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AIMA3000.FT3S

1310 nm Single Optical Forward Transmitter Module

Product User Manual

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AIMA3000.FT3S

1310 nm Single Optical Forward Transmitter Module

Product User Manual

Contents

11 About This Manual 5

1.1 Chapter Overview 5

1.2 Related Documentation 5

1.3 Document Conventions 6

1.4 Technical Support 6

2 Precautions 7

3 Overview 8

3.1 Product Description 8

3.2 Product Key Features 9

3.3 Specifications 10

3.4 Order Details 13

4 Module Characteristics 15

4.1 Module Appearance and Port Layout 15

4.1.1 Overview 15

4.1.2 Front Panel Layout 16

4.1.3 Rear Panel Layout 18

5 Installation 22

5.1 Preparatory Work for Installation 22

5.2 Unpacking 22

5.3 Module Installation 23

5.4 Connect the Optical Cables 24

5.4.1 Using the Sliding Fibre Guide 24

5.4.2 Using the Fibre Tray 26

5.4.3 Cleaning the Fibre Connector Ends and the Front-panel Optical Ports 28

5.4.4 Connecting the Optical Fibres 28

5.5 Check Module LEDs 29

5.6 Test the RF Input Signal 29

5.7 Test the Optical Output Signal 29

5.8 FT3S initial setup....31

6 Module Configuration & Alarm setup....33

6.1 Port Configuration screen....33

6.1.1 Determine the RF power to the RF input port....35

6.2 Applying the RF settings to the FT3S transmitter in MGC mode....39

6.2.1 Sample RF load for 80 analogue channels of RF load....39

6.2.2 Sample RF load for 42 analogue channels of RF load....39

6.2.3 Sample RF load of 50 analogue channels+ 13 QAM64 channels + 15 QAM256 channels....40

6.3 Applying RF settings to FT3S transmitter AGC mode....41

6.3.1 Sample RF load for 80 analogue channels of RF load....41

6.3.2 Sample RF load for 42 analogue channels of RF load....41

6.3.3 Sample RF load for 50 analogue channels + 13 QAM64 channels + 15 QAM256 channels....41

6.3.4 Confirming Input Signal....43

6.3.5 Configuration of Module RF Signal....44

6.4 Alarms Monitoring....45

6.4.1 Alarm Status Pages....45

6.4.2 Alarm Configuration....47

6.5 Log Management....51

6.6 Firmware Upgrade....52

6.7 Restoring Factory Defaults....54

6.8 Reboot....55

7 Troubleshooting....57

8 Declaration of Conformity....58

Appendix A: Default Alarm Limit Settings....59

Appendix B: Factory Default Settings....60

1 About This Manual

1.1 Chapter Overview

1. About This Manual: Preface
2. Precautions
3. Overview: Application module overview, including the module features, technical specifications, and ordering information.
4. Module Characteristics: The appearance of the equipment, port and introduction of other components
5. Installation: Installation procedure
6. Module Configuration & Alarms: Web management configuration instructions.
7. Troubleshooting
8. Product Warranty
9. Declaration of Conformity.

Appendix A: Default Alarm Limit Parameters

Appendix B: Factory Default Settings

1.2 Related Documentation

The following documents may be used in conjunction with this manual:

- Technetix.AIMA3000 - Product User Manual
- Technetix.AIMA ASMM - Product User Manual
- AIMA3000 NMS Web Management System Product User Manual

- Technetix.NMS3-EPSM - Basic Inventory Management
- Technetix.NMS3-EPSM - Basic Alarm Management
- Technetix.NMS3-EPSM - Basic System Management
- Technetix.NMS3-EPSM - Basic Template Management

1.3 Document Conventions

Before you use the manual, please familiarise yourself with the format used in this manual.

'*' Asterisk: Points marked with an asterisk means there is a corresponding note on the page

1.4 Technical Support

If you need help in the process of setting up and maintaining an FT3S, please contact Technetix's technical support staff:

Europe:

Technetix BV
Kazemat 5
NL-3905 NR Veenendaal
P.O. Box 385
NL-3900 AJ Veenendaal
The Netherlands

Phone: +31 318 58 59 59

Email: customer.service.vdl@technetix.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 SC/APC 8°. Note: 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 Technetix qualified service personnel only.

Servicing and repairs

DO NOT attempt to service this unit yourself. Refer all servicing needs to Technetix qualified service personnel only.

WARNING!

Exposure to class 3A laser radiation is possible. Access should be restricted to trained personnel only. Do not view exposed fibre or connector ends when handling optical equipment.

3 Overview

3.1 Product Description

The 1310 nm Forward Transmitter Module - Standard series (FT3S) is designed to plug into Technetix's latest generation Advanced Intelligent Multiservices Access platform - the AIMA3000.

Technetix AIMA3000 FT3S series advanced forward transmitter is available in single and dual port configurations. It is designed for multi-service operators (MSOs) to increase network capacity to satisfy an ever-growing subscriber demand for more bandwidth. The FT3S Multi Quantum Well (MQW) Distributed Feedback (DFB) laser transmitter module allows for full spectrum analogue/digital broadcast and narrowcast channels over the entire 1218 MHz space, which provides utmost flexibility for MSOs during the all digital transition.

The laser transmitter module is available in optical power levels from 2 dBm to 15 dBm (1.6 mW to 31 mW). The module offers a superior frequency response, as well as an extremely low distortion profile and low noise characteristics. The FT3S incorporates specialised circuitry to deliver the best possible CTB and CSO performance of up to 1218 MHz. It employs the latest in broadband linear amplifier technology. In addition, it has a cutting edge optoelectronic design for the delivery of high-quality transmissions, in both analogue and digital formats, over passive fibre-optical networks.

3.2 Product Key Features

- DOCSIS 3.1 compatible with operating bandwidth up to 1218 MHz
- Plug-and-play with the AIMA3000 platform
- High-quality 1310 nm, isolated MQW DFB laser with advanced RF driver circuitry
- RF amplifier gain blocks with advanced GaAs technology for better performance
- Supports CENELEC and NTSC standards up to 110 channels (both analogue and digital)
- Frequency response of 45 MHz to 1218 MHz for both broadcast and narrowcast applications
- Can be locally managed through an Ethernet port
- Alarm monitoring through Technetix's NMSE and ASMM Web Interface
- Automatic gain control (AGC) for a consistent optical modulation index (OMI)
- Automatic thermo-cooler control (ATC) for a consistent laser temperature
- Automatic power control (APC) for a consistent optical output power
- Available in single and dual transmitter configurations
- Up to 64 transmitters in a 4RU chassis
- Remote firmware upgrade and auto upload/download of configuration files through ASMM web interface or using Technetix's NMSE
- Fully FCC, CE, and RCM compliant

3.3 Specifications

Optical Performance

Optical wavelength	1310 nm ±10 nm
Optical outputs	1 or 2
Output power	2 ~ 15 dBm
Optical connector	SC/APC [1], LC/APC, FC/APC

RF Performance

RF bandwidth	45 ~ 1218 MHz
RF flatness	± 0.75 dB
RF input return loss	> 18 dB
RF input level, NC nominal (2)	25 ~ 35 dBmV per channel
RF input level, BC nominal (2)	15 ~ 25 dBmV per channel
AGC range	±3dB
RF impedance	75 Ω
RF test point relative to RF output port	-20 ±1 dB
Isolation between transmitters	> 60 dB
RF input connectors	Single: 2 × GSK-type female (1 for NC, 1 for BC) Dual: 4 × GSK-type female (2 for NC, 2 for BC)
RF test points	Single: 3 × Mini-SMB [3] Dual: 4 × Mini-SMB [4]
Alarms and laser status	Front-panel LEDs, SNMP Traps

Link Performance

	NTSC+QAM [5]	CENELEC(42ch) [6]
CNR *(4 MHz NBW)*	> 53 dB	> 51 dB
CSO	> 65 dB	> 62 dB
CTB	> 70 dB	> 69 dB
MER	> 39 dB	-
BER	< 1E-9	-

Notes:

1. *Standard option. Contact a Technetix Sales Representative for availability of other options*
2. *dBuV = 60 + dBmV*
3. *Three mini-SMB connectors on front panel: each one for BC and NC inputs and one to measure RF input before the laser.*
4. *Four mini-SMB connectors on front panel: BC and NC inputs test points (user switchable) and two to measure RF input before the laser.*
5. *CNR, CSO, CTB and MER are loaded with 30 NTSC+124 QAM256 or 30 PAL D/K+85 QAM256. All are measured with Technetix referenced optical receiver with 10 km single-mode optical fibre 0 dBm.*
6. *CNR, CSO and CTB are loaded with 42 CENELEC. All are measured with Technetix referenced optical receiver with 10 km single-mode optical fibre 0 dBm.*

General

Power supply	Powered via AIMA3000 backplane
Power consumption	Single: < 8 W; Dual: < 15 W
Operating temperature	-5 ~ 55 °C
Operating humidity	90 % (Non-condensing)
Storage temperature	-40 ~ 70 °C
Storage humidity	90 % (Non-condensing)
Dimensions (W x D x H)	24.6 x 410 x 152.5 mm
Weight	0.88 kg
Supported network management options	Technetix NMSE or through ASMM's web Interface

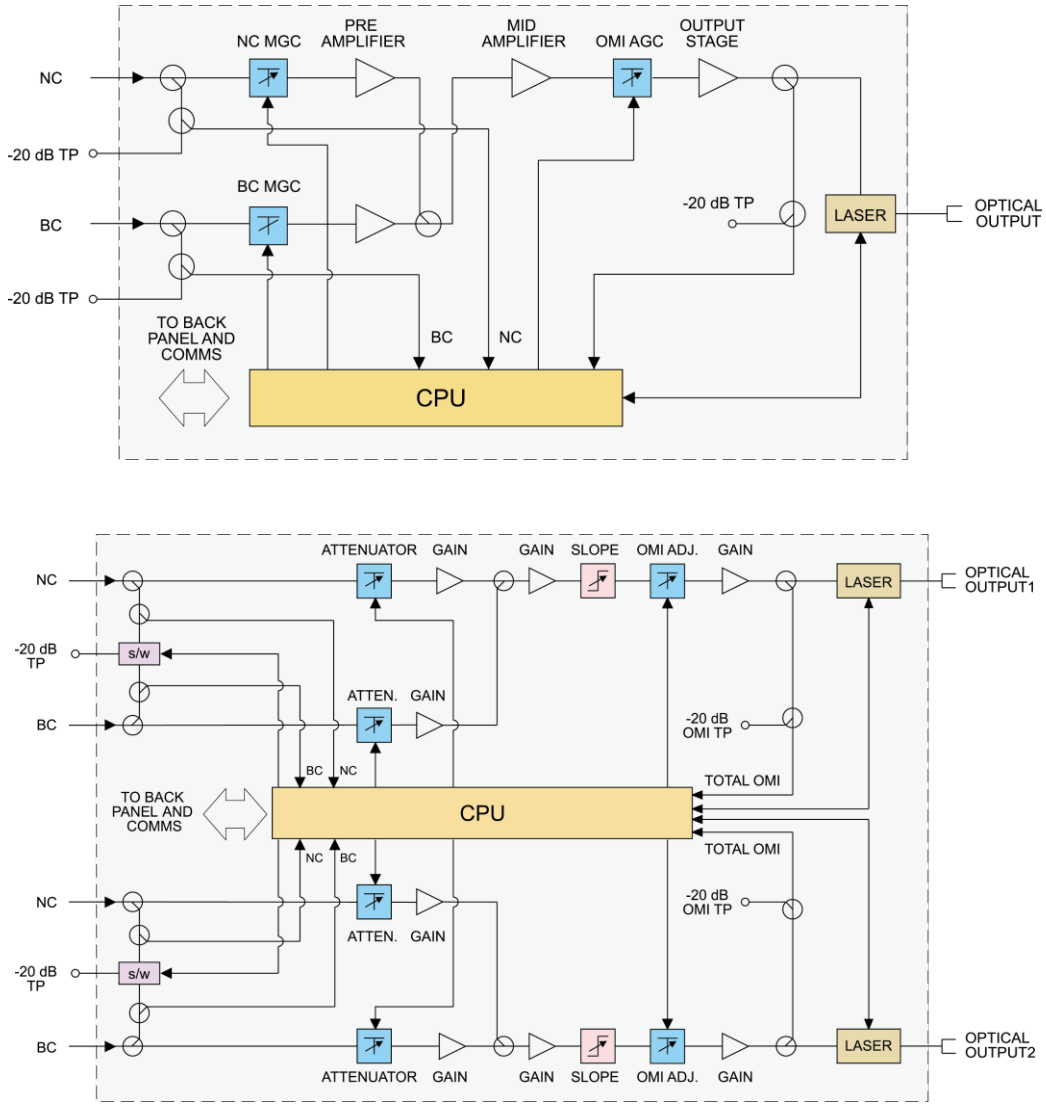


Figure 1 Block diagram FT3S

Table 4-3 FT3S Block Diagram Glossary

Parameters	Glossary
NC	Narrowcast Input
ATTEN	Attenuator
-20 dB TP	-20 dB Test Point
BC	Broadcast Input
OMI ADJ	
TO BACK PLANE AND COMMS	Data Bus
-20 dB OMI TP	-20 dB OMI test point
CPU	Central Processing Unit

3.4 Order Details

AIMA-FT3S-[V]-[W]-[X1X2]-[Y]-[Z] Forward Transmitter 1310 nm module

Options:

V Number of Optical Ports

S	Single port
D	Dual ports

Y Optical Output Power

02	2 dBm (1.6 mW) optical power
04	4 dBm (2.5 mW) optical power
06	6 dBm (4 mW) optical power
08	8 dBm (6 mW) optical power
09	9 dBm (8 mW) optical power
10	10 dBm (10 mW) optical power
11	11 dBm (13 mW) optical power
12	12 dBm (16 mW) optical power
13	13 dBm (20 mW) optical power
14	14 dBm (25 mW) optical power
15	15 dBm (31 mW) optical power

X1X2 [1][2] First Channel Last Channel

(Opiton for CWDM/OBand WDM configurations only, if not used omit X1X2 when making an order) [3]

CWDM [4]		OBand WDM	
29	1290 nm	A	1330.50
31	1310 nm	B	1329.20
33	1330 nm	C	1327.25
35	1350 nm	D	1325.80
37	1370 nm	E	1324.17
		F	1323.00
		G	1321.30
		H	1318.10

Y Optical Connector Type

S	SC/APC [5]
F	FC/APC
L	LC/APC
E	E2000/APC

Z Bandwidth

1G	45 ~ 1000 MHz
12	45 ~ 1218 MHz

Notes:

(1) Default spacing is 20 nm. For other wavelength configurations not listed, please contact Technetix.

(2) X2 used only in dual transmitter versions. Dual version, X1 is first channel and X2 is the second channel. Contact Technetix Representatives for detailed optical information.

Example:

Single	*X1*	*29*
Dual	*X1X2*	*2931, 2929*

(3) For example, A-FT3S-S-02-F-1G refers to an order for an FT3S with a single optical port, 2 dBm of output power, an FC/APC connector, and 45-1218 MHz of bandwidth.

(4) Option for CWDM configurations, the maximum optical output power is 12 dBm.

(5) Standard option. Contact a Technetix Sales Representative for availability of other options

4 Module Characteristics

4.1 Module Appearance and Port Layout

4.1.1 Overview

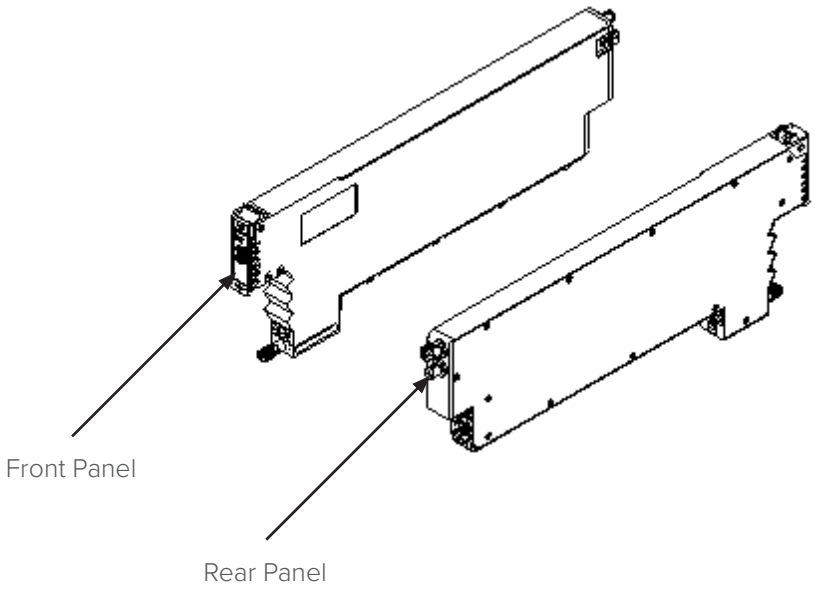


Figure 4.1 Module Appearance

4.1.2 FT3S-S Front Panel Layout

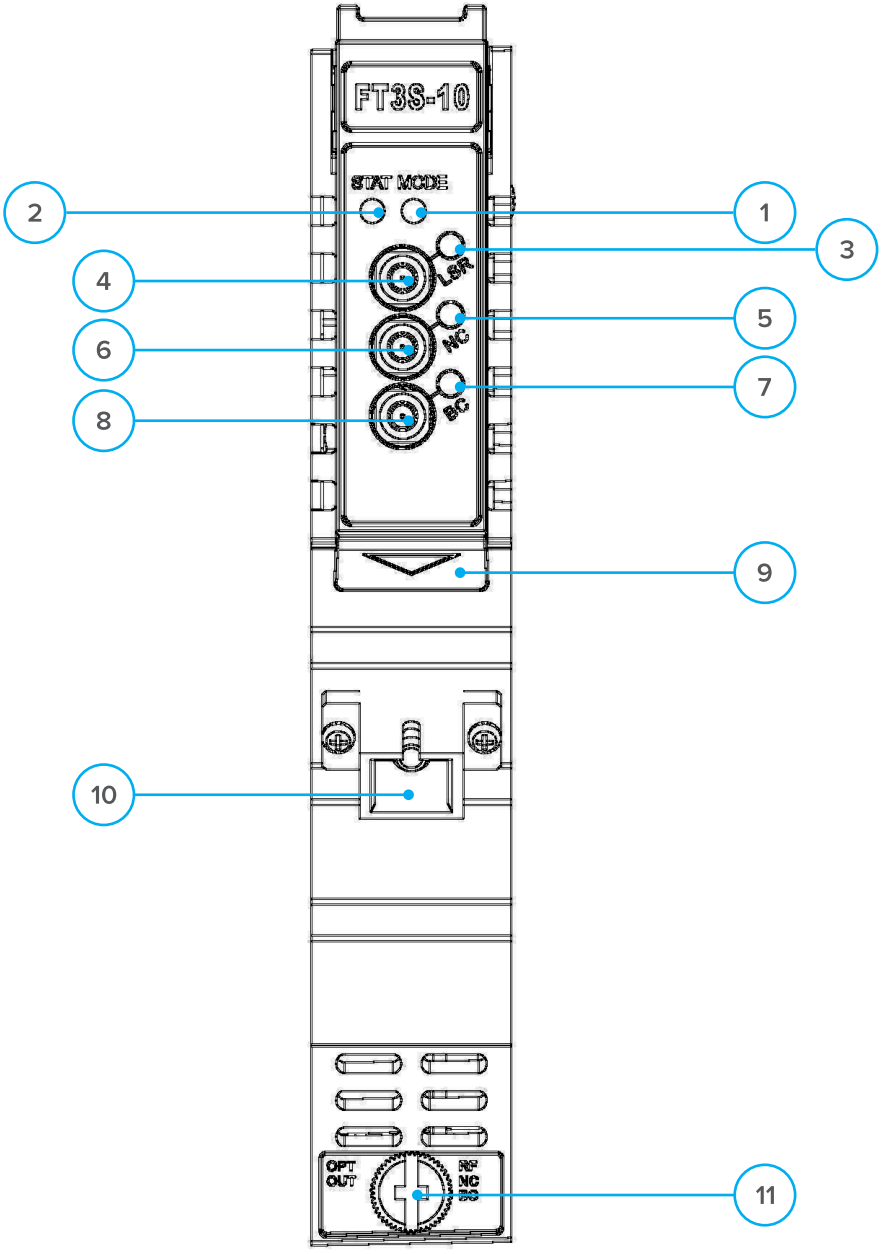


Figure 4-2 FT3S Front Panel Layout

Table 4-1 FT3S-S Front Panel Functions

Item Number	Item	Description
1	MODE LED	Module gain control mode indicator MGC: green light blinking AGC: green
2	STATUS LED	Module alarm indicator Normal: green Minor Alarm: orange Major Alarm: red
3	LSR LED	Laser status indicator ON: green OFF: green light blinking Major Alarm: red
4	LSR-OUT	Laser Former level input test point
5	NC LED	Narrowcast input working status indicator Normal: green Minor Alarm: orange Major Alarm: red
6	NC-IN	Narrowcast input test point
7	BC LED	Broadcast input working status indicator Normal: green Minor Alarm: orange Major Alarm: red
8	BC-IN	Broadcast input test point
9	Orange tab-retaining clip	Used to plug and anchor the module The tab-retaining clip will pop-up after pressing the release and plug module.
10	OPT OUT	Optical output
11	Mounting Screw	Module fastening screw

CAUTION!

"OPT OUT" emits a non-visible laser radiation when working.

4.1.3 Rear Panel Layout

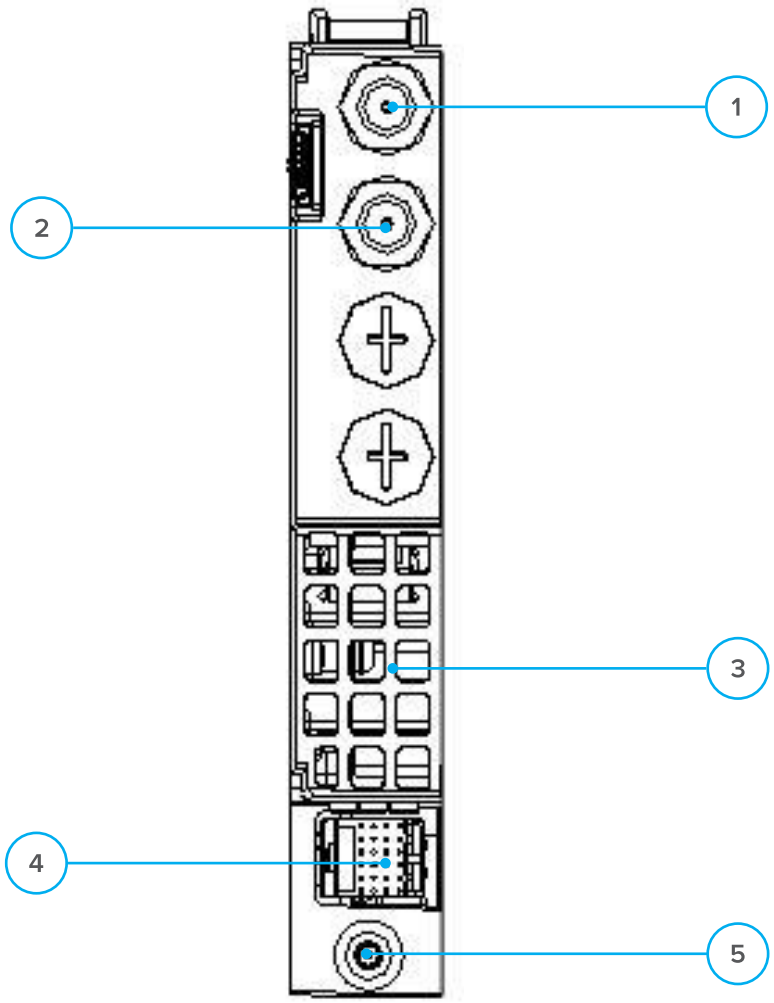


Figure 4.3 Rear Panel Layout

Table 4-2 FT3S-S Rear Panel Functions

Serial Number	Item	Description
1	NC IN	Narrowcast RF input
2	BC IN	Broadcast RF input
3	Air vent	Air vent allowing air to flow out of the module
4	Bus connector	Power and communication port
5	Placement pin	Used to position the module in the chassis

4.1.4 FT3S-D Front Panel Layout

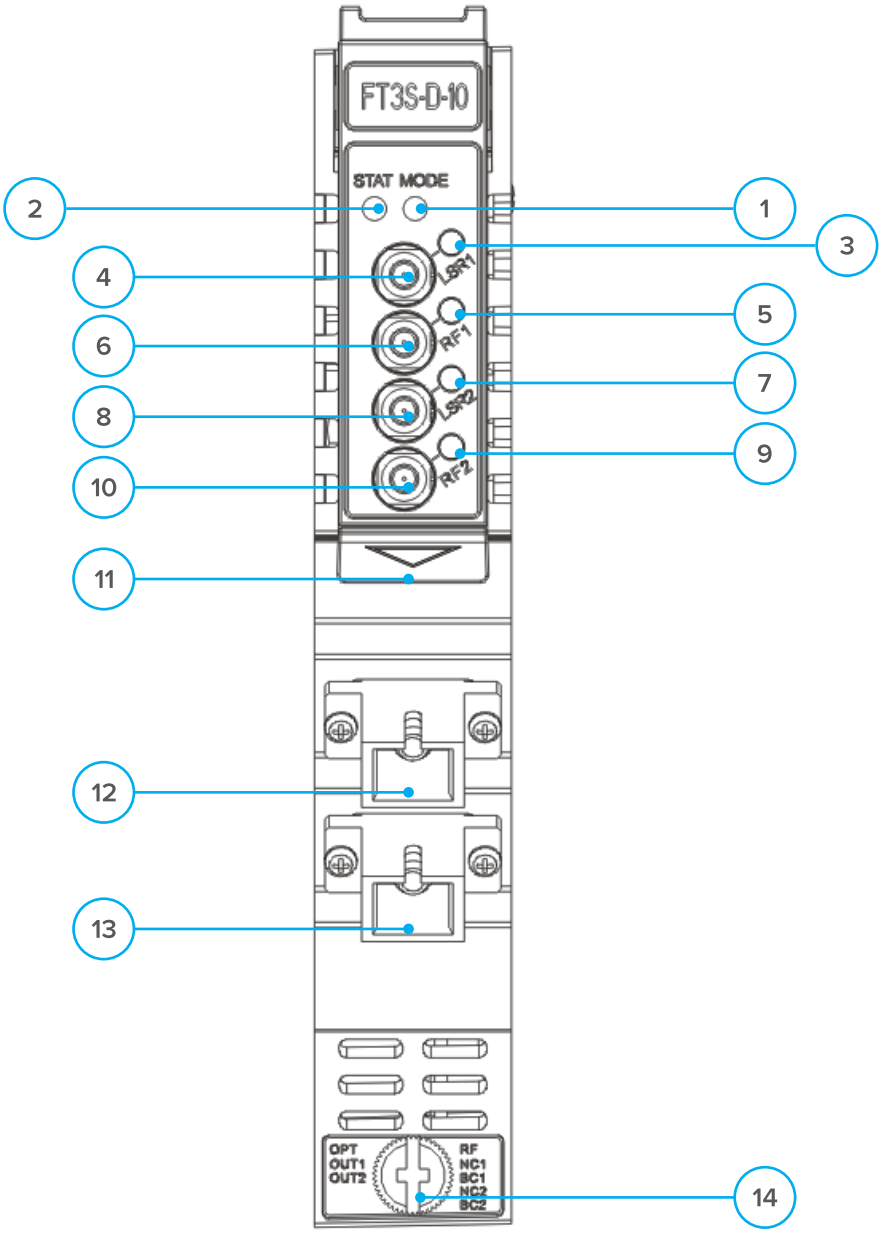


Figure 4-4 Front Panel Layout

Table 4-1 FT3S-S Front Panel Functions

Item Number	Item	Description
1	MODE LED	Module gain control mode indicator MGC: green light blinking AGC: green
2	STATUS LED	Module alarm indicator Normal: green Minor Alarm: orange Major Alarm: red
3	LSR1 LED	Laser status indicator ON: green OFF: green light blinking Major Alarm: red
4	LSR1-OUT	Laser former level input test point
5	RF1 LED	Narrowcast or broadcast input working status indicator Normal: green Minor Alarm: orange Major Alarm: red
6	RF1-IN	Narrowcast or broadcast input test point
7	LSR2 LED	Laser status indicator ON: green OFF: green light blinking Major Alarm: red
8	LSR2-OUT	Laser former level input test point
9	RF2 LED	Narrowcast or broadcast input working status indicator Normal: green Minor Alarm: orange Major Alarm: red
10	RF2-IN	Narrowcast or broadcast input test point
11	Orange tab-retaining clip	Used to plug and anchor the module The tab-retaining clip will pop-up after pressing the release and plug module.
12	OPT OUT 1	Optical output
13	OPT OUT 2	Optical output
14	Mounting Screw	Module fastening screw

4.1.5 FT3S-D Rear Panel Layout

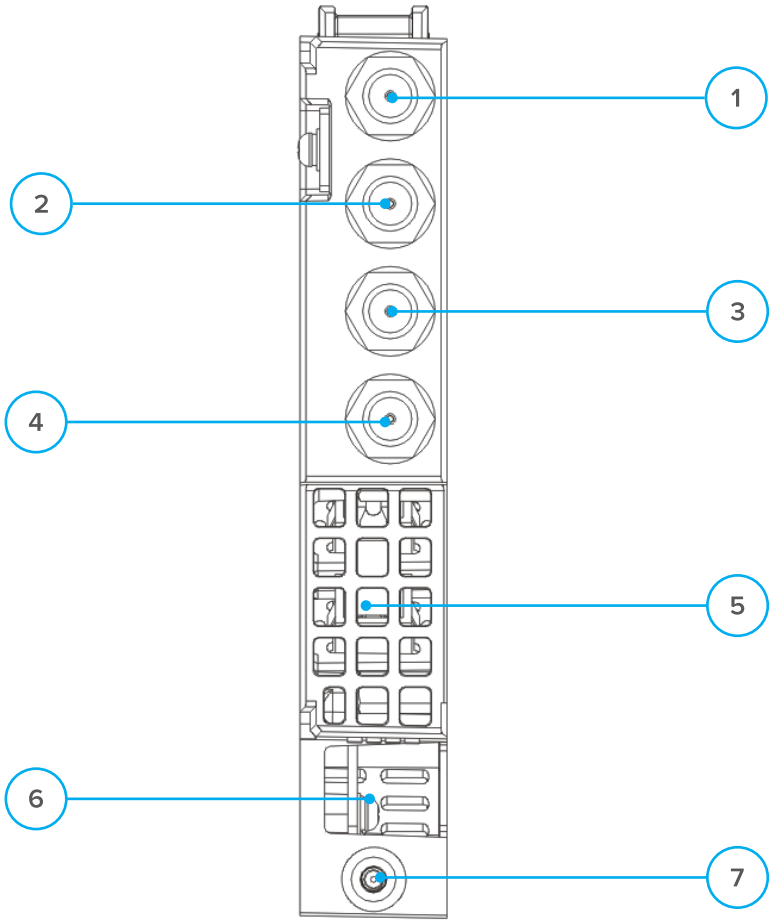


Table 4-4 FT3S-D Rear Panel Functions

Serial Number	Item	Description
1	NC1 IN	Narrowcast RF input
2	BC1 IN	Broadcast RF input
3	NC2 IN	Narrowcast RF input
4	BC2 IN	Broadcast RF input
5	Air vent	Air vent allowing air to flow out of the module
6	Bus connector	Power and communication port
7	Placement pin	Used to position the module in the chassis

5 Installation

5.1 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 Technetix customer support representative.

Necessary equipment and tools for installation:

Table 5.1 Necessary equipment and tools for installation

Tools/Modules	Description
Phillips screwdriver PH1/PH2	For fastening the FT3S module in the AIMA3000 chassis
FT3S Module	The module to install into the AIMA3000 chassis

5.2 Unpacking

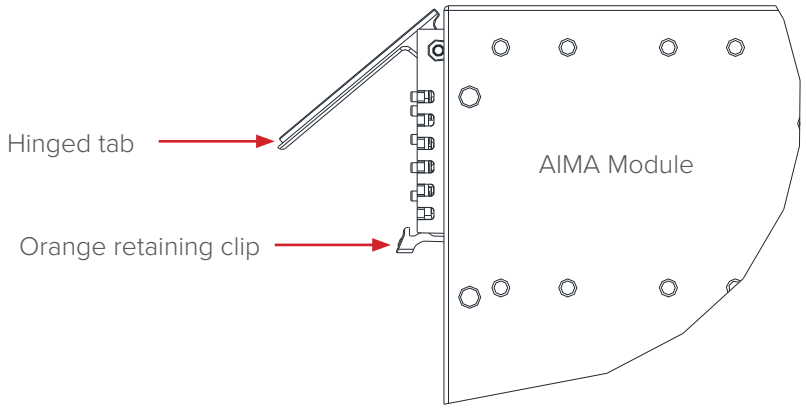
Unpack the module. Keep the packaging materials for future transport needs.
Check the packaging, record the product module type, serial number, purchase date, and any other relevant information to facilitate later management and maintenance.

Table 5.2 Packing Manifest

No.	Description	Qty
1	FT3S module	1
2	Product User Manual (CD)	1
3	Individual test sheet (Certificate of Performance)	1

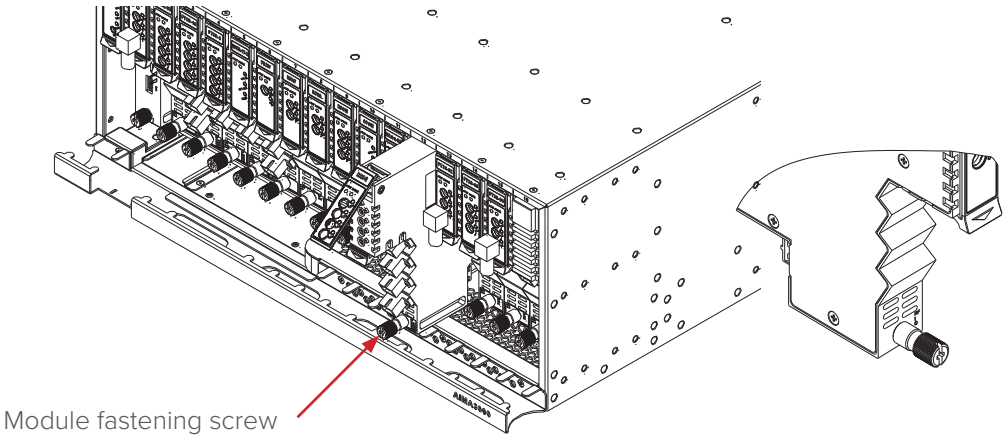
5.3 Module Installation

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 bottom of the AIMA module, fasten the spring-loaded mounting screw. **Only use fingers to fasten the mounting screw. DO NOT use a screwdriver.**

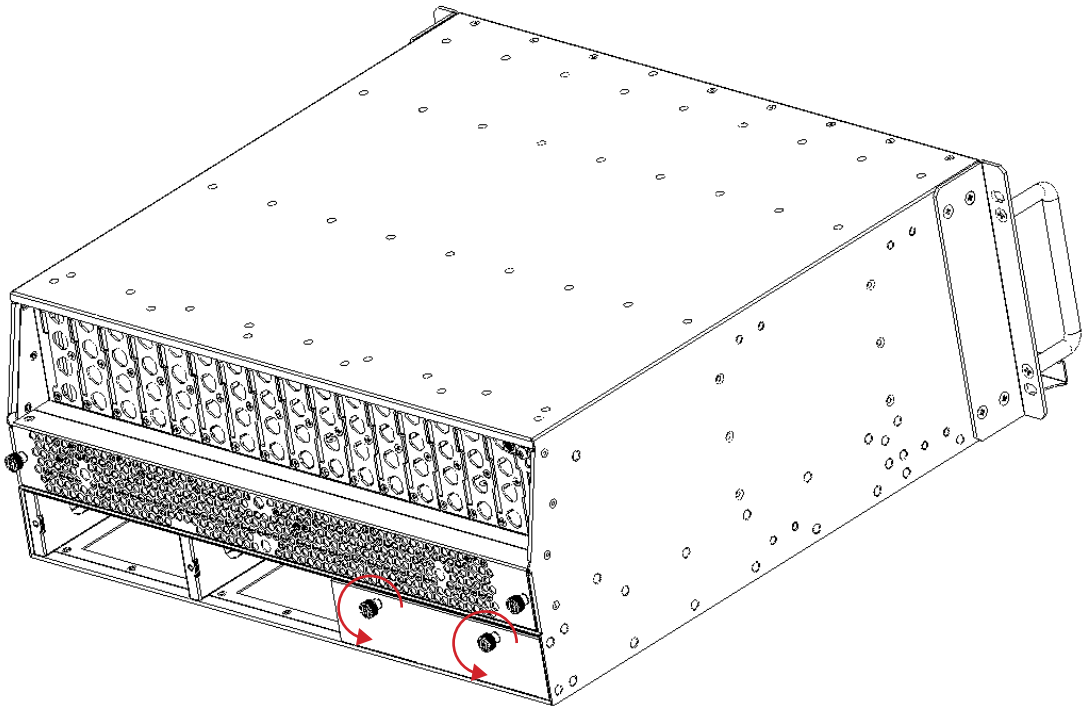
5.4 Connect the Optical Cables

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

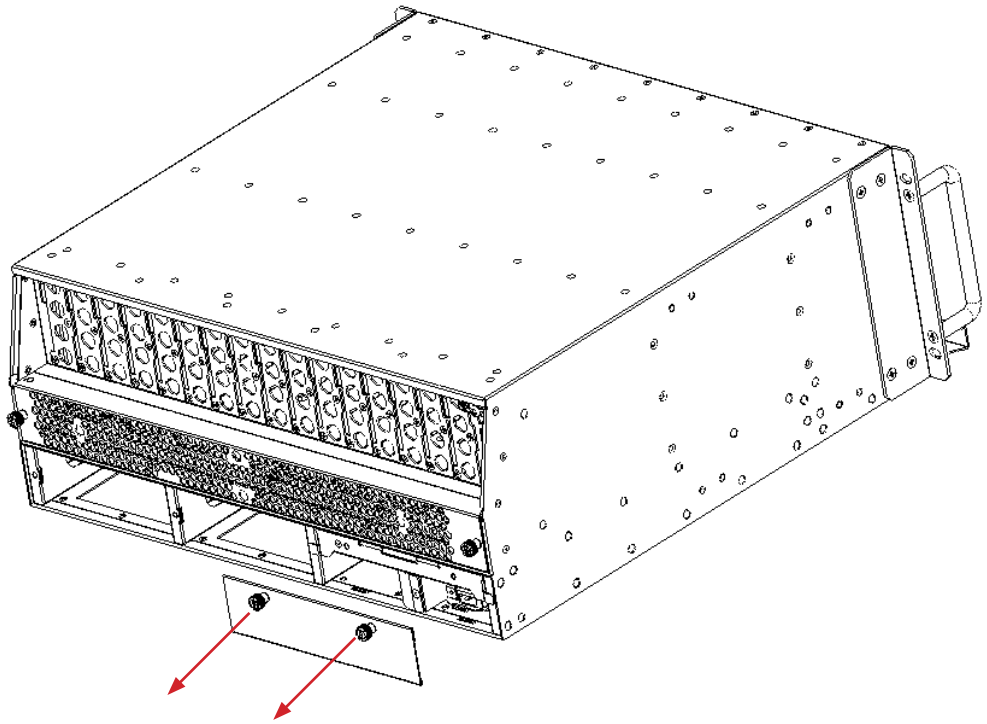
5.4.1 Using the Sliding Fibre Guide

The sliding fibre 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 fibre cabling. To access the sliding fibre guide you will need to first remove the rear panel located on the back of the chassis.

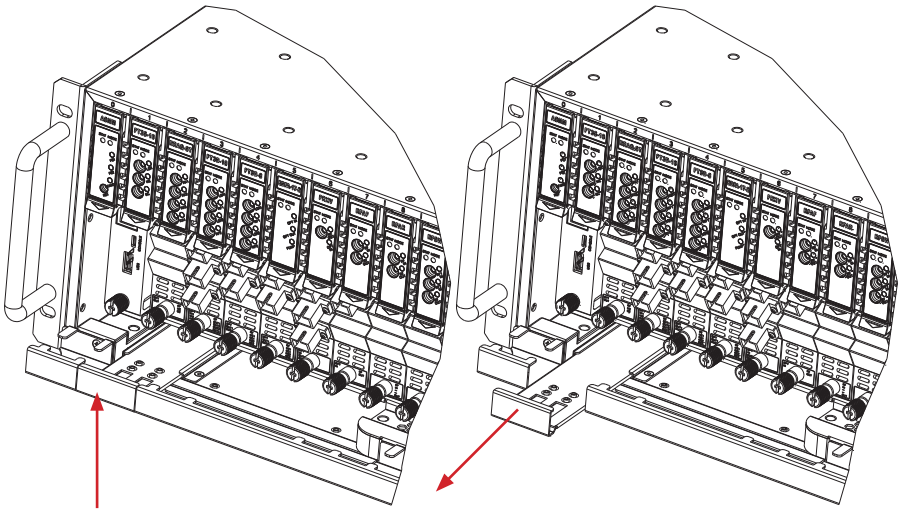
1. Unscrew the two thumbscrews on the rear panel.



2. Then, pull the panel forward.

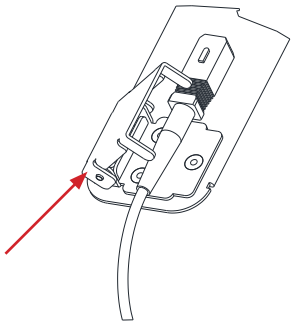


3. Then lift up the handle and slide the fibre guide out of the front of the chassis.



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

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



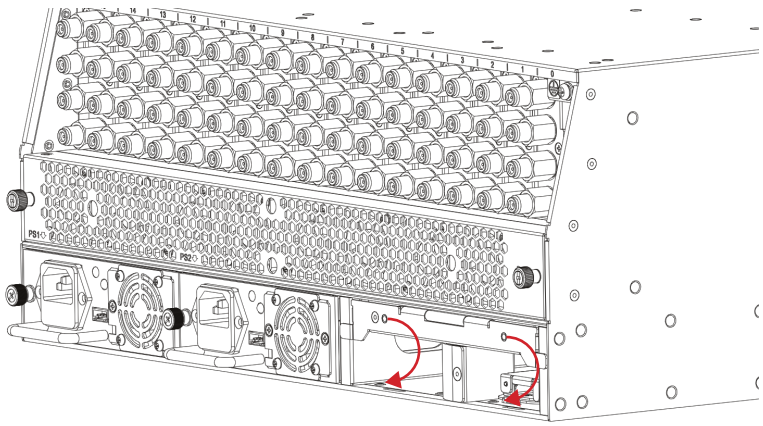
When using the sliding guide, put the fibre connector in the clip and slide it in from the rear to the front, through the chassis. Ensure that the optical fibre tail does not become trapped or pulled tightly.

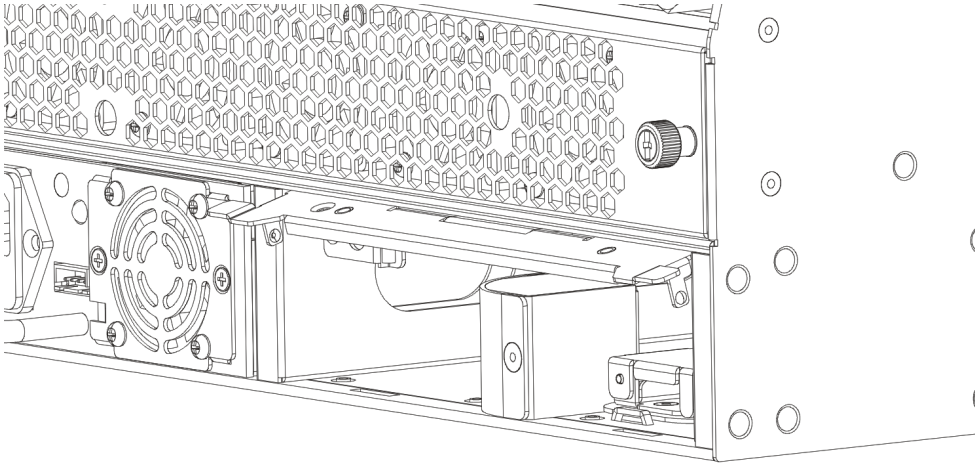
Fibre clip (at rear, for up to two connectors) **Handle (at front)**

5.4.2 Using the Fibre Tray

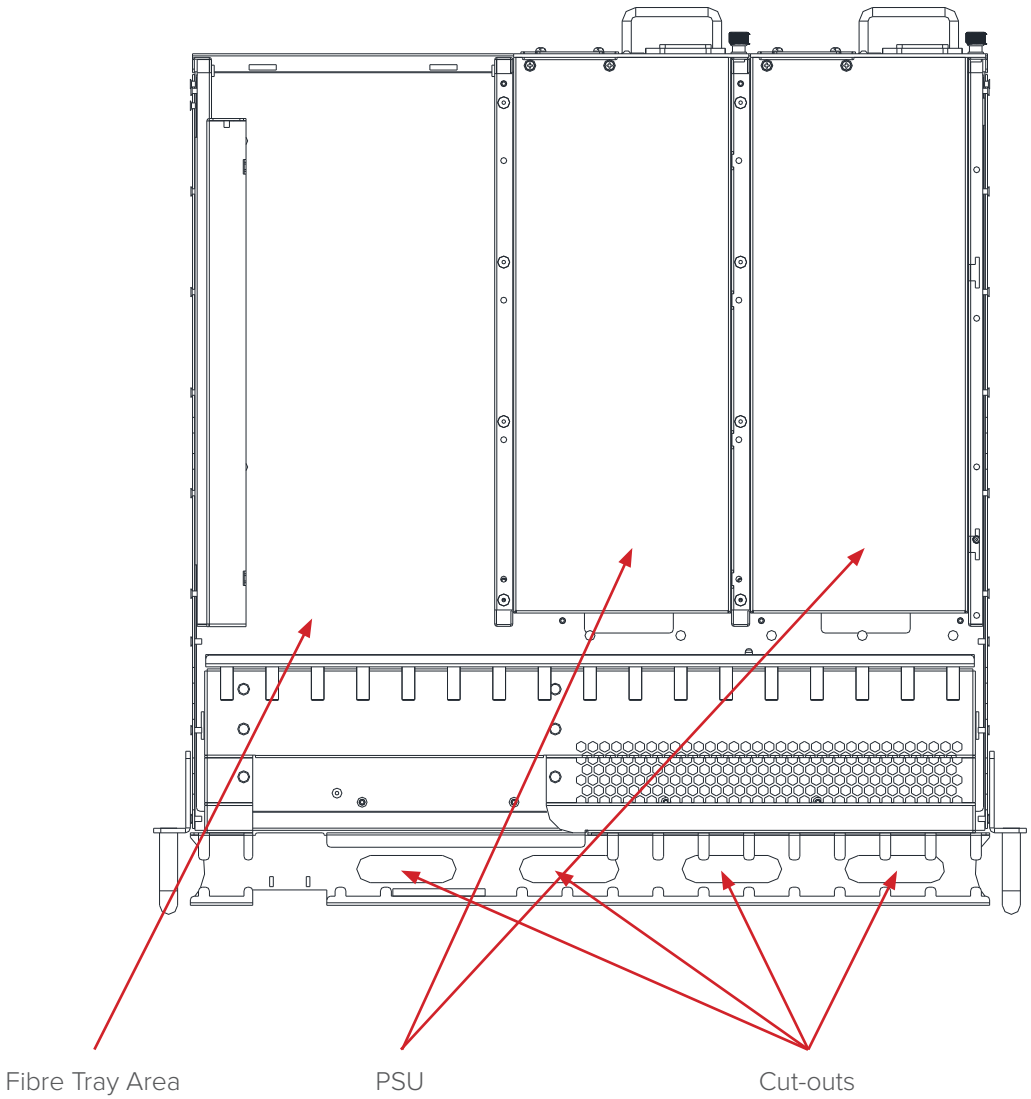
All optical fibres must be organised in a tidy manner in the chassis's fibre tray, which provides enough space for up to 64 optical fibres. This allows for easy positioning and future replacement of optical fibres. Along the front of the chassis, there are cut-outs for keeping the optical fibres in position.

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





2. Use the Fibre Guide Tool to organise the cables and wires in the fibre tray to prevent tangles and the blocking of the guide rails.



5.4.3 Cleaning the Fibre Connector Ends and Front-panel Optical Ports

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

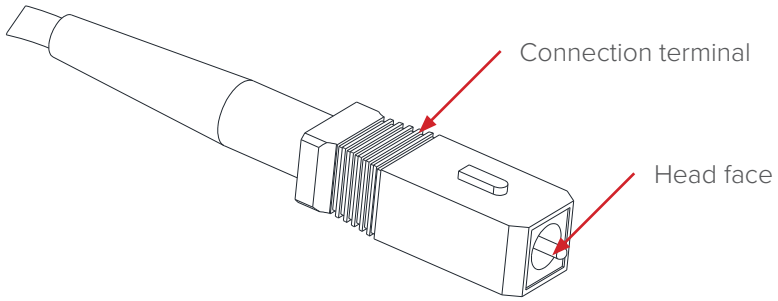


Figure 5-4

When cleaning the optical fibre-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.

5.4.4 Connecting the Optical Fibres

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.

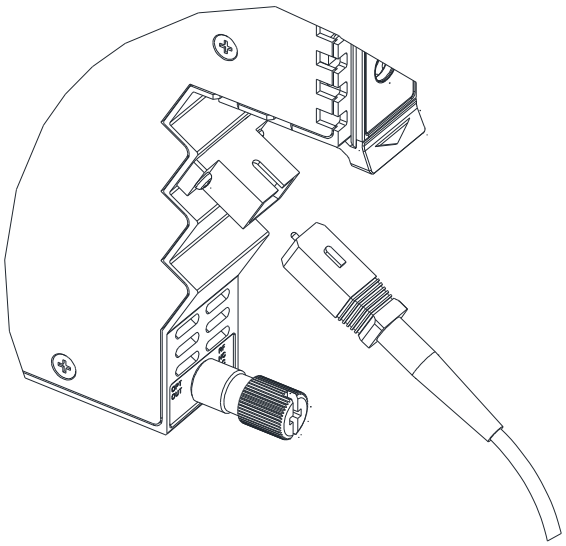


Figure 5-5

5.5 Check Module LEDs

Single port module

When the module has been installed, if the chassis is powered, all LED indicators on the front panel will show a blinking green light, indicating the module is initiating.
If the input and output signals are normal, the “STAT” LED indicator will cease to blink in about 5 seconds and remain constant green afterwards. At the same time, the “LSR”, “BC" and “NC" LED indicators will also remain constant green when the signals are normal.
If the BC RF input signal is out of the expected range, the “STAT” and “BC” LED indicator will show constant orange or red.
If the NC RF input signal is out of the expected range, the “STAT” and “NC” LED indicator will show blinking orange or red*.
If the optical output signal is out of the expected range, the “STAT” and “LSR” LED indicator will show constant orange or red.
FT3S' default alarm setting on "NC input power” is disabled. The NC LED indicator will remain constant green when it’s disabled. Before checking the status of the NC LED indicator, please log into AIMA3000 configuration page to enable the major alarm and minor alarm (check the checkbox on HiHi/Hi/Lo/LoLo and fill in the thresholds).

Dual port module

When the module has been installed, if the chassis is powered, all LED indicators on the front panel will show a blinking green light, indicating the module is initiating.
If the input and output signals are normal, the “STAT” LED indicator will cease to blink in about 5 seconds and remain constant green afterwards. At the same time, the “LSR” LED indicators will also remain constant green when the signals are normal.
The RF indicators will act in 2 different ways when the signal is normal:
a. When BC/NC monitoring is set to BC on, the RF indicators will remain constant green when the signals are normal.
b. When BC/NC monitoring is set to NC on, the RF indicators will remain blinking green when the signals are normal.
If the BC RF input signal is out of the expected range (“Monitor BC or NC” set to BC On), the “STAT” and “RF” LED indicator will show constant orange or red. If the NC RF input signal is out of the expected range (“Monitor BC or NC” set to NC On), the “STAT” and “RF” LED indicator will show blinking orange or red. If the optical output signal is out of the expected range, the “STAT” and “LSR” LED indicator will show constant orange or red.

5.6 Test the RF Input Signal

When setting up the transmitter for final deployment, the RF input levels must not exceed 20 dB.

5.7 Test the Optical Output Signal

After the input signal has been confirmed, the optical power of the optical output port should be tested. Use the optical power meter to test the output levels; the output values should be in accordance with the technical specifications. Before testing, the optical power meter must be calibrated. Before measuring optical signals, verify the interfaces are clean and undamaged.

CAUTION!

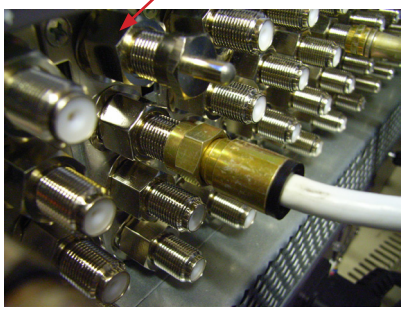
The device output optical power measurement procedure and regular maintenance must be performed by highly trained personnel. All procedures and maintence must be comply with the necessary safety precautions indiciated with using FT3S optical transmitter module:

WARNING!

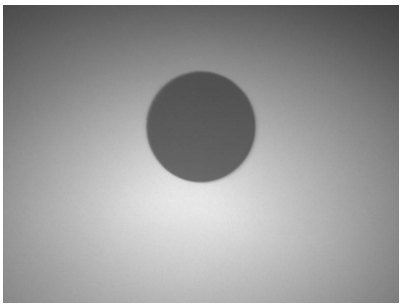
Module emits an invisible laser when working. Avoid direct contact with the laser connector. DO NOT look directly at the fibre connector.

5.8 FT3S initial setup

1. Calculate the correct RF drive level per channel for the channel to be used for RF1 and RF2. Confirm RF channel after calculating the correct RF drive level per channel for the channel plan to be used for BC only or BC and NC. See formula in section 6.1.1. Confirm RF channel level only on the BC RF input lead or BC and NC RF input leads and connect both to the chassis (pictured below). Note: if narrowcast is not in use install an “F” 75 Ω terminator to the NC RF input connection.

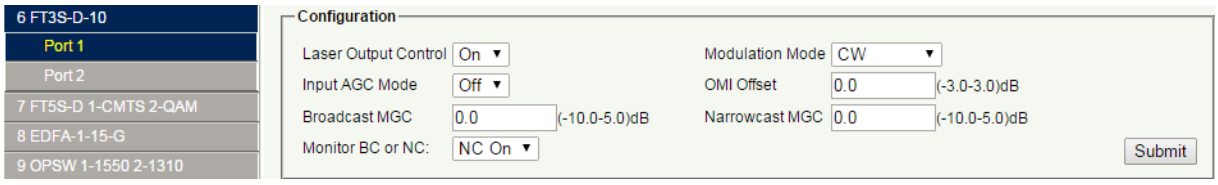


2. Before installing the FT3S, check the optical output ferrule tip with a fibre scope to ensure that the connector is clean (picutred below). The cap on the optical output connector does not prevent contamination from dust, etc getting on to the optical connector, it prevents the laser from being emitted when laser is on and no optical patch cord is installed.



3. Next install the FT3S unit into a slot where RF BC/NC input leads are connected and check the optical output power with a cleaned optical patch cord and a calibrated optical power meter. Record the optical output level. Connect a cleaned patch cord to the fibre output and to the relevant optical distribution frame (ODF) panel.

4. With a laptop connected to the ASMM module’s network or an Android device connected to the front of the ASMM module’s USB port in host mode, confirm that the “Input AGC mode” is set to “OFF”, if not change it to “OFF” and then click on “Submit” button. In addition, confirm that the “Broadcast MGC” and “Narrowcast MGC” fields are set to 0.0, if not set to 0.0 and click on “Submit” button.



Confirm in the management “Status” section that the RF levels for BC or BC and NC inputs and the RF Composite Input Power are within the designated parameters.

Status

Laser Type:	Cooled DFB	Laser Wave Length:	1310.00nm	Laser Output Status:	On
Laser TEC Current:	161mA	AGC Point:	0.0dB		
Broadcast Input Power:	88.7dBµV	Narrowcast Input Power:	Low	RF Composite Input Power:	107.9dBµV

5. Confirm that the ”Alarm Setting[s]” are enabled if BC is only in use or that they are both enabled for BC and NC if both RF inputs are in use. Check the required selection and click on “Submit” to enable/disable alarms.

Alarm Settings

Laser Output Status Alarm enableMajor ▼

Parameter	Current Value	HiHi	Hi	Lo	LoLo	Deadband
BC Input Power(dBµV)	88.7	☑ 113.8	☑ 108.8	☑ 83.8	☑ 78.8	1.0
NC Input Power(dBµV)	Low	☐ 123.8	☐ 118.8	☐ 83.8	☐ 78.8	1.0
Laser Temperature(°C)	25.1	☑ 60.0	☑ 40.0	☑ 15.0	☑ -15.0	0.5
Laser Bias Current(mA)	39	☑ 120	☑ 115	☑ 20	☑ 15	2
Laser Output Power(dBm)	10.1	☑ 16.0	☑ 13.0	☑ 7.0	☑ 4.0	0.5

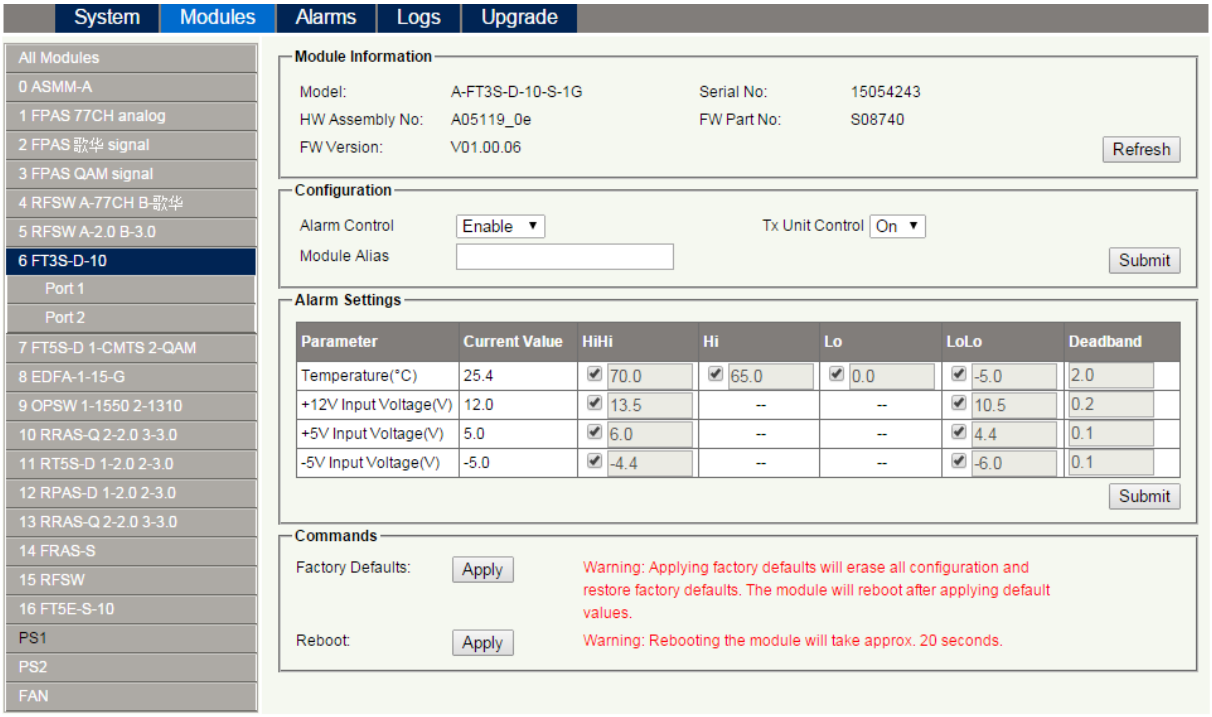
Submit

6 Module Configuration & Alarm setup

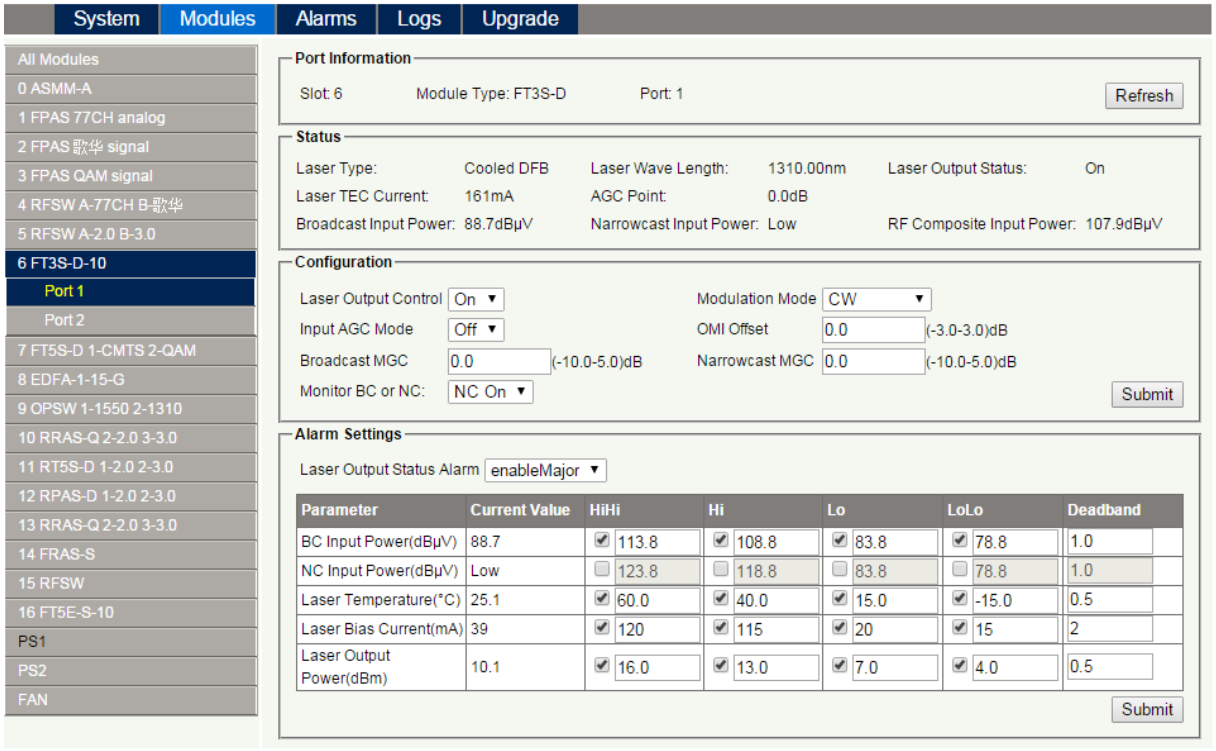
The module configuration settings can be configured using the web interface and Technetix NMSE (network management software). This manual only provides details on the web interface. For login details and network setup please refer to the AIMA-ASMM user manual. If the same module, is reinserted in the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

6.1 Port Configuration screen

After logging in to the AIMA ASMM controller, select the “Modules” tab and then the “FT3S” to configure the FT3S transmitter. After selecting “FT3S”, the “Port” option will appear.



After selecting “Port”, the RF configuration screen will appear.



In the RF configuration screen “Laser Output Control”, “Input AGC Mode”, “Modulation Mode”, “OMI Offset”, “Broadcast MGC”, “Narrowcast MGC”, and ”Alarm Settings” become available. For proper RF settings with different RF channel loads see the example calculations shown in 6.1.1. The applying the values to the RF transmitter is detailed in 6.2.

6.1.1 Determine the RF power to the RF input port.

In order to set up the port configuration for the FT3S transmitter, the proper RF level must to be determined and applied to the transmitter. The factory default RF load is listed below

- Number of analogue RF channels = 80
- RF level for 80 channels = 15 dBµV
- This ensures an OMI of 4% per channel

The channel load listed above is the reference RF load for the FT3S transmitter. Any deviation from this RF load will require new RF levels to be calculated based on 80 analogue channels for a designated RF input level of 15 dBµV.

To recalculate the RF input level following formula can be used:

PEAK analogue RF input = 34 - 10LOG (Na)

(Na) = number of channels to be used by the transmitter

Example 1

Example 1 is to verify the RF calculations. The standard channel load will be used to determine the correct RF input at the transmitter for 80 channels.

Channel load is 80 analogue channels
Peak analogue input = 34 – 10LOG (80)
Peak analogue input = 34 – 19
Peak analogue input = 15 dBµV

The calculated RF level is 15 dBµV as specified on the datasheet.

Example 2

RF loads will be for a set up for 42 analogue RF channels (CENELEC) shown below.
Channel load = 42 analogue channels

Peak analogue input = 34 – 10LOG (42)
Peak analogue input = 34 – 16.2
Peak analogue input = 17.8 dBµV

To calculate the OMI for analogue channels, following formula can be used:

OMI per analogue channel = $((OMI^{80} x (\sqrt{(Na^{80}/2)}) x (\sqrt{(2/Na^{new})})$

OMI^{80} = an OMI for an 80 channel load (4%)
Na^{80} = Channel load of 80 channels (factory standard)
Na^{new} = Actual channel load at the transmitter

In this example when applying a 42 channel load to a transmitter at 17.8 dBµV the OMI per channel is:

OMI per analogue channel = $(OMI^{80} x (\sqrt{(Na^{80}/2)}) x (\sqrt{(2/Na^{new})})$
OMI per analogue channel = $(0.04 x (\sqrt{(80/2)}) x (\sqrt{(2/42)})$
OMI per analogue channel = 0.04 x 6.32 x 0.218)
OMI per analogue channel = 0.0552 = 5.52%

Example 3

RF load consisting of a mix of analogue and of QAM RF channels.

Sample channel load:
Analogue channels = 50
QAM64 channels = 13 channels at a -10 dB backoff
QAM256 channels = 15 channels at a -6 dB backoff

First, the total RF power of the suggested channel load must be determined. This will require the QAM RF channels to be converted to the equivalent analogue RF power. QAM RF channels operate -6 dB and -10 dB below the analogue RF channels, the RF power of QAM channels is significantly lower than the RF power compared with analogue channels.

General Rule:

- 10 channels of QAM operating at -10 dB converted to analogue channels equals the same RF power of a single analogue RF channel

Formula for calculating the QAM RF to equivalent analogue RF power:

QAM RF equivalent power = (Nd) x 10 $^{-(\text{backoff }/10)}$

(Nd) = Number of QAM RF channels
Backoff = RF delta between Analogue RF and QAM RF
Typically QAM64 operates at 10 dB below analogue RF levels, QAM256 operates 6 dB below analogue RF levels.

Calculating the total RF power
13 QAM64 channels at -10 dB
QAM RF equivalent power = (Nd) x 10 –(backoff /10)
QAM RF equivalent power = (13) x 10 –(10 /10)
QAM RF equivalent power = (13) x 0.1
QAM RF equivalent power = 1.3 x analogue channel

15 QAM256 channels at -6 dB
QAM RF equivalent power = (Nd) x 10 –(backoff /10)
QAM RF equivalent power = (15) x 10 –(6 /10)
QAM RF equivalent power = (15) x 0.25
QAM RF equivalent power = 3.8 x analogue channel

Total RF power
50 analogue channels = 50 analogue equivalent
13 QAM64 channels @ -10dB = 1.3 analogue equivalent

15 QAM256 channels @ -6dB = 3.8 analogue equivalent
---------- +
Approximately 55.1 analogue channels

RF level to be applied to the transmitter
Channel load = 55.1 analogue channels

Peak analogue input = 34 – 10LOG (55.1)
Peak analogue input = 34 – 17.4
Peak analogue input = 16.6 dBµV

To calculate the OMI for 55.1 analogue channels

In this example when applying a 55.1 channel load to a transmitter at 17.8 dBµV the OMI per channel is:

OMI per analogue channel = $((OMI^{80} \times (\sqrt{(Na^{80}/2)}) \times (\sqrt{(2/Na^{new})})$

OMI^{80} = OMI for a load of 80 analogue channels (4%)
Na^{80} = Channel load if there are 80 analogue channels (factory standard)
Na^{new} = Actual channel load on transmitter = 55.1 channels

OMI per analogue channel = $(OMI^{80} \times (\sqrt{(Na^{80}/2)}) \times (\sqrt{(2/Na^{new})})$
OMI per analogue channel = $(0.04 \times (\sqrt{(80/2)}) \times (\sqrt{(2/55.1)})$
OMI per analogue channel = 0.04 x 6.32 x 0.1905)
OMI per analogue channel = 0.0481 = 4.81%

6.2 Applying the RF settings to the FT3S transmitter in MGC mode

Go to the “Port” section on the FT3S configuration page through the ASMM’s web interface (see section 6.1 for details).

6.2.1 Sample RF load for 80 analogue channels of RF load

Connect the RF cable to the BC input of the FT3S transmitter. If only the BC port is used it is advised to terminate the NC port with a 75 Ω terminator.

Option 1
Connect the RF load to the transmitter at a level of 15 dBµV (80 analogue channels) See sample calculation for a calculated RF input level (section 6.1.1: Example 1)

1. Set “Input AGC Mode” to “OFF” and click “Submit” to apply all settings
2. Set field the “Broadcast MGC” to 0 and click “Submit” to apply all settings

Option 2
Connect the RF load to the transmitter at a level of 10 dBµV.

1. Set the “Input AGC Mode” to “OFF” and click “Submit” to apply the setting
2. Set the “Broadcast MGC” field to 5 (15 dBµV – 10 dBµV) and click “Submit” to apply the settings

6.2.2 Sample RF load for 42 analogue channels of RF load

Connect the RF load to the BC input of the FT3S transmitter. If the NC port is not used it is advised to terminate the NC port with a 75 Ω terminator.

Option 1
Connect the RF load to the transmitter at a level of 17.8 dBµV (42 analogue channels). See the example calculation for a calculated RF input level (section 6.1.1: Example 2)

1. Set the “Input AGC Mode” to “ON” and click “Submit” to apply all settings
2. Set the “Broadcast MGC” field to 0 and click ”Submit” to apply all settings

Option 2
Connect the RF load to the transmitter at a level of 20 dBµV.

1. Set the “Input AGC Mode” to “OFF” and click “Submit” to apply all settings
2. Set the “Broadcast MGC” field to -2.2 (17.8 dBµV – 20 dBµV) and click submit to apply all settings

6.2.3 Sample RF load of 50 analogue channels+ 13 QAM64 channels + 15 QAM256 channels

Connect the RF load to the BC input of the FT3S transmitter. If the BC port is only being used it is advised to terminate the NC port with a 75 Ω terminator.

Option 1

Connect the RF load to the transmitter at a level of 16.6 dBµV (50 analogue channels + 13 QAM64 channels + 15 QAM256 channels). See the sample calculation for a calculated RF input level (section 6.1.1: Example 3)

1. Set the “Input AGC Mode” to “OFF” and click “Submit” to apply all settings
2. Set the “Broadcast MGC field” to 0 and click ”Submit” to apply all settings

Option 2

Connect the RF load to the transmitter at a level of 15 dBµV.

1. Set the “Input AGC Mode” to “OFF” and click “Submit” to apply all settings
2. Set the “Broadcast MGC” field to 1.6 (16.6 dBµV – 15 dBµV) and click ”Submit” to apply all settings

6.3 Applying RF settings to FT3S transmitter AGC mode

Go to the “Port” section on the FT3S configuration page through the ASMM’s web interface (see section 6.1 for details).

6.3.1 Sample RF load for 80 analogue channels of RF load

Connect the RF load at a level of 15 dBµV ± 3dB (80 analogue channels) to the BC input of the FT3S transmitter. If the BC port is only being used it is advised to terminate the NC port with a 75 Ω terminator.

See the sample calculation for calculated RF input level (section 6.1.1. Example 1)

1. Set the “Input AGC Mode” to “ON” and click “Submit” to apply all settings

6.3.2 Sample RF load for 42 analogue channels of RF load

Connect the RF load to the BC input of the FT3S transmitter. If the NC port is not used it is advised to terminate the NC port with a 75 Ω terminator.

See the sample calculation for calculated RF input level (section 6.1.1. Example 2)

1. Set the “Input AGC Mode” to “ON” and click “Submit” to apply all settings

6.3.3 Sample RF load for 50 analogue channels + 13 QAM64 channels + 15 QAM256 channels

Connect the RF load at a level of 16.6 dBµV ± 3dB (50 analogue channels + 13 QAM64 channels + 15 QAM256 channels) to the BC input of the FT3S transmitter. If the BC port is not used it is advised to terminate the NC port with a 75 Ω terminator.

See sample calculation for calculated RF input level (section 6.1.1. Example 3)

1. Set the “Input AGC Mode” to “ON” and click “Submit” to apply all settings

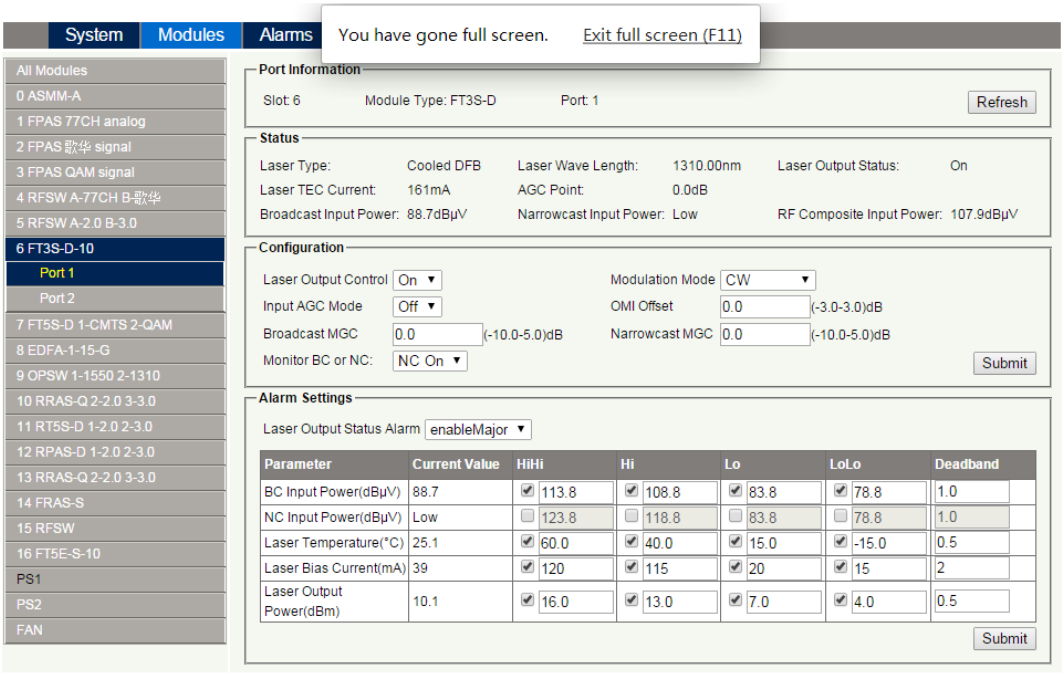


Figure 6-4

Table 6-5 Port Configuration Parameters Description

Items	Sub Items	Description	
		Effect and Configuration Method	HI
Module Information	Slot	-	-
	Module Type	-	-
	Port	-	-
Status	Laser Type	-	-
	Laser Wavelength	-	-
	Broadcast Input Power	-	-
	Laser Output Status	-	On/Off
	Narrowcast Input Power	-	-
	Laser TEC (thermoelectric) Current	-	-
	RF composite input power	-	-
Configuration	Laser Output Control	Control Laser ON or OFF	ON/OFF
	Input AGC Mode	Enable AGC	ON = Automatic Gain Control OFF = Manual Gain Control

	OMI offset	Change Factory Default OMI Value based on individual needs	-3 ~ +3dB
	Modulation Mode	Modulation mode: - CW: continuous wave, for Factory Configuration. - Modulated: modulating signal for customers. The default setting is modulated	Modulated
	Narrowcast MGC	Narrowcast Gain Control	-15 ~ 0dB
Alarm Settings	Critical High	Alarm level threshold, alarm parameters are can be changed	
	Warning High		
	Warning Low		
	Critical Low		
	Dead Band		

6.3.4 Confirming Input Signal

Input Signal is shown as the red box in Figure 6-6:

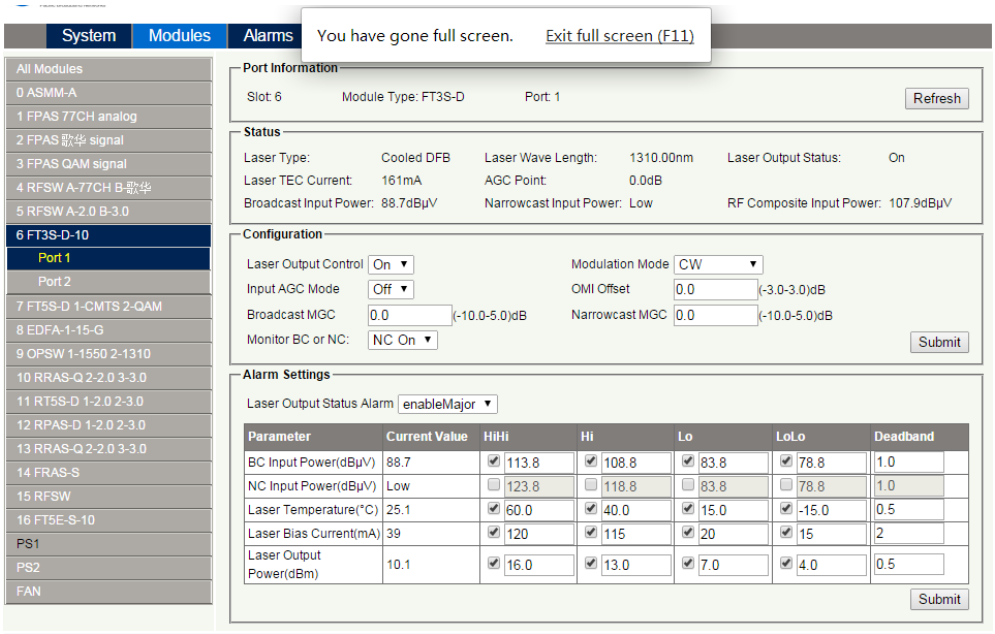


Figure 6-6

Input Power Calculations

The relationship between input power and the number of channels:
Per channel Power = Input Power -10LOG(number of channels)

On Figure 6-6, the interface displays the “Broadcast Input Power” as the total broadcast input power. The “Narrowcast Input Power” value displays the total narrowcast input power.
The operator can calculate the power per channel. When the different channels and levels are configured for the FT3S, the operator can also calculate the appropriate gain adjustment to ensure the total RF power for the laser.

6.3.5 Configuration of Module RF Signal

Default Configuration - AGC ON
The FT3S module’s default signal setting is for 77 channels (NTSC) at 75 dBμV per channel.
If the operator sets the module to AGC mode when the level changes within a range of ± 3 dB the FT3S can still work properly.
Typical environments:

- 77 channels (NTSC), Broadcast input: 75 dBμV per channel
- Narrowcast input: 75 dBμV per channel;

The factory default settings (DO NOT change the values when AGC is ON):

- Broadcast MGC Value: 0
- OMI offset: 0
- Narrowcast MGC: 0

Custom – AGC OFF
If the input signal is ± 3 dB beyond the range of 75 dBuV, set the AGC mode to off and configure the module with the following formula according to the input signal.

The narrowcast channel configuration method is the same as the broadcast method. Use the broadcast channel as an example; the derivation is as below:

1. If BC input signal level is 75 dBμV, the number of channels is N.
2. The adjustment level is: ΔP=75-+ΔS
3. Set the BC MGC value to ΔP, since the range of the MGC is -10 dB to +5 dB, if the value exceeds the range, the OMI offset should be changed (Range: ±3 dB).
4. Please refer to the table below for setting the corresponding values of ΔS=:

Channels	*100*	*90*	*77*	*60*	*50*	*40*	*30*
ΔS	*-1.1*	*-0.6*	*0*	*1*	*1.8*	*2.8*	*4.0*

Configuration Parameters Instruction

Items	Parameters	Description	Configuration
Broadcast MGC	Broadcast Gain Control	Broadcast Gain Control	-10 ~ +5 dB
OMI offset	OMI Offset	Change Factory Default OMI Value based on individual needs	
Narrowcast MGC	Narrowcast Gain Switch	Narrowcast Gain Control	-15 ~ 0 dB

6.4 Alarms Monitoring

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

6.4.1 Alarm Status Pages

Click the “Alarms” tab on the menu bar to display an overview of the alarm status of all the installed modules as shown in Figure 6-7 below.

The each module row has an alarm status indicator used to show:

- Normal operation: Green
- Minor Alarm: Orange
- Major Alarm: Red

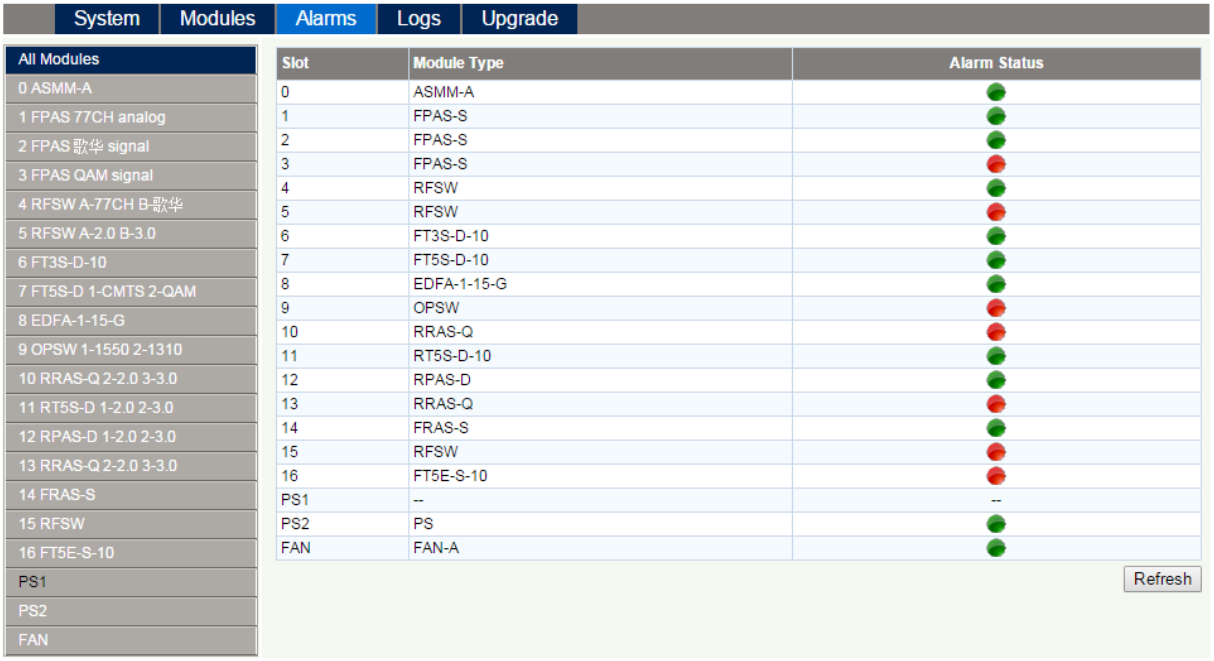


Figure 6-7

Module operating voltage and temperature alarm

Click on the corresponding module, as shown in figure 6-8, to view the module alarm information. For example, clicking on the “FT3S”, under the “Modules” tab, the module temperature and power supply voltage alarms can be viewed. The operator can utilise the status indicators to determine whether the module is functioning properly.

The indicator issued to show

- Normal operation: Green
- Minor Alarm: Orange
- Major Alarm: Red

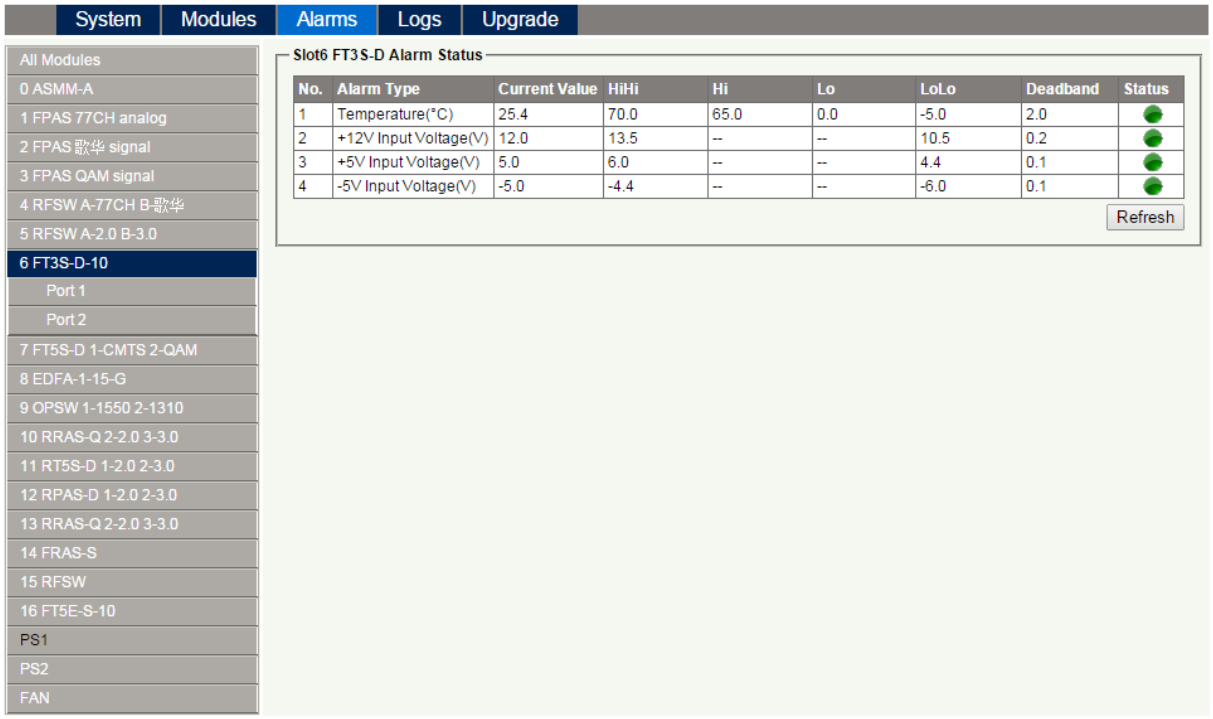


Figure 6-8

Use the status indicators to determine if the module is working properly. If the device has been replaced or reset, click on **"Refresh"** to update the alarm information.

Module Port Alarms

Click on the **"Port"** label under the module on the left columun, as shown in **Figure 6-9**. On the module port page, the operator can view the Total Input Power, Laser Temperature, Laser Output Power and the Laser bias voltage alarms: Status has three coloured indicators:

- Normal operation33: Green
- Minor Alarm: Orange
- Major Alarm: Red

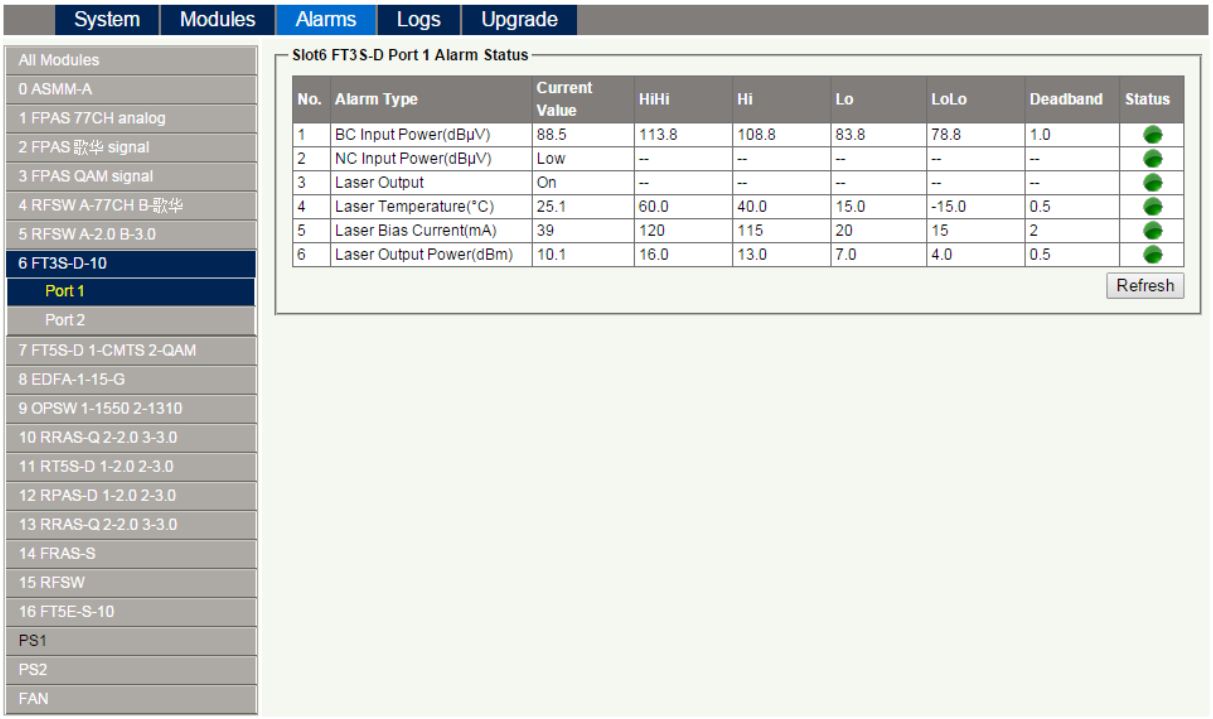


Figure 6-9

6.4.2 Alarm Configuration

Monitoring Function ON/OFF

In the “Configuration” section on Modules page, click “Alarm Control” drop-down menu to toggle the monitoring function.

Temperature, +12V, +5V Voltage Alarm Levels Management

By default, the temperature, +12 V alarm, +5 V alarm, and – 5 V alarms are all set “ON”. The check box ☑, as shown in **Figure 6-9**, indicates the alarm is enabled. When the check box is checked (detection ON), the text in the text box will be solid black. When the unchecked, (detection OFF), the text in the text box will be light grey and cannot be changed. The parameters are shown in **Figure 6-10, Table 6-11** below.

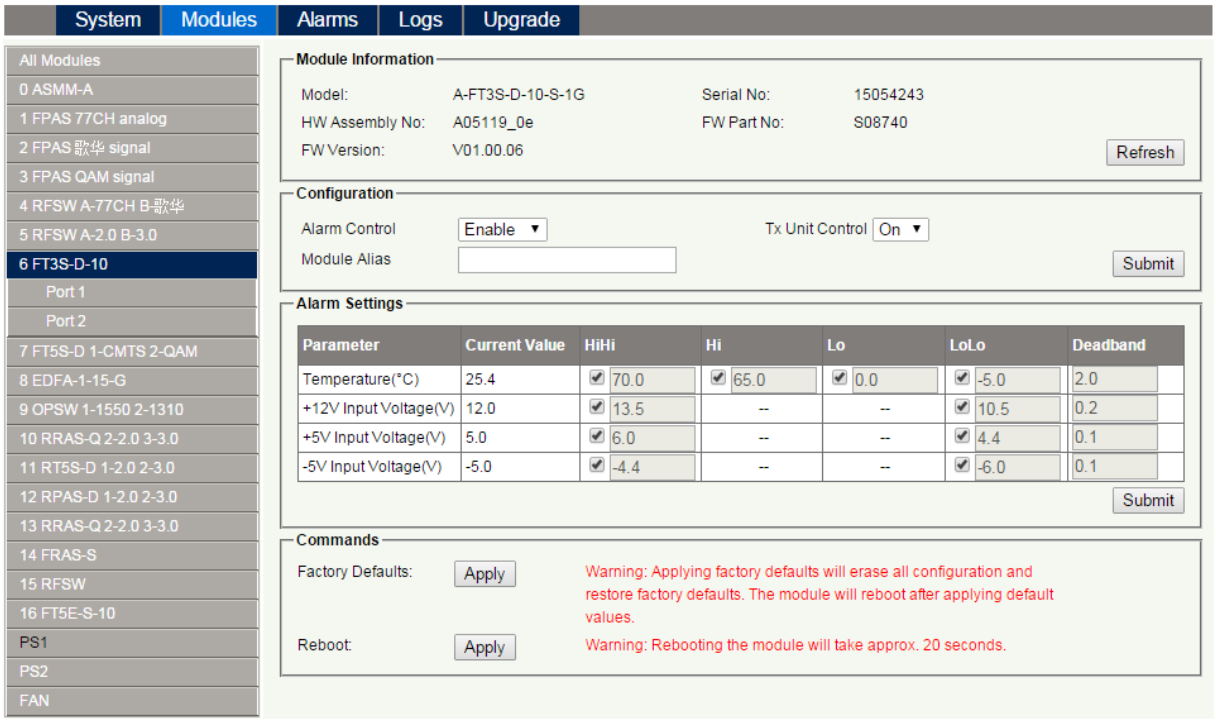


Figure 6-10

Table 6-11 Modules Page Alarms Threshold Parameters Instruction

Parameters	Critical High	Warning High	Normal	Warning Low	Critical Low	Dead Band	Factory Default	Detection Range
Temperature (°C)	70.0	65.0	28.0	0.0	-5.0	2.0	ON	-40 ~ 120
+12V Input Voltage (V)	13.5		12.0		10.5	0.2	ON	0 ~ 15.5
+5V Input Voltage (V)	6.0		5.0		4.4	0.1	ON	0 ~ 6.6
-5V Input Voltage (V)	-4.4		-5.0		-6.0	0.1	ON	-6.6 ~ 0

Input/Output Status Monitoring

To setup Input/Output status monitoring, select the specific **"Port"** from the left menu and the monitoring parameters are listed under "Alarm Settings", click on ☑ to turn the toggle the alarms. The monitoring parameters can be changed by the customer. See **Figure 6-12** below.

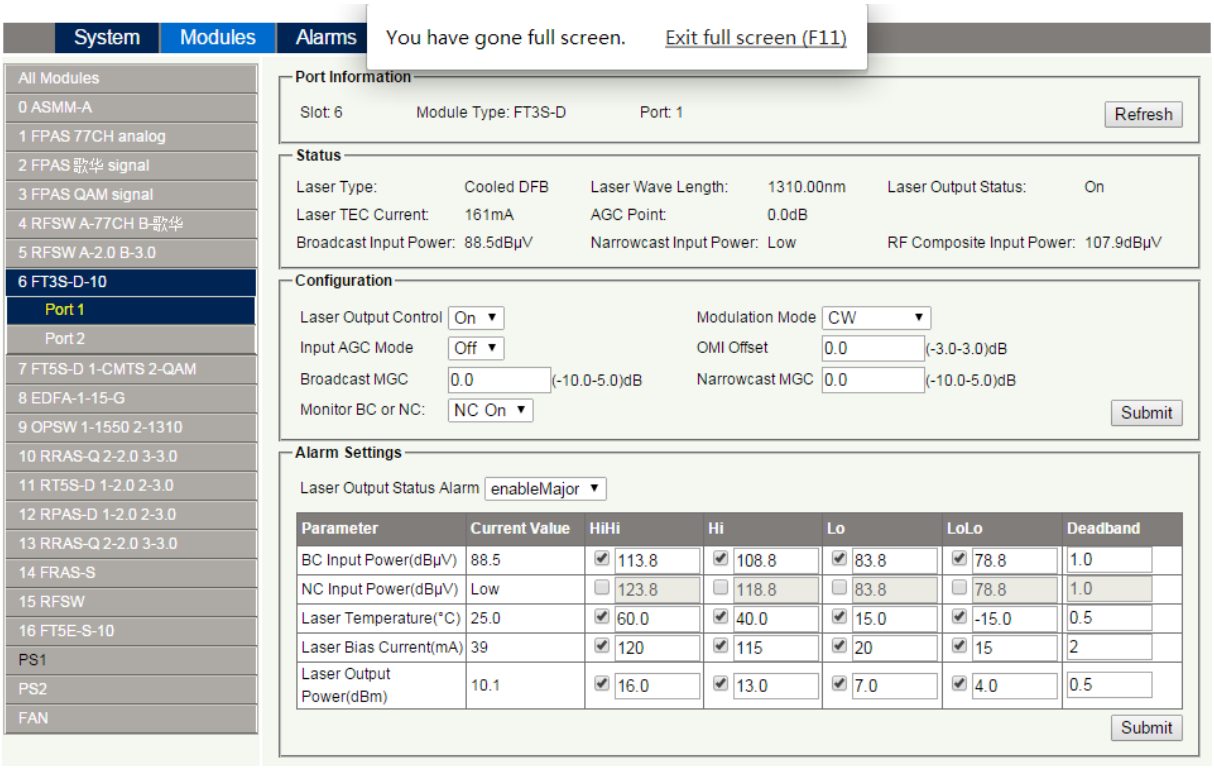


Figure 6-12

Table 6-13 Port Page Alarms Threshold Parameters Instruction

Parameters	Critical High	Warning High	Normal	Warning Low	Critical Low	Dead Band	Can it be modified ?	Factory Default	Adjustment Range
10 dBm Laser Temperature (°C)	60.0	30.0	25.0	20.0		2.4	NO	ON	-15 ~ 60
≤10 dBm Laser Bias Current (mA)	100.0	70.0	45.0	20.0	15.0	10.0	NO	ON	0 ~ 220
> 10 dBm Laser Bias Current (mA)	125.0	100.0	70.0	40.0	15.0	10.0	NO	ON	0 ~ 220
10dBm Laser Output Power (dBm)	16.0	13.0	10.0	7.0	4.0	1.0	YES	ON	-24 ~ 18.9
BC RF input (Total input power in dBm)	5.1	0.1	-15.0	-24.9	-29.9	1.0	YES	ON	-35 ~ 10
NC RF input (Total input powerin dBm)	5.1	0.1	-15.0	-24.9	-29.9	1.0	YES	OFF	-35 ~ 10

Module Alarm Rules

Table 6-14 Module Alarm Rules

Parameters (Common)	Description	Definitions	Related Indicators	Status Lights
Power OFF	Power OFF	Power OFF	All	All OFF
Initiating AM	Power ON	DuringModule Power ON	All	Green (2 times/sec)
No Alarm	Normal operation	Normal	All	Green
Upgrading AM Firmware	AM Upgrading	Module upgrade	MODE	
AM-Critical-ALM	Critical Alarm		STAT	Red
AM-Minor-ALM	Warning Alarm		STAT	Orange
BC Critical High (BC-Major-ALM)	BC Level High		STAT BC	Red
BC Warning High (BC-Minor-ALM)	BC Level Low		STAT BC	Orange
NC Critical High (NC-Critical-ALM)	NC Level High (NC set Enable)		STAT NC	Red
NC Warning High (NC-Minor-ALM)	NC Level Low (NC set Enable)		STAT NC	Orange
AGC/MGC	AGC/MGC Mode Control	AGC/MGC Mode Control	MODE	MGC Blinking (1 times/ sec), AGC Green always
Laser-Critical-ALM	Pre-Laser Gain High	Laser Current High	STAT LSR	Red
Laser-Warning-ALM	Pre-Laser Gain Low	Laser Current Low	STAT LSR	Orange
Laser-Shutdown	Laser-Shutdown	Laser-Shutdown	LSR	Red

6.5 Log Management

The operator can view all the alarms of the modules in the chassis on the Logs Management page. Click Logs to enter the **Logs** Management page. Refer to **Figure 6-15** below:

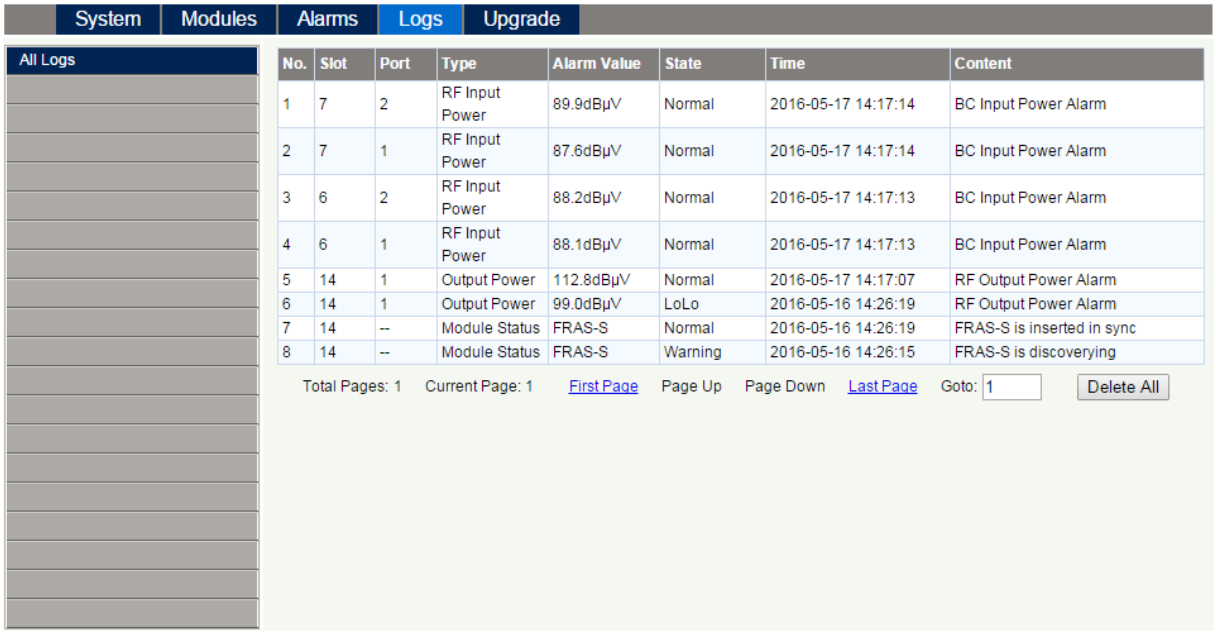


Figure 6-15

6.6 Firmware Upgrade

The Module supports firmware upgrades.

See **Figure 6-16**. Click “Browse” locate the locally stored firmware file. Click **”Start upgrade”** to begin the upgrade process. Once the upgrade is complete, you will be automatically redirected to the Network Management page.

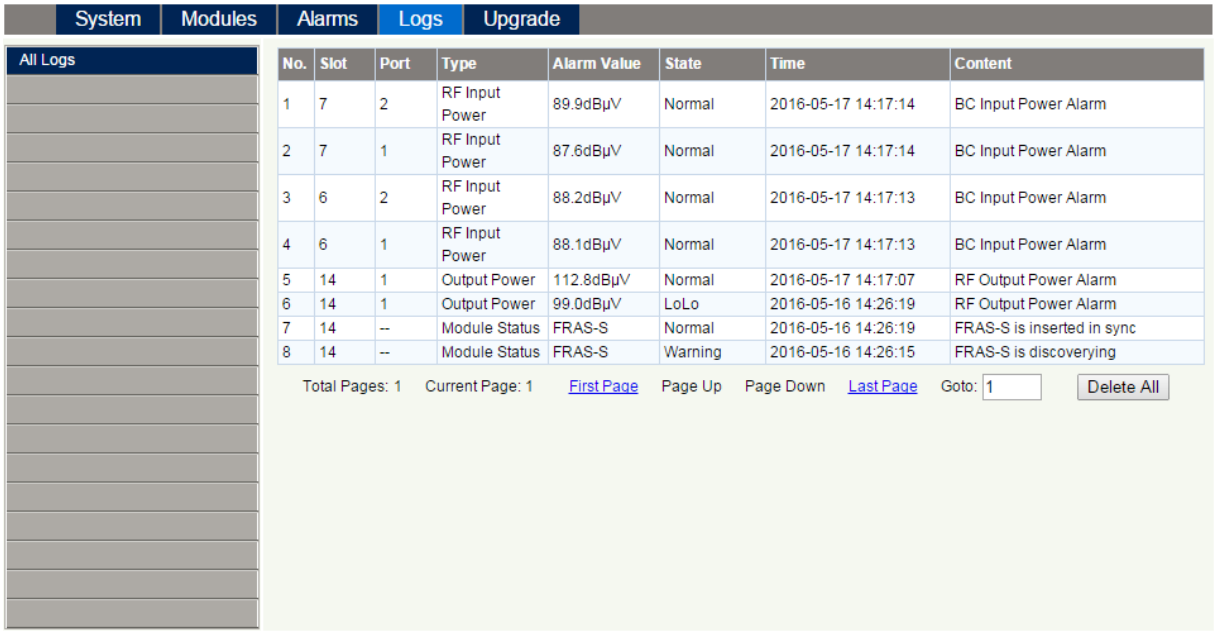


Figure 6-16

** The upgrade file needs to be located on the PC that is connected to ASMM*

** The Web GUI only supports the manual firmware updates from a local PC.*

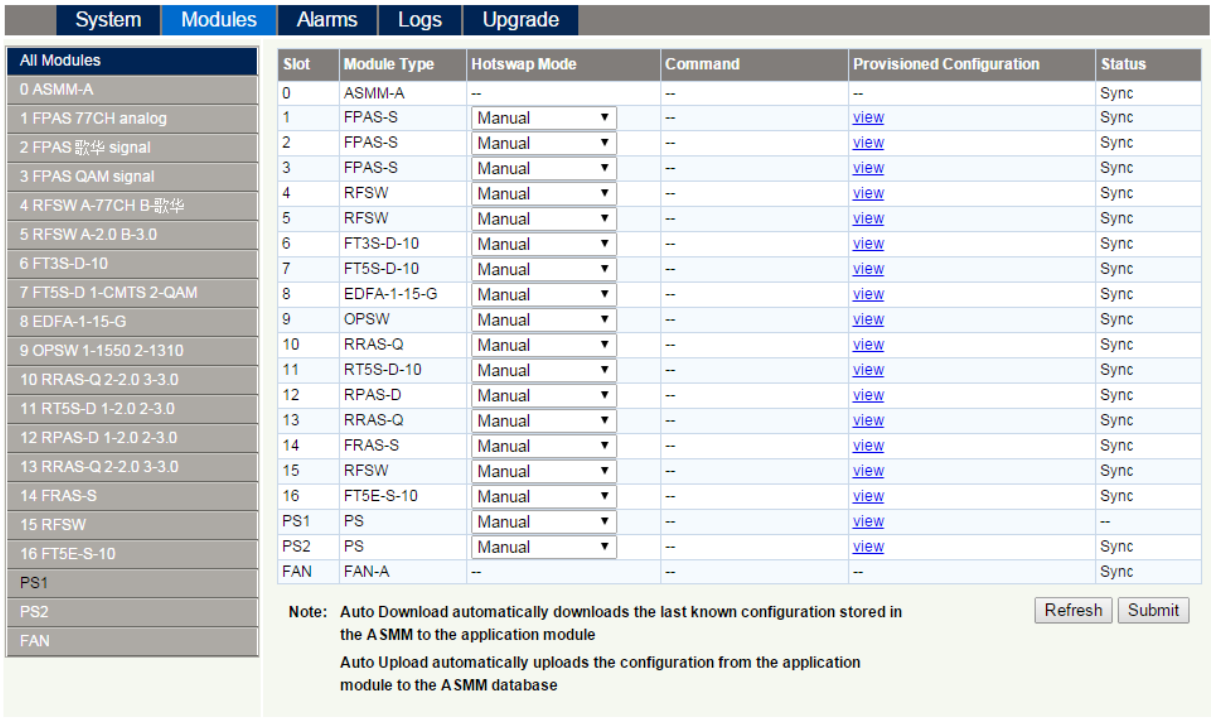
** The FT3S supports automated firmware updates and automatic backup & restore features via TFTP when managed through Technetix NMSE management software. Please refer to the NMSE Product User Manual for more information.*

6.7 Restoring Factory Defaults

Factory defaults can be restored setting all parameters to the factory default setting.

Detailed operations:

Click Modules tab and click the module to be configured as the page shown in **Figure 6-1.** Click **Apply** button in Factory Default section. When finished, the device configuration will be reset. For more detailed factory reset information, please refer to the factory restore and upgrade configuration parameters table as in **Table 6-17**.



Note:

All the powers displayed on the webpage are total power.

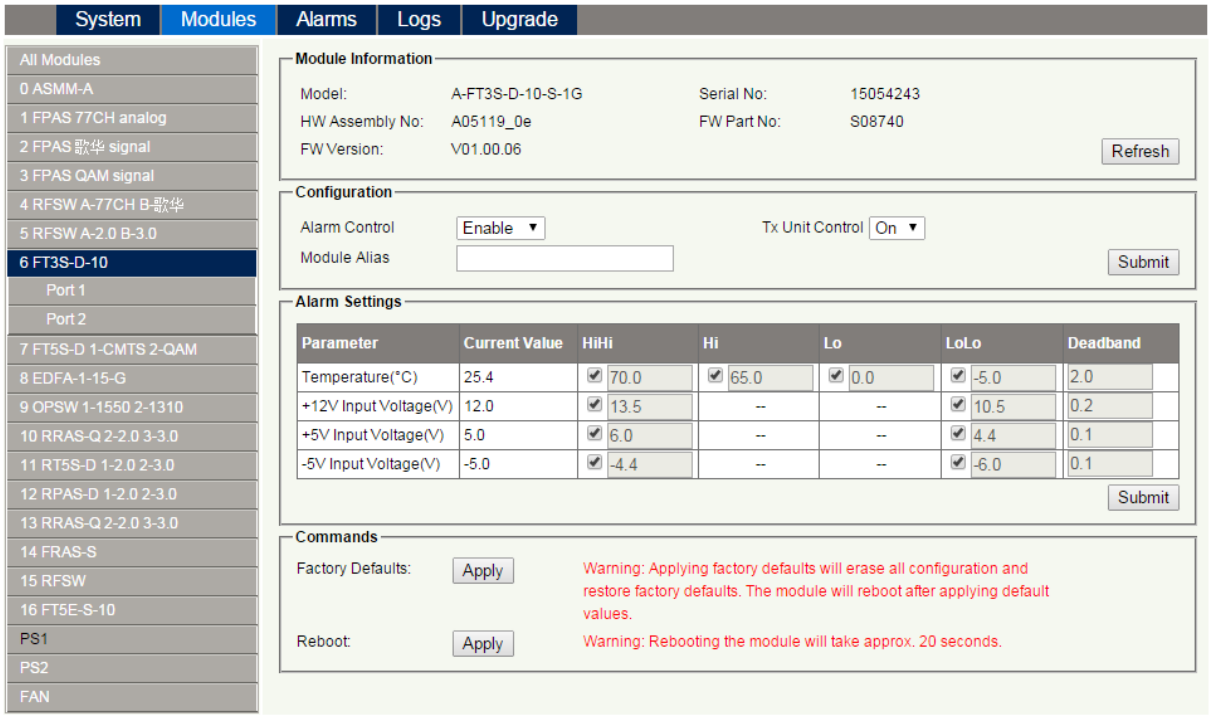


Figure 6-17

Table 6-18 Factory default and upgrade configuration parameters table

Parameters	Configuration	Factory default	After software upgrade
Alarm Control	ON/OFF	ON	ON
TxUnitControl	ON/OFF	ON	OFF
AGC Mode	ON/OFF	OFF	OFF
Broadcast MGC (dB)	-10 ~ +5	0	Previous Setting Retained
Narrowcast MGC (dB)	-15 ~ 0	0	Previous Setting Retained
Laser Output Control	ON/OFF	ON	OFF

6.8 Reboot

The module can be rebooted remotely, see **Figure 6-19**.

Detailed operations:

Click the “Modules” tab, then click the corresponding FT3S module from the left column. Then, from the FT3S page, click the **“Apply”** button next to “Reboot” in the “Commands” section. Next, click **“Submit”** to confirm. The module will restart and retain its configuration settings.

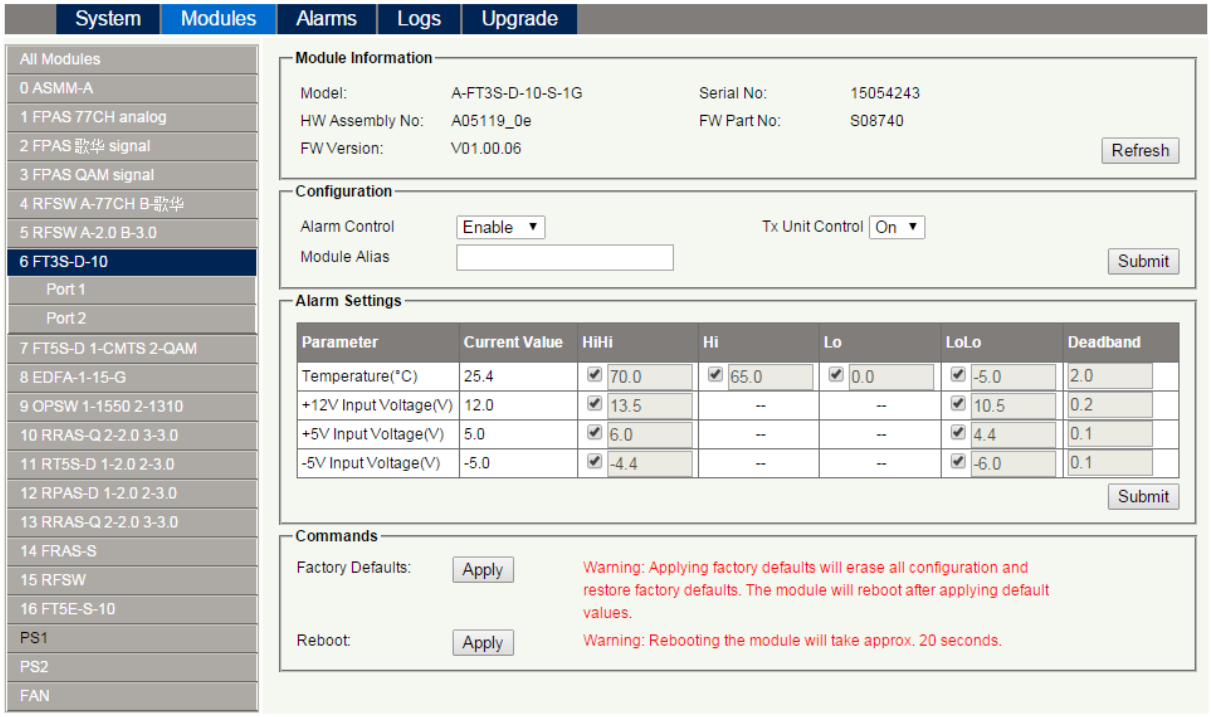

System
Modules
Alarms
Logs
Upgrade
All Modules
0 ASMM-A
1 FPAS 77CH analog
2 FPAS 歌华 signal
3 FPAS QAM signal
4 RFSW A-77CH B-歌华
5 RFSW A-2.0 B-3.0
6 FT3S-D-10
Port 1
Port 2
7 FT5S-D 1-CMTS 2-QAM
8 EDFA-1-15-G
9 OPSW 1-1550 2-1310
10 RRAS-Q 2-2.0 3-3.0
11 RT5S-D 1-2.0 2-3.0
12 RPAS-D 1-2.0 2-3.0
13 RRAS-Q 2-2.0 3-3.0
14 FRAS-S
15 RFSW
16 FT5E-S-10
PS1
PS2
FAN
Module Information
Model: A-FT3S-D-10-S-1G
Serial No: 15054243
HW Assembly No: A05119_0e
FW Part No: S08740
FW Version: V01.00.06
Refresh
Configuration
Alarm Control Enable
Tx Unit Control On
Module Alias
Submit
Alarm Settings
Parameter
Current Value
HiHi
Hi
Lo
LoLo
Deadband
Temperature(°C) 25.4 70.0 65.0 0.0 -5.0 2.0
+12V Input Voltage(V) 12.0 13.5 -- -- 10.5 0.2
+5V Input Voltage(V) 5.0 6.0 -- -- 4.4 0.1
-5V Input Voltage(V) -5.0 -4.4 -- -- -6.0 0.1
Submit
Commands
Factory Defaults: Apply
Warning: Applying factory defaults will erase all configuration and restore factory defaults. The module will reboot after applying default values.
Reboot: Apply
Warning: Rebooting the module will take approx. 20 seconds.

Figure 6-19

7 Troubleshooting

Alarm indicators for diagnosing problems

When there is a problem, the operator can use the status LEDs to determine the location and and issue.
Please see **Table 7-1** below:

Table 7-1 Fault Judgment Table

Alarm Indicator status	Common Faults	Trouble Shooting
BC status is orange	BC input signal is low or high.	Adjust input signal or adjust MGC to an appropriate value.
BC status is red	BC input signal is too high or there is no input.	Adjust input signal
STAT is red	The output optical power is abnormal or bias current is abnormal.	Please contact Technetix's technical support.
	Power failure	Please contact Technetix's technical support.
	Operating environment temperature is too high.	Lower the room temperature. If the temperature is normal, please contact Technetix's technical support.

8 Declaration of Conformity

According to ISO/IEC Guide 22 and EN45014

Manufacturer's Name:	Technetix
Manufacturer's Address:	Technetix Ltd, Innovation House, Technetix Business Park, Albourne, West Sussex, BN6 9EB
Product Name:	FT3S – Optical Forward Transmitter 1310 nm Single Module

Conforms to the following standards:

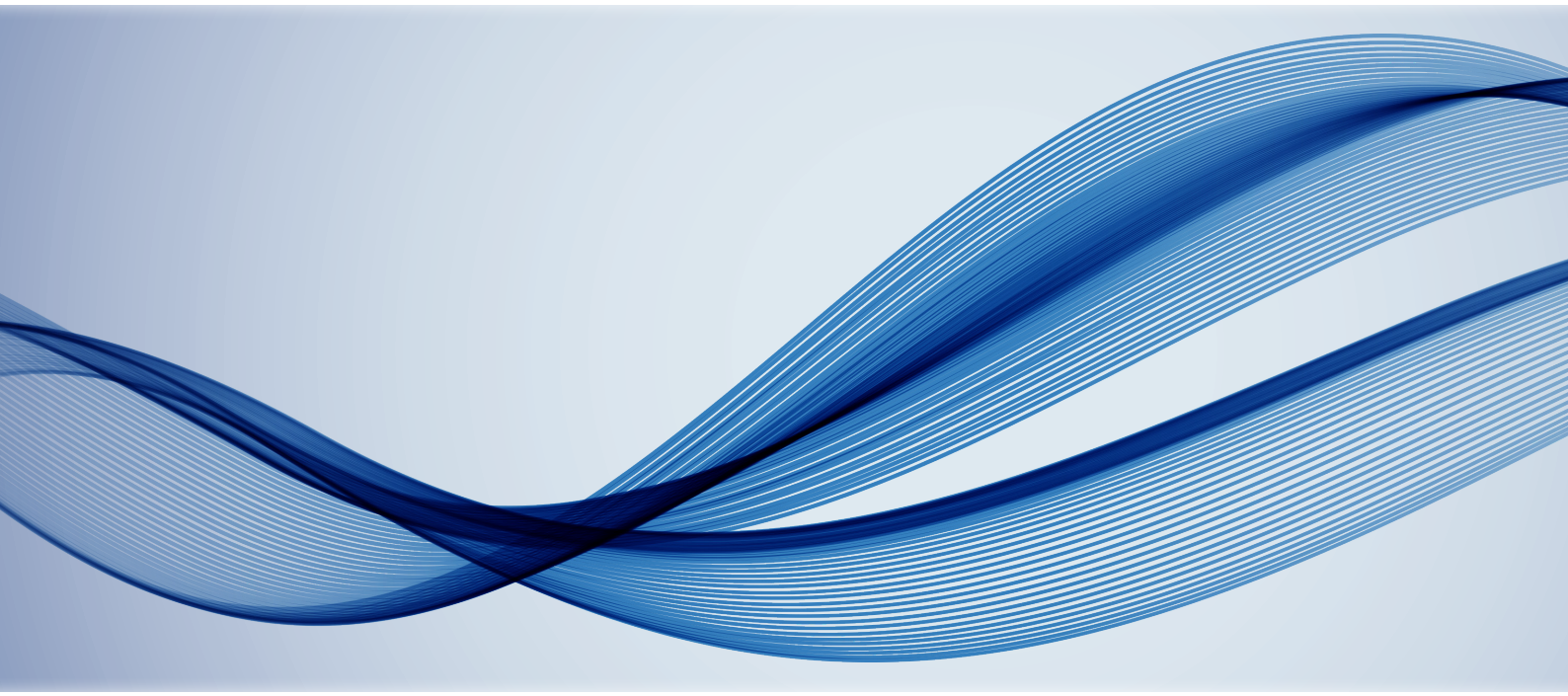
Safety:	EN 80083-1, EN 60950, IEC 950, AS/NZS 3260:1993, EN-60825-1, IEC 825-1, AS/NZS 2211.1 Laser Safety
EMC:	EN 50083-2, EN-55022:1994, IEC/CISPR 22:1993, AS/NZS CISPR 22:2006
CATV/HFC:	EN-50083

Appendix A: Default Alarm Limit Settings

Parameter	Critical High	Warning High	Normal	Warning Low	Critical Low	Dead Band	Factory Default	Detection Range
Temperature (°C)	70.0	65.0	28.0	0.0	-5.0	2.0	ON	-20 ~ 125
+5V Input Voltage (V)	5.7		5.0		4.6	0.1	ON	0 ~ 6.5
+12V Input Voltage (V)	13.2		12.0		10.8	0.1	ON	0 ~ 16

Appendix B: Factory Default Settings

Parameters	Conditions	Factory Default Value	After Software Upgrade
Alarm Detection Control	ON/OFF	ON	ON
Output Control	ON/OFF	ON	ON
Output Gain Type	MGC/OAGC/PAGC	MGC	MGC
Output RF Pad Level (dB)	0 ~ 20	10	10
Remote Node Control	ON/OFF	OFF	OFF



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