



## Foreword

This manual applies to 1310nm AM direct modulated optical transmitter with SNMP network management interface. It mainly describes the performance characteristics, technical parameters, installation and debugging, common troubleshooting, and other related content of the product. In order to ensure that the equipment can be successfully installed and safely operated, please read this manual carefully before installing and debugging the equipment. And the installation and debugging should be strictly according to the specified steps on the manual to avoid unnecessary damage to equipment or accident harm to the operator. Any question, please contact with us in time.

## Special Tips:

- Optical transmitter is professional equipment, and its installation and debugging must be operated by special technician. Read this manual carefully before operating to avoid damage to equipment caused by fault operation or accident harm to the operator.
- While the optical transmitter is working, there is an invisible laser beam from the optical output adapter on the front panel. Avoiding permanent harm to the body and eye, the optical output should not aim at the human body and human should not look directly at the optical output with the naked eye!
- Please make sure that the ground terminal of the case and power outlet has been reliably grounding. Before turning on the power (Grounding resistance should be less than  $4\Omega$ ) to prevent the static damage the pump laser device and harm to human because of case charged.
- To ensure the equipment can work stable over a long time in voltage unsteady or poor voltage wave region, it's recommend to the customer that he equips special AC regulated power supply, or even AC uninterrupted power supply(UPS)system for conditional region. In the region with large temperature variation environment (The equipment's ideal work environment temperature is  $25^{\circ}\text{C}$ ) or bad room environment it's recommend to the customer that he equips special air-condition system to improve the work environment.

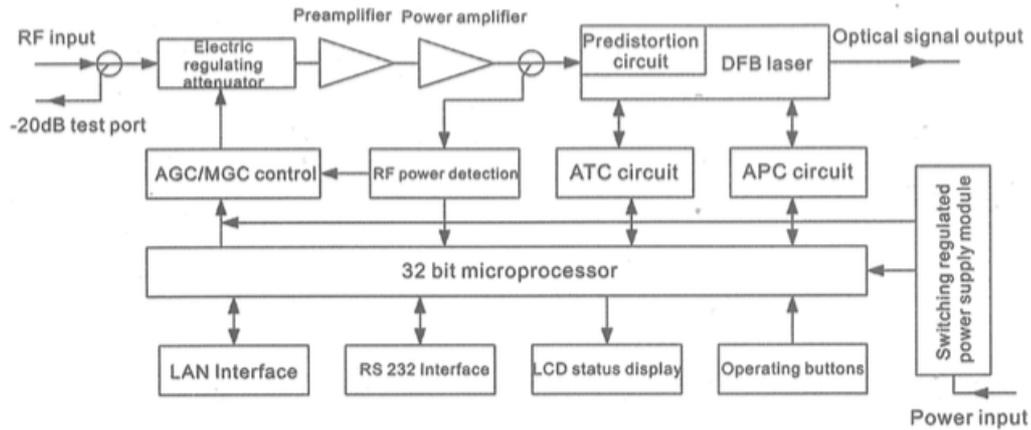
## 1. Product Summary

Optical transmitter is the most important equipment to construct the CATV HFC network. It mainly used for the long distance optical fiber transmission of TV image signal, digital television signal, telephone voice signal and data (or compressed data) signal. This product does use the high-performance DFB laser as the optical source. The RF drive part adopts RF power digital automatic processing technology and advanced RF pre-distortion circuit, and built-in microcomputer automatic monitoring system, to ensure the excellent Performance indicators.

## 2. Performance characteristics

- Adopt high-performance coaxial/butterfly DFB laser, narrow spectral lines, good linearity and high output power.
- The RF drive part adopts the RF power digital automatic processing technology. Automatic processing the drive level power according to the RF input signal level and the number of channels(15-84channels), make the CSO, CTB and C/N index always at the optimal value to ensure the overall performance.
- Advanced multi-frequency RF pre-distortion technology, combined with the GaAs device, effectively improve the CATV system most important CTB and CSO index, C/N index also gets the maximum upgrade.
- Adopt advanced 32 bit processor; coordinate with perfect automatic monitoring system circuit. It's can timely and accurately monitor working status of the laser to ensure a stable optical output power and effectively extend the working life of the laser.
- Built-in blue screen 160x32 dot matrix LCD monitor on the front panel, accurately showing all working status parameters.
- 19"1U standard rack mount, equipped standard IEEE802.3 10Base-T Ethernet interface and RS232 interface, can expediently realize network management monitoring.

### 3. Block Diagram



Note: Adopts butterfly DFB laser or coaxial DFB laser.

### 4. Technology Parameters

#### 4.1 Link test condition

**Special instruction :** The performance of this manual according to the measuring method of GY/T 143-2000 <Specification and methods of measurement on AM optical transmitter and receiver used in CATV system>, and tested under the specified test condition.

**Test condition :** With standard optical fiber and standard optical receiver composed the test link. Set 84 PAL-D analog TV channel signal at 750MHz frequency range under the specified link loss. When the optical input power of optical receiver is -1dBm, measure the C/CTB, C/CSO and C/N.

#### 4.2 Technique Parameters Table

| Item                    | Unit | Technique parameters                |   |    |    |      |      |    |      |    |      |      |      |      |      |
|-------------------------|------|-------------------------------------|---|----|----|------|------|----|------|----|------|------|------|------|------|
|                         |      | 4                                   | 6 | 8  | 10 | 12   | 14   | 16 | 18   | 20 | 22   | 24   | 26   | 28   | 31   |
| Optical Output power    | mW   | 4                                   | 6 | 8  | 10 | 12   | 14   | 16 | 18   | 20 | 22   | 24   | 26   | 28   | 31   |
| Optical link loss       | dB   | 7                                   | 9 | 10 | 11 | 11.8 | 12.5 | 13 | 13.6 | 14 | 14.4 | 14.8 | 15.1 | 15.4 | 15.9 |
| Optical wavelength      | nm   | 1310±20                             |   |    |    |      |      |    |      |    |      |      |      |      |      |
| Laser type              |      | DFB laser                           |   |    |    |      |      |    |      |    |      |      |      |      |      |
| Optical modulation mode |      | Direct optical intensity modulation |   |    |    |      |      |    |      |    |      |      |      |      |      |
| Optical connector type  |      | FC/APC or SC/APC                    |   |    |    |      |      |    |      |    |      |      |      |      |      |
| Frequency range         | MHz  | 47-750/862/1003                     |   |    |    |      |      |    |      |    |      |      |      |      |      |
| RF input level          | dBμV | 72-88                               |   |    |    |      |      |    |      |    |      |      |      |      |      |
| Flatness in band        | dB   | ±0.75                               |   |    |    |      |      |    |      |    |      |      |      |      |      |
| RF input impedance      | Ω    | 75                                  |   |    |    |      |      |    |      |    |      |      |      |      |      |

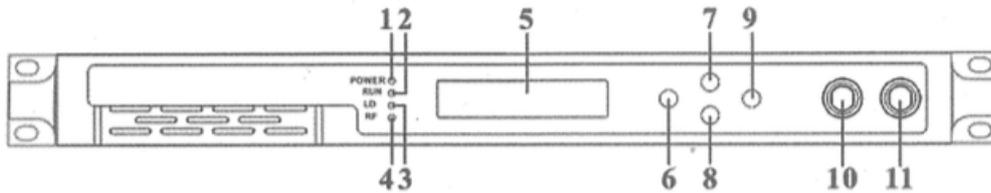
|                       |    |  |
|-----------------------|----|--|
| Input return loss     | dB | ≥ 16 ( 47-550MHz ); ≥ 14 ( 550-750/862/1003MHz ) |
| C/CSO                 | dB | ≥ 60   |
| C/CTB                 | dB | ≥ 65   |
| C/N                   | dB | ≥ 51   |
| AGC control range     | dB | ±5   |
| MGC control range     | dB | 0-10   |
| Power supply voltage  | V  | AC 110V-250V (50Hz)                              |
| Consumption           | W  | 30   |
| Operating temperature | °C | 0--45  |
| Storage temperature   | °C | -20--+65   |
| Relative humidity     | %  | MAX95%no condensation                            |
| Dimension             | mm | 483 (L) x380 (W) x44 (H)                         |

4.3 Optical link carrier to noise ratio degradation table

| Optical Power | Optical link loss (dB) |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|---------------|------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
|               | 4                      | 5    | 6    | 7    | 8    | 9    | 10   | 11   | 12   | 13   | 14   | 15   | 16   | 17   | 18   |      |      |      |      |
| 4mW           | 53.8                   | 52.8 | 51.8 | 51   | 50.1 | 49.2 | 48.2 |      |      |      |      |      |      |      |      |      |      |      |      |
| 6mW           |                        |      |      | 53.0 | 52.0 | 51.0 | 50.1 | 49.1 | 48.1 |      |      |      |      |      |      |      |      |      |      |
| 8mW           |                        |      |      |      | 52.8 | 51.9 | 51.0 | 50.1 | 49.2 | 48.2 |      |      |      |      |      |      |      |      |      |
| 10mW          |                        |      |      |      |      | 52.9 | 51.9 | 51.0 | 50.1 | 49.1 | 48.2 |      |      |      |      |      |      |      |      |
| 12mW          |                        |      |      |      |      |      | 52.7 | 51.8 | 50.8 | 49.9 | 49.0 | 48.0 |      |      |      |      |      |      |      |
| 14mW          |                        |      |      |      |      |      |      | 52.4 | 51.5 | 50.5 | 49.5 | 48.6 | 47.8 |      |      |      |      |      |      |
| 16mW          |                        |      |      |      |      |      |      |      | 52.0 | 51.0 | 50.1 | 49.1 | 48.1 |      |      |      |      |      |      |
| 18mW          |                        |      |      |      |      |      |      |      |      | 52.5 | 51.6 | 50.6 | 49.7 | 48.7 | 47.9 |      |      |      |      |
| 20mW          |                        |      |      |      |      |      |      |      |      |      | 51.9 | 51.0 | 50.0 | 49.0 | 48.0 |      |      |      |      |
| 22mW          |                        |      |      |      |      |      |      |      |      |      |      | 52.2 | 51.4 | 50.4 | 49.4 | 48.6 | 47.8 |      |      |
| 24mW          |                        |      |      |      |      |      |      |      |      |      |      |      | 51.5 | 50.3 | 49.2 | 48.5 | 47.7 |      |      |
| 26mW          |                        |      |      |      |      |      |      |      |      |      |      |      |      | 51.5 | 50.2 | 49.2 | 48.5 | 47.6 |      |
| 28mW          |                        |      |      |      |      |      |      |      |      |      |      |      |      |      | 51.6 | 50.4 | 49.3 | 48.6 | 47.8 |
| 31mW          |                        |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 51.3 | 50.4 | 49.3 | 48.5 |

## 5. External Function Description

### 5.1 Front Panel Description

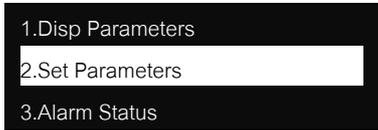


Schematic diagram of the front panel

- 1) Power indicator: The light is on while the switching power supply inside is working.
- 2) Device running indicator: This indicator will flash after the device start running.
- 3) Laser working status indicator: Red light means the laser is not working, but the machine parameters are normal; flashing red light means the machine has broken down, related fault reason see the alarm menu of the display menu; green light means the laser is working normal.
- 4) RF status indicator: Flashing red light means the RF input signal is warned; green light means RF input signal is normal.
- 5) 160x32 dot-matrix LCD screen: used to display all the parameters of the machine.
- 6) Display the exit or cancel key of the setup menu.
- 7) Display the up or increase key of the setup menu.
- 8) Display the down or decrease key of the setup menu.
- 9) Display the enter key of the set up menu.
- 10) Laser switching key: used to control the working status of laser. "ON" means the laser is open and "OFF" means the laser is closed. Ensure the key is on "OFF" position before power on. After passing self-test, rotate the key "ON" position according to the displayed message.
- 11) RF input signal test port: -20dB test port of the rear panel RF input port.

|  |   |
|--|---|
| RF Channel Number : 84<br>Input RF : 30.7 dBμV<br>RF Control Mode: AGC             | RF control mode at present  |
| Input RF : 30.5 dBμV<br>RF Control Mode: AGC<br>AGC Ref: +0 dB                     | The offset of control level in the AGC mode                           |
| Input RF: 30.7 dBμV<br>RF Control Mode: MGC<br>MGC ATT : 3 dB                      | The attenuation of electrically controlled attenuator in the MGC mode |
| RF Control Mode : AGC<br>AGC ATT: +0 dB<br>+5V Read: 5.00V                         | Switching power supply output +5V supply voltage                      |
| AGC Ref : +0 dB<br>+5V Read: 5.00V<br>- 5V Read: 4.90V                             | Switching power supply output -5V supply voltage                      |
| +5V Read: 5.00V<br>- 5V Read: 4.91V<br>+24V Read : 0.00V                           | Switching power supply output +24V supply voltage                     |
| - 5V Read: 4.90V<br>+24V Read : 0.00V<br>S/N : 12345678                            | Serial number   |
| +24V Read : 0.00V<br>S/N : 12345678<br>Box Temperature: 19.2°C                     | Internal temperature at present                                       |
| S/N: 061103123<br>Box Temperature: 25.25°C<br>IP Address: 192.168.0.97             | IP address  |
| Box Temperature: 25.25°C<br>IP Address: 192.168.0.97<br>Subnet Mask: 255.255.255.0 | Subnet Mask   |
| IP Address: 192.168.0.97<br>Subnet Mask: 255.255.255.0<br>Net Gateway: 192.168.0.1 | Gateway   |
| Subnet Mask: 255.255.255.0<br>Net Gateway: 192.168.0.1<br>Mac: 00-03-b9-88-10-11   | MAC address   |
| Net Gateway: 192.168.0.1<br>Mac: 00-03-b9-88-10-11<br>Software Version: 3.00       | Software system version   |

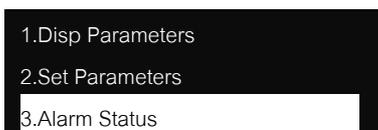
6) Setting menu



Pass "Enter" key into the menu

| Content   | Meaning  |
|---|--|
| Set Laser Output Unit<br>Set Buzzer Alarm<br>Set RF Control Mode  | Set the displayed optical power unit   |
| Set Laser Output Unit<br>Set Buzzer Alarm<br>Set RF Control Mode  | Turn on or off the buzzer  |
| Set Laser Output Unit<br>Set Buzzer Alarm<br>Set RF Control Mode  | Set the control mode of the RF Signal : AGC or MGC   |
| Set Buzzer Alarm<br>Set RF Control Mode<br>Set MGC ATT            | Set the attenuation of MGC   |
| Set Buzzer Alarm<br>Set RF Control Mode<br>Set AGC Ref            | Set the offset of AGC start control level  |
| Set RF Control Mode<br>Set MGC ATT<br>Set Channel Number          | Set system transmission channels number. This parameter is used to correct the accuracy of displayed laser RF signal level |
| Set +24V Low Alarm<br>Set +24V High Alarm<br>Set Local IP Address | Set IP address   |
| Set +24V High Alarm<br>Set Local IP Address<br>Set Subnet Mask    | Set Subnet Mask  |
| Set Local IP Address<br>Set Subnet Mask<br>Set Gateway            | Set gateway  |

7) Warning menu



Pass "Enter" into the alarm menu

## 6. Installation debugging

### 6.1 Unpack and Check

1. Insure the package is not defaced. If it has any damage or water mark, please contact local agency or carrier.
2. After unpacking, check equipment and accessories according to package list. Any question, please contact local agency or our company.
3. If you think the equipment has been damaged, please don't electrify to avoid worse damage. Please contact local agency or our company in time.

### 6.2 Instrument and tools

1. An optical power meter;
2. A digital multimeter;
3. A standard optical fiber test jumper (FC/APC or SC/APC);
4. Some absolute alcohol and medical cotton wool;

### 6.3 Installation steps

1. Before installing the equipment, please read the <User's manual> carefully and install the equipment according to the <User's manual>. **Note** : For the man-made damage and other all consequence caused by error installation that not according to the <User's manual>, we will not be responsible and will not supply free warranty.
2. Take out the device from the box; fix it to the rack and reliably grounding (The grounding resistance must be  $<4\Omega$ ).
3. Use the digital multimeter to check the supply voltage, make sure the supply voltage comply with the requirements and the switch key is on the "OFF" position. Then connect the power supply.
4. Input the RF signal, turn the switch key to the "ON" position and observe the front panel LED status. After the LED working status indicator turn into green, the device is working normal. Then press the menu button on the front panel to check the working parameters.
5. Connect the optical power meter to the optical signal output end by the standard optical fiber test jumper, then measure the optical output power. Affirm the measured optical output power and the displayed power are the same and have reached the nominal value. (Affirm the optical power meter is on 1310nm wavelength test position; the optical fiber test jumper is the matched one and on the connector surface has no pollution). Remove the standard optical fiber test jumper and optical power meter; connect the device to the network. So far, the device has been completely installed and debugged.

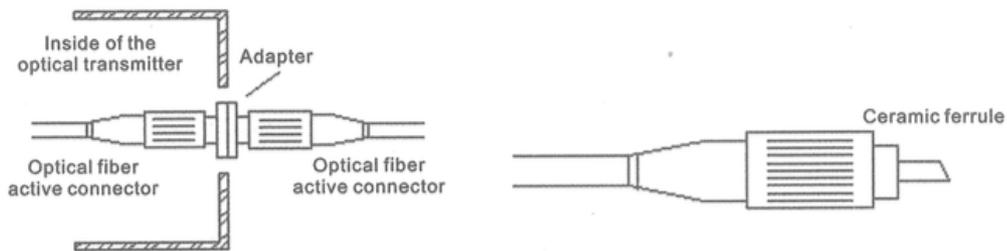
### 7. Common Failure Analysis and Troubleshooting

| Failure phenomenon  | Failure cause  | Solution   |
|---|--|--|
| Power on, the front panel display screen and power Indicator are both off.  | Switch powering power supply couldn't start; equipment; internal DC power supply is not working.   | Check if the power supply is normal (should be AC: 110V-250V). If the Supply voltage is normal, it could be a Failure of switching power supply module. Please contact the dealer or our company   |
| Power on, the display screen is off, only the power indicator is on.  | The internal microprocessor is not working.  | Please contact the dealer or our company.  |
| Power on; the optical output power displayed on the front panel display screen and laser status indicator are both normal, but the actual measured optical output power is low. | <ol style="list-style-type: none"> <li>1. The poor quality of the test jumper.</li> <li>2. The active fiber connector or adapter may be contaminated.</li> <li>3. The ceramic tube in the adapter may have been broken.</li> </ol>   | <ol style="list-style-type: none"> <li>1. Replace with good quality test jumper.</li> <li>2. Clean the contaminated active fiber connector or adapter. Specific operation methods see "The clean and maintenance method of optical fiber connector".</li> <li>3. Replace the damaged adapter.</li> </ol>   |
| After initial startup, the image of the optical contact point has obvious netlike curve or large particles highlights.  | <ol style="list-style-type: none"> <li>1. The received optical power of the optical contact point is too high; the output level of the optical receiver module is too high and intermodulation index of RF signal deteriorates.</li> <li>2. The RF signal input of the optical transmitter is too high; beyond the device AGC control range, results in deterioration of the intermodulation index.</li> <li>3. The intermodulation index of RF signal input of the optical transmitter itself is poor.</li> </ol> | <ol style="list-style-type: none"> <li>1. Check the receiver optical power of the optical contact point and make appropriate adjustments.</li> <li>2. Check the input level of the optical transmitter RF signal, and adjust to the device required input range. (RF signal input level should be 72-88dBμV).</li> <li>3. Check the intermodulation index of the RF signal input of the optical transmitter And make appropriate adjustments.</li> </ol>   |
| After initial startup, the image of the optical contact point has obvious noises.   | <ol style="list-style-type: none"> <li>1. The received optical power of the optical contract point is not high enough, results in decrease of C/N.</li> <li>2. The RF signal level input of the optical transmitter is too low; make modulation degree of the laser is not enough.</li> <li>3. The C/N index of system link signal is too low.</li> </ol>  | <ol style="list-style-type: none"> <li>1. Recover received optical power of the optical contract point by cleaning the active fiber connector or. Specific operation methods see "Clean and maintenance methods of optical fiber connector".</li> <li>2. Check the RF signal level input of the optical transmitter and adjust to the device required input range. (72--88dBμV). When the input channel number less than 15, set to the MGC control mode.</li> <li>3. Use a spectrum analyzer to check the system link C/N and make appropriate adjustment. Make sure the system link Signal C/N &gt; 51dB.</li> </ol> |

|  |   |  |
|--|---|--|
| <p>After initial startup, the image of several optical contact points randomly appear obvious noises or bright trace.</p>  | <p>The optical contact point has open circuit signal interference or strong interference signal intrusions.</p>   | <ol style="list-style-type: none"> <li>1. Check if there is a strong interference signal source; change the optical contact point location if possible to avoid the influence of strong interference signal sources.</li> <li>2. Check the cable lines before the optical contact point, the shielding net or the RF connector shielding effect is not good.</li> <li>3. Close the equipment enclosure tightly to ensure the shielding effect; if possible add shielding cover to the optical contact point and reliable grounding.</li> </ol> |
| <p>After initial startup, at optical contact points, the image of several channels have obvious noises.</p>  | <p>The C/N indexes of these channels are too low.</p>   | <p>Check the C/N of these channels signal and make appropriate adjustments.</p>  |
| <p>After initial startup, the image of several optical contact points appear one or two horizontal bright traces.</p>  | <p>Power supply AC ripple interference because of the bad earth of equipment or power supply.</p>   | <p>Check grounding situation of the equipment; make sure that every equipment in the line has been reliably grounding and the grounding resistance is <math>&lt; 4 \Omega</math>.</p>  |
| <p>After initial startup, the received optical power of the optical contact point is unstable and has large continuous change. The RF output signal is unstable too. But the detected optical output power of the optical transmitter is normal.</p> | <p>The fiber connector types do not match, maybe the APC type connect to PC type, make the optical signal cannot normal transmission. The active fiber connector or adapter may be contaminated seriously or the adapter has been broken.</p> | <ol style="list-style-type: none"> <li>1. Check the fiber connector type; adopt the APC type fiber connector to ensure the normal transmission of optical signal.</li> <li>2. Clean the contaminated active fiber connector or adapter. Specific operation methods see "The clean and maintenance method of optical fiber connector".</li> <li>3. Replace the damaged adapter.</li> </ol>  |

## The Clean and Maintenance Method of Optical Fiber Connector

In many times, we consider the decline of the optical power as the equipment faults, but actually it may be caused by that the optical fiber connector was polluted by dust or dirt. Inspect the fiber connector, component, or bulkhead with a fiberscope. If the connector is dirty, clean it with a cleaning technique following these steps:



1. Turn off the device power supply and carefully pull off the optical fiber connector from the adapter.
2. Wash carefully with good quality lens wiping paper and medical absorbent alcohol cotton. If use the medical absorbent alcohol cotton, still need to wait 1-2 minutes after wash, let the connector surface dry in the air.
3. Cleaned optical connector should be connected to optical power meter to measure optical output power to affirm whether it has been cleaned up.
4. When the cleaned optical connector screwed back to adapter, should notice to make force appropriate to avoid ceramic tube in the adapter crack.
5. The optical fiber connector should be cleaned in pairs. If optical power is on the low side after clean, the adapter may be polluted, clean it. (Note: Adapter should be carefully operated, so as to avoid hurting inside fiber.
6. Use compressed air or degrease alcohol cotton to wash the adapter carefully. When use compressed air, the muzzle aims at china tube of the adapter, clean the china tube with compressed air. When use degrease alcohol cotton, insert directions need be consistent, otherwise can't reach a good clean effect.

### Special notice:

- a. In the process of clean the active optical fiber connector, you should avoid direct shining at eye, which will cause permanence burn!!!!
- b. Use proper energy to install the active optical connector, or the ceramic tape in the adaptor will lead to break. Once the ceramic tape is broken, the optical output power will decrease rapidly. And turn the active optical fiber connector slightly, the optical output power changes obviously.
- c. Please operate the optical fiber under the condition of shut off the pump laser. Or the high output power will lead to burn the joint of the optical output fiber, which will cause the output power decrease.

Changes of the equipment lead to some disagree with this manual, without notice.