SUNWAVE Solutions

CrossFire NP

User Manual

Version 1.0

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Nano Power - CrossFire User Guide

1. Preface

1.1. Safety Instructions

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

Engineering Design

CrossFire achieves signal amplification of the uplink and downlink through direct coupling of 2G, 3G and LTE signals from a base station. The expansion unit accesses WLAN signals and combines these signals with the BTS signal indoor coverage. Normal use of the system will not damage the base station; however, additive uplink noise resulting from the use of many NPRUs may affect the sensitivity of the base station, which should be considered during engineering design.

Grounding

The chassis of the access and expansion units 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. Also, the aerial and feeder must be adequately grounded.

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 100 ~ 240VAC and the rated frequency range is 50Hz / 60Hz. The rated power of the AU, EU-E and NPRU is 80W, 100W and 65W, 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.

Electric Shock Prevention

Touching the internal power supply units is dangerous. To prevent electric shock, do not perform live-line work.

Optical Module

While fiber optic power levels used in this system are very low, it is advisable to avoid exposing the human eye to the laser light emanating from a fiber port or plug.

Device Configuration

Prior to upgrading and plugging in units and parts, first disconnect the standby lithium battery and power source.

BTS Downlink Signals

Signals coupled from the BTS shall be no greater than +15dBm, otherwise the device will not operate normally and damage may occur to the circuit.

Convection Cooling

Reserve at least 40mm of height above the radiation fins during device installation, otherwise the device temperature may rise and affect the service life of the device.

WLAN Protection

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

Warnings

⚠Only qualified personnel are authorized to use and operate the CrossFire system after reading and understanding the entire user guide.

⚠Changes or Modifications not expressly approved by the manufacturer responsible for compliance could void the user's authority to operate the equipment

⚠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.

⚠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 1.79cm or more from all persons during normal operation and must not be co-located with any other antenna for meeting RF exposure requirements.

⚠Antenna gain should not exceed 6 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.

1.2. Warnings

Symbol	Description	Symbol	Description
	General hazard indication		Danger due to electricity
	Risk of damage to property		Non-ionizing radiation radio frequency
	Danger due to laser light		Crushing hazard
	Laser light class 1		Hot surface
	Danger due to rotating fan blades		No remodeling and decomposition

1.3. Abbreviations

For the purposes of the present user guide, the following abbreviations apply:

Abbreviation	Description
ADC/ DAC	Analog to digital converter/ Digital to analog converter
ALC	Automatic Load Control
AP	Access Point
ARM	Advanced RISC Machines
AU	Access Unit
BS	Base Station
CPRI	The Common Public Radio Interface
EU-E	Expansion Unit - Ethernet
FPGA	Field Programmable Gate Array
iDAS	Integrated Distributed Antenna System
LTE	Long Term Evolution
NMS	Network Management System
OMC	Operations and Maintenance Center
OMT	Operations and Maintenance Terminal
OP	Optical Fiber
PA	Power Amplifier
POI	Point of interface
RF	Radio frequency
NPRU	Nano Power Remote Unit
RX	Receiver
SNMP	Simple network management protocol
STP	Shielded Twisted Pair
TX	Transmitter

1.4. Standards

All CrossFire devices meet or exceed 3GPP and FCC standards.

2. System Overview

2.1. Overview

The CrossFire NP system is a distributed antenna system (DAS). It consists of Access Unit (AU), Expansion Unit-Ethernet (EU-E) and Nano Power Remote Unit (NPRU). It splits the transmitted power among several antenna elements installed in the distributed environment, separated in space so as to provide coverage over the ideal area with reduced total power and improved reliability.

Combining digital processing and digital optical transmission technology, the AU is able to process radio-frequency signals of different operators with different standards and frequency bands from base station, and transmits composite signal to EU-E in optical port. EU-E reframes signal and transmits it to NPRU via 10 Gigabit Ethernet port. After digital-analog conversion and power amplification in NPRU, radio signal covers required area through the antenna-feeder system.

2.2. System Framework

Figure 2-1 shows the typical CrossFire system framework.

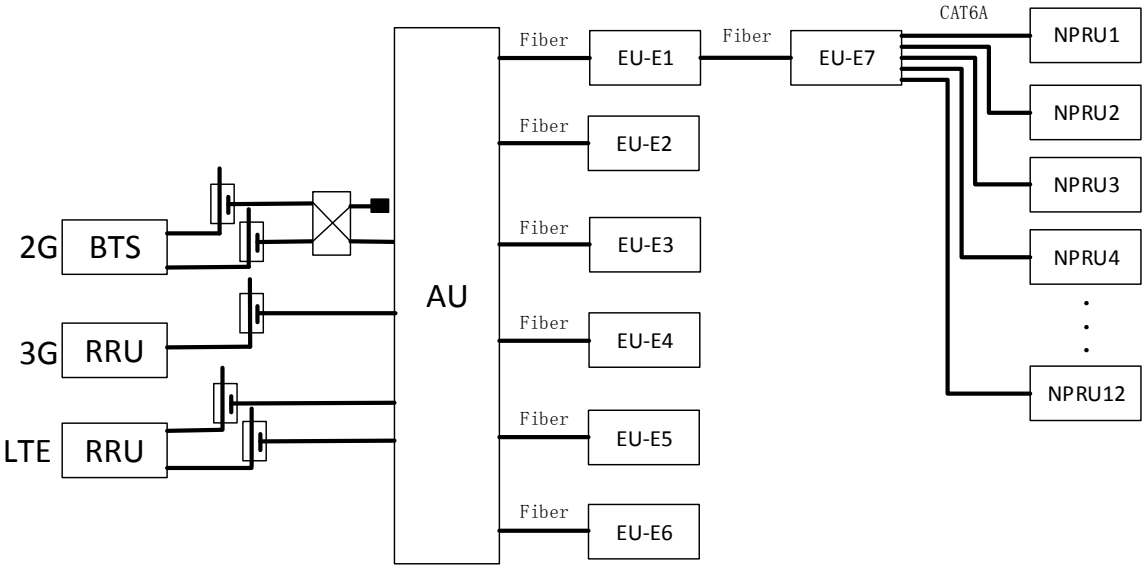

Figure 2-1 Typical System Framework for CrossFire

AU supports star network (AU to EU-E). A Master-AU can connect to up to two Slave-AUs and six EU-Es simultaneously.

EU-E supports a daisy-chained network (EU-E to EU-E) and a star type network (EU-E to NPRU). An EU-E can connect to up to twelve NPRUs.

3. Operations and Maintenance Terminal

3.1. Introduction to the OMT

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

Though Master AU is generally set as Host for NMS to monitor entire system, technicians are able to access to the whole system through WebOMT of any devices (Master or Slave AU, EU-E and NPRU) connected in system.

3.2. Access to OMT

There are two methods accessing to OMT:

1. Wired access
2. Wireless access

3.2.1. Wired Access to the OMT on Master AU

In the CrossFire system, the Master AU is defined as host, with the other AUs, EU-Es and NPRUs defined as slaves. See *Section 4.6* for Master/Slave AU selection.

The default IP address of the AU is 10.7.3.200, while other 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 Master AU with a network cable in the **CONSOLE** port in the front panel.
2. Change the TCP/IP properties (see Figure 3-1):
   a) Click **Network Connections**
   b) Click **Local Area Connection Properties**
   c) Click **TCP/IP Properties**
   d) Change parameters as indicated:
      IP address: 10.7.3.1 to 10.7.3.254 (except for 10.7.3.200)
      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 to access the WebOMT page. Figure 3-2 shows an example using 10.7.3.200 as the default gateway.

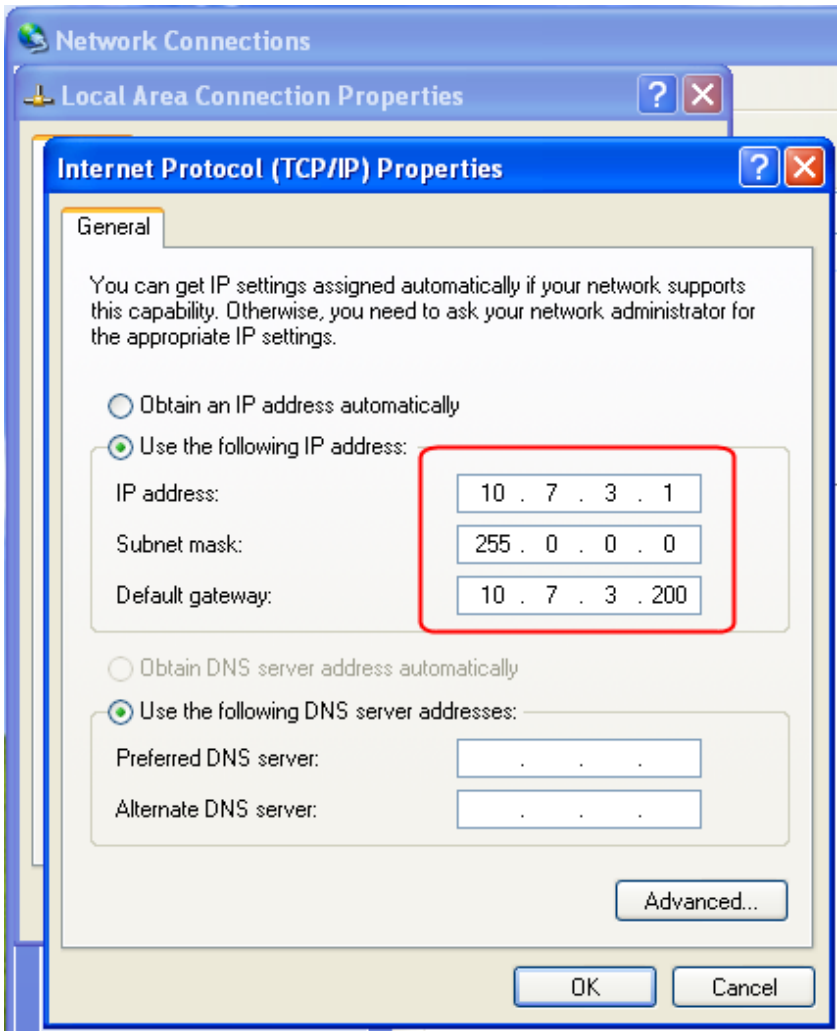

Figure 3-1 Wired Connection to the OMT on the Master AU

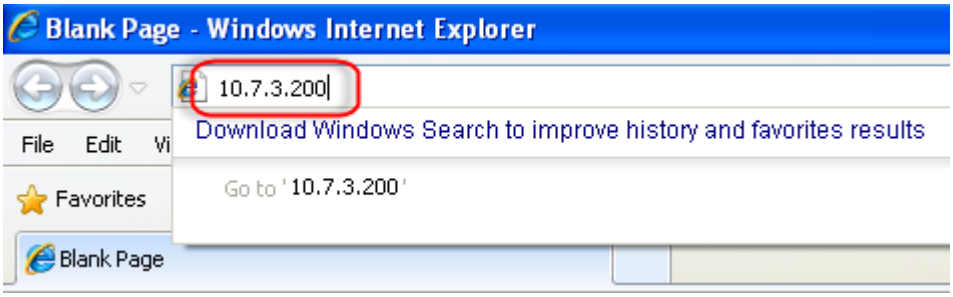

Figure 3-2 Web Browser OMT Connection for Wired Access

3.2.2. Wired Access to the OMT on Slave AU and EU-E

In the CrossFire system, EU-Es and NPRUs, as well as the Slave AUs, are defined as slaves. EU-E and Slave AU have no fixed IP address. Their IP addresses are assigned by the host automatically, based on the network topology.

To set up wired access to the OMT from Slave AU and EU-E, use the following procedure:

1. Connect a PC to Slave device with a network cable in the **CONSOLE** port in the front panel.
2. Change the TCP/IP properties (see Figure 3-3):
   a) Click **Network Connections**
   b) Click **Local Area Connection Properties**
   c) Click **TCP/IP Properties**
   d) Change parameters as indicated:
      a. Select **Obtain an IP address automatically**
      b. Select **Obtain DNS server address automatically**
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 to access the WebOMT page.

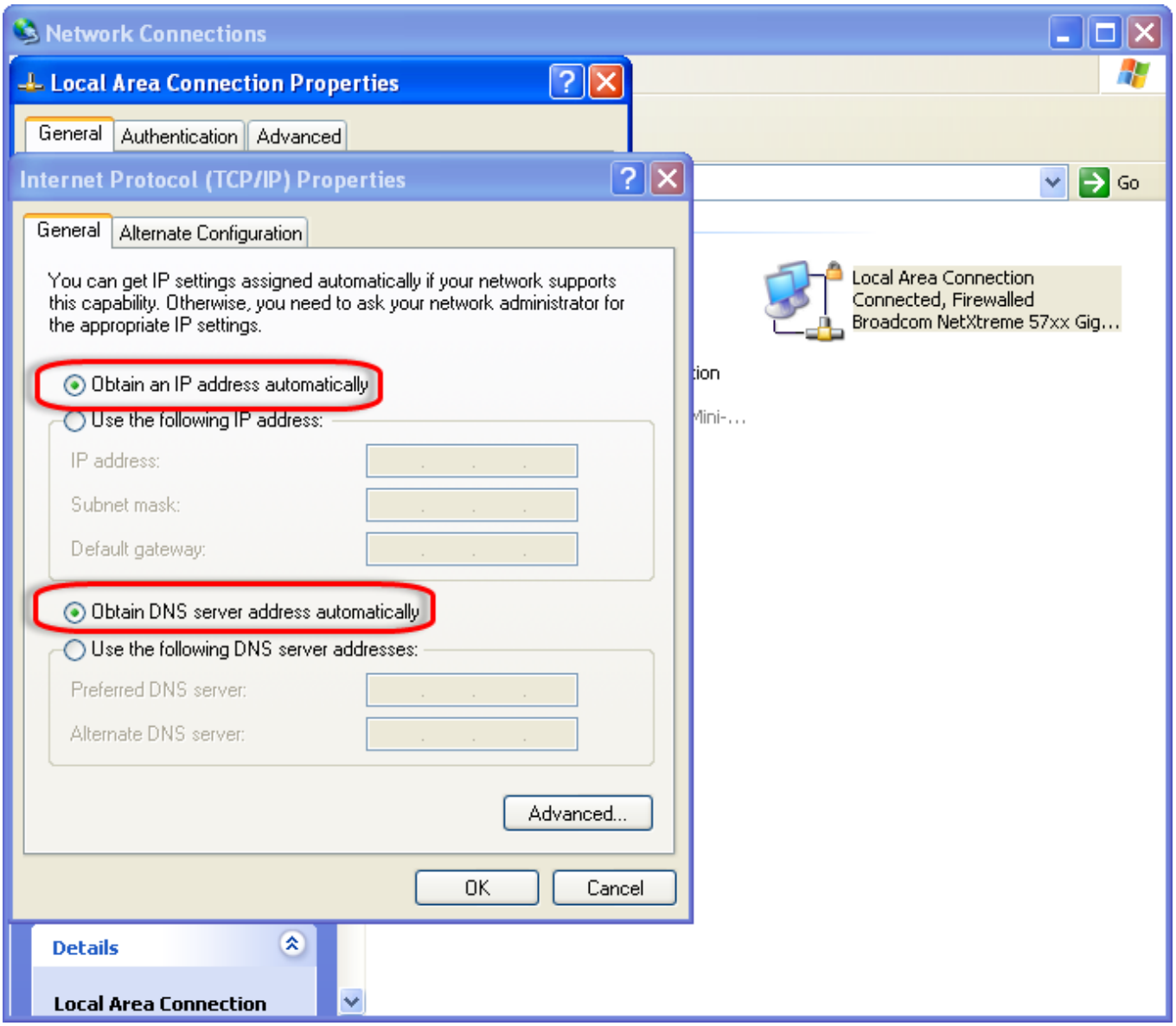

Figure 3-3 Wired access to WebOMT of Slave AU and EU-E

3.2.3. Wired Access to the OMT on NPRU

It is different to get access to WebOMT through NPRU in addition to change Link speed & Duplex. To set up wired access to the OMT from NPRU, use the following procedure:

1. Connect a PC to NPRU with a network cable in the **GE** port in the front panel.
2. Change the TCP/IP properties:
   e) Click **Network Connections**
   f) Click **Local Area Connection Properties**
   g) Click **TCP/IP Properties**
   h) Change parameters as indicated:
   IP address: 11.7.1.2 (the last number is changeable except for 11.7.1.1)
   Subnet mask: 255.0.0.0
   Default Gateway: 11.7.1.1
3. Change **Link Speed & Duplex** to 100Mbps Full Duplex in **Advanced** of **Network Connection Properties** (see Figure 3-4)
4. Check the status of the Local Area Connection and confirm the connection is connected.
5. Open a browser window and enter the default gateway in the navigation bar to access the WebOMT page by using 11.7.1.1 as the default gateway.

Note: Wired access port (GE port) is default set to be disable for the devices' security. The Access Switch must be pre-turned on in the NPRU OMT (Maintenance -> Engineering -> Phy Debug Access) before using the wired access to the NPRU.

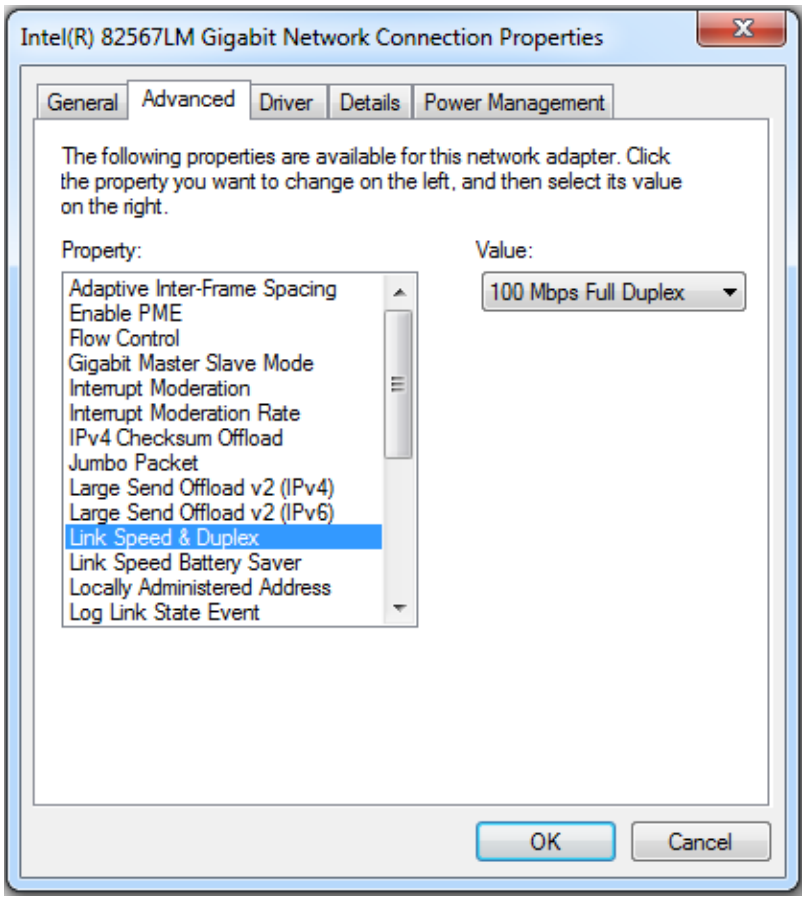

Figure 3-4 Link Speed & Duplex

3.2.4. Wireless Access (for AU and EU-E)

Figure 3-5 shows the equipment required for wireless access to the OMT.

WLAN Network Adapter (Fast 150UM)

PC with wireless connection functionality

Figure 3-5 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.
2. Confirm that the adapter is working by checking if the green indicator is flashing.
3. Change the TCP/IP properties (see Figure 3-6):
   a) Click **Network Connections**
   b) Click **Wireless Network Connection Properties**
   c) Click **TCP/IP Properties**
   d) Change parameters as indicated:
      a. Select **Obtain an IP address automatically**
      b. Select **Obtain DNS server address automatically**
4. Choose the correct wireless network in **Wireless Network Connection** list.
   The network name will be CrossFire-XX (device type)-XXX (Serial Number).
   The default network key is 12345678.
   See Figure 3-8 for details.
5. Check the wireless network status and obtain the default gateway. See Figure 3-9 for details.
6. Open a browser window and enter the assigned default gateway into the navigation bar. This will access the WebOMT page. Figure 3-10 shows an example using 12.7.1.1 as the default gateway.

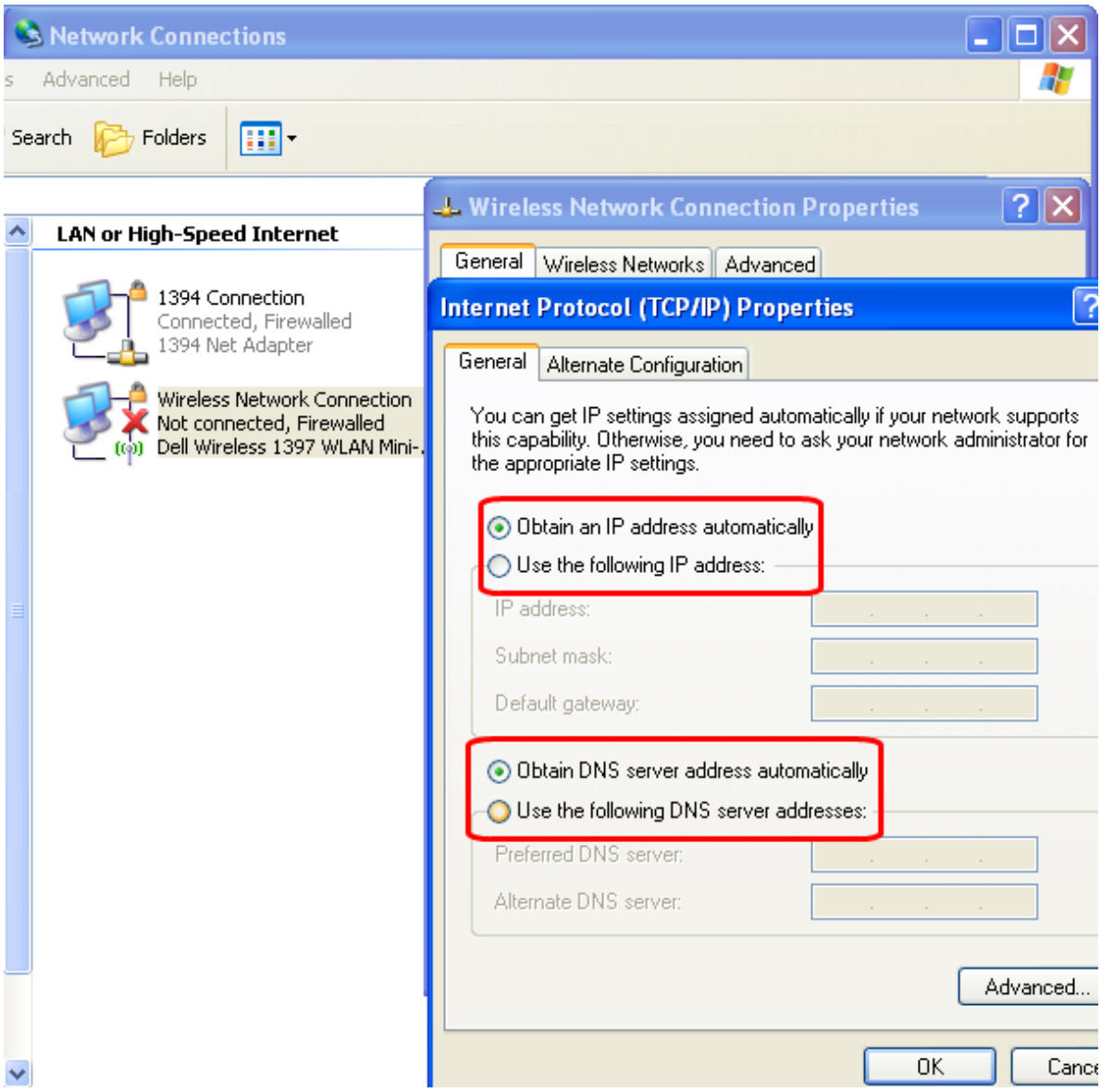

Figure 3-6 Wireless Network Connection Properties for OMT

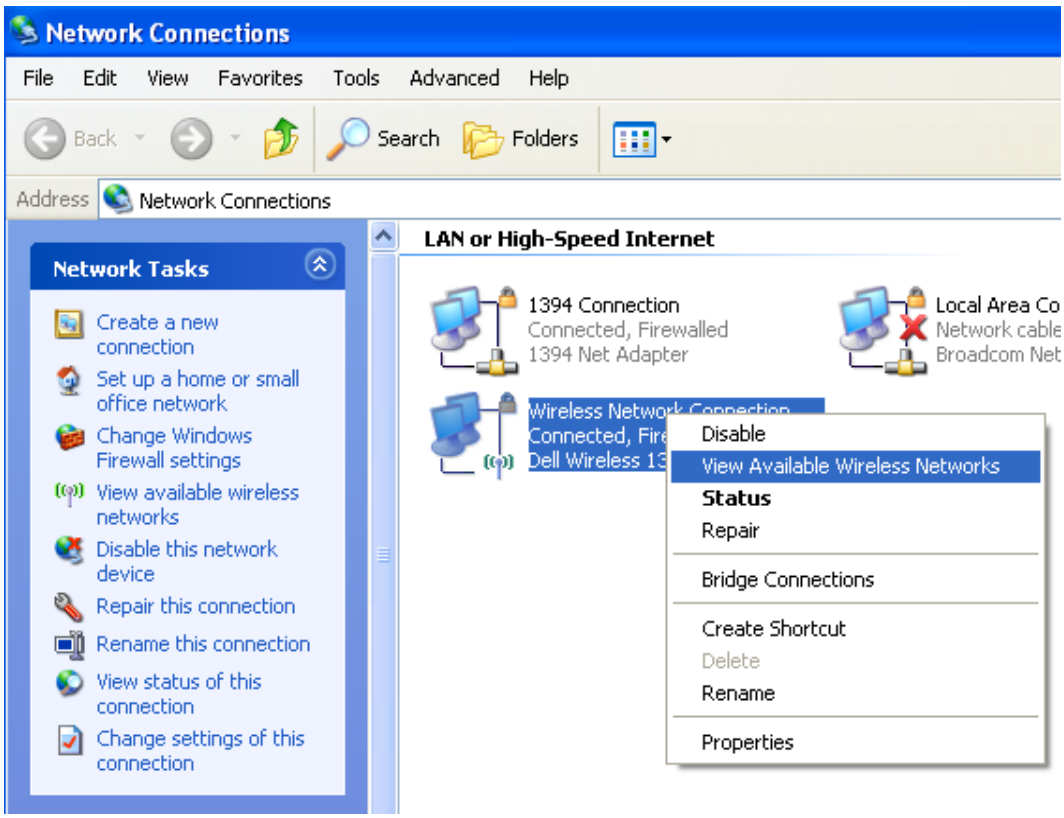

Figure 3-7 Viewing the Available Wireless Networks

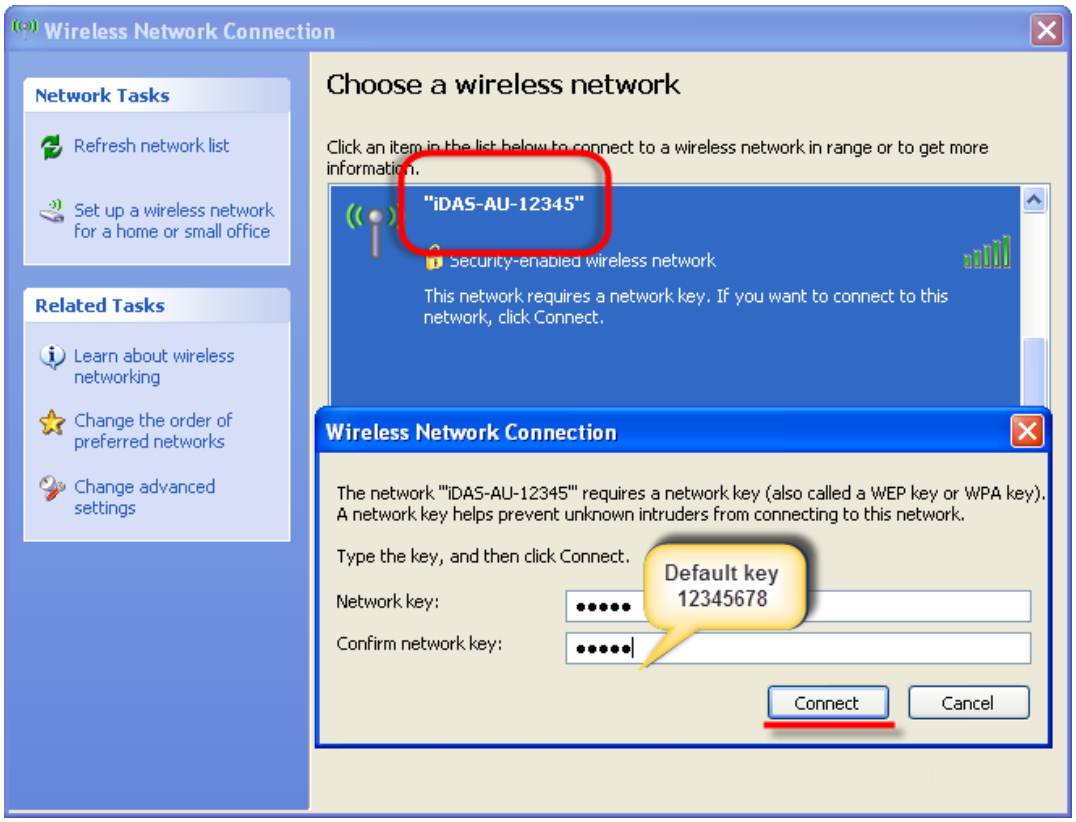

Figure 3-8 Choosing the Correct Wireless Network

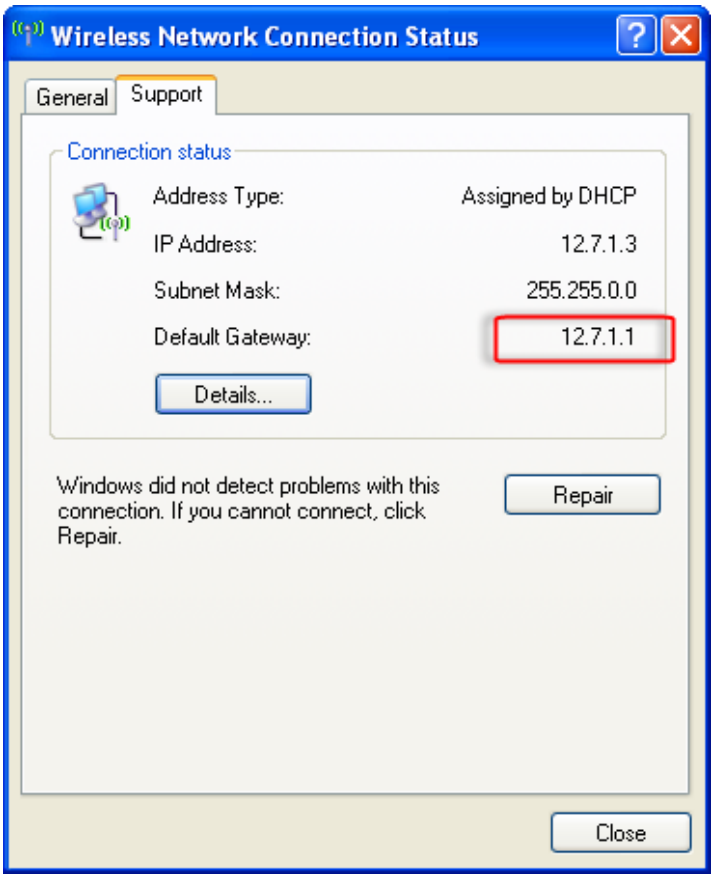

Figure 3-9 Checking the Wireless Network Status

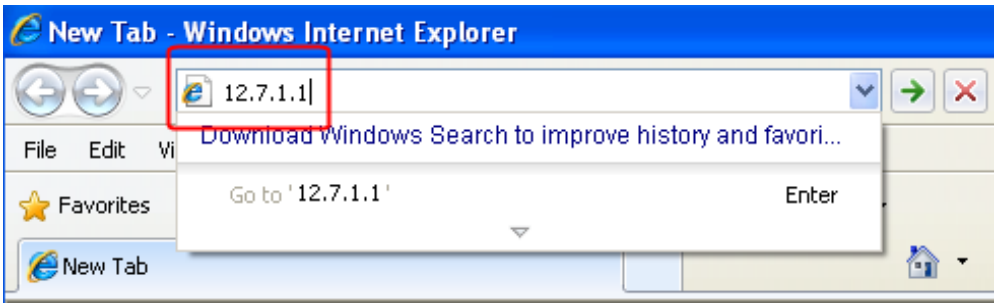

Figure 3-10 Connecting to WebOMT

3.3. OMT Display

3.3.1. Homepage and Basic Functions

The OMT homepage is shown as Figure 3-11.

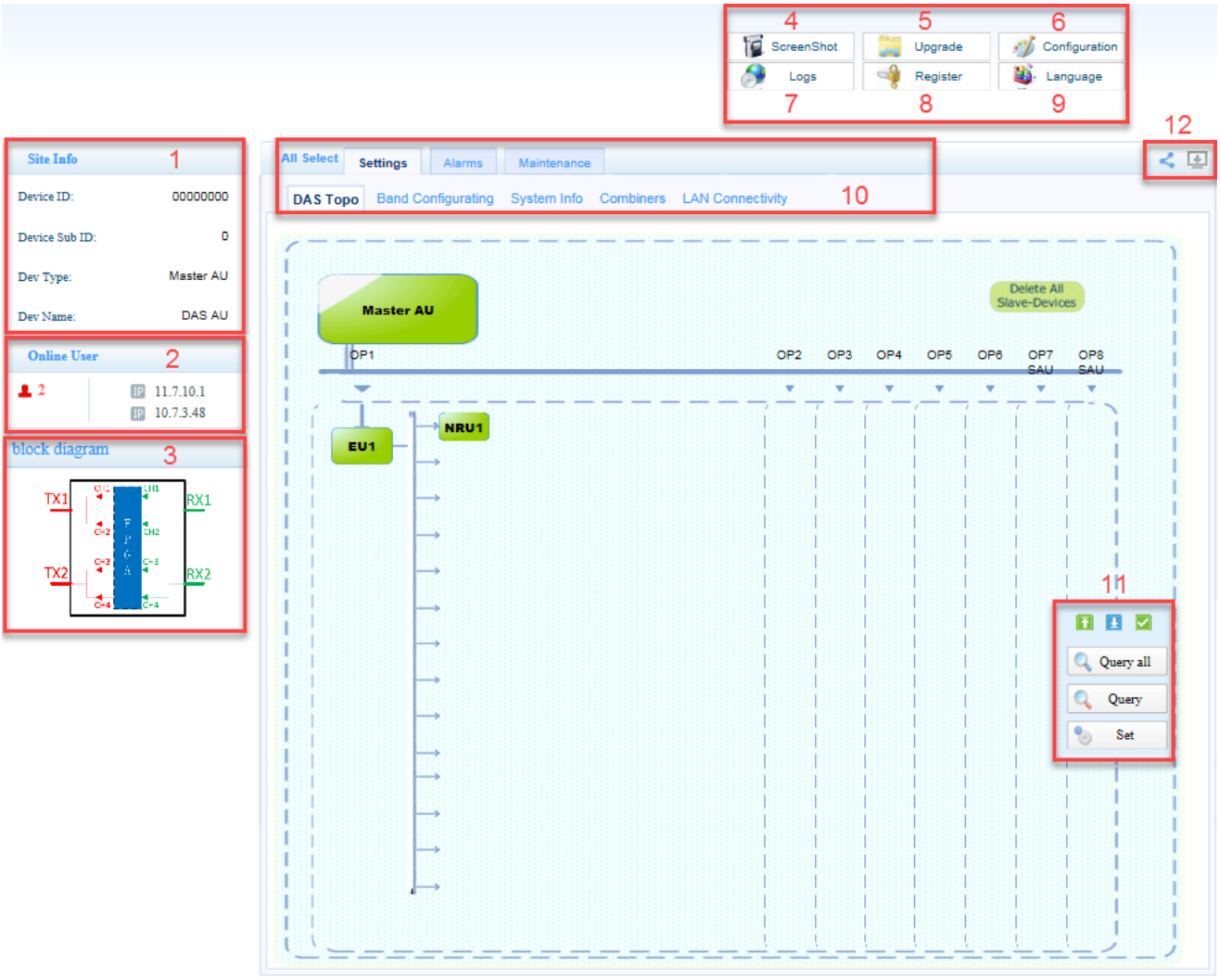

Figure 3-11 WebOMT Homepage

The OMT homepage includes buttons, tabs and fields (refer to corresponding numbers in Figure 3-11):

1. **Site Info**: Shows Device ID, Device Sub ID, Dev Type and Dev Name information.
2. **Online User**: Shows the number of users that are currently connected to the OMT and the IP address of each user's device.
3. **Block Diagram**: Shows the simple fundamental of NPRU.
4. **ScreenShot**: Used for saving the current parameter, information and device operating status. When Sunwave Solutions assistance is required to troubleshoot the system, it will be helpful to send the ScreenShot files to Sunwave technicians.

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

a) Select the page and frame that you want to save.

b) Click the checkbox of the parameter you want to save and then click **Query** or just click **Query all** to save all parameters in the frame.
c) Click **ScreenShot** button. See **#4** in Figure 3-11.
d) Close the prompt dialog box after the screen shot has been successfully captured as shown in Figure 3-12.
e) Click **Configuration** button. See **#6** in Figure 3-11.
f) Click **ScreenShotFile** to open it. See Figure 3-13 for details.
g) Click **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 3-14 for details.

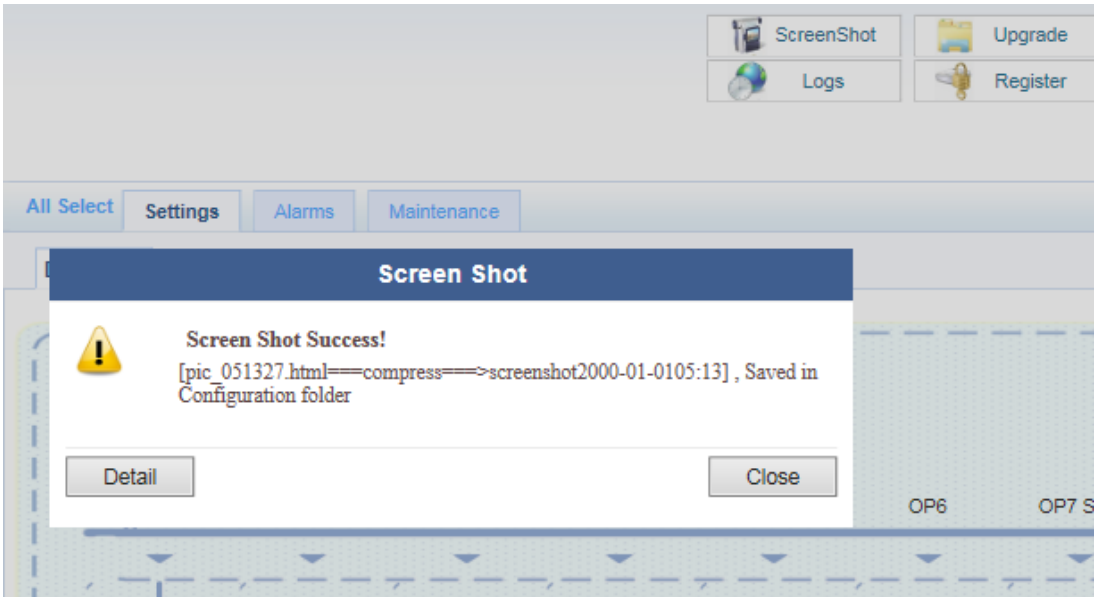

Figure 3-12 Screen Shot Capture Success Pop-up Window

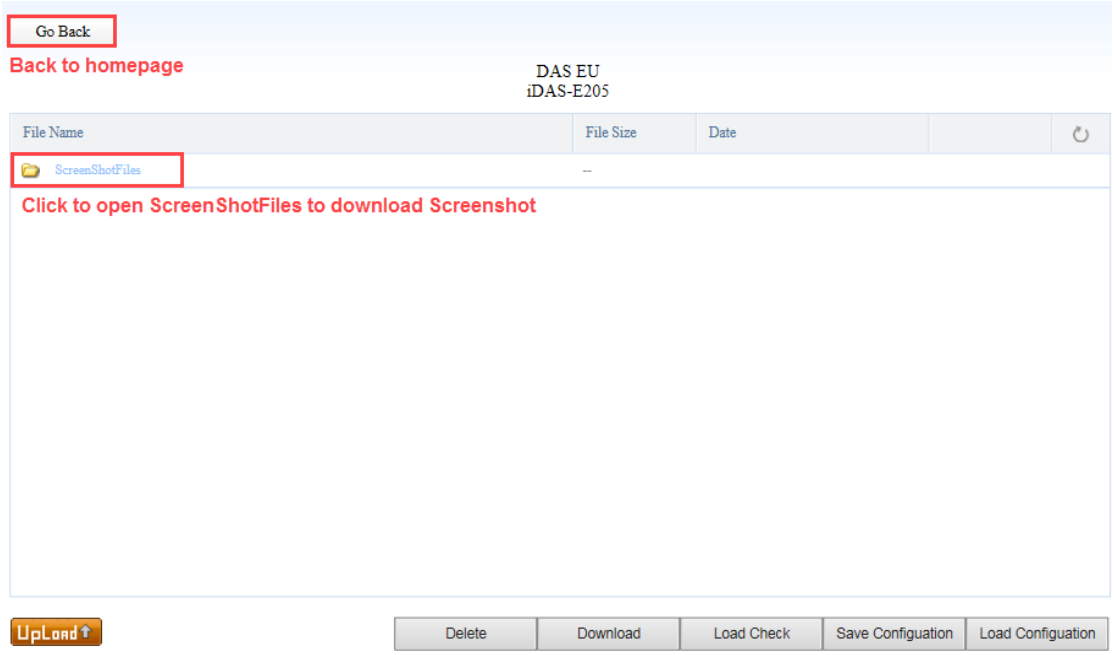

Figure 3-13 Configuration Page

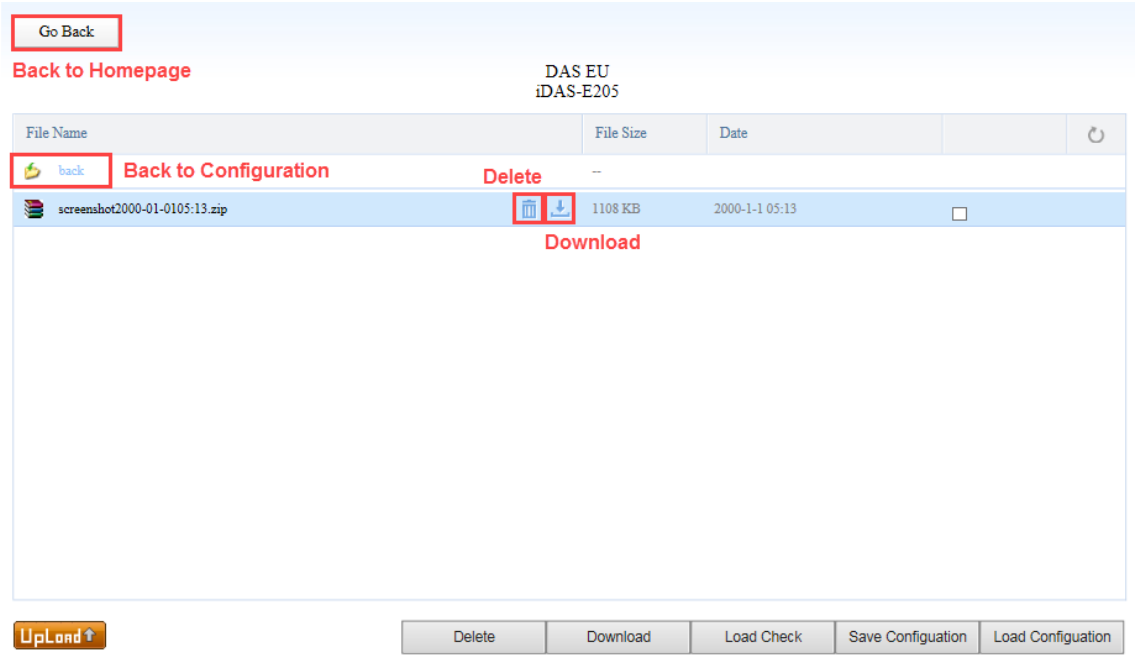

Figure 3-14 Screen Shot Download File

5. **Upgrading**: Used to upgrade the software. See *9* for details.
6. **Configuration**: Used to save and load factory or engineering configuration. See *Section 8.6* for details.
7. **Logs**: Records the operating status of the devices. The logs can be downloaded and deleted in Logs page.

   Note: Check the filename and created date of selected log before downloading.
8. **Register**: This function is not relevant for maintenance activities.
9. **Language:** Dropdown for language selection.
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 8.6* for details.
12. **Operation interface**: Queries status and sets parameters.

3.3.2. System Topology

System Topology is set as default homepage of WebOMT. The following steps is to display System Topology:

1. Select the main **Settings** tab.
2. Select the **DAS Topo** tab.
3. Click **Query all** in pop-up window to display Topology.

The system topology is shown as Figure 3-15. Master AU icon is at up left of frame. If there is any EU-E lined to Master AU in system, the icon of exist EU-E will display under optical port referred to connected port in physical Master AU. Click arrow on the right of EU-E icon to expand topology to see if there is any NPRU connected in system.

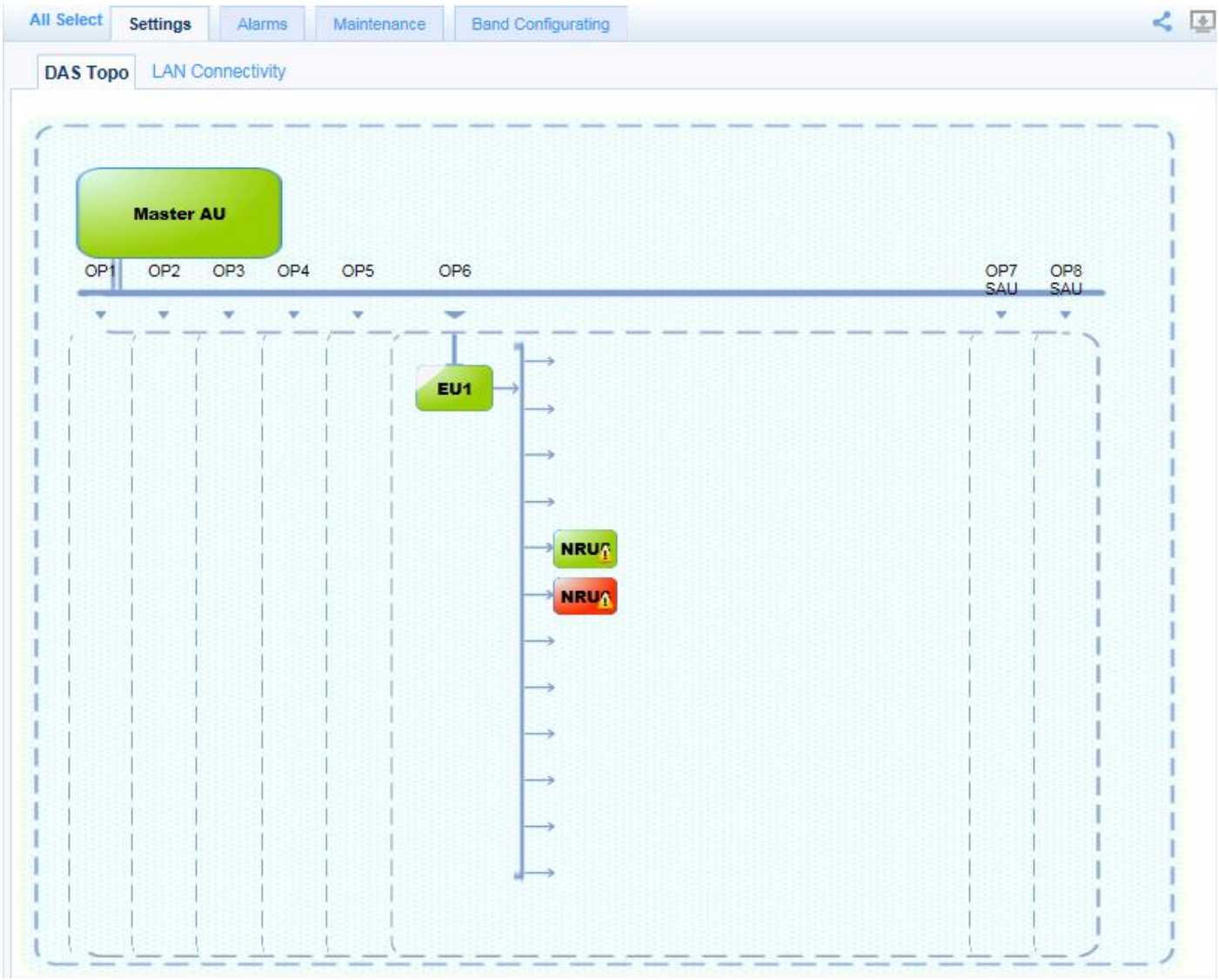

Figure 3-15 Displaying the System Topology

Device icons in the topology have two colors —green and red:

Green icon indicates this device is connected.

Red icon indicates this device was once connected but is currently disconnected.

When a red icon shows up, check whether this device exists or not. If the device does not exist, delete device on the topology page by right-clicking the device icon. And there is a **Delete All Slave-Devices** button at up right of topology for deleting all slave devices in topology.

Note: deleting one device or all slave devices should be under Factory Mode. Get into Factory Mode through **Maintenance -> Factory Command -> Factory Parameter**

 This symbol indicates the devices with alarms.

If PC is solo connected to slave devices, the topology in WebOMT will be blank.

4. AU Instructions

4.1. AU Physical Appearance

Figure 4-1 shows a photograph of the AU component of CrossFire.

Figure 4-1 Physical Appearance of the AU

4.2. AU Front Panel

Figure 4-2 shows a schematic of the front panel of the AU and Table 4-1 lists the interfaces and their functionality.

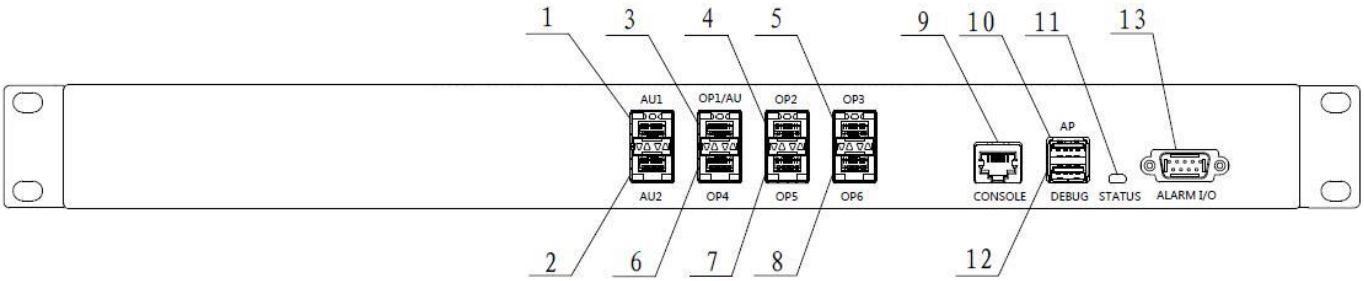

Figure 4-2 Front Panel of the AU

SN	Interface Name	Description
1	AU1	Connects to Slave AU1
2	AU2	Connects to Slave AU2

SN	Interface Name	Description
3	OP1/AU	For Master AU: connects to EU-E For Slave AU: connects to Master AU
4	OP2~6	Connects to EU-E
9	CONSOLE	Connects to OMC or local PC through CAT-5 for local and remote monitor
10	AP	Plug-in WLAN network adapters for monitoring device through Wi-Fi
11	STATUS	Indicates device operating status
12	DEBUG	Connects to local debugging PC through USB connection
13	ALARM I/O	Connects to external environment alarm interface for environment monitoring

Table 4-1 AU Front Panel Interfaces

4.3. AU Back Panel

Figure 4-3 shows a schematic of the back panel of the AU and Table 4-2 lists the interfaces and their functionality.

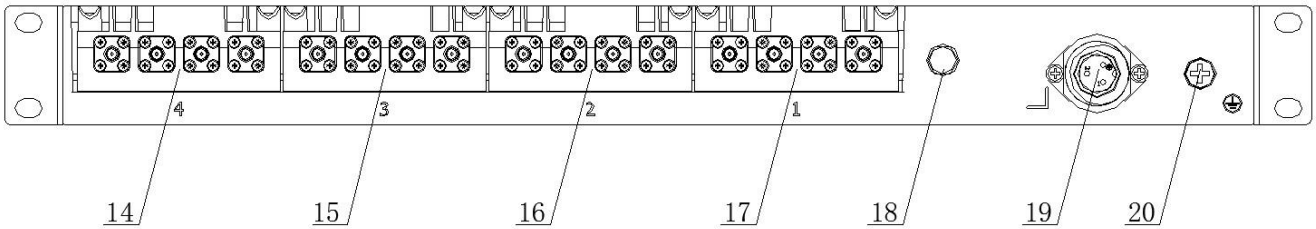

Figure 4-3 Back Panel of the AU

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

Table 4-2 AU-Back Panel Interfaces

4.4. AU Active Combiner

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

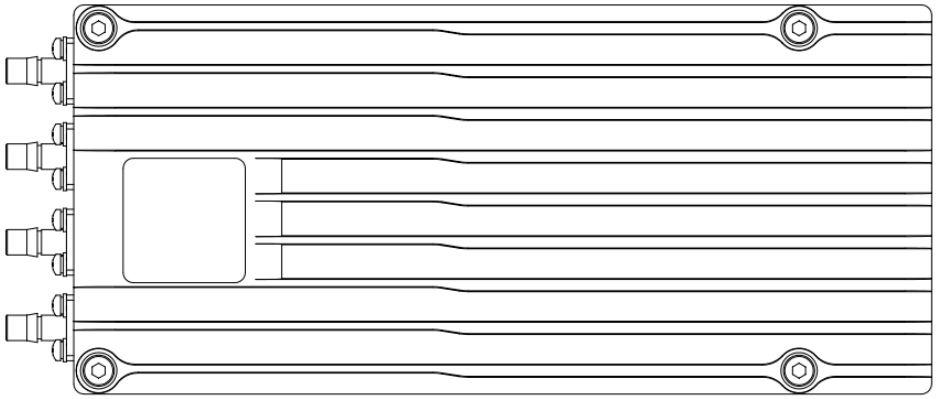

Figure 4-4 AU Active Combiner

4.5. Indicator Descriptions

Each pair of optical interface indicators shows the operating status of an optical module. See Figure 4-5.

Figure 4-5 Optical Indicators

Optical Indicator Behavior	Description
Turns green and stays lit	Normal
Turns red and stays lit	Optical path is not synchronized or optical module is not plugged in

Table 4-3 Optical Interface Indicators

In Figure 4-3, **#11** points to the **STATUS** indicator in the front panel of the AU. Table 4-4 lists the indicator's behaviors and their meaning.

STATUS	Description
Flashes green	Device runs normally without alarm
Turns green and stays lit	Software is crashed, but it can reboot automatically in 3mins
Flashes red	Device runs normally but alarm arise
Turns red and stays lit	Software is crashed, but it can reboot automatically in 3mins
Flashes Orange	Software is upgrading
Turns orange and stays lit	Device is starting

Table 4-4 STATUS Indicator

4.6. Master / Slave AU Selection

Each AU is factory-set as Master AU. The procedure below is 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 as Slave AU.

   Note: The selected AU cannot be connected to the CrossFire system prior to being set to Slave.
2. Log into the AU WebOMT. See *Section 3.2* for access to the OMT.
3. Select the **Engineering** tab in **Maintenance** as Figure 4-6.

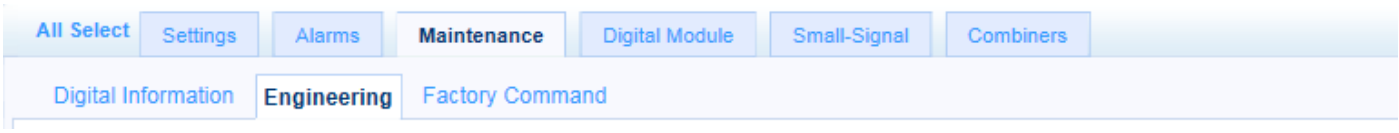

Figure 4-6 Engineering tab

4. In the **Advanced Command** area as Figure 4-7, click the drop-down menu of **Master-slave AU select** command and select **Slave AU** from the drop-down menu.

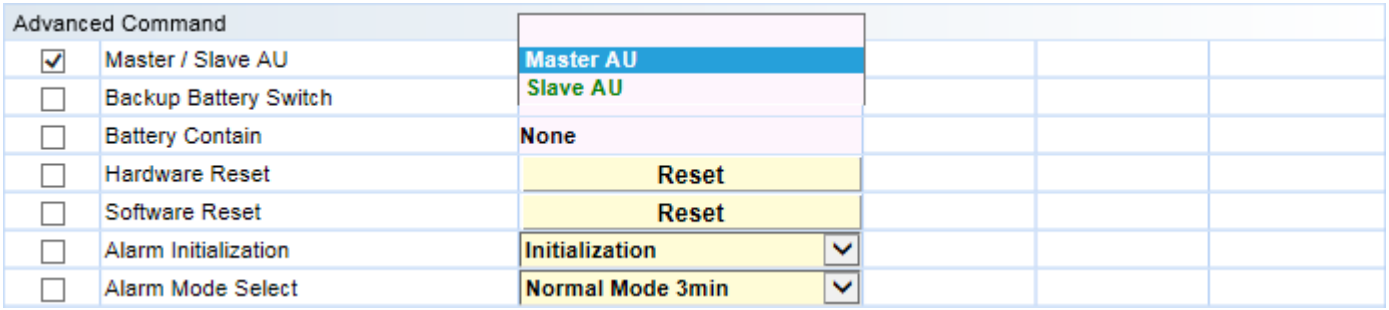

Figure 4-7 Advanced Command

5. Click **Set** in the pop-up window.

After setup is completed and Slave AU hardware reset, check the device type of the AU.

To query the device type:

1. Log into the Slave AU WebOMT. (See *Section 3.2* for the procedures to access the OMT.)
2. View the **Site Info** field as Figure 4-8.
3. The device type should be “Slave AU” if the setup was successful.

Figure 4-8 Site Info

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

4.7. OMT Parameters, Alarms and Commands for the AU

4.7.1. LAN Connectivity

Table 4-5, Table 4-6 and Table 4-7 show **General**, **IP Settings** and **FTP Settings**. Respectively, these parameters are displayed in **LAN Connectivity** in WebOMT.

Note: The input fields cannot contain the following special characters: %, &, ‘, “, \. Device ID cannot be set to FFFFFFFF in order to avoid the NPRU synchronized failure.

Parameter	Description	RD/RW
Vendor	Name to distinguish different manufacturers	RD
Product Model	/	RD
Serial Number	/	RD
Software Version	/	RD
FPGA Version	/	RD
Device ID	Number assigned by the system to distinguish subsets in the same site	RW
Device Sub ID	/	RW
Device Location	/	RW
Site ID	The unique identification number of the site in the system	RW

Table 4-5 General

Parameter	Description	RD/RW
Protocol	UDP or SNMP	RW
NMS IP Addr	IP address of Monitor Center	RW
NMS Port	Port Number of Monitor Center	RW
Trap IP Addr	Trap IP of SNMP Monitor	
Trap Port	Port Number of SNMP Center	RW
Device IP Addr	Default IP Address — 10.7.3.200	RW
Subnet Mask	Default Subnet Mask— 255.0.0.0	RW

Parameter	Description	RD/RW
Default Gateway	Default Gateway— 10.7.0.1	RW
Device Port (UDP)	Device port number for UDP	RW
Heartbeat Interval Time	Interval time of device sending packet to OMC, to confirm a free link	RW

Table 4-6 IP Settings

Parameter	Description	RD/RW
Server IP Addr (FTP)	IP Address of the connected FTP Server for software upgrade	RW
Server 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
Upgrade Filepath	File path (directory) for device to acquire software upgrade file from FTP Server	RW
Upgrade Filename	Filename of the awaiting software upgrade file	RW
Date and Time	/	RW
Site Report	/	RW

Table 4-7 FTP Settings

4.7.2. AU Alarms

Table 4-8 lists the possible alarms on the CrossFire system for the AU.

Parameter	Description	RD/RW
Power Interruption Alarm	Electrical supply failure	RD
Battery Failure Alarm	Standby battery failure	RD
Movement 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
LO1~4 Unlocked Alarm	Local oscillation unlocked	RD
Module1~4 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
External Alarm 1~4	External device failure (such as UPS failure)	RD
Module 1~4 Port1~4 DL Under Input-power Alarm	Module 1~4 Port1~4 input power under rated threshold	RD
Module 1~4 Port1~4 DL Over Input-power Alarm	Module 1~4 Port1~4 input power over rated threshold	RD

Table 4-8 CrossFire Alarms for the AU

Parameter	Description	RD/RW
Module 1~4 DL Under Input-power Threshold	Default value: -30dBm/ Range: -35~ +15dBm	RW
Module 1~4 DL Over Input-power Threshold	Default value: 10dBm/ Range: +10~ +30dBm	RW
Over-temperature Threshold	Default value:85℃/ Range: -55~ +125℃	RW

Table 4-9 Alarm Thresholds

4.7.3. AU System Info

Parameter	Description	RD/RW
RF Signal Switch	/	RW
UL Attenuation	Range: 0-20dB	RW
DL Attenuation	Range: 0-20dB	RW
Filter Bandwidth	/	RD
UL Center Frequency	/	RD
DL Center Frequency	/	RD

Table 4-10 Module 1~4

Parameter	Description	RD/RW
Device Temperature	/	RD
Device Routing Addr	Device routing address	RD

Table 4-11 General

Parameter	Description	RD/RW
UL-DL Configuration	/	RW
Special Subframe Configuration	/	RW
CP Type	/	RW
Sync Indicator	Indicator for TDD Sync	RD

Table 4-12 TDD Manual Mode

4.7.4. AU Band Configuration

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
Digital Signal Bandwidth	/	RW
Signal UL Centre Freq	/	RW
Signal DL Centre Freq	/	RW

Table 4-13 Module 1~4 and Virtual Module

Note: UL Freq_low/high and DL Freq_low/high value should be conform to the corresponding duplexer. The values for signal bandwidth and UL/DL center frequency should be conform to the operators' signal.

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

Table 4-14 General

Note: See *Section 8.2* for details about Band Properties Configuration.

Parameter	Description	RD/RW
Delay Adjustment Type	Automatic or Manual	RW
Max Delay Measured Value	/	RD
Max Delay Adjust Value	/	RD
Manual Delay Activation	/	RW

Table 4-15 System Delay

4.7.5. AU Combiner

Parameter	Description	RD/RW
Combiner Att Control Mode	Automatic or Manual	RW
Adjust Interval	Test(60 Sec), 6 Hour, 12 Hour or 24 Hour	RW

Table 4-16 General

Parameter	Description	RD/RW
UL Freq Low/High	Module UL Frequency information	RD
DL Freq Low/High	Module DL Frequency information	RD
Port 1~4 Input Power Value	Input power query	RD
Port 1~4 Attenuation Value	Input field for attenuation	RW
Port 1~4 Power Offset Value	Input field for power offset	RW
Port 1~4 Operator	Input field for Operator information	RW

Table 4-17 AU Module 1~4

4.7.6. AU Digital Information in Maintenance

Parameter	Description	RD/RW
Module 1~4 DL Baseband Input-power	Power of DL detected in digital domain	RD

Table 4-18 Downlink Power

Parameter	Description	RD/RW
Module 1~4 UL Baseband Output-power	Power of UL detected in digital domain	RD

Table 4-19 Uplink Power

Parameter	Description	RD/RW
Optical Port1~6/Slave AU1~2 Port Optical Module	Optical Module Number	RD
DDM Function Availability	/	RD
Tx Power	/	RD
Rx Power	/	RD
Voltage	/	RD
Bias Current	/	RD
Temperature	/	RD
Tx Optical Wavelength	/	RD

Table 4-20 Optical Module Information

4.7.7. AU Engineering in Maintenance

Parameter	Description	RD/RW
Data Update Time	Last update time	RD
ARM CRC Check	To check ARM software version	RD
FPGA CRC Check	To check FPGA software version	RD
Current AU Software Filename	To check AU software version	RD
AU CRC Check	To check AU software version	RD
Current EU Software Filename	To check EU software version	RD
EU CRC Check	To check EU software version	RD
Current NRU Software Filename	To check NRU software version	RD
NRU ARM CRC Check	To check NRU ARM software version	RD
NRU FPGA CRC Check	To check NRU FPGA software version	RD
NRU PHY CRC Check	To check NRU PHY CRC version	RD

Table 4-21 Engineering Info

Parameter	Description	RD/RW
Maximum Delay	Maximum delay from AU to the last NPRU	RD

Table 4-22 Digital Panel Information

Parameter	Description	RD/RW
OP1~6 CPRI Sync Alarm	CPRI SYNC alarm for Port " OP1~OP6"	RD
OP-AU1~2 CPRI Sync Alarm	CPRI SYNC alarm for Port " AU1/2"	RD
OP1~6LOS Alarm	Loss of optical signal alarm for Port "OP1~OP6"	RD
OP-AU1~2 LOS Alarm	Loss of optical signal alarm for Port "AU1/2"	RD

Table 4-23 OP Info

Command	Description	RD/RW
Master / Slave AU Select	Master AU / Slave AU select	RW
Backup Battery Switch	Enable/Disable backup battery mode	RW
Battery Contain	/	RW
Hardware Reset	***Note:*** Signal is interrupted during hardware reset	RW
Software Reset	***Note:*** Signal is normal during software reset	RW
Alarm Initialization	Initialization: Clear alarms and disable all alarms; Report Site launch: Report to OMC when new site launches;	RW
Alarm Mode Select	Normal mode: 3 minutes Test mode: 1 minute	RW

Table 4-24 Advanced Commands

Parameter	Description	RD/RW
Up-Downlink Switch	Switch for TDD test	RW

Table 4-25 Test Mode

Parameter	Description	RD/RW
Up-Downlink Switch	Switch for TDD test	RW
Isolation ANT Switch	Tx1 or Tx2	RW
Detecting Frequency	/	RW
Isolation Detector Switch	Turn on/off Isolation Detector	RW

Table 4-26 Test Mode

4.7.8. AU Factory Command

Parameter	Description	RD/RW
Factory Mode	Access to Factory Mode with authority	RW
Factory Mode Password	Reserve	RW

Table 4-27 AU Factory Parameters

5. EU-E Instructions

5.1. EU-E Physical Appearance

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

Figure 5-1 Physical Appearance of the EU-E

5.2. EU-E Front Panel

Figure 5-2 shows a schematic of the front panel of the EU-E and Table 5-1 lists the interfaces and their functionality.

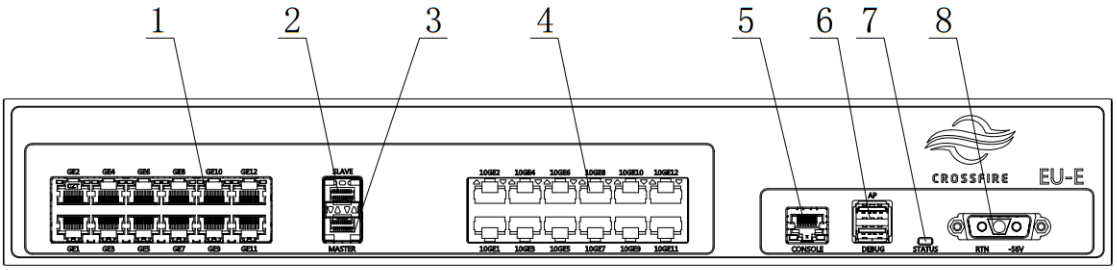

Figure 5-2 Front Panel of the EU-E

SN	Interface Name	Description
1	GE1~12	Wi-Fi signals or S1 signals input
2	SLAVE	Connection to Master AU/EU-E at the next higher level
3	MASTER	Connection to next lower level EU-E
4	10GE1~12	Connection to NPRU through CAT-6A STP
5	CONSOLE	Connection to a PC through CAT-5 for local and remote monitor
6	AP	Connection to WLAN Network Adapter for wireless access to OMT
7	STATUS	Indicates device operating status
8	PWR	Electrical Power Line Interface

Table 5-1 EU-E Front Panel Interfaces

5.3. Indicator Description

In Figure 5-2, **#7** points to the **STATUS** indicator in the front panel of the AU. Table 5-2 lists the indicator's behaviors and their meaning.

STATUS	Description
Flashes green	Device runs normally without alarm
Turns green and stays lit	Software has crashed, but it can reboot automatically in 3mins
Flashes red	Device runs normally but alarm arise
Turns red and stays lit	Software has crashed, but it can reboot automatically in 3mins
Flashes Orange	Software is upgrading
Turns orange and stays lit	Device is starting

Table 5-2 STATUS Indicator

5.4. OMT Parameters, Alarms and Commands for the EU-E

See *Section 3.3*, OMT Display, for information on how to use the WebOMT interface to view and change parameters and run commands.

Note: The input fields cannot contain the following special characters: **%**, **&**, **'**, **"**, ****

5.4.1. EU-E LAN Connectivity

Parameter	Description	RD/RW
Vendor	Name to distinguish from different manufacturers	RD
Product Model	/	RD
Serial Number	/	RD
Software Version	/	RD
FPGA Version	/	RD
Device ID	Number to distinguish the subsets in the same site	RW
Device Sub ID	/	RW
Device Location	/	RW
Site ID	The unique identification number of site in the system assigned by Master AU	RW
Device Temperature	/	RD

Parameter	Description	RD/RW
Device Routing Address	/	RD
License ID	/	RD
System Band Capacity	/	RD
Date and Time	/	RW
Site Report	/	RW

Table 5-3 EU-E General

5.4.2. EU-E Alarms

Parameter	Description	RD/RW
Power Interruption Alarm	Electric supply failure	RW
Movement Alarm	Alarm when device leave the original installation location	RW
Over-temperature Alarm	Alarm when device temperature over rated temperature threshold	RW
Capacity Overflow Alarm	Alarm when the used capacity is over the authorized capacity	RW
10GE1~12 Transceiver Failure Alarm	10GE transceiver unplugged or failure (Port OP1~OP6)	RW
10GE1~12 Transceiver Speed Alarm	Tx speed does not fit Transceiver Speed Threshold	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-E cannot connect to the system	RW

Table 5-4 CrossFire Alarms for the EU-E

Parameter	Description	RD/RW
Over-temperature Threshold	Default value:85℃/ Range: -55~ +125℃	RW
10GE1~12 Transceiver Speed	Threshold option for 5G/10G speed	RW

Table 5-5 Alarm Thresholds

5.4.3. EU-E Digital Information in Maintenance

Parameter	Description	RD/RW
Master/Slave Port Optical Module	/	RD
DDM Function Availability	/	RD
Tx Power	/	RD
Rx Power	/	RD
Voltage	/	RD
Bias Current	/	RD
Temperature	/	RD
TX Optical Wavelength	/	RD

Table 5-6 Optical Module Information

Parameter	Description	RD/RW
10GE1~12 Information	/	RD
Firmware Version	/	RD
Link Mode	/	RD
Auto Negotiation	/	RD
Speed	/	RD
Duplex	/	RD
CHA SNR/mini SNR operating margin	/	RD
CHB SNR/mini SNR operating margin	/	RD
CHC SNR/mini SNR operating margin	/	RD
CHD SNR/mini SNR operating margin	/	RD
BER counter	/	RD

Table 5-7 10G-PHY

5.4.4. EU-E Engineering Information in Maintenance

Parameter	Description	RD/RW
Data Update Time	Last update time	RD
ARM CRC Check	To check ARM software version	RD
FPGA CRC Check	To check FPGA software version	RD
EU CRC Check	To check EU software version	RD

Table 5-8 Engineering Info

Parameter	Description	RD/RW
10GE1~12 CPRI Sync Alarm	CPRI SYNC Alarm of Port 10GE1~12	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
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 5-9 OP Info

Command	Description	RD/RW
Hardware Reset	***Note:*** Signal interruption during hardware reset	RW
Software Reset	***Note:*** Signal is normal during software reset	RW
Alarm Initialization	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

Table 5-10 Advanced Commands

5.4.5. EU-E Factory Command

Parameter	Description	RD/RW
Factory Mode	Access to Factory Mode with authority	RW
Factory Mode Password	Reserve	RW

Table 5-11 Factory Parameters

5.4.6. EU-E Band Configuration

Parameter	Description	RD/RW
AU_Module 1~4 Info (UL/DL)	AU Module 1~4 UL/DL band frequency	RD
AU_virtual_Module Info (UL/DL)	AU virtual Module UL/DL band frequency	RD
SAU1_Module 1~4 Info (UL/DL)	SAU1 Module 1~4 UL/DL band frequency	RD
SAU1_virtual_Module Info (UL/DL)	SAU1 virtual Module UL/DL band frequency	RD
SAU2_Module 1~4 Info (UL/DL)	SAU2 Module 1~4 UL/DL band frequency	RD
SAU2_virtual_Module Info (UL/DL)	SAU2 virtual Module UL/DL band frequency	RD

Table 5-12 AU Frequency Information (UL/DL)

Parameter	Description	RD/RW
AU_Module 1~4 Info (UL/DL/Bandwidth)	AU Module 1~4 UL/DL/Bandwidth band configuration	RD
AU_virtual_Module Info (UL/DL/Bandwidth)	AU virtual Module UL/DL/Bandwidth band configuration	RD
SAU1_Module 1~4 Info (UL/DL/Bandwidth)	SAU1 Module 1~4 UL/DL/Bandwidth band configuration	RD
SAU1_virtual_ModuleInfo (UL/DL/Bandwidth)	SAU1 virtual Module UL/DL/Bandwidth band configuration	RD
SAU2_Module 1~4 Info (UL/DL/Bandwidth)	SAU2 Module 1~4 UL/DL/Bandwidth band configuration	RD
SAU2_virtual_Module Info (UL/DL/Bandwidth)	SAU2 virtual Module UL/DL/Bandwidth band configuration	RD

Table 5-13 AU Carrier Configuration Information

Parameter	Description	RD/RW
10GE1~12	NPRU module mapping information	RD
Authorized Capacity	Authorized bandwidth capacity	RD
Used Capacity	Used bandwidth capacity	RD

Table 5-14 NPRU RF Module Mapping Information

Parameter	Description	RD/RW
GE Port	GE Port Selection	RW
10GE Max Speed	10GE port Max Speed selection: 10G or 5G	RW
RU CH1~4	NPRU mapping configuration for each module	RW
Update	Update after channel parameter configuration. Configuration modification will be effective after update.	RW

Table 5-15 RF Module Mapping Configuration

6. NPRU Instructions

6.1. NPRU Physical Appearance

Figure 6-1 shows a photograph of the NPRU component of CrossFire.

Figure 6-1 Physical Appearance of the NPRU

6.2. NPRU Top Panel

Figure 6-2 shows a schematic of the front panel of the NPRU and Table 6-1 lists the interfaces and their functionality.

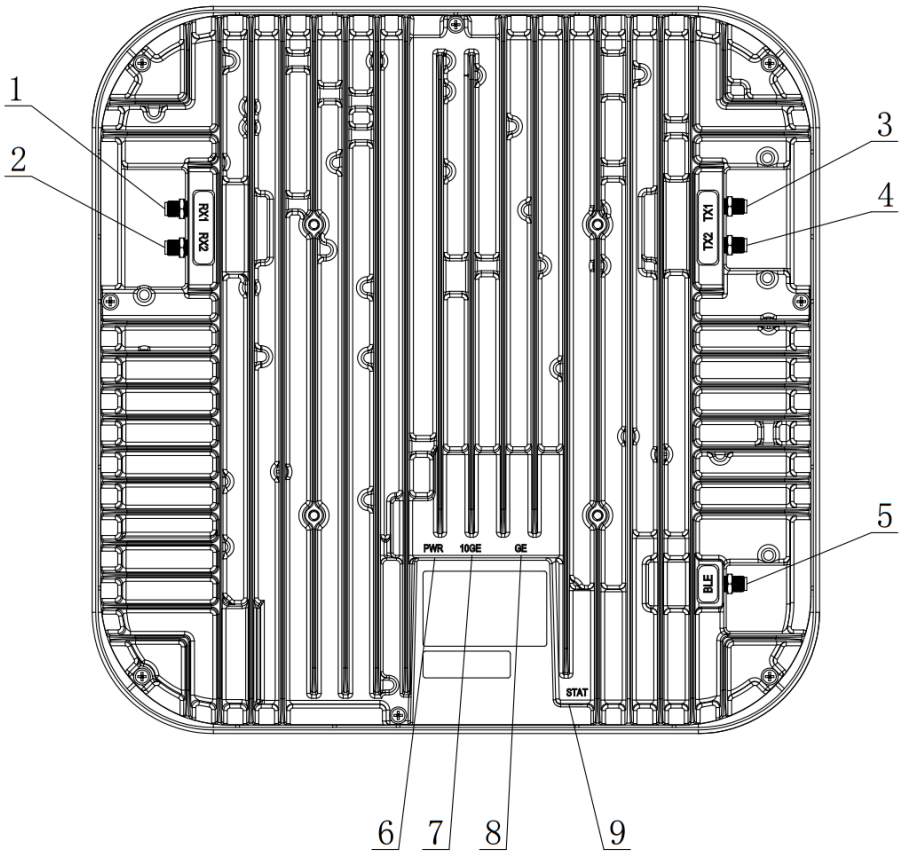

Figure 6-2 Top Panel of the NPRU

SN	Interface Name	Description
1	RX1	Port for Module 1 and 2 to receive radio frequency signal
2	RX2	Port for Module 3 and 4 to receive radio frequency signal
3	TX1	Port for Module 1 and 2 to transmit radio frequency signal
4	TX2	Port for Module 3 and 4 to transmit radio frequency signal
5	BLE	Connection to an antenna for Bluetooth
6	PWR	Electrical Power Line Interface
7	10GE	Connection to EU-E
8	GE	Connection to a PC through CAT-5 for local and remote monitor
9	STATUS	Indicates device operating status

Table 6-1 NPRU Top Panel Interfaces

6.3. Indicator Description

In Figure 6-2, **#9** points to the **STATUS** indicator in the front panel of the AU. Table 6-2 lists the indicator's

behaviors and their meaning.

STATUS	Description
Flashes green	Device runs normally without alarm
Turns green and stays lit	Software has crashed, but it can reboot automatically in 3mins
Flashes red	Device runs normally but alarm arise
Turns red and stays lit	Software has crashed, but it can reboot automatically in 3mins
Flashes Orange slowly	Software is upgrading
Turns orange and stays lit	Device is in progress of synchrony to AU
Flashes orange quickly three times and then turns green and stays lit	Device is starting
Flashes quickly	Device Pop-Flash is on for catchup device

Table 6-2 STATUS Indicator

6.4. OMT Parameters, Alarms and Commands for the NPRU

See *Section 3.3*, OMT Display, for information on how to use the WebOMT interface to view and change parameters and run commands.

6.4.1. NPRU LAN Connectivity

Parameter	Description	RD/RW
Vendor	Name to distinguish from different manufacturers	RD
Product Model	/	RD
Serial Number	/	RD
Software Version	/	RD
FPGA Version	/	RD
Device ID	Number to distinguish the subsets in the same site	RD
Device Sub ID	/	RW
Device Location	/	RW
Site ID	The unique identification number of the site in the system	RW
Date and Time	/	RW
Site Report	/	RW

Table 6-3 General

Note: The input fields cannot contain the following special characters: %, &, ‘, “, \

6.4.2. NPRU Alarms

Parameter	Description	RD/RW
Movement Alarm	Alarm when device leave the original installation location	RW
Over-temperature Alarm	Alarm when device temperature over rated temperature threshold	RW
LO1~4 unlocked Alarm	Local Oscillation unlocked	RW
Module1~4 ALC Alarm	Alarm when ALC is working	RW
ANT 1~2 DL Under Output-power Alarm	ANT 1~2 output-power under rated threshold	RW
ANT 1~2 DL Over Output-power Alarm	ANT 1~2 output-power over rated threshold	RW
Link Alarm	Alarm when local NPRU cannot connect to the system	RW

Table 6-4 CrossFire Alarms for the NPRU

Parameter	Description	RD/RW
ANT 1~2 DL Under Output-power Threshold	Alarm when device leave the original installation location	RW
ANT 1~2 DL Over Output-power Threshold	Local Oscillation unlocked	RW
Over-temperature Threshold	Default value:85℃/ Range: -55~ +125℃	RW

Table 6-5 Alarm Thresholds

6.4.3. NPRU System Information

Parameter	Description	RD/RW
Filter Bandwidth	/	RD
UL Carrier Centre Frequency	/	RD
DL Carrier Centre Frequency	/	RD
UL Input-power	/	RD
Module State	/	RD

Table 6-6 Module 1~4

Parameter	Description	RD/RW
ANT1~2	/	RD

Table 6-7 DL Output-power

Parameter	Description	RD/RW
Device Temperature	/	RD
Device Routing Address	/	RD

Table 6-8 General

6.4.4. NPRU Band Configuration

Parameter	Description	RD/RW
RF Signal Switch	/	RW
UL Gain Attenuation	/	RW
DL Gain Attenuation	/	RW

Table 6-9 Module 1~4

6.4.5. NPRU Actual Gain

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

Table 6-10 Module 1~4 Actual Gain

6.4.6. NPRU Digital Info in Maintenance

Parameter	Description	RD/RW
Module1~4 UL Baseband input-power	Power of UL detected in digital domain	RD

Table 6-11 Uplink Power

Parameter	Description	RD/RW
Module1~4 DL Baseband Output-power	Power of DL detected in digital domain	RD

Table 6-12 Downlink Power

Parameter	Description	RD/RW
Firmware Version	/	RD
Link Mode	/	RD
Auto negotiation	/	RD
Speed	/	RD
Duplex	/	RD
CHA SNR/mini SNR operating margin	/	RD
CHB SNR/mini SNR operating margin	/	RD
CHC SNR/mini SNR operating margin	/	RD
CHD SNR/mini SNR operating margin	/	RD
BER counter	/	RD

Table 6-13 10G-PHY Information

6.4.7. NPRU Engineering Information in Maintenance

Parameter	Description	RD/RW
Data Update Time	Last update time	RD
ARM CRC Check	To check ARM software version	RD
FPGA CRC Check	To check FPGA software version	RD
PHY CRC Check	To check PHY software version	RD

Table 6-14 Engineering Info

Parameter	Description	RD/RW
UUID		RW
Major		RW
Minor		RW

Table 6-15 Beacon Info

Parameter	Description	RD/RW
Module 1~4 UL ALC Working Alarm	/	RD
ANT 1~2 UL Hard ALC Working Alarm	/	RD

Table 6-15 ALC Indicator

Parameter	Description	RD/RW
Blink Switch		RW

Table 6-15 Device Led Blink

Parameter	Description	RD/RW
Access Switch	/	RW

Table 6-15 Phy Debug Access

Parameter	Description	RD/RW
Isolation ANT Switch	/	
Detecting Frequency	/	RW
Isolation Detector Switch	Turn On/Off Isolation Detector	RW
Rx1~2 Isolation Between Tx and Rx	/	RD

Table 6-16 Isolation Detector

Command	Description	RD/RW
Hardware Reset	***Note:*** Signal interruption during hardware reset	RW
Software Reset	***Note:*** Signal is normal during software reset	RW
Alarm Initialization	Initialization: Clear alarms and disable all alarms; Report Site launch: Report to OMC when new site launches;	RW

Table 6-17 Advanced Commands

6.4.8. NPRU Factory Command

Parameter	Description	RD/RW
Factory Mode	Access to Factory Mode with authority	RW
Factory Mode Password	Reserve	RW

Table 6-18 Factory Parameters

7. System Networking

7.1. Device Connections

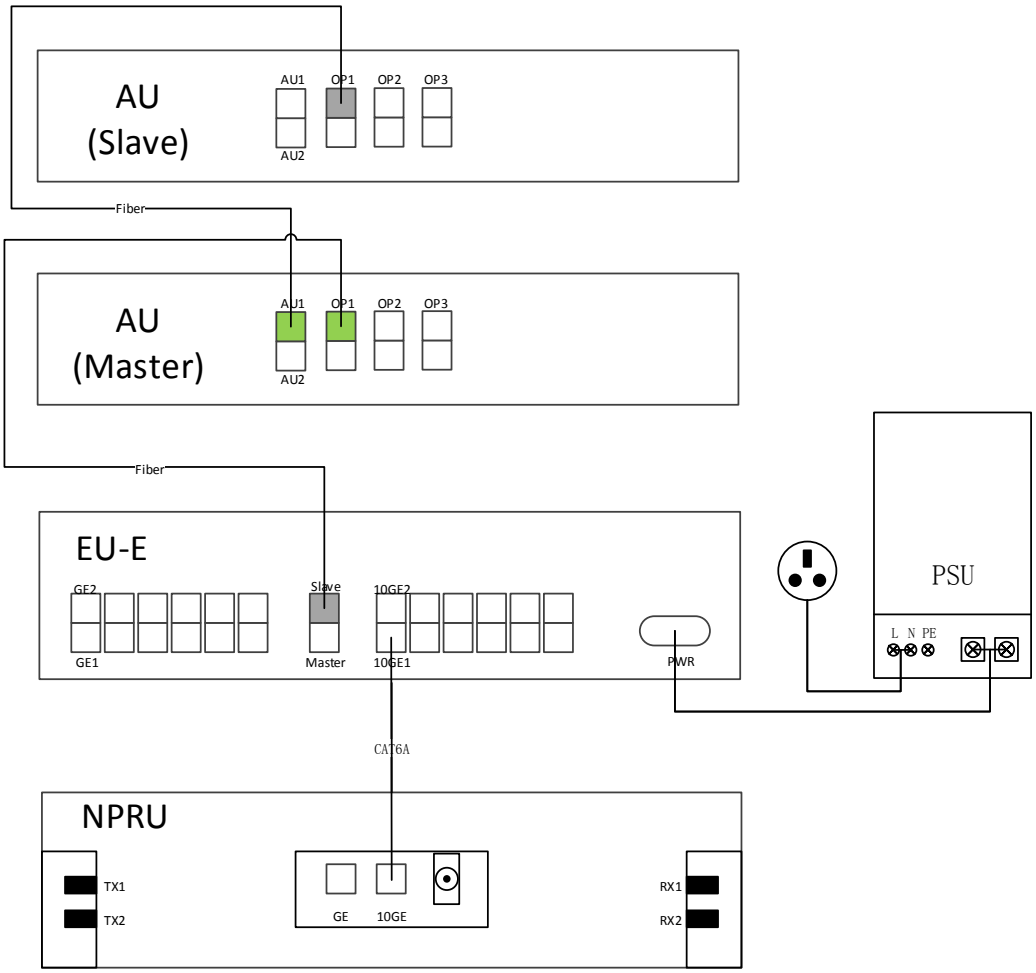

Figure 7-1 System Connection Schematic

7.1.1. Optical Interface Connection

·Single Optical Fiber-module

The optical connector unit includes an optical module and optical fibre. Figure 7-2 shows that when using a pair of single optical fibre-modules, the wavelength of the two modules is different, for example 1271nm & 1331nm are two wavelength of a pair of Bidirectional Optical Fiber Module. See Table 7-1 for the optical fibre module corresponding to each port. Every time connecting two devices, check optical transceiver indicators of both devices. The green indicators mean two devices are synchronized. When the optical module is unplugged or not synchronized, the indicators are red as shown in the left pair of indicators in Figure 7-3.

Device Unit	Port	Wavelength of Module
Master AU	All Ports	1271nm
Slave AU	OP1 (only this port is used)	1331nm
EU-E	Slave	1331nm
	Master	1271nm

Table 7-1 Optical Module Selection for Single Optical Fibre-module

Figure 7-2 Single Optical Fiber Module

Each pair (2) of optical module cages has four LED indicator arrows. Two arrows on the left are green and two on the right are red as shown in Figure 7-3. 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 7-3. When the optical module is unplugged or not synchronized, the indicators are red as shown in the left pair of indicators in Figure 7-3. Check whether both indicators turn green after connecting one pair of optical modules. If they are red, the terminal has not synchronized.

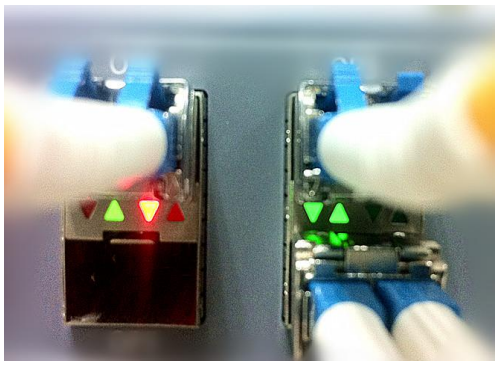

Figure 7-3 Optical SYNC Status

7.1.2. AU Connections

Prior to attempting the AU connections, read *Section 4* 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 EU-Es. Insert the optical module into any one of the OP1~OP6 ports, then insert the tail of the optical fiber into the optical module and connect the other end to the lower level EU-E. After the AU and EU-E 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 stays red, check whether the connection direction of the optical fiber is correct and the optical module is inserted tightly.

The AU1 and AU2 optical ports are for connecting to the slave AU. Before connecting a Slave AU to Master AU, access to Slave AU independently (see *Section 3.2* for instructions how to access the WebOMT of Slave AU). Ensure the Device Type of this AU is Slave AU and then plug optical fiber module.

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.

7.1.3. EU-E Connections

Prior to attempting the EU-E connections, read *Section 5* thoroughly.

The EU-E has 2 optical ports, 12 GE ports and 12 10GE ports. The optical SLAVE port should be connected to Master AU or an upper level EU-E and the optical MASTER port should be connected in a cascading manner to a lower level EU-E in a daisy chain. (Refer to the networking definition of a daisy chain.) The 10GE1~12 ports have the same functionality and are all used for connections to NPRUs. After an EU-E is connected to a upper level device and powered on, the device are synchronized when the optical indicator LED turns green.

Each EU-E has 12 GE ports, GE1~GE12, which support 12 LAN signals. Each GE port corresponds to a specific 10GE port, for example, port GE1 corresponds to port 10GE1 and port GE12 corresponds to port 10GE12.

7.1.4. NPRU Connections

Prior to attempting the NPRU connections, read *Section 6* thoroughly.

The NPRU has 10GE and GE ports. The 10GE port is connected to an upper level EU-E with CAT-6 STP whose length shall be up to 100 meters and GE port is connected to a PC or monitor with CAT-5. After the NPRU has been connected to the upper EU-E and powered on, the device are synchronized when the optical indicator LED turns green.
Note:

7.1.5. 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, battery will be unplugged and packaged in component box before shipping. After the device is operating, plug it in to ensure normal reporting in case of device shutting down.

8. System Debugging Setup

At the point that all devices are powered on after deployment and connection, it is highly recommended to connect a laptop to Master AU to enable system debugging. Check each device's working status. The optical interface indicator LEDs should stay green and stay lit and the STATUS indicator LEDs should be green and flash every 3 seconds. Now, start the online debugging according to Figure 8-1 and Figure 8-2.

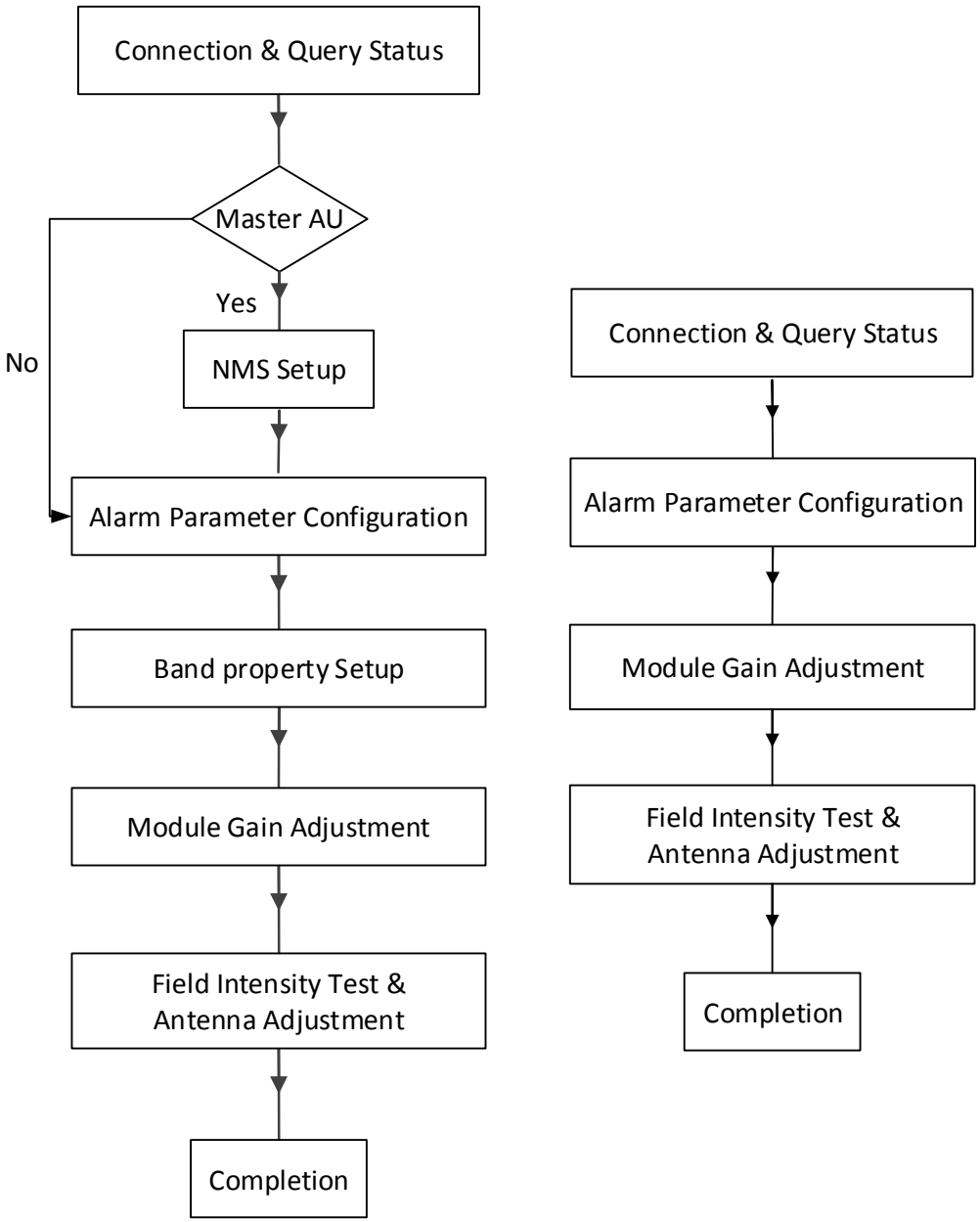

Figure 8-1 AU (left) and NPRU (right) Debugging Procedures

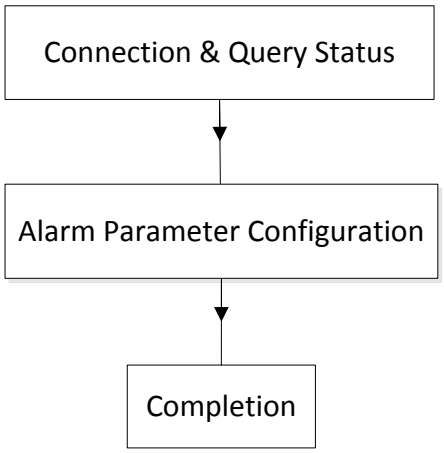

Figure 8-2 EU-E Debugging Procedures

8.1. Network Management System Setup for SNMP

CrossFire system supports Network Management System (NMS) for monitoring the whole system. Each slave devices in system is assigned a unique Site ID automatically by Master AU while Master AU Site ID is default as **Device IP Addr** in **LAN Connectivity** on AU WebOMT. The NMS supports SNMP and UDP protocol. According to selected protocol, configure corresponding parameters as shown in Table 4-6.

The following procedure is setup for MIB Browser of SNMP:

1. Get wired access to OMT on Master AU as *Section 3.2.1*
2. Get into **LAN Connectivity** Under **Settings**
3. Set parameter for SNMP (See Figure 8-3):
   a. Select SNMP in **Protocol** dropdown.
   b. Set PC or monitor device IP address information in **NMS IP Addr** and **NMS port**.
   c. Set trap PC or monitor device IP address information in **Trap IP Addr1** and **Trap port**, if it supports trap functionality.
   d. Click **Set** in pop-up window.
4. Open MIB Browser to monitor the whole system.

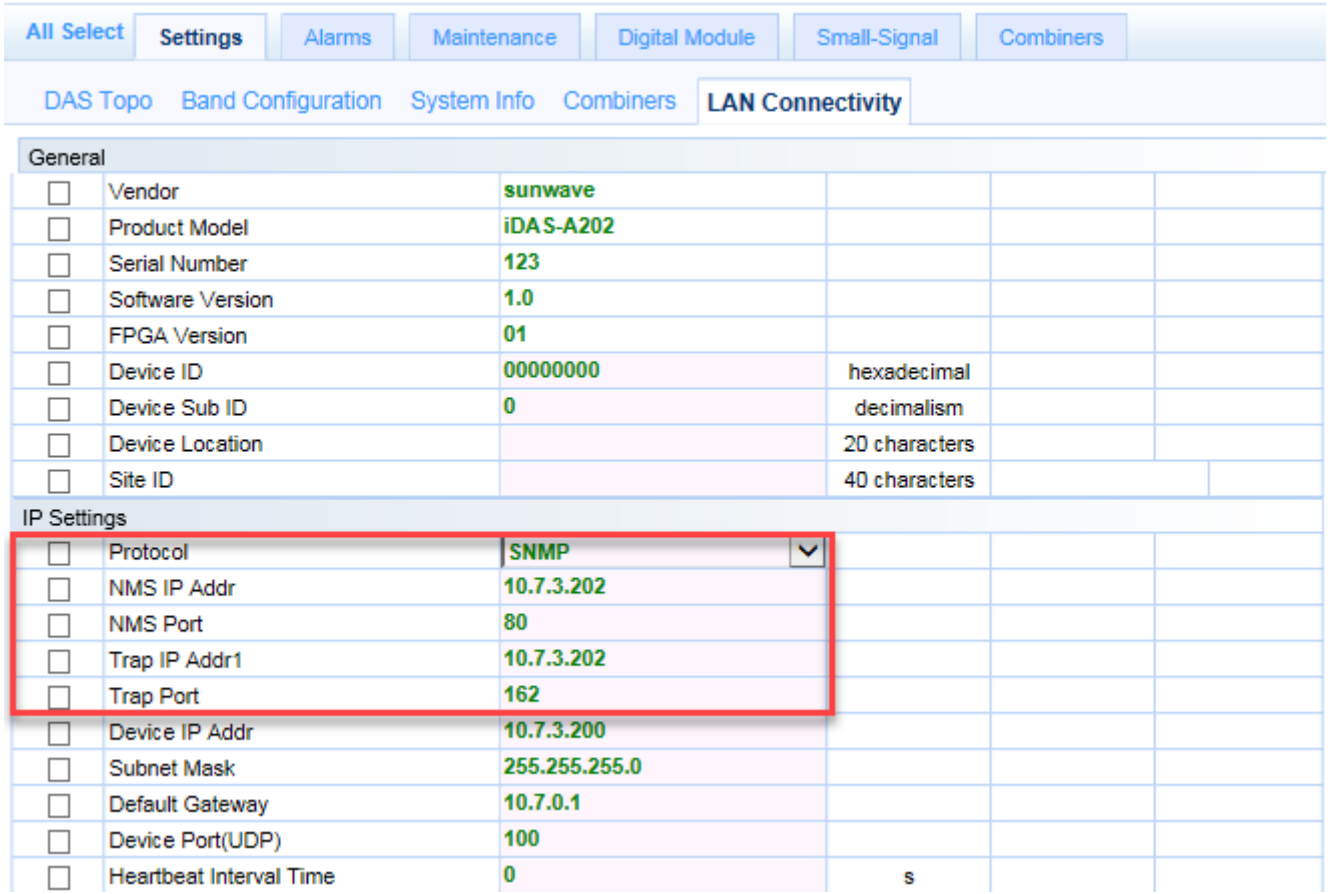

Figure 8-3 NMS Setup

8.2. Band 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 NPRU with the corresponding frequency band and set the Band 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 Band properties (see Figure 8-4):

1. In the WebOMT, select **Settings** tab.
2. Select **Band Configuration** sub-tab under **Settings** tab.
3. Set **Digital Signal Bandwidth** for **Modules 1, 2, 3,** and **4**. See **#1** in Figure 8-4.
   Note: The range of **Digital Signal Bandwidth** for each module is 0-80 MHz. The total **System Transmission Bandwidth** for Master AU and Slave AUs shall not exceed 320 MHz.
4. Set the uplink and downlink centre frequencies for **Modules 1, 2, 3 and 4**. See **#2** in Figure 8-4.
5. Click **Set** in pop-up window to validate the parameter values. And then **Query all** to ensure the **Digital Signal Bandwidth**, **Signal UL Centre Freq** and **Signal DL Centre Freq** of **Module 1~4** have been set
6. In **General** frame, click **Update** button in **AU Module Info Update** to Update band configuration See **#3** in Figure 8-4. And then **Query all** to ensure the value of **Module 1~4 Info Check** is **valid** shown as **#4**.

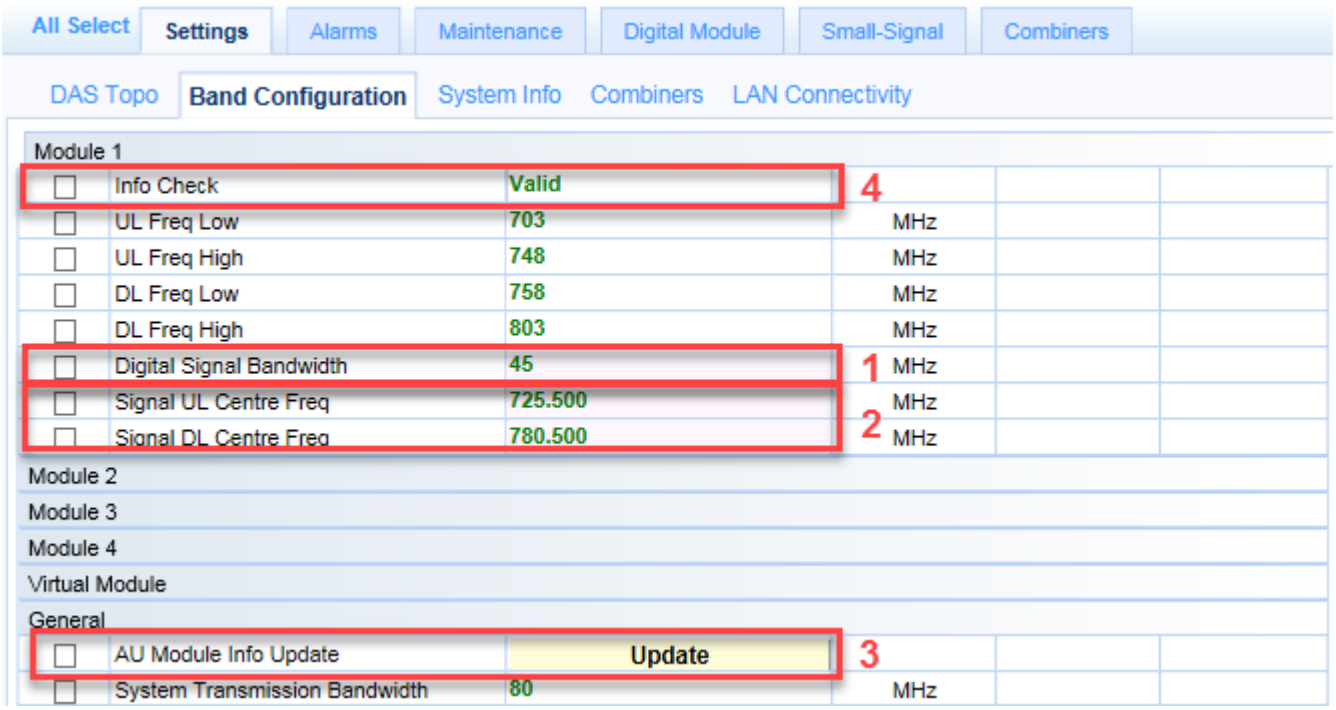

Figure 8-4 Setting Modules Properties

8.3. Band Configuration for Mapping

NPRU supports a range of 700 ~ 2700 MHz signal for downlink and uplink. And it is not set any band class as default. Therefore it is most important to set Band Configuration in EU-E OMT to create mapping between AU and NPRU, which should be done before CrossFire system start to operate.

This section instructs how to set Band Configuration in EU-E OMT for mapping.

1. Get access to OMT on EU-E.
2. Select **Band Configuration** tab and check the **AU Frequencies Information** and **AU Carrier Configuration** for choosing appropriate modules to map. (See Figure 8-5)
3. Set **RF Module Mapping Configuration**: (See Figure 8-6)
   a. Select 10GE Port which is physically used for connection to NPRU in **GE Port**.
   b. Set appropriate mapping for each **NPRU Module**.
   c. Select **GE Port** and all **NPRU Module** checkbox and click **Set** in pop-up window to save the configuration.
   d. Click **Update** button to validate the configuration in system.
4. Click **Query all** in pop-up window to query **NPRU RF Module Mapping Info** to check if the mapping configuration is validated. (See Figure 8-7)

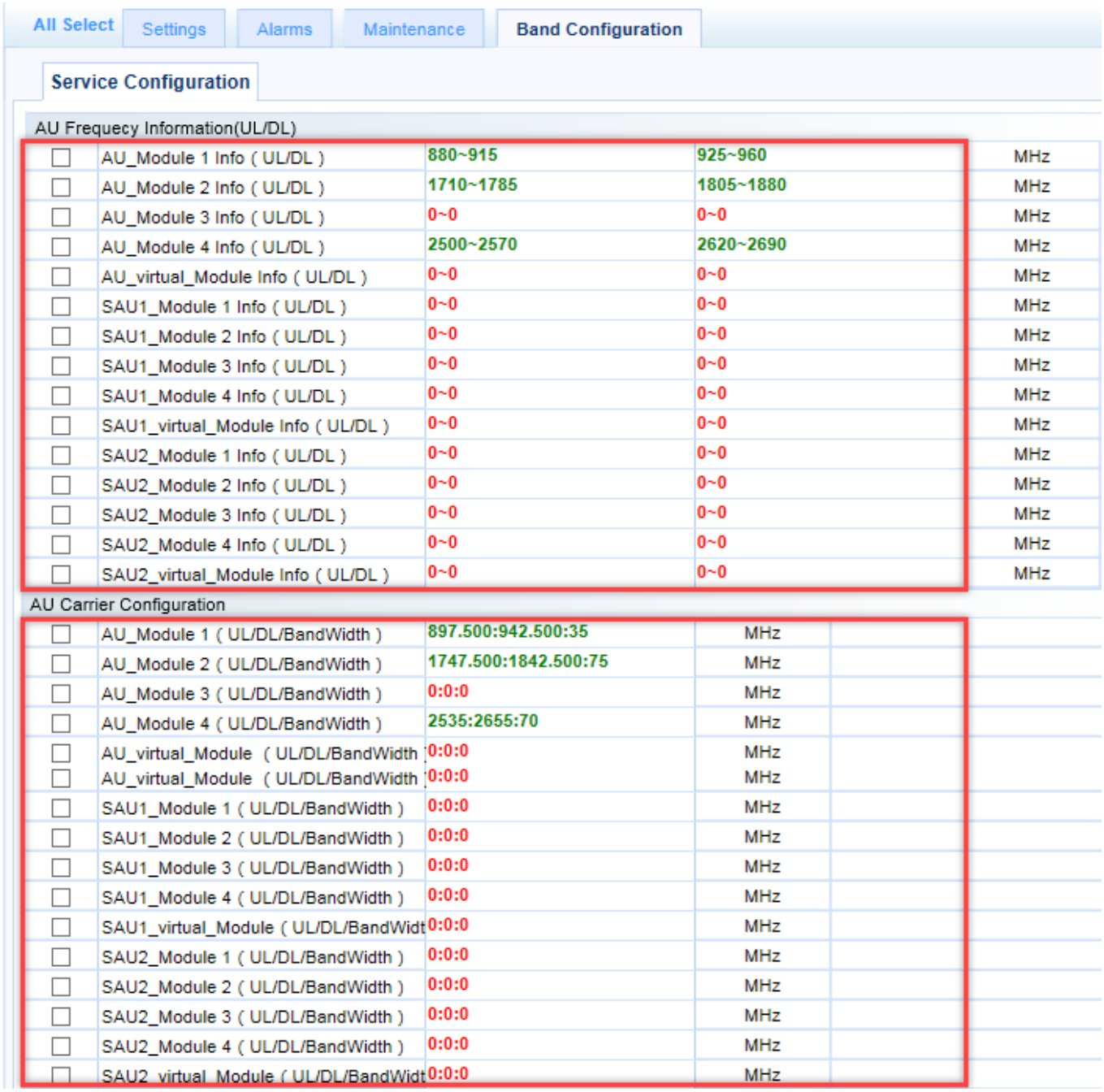

Figure 8-5 AU Module Information

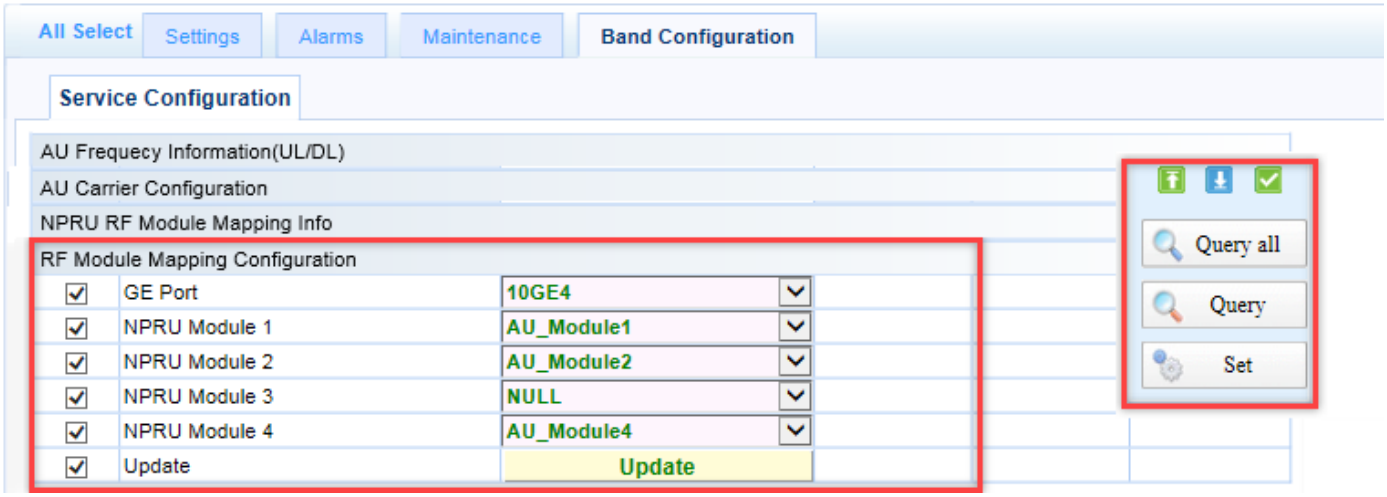

Figure 8-6 Module Mapping Configuration

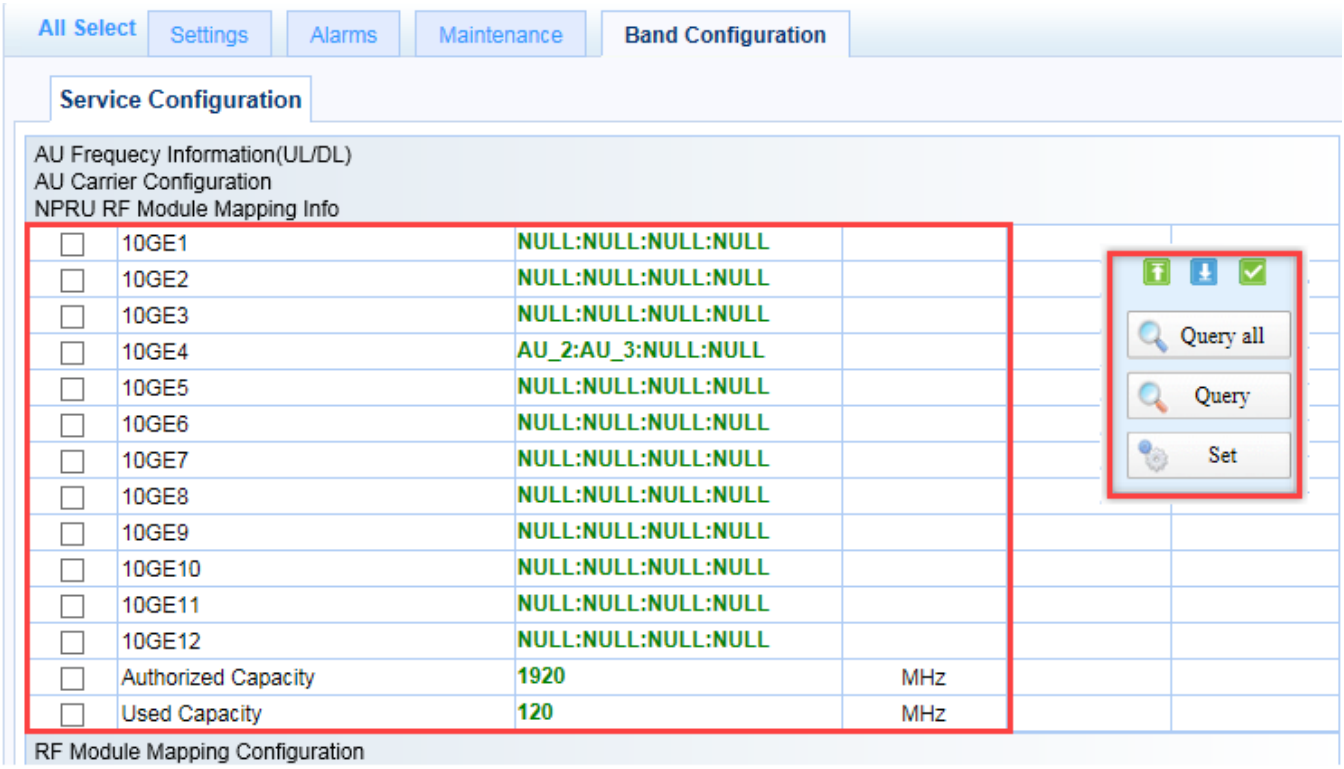

Figure 8-7 Module Mapping Information

8.4. Module Gain Adjustment

After setting the band properties, input RF signals into system. In CrossFire, the downlink input power of the AU is specified as 0dBm and the maximum allowable input power is 15dBm. Therefore, estimate the signal power before input RF signals. Monitor the downlink input power with a spectrum analyzer or check the downlink input power in **Combiner** of the WebOMT in order to set attenuation for the downlink input power within the appropriate range. The adjustable attenuation value of each AU Module is 30dB, which can be set in **Settings -> System Info -> Module X** for each module or **Settings -> Combiner -> Module X** for each port of module.See Figure 8-8 and Figure 8-9 for details.

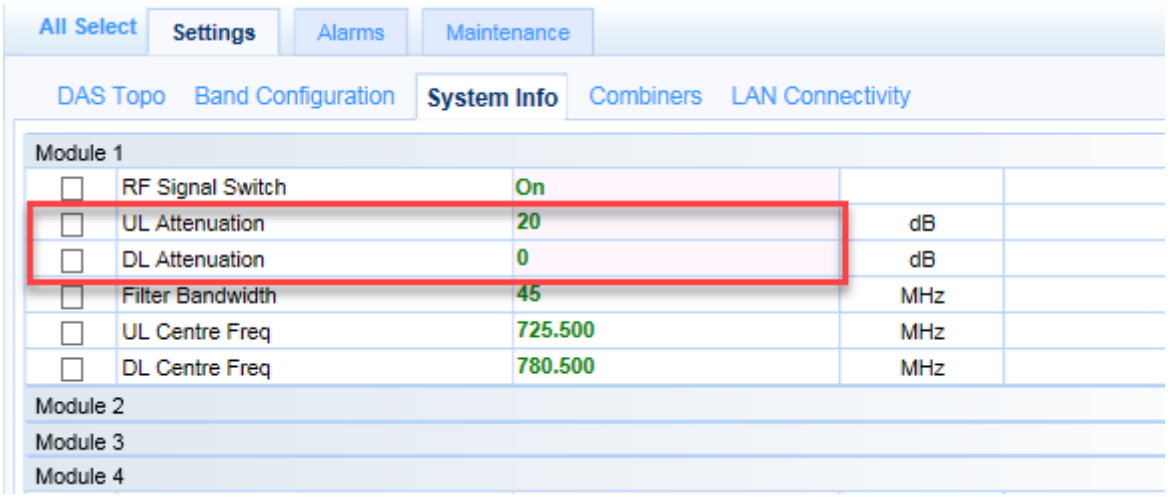

Figure 8-8 Module Gain Adjustment in System Info

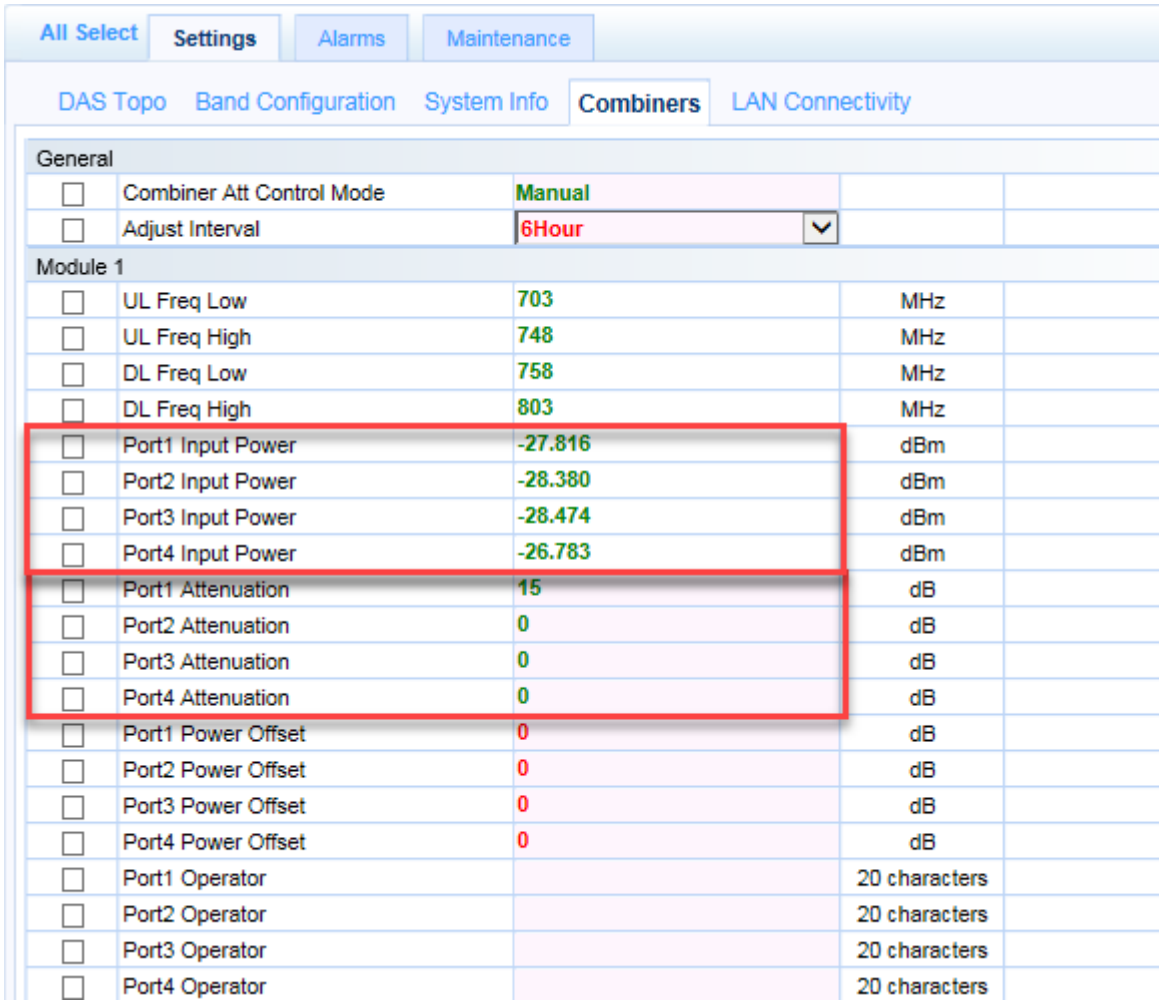

Figure 8-9 Module Gain Adjustment in Combiner

8.5. Isolation Detector

Antenna to antenna isolation is a key consideration in the design of Crossfire NPRU System. Sufficient isolation is required to ensure that interference between antennas is kept within acceptable levels (Tx antenna to Rx antenna isolation shall be over 45dBm; higher values are preferred for equipment to operate effectively).

The Crossfire NPRU system provides isolation detector for measuring isolation between antennas via the following procedures:

1. In the AU WebOMT, go to **Maintenance > Engineering > Isolation Detector**.
2. Select **Tx1** in **Isolation ANT Switch**, type **Detecting Frequency** and then enable **Isolation Detector Switch**.
3. Click **Set** in pop-up window to validate the paramete. And then **Query all** to obtain measured values in **Rx1/2 Isolation between Tx and Rx**.
4. Increase antenna to antenna isolation if needed

   NOTE: Physical separation, polarization and optimization of antenna patterns can increase isolation.
5. Select **Tx2** in **Isolation ANT Switch** and repeat step 2-4.

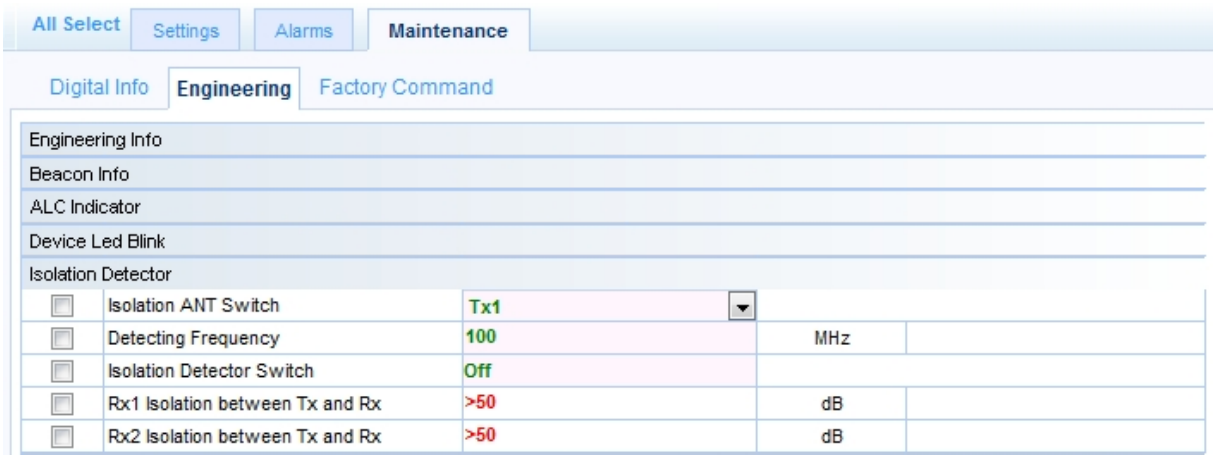

Figure 8-10 Isolation Detector

8.6. Alarm Parameters Setup

After the radio frequency band configuration is completed, set up the alarm parameters via the following procedure:

1. In the WebOMT, select the **Alarms** tab.
2. Set the statuses of the optical transceiver one by one.

   If there is an optical path connection, enable the basic device alarms, such as **Power Interruption Alarm**, **Battery Failure Alarm**, **Movement Alarm**, etc. For alarms related to band properties, such as **LO Unlocked Alarm**, **DL ALC Over Range Alarm**, **OP Transceiver Failure Alarm**, etc., only enable those associated with modules which have an input signal, to avoid unnecessary alarms. See Figure 8-10 for details.

Wait 3~5 minutes after completing the setup, query to see if there is an alarm in the device.

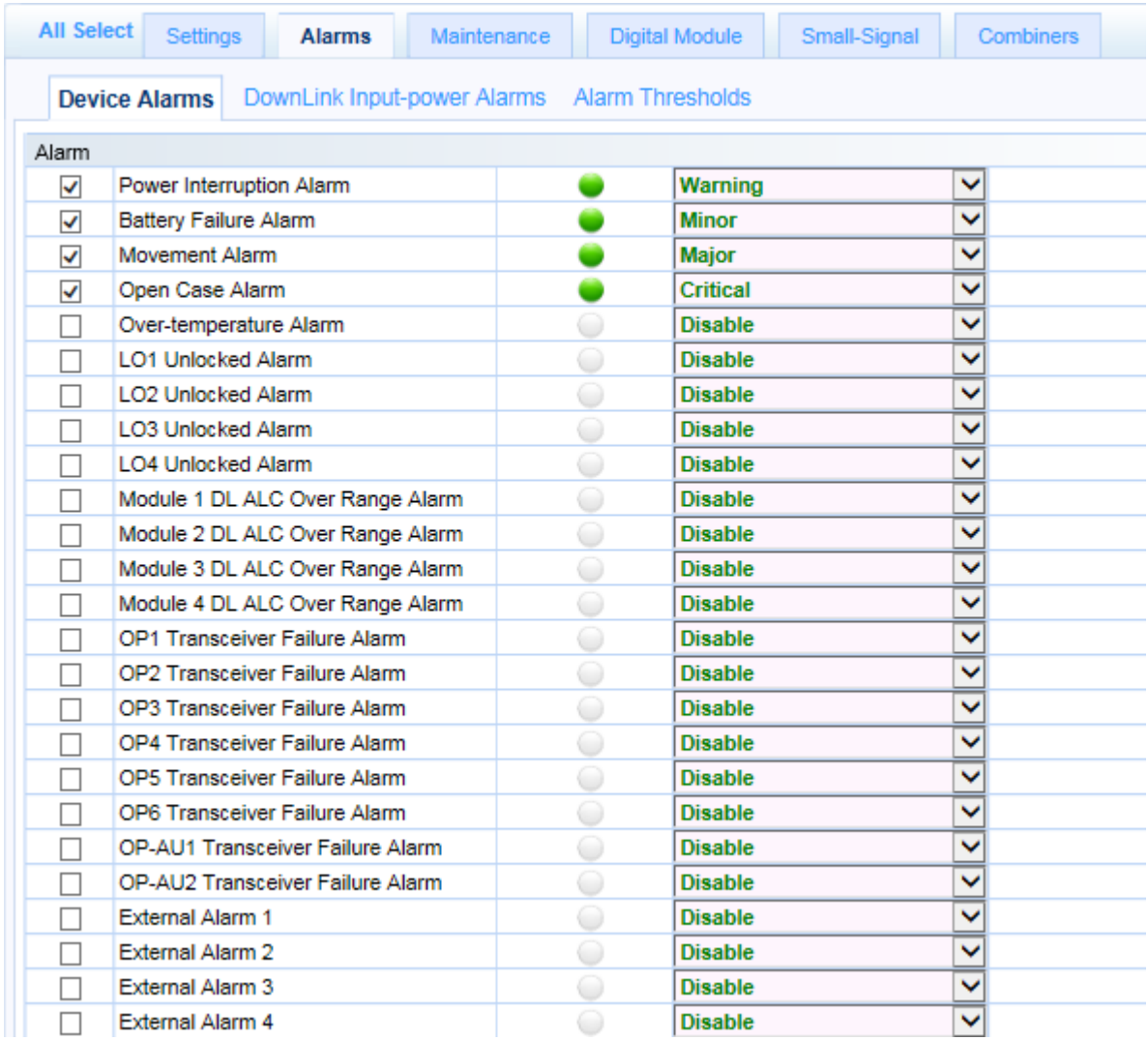

Figure 8-11 Alarm Parameters Setup

8.6.1. Alarm level

Figure 8-12 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.

8.6.2. External Alarms

External Alarms is used for an AU to monitor another system, device or equipment with direct link to Alarm I/O port. See Figure 8-12 for details of external alarm level.

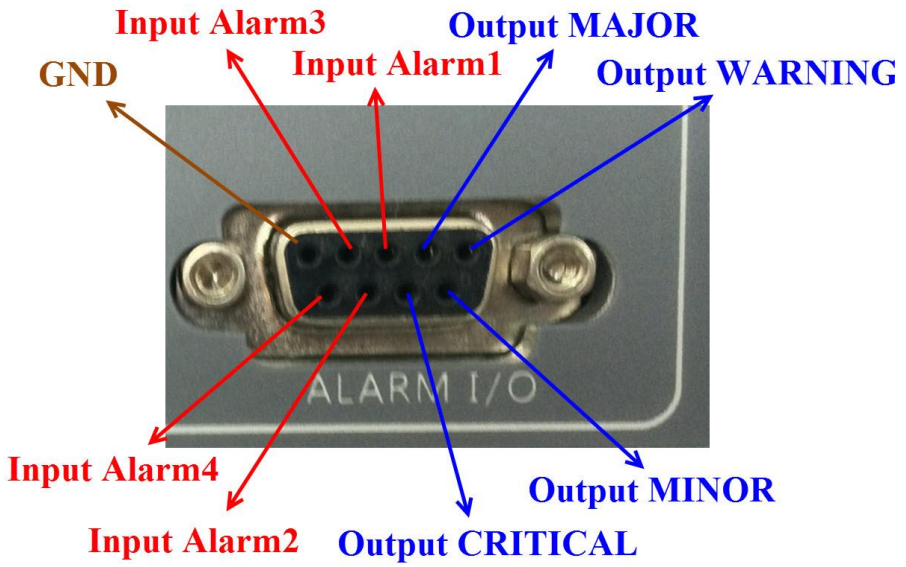

Figure 8-13 External Alarm Level

8.7. OMT User Parameters

Table 8-1 shows the icons in the up right of the WebOMT used for parameters of configuration.

Icon	Description
	Show/hide parameter ID numbers and checkbox for saving configuration. Every parameter can be distinguished by its unique ID number in the WebOMT.
	Save configuration. ***Note:*** this button is only enabled after checking the selected parameter. Otherwise, it is greyed-out and is an invalid choice.

Table 8-1 WebOMT Configuration Icons

To save parameters, use the following procedure and refer to Figure 8-13 and Figure 8-14:

1. In the WebOMT, select the appropriate tab (for example, the **LAN Connectivity** tab).
2. Click the  button to show the parameter ID numbers and checkbox. See **#1** in Figure 8-13.
3. Check the parameter that you want to save. See the blue check mark in **#2** in Figure 8-13.
4. Click the  button to save the configuration. See **#3** in Figure 8-13.
5. Click the **Configuration** button transferring to Configuration page. (See **#4** in Figure 8-13.) In Figure 8-13, click **Save Configuration** to save configuration as **Engineering_Param** file, **Factory_Param** file or **To Default Settings**. After select file, use **Download** button to save the file to a local PC.
6. To load a configuration, click **Upload** to upload configuration file, select the file and then click **Load Configuration** button to load the file to the WebOMT. See the red frames in Figure 8-14.

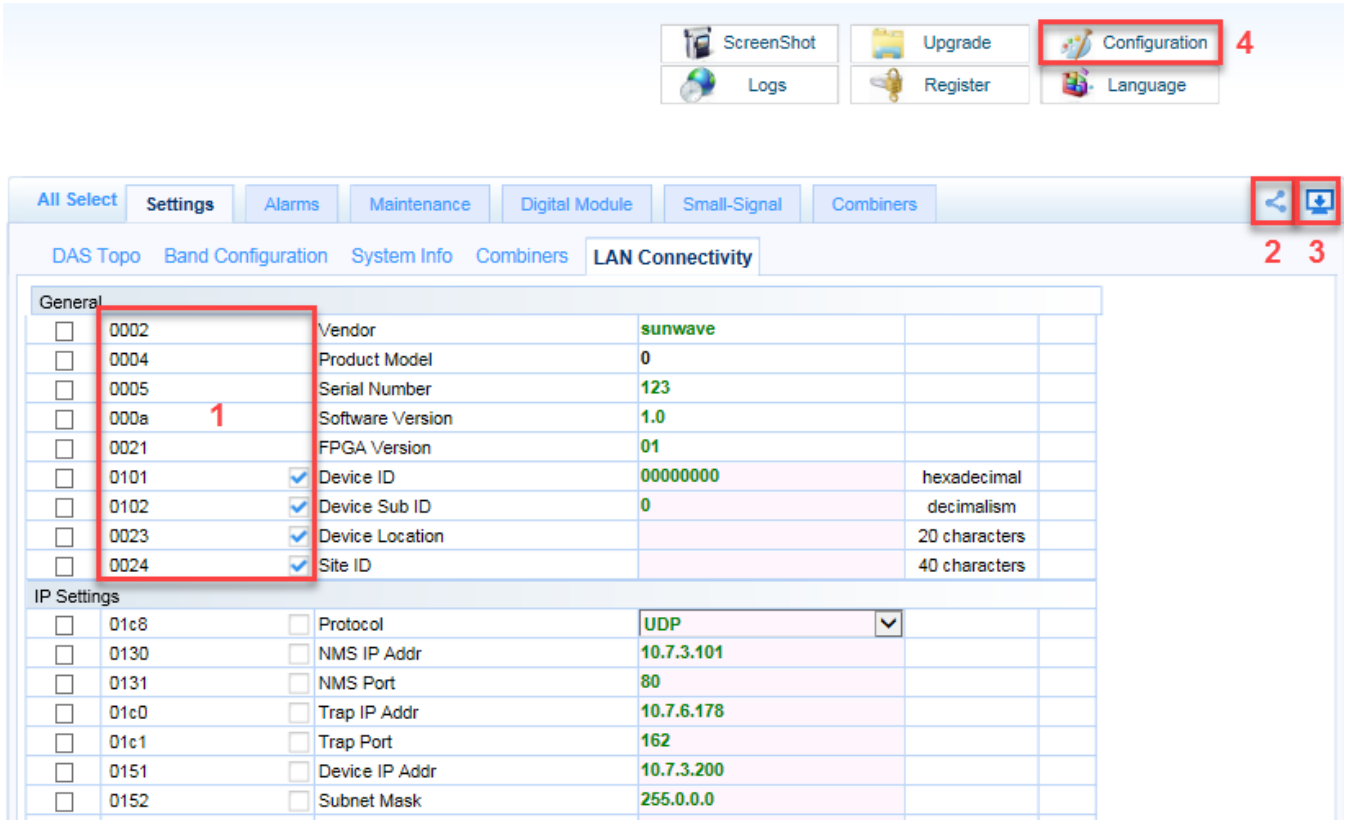

Figure 8-14 Configuring User Parameters

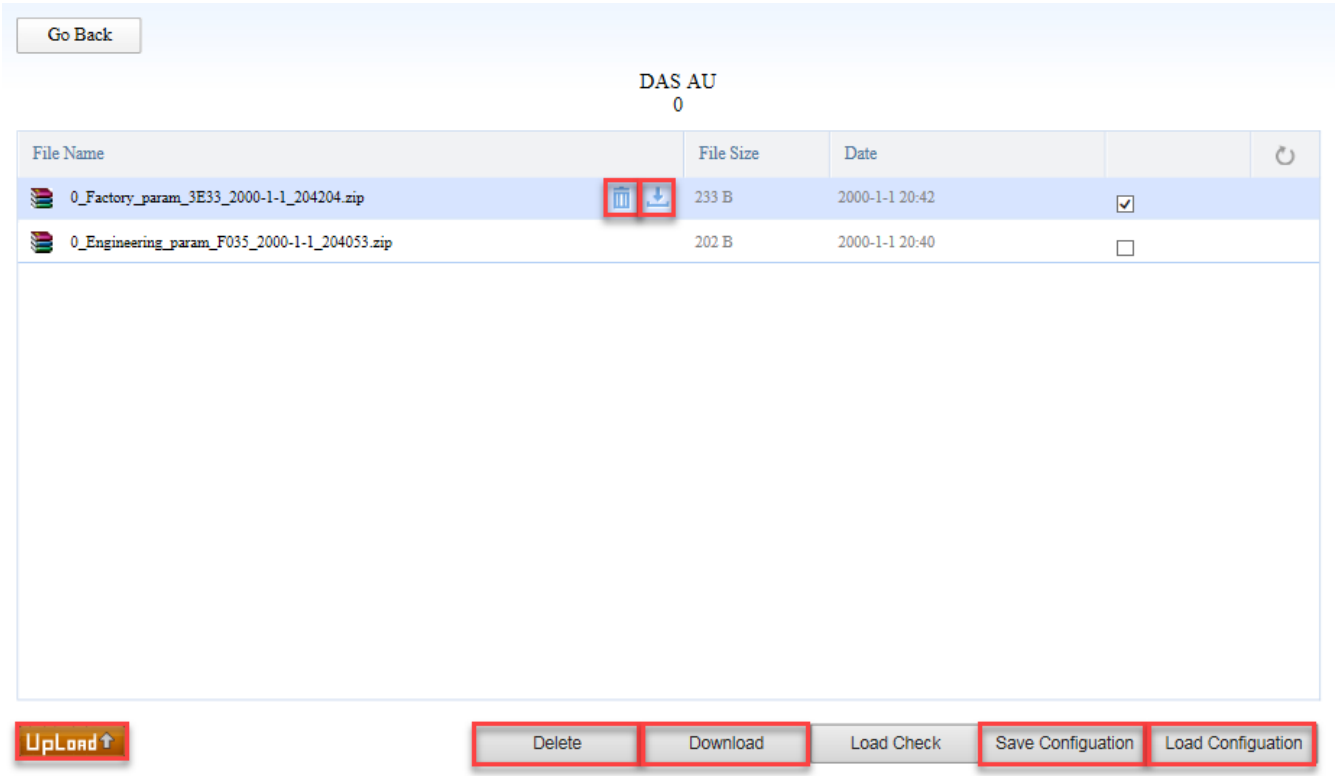

Figure 8-15 Download and Load Configuration

9. Software Upgrade

The Master AU consolidates the management of software upgrades for the entire system and saves the last software package information for AU, EU-E and NPRU shown as Figure 9-1. Slave devices will compare the local software with latest information saved in Master AU by checking CRC at run time. If the CRC is different, slave devices will be synchronized via current software package from Master AU. Therefore, when a slave device is replaced, its software will be upgraded automatically without any additional operation.

Note: If it is the Master AU to be replaced in a system, check software version of the new Master AU before connecting it to the system. If the software version is not the latest version, upload the latest software packages to the new Master AU.

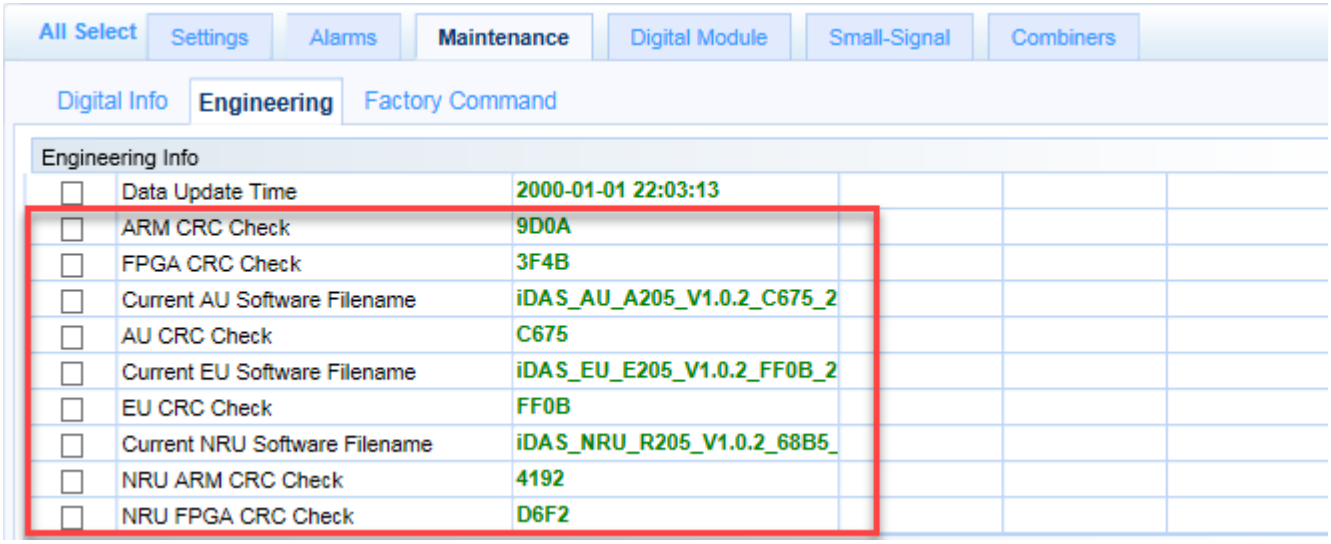

Figure 9-1 Checking Software Package Version

9.1. Local Upgrade

The CrossFire system supports local upgrade. There is two steps for the system software local upgrade. First, upload the software package to Master AU. Second, slave devices will be synchronized automatically if the CRC is different

As an example, to do an NPRU or EU-E local upgrade:

1. Log into the WebOMT on the Master AU. Click the **Upgrade** button on the main page to navigate to the software upgrade page. See Figure 9-2.

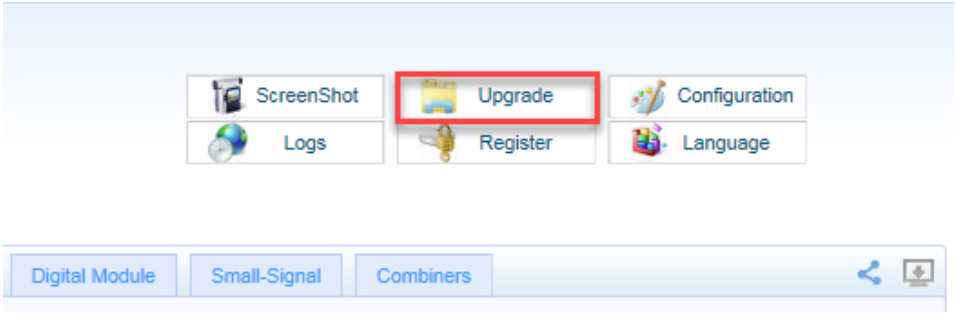

Figure 9-2 Software Upgrade 1

2. On the software upgrade page, as shown in Figure 9-3, click the **Upload** button to upload the NPRU or EU-E software package file.

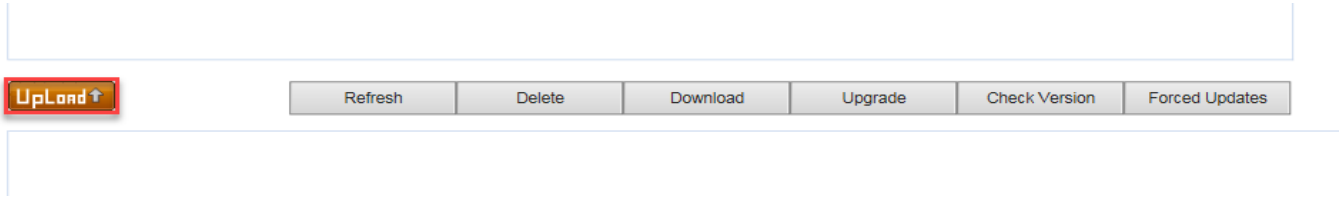

Figure 9-3 Software Upgrade 2

3. After the software is uploaded successfully, select the file that was just uploaded and click the **Upgrade** button to complete the software upgrade, as shown in Figure 9-4 for an NPRU upgrade.

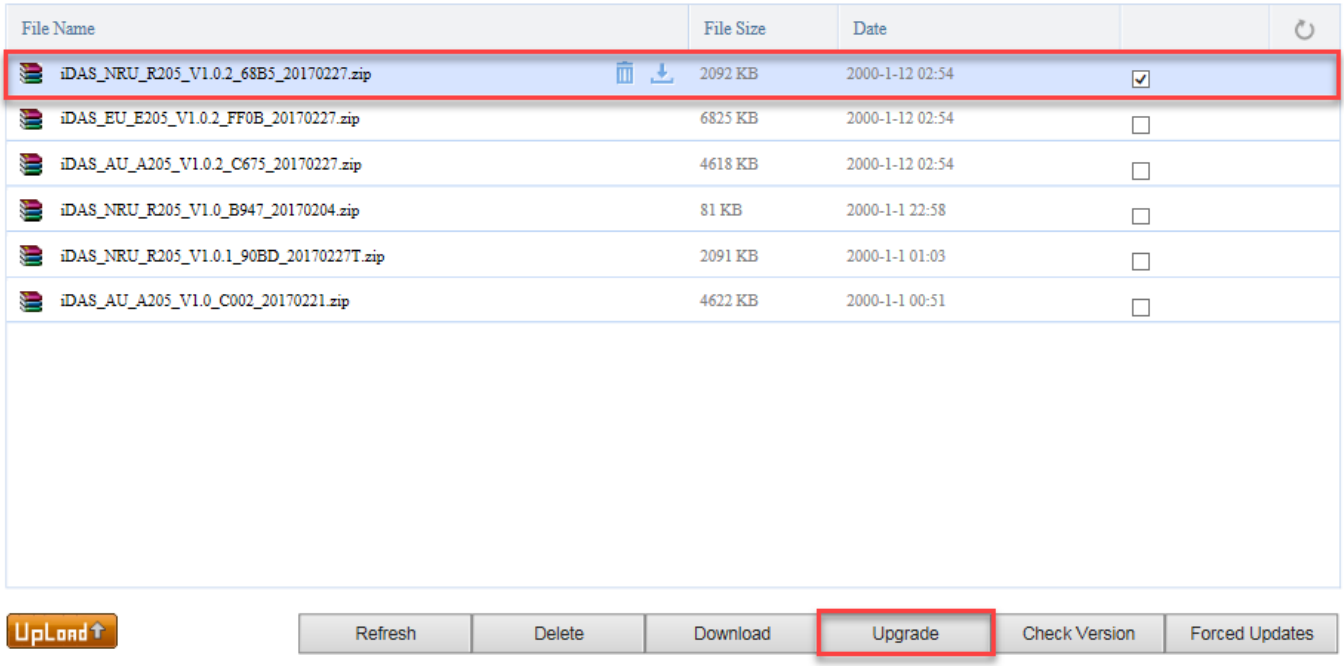

Figure 9-4 Software Upgrade 3

4. After the upgrade has been completed and devices reset, confirm that the software version is correct as shown in Figure 9-1.

9.2. Remote Upgrade

The Crossfire system also supports remote upgrade via FTP server. As shown in Figure 9-5, set up **Server IP addr(FTP)**, **Server Port(FTP)**, **FTP Username**, **FTP Password**, **Upgrade Filepath** and **Upgrade Filename**. Then, select **Start Upgrade** in **FTP File Transfer Control** dropdown. To complete the upgrade, click the **Set** button in pop-up window to download the software from the FTP server.

Note: When using this method, ensure that the FTP server is running and upgrade package is saved in the specified directory.

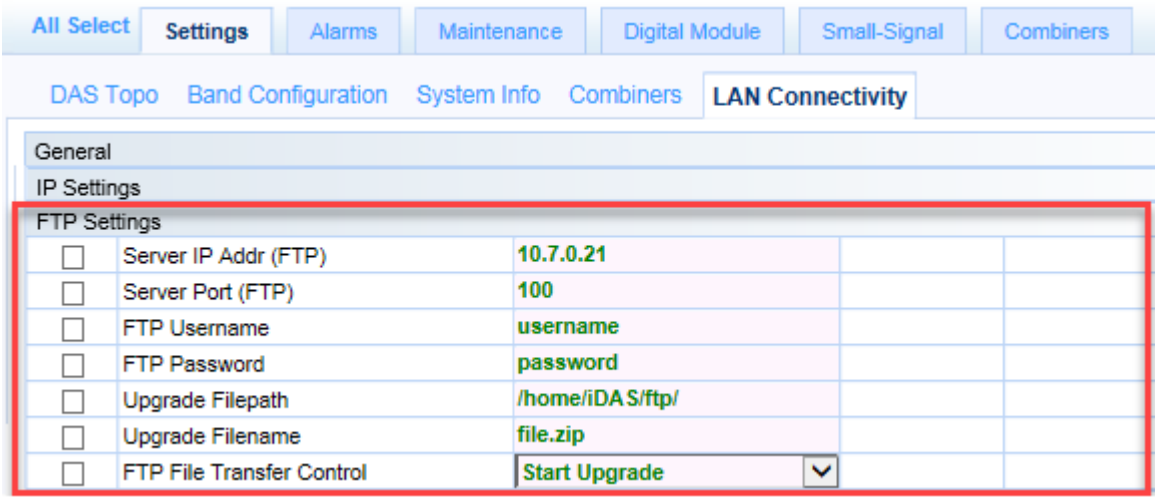

Figure 9-5 Setup Remote Upgrade via FTP

If 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 9-6.

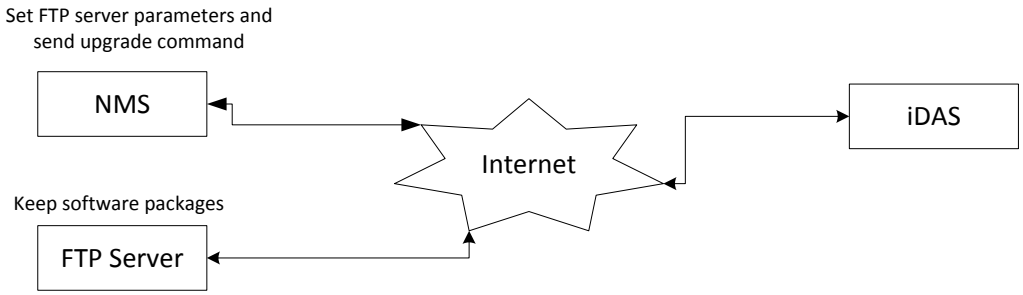

Figure 9-6 Remote Upgrade using an NMS

Sunwave Communications Co., Ltd.
Sunwave Building 581 Huoju Avenue,
Binjiang District, Hangzhou, P.R.China
Zip: 310053