

# Operation Manual



IEC 1074/14

## Fiber Raman Amplifier

Keep this manual properly.  
Read and follow the safety procedures before operation .

SIMTRUM China  
Telephone: +86 133 2643 0008  
Email: info@simtrum.com

SIMTRUM Singapore  
Telephone: +65 6996 0391  
Email: info@simtrum.com

**SIMTRUM**



## ■ Safety warnings and precautions

- Equipment operators must strictly comply with relevant safety regulations and precautions.
- Operators must regularly inspect the equipment and ensure that all relevant personnel comply with safety regulations.
- Because lasers can damage the eyes and skin, please avoid getting lasers in your eyes or irradiating your skin.
- Please note that lasers can damage the retina and conjunctiva.
- Do not touch the fiber optic end face directly with your hands to avoid dust entering and affecting product characteristics.
- Please keep the equipment away from high temperature, high pressure, and humid environments.



To prevent equipment from being damaged by static electricity,  
Please take appropriate precautions when handling the equipment!



Lasers can damage some electronic devices.  
Lasers can accelerate the aging of certain materials.  
Laser radiation can cause harm to the human body and certain sensitive substances!

- This instruction manual applies to the following product models:

All products of STFRA- XXXX - XXXX -B

## ■ Raman Amplifier Product Series

- First-order Raman fiber amplifier
- Second-order Raman fiber amplifier
- Erbium-doped fiber amplifier/Raman amplifier hybrid integrated module

## ■ Packing list

1. Raman amplifier 1
2. One product user manual
3. One product test form
4. One DC power adapter or power cord

## ■ Product Overview

Fiber Raman amplifiers utilize the Raman scattering effect in optical fibers to provide gain to optical signals, effectively compensating for signal attenuation during long-distance fiber optic transmission. They feature high bandwidth, high gain, and low noise, making them suitable for long-distance optical transmission systems and distributed fiber optic sensing systems.

The first-order Raman amplifier uses a 1.4 $\mu$ m band laser as Raman pump to provide gain for C or L band (1.5 $\mu$ m band) signal light, which can effectively compensate for the attenuation of optical signals during long-distance transmission in optical fibers.

A second-order fiber Raman amplifier, based on a first-order fiber Raman amplifier, incorporates a 1.3 $\mu$ m-band pump laser to provide Raman gain for the 1.4 $\mu$ m-band laser of the first-order Raman amplifier. This effectively reduces system noise and is suitable for optical signal amplification in long-distance, repeaterless optical transmission systems. A second-order fiber Raman amplifier must be used in conjunction with a first-order fiber

## Raman amplifier.

Desktop or modular versions are available to meet customer needs . Fiber optic Raman amplifier modules support PC software monitoring and are compact for easy integration . Desktop fiber optic amplifiers facilitate experimental operation, with parameters set via the front panel. More compact modular fiber optic amplifiers are also available for easier system integration. Both desktop and modular fiber optic amplifiers support PC software control or serial command control. Users can choose the appropriate fiber optic amplifier model and type based on their needs , and we can also provide customized fiber optic amplifier products to meet specific customer requirements.

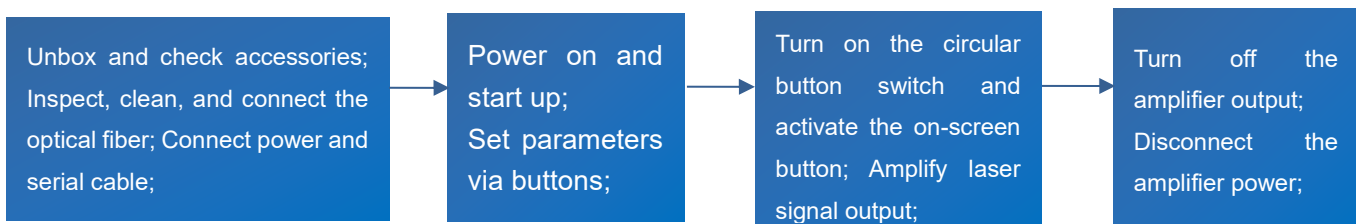
### Characteristic

- Miniaturized modular design
- Wide operating wavelength range
- High gain, flat gain
- Low noise figure, low power consumption

### Application

- Long-distance fiber optic communication
- Distributed fiber optic sensing
- Fiber laser

### ■ Basic Operating Steps



**Step 1:** Unpacking and Assembly . Before assembly, please check that all accessories are complete , including power cord or power adapter, fiber optic patch cord, instruction manual, test report, etc. Connect the power supply. Desktop amplifiers can be directly connected to AC power; modular amplifiers should be connected to a DC switching power supply or regulated power supply that meets their power requirements. Connect the signal source and

SIMTRUM China  
Telephone: +86 133 2643 0008  
Email: info@simtrum.com

SIMTRUM Singapore  
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Email: info@simtrum.com

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amplifier input using fiber optic patch cords. The amplified laser signal is output through fiber optic patch cords. The amplifier output usually has a fixed, non-removable fiber optic patch cord ; when using fiber optic adapters to connect fiber optic patch cords, ensure that the types of fiber optic patch cord connectors used are consistent. ( **Please refer to the product test sheet for signal source input power.** ).

**Step 2 :** Turn on the power switch on the back of the amplifier to start it . Note: At this time, the operating mode (**ACC**) and the amplifier's operating current are the parameters set during the most recent use . If necessary, these can be adjusted via the screen or the host computer software . The amplifier is usually set to the lowest operating current and lowest output power by default at the factory.

**Step 3:** Turn on the activation switch ( Enable ) on the right side of the panel, press the activation button (**ON/OFF**) on the screen , and set the appropriate output power and pump current. The laser will be amplified and output . During the experiment, the working mode and output power can be adjusted as needed. Note that when the amplifier is in the light output state (with the activation switch on), it is strictly forbidden to plug or unplug the fiber optic patch cord connector or perform any connection operations. Otherwise, it is very easy to damage the end face of the fiber optic patch cord connector and the amplifier itself, which will lead to failure.

**Step 4 :** After use, turn off the activation button ( Enable ) to shut off the amplifier output, and finally turn off the power switch.

## ■ Front and Back Panels and Interface

1. The front panel is shown in the image below, with inputs and outputs

SIMTRUM China  
Telephone: +86 133 2643 0008  
Email: info@simtrum.com

SIMTRUM Singapore  
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Email: info@simtrum.com

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arranged in order. Fiber optic interface, touch-screen LCD, enable button , and output indicator lights. This product model uses an LCD touchscreen for control and display of operating parameters.



2. The rear panel, as shown in the image below, includes, in order, an external power interface and switch, an RS232 DB9 communication port, and a cooling fan. The power supply is compatible with a wide range of AC voltages from 100 to 240V, allowing direct use in any country or region.






3. The upper left corner of the screen is the status display area, showing the current real-time input optical power , pump output optical power , pump laser current (C1/C2) , and pump laser temperature (T1/T2) ; the other areas are for control and parameter input.



## ■ Working Mode and Control Method

1. Amplifier operating mode control: The following operating modes are supported by default. The control logic of the modes can be referred to in the following description.

✧ Automatic pump current control mode (ACC mode)

2. Amplifier parameter settings: In **ACC** mode, you can directly click  and  adjust the current value by clicking on the area. Long press for coarse adjustment, short press for fine adjustment. Alternatively, after clicking on the **Current Set** area, you can enter the desired pump current value on the pop-up keyboard. After setting, press  Enter to apply the changes, as shown in the image below.



3. Parameter setting range in control mode:

SIMTRUM China  
Telephone: +86 133 2643 0008  
Email: info@simtrum.com

SIMTRUM Singapore  
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Email: info@simtrum.com

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### **ACC: 0~Maximum current value**

(\*Maximum power and maximum current values are available in the test report for each product .) In **ACC mode, the pump laser current will not exceed the factory setting value, so please use it with confidence .**

4. Amplifier Output Activation: Amplifier output activation is controlled by both the **Active** button on the screen and the mechanical laser output switch ( Emission ) . **The Active button** in the lower right corner of the screen controls and displays the current amplifier output activation status . When the mechanical switch ( Emission ) is pressed (the button's red light illuminates) , the **Active** area in the lower right corner of the screen can be manually switched from **OFF** to **ON** , indicating that the amplified laser is being output . Clicking the **Active** button on the screen again manually switches **the ON** state back to **OFF** , and the amplifier will stop outputting .
5. Software Control and Communication Protocol: This fiber optic amplifier also supports host computer software control or serial port command control . The default communication port is RS232 DB9, located on the rear panel of the amplifier. Dedicated host computer software and serial communication protocol code are provided with the product ; when using the host computer software and serial communication protocol to control the amplifier, the control function of the LCD screen on the front panel is disabled.

## ■ Amplifier Operating Mode Description

Raman fiber amplifiers typically have a control mode: **ACC**

1. **ACC** mode: Automatic current control mode, where the user sets the Raman amplifier pump current and the amplifier automatically locks it to achieve a constant Raman pump current.

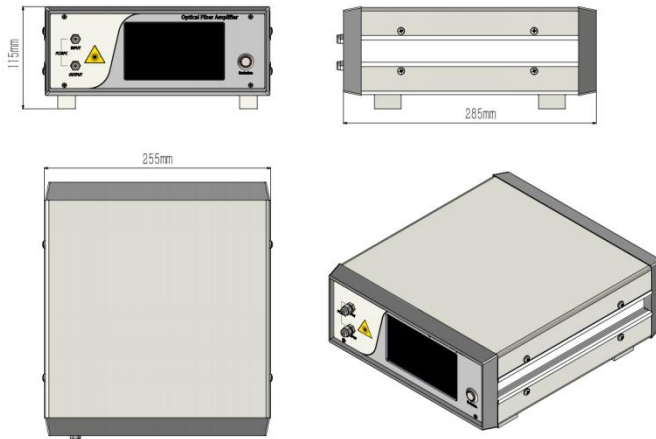
## ■ Operating Precautions and Maintenance

1. The fiber optic amplifier should operate within the rated wavelength and power range of the optical signal. It is not allowed to input optical signals that exceed the wavelength and power range, otherwise the fiber optic amplifier will be damaged. Please refer to the product test sheet for specific parameters.
2. When starting the fiber optic amplifier, first ensure that the power switch and activation button are in the off position before connecting the power supply to prevent sudden laser output from damaging other instruments and devices upon power-on. When shutting down, first turn off the activation switch, wait for the output indicator light to go out, then disconnect the power supply, and then disconnect the fiber optic connection. Never disconnect the power supply directly while the amplifier is working.
3. Before connecting fiber optic connectors, thoroughly clean the fiber optic connector end face using a dedicated fiber optic cleaning tool and carefully inspect it with a fiber optic end face inspection instrument to ensure it is completely free of dust and contamination before connecting via the fiber optic flange. When cleaning, inspecting, and connecting the fiber optic connector end face, ensure that the laser and amplifier are in a stopped

output state; never operate with light on. After use and disconnection from other fiber optic connectors, always cover the fiber optic connector with a dust cap.

4. It is not recommended to frequently plug and unplug fiber optic connectors at the input and output ends to avoid dust accumulation, which can increase losses or damage the fiber optic connector end face .
5. When a contaminated fiber optic connector is connected to a laser, even with a very low laser power, the connector end face can easily be burned out . The damaged fiber optic connector end face will cause great optical loss and must be replaced .
6. The FC/APC connector at the main output of the high-power amplifier is for user convenience only and must not be connected to other fiber optic connectors. If the output fiber needs to be connected to other fibers, the FC/APC connector at the end should be cut off , the outer protective sleeve should be removed, and a fiber optic fusion splicer should be used to perform a heat fusion connection on the output fiber. The fusion point after fusion should be properly protected .
7. If the output is connected to a space optics system, it is recommended to use a space light collimator with an FC/APC interface;
8. Please take precautions against moisture, dust, and corrosion ; store in a dry place.

## ■ Size



## ■ Quality Assurance and After-sales Service

### 1. Product quality warranty period

from the date of delivery , the customer can request the manufacturer to replace the parts or the whole machine free of charge; after one year, the manufacturer will provide paid repair services.

### 2. Product warranty coverage

During the free warranty period, free repair or replacement services will be provided for malfunctions caused by product quality. However, the company reserves the right to refuse free repairs in the following situations during the warranty period:

- 1) This product may be damaged or destroyed due to natural factors or environmental influences (electric shock, dust).
- 2) The product was damaged due to improper operation by the user.
- 3) The product has obvious signs of human-caused damage.
- 4) This product must not be disassembled, modified, or repaired without the company's authorization.

- 5) The warranty label sticker on the light source housing was altered or incomplete.
- 6) The product was damaged or lost during transportation.

<b>Product Warranty Card</b>	
Product Name	
Product Model (PN)	
Product Serial Number (SN)	
Purchase date	
Product Defect Description	
Username	
Contact address	
Contact number	
E-mail	