Operation Manual

High Power Fiber Amplifier Series

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

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Safety Warnings and Precautions

- Equipment operators must strictly abide by relevant safety regulations and preventive measures.
- Operators should regularly inspect the equipment and ensure that all relevant personnel comply with safety regulations.
- Since lasers can cause damage to eyes and skin, please avoid direct or scattered laser radiation from entering the eyes or shining on the skin.
- Note that lasers can cause damage to the retina and conjunctiva.
- Do not touch the fiber end face directly with your hands to prevent dust from entering and affecting product characteristics.
- Keep the equipment away from high temperature, high pressure, and humid environments.

To prevent equipment damage due to static electricity, take appropriate defensive measures when touching the equipment!

Lasers can damage certain electronic devices,

Lasers can accelerate the deterioration of certain materials,

Laser radiation can harm the human body and certain sensitive materials!

Product Models Applicable to This Operation Manual

- STEDFA-C(L)-BA-15~26-SM/PM-B; STEDFA-C(L)-LA-17~26-SM/PM-B; STEYDFA-C(L)-HP-BA-27/30/33/35-SM/PM-B;
- STYDFA-17~35-SM/PM-B;
- STTDFA-1920-BA-20~33-SM-B;

Product Overview

This product uses advanced semiconductor laser pumping and rare earth gain fibers, combined with dedicated integrated circuit chips to achieve high stability, high gain, and low power operation. The laser is coupled and output through a single mode fiber, and it is easy to use. It can be widely used in testing and experiments in fields such as optical communication, fiber lasers, and fiber sensing.

Fiber amplifiers are a series of optical amplifier products dedicated to fiber lasers or optical communication. They use short wavelength semiconductor lasers to pump rare earth fibers to provide gain for signal light in the 1.0, 1.5, or 2.0 μm wavelength bands. They have the advantages of high energy conversion efficiency, high gain, and low noise. Desktop fiber amplifiers are convenient for experimental operations. Users can set parameters through the front panel. More compact modular fiber amplifiers are also available for users to perform system integration. Both desktop and modular fiber amplifiers support host computer software control or serial port command control. Users can select fiber amplifier models with appropriate parameters according to their own needs to achieve the best amplification effect. We can also provide customized fiber amplifier products according to specific customer requirements.

Features

- Optional desktop or modular design
- Wide operating wavelength range
- High gain with flat gain profile
- Good temperature adaptability

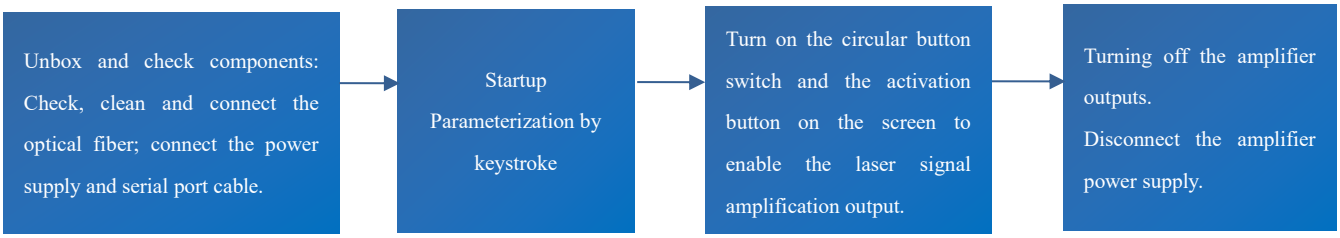
Applications

- Optical communication
- Fiber sensing
- Fiber lasers

Standard Accessories

1. 1 power cord (adapter or switching power supply)
2. 1 data cable (USB - RS232/DB9)
3. Fiber optic jumpers
4. 1 copy of the product operation manual
5. 1 copy of the product test sheet
6. Shipping list

Basic Operation Step



Step 1、 Unboxing and Assembly

Before assembly, check if all components are complete, including the power cord or power adapter, optical fiber patch cord, operation 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-supply requirements. Connect the signal light source and the amplifier input end with an optical fiber patch cord. The amplified laser signal is output through the optical fiber patch cord. The amplifier output end is usually equipped with a fixed non-detachable optical fiber patch cord. When using an optical fiber adapter to connect optical fiber patch cords, ensure that the types of optical fiber patch cord connectors are consistent.（The input power of the signal light source should refer to the product test sheet. Otherwise, the optical fiber amplifier will be locked and unable to work）。

Step 2. Turn on the power switch on the back of the amplifier to start it.

Note: At this time, the working mode (APC/ACC/AGC) and the working current of the amplifier are the parameter settings from the last use. If adjustment is required, it can be modified through the screen or the upper - computer software. Usually, the amplifier is set to the lowest working current and the lowest output power at the factory.

Step 3. Turn on the activation key switch (Enable) on the right side of the panel, press the activation key (ON/OFF) on the screen, and set appropriate output power and pump current. Then the laser will be amplified and output.

During the experiment, adjust the working mode and output power in a timely manner as needed. It should be noted that when the amplifier is in the light - emitting state (with the activation switch on), it is strictly prohibited to perform insertion and extraction operations on the fiber optic patch cord connectors. Otherwise, it is very likely to cause damage to the end - face of the fiber optic patch cord connectors and the amplifier itself, resulting in malfunctions.

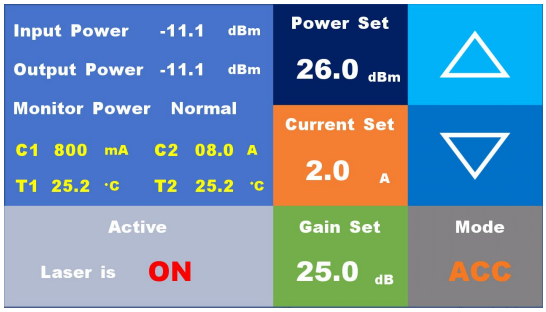
Step 4: After use, turn off the activation key switch (Enable) to cut off the amplifier output, and finally turn off the power switch.

Front and Rear Panels and Interfaces

1. The front panel is as shown in the following figure. Sequentially, there are input/output/Monitor optical fiber interfaces, a touch-controllable liquid-crystal screen, an enable key switch (Enable), and an output indicator light. This product model uses a liquid-crystal touch screen to control and display working parameters.

2. The rear panel is as shown in the following figure. Sequentially, there are an external power interface and switch, an RS232 DB9 communication port, and a cooling fan. The power supply is adapted to AC100 - 240V wide - range AC voltage and can be used directly in any country or region.

3. The upper-left corner area of the screen is the status display area: It shows the real-time input optical power (Input Power), output optical power (Output Power), pump laser current **Pump Current (C1/C2)**, and pump laser temperature **LD Temp (T1/T2)**; other areas are for control and parameter input.



4. **Monitor Power** shows the current self-detection status of the amplifier. After the

amplifier is powered on, it continuously conducts self-detection. When the self-detection is normal, it displays **Normal** and the amplifier can be used normally; when the self-detection is abnormal, it displays **Alarm** for warning, and at this time, the amplifier needs to be returned to the factory for repair.

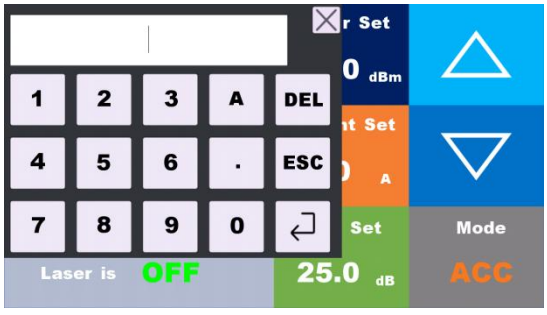
Working Modes and Control Methods

1. Amplifier working mode control: High - power fiber amplifiers natively support the following three working modes. The control logic for each mode can be referred to in the subsequent descriptions.
   - ✧ Automatic Pump Current Control Mode (ACC mode)
   - ✧ Automatic Power Control Mode (APC mode)
   - ✧ Automatic Gain Control Mode (AGC mode)

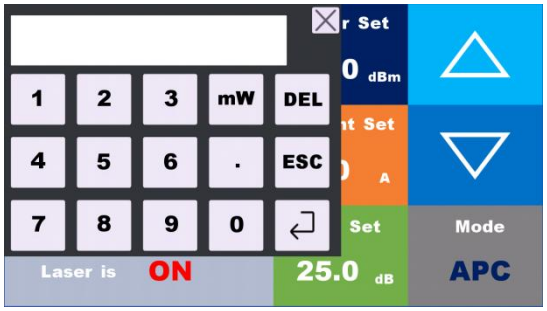
In the lower - right corner of the touchscreen **Mode** area is the mode selection button. Pressing it can cycle through the **APC/ACC/AGC** modes.

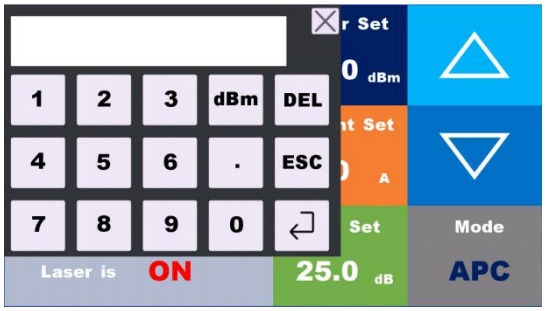
2. Amplifier Parameter Settings:

ACC Mode: You can directly click the △ and ▽ areas to increase or decrease the current value. Long-press for coarse adjustment and short-press for fine adjustment. Alternatively, click the **Current Set** area, then input the required pump current value (unit: Ampere, A) on the pop - up keyboard. After setting, press Enter ↵ to take effect, as shown in the following figure:

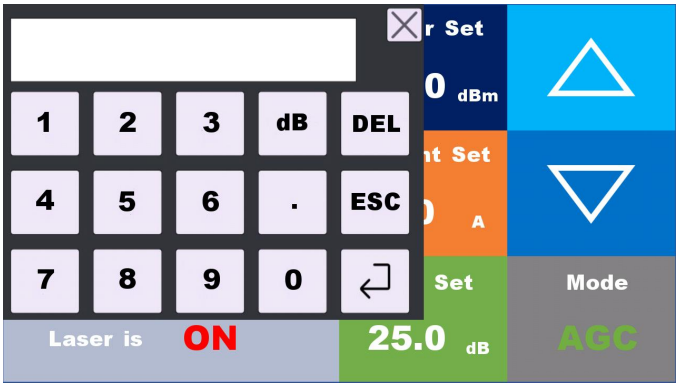


APC Mode: You can directly click the  and  areas to increase or decrease the power value. Long-press for coarse adjustment and short-press for fine adjustment. You can also click the **Power Set** area and input the required power value (unit: dBm or mW, switchable) on the pop-up keyboard. After setting, press Enter  to take effect, as shown in the following figure:





AGC Mode: You can directly click the  and  areas to increase or decrease the power value. Long-press for coarse adjustment and short-press for fine adjustment. You can also click the **Gain Set** area and input the required gain value (unit: dB) on the pop-up keyboard. After setting, press Enter  key to take effect, as shown in the following figure:



3. Parameter setting ranges under three control modes：

   APC：10%~100% of the maximum power value

   ACC：0~maximum current value

   AGC：0~25dB

   (*The maximum power and maximum current values can be found in the product test report of each fiber amplifier. In any mode, the pump laser current will not exceed the pre - set maximum safety limit value at the factory. Users can use it with confidence.)

4. Output activation of the amplifier: The output activation of the amplifier is controlled by both the **Active** button on the screen and the laser output activation switch（Enable）. The **Active** button in the lower-right corner of the screen is used to control and display the current output activation status of the amplifier. When the activation switch （Enable） is pressed (the red light is on), the **Active** area in the lower - right corner of the screen can be manually switched from the **OFF** state to the **ON** state， indicating that the amplified laser is outputting. Click the **Active** button on the screen again, and the，**ON** state will be manually switched to the **OFF** state, and the amplifier will stop outputting.

5. Laser input power threshold of the amplifier (laser input power threshold value): To prevent the amplifier from being mis-activated when there is no input optical power or the input optical power is too low, high-power fiber amplifiers (fiber amplifier product models with a saturated output power greater than or equal to 500mW) have startup threshold requirements for the input optical signal power. When the average optical power of the optical signal input to the amplifier is lower than - 10dBm (i.e., 0.1mW), the amplifier only remains in standby and does not start the amplification output; at this time, the **Active** area in the lower-right corner of the screen described in item 4 above cannot be switched from the **OFF** state to the **ON** state, and the amplifier will not have an amplified

output, but there may be a noise signal output of no more than a few mW. Fiber amplifiers of non-high-power models (fiber amplifier product models with a saturated output power less than 500mW) have no startup threshold requirements for the input optical signal power. Even if the input signal optical power is as low as 0mW, the pump of the amplifier can be fully turned on and activated for output, and at this time, the output light is completely amplified spontaneous emission (ASE) generated by the amplifier itself.

6. Software Control and Communication Protocol: This fiber amplifier also supports control via upper - computer software or serial port commands. The default communication port is RS232 DB9, located on the rear panel of the amplifier. Special upper - computer software and serial port communication protocol code will be provided with the goods. When using the upper - computer software and serial port communication protocol to control the amplifier, the control function of the front - panel LCD screen will be suspended.

■ Explanation of Fiber Amplifier Operating Modes

High - power fiber amplifiers typically have the following control modes：

APC/ACC/AGC

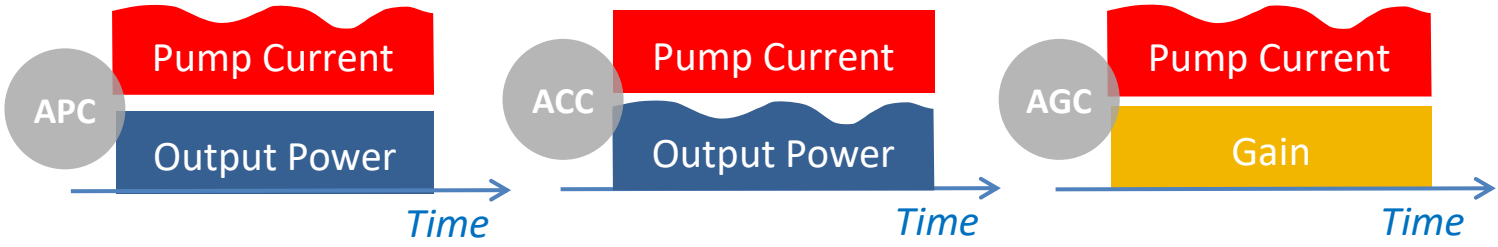
1. **APC Mode (Automatic Power Control Mode)**： In this mode, the user sets the output power of the amplified signal light. The amplifier automatically adjusts the pump current based on the output power monitored by the PD (Photodetector) to stabilize the output signal. In APC mode, the adjustable range of the output power for the user is usually 10% - 100% of the maximum output power. The advantage of APC mode is that when the input optical power fluctuates, the amplifier will minimize the fluctuation of the output power.
2. **ACC Mode(Automatic Current Control mode):** The user sets the pump operating current of the amplifier, and the amplifier automatically locks it to

achieve a constant pump current. When the input optical power fluctuates, the output power will also fluctuate accordingly.

3. **AGC Mode (Automatic Gain Control mode)**: The user sets the gain coefficient of the amplifier. The amplifier automatically controls and adjusts the pump current based on the detected input power and output power to keep the gain multiple as stable as possible. When the input optical power fluctuates, the output power will also fluctuate accordingly, but the gain coefficient remains basically stable.

The parameters monitored/controlled under the three modes are different, resulting in different effects, as shown in the following table and schematic diagram.

Working Mode	Parameter/Range Set by User	Parameter Monitored by Amplifier	Parameter Controlled by Amplifier	Purpose and Effect Achieved
APC Mode (Auto Power Control)	Output Power/10-100%	Output Power	Pump Current	Stable Output Power
ACC Mode (Auto Current Control)	Pump Current/0~100%	Pump Current	Pump Current	Stable Pump Current
AGC Mode (Auto Gain Control)	Optical Power Gain/0-25dB	Input and output optical power, calculation of optical power gain	Pump Current	Stable Gain



■ Operation Precautions and Maintenance

1. The optical fiber amplifier should operate within the rated optical signal wavelength and power range. Do not input optical signals beyond the wavelength

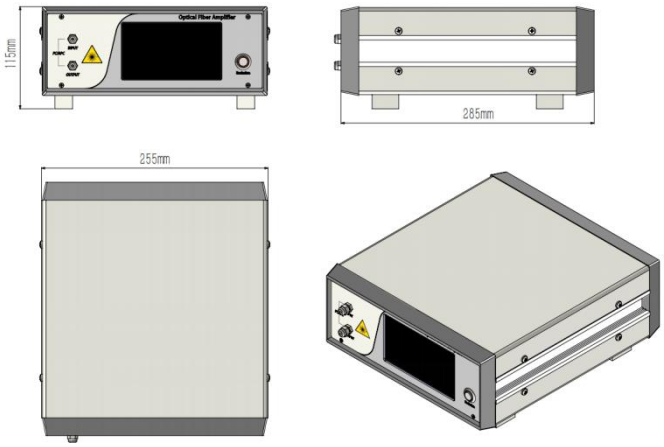
and power ranges, as this may damage the optical fiber amplifier. For specific parameters, please refer to the product test sheet.

2. When starting the optical fiber amplifier, first confirm that the power switch and the activation button switch are in the off position, and then connect the power supply to prevent the sudden output of laser light at the moment of power - on, which may damage other instruments, equipment, and components. When shutting down, first turn off the activation switch. After the output indicator light goes out, disconnect the power supply and then the optical fiber connection. Do not cut off the power supply directly while the amplifier is in operation.
3. Before connecting the optical fiber connector, use a dedicated optical fiber cleaning tool to thoroughly clean the end-face of the optical fiber connector. Observe carefully with the aid of an optical fiber end-face detector. Confirm that there is no dust or contamination, and then connect through an optical fiber flange. When cleaning, inspecting, and connecting the optical fiber connector end-face, ensure that the laser and the amplifier are in the output - stop state. Do not operate with light. After use and disconnection from other optical fiber connectors, be sure to cover the optical fiber connector with a dust-cap.
4. Frequent insertion and extraction of optical fiber connectors at the input and output ends are not recommended, as it may cause dust contamination, resulting in increased loss or damage to the end-face of the optical fiber connector.
5. When a contaminated optical fiber connector end-face is connected to the laser, even if the laser power is very low, the end-face of the optical fiber connector is easily burned. A damaged optical fiber connector end-face will cause a significant optical loss and must be replaced.
6. The FC/APC connector at the main output end of the high-power amplifier is only for the convenience of users to conduct power tests. It is strictly prohibited to connect it to other optical fiber connectors. If the optical fiber at the output end

needs to be connected to other optical fibers, cut off the FC/APC connector at the end, remove the external protective sleeve, and use an optical fiber fusion splicer to perform a heat-fusion connection on the output optical fiber. Also, perform standard protective treatment on the fusion point after splicing.

7. If the output end is connected to a spatial optical system, it is recommended to use a spatial light collimator with an FC/APC interface.
8. Pay attention to moisture - proof, dust - proof, and anti - corrosion measures. Store it in a dry place.

Dimensions



Quality Assurance and After - sales Service

1. Product Quality Assurance Period

From the date of delivery, if there are quality problems (non-human-induced) with the product within one year, the customer can request the manufacturer to replace parts or the entire unit free of charge. After one year, the manufacturer will provide paid repair services.

2. Product Warranty Scope

During the free warranty period, free repair or replacement services will be provided for malfunctions caused by product quality issues.

During the warranty period, our company reserves the right not to provide free repair services in the following situations:

1) The product is damaged or impaired due to natural factors or environmental influences (such as electric shock, dust).

2) The product is damaged due to non - standard operation by the user.

3) The product has obvious signs of human - induced damage.

4) The product has been disassembled, modified, or repaired without the authorization of our company.

5) The quality - assurance label on the light source housing has been tampered with or is incomplete.

6) The product is damaged or lost during transportation.

Product Warranty Card

Product Name	
Product Number(PN)	
Product Serial Number(SN)	
Purchase Date	
Description of Product Defects	
User Name	
Contact Address	
Contact Phone	
E-mail	

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