TNHFC Optical Receiver

Operation and Maintenance Manual

1. Product Summary

TNHFC-MiniN-RCV optical receiver is the bidirectional equipment that is specially developed for HFC structure bidirectional metropolitan area broadband network. Rely on several years' research experience for **CATV HFC** fiber transmitting equipment. Take full account of the **FTTH** (Fiber to the Home) network topology, the engineering technology problem of **CATV** bidirectional return channel noise collection and the high reliability network security transmission requirements of modern **CATV** business. The return path adopts the burst mode (open the laser when have return signal), which greatly reduced the noise collection.

2. Performance Characteristics

- Laser control circuit adopts unique design, the work is reliable and stable.
- Excellent AGC characteristic, when the input optical power range is -7～+2dBm, the output level remains unchanged, CTB and CSO basically unchanged.
- Optimizing circuit design, SMT production process, optimizing the whole signal path, makes the photoelectronic signal transmission more stable, RF linear indicators higher.
- Professional RF attenuator circuit, with good attenuation linear and high precision.
- GaAs amplifier device, with good index, low distortion and high reliability.
- The return path control adopts burst mode, which greatly reduced the noise collection.
- The shell adopts aluminum die casting, cooling effect is good and the appearance is exquisite.

3. Technique Parameters

3.1 Link testing conditions

The performance parameters of this manual according to the measuring method of GY/T 194-2003 < Specifications and methods of measurement on optical node used in CATV systems >, and tested in the following conditions.

Test condition:

1. Forward optical receive part: with **10km** standard optical fiber, passive optical attenuator and standard optical transmitter composed the testing link. Set **59 PAL-D** analog TV channel signal at range of **47/85MHz ～550MHz** under the specified link loss. Transmit digital modulation signal at range of **550MHz ～862/1003MHz**, the digital modulation signal level (in **8 MHz** bandwidth) is **10dB** lower than analog signal carrier level. When the input optical power of optical receiver is **-1dBm**, the RF output level is **92dBμV**, measure the **C/CTB**, **C/CSO** and **C/N**.

2. Backward optical transmit part: Link flatness and **NPR** dynamic range are the link indexes which is composed of backward optical transmitter and backward optical receiver.

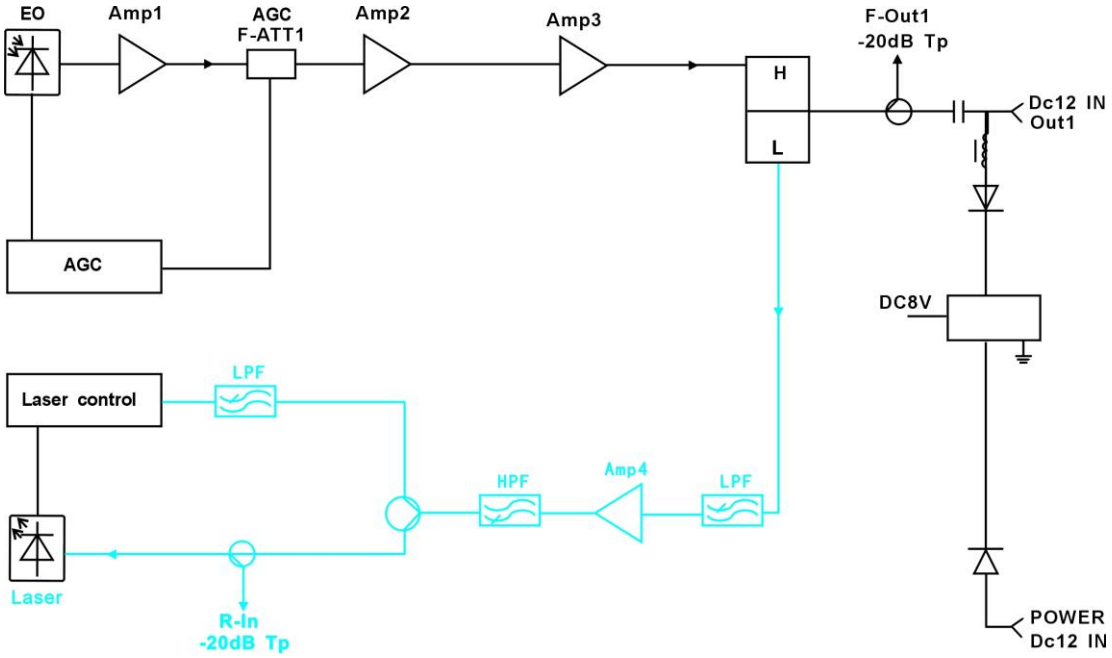
Note: When the rated output level is the system full configuration and the receiving optical power is **-2dBm**, equipment meets the maximum output level of link index. When the system configuration reduce (that is, actual transmission channels reduce), the output level of equipment will be increased.

3.2 Technique Parameters

Item		Unit	Technique Parameters	
			TNHFC	
Forward Optical Receive Part				
Optical Parameters				
Receiving Optical Power		dBm	-7 ~ +2	
Suggested Use Range		dBm	-3 ~ +1	
Optical Return Loss		dB	> 45	
Optical Receiving Wavelength		nm	1100 ~ 1600	
Optical Connector Type			FC/APC, SC/APC (or specified by the user)	
Optical Fiber Type			Single mode	
Link Performance				
C/N		dB	≥ 51 received optical power (-1dBm)	
C/CTB		dB	≥ 63	
C/CSO		dB	≥ 60	
RF Parameters				
Frequency Range		MHz	47/54/70/85～862(1003)	
Flatness in Band		dB	±0.75	
Rated Output Level		dBμV	≥ 92	
Max Output Level		dBμV	≥ 92	
Output Return Loss		dB	≥16	
Output Impedance		Ω	75	
Reverse Optical Transmit Part				
Optical Parameters				
Optical Transmit Wavelength		nm	1310±10, 1550±10 or specified by the user	
Laser Type			DFB or FP laser	
Optical Output Power		mW	0.5, 1, 2	
Optical Connector Type			SC/APC (or specified by the user)	
RF Parameters				
Frequency Range		MHz	5 ~30/42/55/65, (or specified by the user)	
Flatness in Band		dB	±0.75	
Input Level		dBμV	75～85 (Suggested input 80)	
Input Return Loss		dB	≥ 16	
Output Impedance		Ω	75	
NPR dynamic range		dB	≥15 (NPR≥30 dB) Use DFB laser	≥10 (NPR≥30 dB) Use FP laser
General Performance				
Power Voltage		V	DC12V	
Operating Temperature		℃	－30～＋70	
Storage Temperature		℃	－30～＋70	
Relative Humidity		%	Max 95% no condensation	
Consumption		W	≤6	
Dimension		mm	154（L）╳ 116（W）╳ 26（H）	

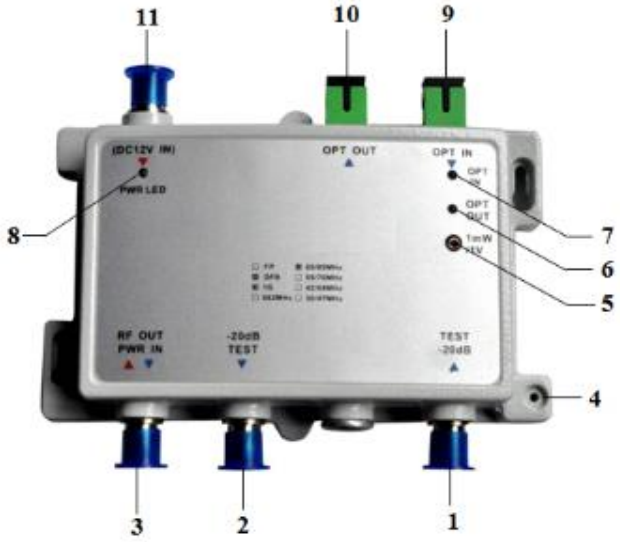
4. Block Diagram

TNHF Cortical node block diagram:



TNHFC block diagram

5. Structure Diagram



1. Return path input test port
2. Forward path input test port
3. RF signal output, DC12V input, return path input
4. Grounding
5. Received optical power test point
6. Laser operating status indicator
7. Input optical power indicator*
8. Power Indicator
9. Input optical signal (Input/output port when WDM)
10. Output optical signal (without this port when WDM)
11. DC12V input

***Note: Optical power＞+2dBm——Red; +2dBm~-8 dBm;-8 dBm~ -15 dBm——Bright orange; ＜-15 dBm——OFF.**

6. Common Failure Analysis and Troubleshooting

Failure phenomenon	Failure cause	Solution
After connecting the network, the image of the optical contact point has obvious netlike curve or large particles highlights but the image background is clean.	1. The optical input power of the optical receiver is too high, make the output level of the optical receiver module too high and RF signal index deteriorate. 2. The RF signal (input the optical transmitter) index is poor.	1. Check the optical input power and make appropriate adjustments to make it in the specified range; or adjust the attenuation of optical receiver to reduce the output level and improve index. 2. Check the front-end machine room optical transmitter RF signal index and make appropriate adjustments.
After connecting the network, the image of the optical contact point has obvious noises.	1. The optical input power of the optical receiver is not high enough, results in the decrease of C/N. 2. The optical fiber connector or adapter of the optical receiver has been polluted. 3. The RF input signal level of the optical transmitter is too low, make the modulation degree of the laser is not enough. 4. The C/N index of system link signal is too low.	1. Check the received optical power of the optical contact point and make appropriate adjustments to make it in the specified range. 2. Improve the optical received power of the optical contact point by cleaning the optical fiber connector or adapter etc methods. Specific operation methods see “Clean and maintenance method of the optical fiber connector”. 3. Check the RF input signal level of the optical transmitter and adjust to the required input range. (When the input channels number less than 15, should be higher than the nominal value.) 4. Use a spectrum analyzer to check the system link C/N and make appropriate adjustments. Make sure the system link signal C/N > 51dB.
After connecting the network, the images of several optical contact points randomly appear obvious noises or bright traces.	The optical contact point has open circuit signal interference or strong interference signal intrusion.	1. Check if there is a strong interference signal source; change the optical contact point location if possible, to avoid the influence of the strong interference signal source. 2. Check the cable lines of the optical contact point, if there is shielding net or situation that the RF connector shielding effect is not good. 3. Tightly closed the equipment enclosure to ensure the shielding effect; if possible, add shielding cover to the optical contact point and reliable grounding.
After connecting the network, the images of several optical contact points appear one or two horizontal bright traces.	Power supply AC ripple interference because of the bad earth of equipment or power supply.	Check grounding situation of the equipment, make sure that every equipment in the line has been reliably grounding and the grounding resistance must be < 4Ω.
After connecting the network, the received optical power of the optical contact point is unstable and changes continuously. The output RF signal is also unstable. But the detected optical output power of the optical transmitter is normal.	The optical fiber connector types do not match, maybe the APC type connect to PC type. The optical fiber connector or adapter may be polluted seriously, or the adapter has been damaged.	1. Check the type of optical fiber connector and adopt the APC type optical fiber connector to ensure the normal transmission of optical signal. 2. Clean the polluted optical fiber connector or adapter. Specific operation methods see “Clean and maintenance method of the optical fiber connector”. 3. Replace the damaged adapter.

7. Clean and maintenance method of the optical fiber active 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 connect the cleaned optical connector back to adapter, should notice to make force appropriate to avoid china tube in the adapter crack.
5. If the optical output power is not normal after cleaning, should pull off the adapter and clean the other connector. If the optical power still low after cleaning, the adapter may be polluted, clean it. (Note: Be carefully when pull off the adapter 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.