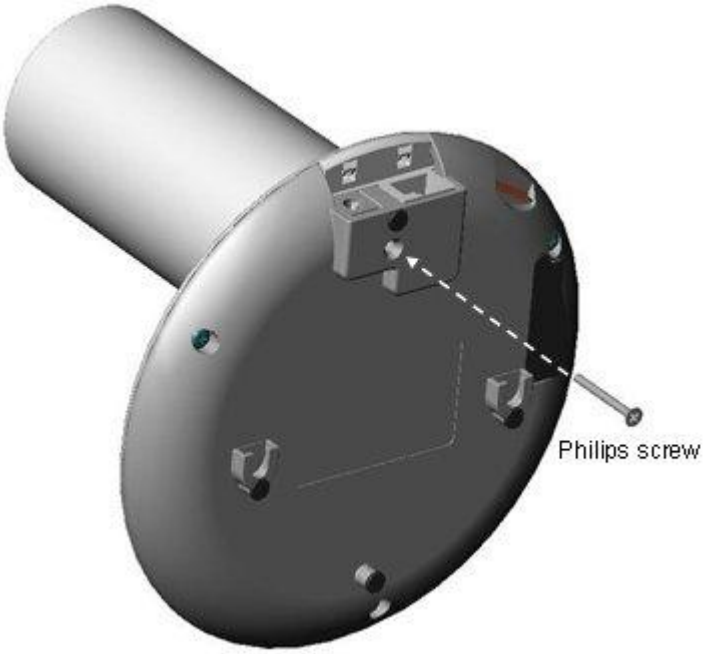
1. Align the clip-on antenna's knob with the EasyST's notch, as shown in the figure below.



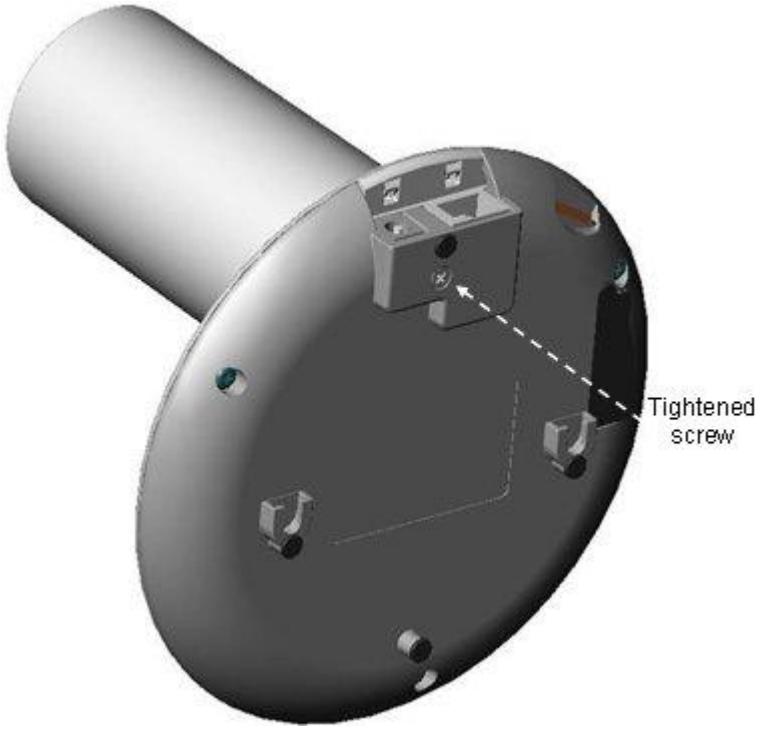
2. Gently push the antenna down onto the EasyST so that the MCX and 6-pin connectors plug into their respective receptacles, and that the antenna's knob sits firmly into the EasyST's notch.

3. For customers possessing EasyST models that implement a screw mechanism for securing the antenna to the EasyST, continue with the following steps:

a. Flip the EasyST over so that its rear panel is visible. Insert the M3 25-mm flat-head Philips screw (supplied) into the hole that's located on the rear panel, behind the RJ-45 and DC power connectors, as shown in the figure below.



b. Using a Philips screwdriver, tighten the screw so that the antenna is firmly attached to the EasyST.


Tightened
screw

SPECIFICATIONS

This section lists the specifications of the following:

- EasyST
- AC/DC Power Adapter

EasyST Specifications

The EasyST's specifications are listed in the table below:

<table>
<tr><th>Category</th><th>Parameter</th><th>Value</th></tr>
<tr><td rowspan="9">Radio Technology</td><td>Frequency band:</td><td>4.9 to 5.0 GHz</td></tr>
<tr><td>RF multiple access scheme:</td><td>256 OFDM</td></tr>
<tr><td>Duplex method:</td><td>Time Division Duplexing (TDD)</td></tr>
<tr><td>Channel size:</td><td>5 MHz or 10 MHz</td></tr>
<tr><td>Tx power:</td><td>up to 17 dBm</td></tr>
<tr><td>Antenna type:</td><td>Clip-on, integrated 4 x 90-degree high-gain 7-dBi directional antennas (EasyST selects antenna with best RF reception)</td></tr>
<tr><td>Modulation method:</td><td>BPSK, QPSK, 16QAM and 64QAM</td></tr>
<tr><td>Channel access method:</td><td>Adaptive TDMA</td></tr>
<tr><td>Receiver (Rx) sensitivity:</td><td>
<table>
<tr><th>Modulation</th><th>5 MHz</th><th>10 MHz</th></tr>
<tr><td>3/4 64QAM:</td><td>-80.5 dBm</td><td>-77.4 dBm</td></tr>
<tr><td>2/3 64QAM</td><td>-82.0 dBm</td><td>-78.9 dBm</td></tr>
<tr><td>3/4 16QAM:</td><td>-86.2 dBm</td><td>-83.1 dBm</td></tr>
<tr><td>1/2 16QAM:</td><td>-89.5 dBm</td><td>-86.4 dBm</td></tr>
<tr><td>3/4 QPSK:</td><td>-92.5 dBm</td><td>-89.4 dBm</td></tr>
<tr><td>1/2 QPSK:</td><td>-95.0 dBm</td><td>-91.9 dBm</td></tr>
<tr><td>1/2 BPSK:</td><td>-97.5 dBm</td><td>-94.4 dBm</td></tr>
</table>
</td></tr>
</table>

Standards Compliance	**Radio:**	▸ WiMAX Forum Certified™ for IEEE 802.16-2004 ▸ TELEC
	Safety:	EN/IEC/UL 60950
	Environmental:	EN 300 019-2-x
Networking	**Protocols:**	Transparent Bridging
	QoS:	▸ IP type of service ▸ Protocol ▸ IP source address ▸ IP destination address ▸ Protocol source port ▸ Protocol destination port ▸ Ethernet destination MAC address ▸ Ethernet source MAC address ▸ Ethertype/IEEE 802.2 SAP ▸ IEEE 802.1D User Priority ▸ IEEE 802.1Q VLAN ID
	Default IP address:	10.0.0.1
Management	**Remote:**	▸ SNMP-based (standard and private MIBs) ▸ Web-based (HTTP)
	Software upgrade:	FTP based
	Management tools:	GUI based for SNMP- and Web-based management
Environmental Conditions	**Operating temperature:**	0°C to +45°C (32°F to 113°F)
	Operating humidity:	+30°C (86°F), RH=90% to 100%

Mechanical and Electrical	**Interfaces:**	▸ 10/100BaseT (8-pin RJ-45) ▸ DC power (DC power jack) ▸ RF: Clip-on antenna (MCX connector and 6-pin Antenna Controller) ▸ SIM slot (planned for future) ▸ Plug-in expansion module through 30-pin IDC socket for the following interfaces: o 802.11 Wi-Fi -- planned for future o LAN switch -- planned for future o VoIP and Battery Backup -- planned for future
	Power requirements:	6 VDC, 4A, supplied by AC/DC power adapter plugged into a standard electrical wall outlet (110/240 VAC, 50/60 Hz)
	Dimensions:	▸ With clip-on antenna: 130 x 145 x 145 mm (5.12 x 5.7 x 5.7 inches) ▸ Without clip-on antenna: 30 x 145 x 145 mm (1.18 x 5.7 x 5.7 inches)
	Weight:	▸ With clip-on antenna: 0.426 kg (approximate) ▸ Without clip-on antenna: 0.3 kg (approximate)

Power Adapter Specifications

The specifications of the AC/DC power adapter are listed in the table below:

Category	Parameter	Value
Input	**Input voltage**	90 to 264 VAC
	Input frequency	47 to 63 Hz
	Input inrush current	▸ 30 A at 115 VAC ▸ 60 A at 230 VAC
	Earth leakage	▸ 0.4 mA max. @ 115 VAC ▸ 0.8 mA max. @ 230 VAC
Output	**Output rating**	6V / 4A
	Output voltage accuracy	± 2% max.
	Max. output power	24W
	Line regulation	± 1% max.
	Load regulation (full to half load)	6 ~6.5V

	Transient response (full to half load)	± 1% max. dev. 500 uS recovery
	Temperature coeffeicient	± 0.04% / °C
	Ripple and noise	100mVp-p max
	Protections	• Over voltage protection (output voltage 7.5V) • Over power protection • Short circuit protection • Over current protection: 130% ~ 160%
General	**Efficiency**	70% typical at full load
	Hold-up time	5 ms @ 115 VAC full load
	EMI / RFI	VDE and FCC Class B limits
	Dielectric withstand	• Input/output: 3000 Vac • Input/Ground: 1500 Vac
	Safety meet	• UL/CUL UL60950 • CE EN55022
	Switching frequency	100 kHz
	Connector for radio	• Input: interchangeable prongs • Output: DC power jack
	Cable length	1.25 m
	Dimensions	86 × 46 × 33 mm
	Weight	180 g
	MTBF	100,000 hours (MIL-HDBK-217F)
Environmental	**Operating temperature**	0 to +40°C
	Storage temperature	-20 to +85°C
	Humidity	5 to 95% RH non-condensing
	Vibration	2.4G, 5 to 500 Hz
	Cooling	Free air convection

TROUBLESHOOTING

Once you have connected the EasyST to the subscriber's LAN and to the power supply, you can verify whether you have cabled the EasyST correctly by checking the EasyST LED status:

Connection	LED	Color	Correct Status	Troubleshooting
Power	**power**	Red	On	If the **power** LED is off, recheck the power cabling and that power exists at the wall socket.
LAN	**lan**	Green	On	If the **lan** LED is off, recheck the LAN cabling; ensure that you have connected it to the correct LAN port on your PC and that your network connection on your PC is enabled.

GENERAL

REVISIONS

Revision Level	Date	Main Changes
A	16-10-2005	Initial Document
B	07-03-2006	Warning changed to 20 cm
C	28-3-2006	Warning Removed
D	01-05-2006	FCC Statement, Warning, additions

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WARNINGS AND CAUTIONS

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Any product performance limits stated within this document are for information purposes only and should be considered as indicative.

1.1 Safety Warnings

1. Read this User Manual and follow all operating and safety instructions.
2. Keep all product information for future reference.
3. This product is supplied with a grounding power plug. Do not defeat this important safety feature.
4. **Warning**: High voltages exist inside the product - do not remove the lid or base: No user serviceable parts inside.
5. CAUTION: DOUBLE POLE/NEUTRAL FUSING - Always replace the fuse with the correct type and current rating.
6. Position the power cord to avoid possible damage; do not overload wall outlets.
7. Do not place this product on or near a direct heat source, and avoid placing objects on the terminal.
8. Do not operate this device near water or in a wet location.
9. Use only a damp cloth for cleaning. Do not use liquid or aerosol cleaners. Disconnect the power before cleaning.
10. Protect the terminal by disconnecting the power if not used for long periods.
11. Mount the terminal in a Telco rack on a stable horizontal surface.
12. The radio antenna units must not be located near power lines or other electrical power circuits.
13. The radio transceiver must be properly grounded to protect against power surges and accumulated static electricity. It is the user's responsibility to install this device in accordance with the local electrical codes: correct installation procedures for grounding of the transceiver unit, mast, lead-in wire and discharge unit, location of discharge unit, size of grounding conductors and connection requirements for grounding electrodes.
14. Installation of the transceiver must be contracted to a professional installer.
15. Disconnect Device. The socket outlet shall be installed near the equipment , easily accessible and will act as the disconnect for the MacroMAX .
16. When installed in the final configuration, the product must comply with the applicable Safety Standards and regulatory requirements of the country in which it is installed. If necessary, consult with the appropriate regulatory agencies and inspection authorities to ensure compliance.

1.2 Important Warning Symbols

The following symbols may be encountered during installation or troubleshooting. These warning symbols mean danger. Bodily injury may result if you are not aware of the safety hazards involved in working with electrical equipment and radio transmitters. Familiarize yourself with standard safety practices before continuing.

Electro-Magnetic Radiation

High Voltage

1.3 Important Service Information

1. Refer all repairs to qualified service personnel. Do not remove the covers or modify any part of this device, as this will void the warranty.
2. Disconnect the power to this product and return it for service if the following conditions apply:
    a. The terminal does not function after following the operating instructions outlined in this manual.
    b. Liquid has been spilled, a foreign object is inside, or the terminal has been exposed to rain.
    c. The product has been dropped or the housing is damaged.
3. Locate the serial number of the terminal, antenna, and transceiver and record these on your registration card for future reference. Use the space below to affix serial number stickers. Also record the MAC address, located on the back of the terminal.

1.4 UL Information

- The equipment must be properly grounded according with NEC and other local safety code requirements

- Reminder to all the BWA system installers: Attention to Section 820-40 of the NEC which provides guidelines for proper grounding and, in particular, specifies that the cable ground shall be connected to the grounding system of the building, as close to the point of cable entry as is practical.

1.5 CE Notice

The MacroMAX shelf carries the CE mark to demonstrate conformity with the Radio Equipment and Telecommunications Terminal Equipment and the Mutual recognition of their conformity (R&TTE) directive 1999/5/EC.

WARNING: This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Installation

The transceiver and antenna equipment must be installed by a qualified professional installer and must be installed in compliance with regional, national, and local regulations. It is the responsibility of the system installer and/or system operator to ensure the installed system does not exceed any operational constraints identified by local regulations.

Refer to the sections in this product User Guide for detailed information about the correct installation steps to ensure power and frequency settings are set correctly before connecting the antenna.

Antenna Selection

Refer to the product User Guide for a list of Airspan Networks approved antennas. Antennas not listed in the User Guide are outside the scope of this Declaration.

CAUTION: European Directive 1999/519/EC details basic restrictions and reference levels on human exposure to electromagnetic fields as advised by the ICNIRP. The directive states that adherence to these recommended restrictions and reference levels should provide a high level of protection as regards the established health effects that may result from exposure to such fields.

By the very nature of the system design and installation users will not find them selves within close proximity of the subscriber terminals.

Standards EN50383 and EN50385 are the applicable harmonised standards for EM fields generated by fixed wireless equipment.

The Electromagnetic fields generated by the Central Terminal antenna are below the recommended safe levels at all distances greater than 65 cm from an approved Airspan antenna.

The safe distance from a non-approved antenna of length D and Sector Angle δ may be calculated using the formula:

Safe distance, r = 36 / (π * D * δ)

1.6 European Community, Switzerland, Norway, Iceland, and Liechtenstein

Declaration of Conformity with Regard to the R&TTE Directive 1999/5/EC

English:

This equipment is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

Deutsch:

Dieses Gerät entspricht den grundlegenden Anforderungen und den weiteren entsprecheneden Vorgaben der Richtlinie 1999/5/EU.

Dansk:

Dette udstyr er i overensstemmelse med de væsentlige krav og andre relevante bestemmelser i Directiv 1999/5/EF.

Español:

Este equipo cumple con los requisitos esenciales asi como con otras disposiciones de la Directive 1999/5/EC.

Ελληνικά:

Αυτός ο εξοπλισμός συμμορφώνεται με τις ουσιώδεις απαιτήσεις και τις λοιπές διατάξεις της Οδηγίας 1999/5/ΕΚ.

Français:

Cet appareil est conforme aux exigencies essentialles et aux autres dispositions pertinantes de la Directive 1999/5/EC.

Íslenska:

Þessi búnaður samrýmist lögboðnum kröfum og öðrum ákvæðum tilskipunar 1999/5/ESB.

Italiano:

Questo apparato é conforme ai requisiti essenziali ed agli altri principi sanciti dalla Direttiva 1999/5/EC.

Nederlands:

Deze apparatuur voldoet aan de belangrijkste eisen en andere voorzieningen van richtlijn 1999/5/EC.

Norsk:

Dette utstyret er i samsvar med de grunnleggende krav og andre relevante bestemmelser i EU-directiv 1999/5/EC.

Português:

Este equipamento satisfaz os requisitos essenciais e outras provisões da Directiva 1999/5/EC.

Suomalainen:

Tämä laite täyttää direktiivin 1999/5/EY oleelliset vaatimukset ja on siinä asetettujen muidenkin ehtojen mukainen.

Svenska:

Denna utrustning är i överensstämmelse med de väsentliga kraven och andra relevanta bestämmelser i Direktiv 1999/5/EC.

The Declaration of Conformity related to this product can be obtained from product_management@Airspan.com

1.7 CAUTION

Any modifications to this device not expressly authorised by the manufacturer could void the user's authority to operate this device.

Responsible party for compliance is:

David Mann, Airspan Networks Inc.,Cambridge House, Oxford Rd, Uxbridge, Middlesex, England, UB8 1UN. Telephone (44) 1 895 467450.

1.8 Lightning Protection

WARNING: The following notes are general recommendations for the system. The wireless equipment should be installed by a qualified professional installer and must follow local and national codes for electrical grounding and safety. Failure to meet safety requirements and/or use of non-standard practices and procedures could result in personal injury and damage to equipment. A direct lightning strike may cause serious damage even if these guidelines are followed.

All outdoor wireless equipment is susceptible to lightning damage from a direct hit or induced current from a near strike. Lightning protection and grounding practices in local and national electrical codes serve to minimize equipment damage, service outages, and serious injury. Reasons for lightning damage are summarized as:

- Poorly grounded tower/antenna sites that can conduct high lightning strike energy into equipment.

- Lack of properly installed lightning protection equipment that can cause equipment failures from lightning induced currents.

A lighting protection system provides a means by which the energy may enter earth without passing through and damaging parts of a structure. A lightning protection system does not prevent lightning from striking; it provides a means for controlling it and preventing damage by providing a low resistance path for the discharge of energy to travel safely to ground. Improperly grounded connections are also a source of noise that can cause sensitive equipment to malfunction.

A good tower grounding system disperses most of the surge energy from a tower strike away from the building and equipment. The remaining energy on the RF cable shield and center conductor can be directed safely to ground by using a lightning arrestor in series with the RF cable.

To limit the equipment damage due to a lightning strike, the following practices are recommended for the wireless system:

- Provide direct grounding from the antenna mounting bracket, the radio and antenna and the lightning arrestors to the same ground point at the base of the tower or a ground bus on the building. Use the grounding screws on the antenna bracket and the radio and antenna for terminating the ground wires.

- Install one RF lightning protector between the radio and antenna in series with the RF cable.

- A lightning arrestor in series with the RF cable at the point of entry to the building.

- Install a lightning arrestor in series with the IF cable at the transceiver on the tower/mast.

- The AC wall outlet ground for the MacroMAX terminal must be connected to the same grounding system as the radio and antenna lightning protectors.

GLOSSARY

A

AP: Access Point (e.g. WiFi AP)

B

BPSK: Binary Phase Shift Keying

BS: Base Station (e.g. WiMAX BS)

BWA: Broadband Wireless Access

C

CID: Connection IDs

CPE: Customer Premises Equipment (interchangeable with ST)

D

dB: Decibel

dBm: Power ratio in dB (decibel) of the measured power referenced to one milliwatt

DHCP: Dynamic Host Configuration Protocol

DL: Downlink

F

FDD: Frequency Division Duplex

FEC: Forward Error Correction

FTP: File Transfer Protocol

G

GHz: Gigahertz

GW: Gateway

H

H-FDD: Half duplex FDD

HTTP: HyperText Transfer Protocol

I

IAD: Integrated Access Device

IP: Internet Protocol

ISP: Internet Service Provider

L

LAN: Local-Area Network

M

MAC: Media Access Controller. The next layer up from the PHY.

Mbit/s: Megabits per second

MHz: Megahertz (one million cycles per second)

MIB: Management Information Base

N

NLOS: Non Line of Sight radio propagation path

O

ODU: Outdoor unit associated with an ST

OFDM: Orthogonal Frequency Division Multiplexing

P

PHY: The physical layer associated with the WiMAX interconnection stack

POTS: Plain old telephone service

Q

QAM: Quadrature Amplitude Modulation

QoS: Quality of Service, which is used to specify level of data throughput

QPSK: Quadrature Phase Shift Keying

R

RF: Radio frequency

Rx: Receive

S

SF: Service Flow

SIM: Subscriber Identity Module

SNMP: Simple Network Management Protocol

SNR: Signal-to-Noise Ratio

ST: Subscriber terminal (interchangeable with CPE or SS)

SW: Software

T

TDD: Time Division Duplex

TDMA: Time Division Multiple Access. Technology for delivering digital wireless service using time-division multiplexing (TDM)

Tx: Transmit

U

UGS: Unsolicited Grant Service used to provide fixed bandwidth slots on the uplink for an ST to transmit data at regular intervals. The bandwidth should be used by the UGS SF, however the final decision of which SF (if any) uses the bandwidth slot is made by the ST.

V

VoIP: Voice-over-Internet Protocol

W

WBM: Web-based management

Wi-Fi: Wireless Fidelity

WiMAX: WiMAX is a wireless industry coalition whose members are organized to advance IEEE 802.16 standards for broadband wireless access (BWA) networks.

INDEX

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