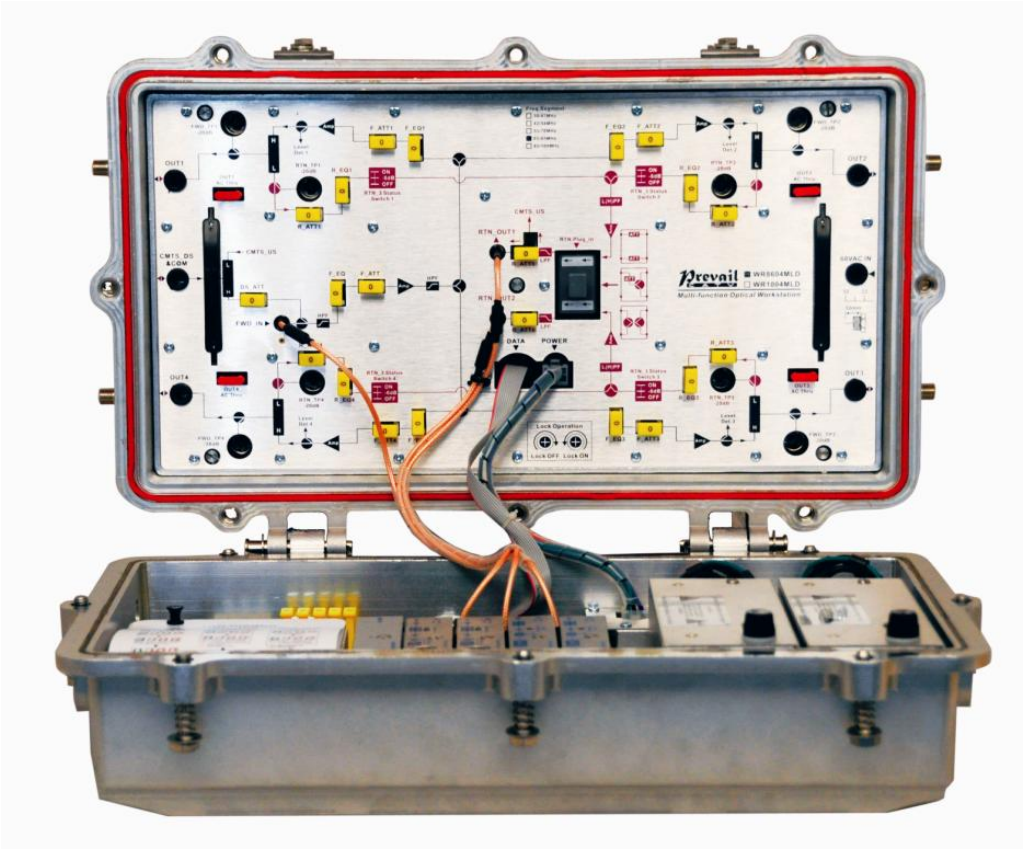
PREVAIL

WR-1004N-MLD-GD
Outdoor Optical Node
Operation and Maintenance Manual



1. Product Summary

WR-1004N-MLD-GD Outdoor optical node can be configured 2 forward path optical receiver modules, 2 return path optical transmitter modules, 1 Ethernet transponder module and 2 switching power supply modules at most. Adopts advanced optical AGC technology, the adjustment of output level and output slope both adopt fixed inserter. Add LED nixie tube display function, can output 4-way forward path signal (≥108dBμV) at most.

2. Performance Characteristics

- Forward path optical receiving part adopts advanced optical AGC technology, the input optical power range extended to -8～+2dBm.
- Forward path optical receiving part: RF operating bandwidth extended to 1GHz, each way maximum output level up to 114dBμv.
- The attenuation and equilibrium control circuit adopts fixed inserter, and achieve remote monitoring by NMS.
- RF amplifier part adopts quick plug modular design, can quickly replace RF amplifier module without dismantling the RF cable connector.
- Built-in perfect condition monitoring circuit, and support Ethernet transponder.
- Built-in tri-state gate switch circuit in the return path. Three states passthrough, -6dB and OFF can be remote set by network management responder.
- Reserved C-CMTS forward path and return path RF interface, support DOCSIS EOC networking scheme.

3. Technique Parameter

3.1 Link Testing Conditions

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

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 45/87MHz～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 108dBμV independent output, with 8dB output tilt, measure the C/CTB, C/CSO and C/N.
2. Return optical transmit part: Link flatness and NPR dynamic range are the link indexes which is composed of return path optical transmitter and optical receiver.

Note: When the rated output level is the system full configuration and the receiving optical power is -1dBm, equipment meets the maximum output level of link index. When the system configuration degrade (that is, the actual transmission channels reduce), the output level of equipment will be increased.

Friendly Notice: Suggest you setting the RF signal to 6~9dB slope output in the practical engineering application to improve the nonlinear index (behind the node) of the cable system.

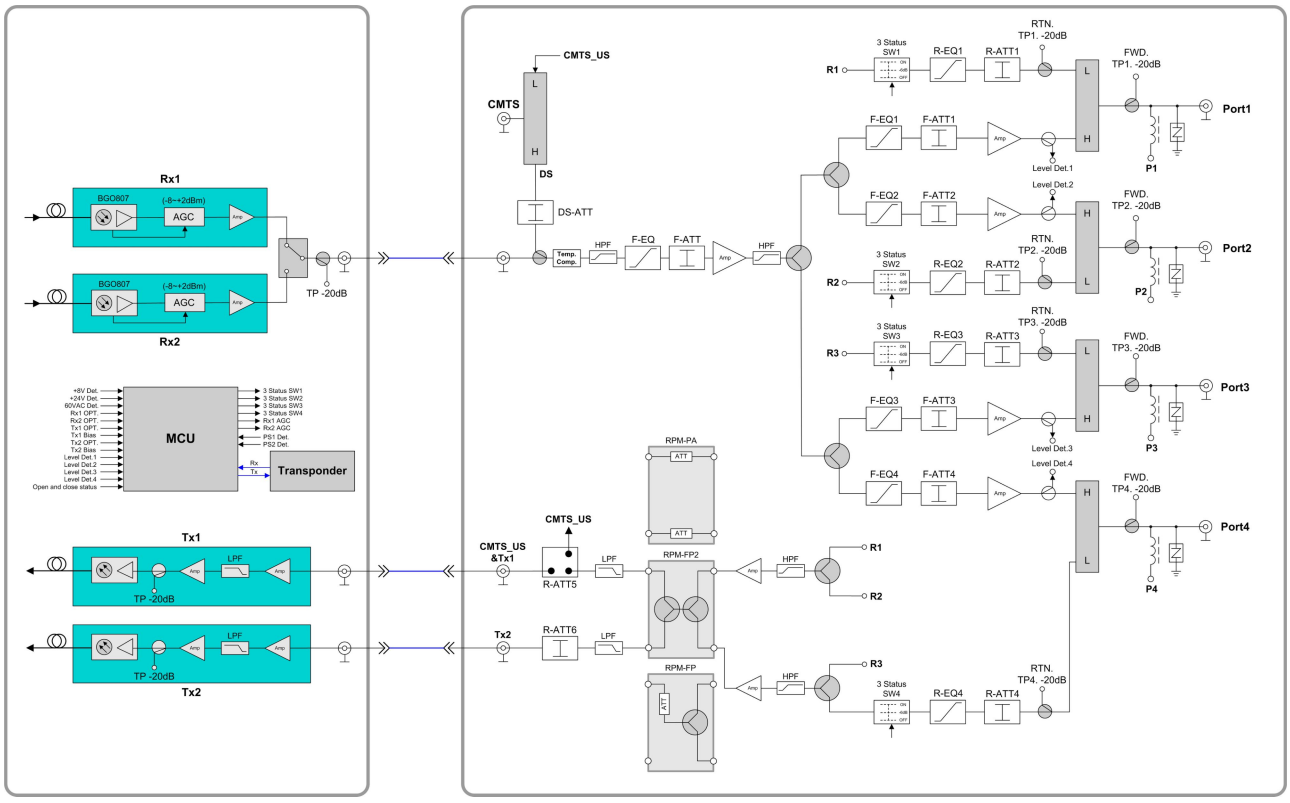
3.2 Performance Parameters

Item	Unit	Performance Parameters	
Forward Part			
Optical Parameters			
Optical AGC control range	dBm	+2～-8/-7/-6/-5 adjustable	
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	-1dBm optical input, output level 108dBμV, EQ 8dB
C/CTB	dB	≥ 65	
C/CSO	dB	≥ 60	
RF Parameters			
Frequency Range	**MHz**	45/85 ~862/1003	
Flatness in Band	dB	±0.75	
Rated Output Level	dBμV	≥ 108 (when the optical AGC control range is +2～-8)	
Max Output Level	dBμV	≥ 114 (when the optical AGC control range is +2～-5)	
Output Return Loss	dB	(85 ~550MHz) ≥16 / (550~1000MHz) ≥14	
Redundant Receiver Isolation	dB	≥75	
Output Impedance	Ω	75	
Return Part			
Optical Parameters			
Optical Transmit Wavelength	nm	1310±10, 1550±10 or specified by the user	
Laser Type	—	DFB or FP laser	
Output Optical Power	mW	1,2	
Optical Connector Type	—	FC/APC, SC/APC (or specified by the user)	
RF Parameters			
Frequency Range	**MHz**	5 ~ 42/65 (or specified by the user)	
Flatness in Band	dB	±0.75	
Input Level	dBμV	75~ 85	
Input Return Loss	dB	≥16	
Independent Transmit Isolation	dB	≥60	
Input Impedance	Ω	75	
NPR dynamic range	dB	≥15 (NPR≥30 dB) Use DFB laser	≥10 (NPR≥30 dB) Use FP laser

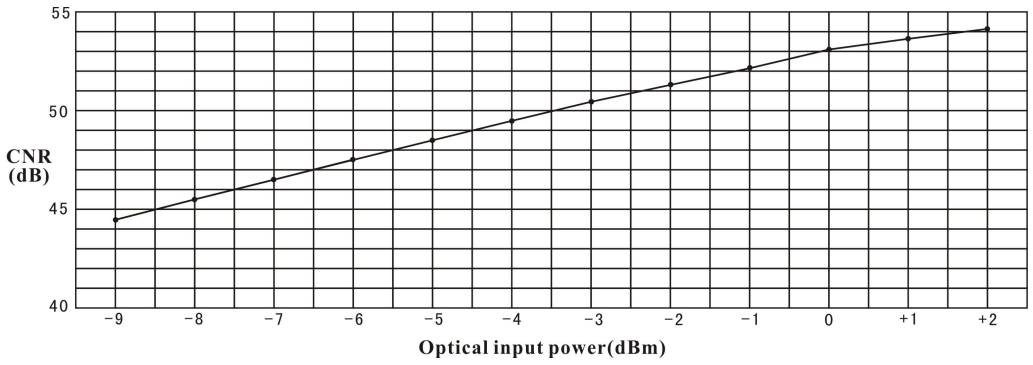
RF Parameters of C-CMTS interface		
CMTS_DS forward path insertion port level	dBμV	100±2

CMTS_US return path output gain	dB	0±1	Port～CMTS_US OUT
Isolation (forward path— CMTS_US return path output)	dB	≥70	
General Performance			
Power voltage	**V**	A：AC（90~250）V；B：AC（35~90）V	
Feed current through	**A**	10	
Operating temperature	℃	-40~+60	
Storage temperature	℃	-40~+70	
Relative humidity	%	Max 95% no condensation	
Consumption	VA	≤ 42	
Dimension	mm	460（L）×282（W）×175（H）	

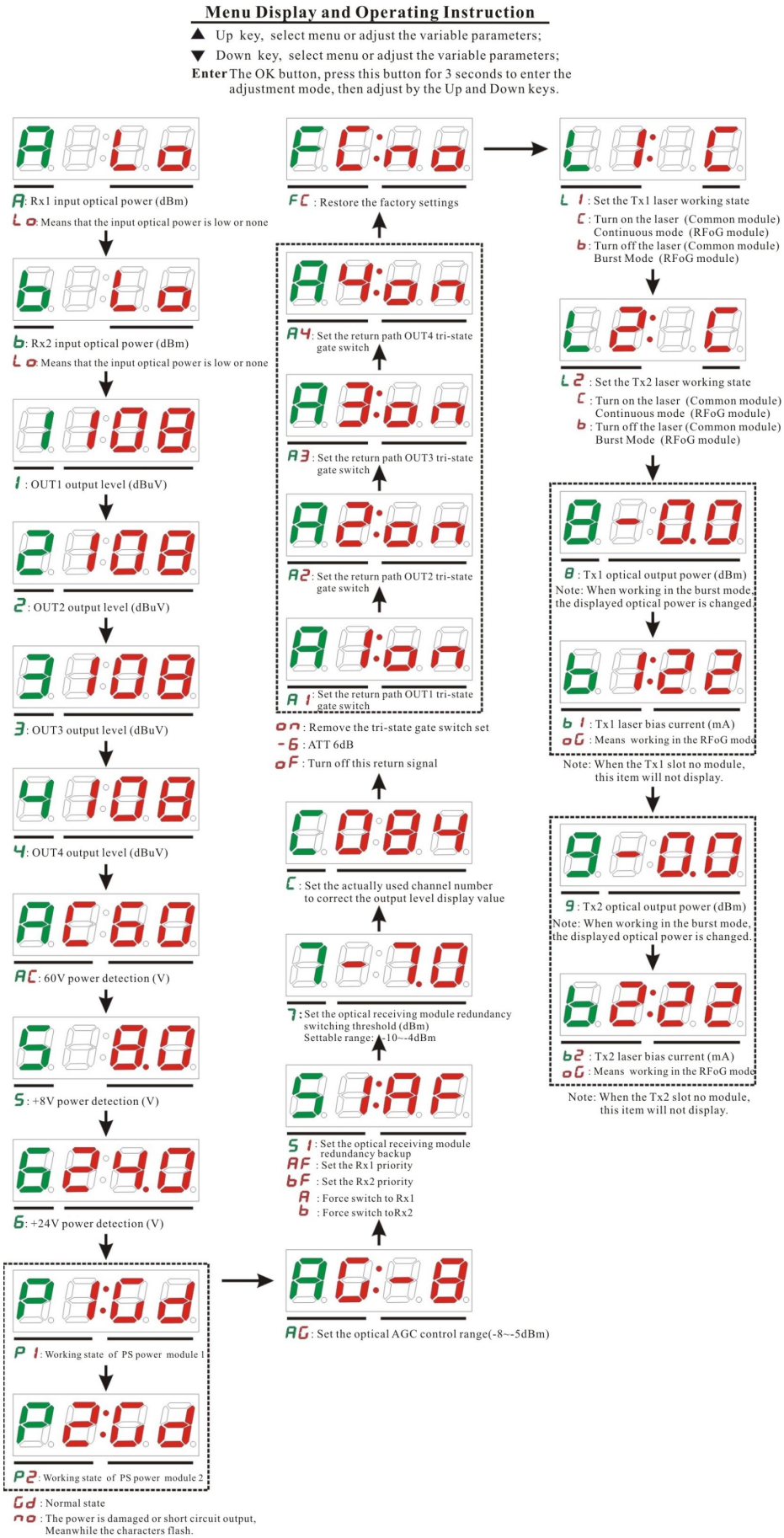
4 Block Diagram



5. Relation Table of Input Optical Power and CNR

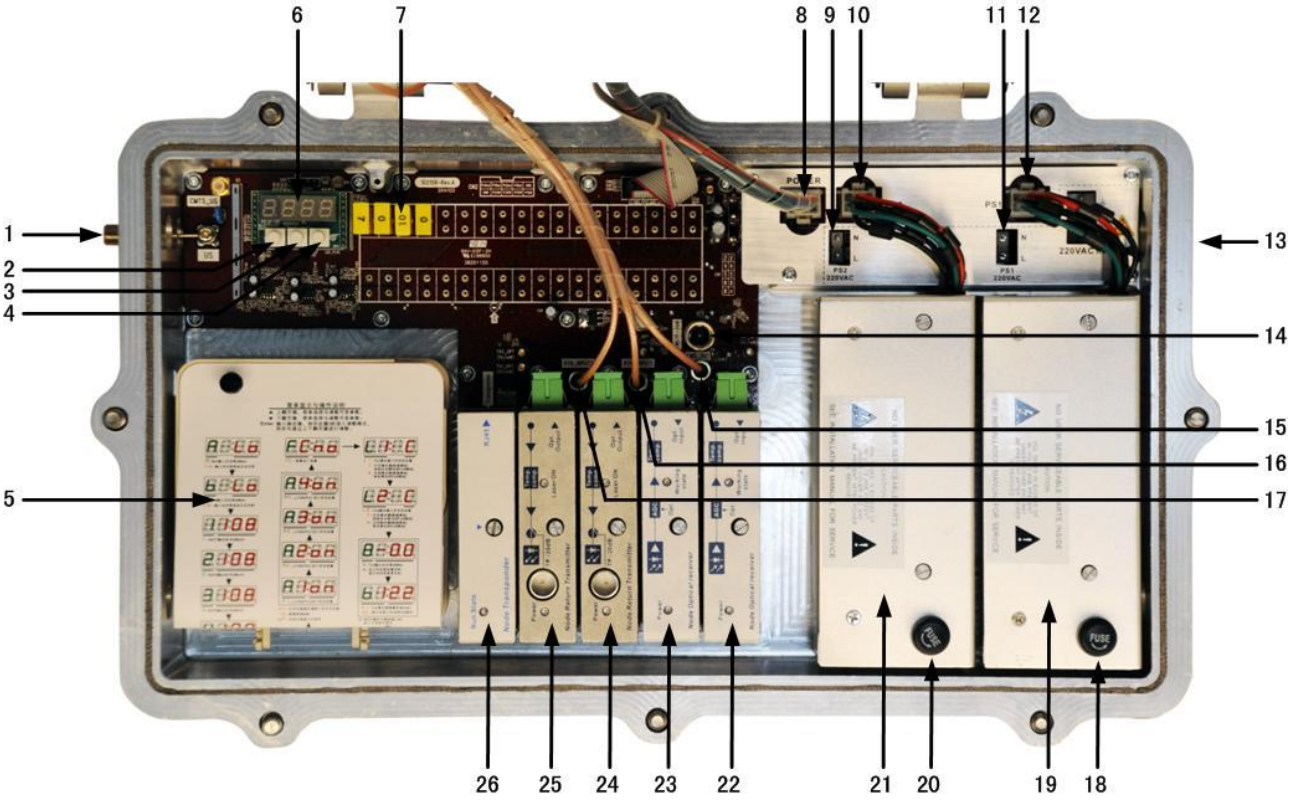


6. Function Display and Operating Instruction



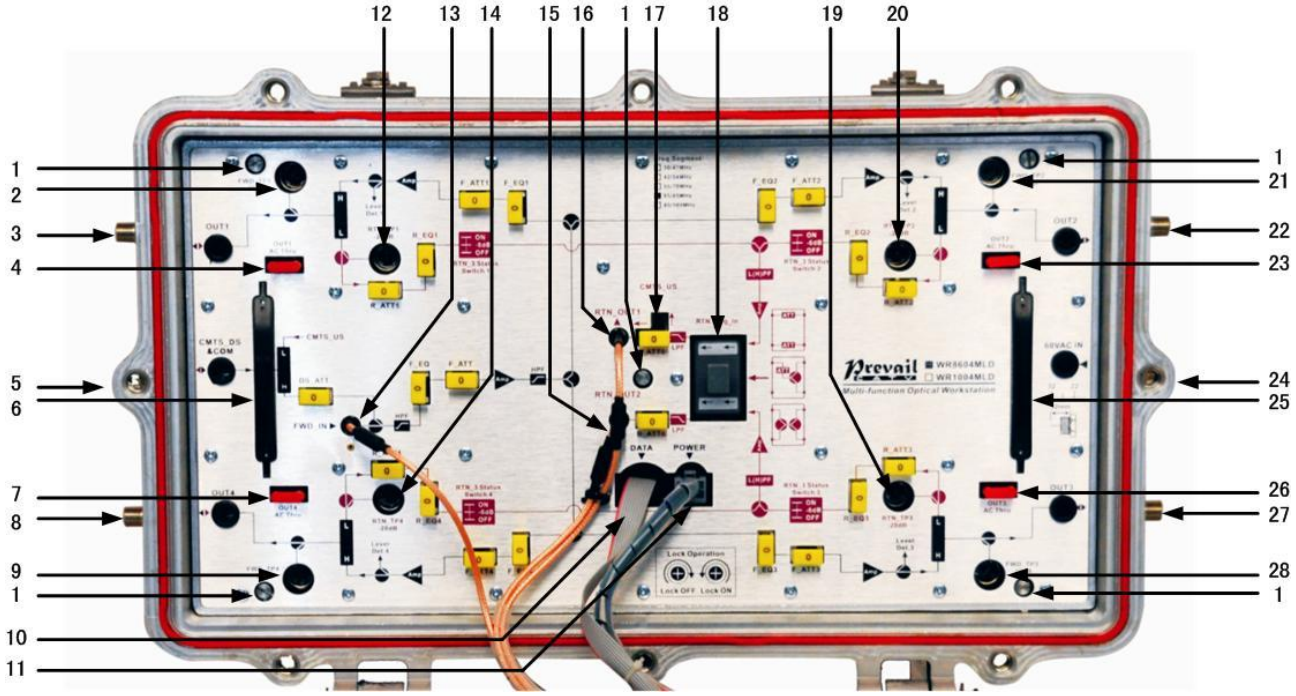
7. Structure Diagram

Upper cover:



1. CMTS return path output	2. Up key
3. Down key	4. Enter key
5. Operating instructions and fiber splice tray	6. Nixie tube display screen
7. Inserter	8. Redundant power output
9. Power module 2 220Vac socket	10. Power module 2 socket
11. Power module 1 220Vac socket	12. Power module 1 socket
13. 220Vac input	14. The RF output test port (-20dB) of forward path optical receiver modules
15. RF output of forward path optical receiver modules	16. The RF input interface of return path optical transmit modules 1
17. The RF input interface of return path optical transmit modules 2	18. Power 1 fuse
19. Power module 1	20. Power 2 fuse
21. Power module 2	22. Forward path optical receiver modules 1
23. Forward path optical receiver modules 2	24. Return path optical transmit modules 1
25. Return path optical transmit modules 2	26. NMS transponder module

Bottom Cover:



1. Fixed screw	2. Port1 forward path output test port (-20dB)
3. Port 1	4. Port 1 feed fuse
5. CMTS forward path IN	6. Handle *
7. Port 4 feed fuse	8. Port 4
9. Port 4 forward path output test port (-20dB)	10. Data interface
11. Main board power input	12. Port 1 return path input test port (-20dB)
13. Forward path RF input	14. Port 4 return path input test port (-20dB)
15. Return path RF output 2	16. Return path RF output 1
17. Mode setting and attenuation jumper	18. Return path components
19. Port 3 return path input test port (-20dB)	20. Port 2 return path input test port (-20dB)
21. Port 2 forward path output test port (-20dB)	22. Port 2
23. Port 2 feed fuse	24. AC60V independent feed port
25. Handle *	26. Port 3 feed fuse
27. Port 3	28. Port 3 forward path output test port (-20dB)

*** Turn off the five fixed screws before take out the module with handles.**

8. NMS setup instructions

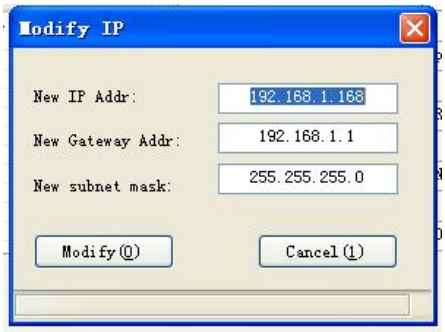
If users configured the network management responder, need to do the following settings:

Responder IP setup instruction:

Network management directly modify:

1. Default IP is 192.168.1.168， default gateway is 192.168.1.1， default subnet mask is 255.255.255.0
2. Connect the computer and responder (can be direct connected), and change the computer IP to 192.168.1.XXX (XXX is any number from 0 to 255 except 168); start upper computer network management software, then search the device and log in.
3. Right-click device icon and choose modify the device IP.

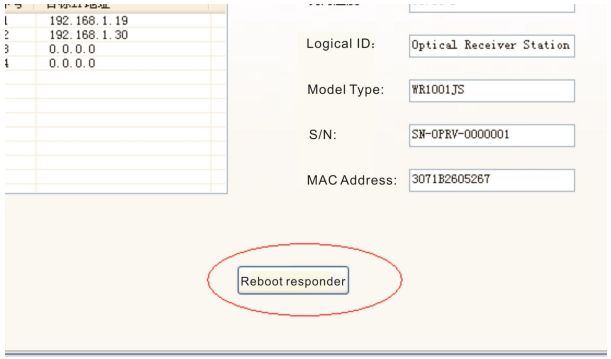
4. Enter new IP address, gateway and subnet mask.



5. Click modify， then exit, it is done. There will show new IP address and gateway on operational logbook.

Log Number	Log Type	Log Contents	Login time
1752	ChangIPAddress	Modify equipment192.168.1.168 IP address: New IP: 192.168.1.167;New gateway:192.168.1.1	2009-9-9 12:39:03

6. Reboot the responder, the new IP take effect (Click the reboot button in the network management software or power on again)



9. 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.

10. Clean and maintenance method of the optical fiber active connector

In many times, we misjudge the decline of the optical power or the reduce of optical receiver output level as the equipment faults, but actually it may be caused by the incorrect connection of the optical fiber connector or the optical fiber connector has been polluted by the dust or dirt.

Now introduce some common clean and maintenance methods of the optical fiber active connector.

1. Carefully pull off the optical fiber active connector from the adapter. The optical fiber active connector should not aim at the human body or the naked eyes to avoid accidental injury.
2. Wash carefully with good quality lens wiping paper or medical degrease alcohol cotton. If use the medical degrease alcohol cotton, still need to wait 1~2 minutes after wash, let the connector surface dry in the air.
3. The cleaned optical fiber active connector should be connected to optical power meter to measure output optical power to affirm whether it has been cleaned up.
4. When connect the cleaned optical fiber active connector back to adapter, should notice to make the force appropriate to avoid the ceramic tube in the adapter crack.
5. If the output optical 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 the dedicated compressed air or degrease alcohol cotton bar to clean the adapter. When use the compressed air, the muzzle of the compressed air tank should aims at the ceramic tube of the adapter, clean the ceramic tube with compressed air. When use degrease alcohol cotton bar, carefully insert the alcohol cotton bar into the ceramic tube to clean. The insert direction should be consistent, otherwise can not reach ideal cleaning effect.