Zinwave 3000 Distributed Antenna System

User Guide

3000_DAS_UG_v1.11

Edition

Warranty

Technology licenses

Trademark acknowledgements

About this guide

This guide contains hardware installation and software configuration & operating instructions for the Zinwave 3000 Distributed Antenna System (DAS).

Warning: A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Caution: A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

Safety notices

Cautions and warnings

Caution: This unit is fitted with a 5A 20x5mm anti-surge ceramic fuse (RC). For continued protection against risk of fire, replace only with same type and rating of fuse. Keep all product information for future reference.

Warning: High voltages exist inside the product; Do not remove the lid or base: No user serviceable parts inside.

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 centre. To prevent electrical shock, do not remove the covers.

Notes

- Read this User Manual and follow all operating and safety instructions.
- Position the power cord to avoid possible damage; do not overload wall outlets.
- Do not place this product on or near a direct heat source, and avoid placing objects on the terminal.
- Do not operate this device near water or in a wet location.
- Use only a damp cloth for cleaning. Do not use liquid or aerosol cleaners. Disconnect the power before cleaning.
- Installation of the 3000 DAS system must be contracted to a suitably trained and competent professional installer.

Declaration of Conformity

- Hereby, Zinwave Ltd, declares that this Distributed Antenna System is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
- Zinwave Ltd, vakuuttaa täten että Distributed Antenna System tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
- Hierbij verklaart Zinwave Ltd, dat het toestel Distributed Antenna System in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG
- Bij deze verklaart Zinwave Ltd, dat deze Distributed Antenna System voldoet aan de essentiële eisen en aan de overige relevante bepalingen van Richtlijn 1999/5/EC.
- Par la présente, Zinwave Ltd, déclare que ce Distributed Antenna System est conforme aux exigences essentielles et aux autres dispositions de la directive 1999/5/CE qui lui sont applicables
- Härmed intygar Zinwave Ltd, att denna Distributed Antenna System står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.
- Undertegnede Zinwave Ltd, erklærer herved, at følgende udstyr Distributed Antenna System overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF

- Hiermit erklärt Zinwave Ltd., dass sich dieser Distributed Antenna System in Übereinstimmung mit den grundlegenden Anforderungen und den anderen relevanten Vorschriften der Richtlinie 1999/5/EG befindet
- ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ Zinwave Ltd, ΔΗΛΩΝΕΙ ΟΤΙ Distributed Antenna System ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ
- Con la presente Zinwave Ltd, dichiara che questo Distributed Antenna System è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
- Por medio de la presente Zinwave Ltd, declara que el Distributed Antenna System cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE
- Zinwave Ltd, declara que este Distributed Antenna System está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.

Optical Remote Unit interference

Warning: This is a class A product (as defined in EN 55022). In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

FCC compliance and interference statements

Hub. This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

1) This device must accept any interference and

2) This 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.

Remote Unit. This device complies with Part 22, Part 24, Part 27 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. For a list of services, please contact Zinwave.

Remote Units with FCC ID:UPO302-0006 and FCC ID:UPO302-0007 only support services in the following bands of operation:
- 406.1 – 454.0 MHz
- 456.0 – 512.0 MHz
- 698.0 – 824.0 MHz
- 851.0 – 869.0 MHz
- 869.0 – 894.0 MHz
- 928.0 – 929.0 MHz
- 931.0 – 935.0 MHz
- 935.0 – 940.0 MHz
- 1930.0 – 1990.0 MHz
- 2110.0 – 2155.0 MHz

Rack mount instructions

Caution: Double Pole/Neutral Fusing.

- Elevated Operating Ambient – If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (Tma) specified by the manufacturers. 3000 DAS Primary and Secondary Hubs have a Tma of 45°C.
- Reduced Air Flow – Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.
- Mechanical Loading – Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.
- Circuit Overloading – Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.
- Reliable Earthing – Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g. use of power strips).
- Disconnect Device – The socket outlet shall be installed near the equipment, be easily accessible and will act as the disconnect for the Hub.
- Keep these Instructions in a safe place.

General safety considerations

The installation of electrical supplies in support of Zinwave 3000 DAS products shall be in accordance with national and local regulations.

Other aspects of the installation of Zinwave 3000 DAS products and interconnecting cabling shall be in accordance with the following standards:

- EN 50174 series: Information technology – Cabling installation
- IEC 60825-2: Safety of laser products – Part 2: Safety of optical fibre communication systems (OFCS)
- This equipment complies with 21CFR1040 - Performance Standards For Light-Emitting Products (FDA).

RF exposure

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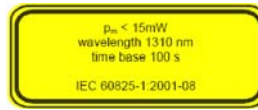
- Do not remove the Fibre Port dust covers unless the port is in use. Do not stare directly into a Fibre Port.
- Cover any unconnected fibre ends with an approved cap.
- Do not stare with unprotected eyes at any broken ends of the fibre.
- Use only approved methods for cleaning optical fibre connectors.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

Warning: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Installation, use and storage

The Zinwave 3000 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 3000 DAS shall only be undertaken if precautions required by IEC/TS 61340-5-1 have been taken.

This covers the installation of Zinwave Optical Link modules into the Zinwave 3000 DAS Hub 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"

Caution: Unit operating voltage is factory set at either 120V or 230V and cannot be changed by an operator. Check which variant is supplied and only operate at the rated voltage.

Signal and input power

Caution: The input power to the 3000 DAS Hub Unit should not exceed +10dBm. Power levels greater than +25dBm will damage the unit

Caution: The input power to the Zinwave Remote Unit should not exceed -10dBm. Power levels greater than 0dBm will damage the unit

Caution: The total broadband composite output power is limited to +18dBm in Europe and +20dBm in the USA and Canada. The maximum allowed EIRP in the USA & Canada is +28dBm which corresponds to an antenna gain of 8dBi. Contact Zinwave for the maximum output power in other regions.

Caution: The maximum allowed antenna gain when operating in Europe in the 2.4GHz ISM band shall be +2dBi. Contact Zinwave for further information regarding use of the ISM band in other regions.

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Chapter 1

SYSTEM DESCRIPTION

The Zinwave 3000 Distributed Antenna System is a wideband in-building system that provides excellent RF coverage for a multitude of wireless services, irrespective of carrier frequency or signal protocol.

- Different services are carried without multiple infrastructure overlays, or specific band units. New services can be easily integrated without adding more components to the infrastructure.
- The 3000 DAS double-star architecture (Primary Hub Unit, Secondary Hub Unit and Remote Units) provides enhanced scalability; a single-star configuration supports small site solutions.
- Modular system design means the same equipment can be used for a wide variety of applications.

1.1 Key features

- Simple 3-stage fibre-optic DAS: one Primary Hub Unit (PH) distributes to eight Secondary Hub Units (SH), each of which distributes to eight Remote Units (RUs). This gives a maximum of 64 RUs fed by one PH (when more RUs are required, more than one PH can be used)

- The same components support a 2-stage, single star configuration: one Primary Hub Unit (PH) distributing to eight RUs

- Wide frequency range: 136 - 2700 MHz, with both FDD and TDD systems supported

- Each Hub has four inputs. All four are used as service inputs in the Primary Hub; In the Secondary Hub, one input is used for optical connection to the Primary Hub (with a second for service distribution flexibility or redundancy if required) and the remainder can be used for local service signal injection (such as WiFi)

- Only system to deliver truly broadband solution over multimode fibre (MMF), but can also be used over singlemode fibre (SMF)

- Optional Coax or Fibre link connection to the RUs

- Remote Units are remotely powered from the hub

- Maximum total supported cable distances: 100m (Coax LMR400), 550m (MMF), 2000m (SMF)

- Self calibrating system, gain levels adjusted automatically to accommodate different cable lengths

- Hot-pluggable Optical & Coaxial transceiver modules used in PH and SH

- Web-based and SNMP network management, plus local command interface

- Unique service distribution matrix on the hubs.

1.2 Multimode fibre technology

The 3000 DAS is the only system that provides a truly wideband solution based on multimode fibre (MMF). Zinwave's technology extends the bandwidth of in-situ MMF optic cables to conduct multiple radio frequency signals, at original carrier frequency, over long distances.

1.3 System architecture

The 3000 DAS system is built from Hub Units and Remote Units (RU). Smaller systems comprise a single Hub and up to 8 RUs. Larger systems comprise one or two Primary Hubs, each of which can serve up to eight Secondary Hubs (and hence up to sixty-four RUs).

The RUs can be:

- wideband coaxial or fibre fed

- band-specific coaxial or fibre fed.

Chapter 2

HARDWARE INSTALLATION

This chapter explains how to install Primary and Secondary Hubs, Remote Units and Antennas.

2.1 Overview

Rather than trying to cover every possible network topology in this guide, we'll explain how to install each type of unit in a simple dual-star configuration.
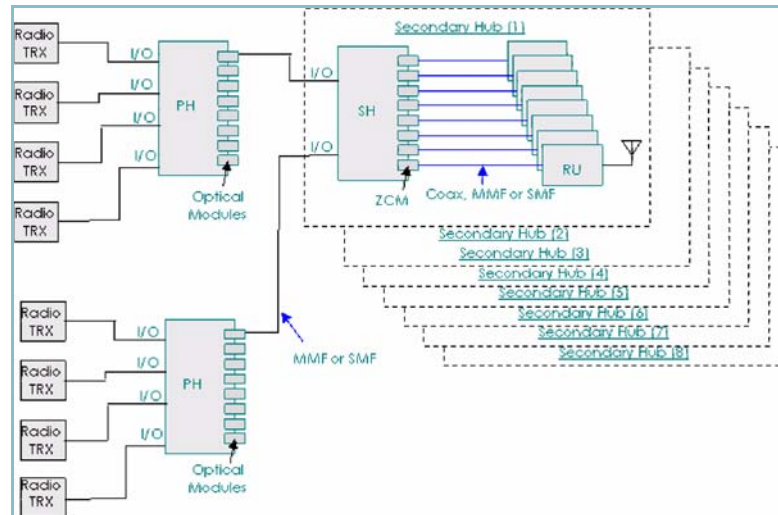

Fig. 2-1   *Simple dual-star configuration to illustrate installation procedures*

Generally, you should install Zinwave 3000 DAS hardware in the following order:

- Install the Primary Hub:
  - Install into a 19" rack.
  - Provide mains power to Primary Hub and switch on.
  - Populate the Primary Hub with Service, Drive and Link Modules.
- Install the Secondary Hub into a 19" rack, provide power and populate with Modules.
- Install Remote Units (RU) and Antennas
- Make optical and RF connections:
  - Connect Primary and Secondary Hubs via fibre infrastructure.
  - Connect Remote Units (RU) to Hubs.
  - Connect Antennas to Remote Units (RU)

That's the main part of the hardware installation process. Once complete, later chapters explain how to:

- Configure and test the network before you connect your services.
- Connect service inputs to Hubs.

Once you've got this far, you're ready to configure your system using the pre-installed software, via a web browser. This is explained in *Configuration and Control on page 23*.

2.1.1 Module types

Before installing modules, it may help to understand what each module does, and where it can be installed (i.e. front or rear panel of a Hub):

Table 2-1

Zinwave 3000 DAS Module types

Module	Description	Installed in?		Connectors
		Primary	Secondary	
Service	Input of RF signal sources (e.g. BDA, BTS, WLAN access point)	Rear slots	Rear slots	N-type female
Optical Link	Fibre (SM-MM) link between Primary and Secondary Hubs	Front slots	Rear Slots	Zinwave SC
RU Drive	Currently, coaxial link from Hub to RU. Power and signal to RU are provided over the coaxial link.	Front slots	Front slots	N-type female

2.1.2 Slot numbering

The slots on the front and rear panels adhere to a numbering system that is reflected in the web-based configuration application:

• Front (from left to right, looking from the front of the unit) slots 1 to 8

• Rear (from right to left, looking from the rear of the unit) slots A to D

2.2 Installing the Primary Hub

⚠️ **Caution:** Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised. Leave sufficient space around ventilation holes in the top and bottom of the Hub casing.

2.2.1 Install the Hub into a rack

⚠️ **Caution:** 3000 DAS Hubs are heavy 3U units (18kg) which must be supported front and rear when installed into a 19" rack.

There are many 19" rack systems on the market of various depths. It is essential that the weight of the hub is supported front and rear. If it is not possible to use both sets of brackets, alternative supports mechanisms must be used such as front-to-rear chassis runners or fully supported shelves. Once installed, the unit should be fixed into the rack using the supplied rack-mount brackets.

It is beyond the scope of this manual to cover all rack depths and mounting systems. Here we give an example installation using the supplied rack-mounting brackets.

2.2.1.1 *Installing using the supplied rack-mount brackets*

You'll need the following tools and equipment before you start:

- 4 x rack-mount brackets
- 8 x (screws to fix brackets to Hub)
- 8 x M6 cage nuts
- 8 x M6 nylon cup washer
- 8 x M6 x 16 pozi pan head screw
- M6 pozi-driv screwdriver
- Flat-bladed screwdriver
- Cage nut insertion/extraction tool

To install the Primary Hub:

1 Fix the four rack-mount brackets to the Primary Hub.

2 Adjust the position of the brackets to suit the depth of the 19" rack being used. If using a 455mm (18inch) rack depth when complete, the brackets should be flush with the front and rear of the Hub.
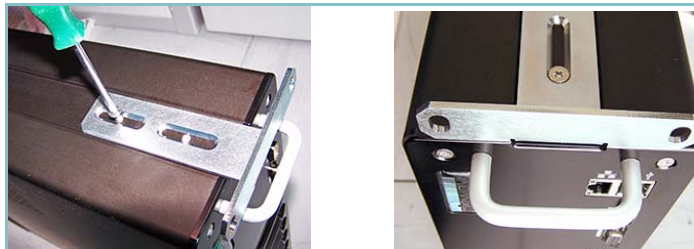
3 Install the eight cage nuts into the rack using a cage nut insertion/extraction tool.

You'll need to take the rack-mount bracket size and Hub size into account when fitting the cage nuts (you need clearance above and below the brackets, as shown).

4 Fit the Hub into the rack using the pan head screws and nylon washers.

2.2.2 Provide mains power to Primary Hub

Caution: Unit operating voltage is factory set at either 120V or 230V and cannot be changed by an operator. Check which variant is supplied and only operate at the rated voltage.

1 Make sure that the ON/OFF switch is in the OFF (O) position.

2 Connect the AC power cord to the Hub.

3 Plug the AC power cord into an outlet providing AC power (either 110V or 230V, 50-60Hz).

4 Switch on the Primary Hub.

5 Check the LED status indicators show correct operation.

Rear left of Hub

Front right of Hub

mains power input

Status LEDs

Table 2-2   *HUB front panel LED status*

LED	Status	Description
⏻	Green	Power connected to CPU board
	Off	No power connected
⊗	Green	No error
	Red	Error relay activated
	Red/Green Flashing	Firmware programming in progress
⚠	Green	No warning
	Red	Warning relay activated
▦	Green	CPU running
	Red	CPU restarting

2.2.3 Populate the Primary Hub

1 Follow the instructions below to install any Service modules into the rear of the Primary Hub.

2 Follow the instructions below to install any RU Drive and Optical Link modules into the front of the Primary Hub.

Caution: Optical Link Modules **must** be installed on the front panel in a Primary Hub, or the unit will not function as expected.

2.2.3.1 *Installing a Module (general instructions)*

In order to make a good signal connection, all modules are a very snug fit when you install them into a hub.

1 If necessary, remove any blanking panels from slots that you want to populate. To do this, remove the retaining screw using a flat-bladed screwdriver.

2 Carefully align and slide the module into the hub.

3 Once the module is in place, press it home firmly with your thumbs at the top and bottom to ensure the internal contacts mate correctly.

4 Replace the retaining screw and tighten using a flat-bladed screwdriver.

5 It's good practice to fit blanking plates (supplied) to any unused slots in the hub.

When you install a module into a slot, the three LEDs on the front of the module will indicate operational status:

Table 2-3   *Module LED status*

LED	Status	Description
Lefthand LED	Green	Ready for use
	Red	Condition when first plugged in
Middle LED	Green	Comms link running
	Red	No comms with unit
	Off	Disabled
Righthand LED	Green	Unit normal
	Red	Fault
	Off	Disabled

2.3 Installing the Secondary Hub

Essentially, this is very similar to installing the Primary Hub, described in *Section 2.2*. The only differences are in the modules you install:

1 Install the Secondary Hub into the 19" rack.

2 Provide mains power to the Secondary Hub and switch on.

Caution: Unit operating voltage is factory set at either 120V or 230V and cannot be changed by an operator. Check which variant is supplied and only operate at the rated voltage.

3 Ethernet connection to Secondary Hub (optional).

4 Rear panel: Install Optical Link Modules and any Service Modules (optional).

Caution: The Optical Link module **must** be installed on the rear panel in a Secondary Hub, or the unit will not function as expected.

5 Front panel: Install any RU Drive Modules.

2.4 Installing Remote Units and Antennas

You should mount the RUs and Antennas in the locations assigned in your system installation plan. Antennas are supplied with 1m N-type (female) tails. For most installations, you will need to supply longer coaxial cables to extend the distance between an RU and Antenna.

You'll need the following tools and equipment before you start:

- Any extra coaxial extension cables (N-type male to N-type female).

2.4.1 Mounting an RU

Caution: RUs **must** be vertically-mounted to ensure optimum cooling effect.

Often, RUs are sited in equipment rooms, out of sight. This also allows for easier cable routing to the Antenna (which must exit from a hole in the ceiling).

1 Note which way up the bracket goes.
2 Offer the RU mounting bracket up to the wall.
3 Mark the four holes using a pencil.
4 Drill four M3 holes.
5 Fix the bracket to the wall using four M3 screws and appropriate fixings such as rawl plugs (not supplied).
6 Position the RU above the bracket, then slide it down onto the bracket.

Top of bracket

2.4.2 Mounting an Antenna

⚠️ **Caution:** This section relates to Zinwave antenna units, which are dual-port (Tx/Rx) devices. If you are using a third-party antenna unit, you must ensure there is adequate isolation between Tx and Rx.

⚠️ **Caution:** Antennas must be ceiling-mounted, horizontally, for correct operation.

An Antenna is supplied with 1m coaxial tails. You need to make a suitable hole in the ceiling and feed the coaxial tails up into the space above, so that they are out of sight. Ensure that any coaxial extension cables can reach from the RU to the Antenna.

1 Separate the Antenna casing from the mounting bracket.

2 Offer the Antenna mounting bracket up to the ceiling.

3 Mark the eight screw holes and the large cable entry hole using a pencil.

4 Drill eight M4 holes.

5 Cut out the cable entry hole.

6 Fix the bracket to the wall using eight M4 screws and appropriate fixings such as rawl plugs (not supplied).

7 Feed the 1m Antenna coaxial tails through the cable entry hole.

8 Offer the Antenna up to the bracket. The Antenna will only fit one way round on the bracket: Ensure the two locating screws in the Antenna mounting fit into the two holes at one end of the mounting bracket.

9 Lower the other end of the Antenna onto the mounting bracket and fix in place with the screw (supplied).

2.5 Making the signal connections

⚠️ **Caution:** Observe safety precautions when working with fibre cables and devices (see *Optical Safety Precautions on page 6*).

2.5.1 Connect Primary and Secondary Hubs to the fibre infrastructure

Follow these instructions for each Optical Link Module in the Primary and Secondary Hubs.

⚠️ **Caution:** Zinwave Optical Link Modules use Single Mode on Transmit (APC) and Multimode on the receive direction (PC). Both transmit and receive are SC Connectors.
All optical devices require a Zinwave patch cord irrespective of the existing or installed fibre and connector type.

1 Remove the protectors from the SC connectors on the Optical Link Module and the Zinwave patch cord.

2 Plug the green/blue end of the Zinwave SC optical patch cable into the Optical Link Module. It is vital that you fit this connector the right way up (blue tag at the top, as shown). Incorrect installation will damage the ends of the fibre.

3 Connect the other end of the patch cable to your fibre infrastructure (this will usually be via a fibre patch panel).

2.5.2 Connect Hubs to Remote Units (RUs)

⚠️ **Caution:** Power and data is carried over the co-axial cable between the RU Drive Module and the RU. The power carried is 16VDC, so you must not connect other equipment (e.g. a spectrum analyzer) directly into the output of an RU Drive Module.

1 Connect two coaxial cables (N-type male connectors) to the female connectors on the RU Drive Module.

2 Connect the other ends of the coaxial cables to the N-type female connectors on the underside of the RU.

2.5.3 Connect RUs to Antennas

If you're not using extension RF cables:

1 Connect the 1m coaxial tails of the Antenna to the top of the RU.

If you are using extension RF cables (N-type male to N-type female):

1 Connect the two N-type male connectors to the top of the RU.

2 If you haven't already done so, feed the RF extension cables through from the RU to the Antenna.

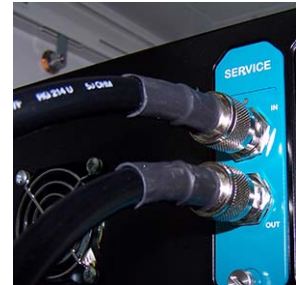**3** Connect the two N-type female connectors to the Antenna RF tails.

2.6 Connecting service inputs

You can connect Service inputs (e.g. BDA, BTS, WLAN access point) to Primary and Secondary Hubs:

1 Make N-type male connections to the N-type female connectors on the Service Modules (on the rear of the Hub).

Chapter 3

CONFIGURATION AND CONTROL

This chapter explains how to use a web browser to configure and control your Zinwave 3000 Distributed Antenna System.

3.1 Overview

The Zinwave 3000 DAS provides a built-in Element Management System (EMS), for centralised monitoring, and configuration. With a user friendly web interface, the management features can be accessed using a standard internet browser, and standard alarms management tools – no proprietary equipment or software is required. An SNMP interface supports integration with higher order NMS applications. Security features such as separate user classes and secure communications via SSH & SSL are provided, along with support for secure SNMP v3. Local diagnostics are also available via LEDs indicating equipment status on the hubs for rapid fault isolation.

In brief, the steps you need to follow are:

* Make some initial configuration changes via a direct Ethernet connection to a standalone PC:
    – Configure a standalone PC so it can communicate directly (over Ethernet) with factory-default Hubs
    – Make an Ethernet connection to each Hub in turn from the standalone PC and set up IP addressing (DHCP or fixed IP address) and Hub status (Primary or Secondary)
    – Make final Ethernet connections as necessary to each Hub
* Configure each Hub via a web interface to the Primary Hub.

3.2 Before you start

Before you start to configure your Zinwave 3000 Distributed Antenna System, you should have a firm idea of your final system architecture and any operational parameters (for example, you may have used Zinwave's Design Guide documentation, and planned your RF strategy using Zinwave's Link Budget spreadsheet.

You will need to have the following information to hand:

* Input power from each Service
* Composite power settings
* Results of any coverage calculations for each RU.

You'll enter this information as part of the system configuration process described in this chapter.

3.3   Initial Hub configuration

You need to set up a standalone PC so that it can communicate over Ethernet with your Primary Hub in its factory default state, to make some initial configuration changes. After this, you will be able to make any other configuration changes via a local network connection to the Primary Hub.

- Every Primary Hub is supplied from the factory with exactly the same IP address (192.168.0.2). You need to change this so that it will operate on your enterprise network (using static IP addressing or DHCP as appropriate).

- Secondary Hubs do not normally need an Ethernet connection to the local network; all communications are via the fibre-optic link to the Primary Hub.

Since 3000 DAS configuration is web-based, you can use any type of PC (e.g. Macintosh, Windows, Linux) to make these changes.

3.3.1   Change the standalone PC's IP address

1   On the standalone PC, change the IP address so that it is on the same subnet as a factory default Primary Hub. For example, set the standalone PC's IP address to 192.168.0.1 (the default Hub IP address is 192.168.0.2).

3.3.2   Connect the standalone PC

Make an Ethernet connection from the standalone PC to the Primary Hub (you can use a crossover or straight-through Ethernet cable):

1   Connect one end of a CAT-5 Ethernet cable to the network (RJ45) port on the front of the Primary Hub.

2   Connect the other end of the Ethernet cable to the standalone PC.

RJ45 port

3.3.3 Start the web configuration GUI

1 On the standalone PC, start a web browser and
enter the following URL:

https://192.168.0.2

Note the 's' in https, as this is a secure page.

2 Since this is the first time you've connected to a
Hub, you'll need to step through three screens to
accept a security certificate (you'll need to do this
every time you connect a different computer for the
first time):

– Click **Continue**.

– Click the first radio button to *Accept this certificate
permanently* and click **OK**.

– Click **OK** to establish the connection.

3 At the Login screen, enter the username and
password for the level of access you need (see
Table-3-1; for this session you need to be an
Advanced user) then click **OK**.
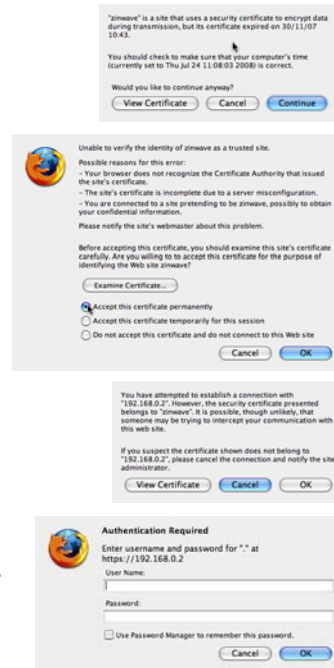
Note: Once logged in, you can only change user login
type by closing the browser window and logging in
again.

4 You'll see the default web configuration GUI screen
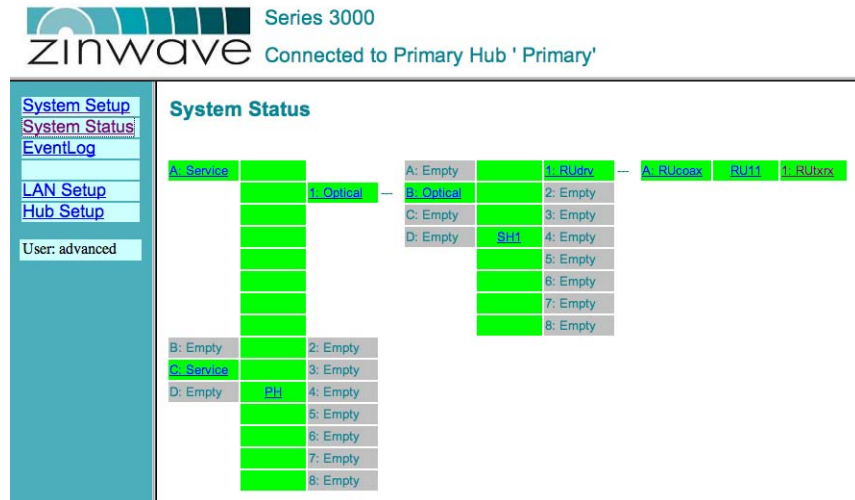(the System Status page):

Table 3-1   *User login types*

| User type	Description	Default password
Viewer	Can view system status but not make any configuration changes	(none)
Basic	can view system status and make changes to a subset of configuration options	installer
Advanced	can view all status settings and make changes to all configuration options	supervisor

3.3.4 Note the MAC address of the Primary Hub

You only need to follow the steps in this section if you want your Primary Hub to be allocated its IP address by a DHCP server. In the next section, we'll be setting up IP addressing, and once you change the IP address of the Primary Hub you will lose contact with it from the standalone PC. You will need to know its new IP address so that you can continue the initial configuration from the standalone PC, and so that subsequently you'll be able to configure and monitor the Hub from any network-attached PC on your LAN.

- If you're going to allocate the Primary Hub a static IP address, there's no need to discover its MAC address (although it won't hurt to note it down anyway)
- If you're going to be using DHCP, knowing the Hub's MAC address will allow you to interrogate the DHCP server and discover which IP address it has allocated to the Hub.

Proceed as follows:

1 On the System Status page in the web configuration GUI, click the link for the Primary Hub (labelled PH) to display its module status page.

2 Make a note of the Hub's Ethernet MAC address.
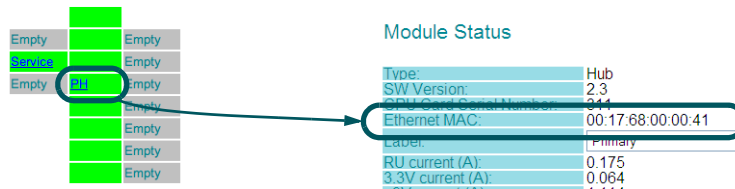
3.3.5 Set up Primary Hub IP addressing

1 Display the **LAN Setup** screen.

   – If your enterprise network uses DHCP, select **Enabled** in the DHCP Client drop-down menu.

   – If you are using static IP addresses, select **Static** and enter the static IP settings needed for correct operation on your network:

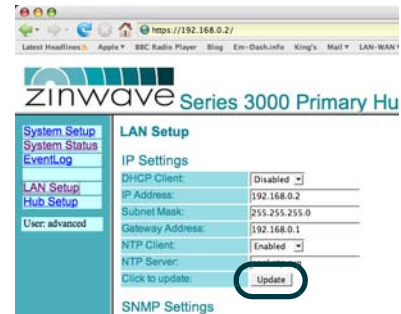**2** Click **Update** at the bottom of the IP Settings table in the web configuration GUI.

Table 3-2   *Static IP addressing parameters*

Field	Description
IP Address	The IP address of the Hub on your enterprise network. Make sure it is unique.
Subnet Mask	Defines how IP addresses are partitioned on your network. Usually 255.255.255.0
Gateway Address	IP address of a computer on your network that provides access to other networks or the Internet.
NTP Client	When enabled, the Hub will fetch the correct time from the specified server (on your network, or the Internet).
NTP Server	A list of time servers used by this Hub to set the correct time.

At this point you will lose connection with the Primary Hub, as you've changed its IP address. We'll reconnect in the next section.

3.4 Detailed Hub configuration

Your Primary Hub should now be using its new IP address. From this point on, you can

- Continue to configure the Hub from the standalone PC (don't forget to change the standalone PC's IP address to be on the new subnet)
- Connect the Hub to your LAN and access the web configuration GUI from any network-attached PC.

3.4.1 Log back in to the web configuration GUI

1 Knowing the Hub's new IP address, log back into the web configuration GUI.
2 For example:
   – If you gave the Primary Hub the static IP address 10.10.10.5, you log in from the URL https://10.10.10.5
   – If you changed the Hub to be a DHCP client, you need to discover its IP address from the lookup table on your DHCP server (you'll need to know the Hub's MAC address; see *page 27*). DHCP server instructions are beyond the scope of this manual.
3 For now, log in as the *advanced* user with the default password (supervisor).

3.4.2 Set the date, time and passwords

1 In the web configuration GUI, display the Hub Setup page.
2 Set the date and time and click **Update**.
3 Change the default passwords for basic and advanced users and click **Set Password**.

3.4.3 Set up the operating parameters and switching matrix

1 Display the System Setup page.

This shows the switching matrix for your system (which Service inputs are connected to which outputs on the Primary Hub. Lower down the page there are configuration options for the Secondary Hub and any RUs. Initially, all settings are defaults.

2 Tell the system which of the available Service inputs you want it to use by setting them to **Enabled**.

3 For each Service, select the Input power in dBm. This is the value that you know you should be getting from the donor Service. We assume 0dB, but change this if necessary.

Caution: The Input power must not exceed the safe operating limit of +25dBm.

4 Set the Overload margin.

This is in effect an alarm threshold for input power. If, for example, you had your system all set up then added another Service, your input power might rise by 3dB. You might set the Overload margin to 3dB to flag this. Alternatively, you might want to know whenever the input power level changed, for any reason, in which case you'd set the Overload margin to a very low threshold.

5 Set the Relative Power per Service.

Here you are setting the relative power level for each Service, based on values you should have calculated as part of your system design. This should take into account all Service inputs that contribute to the composite power level.

The maximum that all Services can add up to is 18dBm in Europe and 20dBm in the USA & Canada (the maximum power that an RU can handle). The maximum EIRP is 20dBm for WLAN in Europe and 28dBm for all approved services in USA & Canada. This corresponds to antenna gains of 2dBi for WLAN in Europe and 8dBi for USA & Canada.

6 Set the Uplink/Downlink balance.

Set the relative gain according to your system design parameters.

7 Enter a label (name) for each Service (e.g. Tetra, or DCS 1800).

8 Set the number of carriers for each Service.

9 Enable or disable the links to the Secondary Hub as appropriate.

10 Click to tick (enable) boxes in the switching matrix. This is where you tell the system which Services are output on which link.

11 Enter a label (name) for the Primary Hub.

12 Click **Load Primary Hub Settings** below the Primary Hub table to make your settings take effect.

3.4.4 Set up the Secondary Hubs

Note: You'll need to follow the steps in this section for each Secondary Hub in turn.

1 On the System Setup page, scroll to the Secondary Hub table.
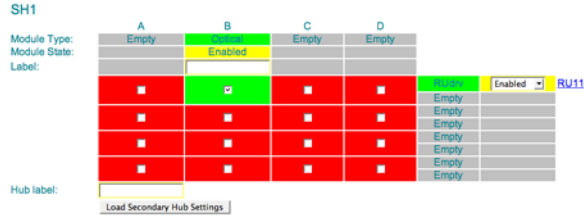
2 Enter a label (name) for the Secondary Hub.

3 Set up your switching matrix (which Optical Link Modules are connected to which RU Drive Module).

4 Enter a label (name) for the Secondary Hub.

5 Click **Load Secondary Hub Settings** below the Secondary Hub table to make your settings take effect.

6 Repeat steps 1 through 5 for other Secondary Hubs (each will have their own table).

3.4.5 Set up the RUs

1 On the System Setup page, scroll to the RU table.

There is one row per RU in this table. Set up all the RUs before loading the settings.

2 Enter a label (name) for the RU.

3 Set the Downlink power.

4 Set the upper limit for the Uplink power.

This value should come from your system design. It limits the power back from the RU, and is also an alarm threshold.

5 Set the RU Tx state (Enabled or Disabled).

6 If necessary, repeat steps 2 through 5 for other RUs in the table.

7 Click **Load Remote Unit Settings** below the RU table to make your settings take effect.

3.4.6 Run Autosetup

So far, we have applied configuration changes to the Hubs, but the system has not made any automatic gain calculations or 'switched on' the RF.

1 At the bottom of the System Setup page, click **Validate**.

The system will automatically make gain calculations, based on the values you've supplied. It will take into account any path losses due to cable lengths.

**2** When you calculations are complete, you'll see the downlink power available to each RU.
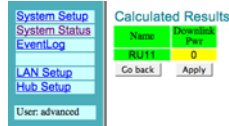
3 If there are no errors, click **Apply**.

If there are errors, click **Go Back** to return to the System Setup page and check the settings. Click **Validate** again once you're sure they're OK.

Once the settings have been applied and there are no errors, the System Setup page will redisplay. Note that, now the settings are correct, you can't edit them (as the system is operational, with those values in operation):
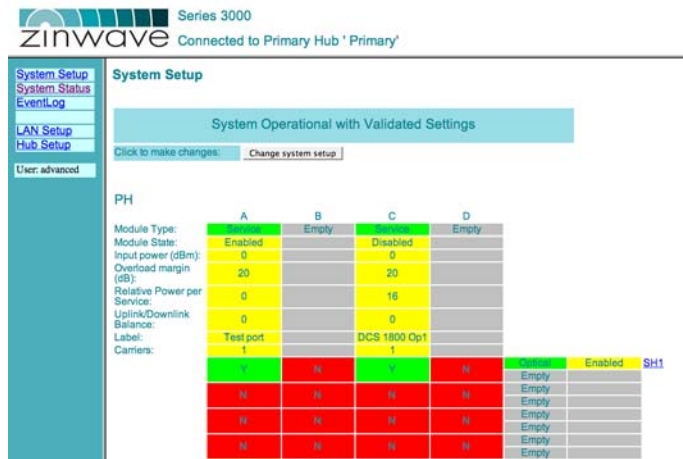
4 Once you've finished, take a look at the System Status page. Click on the links to see detailed status information for a particular unit.
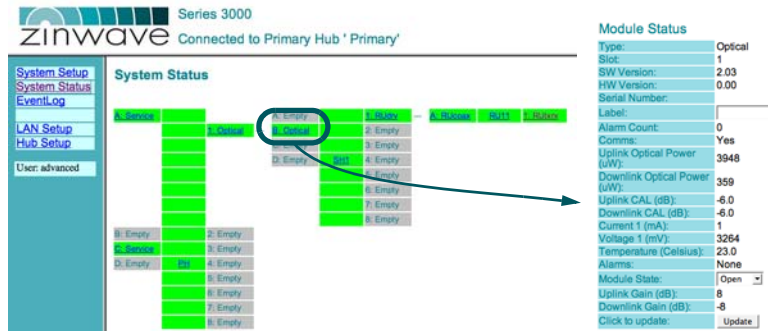
3.4.7 Changing the System Setup

Once you've clicked **Validate** and made your settings active, they are not immediately editable in the System Setup page. If you want to make more changes, you can do so by clicking the **Change System Setup** button at the top of the System Setup page.