ZINWAVE 2700
DISTRIBUTED ANTENNA SYSTEM

USER GUIDE

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About this guide

This guide contains installation and operating instructions for the ZinWave 2700 Hub (HU), as well as instructions for using the ZinWave 2760 Multi-service Antenna Unit (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:

- **2700 Software Manual**—

- **Installation and Technical Manual**—

- **System Design and Planning Guidelines (To be added later)**

- **DAS Quick Basics**—online tutorial that provides interactive training on how to use the system. **(To be added later)**

- **Getting Started Poster**—helps you quickly set up the hardware. You'll find that the steps on the poster correspond directly to the chapters in this book, making it easy to know where to go for more information. **(To be added later)**

- **Online help**—provides context-sensitive information for entries in each of the views within the software, as well as in-depth information about the use of the ZinConfig software. **(To be added later)**

Contents

1 Get Ready

Unpacking your boxes

The ZinWave 2700 system is a modular system so your delivery may arrive as a collection of boxes. Carefully unpack each box and locate the following items:

Hub

- ☐ 2700 Hub (without optical modules fitted)
- ☐ 930x Mains lead
- ☐ D-sub 9 way null modem cable.
- ☐ RJ45 (cat 5e) path cord.
- ☐ 2780 SFP optical fibre transceiver modules (1 required for each active optical port)
- ☐ 50Ω Dummy loads (optional)
- ☐ SFP port EMC dust shields (if supplied)
- ☐ CD containing software and documentation.
- ☐ Quick start poster

Antenna Unit

- ☐ 2760 Antenna Unit
- ☐ 9370 AU Power supply unit (Optional)
- ☐ 930x Mains Lead (Optional)
- ☐ Installation hardware kit
- ☐ 2781 SFP optical fibre transceiver module

Mains lead options

- 9301 – UK
- 9302 – European
- 9303 – US

Any damaged units should be returned to your supplier.

NOTE **Do not connect any hardware at this stage.**

Before installing the software

Once you have identified your delivered items and before connecting any hardware or installing any software, check you have these items:

- A PC that meets the minimum requirements

Refer to "Computer Hardware and Software Requirements" on page 27

If you are unclear about any items you have received, please contact us as soon as possible.

2 Installing the Software

What is on the CD (To be released latter)

- ZinConfig software
- Operation and Maintenance software
- Release Notes
- User Guide
- Technical Manual
- Adobe Reader

NOTE It is recommended that you read the **Release Notes** before you install the software.

The **Release Notes** include information that may not appear in this guide. It also lists all the new features and enhancements made since the last released version.

Install the ZinConfig software.

Follow these steps.

1 Insert the ZinWave CD. This CD contains the required configuration software.

2 Your system may have autostart or go to the **Start** button, click **Run** and type D:\setup (where D is your CD drive). The installation dialog box appears (see below).

3 Select **View** and read the ZinWave Release Notes before installing.

These notes provide additional information that may not be covered in this guide.

4 Select **Install** next to the ZinConfig Software option.

5 Follow the installation instructions. Select the **Custom Install** option if you wish to install tutorials.

Once the installation has completed you are returned to the installation dialog box.

If you have installed the options you require, select Quit to close the installation screen.

Verifying your software installation

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

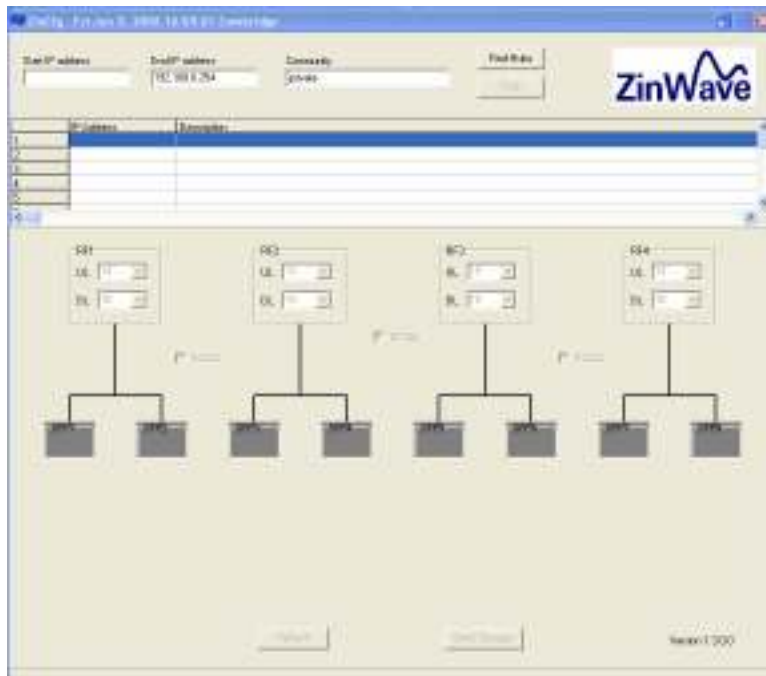Figure 4 below shows the default view with no devices connected.

Figure 4

3 Installing the Hardware

Hub Installation

Mount the Hub onto the rack in the assigned equipment cabinet using the four screws supplied. (Figure 6) Firmly hand-tightening the screw is adequate. If the Hub is be shelf mounted ensure that the rubber feet supplied are in place to prevent blocking the ventilation holes on the underside.

Figure 6

CAUTION For air circulation, be sure to leave at least 25mm (one inch) space between hubs and any other equipment. If mounting a hub on the rack's bottom shelf, also leave at least 25mm (one inch) clearance from the bottom.

Antenna Unit Installation

Mount the Antenna unit following the system plan in the assigned location using the supplied hardware and appropriate wall fixings. Allow space above and below the unit for adequate ventilation and to accommodate the minimum bend radius for the coax and fibre cables according to Figure 7.

CAUTION The antenna unit and associated antennas must be installed at a distance of greater than 20cm away from the proximity of operators and intended operation.
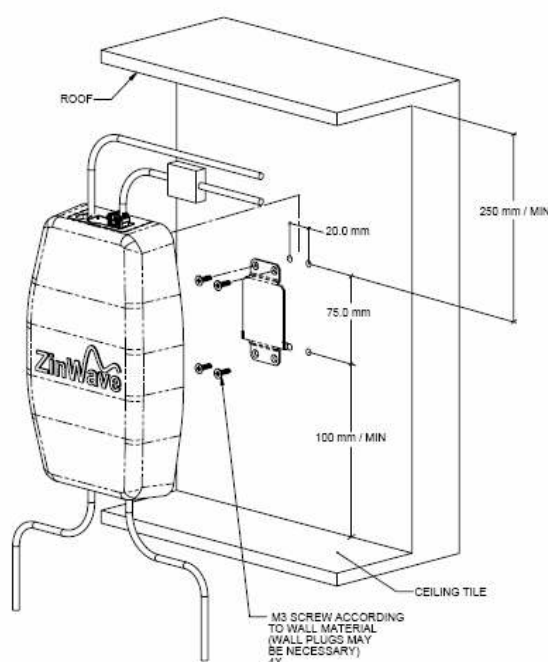
Figure 7

4 Set Up Your System

Overview

This chapter explains how to connect and set up the hardware that forms your 2700 system.

The ZinWave 2700 DAS is a simple 2-stage DAS, utilising either multimode optical fibre (MMF) or Singlemode optical fibre (SMF) to connect the two system units together.

The ZinWave 2700 DAS unifies the distribution of multiple cellular and WLAN signals over a single cabling infrastructure and supports current and future wireless technologies. Initial support is provided in the frequency range 370 -2500 MHz which covers the following services: TETRA, GSM, CDMA, TDMA, UMTS, iDEN, WLAN (IEEE 802.11b/g), LMR, SMR, Paging, DCS, EDGE, EVDO, DECT.

The programmable RF combiner within the ZinWave 2700 Hub Unit enables a wide variety of "RF to antenna" mappings and provides the flexibility to move/add capacity as needed within the building without the need to change the deployed antenna devices.

Only one RF source and Antenna Unit connection is shown for clarity.
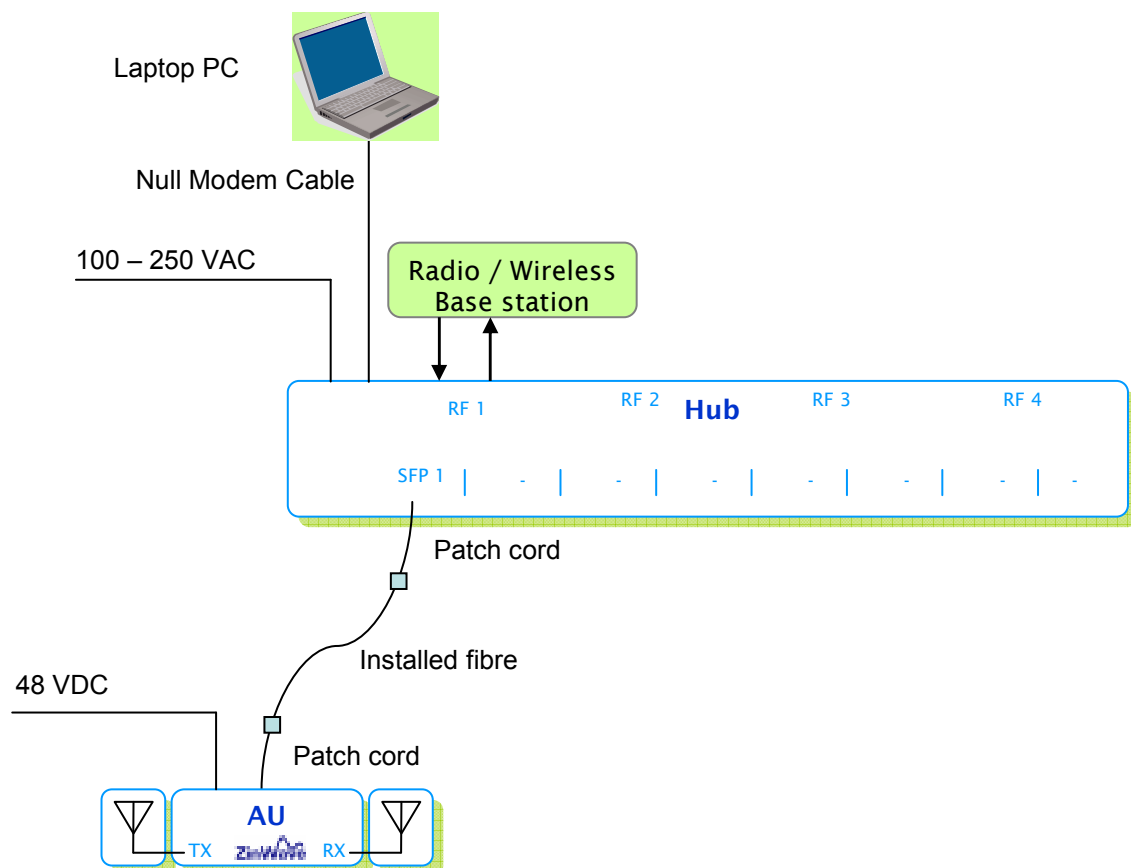
Figure 8

How to connect the Hub

Ensure that the ON/OFF switch is in the OFF (O) position before you connect the AC power cord to the Hub. (Figure 9) Plug the power cord into an outlet providing AC Power (100-250VAC, 50-60Hz)

Figure 9

Connect the PC RS232 port or external serial adaptor to the Hub Serial port using the D-sub 9 way null modem cable. Finger tighten the screws. Connect the PC LAN port to the Hub Ethernet port using the supplied RJ45 (cat 5e) path cord. (Figure 10)

Figure 10

Connect the WLAN Access Point, BTS or Repeater to the RF ports on the rear panel of the Hub. (Figure 11)

Figure 11

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 for providing WLAN services.
NOTE All un-used RF ports should be terminated with a 50 ohm load.

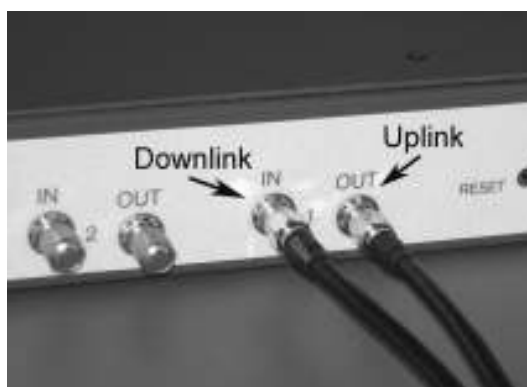## How to connect the Antenna Unit (AU)

Connect the antennas, using the coax cables, to the corresponding ports on the AU.
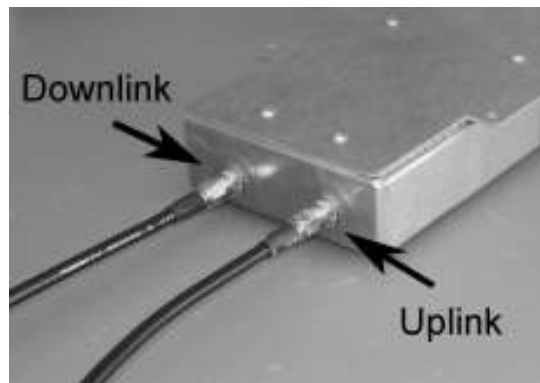
Figure 12

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.

Connect DC Power to the AU. This can be either an external 48 V DC PSU (Figure 13) or by Power over Ethernet (Figure 14). The green power LED on RJ45 socket should be illuminated when power is applied to the unit.

Figure 13

Figure 14

CAUTION Connecting more than one source of power at a time to an AU can cause permanent damage to the unit.

How to connect Antenna Units (AU) to the Hub (HU)

<mark>CAUTION</mark> 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.

Hold the SFPs by the metal body and insert it into the designated HU and AU optical slots. An audible click can be heard when the SFP is fully latched. Ensure that the de-latch bail is in the upright position.
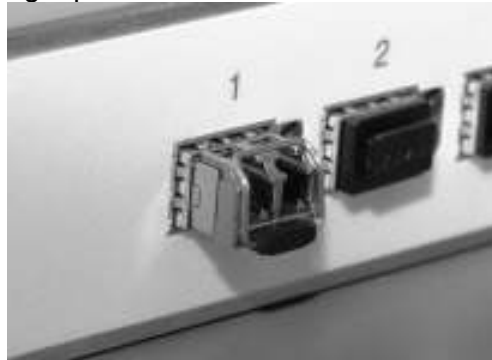
Figure 15

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

Figure 16

Remove the protective end caps and connect the patch cord between the SFP on the HU (Figure 11) and the local end of the Installed Fibre and between the remote end of the Installed Fibre and the SFP on the AU. (Figure 12)The optical connectors are keyed and care must be taken when inserting them.

Figure 17

Figure 18

<mark>NOTE</mark> **Using patch cords other than those specified by ZinWave can affect the overall performance of the system.**

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5 Use Your System

Overview

This chapter tells you how to start configuring and using your system.

Prepare your PC

Turn on your PC and set the Network connection TCP/IP properties to: static ip address and enter the corresponding subnet mask and default gateway.

Turning the power on

Power up the Hub by moving the power switch from position **O** to position **I**. The Hub will perform a self test during which all LEDs will be illuminated in a set sequence. This may take several seconds at the end of which the power LED on the front panel should remain lit (green)

Figure 19

CAUTION

Before switching on the Hub, ensure that the supply voltages are in the specified ranges. Refer to "System Information" on page 30.

Command Line Interface (CLI)

This interface is in the form of an RS232 interface. This uses the following settings: 57600 Baud, 8 Data Bits, 1 Stop Bit, No Parity and no flow control.

This interface uses keywords in a fairly natural way to enter data. The interface is driven by commands entered and edited on a single line, each command consisting of a command mnemonic followed by a number of command parameters.

Commands are entered in lower or uppercase, or a mixture of the two. Command lines are executed by pressing the Carriage Return (<CR>) or Enter key of the attached terminal. Up to this point, the Delete or Backspace key can be used to delete the character to the left of the cursor position.

Using an RS232 terminal (e.g. HyperTerminal) open a connection to the HU over the serial interface

The 'help' or '?' command displays a list of available commands.

The 'reboot' or 'rst' command causes the Hub to restart after a short delay.

The 'default' command resets all configuration settings other than the MAC address to factory default values. The unit must be restarted to use the new defaults.

The 'config' command configures the Hub. All of these values are stored in non-volatile memory and are preserved across power on/off cycles. The Username <USR> and password <PSWD> can be up to 19 characters long. If the IP address is set to 0.0.0.0, the Hub will use the DHCP protocol to fetch this address from a DHCP server.

The 'config>' command will display the current settings.

Command format:
config <IP | GATEWAY | NETMASK> <IP addr><CR>
config <USR | PSWD> <string><CR>

Attaching Antenna Units (AU) to a Hub (HU)

An AU is attached to an HU via a fibre cable. The fibre carries both RF signals as well as signals to control and configure the AU. An AU initially has no knowledge of any HU and nor does the HU have any knowledge of the AU. So a procedure has to be followed to attach the AU to the HU:-

Using an RS232 terminal (e.g. HyperTerminal) open a connection to the HU over the serial interface

1. Ensure that all AU are connected to the Hub.

2. Use the 'discover ' command.

3. All AU port and MIDs will be displayed.

4. Select the new AU with the ReID command e.g. reid au1 This will display the current settings for AU1.

5. Exit CLI.

Starting the software

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

Identifying Hubs

Enter the start and end IP address range of the attached Hubs and click on the "Find Hubs" button. All attached Hubs should now be displayed showing their IP address and description. Selecting a Hub from the list will reveal its settings. (Figure 20)
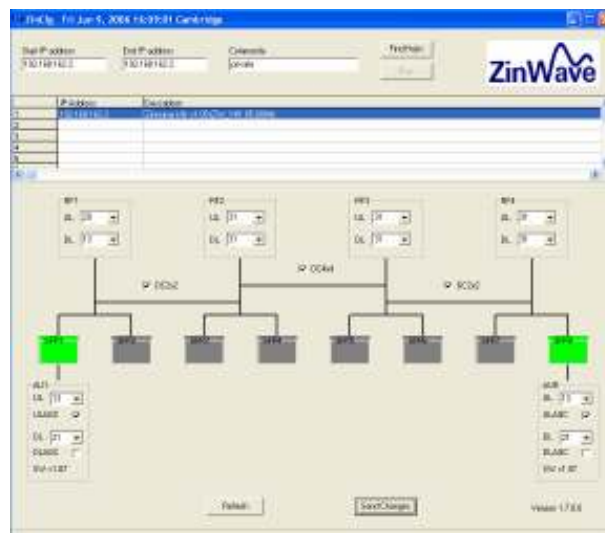
Figure 20

If the attached AU are not displayed, follow the procedure for attaching an AU using the Command Line Interface (CLI)

Enabling the Ports

Active ports will be shown green, inactive ports will be grey and red indicates an alarm condition. Ports can be enabled/disabled by right clicking on the SFP and selecting the required option from the pop up list. (Figure 21)
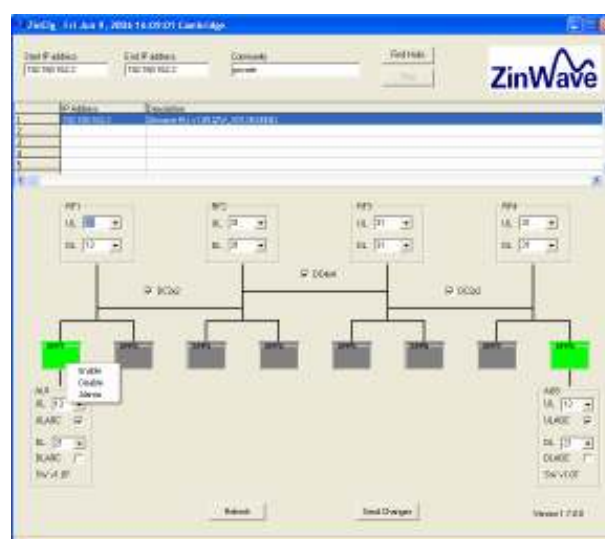
Figure 21

Configuring devices

The uplink (UL) and downlink (DL) attenuation for the Hub and AU can be selected using the drop down lists. The AU Uplink AGC (ULAGC) and the Downlink AGC (DLAGC) are enabled by ticking the respective boxes. Click on the "Send Changes" button to implement the changes. (Figure 22)
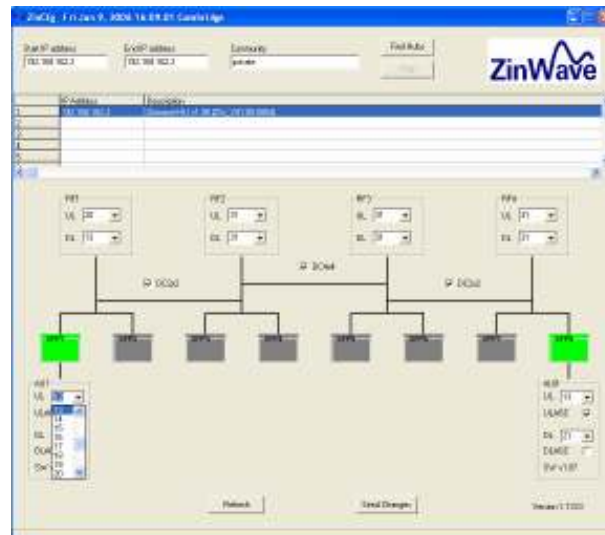
Figure 22

RF1 port is connected to SFP/AU port 1 & 2, RF2 to port 3 & 4, RF3 to port 5 & 6 and RF4 to port 7 & 8.

RF ports 1 & 2 can be cross-connected simultaneously to SFP ports 1, 2, 3 & 4 by ticking the DC2x2 box. RF 3 & 4 can be cross-connected in the same manner to SFP ports 5, 6, 7 & 8.

Ticking the DC4x4 box will cross-connect all four RF ports to all eight SFP/AU ports.
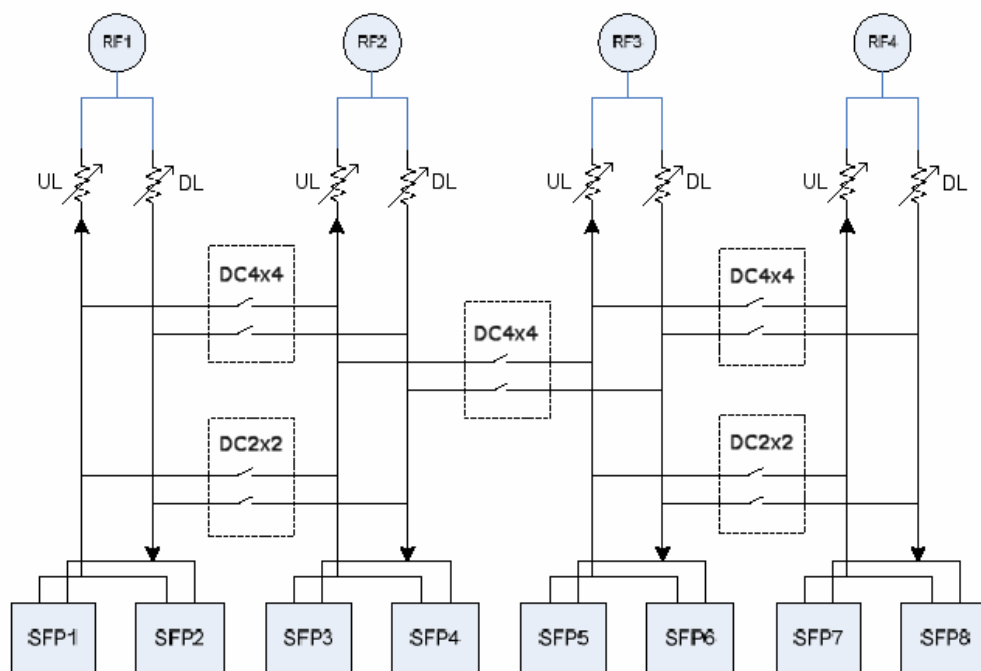
Figure 23

Alarms

A red SFP indicates that an alarm is present. The nature of the fault can be investigated by right clicking on the red SFP and selecting Alarms from the pop-up list. (Figure 24)
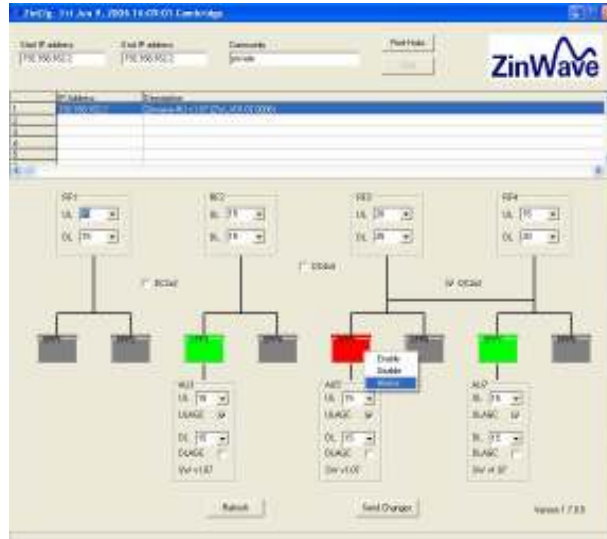
Figure 24

A box will appear displaying the cause of the alarm. (Figure 25)
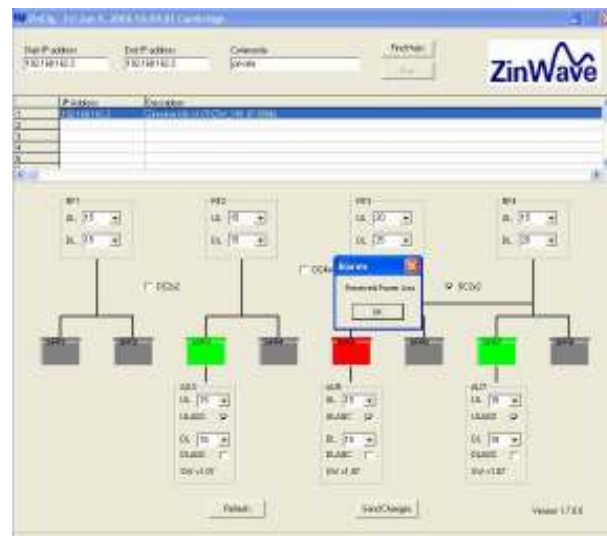
Figure 25

6 Get results fast

Using Quick Basics — the Online Tutorial

(To be added later)

Online Help

(To be added later)

Accessing Online Help

(To be added later)

Using Online Help

(To be added later)

7 Get Assistance, if You Need It

Troubleshooting your 2700 system

Hub and Antenna Unit LED Indicators

Main Hub (HU)

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

Main Hub optical port

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 Fibre or AU	Off	On

Antenna Unit (AU)

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

Device communication problems

- 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.

Verifying your System

O & M Tool (To be added later)

Returning the System for Service

Contact equipment vendor.

Warranty repair

Contact equipment vendor.

Preparing the system for shipping

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

A Safety and Regulatory Information

Warning and caution notices

Overview

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

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 authorised 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.**

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:

Cabling installation
- EN 50174 series: Information technology – Cabling installation

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

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.

Optical Safety Precautions

| CLASS 1 INVISIBLE LASER RADIATION | $p_m < 15mW$ wavelength 1310 nm time base 100 s IEC 60825-1:2001-08 |
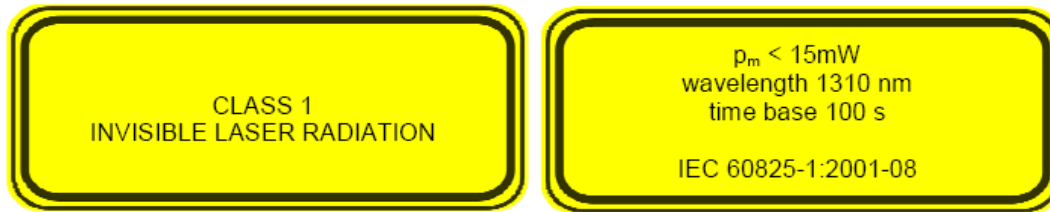
- Do not stare with unprotected eyes at the connector ends of the fibre or the ports of the SFP. Do not remove the Fibre Port dust covers unless the port is in use. Do not stare directly into a Fibre Port.
- Cover any unconnected fibre ends with an approved cap.
- Do not stare with unprotected eyes at any broken ends of the fibre.
- Use only approved methods for cleaning optical fibre connectors.
- Do not make any unauthorised modifications to this fibre optical system.
- No warning signs are required as it is a Class 1 hazard.
- Use Class 1 test equipment.

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 fibre transceiver modules into the ZinWave 2700 Hub;
- the replacement of the Zinwave 2781 SFP optical fibre 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 "Laite on liitettävä suojamaadoituskoskettimilla varustettuun pistorasiaan "

Norway "Apparatet må tilkoples jordet stikkontakt"

Sweden "Apparaten skall anslutas till jordat uttag"

Signal and input power

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

CAUTION The total broadband composite output power is limited to +6dBm for the US market.

Storage

Storage Temperature Range: -25ºC to +55 ºC

B Connection Panels and LED Indicators

Overview

This appendix contains information about the panel connectors and LED indicators of the Zinwave 2700 Hub and 2760 Antenna Unit.

2700 Hub (HU)
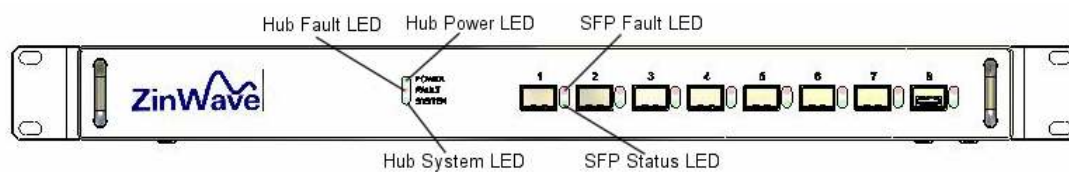
Front View
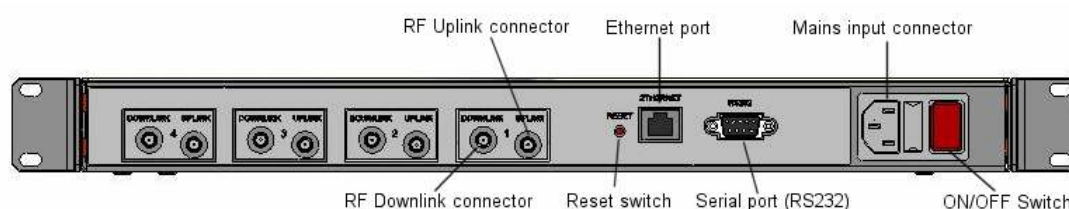
Rear View

2760 Antenna Unit (AU)
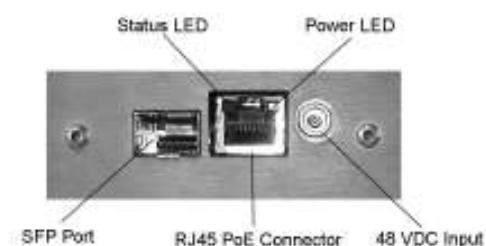
End View

C System Information

Overview

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

2700 Hub
2760 Antenna Unit
Cables

Computer Hardware and Software Requirements

The following are the recommended minimum computer requirements:

- 300 MHz Pentium processor or higher
- 256 MB of RAM or higher
- Windows 2000 or XP operating system
- 1 RS-232 DB9 serial port or external serial adaptor
- Ethernet port
- 10 Gigabyte hard drive or higher
- 800 x 600 display resolution
- CD-ROM drive (for software installation)

Options and Part Numbers

(To be added later)

Cable part numbers

(To be added later)

System specification

Channel transmission performance

Parameter	Symbol	Value			Unit	Comments
		Min.	Nom.	Max.		
Input impedance	R_in		50		Ohms	At HU service & AU uplink inputs
Output impedance	R_out		50		Ohms	At HU service & AU downlink outputs
Operating Temperature Range	T_op	0		+55	°C	Ambient, non-condensing
Channel length - MMF	L_fmm	1		550	m	50/125 µm, 62.5/125 µm[1]
Channel insertion loss - MMF		0		4	dB	@ 1300 nm
Channel length - SMF	L_fsm	1		2000	m	
Channel insertion loss - SMF		0		4	dB	@ 1310 nm
TX-RX Isolation[2]	$Is,TX1\text{-}RX1$	30			dB	HU service input to service output (same service)
TX-RX Isolation[2]	$Is,TX1\text{-}RXn$	70			dB	HU service input to any other service output
TX-TX Isolation[2]	$Is,TX\text{-}TX$	70			dB	HU service input to any other service input
Antenna Isolation	Is,ant	35			dB	AU antenna output to AU antenna input

NOTE 1: Minimum modal bandwidth @ 1300 nm = 500MHz.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

Downlink RF parameters

Parameter	Symbol	Value			Unit	Comments
		Min.	Nom.	Max.		
System Bandwidth		370		2500	MHz	
RF input power	P_in	-5	0	+10	dBm	At HU service input with 14dB peak-average-ratio
RF output power	P_out,max			+ 6	dBm	Broadband rms composite power at AU antenna output
VSWR				1.5:1		
Return loss				14	dB	
Response variation	$dg,full$	-5		+5	dB	Full bandwidth
Response variation	$dg,200kHz$	-1		+1	dB	Any 200kHz band
Response variation	$dg,100MHz$	-2		+2	dB	Any 100MHz band

Uplink RF parameters

Parameter	Symbol	Value			Unit	Comments
		Min.	Nom.	Max.		
System Bandwidth		370		2500	MHz	
RF input power				-15	dBm	Input gain adjustment for minimum coupling loss
Max RF output power	P_out,max	-20	-10		dBm	At HU service output for 1dB compression with maximum AU input power
Response variation	$dg,full$	-5		+5	dB	Full bandwidth
Response variation	$Dg,100MHz$	-2		+2	dB	Any 100MHz band
Response variation	$dg,5MHz$	-1		+1	dB	Any 5MHz band

ZinWave 2700 Hub Unit physical parameters

Parameter	Symbol	Value			Unit	Comments
		Min.	Nom.	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 connectors (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) 100BASE-T
Control interfaces			1		-	9-pin D connector (RS232 - CLI)
Temperature - operating		0		+55	°C	
Temperature - storage		-25		+55	°C	

ZinWave 2780 optical fibre transceiver module physical parameters

Parameter	Symbol	Value			Unit	Comments
		Min.	Nom.	Max.		
Weight					kg	
Optical interfaces		-	-	1	-	IEC 61754-20 (LC-Duplex)
Temperature - operating		0		+55	°C	
Temperature - storage		-25		+55	°C	

ZinWave 2760 Antenna Unit physical parameters

Parameter	Symbol	Value			Unit	Comments
		Min.	Nom.	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 (IEEE 802.3af)			1		-	IEC 60603-7 (RJ-45)
RF interfaces			2		-	SMA
Optical interfaces			1		-	IEC 61754-20 (LC-Duplex)
Temperature - operating		0		+55	°C	
Temperature - storage		-25		+55	°C	

D Glossary of terms

Abbreviations

2G	2nd Generation
3G	3rd 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	Comite International Special des Perturbations Radioelectriques
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 fibre
R&TTE	Radio and Telecommunication Terminal Equipment
RF	Radio frequency
RMA	Returns Material Authorisation
Rx (RX)	Receiver
SFP	Small Form Pluggable
SMF	Singlemode optical fibre
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