AIMA-RRAS / RRAF / RRAG

Analog Return Receiver Series

Product User Manual

Offices

Australia, Melbourne : tel. +61-3-8561-1400

China, Beijing : tel. +86-10-5791-0655

Americas : tel. +1-888-339-8805

EMEA, Netherlands : tel. +31-36-536-8011

info@pbnglobal.com

www.pbnglobal.com

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Product User Manual

Last update	15 January 2015
Document version	3c
Document reference	Manual
Document status	Released
Prepared by	Pacific Broadband Networks
Prepared for	Product Users

Contents

1 About This Manual

1.1 Related Documentation

Documents listed below can be used in association with this Manual:

- PBN.AIMA3000 - Product User Manual
- PBN.AIMA ASMM - Product User Manual
- AIMA3000 NMS Web Management System Product User Manual
  - PBN.NMS3-EPSM - Basic Inventory Management
  - PBN.NMS3-EPSM - Basic Alarm Management
  - PBN.NMS3-EPSM - Basic System Management
  - PBN.NMS3-EPSM - Basic Template Management

The document can be found at the download section of PBN's corporate website: http://www.pbnglobal.com/en/support/downloads/manuals. A registered account is required.

1.2 Technical Support

Please contact the technical support team at PBN if you have any problems during module installation or maintenance.

Australia:
Suite 15, Building 3, 195 Wellington Rd
Clayton, VIC 3168, Australia
Phone: +61-3-8561-1400
Fax: +61-3-9562-2957

Europe:
Argonweg 15,
1362AA Almere
The Netherlands
Phone +31 (36) 536 8011
Fax +31 (36) 536 4367

China:
Unit 403, Entrance C, Building No. 201 A-10, Jiuxianqiao Beilu
Chaoyang District, Beijing, China
Phone: +86-10-5791-0655
Fax: +86-10-5791-0855

Americas:
Phone: +1-888-339-8805

Company Website: www.pbnglobal.com

Support Email: support@pbnglobal.com

2 Precautions

WARNING!

This equipment is intended for indoor applications. To prevent fire or electrical shock, or damage to the equipment, do not expose units to water or moisture.

- You should carefully read and thoroughly understand the contents of the manual before installing and using this equipment.
- A typical connector is the SC/APC 8°. **Note**: An 8 ° angle polished optical connectors must be used.
- At any time, there may be dangerous voltage inside the device.
- Do not power up before the cover and the panels of the equipment are installed and the enclosure is closed.

Cleaning

Only use a damp cloth for cleaning the front panel. Use a soft dry cloth to clean the top of the unit. Do not use any spray cleaners or chemicals of any kind.

Outage or overload requiring service and repairs

Unplug the unit and refer the servicing to Pacific Broadband Networks' qualified service personnel only.

Servicing and repairs

Do not attempt to service this unit yourself. Refer all servicing needs to Pacific Broadband Networks' qualified service personnel only.

WARNING!

Exposure to class 1M laser radiation is possible. Access should be restricted to trained personnel only. Do not view exposed fiber or connector ends when handling optical equipment.

3 Overview

3.1 About the RRAS

The PBN AIMA3000 RRAS series Analog Return Receiver - Standard are designed for multi-services operators to increase network-return capacities for the ever-growing demand for data and voice bandwidth, while minimizing physical headend space and power requirements.

The RRAS, is designed to plug into PBN's latest generation Advanced Intelligent Multi- Service Headend Platform (AIMA3000). The RRAS incorporates four independent optical return-path receivers that can operate at any wavelength between 1260~1620 nm. This density allows up to 64 independent receivers in only 4 RU of space. The user can set each receiver individually for operation in either manual gain control (MGC) mode or automatic gain control (AGC) mode based on optical input power.

The unit has a low-noise profile and high-performance amplifiers to ensure a good signal-to-noise ratio as well as low distortion characteristics. The RRAS is compatible with PBN's existing optical nodes including the ODN1P, ODN2P, ODN4P, and ODN2000. With high RF outputs, the RRAS can be adapted to work with various headend configurations.

The RRAS can also be conveniently monitored and controlled through a computer connected to one of the Ethernet ports via the ASMM module. All module settings are retained in non-volatile memory to ensure trouble-free operation. Bulk updating, automatic uploading and downloading of configuration files is possible using PBN's NMSE web-based management system.

3.2 Features for the RRAS

- Bandwidth 5 ~ 200 MHz to meet EuroDOCSIS and DOCSIS 3.0 frequency band requirements
- RF output 48 dBmV with a -6 dBm optical input and an OMI of 6%
- Operates between 1260 ~ 1620 nm wavelength, to suit CWDM and DWDM applications
- 19-inch 4RU chassis supports up to 16 Application Modules
- A single RRAS module has 4 optical inputs; the full chassis supports up to 64 channels
- Fast switching time of less than 15 ms ensures zero interruption to the network
- User-selectable MGC or AGC
- Real-time alarm monitoring
- Remote firmware upgrade and auto upload/download of configuration files through ASMM web interface or using PBN's NMSE
- Bulk firmware updates through PBN's NMSE
- Easy to install, with blind mate RF connectors
- Independent RF test points for ease of setup and maintenance
- A single receiver consumes less than 2 W of power
- FCC, CE and RCM [(1)] compliant

[(1)] See Declaration of Conformity for current status.

3.3 Order Details for RRAS

A-RRAS–[X]-[Y]-[Z] Analog Return Receiver - Standard

Options:

X Optical port

- **Q** Quad (4)

Y Optical Connector Type

- **S** SC/APC *
- **E** E2000/APC
- **F** FC/APC
- **L** LC/APC

Z Bandwidth

- **20** 5~200 MHz (Standard)

** Standard option. Contact a PBN Sales Representative for availability of other options.*

3.4 Specifications for the RRAS

Optical Performance

Optical wavelength	1260 ~ 1620 nm
Optical inputs	-18 ~ +2 dBm
Optical connectors	4 x SC/APC [(1)], FC/APC, LC/APC, E2000/APC

RF Performance

RF bandwidth	5 ~ 200 MHz
RF output level [(2)]	48 dBmV
RF flatness	± 0.75 dB (5 ~ 200 MHz, no 4.5 MHz pilot tone option)
Gain adjustment	0 ~ 52 dB (default 42 dB)
RF impedance	75 Ω
RF return loss	> 16 dB
Receiver isolation	> 60 dB
RF test point relative to RF output port	-20 ±1 dB
RF connectors	4 x GSK-type female
RF test points	4 x Mini-SMB
Alarms and status	Front-panel LEDs, SNMP Traps

Notes:

(1) Standard option. Contact a PBN Sales Representative for availability of other options.

(2) Measured in a typical system with -6 dBm optical input, 6 % OMI, gain setting adjusted to maximum (the stated RF output level does not necessarily apply with other optical input levels). dBuV= 60 + dBmV.

Link Performance

CNR [(3)]	> 48 dB
IMD2 [(4)]	< -52 dBc
NPR [(5)]	> 35 dB *(over dynamic range of 15 dB)*

General

Power	Powered via AIMA3000 backplane
Power consumption	< 8.0 W
Operating temperature	-5 ~ +55 ^{o}C
Storage temperature	-20 ~ +70 ^{o}C
Operating/storage humidity	Max. 90% RH (non-condensing)
Dimensions (W*D*H)	24.6 * 410 * 152.5 mm
Weight	0.87 kg
Network management	PBN's NMSE or through ASMM's Web Interface

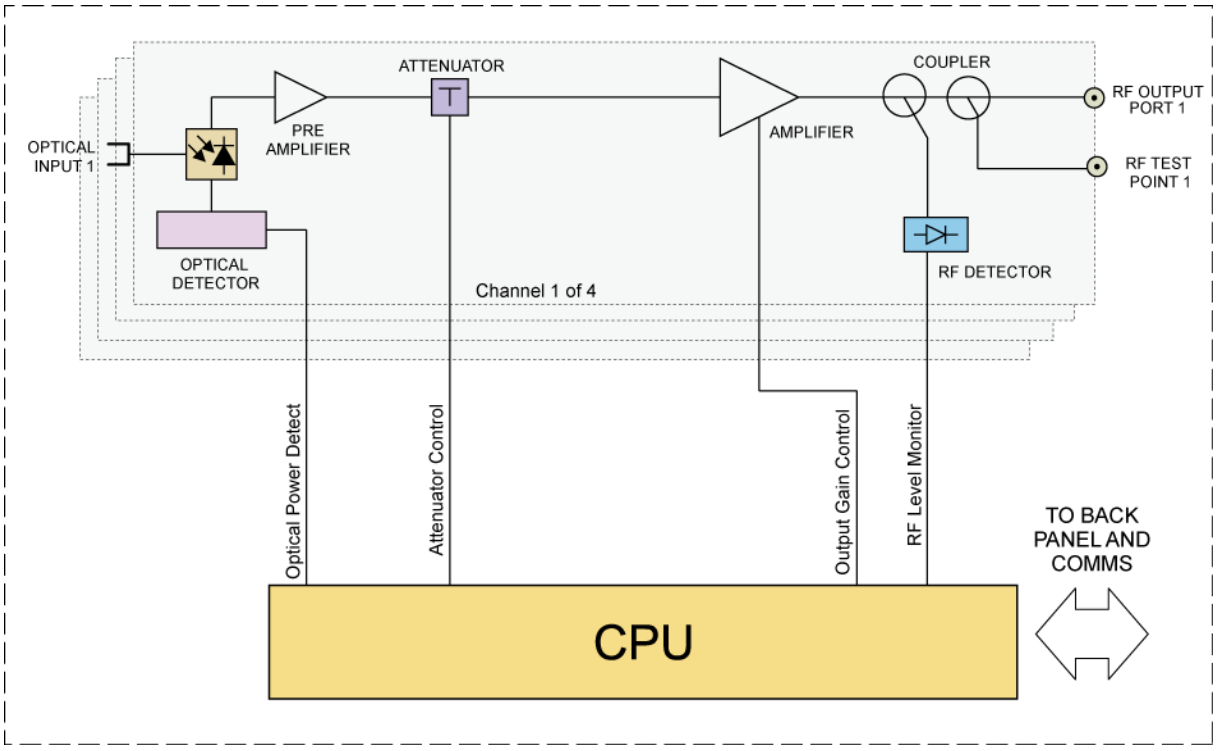
Notes:

(3) Measured @ -2 dBm ,6% OMI, 4 Channels

(4) RRAS and RRAF: Measured in a typical system with PBN ODN4P-RT, 4 channels, (11.5 MHz, 26.5 MHz, 45.5 MHz, and 58.5 MHz), 0 dBm, 6 % OMI. IMD2 is measured at f1 ± f2.

(5) RRAS and RRAF: Measured in a typical system with PBN ODN4P-RT, 10 km single mode optical fiber using 35 MHz noise loading.

3.5 Block Diagram for RRAS



3.6 About the RRAF

The PBN AIMA3000 RRAF series Analog Return Receiver - FSK are designed for multi-services operators to increase network-return capacities for the ever-growing demand for data and voice bandwidth, while minimizing physical headend space and power requirements.

The RRAF, as a key element of the AIMA3000 platform, is designed to plug into PBN's latest generation Advanced Intelligent Multi-Service Headend Platform (AIMA3000). The RRAF incorporates four independent optical return-path receivers that can operate at any wavelength between 1260~1620 nm. This density allows up to 64 independent receivers in only 4 RU of space. The user can set each receiver individually for operation in either manual gain control (MGC) mode or automatic gain control (AGC) mode. The unit has a low-noise profile and high-performance amplifiers to ensure a good signal-to-noise ratio as well as low distortion characteristics. The RRAF is compatible with PBN's existing optical nodes including the ODN1P, ODN2P, ODN4P, and ODN2000. With high RF outputs, the RRAF can be adapted to work with various headend configurations.

Microprocessor-based status monitoring and control requires an AIMA3000 System Management Module (ASMM) in slot 0 of the chassis.

All module settings are retained in non-volatile memory to ensure trouble-free operation. Furthermore, bulk updating, automatic uploading and downloading of configuration files and PBN's NMSE Web-based Management system are available for this module. In addition, RRAF makes use of FSK to allow for remote node monitoring.

3.7 Features for the RRAF

- Upstream bandwidth 5-200 MHz with DOCSIS 3.0 support
- RF output 48 dBmV with a -6 dBm optical input and an OMI of 6%
- 1260 - 1620 nm operating wavelength, to suit CWDM and DWDM
- 19-inch 4RU chassis supports up to 16 Application Modules
- A single RRAF module has 4 optical inputs; a full chassis supports up to 64 channels
- Fast switching time of less than 15 ms ensure zero interruption to the network
- User selectable MGC or AGC
- Remote status monitoring of connected PBN optical nodes
- Real-time alarm monitoring
- Remote firmware upgrade and auto upload/download of configuration files through ASMM web interface or using PBN's NMSE
- Plug-and-play hot-swappable AIMA3000 platform module with four independent return-path receivers
- Easy to install, with blind mate RF connectors
- Independent RF test points for ease of setup and maintenance
- A single receiver consumes less than 2 W of power
- FCC, CE and RCM [(1)] compliant

[(1)] See Declaration of Conformity for current status.

3.8 Order Details for RRAF

A-RRAF–[X]-[Y]-[Z] Analog Return Receiver - FSK

Options:

X Optical port

- **Q** Quad (4)

Y Optical Connector Type

- **S** SC/APC *
- **E** E2000/APC
- **F** FC/APC
- **L** LC/APC

Z Bandwidth

- **20** 5~200 MHz (Standard)

** Standard option. Contact a PBN Sales Representative for availability of other options.*

3.9 Specifications for the RRAF

Optical Performance

Optical wavelength	1260 ~ 1620 nm
Optical inputs	-18 ~ +2 dBm
Optical return loss	>50 dB
Optical connectors	4 x SC/APC [(1)], FC/APC, LC/APC, E2000/APC

RF Performance

RF bandwidth	5 ~ 200 MHz
RF output level [(2)]	48 dBmV
RF flatness	± 0.75 dB (5 ~ 200 MHz, no 4.5 MHz pilot tone option)
Gain adjustment	Up to 52 dB in 0.5 dB increments (default 42 dB)
RF impedance	75 Ω
RF return loss	> 16 dB
Receiver isolation	> 60 dB
RF test point relative to RF output port	-20 ±1 dB
RF connectors	4 x GSK-type female
RF test points	4 x Mini-SMB
Alarms and status	Front-panel LEDs, SNMP Traps

Notes:

(1) Standard option. Contact a PBN Sales Representative for availability of other options.

(2) Measured in a typical system with -6 dBm optical input, 6 % OMI, gain setting adjusted to maximum (the stated RF output level does not necessarily apply with other optical input levels). dBuV= 60 + dBmV.

Link Performance

CNR [(3)]	> 48 dB
IMD2 [(4)]	< -52 dBc
NPR [(5)]	> 35 dB *(over dynamic range of 15 dB)*

General

Power	Powered via AIMA3000 backplane
Power consumption	< 8.0 W
Operating temperature	-5 ~ +55 ^{o}C
Storage temperature	-20 ~ +70 ^{o}C
Operating/storage humidity	Max. 90% RH (non-condensing)
Dimensions (W*D*H)	24.6 * 410 * 152.5 mm
Weight	0.87 kg
Network management	PBN's NMSE or through ASMM's Web Interface

Notes:

(1)Standard option. Contact a PBN Sales Representative for availability of other options.

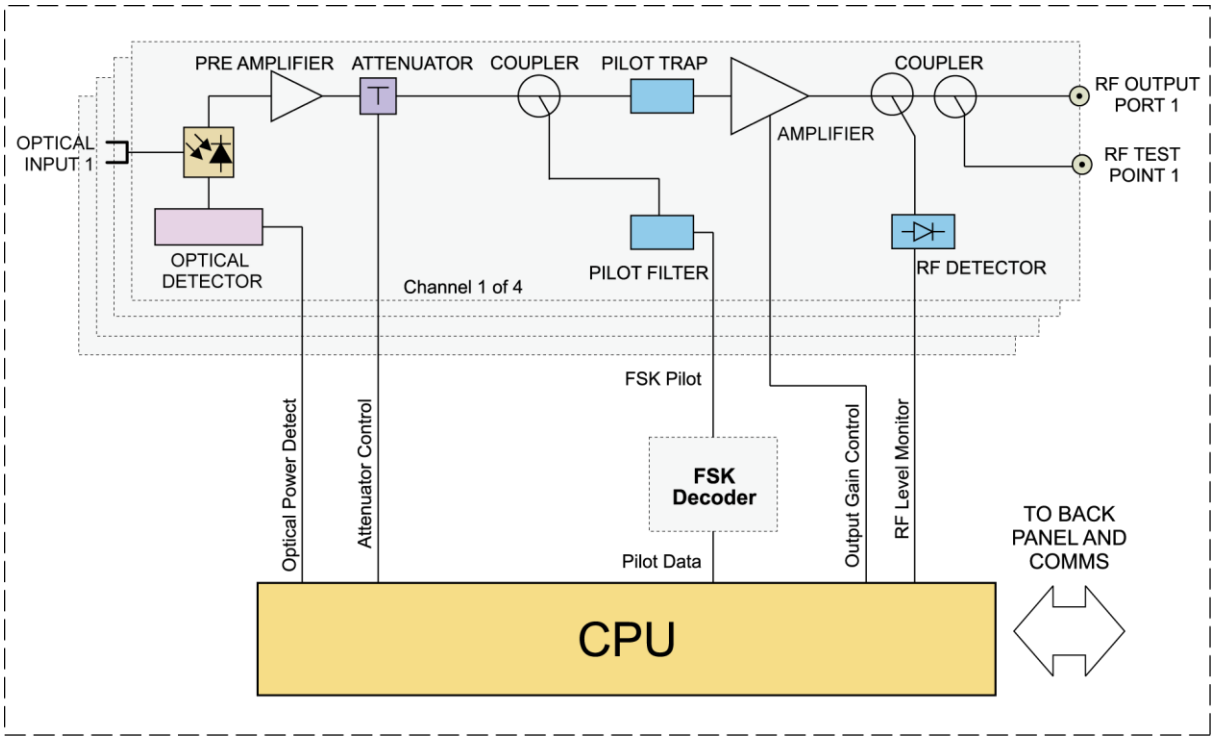
(2)Measured in a typical system with -6 dBm optical input, 6% OMI, gain setting adjusted to maximum (the stated RF output level does not necessarily apply with other optical input levels). dBuV=60+dBmV

(3) Measured @ -2 dBm,6% OMI, 4 Channels

(4) RRAF: Measured in a typical system with PBN ODN4P-RT, 4 channels, (11.5 MHz, 26.5 MHz, 45.5 MHz, and 58.5 MHz), 0 dBm, 6 % OMI. IMD2 is measured at f1 ± f2.

(5) RRAS and RRAF: Measured in a typical system with PBN ODN4P-RT, 10 km single mode optical fiber using 35 MHz noise loading.

3.10 Block Diagram for RRAF



3.11 About the RRAG

The PBN AIMA3000 RRAG series Analog Return Receiver- RFoG are designed for multi-service operators to increase network return capacity and meet an ever-growing demand for bandwidth, while minimizing physical headend space and increasing power efficiency.

The RRAG is designed to plug into PBN's latest generation Advanced Intelligent Multi-Service Headend Platform (AIMA3000). The RRAG is specially designed to accommodate low power optical input as low as -28 dBm. The RRAG incorporates four independent optical return-path receivers that operate at wavelengths between 1260-1620 nm. The design allows up to 64 independent receivers in 4 RU of space. The user can set each receiver individually for manual gain control (MGC) mode. The unit has a low noise profile and high-performance amplifiers to ensure good signal-to-noise ratio as well as low distortion characteristics. The RRAG is compatible with RFoG ONU (R-ONU) as well as PBN micro nodes DPON. With versatile RF outputs, the RRAG is flexible for various headend configurations.

The RRAG can also be conveniently monitored and controlled through a computer connected to one of the Ethernet ports via the ASMM module. All module settings are retained in non-volatile memory to ensure trouble-free operation. Bulk updating is possible using PBN's NMSE web-based management system.

3.12 Features for the RRAG

- Upstream bandwidth 5 - 85 MHz with DOCSIS 3.0 support
- RF output 48 dBmV with a -20 dBm optical input and an OMI of 10%
- 1260 - 1620 nm operating wavelength, to suit CWDM, DWDM, and RFoG applications
- Wide optical input from -28 dBm to -12 dBm
- 19-inch 4RU chassis supports up to 16 Application Modules
- A single RRAG module has 4 optical inputs; a full chassis supports up to 64 channels
- Real-time alarm monitoring
- Remote firmware upgrade and auto upload/download of configuration files through ASMM web interface or using PBN's NMSE
- Plug-and-play hot-swappable
- Easy to install, with blind mate RF connectors
- Independent RF test points for ease of setup and maintenance
- A single receiver consumes less than 2 W of power
- FCC, CE and RCM [(1)] compliant

[(1)] See Declaration of Conformity for current status.

3.13 Order details for RRAG

A-RRAG–[X]-[Y]-[Z] Analog Return Receiver - RFoG

Options:

X Optical port
- **Q** Quad (4)

Y Optical Connector Type
- **S** SC/APC *
- **E** E2000/APC
- **F** FC/APC
- **L** LC/APC

Z Bandwidth
- **20** 5~85 MHz (Standard)

** Standard option. Contact a PBN Sales Representative for availability of other options.*

3.14 Specifications for the RRAG

Optical Performance

Optical wavelength	1260 ~ 1620 nm
Optical inputs	-28 ~ -12 dBm
Optical return loss	>50 dB
Optical connectors	4 x SC/APC [(1)], FC/APC, LC/APC, E2000/APC

RF Performance

RF bandwidth	5 ~ 85 MHz
RF output level [(2)]	48 dBmV (108 dBuV) @-20 dBm optical input 10% OMI, full gain.
RF flatness	± 0.75 dB
Gain range	42 ~ 52 dB in 0.5 dB increments
RF impedance	75 Ω
RF return loss	> 16 dB
Receiver isolation	> 55 dB
RF test point relative to RF output port	-20 ± 1 dB
RF connectors	4 x GSK-type female
RF test points	4 x Mini-SMB
Alarms and status	Front-panel LEDs, SNMP Traps
Equivalent Input Noise Current	4 pA/sqr(Hz)

Link Performance

CNR [(2)]	> 38 dB
IMD2 [(2)]	< -47 dBc
NPR (@ -22 dBm)	> 30 dB (over 10 dB dynamic range)

General

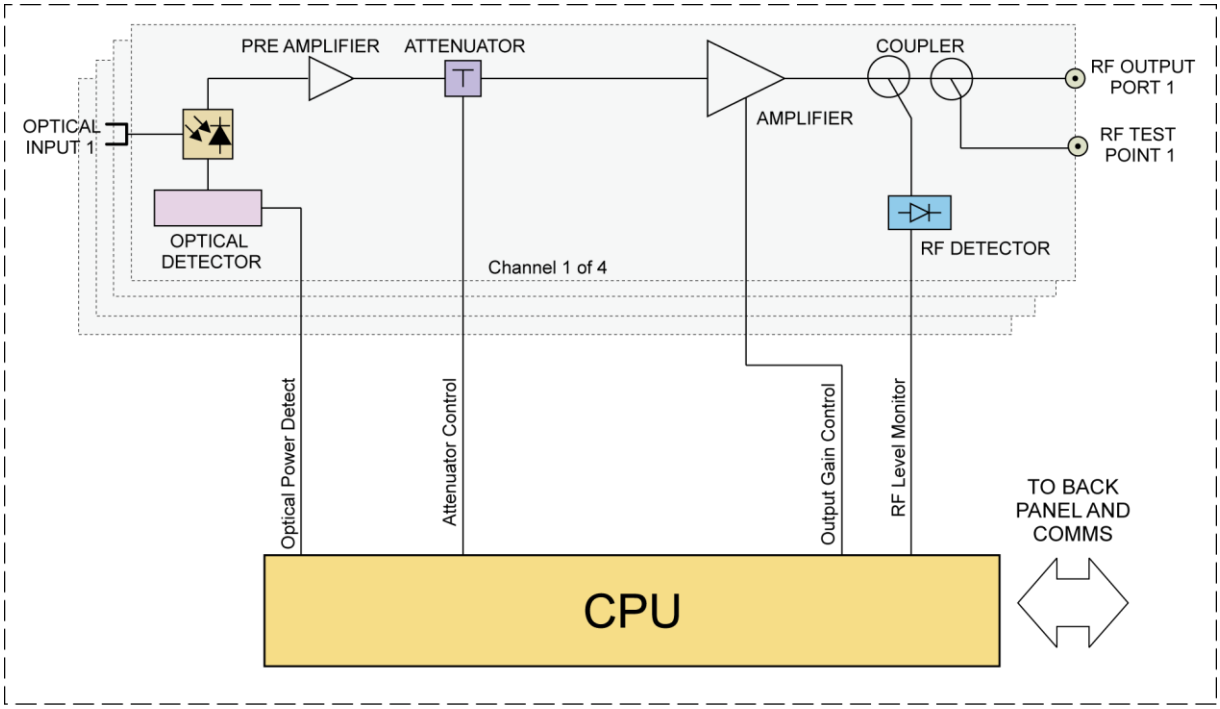
Power supply	Powered via AIMA3000 backplane
Power consumption	< 8.0 W
Operating temperature	0 ~ +55 °C
Storage temperature	-20 ~ +70 °C
Operating/storage humidity	Max. 90% RH (non-condensing)
Dimensions (W*D*H)	24.6 * 410 * 152.5 mm
Weight	0.87 kg
Network management	PBN's NMSE or through ASMM's Web Interface

Notes:

(1) Standard option. Contact a PBN Sales Representative for availability of other options.

(2) Measured in a typical system with a -20 dBm optical input, an OMI of 10%, and gain set to maximum (the stated RF output level may differ with other optical input levels). And dBuV= 60 + dBmV.

3.15 Block Diagram for RRAG



4 Functional Overview

4.1 Automatic Gain Control

The microcontroller monitors the optical input power and controls the gain. Alarms are activated if the levels are outside the normal working range.

In AGC mode, the output gain automatically adjusts according to the optical input signal level (within a range of ± 5 dBm) to ensure RF output stability.

4.2 Manual Gain Control

The user can select the MGC mode when the input power is relatively stable or the user has special requirements based off the input signal. The user can regulate the gain to accommodate a wide range of input signals and ensure an ideal output index.

4.3 Output Level Control Chart for RRAS

The output signal level depends on the transmitter configuration, transmitter laser, the received optical RF input signal level, the receiving device configuration, and the link loss.

With the PBN optical transmitter, when the optical input signal has an OMI of 6% and the module output gain is 42 dB, the corresponding relationship between the optical input signal power and the output level is shown in the diagram below.

OMI 6%, Gain 42 dB	
OPT dBm input	RF OUT (dBmV)
2	64
1	62
0	60
-1	58
-2	56
-3	54
-4	52
-5	50
-6	48
-7	46
-8	44
-9	42
-10	40
-11	38
-12	36
-13	34
-14	32
-15	30
-16	28
-17	26
-18	24

4.4 Output Level Control Chart for RRAG

The output signal level depends on the transmitter configuration, transmitter laser, the received optical RF input signal level, the receiving device configuration, and the link loss.

With the PBN optical transmitter, when the optical input signal has an OMI of 15% and the module output gain is 42 dB, the corresponding relationship between the optical input signal power and the output level is shown in the diagram below.

OMI 15%, Gain 42 dB	
OPT input (dBm)	RF OUT (dBmV)
-12	56
-13	54
-14	52
-15	50
-16	48
-17	46
-18	44
-19	42
-20	40
-21	38
-22	36
-23	34
-24	32
-25	30
-26	28
-27	26
-28	24

4.5 Pilot Signal and FSK Decoding (only for RRAF)

The RRAF module has an internal pilot-signal regulating function, which has the capability to receive information from the optical transmitter for remote-node status monitoring (SMS). Data is modulated on a 4.5 MHz carrier wave using Frequency-shift keying (FSK) and the RRAF filters the pilot signal from the RF signal for further processing.

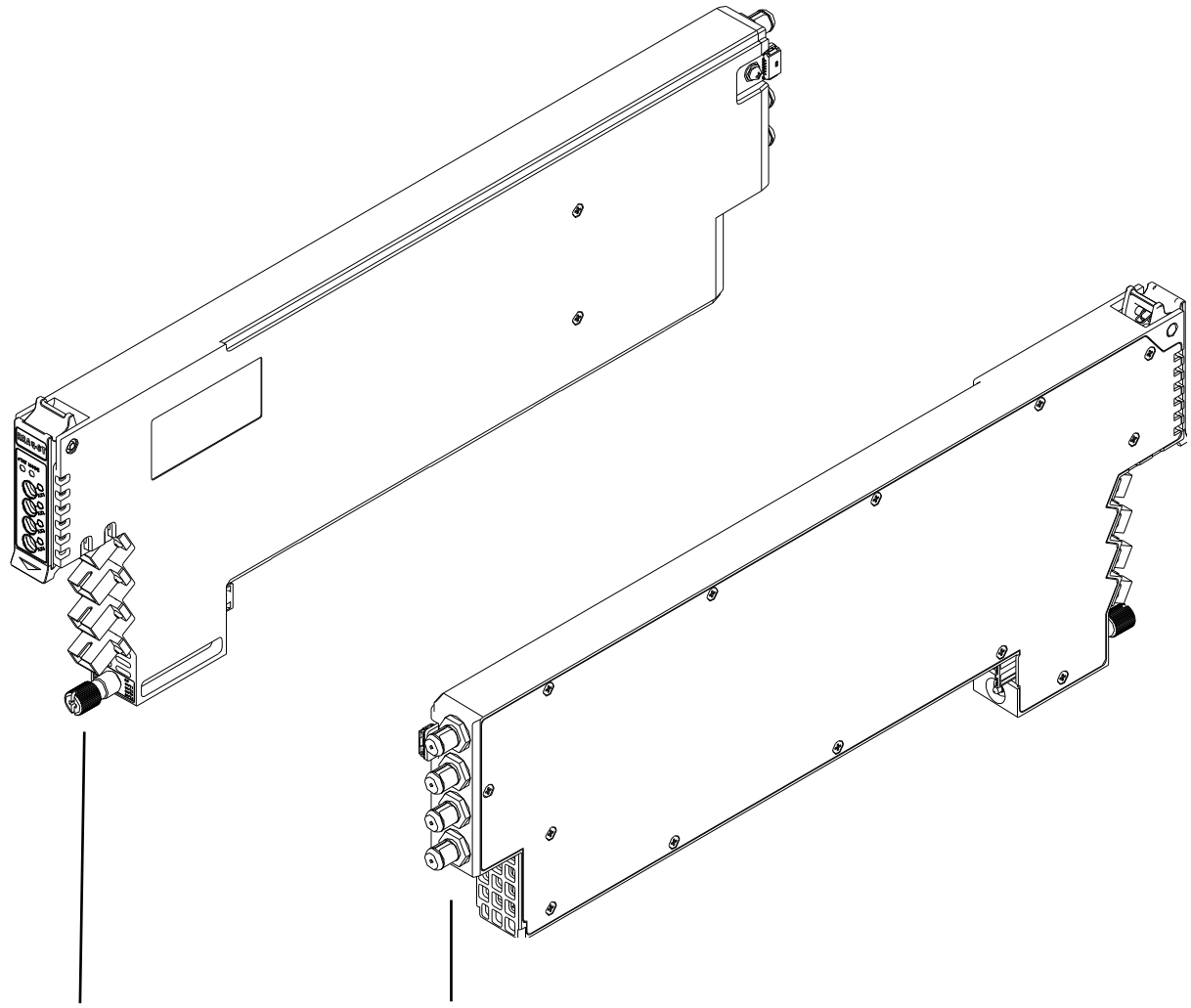
The FSK decoding circuitry samples each channel, and then locks on to the pilot carrier frequency. The demodulator circuit feeds the data stream to the controller to validate the data, extract it, and prepares it for display. Each of the four channels is treated independently and each can have status monitoring enabled or disabled.

4.6 Hot-Swap Function Overview

The Hot-Swap function enables quick replacement of a module while the chassis is powered on. The replacement module automatically downloads the configuration parameters of the previous module after powering on. This works only for modules of the same type. The ASMM management module stores all configuration parameters for each inserted module. The inserted module needs to be set to download configuration for settings and parameters to be automatically configured.

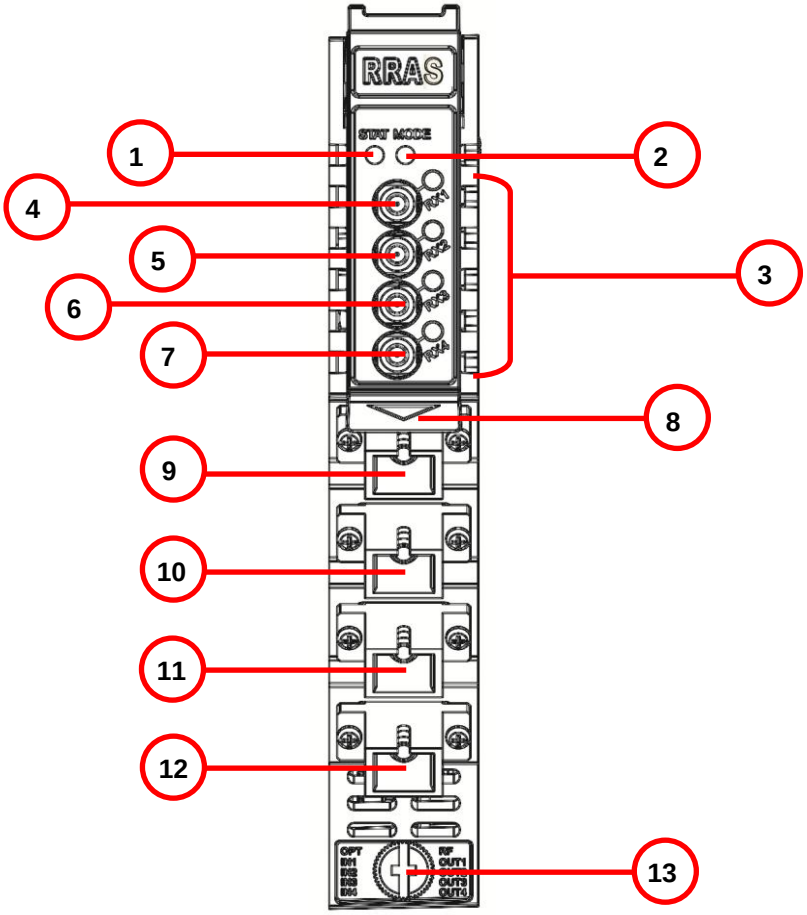
5 Module details

5.1 Front Panel and Rear Panel View



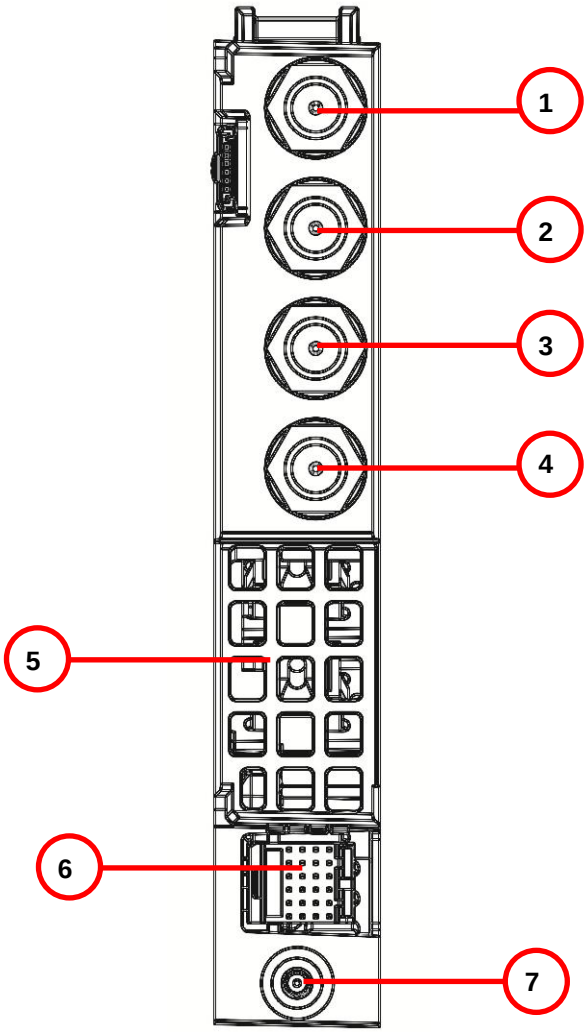
Front Panel **Rear Panel**

5.1.1 Front Panel View



Item	Description
1	STAT LED
2	MODE LED
3	LED status indicators (see **Chapter 6.7.3**)
4	RX1 Test Point (Mini-SMB connector)
5	RX2 Test Point (Mini-SMB connector)
6	RX3 Test Point (Mini-SMB connector)
7	RX4 Test Point (Mini-SMB connector)
8	Orange Tab-Retaining Clip
9	OPT IN 1 (Optical Input 1)
10	OPT IN 2 (Optical Input 2)
11	OPT IN 3 (Optical Input 3)
12	OPT IN 4 (Optical Input 4)
13	Module Retaining Screw

5.1.2 Rear Panel View



Item	Description
1	RF OUT 1 (RF output port with GSK-type female connector)
2	RF OUT 2 (RF output port with GSK-type female connector)
3	RF OUT 3 (RF output port with GSK-type female connector)
4	RF OUT 4 (RF output port with GSK-type female connector)
5	Air Vent
6	Multi-pin connector
7	Placement Pin

Note:

RF1 ~ RF4 OUT connect with the blind RF connectors at the rear of the AIMA3000 chassis.

6 Installation

6.1 Preparatory Work for Installation

Before installing this device, you must ensure that the unit is intact and ready for installation.

Unpack and check the unit: Open the box to check for any damage that may have occurred during shipment.

If damage is found, please contact a PBN customer support representative.

Necessary equipment and tools for installation:

Table 6-1 Necessary equipment and tools for installation

Tools/Modules	Description
Phillips screwdriver PH1/PH2	For use with the AIMA3000 chassis
RRAS / RRAF / RRAG Module	The module to install into the AIMA3000 chassis

6.2 Unpacking

Unpack the module. Keep the packaging materials for future transport needs.

Check the package manifest, record the product module type, serial number, purchase date, and any other relevant information to facilitate later management and maintenance.

Table 6-2 Packing Manifest

No.	Description	Qty
1	RRAS / RRAF / RRAG Module	1
2	Individual test sheet (Certificate of Performance)	1

6.3 Power and Cooling Requirements

The RRAS / RRAF / RRAG module is powered by the power supply in the AIMA3000 chassis. The module can consume up to 8 W.

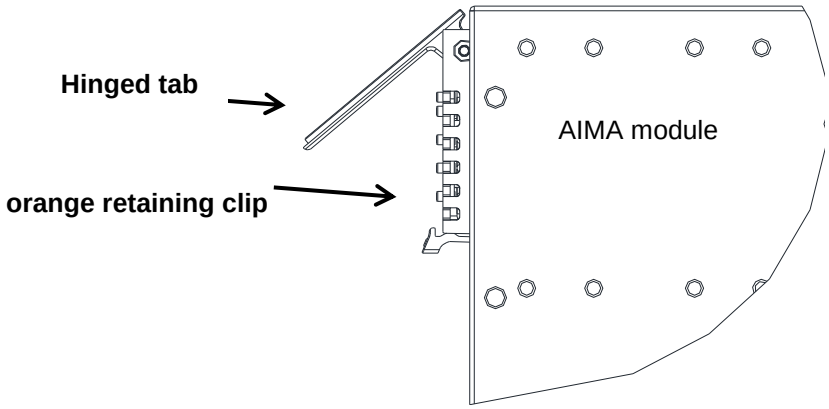
The RRAS / RRAF / RRAG module and its corresponding AIMA3000 chassis should be located in an environment where the temperature range is from -5 ºC to +55 ºC with the AIMA3000 fans running.

If the temperature exceeds these limits, the AIMA3000 should be relocated in the equipment rack where the ambient temperature is less than +55 ºC.

The AIMA3000 chassis should have adequate ventilation clearance. See the installation and operating instructions for your AIMA3000 chassis.

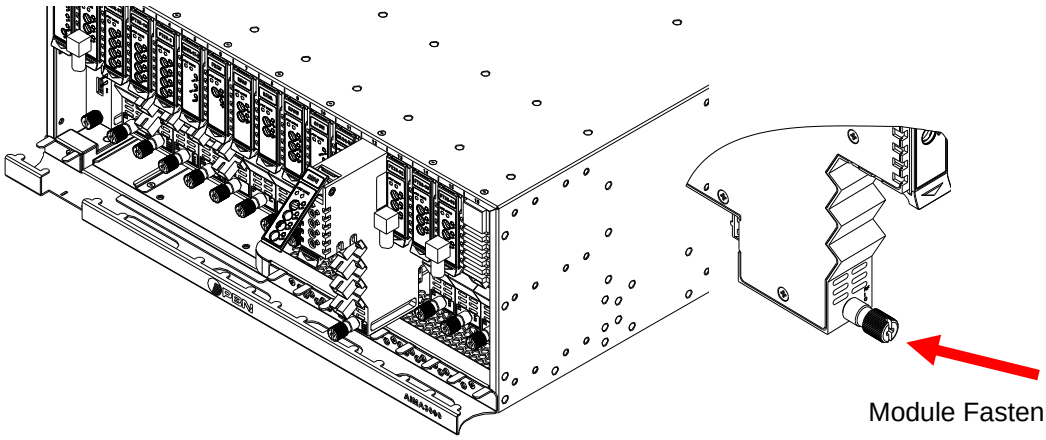
6.4 Module Installation

1. Gently depress the orange retaining clip and release the hinged tab



2. Hold the AIMA module casing upright, align it with the AIMA3000 slide rails for the correct slot, and insert the module until it reaches the multi-pin connector.

   DO NOT use excessive force when inserting the module, but ensure the RF connectors at the rear of the module are securely connected with the chassis's RF connectors.



CAUTION!

The module MUST be installed correctly to ensure a proper connection of the module's multi-pin connector and the backplane.

Tip:

When inserting the module into the guide rails, vertically tilt the module slightly to check that the guides are properly seated on the rails. The module is guided to the correct position using the large metal fastening screw on the lower part of the front panel.

3. After the module is inserted, gently push the hinged tab until it snaps into the Orange retaining clip. While pushing down on the hinged tab, the AIMA module will mate with the power bus and will lock in into the chassis

CAUTION!

If force is required to insert a module, then it may not be correctly seated on the slide rails, or the mounting screw may be misaligned.

4. When the module is fully seated within the chassis, on the of the AIMA module, fasten the spring-loaded mounting screw. **Only use fingers to fasten the mounting screw. DO NOT use a screwdriver**

6.4.1 Checking the optical input-signal level

Before connecting optical cables to the RRAS / RRAF / RRAG module, the input-signal level must be checked using an optical power meter, to ensure it is within the specifications. All optical inputs must be checked.

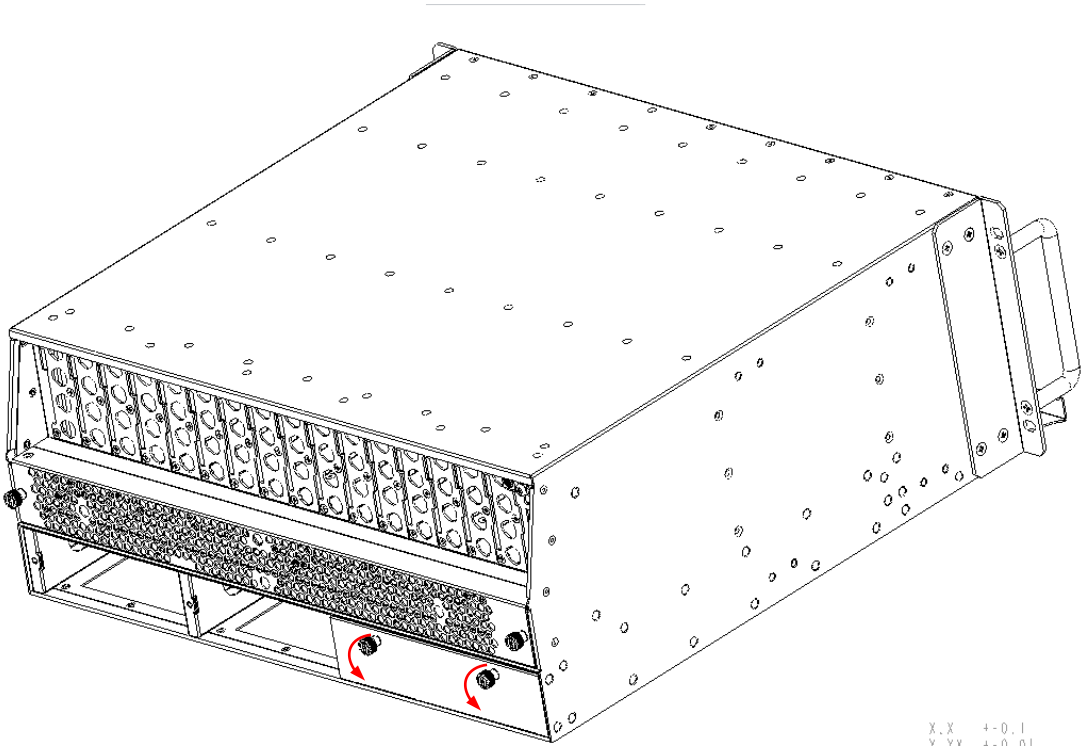
6.5 Connecting the optical cables

For the convenience of the user, the AIMA3000 Chassis has a Sliding Fiber Guide to help the operator to arrange the cables. For the specific steps to connect the fiber, please refer to the instructions in section 5.4.1.

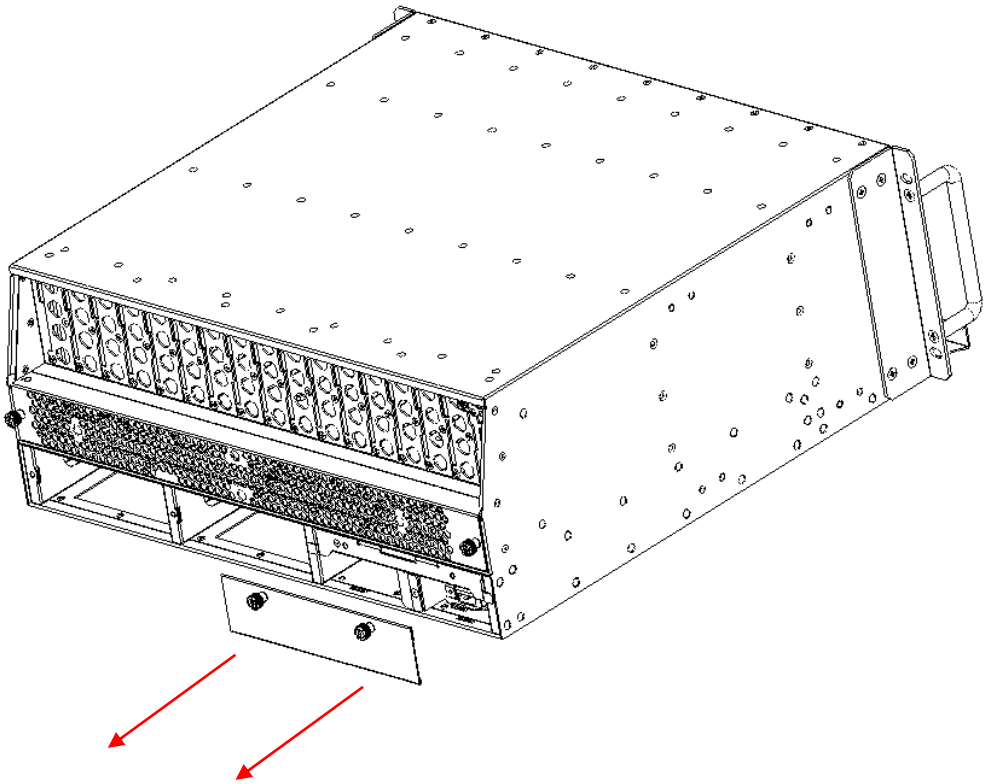
6.5.1 Using the Sliding Fiber Guide

The sliding fiber guide is located in the lower-left corner of the chassis if looking at the front of the chassis, and is designed to help installation of the optical fiber cabling. To access the sliding fiber guide you will need to first remove the rear panel located on the back of the chassis.

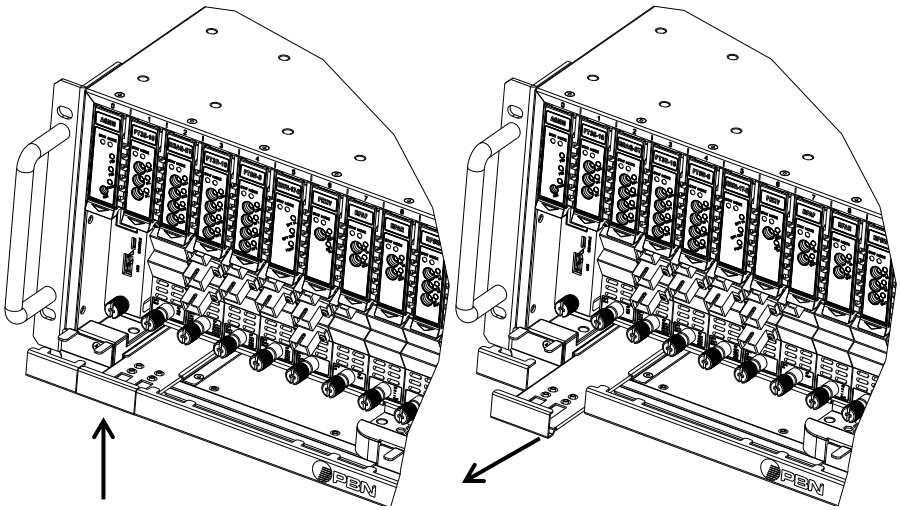
1. Unscrew the two thumbscrews on the rear panel.



2. Then, pull the panel forward.

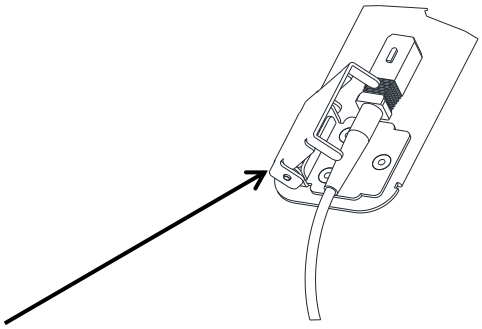


3. Then lift up the handle and slide the fiber guide out of the front of the chassis.



DO NOT remove the dust cap from the fiber connector until right before connecting it to the input port.

4. Raise the clip, insert the fiber connector, and then lower the clip over the connector.



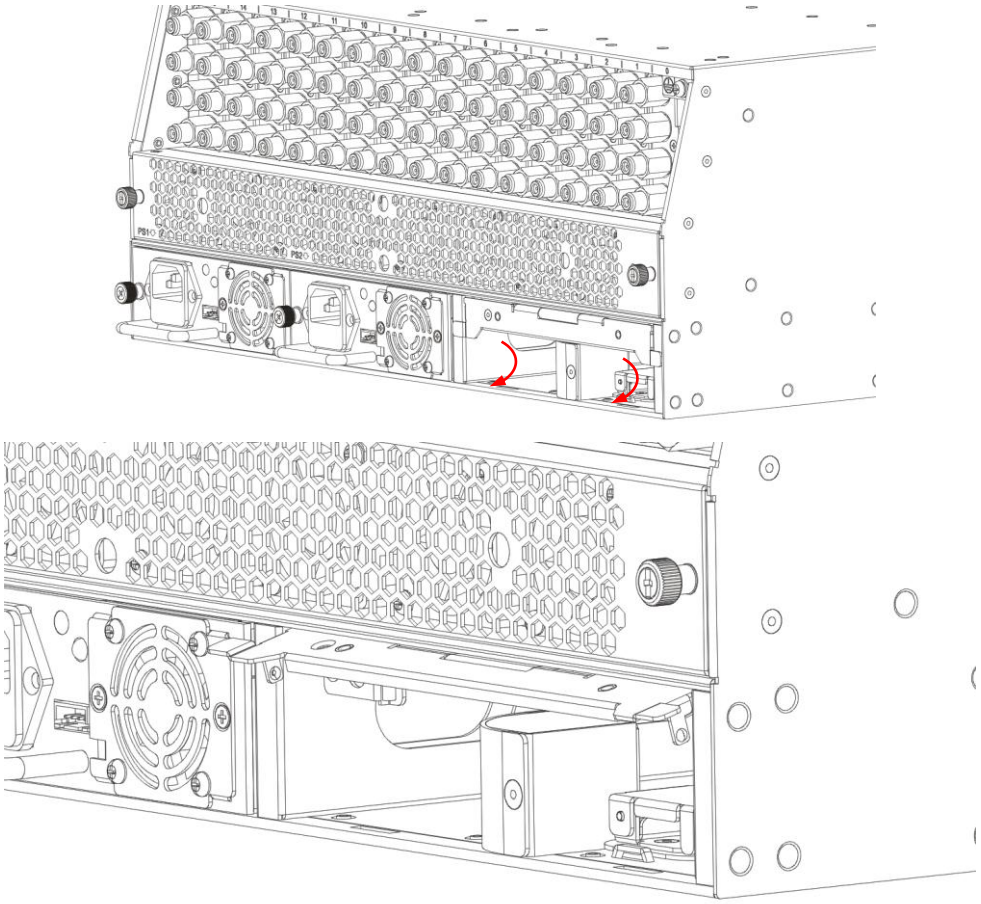
When using the sliding guide, put the fiber connector in the clip and slide it in from the rear to the front, through the chassis. Ensure that the optical fiber tail does not become trapped or pulled tightly.

Fiber clip (at rear, for up to 2 connectors) **Handle (at front)**

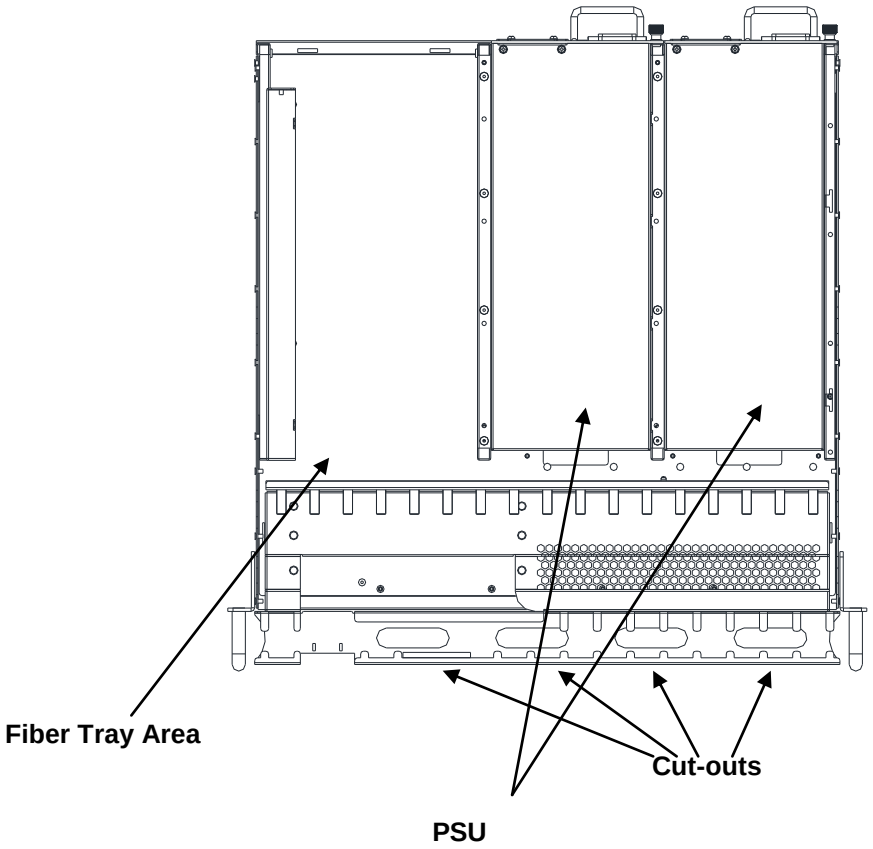
6.5.2 Using the Fiber Tray

All optical fibers must be organized in a tidy manner in the chassis's fiber tray, which provides enough space for up to 64 optical fibers. This allows for easy positioning and future replacement of optical fibers. Along the front of the chassis, there are cut-outs for keeping the optical fibers in position.

1. When organizing the optical fibers, lift up the metal flap at the rear of the panel above the sliding guide. This will allow fiber cables to be moved away from the sliding guide rails.

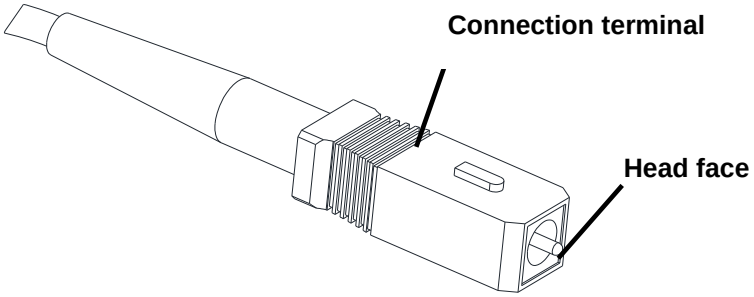


2. Use the Fiber Guide Tool to organize the cables and wires in the fiber tray to prevent tangles and the blocking of the guide rails.



6.5.3 Cleaning the Fiber Connector Ends and the Front-panel Optical Ports

To obtain a good-quality optical input signal, optical fiber input ports and fiber connector ends must be carefully cleaned.



When cleaning the optical fiber-connector end, remove the dust cap and then use a lint-free cloth dampened with a static dissipative solvent to clean the angled surface. Dry the surface using a dry lint-free cloth.

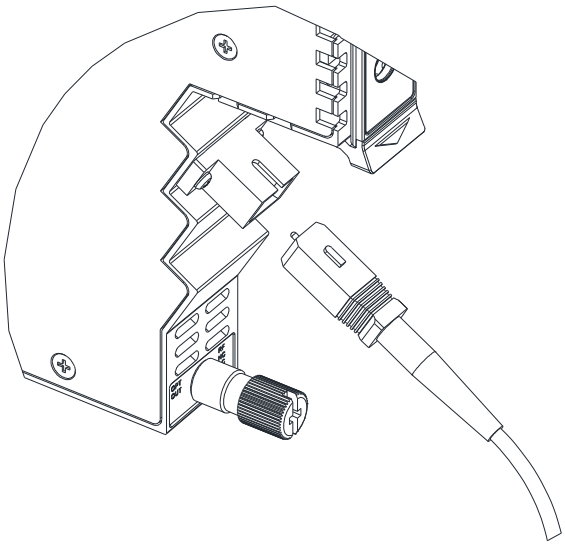
To clean the front-panel optical port, use a special lint-free swab that is designed for this purpose. Dampen it with a static dissipative solvent. Apply slight pressure to the internal angled surface of the optical port, while rotating the swab 90 degrees back and forth. You may need to remove excess solvent using a dry lint-free swab. Alternatively, a cleaning pen such as the one click cleaner can be used.

SC one click cleaning pen

www.oneclickcleaner.com

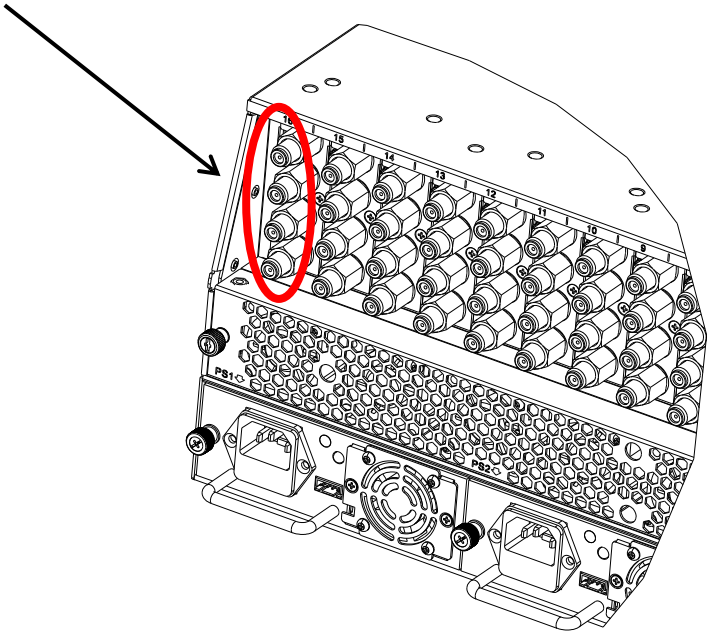
6.5.4 Connecting the Optical Fibers

Carefully lift up the hinged cover of the optical input port, align the raised tab on the connector with the slot in the port. Insert the connector until the connector is securely held in place indicated by a clicking sound.



6.6 Connecting RF cables

RF output ports 1 ~ 4



Rear of the AIMA3000 chassis

Connect the RF cables to the F-type connectors at the rear of the AIMA3000 chassis. The connectors are numbered 1 ~ 4 from top to bottom. If any RF connectors are unused, use a 75 Ω terminator to cover the port.

6.7 Power-on testing

After installing the module, power-on the chassis.

When the chassis is powered on, the LEDs on the front of module start to flash green for approximately 15 seconds.

If the input signal is normal, the STAT LED will be green. If there is no input signal, the LED will be red. If there is a low input signal, the LED will be amber.

If the input signal is normal, each of the corresponding RX1 ~ RX4 LEDs should be green.

A red or amber RX1 ~ RX4 LED indicates an RF output problem on the associated receiver port.

6.8 Module Removal

1. Disconnect the optical cables from the front panel of the module and place dust caps on the exposed ports.
2. Unscrew the module retaining screw until it releases.
3. Gently press the orange retaining clip to release the hinged tab.
4. Lift the hinged tab to remove the module from the multi-pin connector.
5. Carefully use the hinged tab to initially pull the module out of the chassis.
6. Then, grasp the module's casing and continue to remove the module from the chassis.

CAUTION!

DO NOT completely pull the module only by the hinged tab, to avoid damage. **Once the module is removed from the chassis, secure the hinged tab in the closed position behind the orange tab-retaining clip.**

Note:

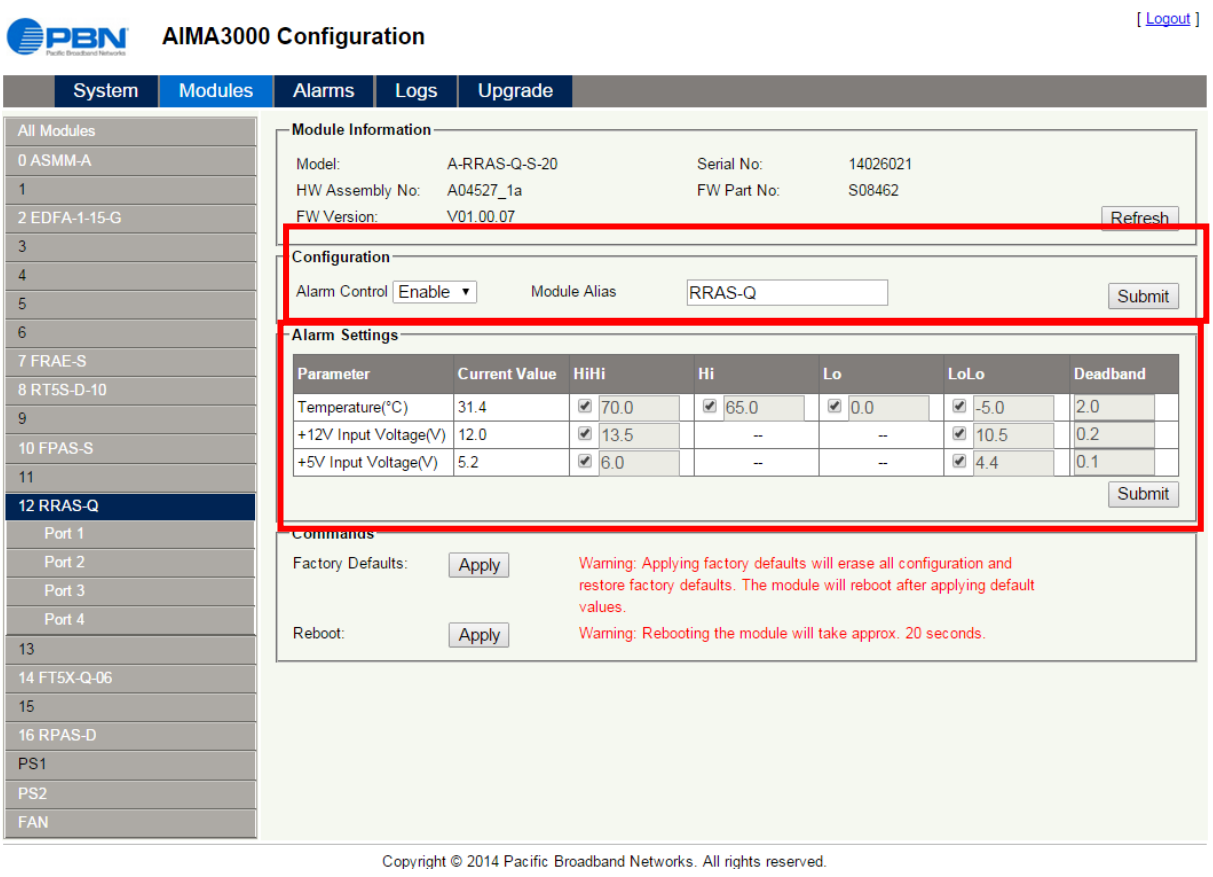
A module can be removed from or inserted into the AIMA3000 chassis while power is being supplied to the AIMA3000. Always place protective dust caps on all optical connectors when not in use.

7 Module Configuration & Alarms

The module configuration settings can be configured using the web interface and PBN's NMSE network management software. This manual only provides details on the web interface. For login details and network setup, please refer to the AIMA-ASMM user manual. If the same module is reinserted in the same slot, the ASMM will restore the previous settings if the module is set to "**Auto Download**" the configuration.

7.1 Port configuration

To set up the RF output, go to **"Modules**" tab, and then select the "**RRAS**", "**RRAF**", or the "**RRAG**". The RRAS / RRAF / RRAG is equipped with four individual receivers, these are listed as "**Port 1**", "**Port 2**", "**Port 3**", and "**Port 4**".



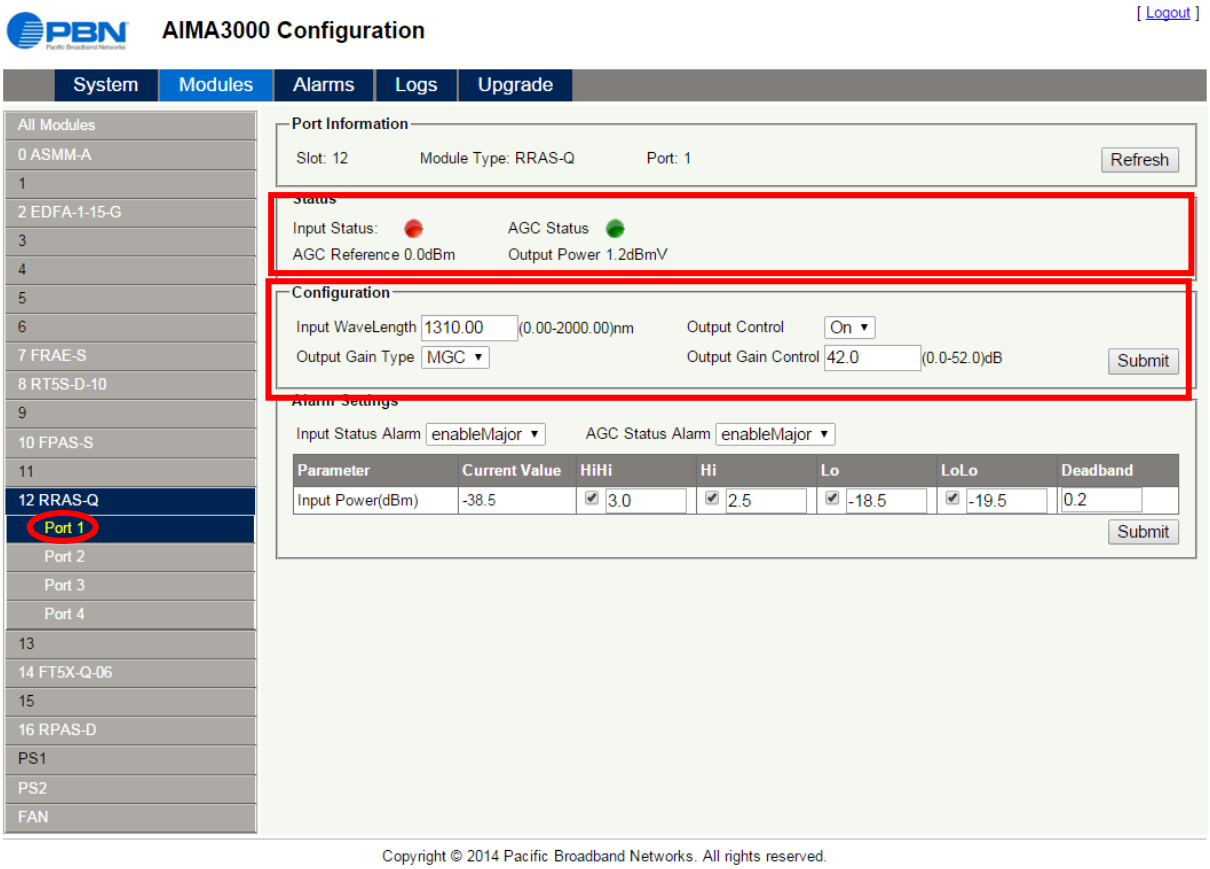
On the main settings page, alarms can be toggled.

Table 7-1 RRAS Common parameters (non configurable)

Parameter	Units	HIHI	HI	Normal	LO	LOLO	DeadBand	Threshold changeable by user	Default Alarm Enable
Temperature	°C	70	60	-	0	-5	2	N	ON
+12V Input voltage	Vdc	13,5	-	12	-	10,5	0,2	N	ON
+5V Input voltage	Vdc	6	-	5	-	4,4	0,1	N	ON

7.2 Setting up the RF output level

When the main RRAS / RRAF / RRAG web interface is opened, on the left toolbar each port can be selected and configured individually. The ports are listed as port 1 – 4. In the example below, **"Port 1"** is selected.



In the setup page for "**Port 1**" the operator can view the module's status for the RRAS:

Field	Description	Factory Default Setting (bold) and range if applicable
Input Status Alarm	Monitors Optical Input Level	**Enable Major** Enable Minor Disable
AGC Status Alarm	Monitors the mode for gain control	**Enable Major** Enable Minor Disable

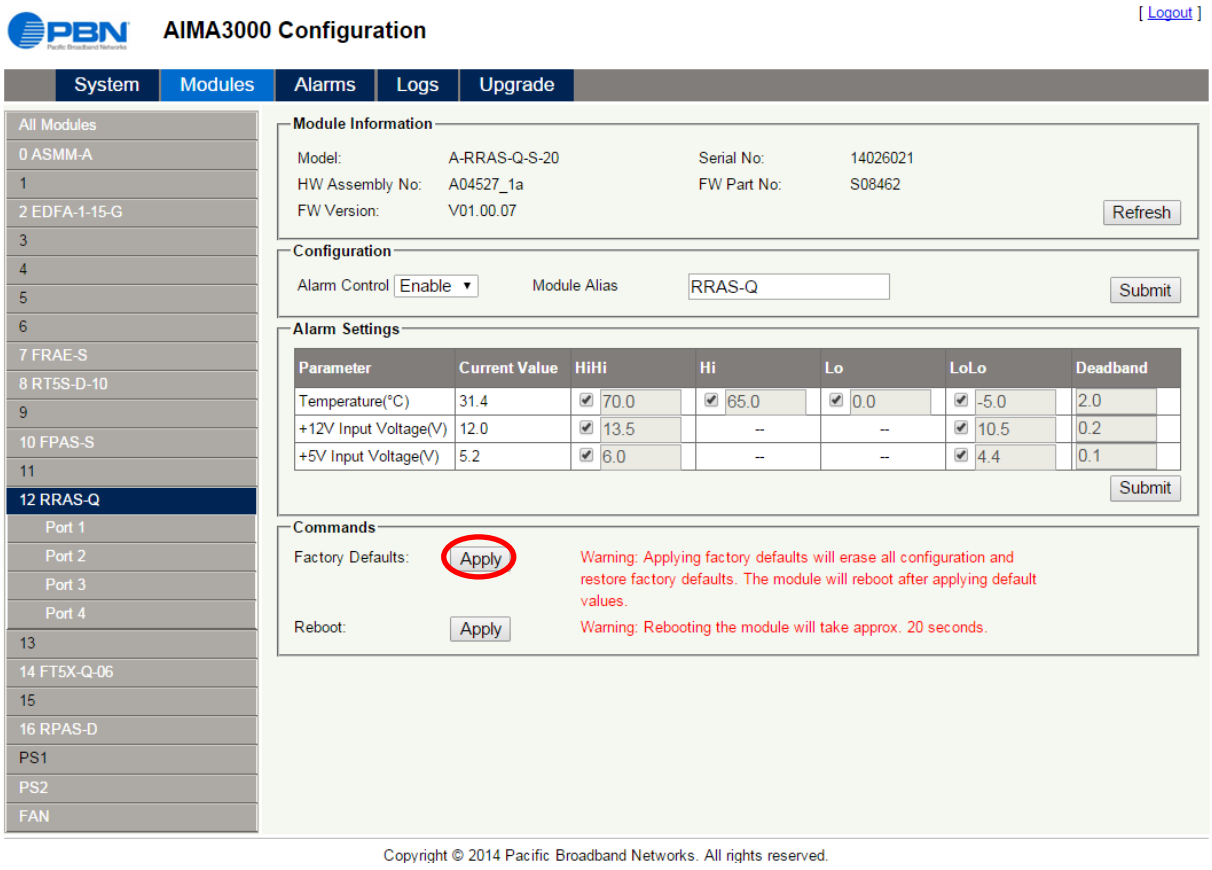
Parameter	Units	HiHi	Hi	Normal	Lo	LoLo	Deadband
Input Power	dBm	3	2,5	-	-18,5	-19,5	0,2

On the configuration section of the page, following settings can be changed.

Setting	Description
Input Wavelength	Can specify the input wavelength for DWDM and CWDM applications
Output Gain Type	Set Automatic Gain Control or Manual Gain Control
Output Gain Control	Can configure attenuators to set proper RF output. Maximum 48 dBmV.
Output Control	Allows RF output to be toggled

7.3 Factory Default Settings

Factory default settings can be restored from the main RRAS / RRAF / RRAG page.



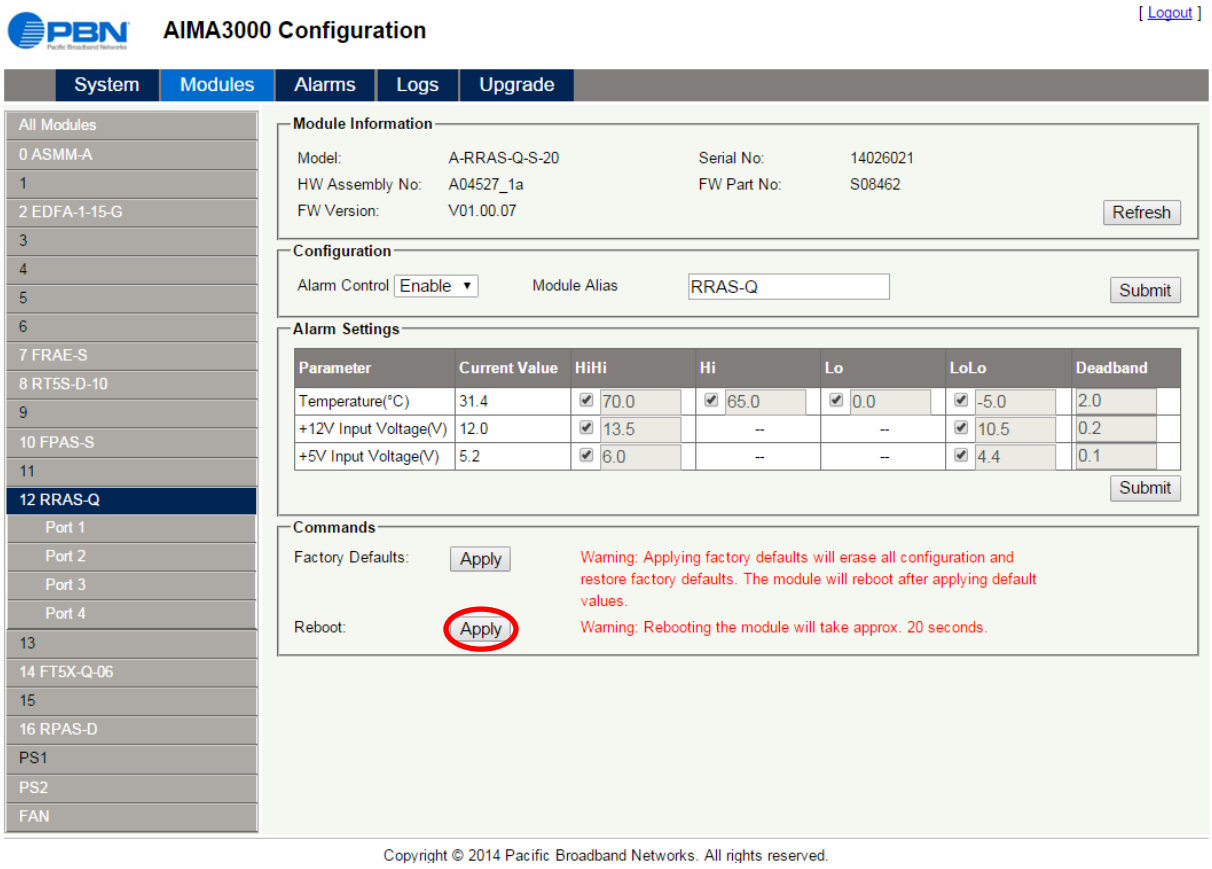
You can apply the factory default configuration by clicking the associated "**Apply**" button.

Factory default settings

Name	Options	Default Value
Alarm Control	Enable / Disabled	Enabled
Output Control	Enable / Disabled	Enabled
Output Gain Type	MGC / AGC	MGC
Output Gain Control	0 ~ 52	42
Remote Node Control	Enable / Disabled	Disabled

7.4 Reboot RRAS / RRAF / RRAG Module

You can reboot the RRAS / RRAF / RRAG module by clicking the associated "**Apply**" button in the "**Commands**" section of the RRAS / RRAF / RRAG's main configuration page.



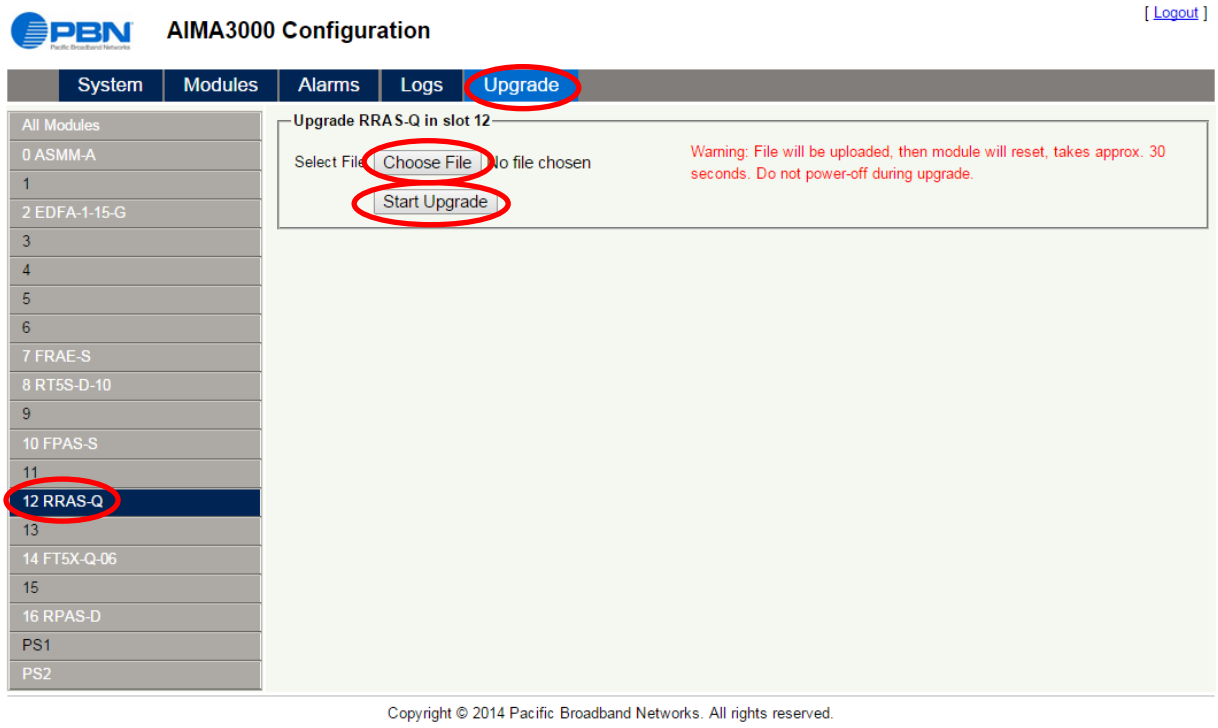
The module's current configuration settings will be retained after rebooting.

7.5 Upgrade RRAS / RRAF / RRAG Firmware

You can upgrade the RRAS / RRAF / RRAG's firmware by performing the following steps:

Click the "**Upgrade"** tab on the top menu bar.

On the left column, click the corresponding "**RRAS"** that needs to be upgraded.



Click "**Choose File**" button and navigate to the new firmware file.

Select the file and then click the "**Start Upgrade**" button. After the firmware has been upgraded, the RRAS / RRAF / RRAG module will reset and a message will appear confirming the upgrade process has been completed.

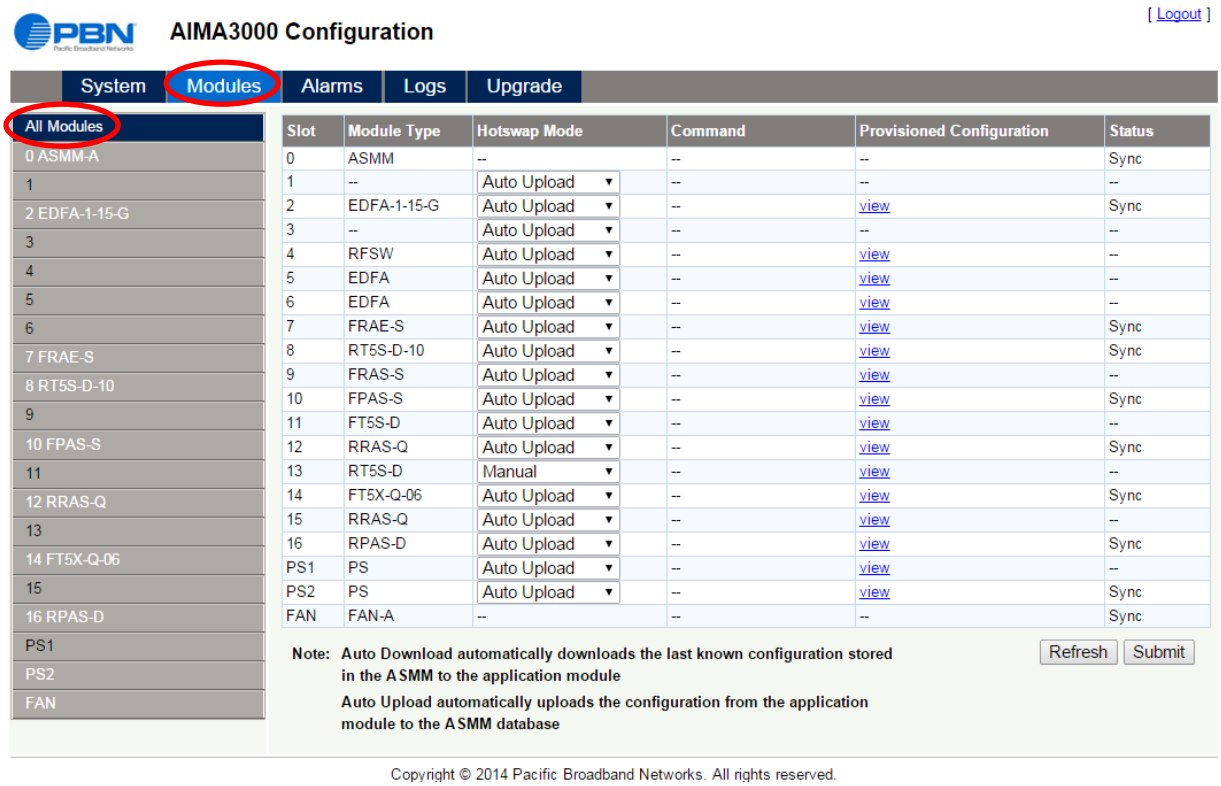
** The upgrade file will need to be located in the PC that is connected to ASMM*

** The web interface only supports the manual upgrades from a locally connected PC.*

** The RRAS / RRAF / RRAG supports automated firmware updates and automatic backup & restore features via TFTP when managed by PBN's NMSE management software. Please refer to the NMSE Product User Manual for more information.*

7.6 Hot-swap Configuration

Click the "**Modules**" tab on the top menu bar.
Click the "**All Modules"** label on the left column of the "**Modules**" page.



For each chassis slot (1 ~ 16), you can configure the application module's hot-swap Mode. There are three possible settings in the drop-down list for each slot:

Hot-swap mode	Description
Auto Download	When a new application module is inserted into a slot that previously contained the same type of module, the last known configuration is automatically downloaded from the ASMM module
Auto Upload	When you insert an application module into the slot, its settings are automatically uploaded to the ASMM module
Manual	Automatic transfer of the module's configuration is disabled.

Note:

You can use this feature to configure identical application modules to automatically have the same settings.

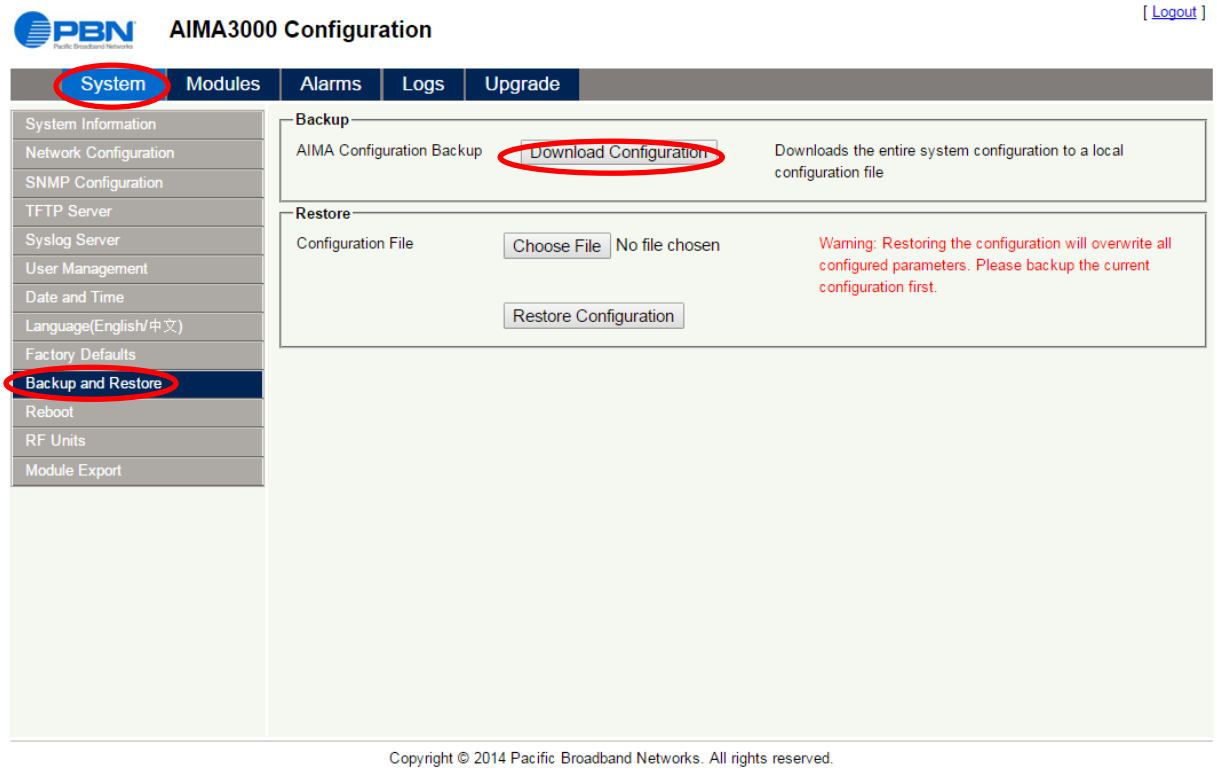
First, automatically upload the configuration settings you want from a pre-configured module. Then remove the module and change the slot's Hot-swap Mode from "**Auto Upload**" to "**Auto Download**".

Now, each new module of the same type that is inserted into this slot will automatically be configured with the previously uploaded settings.

7.7 Backup and Restore Feature

Click on the "**System"** tab on the top menu bar.

Click the "**Backup and Restore"** label on the left column of the System page.



Backup

You can use this feature to backup the entire AIMA3000 system's configuration settings to a local file.

Click the "**Download Configuration"** button and then choose the filename and destination folder.

Click "**OK"** to save the file.

Restore

CAUTION!

Restoring the configuration will overwrite all configured parameters. Ensure that you first backup the current system configuration.

To restore previously saved system configuration settings, first click the "**Choose File**" button. Navigate to the configuration file you want to restore.

Select the file, its name will appear in the box to the right of the "**Choose File**" button.

Click the "**Restore Configuration"** button.

** The backup and restore function will work with a device that is using the web interface and is connected to the ASMM*

** The web interface only supports the manual backup and restoration of configuration files from a locally connected device.*

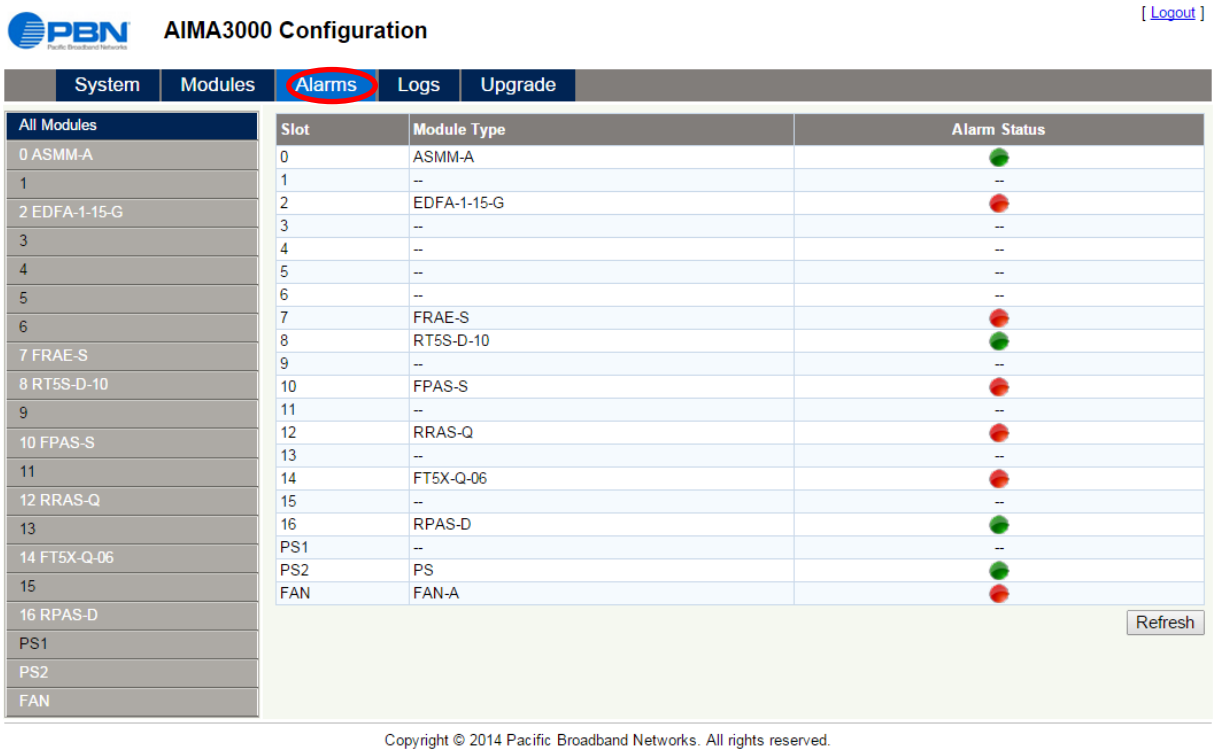
** The RRAS / RRAF / RRAG support automated firmware updates and automatic backup / restore via TFTP when managed by PBN's NMSE management software. Please refer to the NMSE Product User Manual for more information.*

7.8 Alarm Monitoring

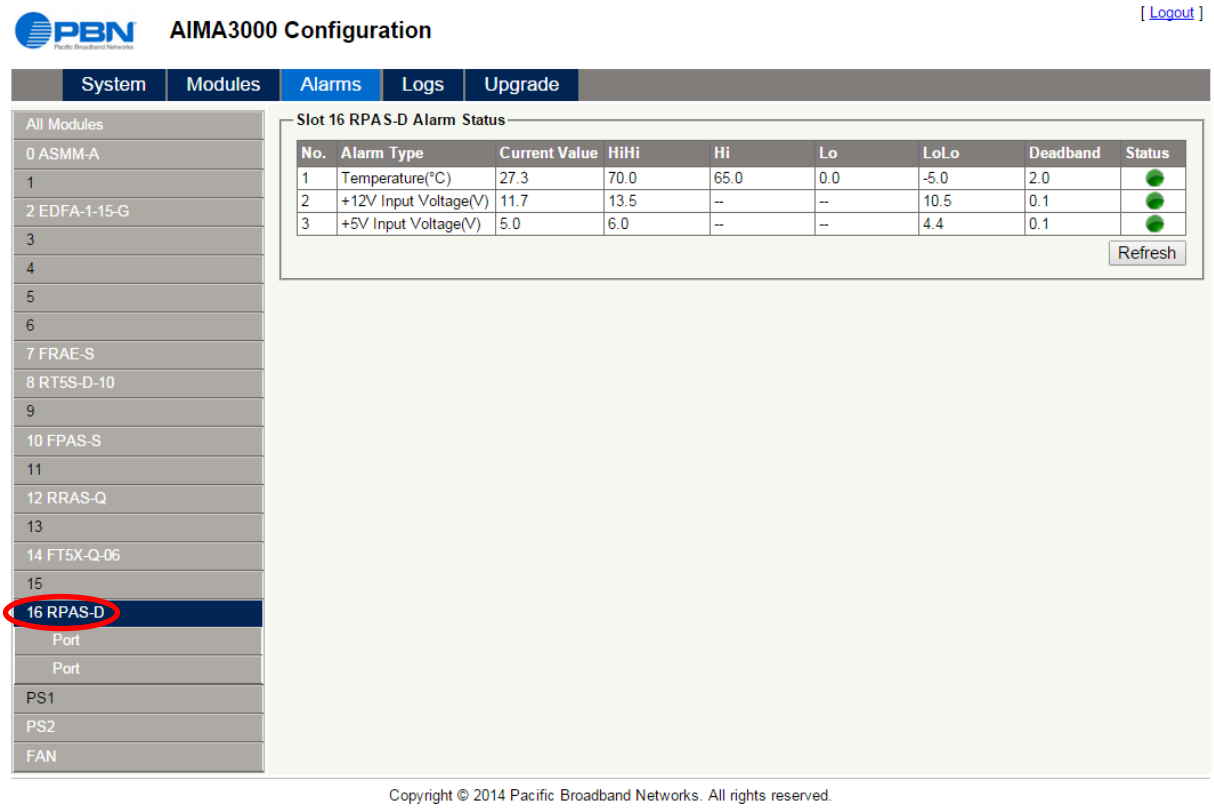
All alarm information is monitored by the ASMM module. If an alarm occurs, you can view the associated page to find information that is more detailed.

7.8.1 Alarm Status Pages

Click the "**Alarms"** tab from the top menu bar to display an overview of the alarm status of all the installed modules (normal: **green**; alarm: **red**).



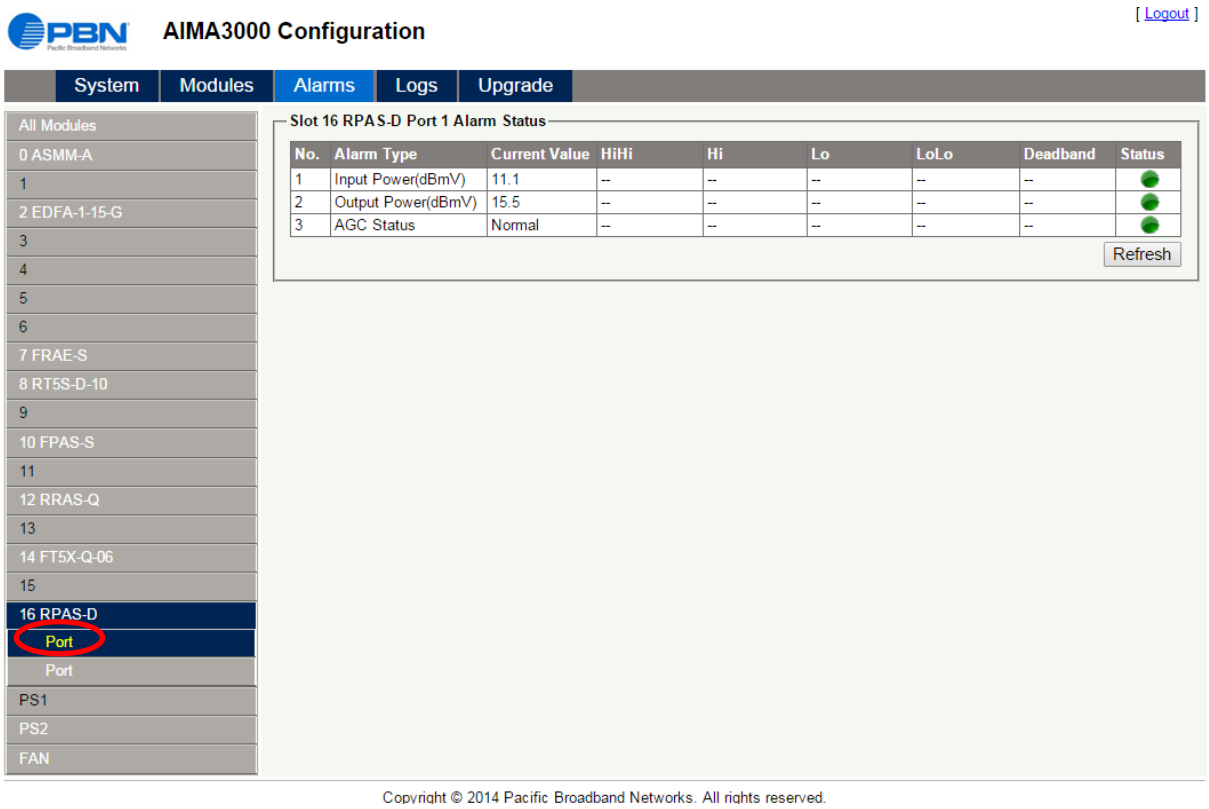
For more detailed alarm information, click on the associated **RRAS / RRAF / RRAG** module in the left column of the "**Alarms"** page. This page shows temperature and input voltage alarms for the selected module.



Three types of alarm status are displayed:

- Normal: **Green**
- Minor Alarm: **Amber**
- Major Alarm: **Red**

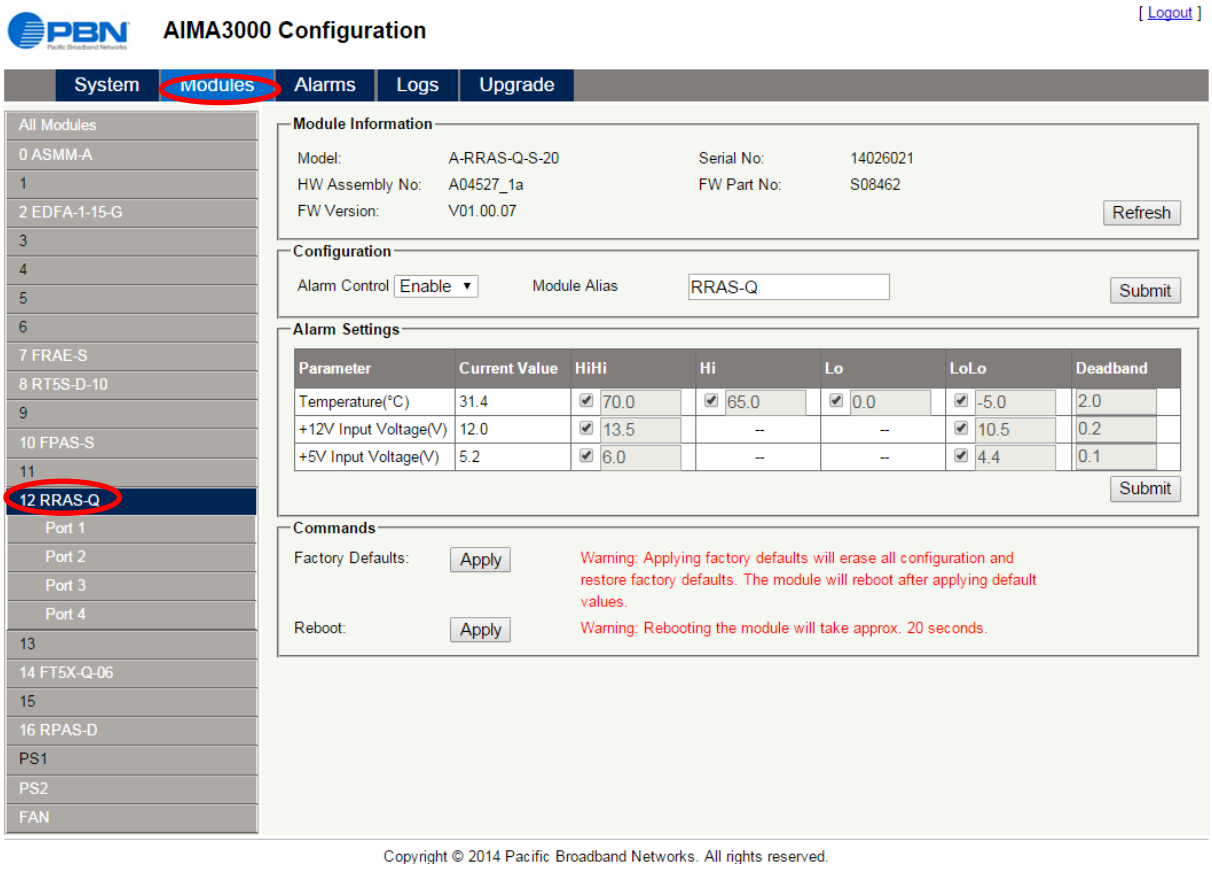
An individual port's alarm status can be viewed by clicking an RRAS / RRAF / RRAG's Port Number, for example "**Port 1"**. This page shows input power, input status, FSK (for RRAF only) status, and the AGC status alarms.


[Logout]
AIMA3000 Configuration
System
Modules
Alarms
Logs
Upgrade
All Modules
0 ASMM-A
1
2 EDFA-1-15-G
3
4
5
6
7 FRAE-S
8 RT5S-D-10
9
10 FPAS-S
11
12 RRAS-Q
13
14 FT5X-Q-06
15
16 RPAS-D
Port
Port
PS1
PS2
FAN
Slot 16 RPAS-D Port 1 Alarm Status
No. Alarm Type Current Value HiHi Hi Lo LoLo Deadband Status
1 Input Power(dBmV) 11.1 -- -- -- -- --
2 Output Power(dBmV) 15.5 -- -- -- -- --
3 AGC Status Normal -- -- -- -- --
Refresh
Copyright © 2014 Pacific Broadband Networks. All rights reserved.

7.8.2 Alarm Settings Configuration

Click on the "**Modules"** tab on the top menu bar.

Click on the associated **RRAS / RRAF / RRAG** module from the left column of the "**Modules"** page.



Module Information (read only)

This page displays the Model, Serial Number, HW Assembly Number, FW Part Number, and FW Version.

Click on the "**Refresh"** button to update the module's status.

Configuration

Alarm Control (Enable / Disable)

Choose the setting from the drop-down menu and then click the "**Submit"** button to confirm any changes.

Alarm Settings

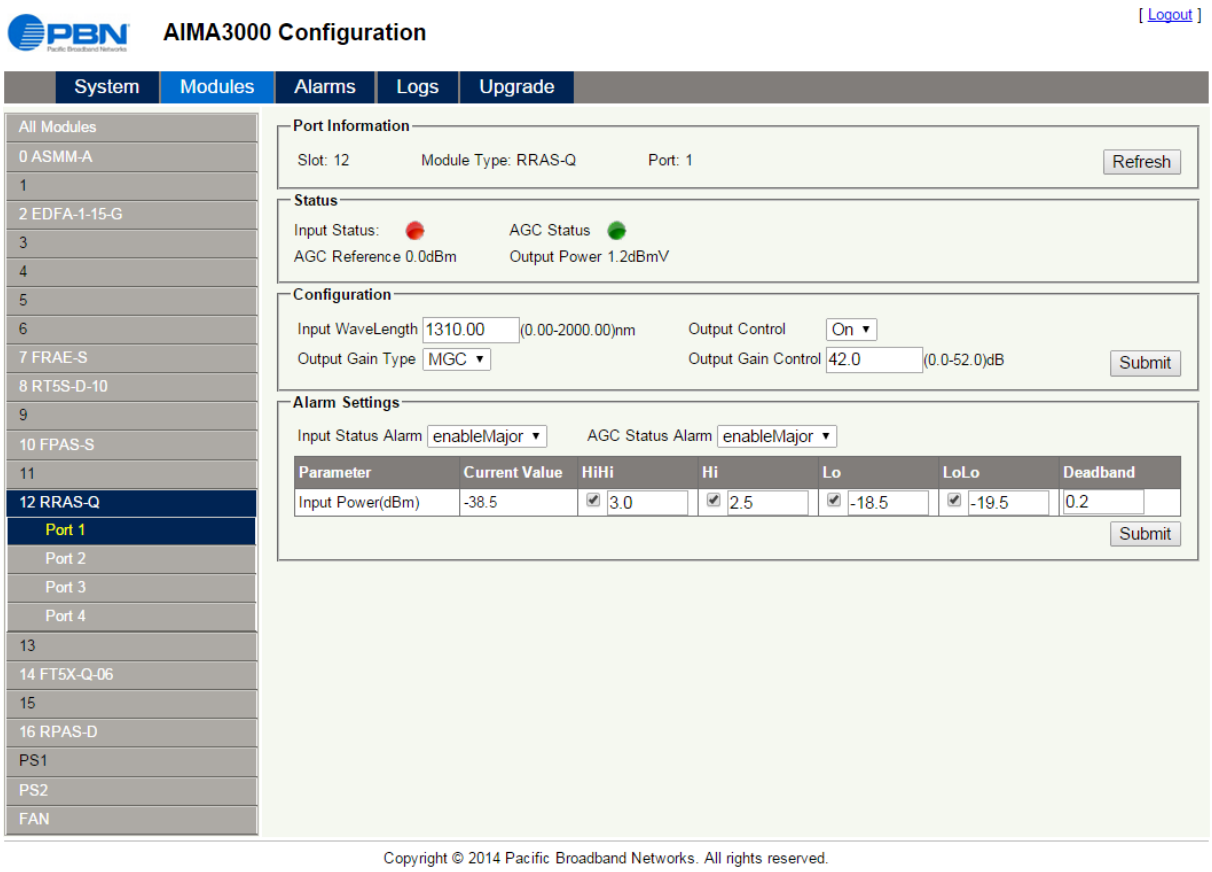
You can toggle individual Temperature and Input Voltage alarms by checking or unchecking the associated boxes. Then, click on the "**Submit"** button to confirm any changes.

> **Note:**
>
> Temperature and Input Voltage alarm parameters cannot be changed by the user.

Factory default alarm settings are shown below.

Parameter	Units	HIHI	HI	Normal	LO	LOLO	DeadBand	Threshold changeable by user	Default Alarm Enable
Temperature	℃	70	60	-	0	-5	2	N	ON
+12V Input voltage	Vdc	13,5	-	12	-	10,5	0,2	N	ON
+5V Input voltage	Vdc	6	-	5	-	4,4	0,1	N	ON

To display Alarm Settings for any of the RRAS / RRAF / RRAG's ports, click a port number, for example "**Port 1**", on the left column of the "**Modules**" page.



Alarm Settings	Factory Default Setting (bold)
Input Status Alarm	**Enable Major** Enable Minor Disable
AGC Status Alarm	**Enable Major** Enable Minor Disable

Parameter	Units	HiHi	Hi	Normal	Lo	LoLo	Deadband
Input Power	dBm	3	2,5	-	-18,5	-19,5	0,2

Click on the value of an enabled alarm you want to change, and then enter the new value. If the box next to the value is checked then the value can be changed.

You can also toggle individual alarms by checking or unchecking the associated boxes.

Click on the "**Submit"** button to confirm changes.

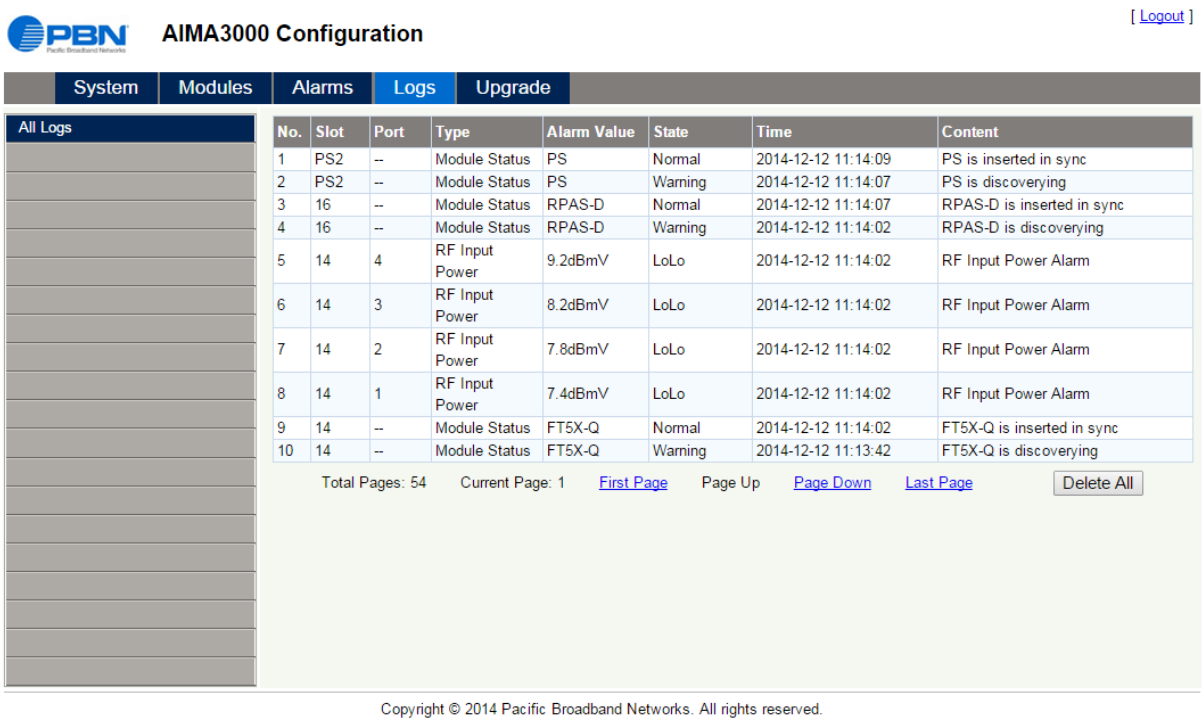
7.8.3 LED Status Indicators

STAT	MODE	RX1	RX2	RX3	RX4	Condition
○	○	○	○	○	○	**All off:** **Power off** – check power supply to AIMA chassis, ensure module is properly inserted into chassis
●	●	●	●	●	●	**All flashing green** (1 times per second): Module initializing
N/A	●	N/A	N/A	N/A	N/A	**Constant green**: No alarm
●		●	●	●	●	**Constant amber**: Warning Low or Warning High alarm
N/A	●	N/A	N/A	N/A	N/A	**Flashing green** (1 time per second) Module operating in MGC mode
●	N/A	N/A	N/A	N/A	N/A	**Constant red**: Critical Low or Critical High alarm
●	N/A	N/A	N/A	N/A	N/A	**Constant amber**: Warning Low or Warning High alarm

STAT	MODE	RX1	RX2	RX3	RX4	Condition
	N/A		N/A	N/A	N/A	**Constant Red**: RX1 Critical Low or Critical High alarm
	N/A		N/A	N/A	N/A	**Constant Amber**: RX1 Warning Low or Warning High alarm
	N/A	N/A		N/A	N/A	**Constant Red**: RX2 Critical Low or Critical High alarm
	N/A	N/A		N/A	N/A	**Constant Amber**: RX2 Warning Low or Warning High alarm
	N/A	N/A	N/A		N/A	**Constant Red**: RX3 Critical Low or Critical High alarm
	N/A	N/A	N/A		N/A	**Constant Amber**: RX3 Warning Low or Warning High alarm
	N/A	N/A	N/A	N/A		**Constant Red**: RX4 Critical Low or Critical High alarm
	N/A	N/A	N/A	N/A		**Constant Amber**: RX4 Warning Low or Warning High alarm
N/A	N/A					**Flashing Any Color**: Communication with remote node in progress

7.9 Log Management

Click on the "**Logs"** tab on the top menu bar to display an event history of all recorded alarms for all the installed modules.



If there is more than one page of events to display, you can display other pages using the links at the bottom of the displayed list.

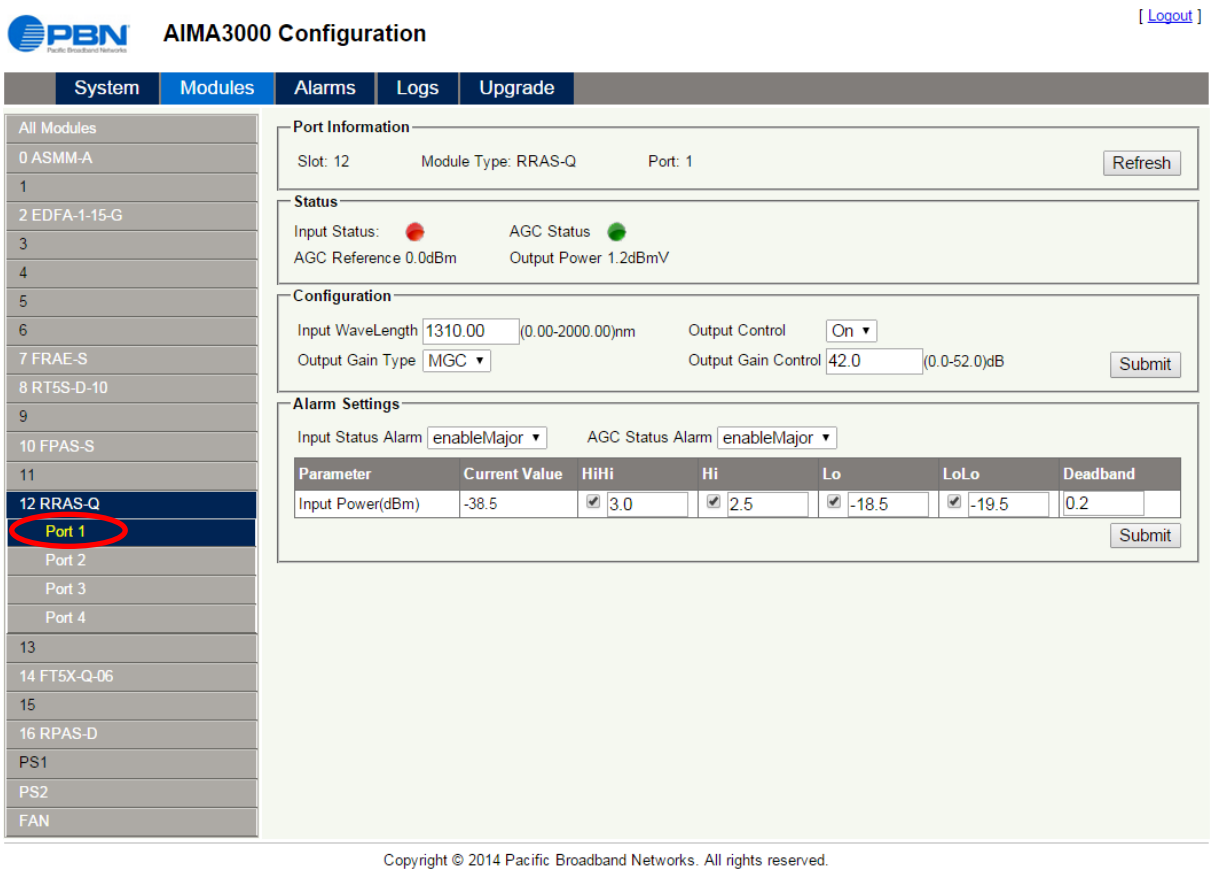
To clear all existing events from the log, click the "**Delete All"** button. You must confirm or cancel this action by clicking on the "**OK"** or "**Cancel"** button in the pop-up dialog box.

7.10 Port Configuration

Ensure that you are familiar with the LED status indicators, alarm functions and port configuration functions before making any changes to the port configuration settings.

7.10.1 Using the Port Configuration Page

To display the configuration settings for any of the RRAS / RRAF / RRAG's ports, click on a port number, for example "**Port 1"**, in the left column of the "**Modules"** page.



Port Information (read only)

This page displays the Slot Number, Module Type, and Port Number.

Click on the "**Refresh"** button to update the above information.

Status

Parameters	Description
Input Status	**Indicates if it is within the normal input range**
AGC Status	**Indicates if the output power is within the normal range (AGC only)**
Output Power (dBmV)	**RF output power**
AGC Reference (dBm)	**AGC reference power**

Configuration

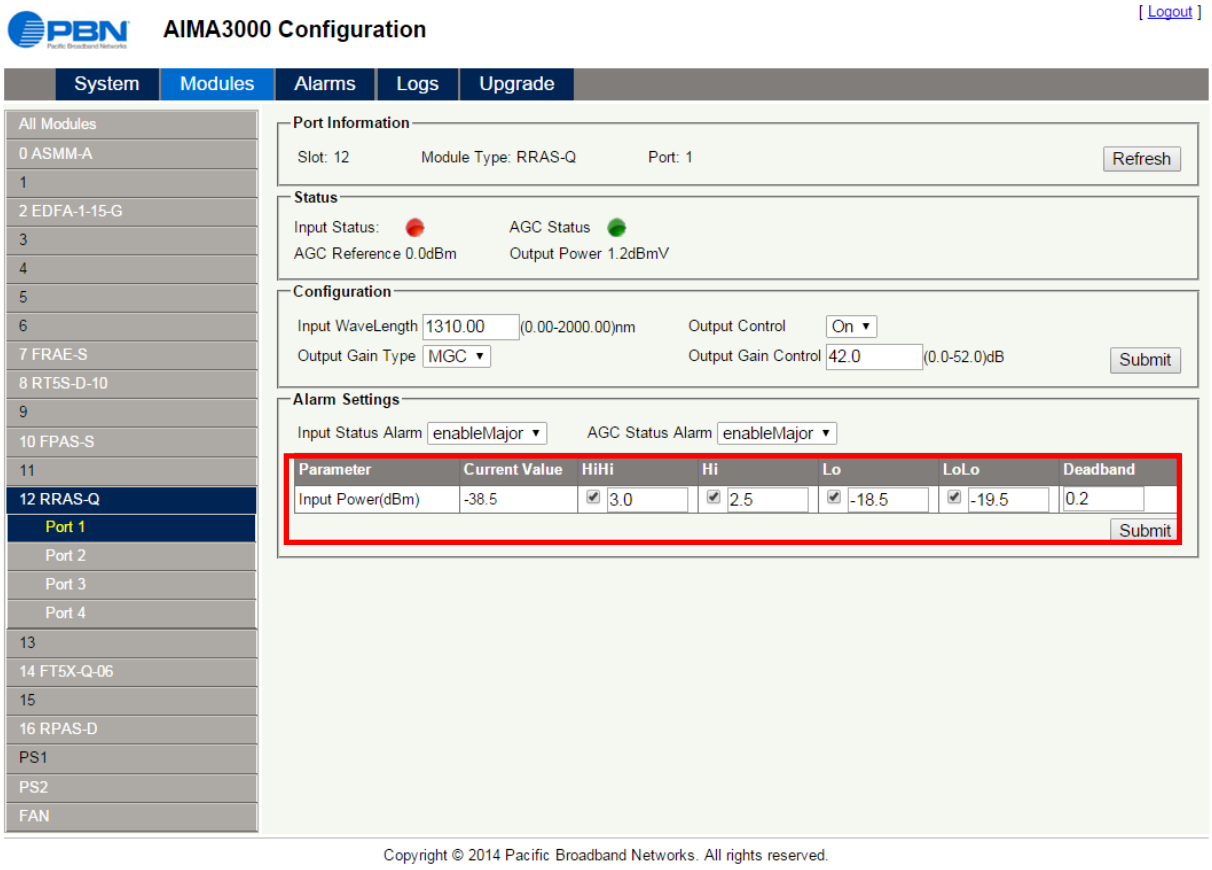
Parameters	Factory Default Setting (bold)
Input Wavelength	**1310 – 1610 nm**
Output Control	**On** Off
Output Gain Type	**MGC** AGC
Output RF AMP Level (dB)	**42.0** (0 ~ 52 dB)

7.10.2 Optical Input Port Signal

Check the current value of the optical input power that is displayed on the page. The acceptable range is between **-18 ~ +2 dBm** for standard RRAS / RRAF models, and between **-28 ~ -12 dBm** for the RRAG.

CAUTION!

Ensure that the difference between the previously measured optical input power level and the displayed RRAS / RRAF / RRAG Port input level is ± 1 dBm. If not, you may need to clean the fiber connector and optical input port.



Click on the "**Submit"** button to confirm any changes.

7.10.3 RF Configuration

CAUTION!

Configure the RF output signal for each port only when the corresponding optical input power level is known to be within acceptable limits.

Configure the RF output signal level on each port in accordance with local requirements:

1. Change the "**Output Gain Type"** to "**MGC"** mode.
2. Adjust the "**Output Gain Control**" level until the RF output is at the required level.
3. If the RRAS / RRAF / RRAG receiver path uses a continuously emitting laser as the transmitting carrier, you can change the "**Output Gain Type**" to "**AGC"** mode.
4. Finally, set the required **AGC** mode.

   In "**AGC"** mode, the port adjusts gain by using the optical input power as a reference.

   The factory default value of output gain is 42 dB and the adjustment range of the optical input level is ± 5 dB.

Note: AGC mode will be maintained with variance in the optical level.

CAUTION!

Both types of AGC modes use the current Output RF Pad Level setting in order to stabilize the output. If the RF pad level is set either too high or too low, this will affect the AGC control range.

8 Common Faults

8.1 Status LED Fault Indications

LED Status	Common Faults	Possible Solutions
Optical Input LED RX1 ~ RX4 Shows Amber	Input Port Optical Gain slightly low and slightly high	Clean the optical port and tail fiber. Check the optical input power; make sure it is within the normal range. If the alarm persists, contact PBN technical support.
Optical Input LED Shows Red	Input Port Optical Gain too Low	Check the optical input power; make sure it is within the normal range.
STAT LED Shows Red	Optical Input Power Abnormal	Bias current abnormal. Contact PBN technical support.
	Room Temperature Too High	Lower the room temperature. If the alarm persists, contact PBN technical support.

8.2 Common Faults – Resultant LED Status

Common Faults	LED Status	Possible Solutions
Input Port Optical Gain too Low	Optical Input LED RX1 ~ RX4 is Red	Clean the optical port and fiber. Check the optical input power; make sure it is within the normal range. If the alarm persists, contact PBN's technical support.
Input Port Optical Gain too High	Optical Input LED RX1 ~ RX4 is Red	Check the optical input power; make sure it is within the normal range.
Optical Input Power Abnormal	STAT LED is Red	Bias current abnormal. Contact PBN's technical support.
Power Supply Fault	STAT LED is Red	Bias current abnormal. Contact PBN's technical support.
Room Temperature too High	STAT LED is Red	Lower the room temperature. If the alarm persists, contact PBN's technical support.

8.3 Other Faults

Fault	Possible Cause	Possible Solution
No power supply to module	No power supply to AIMA chassis	Reconnect/switch on power supply to chassis
	Blown fuse in AIMA PSU	Fit new AIMA PSU fuse
	Faulty AIMA PSU	Replace AIMA PSU
	Damaged multi-pin connector on module	Repair/replace module (contact PBN support)
	Damaged multi-pin connector on chassis	Repair chassis backplane (contact PBN support)
		Try inserting module into a different chassis slot
Module is not recognized when inserted into chassis	Incorrectly fitted module	Re-insert module correctly
	Damaged multi-pin connector on module	Repair/replace module (contact PBN support)
	Damaged multi-pin connector on chassis	Repair chassis backplane (contact PBN support)
		Try inserting module into a different chassis slot
No RF power at output port, or RF power lower than required	Dirty or damaged optical input connector	Clean or replace the relevant optical input connector
	Optical input power level is incorrect	Check optical input power is within specifications
	Incorrectly adjusted Output RF Pad Level	Switch to MGC and adjust Output RF Pad Level
	Faulty RRAS / RRAF / RRAG module	Repair/replace module (contact PBN support)

9 Product Warranty

Pacific Broadband Networks warrants its equipment to be free of manufacturing defects for a period of one year from the date of shipment, provided it is installed and operated in accordance with the factory recommendations.

The liability of Pacific Broadband Networks under this warranty is solely limited to repairing, replacing, or issuing credit provided that:

1. The warranty registration has been completed and received by Pacific Broadband Networks.
2. Pacific Broadband Networks' helpdesk is promptly notified in writing or by telephone that a failure or defect has occurred.
3. A return authorization number is obtained from Pacific Broadband Networks' helpdesk and clearly marked on the outside of the shipping container and all the documents.
4. The customer is responsible for all the shipping and handling charges. C.O.D. and freight collection will not be accepted without prior approval from Pacific Broadband Networks' helpdesk.
5. The equipment (at PBN's sole discretion) has not been abused, misused, or operated under conditions outside the manufacturer's specifications.

The warranty does not cover the following:

1. Products purchased from someone other than an authorized Pacific Broadband Networks dealer.
2. Damage caused by accident, negligence, misuse, abuse, improper operation, or failure to operate the equipment according to the manufacturer's specifications.
3. Damage caused by fluctuation in electrical current, lightning, power surges, etc.
4. Damage resulting from overhaul, repair, or an attempted repair caused by someone other than Pacific Broadband Networks' qualified service personnel.
5. Any product where the serial number has been defaced, modified, or removed.
6. Any product that has been opened or modified without prior written permission from PBN.
7. Replacement of parts necessitated by normal wear and tear.
8. Any consequential or implied damage.
9. Pacific Broadband Networks will not be liable for DFB Laser failure after 90 days from receipt of item. Any claim for DFB Lasers will be presented to the laser vendor for replacement. Pacific Broadband Networks will make every effort to replace faulty lasers although the ultimate decision is at the laser vendor's discretion. Pacific Broadband Networks will cover all the labor costs associated with the replacement of the laser within the one-year warranty period.

10 Declaration of Conformity

According to ISO/IEC Guide 22 and EN45014

Manufacturer's Name:	Pacific Broadband Networks
Manufacturer's Address:	Suite 15, 1st Floor, Building 3, 195 Wellington Road, Clayton, Victoria 3168, Australia
Product Name:	RRAS / RRAF / RRAG Analog Return Receiver Module Series

Conforms to the following standards:

FCC:	FCC Part 15 Subpart B: 2012
CE:	EN 50083-2: 2012; EN 5504: 2010; EN 61000-3-2: 2006+A1: 2009+A2: 2009; EN 55022:2010; EN 61000-3-3: 2008
RCM:	AS/NZS CISPR22: 2009+A1: 2010 (Pending)

Federal Communications Commission

For Compliance Information ONLY, contact:

Australia:	Pacific Broadband Networks Suite 15, 1st Floor, Building 3, 195 Wellington Road, Clayton, Victoria 3168, Australia Phone:+61-3-8561-1400, Fax +61-3-9562-2957 Email: sales@pbn.com.au
Europe:	Pacific Broadband Networks Phone: +31-36-536-8011, Fax: +31-36-536-4367 Email: sales@pbneurope.eu
China:	Pacific Broadband Networks Phone: +86-10-5791-0655, Fax: +86-10-5791-0855 Email: office@pbn.com.cn
Americas:	Pacific Broadband Networks Americas LLC Phone: +1-888-339-8805 Email: sales@pbnamericas.com

Appendix A: Default Alarm Limit Settings

Parameter	Units	HIHI	HI	Normal	LO	LOLO	DeadBand	Threshold changeable by user	Default Alarm Enable
Temperature	℃	70	60	-	0	-5	2	N	ON
+12V Input voltage	Vdc	13,5	-	12	-	10,5	0,2	N	ON
+5V Input voltage	Vdc	6	-	5	-	4,4	0,1	N	ON

Appendix B: Factory Default Settings

Name	Options	Default Value
Alarm Control	Enable / Disable	Enable
Output Control	Enable / Disable	Enable
Output Gain Type	MGC / AGC	MGC
Output Gain Control	0~52	42

Offices

Australia, Melbourne : tel. +61-3-8561-1400

China, Beijing : tel. +86-10-5791-0655

Americas : tel. + 1-888-339-8805

EMEA, Netherlands : tel. +31-36-536-8011

info@pbnglobal.com

www.pbnglobal.com