



Zinwave 2700  
Distributed Antenna System

User Manual

## Document History

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### Edition

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Issue 1.2, April 2007

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## About this guide

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This guide contains installation and operating instructions for the Zinwave 2700 Distributed Antenna System (DAS). The basic 2700 DAS consists of one Hub Unit (HU) and up to 8 Antenna Units (AU).

This guide is one member of a comprehensive documentation set for the Zinwave DAS. It is designed to provide you with a smooth, successful installation and set-up. In addition to this guide, the documentation set includes:

- Installation Guide
- System Design and Configuration (To be added later)
- Software Manual

# TABLE OF CONTENTS

Document History	2
Edition	3
Warranty	3
Technology Licenses	3
Safety Notices	3
Trademark Acknowledgements	4
About this guide	4
<b>Chapter 1 System Description</b>	<b>8</b>
1.1 Overview	8
1.2 Key features	8
1.3 Architecture	9
1.4 System Components	11
1.5 Configuration and Control	12
<b>Chapter 2 Quick Start</b>	<b>13</b>
2.1 Overview	13
2.2 Setting up the Hub Unit	13
2.3 Setting up the Antenna Units	14
2.4 Configuring the system	15
<b>Chapter 3 Equipment Description</b>	<b>17</b>
3.1 2700 Hub Unit	17
3.2 2780/2781 SFP module	24
3.3 2760 + 2765 Antenna Unit – Wideband	27
3.4 277X Antenna Unit – Band specific	36
<b>Chapter 4 Configuration and Control</b>	<b>42</b>
4.1 Overview	42
4.2 Control via ZinConfig	42
4.3 Control via Command Line Interface (CLI)	46
<b>Chapter 5 Get Assistance, if You Need It</b>	<b>54</b>
5.1 Troubleshooting the 2700 DAS	54
5.2 Device communication problems	55
5.3 Returning the System for Service	55
5.4 Warranty repair	55
5.5 Preparing the system for shipping	55
<b>Appendix A Safety and Regulatory Information</b>	<b>56</b>
A.1 Warning and caution notices	56
A.2 General safety considerations	58
A.3 Optical Safety Precautions	58
A.4 Installation, Use and Storage	58
A.5 Signal and input power	59
<b>Appendix B System Information</b>	<b>60</b>

B.1	Overview	60
B.2	ZinConfig/CLI Hardware and Software Requirements	60
B.3	System specification	61
<b>Appendix C Glossary of terms</b>		<b>67</b>
C.1	Abbreviations	67

# TABLE OF FIGURES

Figure 1-1:	Extended MMF bandwidth using the Zinwave patented technology.....	8
Figure 1-2:	Schematic of a basic 8-port 2700 system. ....	9
Figure 1-3:	Five different possibilities to distribute the input signals. ....	10
Figure 3-1:	Block diagram of the 2700 HU. ....	17
Figure 3-2:	Front View of the 2700 Hub Unit. ....	18
Figure 3-3:	Rear View of the 2700 Hub Unit. ....	18
Figure 3-4:	Hub Unit mounted into a 19" equipment rack. ....	20
Figure 3-5:	Connection of the mains cable. ....	21
Figure 3-6:	Connection of the RS232 null modem and the RJ45 Ethernet cable. ....	22
Figure 3-7:	Connecting a pair of jumper leads from a RF transceiver. ....	22
Figure 3-8:	Block diagram of the 2780/2781 SFP module. ....	24
Figure 3-9:	Picture of fully latched SFP module. ....	25
Figure 3-10:	To remove the SFP pull at the de-latch bail. ....	25
Figure 3-11:	Block diagram of the 2760 AU. ....	27
Figure 3-12:	Block diagram of the 2765 AU. ....	27
Figure 3-13:	Front view of the 2760 AU. ....	28
Figure 3-14:	Rear view of the 2760 AU. ....	29
Figure 3-15:	Front view of the 2765 AU. ....	29
Figure 3-16:	Rear view of 2765 AU. ....	30
Figure 3-17:	Mounting instructions for the 2760 AU. ....	32
Figure 3-18:	Mounting instructions for the 2765 AU. ....	33
Figure 3-19:	Connecting antenna cables to the 2760 AU. ....	33
Figure 3-20:	Connecting the DC supply unit or the PoE mains adaptor. ....	34
Figure 3-21:	Block diagram of the 277X AU. ....	36
Figure 3-22:	Front view of the 277X AU. ....	37
Figure 3-23:	Connecting the RF jumper leads on the 277X AU. ....	38
Figure 3-24:	Connecting the antenna cable to the 277X AU. ....	39
Figure 3-25:	Connecting the fiber-optic cable to the 277X AU. ....	40
Figure 3-26:	Connecting the power supply cable to the 277X AU. ....	41
Figure 4-1:	Select the IP range and the access community. ....	43
Figure 4-2:	Selecting the HU. ....	43
Figure 4-3:	Buttons for discovering AUs and updating values. ....	43
Figure 4-4:	Schematic of the HU distribution and attenuation circuit. ....	44
Figure 4-5:	Enabling the optical ports. ....	45
Figure 4-6:	Changing the AU attenuators. ....	45
Figure 4-7:	Reading out alarms on the optical link. ....	46
Figure 4-8:	Alarm description. ....	46
Figure 4-9:	Required connections for local and remote control of the 2700 DAS. ....	47
Figure 4-10:	Open a new HyperTerminal session. ....	47
Figure 4-11:	Identify the serial port on your computer. ....	48
Figure 4-12:	Adjust the serial port settings. ....	48
Figure 4-13:	Serial connection via Telnet. ....	49

# Chapter 1

## System Description

### 1.1 Overview

The Zinwave 2700 Distributed Antenna System (DAS) is a simple two-stage fiber-optic solution comprising a centrally located Hub Unit (HU) and distributed Antenna Units (AU). The Zinwave 2700 DAS is at present the only available system which provides a truly wideband solution utilizing multimode fiber (MMF). Zinwave's technology approach allows the bandwidth of in situ MMF optic cables to be extended sufficiently to conduct multiple radio frequency signals, at original carrier frequency, over long distances.

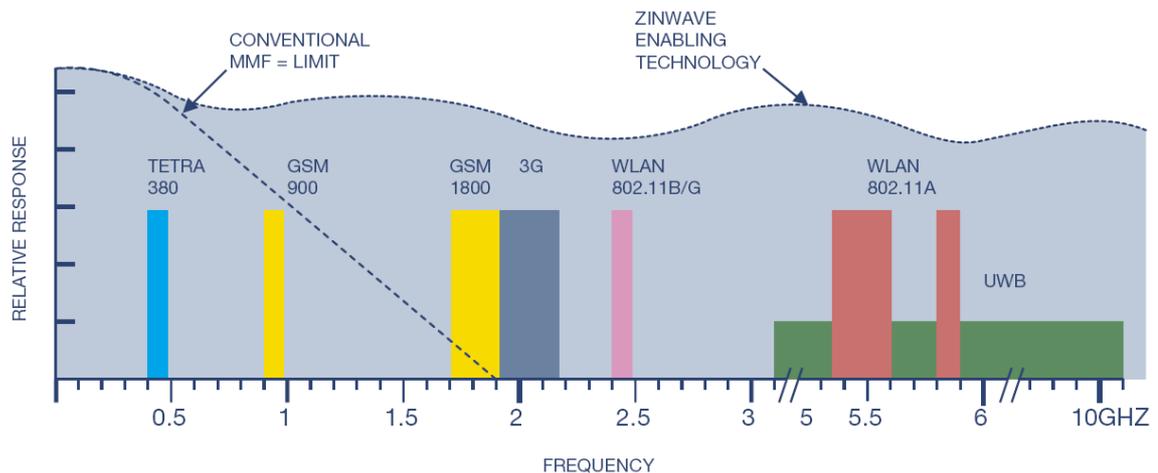


Figure 1-1: Extended MMF bandwidth using the Zinwave patented technology.

### 1.2 Key features

- Simple two-stage fiber-optic DAS: one Hub Unit (HU) distributes to eight Antenna Units (AU)
- Wide frequency range: 370 – 2500 MHz
- Only system to deliver truly broadband solution over multimode fiber (MMF)
- Minimum supported distance of 550 m over OM1, OM2 and OM3 type MMF, in excess of building wiring standard

- Minimum supported distance of 2000 m over standard SMF
- Dynamically configurable RF signal distribution
- Electronically adjustable signal levels without the need of manual handling
- Hot-pluggable optical transceivers used in HU
- SNMP and CLI based network management

## 1.3 Architecture

The 2700 DAS system is built from several basic 8-port systems. Each basic 8-port system comprises one 2700 HU and up to eight AU. The AU can be wideband (276X series), band-selective (277X series) or a combination of the two.

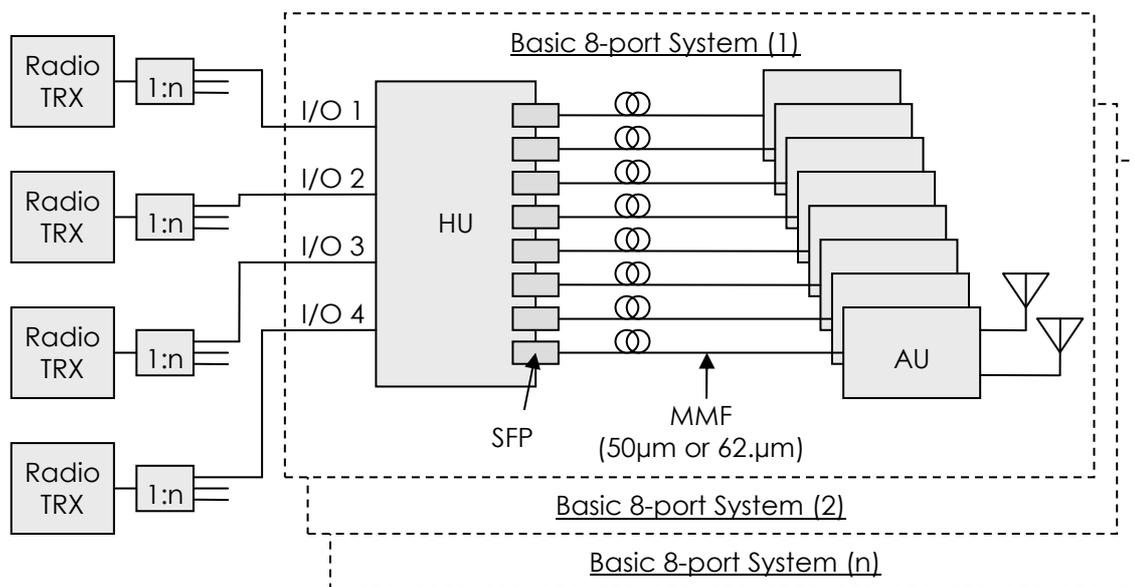


Figure 1-2: Schematic of a basic 8-port 2700 system.

Each basic 8-port system can be connected to four radio transceivers (e.g. BTS, BDA, WLAN access point). The connections are made via simplex connectors. Duplex connections can be realized through the use of external duplexers. The I/O ports are wideband and accept signals operating in the range 370 – 2500 MHz.

The HU is equipped with eight ports which accept analogue optical transceivers in the small form pluggable (SFP) form factor. While following the industry standard, these analogue SFP transceivers are proprietary to Zinwave. Ports which are not connected to an AU do not have to be equipped with an SFP module.

The SFP modules are connected to the AU via the optical fiber plant. The maximum optical link length for MMF is at least 550 m, provided that a special Zinwave patchcord is used to connect SFP and AU to the fiber plant.

In the AU the signals in both the uplink and the downlink are amplified, however without applying any complex signal processing. In the downlink direction the amplification is required to compensate for the electrical-to-optical (E/O) and optical-to-electrical (O/E) conversion losses as well as fiber attenuation. In the uplink direction the amplification is used to optimize the dynamic range of the system. The wideband AUs (276X series) are equipped with two simplex antenna connectors while the band-selective AUs (277X series) are equipped with a single duplex antenna connector.

### 1.3.1 RF Signal Distribution

In the HU a RF signal distribution circuitry is implemented which gives the flexibility to dynamically adjust the routing of radio transceivers to AU. In its default configuration the HU routes each electrical I/O port to two adjacent optical ports. By enabling a set of switches in the circuitry this distribution can be changed to simultaneously route two electrical I/O ports to four optical ports or to route all four electrical I/O ports to all eight optical ports.

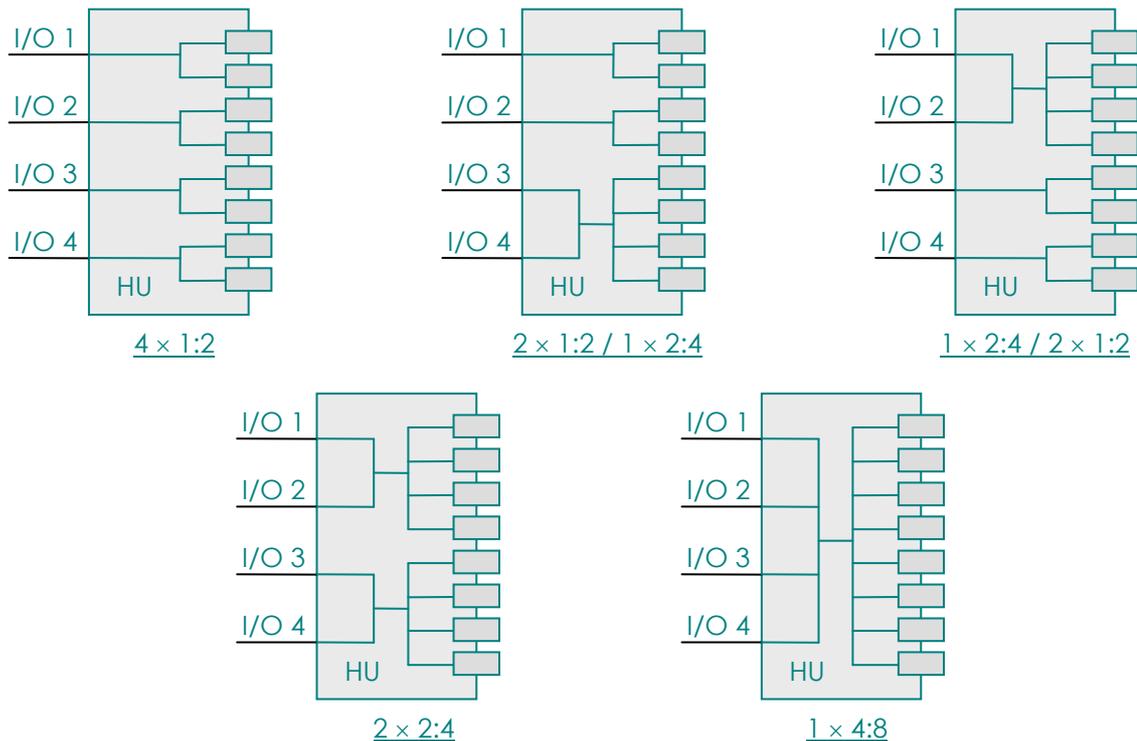


Figure 1-3: Five different possibilities to distribute the input signals.

### 1.3.2 Signal Level Control

The Zinwave 2700 DAS implements a two-stage attenuator based approach to signal level control. All attenuators are electronically switched and do not require manual handling.

A first set of attenuators is situated in the HU right at the electrical I/O ports. These attenuators are intended to balance signal power of different services such that each service covers the same area. A high frequency signal, such as UMTS or WLAN for example, requires more RF power than a PMR or GSM900 signal for the same coverage area. In addition these attenuators allow the HU to be connected to a range of radio transceivers with different output power values. A similar attenuator is provided in the uplink path which can be adjusted to establish link balance between the uplink and the downlink of the DAS.

A second set of attenuators is situated in the AU. These attenuators are intended to adjust the cell size of the specific AU and to compensate for different optical loss values. In the uplink direction the attenuator is used to trade-off cell size and minimum coupling loss (MCL).

### 1.3.3 AU Remote Setup

To simplify installation and maintenance and to enhance security, all AU are controlled remotely via the HU. This includes setting attenuator values, enabling or disabling overload protection and reading status and alarm information. Each AU can be addressed individually. The required routing information for this is obtained by following the setup-procedure after all units are connected.

## 1.4 System Components

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The Zinwave 2700 DAS consists of HU, SFP modules and wideband or band-selective AU. Apart from the band-selective AU all components cover the frequency range 370 – 2500 MHz.

### 1.4.1 Hub Unit (2700)

The Zinwave 2700 HU is a 1U high 19" rack mountable device which distributes four electrical ports to eight SFP ports. The connection to each of the four possible radio transceivers is via two simplex RF connectors (female SMA type) located at the back of the unit. The eight optical ports can be equipped with the Zinwave 2780 SFP optical transceivers. These transceivers are hot-pluggable.

The HU features a series of LED indicators on the front of the unit, indicating the status of each optical link and of the whole system. Control and network management is performed via an SNMP based GUI or via a Command Line Interface (CLI) through a direct serial (RS232) connection. The HU also acts as a master device when remotely configuring the attached AU.

### 1.4.2 SFP optical transceiver (278X)

The Zinwave 278X SFP optical transceiver comprises a directly modulated DFB laser diode operating at a wavelength of 1.3  $\mu\text{m}$  and a PIN photodiode which is capable of detecting light at this wavelength. In addition a control circuitry is implemented which is used for bias control, temperature compensation and status and alarm reporting. The SFP module can be used to connect to both single mode fiber (SMF) and multimode fiber (MMF).

The SFP module is designed to the mechanical dimensions specified in the SFP-MSA. An electronic circuitry ensures that no damage occurs when mistakenly plugging a digital SFP transceiver into one of the Zinwave SFP ports and vice versa. The SFP is equipped with an LC duplex connector which requires only half the foot-print of the traditionally used SC connector.

### 1.4.3 Wideband Antenna Units (276X series)

The Zinwave 276X series of wideband AU amplify the received optical (downlink) and wireless (uplink) signals and perform the electrical-optical conversion. The units are designed to operate in the frequency range 370 – 2500 MHz.

The 2760 AU is equipped with a SFP port which is populated with a 2781 SFP module.

The 2765 AU has integrated optics connected to a SC duplex connector on the front panel. Because of the very wide bandwidth of the unit, the AU features two simplex electrical antenna connectors (female SMA type), one for uplink and one for downlink. It is recommended that patch antennas are used with this class of AU. These units are not intended to be connected to omni-directional antennas as they do not provide sufficient transmit-receive isolation.

The wideband AU are powered via PoE (power over Ethernet) according to the IEEE 802.3af standard. Configuration of the AU is remotely via a 2700 HU. The 276X series AU are intended for mounting to a wall or a ceiling.

*Table 1-1: 276X wideband Antenna Units.*

PN	Product description	Max. Output power (composite)
2760	Wideband (370 – 2500 MHz)	+ 6 dBm
2765	Wideband (370 – 2500 MHz)	+ 12 dBm

#### 1.4.4 Band-selective Antenna Units (277X series)

The Zinwave 277X series of band-selective AU are designed to operate at certain combinations of frequency bands only. The 277X AU comprise a 276X wideband AU together with a single-, dual- or tri-band duplexer. The optical interface is identical to that of the 276X series AU. However, the 277X AU features only one duplex electrical antenna connector (female N-type).

Because of the filtering performed in the duplexer, the 277X series AU can be operated at higher composite powers than the 276X series AU and they also support installations with omni-directional antennas.

The band-selective AUs are powered via PoE (power over Ethernet) according to the IEEE 802.3af standard. Configuration of the AU is remotely via a 2700 HU. The 277X series AUs are intended for mounting to a wall, a ceiling or into a 19" rack.

*Table 1-2: 277X band selective Antenna Units.*

PN	Product description	Max Output power (composite)
2776	GSM850 & PCS 1900 (US)	+ 18 dBm GSM / + 15 dBm WCDMA & CDMA
2777	GSM900 & UMTS (Europe)	+ 18 dBm GSM / + 15 dBm WCDMA & CDMA
2778	DCS1800 & UMTS (Europe)	+ 18 dBm GSM / + 15 dBm WCDMA & CDMA

## 1.5 Configuration and Control

The 2700DAS can be remotely controlled via an Ethernet interface or locally via a serial RS232 connection on the Hub Unit. The Ethernet interface supports DHCP. The AUs are controlled through the HU interface. All settings on the system area configured through one of these interfaces, there are no manual controls on the 2700 DAS. In addition alarm and status information on a range of system parameters can be obtained and monitored.

The remote control supports SNMP V2.0. The application ZinConfig provides a graphical user interface (GUI) for the control via the Ethernet Interface.

The local command line interface (CLI) can be accessed using a terminal application such as HyperTerminal on a MS Windows based computer. Connection is via a 9 pin null- modem.

# Chapter 2

## Quick Start

### 2.1 Overview

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This chapter provides a brief overview over the steps required to setup a Zinwave 2700 DAS. For a more detailed description of each step please refer to the relevant section of this user guide.

### 2.2 Setting up the Hub Unit

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#### 2.2.1 Mount the Hub

- Mount the HU in a 19" equipment rack using the provided rack-mounting brackets and screws. Alternatively the HU can be shelf-mounted using the provided rubber feet. → section 3.1.4.1

#### 2.2.2 Connect the Hub

##### 2.2.2.1 RF

- Connect up to four RF signal sources (BTS, BDA, repeater, or WLAN access point) to the RF ports located on the back of the HU. Each RF port has two simplex SMA-female connectors, one for downlink and one for uplink. When connecting an RF signal source equipped with a duplex connector, a diplexer or circulator is required to separate uplink and downlink signals. When setting up a larger system consisting of several basic 2700 DAS, a splitter is required to feed the RF signals into each HU. → section 3.1.4.4

##### 2.2.2.2 Power and Control

- Make sure that the ON/OFF switch is in the OFF (O) position. Connect the AC power cord to the HU. Plug the AC power cord into an outlet providing AC power (110-230 V, 50-60 Hz). → section 3.1.4.2
- For local control connect an RS232 null-modem from a computer running a RS232 terminal (e.g. Microsoft → section 3.1.4.3

HyperTerminal) to the serial port (9-pin D-sub) of the HU. If no RS232 terminal is available a local connection can be established by directly connecting an Ethernet Cross-Over cable from a laptop/computer to the Ethernet port of the HU.

- For remote control connect an RJ45 patch-lead from a spare outlet of your LAN to the Ethernet port of the HU. → Section 3.1.4.3

### 2.2.2.3 Optical Fiber

→ Section 3.2.4

- Insert the required number of SFP modules into the SFP ports on the HU. Push the module firmly into the SFP port to ensure that it is fully latched.
- Connect the Zinwave fiber-optic patch-lead from the patch-panel of your fiber distribution to the SFP, making sure that both sides of the duplex connector are fully latched. The connector labeled “Equipment” connects to the HU, the connector labeled “Infrastructure” connects to the fiber distribution.
- When using MMF, ensure that the patch-leads are of the same MMF type (i.e. OM1, OM2 or OM3) as your fiber infrastructure

## 2.3 Setting up the Antenna Units

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### 2.3.1 Mount the Antennas

- Mount the antennas according to your system design plan following the manufacturer guidelines → section 3.3.4.1  
→ section 3.4.4.1

### 2.3.2 Mount the Antenna Unit

- Mount the 276X wideband AU to the ceiling or the wall in the locations identified in your system design plan using the provided brackets and screws. → section 3.3.4.2  
→ section 3.3.4.3
- Mount the 277X band-selective AUs either to a ceiling/wall or in a 19” equipment rack using the optionally available rack-mounting set. → section 3.4.4.2
- Make sure to allow enough clearance for the minimum bend radius of the coaxial and fiber cables.

### 2.3.3 Connect the Antenna Unit

#### 2.3.3.1 RF

- Connect the antennas (for the 276X AU) / antenna (for the 277X AU) to the AU using the shortest possible length of coaxial cable. Excessive cable lengths will affect the system performance. → section 3.3.4.4  
→ section 3.4.4.3

#### 2.3.3.2 Power

→ section 3.3.4.5

→ section 3.4.4.5

- Connect the mains cable of the Power-over-Ethernet PoE adaptor into an outlet providing AC power (110-230 V, 50-

- 60 Hz). A green LED on the PoE adaptor will illuminate.
- Connect the PoE adaptor (the port labeled “To Equipment”) to the RJ45 connector on the AU using a Cat5 Ethernet cable no longer than 100m. On powering up the green LED indicators on the RJ45 connector will illuminate.
- 2760 only: Alternatively the AU can be powered using the optional 48V mains adaptor. Do not connect both types of power adaptors to the AU at the same time as this may cause permanent damage to the unit.

### 2.3.3.3 Optical Fiber

→ section 3.4.4.4

- 2760 AU only: Insert the SFP module into the SFP port on the AU. Push the module firmly into the SFP port to ensure that it is fully latched.
- Connect the Zinwave fiber-optic patch-lead from the patch-panel of your fiber distribution to the SFP, making sure that both sides of the duplex connector are fully latched. The connector labeled “Equipment” connects to the HU, the connector labeled “Infrastructure” connects to the fiber distribution.
- When using MMF, ensure that the patch-leads are of the same MMF type (i.e. OM1, OM2 or OM3) as your fiber infrastructure

## 2.4 Configuring the system

### 2.4.1 Configure the network interface of the HU

- Connect to the HU through the RS232 interface using the following settings for the serial port: → section 4.3.1
  - 19200 Baud, 8 Data Bits, 1 Stop Bit, No Parity and no flow control.
- If the default network interface settings do not match your network configuration, change the IP address, the subnet mask and the gateway address of the network port using the following command line interface (CLI) commands. Each command is terminated by a carriage return. → section 4.3.3.2 → section 4.3.4.1
  - `config ip <xxx.xxx.xxx.xxx>`
  - `config netmask <xxx.xxx.xxx.xxx>`
  - `config gateway <xxx.xxx.xxx.xxx>`
- Reboot the HU using the following CLI command:
  - `reboot`

### 2.4.2 Install the ZinConfig utility tool

- Place the installation CD in your CD drive. If the installer does not start automatically, open a Windows File Explorer window, and double-click on readme.htm → section 4.2.1

### 2.4.3 Use the ZinConfig utility tool

- To launch ZinConfig double click on the desk top icon or click *Start >Programs >Zinwave->ZinConfig* → section 4.2.2
- The default community for read/write access is “private”, for read-only access is “public”. These are configured through the CLI. → section 4.3.4.2
- Specify the IP address range (Start IP address / End IP address) of your attached Hub Units and press “Find Hubs” to load them into ZinConfig. → section 4.2.3
- Select the HU which you wish to configure (and the AUs attached to it).
- Press “Discover AUs” to associate the connected AUs to the HU → section 4.2.4
- Adjust the HU signal distribution, the HU gain settings and the AU gain settings according to your system design. → section 4.2.6  
→ section 4.2.7

# Chapter 3

## Equipment Description

### 3.1 2700 Hub Unit

#### 3.1.1 Overview

The HU is a 1U high rack or shelf mountable device with four RF input ports (each port has two simplex connectors, 1 for downlink and 1 for uplink). The signals are routed from the RF I/O ports to 8 SFP ports through a dynamically configurable distribution circuit. In addition the signal amplitudes can be adjusted using 8 controllable attenuators (4 in the downlink and 4 in the uplink direction). A block diagram of the HU is shown in Figure 3-1.

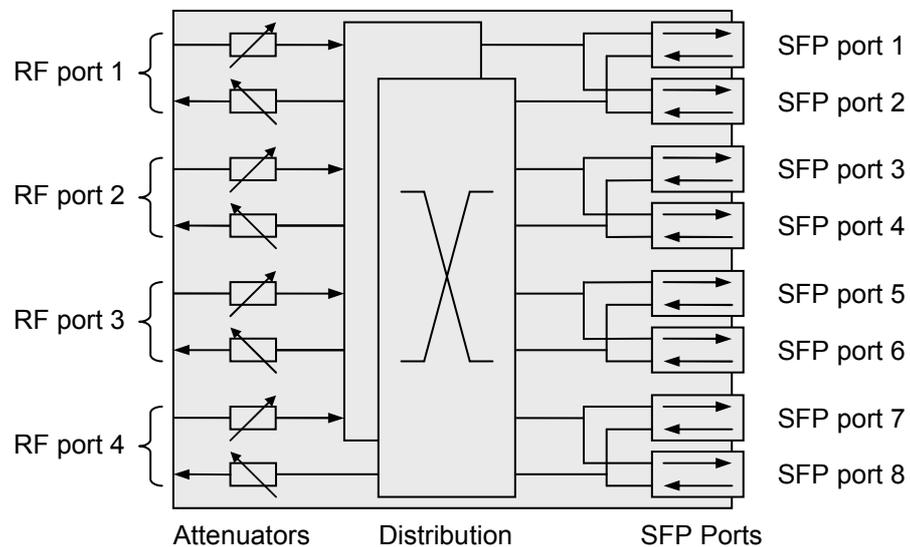


Figure 3-1: Block diagram of the 2700 HU.

#### 3.1.2 Dimensions and Weight

Dimensions and weight of the HU are listed in Table 3-1. These are for a HU not populated with SFP modules and without the rack mounting brackets attached.

Table 3-1: Dimensions and weight of the 2700 HU.

Parameter	Value	Unit
Height	4.4 (1.8)	cm (inch)
Width	44.5 (17.8)	cm (inch)
Depth	27.0 (10.6)	cm (inch)
Weight	3.5	kg

### 3.1.3 Connection panels and LED indicators

A drawing of the front view is shown in Figure 3-2. The front panel of the HU contains

- 8 SFP ports for the 2780 SFP modules
- Hub + System LED indicators for status information and alarms.
- SFP port LED indicators

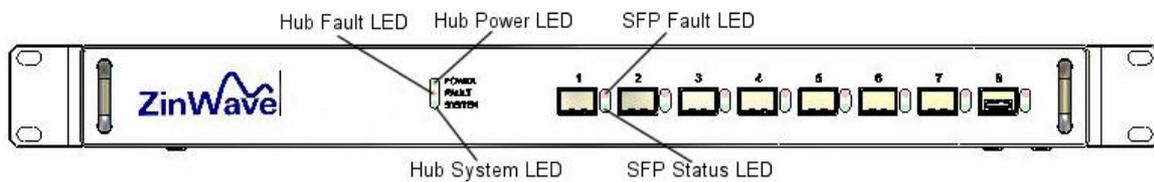


Figure 3-2: Front View of the 2700 Hub Unit.

A drawing of the rear view is shown in Figure 3-3. The back panel of the HU contains

- 8 SMA-female RF connectors (4 × downlink / 4 × uplink)
- RJ45 Ethernet port
- RS232 Serial port (9 pin sub-D)
- Mains input connector
- Fuse drawer
- ON/OFF switch
- Reset switch

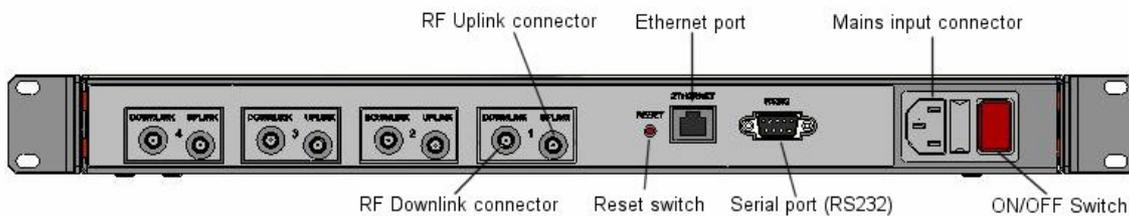


Figure 3-3: Rear View of the 2700 Hub Unit.

Following is a description of all interfaces and LED indicators of the 2700 HU.

#### Hub + System LED indicators

	Hub Power LED	indicates the power status of the HU (see Table 3-2)
	Hub Fault LED	indicates a fault in the HU (see Table 3-2)

System Status LED Indicates the status of the 2700 DAS (see Table 3-2)

### SFP ports and LED indicators

	SFP port	8 SFP ports which can be individually populated with the Zinwave 2780 SFP module.
	SFP Fault LED	indicates a fault in the fiber-optic link or a fault in the attached AU (see Table 3-3)
	SFP Status LED	Indicates the status of the SFP port (see Table 3-3)

### RF ports

	RF Uplink	4 simplex SMA-female connectors (labeled 1 to 4) located at the rear of the HU to connect to the RX port of a radio TXR.
	RF Downlink	4 simplex SMA-female connectors (labeled 1 to 4) located at the rear of the HU to connect to the TX port of a radio TRX.

### Control and Power

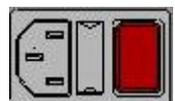
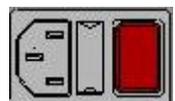
	Reset switch	Can be used to reset the HU to the factory default state (refer to Table 4-4 for a list of all default settings)
	RJ45 Ethernet port	Connects to a local area network (LAN) for remote control and management of the system
	9-pin sub-D connector	For local control of the system via a RS232 null-modem cable.
	Mains input connector	IEC connector to mains (110-240V, 50-60) including fuse tray for 2 × 2A fuses
	ON/OFF switch	(O) indicates OFF state, (I) indicates ON state

Table 3-2 lists the possible indications of the Hub and system LEDs. A description of the SFP port indicators on is provided in Table 3-3.

Table 3-2: Description of Hub + System LED indicators.

LED indicators	Description
○ Power	No power to unit
○ Fault	
○ System	
● Power	Unit operational
○ Fault	
● System	
● Power	Fault (see section 5.1.1)
● Fault	
○ System	

Table 3-3: Description of SFP port LED indicators.

LED indicators	Description
	No SFP in port or SFP disabled
	Port operational
	A fault has occurred on the optical link or the attached AU (see section 5.1.2)
	Communication to AU is active

### 3.1.4 Installation

#### 3.1.4.1 Mounting the Unit

The HU package should contain the following items:

- 1 × Hub Unit
- 2 × 19" rack mounting brackets (including screws)
- 4 × M6 screws for rack-mounting
- 4 × Rubber feet for shelf mount
- 1 × IEC mains cable

The HU can be mounted into a standard 19" equipment rack using the supplied rack mounting brackets. Mount the Hub onto the rack in the assigned equipment cabinet using the four screws supplied (Figure 3-4). If the Hub is shelf mounted ensure that the rubber feet supplied are in place to prevent blocking the ventilation holes on the underside.



Figure 3-4: Hub Unit mounted into a 19" equipment rack.

**CAUTION**

For sufficient air circulation, ensure a top and bottom clearance of 25 mm (1 ") to any other equipment.

#### 3.1.4.2 Connecting the mains cable

The specifications of the power supply unit (PSU) of the HU are listed in Table 3-4. Ensure that the ON/OFF switch is in the OFF (O) position before connecting the IEC mains cable to the Hub (Figure 3-5). Plug the mains cable into an outlet providing AC power with a voltage of 100 – 240 VAC and a frequency of 47 – 63 Hz.

Table 3-4: Power supply unit (PSU) parameters.

Parameter	Min	Typical	Max	Unit	Comment
Input voltage	100		240	VAC	
Input Frequency	47		63	Hz	
Fuse		2		A	Anti-surge
Current consumption			220	mA	
Power consumption			15	W	

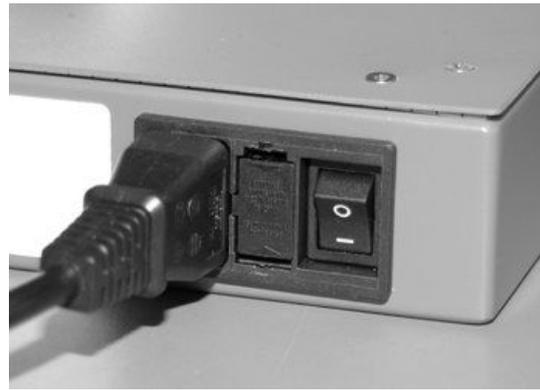


Figure 3-5: Connection of the mains cable.

### 3.1.4.3 Connecting the control cables

The 2700 DAS can be controlled locally via the serial port or remotely via the network interface (Figure 3-6). For details on controlling the 2700 DAS refer Chapter 4 of this guide. To attach the required cables to the Hub Unit follow these steps:

- **Serial Port:** The serial interface connector is a 9 pin sub-D male connector. To connect the HU directly to a computer, use a RS 232 null modem. Connect the RS232 cable to the serial connector, hand tightening the screws to prevent the connector from loosening.
- **Ethernet Port:** Connect the Ethernet port of the HU to your network using a RJ45 category 5e patch cable. For further details on how to configure the network interface refer to section 4.3.4.1 of this guide.

#### CAUTION

Before connecting the Ethernet port of the hub unit make sure that the network parameters (IP address, subnet mask, and gateway) on the HU are properly set. Failure to do so may affect the performance of the network. Contact your network administrator if necessary, for valid parameters.

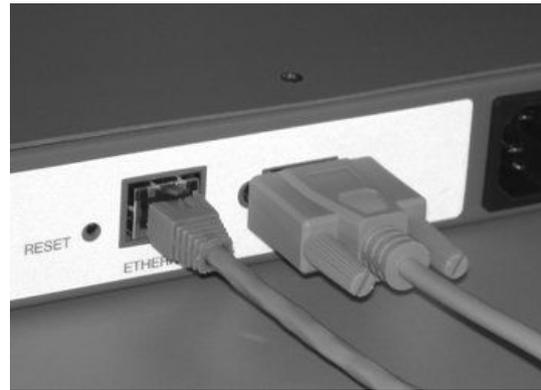


Figure 3-6: Connection of the RS232 null modem and the RJ45 Ethernet cable.

#### 3.1.4.4 Connecting the RF transceiver

Connection of the RF signal sources (e.g. BDA, BTS, WLAN access point) is via a pair of simplex SMF-female connectors per RF port. The ports are labeled 1 to 4 for connecting up to four RF transceivers. Connect the ports labeled “IN” to the transmit port of the RF transceiver (= downlink). Connect the ports labeled “OUT” to the receive ports of the RF transceivers (= uplink).

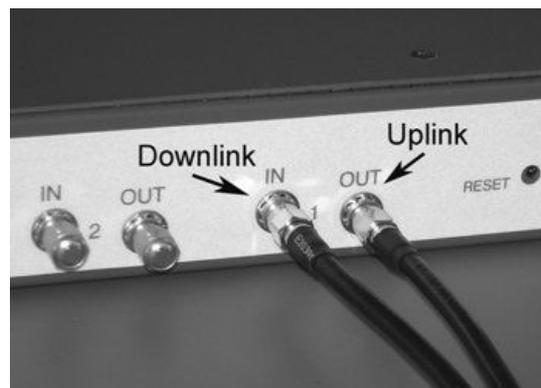


Figure 3-7: Connecting a pair of jumper leads from a RF transceiver.

As the 2700 DAS is a broadband system, the connections to the RF transceivers are via simplex connectors. In cases where the RF transceiver has a common duplex connector for uplink and downlink the signals traveling in opposite direction need to be separated. This is done with an external duplexer or circulator.

For a larger system with more than eight AU, the RF signals have to be routed to several hubs. This is achieved by inserting a passive splitting/combining circuitry.

**CAUTION** When connecting to the SMA connector on the Hub, DO NOT over tighten the connector. Use a dedicated torque wrench pre-set to 0.8 to 1.1 Nm. If a torque wrench is not available, firmly hand-tightening the connector is adequate.

**CAUTION** In the US and Canada, only the use of the Cisco® Aironet® 1200 WLAN access point (Model AIR-AP1231-A-K9) is approved for connection to the 2700 Hub Unit for providing WLAN services.

**NOTE**

Termination of the unused RF ports with a 50Ω load is not necessary. It is however recommended to set all gain control settings of the unused ports to maximum attenuation (refer to section 4.2.6.1 of this guide for directions on how to do this).

### 3.1.5 Environmental

The environmental specifications of the HU for operation and storage are listed in Table 3-5.

*Table 3-5: Environmental specifications of 2700 HU.*

Parameter	Min	Typical	Max	Unit
Temperature - Operating	0		+55	°C
Temperature - Storage	-25		+55	°C
Relative Humidity (non-condensing)	10		95	%

## 3.2 2780/2781 SFP module

### 3.2.1 Overview

The 2780/2781 small form-factor pluggable (SFP) modules are broadband components (350-2700MHz) converting electrical to optical signals (Transmit) and optical to electrical signals (Receive). A block diagram of the SFP module is shown in Figure 3-8.

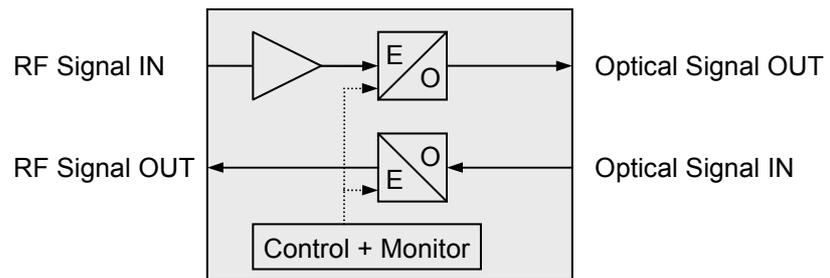


Figure 3-8: Block diagram of the 2780/2781 SFP module.

The electrical input signal is amplified before it is modulated onto the optical carrier wave. The optical input signal is directly routed to the electrical connector. A micro controller is included for control and monitoring purpose.

The 2780 SFP is designed to be used in the 2700 Hub Unit. The 2781 SFP is designed to be used in the 2760 Antenna Unit. While the modules are identical in their design they differ in the rated operating temperature range.

**CAUTION** Electrostatic discharge (ESD) preventative measures (i.e. wrist straps, use of ESD protective bags) should be taken when storing, transporting and handling SFPs as voltages in excess of 50V can cause damage to the device.

**NOTE** The 2780 and 2781 SFP have an identical form factor. Make sure to insert the 2780 only in the 2700 HU and the 2781 only in the 2760 AU.

### 3.2.2 Dimensions and Weight

The physical design of the 2780/2781 SFP module follows the design of standard digital SFP transceivers as outlined in the SFP Multi-Source Agreement (MSA).

Table 3-6: Physical parameter of the 2780/2781 SFP modules.

Parameter	Value	Unit
Height	0.85 (0.33)	cm (inch)
Width	1.37 (0.54)	cm (inch)
Length	5.65 (2.22)	cm (inch)
Weight	40	g

### 3.2.3 Ports

#### 3.2.3.1 Electrical port

The electrical connection of the SFP is via a push-fit 20-pin connector located at the rear of the module.

#### 3.2.3.2 Optical port

The optical port on the SFP module is LC duplex (according to IEC 61754-20). Looking from the front, the optical transmit port is on the left hand side and the optical receive port is on the right hand side.

#### **WARNING**

Optical emission can damage your eye-sight. DO NOT look directly into the transmit port of an active SFP module.

### 3.2.4 Installation

The SFP is a hot pluggable module. To install the SFP in the HU or the AU, the unit does NOT need to be powered down. The remaining system remains completely operational and unaffected by plugging or un-plugging a module into an SFP port.

To insert the SFP, hold the module by the metal body and slide it into the designated HU/AU port. An audible click can be heard when the SFP is fully latched. Ensure that the de-latch bail is in the upright position (this prevents accidental unlatching of the module).

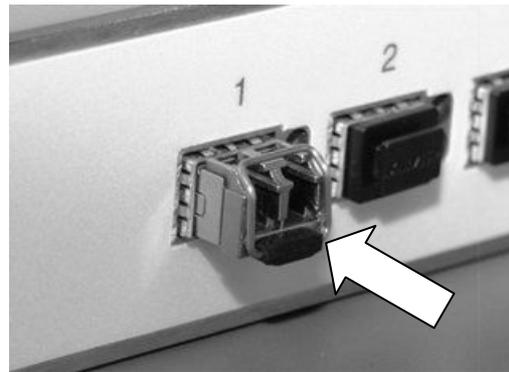


Figure 3-9: Picture of fully latched SFP module.

Removal of the SFP is achieved by extending the de-latch bail and pulling it away from the unit.

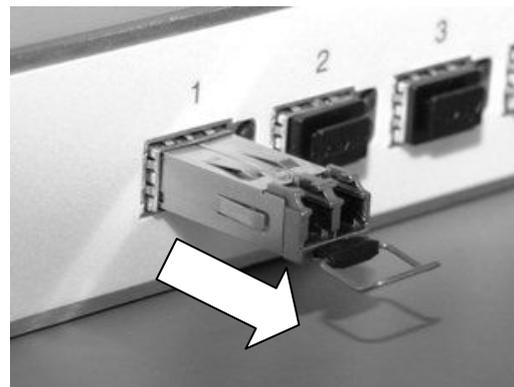


Figure 3-10: To remove the SFP pull at the de-latch bail.

### 3.2.5 Environmental

*Table 3-7: Environmental specifications of 2780 SFP module (designed for the 2700 Hub Unit).*

Parameter	Min	Typical	Max	Unit
Temperature - Operating	0		+85	°C
Temperature - Storage	-25		+55	°C
Relative Humidity (non-condensing)	10		95	%

*Table 3-8: Environmental specifications of 2781 SFP module (designed for the 2760 Antenna Unit).*

Parameter	Min	Typical	Max	Unit
Temperature - Operating	0		+55	°C
Temperature - Storage	-25		+55	°C
Relative Humidity (non-condensing)	10		95	%

### 3.3 2760 + 2765 Antenna Unit – Wideband

#### 3.3.1 Overview

- The 2760/2765 AUs are small wall- or ceiling mountable units which amplify the received optical signals for transmission over a wireless link (in the case of the downlink signals) and amplify the received wireless signals for transmission over the optical link (in the case of the uplink signals).
- The 2760 AU utilizes the 2781 SFP optical transceiver for the electrical-optical signal conversion. The 2765 AU utilizes an integrated optical transceiver which is not pluggable.
- Because of the wide bandwidth of the units (370 – 2500 MHz) separate wideband antennas are required for Transmit and Receive.
- Adjustable gain settings allow you to define the coverage area of each AU individually. Control of the AU is remotely via the HU. These are controlled remotely via the Hub Unit.
- The 2760 AU can be powered via a 48 V DC supply or Power-over-Ethernet (PoE). The 2765 is powered only via PoE.

Figure 3-11 and Figure 3-12 show a block diagram of the 2760 and 2765 AU, respectively.

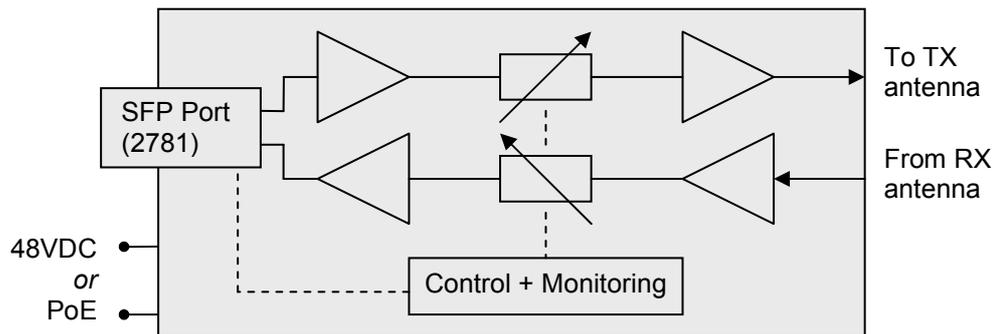


Figure 3-11: Block diagram of the 2760 AU.

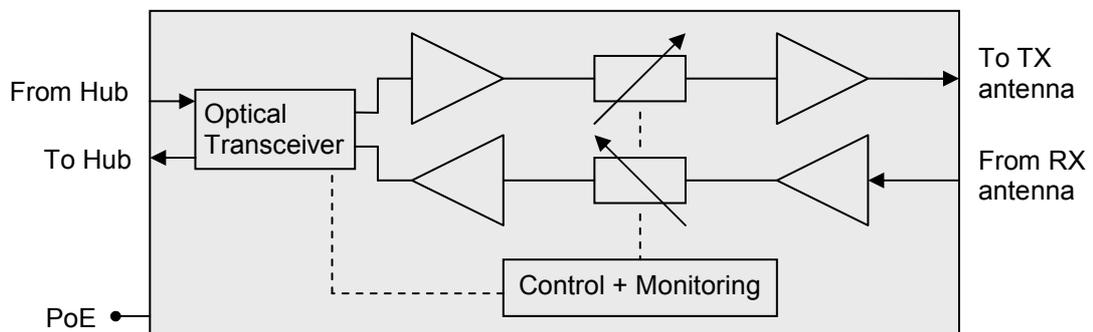


Figure 3-12: Block diagram of the 2765 AU.

### 3.3.2 Dimensions and Weight

Dimensions and weight listed in Table 3-9 are for an AU without the optional cover.

*Table 3-9: Dimensions and weight of the 2760 + 2765 AU.*

Parameter	2760	2765	Unit
Height	21.5 (8.5)	20.0 (8.0)	cm (inch)
Width	13.0 (5.125)	12.0 (4.75)	cm (inch)
Depth	4.5 (1.8)	6.0 (2.4)	cm (inch)
Weight	0.75	0.75	kg

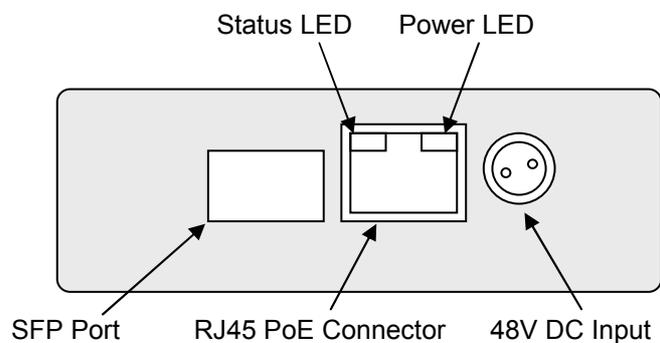
### 3.3.3 Connection panels and LED indicators

#### 3.3.3.1 2760 AU

A drawing of the front view is shown in

Figure 3-13. The front panel of the AU contains:

- SFP port for the 2781 SFP module
- RJ45 connector for powering via Power-over-Ethernet (PoE, IEEE 802.3af)
- 2-pin 48VDC input for powering via AC/DC
- Status LED, incorporated in the RJ45 connector
- Power LED, incorporated in the RJ45 connector



*Figure 3-13: Front view of the 2760 AU.*

A drawing of the rear view is shown in Figure 3-14. The rear panel of the AU contains

- 2 SMA-female RF connectors, one for TX and one for RX

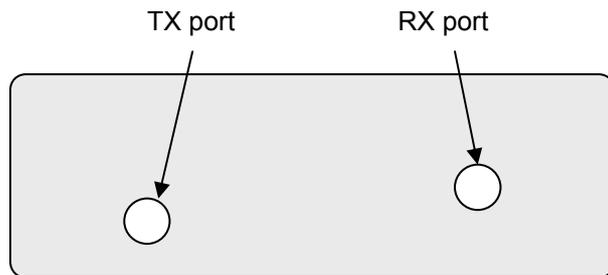


Figure 3-14: Rear view of the 2760 AU.

Following is a description of all interfaces and LED indicators of the 2760 AU.

#### Optical and Electrical I/O ports

SFP port	SFP port which can be populated with the Zinwave 2781 SFP module.
RF ports	Two simplex wideband (370 – 2500 MHz) SMA-female connectors, one for TX (downlink) and one for RX (uplink)

#### Powering and LED indicators

48 VDC Input	2-pin latching connector (LEMO, EGG.00.302.CLL) for powering via the DC mains adapter
PoE Connector	RJ45 connector for powering via PoE
Status LED	Indicates the status of the AU (see Table 3-10)
Power LED	Indicates the power state of the AU (see Table 3-10)

### 3.3.3.2 2765 AU

A drawing of the front view is shown in Figure 3-13. The front panel of the AU contains

- RJ45 connector for powering via Power-over-Ethernet (PoE, IEEE 802.3af)
- Status LED, incorporated in the RJ45 connector
- Power LED, incorporated in the RJ45 connector



Figure 3-15: Front view of the 2765 AU.

A drawing of the rear view is shown in Figure 3-14. The rear panel of the AU contains

- 2 SMA-female RF connectors, one for TX and one for RX
- Optical Duplex SC connector

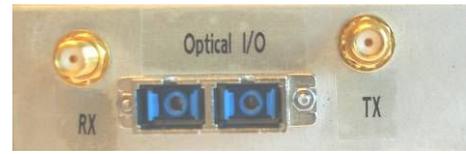


Figure 3-16: Rear view of 2765 AU.

Following is a description of all interfaces and LED indicators of the 2765 AU.

#### Optical and Electrical I/O ports



Duplex SC connector

Optical port which connects to the fiber-infrastructure.



RF ports

Two simplex wideband (370 – 2500 MHz) SMA-female connectors, one for TX (downlink) and one for RX (uplink)

#### Powering and LED indicators

PoE Connector

RJ45 connector for powering via PoE

Status LED

Indicates the status of the AU (see Table 3-10)

Power LED

Indicates the power state of the AU (see Table 3-10)

### 3.3.3.3 LED indications

Table 3-10 lists the possible indications of the Antenna Unit LEDs.

Table 3-10: Description of Antenna Unit LED indicators.

LED indicators	Description
	No power to unit
	Unit powered but optical connection not active
	Unit operational and optical connection active
	Status LED Communication to Hub Unit is active blinking

## 3.3.4 Installation

### 3.3.4.1 Mounting the Antennas

Prior to mounting the Antenna Unit, mount the Transmit and Receive antennas following your system installation plan in the assigned locations. Follow the antenna manufacturer guidelines to do so.

Transmit and receive antennas need to be separated to improve the required antenna isolation of 35dB. Lower antenna isolation leads to increased blocking and uplink noise figure. The use of directional antennas is recommended to improve this antenna isolation.

---

**CAUTION** The antenna must be installed / positioned at a distance of greater than 20 cm away from the proximity of operators and intended operators.

---

### 3.3.4.2 Mounting the 2760 Antenna Unit

The 2760 AU package should contain the following items:

- 1 × 2760 AU
- 1 × Mounting bracket
- 1 × 2781 SFP module
- 1 × PoE converter (incl. mains cable and 1m Cat5 Ethernet cable) (optional)
- 1 × 48V PSU (incl. mains cable) (optional)

The Antenna Unit can be mounted to a ceiling or a wall or any horizontal or vertical flat surface using the provided mounting bracket.

Choose the Antenna Unit position following these guidelines:

- Mount the Antenna Unit as close as possible to the relevant Transmit and Receive antenna such that the minimum length of coaxial cable is required to connect the AU to the antennas. Excessive coaxial cable lengths will reduce the available signal power and increase the uplink noise figure.
- Allow space above and below the unit for adequate ventilation and to accommodate the minimum bend radius for the coaxial and fiber cables according to Figure 3-17
- The position of the Antenna Unit should provide sufficient air circulation

Prepare the Antenna Unit for mounting following these steps:

- Push the SFP module firmly into the SFP port, ensuring that it is fully latched. Do not remove the dust-cover at this stage.
- Attach the Antenna Unit cover (optional) to the Antenna Unit using the four provided M4 screws.

Mount the Antenna Unit to the identified location following these steps:

- To attach the mounting bracket, drill four holes into the wall, using the dimensions shown in Figure 3-17.
- Secure the mounting bracket using 4 countersunk M3 screws (not provided)
- For vertical mounting: Slide the Antenna Unit onto the mounting bracket with the RF ports pointing downwards
- For horizontal mounting: Slide the Antenna Unit onto the mounting bracket with either the RF ports or the SFP port pointing forward. Ensure that the Antenna Unit latches on the mounting bracket.

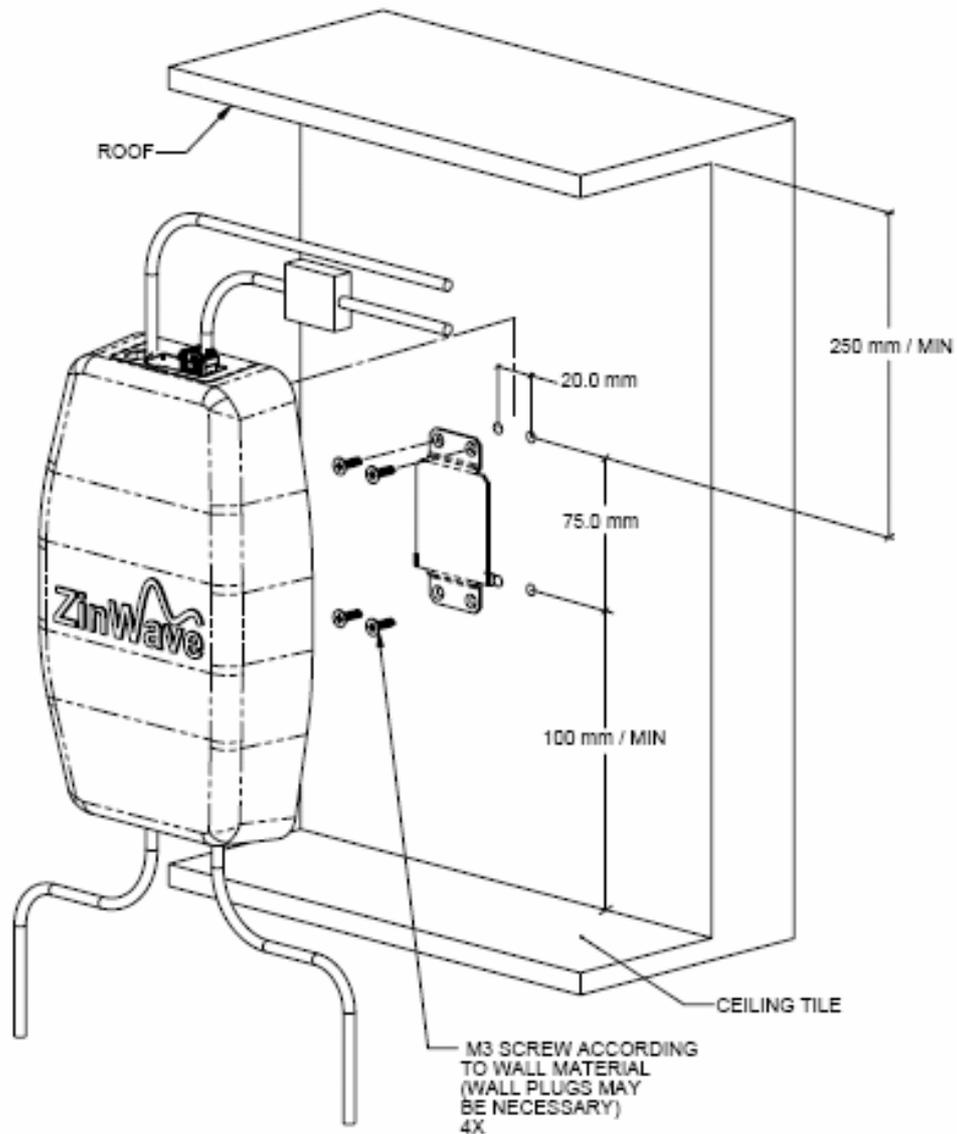


Figure 3-17: Mounting instructions for the 2760 AU.

### 3.3.4.3 Mounting the 2765 Antenna Unit

The 2765 AU package should contain the following items:

- 1 × 2765 AU
- 1 × PoE converter (incl. mains cable and 1m Cat5 Ethernet cable) (optional)

The Antenna Unit can be mounted to a ceiling or a wall or any horizontal or vertical flat surface.

Chose the Antenna Unit position following these guidelines:

- Mount the Antenna Unit as close as possible to the relevant Transmit and Receive antenna such that the minimum length of coaxial cable is required to connect the AU to the antennas. Excessive coaxial cable lengths will reduce the available signal power and increase the uplink noise figure.

- Allow space above and below the unit for adequate ventilation and to accommodate the minimum bend radius for the coaxial and fiber cables
- The position of the Antenna Unit should provide sufficient air circulation

Mount the Antenna Unit to the identified location following these steps:

- To attach the AU, drill four holes into the wall, using the dimensions shown in Figure 3-18.
- Secure the AU using 4 countersunk M4 screws (not provided)

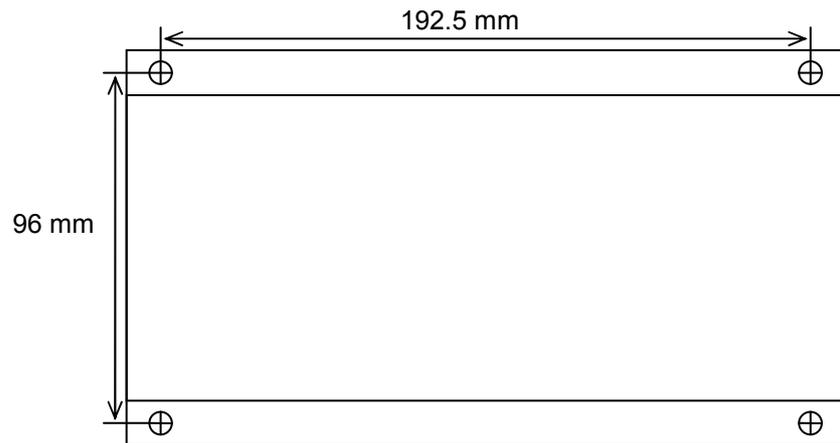


Figure 3-18: Mounting instructions for the 2765 AU.

### 3.3.4.4 Connecting the antennas to the AU

Connect the antennas to the AU, using low loss coaxial cables. The downlink port (TX) of the AU connects to the TX antenna and the uplink port (RX) of the AU connects to the RX antenna.

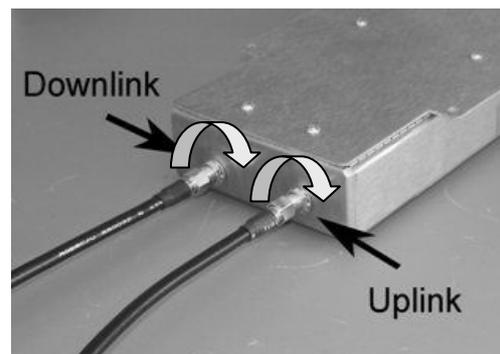


Figure 3-19: Connecting antenna cables to the 2760 AU.

#### **CAUTION**

When connecting to the SMA connectors on the Antenna Unit, DO NOT over-tighten the connectors. Use a dedicated torque wrench pre-set to 0.8 to 1.1 Nm. If a torque wrench is not available, firmly hand-tightening the connector is adequate.

### 3.3.4.5 Connecting the Power Supply Unit

The 2760 AU can be powered by an external 48V DC power supply or by Power over Ethernet (PoE) (Figure 3-20). The 2765 AU can be powered only by PoE. To connect the power supply to the AU, follow these steps:

- Using an external 48VDC power supply unit (optional).
  - Mount the PSU next to the Antenna Unit using the provided brackets with the IEC mains connector facing downwards
  - Connect the mains cable from the PSU to an outlet providing 110 – 250 V, 50 – 60 Hz AC power.
  - Connect the DC cable of the PSU to the 2-pin latching input of the Antenna Unit
  
- By Power over Ethernet. (PoE) using an IEEE802.3af compliant PoE injector.
  - Using the IEEE 802.3af PoE protocol the PoE injector can be connected to the Antenna Unit with a Cat5 Ethernet cable of up to 100 m length. This can be beneficial in situations where it is difficult to provide AC power near the Antenna Unit location
  - Install the PSU in a suited location, making sure that adequate air circulation is provided.
  - Connect the Cat5 Ethernet cable to the connector labeled “To Network Jack” on the PoE injector.
  - Connect the other end of the Ethernet cable to the RJ45 connector on the Antenna Unit.

**CAUTION**

Connecting more than one source of power at a time to any single 2760 AU can cause permanent damage to the unit.



Figure 3-20: Connecting the DC supply unit or the PoE mains adaptor.

Table 3-11: DC Power Supply Unit (PSU) characteristics.

Parameter	Min	Typical	Max	Unit	Comment
Power supply voltage	40		48	V	
Power supply frequency		DC		-	
Power consumption			3	W	

### 3.3.5 Environmental

Table 3-12: Environmental specifications of 2760 + 2765 Antenna Unit.

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Parameter	Min	Typical	Max	Unit
Temperature - Operating	0		+45	°C
Temperature - Storage	-25		+55	°C
Relative Humidity (non-condensing)	10		95	%

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## 3.4 277X Antenna Unit – Band specific

### 3.4.1 Overview

- The 277X AUs are 3U high wall, ceiling or rack mountable units which amplify the received optical signals for transmission over a wireless link (in the case of the downlink signals) and amplify the received wireless signals for transmission over the optical link (in the case of the uplink signals).
- The 277X AUs utilize the 2765 wideband AU in its core together with a band-specific duplexer to suppress undesired frequency bands.
- Because of the integrated duplexer, a single antenna is required for both transmit and receive.
- Adjustable gain settings allow you to define the coverage area of each AU individually. Control of the AU is remotely via the HU. These are controlled remotely via the Hub Unit.
- The 277X AUs are powered via IEEE 802.3af compliant Power over Ethernet (PoE).

Figure 3-21 show a block diagram of the 277X AU.

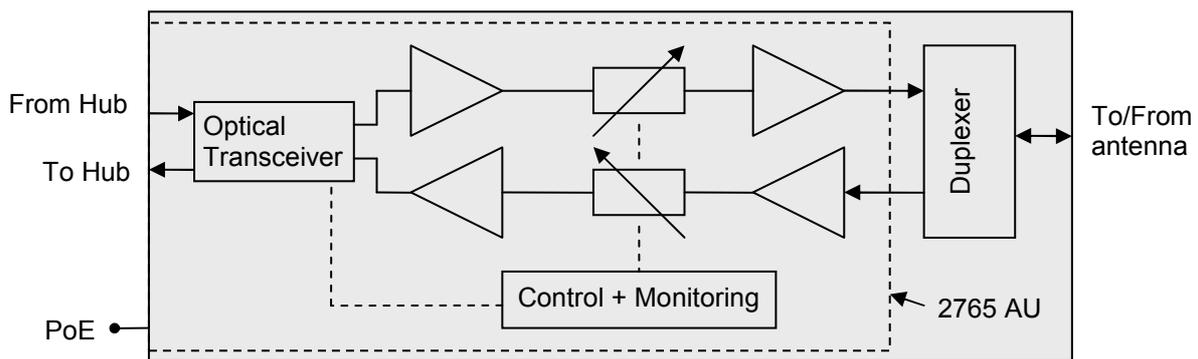


Figure 3-21: Block diagram of the 277X AU.

### 3.4.2 Dimensions and Weight

Dimensions and weight listed in Table 3-13 are for an AU without the optional 19" rack mounting kit.

Table 3-13: Dimensions and weight of the 277X AU.

Parameter	277X	Unit
Height	12.0 (4.75)	cm (inch)
Width	37.0 (14.5)	cm (inch)
Depth	26.0 (10.25)	cm (inch)
Weight	5.3	kg

### 3.4.3 Connection panels and LED indicators

A drawing of the front view of the 277X AU is shown Figure 3-22. The front panel of the AU contains

- Optical I/O
- RJ45 connector for powering via Power-over-Ethernet (PoE, IEEE 802.3af)
- N-type (female) antenna connector
- 4 SMA (female) connectors for semi-rigid jumper cables

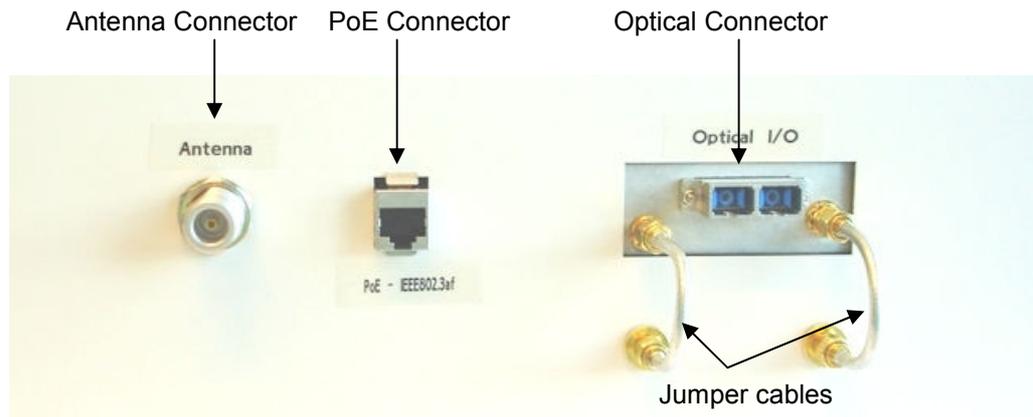


Figure 3-22: Front view of the 277X AU.

The 277X AU rear panel does not contain any interfaces

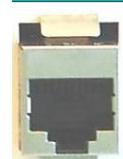
The 277X AU does not contain any LED indicators.

Following is a description of all interfaces of the 277X AU.

#### Optical and Electrical I/O ports

	Duplex SC connector	Optical port which connects to the fiber-infrastructure.
	RF port	Duplex N-type (female ) connector
	DL Jumpers	Connects the DL output of the integrated 2765 AU to the duplexer
	UL Jumpers	Connects the UL input of the integrated 2765 AU to the duplexer

#### Powering

	PoE Connector	RJ45 connector for powering via PoE
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## 3.4.4 Installation

### 3.4.4.1 Mounting the Antenna

Prior to mounting the Antenna Unit, mount the antenna following your system installation plan in the assigned locations. Follow the antenna manufacturer guidelines to do so.

**CAUTION** The antenna must be installed / positioned at a distance of greater than 20 cm away from the proximity of operators and intended operators.

### 3.4.4.2 Mounting the 277X Antenna Unit

The 277X AU package should contain the following items:

- 1 × 277X AU
- 2 × SMA (male) – SMA (male) jumper cables
- 1 × PoE converter (incl. mains cable and 1m Cat5 Ethernet cable) – optional
- 1 × 19" equipment rack mounting kit (shelf and screws) – optional

Connect the SMA (male) – SMA (male) jumper cables to the provided SMA (female) ports on the 277X (Figure 3-23).



Figure 3-23: Connecting the RF jumper leads on the 277X AU.

**NOTE** Once connected, do not remove the jumper leads as they are required for the functioning of the 277X Antenna Unit.

The Antenna Unit can be mounted to a ceiling or a wall or any horizontal or vertical flat surface. Alternatively the AU can be installed in a 19" equipment rack using the optional mounting kit.

For ceiling or wall mounting, chose the Antenna Unit position following these guidelines:

- Mount the Antenna Unit as close as possible to the relevant antenna such that the minimum length of coaxial cable is required to connect the AU to the antenna. Excessive coaxial cable lengths will reduce the available signal power and increase the uplink noise figure.
- Allow space above and below the unit for adequate ventilation and to accommodate the minimum bend radius for the coaxial and fiber cables

- The position of the Antenna Unit should provide sufficient air circulation

For mounting in a 19" equipment rack, chose the Antenna Unit position following these guidelines:

- Locate free space in the rack of 3U height
- Use a location which allows for minimum coaxial cable length to connect the antenna

Follow the following steps to mount the AU in a 19" equipment rack using the rack mounting kit (optional)

- Attach the 277X AU to the shelf using the 4 provided screws.
- Place the shelf into the rack and secure with the 4 provided screws

### 3.4.4.3 Connecting the Antenna to the AU

Connect the antenna to the AU, using low loss coaxial cables. If the antenna cable is terminated with a connector other than N-type (male) on the AU end, use an appropriate connector adaptor.

When connecting an N-type connector, firmly hand-tightening is adequate.

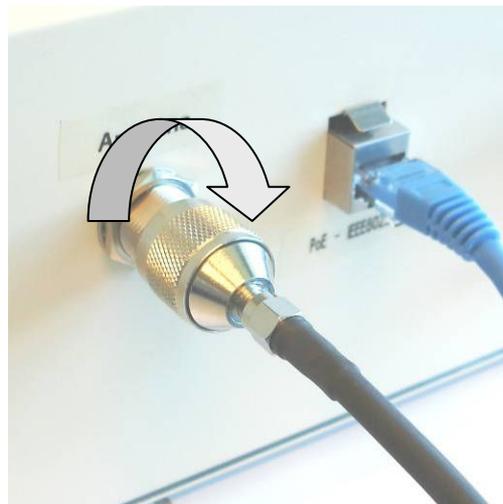


Figure 3-24: Connecting the antenna cable to the 277X AU.

### 3.4.4.4 Connecting the Optical Fiber

- When using MMF, connect the 277X AU to the fiber-infrastructure using the special Zinwave patch-cord. Connecting to the fiber-infrastructure without the special patch-cord will lead to a poor quality optical link and reduced maximum transmission distance.
- Connect the patch-cord end with the SMF (yellow) and MMF (orange or grey) cords to the AU. Connect the patch-cord end with the two MMF (both cables either orange or grey) cords to the fiber infrastructure.
- The SC connectors are keyed with a slot and will thus only fit in one (i.e. the correct) direction.
- Insert the SC duplex connector into the optical I/O port on the AU and press it firmly into place, making sure that both sides of the connector are securely latched (indicated by a "clicking" sound)

Follow these guidelines when using fiber-optic cabling:

- Do not remove the dust-caps on both the equipment and the optical fiber until required – they're there for a reason
- Before connecting, clean the facet of the connectors with a lint-free tissue
- Always make sure that all optical connectors are securely latched
- Do not bend the optical fiber below a radius of 3 cm

**NOTE**

Failure to follow these guidelines may result in a poor quality optical link or in a complete link failure

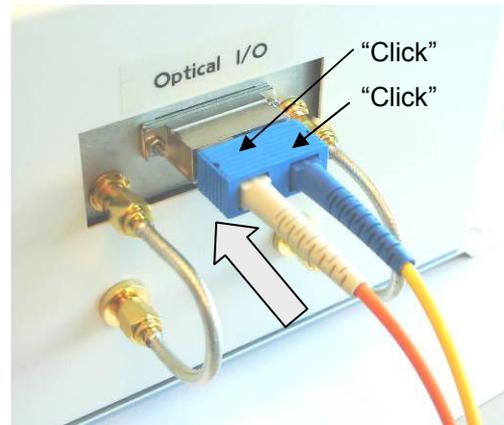


Figure 3-25: Connecting the fiber-optic cable to the 277X AU.

### 3.4.4.5 Connecting the Power Supply Unit

- Using the IEEE 802.3af PoE protocol the PoE injector can be connected to the Antenna Unit with a Cat5 Ethernet cable of up to 100 m length. This can be beneficial in situations where it is difficult to provide AC power near the Antenna Unit location
- Install the PSU in a suited location, making sure that adequate air circulation is provided.
- Connect the Cat5 Ethernet cable to the connector labeled “To Network Jack” on the PoE injector.
- Connect the other end of the Ethernet cable to the RJ45 connector on the Antenna Unit.

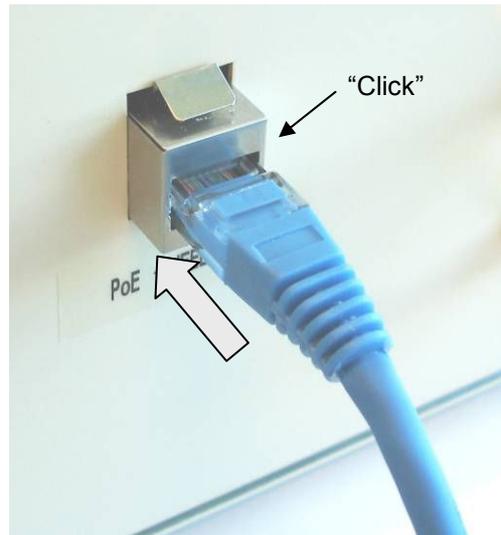


Figure 3-26: Connecting the power supply cable to the 277X AU.

### 3.4.5 Environmental

Table 3-14: Environmental specifications of the 277X Antenna Unit.

Parameter	Min	Typical	Max	Unit
Temperature - Operating	0		+45	°C
Temperature - Storage	-25		+55	°C
Relative Humidity (non-condensing)	10		95	%

# Chapter 4

## Configuration and Control

### 4.1 Overview

---

The 2700 DAS can be configured and controlled either via a command line interface (CLI) or using SNMP (Simple Network Management Protocol). Control of the system with the CLI gives the same functionality as with the SNMP. Please refer to the [Zinwave 2700 DAS – Software Manual](#) for a detailed description of all the commands available through the CLI.

### 4.2 Control via ZinConfig

---

ZinConfig is an application based on the SNMP. It has a graphical user interface (GUI) and can be used to control the most important aspects of the 2700 DAS.

#### 4.2.1 Installing the Software

Place the installation CD in your CD drive. If the installer does not start automatically, open a Windows File Explorer window, and double-click on readme.htm.

#### 4.2.2 Starting the software

To launch ZinConfig double click on the desk top icon or click *Start->Programs->Zinwave->ZinConfig*.

### 4.2.3 Identifying Hubs

Enter the start and end IP address range of the attached Hubs and click on the “Find Hubs” button (Figure 4-1). All detected Hubs will be displayed showing their IP address and description (Figure 4-2). Selecting a Hub from the list will reveal its settings.

Use the “Community” field as defined in section 4.3.4.2 if you wish read-only or read-write access. This field is required for communication with the HU.

Refer to section 4.3.3.2 for a list of all default settings of the HU.



Figure 4-1: Select the IP range and the access community.

	IP Address	Description
1	10.10.10.10	ZinWave 2700 DAS Hub
2		
3		
4		

Figure 4-2: Selecting the HU.

**NOTE** The attached Hubs need to be on the same IP subnet in order to be detected by ZinConfig. If this is not the case refer to section 4.3.4.1 of this guide for changing the network settings on the HU.

### 4.2.4 Enabling control of the attached AUs

If the attached AUs are not displayed, use the “Discover AUs” button to detect all attached AUs (Figure 4-3). This process can take up to 1 minute. During the execution of this command do not connect/disconnect any of the optical cables.



Figure 4-3: Buttons for discovering AUs and updating values.

**NOTE** Control of the attached AUs is not possible without first running the “Discover AUs” command.

### 4.2.5 Updating values

- Values are changed by selecting the new value from the drop-down list or by checking/unchecking the check-boxes.
- When “Auto-update” is enabled, the values are updated immediately. In this case the “Send Changes” button is disabled.

- When “Auto-update” is disabled, the values are only updated after pressing “Send changes” (Figure 4-3).
- “Refresh” reads the current configuration from the 2700 system (Figure 4-3). Changes in the GUI that haven’t been updated will be lost.

## 4.2.6 Controlling the Hub Unit

Figure 4-4 shows a schematic of the 2700 HU with the downlink input attenuators (DL) and uplink output attenuators (UL). Also shown is the distribution circuitry.

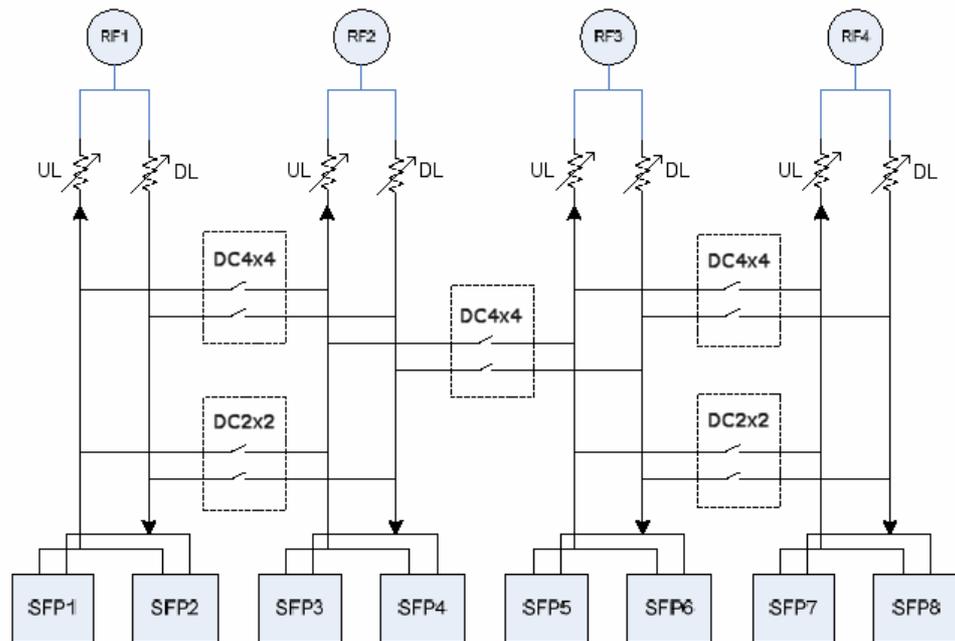


Figure 4-4: Schematic of the HU distribution and attenuation circuit

### 4.2.6.1 Setting the attenuation values

The values which can be selected on the GUI represent attenuation values by which the gain of the HU can be reduced.

#### NOTE

The attenuation setting on the HU does not correspond with the actual gain of the unit.

The downlink (DL) and uplink (UL) attenuators for the HU can be selected using the drop down lists. The range of permitted values is 5 – 31 dB for all attenuators in steps of 1 dB.

### 4.2.6.2 Setting the RF signal distribution

- Without any of the distribution switches enabled, RF1 port is connected to SFP ports 1 & 2, RF2 to SFP ports 3 & 4, RF3 to SFP ports 5 & 6 and RF4 to SFP ports 7 & 8, as shown in Figure 4-4
- RF ports 1 and 2 can be cross-connected simultaneously to SFP ports 1 – 4 by ticking the DC2x2 box. RF 3 and 4 can be cross-connected in the same manner to SFP ports 5 – 8.
- Ticking the DC4x4 box will cross-connect all four RF ports to all eight SFP/AU ports.

### 4.2.6.3 Enabling/Disabling the optical ports

Active SFP ports are shown green, inactive ports are grayed out and red indicates an alarm condition. SFP ports can be enabled/disabled by right clicking on the SFP port and selecting the required option from the pop-up menu (Figure 4-5).

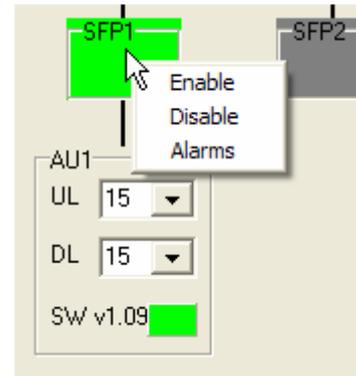


Figure 4-5: Enabling the optical ports.

**NOTE** Disabling a port will result in the attached AU not transmitting or receiving any signal.

## 4.2.7 Controlling the Antenna Unit

The changeable parameters in the AU are the downlink and uplink attenuators and downlink and uplink gain controls.

### 4.2.7.1 Setting the attenuation values

The values which can be selected on the GUI represent attenuation values by which the gain of the AU can be reduced.

The downlink (DL) and uplink (UL) attenuators for the AU can be selected using the drop down lists. The range of permitted values is 5 – 31 dB for all attenuators in steps of 1 dB (Figure 4-6).

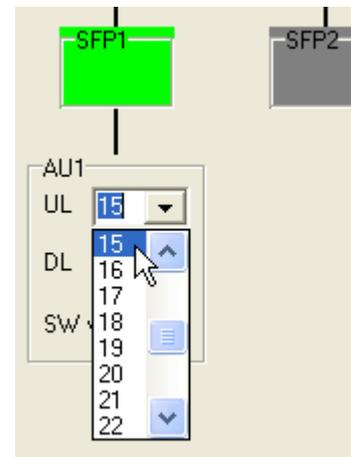


Figure 4-6: Changing the AU attenuators.

**NOTE** The attenuation setting on the AU does not correspond to the actual gain of the unit.

## 4.2.8 Status and Alarms

When an alarm is present, the SFP port or the status box in the AU frame is colored red. Status and alarm information is displayed by left-clicking on one of the colored boxes. Alternatively status information on the SFP ports can be displayed by right-clicking on the SFP port and selecting “Alarms” from the pop-up menu (Figure 4-7).

Clicking on one of the SFP ports displays information on the HU SFP. Clicking on the colored box in the AU frame displays information on the AU optical transceiver

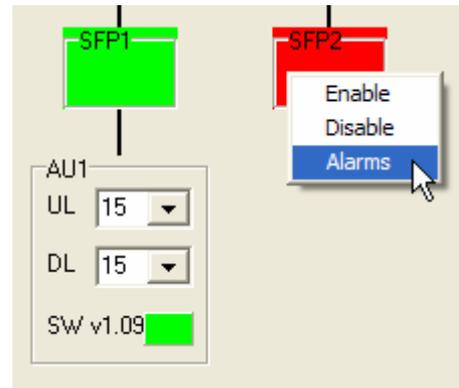


Figure 4-7: Reading out alarms on the optical link.

A box will appear describing the alarm if present together with a range of status information (Figure 4-8). The displayed parameters are:

- RX optical power
- TX optical power
- Laser bias current
- SFP supply voltage
- SFP temperature

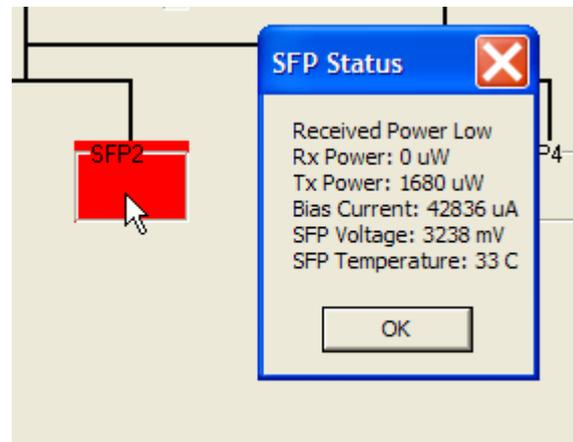


Figure 4-8: Alarm description.

## 4.3 Control via Command Line Interface (CLI)

A detailed description of the full CLI functionality can be found in [Zinwave 2700 DAS – Software Manual](#).

The CLI can be accessed directly with an RS-232 serial connection, or remotely through a network using the Telnet protocol.

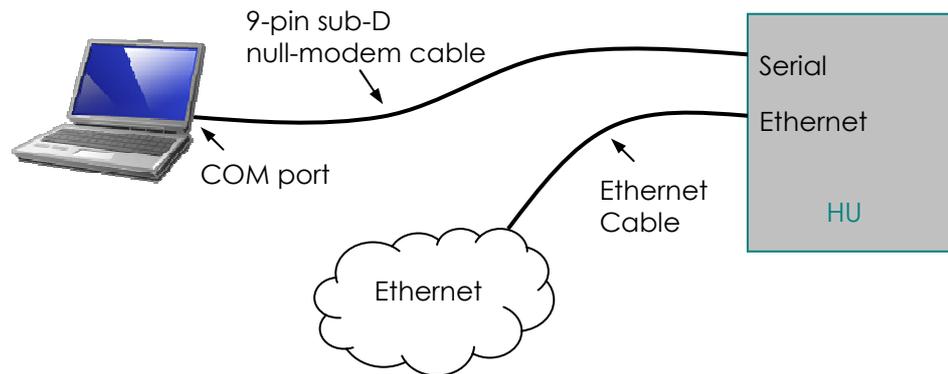


Figure 4-9: Required connections for local and remote control of the 2700 DAS.

### 4.3.1 Connecting to the CLI via RS232

This section describes how to access the CLI via the RS232 protocol using the Microsoft Windows based HyperTerminal application. The setup using a different terminal emulation application is likely to be very similar.

The serial port on the HU is configured as DTE (Data Terminal Equipment). When the HU is directly connected to the serial port of a computer (which is another DTE), a null modem has to be used. Follow these steps to establish a RS232 connection:

- Connect your laptop/PC via the null modem cable to the hub unit.
- Run HyperTerminal. This application can be found under *Start → All Programs → Accessories → Communications → HyperTerminal*. After entering a descriptive name for the connection click OK to proceed.



Figure 4-10 Open a new HyperTerminal session.

- Select the serial port of your laptop or PC. Typically this is the COM1 port. Press OK to continue.



Figure 4-11: Identify the serial port on your computer.

- Adjust the parameters of the serial connection according to the values listed in table 3-1. Clicking OK stores these settings under the name defined in step 1 and a connection to the Hub Unit is established.

Parameter	Value
Baud rate	19200
Data bits	8
Parity	None
Stop bits	1
Flow control	None

Table 4-1: Serial port settings.

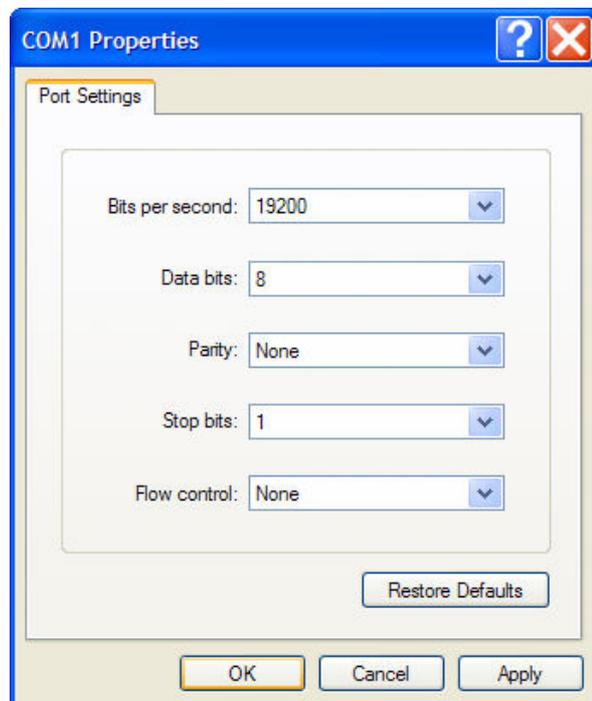


Figure 4-12: Adjust the serial port settings.

## 4.3.2 Connecting to the CLI via Telnet

When a network connection to the HU is available, the CLI can be accessed via the Telnet protocol. On a Windows based laptop/PC Telnet can be started via *Start* → *Run...* → *telnet*).

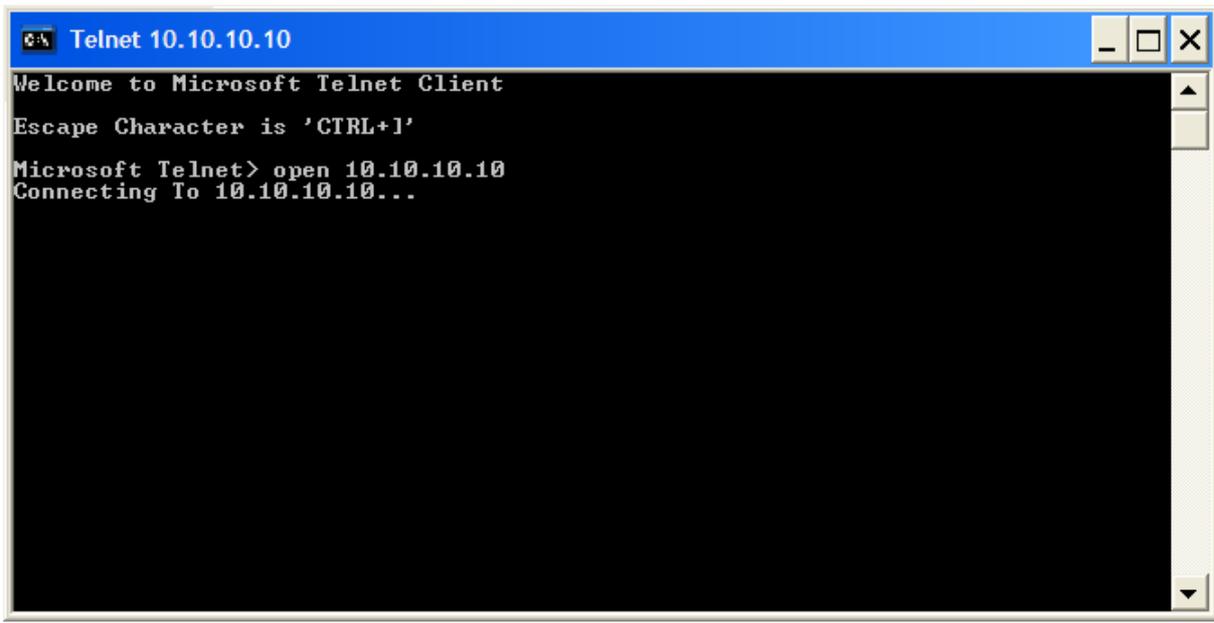


Figure 4-13: Serial connection via Telnet.

To open a connection to the hub unit type “*open <ip address>*” where <ip address> should be replaced by the IP address of the HU.

A password is required to access the CLI using Telnet. If this is not known or if the HU cannot be accessed, use the local RS232 interface to change the password or to adjust the network settings.

### NOTE

The factory set password of the hub unit is “*password*”.

## 4.3.3 CLI Commands

### 4.3.3.1 Overview

Table 3-2 shows a list of all available CLI commands. This list can be generated by typing the command “?” in the CLI. This chapter briefly introduces those commands most important to set up the 2700 DAS. A more detailed description of all commands can be found the [Zinwave 2770 DAS – Software Manual](#).

Table 4-2: Overview of CLI commands for control of the HU.

Hub Commands	Description	Type
<i>dli</i> a <1-4> <0-31>	Downlink Input Attenuation	R/W
<i>ulo</i> a <1-4> <0-31>	Uplink Output Attenuation	R/W
<i>dc</i> 22 <1-2> <1/0>	Distribution Circuits(2x2)	R/W
<i>dc</i> 44 <1/0>	Distribution Circuit (4x4)	R/W

Hub Commands	Description	Type
<code>default</code>	Set default values and reboot	W
<code>discover</code>	Discover AUs	W
<code>sfpdis &lt;1-8&gt; &lt;1/0&gt;</code>	SFP Enable/Disable	R/W
<code>reID &lt;au1-au8&gt;</code>	Set the active remote AU	R/W
<code>config &lt;IP/GATEWAY/NETMASK/ USR/PSWD (Telnet) / TRAPIP/TRAPPORT / R_COMMUNITY / RW_COMMUNITY&gt;</code>	Misc. configuration	R/W
<code>alarm &lt;1-8&gt;</code>	SFP Alarm Status	R
<code>version</code>	Software / Hardware / SFP Version	R
<code>help</code>	Display help information	R
<code>reboot</code>	Reboot the system	W

*Table 4-3: Overview of CLI commands for control of the AU*

Antenna Unit Command	Description	Type
<code>++dla &lt;0-31&gt;</code>	Downlink Attenuation	R/W
<code>++ula &lt;0-31&gt;</code>	Uplink Attenuation	R/W
<code>++dle &lt;1/0&gt;</code>	Enable/disable downlink gain control	R/W
<code>++ule &lt;1/0&gt;</code>	Enable/disable uplink gain control	R/W
<code>++dflt</code>	Set default values	W
<code>++alarm</code>	AU alarm status	R
<code>++version</code>	Software Version	R

Commands are executed on typing a carriage return. Settings can be queried by replacing the last value with a “>” sign. The CLI is case in-sensitive.

#### EXAMPLE

The command “`sfpdis 5 1`” disables the SFP module plugged into SFP port #5. This setting can be queried using the command “`sfpdis 5 >`”. The command “`sfpdis >`” returns the settings for all eight SFP ports #1 – #8.

The values of all settings in the factory default state and after execution of the “`default`” command are listed in Table 4-4.

#### 4.3.3.2 Default settings

The default settings are loaded when installing a new HU or AU. The unit can be reset to this factory default state using the “`default`” command (for the Hub Unit) or the “`++dflt`” command (for the Antenna Unit).

*Table 4-4: Factory default state of the HU*

Hub Parameter	Description	Default value
<code>dla &lt;1-4&gt;</code>	Downlink Input Attenuation	31

Hub Parameter	Description	Default value
<code>uloa &lt;1-4&gt;</code>	Uplink Output Attenuation	31
<code>dc22 &lt;1-2&gt;</code>	Distribution Circuits(2x2)	Disabled
<code>dc44 &lt;1/0&gt;</code>	Distribution Circuit (4x4)	Disabled
<code>sfpdis &lt;1-8&gt;</code>	SFP Enable/Disable	Disabled
<code>ReID &lt;au1-au8&gt;</code>	Set the active remote AU	AU1
<code>config IP</code>	IP address of the HU	10.10.10.10
<code>config GATEWAY</code>	IP address of the gateway	10.10.10.1
<code>config NETMASK</code>	Subnet mask	255.255.255.0
<code>config USR</code>	Administrator username	'admin'
<code>config PSWD(Telnet)</code>	Administrator password	'password'
<code>config TRAPIP</code>	IP address to which SNMP traps are sent	0.0.0.0
<code>config TRAPPORT</code>	Port number to which SNMP traps are sent	162
<code>config R_COMMUNITY</code>	Read-only community string	'public'
<code>config RW_COMMUNITY&gt;</code>	Read-write community string	'private'

*Table 4-5: Factory default state of the AU*

Hub Parameter	Description	Default value
<code>dla</code>	Downlink Attenuation	15
<code>ula</code>	Uplink Attenuation	15
<code>dle</code>	Downlink Gain Control	Disabled
<code>ule</code>	Uplink Gain Control	Disabled

## 4.3.4 Controlling the HU (2700)

Commands to control the HU are typed directly into the HyperTerminal application window as listed in Table 4-2.

### 4.3.4.1 Configuring the network interface manually

Setup the network interface of the HU using the “`config`” command. Make sure that the subnet mask matches that of your network and that the IP address is not already assigned to another device.

#### EXAMPLE

To configure the network interface with an IP address of 10.10.10.2, a subnet-mask of 255.255.255.0 and a gateway address of 10.10.10.1 use the following commands:

```
“config ip 10.10.10.2”
“config netmask 255.255.255.0”
“config gateway 10.10.10.1”.
```

#### 4.3.4.2 Configuring the network interface via DHCP

The network interface can be configured to obtain the relevant parameters via DHCP (Dynamic Host Configuration Protocol). DHCP is enabled by setting the IP address of the HU to 0.0.0.0. This will cause the HU to request IP address, subnet mask and gateway address from a DHCP server.

#### 4.3.4.3 Configuring Communities

Communities define the user groups for SNMP with read-only access to the system or with read-write access. Define these communities using the “`config`” command.

##### EXAMPLE

To designate the read-only community “readonly” and the read-write community “readwrite” use the following commands:

```
“CONFIG R_COMMUNITY readonly”
“config RW_COMMUNITY readwrite”.
```

#### 4.3.4.4 Setting the Signal Distribution

The routing of the RF signals in the HU is controlled via the commands “`dc22`” and “`dc44`”. As described in section 4.2.6, five different routing combinations are possible. The command “`dc22 1`” addresses the switch combining RF ports 1 & 2 onto the SFP ports 1 – 4. The command “`dc22 2`” addresses the switch combining RF ports 2 & 3 onto the SFP ports 5 – 8. The command “`dc44`” addresses the switch coupling the two other switches in order to combine all four RF ports onto all eight SFP ports. The commands required to set all viable distributions are listed in Table 4-6.

Table 4-6: Setting the RF distribution.

Distribution	Command 1	Command 2	Command 3
1x2 / 1x2 / 1x2 / 1x2	<code>dc22 1 0</code>	<code>dc22 2 0</code>	<code>dc44 0</code>
2x4 / 1x2 / 1x2	<code>dc22 1 1</code>	<code>dc22 2 0</code>	<code>dc44 0</code>
1x2 / 1x2 / 2x4	<code>dc22 1 0</code>	<code>dc22 2 1</code>	<code>dc44 0</code>
2x4 / 2x4	<code>dc22 1 1</code>	<code>dc22 2 1</code>	<code>dc44 0</code>
4x8	<code>dc22 1 1</code>	<code>dc22 2 1</code>	<code>dc44 1</code>

##### EXAMPLE

The three commands “`dc22 1 1`”, “`dc22 2 1`” and “`dc44 1`” entered sequentially set the HU to full distribution where all input RF signals are present at all eight SFP ports.

#### 4.3.4.5 Setting the Attenuator Values in the Hub Unit

The attenuators in the HU are controlled using the “`DLIA`” (DownLink Input Attenuator) and the “`ULOA`” (UpLink Output Attenuator) commands for the downlink and the uplink, respectively. The first parameter selects the RF I/O while the second parameter specifies the required attenuation value.

##### EXAMPLE

The commands “`uloa 2 15`” sets the uplink output attenuator of RF I/O # 2 to 15dB.

## 4.3.5 Enabling Communication to Antenna Units

### 4.3.5.1 Auto configuration

In order to be able to communicate with the attached AUs, the HU requires information on their unique identifiers (MID-numbers). This information is collected via the command `discover`.

---

**NOTE** Control of the attached AUs is not possible without first running the discover command.

---

### 4.3.5.2 Manually adding AUs

If for some reason the `discover` command is not executed successfully the AUs can be manually added to the system configuration. For this you need the unique identifier of the AU, the MID number. This is an 8-digit hexadecimal (0-9, A-F) number and can be found on the AU label. The AU is added using the `+addau` command.

---

**EXAMPLE** The command `+addau 1 10F54D9A` adds the AU with the MID 10F54D9A to the SFP port 1.

---

Adding the same AU to another SFP port deletes the old entry. Multiple entries of the same MID are not possible.

## 4.3.6 Controlling the AU (276X and 277X)

Commands preceded by ++ are Antenna Unit commands and routed to the currently active AU. AUs are activated using the REID command. On activating a new AU its current settings are displayed.

---

**EXAMPLE** The command `reid au3` activates the AU connected to the SFP port # 3. All commands preceded by `++` are now directed to this AU.

---

### 4.3.6.1 Setting the Attenuator Values in the Antenna Unit

The attenuators in the AU are controlled using the `++dla` (DownLink Attenuator) and the `++ula` (UpLink Attenuator) commands for the downlink and the uplink, respectively. Before using this command, make sure that the correct AU is active.

---

**EXAMPLE** To set the attenuation of the AU which is connected to SFP port # 7 to 3 dB, the AU has to be activated using the command `reid au7`. Then the attenuation setting can be changed using the command `++dla 3`.

---

# Chapter 5

## Get Assistance, if You Need It

### 5.1 Troubleshooting the 2700 DAS

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#### 5.1.1 Hub Unit (HU) main LED Indicators

Condition	Green Power LED	Red Fault LED	Green System LED
No power to unit	Off	Off	Off
Unit operational	On	Off	On
Fault	On	On	Off

The red fault LED indicates the occurrence of a fault condition in the system. Use the ZinConfig tool (see section 4.2) to determine the source of the fault.

#### 5.1.2 Hub Unit SFP port indicators

Condition	Green Status LED	Red Fault LED
No SFP in port	Off	Off
Port disabled	Off	Off
Port operational	On	Off
Data activity / communicating	Flashing	Off
Fault in Fiber or AU	Off	On

The red fault LED indicates the occurrence of a fault condition in the optical link or one of the attached AUs. Use the ZinConfig tool (see section 4.2) to determine the source of the fault.

### 5.1.3 2760 + 2765 Wideband Antenna Unit

Condition	Green Status LED	Green Power LED
No power to unit	Off	Off
Unit operational	On	On
Data activity / communicating	Flashing	On
Fault in Fiber or Hub	Off	On

### 5.1.4 277X Antenna Unit

There are no LED indicators located on the front or rear panel of the 277X AU.

## 5.2 Device communication problems

### 5.2.1 Network Connection

- The IP address on the Hub is incorrectly configured
- The computer used for control & monitoring and the Hub Unit are not on the same subnet.
- Your firewall may block the SNMP traffic

### 5.2.2 Serial Connection

- The Hub or a device connected to a serial port is not powered on.
- The Hub has a defective interface cable.
- The serial port has no device connected to it.
- The Hub is communicating at the wrong baud rate.
- The Hub itself is defective.

## 5.3 Returning the System for Service

Contact equipment vendor.

## 5.4 Warranty repair

Contact equipment vendor.

## 5.5 Preparing the system for shipping

Use suitable packaging to same standard as original packaging. Include Returns Material Authorization (RMA).

# Appendix A

## Safety and Regulatory Information

This appendix contains important warnings and cautions for hardware products that comprise the 2700 DAS system.

### A.1 Warning and caution notices

---

**WARNING** If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection is intact) only. No operator serviceable parts are inside this system. Refer servicing to an authorized Zinwave Ltd service center. To prevent electrical shock, do not remove the covers.

---

**NOTE** **2700 Hub unit.** This device complies with Part 15 of the FCC rules for provision of WLAN services when connected to a Cisco® Aironet® 1200 WLAN access point (model AIR AP1231G-A-K9). Operation is subject to the following conditions:

- This device may not cause harmful interference, and
- The device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by Zinwave Ltd could void the user's authority to operate the equipment.

---

**NOTE** **2760 Antenna Unit.** This device complies with Part 15, Part 22, Part 24 and Part 90 of the FCC rules. Changes or modifications not expressly approved by Zinwave Ltd could void the user's authority to operate the equipment.

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**NOTE** **2765 Antenna Unit.** This device complies with Part 15, Part 22, Part 24 and Part 90 of the FCC rules. Changes or modifications not expressly approved by Zinwave Ltd could void the user's authority to operate the equipment.

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**NOTE**

**2776 Antenna Unit.** This device complies with Part 22 and Part 24 of the FCC rules. Changes or modifications not expressly approved by Zinwave Ltd could void the user's authority to operate the equipment.

---

## A.2 General safety considerations

---

The installation of electrical supplies in support of Zinwave 2700 DAS products shall be in accordance with national and local regulations.

Other aspects of the installation of Zinwave 2700 DAS products and interconnecting cabling shall be in accordance with the following standards:

### A.2.1 Cabling installation

- EN 50174 series: Information technology – Cabling installation

### A.2.2 Optical safety

- IEC 60825-2: Safety of laser products - Part 2: Safety of optical fiber communication systems (OFCS).

### A.2.3 RF exposure

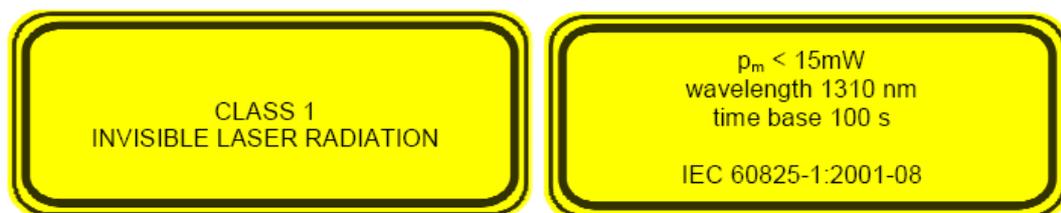
#### **CAUTION**

This equipment complies with FCC radiation exposure limits set forth for an occupational/ controlled environment. This equipment should be operated with a minimum distance of 20cm between radiator and your body.

---

## A.3 Optical Safety Precautions

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- Do not stare with unprotected eyes at the connector ends of the fiber or the ports of the SFP. Do not remove the Fiber Port dust covers unless the port is in use. Do not stare directly into a Fiber Port.
- Cover any unconnected fiber ends with an approved cap.
- Do not stare with unprotected eyes at any broken ends of the fiber.
- Use only approved methods for cleaning optical fiber connectors.
- Do not make any unauthorized modifications to this fiber optical system.
- No warning signs are required as it is a Class 1 hazard.
- Use Class 1 test equipment.

## A.4 Installation, Use and Storage

---

The Zinwave 2700 DAS is designed to operate in conditions conformant with Pollution Degree 2 as defined in IEC 60950 (the normal environmental class for offices).

The installation of sub-assemblies into the main units of the Zinwave 2700 DAS shall only be undertaken if precautions required by IEC/TS 61340-5-1 have been taken.

This covers:

- the installation of Zinwave 2780 SFP optical fiber transceiver modules into the Zinwave 2700 Hub Unit,
- the replacement of the Zinwave 2781 SFP optical fiber transceiver modules in the Zinwave 2760 Antenna Unit.

**WARNING**

CLASS I PLUGGABLE EQUIPMENT TYPE A as defined in IEC 60950. This equipment is intended for connection to other equipment or a network, relies on connection to protective earth and must be connected to an earthed mains socket-outlet.

Country specific warnings:

Finland "Laitte on liitettävä suojamaadoituskoskettimilla varustettuun pistorasiaan "

Norway "Apparatet må tilkoples jordet stikkontakt"

Sweden "Apparaten skall anslutas till jordat uttag"

## A.5 Signal and input power

**CAUTION**

The input power to the 2700 Hub Unit should not exceed +10 dBm. Power levels greater than +20 dBm will damage the unit

**CAUTION**

The input power to the Zinwave Antenna Unit Hub (2760 / 2765 / 277X) should not exceed -15 dBm. Power levels greater than 0 dBm will damage the unit

**CAUTION**

The total broadband composite output power is limited to +6dBm (2760) / + 12dBm (2765) / +18dBm (277X).

# Appendix B

## System Information

### B.1 Overview

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This appendix provides you with hardware specifications, options, and part numbers for the following.

- 2700 Hub Unit
- 2760 wideband AU
- 2765 wideband AU
- 2776 band-specific AU (GSM850 / PCS1900)
- 2777 band-specific AU (GSM900 / UMTS)
- 2778 band-specific AU (DCS1800 / UMTS)

### B.2 ZinConfig/CLI Hardware and Software Requirements

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The following are the recommended minimum computer requirements

- Windows 2000 or XP operating system
- 1 RS-232 DB9 serial port or external serial adaptor
- 10BASE-T Ethernet port or faster
- 10 megabytes free hard disk space
- 800 x 600 display resolution
- CD-ROM drive (for software installation)

## B.3 System specification

### B.3.1 Channel transmission performance

Parameter	Value		Unit	Comments
	Min.	Nom. Max.		
Input impedance	50		Ohms	At HU service & AU uplink inputs
Output impedance	50		Ohms	At HU service & AU downlink outputs
Operating Temperature Range	0	+55	°C	Ambient, non-condensing
Channel length - MMF	1	550	m	OM1 (62.5/125 $\mu\text{m}^1$ ), OM2, OM3 (both 50/125 $\mu\text{m}$ )
Channel insertion loss - MMF	0	4	dB	@ 1300 nm, includes fiber attenuation and connector losses
Channel length - SMF	1	2000	m	
Channel insertion loss - SMF	0	4	dB	@ 1310 nm, includes fiber attenuation and connector losses
TX-RX Isolation <sup>2</sup>	30		dB	HU service input to service output (same service)
TX-RX Isolation <sup>2</sup>	70		dB	HU service input to any other service output
TX-TX Isolation <sup>2</sup>	70		dB	HU service input to any other service input
Antenna Isolation	35		dB	AU antenna output to AU antenna input

NOTE 1: Minimum modal bandwidth @ 1300 nm = 500 MHz·km. Reduced channel lengths/insertion loss values may be supportable for lower modal bandwidth options following detailed analysis by Zinwave.

NOTE 2: At max HU RF input power, max AU RF output power, maximum uplink noise figure and for any RF combiner distribution

### B.3.2 System Downlink RF parameters

Parameter	Value		Unit	Comments
	Min.	Nom. Max.		
System Bandwidth → 2760/2765 AU → 2776 AU	370 869-894	2500 1930-1990	MHZ MHZ	Wideband Unit Dual band GSM850 / PCS1900

Parameter	Value		Unit	Comments
	Min.	Max.		
→ 2777 AU	925-960	2110-2170	MHz	Dual band GSM900 / UMTS
→ 2778 AU	1805-1880	2110-2170	MHz	Dual band DCS1800 / UMTS
RF input power	-5	0	dBm	At HU service input with 14dB peak-average-ratio
RF output power				
→ 2760 AU		+6	dBm	Broadband RMS composite power at AU antenna output
→ 2765 AU		+12	dBm	Broadband RMS composite power at AU antenna output
→ 2776 AU		+18	dBm	CW power (+15 dBm composite for W-CDMA & CDMA)
→ 2777 AU		+18	dBm	CW power (+15 dBm composite for W-CDMA & CDMA)
→ 2778 AU		+18	dBm	CW power (+15 dBm composite for W-CDMA & CDMA)
VSWR		1.5:1		
Return loss		14	dB	
Response variation	-5	+5	dB	Full bandwidth
Response variation	-1	+1	dB	Any 5 MHz band
Response variation	-2	+2	dB	Any 100 MHz band

### B.3.3 System Uplink RF parameters

Parameter	Value		Unit	Comments
	Min.	Max.		
System Bandwidth				
→ 2760/2765 AU	370	2500	MHz	Wideband Unit
→ 2776 AU	824-849	1850-1919	MHz	Dual band GSM850 / PCS1900
→ 2777 AU	880-915	1920-1980	MHz	Dual band GSM900 / UMTS
→ 2778 AU	1710-1785	1920-1980	MHz	Dual band DCS1800 / UMTS
RF input power – operation		-15	dBm	Input gain adjustment for minimum coupling loss
RF input power – absolute max		0	dBm	Exceeding this value can result in permanent damage to the unit.

Parameter	Value		Unit	Comments
	Min.	Max.		
Max RF output power	-20	-10	dBm	At HU service output for 1dB compression with maximum AU input power
Response variation	-5	+5	dB	Full bandwidth
Response variation	-1	+1	dB	Any 5 MHz band
Response variation	-2	+2	dB	Any 100 MHz band

### B.3.4 Zinwave 2700 Hub Unit physical parameters

Parameter	Value		Unit	Comments
	Min.	Max.		
Height	44 (1.8)		mm (in)	
Width	445 (17.5)		mm (in)	
Depth	270 (10.6)		mm (in)	
Weight	3.5		kg	
Mains power voltage	100	250	VAC	
Mains power frequency	50	60	Hz	
Mains power consumption		15	W	
Mains power interface	1		-	IEC Socket
RF interfaces	8		-	SMA female (separate TX and RX providing 4 RF I/O pairs)
Optical interfaces	-	8	-	Using Zinwave 2780 SFP modules
Control interfaces	1		-	IEC 60603-7 (RJ-45) 10BASE-T
Control interfaces	1		-	9-pin D connector (RS232 - CLI)
Temperature - operating	0	+55	°C	
Temperature - storage	-25	+55	°C	

### B.3.5 Zinwave 2780 + 2781 SFP module physical parameters

Parameter	Value		Unit	Comments
	Min.	Max.		
Weight	0.04		kg	
Optical interfaces	-	1	-	IEC 61754-20 (LC-Duplex)
Temperature – operating	0	+85	°C	2780 SFP
	0	+55	°C	2781 SFP
Temperature - storage	-25	+55	°C	

### B.3.6 Zinwave 2760 Antenna Unit physical parameters

Parameter	Value		Unit	Comments
	Min.	Max.		
Height	215 (8.5)		mm (in)	
Width	130 (5.1)		mm (in)	
Depth	45 (1.8)		mm (in)	
Weight	0.75		kg	
Power supply voltage	40	48	V	
Power supply frequency	DC		-	
Power consumption	3		W	
Power supply interface – AC/DC	1		-	LEMO
Power supply interface – PoE	1		-	IEC 60603-7 (RJ-45)
RF interfaces	2		-	SMA female
Optical interfaces	1		-	IEC 61754-20 (LC-Duplex)
Temperature - operating	0	+45	°C	
Temperature - storage	-25	+55	°C	

### B.3.7 Zinwave 2765 Antenna Unit physical parameters

Parameter	Value		Unit	Comments
	Min.	Max.		
Height	200 (8.0)		mm (in)	
Width	120 (4.75)		mm (in)	
Depth	60 (2.4)		mm (in)	
Weight	0.75		kg	
Power supply voltage	40	48	V	
Power supply frequency	DC		-	
Power consumption		15	W	
Power supply interface – PoE	1		-	IEC 60603-7 (RJ-45)
RF interfaces	2		-	SMA female
Optical interfaces	1		-	SC-Duplex
Temperature - operating	0	+45	°C	
Temperature - storage	-25	+55	°C	

### B.3.8 Zinwave 277X Antenna Unit physical parameters

Parameter	Value		Unit	Comments
	Min.	Max.		
Height	120 (4.75)		mm (in)	
Width	370 (14.5)		mm (in)	
Depth	260 (10.25)		mm (in)	
Weight	5.3		kg	
Power supply voltage	40	48	V	

Parameter	Value		Unit	Comments
	Min.	Nom. / Max.		
Power supply frequency	DC		-	
Power consumption		15	W	
Power supply interface – PoE	1		-	IEC 60603-7 (RJ-45)
RF interfaces	1		-	N-type female
Optical interfaces	1		-	SC-Duplex
Temperature - operating	0	+45	°C	
Temperature - storage	-25	+55	°C	

# Appendix C

## Glossary of terms

### C.1 Abbreviations

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2G	2 <sup>nd</sup> Generation
3G	3 <sup>rd</sup> Generation
AGC	Automatic Gain Control
AP	Access Point
AU	Antenna Unit
CDMA	Code Division Multiple Access
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
CISPR	Comité International Spécial des Perturbations Radioélectriques
CLI	Command Line Interface
DAS	Distributed Antenna System
dB	Decibels
dBm	Decibels referenced to one milliwatt
DCS	Digital Cellular System
EDGE	Enhanced Data rates for GSM Evolution
EMC	Electromagnetic Compatibility
EN	Euronorm (European Standard)
ESD	Electro Static Discharge
ETSI	European Telecommunications Standards Institute
EVDO	Evolution-Data Optimized
FCC	Federal Communications Commission
GSM	Global System for Mobile Communications
HU	Hub Unit
Hi-conn	High concentricity
iDEN	integrated Dispatched Enhanced Network
IEC	International Electrotechnical Commission
LMR	Land Mobile Radio (US Department of Defense)
MMF	Multimode optical fiber

R&TTE	Radio and Telecommunication Terminal Equipment
RF	Radio frequency
RMA	Returns Material Authorization
Rx (RX)	Receiver
SFP	Small Form Pluggable
SMF	Singlemode optical fiber
SNMP	Simple Network Management Protocol
TDMA	Time division multiple access
TETRA	Terrestrial Trunked Radio
Tx (TX)	Transmitter
UMTS	Universal Mobile Telecommunications System
VSWR	Voltage Standing Wave Ratio
W-CDMA	Wideband - Code division multiple access
WLAN	Wireless Local Area Network