SUNWAVE

CROSSFIRE

CrossFire HP

User Manual

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List of Changes

Ed	Author	Approver	Remarks	Date
1	WANG		Official Version. Draft	2015/01/27
2	Layla Wu		Format Change	2015/02/04
3	WANG		Add Suspension Installation	2015/02/06
4	XXXXXX		Change SMA to QMA Output Power alarm threshold	2016/02/08
5	Ren Ailin		Add warning and notes	2017/07/11

High Power-CrossFire User Guide

0. Preface

0.1. Safety Instructions

Before installing and operating the CrossFire, read and comply with the following safety instructions:

1. Engineering design: The CrossFire achieves signal amplification of the uplink and downlink through direct coupling of the 2G, 3G and LTE signals from the base station. The expansion unit accesses WLAN signals and combines the WLAN signal with the coupled signal for indoor coverage. Normal use of the system will not damage the base station; however, with the increase of RU during network coverage for indoor distribution, the uplink output noise level may affect the sensitivity of the base station, which should be considered during engineering design.

2. Grounding: the shells of the access and expansion units of the device have protective ground terminals. During installation, connect the ground terminals securely to the protective building ground with yellow and green conductors or with braided ground wire. The aerial and feeder must be adequately grounded.

3. Power supply: The power source must be within the required range of the device. The rated voltage range for the AC power supply system is AC100V～240V and the rated frequency range is 50Hz / 60Hz. The rated power of the AU, EU and RU is 100W, 50W and 250W, respectively. The ground terminal of the three-core power socket used at the device installation site must be securely connected to the protective building ground.

4. Electric shock prevention: touching the internal power supply units is dangerous. To prevent electric shock, do not perform live-line work.

5. The optical module can support a hot plug, but do not turn the optical fiber head towards any human body part when plugging it in.

6. During device configuration, upgrading and plugging in units and parts, first disconnect the standby lithium battery and device power source.

7. When accessing the radio-frequency signal, confirm that the downlink signal is no greater than 10dBm, otherwise the device will not operate normally and damage may occur to the circuit.

8. Natural cooling: Reserve at least 40mm of height above the radiation fins during the device

installation, otherwise the device temperature may rise and affect the service life of the device.

9. Replacing the Power Amplifier (PA) module and duplexer module onsite is permitted. Power off the device before replacing.

Note: Charged operation is not allowed to prevent damage to the devices.

10. Please use Shielded Twisted Pair (STP) for WLAN application.

0.2. Warning

The warning marks on the CrossFire shell should be kept clean, readable and identifiable.

ALWAYS disconnect all lines and power connections before servicing or disassembling this equipment.

NEVER touch the surface after the devices power on.

For performance and safety reasons, NEVER disassemble and remodel the devices.

SUNWAVE

WARNING: Changes or modifications to this equipment not expressly approved by SUNWAVE could void the user's authority to operate the equipment.

WARNING: This is NOT a CONSUMER device. It is designed for installation by FCC LICENSEES and QUALIFIED INSTALLERS. You MUST have an FCC LICENSE or express consent of an FCC License to operate this device. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of $100,000 for each continuing violation.

WARNING: This is NOT a CONSUMER device. It is designed for installation by an installer approved by an ISED licensee. You MUST have an ISED LICENCE or the express consent of an ISED licensee to operate this device.

WARNING: To comply with FCC RF exposure compliance requirements, each individual antenna used for this transmitter must be installed to provide a separation distance greater than 385cm or more from all persons during normal operation and must not be co-located with any other antenna for meeting RF exposure requirements.

WARNING: Antenna gain should not exceed 12.5 dBi.

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

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

　　-- Reorient or relocate the receiving antenna.

　　-- Increase the separation between the equipment and receiver.

　　-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

　　-- Consult the dealer or an experienced radio/TV technician for help.

　　Note: Only authorized person can enter the area where the antenna is installed. And the person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other

appropriate means. Awareness of the potential for RF exposure in a workplace or similar environment can be provided through specific training as part of a RF safety program.

NOTE: This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

0.3. Electrostatic Protection

Keep clothes and hands off the PCB, elements and conductor surface. If any maintenance is required on the PCB, components, or conductors, take electrostatic prevention measures, such as wearing electrostatic prevention gloves and using electrostatic prevention bags, since static electricity may damage the devices.

0.4. Standards

All CrossFire devices meet the 3GPP standards.

0.5. Abbreviations

Abbreviations used in this manual are listed below:

Abbreviation	Description
ADC/ DAC	Analog to digital converter/ Digital to analog converter
AP	Access Point
ARM	Advanced RISC Machines
AU	Access Unit
BS	Base Station
CMM	Control & Management Module
CPRI	The Common Public Radio Interface
DCM	Downlink Channel Module
DPLL	Digital phase lock loop

EU	Expansion Unit
FPGA	Field Programmable Gate Array
iDAS	Integrated Distributed Antenna System
GSM	Global System for Mobile Communication
IPM	Interface Processing Module
LTE	Long Term Evolution
NMS	Network Management System
OMC	Operations and Maintenance Center
OMT	Operations and Maintenance Terminal
OP	Optical Fibre
PA	Power Amplifier
POI	Point of interface
RF	Radio frequency
RU	Remote Unit
RX	Receiver
SFP	Small Form-factor Pluggable
SNMP	Simple network management protocol
STP	Shielded Twisted Pair
TX	Transmitter
UCM	Uplink Channel Module
USB	Universal Serial Bus
WCDMA	Wideband Code Division Multiple Access

1. System Overview

1.1. Overview

The CrossFire system includes the Access Unit (AU), Expansion Unit (EU) and Remote Unit (RU).

Using digital processing and digital optical transmission technology, the AU frames radio-frequency signals from base stations of different operators, and of different standards and frequency bands, and transmits the composite signal to the EU. WLAN and small cell base station signals access the gigabit/megabit Ethernet port on the EU and are reframed with optical signals from the AU and then transmitted to the RU. The RU conducts digital-analog conversion and power amplification of the input signals and then achieves radio coverage through the antenna-feeder system for signals of all standards and frequency bands.

1.2. Product model

AU: iDAS-A202, EU: iDAS-E202, RU: iDAS-R211

1.3. Operating Fundamentals

Figure 1- 1 shows the fundamentals of how the CrossFire operates.
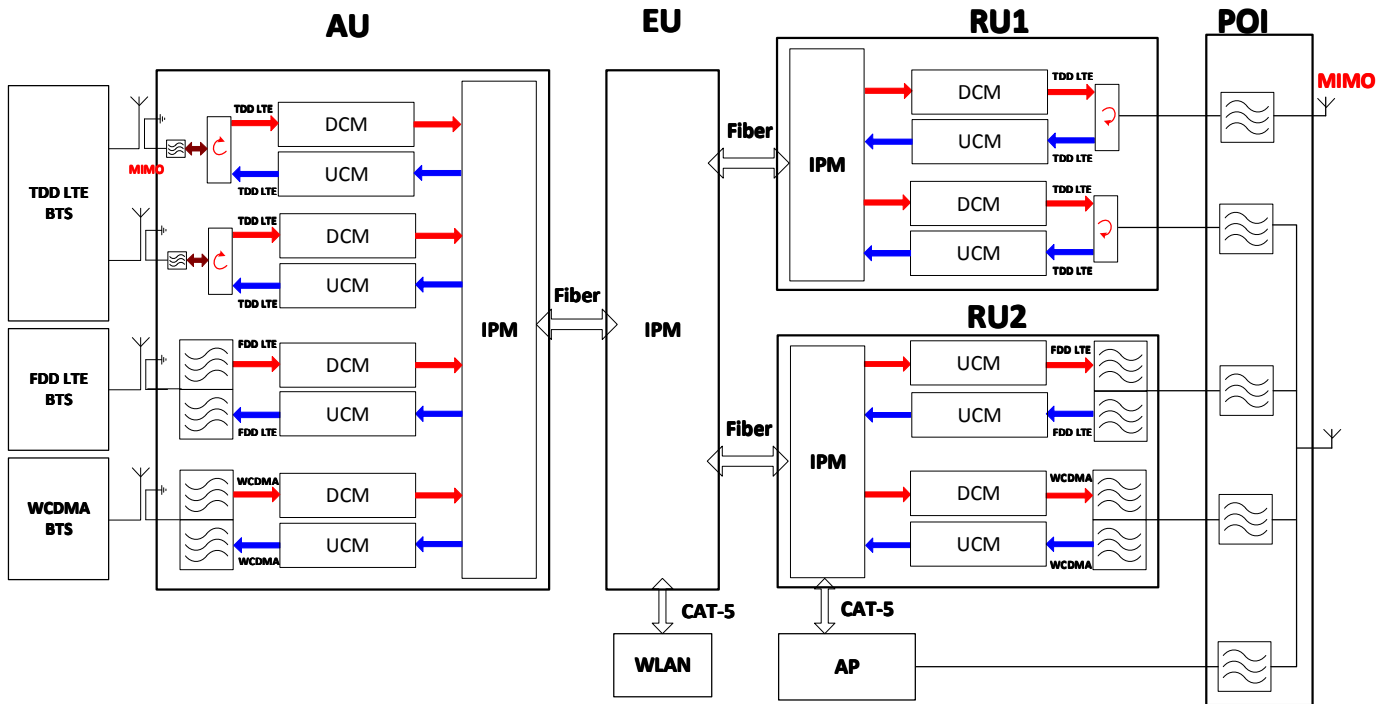
Figure 1- 1 CrossFire Operating Fundamentals

The CrossFire is divided into three logical functional units according to function:

- Interface Processing Module (IPM): Interface switch and protocol analysis.

- Downlink Channel Module (DCM): The AU terminal (upper layer of the DCM) converts RF signals into digital signals and includes filtration and ADC conversion. The RU terminal (lower layer of the DCM) converts digital signals into RF signals and includes DAC conversion and IQ modulation.

- Uplink Channel Module (UCM): The RU terminal (upper level of the UCM) converts RF signals into digital signals and includes filtration and ADC conversion. The AU terminal (lower level of the UCM) converts digital signals into RF signals and includes DAC conversion and IQ modulation.

1.4. Technical Specifications

See the Technical Specifications Document for details.

1.5. System Framework

Figure 1- 2 shows the typical CrossFire system framework.
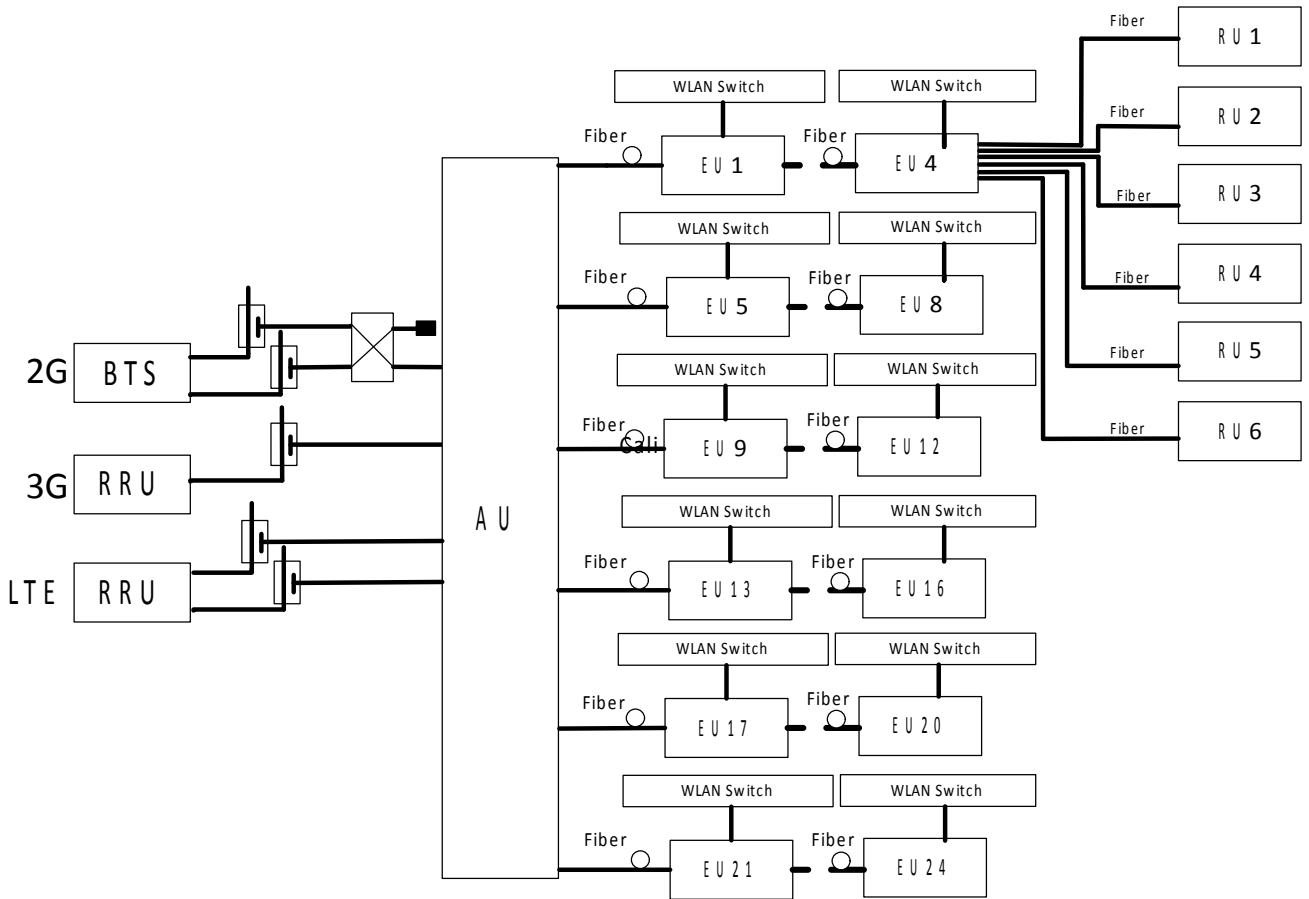
Figure 1- 2 Typical System Framework for the CrossFire

1.6. Networking Layout

The CrossFire has a number of different networking layouts shown as Figure 1- 3:

- The AU supports a star network. Note that the Master-AU can connect to a maximum of two Slave-AUs simultaneously.

- The EU supports a daisy-chained network (for EU—EU) and a star-type network (for EU—RU).

- In smaller systems, the AU and RU can be directly connected without the EU, as shown in Figure 1- 3.

- For a direct AU—RU connection, an RU can cascade up to five RUs at different levels. For an AU—EU—RU connection, an RU can cascade up to four RUs at different levels.
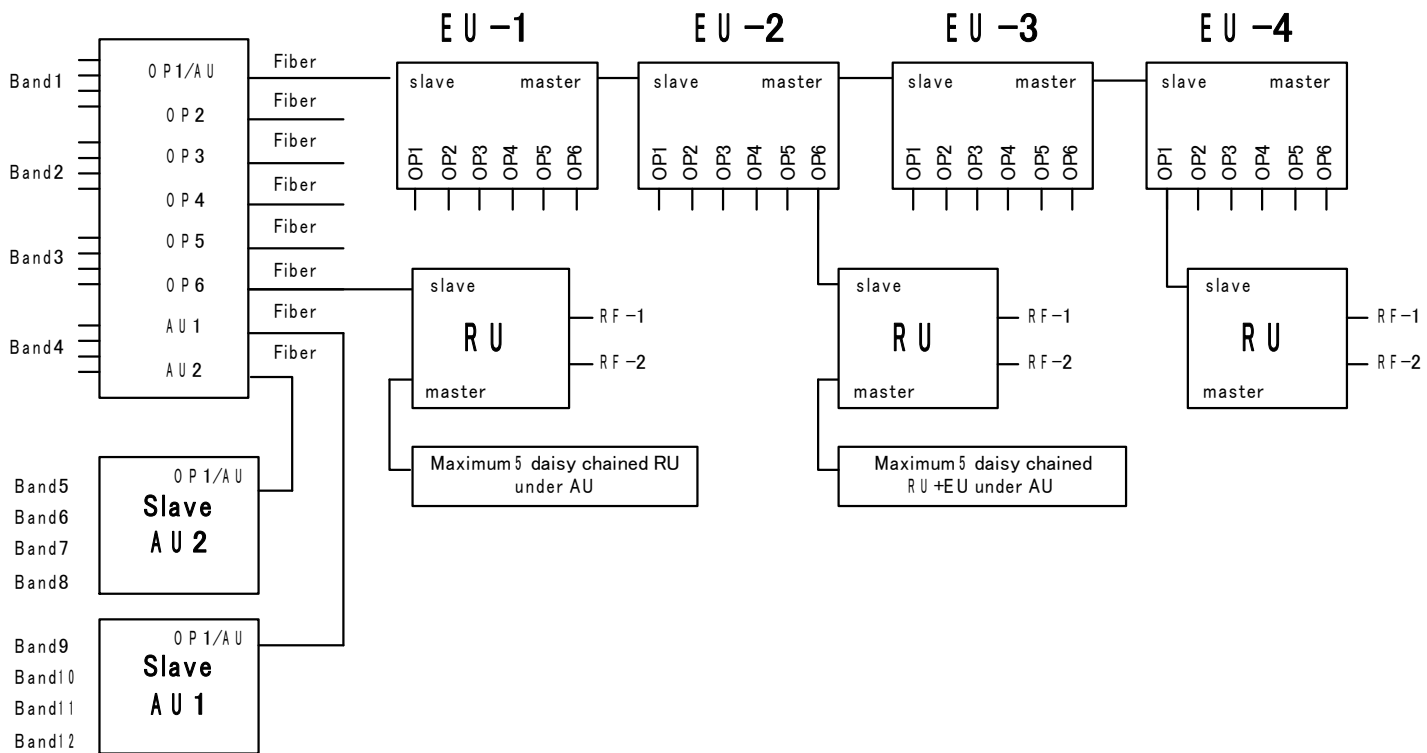
Figure 1- 3 Networking Layout

2. Operations and Maintenance Terminal

2.1. Introduction to the OMT

The Operations and Maintenance Terminal (OMT) software runs on all of the devices in the CrossFire system. The interface to the OMT is WebOMT. WebOMT is based on a web browser and is compatible with most common browsers such as IE and Google Chrome. WebOMT is customized for the CrossFire and is used for query, debugging and configuration.

An NMS can only connect to the Master AU, therefore the Master AU is known as the host. However, to maintain the CrossFire system locally, a technician can access the whole system through any one of the devices in the CrossFire system (Master or Slave AU, EU or RU). For example, the technician may connect a laptop to the RU, log into the WebOMT and query the DAS topology. The device name on the topology diagram is a URL link to the WebOMT on the selected device. Therefore, by clicking on the device's name, the technician can access any other device easily, regardless of which device's WebOMT they initially logged into.

2.2. Accessing the OMT

There are several methods for accessing the OMT:

- Wired access

- Wireless access

- USB access

Unless indicated otherwise, the examples use the Windows XP operating system and Internet Explorer 8 web browser.

2.2.1. Wired Access to the OMT on the Master AU

In the CrossFire system, the Master AU is defined as the host, with the other AUs, EUs and RUs defined as slaves. See Section 3.6 for Master/Slave AU selection.

The default IP address of the AU is 10.7.3.200, while the slaves have no fixed IP address. The IP addresses of the slaves are assigned by the host automatically, based on the network topology.

To set up wired access to the OMT, use the following procedure:

1. Connect a PC to the **CONSOLE** port on the front panel of the Master AU with a network cable.

2. Change the TCP/IP properties (see Figure 2- 1):

a) Click **Network Connections**

b) Click **Local Area Connection Properties**

a. Click **TCP/IP Properties**

b. Change the following parameters as indicated:

IP address: 10.7.3.1

Subnet mask: 255.0.0.0

Default Gateway: 10.7.3.200 (IP address of Master AU)

3. Check the status of the Local Area Connection and confirm the connection is connected.

4. Open a browser window and enter the default gateway in the navigation bar. This will access the WebOMT page. Figure 2- 2 shows an example using 10.7.3.200 as the default gateway.
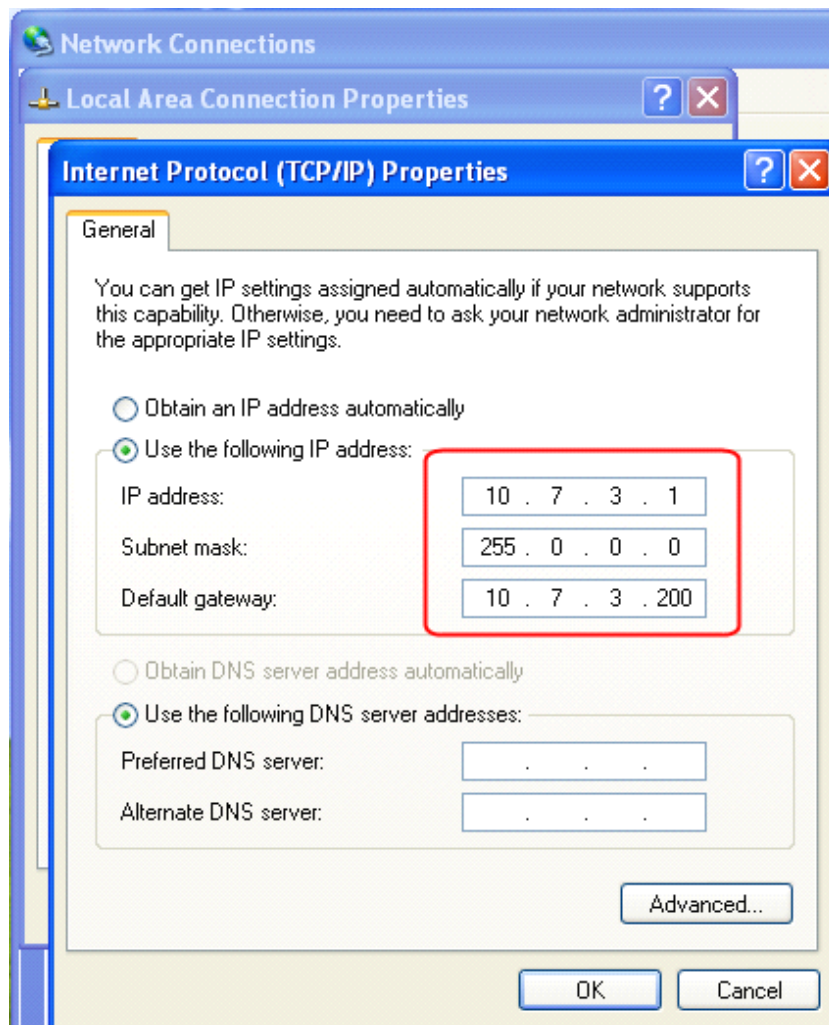
Figure 2- 1 Setting up a Wired Connection to the OMT on the Master AU
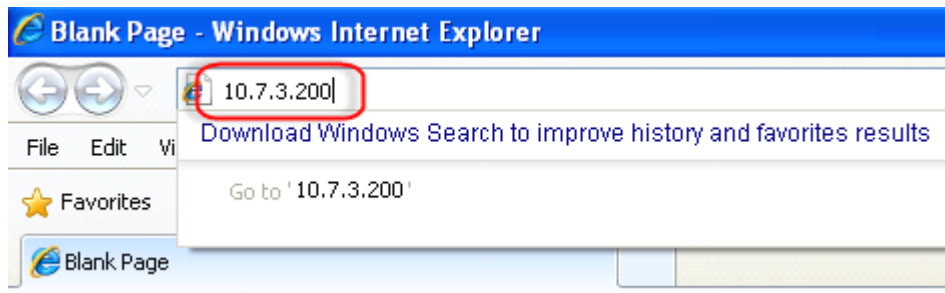
Figure 2- 2 Web Browser OMT Connection for Wired Access

2.2.2.   Wired Access to the OMT on the Slave AU, EU and RU

In the CrossFire system, EUs and RUs, as well as the Slave AUs, are defined as slaves. They have no fixed IP address.

The IP addresses are assigned by the host automatically, based on the network topology.

To set up wired access to the OMT, use the following procedure:

1. Connect a PC to the "CONSOLE" port on the front panel of the Slave device with a network cable.

2. Change the TCP/IP properties (see Figure 2- 3):

a)   Click **Network Connections**

b)   Click **Local Area Connection Properties**

c)   Click **TCP/IP Properties**

d)   Select the **General** tab

e)   Change the following parameters as indicated:

   a.   Enable **Obtain an IP address automatically** by clicking the check box

   b.   Enable **Obtain DNS server address automatically** by clicking the check box

3. Check the status of the Local Area Connection and confirm the connection is connected.

4. Open a browser window and enter the default gateway in the navigation bar. This will access the WebOMT page.
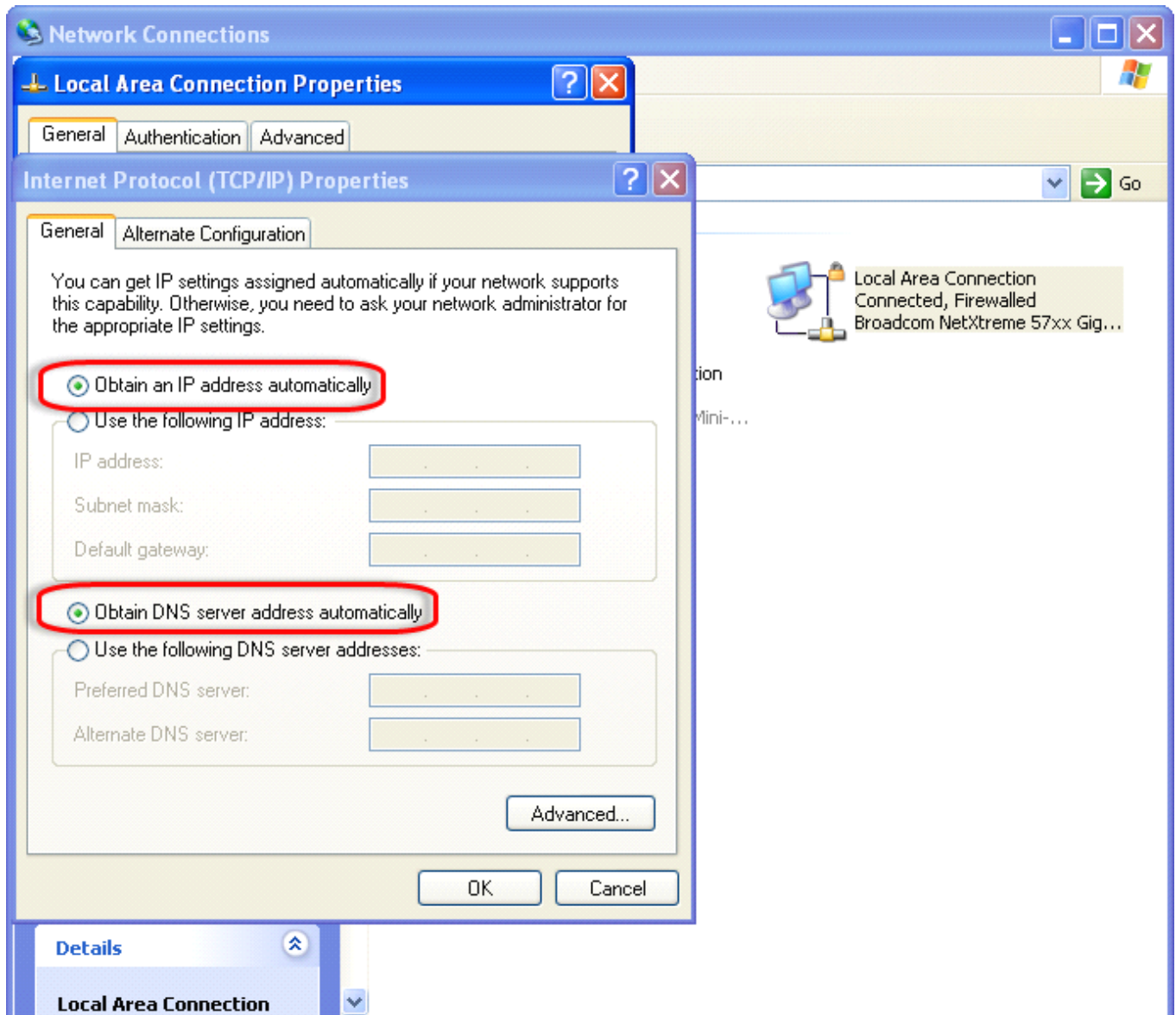
Figure 2- 3 Wired access to WebOMT on Slave AU, EU and RU

2.2.3. Wireless Access (for AU and EU)

Figure 2- 4 shows the equipment required for wireless access to the OMT.

WLAN Network Adapter (*SUNWAVE*-specified only)   PC with wireless connection function

Figure 2- 4 Equipment Required for Wireless Access to the OMT

To set up wireless access to the OMT, use the following procedure:

1. Plug the WLAN Network Adapter into the "AP" port of the device (Only AU & EU support).

2. Confirm that the adapter is working by checking that the green indicator is flashing.

3. Change the TCP/IP properties (see Figure 2- 5):

a) Click **Network Connections**

b) Click **Wireless Network Connection**

c) Click **TCP/IP Properties**

d) Select the **General** tab

e) Change the following parameters as indicated:

   a. Enable **Obtain an IP address automatically** by clicking the check box

   b. Enable **Obtain DNS server address automatically** by clicking the check box

4. Choose the correct wireless network and connect to it.

   • The naming rule for the network is CrossFire-XX (device type)-XXX (Serial Number).

   • The default network key is 12345678.

   • See Figure 2- 6 and Figure 2- 7 for details.

5. Check the wireless network status and obtain the default gateway. See Figure 2- 8 for details.

6. Open a browser window and enter the assigned default gateway into the navigation bar. This will

access the WebOMT page. Figure 2- 9 shows an example using 12.7.1.1 as the default gateway.
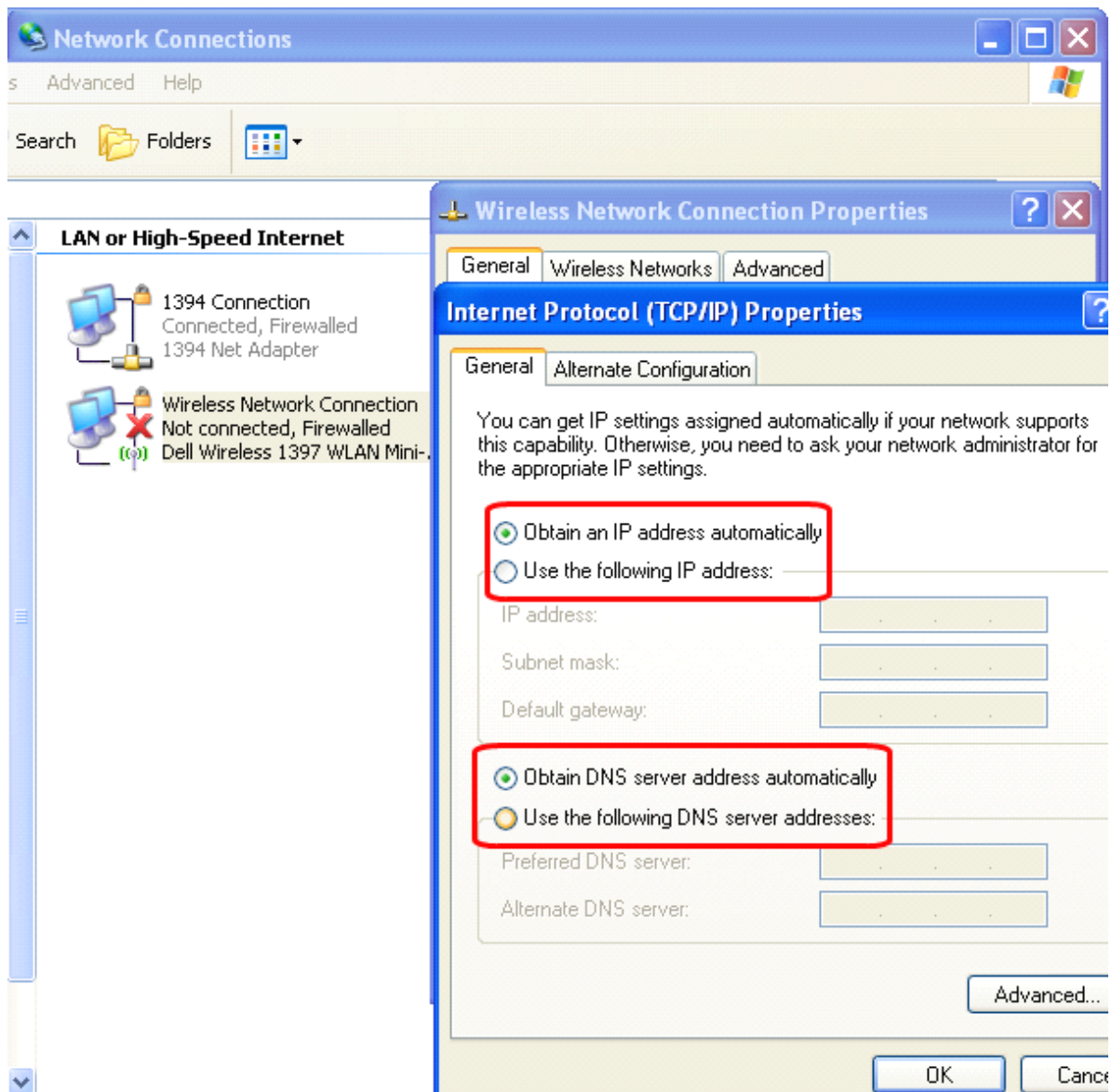
Figure 2- 5 Wireless Network Connection Properties for OMT
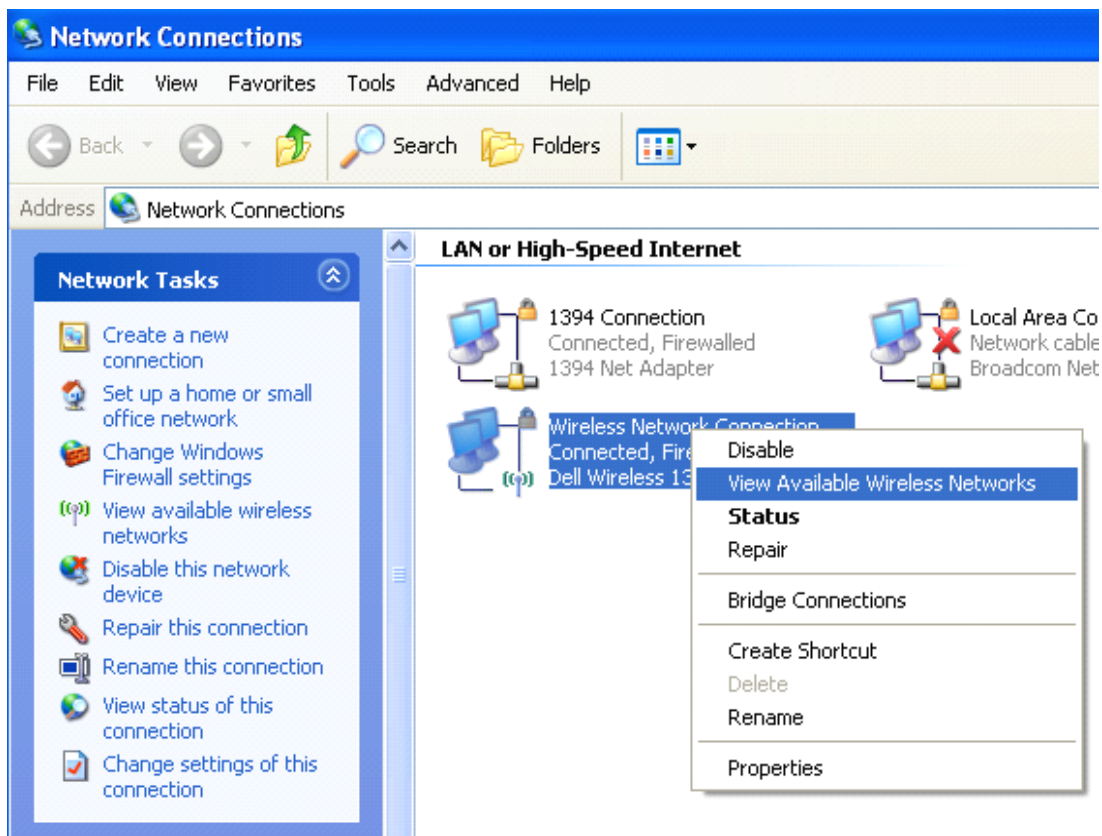
Figure 2- 6 Viewing the Available Wireless Networks
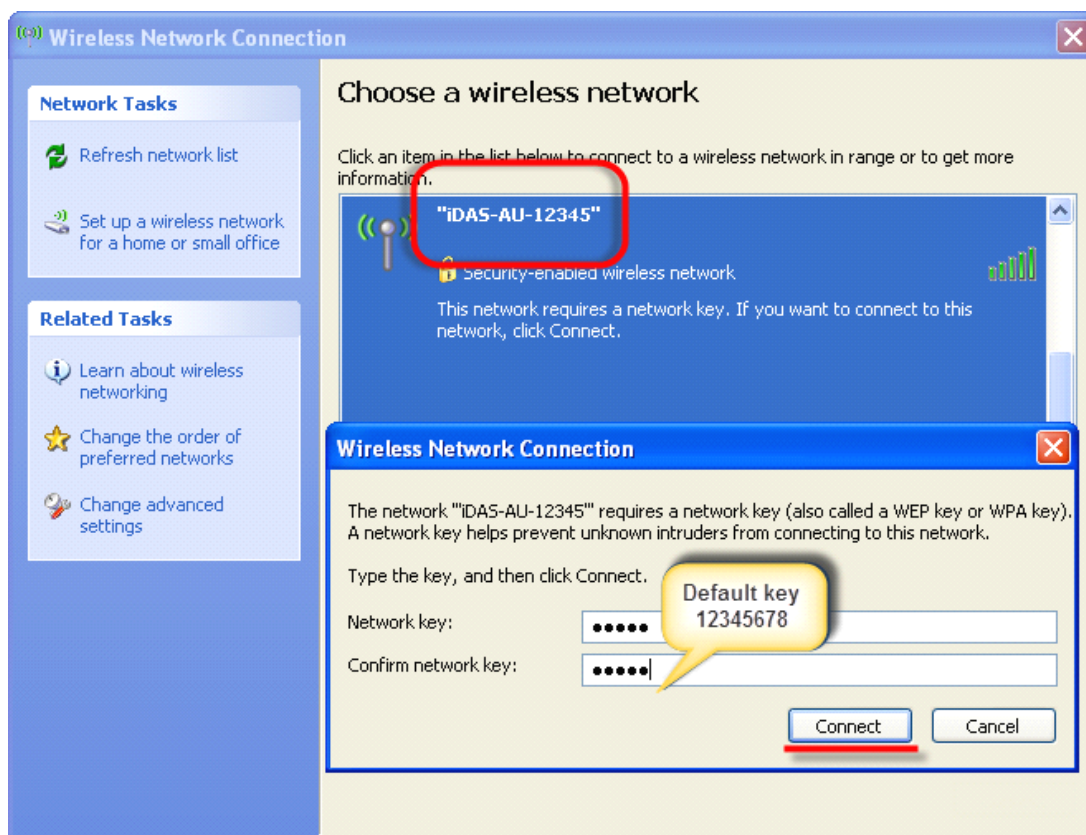
Figure 2- 7 Choosing the Correct Wireless Network
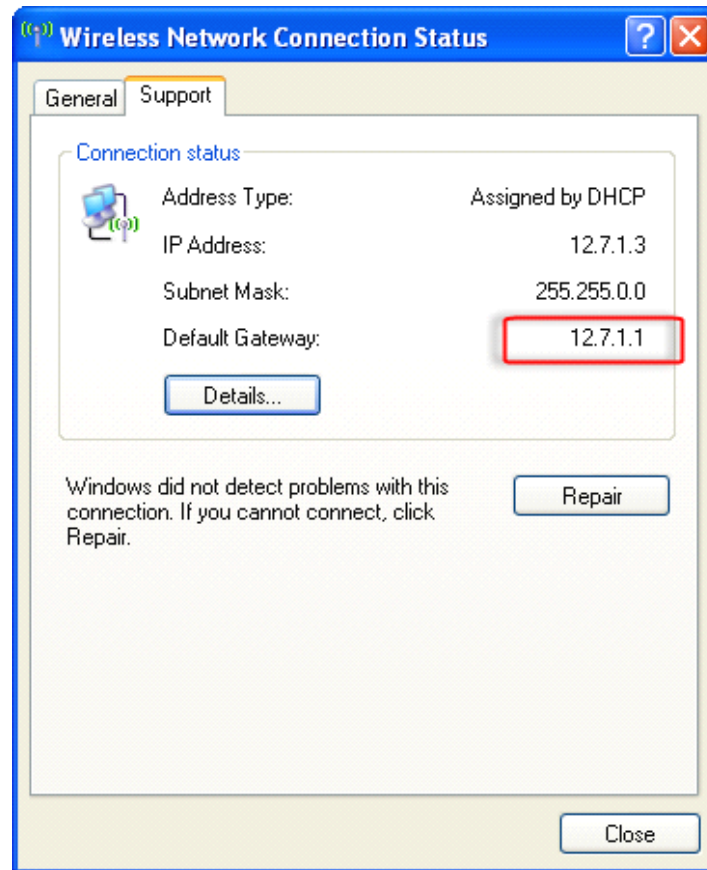
Figure 2- 8 Checking the Wireless Network Status
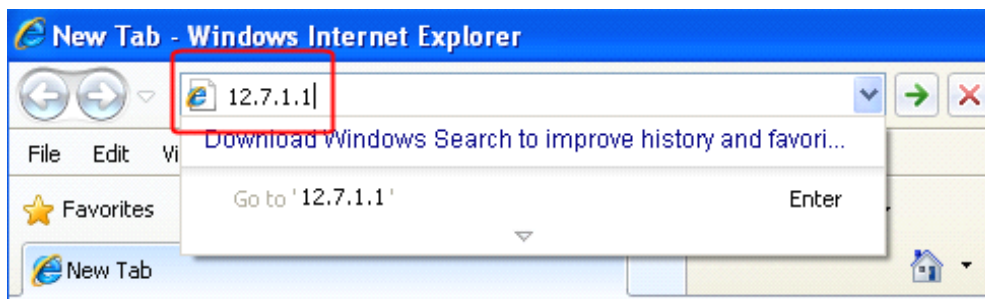
Figure 2- 9 Connecting to WebOMT

2.2.4.   USB Access

To set up USB access to the OMT, use the following procedure:

1.   Connect a PC to the "Debug" port on the front panel of the device with a USB-to-USB cable.

    Note: The USB-to-Ethernet drive should be installed in the connected PC. Contact *SUNWAVE* if you have any

    problems with this.

2.   Check the status of the Local Area Connection and confirm the connection was successful.

3.   Open a browser window and enter default gateway in the navigation bar. This will access the WebOMT page.

2.3. OMT Display

2.3.1. Login

Figure 2- 10 shows the login page and default username & password.

See Section 2.3.3 for the details about user management.
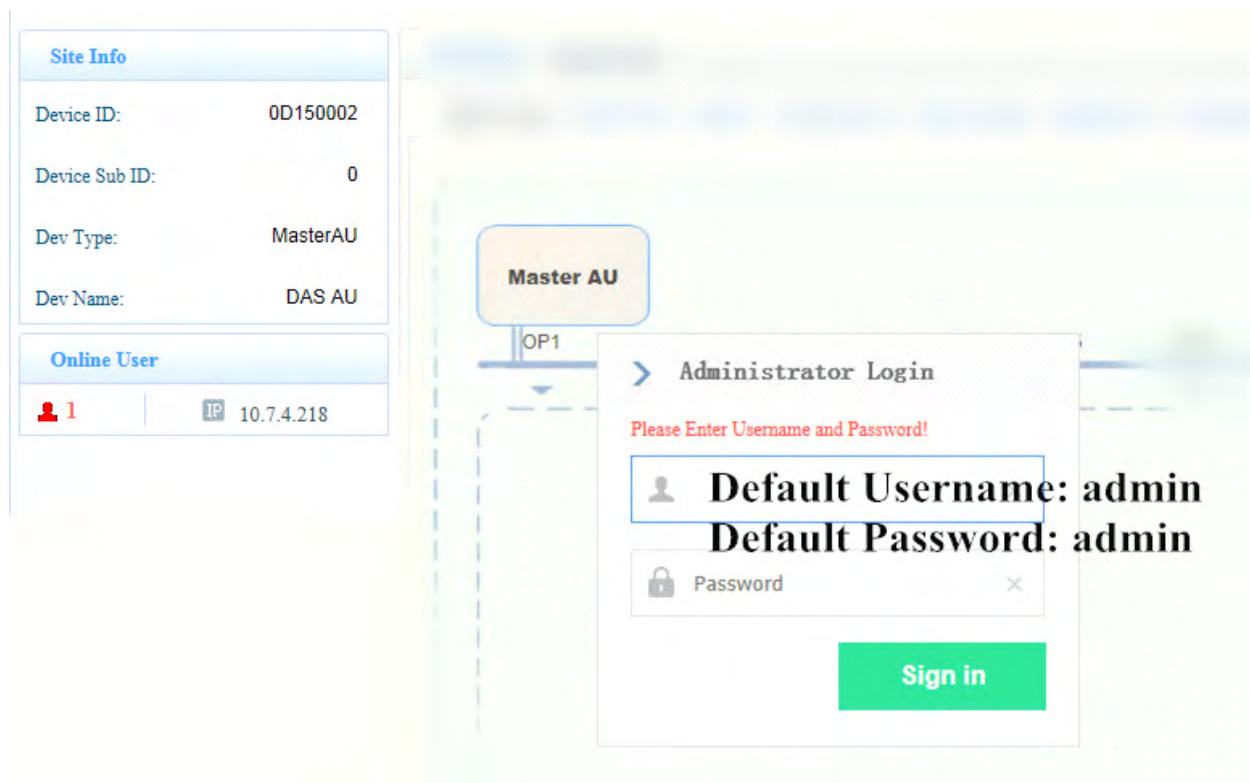
Figure 2- 10 Login Page

2.3.2. Homepage and Basic Functions

Figure 2- 11 shows the OMT homepage. The buttons, tabs and fields are referenced by number and are described below the figure.
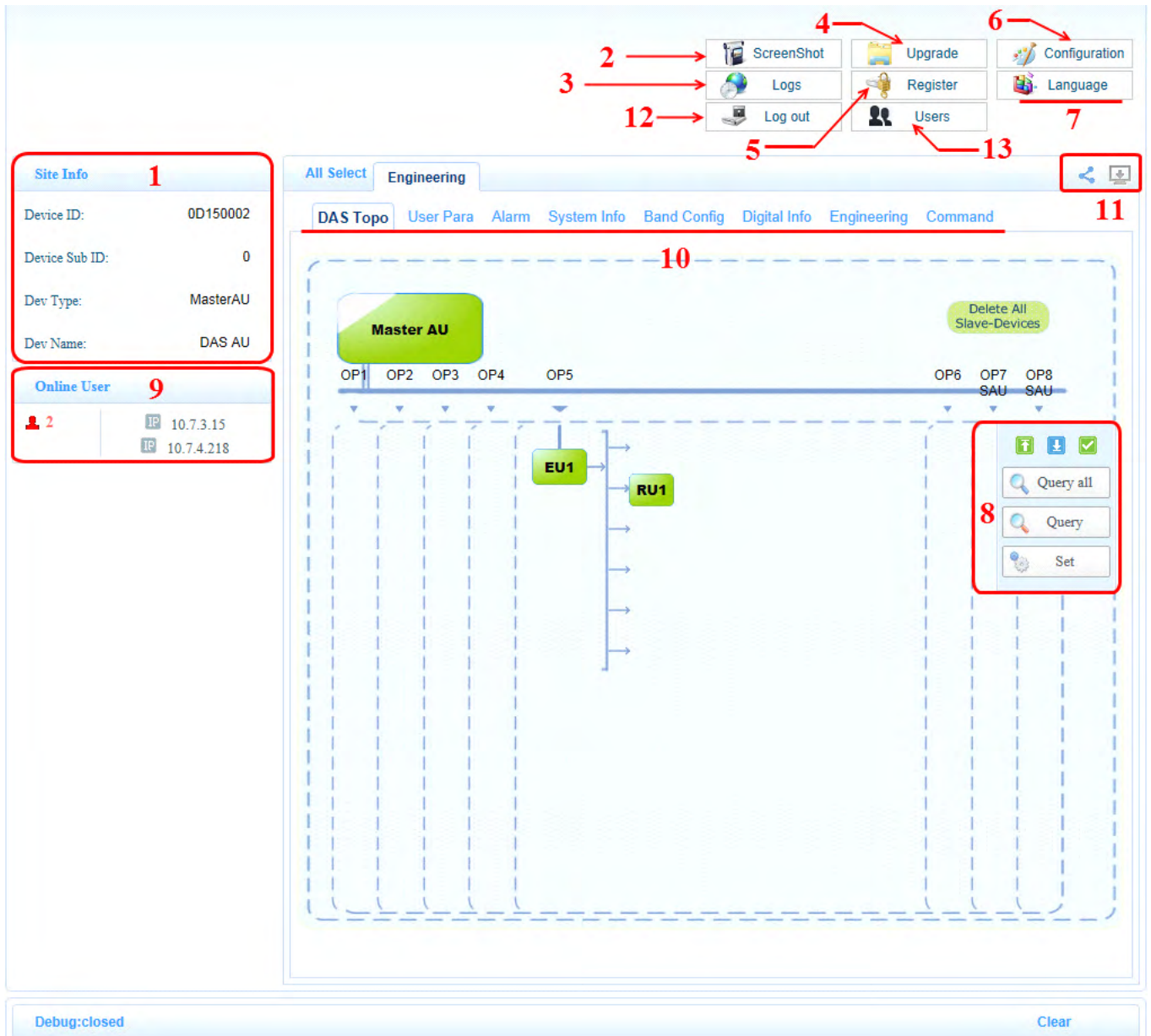
Figure 2- 11 WebOMT Homepage

The OMT homepage includes the following buttons, tabs and fields (refer to corresponding numbers in Figure 2- 11):

1. **Site Info**: Includes "Station ID", "Device ID", "Dev Type" and "Dev Name" information.

2. **ScreenShot**: Used for saving the current parameter information and device operating status. When SUNWAVE assistance is required to troubleshoot the system, send the "ScreenShot" file to the SUNWAVE technicians.

To use the **ScreenShot** function, follow the procedure below:

a) Select the page that you want to save.

b) Click the **ScreenShot** button. See **2** in Figure 2- 11.

c) Close the popup window after the screen shot has been successfully captured as shown in Figure 2- 12.

d) Click the **Configuration** button. See **6** in Figure 2- 11.

e) Click the **Download** shortcut icon to download the screen shot file. Check the filename and date to ensure

that the correct file has been selected. See Figure 2- 13 for details.
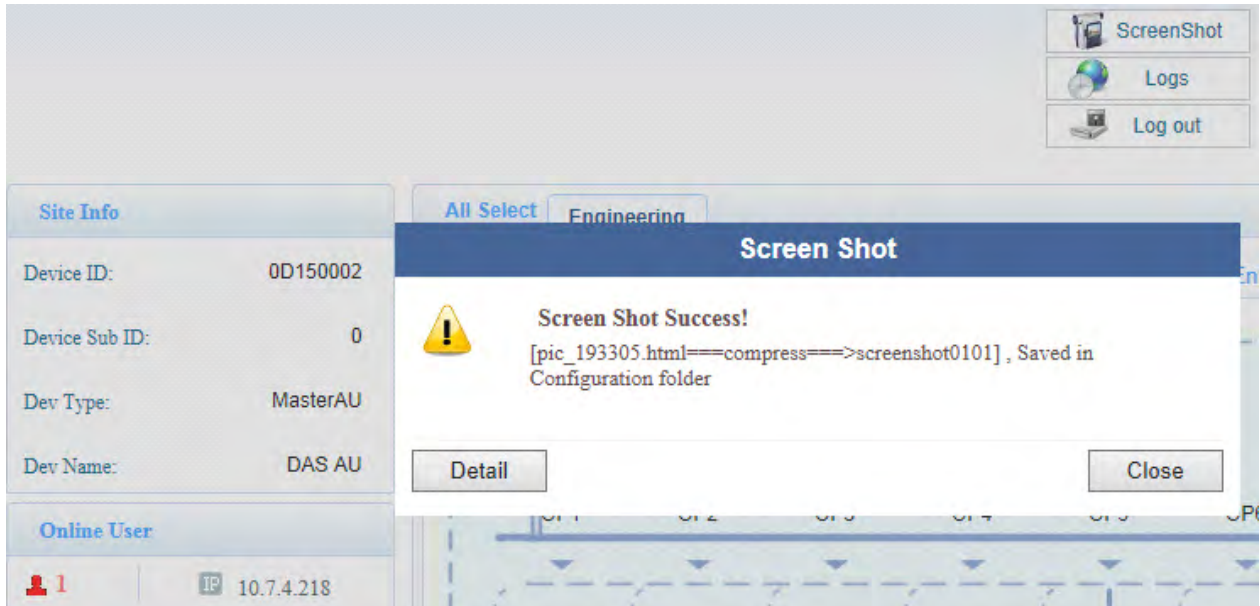
Figure 2- 12 Screen Shot Capture Success Pop-up Window
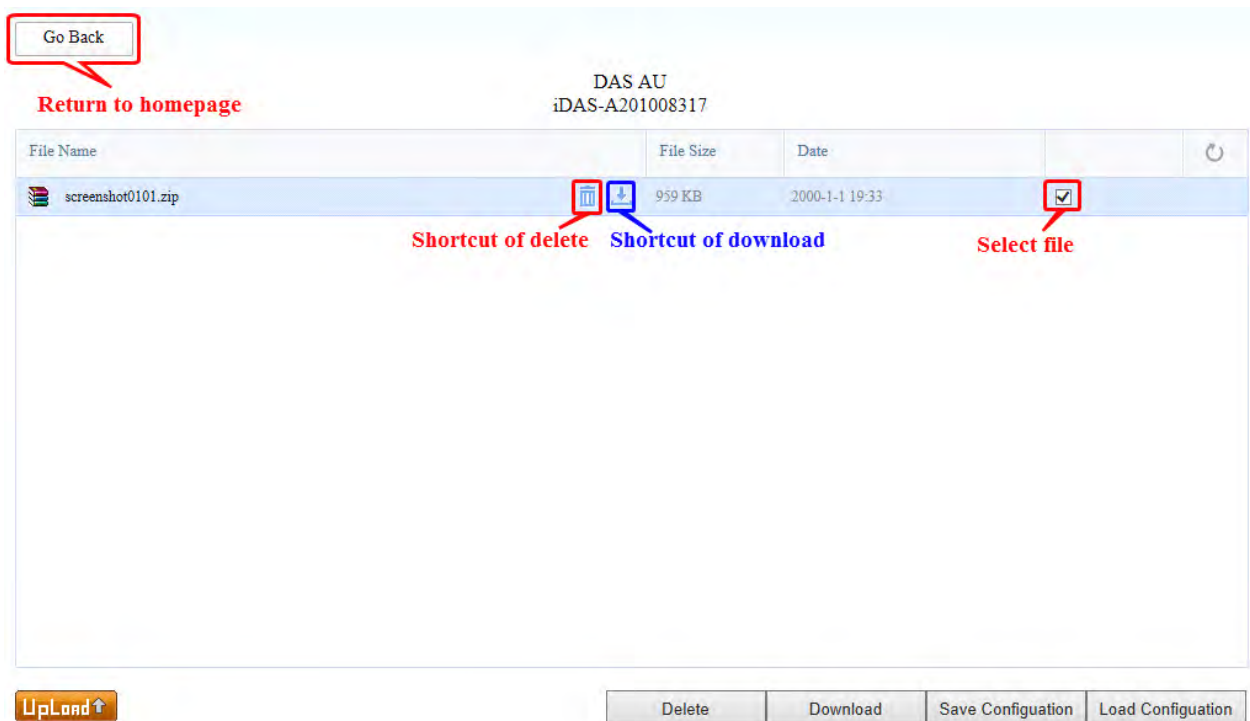
Figure 2- 13 Screen Shot Download File

3. **Logs**: Records the operating status of the devices. The logs can be downloaded and deleted from this

page. To ensure that the correct log has been selected, check the filename and date before downloading the

file.

4. **Upgrading**: Used to upgrade the software. See Section 8 for details.

5. **Register**: This function is not relevant for maintenance activities.

6. **Configuration**: See Section 7.5 for details.

7. **Language**: Switches language between English and Chinese. (Other languages are being developed.)

8. **Operation interface**: Queries status and sets parameters.

9. **Online User**: Shows the number of users that are currently connected to the OMT and the IP address of each user's device.

10. **Parameters**: Tabs that access pages that display and allow setting of device parameters.

11. **Parameter configuration field**：Buttons that show/hide the parameter ID number & checkbox and save configuration parameters. See Section 7.5 for details.

12. **Log out**: Button that used for logging out.

13. **Users**: See Section 2.3.3 for details.

2.3.3. Users Management

Figure 2- 14 shows the page of user management by clicking **Users** button on the homepage.

➢ *Note:* Users management should be operating on **Master AU** WebOMT only.

➢ *Note:* Only **admin** account has the authority to do users management.
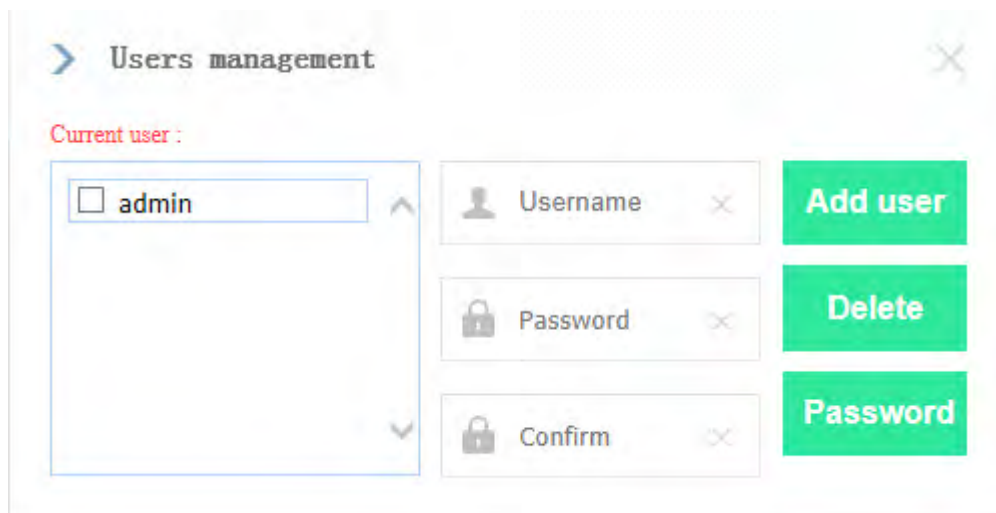
Figure 2- 14 Users Management

1) Add user account

a) Enter the new username. See **1** in the Figure 2- 15.

b) Enter the password and confirm. See **2** in the Figure 2- 15.

c) Click **Add user** button.
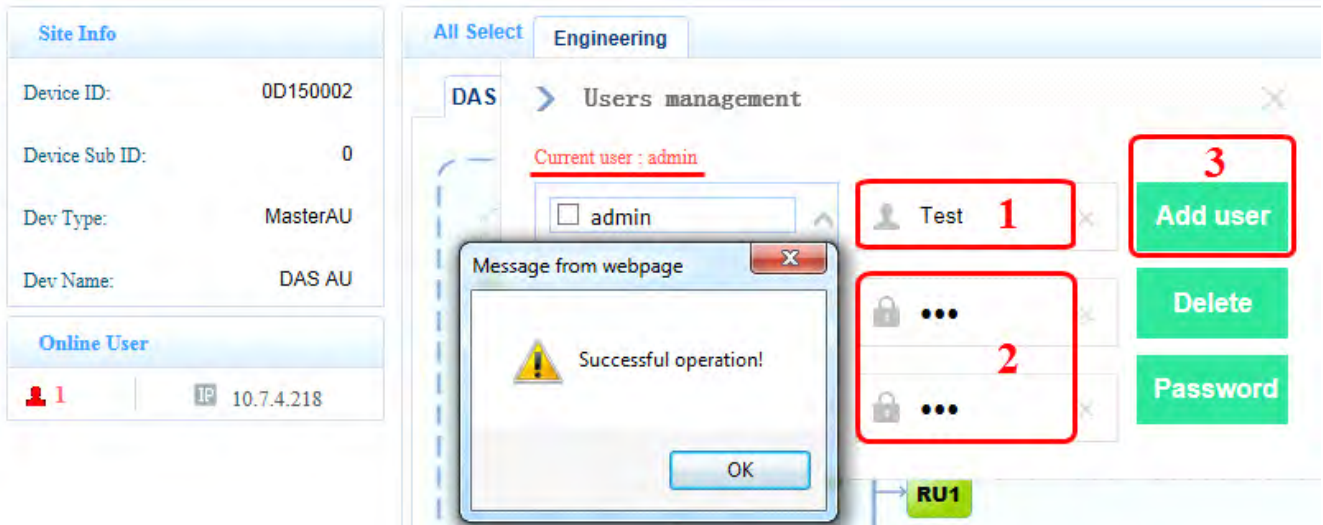
Figure 2- 15 Add User

2) Delete user

a) Choose the user need to delete. See **1** in the Figure 2- 16.

b) Click **Delete** button. See **2** in the Figure 2- 16.

c) Click **OK** button to confirm. See **3** in the Figure 2- 16
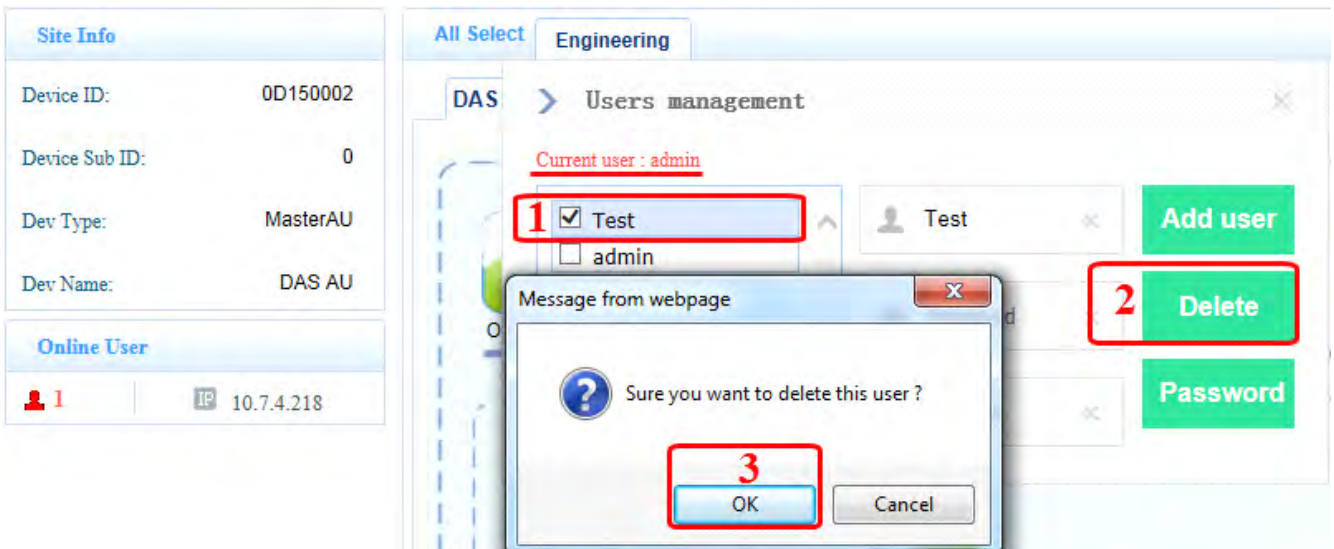
Figure 2- 16 Delete User

3) Change password

a) Choose the user need to change password. See **1** in the Figure 2- 17.

b) Enter the new password and confirm. See **2** in the Figure 2- 17.

c) Click **Password** button.
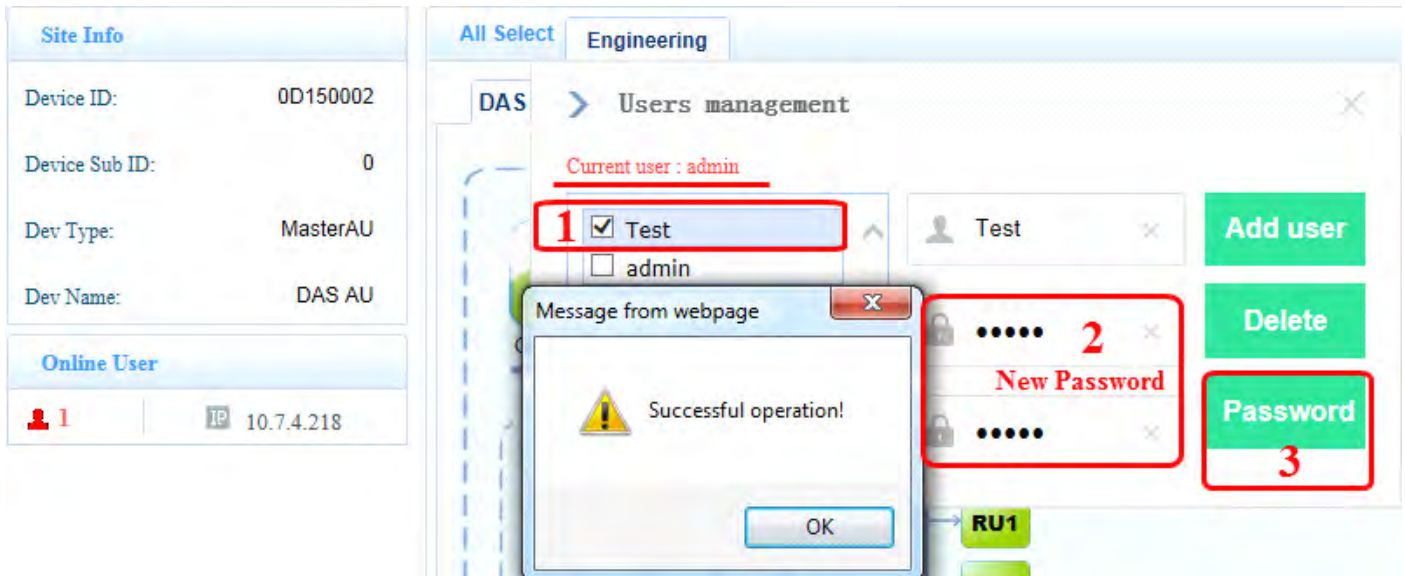
Figure 2- 17 Change Password

2.3.4. Displaying the System Topology

To display the system topology:

1. Log in to the WebOMT.

2. Select the main **Engineering** tab.

3. Select the **DAS Topo** tab.

4. Select **Query all**.

Figure 2- 18 shows the system topology display. If networking is successful, arrows will be displayed for the six optical ports behind the Master AU (for example, see the green "EU1" icon in Figure 2- 18), which means that there are connected devices corresponding to the optical port. Click the arrow to extend the topology for this port.

Figure 2- 18 Displaying the System Topology

Devices in the topology have two colors —green and red:

- Green indicates a connected device.

- Red indicates a device that was once connected but is currently disconnected. When a red device is displayed, check whether this device exists or not. If the device does not exist, delete this device on the topology page by right-clicking the frame indicating the device, and then clicking the **Delete** button.

Note: To use the **Delete All Slave-Devices** button, factory authorization is required. See Section 3.7.8 for details.

⚠ This symbol indicates the devices with alarms.

3. AU Instructions

3.1. AU Physical Appearance

Figure 3- 1 shows a photograph of the AU component of the CrossFire.

Figure 3- 1 Physical Appearance of the AU

3.2. AU Front Panel

Figure 3- 2 shows a schematic of the front panel of the AU and Table 1 lists the interfaces and their functionality.
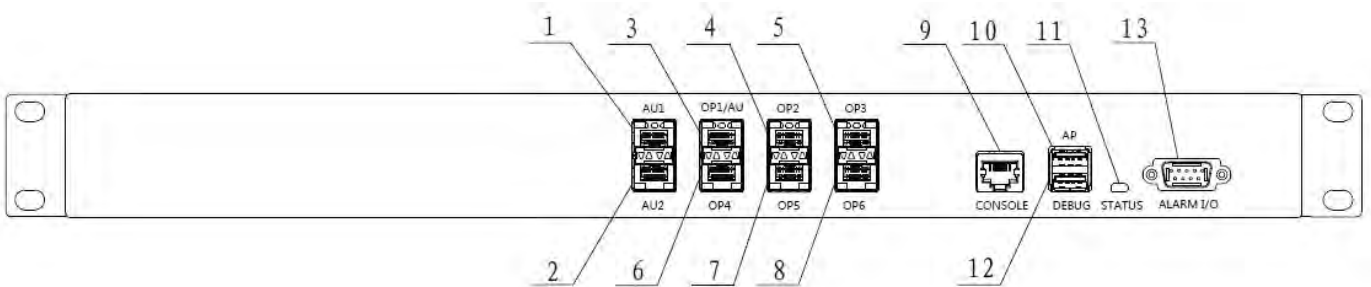
Figure 3- 2 Front Panel of the AU

Table 1   AU Front Panel Interfaces

SN	Interface Name	Description
1	AU1	Connects Slave AU1

SN	Interface Name	Description
2	AU2	Connects Slave AU2
3	OP1/AU	For Master AU: connects EU/RU For Slave AU: connects Master AU
4	OP2	Connects EU/RU
5	OP3	Connects EU/RU
6	OP4	Connects EU/RU
7	OP5	Connects EU/RU
8	OP6	Connects EU/RU
9	CONSOLE	Connects OMC or local PC through CAT-5 for local and remote monitoring
10	AP	Connects WLAN network adapters for monitoring device through Wi-Fi
11	STATUS	Indicates device operating status
12	DEBUG	Connects local debugging PC through USB connection
13	ALARM I/O	Connects external environment alarm interface for environment monitoring

3.3. AU Back Panel

Figure 3- 3 shows a schematic of the back panel of the AU and Table 2 lists the interfaces and their functionality.
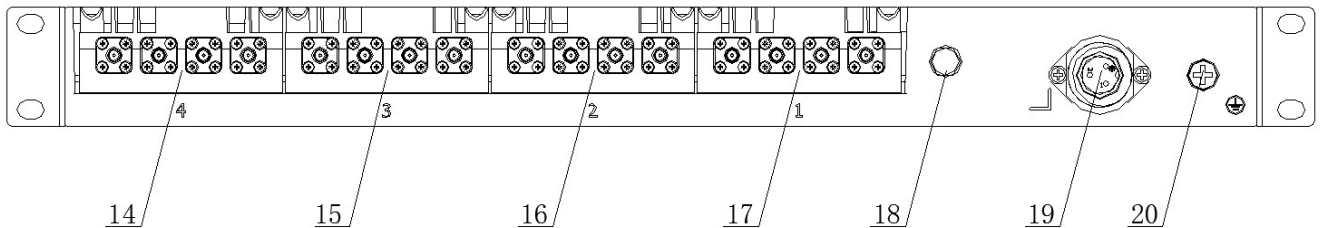
Figure 3- 3 Back Panel of the AU

Table 2   AU-Back Panel Interfaces

SN	Interface Name	Description
14	Channel 4 Duplexer Interface	QMA Female
15	Channel 3 Duplexer Interface	QMA Female
16	Channel 2 Duplexer Interface	QMA Female
17	Channel 1 Duplexer Interface	QMA Female
18	Modem Interface /Reserved	Reserved if no modem
19	Electric Power Line Interface	/
20	Grounding	/

3.4.   AU Active Combiner

Figure 3- 4 shows a schematic of the AU Active Combiner.
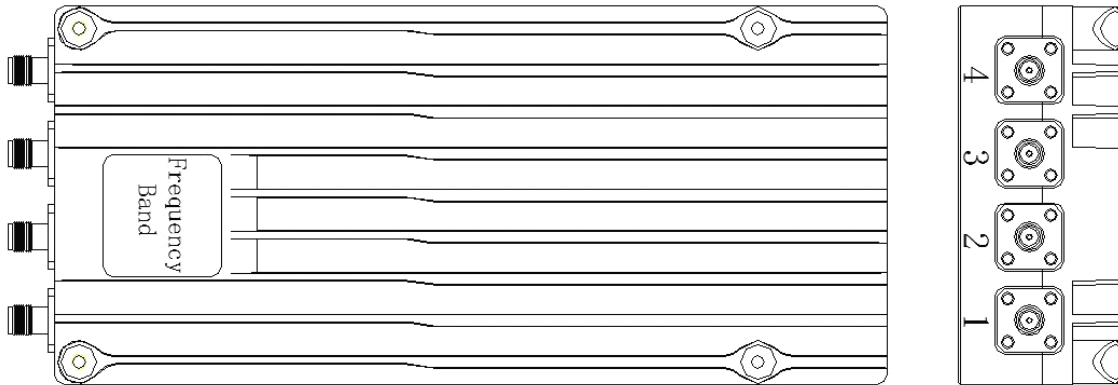
Figure 3- 4 AU Active Combiner

3.5.   Indicator Descriptions

Each pair of optical interface indicators shows the operating status of an optical module. See Figure 3- 5.

Figure 3- 5 Optical Indicators

Table 3   Optical Interface Indicators

Optical Indicator Behavior	Description
Turns green and stays lit	Normal
Turns red and stays lit	Optical path is not synchronized or optical module has not been inserted

In Figure 3- 2, "**10**" points to the **STATUS** indicator on the front panel of the AU. Table 4 lists the indicator's behaviors and their meaning.

Table 4   STATUS Indicator

STATUS	Description
Flashes green	Device runs Normally
Turns green and stays lit	Software has crashed, but it can reboot automatically in 3mins
Flashes red	Device alarms, need check
Turns red and stays lit	Software has crashed, but it can reboot automatically in 3mins
Flashes yellow	Program is upgrading
Turns yellow and stays lit	Device is starting

3.6. Master / Slave AU Selection

Each AU is factory-set to be the Master AU. See Figure 3- 6 and the procedure below to set or change an AU to Master or Slave.

To change an AU to Slave:

1. Power on the AU which will be set to be the Slave AU.

Note: The selected AU cannot be connected to the CrossFire system prior to being set to Slave.

2. Log in to the AU WebOMT. See Section 2 for the procedures to access the OMT.

3. Select the **Engineering** tab.

4. In the **Advanced Command** area, click the drop-down menu for the **Master-slave AU select** command and select **Slave AU** from the drop-down menu.

5. Click **Set** in the pop-up window.
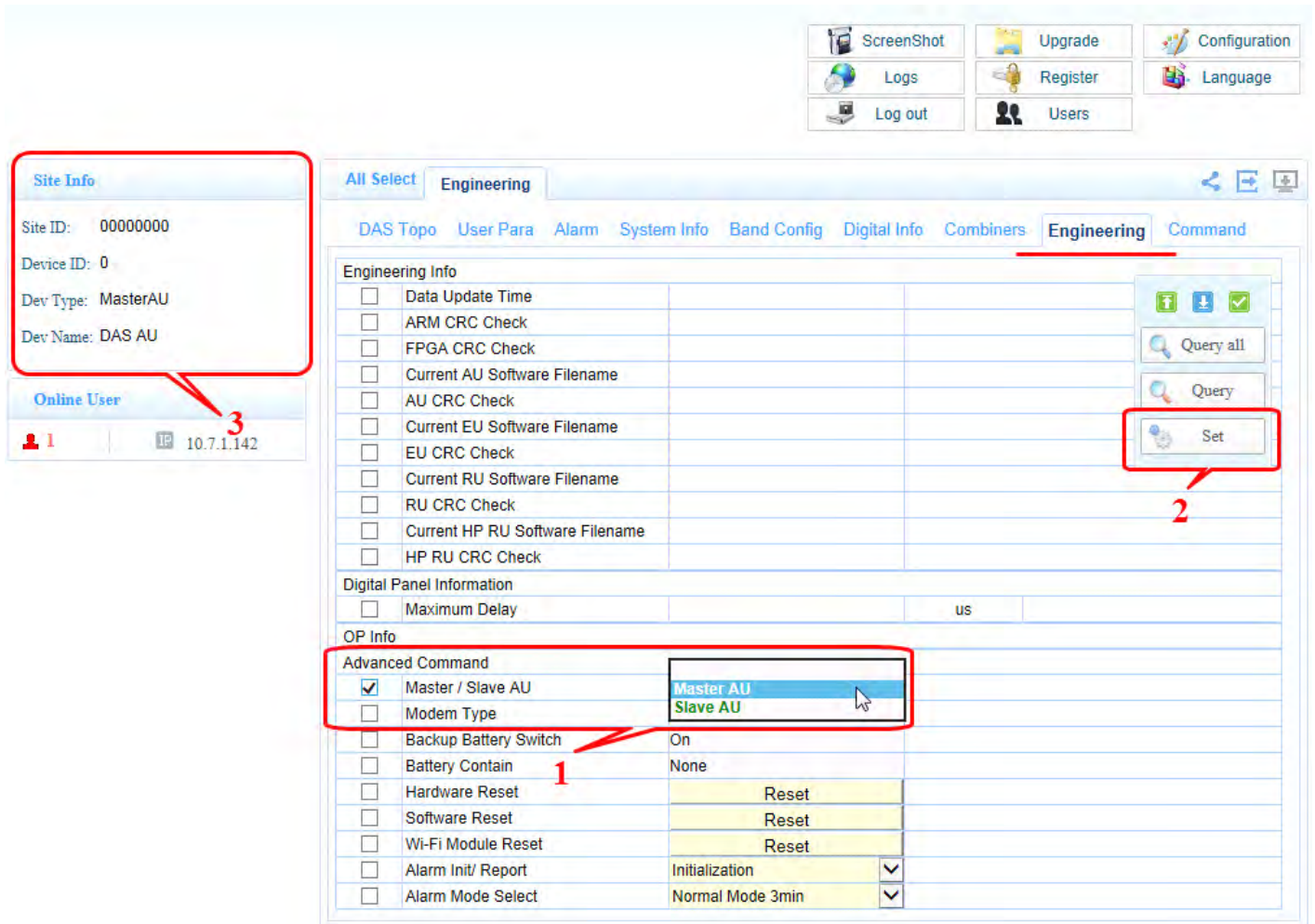
Figure 3- 6 Master / Slave AU Selection

After setup is complete, check the device type of the AU.

To query the device type:

1. Log in to the Slave AU WebOMT. (See Section 2 for the procedures to access the OMT.)

2. View the **Site Info** field. See **3** in Figure 23.

3. The device type should be "Slave AU" if the setup was successful.

Note: Please update the day and time after a Slave AU changes to a Master AU.

3.7. OMT Parameters, Alarms and Commands for the AU

See Section 2.3, OMT Display, for information on how to use the WebOMT interface to view and change parameters and run commands.

3.7.1. AU User and Network Parameters

Table 5, Table 6 and Table 7 show the device information, TCP/IP and SNMP network management parameters, respectively, that are displayed on the WebOMT under the **User Parameters** tab.

Table 5   AU Device Information

Parameter	Description	RD/RW
Vendor Name	Name to distinguish different manufacturers	RD
Product Model	/	RD
Serial Number	/	RD
RMON Mode	Current remote monitoring mode	RD
Software Upgrade Result	/	RD
Remote Upgrade Mode		RD
RMON Edition	Current edition of remote monitoring software	RD
Device Edition (FPGA)	Device edition defined by FPGA	RD
Device Location	/	RW

Table 6   AU Network Management (TCP/IP protocol)

Parameter	Description	RD/RW
Site ID	The unique identification number of the site in the system	RW
Device ID	Number assigned by the system to distinguish subsets in the same site	RW
OMC IP Addr	IP address of Monitoring Center	RW
OMC IP Port	Port Number of Monitoring Center	RW
Heartbeat Interval Time	Interval time of device sending packet to OMC, to confirm a free link	RW
Protocol Select	TCP/IP	RW
Region Protocol	Reserve	RW
Device Recv Port (UDP)	Device receive port number	RW
Query/Set IP Addr1	Only a device with this specified IP address can connect to the system via UDP connection mode	RW
Query/Set IP Addr2	Only a device with this specified IP address can connect to the system via UDP connection mode	RW
Date and Time	/	RW
Device IP Addr	Default IP Address — 10.7.3.200	RW
Subnet Mask	Default Subnet Mask— 255.0.0.0	RW
Default Gateway	Default Gateway— 10.7.0.1	RW
Server IP Addr (FTP)	IP Address of the connected FTP Server for software upgrade	RW
Server IP Port (FTP)	Port Number of the connected FTP Server for software upgrade	RW
FTP Username	Username for device to log into FTP Server	RW
FTP Password	Password for device to log into FTP Server	RW
Awaiting Upgrade Filepath	File path (directory) for device to acquire software upgrade file from FTP Server	RW
Awaiting Upgrade Filename	Filename of the awaiting software upgrade file	RW
FTP File Transfer Control	Start /Cancel upgrade	RW

Table 7   AU Network Management (SNMP protocol)

Parameter	Description	RD/RW
Site ID	The unique identification number of the site in the system	RW
Device ID	Number assigned by the system to distinguish the subsets in the same site	RW
Trap IP Addr	IP address of Monitoring Center	RW
Trap IP Port	Port Number of Monitoring Center	RW
Protocol Select	SNMP	RW
Date and Time	/	RW
Device IP Addr	Default IP Address — 10.7.3.200	RW
Subnet Mask	Default Subnet Mask— 255.0.0.0	RW
Default Gateway	Default Gateway— 10.7.0.1	RW
Server IP Addr (FTP)	IP Address of the connected FTP Server for software upgrade	RW
Server IP port (FTP)	Port Number of the connected FTP Server for software upgrade	RW

Parameter	Description	RD/RW
FTP Username	Username for device to log into FTP Server	RW
FTP Password	Password for device to log into FTP Server	RW
Awaiting Upgrade Filepath	File path (directory) for device to acquire software upgrade file from FTP Server	RW
Awaiting Upgrade filename	Filename of the awaiting software upgrade file	RW
FTP File Transfer Control	Start /Cancel upgrade	RW

3.7.2.   AU Alarms

Table 8 lists the possible alarms on the CrossFire system for the AU.

Table 8   CrossFire Alarms for the AU

Parameter	Description	RD/RW
Power Interruption Alarm	Electrical supply failure	RD
Battery Failure Alarm	Standby battery failure	RD
MOV Alarm	Device has been moved from the original installation location	RD
Open Case Alarm	Alarm when device is open	RD
Over-temperature Alarm	Device temperature is over the rated temperature threshold	RD
DPLL Unlocked Alarm	Digital phase lock loop unlocked	RD
LO1~4 Unlocked Alarm	Local oscillation unlocked	RD
CH1~4 ALC Alarm	Alarm when ALC is working	RD
OP1~6 Transceiver Failure Alarm	OP-transceiver unplugged or failure (Port OP1~OP6)	RD
OP-AU1/2 Transceiver Failure Alarm	OP-transceiver unplugged or failure (Port S_AU1/2)	RD
CH1~4 DL Under Input-power Alarm	Channel 1~4 input power under rated threshold	RD
CH1~4 DL Over Input-power Alarm	Channel 1~4 input power over rated threshold	RD
External Alarm 1~4	External device failure (such as UPS failure)	RD

3.7.3.   AU System Info

Table 9   AU: RF Channels 1~4

Parameter	Description	RD/RW
RF Signal Switch	/	RW
UL Attenuation	Range: 0-15dB	RW
DL Attenuation	Range: 0-15dB	RW
DL Under Input-power Threshold	Default value: -30dBm/ Range: -35~ +15dBm	RW
DL Over Input-power Threshold	Default value: 10dBm/ Range: +10~ +30dBm	RW
DL Input-power	/	RD
Bandwidth	/	RD
UL Center Frequency	/	RD
DL Center Frequency	/	RD

Table 10   AU Sampling Info

Parameter	Description	RD/RW
Over-temperature Threshold	Default value:80℃/ Range: -55~ +125℃	RW
Device Temperature	/	RD
Device Routing Addr	Device routing address	RD

3.7.4. AU Band Config

Table 11   Channel 1~4

CH1 Info Check	Valid: Channel operating normally Invalid: out of operation	RD
UL Freq_low	Lower limit of uplink frequency	RW
UL Freq_high	Higher limit of uplink frequency	RW
DL Freq_low	/	RW
DL Freq_high	/	RW
Signal1~3 Bandwidth	/	RW
Signal1~3 UL Center Frequency	/	RW
Signal1~3 DL Center Frequency	/	RW

Note: UL Freq_low/high and DL Freq_low/high should agree with the values for the corresponding duplexer.

The values for signal bandwidth and UL/DL center frequency should agree with the operators' signal.

Table 12   AU Public Parameters

Parameter	Description	RD/RW
AU CH Info Update	Update after channel parameter configuration. Configuration modification will be effective after update.	RW
Local Signal Bandwidth	Signal bandwidth of local AU	RD
Local Transmission Bandwidth	Transmission bandwidth of local AU	RD
System Signal Bandwidth	Signal bandwidth of all AUs if Slave AU exists	RD
System Transmission Bandwidth	Transmission bandwidth of all AUs if Slave AU exists	RD

Note: See Section 8.2 for details on configuring channel properties.

3.7.5. AU Digital Info

Table 13   AU Downlink Power

Parameter	Description	RD/RW
CH1~4 DL Baseband Input-power	Power of DL detected in digital domain	RD

Table 14   AU Uplink Power

Parameter	Description	RD/RW
CH1~4 UL Baseband Output-power	Power of UL detected in digital domain	RD

Table 15   Optical Module Information

Parameter	Description	RD/RW
Optical Port 1 Optical Module	Optical Module Number	RD
DDM Function Availability	/	RD
Tx Power	/	RD
Rx Power	/	RD
Voltage	/	RD
Bias Current	/	RD
Temperature	/	RD
Optical Wavelength	/	RD

3.7.6.   AU Combiner

Table 16   AU Channel 1~4

Parameter	Description	RD/RW
Port 1~4 Input Power Value	/	RD
Port 1~4 Attenuation Value	/	RW

3.7.7.   AU Engineering Information

Table 17   AU Engineering Info

Parameter	Description	RD/RW
Update Time	Last update time	RD
ARM CRC Check	To check ARM software version of current device	RD
FPGA CRC Check	To check FPGA software version of current device	RD
Current AU Upgrade-file name	To check AU software version	RD
AU CRC Check	To check AU software version	RD
Current EU Upgrade-file name	To check EU software version	RD
EU CRC Check	To check EU software version	RD
Current RU Upgrade-file name	To check RU software version	RD
HP RU CRC Check	To check RU software version	RD

Table 18   AU Digital Panel Information

Maximum Delay	Maximum delay from AU to the last RU	RD

Table 19   AU: OP Info

OP1~6CPRI Sync Alarm	CPRI SYNC alarm for Port " OP1~OP6"	RD
OP-AU1 CPRI Sync Alarm	CPRI SYNC alarm for Port " AU1"	RD
OP-AU2 CPRI Sync Alarm	CPRI SYNC alarm for Port " AU2"	RD
OP1~6LOS Alarm	Loss of optical signal alarm for Port "OP1~OP6"	RD
OP-AU1 LOS Alarm	Loss of optical signal alarm for Port "AU1"	RD
OP-AU2 LOS Alarm	Loss of optical signal alarm for Port "AU2"	RD

Table 20   AU Advanced Commands

Command	Description	RD/RW
Master / Slave AU Select	Master AU / Slave AU select	RW
Modem Type	Reserve	RD
Backup Battery Switch	/	RW
Hardware Reset	*Noted*: Signal interruption during hardware reset	RW
Software Reset	*Noted*: Signal is normal during software reset	RW
Wi-Fi Module Reset	/	RW
Initialization/Alarm Report	Initialization: Clear alarms and disable all alarms; Report Site launch: Report to OMC when new site launches;	RW
Alarm Mode Selection	Normal mode: 3 minutes Test mode: 1 minute	RW

3.7.8.   AU Command

Table 21   AU Factory Parameters

Factory Pattern	To perform **Delete all Slave-Devices** or **Device Initialization** functions, factory authorization is required.	RW
Factory Pattern Password	Reserve	RW

4.   EU Instructions

4.1.   EU Physical Appearance

Figure 24 shows a photograph of the EU component of the CrossFire.

Figure 4- 1 Physical Appearance of the EU

4.2. EU Front Panel

Figure 25 shows a schematic of the front panel of the EU and Table 21 lists the interfaces and their functionality.

Figure 4- 2 Front Panel of the EU

Table 22   EU Front Panel Interfaces

SN	Interface Name	Description
1	SLAVE	Connection for Master AU/EU at the next higher level
2	MASTER	Connection for EU at the next lower level
3	OP1	Connection for RU
4	OP2	Connection for RU
5	OP3	Connection for RU
6	OP4	Connection for RU
7	OP5	Connection for RU
8	OP6	Connection for RU
9	GE1	Wi-Fi signals or S1 signals input
10	GE2	Wi-Fi signals or S1 signals input

SN	Interface Name	Description
11	GE3	Wi-Fi signals or S1 signals input
12	GE4	Wi-Fi signals or S1 signals input
13	GE5	Wi-Fi signals or S1 signals input
14	GE6	Wi-Fi signals or S1 signals input
15	CONSOLE	Connection for local PC through CAT-5 for local monitoring
16	AP	Connection for WLAN Network adapters for monitoring device through Wi-Fi
17	DEBUG	Connection for local debugging PC through USB wire
18	STATUS	Indicates device operating status

4.3. EU Back Panel

Figure 26 shows a schematic of the back panel of the EU and Table 22 lists the interfaces and their functionality.

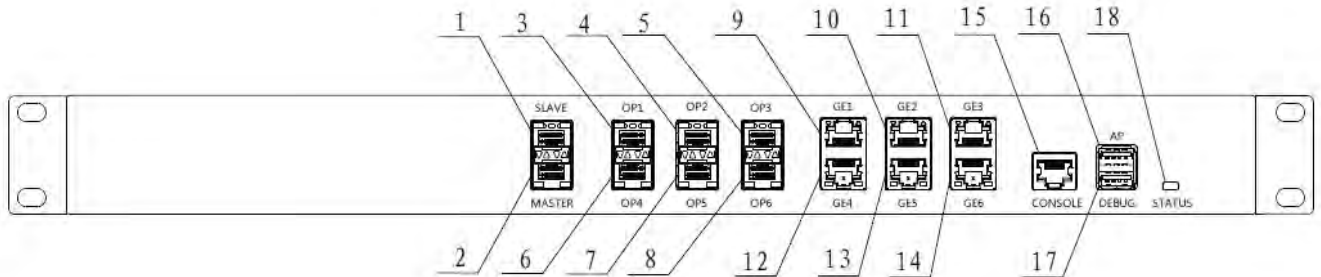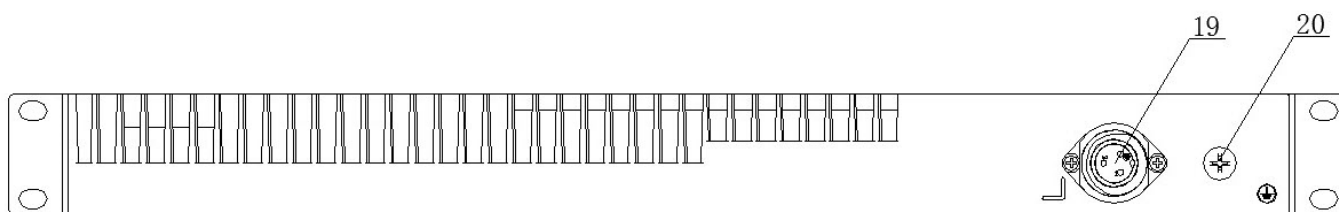**Figure 4- 3 Back Panel of the EU**

Table 23   EU Back Panel Interfaces

SN	Interface Name	Description
19	Electrical Power Line Interface	/
20	Grounding	/

4.4. Indicator Description

See Section 3.5 for details.

4.5. OMT Parameters, Alarms and Commands for the EU

See Section 2.3, *OMT Display*, for information on how to use the WebOMT interface to view and change parameters and run commands.

4.5.1. EU User Parameters

Table 24   EU Device Information

Parameter	Description	RD/RW
Vendor	Name to distinguish from different manufacturers	RD
Product Model	/	RD
Serial Number	/	RD
RMON Mode	Current remote monitoring mode	RD
Software Upgrade Result	/	RD
Remote Upgrade Mode	/	RD
RMON Edition	Current edition of remote monitoring software	RD
Device Edition(FPGA)	Device edition defined by FPGA	RD
Device Location	/	RW

Table 25   EU Network Management

Parameter	Description	RD/RW
Site ID	The unique identification number of site in the system assigned by Master AU	RW
Device ID	Number to distinguish the subsets in the same site assigned by Master AU	RW
Date and Time	/	RW

4.5.2. EU Alarms

Table 26   CrossFire Alarms for the EU

Parameter	Description	RD/RW
Power Interruption Alarm	Electric supply failure	RW
MOV Alarm	Alarm when device leave the original installation location	RW
Open Case Alarm	Alarm when device is open	RW
Over-temperature Alarm	Alarm when device temperature over rated temperature threshold	RW
DPLL Unlocked Alarm	Digital phase lock loop unlocked	RW
OP-transceiver1~6 Failure Alarm	OP-transceiver unplugged or failure (Port OP1~OP6)	RW
OP-slave transceiver Alarm	OP-transceiver unplugged or failure (Port SLAVE)	RW
OP-master transceiver Alarm	OP-transceiver unplugged or failure (Port MASTER)	RW
Link Alarm	Alarm when local EU cannot connect to the system	RW

4.5.3. EU System Info

Table 27   EU Sampling Info

Parameter	Description	RD/RW
Over-temperature Threshold	Default value: 80℃/ Range: -55~ +125℃	RW
Device Temperature	/	RD
Device Routing Addr	Device Routing Address	RD

4.5.4. EU Engineering Information

Table 28   EU Engineering Info

Parameter	Description	RD/RW
Update Time	Last update time	RD
ARM CRC Check	To check ARM software CRC value of current device	RD
FPGA CRC Check	To check FPGA software CRC value of current device	RD
EU CRC Check	To check EU software CRC value of current device	RD

Table 29   EU: OP Info

OP1~6 CPRI Sync Alarm	CPRI SYNC Alarm of Port " OP1~OP6"	RD
OP-slave CPRI Sync Alarm	CPRI SYNC Alarm of Port " SLAVE"	RD
OP-master CPRI Sync Alarm	CPRI SYNC Alarm of Port " MASTER"	RD
OP1~6LOS Alarm	Loss of optical signal Alarm of Port "OP1~OP6"	RD
OP-slave LOS Alarm	Loss of optical signal Alarm of Port "Slave"	RD
OP-master LOS Alarm	Loss of optical signal Alarm of Port "Master"	RD

Table 30   AU Advanced Commands

Command	Description	RD/RW
Hardware Reset	*Noted*: Signal interruption during hardware reset	RW
Software Reset	*Noted*: Signal is normal during software reset	RW
Wi-Fi Module Reset	/	RW
Initialization/Alarm Report	Initialization: Clear alarms and disable all alarms; Report Site launch: Report to OMC when new site launches;	RW
Alarm Mode Selection	Normal mode: 3 minutes Test mode: 1 minute	RW

4.5.5. EU Digital Info

Table 31   Optical Module Information

Optical Port 1 Optical Module	/	RD
DDM Function Availability	/	RD
Tx Power	/	RD
Rx Power	/	RD
Voltage	/	RD
Bias Current	/	RD
Temperature	/	RD
Optical Wavelength	/	RD

4.5.6. EU Command

Table 32   EU Factory Parameters

Factory Pattern	To perform **Device Initialization** functions, factory authorization is required.	RW
Factory Pattern Password	Reserve	RW

5. RU Instructions

5.1. RU Physical Appearance

Figure 5- 1 shows a photograph of the RU component of the CrossFire.

Figure 5- 1 Physical Appearance of the RU

5.2. RU Front Panel

Figure 5- 2 shows a schematic of the front panel of the RU and Table 33 lists the interfaces and their functionality.
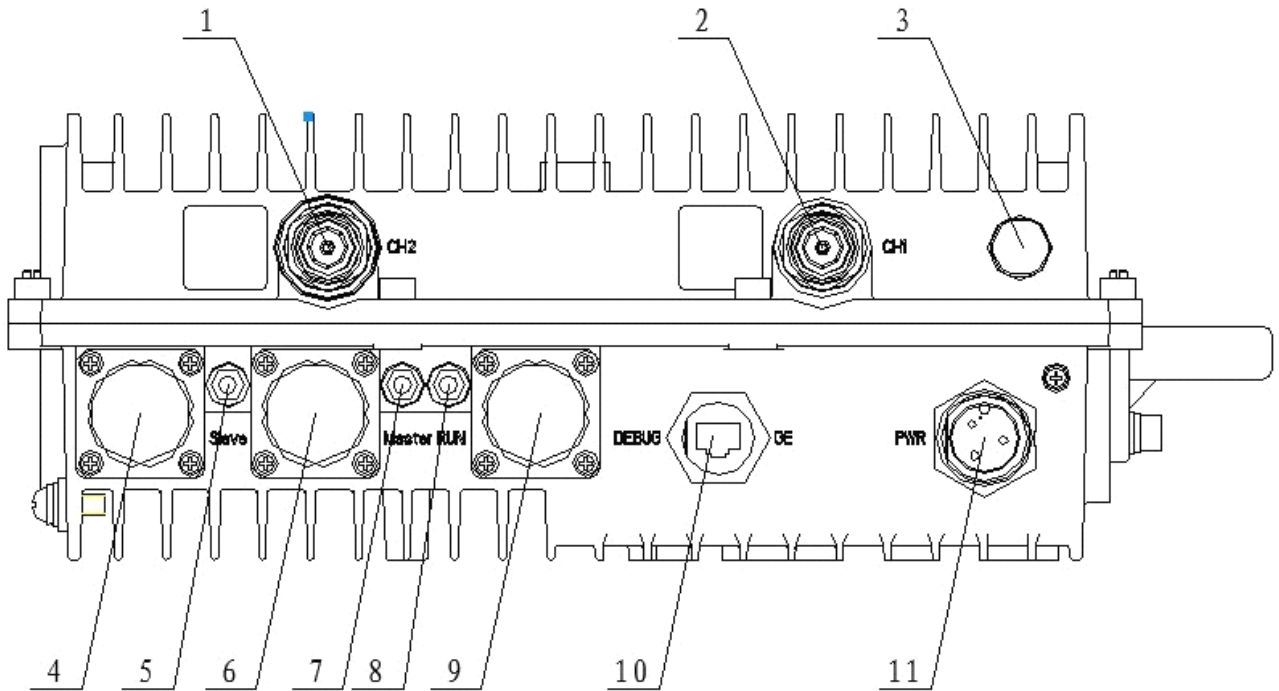
Figure 5- 2 Front Panel of the RU

Table 33   RU Front Panel Interfaces

SN	Interface Name	Description
1	CH2	PA 2 Module Interface, 4.3-10 female Connector
2	CH1	PA 1 Module Interface, 4.3-10 female Connector
3	Modem Interface /Reserved	Reserved if no modem
4	Slave OP	Connection for EU or RU at the next higher level
5	Slave	Indicates Slave OP port operating status
6	MASTER OP	Connection for RU at the next lower level
7	Master	Indicates Master OP port operating status
8	RUN	Indicates device operating status
9	DEBUG	Connection for local PC through CAT-5 for local monitoring
10	GE	Wi-Fi signal output port
11	PWR	Electrical Power Line Interface

5.3.   Indicator Description

Refer to Section 3.5 for details.

5.4.   OMT Parameters, Alarms and Commands for the RU

See Section 2.3, *OMT Display*, for information on how to use the WebOMT interface to view and change parameters

and run commands.

5.4.1. RU User Parameters

Table 34   RU Device Information

Parameter	Description	RD/RW
Vendor	Name to distinguish from different manufacturers	RD
Product Model	/	RD
Serial Number	/	RD
RMON Mode	Current remote monitoring mode	RD
Software Upgrading Result		RD
Remote Upgrade Mode	/	RD
MON Edition	Current edition of remote monitoring software	RD
Device Edition(FPGA)	Device edition defined by FPGA	RD
Device Location	/	RW

Table 35   RU Network Management

Parameter	Description	RD/RW
Site ID	The unique identification number of the site in the system	RW
Device ID	Number to distinguish the subsets in the same site	RW
Date and Time	/	RW

5.4.2. RU Alarms

Table 36   CrossFire Alarms for the RU

Parameter	Description	RD/RW
Power Interruption Alarm	Electric supply failure	RW
MOV Alarm	Alarm when device leave the original installation location	RW
Open Case Alarm	Alarm when device is open	RW
Over-temperature Alarm	Alarm when device temperature over rated temperature threshold	RW
DPLL unlocked Alarm	Digital phase lock loop unlocked	RW
LO1~2 unlocked Alarm	Local Oscillation unlocked	RW
CH1~2 ALC Alarm	Alarm when ALC is working	RW
OP-slave Transceiver Alarm	OP-transceiver unplugged or failure (Port "Slave")	RW
OP-master Transceiver Alarm	OP-transceiver unplugged or failure (Port "Master")	RW
CH1~2 DL Under Output-power Alarm	Channel 1~4 output-power under rated threshold	RW
CH1~2 DL Over Output-power Alarm	Channel 1~4 output-power over rated threshold	RW
Link Alarm	Alarm when local RU cannot connect to the system	RW

5.4.3. RU System Info

Table 37　RU: RF Channel 1~2

RF signal switch	/	RW
UL Attenuation	Range:0-15dB	RW
DL Attenuation	Range:0-15dB	RW
DL under output-power threshold	Default value: -30dBm/ Range: -35~ +15dBm	RW
DL over output-power threshold	Default value: 10dBm/ Range: +10~ +50dBm	RW
DL output-power	/	RD
Bandwidth	/	RD
UL center frequency	/	RD
DL center frequency	/	RD
UL Gain	/	RD
DL Gain	/	RD

Table 38　RU Sampling Info

Parameter	Description	RD/RW
Over-temperature threshold	Default value: 80℃/ Range: -55~ +125℃	RW
Device Temperature	/	RD
CH1 DL Output-power	/	RD
CH2 DL Output-power	/	RD
CH1 VSWR	/	RD
CH2 VSWR	/	RD
Device Routing Addr	Device Routing Address	RD

5.4.4. RU Band Config

Table 39　RU Channel 1~2

Command	Description	RD/RW
UL Freq_low	Lower limit of uplink frequency	RW
UL Freq_high	Higher limit of uplink frequency	RW
DL Freq_low	/	RW
DL Freq_high	/	RW

5.4.5. RU Digital Info

Table 40　RU Downlink Power

CH1~2 UL Baseband input-power	Power of UL detected in digital domain	RD

Table 41   RU Uplink Power

CH1~2 DL Baseband Output-power	Power of DL detected in digital domain	RD

Table 42   Optical Module Information

Slave/Master Optical Port Optical Module	/	RD
DDM function availability	/	RD
Tx power	/	RD
Rx power	/	RD
Voltage	/	RD
Bias Current	/	RD
Temperature	/	RD
Optical wavelength	/	RD

5.4.6.   RU Actual Gain

Table 43   RU Channel 1~2 Actual Gain

Parameter	Description	RD/RW
Port 1~4 UL	Channel 1~2 Port 1~4 UL gain	RD
Port 1~4 DL	Channel 1~2 Port 1~4 DL gain	RD

5.4.7.   RU Engineering Information

Table 44   RU Engineering Info

Parameter	Description	RD/RW
Update Time	Last update time	RD
ARM CRC Check	To check ARM software CRC value of current device	RD
FPGA CRC Check	To check FPGA software CRC value of current device	RD
RU CRC Check	To check RU software CRC value of current device	RD

Table 45   RU DPD Switch

Parameter	Description	RD/RW
CH1 DPD Switch	Enable/Disable	RW
CH2 DPD Switch	Enable/Disable	RW

Table 46   RU Digital Panel Information

Maximum Delay to Master Device	Maximum delay from AU to the last RU	RD

Table 47   RU: OP Info

OP-slave CPRI Sync Alarm	CPRI SYNC Alarm of Port " Slave"	RD
OP-master CPRI Sync Alarm	CPRI SYNC Alarm of Port " Master"	RD
OP-slave LOS Alarm	Loss of optical signal Alarm of Port "Slave"	RD
OP-master LOS Alarm	Loss of optical signal Alarm of Port "Master"	RD

Table 48   RU Channel Map (RU-AU)

Channel Map 1	See below for details	RD
Channel Map 2	See below for details	RD

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

The value of channel map contains 16 binary numbers. "0" means the corresponding channel is not in use while "1" means the corresponding channel is in use.

Numbers "0"~"3" correspond to RF channels "1~4" of Master AU(0)

Numbers "4"~"7" correspond to RF channels "1~4" of Slave AU(1)

Numbers "8"~"11" correspond to RF channels "1~4" of Slave AU(2)

Numbers "12"~"15" are not in use and should be all zero.

For example, the value "0000 0100 0010 0001" means that the first channel on the Master AU and the second channel on the Slave AU1 and the third channel on the Slave AU2 are now in use, while all others are not in use.

Table 49   RU Advanced Commands

Command	Description	RD/RW
Hardware Reset	/	RW
Software Reset	/	RW
Wi-Fi module reset	/	RW
Initialization/Alarm report	Initialization: Clear and disable all alarms； Report site launch: Report to OMC when new site launches；	RW
Alarm mode selection	Normal mode = 3 minutes / Test mode = 1 minute	RW

5.4.8.   RU Command

Table 50   RU Factory Parameters

Factory pattern	To perform **Device Initialization** functions, factory authorization is required.	RW
Factory pattern password	Reserve	RW

6. Installation and Connections

6.1. Installation Preparation

6.1.1. Client Cooperation

To guarantee a secure installation and proper operation and maintenance of the device, please contact *SUNWAVE* for technical support and actively cooperate with *SUNWAVE*'s engineering technicians to understand the installation process,
structure, wiring, debugging steps and so on.

6.1.2. Site Investigation

Before installation, the installer should contact the project director to ensure that the site is suitable for installation. Details required include information about the installation site such as whether there is an iron tower or high mast nearby, the surrounding environmental conditions such as temperature and humidity, the power source and so on. Installation staff should complete a site investigation with the project director before construction and conduct field observation of the installation site and the coverage area of the device, to confirm factors such as signal intensity, signal quality, the required coverage range, device location, antenna-feeder system and power supply system.

All devices must be installed indoors. The operating temperature range is -10ºC～+45 ºC. Indoor ventilation should be robust and humidity should be≤ 85%. (See the **SPEC** for the complete technical specifications.)

Note: Only the maintenance personnel or the users who understand the reason for access and are experienced with restricted area access and understand the necessary preventive measures should access the installation site.

6.1.3. Installation Tools

Tools required for installation include:

- electric percussion drill

- screwdriver

- wrench

6.2. Unpacking and Inspecting the Device

This section discusses the procedures for receiving the shipment, inspecting the packing container, unpacking and inspecting the device.

6.2.1. Inspecting the Packing Container

Handle the packing container carefully. Inspect the packing container immediately on arrival at the installation site to verify that no obvious damage occurred during shipment. Ensure that the container is sound and that the waterproof and vibration warning notices are still obvious.

If any damage is observed, notify *SUNWAVE* immediately. Do not open or unpack the container until *SUNWAVE* personnel have inspected it.

A *SUNWAVE* engineering technician will attend the installation site to inspect and unpack the shipment with the customer. The technician will complete a shipment arrival and inspection report.

6.2.2. Unpacking the Device

If the container appears to be in satisfactory condition, perform the following procedures to unpack the device:

1. Ensure both user and supplier representatives are in attendance during shipment inspection.

2. Confirm where the device is to be stored.

3. Ensure procedures are in place to handle the device and other equipment properly, after it has been unpacked and inspected.

4. Ensure the following tools are available to unpack the shipment: hammer, paper cutter and crow bar.

5. Open the packing container carefully. The device is contained in a protective package inside the packing container; however, caution is still necessary so as not to damage the internal package and device.

6. Remove the internal package from the packing container.

7. Unpack the device from the internal package carefully.

6.2.3. Verifying the Contents

To verify the contents of the package:

1. Verify that the contents and quantities agree with the Delivery Packing List.

2. Check the device model against the Delivery Packing List.

3. Notify *SUNWAVE* immediately if any discrepancies are discovered, to verify whether the complete and correct shipment has been received.

6.2.4. Inspecting the Device

After unpacking the device, place the device on solid ground and check the following to ensure the device has not been damaged:

1. Inspect the device's appearance, overall dimensions and weight.

2. Check that the device has not been deformed or bent in any way.

3. Check that there are no warps, scratches, bubbles or dirt marks.

4. Check that there are no loose, missing or incorrectly fastened screws.

5. Check that the installation slots in the cabinet sub-rack are rectangular.

6. Ensure that the guide bar has not been damaged and the fittings and auxiliary parts are intact.

7. Check that the silk—screened images on the device are clearly visible and intact.

6.3. Device Installation

The AU, EU and RU have two possible installation modes: rack installation and wall mounted. The AU is usually installed in a rack, while the EU and RU is usually wall mounted.

Note: **Never** placed an operating RU horizontally.

6.3.1. Rack Installation (Only for AU and EU)

To install the device into a 19" standard rack:

1. Choose an indoor location. The location should be larger than 1000×800×2500 mm and it is recommended that the rack be at least 200 mm away from the wall.

2. Install the device into the 19" standard rack and fasten with 4*M6 screws.

6.3.2. Wall Mounting Installation (for AU and EU)

To install the device using a wall mounting (see Figure 6- 1):

1. Rotate the hanger 90º and install (the hanger can be installed in the middle of the rack).

2. Choose an appropriate indoor location. Mark 4*ϕ6.8 holes sites for the hanger to be attached to the wall.

3. Drill at the four sites using a percussion drill and embed 4*ϕ8 plastic expansion pipes.

4. Fasten the case with 4*ST4.5 self-tapping screws.

Note: Wall mounting installation of the AU is exactly the same as that of EU.
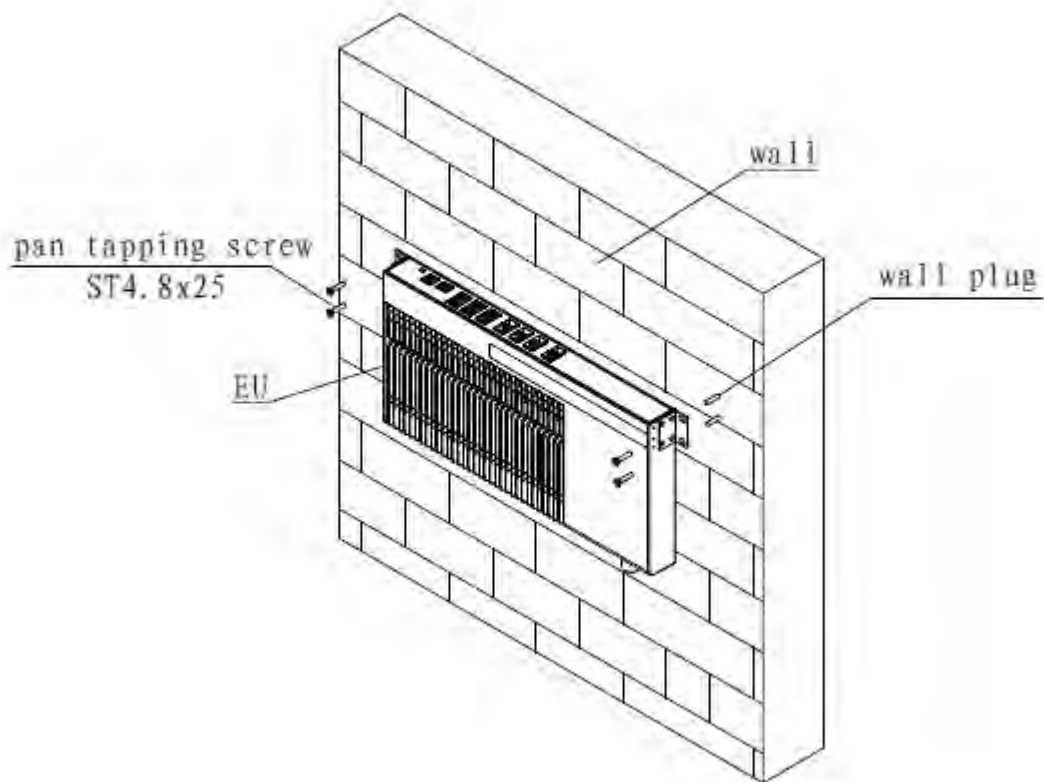
Figure 6- 1 Wall Mounting Installation of an EU

6.3.3. Wall Mounting Installation (for RU)

To install the device using a wall mounting:

Note: Wall mounting installation of the POI is exactly the same as that of RU.

1) Front-mounting Installation (see Figure 6- 2, Figure 6- 3):

a) Choose an appropriate location. Mark 2*ϕ13 holes sites for the **mounting bracket I** to be attached to the wall.

b) Drill at the two sites using a percussion drill and embed 2*M10*90 expansion bolts.

c) Fasten the **mounting bracketII** to the back of device with 2*M6*14 screws.

d) Hang the device on the mounting bracket and fasten the case with 2*M10 nut.

Figure 6- 2 Schematic of RU Wall Front-mounting Installation
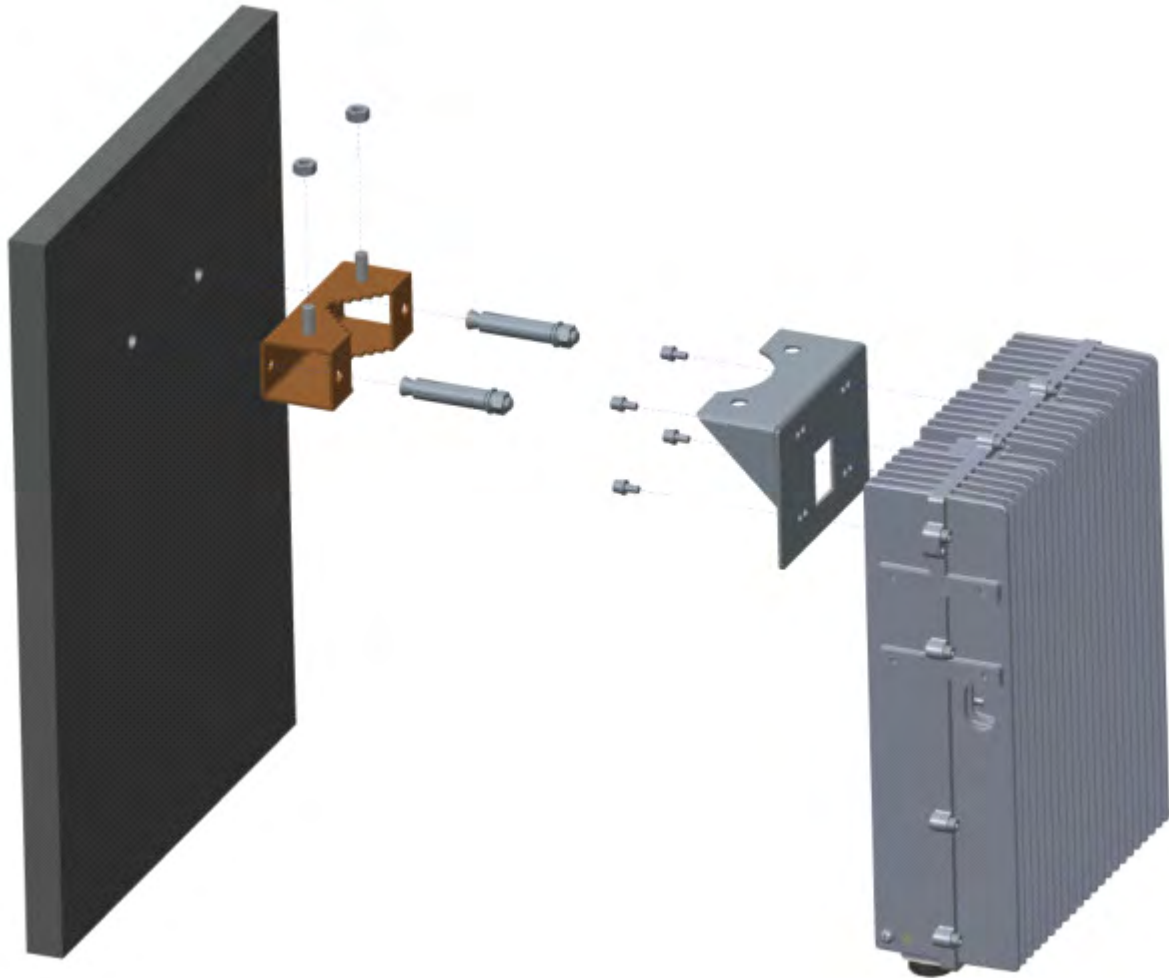
Figure 6- 3 Exploded View of RU Front-mounting Installation

2)   Side-mounting Installation(see Figure 6- 4 and Figure 6- 5):

a)   Choose an appropriate location. Mark 2*φ13 holes sites for the **mounting bracket I** to be attached to the

wall.

b)   Drill at the two sites using a percussion drill and embed 2*M10*90 expansion bolts.

c)   Fasten **mounting bracket II** to the side of device with 2*M6*14 screws.

d)   Hang the device on the mounting bracket and fasten the case with 2*M10 nut.
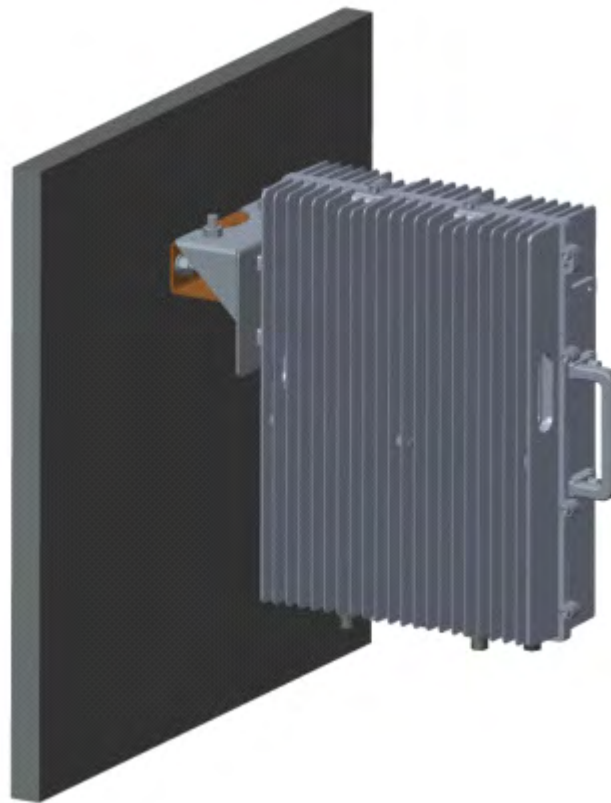
Figure 6- 4 Schematic of RU Wall Side-mounting Installation
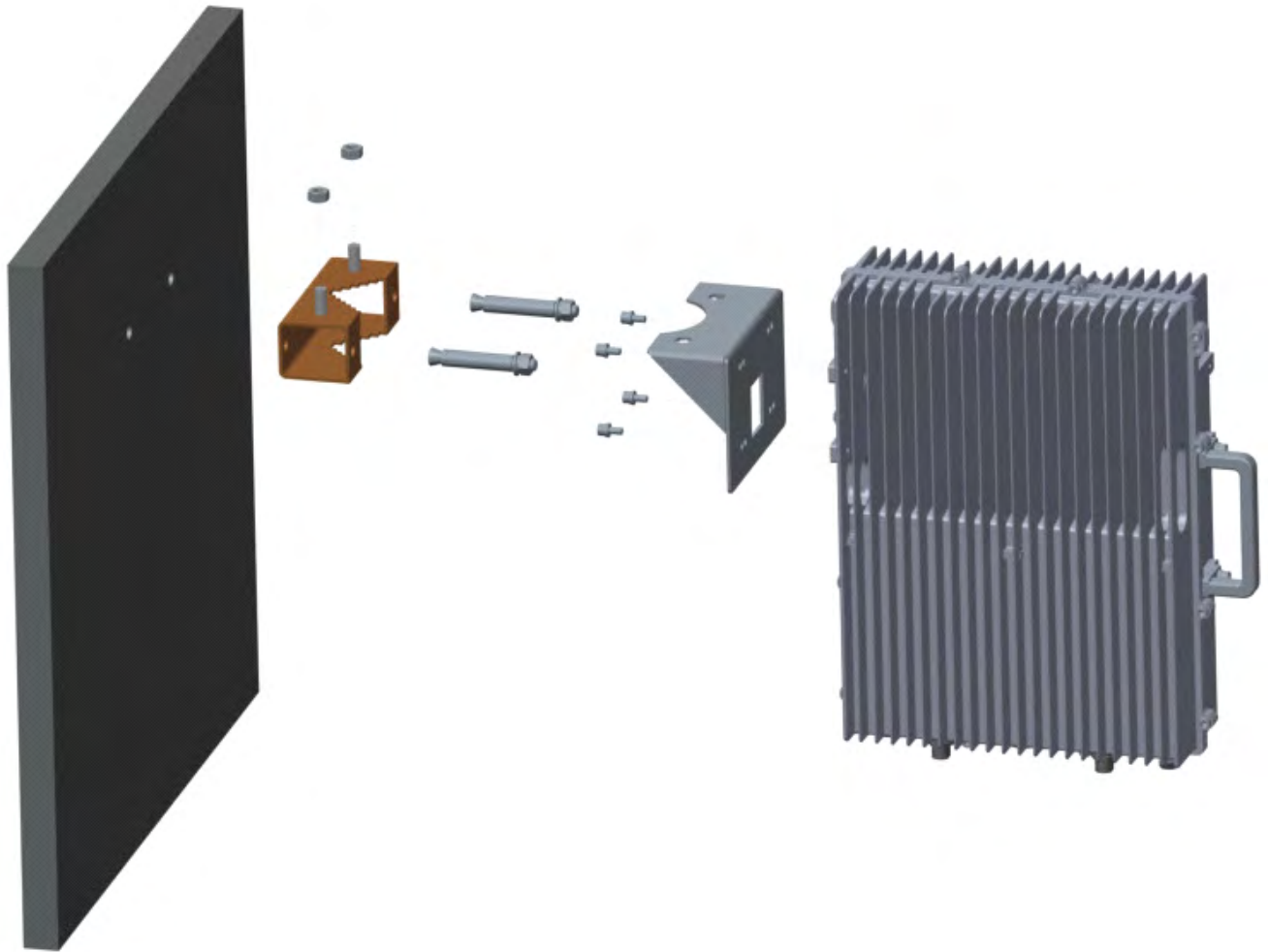
Figure 6- 5 Exploded View of RU Side-mounting Installation

6.3.4. Suspension Installation (For AU and EU, Optional)

To install a device using a suspension installation:

1.   Fasten two hangers to the sides of device with 8 M3*6 screws. See Figure 6- 6 for details.

2.   Measure the dimension between the centres of hangers. See Figure 6- 7 for details.

3.   Choose an appropriate indoor location. Mark 4 holes sites for the stand-off bracket to be attached to the wall.

    See Figure 6- 8 for details.

4.   Hang the device on the stand-off bracket and fasten with the bolts. See Figure 6- 9 for details.
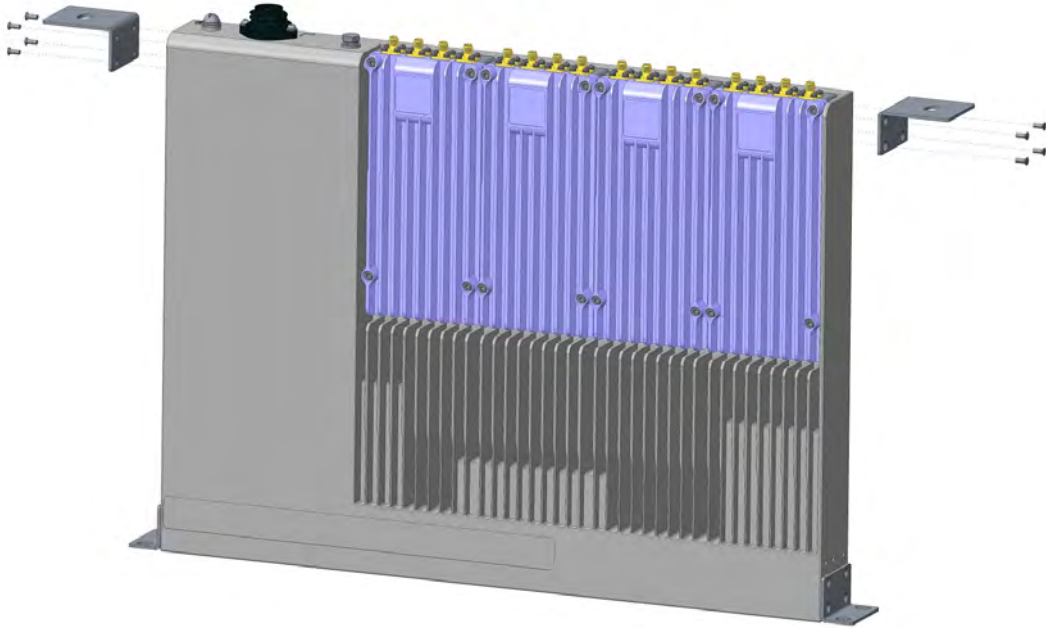
Figure 6- 6 Step 1 of Suspension Installation

Figure 6- 7 Step 2 of Suspension Installation

Figure 6- 8 Step 3 of Suspension Installation
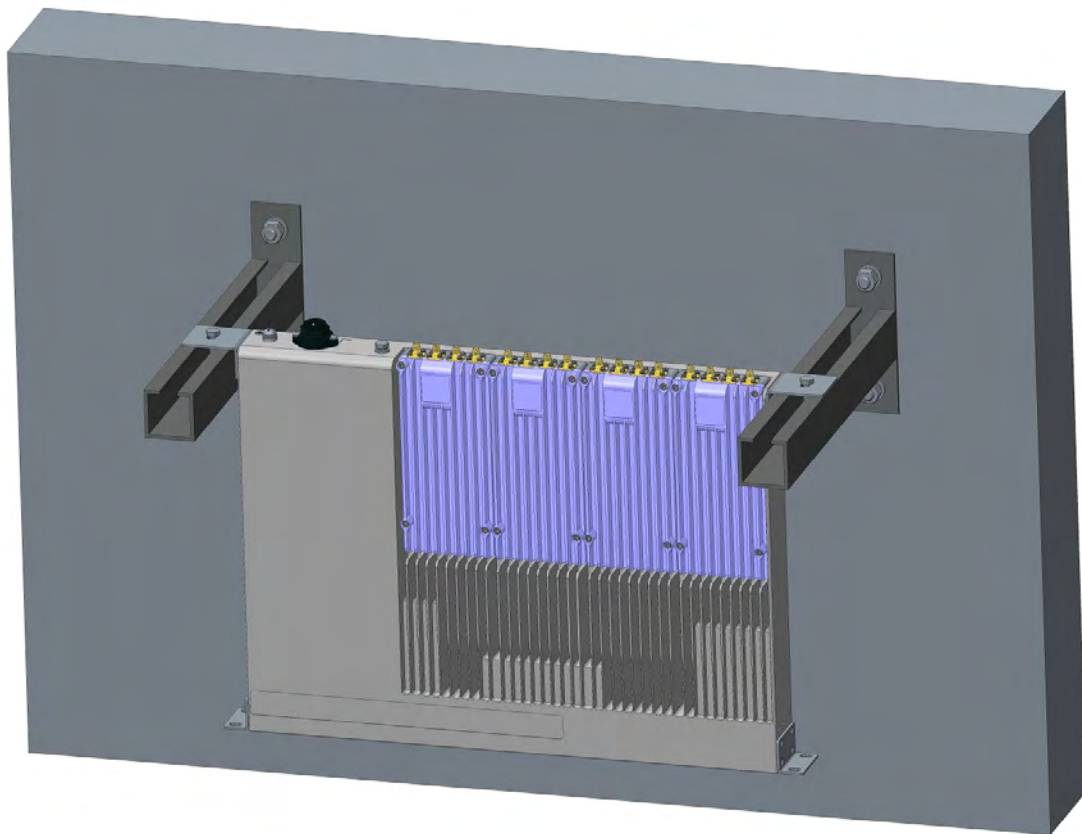
Figure 6- 9 Step 4 of Suspension Installation

6.3.5. Pole Mounting (Only for RU, Optional)

To install the device using pall mounting (see Figure 6- 10 and Figure 6- 11).

Note: Pole mounting of the POI is exactly the same as that of RU.

1) Choose an appropriate location.

2) Fasten **mounting bracket Ⅰ** to the side of device with 2*M6*14 screws.

3) Fasten the case to **mounting bracketⅡ**and **mounting bracket Ⅲ**with 2*M10*200 bolts.

Figure 6- 10 Schematic of RU Pall Installation
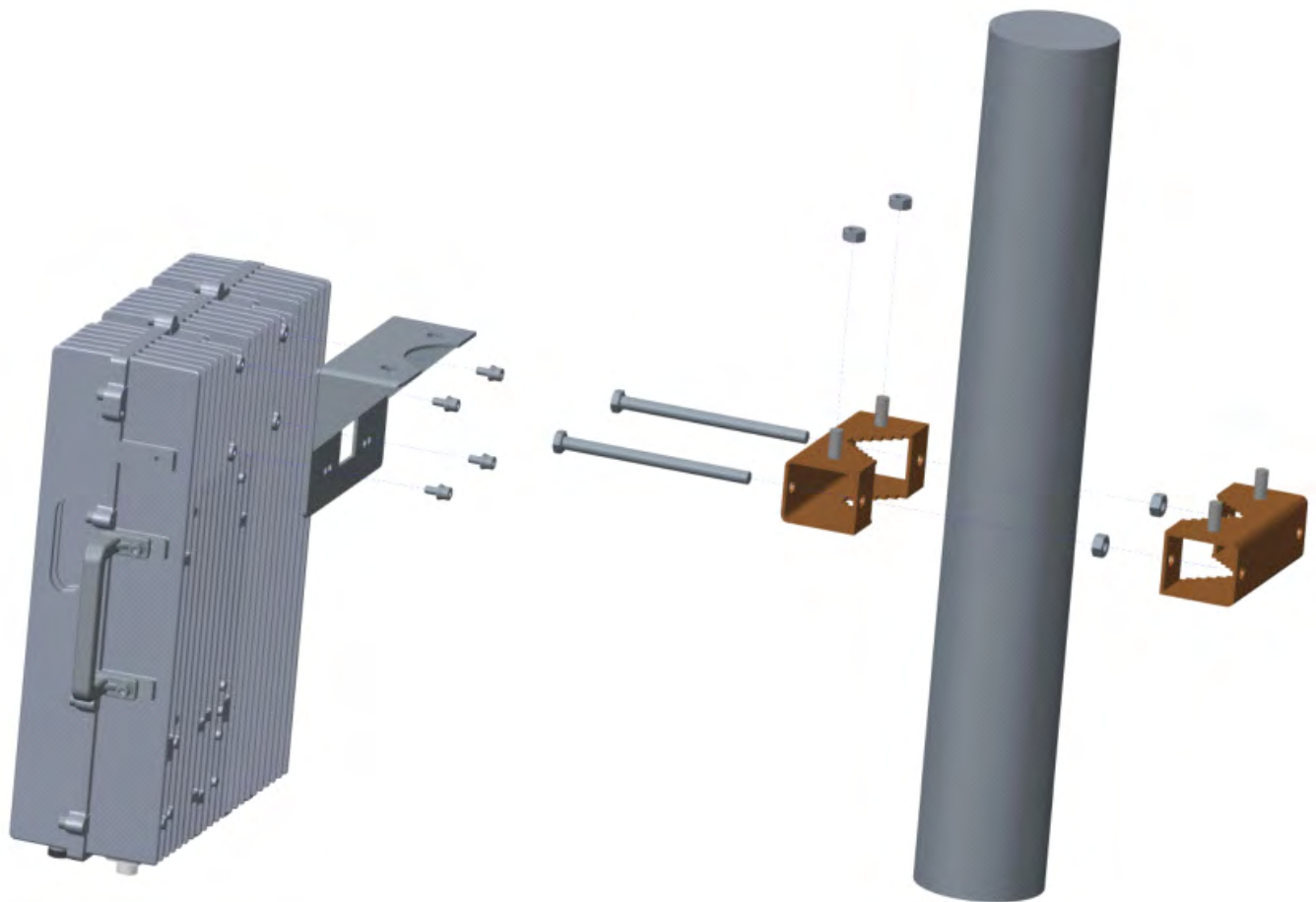
Figure 6- 11 Exploded View of RU Pall Installation

6.3.6. Selecting the Installation Site

1. Choose a location for installation that is convenient based on the power supply and feeder layout and where an optical cable interface is available for the optical fibre connection.

2. The installation location should be away from heat sources and should not be located in a damp environment.

3. The ventilation should be adequate such that the indoor temperature is maintained between -10℃ and 45 ℃.

4. The back and sides of the case should be at least 80-100 cm away from the wall or other devices.

6.4.   Device Connections

Slave AU Connection
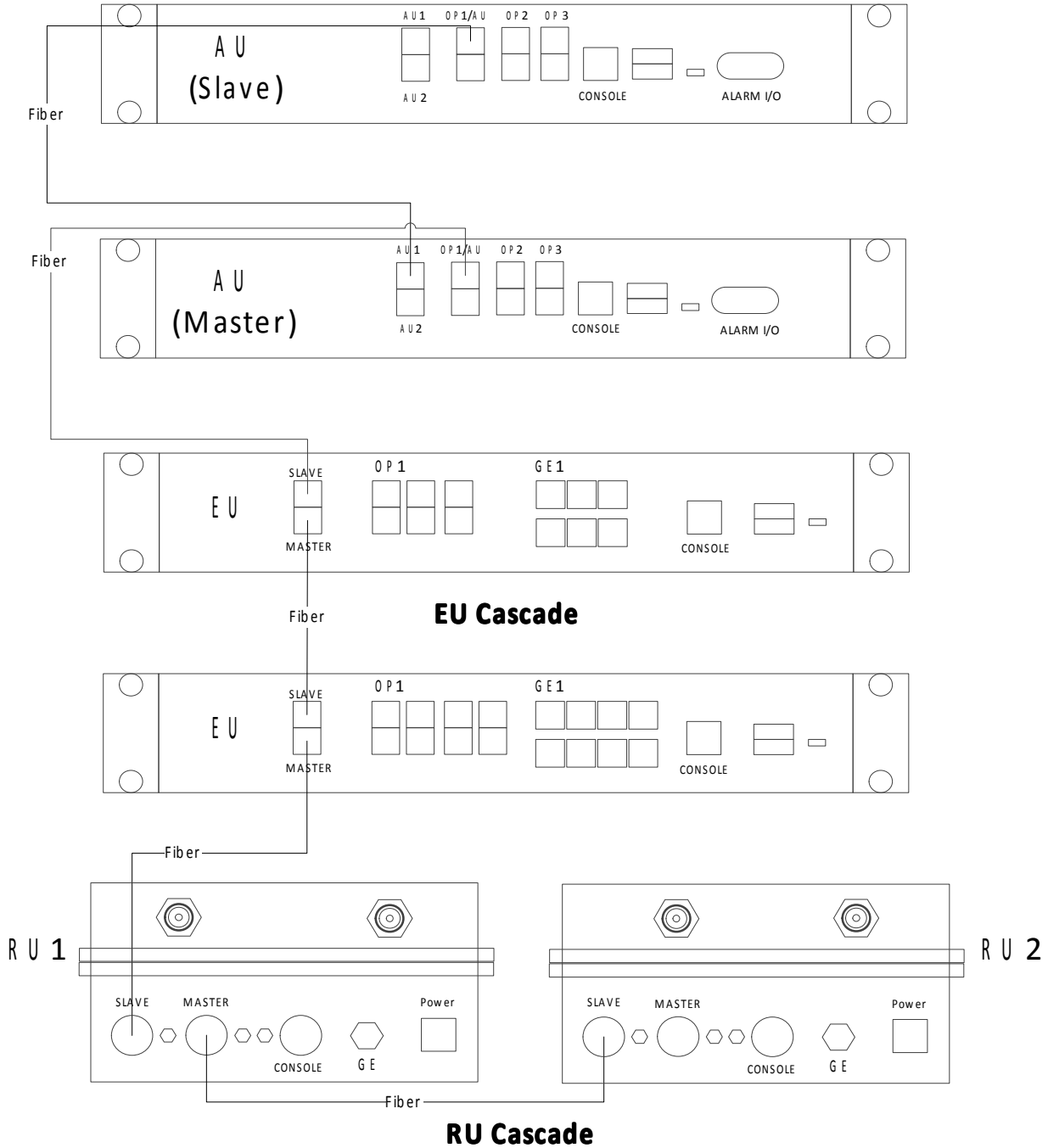
Figure 6- 12 System Connection Schematic

6.4.1.　Optical Interface Connection

- Single Optical Fibre-module

Figure 6-13 shows that when using a pair of single optical fibre-modules, the wavelength of the two modules should be different, for example, 1271nm & 1331nm. See Table 51 for the optical fibre module corresponding to each port. When the optical module is unplugged or not synchronized, the indicators are red as shown in the left pair of indicators in Figure 6-15. Check whether both indicators turn green after connecting one pair of optical modules. If they are red, the terminal has not synchronized. See Section 9 for how to resolve this issue.

Table 51　Optical Module Selection for Single Optical fibre-module

Device Unit	Port	Wavelength of Module
Master AU	All Ports	1271nm
Slave AU	OP1 (only this port is used)	1331nm
EU	Slave	1331nm
	Master & OP1~OP6	1271nm
RU	Slave	1331nm
	Master	1271nm

Figure 6-13 Single Optical Fibre Module

- Double Optical Fibre-module

The optical connector unit includes an optical module and optical fibre. Figure 6- 14 shows that when using a double optical fibre-module, the optical transmitter and optical receiver should correspond to each other. In other words, the optical transmitter of optical module A should correspond to the optical receiver of optical module B and the receiver of A should correspond to the transmitter of B. The optical receiver and transmitter terminals of the optical module can be determined by the triangular mark on the optical module. Figure 6- 14 shows the triangular mark in the yellow box and the red and green lines indicate the optical fibre connections.
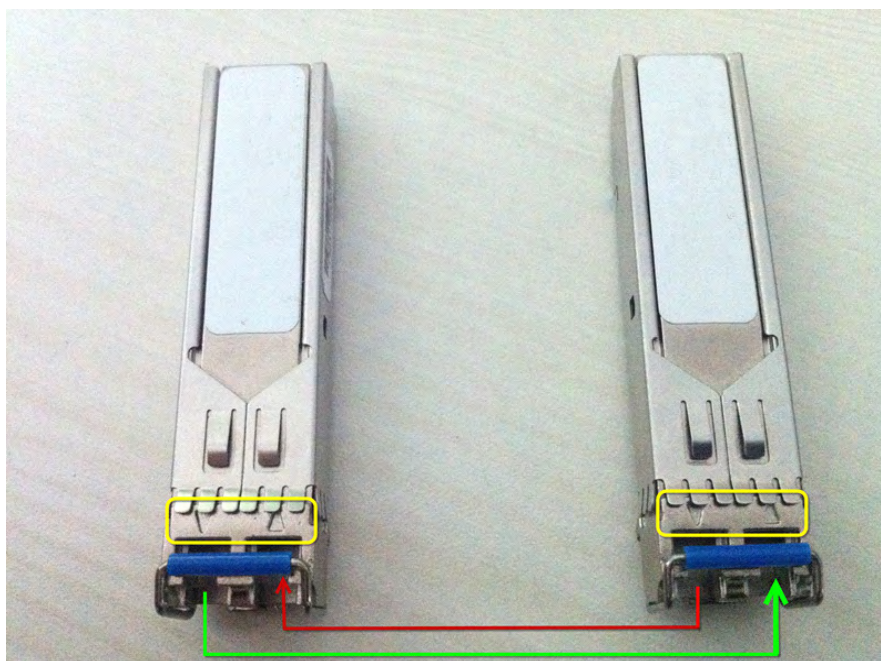
Figure 6- 14 Optical Module Connection

Each pair (2) of optical module cages has four LED indicator arrows. The two on the left are green and the two on the right are red as shown in Figure 6- 15. The indicator arrows represent the synchronization status of the upper and lower optical modules. When optical module A has synchronized with module B (both uplink and downlink), the indicators turn green as shown in the right pair of indicators in Figure 6- 15. When the optical module is unplugged or not synchronized, the indicators are red as shown in the left pair of indicators in Figure 6- 15. Check whether both indicators turn green after connecting one pair of optical modules. If they are red, the terminal has not synchronized.
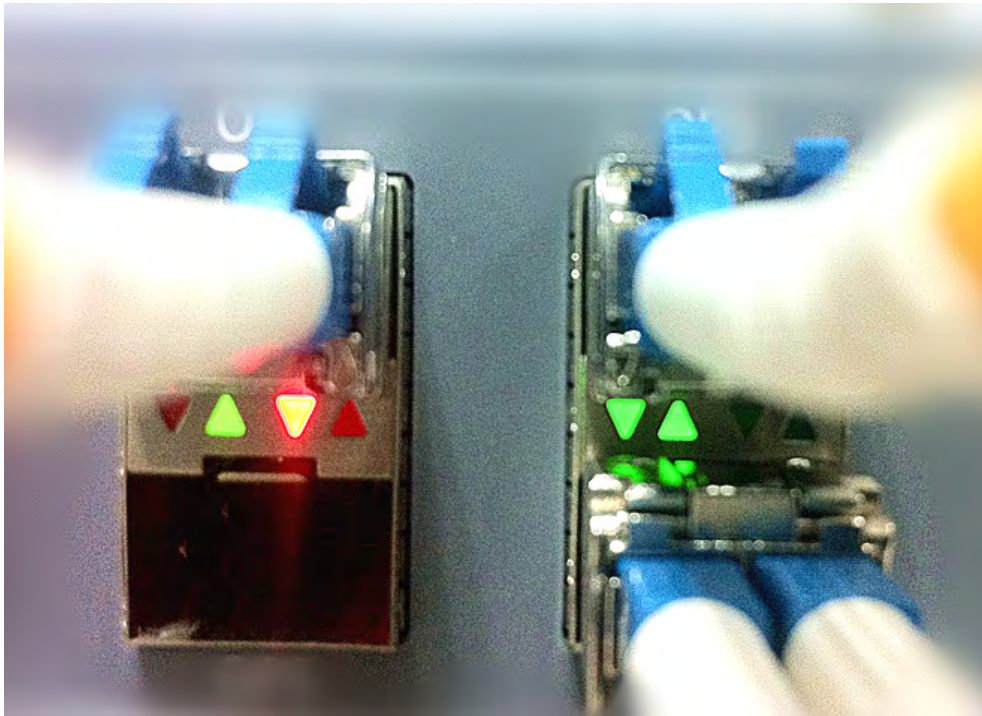
Figure 6- 15 Optical SYNC Status

6.4.2.　AU connections

Prior to attempting the AU connections, read Section 3 thoroughly.

The AU has eight optical ports, designated by eight silk-screened images: "AU1", "AU2", "OP1/AU", "OP2", "OP3", "OP4", "OP5" and "OP6". The ports "OP1~OP6" all have the same functionality, providing connections to lower level EUs or RUs. Insert the optical module into any one of the OP1～OP6 ports, then insert the tail of the optical fibre into the optical module and connect the other end to the lower EU or RU. After the AU and EU/RU are connected and powered on, the optical interface indicator LED will turn green, which indicates that the devices are synchronized. If the optical indicator LED does not turn green, check whether the connection direction of the optical fibre is correct and whether the optical module is inserted tightly.

The "AU1" and "AU2" optical ports are for connecting to the slave AU.

When connecting to the slave AU, first access the slave AU independently (see Section 2.2 for instructions on how to access the WebOMT for the Slave AU). Ensure the status of the AU is "Slave AU" and then connect the optical fibre.

Note: The connection between the Master AU and the Slave AU can only be from the OP1/AU port on the Slave AU to the AU1 (or AU2) port on the Master AU; other optical ports are invalid for Master-Slave AU connections.

6.4.3.　EU connections

Prior to attempting the EU connections, read Section 4 thoroughly.

The EU has 8 optical ports and 6 electrical ports. The optical "SLAVE" port should be connected to the AU or upper EU and the optical "MASTER" port should be connected in a cascading manner to a lower EU in a daisy chain. (Refer to the networking definition of a daisy chain.) The OP1~OP6 ports have the same functionality and are all used for connections to RUs. After the EU is connected to the upper device and powered on, the optical indicator LED turns green which means that the devices are synchronized. If the LED does not turn green, see Section 10 to resolve the issue.

Each EU has six electrical ports, GE1~GE6, which support six LAN signals. Each electrical port corresponds to a specific optical port, for example, port GE1 corresponds to port OP1 and port GE6 corresponds to port OP6.

6.4.4.   RU connections

Prior to attempting the RU connections, read Section 5 thoroughly.

The RU has 2 optical ports, "SLAVE" and "Master. The "SLAVE" port should be connected to an upper AU, EU or RU, and the "MASTER" port should only be connected to a lower RU. After the RU has been connected to the upper device and powered on, the optical indicator LED turns green which means that the devices are synchronized. If the LED does not turn green, see Section 9 to resolve the issue.

6.4.5.   Standby battery connection

A plug is connected to a power source on the output wire of the device's lithium battery. To prevent battery discharge, this is unplugged before shipping. After the device is operational, plug it in to ensure normal reporting if the power is cut.

6.5.   WLAN Access (Wi-Fi)

Each EU has six electrical ports, GE1~GE6, which support up to 6 LAN signals. LAN signals are input on the GE1~GE6 ports and output from the corresponding OP1~OP6 ports. The signals are then transmitted to the RUs via optical signals over optical fibre and output from the GE port on the RU. Each RU connects to an AP device through their respective GE port. Thus, 6 independent Gigabit Ethernet transmission channels can be completed. See Figure 6-16 for WLAN connection details.

Note: each electrical port (GE1~GE6) must correspond to an optical port (OP1~OP6), i.e. GE1 should correspond to OP1, GE2 should correspond to OP2, etc. WLAN signal input on GE1 is then sent out on OP1.

If there are multiple access points (AP) that are connected to more than one cascading RU in a signal chain, the WLAN signal will only be output from one of the RUs, with the priority being RU1>RU2>RU3 when selecting which RU the signal will be output from. If there is only one AP device, then the WLAN signal is always output from the RU that is connected to

the AP.
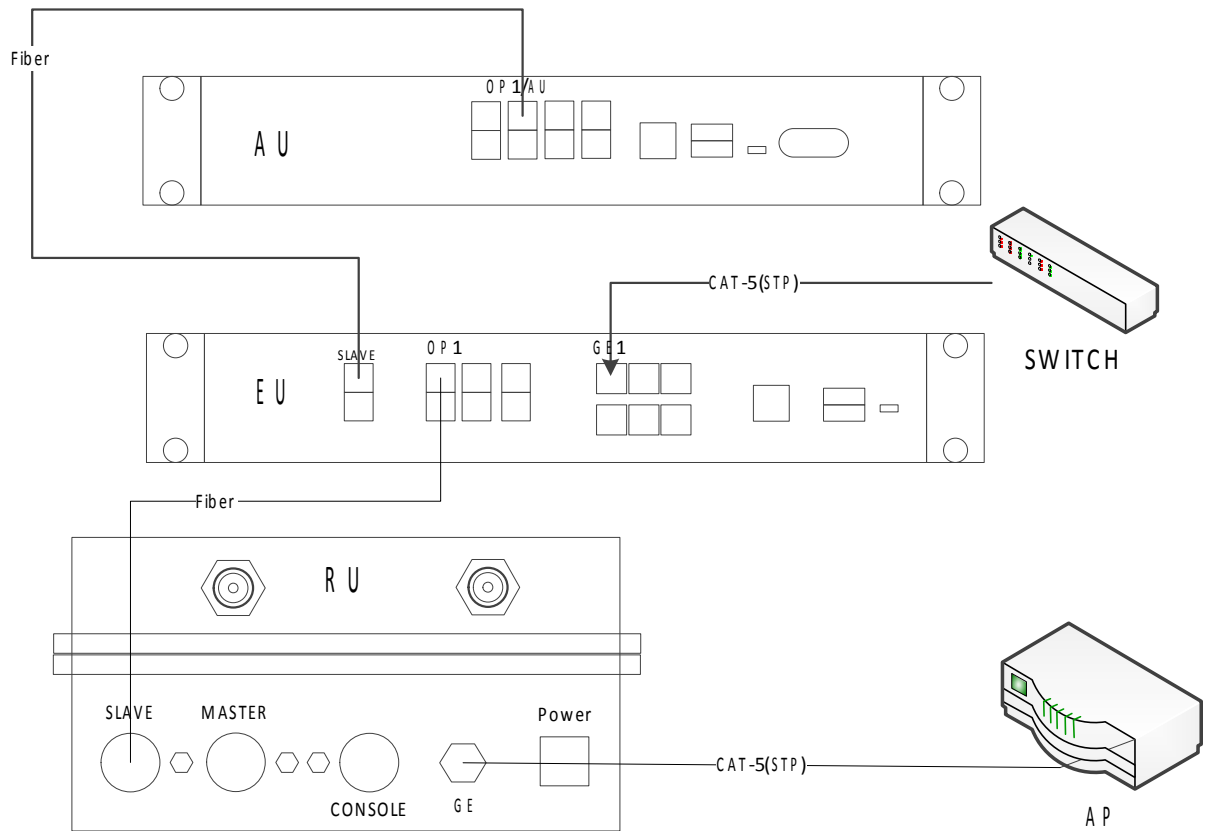
Figure 6- 16 WLAN Access

7. System Debugging Setup

After installation and connection, power the devices on. At this point, it is strongly recommended that a laptop be connected to the Master AU to enable system debugging. Check each device's working status. The optical interface indicator LEDs should be green and stay lit and the STATUS indicator LEDs should be green and flashing slowly. Now, start the online debugging according to Figure 7- 1 and Figure 7- 2.
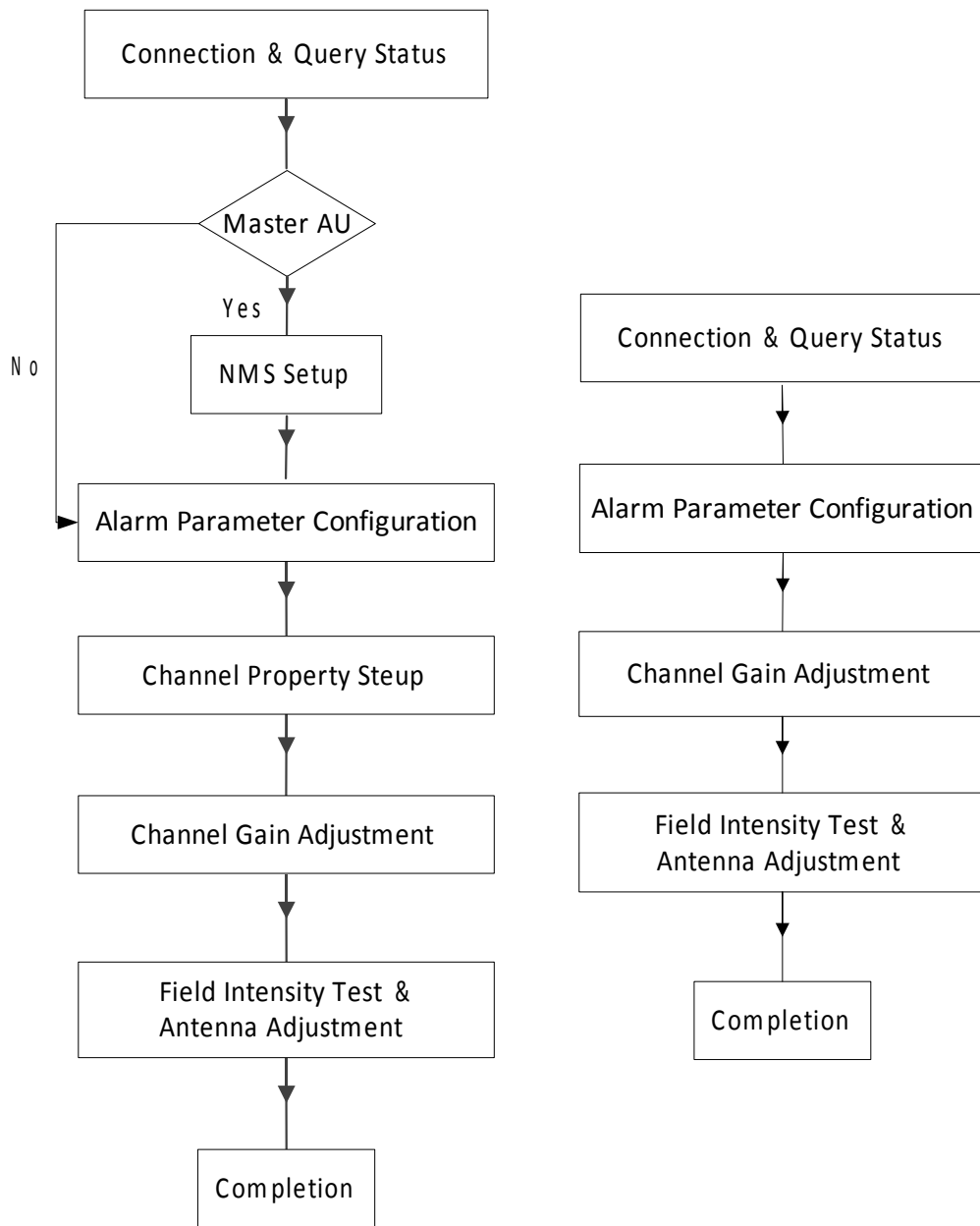
Figure 7- 1 AU (left) and RU (right) Debugging Procedures
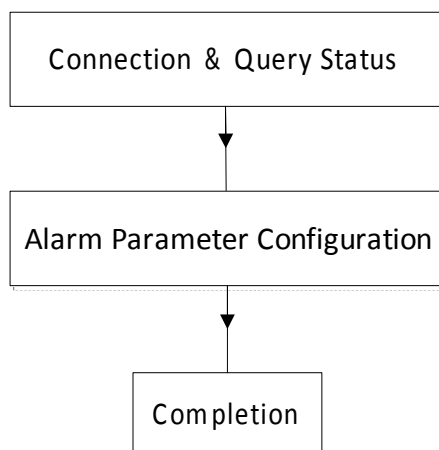
Figure 7- 2 EU Debugging Procedures

7.1. Network Management System Setup for SNMP

The site number must be set using the WebOMT on the Master AU before connecting to the network management system (NMS). The NMS should identify devices by their unique site number. Network parameters also need to be set up for the specific network. If the NMS supports the SNMP protocol, set **Protocol Select** to "SNMP" and configure related parameters such as the **Trap IP Addr**, **Trap Port**, **Subnet Mask**, **Default Gateway**, etc. as shown in Table 7. If the NMS supports the SUNWAVE proprietary protocol, set **Protocol Select** to "TCP/IP" and configure the corresponding parameters as shown in Table 6.

The remote FTP server parameters also need to be set up if remote software upgrades are supported. These parameters are set in the **Engineering** tab —> **User Para** sub-tab in the WebOMT. See Figure 7- 3 for details.
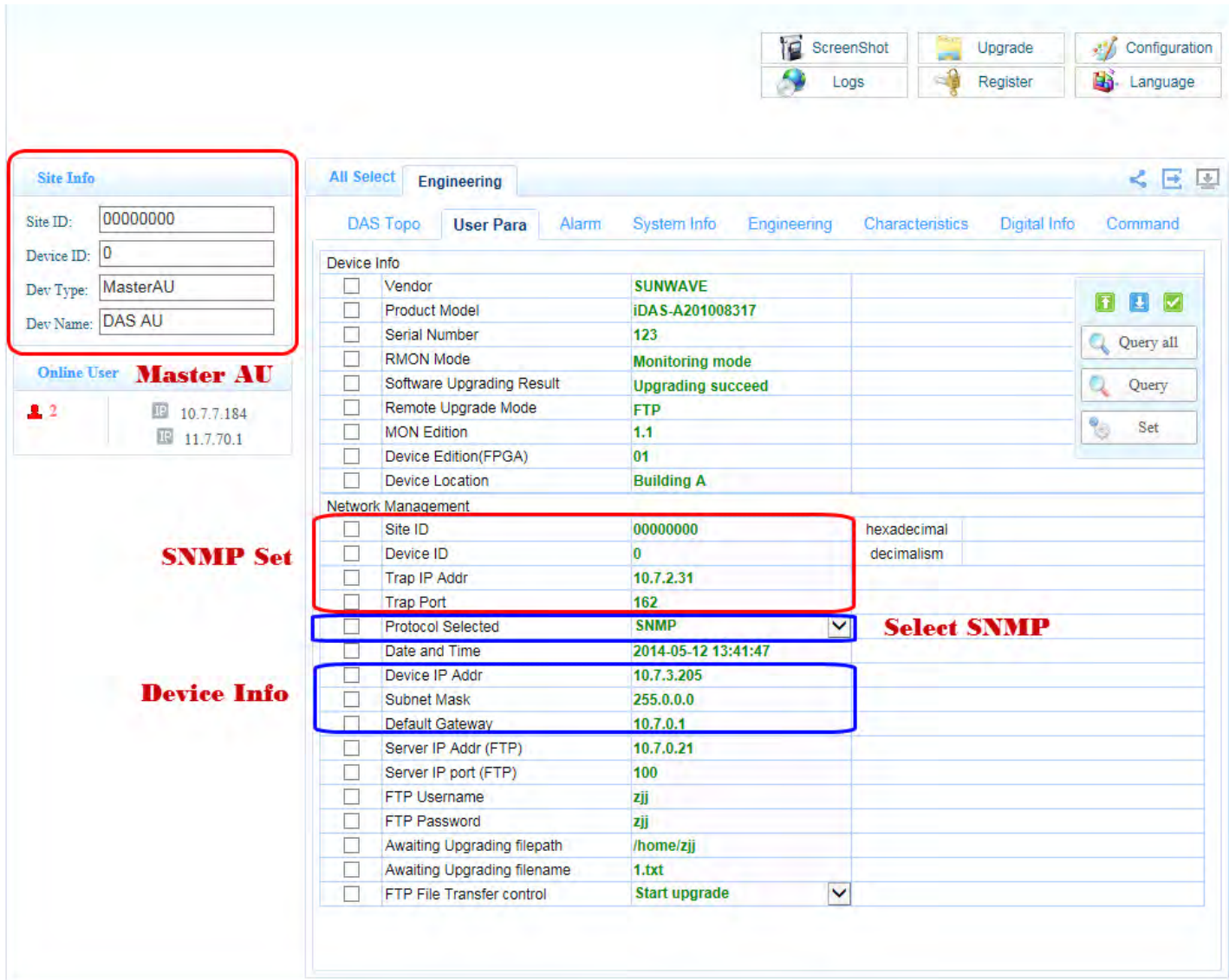
Figure 7- 3 NMS Setup

7.2. Channel Properties Configuration

According to the different base station operating frequency bands for each operator, select the passive RF modules for the AU and active RF modules for the RU with the corresponding frequency band and set the channel properties in the WebOMT of the Master AU. The limits of the uplink and downlink operating frequency bands correspond to the effective RF range of the selected RF modules.

To set the channel properties (see Figure 7- 4):

1. In the WebOMT, select the **Engineering** tab.

2. Select the **Characteristics** sub-tab on the **Engineering** page.

3. Set the uplink and downlink operating frequency band limits for channels 1, 2, 3 and 4.

(See step **1** in Figure 7- 4.)

4. Set the uplink and downlink centre frequencies and the bandwidth for signals 1, 2, 3 and 4.

(See step **2** in Figure 7- 4.)

5. Click **Set** to validate the parameter values. (See step **4** in Figure 7- 4.) Ensure the value of **CH1~4 info**

is **valid**.

6. In the **Public Parameters** section, set **AU CH Info Update** to "Update". (See step **3** in Figure 7- 4.)

Note: The maximum bandwidth per operating band should be less than 80MHz and the maximum bandwidth for all

operators should be less than 200 MHz

Figure 7- 4 Setting Channel Properties

7.3. Channel Gain Adjustment

After setting the channel properties, access the RF signals. In the CrossFire, the nominal downlink input power of the AU is 0dBm and the maximum allowable input power is 10dBm. Therefore, before accessing the RF signals, estimate the signal power. Monitor the downlink input power with a spectrum analyzer or read the downlink input power from the "Digital Info" on the WebOMT in order to set the downlink input power within the appropriate range. The adjustable attenuation value of each AU channel is 5dB, which can be set in **Engineering** —> **Real-time Info** —> **RF Channel x**.

See Figure 7- 5 for details.
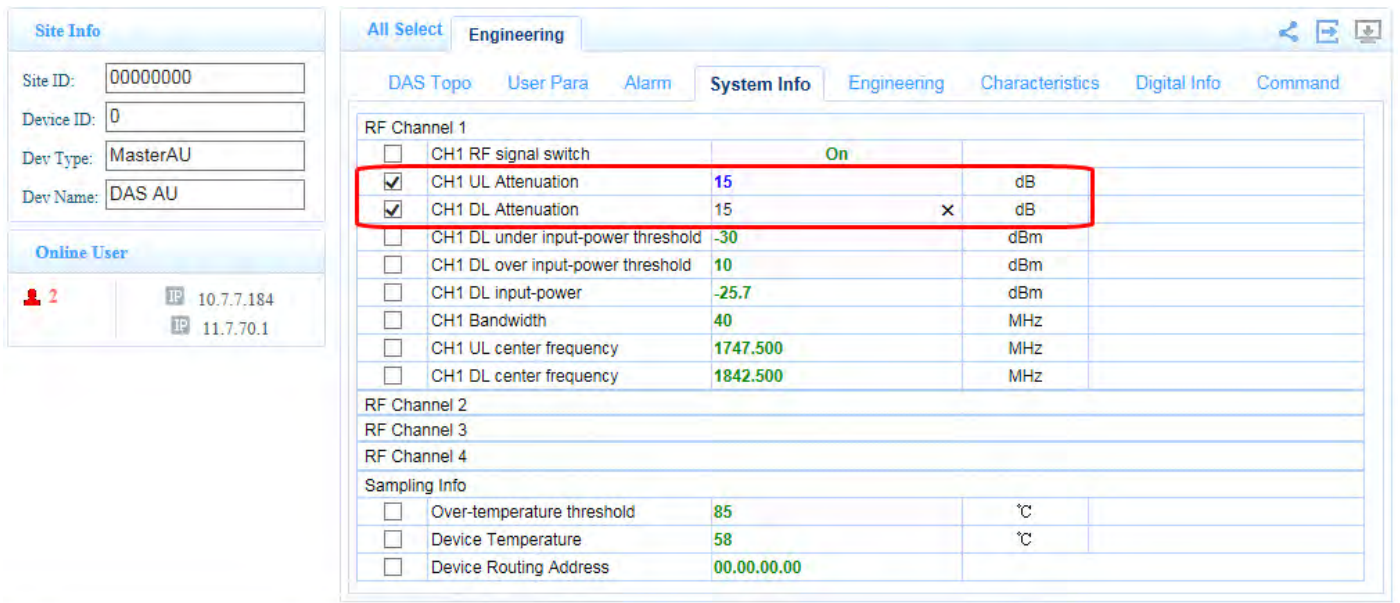
Figure 7- 5 Channel Gain Adjustment

7.4. Alarm Parameters Setup

After completing the radio-frequency channel properties configuration, set up the alarm parameters using the following procedure:

1. In the WebOMT, select the **Engineering** tab.

2. Set the status of the optical transceiver one by one.

3. If there is an optical path connection, enable the basic device alarms, such as Power Interruption Alarm, Battery failure Alarm, MOV Alarm, etc.

For alarms related to channel properties, such as the DPLL unlocked Alarm, LO unlocked Alarm, OP transceiver failure Alarm, etc., only enable those associated with the channels which have an input signal, to avoid unnecessary alarms. See Figure 7- 6 for details.

Wait 3~5 minutes after completing the setup, then query to see if there is a failure alarm for the device. If there is

an alarm, see Section 9 to resolve the issue.

Figure 7- 6 Alarm Parameters Setup

7.4.1. Alarm level

Figure 7- 7 Alarm Level

The alarm level is distinguished to four levels— Warning, Minor, Major, Critical corresponding to the alarm level on NMS. The level of specific alarm is independently chosen by user.
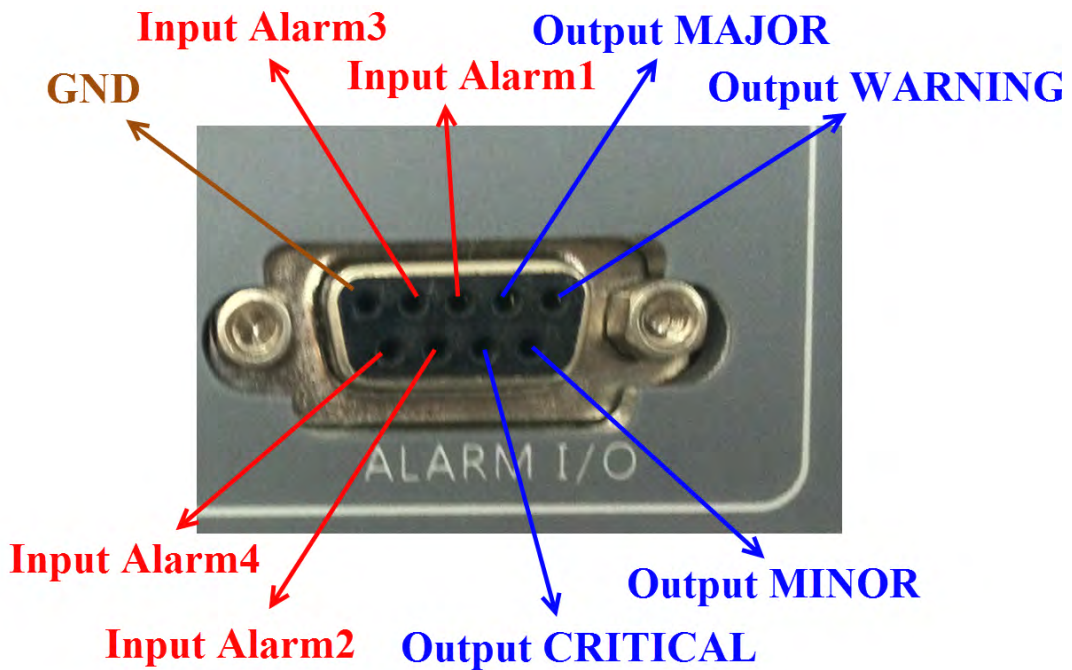
7.4.2. External Alarms

Figure 7- 8 External Level

See Figure 7- 8 for details of external level.

7.5. Configuring OMT User Parameters

Table 52 shows the clickable icons in the WebOMT used for configuration.

Table 52   WebOMT Configuration Icons

Icon	Description

	Show/hide parameter ID numbers. Every parameter can be distinguished by its unique ID number in the WebOMT.
	Show/hide configurable parameters. *Note:* only some of the read-write parameters are configurable and can be modified.
	Save configuration. *Note:* this button is only enabled after checking the selected parameter. Otherwise, it is greyed-out and is an invalid choice.

To configure the parameters, use the following procedure and refer to Figure 7- 9 and Figure 7- 10:

1. In the WebOMT, select the appropriate tab (for example, the **User Para** tab).

2. Click the   button to show the parameter ID numbers. See **1** in Figure 7- 9.

3. Click the   button to show the configurable parameter choice box. See **2** in Figure 7- 9.

4. Check the parameter that you want to configure. See the blue check mark in **3** in Figure 7- 9.

5. Click the   button to save the configuration. See **4** in Figure 7- 7. *Note:* you can also use the **Save Configuration** button on the Configuration page shown in Figure 7- 10. (See next step.)

6. Click the **Configuration** button. (See **5** in Figure 7- 9.) This takes you to the Configuration page. In Figure 7- 10, the underlined file contains the configuration parameter data. Use the **Download** and **Load Configuration** buttons to save the file to a local PC and load the file to the WebOMT, respectively. See the red frames in Figure 7- 10.
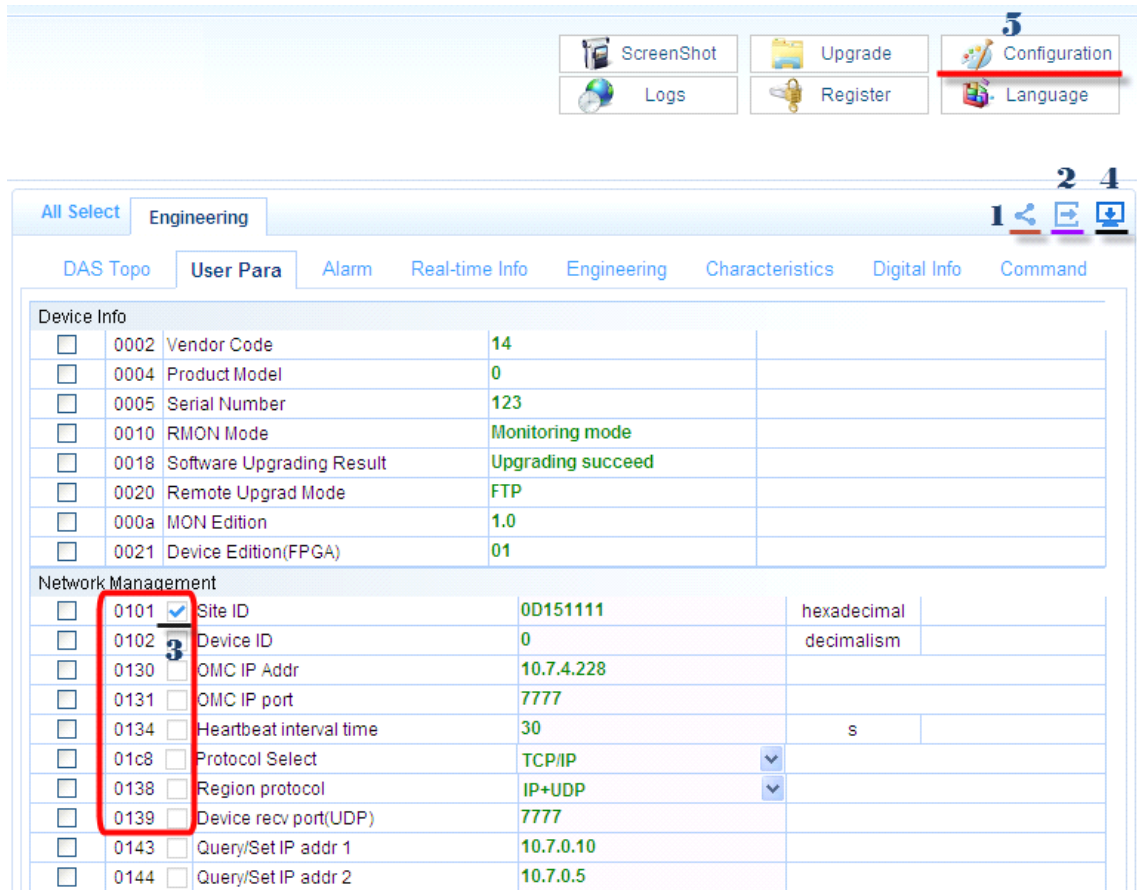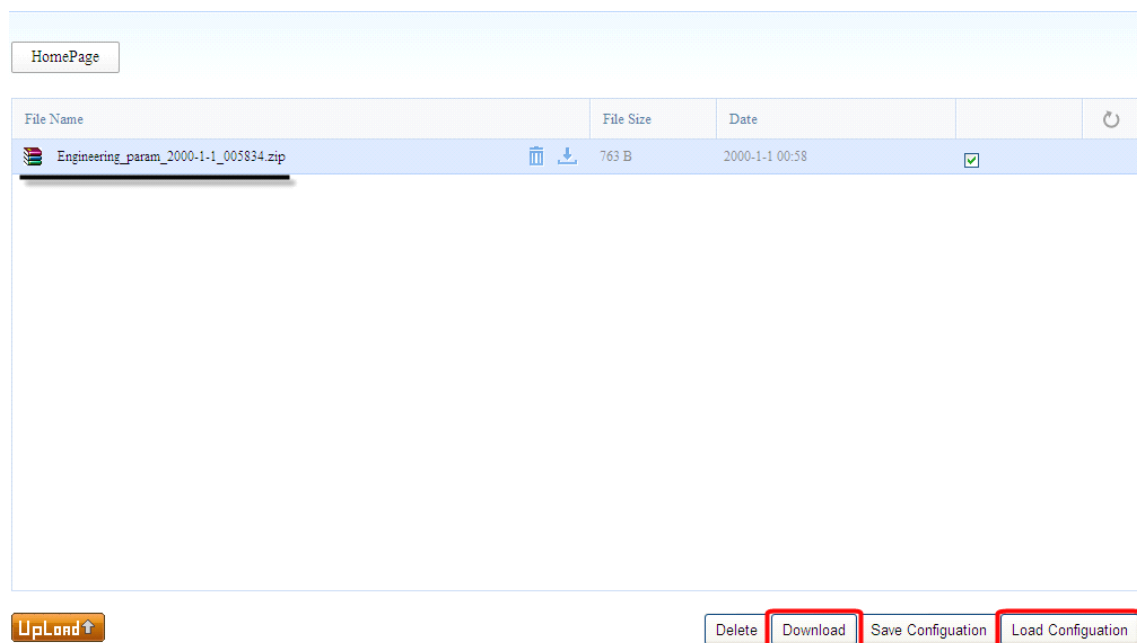
Figure 7- 9 Configuring User Parameters

Figure 7- 10 Download and Load Configuration

8.　Software Upgrade

The Master AU consolidates the management of software upgrades for the entire system and saves the last software package for the AU, EU and RU. Slave devices compare the local software with that saved in the Master AU at run time. If the software version is different, the slave device will start the software upgrade progress and reset automatically after the upgrade is complete. The benefit of this approach is that if a slave device is replaced, a software upgrade is started automatically without having to do additional operations. If the Master AU is replaced, before connecting the new Master AU to the system, check the software version using the WebOMT as shown in Figure 8- 1. If the software version is not the latest version, upload the latest software packages to the new Master AU.

Figure 8- 1 Checking Software Package Version

As mentioned above, the system software upgrade is divided into two steps. First, upload the package to the master AU. Second, the slave device automatically downloads the new software package from the Master AU to complete the upgrade process. This process can be performed in one of two ways: by performing a local upgrade using the OMT or by performing a remote upgrade via FTP.

8.1.　Local Upgrade

As an example, to do an RU or EU upgrade:

1. Log in to the WebOMT on the Master AU. Click the **Upgrading** button on the main page to navigate to the software upgrade page. See Figure 8- 2.
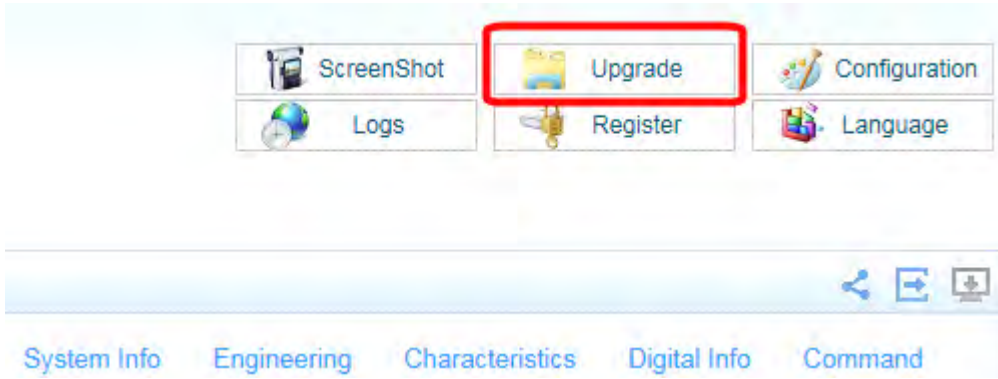
Figure 8- 2 Software Upgrade Step 1

2. On the software upgrade page, as shown in Figure 8- 3, click the **Upload** button to upload the RU or EU software package file.
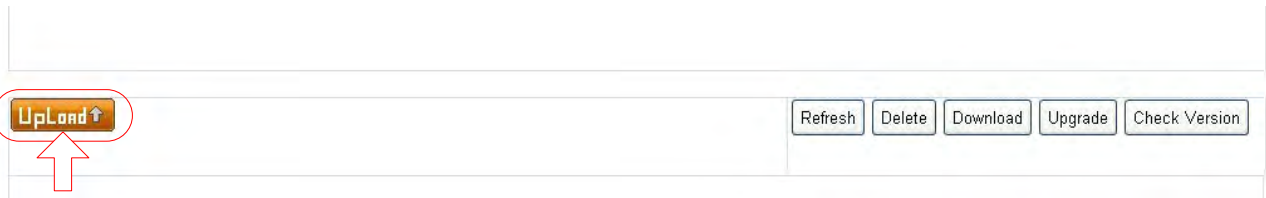

Figure 8- 3 Software Upgrade Step 2

3. When the software upload has completed successfully, select the file that was just uploaded and click the **Upgrade** button to complete the software upgrade, as shown in Figure 8- 4 for an RU upgrade.
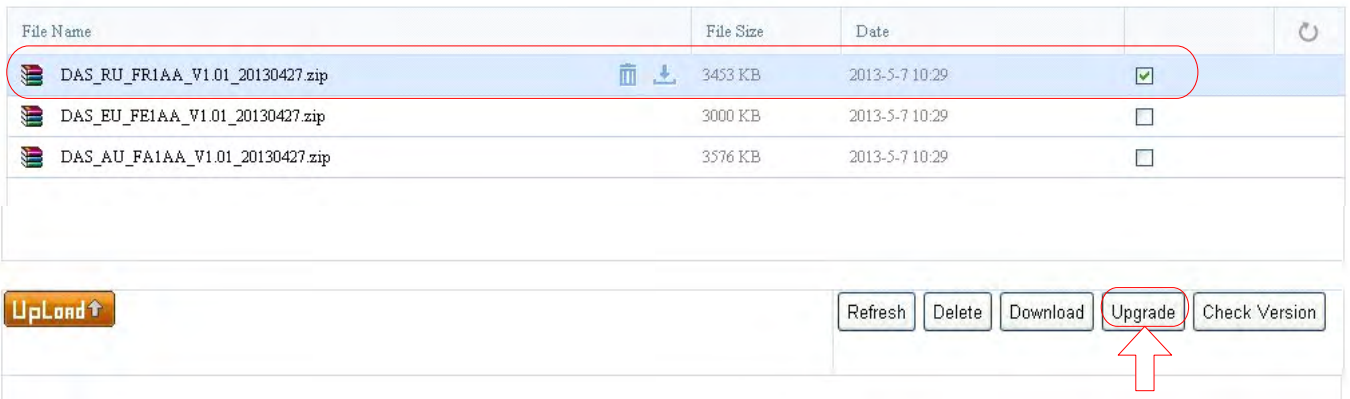

Figure 8- 4 Software Upgrade Step 3

4. When the upgrade has completed, confirm that the software has been updated correctly as shown in Figure 8- 1.

There is one difference in the AU upgrade process. Follow the same steps as for the RU or EU; however, when the AU package upgrade has completed successfully, the Master AU resets itself automatically to complete the software upgrade.

8.2. Remote Upgrade

Use FTP to perform an upgrade remotely. As shown in Figure 8- 5, set up the FTP server IP address, port number, login name, login password, file storage path and filename to be upgraded. Then, set the **FTP File Transfer Control** item to "Start upgrade". To complete the upgrade, click the **Set** button to download the software from the FTP server. When using this method, ensure that the FTP server is running correctly and the file to be upgraded has been saved in the specified directory.
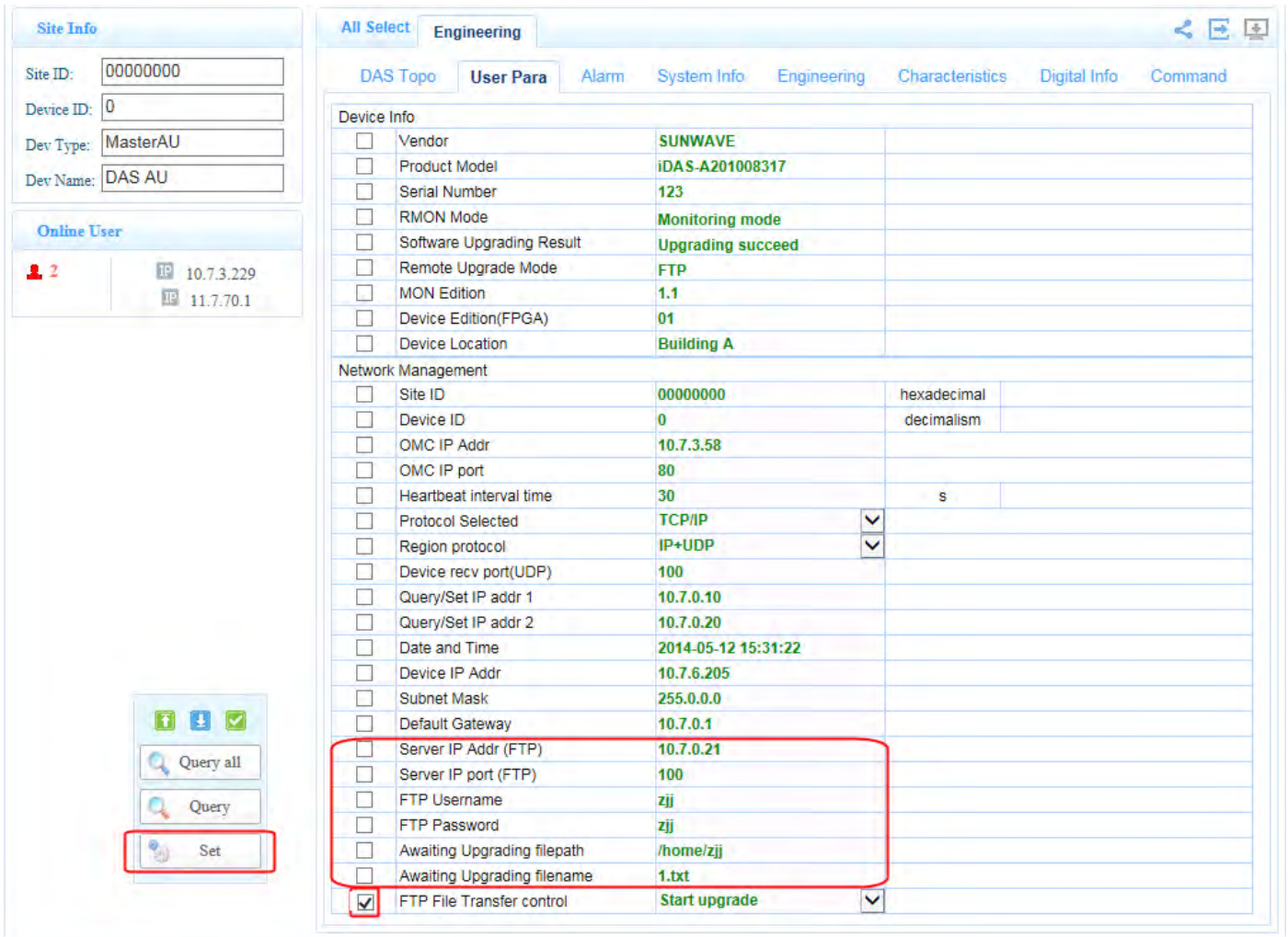

Figure 8- 5 Setting up Remote Upgrade via FTP

If the CrossFire is connected to an NMS, the operations above can be set through the NMS to implement a remote software upgrade, as shown in Figure 8- 6.
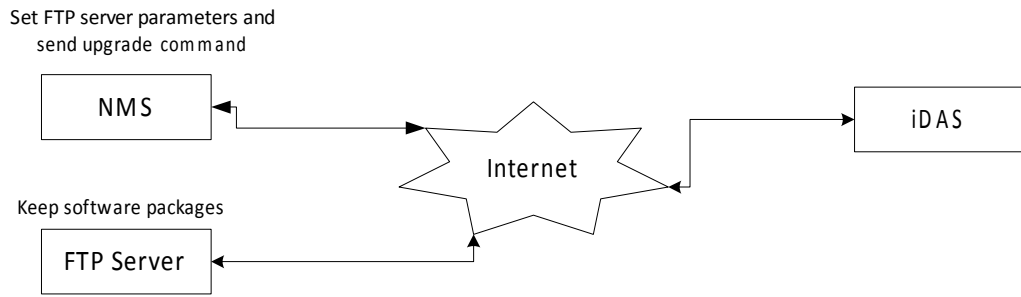
Set FTP server parameters and
send upgrade command

NMS

Keep software packages

FTP Server

Internet

iDAS

Figure 8- 6 Remote Upgrade using an NMS

9. Device Maintenance

9.1. Regular Maintenance

When the CrossFire is running, regular inspection is recommended, as follows:

1. Check that RF and power cables are connected securely and that all screws are tight. If any connections pose a safety hazard, deal with them as soon as possible.

2. Check the ground status of the device.

3. Measure the power supply voltage of the devices.

4. Check the operating status and main performance parameters of devices regularly through the NMS or OMT.

5. Check whether all warning marks are intact.

If a fault occurs and the device cannot operate normally, return the device to the factory for repair or send to technicians for site repair.

9.2. Troubleshooting

This section lists problems that may arise in engineering applications and suggests relevant solutions.

1. The slave device cannot synchronize with the master device:

a) Query the software version using the OMT. Make sure that the device is running the correct software.

b) Check the SFP module to confirm whether the SFP module has been damaged.

c) Restart the device. If the problem persists, the device may have been damaged. The equipment needs to be replaced.

2. RU downlink shows an output-power alarm:

a) The gain of the RU downlink is equal to (37- DL attenuation dB). Check the RU downlink baseband power, and then add the downlink baseband power to the RU downlink gain. The result should be close to the output power. If the deviation is more than 5 dB, the PA module may be damaged.

3. Over-temperature alarm:

a) The devices need space to dissipate heat. Ensure the device is not covered by anything. If the device is covered, the temperature will rise.

10. Application Scenarios

This section describes various configuration scenarios for the CrossFire.

10.1. Operators Located at Same Site

In this example, operators A, B, C, D and E are located at the same site (see Figure 10- 1). Operators B and C operate in the same frequency band, which can be combined in one channel in "the RF domain". The maximum bandwidth per operating band should be less than 60MHz and the maximum bandwidth of all operators should be less than 200 MHz.
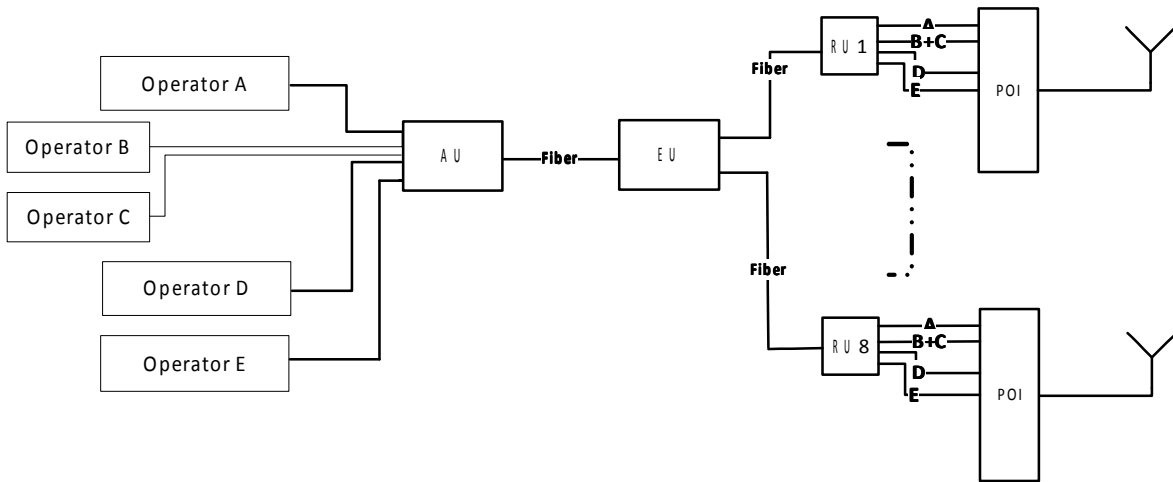
Figure 10- 1 Example for Operators Located at Same Site

10.2. Operators Located at Separate Sites

In this example, operators A, B, D and E are located at one site and operators C and F are located at a different site. (See Figure 10- 2) Operators C and F can access the Master AU through the Slave AU so that all operators can combine within the same fibre from the Master AU to the EU. In contrast with the scenario in section 11.1, operators B and C can be combined in the "baseband domain". The maximum bandwidth per operating band should be less than 60MHz and the maximum bandwidth of all operators should be less than 200 MHz.
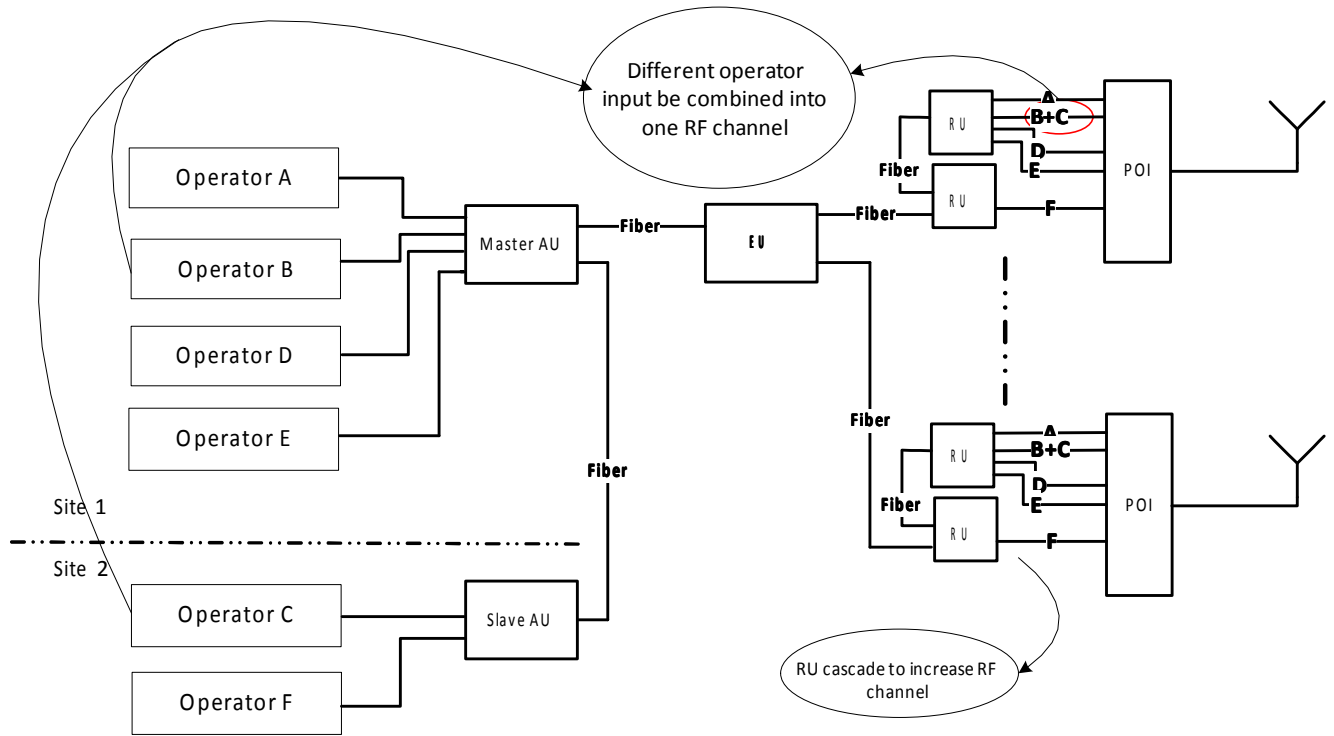
Figure 10-2 Example for Operators Located at Separate Sites

10.3. MIMO Application

Since the same frequency is used between MIMO1 and MIMO2, operator C, as shown in Figure 10-3, must employ two special channels in the AU and RU. In order to guarantee coherence between MIMO1 and MIMO2, MIMO1 and MIMO2 must be in the same AU and RU. The maximum bandwidth per operating band should be less than 60MHz and the maximum bandwidth of all operators should be less than 200MHz.
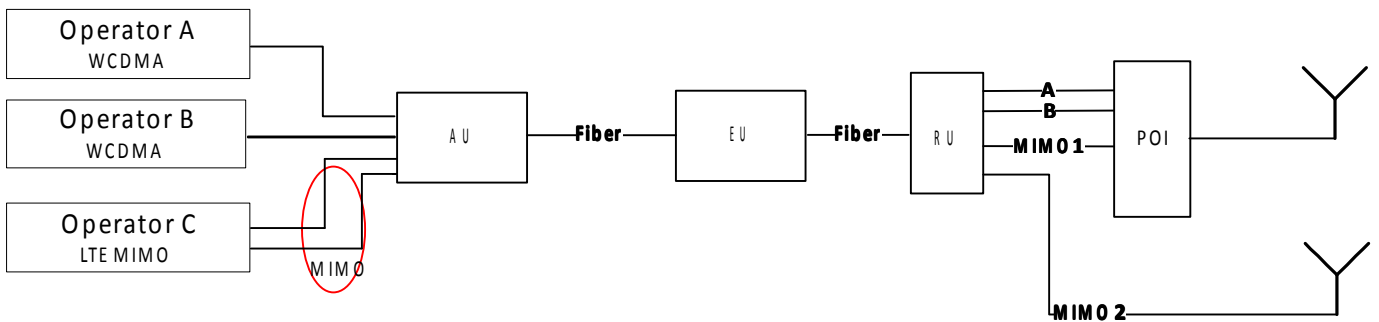

Figure 10-3 Example for MIMO Application

10.4. RU Cascade Application

In this scenario, RU1 can connect to the EU or directly to the AU. A maximum of four RUs can cascade when RU1 is

connected to the EU and a maximum of five RUs can cascade when RU1 is directly connected to the AU. (See Figure 10- 4)

The maximum bandwidth per operating band should be less than 60MHz and the maximum bandwidth of all operators
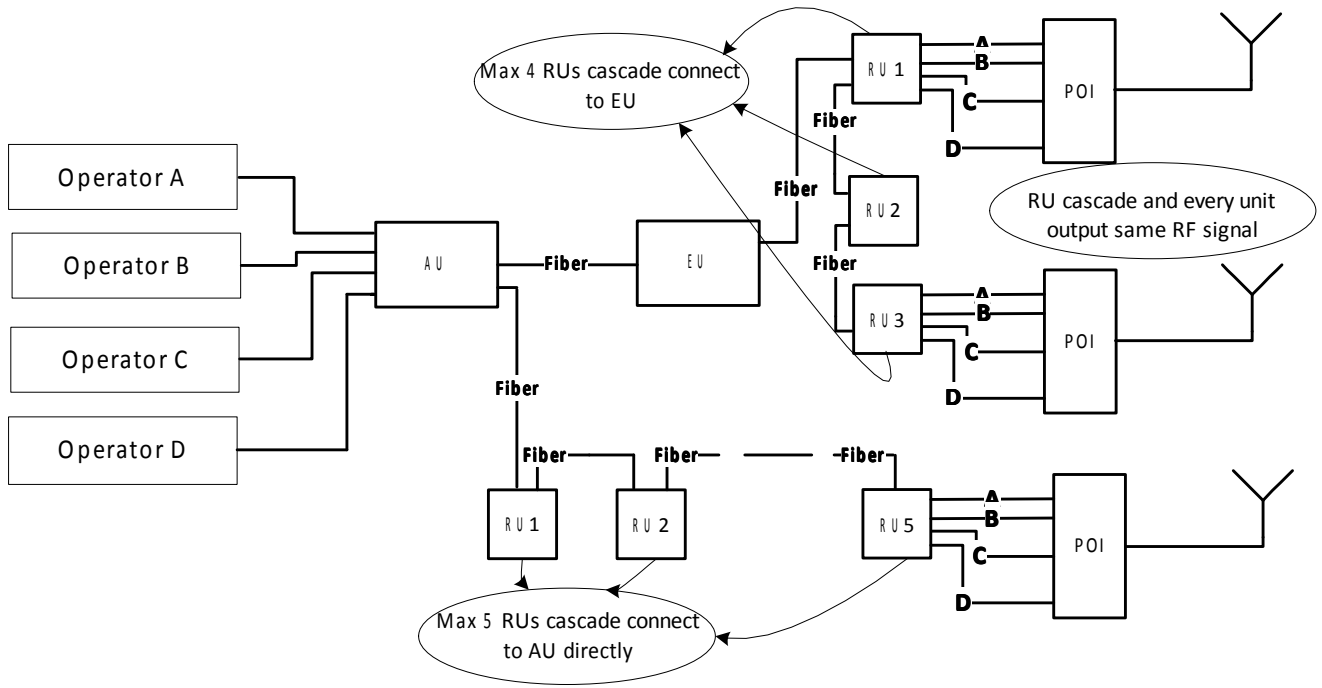
should be less than 200 MHz.

Figure 10- 4 Example for Cascading RU Application

10.5. WLAN Application

CrossFire provides a transparent pipeline for 10M/100M/1000Mbps Ethernet transmission. Each EU has six electrical

ports (GE1~GE6) for six WLAN signals to access. Meanwhile, six optical ports (OP1~OP6) correspond to GE1~GE6 for the

output signal. (See Figure 10- 5) The flow path of the signal is:

Input LAN signals— EU— RU— AP— POI— Antenna-feeder system.

Note:

- The electrical port must correspond to an optical port, for example, GE1 corresponds to OP1.

  - If multiple cascading RUs connect, the WLAN signal can be output from a random RU.

  - If multiple cascading RUs connect and more than one AP device connects to the RUs, the WLAN

    signal can be output from one RU, and the priority is RU1＞RU2＞RU3.
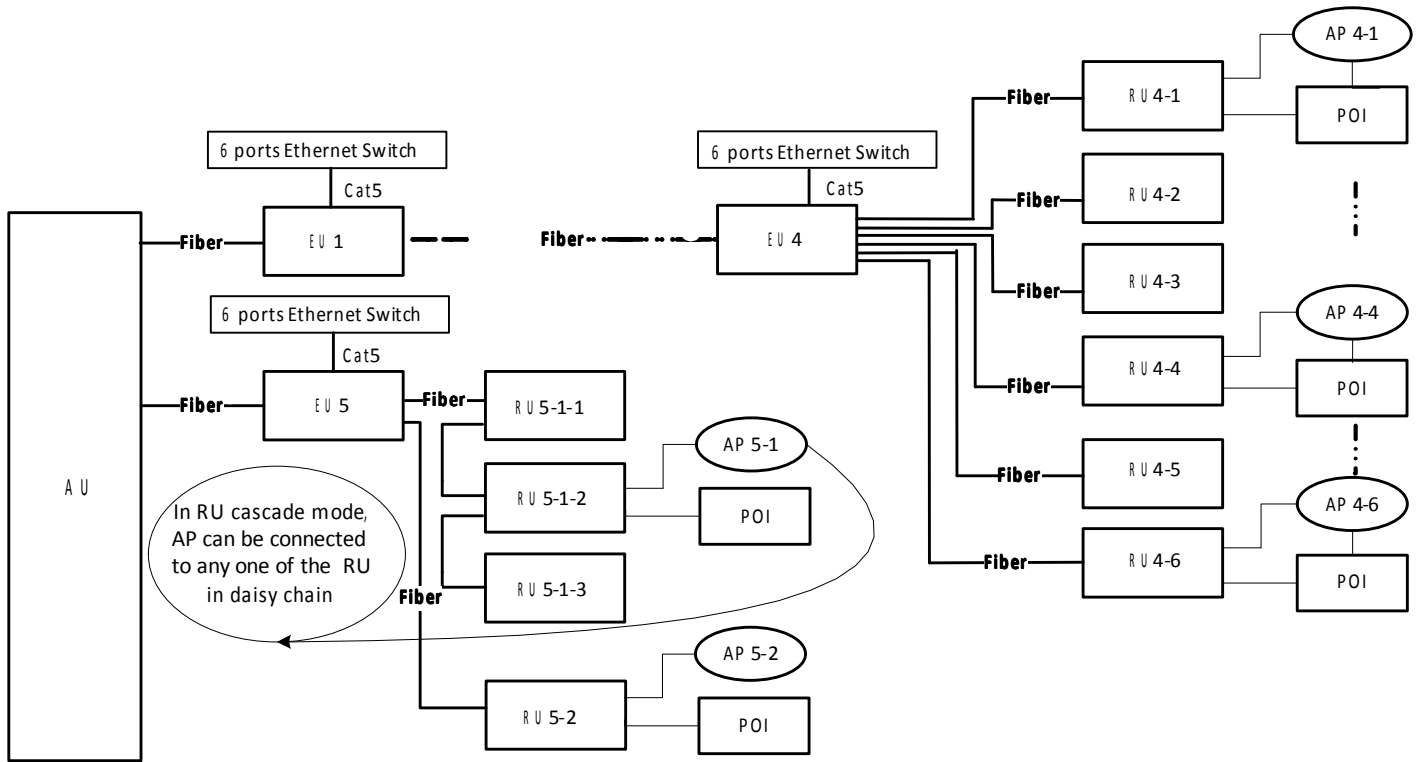
Figure 10- 5 Example for WLAN Application

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