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# The User Guide

## FWAP-1550H-8 WDM PON EDFA



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# 1 Overview

## 1.1 overview

FWAP-1550H-8 Series PON+CATV EDFA Combiner, High power Erbium Doped Fiber Amplifier, it is the core equipment of three of one net in optical transmitter system, input 8 ports PON+1port CATV and output 8 ports combined 1550/1490/1310nm. The combined optical output power: 15dBm. plug-in dual power supply, achieved the function of OLT and CATV 1550nm optical single combined and amplify, having high cost performance value.(Erbium Doped Fiber Amplifier) is a representative one in the optical amplifier. As the EDFA's wavelength is 1550nm, it is in line with the low-loss band of fiber and its technology has been relatively mature, so widely used. Erbium-doped fiber is the core components of the EDFA, it makes quartz optical fiber as matrix material, and incorporate a certain proportion of rare earth element erbium ions (Er<sup>3+</sup>) in the core of a fiber. When certain amount of pump light is injected into the erbium-doped fiber, Er<sup>3+</sup> have been excited from the low-energy level to the high energy level, due to Er<sup>3+</sup> has a very short lifespan on the high energy level, and soon transit to a higher level by the form of a non-radiative, and form the population inversion distribution between this energy level and low-energy-level. Because the energy between these two energy levels is exactly equal to the photon energy of 1550nm, stimulated emission of 1550nm light can only occur, we can only enlarge 1550nm optical signal.

FWAP-1550H-8 Series PON+CATV EDFA Combiner , adopt 980nm or 1480nm high linearity, optical isolation, the DFB, thermoelectric cooling DFB laser produced by JDSU, Fujitsu, Nortel, Lucent, Fitel and other world-renowned semiconductor companies as the pumping source. In the interior of the machine is equipped with the light power export stable circuit and laser thermoelectric cooling device Temperature stability control circuit to ensure optimal machine performance and long-life laser stability. The microprocessor software monitor the lasers' working state, the Digital Panel (VFD) displays the operating parameters. Once the laser operating parameters deviate from the permissible range set by the software, micro-processing will automatically turn off laser power, red light goes on to warn, digital panel prompts cause of troubles., a detailed report of the device parameters please read "instructions."

## 1.2 Features

1.2.1) High quality: adopt multimode large power pump laser, power is optimized reasonably by software, and can most unlimited reduce NF of EDFA, it is comparable with EDFA. The feature can make system achieve excellent CNR.

1.2.2) Reliability: The 19 "2U rack, built-in high-performance plug-in dual power supply, it can work at 85 ~ 265Vac City Network Voltage, As well as an optional DC48V power supply (reservations required); chassis cooling can be automatic control by temperature.

1.2.3) Intuition: The pump laser is the most expensive machine components, machine equipped with microprocessor monitors the working state of the laser, the panel LCD window displays the operating parameters.

1.2.4) Network type: Select All-piece status monitoring transponder guarantees to meet the

national standard and be compatible with the SCTE HMS standard, it enables network management to monitor capabilities.

1.2.5) The plug is draw-out type: switching power supply is draw-out type with aluminum profile structure, it helps greatly to cooling and replacement. Besides it can make dual supply cold-heat backup.

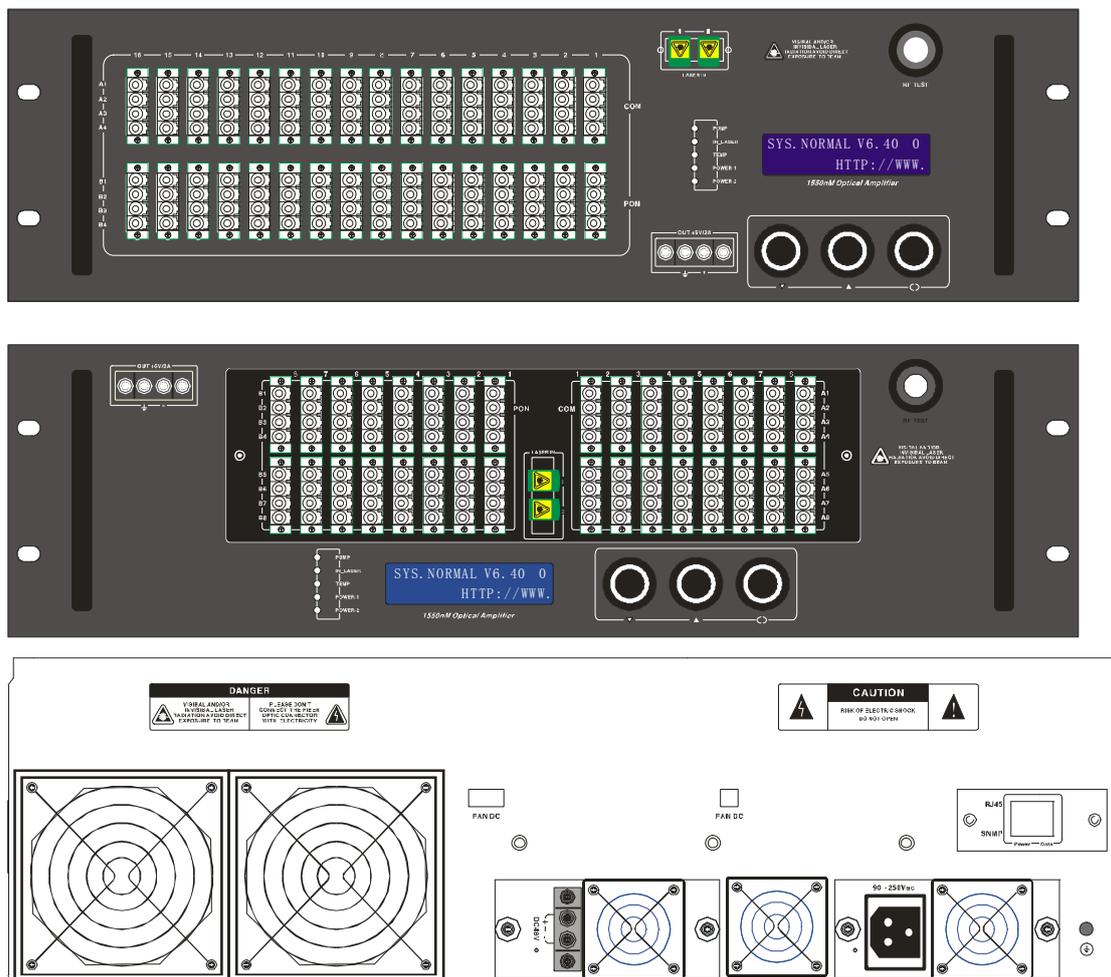
1.2.6) Adjustable output optical power: You can adjust the range of output optical power (downwards -3dB), it is required specification when user orders.

1.2.7) High output power: Matched output power maximum is 4W~6W.

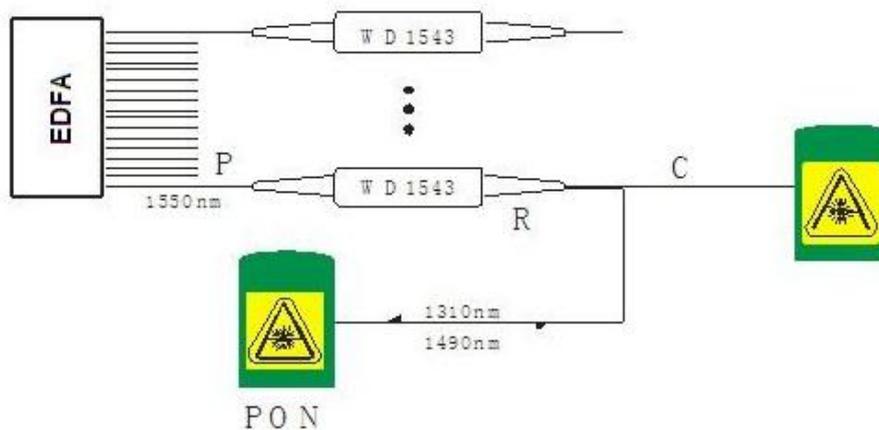
1.2.8) Some models can be integrated WDM, in GPON, EPON is more simple to use

## 2 Product structure diagram

### 2.1 EDFA front panel, back panel diagram



### 2.2 The block diagram of the integrated WDM



### 3 Modules main technical indexes

Model	FWAP-1550H-8
<b>Item</b>	
Operating wavelength (nm)	1545~1555
Input optical power(dBm)	-10~+10
Nominal input optical power (dBm)	+3
Noise figure (dB) (+3 dBm,@1550nm)	5.0~6.0
Gain flatness(dB)	< ±0.3
Stability of output optical power (dB)	< ±0.5
Polarization sensitivity (dB)	<0.2
Polarization modal dispersion (ps)	<0.5
Optical connector(IN/OUT)	SC/APC
Pump work quantity (N)	4
Saturated output power (dBm)	According order request
Power supplies (Vac)	115~265(draw-out plug)
Power supplies (Vdc)	48(draw-out plug)—optional

Operating temperature (°C)	0~50
Size (mm)	88×482.6×387
WDM-PON with optical path	
PON port operating wavelength (nm)	1310/1490
PON port insertion loss (dB)	<1
1550 port insertion loss (dB)	<0.5

## 4 Operation instructions

**4.0) Boot show:** Please put the plug in the outlet with AC220V, and the LCD panel will show “SYS\_INITIALIZATTING Wait.....”, after system initialization, the LCD panel will show as Figure (1) in page “0”. The LCD panel shows “SYS.NORMAL V6.00”.

**4.1) Product Type:** Figure (2) in page “1.1”.

**4.2) Product serial number:** Figure (1) page “2”

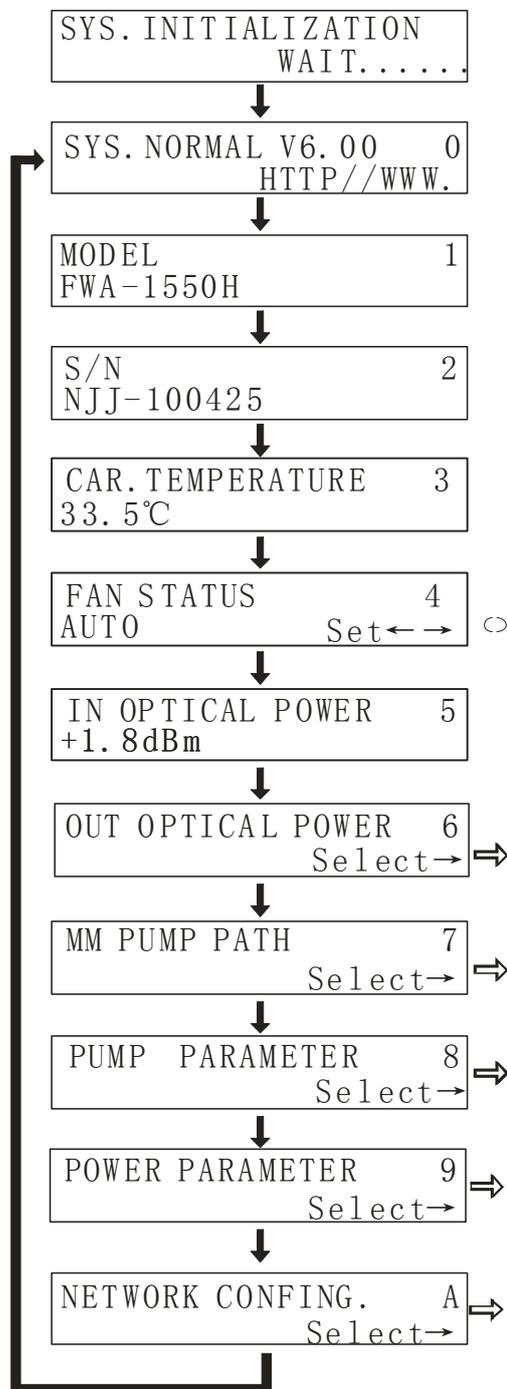
**4.3) Optical power input:** Figure (1) page “5”. Displaying the current optical power input. When the optical power output is less than -10 dBm, it displays " IN OPTICAL POWER <-99 dBm".

**4.4) Query output optical power:** Figure (1) page “6”. In the current page click the button “↻” to query A, B, C, D the four parameters of optical power As shown in Figure (2).

**4.4.1) Device temperature:** 4.1, 4.2, 4.3, 4.4 display the A&B, C&D route the actual optical power (referential ration) of single export in the front panel, by “6.1” and “6.3”,and it also can be pulled down 3dB. When the optical power output is less than -10 dBm or the route is out of existence, it displays "-----"

**4.5) Device temperature:** Figure (1) page “5”. In the current page click the button “↻” to ensure device temperature and setting state of fans. 45 degree.

**4.5.1) Temperature of motherboard and**

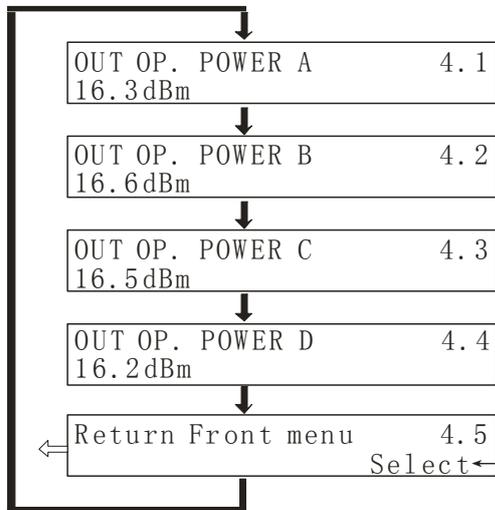


**pump housing:** Figure (3) page "1" and page "3".

**4.5.2) fan status:** Figure (1) page"4" . The fan, a total of three kinds of working state can be adopted .In the current page, click the" $\odot$ "key to change the working state, while in the "AUTO" state,

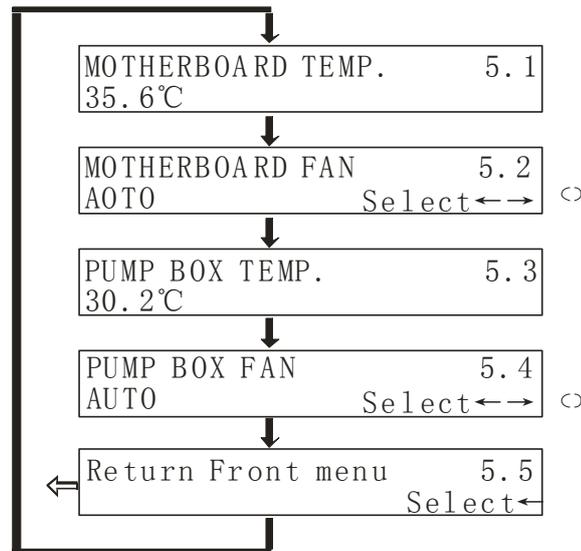
when the device internal temperature is higher than 35 °C, the SCM will automatically open the chassis fan to cool, and it will not close until the temperature dropped to 30 °C.

**4.6) query the parameters of pump laser:** Figure (1) page "6". In the current page click the button " $\odot$ " to query the parameters of pump laser. As shown in Figure (2).



图(2)

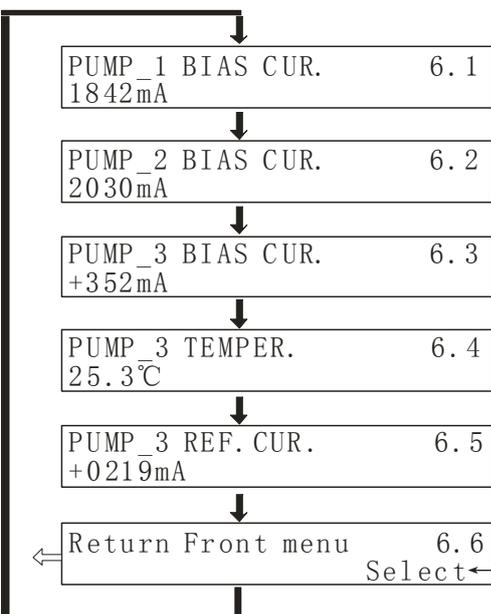
**4.6.1) Pump laser bias:** laser 1, 2, 3 bias, 6.1,6.2,6.3 in Figure (4), shows the bias current of the LD within the current laser. when the operating current is greater than 130% of rated current, the working life of laser are affected, even damage the lasers. Therefore, when detected laser operating current is greater than 130% of rated current. The internal hardware



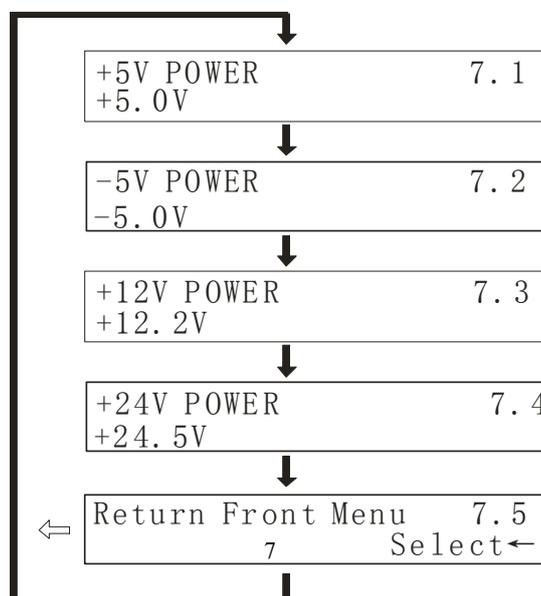
图(3)

circuit of equipment has limited its scope. When the bias current directives is "----", it states that the pump laser was not be used. **Temperature and cooling current show similarly.**

**4.8.2) Laser Temperature:** lasers work properly at 20 °C ∼ 35 °C temperature range. 6.4 in Figure (4). LCD displays the actual temperature of laser, such as "25.5 °C", when the detected temperature is 20 °C ∼ 30 °C, the LCD displays real-time temperature.



图(4)



图(5)

**4.8.3) laser cooling current:** 6.5 in Figure (4):

In order to ensure the internal temperature of laser range from 20 °C to 30 °C, we should provide

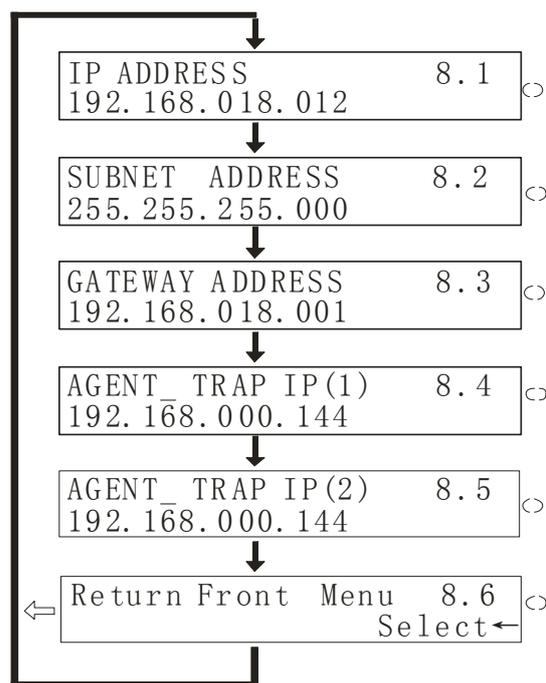
Thermoelectric cooling device a certain amount of operating current.

When the detected working current of thermoelectric cooling device is within-1500mA ~ +1500 mA, the LCD displays real-time current. When the current is positive, the TEC cool.

**4.7) Power parameter query:** Figure (1) page"8".In the current page click the button "◁" to query the power parameters, as shown in Figure (3). the display circuit of supply voltage (+5 V,-5V): displays real-time values of ± 5V power supply.

**4.9) setting IP address:** Figure (1) page "9". In the current page click the button "◁" to search and configuration net (if you didn't purchase the network transponders, you can skip this step)

In the LAN, this machine should be assigned an IP address and related information. Click "▼" to enter "NETWORK CONFING. 9", then click "◁" to enter the program flowcharts as shown in Figure (4) The Flowchart shown in pages 9.1.



图(6)

**4.9.1) setting IP address:** Press key "◁" to enter the first in paragraph 1 of IP address, click "▲" the number increases, click "▼" number decreases,after the number is selected well ,press "◁" key to enter the second setting, and so on. If there is only one paragraph, the front figures are 0.

**4.9.2) mask:** Click "▼" to enter the following sequence flow chart on page A.2, general equipment has been set "255.255.255.000" in the factory,so adjustment is unnecessary.

**4.9.3) Default Gateway:** Setting method ibid.

**4.9.4) the preferred DNS settings:** Setting method ibid.

**4.9.5) alternate DNS settings:** Setting method ibid.

## 5 Network management applications

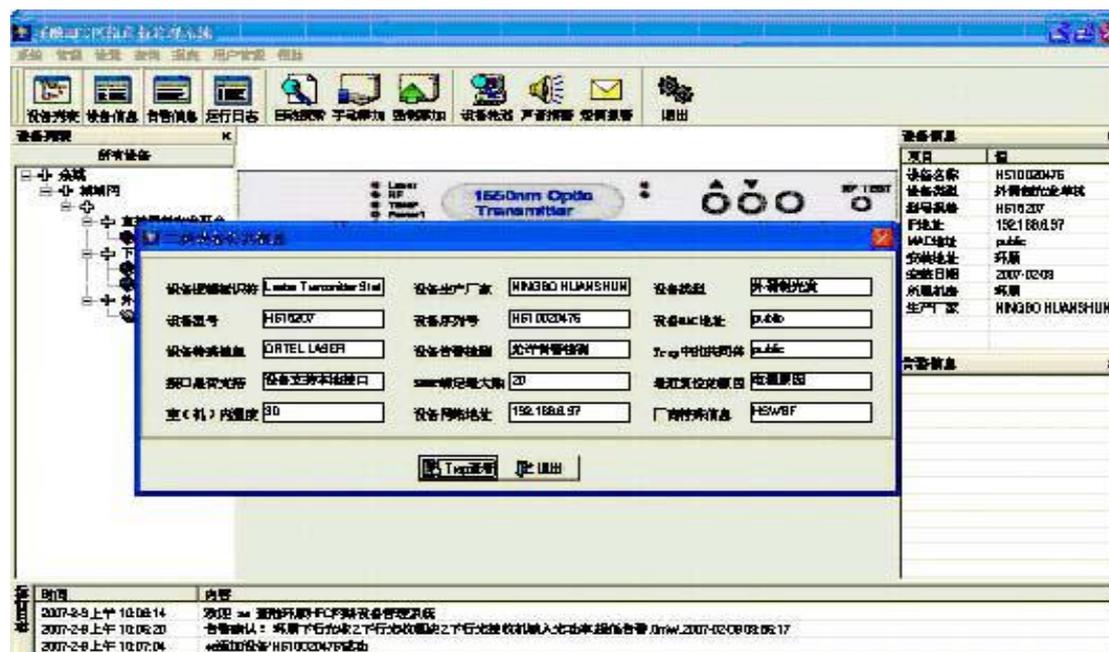
HFC network management system, has always been a difficulty that concerned by users and manufacturers. Imported equipment is generally claimed with a network management system which is based on industry standard RS232 or RJ45 interface. In order to achieve the network management, the users need to purchase high-cost private network management software. And each manufacturer's software is not compatible with each other. To achieve network management is very difficult. At present there are no news reports about available network management in Domestic system. If adopt the SNMP, the users also need to purchase specialized network management software and there are incompatible issues between manufacturers. Many domestic manufacturers also claim that their equipments have a network management system or are compatible with the AM company network management system. but the device's RJ45 or RS232 interface is basically vacant and cannot achieve the network management functions.

Our company is the well-known manufacturers in the cable broadband optical transmission system. We have been concerned about how to use the most economical and most convenient way

to achieve the network management in the cable broadband networks. Now the ESV6.0 network management system launched by our company is a new network management concepts based on the SNMP / TCP / IP protocol.

### 5.1) Interface of integrated work of the monitor server

After plugging the optional transponder, the machine has the function of network management, just need to connect the RJ45 interface signals to the LAN, and connect to the main server from any of the LAN Ethernet port., then set up IP addresses, according to the method in 4.A etc. so we can monitor the machine's running conditions at real time when the network management system is running.



### 5.2) Search interface of the equipment



## 6 The notes about optical connection

6. 1) before you connect them, carefully cleaning all the fiber optic connectors and

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connectors

Cleaning Guide:

### **6.1.1) Fiber Optic jumper**

- ✧ Removal the dust cap of fiber optic connector, pay attention to confirm the optical connector is a APC surface;
- ✧ The tips of cleaning fiber optic connector is to use a dedicated and dry cloth without velveteen (the company 5Kimwipes ®'s fine cloth); In addition, preferably adopt special microscope (at 100 times, 200 times) to check the cleanliness of fiber optic connector surface or blemish.
- ✧ pay attention to maintaining the fiber optic connectors is clean;
- ✧ fiber optic connectors (flange) is clean;
- ✧ you can use a dedicated compressed gas to clean the surface of fiber optic connector;
- ✧ you can remove the dust which is less than 0.2 microns, better without residue;
- ✧ hold the tank of compressed air from the connector about 6 inches, alignment flange, and press the nozzle switch shortly times, so you can clean the connector completely;
- ✧ if there is no dedicated compressed air, the 2.5 mm cotton swab for cleaning can also be used to clean the optical transmitter connectors, or remove the flange and clean the other side of the optical fiber jumper connector directly ;

Note: When handling fiber optic connectors must be very careful to avoid damage.

**6.1.2)** using the optical fiber jumper to connect the output of optical transmitter to the optical power meter;

**6.1.3)** Using the optical power meter to check the output of the transmitter optical power is within normal limits;

## **7 Other notes**

**7.1)** The machine should have a good grounding, grounding resistance should be smaller than 4Ω. According to international standards, 220Vac line adopt three-wire system, the midline is grounding wire.

**7.2)** The machine should be set up in a anti-hot, anti-cold, anti-wet environment, so as to avoid excessive temperature and humidity affect the use life of machine.

**7.3)** The machine adopts high-performance, highly reliable switching power supply with constant voltage and over-current protection. In the right of switching power supply, there is 1A imported fuse that can be work at 85Vac ~ 265Vac electrical line.

**7.4)** To ensure the optical return loss  $\geq 45\text{dB}$ , this machine's optical connectors adopt SC / APC& SC/PC.The connector should be installed to keep clean. You should use ethanol and defatted cotton wool to wipe after plug repeatedly.

**7.5)** Once the laser transmitter enter the work state, because the light signal input(pump light input) is quite high light output for pump light, the eye cannot look directly at the light input from the back panel of the machine in order to avoid the laser beam burning the human eye retina.

## **8 The scope of the product warranty**

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The company's quality assurance system includes equipment testing and inspection of operational procedures to ensure the reliability of product quality. Prior to the product exporting from the Company, we adopt all possible measures to make the electrical, optical, mechanical and other indicators of products reached the standards promulgated. The Company requires the user to monitor on-site inspection and assembly; the testing personnel should carry out related operations in strict accordance with the preventive measures formulated when they operate and test optical static sensitive devices.

### **8.1) Warranty Rules**

For users' first-hand products, the company repairs them in the area of materials and manufacturing processes free in a year since users pick up them.

Using this product, please follow the requirements on the instructions strictly, do not arbitrarily change. In the warranty period, the user can not break the seal, and the internal circuitry cannot be changed. If the product fails to reach the quality requirements or experience problems to be solved, please return the products to the company, which will handle according to the warranty provisions.

In the warranty period, users have the right to repair or replace the defective product confirmed by the company. However, the above provision is considered invalidly to change ownership, or the irregularities caused by use, storage, transport, assembly or accidents.

### **8.2) Assurance for specific product and guide to repair**

All products are produced according to high-quality standards to ensure that avoid the failures in technology, materials and external framework, etc. If requests maintenance or return faulty equipment, the user should raise within 30 days on receipt of goods or in the warranty period, please follow the following principles:

**8.2.1)** You shall return them after you receive the Recycling Single issued by the company's sales department. When you apply return, please attach the device model, serial number and return reasons, and requested prepay return shipping. If you do not pay the freight in advance nor recycling single, the Company will not receive.

**8.2.2)** Before the repair, the Company will inform the user about the equipment test results and maintenance costs (generally about the failure caused by the users or issues which do not meet the warranty conditions). If the returned facilities fully meet the quality requirements and don't need to repair, or the user does not require repairs outside of warranty service, users have to pay the basic fee. Only when the user acknowledges all the costs of maintenance, the company will carry out repairs. Similarly, only with the user's consent, the company will be able to replace equipment parts (such as connectors), which is very necessary to the company's testing and repair.