

CTV-2000-FRX

CATV Fiber Optic Receiver

Users' Manual

(REV 1.0)

Table of Contents

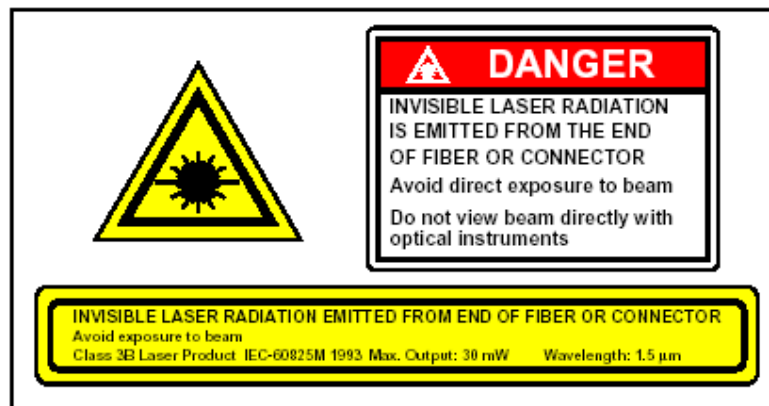
Preface.....	3
Chapter 1 Overview	4
Chapter 2 Features	4
Chapter 3 Internal function block	4
Chapter 4 Specifications	5
Chapter 5 Function Guide	6
5.1 Front Panel Guide	6
5.2 Rear Panel Guide.....	6
5.3 Parameter display	7
5.4 Alarm Indication.....	8
Chapter 6 Installation & Adjustment.....	8
6.1 Opening the cover	8
6.2 Apparatuses & Tools	8
6.3 Installation.....	8
Chapter 7 Clean & Maintenance.....	9
Chapter 8 After-sale customer service	10
Chapter 9 Troubleshooting.....	11

Preface

This manual is designed for CTV-2000 series 1310 nm broadcast transmitter along with detailed description of product feature, specification, installation, adjustment and troubleshooting. To install this transmitter successfully and use it safely, users must read the manual carefully before their installation, and perform their installation and adjustment according to this manual. Otherwise, some practices or circumstances can lead to property damage or personal injury. Please contact our service center if any question:

Important user information:

- The transmitter installation and adjustment should be conducted by the person after reading this manual, so as to avoid hazard of equipment damage or personal injury.
- **Caution:** it would be very dangerous to point the Fiber Output Port, from which invisible laser emit, directly to human body along with the risk of permanent injury to skin or eyes.
- Make sure the case and the power supply grounded well before turn on the transmitter (grounding resistance should be less than 4Ω).
- To get a stable running circumstance for the transmitter, it would be helpful to equip the UPS AC power supply and air-conditioner.



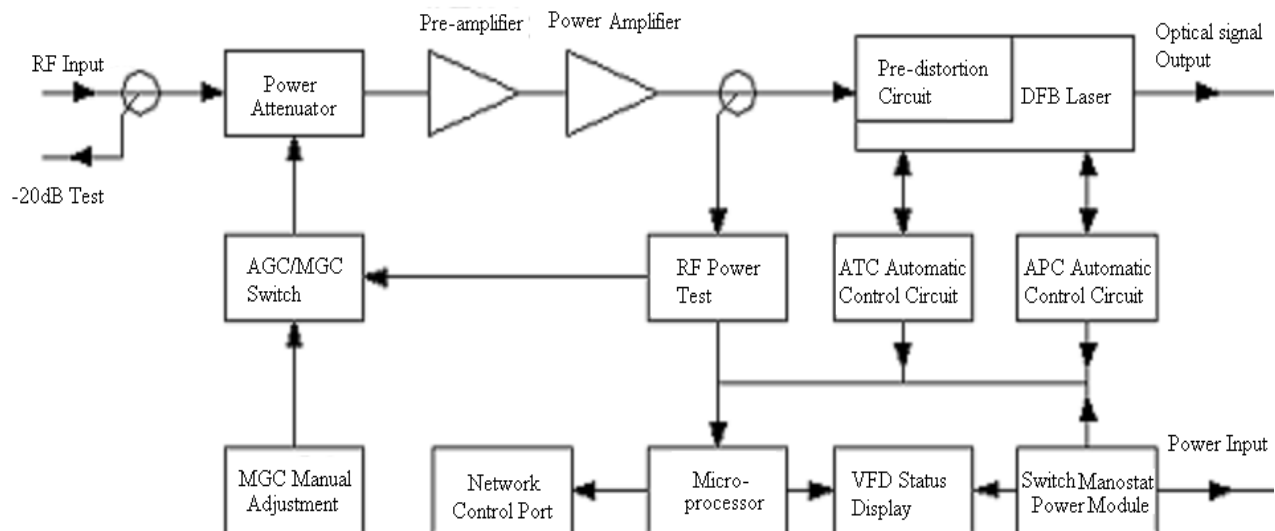
Chapter 1 Overview

CTV-2000 series 1310 nm broadcast transmitters are important equipments to set up CATV HFC network, and primarily used for TV video signal, digital TV signal, telephone voice signal and data signal long-distance fiber transmission. The product utilize imported high performance DFB laser transmitter as light source and RF power digital automatic process technique, along with advanced RF pre-distortion circuit developed by Our company. At the same time, built-in microprocessor automatically ensures the excellent performance of this transmitter.

Chapter 2 Features

- High performance DFB laser with narrow spectrum and good linearity.
- With RF power digital automatic process technology, CTV-2000 series 1310 nm broadcast transmitter can control the laser driving RF power level automatically according to voltage of input RF signal and number of channels, ensuring the best C/N, CTB and CSO.
- Excellent pre-distortion technology leads to the improved CTB, CSO and C/N.
- Built-in microprocessor accurately monitor laser output power and temperature.
- Front panel VFD screen can real-time display the status parameters and function message.
- 19" 1U standard rack with RS485 and RS232 ports for remote monitor and control.
- Ethernet port option, support Ethernet-basing network monitoring system.

Chapter 3 Internal function block



Chapter 4 Specifications

Item	Unit	Parameter									
Optical Power	mW	4	6	8	10	12	14	16	18	20	22
Optical Link Path Loss	dB	7	9	10	11	11.8	12.5	13	13.6	14	14.4
Optical Wave Length	nm	1310±20									
Type of Laser		DFB									
Optical modulation mode		Direct Modulation									
Optical connector Type		SC/APC									
Frequency Range	MHz	47~862									
RF Input Level	dBmV	15~25									
Flatness In Band	dB	±0.75									
RF Input Impedance	Ω	75									
Input Reflection Loss	dB	≥16 (47~862)MHz									
C/CTB	dB	≥67									
C/CSO	dB	≥62									
C/N	dB	≥51									
AGC Control Range	dB	±5									
MGC Control Range	dB	±5									
Power Voltage	V	AC 90V~265V (50/60 Hz)									
Power Consumption	W	24									
Operation Temperature	°C	0~45									
Store Temperature	°C	-20~65									
Relative Humidity	%	Max 95% no condensation									
Dimension	mm	433(L) × 325(W) × 44(H)									

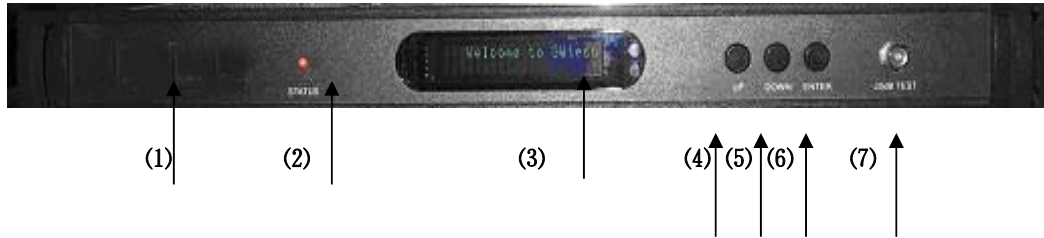
Optical Link Path C/N Specifications:

Optical Loss (dB)	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
CTV-2000-04	53.8	52.8	51.8	51.0	50.1	49.2	48.2								
CTV-2000-06				53.0	52.0	51.0	50.1	49.1	48.1						
CTV-2000-08					52.8	51.9	51.0	50.1	49.1	48.2					
CTV-2000-10						52.9	51.9	51.0	50.1	49.1	48.2				
CTV-2000-12							52.7	51.8	50.8	49.9	49.0	48.0			
CTV-2000-14								52.4	51.5	50.5	49.5	48.6	47.8		
CTV-2000-16									52.0	51.0	50.1	49.1	48.1		
CTV-2000-18									52.5	51.6	50.6	49.7	48.7	47.9	
CTV-2000-20										51.9	51.0	50.0	49.0	48.0	
CTV-2000-22										52.2	51.4	50.4	49.4	48.6	47.8

Test condition: Test link path consists of CTV-2000, standard fiber and standard optical receiver. When optical receiver input optical power is -1dBm, measure CTB, CSO, C/ N under 59 PAL-D channels.

Chapter 5 Function Guide

5.1 Front Panel Guide



Front View

1 CTV-2000 trademark

2 LED status indicator: Green light: normal; Red light: abnormal. User can get message from VFD monitor to fix the trouble.

3 VFD Monitor: Display each status parameter, product model, delivery series number and other information of the equipment.

4 UP button: page up the VFD display and increase setting value

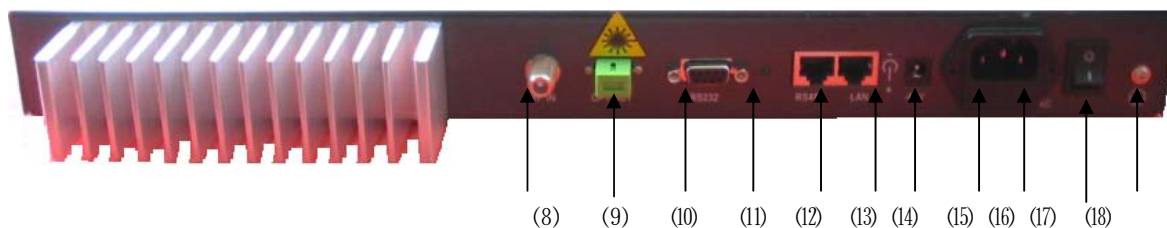
5 Down button: page down the VFD display decrease setting value

6 Enter button: MGC mode select and ENTER button.

(Notice: To CTV-2000 transmitter, initial control mode is AGC . **If number of channels is less than 15**, press UP or DOWN button to shift the VFD display, and press ENTER button when display '**MOD LEVEL=XXdBmV**' to select MGC mode. After the selection, VFD display '**MOD LEVEL=XXdBmV**' and '**Please install...**', enter modulating level setting program in which user can change modulating level by **1 dBmV** by pressing UP or DOWN. When modulating level is changed to user's ideal value, press ENTER to make it effected, at that time VFD display '**MOD LEVEL=XXdBmV**' and transmitter shift to AGC mode. For instance, if user's ideal Modulating level is **42dBmV**, VFD would display "**MOD LEVEL= 42dBmV**" after operations shown above)

7 RF input test port: Standard 75 Ω style F metric test port for RF signal on-line test. Level tested from this port is 20dB less than real input level.

5.2 Rear Panel Guide



Rear View

8 RF input port: Standard 75 Ω American style F port, used for connecting RF signal and the equipment. Level in this input port must be at the range of 15~25dBmV. Too high level may damage laser.

Optimum input level is 20dBmV

***The input level out of range may have chance to damage Laser**

9 Optical signal output: Optical signal output port, has two interface: FC/APC and SC/APC. There is invisible laser from Fiber output when laser works.

***It would be dangerous to point this port to human body especially eyes when equipment works.**

10 RS-232 standard network management port: Use for connecting equipment with RS-232 port in network management server.

11 Network management indicator

12 RS-485 standard network management port: Use for connecting equipment with RS-485 port on network management server.

13 LAN network management port: Use for connecting equipment with Ethernet-basing network management server.

14 -48V DC INPUT

15 Power in: Connection the equipment and power.

16 Fuse: AC fuse

17 AC Power switch: Turn on or turn off the power.

18 Case grounding nut : Connecting the equipment and the ground.

5.3 Parameter display

5.3.1 Turning on power display

When turn on power, display '**Initialize...**' for 2 seconds and buzzer briefly tweet one time indicated that initialized successfully.

5.3.2 Status display

When the transmitter running after turning on the power, press UP or DOWN button on the front panel, VFD displays in turn shown below:

- ① **“Welcome to MultiDyne”**:trademark
- ② **“CTV-2000-XX-SC”**:module name , SC indicated output port type
- ③ **“POWER=XX.X mW”**: output power, unit **mW**.
- ④ **“TEMP=XX.X °C”**: internal temperature value of the laser
- ⑤ **“BIAS= XX mA”**: bias current of the laser

- ⑥ “**RF INPUT = XXdBmV**”: RF input level
- ⑦ “**ATT= XXdB**”: attenuation value
- ⑧ “**MODEL LEVEL= XXdBmV**”: modulating level value
- ⑨ “**S/N: xxxx-xx-xxxx**”: equipment series number

5.4 Alarm Indication

Display Message	Alarm Status	System Indication
Warning...!!! Input RF is low	Input RF is too low	<ul style="list-style-type: none"> • <i>Status indicator</i> red light flashes
Warning... !!! Input RF is high	Input RF is too high	<ul style="list-style-type: none"> • <i>Status indicator</i> red light flashes

Chapter 6 Installation & Adjustment

6.1 Opening the cover

- 6.1.1** Inspect the package. If there is any damage or watermark, please contact the freight company or contact our company.
- 6.1.2** After unpacking, check equipments and accessories according to packing list. Any question, please contact local dealer or our company.
- 6.1.3** If you think equipment has been damaged, please don't turn on the power and avoid worse damage. Please contact local dealer or our company.

6.2 Apparatuses & Tools

An optical power meter

A digital multimeter

A frequency analyzer

A standard fiber test jumper (FC/APC or SC/APC)

Waterless alcohol and nosocomial degrease cotton

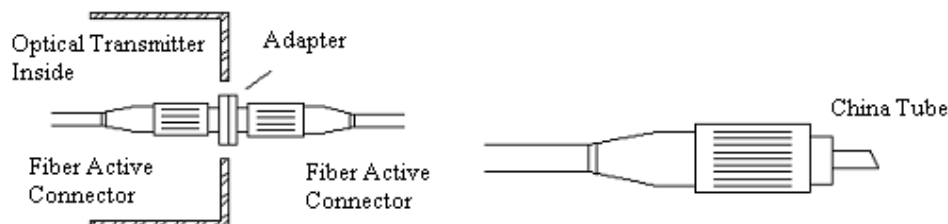
6.3 Installation

- a. Fix equipment on rack and ground the case.
- b. Check voltage by digital multimeter in accordance with power requirement and make sure laser lock is OFF. Then turn on power.

- c. Check message on the VFD and the status of front panel LED indicator, push **UP** and **DOWN** button to check each parameter, insure transmitter at normal working status. (Due to no RF input, LED red light, VFD display: **"input RF is low"**.)
- d. Connect standard fiber test wire to equipment optical signal output, measure output optical power, affirm output optical power is the same as the value displayed, and has reached setup value. (When measure optical power, make sure that optical power meter at 1310nm wavelength and that fiber test jumper is clean.)
- e. Measure input RF signal level with a oscillograph or a frequency analysis instrument, make sure that input RF signal be in the range of 15~25dBmV (optimum value 20dBmV) and connect RF signal to RF signal input port of the equipment. This time front panel LED turns to green and VFD displays RF input value as **"RF INPUT = XXdBmV"**.
(Notice: get the real RF input value, press UP or DOWN button to shift the VFD display, and press ENTER button when display **'RF LEVEL=XXdBmV'** to enter input level setting program when VFD display **'MOD LEVEL=XXdBmV'** and **'Please install...'**, in this setting program user can set RF input level by **1 dBmV** by pressing UP or DOWN button. when setting level equal real value, press ENTER to make it effected, at that time VFD display **'RF LEVEL=XXdBmV'**. For instance, if real RF input level is **20dBmV**, VFD would display **"RF LEVEL= 20dBmV"** after operations shown above)
- f. Re-measure optical output power, make sure that optical output power being normal, remove standard fiber test jumper and optical power meter, connect the equipment to network and end the installation.

Chapter 7 Clean & Maintenance

Each fiber connector maybe polluted by dust or dirt in the operation process, which results in optical link loss increase. If optical receive power and output level of the receiver decline, you should clean and maintain fiber active connector. The clean methods are recommended below:



- a. Carefully screw off fiber active connector from the adapter avoids the fiber active connector with laser to aim at the human body or eye resulting in harm.
- b. Use nosocomial degrease alcohol cotton to wash carefully, after finish, still need to be waited 1~2 minutes until active connector surface dry in the air.

- c. When the cleaned optical active connector screwed back to adapter, it should be noticed that we should make force slowly to avoid china tube crack in the adapter.
- d. The fiber active connector should be cleaned in two ends. If optical power is still low after clean, cleaning the other end of the fiber is recommended. If optical power is still low after clean the two ends, it is recommended that clean the inner adaptor. (Take care of the fiber when disassembly the adaptor).
- e. Use compressed air or degrease alcohol cotton to wash the adapter carefully. When use compressed air, aim the muzzle at china tube of the adapter, clean the china tube with compressed air. When use alcohol cotton, the insert direction need to be consistent, otherwise, user can't reach a good clean effect.

Notice:

- 1. Avoid laser aiming at the human body or eyes that can result in harm.
- 2. Assembly the fiber adaptor with gentle action to prevent the china tube inside the adaptor from breaking up.

Chapter 8 After-sale customer service

- a. Our commitment: One year free trouble fixing service and life-long customer service (1 year free guarantee time start from the date indicated in products S/N attaching on side of products).
- b. If the equipment failed, please contact immediately local dealer or our customer service centre.
- c. Don't try to fix the equipment trouble without the help from technician, it may lead to worse trouble.
- d. Notice: There are adhesive tape seals on both sides of the case. Any unauthorized remove to this tape seal by user will end our free customer service even in guarantee time.

Chapter 9 Troubleshooting

SYMPTOM	FAULT	ACTION
No VFD or LED display after turn on the power	Switching power abnormally start and equipment DC power supply abnormal.	Check power supply whether normal (AC90V~250V), if power voltage normal, most cause is switch power module fault, contact dealer or our company.
After turn on the power, VFD monitor and LED normal, but optical output power low.	<ol style="list-style-type: none"> 1. Check jumper quality 2. Polluted optical active connector or adapter 3. Damaged china tube in adapter maybe 	<ol style="list-style-type: none"> 1. Alternate an good test jumper 2. Clean polluted fiber active connector or adapter 3. Alternate damaged adapter
After connecting to network, figure of optical connector has obvious noise point.	<ol style="list-style-type: none"> 1. Optical connector receive optical power not enough cause C/N drop. 2. RF input level too low for laser to modulate 3. System link path C/N too low. 	<ol style="list-style-type: none"> 1. Clean fiber active connector or adapter to reset optical connector receiver optical power (According to chapter 7 <u>The clean and maintenance</u>). 2. Check optical link path and input optical transmitter RF signal, adjust system C/N to higher than 51dB. 3. Make sure RF input level within the range (15~25dBmV)
After connecting to network, some channels figure of optical connector has obvious noise point.	Some channels C/N too low.	<ol style="list-style-type: none"> 3. Check the channel signal C/N 4. Check the flatness of RF input signal
After connecting to network, optical connector figure has obvious ripple.	<ol style="list-style-type: none"> 1. Receive optical power in optical connector too high to RF signal alternate modulate parameter going bad. 2. Input optical transmitter RF signal alternate modulate parameter too bad. 	<ol style="list-style-type: none"> 1. Check received optical power at optical connector and properly adjust. 2. Check input optical transmitter signal alternate modulate parameter and properly adjust. 3. Make sure RF input level within the range (15~25dBmV)

CTV2000-FRX Users' Manual Version 1.0

Table of Content

Table of Content	13
Chapter 1 Preface.....	14
Chapter 2 Description.....	15
Chapter 3 Features.....	15
Chapter 4 Specifications:.....	15
Chapter 5 Accessory.....	16
Chapter 6 Installation & Adjustment.....	16
6.1 Opening the cover	16
6.2 Apparatuses & Tools	16
6.3 Installation.....	16
Chapter 7 Clean & Maintenance	17
Chapter 8 After-sale customer service	17

Chapter 1 Preface

This manual states CTV2000-FRX FTTH optical receiver product feature, specification, installation, adjustment and maintenance. To install this receiver successfully and use it safely, users should read the manual carefully before installation, and perform the installation and adjustment in accordance with this manual. Otherwise, some practices or circumstances may lead to damage or personal injury. Please contact MULTIDYNE if any question.

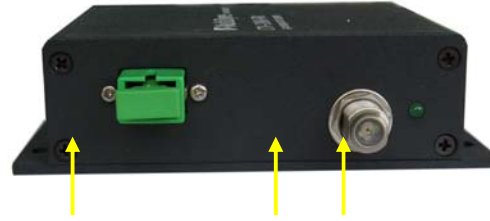
Important user information:

- **Caution:** There would be invisible laser from the fiber output port, which may cause permanent injury to human skin and eyes. Please do not point the fiber connector to the skin. In any case it is strictly forbidden to point the fiber connector to the eyes.
- The input optical power shall be $-8\sim+3\text{dBm}$, strong optical power may damage the photodiode.
- Make sure the case and the power supply grounded well before turning on the receiver (grounding resistance should be less than 4Ω), prevent the static from damaging photodiode and injuring user.
- To get a stable running circumstance for the receiver, it would be useful for the users in regions without steady electricity to equip the AC power supply (UPS would be better).

The CTV2000-FRX optical node has the Aluminum housing, which has an excellent heat dissipation performance.

Chapter 2 Description

CTV2000-FRX Optical Receiver is designed for PON FTTH broadband analog or digital CATV services. Working at extremely low optical input power, CTV2000-FRX still generates excellent CATV signals for home subscribers.



1)

2)

3)

1) Optical Input SC/APC Adaptor

2) RF Output

3) Power Indicator

Chapter 3 Features

High Linearity Photodiode

1000MHz Bandwidth

Low noise GaAs Amplifier

Compact Housing

12V DC External Power Supply

Chapter 4 Specifications:

Item	Parameter
Input Optical Wavelength	1000~1600 nm
Working Optical Power	+2 ~ -8 dBm
Optical Connector	SC/APC
Optical Return Loss	60 dB
RF Bandwidth	45 ~ 1000 MHz
RF Connector	Metric F or American F
RF Output Impedance	75Ω
RF Output Level	20dBmV @ -5dBm input optical Power
RF Flatness	± 0.75dB
RF Return Loss	>16 dB
CNR	>47 dBc @ -5dBm input optical power
CSO	<-70 dBc @77ch NTSC
CTB	<-70 dBc @77ch NTSC
Power Supply	12 V DC, Power Adapter Meet UL or CE or PSE or CCC
Power Consumption	< 3.5W
Working Temperature	-40 ~ +60℃
Dimension (L*W*H)	85mm×80mm×28mm
Weight	0.25 Kg (not including power adapter)

Test condition:

Input 59 channels PAL-D signal to standard optical transmitter and measure the optical receiver C/CTB, C/CSO and C/N in conditions of -5dBm optical input (10km fiber + optical attenuator) and 20dBmV RF output.

Chapter 5 Accessory

12V DC Adaptor: 1pcs

Users' Manual: 1pcs

Chapter 6 Installation & Adjustment

6.1 Opening the cover

6.1.1 Inspect the package. If there is any damage or watermark, please contact the freight company or MULTIDYNE.

6.1.2 After unpacking, check equipments and accessories according to packing list. Any question, please contact local dealer or MULTIDYNE.

6.1.3 If you think equipment has been damaged, please don't turn on the power and contact local dealer or MULTIDYNE.

6.2 Apparatuses & Tools

An optical power meter

A digital multimeter

A frequency analyzer

A standard fiber test jumper (FC/APC or SC/APC or SC/UPC)

Waterless alcohol and nosocomial degrease cotton

6.3 Installation

- c. Check input optical power with optical power meter. Making sure that the input power in the range of -2dBm~-8dBm. -5dBm optical power input is recommended.
- d. Insert the input fiber cable to the fiber input port. Clean the connector. Fix the fiber connector with the fiber adaptor after confirming the input optical power is normal.
- e. Connect the RF output port with coaxial cable. The optical receiver installation is finished.

Troubleshooting during installation

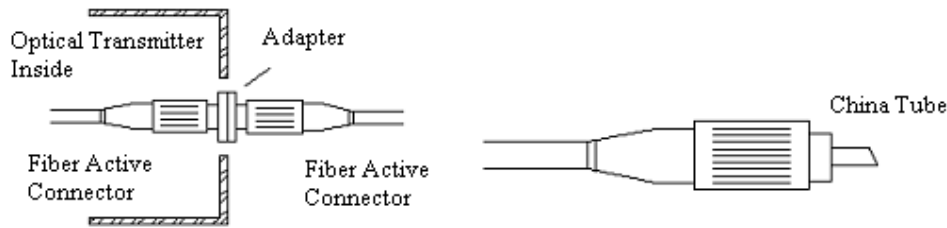
- a) RF Output Low: check the connection of RF adaptor and the coaxial cable.
- b) No RF Output: check the power indicator. If power is on, check the optical input power in the recommended range.
- c) Cautions:
 - 1) There might be invisible laser beam from fiber pigtail, which might cause permanent injury to

human eyes.

- 2) Make sure fiber connector and RF connector are clean and in good shape.

Chapter 7 Clean & Maintenance

Each fiber connector maybe polluted by dust or dirt in the operation process, which results in optical link loss increase. If optical receive power and output level of the receiver decline, you should clean and maintain fiber active connector. The clean methods are recommended below:



- f. Carefully screw off fiber active connector from the adapter avoids the fiber active connector with laser to aim at the human body or eye.
- g. Use nosocomial degrease alcohol cotton to wash carefully, after finish, still need to be waited 1~2 minutes until active connector surface dry in the air.
- h. When the cleaned optical active connector screwed back to adapter, it should be noticed that we should make force slowly to avoid china tube crack in the adapter.
- i. The fiber active connector should be cleaned in two ends. If optical power is still low after clean, cleaning the other end of the fiber is recommended. If optical power is still low after clean the two ends, it is recommended that clean the inner adaptor. (Take care of the fiber when disassembly the adaptor).
- j. Use compressed air or degrease alcohol cotton to wash the adapter carefully. When use compressed air, aim the muzzle at china tube of the adapter; clean the china tube with compressed air. When use alcohol cotton, the insert direction need to be consistent, otherwise, user can't reach a good clean effect.

Notice:

- a) Avoid laser aiming at the human body or eyes, which may result in permanent injury.
- b) Assembly the fiber adaptor with gentle action so as to prevent the china tube inside the adaptor from breaking up.

Chapter 8 After-sale customer service

- e. Warranty: One year free trouble fixing service and life-long customer service (1 year free guarantee time start from the date indicated in products S/N attaching on side of products).

- f. If the equipment failed, please contact immediately local dealer or MULTIDYNE. Don't try to fix the equipment trouble without the guidance from technician; it may lead to worse trouble.