Airspan

UGD-D00111 Rev K

ProST
Hardware Installation
User Guide

Software Release 7.7

WiMAX FORUM

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Product performance figures quoted within this document are indicative and for information purposes only.

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Human Exposure to Radio Frequencies

The ProST should be installed and operated from a minimum distance of 2 meters 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 technician is encouraged to try to correct the interference by performing one or more of the following measures:

- ➢ Re-orientate 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

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 ProSTs.
- ➢ When using an external antenna, the external antenna must not be co-located or operating in conjunction with any other antenna or transmitter.

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.

General

- ➢ Only qualified personnel should be allowed to install, replace, and service the equipment.
- ➢ The device cannot be sold retail, to the general public or by mail order. It must be sold to dealers.
- ➢ Installation must be controlled.
- ➢ Installation must be performed by licensed professionals.
- ➢ Installation requires special training.
- ➢ The Airspan WiMAX radios and antennas should be installed ONLY by experienced installation professionals who are familiar with local building and safety codes and, wherever applicable, are licensed by the appropriate government regulatory authorities. Failure to do so may void Airspan's WiMAX product warranty and may expose the end user or the service provider to legal and financial liabilities. Airspan and its resellers or distributors are not liable for injury, damage or violation of regulations associated with the installation of outdoor units or antennas.
- ➢ Do not mount outdoor radios and external antennas in weather that may increase risk of electrocution such as rain or lightning.
- ➢ To prevent ESD damage to devices, always wear an ESD wrist strap when handling these devices or coming into contact with internal components.

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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 Notice

Federal Communication Commission Notice

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.

Fixed and base stations transmitting a signal with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP.

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 2 meters between the radiator & your body.

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

Maximum Output TX Power

Frequency Band	ETSI TX	ETSI EIRP	FCC TX	FCC EIRP	Rest of the World TX	Rest of the World EIRP	Antenna Gain
698-746 MHz TDD			25.9dBm	41.2dBm	25.9dBm	41.2dBm	15.3 dBi
1.4GHz TDD			25.15dBm	43.15dBm	25.15dBm	43.15dBm	18 dBi
2.4975-2.6885 GHz TDD			24.14dBm	41.14dBm	24.14dBm	41.14dBm	17 dBi
2.7-2.9 GHz TDD (NPI)					24dBm	40dBm	16 dBi
3.3-3.5 GHz TDD	24dBm	40dBm	N/A	N/A	24dBm	40dBm	16 dBi
3.4-3.6 GHz FDD	24dBm	40dBm	N/A	N/A	24dBm	40dBm	16 dBi
3.6-3.8 GHz FDD	24dBm	40dBm	N/A	N/A	24dBm	40dBm	16 dBi
3.7GHz TDD	24dBm	40dBm	23.8	39.8	24dBm	40dBm	16 dBi
5.15-5.35 GHz TDD	6dBm	23dBm			19dBm	36dBm	17 dBi
5.15-5.25 GHz TDD			-0.5dBm	17dBm	19dBm	36dBm	17.5 dBi
5.25-5.35 GHz TDD			9.5dBm	27dBm	19dBm	36dBm	17.5 dBi
5.47-5.725 GHz TDD	12.5dBm	30dBm	9.1dBm	26.6dBm	19dBm	36dBm	17.5 dBi
5.725-5.850 GHz TDD	15.5dBm	33dBm	18.5dBm	36dBm	19dBm	36dBm	17.5 dBi

Figure 1 - ProST Maximum Output TX Power

Caution: Do not set maximum output TX power to higher than local regulations.

700MHz Antennas

Table 1 - 700MHz Antenna Types

Type	Frequency range	Gain	Manufacturer	Model number
V-Pol MCX	698-746 MHz	7.5 dBi	Mars Antennas	MA-WA70-AS8
Flat panel	698-746 MHz	10.5 dBi	Mti Wireless Edge Ltd.	MT-223003/N
Sector	698-746 MHz	12 ± 0.5 dBi	Mti Wireless Edge Ltd.	MT-223002/NV
Sector	698-746 MHz	13.5 dBi	Mti Wireless Edge Ltd.	MT-223006/NV
Yagi directional	698 - 746 MHz	15.3 dBi	Trival antene	AD-40/722-14

1.4 GHz Antennas

Table 2 - 1.4GHz Antenna Types

Type	Frequency range	Gain	Manufacturer	Model number
Omnidirectional	1425-1535 MHz	10 dBi	TIL-TEK	TA-1450
Omnidirectional	1425-1535 MHz	12 dBi	TIL-TEK	TA-1450-2
Panel	1425-1535 MHz	17 dBi	TIL-TEK	TA-1406
Direction Panel	1425-1535 MHz	18 dBi	Foshan Sanshui Shing Road Antenna Co.	TDJ-SA1500-18-65

2.5 GHz Antennas

Table 3 - 2.5GHz Antenna Types

Type	Frequency range	Gain	Manufacturer	Model number
Flat Panel	2.3 - 2.7 GHz	14 ± 0.5 dBi	Mti Wireless Edge Ltd.	MT-344052/mV
Panel	2.3 - 2.7 GHz	17 dBi	Mars Antennas	MA-WA24-2XBRFC

1 About this Guide

This section discusses the purpose, intended audience, conventions, referenced documentation and organization for this guide.

1.1 Purpose

This guide provides step-by-step instructions for setting up and installing the ProST customer premise equipment (CPE) is part of Airspan's WiMAX family of WiMAX-based products. ProST also has a multimode model (ProST-2) based on the Rosedale chipset which supports both TDD and FDD.

	Note: ProST-2 is presently available for frequencies, 3.4–3.6 and 3.6–3.8 **only**.

	Note: For more information on the ProST-2 contact your supplier.

The purpose of this User Guide is to provide step-by-step instructions for setting up and installing the ProST. These procedures include:

➢ System Overview
➢ Installation Prerequisites
➢ Physical description
➢ Mounting
➢ Cabling
➢ Connecting
➢ Lightning and Surge Protection

1.2 Intended Audience

This guide is intended for qualified and authorized technicians who are responsible for installing the ProST.

1.3 Conventions

Icon	Description
	Checkpoint: Marks a point in the workflow where there may be an exit or branch to some other procedure. At each **Checkpoint** the reason for an exit or branch is given along with specific directions to locate the entry point in the other procedure.
	Reference: Gives a resource in the workflow that may be needed to complete a procedure along with specific directions to use the resource.
	Caution: Describes a possible risk and how to lessen or avoid the risk.
	Advice: Provides a recommendation based on best practice.
	Note: Provides useful information.

1.4 Referenced Documentation

For a detailed description of the Web-based configuration tool, refer to the *WiMAX Web-based Management for Subscriber Stations User Guide.*

2 System Overview

The ProST is an outdoor WiMAX-based customer premises equipment (CPE). The ProST, which uses Intel Corporation's Pro/Wireless 5116 broadband interface, connects IP-enabled devices directly to WiMAX networks. Designed for the residential and small enterprise (SME) markets, the device supports high-speed broadband Internet through a Fast Ethernet connection.

The ProST ensures high service availability at enhanced ranges, operating in both LOS and NLOS propagation environments. ProST uses the OFDM signaling format, providing non line-of-sight (NLOS) performance. ProST 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 ProST to optimize throughput, yielding higher throughputs while also covering long distances.

ProST models support IP services at speeds of up to 37 Mbit/s over-the-air gross rates over channel bandwidths of up to 10 MHz in both uplink and downlink. ProST is available in numerous ETSI frequency bands, operating in FDD and TDD modes in numerous channels, see: ProST Frequency Ranges and ProST-2 Frequency Ranges.

ProST is also available in a multi-mode model (ProST-2) based on the Intel ® Rosedale chipset which supports both TDD and FDD.

> **Note:** ProST-2 is presently available for frequencies, 3.4–3.6 and 3.6–3.8 **only**.

ProST can be deployed with a built-in, integral antenna or alternatively, with an external antenna to provide better radio coverage. Requiring professional installation, the ProST is installed outdoors on a pole or wall, enabling optimal positioning for best reception with the BS. Outdoor mounting of the ProST is made possible due to ProST's built-in lightning surge protection feature (complying with Surge Immunity standard EN 61000-4-5).

ProST is powered through the SDA-1 Type II (referred henceforth as SDA-1) adapter which interfaces with the subscriber's LAN. ProST connects to the SDA-1's 100BaseT interface port by a standard 100-meter CAT-5 cable. The SDA-1 also provides the ProST with 10 to 52 VDC power supply. However, as an alternative to these adapters, Airspan offers three optional integrated LAN switches:

- **SDA-4S Type II:** A standard integrated LAN switch, providing four 10/100BaseT interfaces with the subscriber's computers. This model is ideal for SOHO implementation.

- **SDA-4S/VL Type II:** Provides VLANs between ports and the ProST, ensuring privacy between LAN users of the different ports. For example, all users connected to Port 1 do not "see" users connected to Port 2. This model is ideal for multi-tenant (VLAN security) implementation.

- **SDA-4S/DC Type II:** integrated LAN switch, providing power and four 10/100BaseT interfaces and especially designed for implementation where available power supply is DC (10 to 52 VDC), e.g. from a solar panel. This model provides regulated –48 VDC power to the BSR.

All SDA types work in VLAN Pass-through mode. Tagged and Untagged packets are forwarded transparently by the SDA. The SDA has no VLAN ID configuration per port.

ProST can be managed by Airspan's Web-based management system using standard Web browsers 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 ProST using these MIBs.

> **Note:** For management refer to *WiMAX Web-based Management for Subscriber Stations User Guide*.

2.1 ProST Frequency Ranges

The table below lists the frequency range of ProST models currently available. This table will grow as more models become available.

Table 4 - ProST Frequency Ranges

Frequency Band	Channel Bandwidth
698 – 746 in MHz TDD mode	➢ 2.5 MHz ➢ 5 MHz ➢ 10 MHz
1.39 – 1.524 in GHz TDD mode	➢ 1.5 MHz ➢ 1.75 MHz ➢ 2.5 MHz ➢ 5 MHz
2.5 – 2.69 GHz in TDD mode **NPI**	➢ 2.5 MHz ➢ 5 MHz ➢ 10 MHz
2.7 – 2.9 GHz in TDD mode **NPI**	➢ 3 MHz ➢ 6 MHz ➢ 10 MHz
3.3 – 3.5 GHz in TDD mode	➢ 1.75 MHz ➢ 2.75 MHz ➢ 3.5 MHz ➢ 5 MHz
3.4 – 3.6 GHz in FDD mode	➢ 1.75 MHz ➢ 3.5 MHz
3.6 – 3.8 GHz in TDD mode	➢ 1.75 MHz ➢ 3.5 MHz ➢ 5 MHz
4.9 – 5.0 GHz in TDD mode	➢ 2.5 MHz ➢ 5 MHz ➢ 10 MHz
5.15 – 5.35 GHz in TDD mode	➢ 2.5 MHz ➢ 5 MHz ➢ 10 MHz
5.47 – 5.725 GHz in TDD mode	➢ 2.5 MHz ➢ 5 MHz ➢ 10 MHz

5.725 – 5.875 GHz in TDD mode	➢ 2.5 MHz
	➢ 5 MHz
	➢ 10 MHz
5.850 – 5.950 GHz in TDD mode	➢ 2.5 MHz
	➢ 5 MHz
	➢ 10 MHz

2.1.1 Main Features

The ProST provides the following main features:

➢ Full Outdoor Non-LOS Deployment: 256 FFT

➢ Based on the latest wireless technology WiMAX IEEE 802.16 standard

➢ Integrated antenna gain of 16 dBi

➢ Indoor Ethernet adapter (SDA-1 Type II):

➢ Providing power and interface termination

➢ Up to 100-m Category 5e cable between ProST and SDA-1

➢ Indoor:

- SDA-4S Type II: small low cost IDU with built in LAN switch

- SDA-4SDC Type II: small low cost DC IDU with built in LAN Switch

- SDA-WiFi: Optional WiFi module -- an extension module allowing you to add WiFi functionality to your ProST unit(s)

- SDA-MSG (Multi-Service Gateway): Optional VoIP module -- an extension module allowing you to add VoIP functionality to your ProST unit(s).

➢ High throughput providing fast access at burst data rates up to 37 Mbps over-the-air (gross rate) over up to a 10 MHz channel

➢ Option of LAN switch with indoor adapter

➢ Up to 4 ports with VLAN port switching

➢ Supports multiple UL bursts per SS frame

➢ Signal information can be obtained via Web Management Performance tool

➢ Integral WiFi and LAN switch

Note: Contact your Airspan representative for more information on the SDA-MSG VoIP extension module or the SDA-WiFi extension module.

2.2 ProST-2 Frequency Ranges

The table below lists the frequency range of ProST-2, TDD/FDD Multimode models currently available. This table will grow as more models become available.

Figure 2 - ProST-2 Frequency Ranges

Frequency Band	Channel Bandwidth

3.4 – 3.6 GHz in TDD/FDD 50/100 mode	• 1.75 MHz
	• 2.75 MHz
	• 3.5 MHz
	• 5 MHz
	• 7 MHz
	• 10 MHz
3.6 – 3.8 GHz in TDD/FDD 50/100 mode	• 1.75 MHz
	• 2.75 MHz
	• 3.5 MHz
	• 5 MHz
	• 7 MHz
	• 10 MHz

Note: These ProST-2 Frequencies do not support the older type RSSI plug.

2.2.1 Main Features

The ProST-2 provides the following main features:

➢ New CPE variants are equipped with Rosedale 2 chipset enabling FDD/TDD multimode operation, supporting 5 MHz and 7 MHz in both TDD and HFDD modes.

➢ Full Outdoor Non-LOS Deployment: 256 FFT

➢ Based on the latest wireless technology WiMAX IEEE 802.16 standard

➢ Integrated antenna gain of 16 dBi

➢ Indoor Ethernet adapter (SDA-1 Type II):

➢ providing power and interface termination

➢ up to 100-m Category 5e cable between ProST and SDA-1

➢ Indoor:

• SDA-4S Type II: small low cost IDU with built in LAN switch

• SDA-4SDC Type II: small low cost DC IDU with built in LAN Switch

• SDA-WiFi: Optional WiFi module -- an extension module allowing you to add WiFi functionality to your ProST-2 unit(s).

• SDA-MSG (Multi-Service Gateway): Optional VoIP module -- an extension module allowing you to add VoIP functionality to your ProST-2 unit(s).

➢ High throughput providing fast access at burst data rates up to 37 Mbps over-the-air (gross rate) over up to a 10 MHz channel

➢ Option of LAN switch with indoor adapter

➢ Up to 4 ports with VLAN port switching

➢ Supports multiple UL bursts per SS frame

➢ Signal information can be obtained via Web Management Performance tool

➢ Integral WiFi and LAN switch

> **Note:** Contact your Airspan representative for more information on the SDA-MSG VoIP extension module or the SDA-WiFi extension module.

2.3 Architecture

The ProST installation consists of the following components:

- Encased ProST outdoor unit (available in two variations)

- SDA-1 indoor adapter or optional SDA-4S Type II, SDA-4S/VL Type II, or SDA-4S/DC Type II

- Third-party external antenna (optional deployment)

> **Note:** The SDA-1 Type II adapter can also be implemented with other Airspan's products (i.e. BSR, PPR, and SPR). For further information regarding these products, please contact your nearest Airspan dealer.

The figure below displays a typical architecture setup of the ProST with an integrated antenna.

.
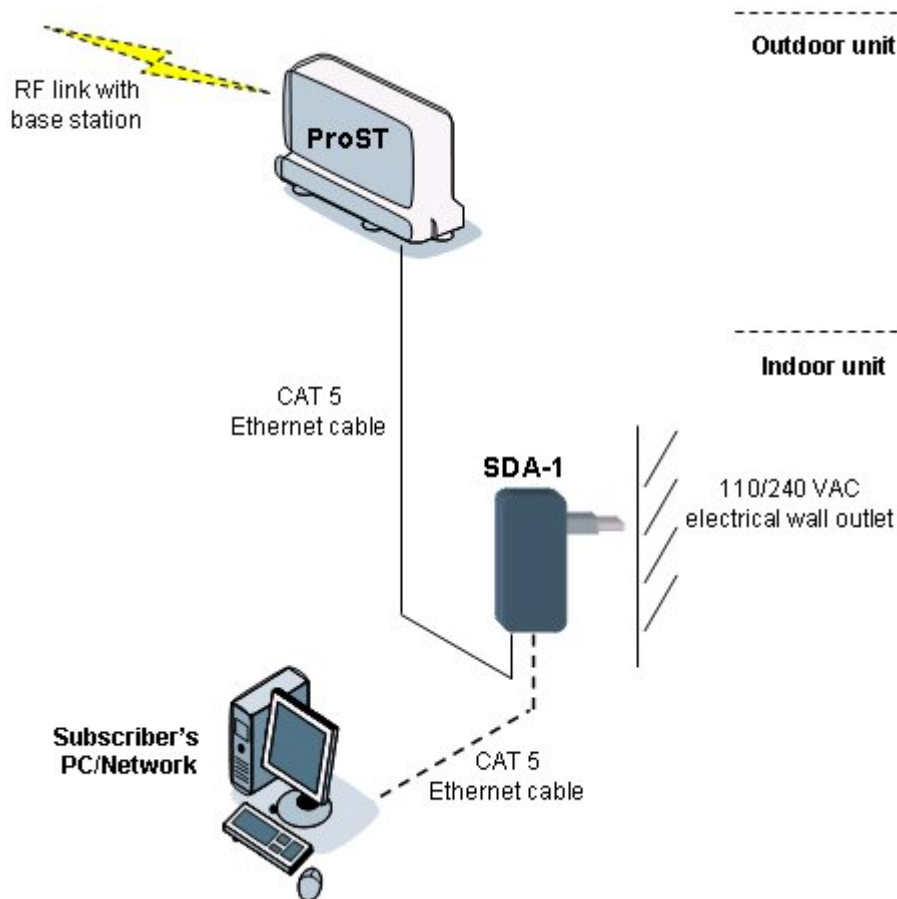
Figure 3 - Typical Setup

2.4 Models

The ProST is available in the following variations, differing in antenna configuration:

➢ ProST with built-in (integrated), flat-panel antenna

➢ ProST with N-type connector for attaching third-party external antenna (i.e. no integrated antenna)

The ProST model with the integrated antenna is shown below:

Figure 4 - ProST with integrated antenna

The ProST model with the N-type connector for connecting an external antenna is shown below:

Figure 5 - ProST with external antenna

2.4.1 ProST Block Diagram
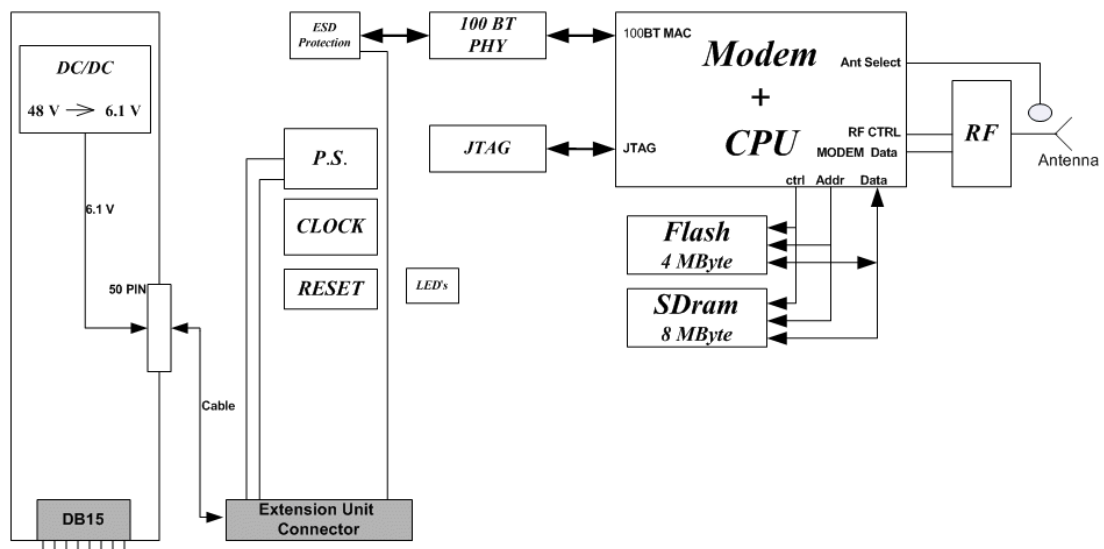
Figure 6 - Block Diagram

2.4.2 ProST Protocol Stack
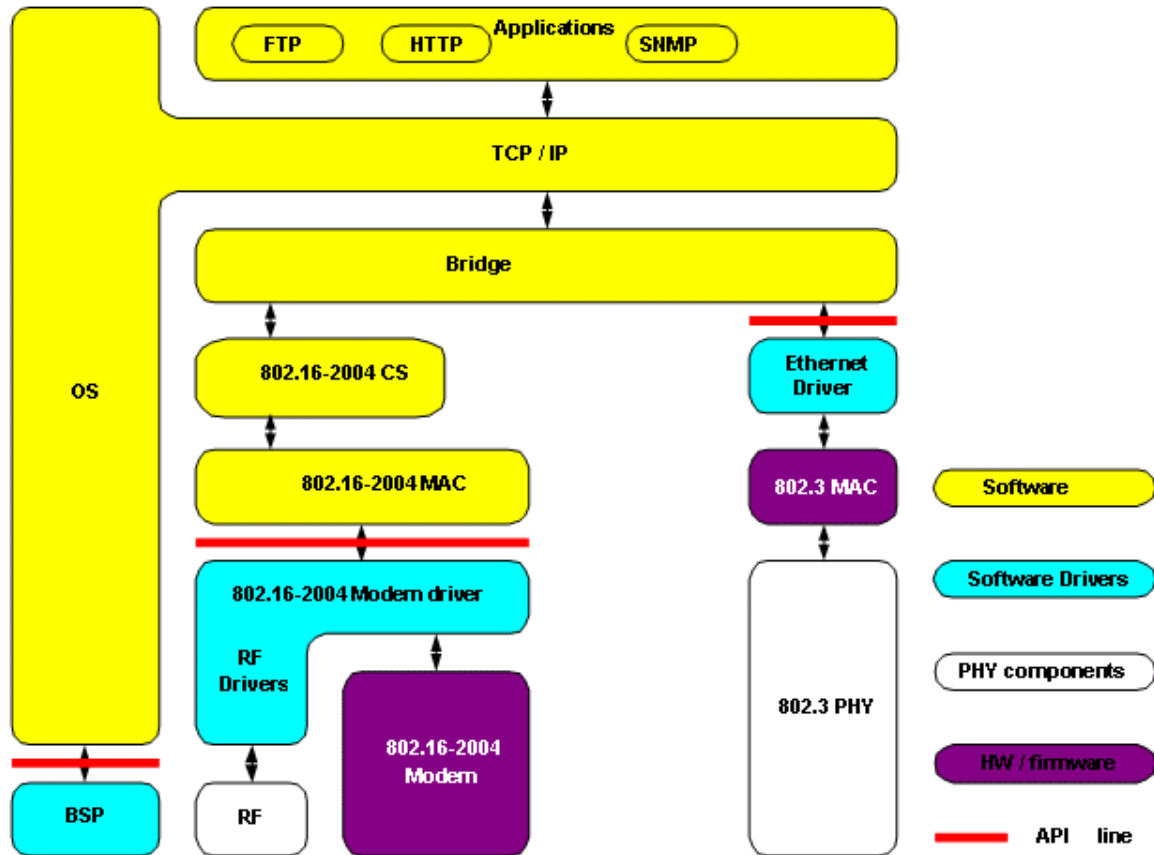
Figure 7 - Protocol Stack

2.4.3 Theory of Operation

For basic operation, the ProST requires no initial configuration--simply plug and play. Configuration is automatically performed over the air by the BS. The ProST 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. These configuration parameters are stored in Netspan's database corresponding to the ProST's MAC address.

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

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

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

3 Installation Prerequisites

Before installing your ProST, read the following to ensure that:

➢ No items are missing from the package

➢ Minimum computer requirements are fulfilled

➢ You have the required installation tools

➢ Radio Site planning has been performed

3.1 Package Contents

Examine the ProST 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 a Airspan representative.

The ProST kit should contain the following items:

➢ ProST

➢ DB15-to-RJ45 adapter for plugging into the ProST's 15-pin D-type port (with pins 7 & 8 **not** connected), replaces previous adapter.

➢ Wall-mounting kit:

• Mounting bracket

• 2 x M10 x 1.5 hex head screws - 20mm length

• 2 x M10 hex nuts

• 2 x M10 plain washers

• 2 x M10 spring lock washers

	Note: The standard ProST kit does not include pole-mounting accessories. For pricing and ordering of pole-mounting accessories, please contact your nearest Airspan dealer.

	Note: The standard ProST kit does not include the SDA-1 Type II adapter. For pricing and ordering of the SDA-1 Type II adapter, please contact your nearest Airspan dealer.

3.2 Minimum PC Requirements

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

	Caution: Only subscriber terminal equipment (e.g. computer modem port) that is designed for full compliance with TNV-1 telecommunication network can be connected to the SDA-1. Warranty of Airspan's equipment shall be made void if the SDA-1 is connected to a computer that is not compliant with TNV-1.

3.3 Required Tools

The following tools are required to install the ProST unit:

➢ Crimping tool for crimping CAT-5e cables to RJ-45 connectors.

➢ Cable stripping tool

> Wall Mounting:

- drill bits

- 4 x wall anchors

- 4 x screws

- Philips head screwdriver

- Flat-blade screwdriver

- A/F open ended spanner

> Crimping tool for crimping RF cable to N-type connector (only relevant when implementing external antenna).

> Torque wrench for N-type connectors (only relevant when implementing external antenna).

Note: Airspan does not provide screws and wall anchors for mounting the ProST to the wall. The screw size depends on the structure of the building to which the ProST is to be attached. When selecting screw sizes, consideration must be given to the weight of the ProST and load that may be induced in windy conditions.

3.4 Radio Site Planning

Proper site selection and planning before installing your ProST will ensure a successful deployment of your Airspan WiMAX system. Site planning includes the following main considerations:

> Minimum obstructions (e.g. buildings) in the radio path between base station and the ProST.

> Mount radios as high as possible to avoid obstructions in the wireless path.

> Check possibility of future obstructions such as plans to erect buildings and trees that may grow tall enough to obstruct the wireless path.

> Align antenna for maximizing received signal strength (RSS).

> Consider nearby sources of interference that could degrade performance of radio. Mount radios as far from sources of interference as possible.

> Ensure base station and ProST are within maximum coverage range of reception.

> Maximum standard CAT-5e cable length connecting the outdoor ProST to the indoor SDA is 100 meters.

3.4.1 Minimal Radio Path Obstructions

Airspan WiMAX radios communicate by propagation of waves. Thus, ensure minimum obstructions (from, e.g. buildings and trees) in the radio path between base station and ProST.

3.4.2 Fresnel Zone Clearance

It is advisable to have a sufficient open space around the radio path to minimize blocking of the radio beam. A minimum of 60% of the first Fresnel Zone of the path should be clear of obstructions. Despite a clear line-of-sight, objects close enough to the transmission path may cause attenuation in signal strength and an increase in signal interference. Objects with reflective surfaces that seem relatively far away, may still encroach on the Fresnel Zone, and cause interference.
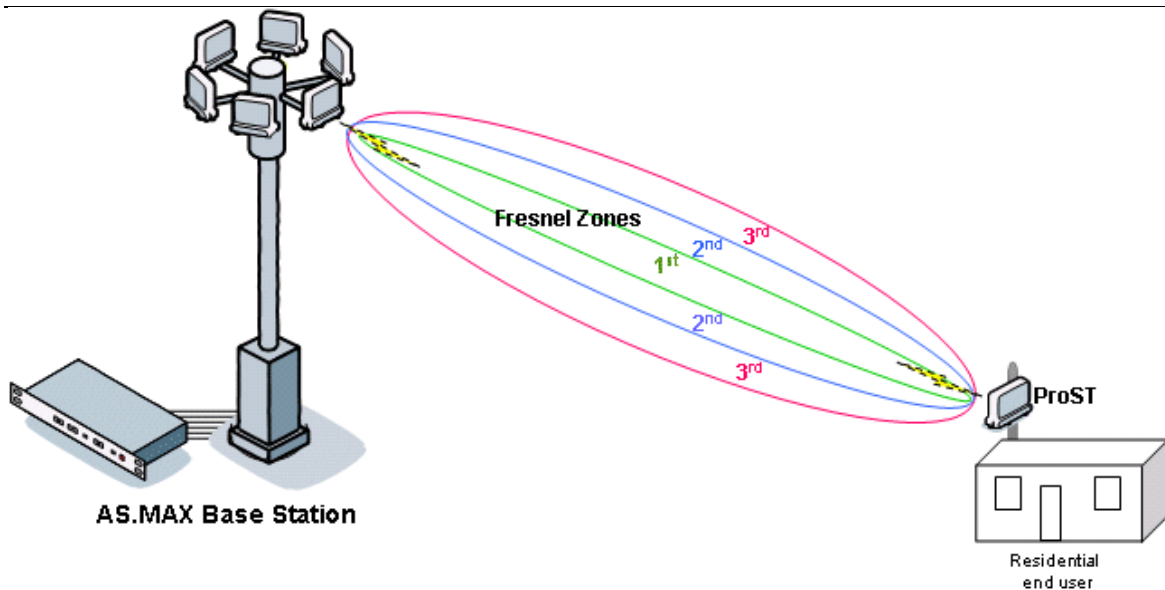
Figure 8 - Fresnel Zones

Fresnel Zones define the amount of clearance required from obstacles. These zones are composed of concentric ellipsoid areas surrounding the straight-line path between two antennas. Thus, the zone affects objects to the side of the path and those directly in the path. The first Fresnel Zone is the surface containing every point for which the distance from the transmitter to any reflection point on the surface point and then onto the receiver is one-half wavelength longer than the direct signal path.

One method for clearing the Fresnel Zone is by increasing the antenna height.

The first Fresnel Zone radius is calculated by the following equation:

$$r = \sqrt{\frac{75 \cdot d}{f}}$$

d (distance) – kilometers
f (frequency) – GHz
r (Fresnel Zone radius) – meters

Figure 9 - Fresnel formula
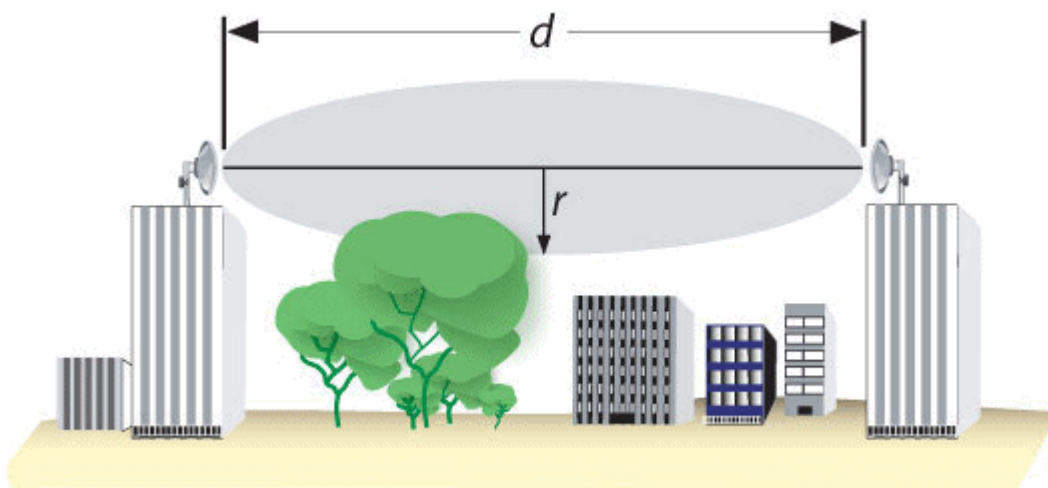
Figure 10 - Fresnel Zones

Typically, at least 60% clearance of the first Fresnel Zone is considered as LOS. To ensure the ground does not enter into the first Fresnel Zone, both antennas (i.e. at Base Station and subscriber) must be mounted at least 0.6 x r meters above ground level (or clutter level).

Examples, using the formula above,

> ➢ For a link of 4 km, at 3.5 GHz produces a first Fresnel Zone radius clearance of about 9.3 meters, meaning the antennas should be mounted at a height of at least 5.6 meters (60% of 9.3 meters) above ground level (or clutter level).

> ➢ For a link of 4 km, at 4.9 GHz produces a first Fresnel Zone radius clearance of about 7.8 meters, meaning the antennas should be mounted at a height of at least 4.7 meters (60% of 7.8 meters) above ground level (or clutter level).

3.4.3 Radio Antenna Alignment

Once the ProST is installed and aimed in the general direction of the base station, it is recommended to measure the received signal strength (RSS) to determine the signal strength received from the base station, and to precisely align the ProST for maximum signal strength. You need to orientate (up/down, left/right) the ProST until the maximum RSSI levels are achieved, and then secure the ProST. For viewing RSS values, see "Web-based Management" for standard alignment, for finer alignment, see RSSI LED Plug Adapter.

4 Physical Description

This section provides a description of the components of the ProST installation:

➢ ProST radio (outdoor unit)

➢ SDA-1 adapter (indoor unit -- switch and power interface)

➢ SDA-4S Type II and SDA-4S/VL Type II adapters (optional)

➢ SDA-4SDC Type II (indoor DC unit) (optional)

4.1 ProST Physical Description

The ProST is an encased outdoor radio providing access to communication ports on its bottom panel. The ProST's back panel provides holes for ProST mounting.

This subsection provides the following ProST physical descriptions:

➢ Dimensions

➢ Ports

4.1.1 Physical Dimensions

The table below lists the physical dimensions of the ProST.

Table 5 - ProST Dimensions

Parameter	Value
Dimensions (H x W x D)	311 x 244 x 65.5 mm (12.24 x 9.6 x 2.57 inches)
Weight	1.94 kg (approximate)

4.1.2 Port

The ProST provides a 15-pin D-type port for interfacing with the SDA-1. For convenience, a DB15-to-RJ45 adapter is supplied for attaching to the 15-pin D-type port to allow the use of RJ-45 connectors for outdoor-to-indoor CAT 5E connectivity.

For ProST models implementing third-party external antennas, an N-type port is also provided on the bottom panel.
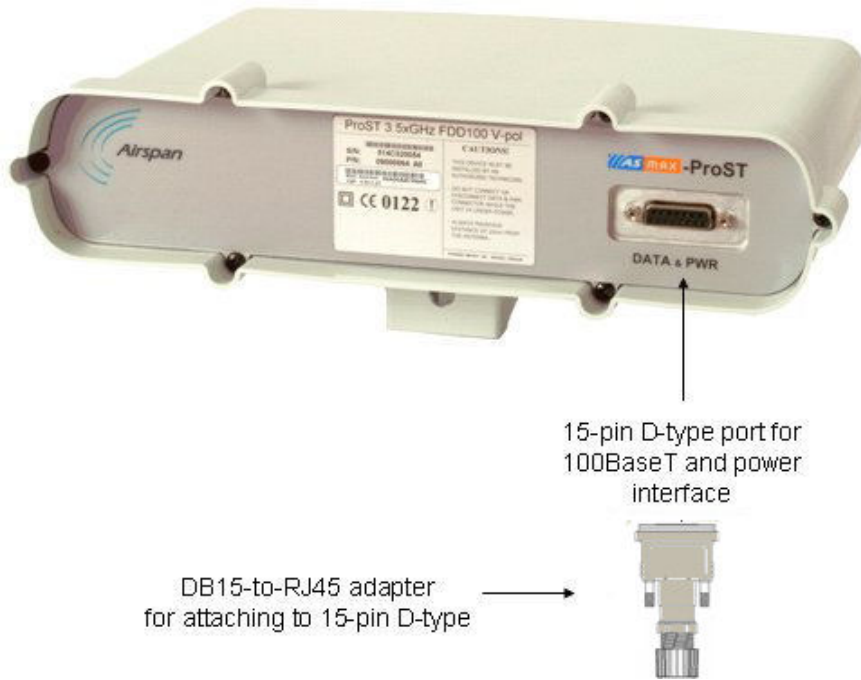
Figure 11 - ProST ports

> **Note:** ProST models that use third-party external antennas provide an N-type receptacle for attaching an external antenna.

4.2 SDA-1 Physical Description

The SDA-1 is an integrated Ethernet and AC/DC power supply adapter that simply plugs into a standard electrical wall outlet (110/240 VAC). The SDA-1 enables easy plug prong replacement to suit geographical location of electrical outlet sockets (e.g. American vs. European).

The SDA-1 provides the ProST with the following interfaces:

➢ 10/100BaseT interface with subscriber's network/PC

➢ 10 to 52 VDC power supply

The SDA-1 physical description is shown in the figure below:
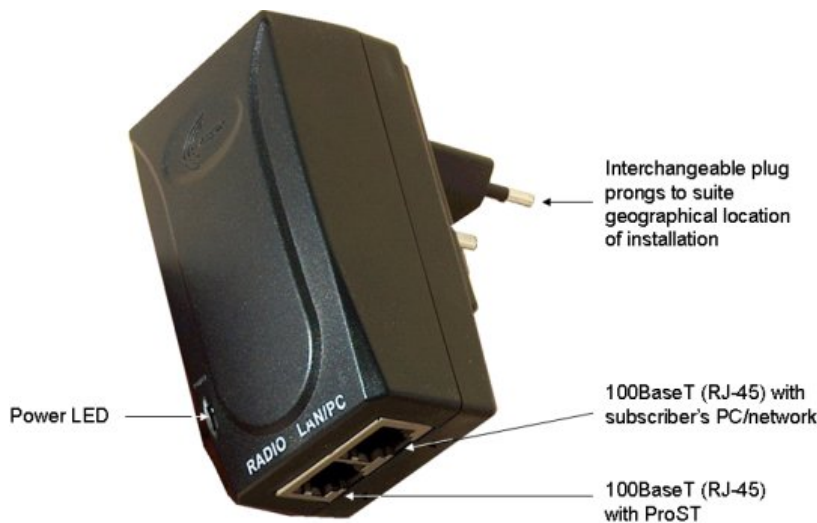
Figure 12 - SDA-1

This section provides the following SDA-1 physical descriptions:

- Dimensions
- Ports
- LED

4.2.1 Physical Dimensions

The SDA-1 physical dimensions are described in the table below:

Table 6 - SDA-1 Dimensions

Parameter	Value
Dimensions (L x W x H)	72 x 42.5 x 26 mm (2.83 x 1.67 x 1.02 inches)
Weight	0.159 kg

4.2.2 Ports

The SDA-1 provides two ports, as described in the table below:

Table 7 – SDA-1 ports

Port	Label	Interface
8-pin RJ-45	RADIO	10/100BaseT with ProST radio
8-pin RJ-45	LAN/PC	10/100BaseT with subscriber's network

4.2.3 LED

The SDA-1 provides a green power LED (labeled **POWER**), located on its front panel. This LED light not only indicates the presence of power, but also can indicate incorrect SDA-1 port assignment for the network cables, i.e. from the ProST and computer. For a detailed description of the **POWER** LED, see Troubleshooting.

4.3 SDA-4S Type II and SDA-4S/VL Type II (Optional)

> ***Note:*** The SDA-4S Type II and the SDA-4SDC are physically (externally) the same other than the power socket.

The SDA-4S Type II and SDA-4S/VL Type II indoor units (hereafter referred to as *SDA-4S*) are two optional integrated LAN switches that offer an alternative to the SDA-1 Type II unit. These two units have identical physical dimensions and design, as displayed in the figure below.

Figure 13 - SDA-4S Type II

This subsection provides the following SDA-4S physical descriptions:

➢ Dimensions

➢ Ports

➢ LEDs

4.3.1 Physical Dimensions

The SDA-4S Type II and SDA-4S/VL Type II physical dimensions are described in the table below:

Table 8 - SDA-4S Type II dimensions

Parameter	Value
Dimensions (L x W x H)	200 x 150 x 40 mm (7.87 x 5.9 x 1.57 inches)
Weight	0.577 kg

4.3.2 Ports

The SDA-4S Type II and SDA-4S/VL Type II adapters provide ports on their bottom panels, which are described in the table below

Table 9 - SDA-4S ports

Port	Interface
4 x 8-pin RJ-45	10/100BaseT with subscriber's network (supports Auto Negotiation and MDI/MDI-X automatic crossover, allowing connection of straight-through or crossover cables)
15-pin D-type (female)	10/100BaseT with BSR
AC power socket	Subscriber's power outlet (110-240 VAC, 1A, 50/60 Hz, 50W)

> **Note:** The ports of the SDA-4S models support Auto Negotiation, allowing automatic configuration for the highest possible speed link (10BaseT or 100BaseT), and Full Duplex or Half Duplex mode. In other words, the speed of the connected device (e.g. PC) determines the speed at which packets are transmitted through the specific SDA-4S port. In addition, the SDA-4S ports support MDI/MDI-X automatic crossover, allowing connection to straight-through or crossover cables.

4.3.3 LEDs

The LEDs description is the same as for the SDA-4SDC below.

4.4 SDA-4SDC Type II (Optional DC power supply)

The SDA-4SDC Type II indoor unit is an integrated LAN switch, providing power and four 10/100BaseT ports for interfacing with the subscriber's network and especially designed for implementation where available power supply is DC. This model provides regulated –48 VDC power. The unit is displayed in the figure below.
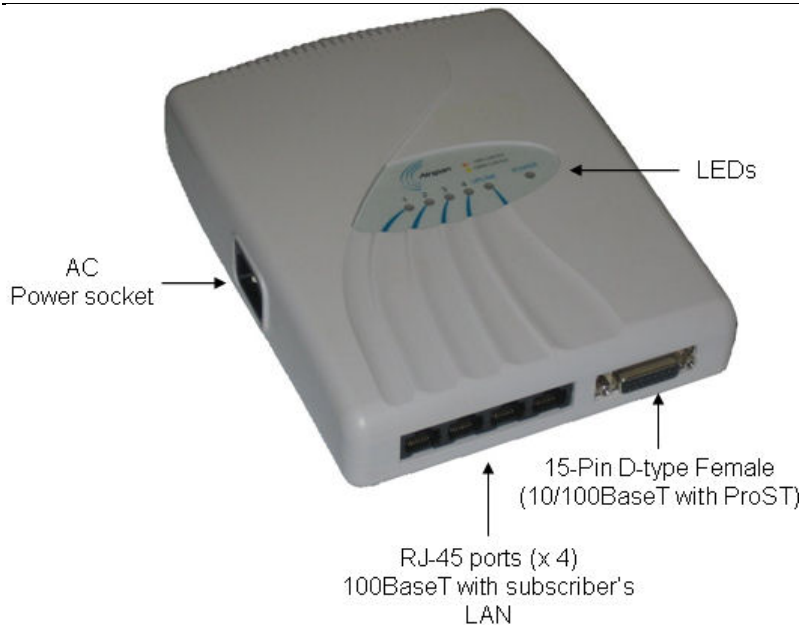

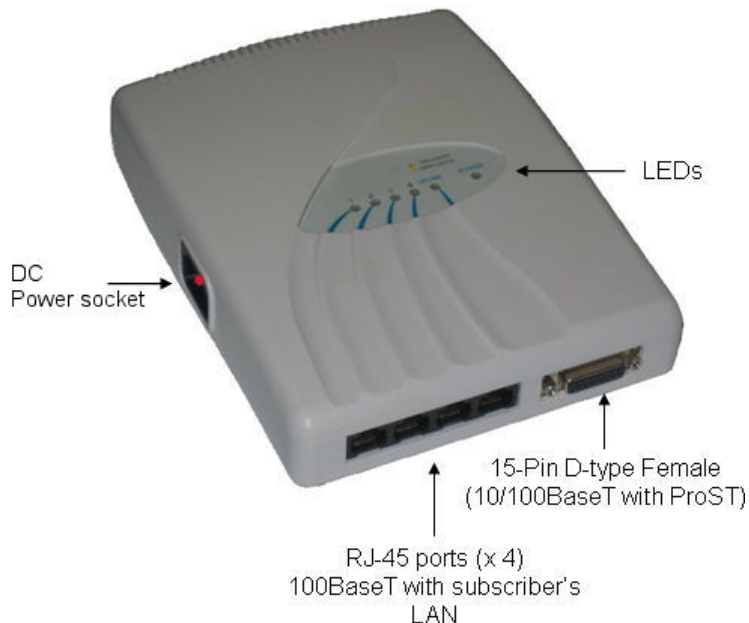**Figure 14 - SDA-4SDC Type II**

This subsection provides the following SDA-4SDC physical descriptions:

➢ Dimensions

➢ Ports

➢ LEDs

4.4.1 Physical Dimensions

The SDA-4SDC physical dimensions are described in the table below:

Table 10 - SDA-4SDC dimensions

Parameter	Value
Dimensions (L x W x H)	200 x 150 x 40 mm (7.87 x 5.9 x 1.57 inches)
Weight	0.577 kg

4.4.2 Ports

The SDA-4SDC adapter provides ports on the front panel, which are described in the table below:

Table 11 - SDA-4SDC ports

Port	Interface
4 x 8-pin RJ-45	10/100BaseT with subscriber's network (supports Auto Negotiation and MDI/MDI-X automatic crossover, allowing connection of straight-through or crossover cables)
15-pin D-type (female)	10/100BaseT with BSR
DC power socket	DC power outlet (10-52 VDC, 24W)

4.4.3 LEDs

The SDA-4S (all Types) adapters (referred to as *SDA-4S*) provide LED indicators on their top panels, which are described in the table below:

Table 12 - SDA-4S LEDs

LED	Color	Status	Meaning
UPLINK	**Yellow** (100BaseT) or **Orange** (10BaseT)	On	Physical link (10BaseT or 100BaseT) between SDA-4S adapter and ProST
		Blinking	Traffic currently flowing between SDA-4S and ProST
		Off	No link between SDA-4S and ProST
1, 2, 3, 4	**Yellow** (100BaseT) or **Orange** (10BaseT)	On	Physical link (10BaseT or 100BaseT) between SDA-4S and subscriber's Ethernet network
		Blinking	Traffic currently flowing between SDA-4S and subscriber's Ethernet network
		Off	No link between SDA-4S and subscriber's Ethernet network
POWER	**Green**	On	Power received by SDA-4S
		Off	No power received by SDA-4S

The figure below displays the LEDs which are located on the top panel of the SDA-4S Type II, SDA-4S/VL Type II, and SDA-4SDC Type II adapters:
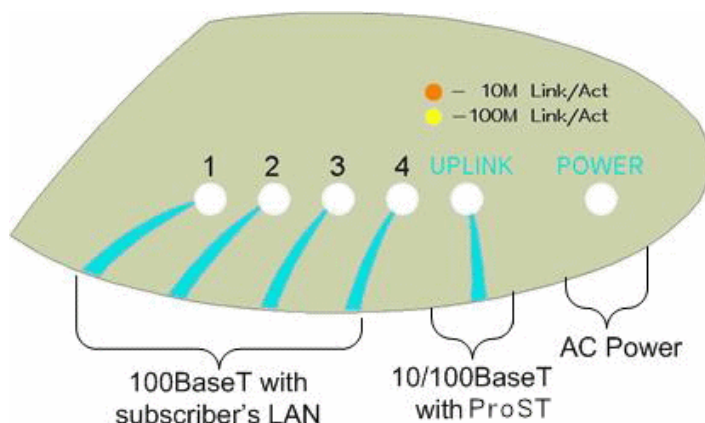

Figure 15 - SDA-4S top panel

5 Mounting the ProST

This section describes the mounting procedures for the ProST and the optional SDA-4S adapters.

	Caution: The ProST device is an outdoor radio unit and therefore, must only be mounted outdoors.

	Caution: Mount the ProST in an orientation such that its 15-pin D-type port (located on the bottom panel) faces downwards. This prevents rain water from settling on the port, and thereby, avoiding damage to the unit such as corrosion and electrical short-circuiting.

The ProST offers two optional methods for outdoor mounting:

➢ Wall mounting

➢ Pole mounting

For either mounting methods, the ProST provides mounting holes molded into its back panel for attaching the wall or pole-mounting brackets, as displayed in the figure below.
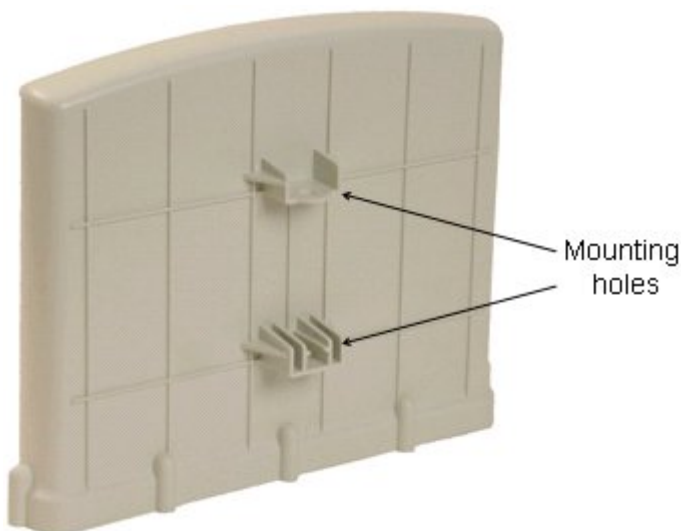
Figure 16 - ProST- rear view

	Note: The standard ProST kit provides wall-mounting brackets. To pole mount the ProST, contact your nearest Airspan distributor for pricing and ordering of pole-mounting brackets.

	Note: A minimum of 3-meter separation is required between mounted ProSTs and existing customer radio equipment when transmitting on different sectors (see figure below). However, only a 1-meter separation is required between ProSTs when on the same sector and transmitting to the same base station radio without requiring shielding (see figure below).

The figure below illustrates the minimum separation between mounted ProST's when transmitting on different sectors:
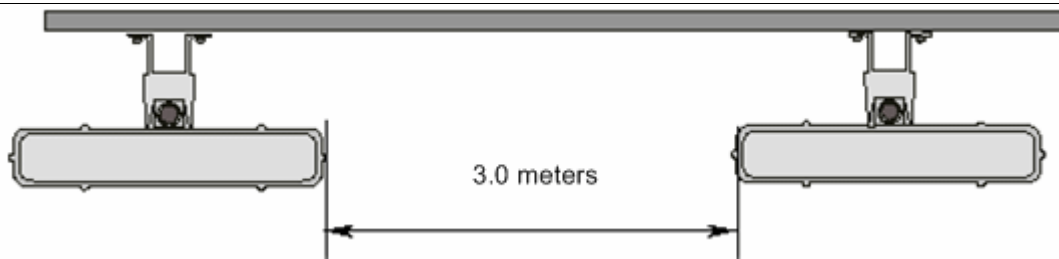
Figure 17 - Mount separation

The figure below illustrates the minimum separation between mounted ProST's when transmitting on the same sector:
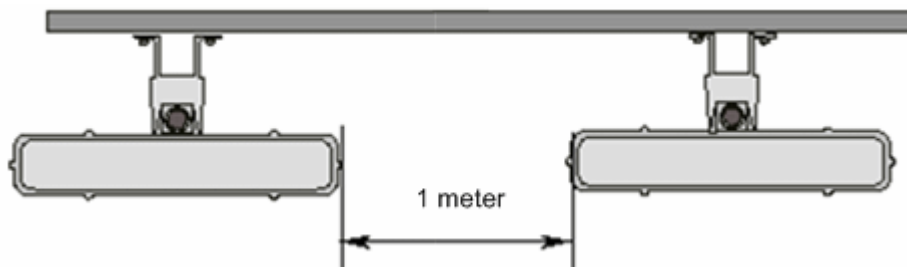
Figure 18 - Mount separation 1

5.1 Wall Mounting

The ProST is wall mounted in two main stages:

➢ Attaching the mounting bracket to the ProST's mounting holes

➢ Attaching the mounting bracket (attached to the ProST) to the wall

To wall mount the ProST:

1. Position the unassembled mounting bracket on the mounting surface (e.g. wall), and then use a pencil to mark the position of the four mounting holes. Ensure that the distance between the hole centers are 120 mm (height) and 60 mm (width), as displayed in the figure below showing the ProST's fixing dimensions.
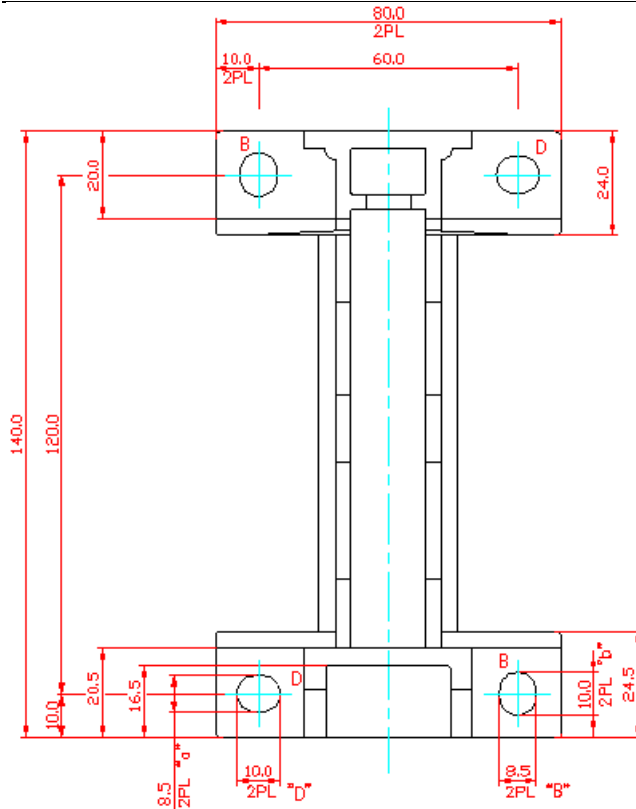
Figure 19 - Wall mount template

2. Drill holes for each hole that you marked in the step above.

3. Insert wall anchors (not supplied) into each of the drilled holes.

4. Align the mounting bracket's four holes with the wall anchors, and then insert a screw (not supplied) through the mounting bracket holes into each wall anchor, and tighten.

> *Note:* The screws are not provided for attaching the mounting bracket to the wall. The screw size depends on the structure of the building to which the bracket is to be attached. When selecting screw sizes, consideration must be given to the weight of the ProST and load that may be induced in windy conditions.
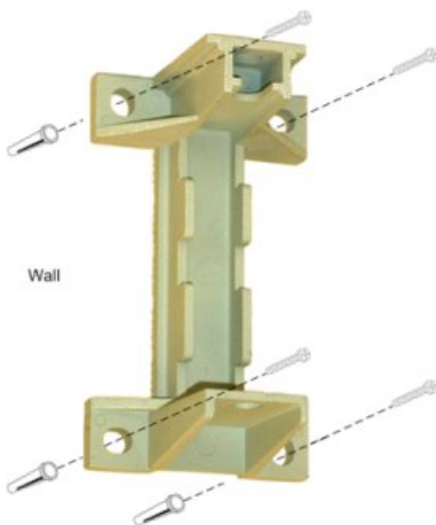
Figure 20 - Mounting bracket

5. Attach the ProST to the mounting bracket by performing the following:

   a) Slide an M10-spring lock washer and then an M10-plain washer onto each M10 x 1.5 hex head screw (20mm length) – (ensure lock washer is nearest to head of screw bolt).

   b) Align the mounting bracket's holes with the ProST's mounting holes as displayed below. (The mounting bracket side that provides a groove for inserting a nut must be aligned with the ProST's mounting hole that is nearest to the ProST's rear panel.)

   c) From the external sides, insert the M10-hex head screws through the mounting bracket's holes and ProST's mounting holes. Loosely fasten with the M10-hex nuts.
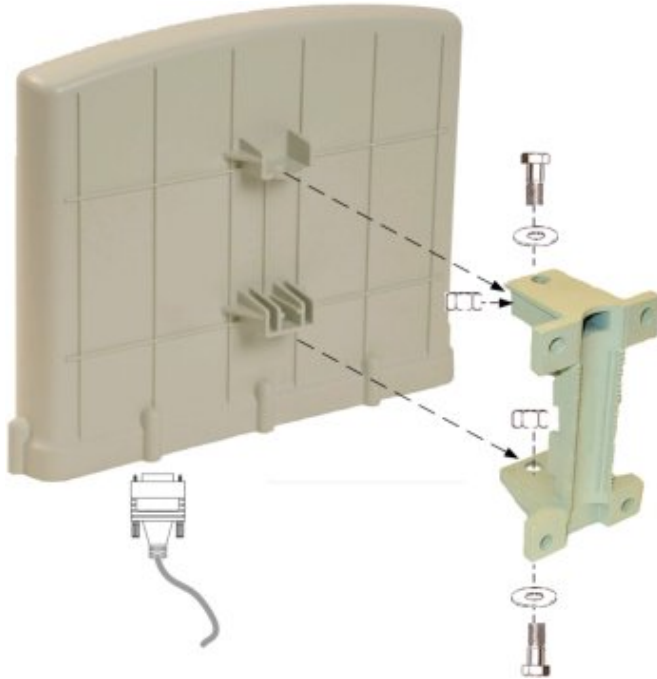
Figure 21 - Mounting to bracket

6. Adjust the horizontal positioning of the ProST, and then tighten the two M10 x 1.5-hex head screws (20mm length) with the M10 hex nuts. Max torgue for M10 is 44N**m** (32lbf.ft.).

> *Note:* A third-party thread-locking compound must be applied to the M10-hex head screws to prevent the bolts from working loose.

Rotation is restricted in the horizontal plane only, as shown in the figure below:
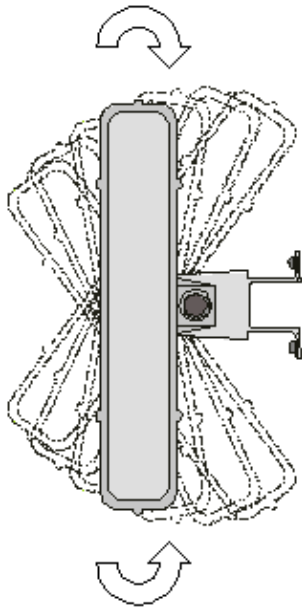
Figure 22 – Rotation

5.2 Pole-Mounting

Pole mounting allows the ProST to be easily adjusted in the horizontal (azimuth) and vertical (elevation) planes for antenna alignment. The ProST is mounted using the mounting holes located on the ProST's back panel and the supplied (when ordered) pole-mounting brackets. The pole-mounting bracket is designed to support the ProST on a round pole of 45 mm in diameter.

The figure below illustrates a summary of the ProST pole-mounting procedure.
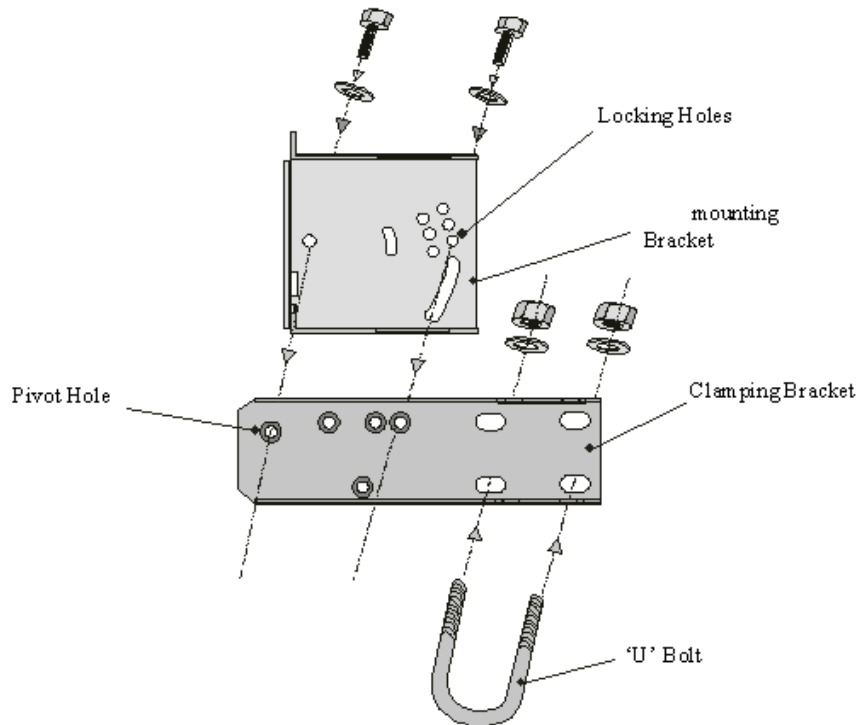
Figure 23 - Pole mount summery

To pole mount the ProST:

1. Attach the mounting bracket to the ProST:

a. Align the mounting bracket with the ProST's mounting holes so that the mounting bracket's side with the built-in nut is aligned with the ProST's mounting holes furthest from the ProST's bottom panel, as shown in the figure below.

b. Slide an M10-flat washer and M10-spring lock washer onto an M10-hex head screw (ensure spring lock washer is closest to the bolt's head). From the external side, insert the M10-hex head screw through the mounting bracket and ProST's mounting holes. Fasten the M10-hex head screw (one is provided with a built-in nut while the other requires you to insert an M10-hex nut into the ProST's mounting hole). Max torgue for M10 is 44N**m** (32lbf.ft.).
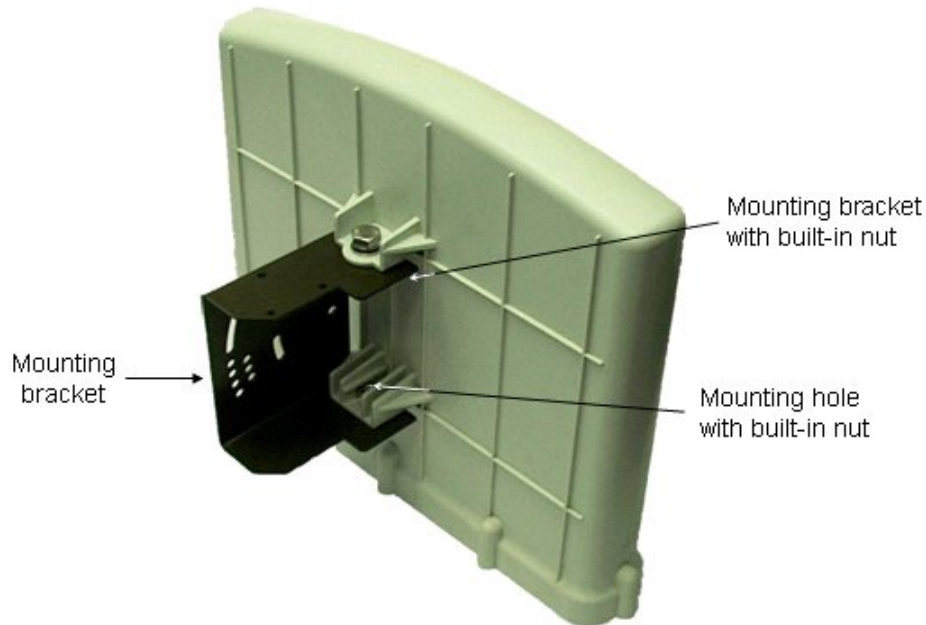
Figure 24 - Mounting bracket attached

2. Attach the clamping bracket to the mounting bracket:

a. Slide an M6-spring lock washer onto an M6-hex head screw. Align the mounting bracket's and clamping bracket's pivot holes, such that the clamping bracket is aligned to the inside of the mounting bracket. From the external side of the mounting bracket, insert the M6-hex head screw into the pivot holes and then fasten, but not tightly. (The clamping bracket provides a built-in nut.)

b. Choose an elevation hole on the mounting bracket and then align it with the corresponding hole on the clamping bracket. Slide an M6-spring lock washer onto an M6-hex head screw, and then from the external side of the mounting bracket, insert the M6-hex head screw through the elevation hole on the mounting bracket and into the clamping bracket's corresponding hole. Fasten but not tightly the M6-hex head screw (the clamping bracket provides built-in nut). The elevation hole can later be changed according to desired antenna orientation in the elevation plane.
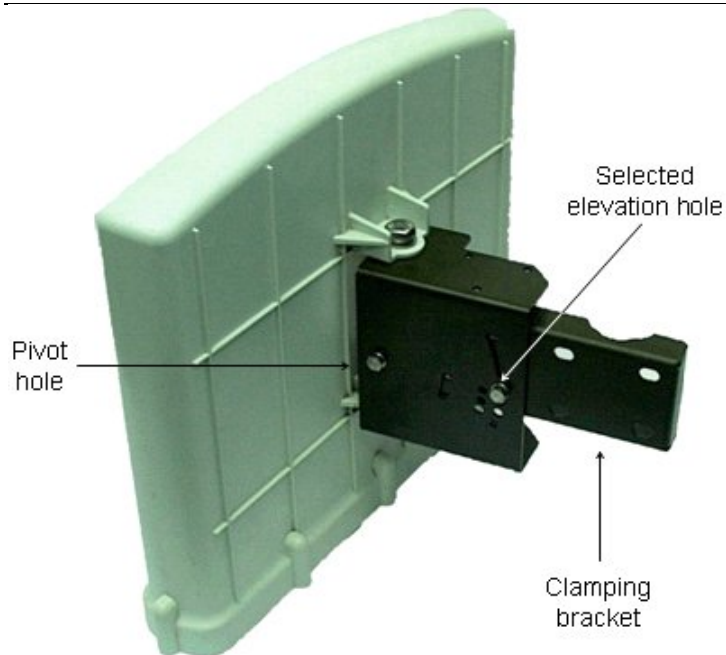
Figure 25 - Pole mount clamping bracket

3. Attach the U-bolt to the pole:

   a. Place one U-bolt around the pole, and then insert the U-bolt screw side through the two corresponding holes (horizontally parallel) on the clamping bracket. Slide an M8-flat washer and M8-spring lock washer onto each U-bolt screw side (ensure that the flat washer is adjacent to the clamping bracket). Fasten each U-bolt side with the two M8-hex nuts.

   b. Attach the second U-bolt as described above.
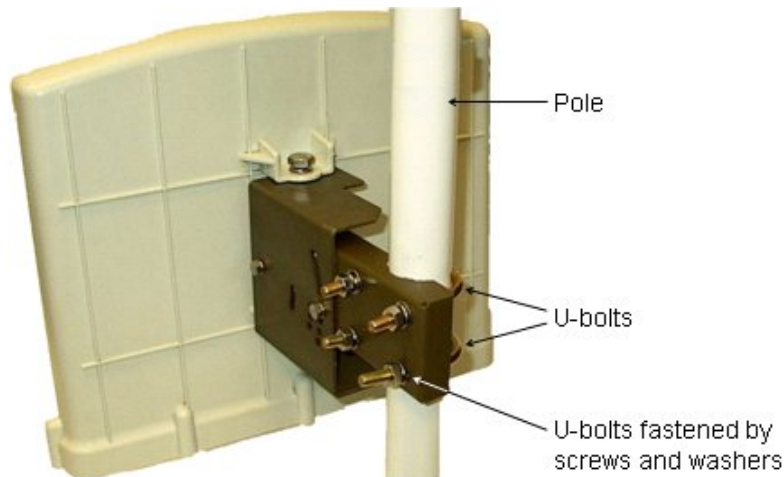
Figure 26 - Pole mount U-bolts

4. Perform final MicroMAX orientation:

   a. Adjust the vertical position of the ProST by choosing a final elevation hole as described in Step 2. Lock the ProST at the desired position by inserting the locking bolt in the desired position and fastening it tightly. Fasten tightly the bolt in the pivot hole. The figure below illustrates the angles (in degrees) of each elevation hole. As shown, the ProST pole-mounting bracket allows elevation between -18.5° and 26.3°.

   b. Adjust the horizontal position of the ProST by rotating it about the pole, and then tightening the nuts of the U-bolts.
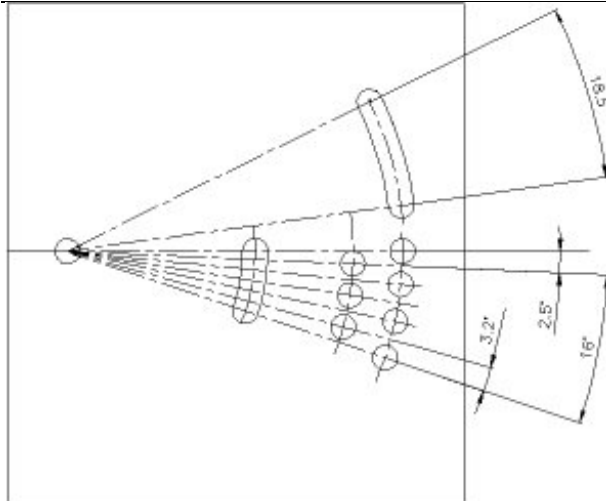
Figure 27 - Elevation holes

Note: A thread-locking compound must be used to prevent the bolts from working loose.

ProST positioning is obtained in two planes by adjustment of the mounting bracket assembly as shown below:

Rotation about the mounting bracket

Rotation about the mounting pole
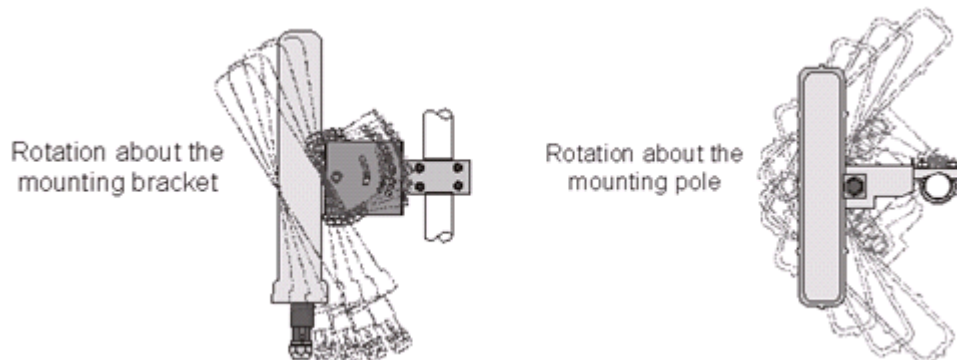
Figure 28 – ProST positioning

It is important to provide strain relief and drip loop for Cat-5e cables. Create a drip loop and strain relief using cable tie, to tie cable to pole, as displayed in the figure below:

Drip loop and strain relief

Cable tie
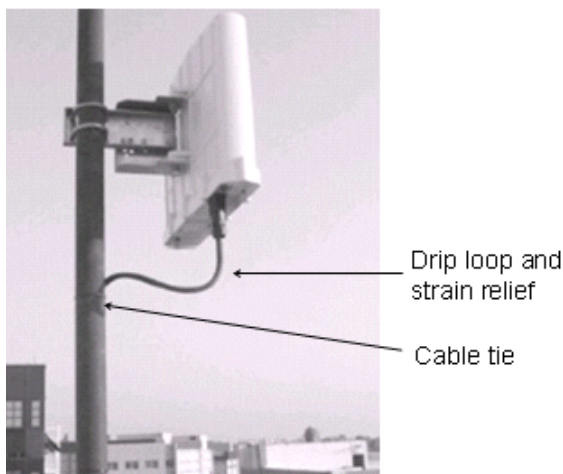
Figure 29 - strain relief

5.3   Mounting the SDA-4S

The SDA-4S Type II adapters (all types) can be mounted either horizontally on a desktop or vertically on a wall.

5.3.1   Desktop Mounting

Desktop mounting is made possible by the existence of four feet, each located on the four corners of the SDA-4S bottom panel. Therefore, no installation is necessary for desktop mounting.

> ⚠️ **Caution:** To prevent a fire hazard caused by overheating, do not place the SDA-4S on a carpeted surface where airflow is restricted.

5.3.2   Wall Mounting

Wall mounting is made possible by the existence of two mounting hooks molded into the SDA-4S's bottom panel, as displayed in the figure below.
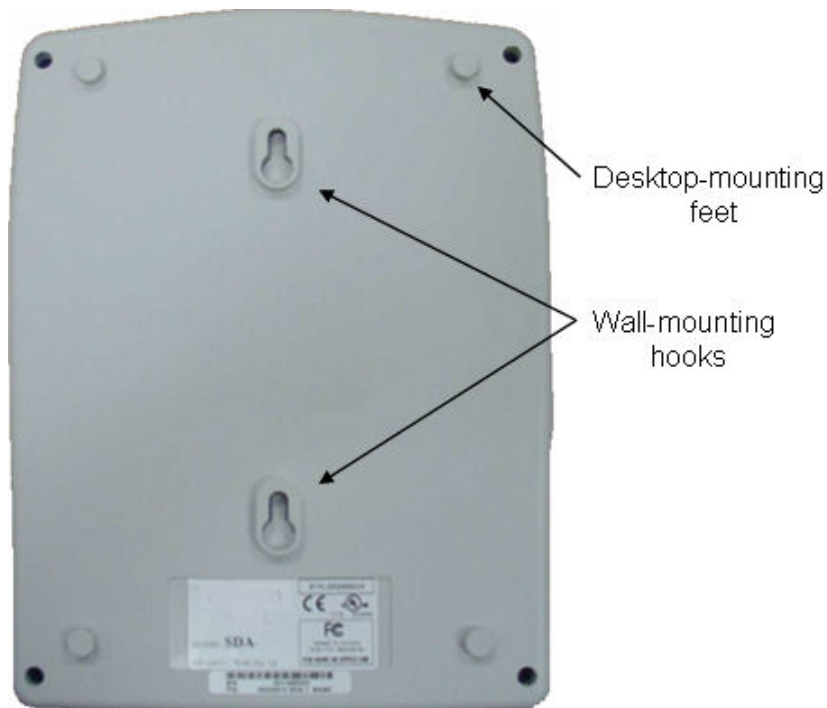
Figure 30 - Wall mount

To wall mount the SDA-4S:

1. On the wall, mark the position of the two mounting hooks. The dimensions of the wall-mounting hooks are displayed in the template below.
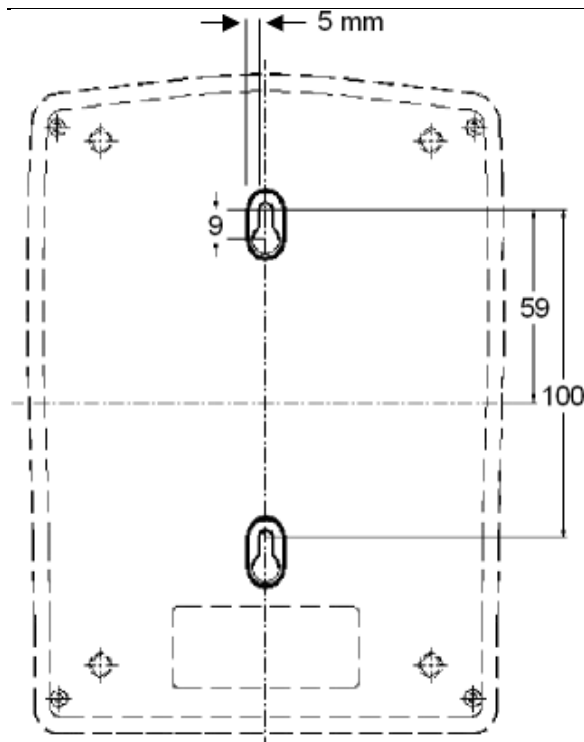
Figure 31 - SDA-4S mounting template

2. Drill holes for each hole that you marked in the step above.

3. Insert wall anchors (supplied) into each of the drilled holes.

4. Insert the 9-inch screws (supplied) into the wall anchors. Ensure at least 2 mm of the screw is exposed to allow insertion into the SDA-4S mounting holes.

5. Hold the SDA-4S with both hands, and align the entrance to the two mounting hooks with the screws. Slide the screws into the mounting hooks, by lowering the SDA-4S onto the screws.

> *Note:* For safety, both mounting hooks must be utilized when mounting the unit.

> *Note:* The SDA-4S is supplied with a 1-metre AC power lead assembly. Therefore, ensure the unit is mounted within reachable distance to the customer's mains power outlet.

> *Note:* The maximum cable run between SDA-4S and ProST is 100 meters. Therefore, ensure the unit is mounted within reachable distance.

6 Network Cabling

ProST interfaces with the subscriber's network through the IDU (i.e. typically the SDA-1 Type II, or optionally through the SDA-4S Type II, SDA-4S/VL Type II or SDA-4S/DC). The ProST also receives DC power from the IDU.

This section describes the ProST network cabling:

➢ Connecting ProST to IDU

➢ Connecting IDU to a Computer

6.1 Connecting to IDU

The ProST typically interfaces with the subscriber's network using the indoor SDA-1 Type II adapter. However, optional IDU adapters (SDA-4S Type II, SDA-4S/VL Type II or SDA-4S/DC) are offered that provide multiple LAN ports for interfacing with the subscriber's network.

Note: Use CAT-5e unshielded cable only.

6.1.1 Connecting the SDA-1 Type II

The ProST connects to the SDA-1 using a CAT 5Ee cable with 8-pin RJ-45 connectors on either end. The ProST provides a 15-pin D-type port for interfacing with the SDA-1. However, for allowing the use of RJ-45 connectors, your ProST kit includes a DB15-to-RJ45 adapter that can easily be attached to the ProST's 15-pin D-type port.

The cable setup for ProST-to-SDA-1 connectivity is as follows:

➢ **Cable:** Straight-through CAT 5Ee Ethernet cable

➢ **Connectors:**

- ProST: DB15-to-RJ45 adapter

- CAT 5Ee cable with 8-pin RJ-45 male connectors on either end

➢ Connector pinouts:
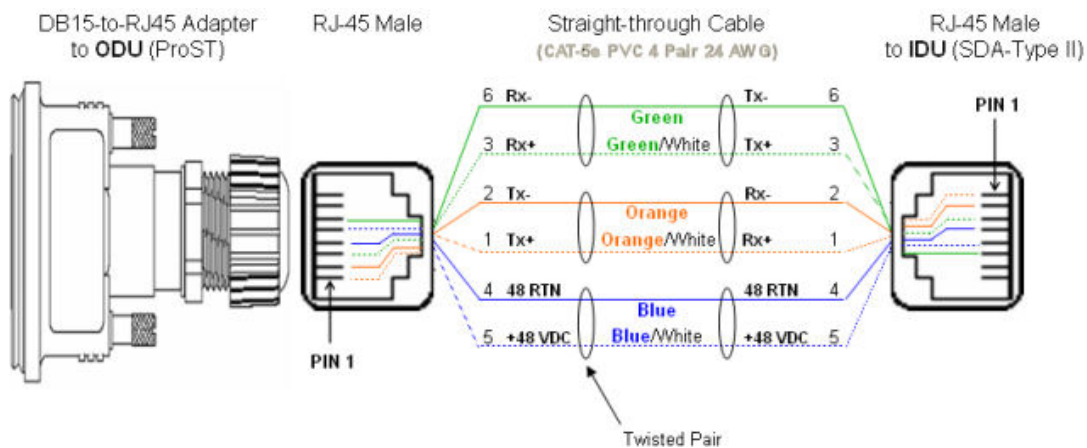
Figure 32 – Pinouts- ODU to IDU

Note: The SDA-1 Type II is protected in the event power is inadvertently inserted to the radio port so as not to damage the Ethernet card.

Note: A DB15-to-RJ45 (gray colored) adapter for plugging into the ProST's 15-pin D-type port (pins 7 & 8 disconnected) is included, replacing previous (black colored) adapter.

Note: Only pins 1 to 6 are used.

• When using previous black adapter (outdoor DB15-to-RJ45), pins 7 and 8 must not be wired to either end.

• The wire color-coding described in the table is Airspan's standard for wire color-coding. However, if you implement your company's wire color-coding scheme, ensure that the wires are paired and twisted according to pin functions listed in the table above (e.g. Rx+ with Rx-).

• The maximum CAT 5Ee cable length for ODU/IDU connectivity is 100 meters.

To connect the ProST to the SDA-1:

1. Attach the DB15 side of the DB15-to-RJ45 adapter to the ProST's 15-pin D-type port (female), labeled **DATA & PWR.**

2. Plug the RJ-45 connector of the Category 5 Ethernet cable (not supplied) into the RJ-45 port of the DB15-to-RJ45 adapter.

3. Plug the RJ-45 connector, at the other end of the Category 5 Ethernet cable, into the SDA-1's RJ-45 port labeled **RADIO**.
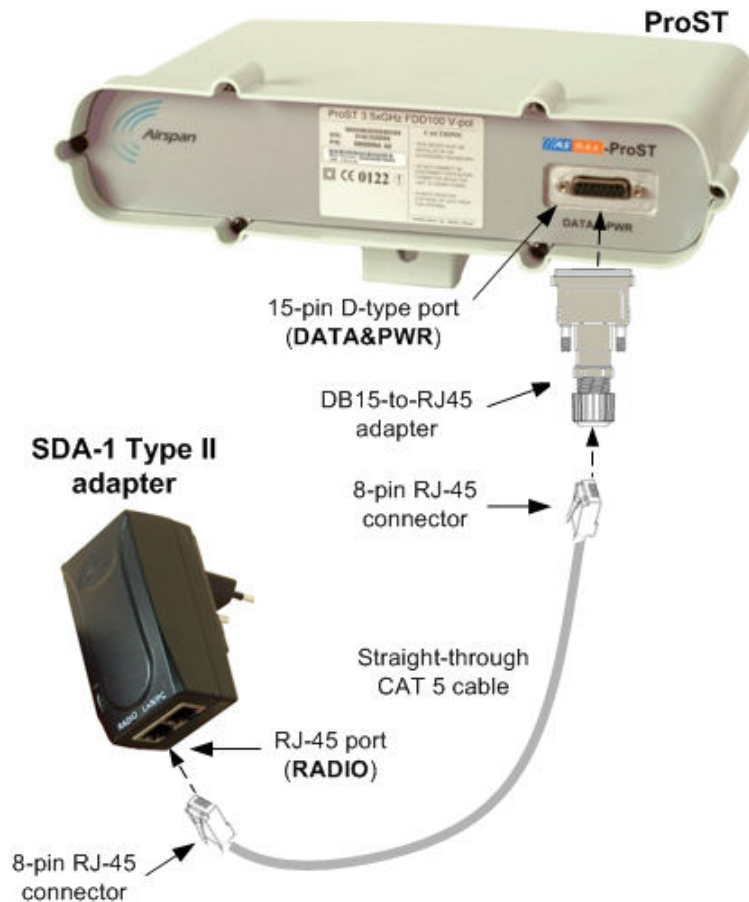
Figure 33 - ProST & SDA-1

6.1.2 Connecting the SDA-4S Type II, SDA-4S/VL Type II or SDA-4S/DC Type II

The SDA-4S Type II, SDA-4S/VL Type II or SDA-4S/DC Type II adapters (referred hereafter as SDA-4S) provide one 15-pin D-type female port for interfacing with the ProST (which also provides a 15-pin D-type female port).

The ODU-to-IDU connectivity implements a CAT 5E cable with 8-pin RJ-45 connectors at either end. However, for allowing the use of RJ-45 connectors, your ProST kit includes two DB15-to-RJ45 adapters that can easily be attached to the 15-pin D-type ports of the ProST and SDA-4S.

The cable setup for ProST to SDA-4S connectivity is as follows:

  ➢ **Cable:** Straight-through CAT 5E Ethernet cable

  ➢ **Connectors:**

   • **ProST:** DB15-to-RJ45 adapter

   • **SDA-4S:** DB15-to-RJ45 adapter

   • CAT 5Ee cable with 8-pin RJ-45 male connectors on either end

  ➢ Connector pinouts:
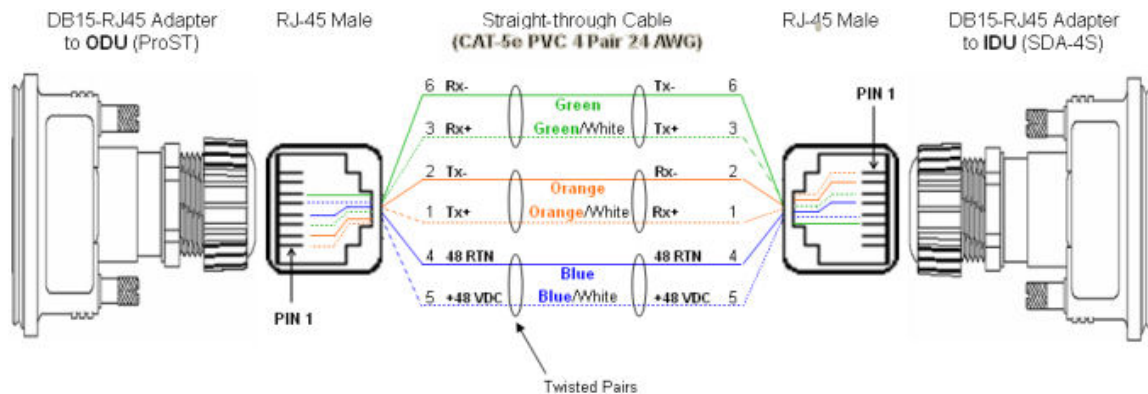
Figure 34 - Pinouts ProST to SDA-4S

> *Note:* The standard ProST/ProST-WiFi kit does not include the SDA-4S Type II, SDA-4S/VL Type II or SDA-4S/DC adapters. For pricing and ordering of the SDA-4S Type II, SDA-4S/VL Type II or SDA-4S/DC adapter, please contact your nearest Airspan dealer.

To connect the ProST to the SDA-4S:

1. Attach the DB15 side of the DB15-to-RJ45 adapter to the ProST's 15-pin D-type port (female), labeled **DATA & PWR**.

2. Attach the DB15 side of the second DB15-to-RJ45 adapter to the SDA-4S's 15-pin D-type port (female).

3. Plug the RJ-45 connector, at one end of the CAT 5Ee cable (not supplied), into the RJ-45 port of the DB15-to-RJ45 adapter located at the ProST.

4. Plug the RJ-45 connector, at the other end of the CAT 5Ee cable, into the RJ-45 port of the DB15-to-RJ45 adapter located at the SDA-4S.
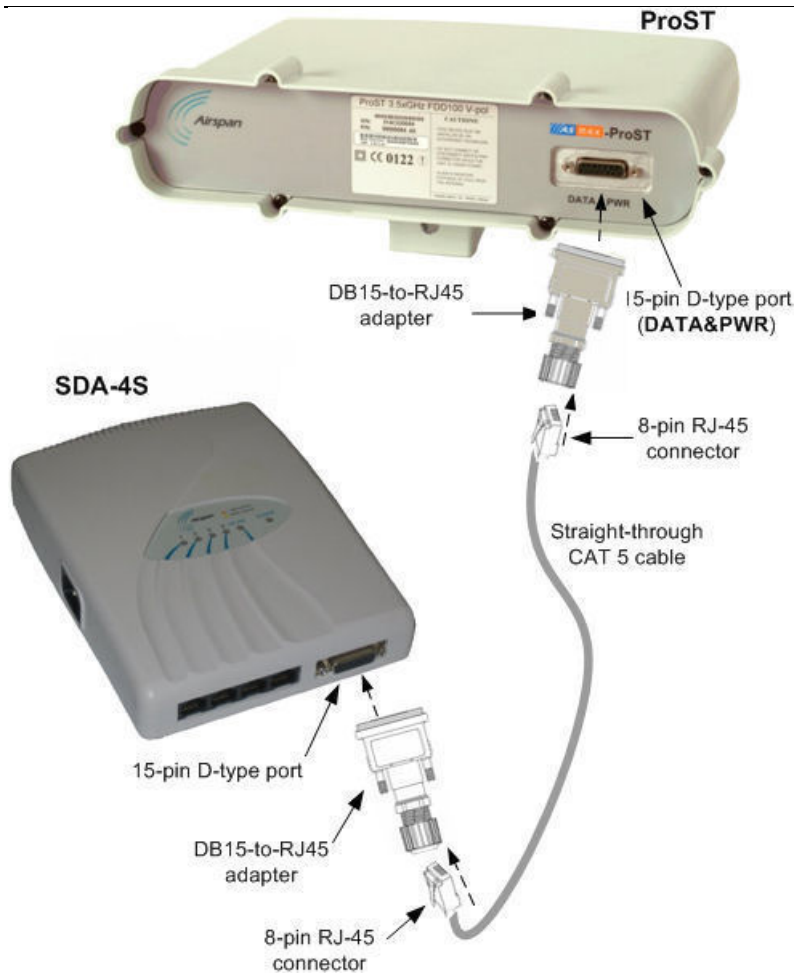
Figure 35 - ProST & SDA-4S

6.2 Connecting to LAN Network

The ProST typically interfaces with the subscriber's LAN network using the indoor SDA-1 Type II adapter. This adapter provides one 100BaseT interface. However, optional IDU adapters (SDA-4S Type II, SDA-4S/VL Type II or SDA-4S/DC Type II) are offered that provide four LAN ports for interfacing with the subscriber's LAN network.

> ⚠️ **Caution:** Only subscriber terminal equipment (e.g. computer modem port) that is designed for full compliance with TNV-1 telecommunication network connectivity can be connected to the SDA-1. Warranty of Airspan's equipment shall be made void if the SDA-1 is connected to a computer that is not compliant with TNV-1.

6.2.1 Connecting the SDA-1 Type II

The SDA-1 Type II provides a single 100BaseT interface with the subscriber's LAN network.

The cable setup for SDA-1 Type II connectivity is as follows:

➢ **Cable:** Straight-through CAT 5e Ethernet cable

➢ **Connectors:** 8-pin RJ-45

➢ Connector pinouts:

Table 13 - SDA-1

Pin	Function	8-Pin RJ-45
1	Tx+	
2	Tx-	
3	Rx+	
6	Rx-	

To connect the ProST to the subscriber's network/PC (via SDA-1 Type II):

1. Plug the supplied Category 5e Ethernet cable into the SDA-1's RJ-45 port labeled **LAN/PC**.

2. Plug the loose end of the Category 5e Ethernet cable into the computer's LAN port.

Figure 36 - ProST & SDA1 & PC

6.2.2 Connecting the SDA-4S Type II, SDA-4S/VL Type II or SDA-4S/DC Type II

The SDA-4S Type II, SDA-4S/VL Type II or SDA-4S/DC adapters (referred hereafter as SDA-4S) provide four RJ-45 (100BaseT) ports for interfacing with the subscriber's LAN network. The difference between these adapters is that the SDA-4S/VL supports VLAN functionality at the ports.

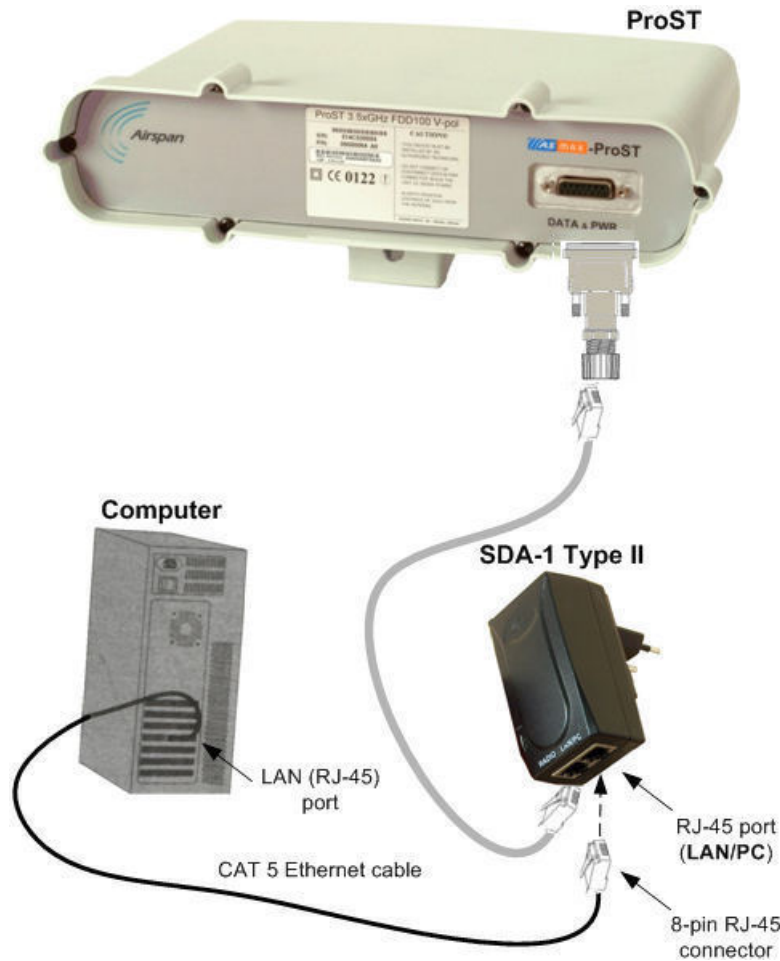The ports of the SDA-4S models support Auto Negotiation, allowing automatic configuration for the highest possible speed link (10BaseT or 100BaseT), and Full Duplex or Half Duplex mode. In other words, the speed of the connected device (e.g. PC) determines the speed at which packets are transmitted through the specific port. For example, if the device to which the port is connected is running at 100 Mbps, the port connection will transmit packets at 100 Mbps. Conversely, if the device to which the port is connected is running at 10 Mbps, the port connection will transmit packets at 10 Mbps

In addition, the SDA-4S ports support MDI/MDI-X automatic crossover, allowing connection to straight-through or crossover CAT-5e cables. Therefore, these ports can be connected to either a hub (i.e. using crossover cables) or a PC (i.e. using straight-through cables).

The cable setup for SDA-4S LAN connectivity is as follows:

- ➢ **Cable:** Straight-through (e.g. when connecting to PC) or crossover (i.e. when connecting to a hub) CAT 5e Ethernet cable

- ➢ **Connectors:** 8-pin RJ-45 at both ends

- ➢ **Connector pinouts:**

  - • Straight-through cable (e.g. connecting to a PC)

Table 14 - SDA-4S straight-through

Pin	Function	8-Pin RJ-45
1	Tx+	
2	Tx-	
3	Rx+	
6	Rx-	

  - • Crossover cable (e.g. connecting to a hub)

Table 15 - SDA-4S crossover

Pin	Function	Pin	Function	8-Pin RJ-45
1	Rx+	3	Tx+	
2	Rx-	6	Tx-	
3	Tx+	1	Rx+	
6	Tx-	2	Rx-	
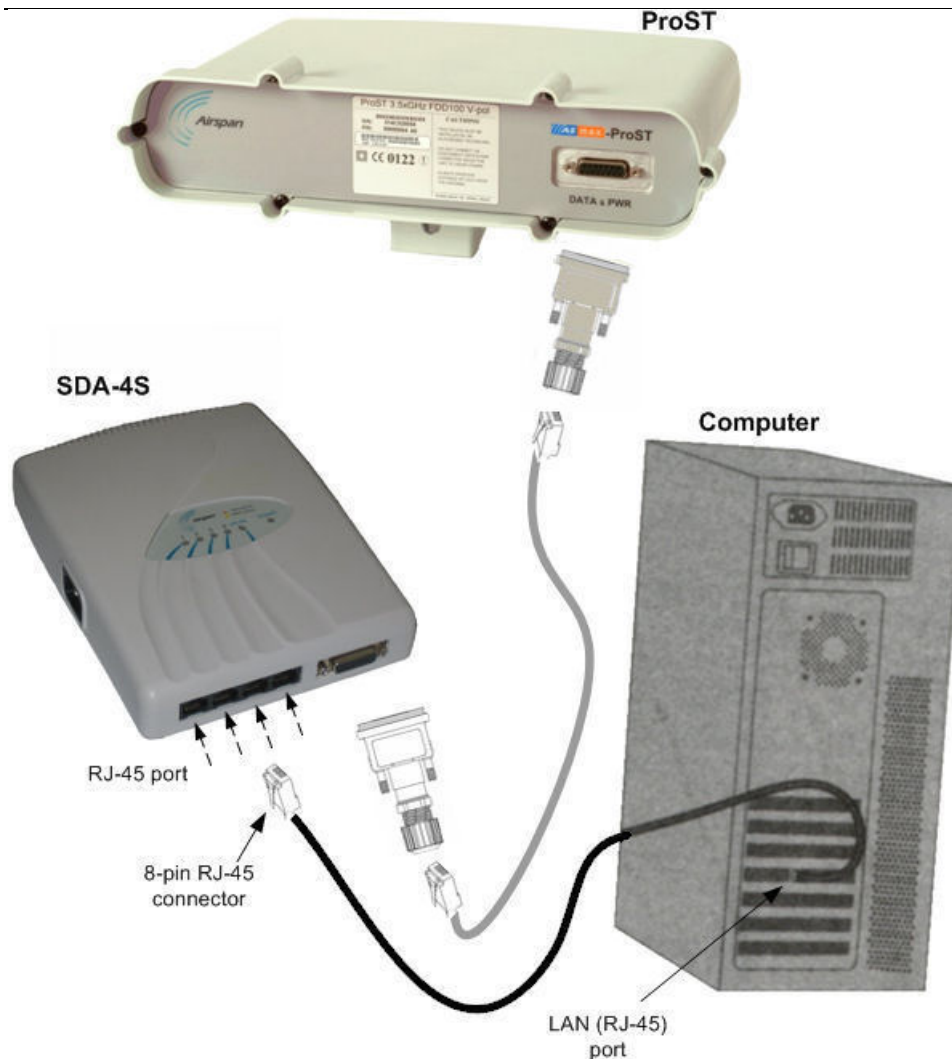
Figure 37 - ProST & SDA-4S & PC

6.2.3 Connecting the SDA-MSG

Connecting the SDA-MSG – the optional extension VoIP module enabling VoIP functionality to your ProST units.

> **Note:** For pinout refer to SDA-1 Type II above.

To connect the SDA-MSG's Radio port to Ethernet network and the RJ 45 port to ProST:

1. Plug the CAT 5e Ethernet cable into the MSG unit 8-pin RJ-45 LAN port.

2. Plug the other end of the CAT 5e Ethernet cable into your computer's LAN port located at the back of your computer.

3. Plug the additional CAT 5e Ethernet cable into the other SDA unit 8-pin RJ-45 Radio port and then into the ProST.

4. Plug standard telephone cable(s) (with RJ 11 ends) into phone(s) and MSG jack(s).

The figures below illustrate the SDA-MSG-to-computer cable and SDA-MSG-to-ProST (or ProST-WiFi) cable connection:
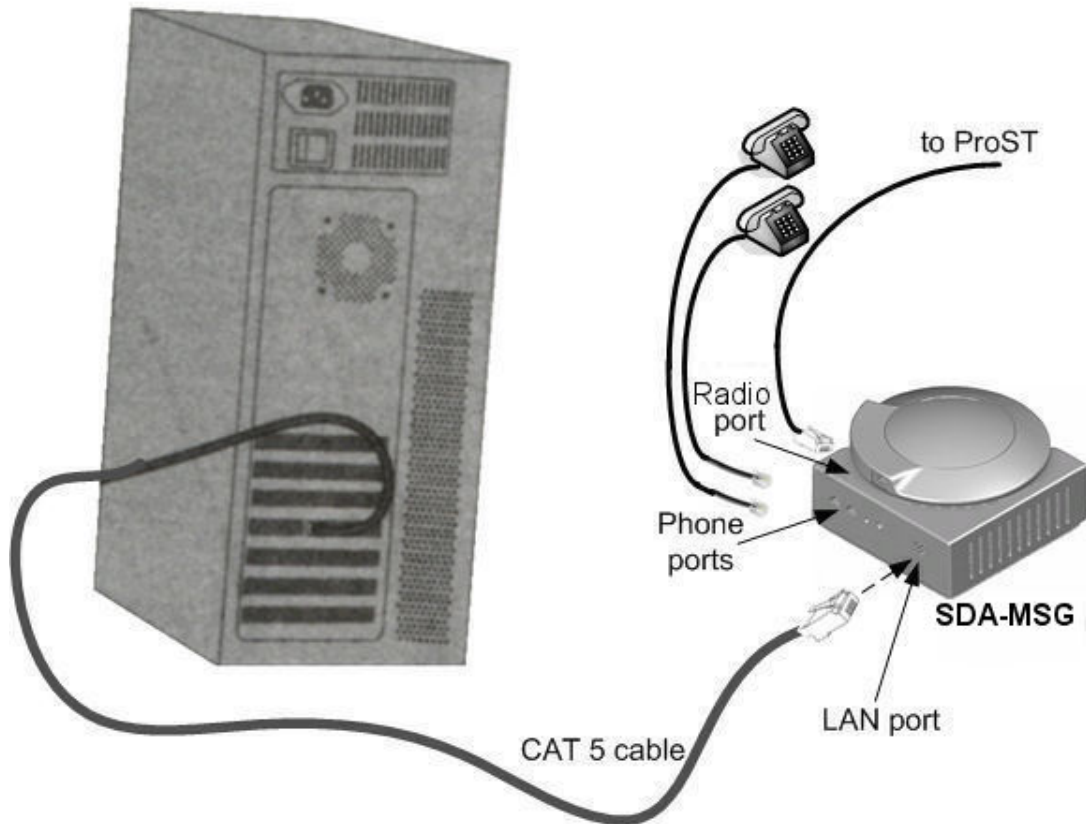
Figure 38 - SDA-MSG & PC to ProST

6.2.4 Connecting the SDA-WiFi

Connecting the SDA-WiFi – the optional extension WiFi module enabling WiFi functionality to your ProST units.

> **Note:** For pinout refer to SDA-1 Type II above.

To connect the SDA-WiFi's LAN port(s) to Ethernet network and the RJ 45 port to ProST:

1. Plug a CAT 5e Ethernet cable into one or more of the SDA-WiFi unit's 8-pin RJ-45 LAN ports.

2. Plug the other end of the CAT 5e Ethernet cable into a computer's LAN port located at the back of the computer.

3. Plug the additional CAT 5e Ethernet cable into the PSA unit 8-pin RJ-45 Radio port and then into the ProST.

The figures below illustrate the SDA-WiFi-to-computer cable and SDA-WiFi-to-ProST cable connection:
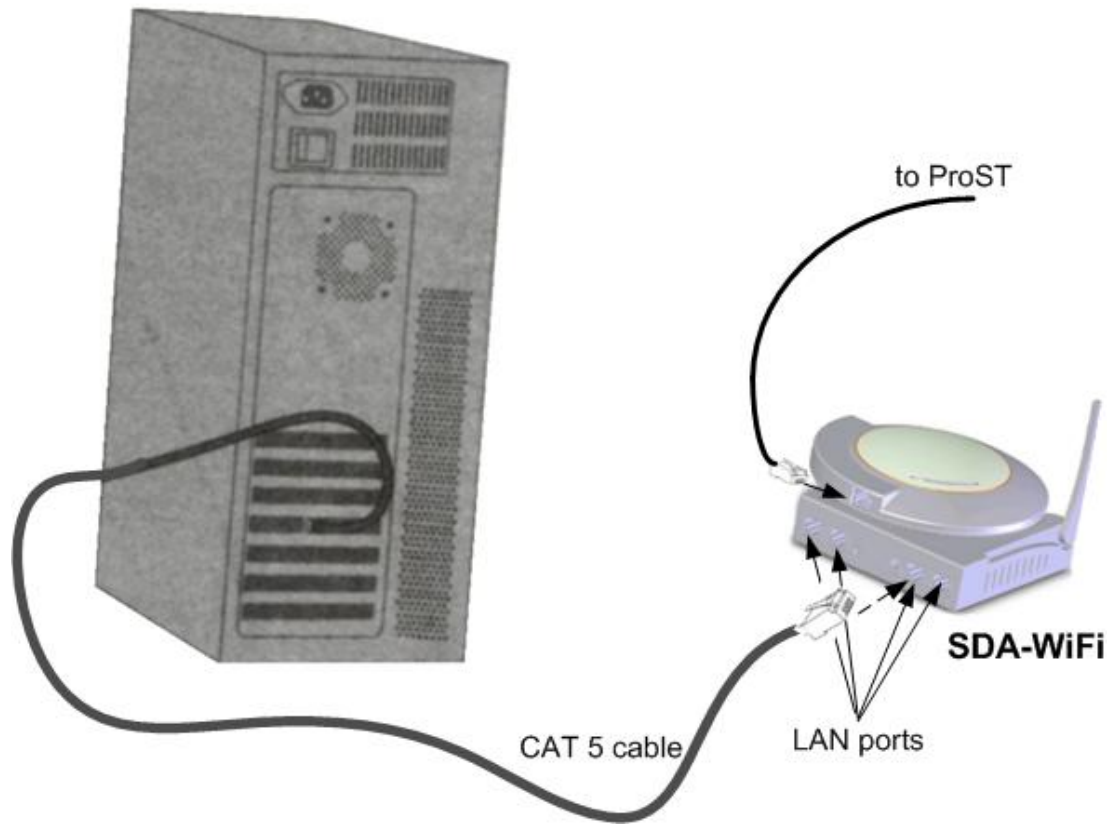
Figure 39 - SDA-WiFi & PC to ProST

7 Connecting to Power

ProST can be powered from one of the following power sources:

➢ DC power: connected directly to a 10 - 52 DC power source

➢ AC power: connected to a standard electrical wall outlet (110/240 VAC) using an AC/DC power adapter

In addition, Airspan offers an optional third-party outdoor, lightning and surge protector that protects the ODU-to-IDU CAT 5e cable's power and data signals from any electrical surges due to lighting strikes.

> **Note:** ProST is designed with a built-in lightning surge protection that complies with the Surge Immunity standard EN 61000-4-5.

7.1 DC Power Source

ProST can be connected directly to a DC power supply unit that supplies 10 – 52 VDC (0.2 to 0.9 A; 15W maximum, assuming up to 100-m cable length between ProST and power source).

The ProST-to-DC power connectivity is supported by a splitter cable. One end of the splitter cable connects to the ProST (using the RJ45-to-DB15 adapter or connecting directly to the 15-pin D-type port); the other end of the cable splits into the following two wire groups:

➢ One group for the subscriber's Ethernet interface (four wires for the Tx and Rx signals)

➢ One group for the DC power source interface (two wires for +48 VDC and +48 RTN)

> **Caution:** ProST should be powered by a safety approved Class II limited DC power source with maximum current of 1A.

The figure below displays the ProST-to-DC power supply cable setup:
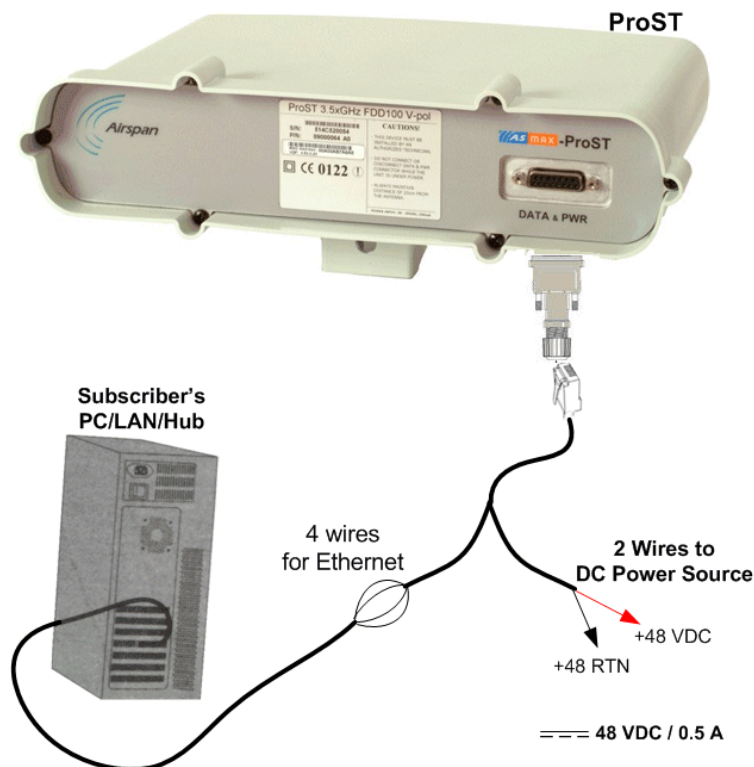
Figure 40 - ProST DC power connection

7.2 Connecting the SDA-4SDC Type II (Optional DC adapter)

The SDA-4SDC adapter is connected to the DC power supply using a cable appropriate to the specific field conditions.

The setup between the SDA-4SDC and power connection includes the following:

➢ **Connector:** Anderson Connector Housings for connecting the cable to the SDA-4SDC DC power socket.

- 1327 - Red Housing x 1
- 1327G6 - Black Housing x 1
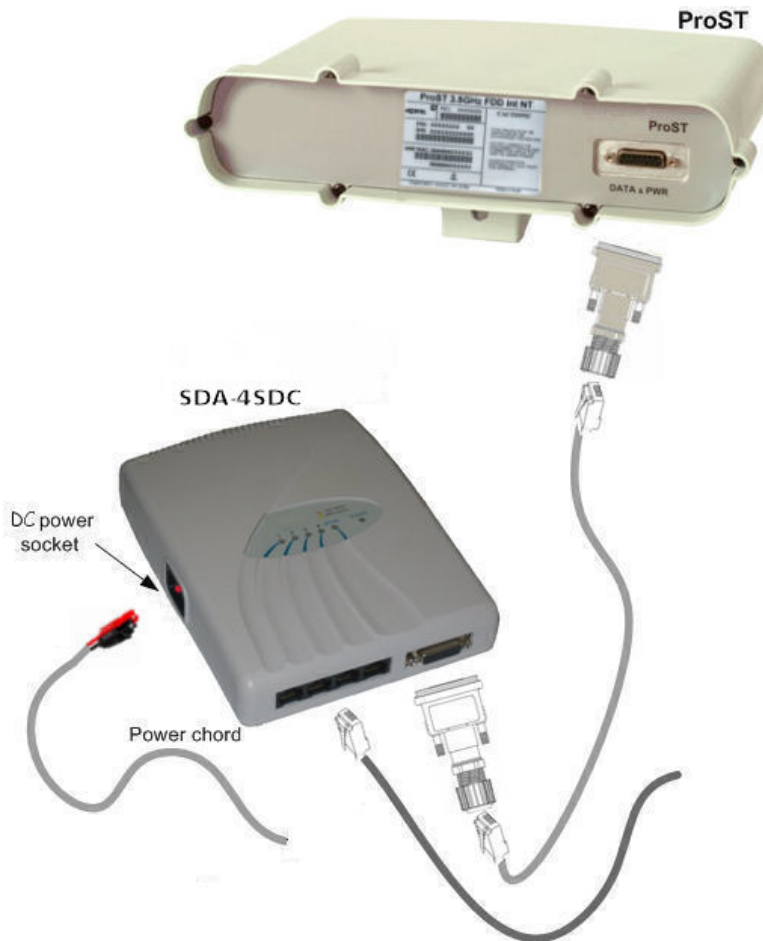
Figure 41 - ProST SDA-4SDC power connection

7.3 AC Power Source

ProST is powered from an AC power source when implementing the SDA-1 Type II, which is plugged directly into a standard electrical wall outlet (110/240 VAC). The optional IDU adapters (SDA-4S Type II and SDA-4S/VL Type II) also power ProST from the subscriber's AC electrical wall outlet. The difference between the SDA-1 Type II and SDA-4S Type II adapters is the method of connectivity to the power outlet, as discussed in the subsections below.

7.3.1 Using SDA-1 Type II

The SDA-1 Type II is plugged directly into a standard electrical wall outlet ((110/240 VAC). The SDA-1 Type II also allows easy plug prongs replacement to suit the electrical wall socket (e.g. American vs. European type) of the geographical location in which the ProST is being installed.

The AC power cabling consists of the following stages:

➢ Changing SDA-1 Type II plug prongs

➢ Plugging SDA-1 into wall outlet

7.3.1.1 Changing the SDA-1 Type II Plug Prongs

The SDA-1 Type II allows you to attach plug prongs suited to the electrical wall socket of the country in which you are installing the equipment. Therefore, before plugging the SDA-1 Type II into the electrical outlet, ensure that the correct prongs are attached to the SDA-1 Type II.

To change the SDA-1 Type II plug prongs:

1. On the rear of the SDA-1 Type II, slide the locking switch to **OPEN**.

2. Remove the prongs by sliding the prongs in the direction away from the switch.

3. Insert the desired prongs by aligning the prongs with the SDA-1 Type II's prong groove, and then sliding the prongs onto the SDA-1 Type II until it reaches the end of the groove.

4. Lock the prongs in place by moving the switch to **LOCK**.

Figure 42 - SDA-1 Type II prongs

7.3.1.2 Plugging the SDA-1 Type II into an Electrical Wall Outlet

After you have attached the suitable plug prongs onto the SDA-1 Type II, you can plug it into a standard electrical wall outlet (110/240 VAC), as illustrated below.
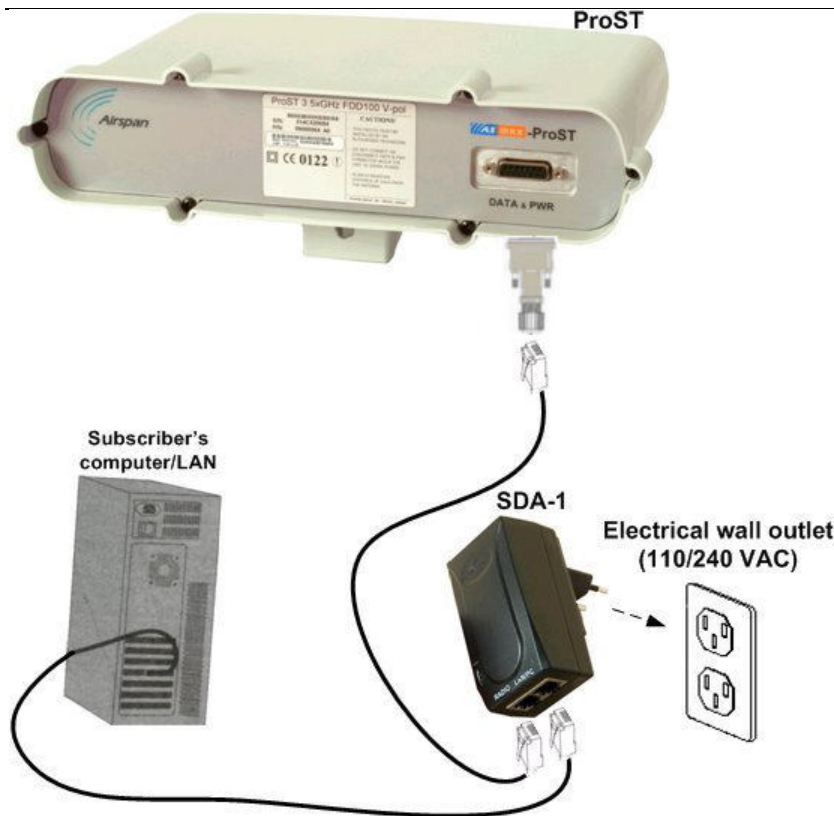
Figure 43 - ProST to power

Verify that your SDA-1 Type II is on and receiving power by checking that the LED labeled **POWER** is lit (see SDA-1 Type II LED description). If it is not lit, see Troubleshooting.

7.3.1.3 Using SDA-4S Type II and SDA-4S/VL Type II

The SDA-4S adapters are plugged into a standard electrical wall outlet (110/240 VAC) using an AC power cord. The appropriate AC power cord is supplied according to the country of use.

The cable setup between the SDA-4S and power outlet includes the following:

> **Connector:** AC IEC 60320 type (female)

> **Plug:** The appropriate plug type is supplied according to the country of use

> **Cable:** 3x1.z0 mm, 10A / 250 VAC (maximum length is 180 cm)
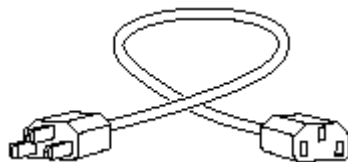
Figure 44 - Power cord

To connect the SDA-4S to the AC power supply:

1. Connect the power plug female, at the end of the AC power cord, into the AC power socket located on the left panel of the SDA-4S.

2. Plug the power plug male, at the other end of the AC power cord, into the AC power outlet (110-240 VAC).

3. Verify that the power is received by the SDA-4S by checking that the **POWER** LED light is on.
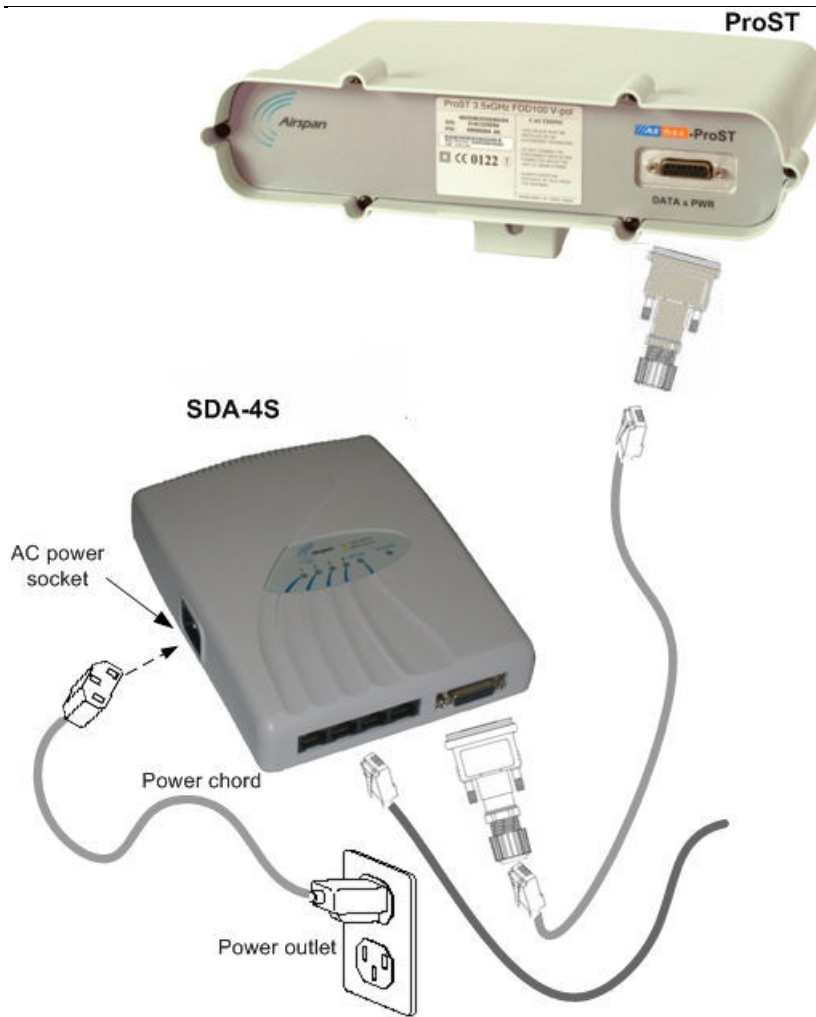
Figure 45 - Connecting to AC power

Verify that your SDA-4S is on and receiving power by checking that the LED labeled **POWER** is lit (see SDA-4S LED description). If it is not lit, see Troubleshooting.

8 Power Cable Connection

In the SDA-4SDC installation Kit there are two polarized and genderless unassembled Anderson Powerpole power connectors: **red** for positive connection and **black** for the negative connection.

Figure 46 - Power connectors (Anderson Powerpole)

The power connectors consist of housing (hood and a contact pins). The contact pin is displayed below:

Figure 47 - Contact pin

8.1 Housing the Connectors

The power connectors are supplied unassembled. Therefore, you need to crimp the power wires to the connector's contact pins, and then house them in the Powerpole hood.

Crimping the power wires to the connectors:

1. Insert the wire into the contact pin's barrel, and then, with a standard crimping tool crimp the barrel tightly onto the wire (recommended 16 AWG cable wire).

Figure 48 – crimped

2. Insert the contact into the hood with the contact's **tongue pointing downwards** and snap into place. Ensure that the housing spring mates with the underside of the contact's tongue.

Figure 49 – Insertion

8.2 Connecting to the SDA-4SDC

Once you have crimped the power cord to the Powerpole connectors, connect the power connectors to the SDA-4SDC power receptacles.

To connect the power cord to the SDA-4SDC:

> ⚠ *Caution:* The plastic housings are held together with dovetail joints. Always slide these joints together! They will be damaged if you try to snap them together or apart. They ONLY slide together in one direction. This should be obvious by looking at them carefully.

1. Assemble the **red** and **black** plastic housings together. Mate both connectors, by sliding them along the dovetail joints.
    When looking at the connector side (not the wire side), the **red** connector should be on the

left and the **black** on the right.
The housing dovetails should be mated fully.

2. Connect the power connectors to the SDA-4SDC power receptacles so that the connectors' color matches the receptacle's color, red to red (**positive**), and black to black (**negative**).

3. Connect the other end of the power cord to the third-party DC power source. Ensure that the positive and negative sides are correct.
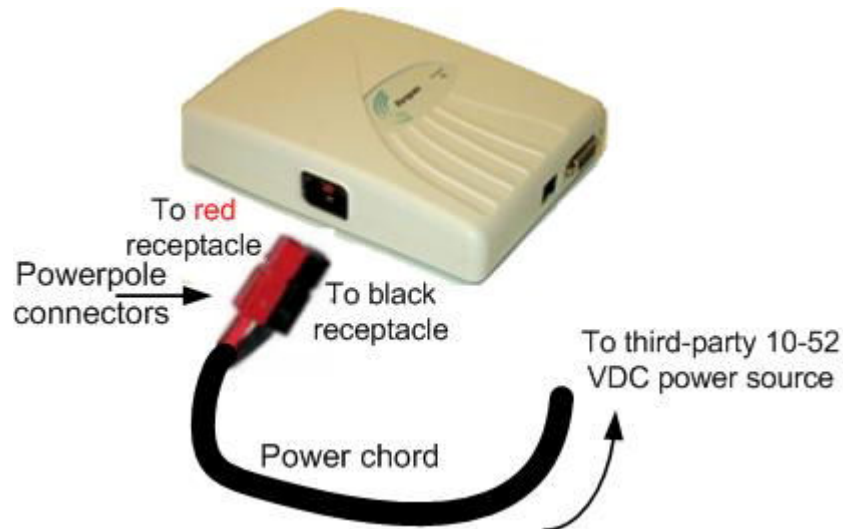

Figure 50 - Connect to power source

9 Connecting Lightning and Surge Protector

The optional third-party lightning and surge protector (Polyphaser) is implemented in the following deployment scenarios:

➢ ODU-to-IDU cable length of 40 meters or more (optional to use surge protector unless required by local law)

➢ Deployment of CPE in geographical areas that frequently experience severe lightning storms

The lightning and surge protector protects the ODU-to-IDU CAT 5e cable's six used wires (two -48 VDC wires and four Ethernet Tx and Rx wires) from any electrical surges due to lighting strikes.

The protector is installed outdoors on the CAT 5e cable that connects between the CPE and the SDA. In other words, two CAT 5e cables are required for the following connections:

➢ CPE-to-protector connection

➢ Protector-to-IDU connection

	Caution: Do not install the lightning and surge protector during adverse weather conditions when the threat of lightning strike is possible.

	Note: The protector unit must be grounded to a low-impedance (low R and low L) ground system to operate properly.

	Note: For pricing and ordering of the Polyphaser lightning and surge protector, contact your Airspan representative.

To install the lightning protector:

1. Connect the protector in the direction according to the labels. The end labeled SURGE accepts the cable from the ProST; the end labeled PROTECTED accepts the cable from the IDU.

2. Feed the CAT 5e cable through the grommet (for each side). If the RJ-45 connector is already crimped to the other end, ensure that you have fed the cable through the gland nut beforehand. The gland nut secures the cable to the grommet.

3. Strip about 0.25" (6.35 mm) of the cable sheath and expose about 0.03" (0.8 mm) of the strands/wires.

4. Secure the wires to the protector's terminal block using the two spot ties. Each side of the data and DC assembly has + or – markings to ensure lines entering (surge side) match lines exiting (protected side).

9.1 PolyPhaser Wiring Diagram
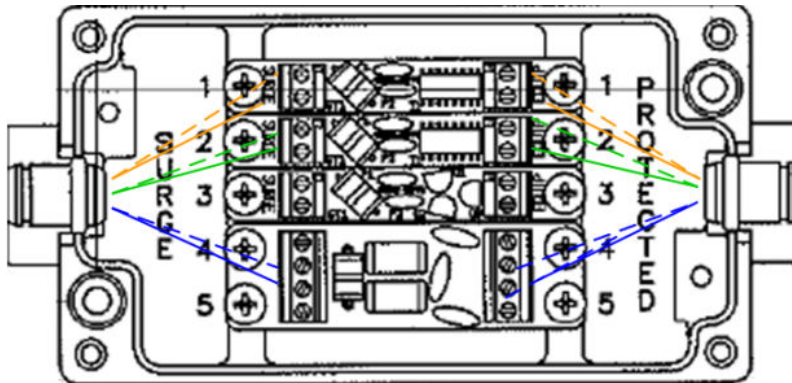
Figure 51 - Working with SDA

brown
brown/white
green
blu/white
blu
green/white
orange
orange/white

Pin 1
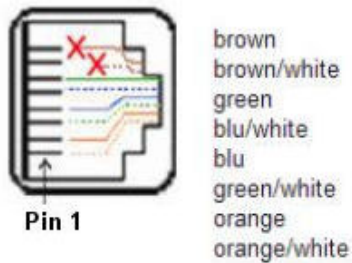
Figure 52 - RJ45 working with SDA

1. Mount and ground the protector outdoors with the provided 2 x 8-32 screws according to the template illustrated below (showing distances between centers of the two mounting holes). The unit may be mounted/grounded on a nearby plate or bulkhead panel that is bonded to an earth-ground system.

4.063 in. (103.2 mm)

1.386 in. (35.20 mm)
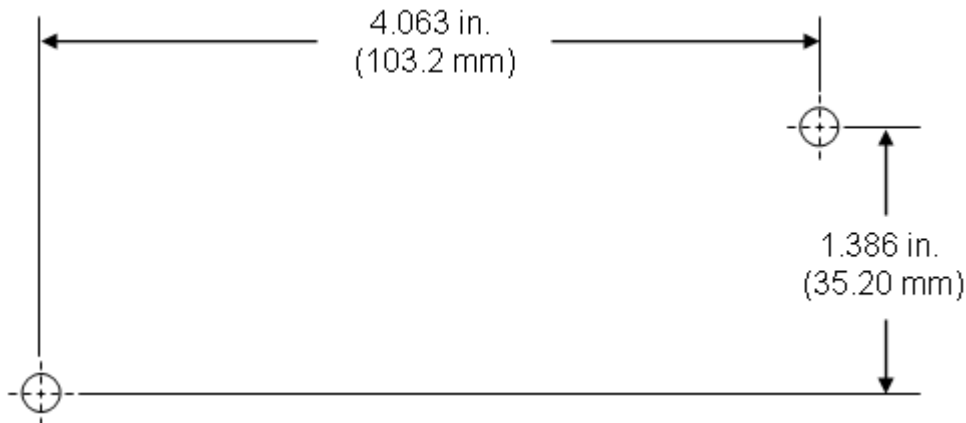
Figure 53 - Mounting template

2. Attach the protector's lid by using the four M4 x 20-mm screws. Ensure that the neoprene gasket on the lid is not loose or out of the groove.

3. Secure the CAT 5e cable to the grommet by fastening the gland nut.

9.2 Lightning and Surge Protection Connection Scenarios

The figures below illustrate various lightning and surge protector connectivity scenarios.

The figure below illustrates the connectivity of the lightning and surge protector using the SDA-1 Type II adapter.
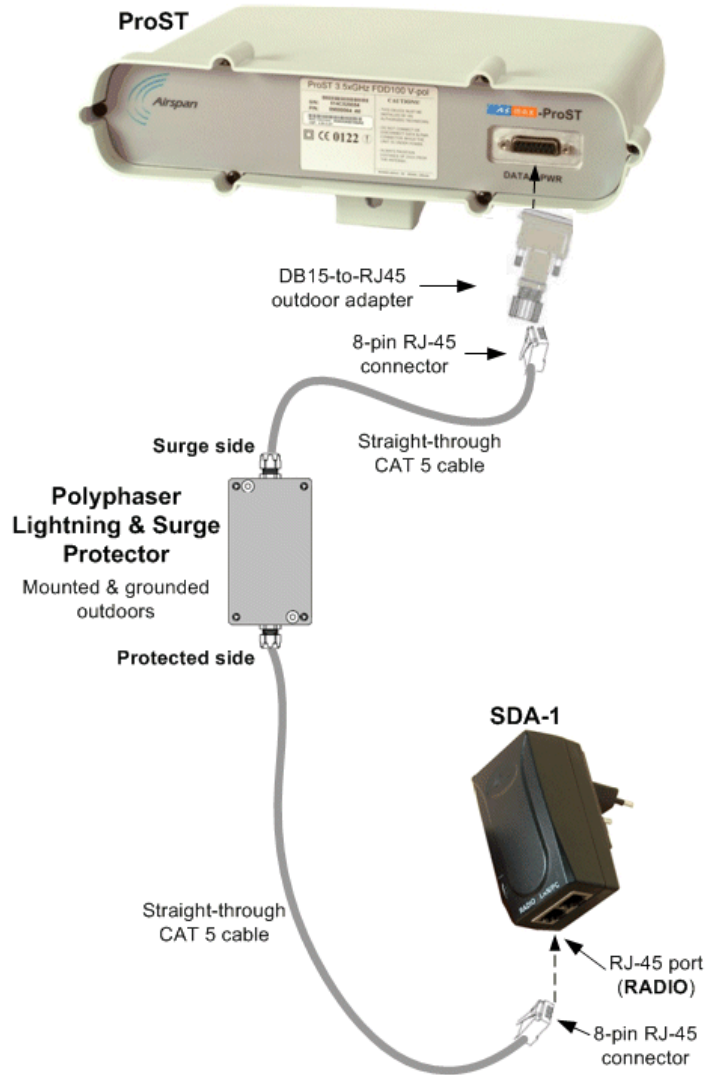
Figure 54 - SDA-1 + PolyPhaser + ProST
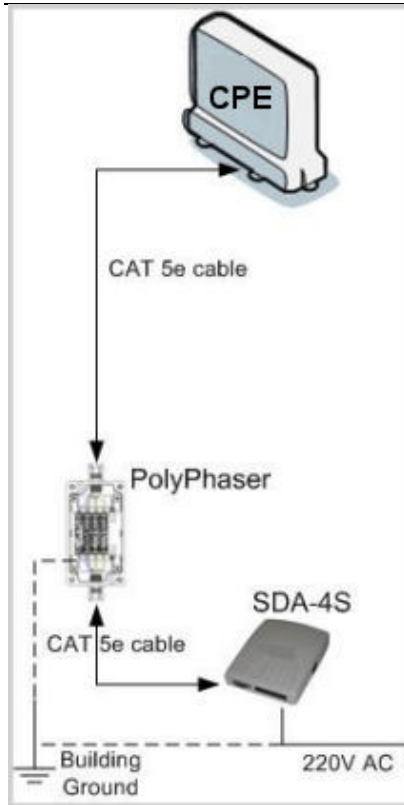
Figure 55 - SDA-4S + PolyPhaser + ProST
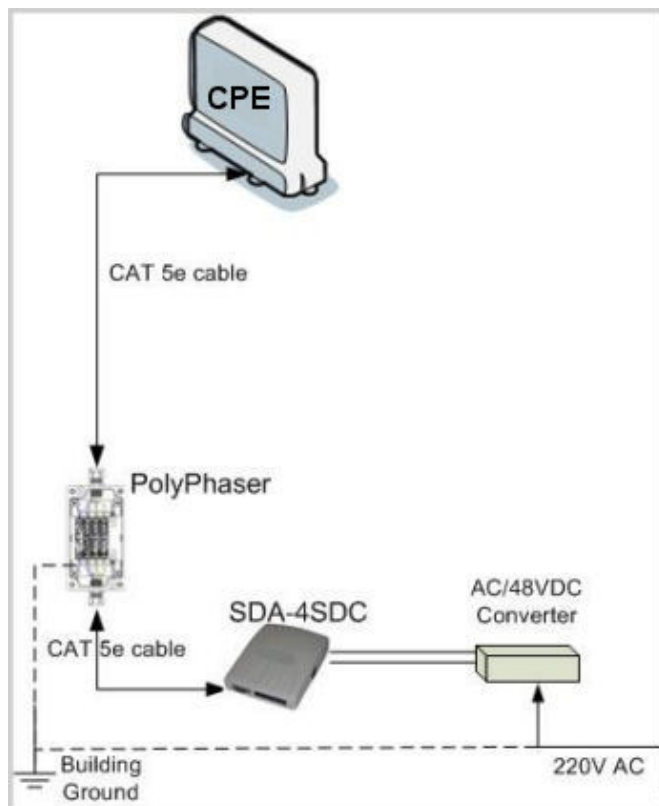
Figure 56 - SDA-4SDC + PolyPhaser + ProST

10 RSSI LED Plug Adapter for Antenna Alignment

The RSSI LED Plug is a small adapter that allows you to accurately position (align) the ProST for optimal radio frequency signal reception with the Base Station. The RSSI LED Plug adapter provides LEDs that indicate the ProST's received signal strength (RSS) with the Base Station.

Once the RSSI LED Plug adapter is connected, you need to orientate the ProST (or third-party external antenna) to the position where the RSSI LEDs display the highest RSS measurements.

The RSSI LED Plug adapter connects between the ProST and SDA by a CAT 5e cable(s). The RSSI LED Plug adapter provides two 15-pin D-type ports: one for the ProST side, and the other for the SDA side.

The RSSI LED Plug adapter can be connected in one of the following manners:

➢ One end connects directly to the ProST's 15-pin D-type port, and the other end connects to the SDA (IDU adapters) by a CAT 5e cable.

➢ Both ends connect to the ProST and SDA by a CAT 5e cable.

The following describes the RSS LED Plug adapter's cable setup:

➢ Cables: two straight-through cables for connecting the RSSI LED adapter to both the SDA and ProST

➢ Connectors:

• ProST side: 15-pin D-type male (only 6 pins used)

• RSSI LED Plug adapter:

o ProST side: 15-pin D-type female

o SDA side: 15-pin D-type male

• SDA side: 15-pin D-type male

10.1 LED Status

The RED Power LED functions as follows:

Table 16 - LED Status

Status	Description
ON	ProST receiving power from SDA
OFF	No power being received
Blinking	Data transmission via Ethernet LAN

The LED status for each RSSI level is defined in the following table:

Table 17 - LED Status per RSSI level

RSSI Level dB	LED 0	LED 1	LED 2	LED 3	LED 4	LED 5	LED 6	LED 7
97dB-	0	0	0	0	0	0	0	0
93 - 96	1	0	0	0	0	0	0	0
89 - 92	1	1	0	0	0	0	0	0
83 - 88	1	1	1	0	0	0	0	0
79 - 82	1	1	1	1	0	0	0	0
75 - 78	1	1	1	1	1	0	0	0
71 - 74	1	1	1	1	1	1	0	0
67 - 70	1	1	1	1	1	1	1	0
66 dB+	1	1	1	1	1	1	1	1

Before connecting the power adapter to the ProST, you need to connect the AC power cable (that connects to the subscriber's power outlet) to the adapter, as described in the following procedure.

To connect the RSSI LED Plug Adapter:

1. Connect the 15-pin D-type male connector, at one end of the straight-through cable, to the ProST.

2. Connect the 15-pin D-type female connector, at the other end of the straight-through cable from the ProST, to the RSSI LED adapter.

3. Connect the 15-pin D-type male connector, at one end of the straight-through cable, to the SDA.

4. Connect the 15-pin D-type male connector, at the other end of the straight-through cable from the SDA, to the RSSI LED adapter.

> **Note:** You can connect the RSSI LED Plug adapter's 15-pin male port directly to the ProSt's 15-pin female port, instead of using a cable.

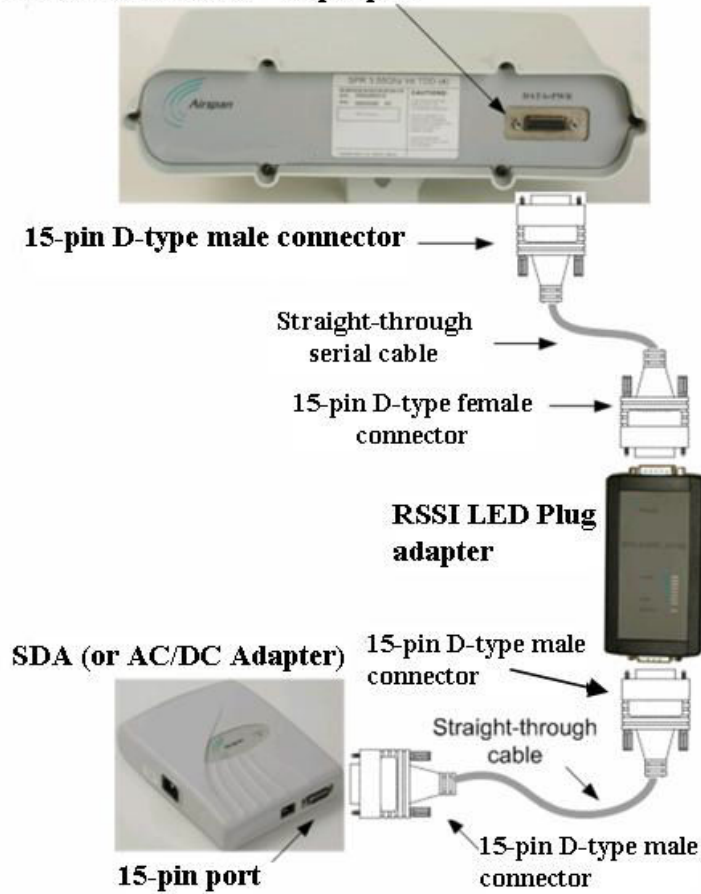The following diagram illustrates the RSSI LED plug connections:

Figure 57 - RSSI connections

	Note: RSSI response time has been proportionally increased (from previous models) to enable longer alignment.

11 Connecting External Antenna

The ProST model without a built-in antenna provides an N-type port for connecting a third-party external antenna. The addition of an external antenna allows greater RF sector coverage than the standard ProST built-in antenna model. The external antenna is typically implemented in scenarios where the ProST is deployed at relatively far distances from the base station.

⚠	***Caution:*** Before connecting the external antenna, ensure that the ProST is not connected to the power source.
⚠	***Caution:*** Before powering on the ProST, ensure that some type of equipment such as an antenna or an RF attenuator is connected to the N-type receptacle. This eliminates the risk of irreversibly damaging the ProST device.
⚠	***Caution:*** It is the responsibility of the person installing the ProST to ensure that only those antennas certified with the product are used. The use of any antenna other than those certified with the product is expressly forbidden.
⚠	***Caution:*** The external antenna must **not** be co-located or operating in conjunction with any other antenna or transmitter.
⚠	***Caution:*** The ProST and external antenna should be installed ONLY by experienced installation professionals who are familiar with the local building and safety codes and are licensed by the appropriate government authorities.
📝	***Note:*** The ProST model that provides an N-type connector for attaching a third-party external antenna does not contain an internal, built-in antenna.
📝	***Note:*** It is recommended that the same antenna polarization (i.e. horizontal or vertical) exists at both ends of the link (i.e. base station and subscriber site).

The following lists the cable setup for attaching the external antenna:

➢ **Cable:** RF coaxial

➢ **Connector:** N-type male

To connect a third-party external antenna to the ProST:

1. Connect the N-type male connector of the third-party antenna to the N-type receptacle located on the ProST's bottom panel (labeled **ANTENNA**), as displayed below.

12 Appendix

12.1 Troubleshooting

The table below provides some possible solutions to problems that may arise if the ProST is incorrectly installed:

Table 18 - Troubleshooting

Problem	Possible Cause	Solution
SDA-1 (and therefore, ProST) not receiving power --**POWER** LED is off	No electricity at wall outlet	Ensure household provides electricity to the specific wall outlet (professional electrician required)
	SDA-1 prongs not plugged entirely into wall outlet socket	Ensure SDA-1 plug prongs are completely inserted into wall outlet
	SDA-1 plug prongs attached incorrectly to SDA-1	Remove the SDA-1 plug prongs and reinsert them, ensuring the following: ➢ Prongs are inserted into the SDA-1's prong grooves ➢ Prongs slid to the end ➢ Switch is in LOCK position
	Network cables (radio and LAN) inserted into incorrect RJ-45 ports of the SDA-1	Ensure that the cables are plugged into the correct SDA-1 ports: ➢ Port labeled **RADIO**: for ProST-to-SDA-1 connectivity ➢ Port labeled **LAN/PC**: for computer-to-SDA-1 connectivity

12.2 Glossary of Terms

BPSK	Binary Phase Shift Keying
BS	Base Station
BWA	Broadband Wireless Access
CID	Connection Identifier Number
CPE	Customer Premises Equipment (interchangeable with ST)
dB	Decibel
dBm	Power ratio in dB (decibel) of the measured power referenced to one milliwatt
DL	Downlink
FDD	Frequency Division Duplex

FEC	Forward Error Correction
FTP	File Transfer Protocol
GHz	Gigahertz. One GHz represents 1 billion cycles per second
HFDD	Half-Duplex FDD
Hz	Hertz
IAD	Integrated Access Device
IDU	Indoor Unit (i.e. SDA-1 Type II, SDA-4S Type II, or SDA-4S/VL Type II)
IP	Internet Protocol
ISP	Internet Service Provider
LAN	Local-Area Network
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
NLOS	Non Line-of-Sight radio propagation path
ODU	Outdoor Unit (i.e. ProST)
OFDM	Orthogonal Frequency Division Multiplexing
QAM	Quadrature Amplitude Modulation
QoS	Quality of Service, which is used to specify level of data throughput
QPSK	Quadrature Phase Shift Keying
RF	Radio Frequency
Rx	Receive
SDA-4S	Convenient term for either the SDA-4S Type II or SDA-4S/VL adapters
SF	Service Flow
SME	Small and Medium-sized Enterprise
SNMP	Simple Network Management Protocol
SNR	Signal-to-Noise Ratio
ST	Subscriber Terminal (interchangeable with CPE or SS)
TDMA:	Time Division Multiple Access. Technology for delivering digital wireless service using time-division multiplexing (TDM)
TNV:	Telecommunications Network Voltage
Tx:	Transmit
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.
VoIP	Voice over Internet Protocol

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

12.3 Revision History

Revision	Originator	Date	Description
Rev A	M. Dubb	11-2005	Initial document
Rev B	M. Falik	03-2006	Corrections & additions
Rev C	M. Falik	04-2006	Warning Removed & Additions
Rev D	M. Falik	06-2006	RSSI LED Plug
Rev E	M. Falik	07-2006	Standardize document + additions
Rev F	M. Falik	09-2006	Corrections & additions
Rev G	M. Falik	02-2007	SDA-4SVL & DC, removed PSU, corrections
Rev H	M. Falik	08-2007	Additional ranges + additions + Polyphaser info
Rev I	M. Falik	12-2007	Rosedale2 + ranges
Rev J	M.Falik	8-2008	Template change + updates
Rev J	M.Falik	2-2009	Additional ranges + additions

12.4 Contact Information

Customer Service Help-Desk for customer service emergency

Airspan Networks have introduced the Airspan Tracker application to enable prompt and efficient Customer Support services.

If you do not have an Airspan Tracker account, please obtain login credentials by filling-in the form in the main page "Register New Account".

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Feedback:

To provide feedback on this document, please send comments to the following email address: www.airspan.com