Rack-Mounted 1 × N Multimode

Optical Switch

Specifications

1. Product Introduction

Optical switch is a kind of optical path control device, which plays the role of controlling and converting the optical path. And play an important role in optical communication application. The optical switch is mainly used in multi-channel optical monitoring, LAN multi-light source/detector automatic switching and optical sensing multi-point dynamic monitoring system in the optical transmission system, optical fiber, optical device, network and field engineering optical cable test in the optical test system; Optical device assembly and adjustment. The 1 × N optical switch can switch one input route to one of N output routes.

2. Product Features

➢ It has the characteristics of low insertion loss and fast switching speed.

➢ The LCD display screen is used to display data intuitively and facilitate the user's operation.

➢ Automatic scanning can be set, and the maximum switching interval is 99 hours, 59 minutes and 59 seconds; You can also set the Start Channel and End Channel of the scan.

➢ The "device address" can be set to facilitate the user to use one serial port to control multiple optical switch instruments in the case of shortage of serial port resources.

3. Technical Parameters

Model	HC-FSW-MM-1XN -1U/2U
Operating wavelength	850 nm
Test wavelength	850nm
Insertion loss	≤1.2 dB
Repeatability	≤±0.05 dB

Return loss	≥30dB
Crosstalk	≥30dB
Wavelength dependent loss	≤0.25
Switching time	≤ 10 ms (adjacent sequential switching)
Fiber type	MM（50/125um）OM3
Connector form	FC/PC
Monitoring port	RJ45、RS-232
Working power supply	Single AC: 85 ~ 264 (50/60Hz)
Operating temperature	-5 ~ + 60℃
Storage temperature	-40 ~ + 80°C
Chassis type	19-inch standard 1U rack (483 × 220 × 44mm)

4. Instructions for Use

4.1. Schematic Description of the Structure

4.1.1. Front Panel Description

Front panel

(1) LCD display screen: display of equipment address, current channel and relevant information.

(2) ▲-Move up key; ▼-Move down key; Enter-Confirm key; Esc-Cancel key.

(3) Power indicator lamp Power 1, Power2: working power indicator.

(4) Optical interface description: I/O ports on the equipment panel are public ports, 1, 2, 3, … … 24 is the number of each channel.

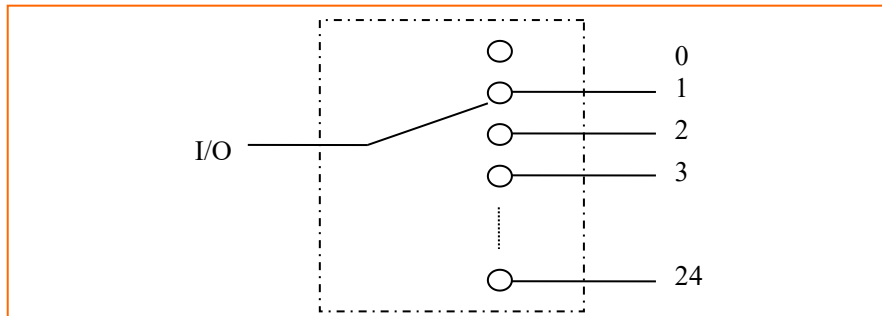### 4.1.2. Rear Panel Description

Rear panel
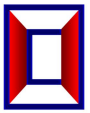
(1) RJ45 Ethernet interface, RS-232 serial port: communication interface for equipment monitoring data information.

(2) AC power interface: AC power input interface for equipment operation.

4.2. Device Connection Instructions

4.2.1. Schematic Description of Internal Optical Path

Schematic diagram of internal optical path of 1 × 24 optical switch

4.2.2. Description of Communication Interface Connection

(1) RS-232 interface

When connecting the device to a computer, you should use a serial port crossover cable with a hole DB9 at both ends. That is, the # 2 and # 3 pins at both ends are crossed and connected, the # 5 pins at both ends are butted, and the other pins may not be connected.

(2) RJ45 Ethernet interface

When the equipment is connected to the computer through the switch, the straight-through line should be used (the wiring sequence at both ends is: 1-orange white, 2-orange, 3-green white, 4-blue, 5-blue white, 6-green, 7-brown white, 8-brown); When the device is connected directly to the computer, a

crossover wire should be used (one end: 1-Orange-White, 2-Orange, 3-Green-White, 4-Blue, 5-Blue-White, 6-Green, 7-Brown-White, 8-Brown; the other end: 1-Green-White, 2-Green, 3-Orange-White, 4-Blue, 5-Blue-White, 6-Orange, 7-Brown-White, 8-Brown).

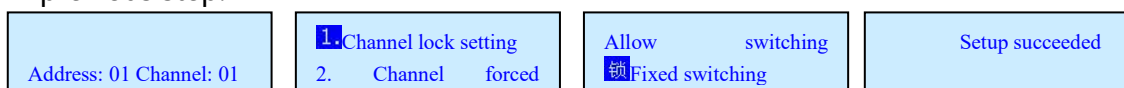### 4.3. Operating Instructions for the Panel

(1) Keyboard locking: The communication interface of the channel device sends the corresponding command to set whether the keys on the panel are allowed to be used. See "Communication Protocol Description" for details. When the panel key is locked, the corresponding parameters cannot be set through the panel.

(2) Whether the initial interface allows the setting of channel switching

● Setting steps for allowing channel switching on the initial interface: when the key is allowed to be used, ① press the "Enter" key to enter the menu; ② press the "▲" or "▼" key to select "1. Channel locking setting"; ③ press the "Enter" key to enter; ④ press the "▲" or "▼" key to select "Allow switching"; ⑤ press the "Enter" key to confirm completion. ⑥ During the whole process, press the "Esc" key to return to the previous step.
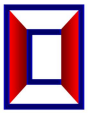
Address: 01 Channel: 01	1.Channel lock setting 2. Channel forced	允 Allow switching locking switching
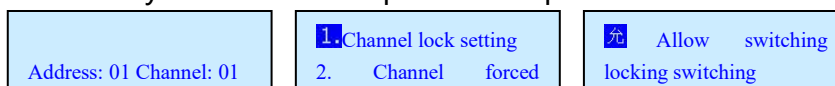
● Setting steps of initial interface locking channel switching: when the key is allowed to be used, ① press "Enter" key to enter the menu; ② press "▲" or "▼" key to select "1. Channel locking setting"; ③ press "Enter" key to enter; ④ press "▲" or "▼" key to select "locking switching"; ⑤ press "Enter" key to confirm completion. ⑥ During the whole process, press the "Esc" key to return to the previous step.

Address: 01 Channel: 01	1.Channel lock setting 2. Channel forced	Allow switching 锁Fixed switching	Setup succeeded

(3) Channel switching

● When the channel switching is allowed in the initial interface, press the "▲" or "▼" key to switch the channel circularly; when the channel switching is locked in the initial interface, press the "▲" or "▼" key to switch the channel.

● When the key is allowed to be used, ① press the "Enter" key to enter the menu; ② press the "▲" or "▼" key to select "2. Channel Forced Selection"; ③ press the

"Enter" key to enter; ④ press the "▲" or "▼" key to select "New Channel"; ⑤ press the "Enter" key to confirm completion. ⑥ During the whole process, press the "Esc" key to return to the previous step.

Address: 01 Channel: 01	1.Channel lock settings 2. Channel forced	New channel: 03	Setup succeeded
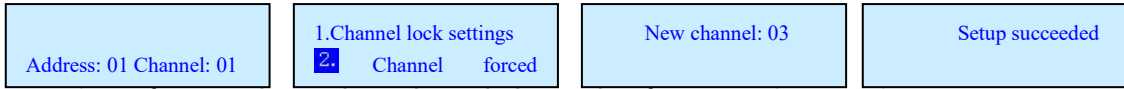
(4) Setting of "start channel" and "end channel" of automatic scanning

- When the key is allowed to be used, ① press the "Enter" key to enter the menu; ② press the "▲" or "▼" key to select "3. Scan Channel Setting"; ③ press the "Enter" key to enter; ④ press the "▲" or "▼" key to select "Start Channel"; ⑤ press the "Enter" key to confirm completion. ⑥ Press "▲" or "▼" to select "End Channel"; ⑦ Press "Enter" to confirm completion. ⑧ During the whole process, press the "Esc" key to return to the previous step.

Address: 01 Channel: 01	3.Scan channel settings 4. Auto Scan Settings	Start channel: 001 End Channel: 008	Setup succeeded

(5) Set the time of automatic scanning and start the automatic scanning
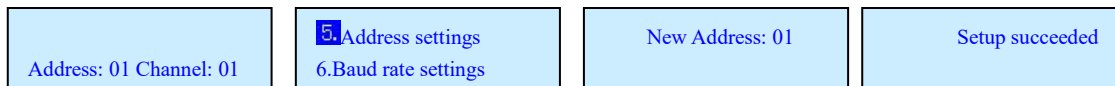
- When the key is allowed to be used, ① press the "Enter" key to enter the menu; ② press the "▲" or "▼" key to select "4. Automatic scanning setting"; ③ press the "Enter" key to enter; ④ press the "▲" or "▼" key to select the "hour" of the scanning interval; ⑤ press the "Enter" key to confirm; ⑥ press the "▲" or "▼" key to select the "minute"; ⑦ Press the "Enter" key to confirm; ⑧ Press the "▲" or "▼" key to select "Second"; ⑨ Press the "Enter" key to confirm completion. If the time is not zero, the automatic scanning will be started. ⑩ During the whole process, press the "Esc" key to return to the previous step.

Address: 01 Channel: 01	3.Scan channel settings 4. Automatic scan	Scan interval: 00 Hours 00 minutes 00	Setup succeeded

- During automatic scanning, there are three ways to stop scanning on the panel: ① When the initial interface allows channel switching, press "▲" or "▼" to switch the channel to stop scanning; ② Switch the channel under the menu "2. Channel forced selection" to stop scanning; ③ Set the scanning interval as "00 hours, 00 minutes and 00 seconds" under the menu "4. Automatic scanning setting" to stop scanning.

(6) Device address setting, which is used to control multiple devices with different addresses in the case of shortage of serial port resources.

- When the key is allowed to be used, ① press the "Enter" key to enter the menu; ② press the "▲" or "▼" key to select "5. Address Setting"; ③ press the "Enter" key to enter; ④ press the "▲" or "▼" key to select "New Address"; ⑤ press the "Enter" key to confirm. ⑥ During the whole process, press the "Esc" key to return to the previous step.

Address: 01 Channel: 01	5.Address settings 6.Baud rate settings	New Address: 01	Setup succeeded

(7) The setting of serial port baud rate can meet the setting of different baud rates. The baud rates that can be set are: 1200, 2400, 4800, 9600, 19200, 57600, and 115200. The factory setting is: 19200. (Note: The baud rate setting takes effect after a reboot.)

- When the key is allowed to be used, ① press the "Enter" key to enter the menu; ② press the "▲" or "▼" key to select "6. Baud rate setting"; ③ press the "Enter" key to enter; ④ press the "▲" or "▼" key to select "Baud rate"; ⑤ press the "Enter" key to confirm completion. ⑥ During the whole process, press the "Esc" key to return to the previous step.

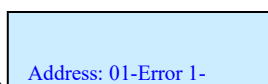| Address: 01 Channel: 01	5. Address settings 6.Baud rate setting	Baud rate: 19200 (Will not take effect until	Setup succeeded

(8) LCD backlight delay setting

- When the key is allowed to be used, ① press the "Enter" key to enter the menu; ② press the "▲" or "▼" key to select "7. LCD backlight"; ③ press the "Enter" key to enter the menu; ④ press the "▲" or "▼" key to select the delay time; ⑤ press the "Enter" key to confirm; ⑥ during the whole process, press the "Esc" key to return to the previous step.
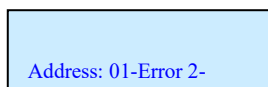
Address: 01 Channel: 01		15 seconds | 30 seconds | 1 minute	Setup succeeded
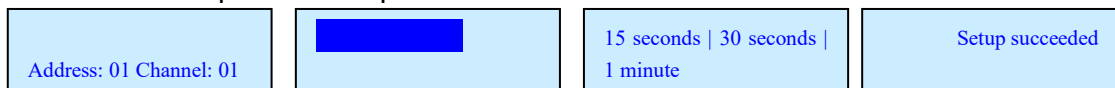
(9) Error message prompt

- Error 1-Indicates data overflow.

Address: 01-Error 1-

- Error 2-Indicates that the optical switch module is operating incorrectly.

Address: 01-Error 2-

4. 4. Upper Computer Monitoring Description

The device can receive control signals from a computer through the RS-232 interface on the front panel to realize automatic measurement or real-time monitoring (by using a serial monitoring system or serial software), and can also carry out remote monitoring through an Ethernet port.

4.4.1. Programmed Instruction

(1) The instrument can only execute one command at a time. The next instruction is
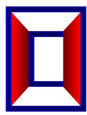
usually entered after the program returns the corresponding value.

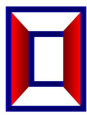(2) Please use capital letters.

(3) In the actual operation, input the angle bracket "<" as the start character and
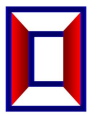
the angle bracket ">" as the end character.

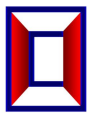(4) Return data with "<" as the start character and ">" as the end character.

Programmed instruction set

Command	Description	Examples
<ADXX_S_YY> Note: Automatic scanning can be stopped	Sets the current channel XX value: 00 ~ 99 (indicating equipment address) YY value: 00 ~ 20 (indicating which channel to switch to) Success return: <; ADXX_OK> Failure return: <; ADXX_E1>	< AD01_S_08> The optical switch indicating the address 01 is switched to channel 8; Success return: <; AD01_OK> Failure return: <; AD01_E1>
<ADXX_C_YY> Note: Automatic scanning can be stopped	Sets the current channel XX value: 00 ~ 99 (indicating equipment address) YY value: 00 ~ 20 (indicating which channel to switch to) This directive does not return any value!! Therefore, the command must be used with caution to avoid misoperation of the optical switch.	< AD01_C_08> The optical switch indicating the address 01 is switched to channel 8; Note: There is no return message.
<ADXX_B_YYY_E_ZZZ>	Set the automatic scanning channel XX value: 00 ~ 99 (indicating equipment address) YYY value: 001 ~ 020 (indicating initial channel) ZZZ value: 001 ~ 020 (indicating end channel) Success return: <; ADXX_OK> Failure return: <; ADXX_E1>	<AD01_B_001_E_008> Indicates that the scanning channel is: 1, 2, 3 ... ... 8、1; <AD01_B_008_E_002> Indicates that the scanning channel is: 8 ... ... N、1、2、8;
<ADXX_B_E_?>	Query automatic scanning channel Return: <; ADXX_YYY_ZZZ> XX value: 00 ~ 99 (indicating equipment address) YYY value: 001 ~ 020 (indicating initial channel) ZZZ value: 001 ~ 020 (indicating end channel)	<AD01_B_E_?> Return: <; AD01_004_008> Indicates that the starting channel is 004 and the ending channel is 008.
<ADXX_T_CHN?> Note: Automatic	Query the current channel Return: <; ADXX_YY>	<AD01_T_CHN?> If the current channel is 2,

	XX value: 00 ~ 99 (indicating equipment address) YY value: 00 ~ 20 (indicating the current channel)	Return: <; AD01_02>;
<ADXX_M_STA?> Note: Automatic scanning can be stopped	Querying the current running state of the optical switch Return: <; ADXX _ OK & > (indicating normal operation) Or Return: <; ADXX _ E1 (indicates data overflow)	<AD01_M_STA?> If the optical switch operates normally, return: <AD01_OK> If the optical switch runs incorrectly, return: <AD01_E1>
<ADXX_A_YY>	Set Auto Scan Interval and Start XX value: 00 ~ 99 (indicating equipment address) YY value: 00 ~ 99 (indicates the scanning interval, the specific time is YY × 100ms, and the default is 100ms at 00)- Success return: <; ADXX _ YY & gt; (current channel) Note: This command returns the channel traversed by the automatic scan.	<AD01_A_10> If the current channel is 2, return: AD01 _ 02, delay 1000ms, AD01_03>...... ;
<ADXX_F_YY>	Set Auto Scan Interval and Start XX value: 00 ~ 99 (indicating equipment address) YY value: 00 ~ 99 (indicating the scanning interval, the specific time is YY × 100ms, and the default is 100ms at 00) Success return: <; ADXX_OK> Note: This command does not return the channels traversed by the automatic scan.	<AD01_F_10> Success return: <; AD01_OK> The optical switch is switched every 1000 ms, but no information is returned.
<ADXX_A_T_HH_MM_SS> Note: When "HH _ MM _ SS" is "00 _ 00 _ 00", automatic scanning can be stopped	Set Auto Scan Interval and Start XX value: 00 ~ 99 (indicating equipment address) HH value: 00 ~ 99 (representing the number of hours between scans) MM value: 00 ~ 59 (indicating the number of minutes between scans) SS value: 00 ~ 59 (indicating the number of seconds between scans) Success return: <; ADXX _ YY & gt; (current channel) Note: This command returns the channel traversed by the automatic scan. Stop scanning when the HH _ MM _ SS is 00 _ 00 _ 00 (return: < ADXX _ OK >).	<AD01_A_T_01_02_30> The optical switch switches once every "01 H 02 min 30 s"; If the current channel is 2, return to < AD01 _ 02 >, delay, < AD01_03>...... ;

<ADXX_F_T_HH_MM_SS> Note: When "HH _ MM _ SS" is "00 _ 00 _ 00", automatic scanning can be stopped	Set Auto Scan Interval and Start XX value: 00 ~ 99 (indicating equipment address) HH value: 00 ~ 99 (representing the number of hours between scans) MM value: 00 ~ 59 (indicating the number of minutes between scans) SS value: 00 ~ 59 (indicating the number of seconds between scans) Success return: <; ADXX_OK> Note: This command does not return the channels traversed by the automatic scan Stop scanning when HH _ MM _ SS is 00 _ 00 _ 00.	<AD01_F_T_01_02_30> Success return: <; AD01_OK> The optical switch is switched every "01 H 02 min 30 s", but no message is returned.
<ADXX_U_ VALUE>	Set the baud rate of the serial port of the device XX value: 00 ~ 99 (indicating the current address of the device) Value: 1200, 2400, 4800, 9600, 19200, 57600, 115200 Success return: <; ADXX_OK>	< AD01_U_9600> Indicates that the baud rate is set to 9600; < AD01_U_19200> Indicates that the baud rate is set to the 19200.
<ADXX_KEY_Y>	Set or query the permission of the device button XX value: 00 ~ 99 (indicating the current address of the device) Y value: 0 means forbidden; 1 indicates permission; Success return: <; ADXX_OK> Or Y value:? Represents a query; Success return: <; ADXX_KEY_0> Or <; ADXX_KEY_1>	<AD01_KEY_1> Indicates that the key is allowed to be used; <AD01_KEY_0> Indicates that the key is prohibited to be used; <AD01_KEY_?> If the key is allowed to be used, return: < AD01 _ KEY _ 1, if the key is disabled, return: <AD01_KEY_0>
<ADXX_LOCK_Y>	Set or query whether the channel switching function of the device panel is allowed XX value: 00 ~ 99 (indicating the current address of the device) Y value: 1 indicates locking; 0 indicates permission; Success return: <; ADXX_OK> Or Y value:? Represents a query; Success return: <; ADXX_LOCK_0> Or <; ADXX_LOCK_1>	< AD01_LOCK_1> Indicates that channel switching is prohibited on the panel; <AD01_LOCK_0> Indicates that the channel is allowed to be switched on the panel; <AD01_LOCK_?> If switching is prohibited on the panel, return to: < AD01_LOCK_1> If switching is allowed on the panel, return to: <AD01_LOCK_0>

<ADXX_G_YY>	Change the device address XX value: 00 ~ 99 (indicating the current address of the device) YY value: 00 ~ 99 (indicating the new address of the device) Success return: <; ADYY_OK>	< AD01_G_03> Indicates that the device address is changed to 03; Success return: <; AD03_OK>
<ADXX_MAX_?>	Query optical switch main channel XX value: 00 ~ 99 (indicating the current address of the device) Success return: <; ADXX_MAX_020>	Success return: <; AD01_MAX_020> Indicates that the total number of channels of the optical switch is 20.

Notice!

(1) ADXX represents the address identification bit of the optical switch. The setting of the identification bit is to facilitate the user to use one serial port to control multiple optical switch instruments in the case of shortage of serial port resources. For example, AD01 represents the first optical switch, and AD03 represents the third optical switch. Unless otherwise specified or required, the instrument is factory set to AD01.

(2) The command error returns "< ADXX _ E? >". Where "?" Is one of the values 0, 1, 2. Different values returned in a specific run represent different types of errors depending on the situation. "ADXX _ E0" means command format error, "ADXX _ E1" means data overflow, and "ADXX _ E2" means optical module operation error.
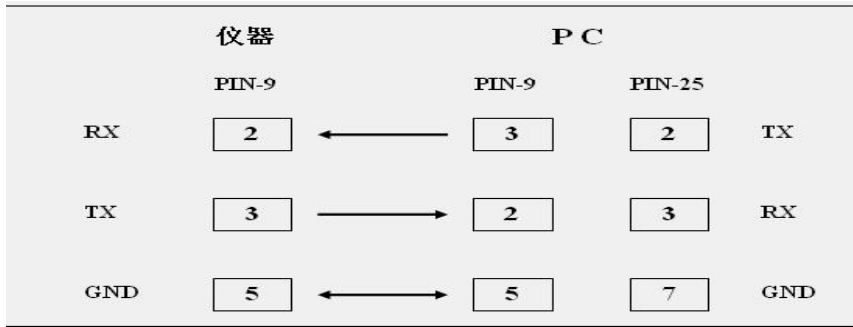
(3) "_" means underline.

(4) Return data with "<" as the start character and ">" as the end character.

4.4.2. Serial Port Connection Mode and Control

(I) Pin definition and connection mode of RS-232

(1) Definition of RS-232 pins: DB9 pin type, # 2-RXD, # 3-TXD, # 5-GND, and other pins are not connected.

(2) RS-232 connection mode between the instrument and PC:

RS-232 serial port connection diagram

(II) Serial port setting of PC

(1) The serial port setting of the PC is: the serial port setting of the computer should be the same as that of the device.

(2) Serial port to network debugging assistant USR-TCP232-Test is used for the serial port and network port debugging software of the equipment. The software can be downloaded from the following link:http://www.usr.cn/Download/27.html。 The left side of the USR-TCP232-Test software is the serial port debugging assistant, and the right side is the network debugging assistant, as shown in the figure:

USR-TCP232-Test interface of serial port to network debugging assistant

(3) Use the left part of USR-TCP232-Test software for serial port debugging. The RS-232 serial port is set to 19200 baud rate, 8 data bits, 1stop bit, and no parity.

Generally, the serial port number of the built-in serial port of the desktop computer is COM 1, while the serial port number of some USB to serial port cables plugged into different USB ports will be different, so the serial port number must be set as the serial port number of the actual connection between the device and the computer.
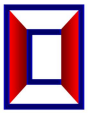
(4) After the device is connected to the serial port of the upper computer, use the serial port debugging assistant to send relevant commands, and the device will return relevant data to monitor the relevant conditions of the device. As shown in the figure:

Serial debugging interface

4.4.3. Network Port Monitoring

When the RJ45 Ethernet port on the device is used to monitor the device, the IP address of the upper computer (computer) must be in the same network segment as the IP address of the device. For example, the IP address of the computer whose IP address has not been changed is 192.168.2.45, and the subnet mask is

255.255.255.0. Default gateway: 192.168.2.1; the IP, mask and gateway of the device should be changed to be similar to 192.168.2.11, 255.255.255.0 and 192.168.2.1. The following are the specific operating instructions.

(1) Set the IP address of the computer

First, change the computer IP to 192.168.0.188, the subnet mask to 255.255.255.0, the default gateway to 192.168.0.1, and the DNS part can be left blank. (Because the factory IP address of the device is 192.168.0.178, the device can only be accessed and changed by setting the same network segment as the device.). As shown in the figure:
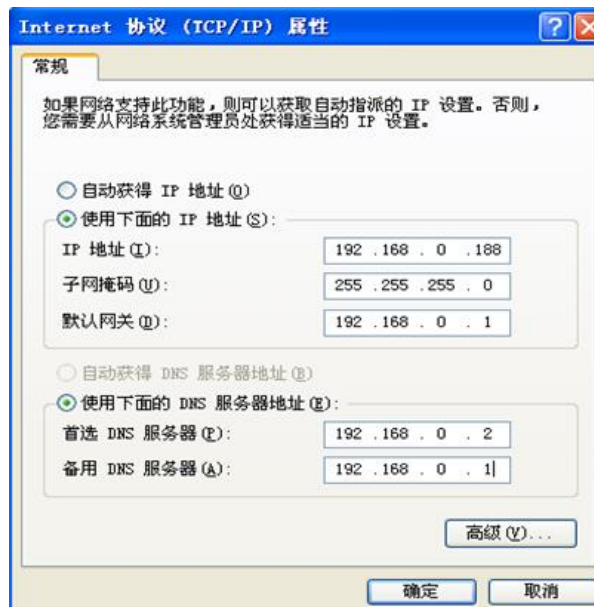

Change Computer IP Diagram

(2) Configure the device in the WEB page

① Login page configuration system

First open a web browser and type the original IP address of the device in the address bar (e.g.http://192.168.0.178). After typing, press the Enter key. If the network cable is connected correctly, the following web page will be displayed. Enter the configuration password in [Password] (the factory setting is "88888"), and

click "Login" to enter the setting interface.
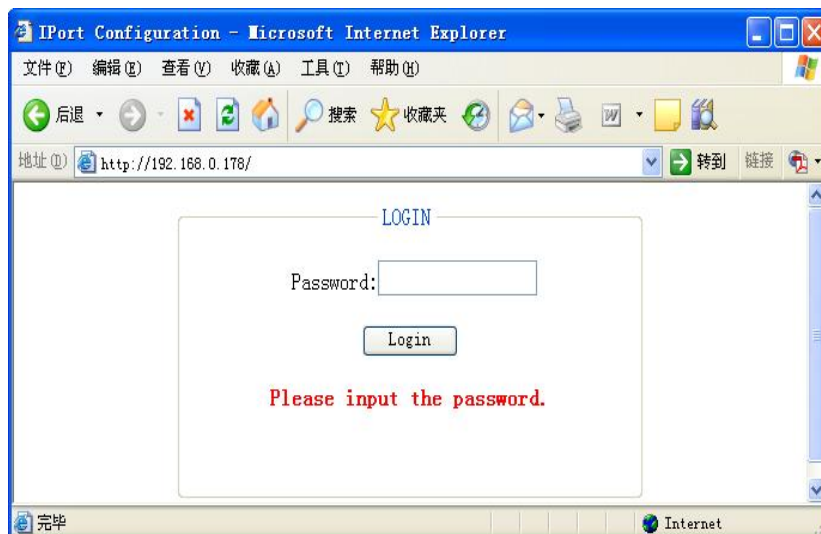
Schematic diagram of login page configuration system

② Change the IP address of equipment

Click "system info" to open the system parameter setting page. Enter the IP address (such as 192.168.2.11) in "IP:", the subnet mask (such as 255.255.255.0) in "SubMark:", and the gateway (such as 192.168.2.1) in "Gateway:". Other parameters generally do not need to be changed. Click the "Apply" button to modify the IP information of the device. Then click "reset device" to restart the device to make the parameter change take effect. As shown in the figure:
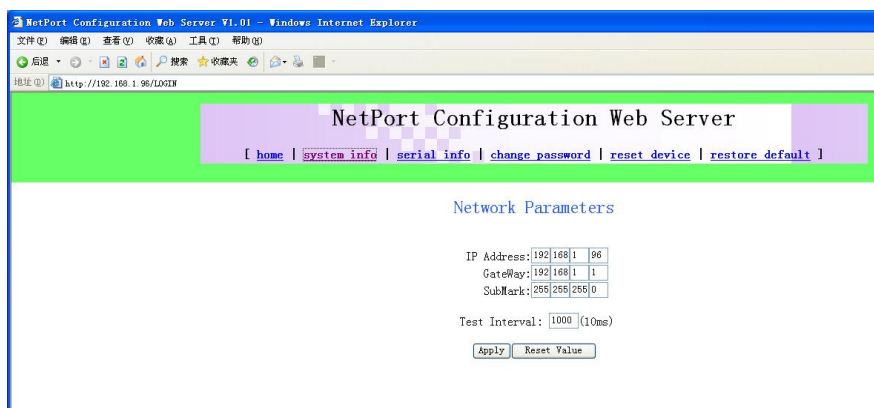

System parameter setting page

(3) Search IP address through ZNETCOM software

The ZNetCom software is the configuration software for the network port running on the Windows platform. No matter what the current IP address of the device is, the current IP address of the device can be obtained through the ZNetCom software to help the user forget the IP address of the device. The ZNetCom software can download the latest version of the software in the following connection. The steps to use ZnetCom software are as follows:

http://www.embedcontrol.com/products/Ethernet_tools/ethernetsoft.asp

① Click Run the ZNetCom software. After confirming that the computer is connected to the device, click the "Search Device" button on the software. If the above settings are correct, the searched IP will appear on the ZNetCom software, as shown in the figure:
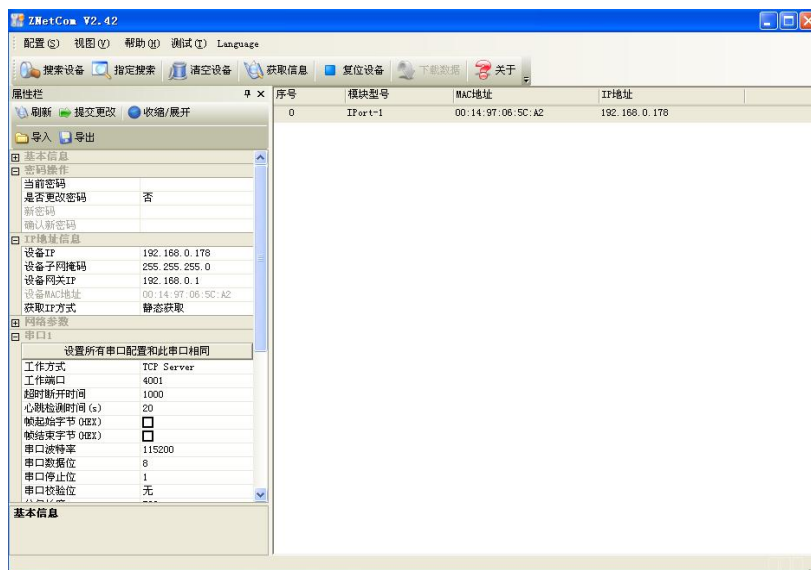
Use the ZNetCom software to search for the device IP

(4) Network debugging assistant monitoring

After connecting the network port of the device to the computer, set the protocol type TCP Client, the server IP address as the device IP, and the server port number as 4001 in the network debugging assistant part on the right side of the USR-TCP232-Test software. Send relevant commands after connection, and the

device will return relevant data to monitor the relevant situation of the device.

Network Debug Assistant Change Device IP Diagram

(5) Change the IP address of the computer

If the IP address of the device is modified, you need to change the IP address of the computer to the same network segment as the device to access and change the device. For example, in the above step, the IP, mask and gateway of the device are changed to 192.168.2.11, 255.255.255.0 and 192.168.2.1, The IP, mask, and gateway of the computer should be changed to something like 192.168.2.45, 255.255.255.0, and 192.168.2.1 to connect to the device.

5. Notes and Maintenance

5.1. Precautions

(1) When using this equipment, each port must be connected correctly according to the optical path connection instructions.

(2) The power supply shall be grounded, and the input power supply voltage shall be within the range required by the equipment.

(3) If the host is abnormal due to sudden interference, it should be shut down first and then handled.

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HC Optical Science and Tech Co., Ltd.
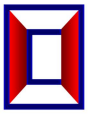
(4) The optical input port must be well connected and accurately positioned, otherwise the measurement results and insertion loss may be incorrect.

(5) It is normal to have slight vibration or sound when switching the optical path.

5.2. Equipment Maintenance

Reasonable use and proper storage of equipment can maintain good performance indicators for a long time and prolong its service life, so proper maintenance is required:

(1) The equipment shall be free from strong mechanical vibration, collision, falling and other mechanical damage. There must be good packaging and vibration damping, rain-proof and waterproof measures during transportation;

(2) The equipment shall always be kept clean, and the working environment shall be free of acid, alkali and other corrosive gases. Gently scrub the chassis and panel with a clean towel dampened with water or soapy water. It is forbidden to scrub with alcohol and other solvents.

(3) When removing the optical fiber connecting line, cover the dust cap in time to prevent hard objects, dust or other dirt from touching the end face of the optical fiber.

For matters not covered, please contact us. We will be very happy to hear your valuable comments.

6. Common Fault Handling

| Fault manifestation	Possible causes	The solution
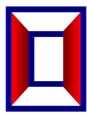
No display when starting up	The power supply is not connected properly.	Reconnect the power supply and turn it on.
Excessive insertion loss	Contamination of end face of connecting head	Clean end face of the optical connector again and fix the connector. Check the end face for damage.
The upper computer command is invalid	Baud rate settings are inconsistent	Check the baud rate of the device in the menu "Baud rate setting" of the device, and set it as required.
	The network cable and serial port cable are not connected properly	Turn off the machine first, check the network cable and serial port cable again, and then turn on the machine.

7. Factory Default Configuration

Factory Default Configuration List

Project	Factory default configuration	Remark
Use of panel keys	Permission to use	
Scan channel	1、2、3、......, 24 channels	
Device address	01	
Baud rate setting	19200	8 data bits, 1stop bit, no parity.
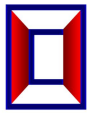
LCD backlight	1 minute	There is no panel key operation within "1 minute", and the backlight is turned off.
Device IP	192.168.0.178	Working mode: TCP Server; Working port: 4001