SICOM3000
Industrial Ethernet Switch

User's Manual

KYLAND Technology Co., Ltd.

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Preface

SICOM3000 is a high-performance Gigabit industrial Ethernet switch specially designed by KYLAND Technology CO., LTD. for industrial applications. Its high-performance switch engine, solid and sealed case design, single ribbed fanless case for high efficient heat dissipation, over current and overvoltage protection at power input terminal, and excellent EMC protection of RJ45 port make SICOM3000 applicable in harsh and dangerous industrial environments. Fiber network redundancy function and dual redundant power supplies provide multiplex guarantee for reliable operation of the system.

The user's manual for SICOM3000 Industrial Ethernet Switch mainly introduces the technical principles, performance indexes, installation and commissioning, etc. It is a reference for users in system startup, expansion and routine maintenance. It is also a practical teaching material for user training and technician study.

This manual mainly includes the following contents:

Chapter 1 Overview and system features of SICOM3000;

Chapter 2 Performance and service functions of SIOCM3000;

Chapter 3 Hardware structure of SICOM3000;

Chapter 4 Installation of SICOM3000;

Chapter 5 Field test methods for SICOM3000;

Chapter 6 Network topology and system configuration of SICOM3000;

Appendix A Introduces twisted pair and pin distribution rules of SICOM3000;

Appendix B Introduces cable types and specifications of SICOM3000;

Appendix C Introduces abbreviations used in this manual.

Statement: As product and technology upgrades and improves constantly, the contents of this document may not completely accord with the actual product. For product upgrading information, please visit our company's website or directly contact with our business representative.

Notice for Safety Operation

This product performs reliably as long as it is used according to the guidance. Artificial damage or destruction of the equipment should be avoided.

● Read this manual carefully and keep it for future reference;

● Do not place anything on power cable and put the cable in unreachable places;

● Do not tie or wrap the cable to prevent fire.

● Power connectors and other equipment connectors should be firmly interconnected and frequently checked.

 In the following cases, please immediately cut off the power supply and contact our company:

1. Water gets into the equipments;

2. Equipment damage or shell breakage;

3. Abnormal operation conditions of equipment or the demonstrated performances have changed;

4. The equipment emits odor, smoke or makes noise.

● Please keep optical fiber plugs and sockets clean. During the operation of equipments, do not look directly at the cross section of optical fiber;

● Please keep the equipment clean; if necessary, wipe the equipment with soft cotton cloth;

● Do not repair the equipment by yourself, unless it is clearly specified in the manual.

Explanation of Warning Marks:

This manual uses two kinds of noticeable warning signs to arouse special attention of users during operation. The implications of these signs are as follows:

Warning: pay special attention to the notes behind the mark, improper operation will lead to serious damage of the switch or injury of the operating personnel.

Caution, attention, danger: remind the operators places that need to pay attention to.

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Chapter 1: System Overview

1.1 Product Overview

SICOM3000 is a high-performance Gigabit industrial Ethernet switch specially designed by KYLAND Technology CO., LTD. for industrial applications. Its high-performance switch engine, solid and sealed case design, single ribbed fanless case for high efficient heat dissipation, over current and overvoltage protection at power input terminal, and excellent EMC protection of RJ45 port make SICOM3000 applicable in harsh and dangerous industrial environments. Fiber network redundancy function and redundant power input provide multiplex guarantee for reliable operation of the system.

SICOM3000 series Gigabit industrial Ethernet switch have strong web-management function which support CLI, Telnet, WEB, SNMP and OPC-based network management.

SICOM3000 supports two ways of installation: DIN-Rail installation and wall-mounting. It has 2 uplinked redundant pluggable 1000M SFP ports in the front panel, 2 pairs of redundant 100Base-FX, single mode/multi mode, fiber ports or 2 redundant 10/100Base-TX RJ45 ports. It can form 1000Mbit fiber redundant ring network with the recovery time of less than 50ms, and can also form redundant 100Mbit fiber or twisted pair ring network with the recovery time of less than 50ms. SICOM3000 is equipped with 6 10/100Base-T/TX RJ45 ports and each of them has self-adaptive function, making it automatically configured to 10Base-T/100Base-TX, full/half duplex mode and MDI/MDI-X auto-connection.

1.2 Product Features

1.   **High performance industrial Ethernet switch**

    Pluggable 1000M SFP ports, be used as fiber ports or RJ45 copper ports

    2 Gigabit and 2 100M fiber ports, providing flexible network forming methods

    Support various management methods for user's easy management, such as WEB, CLI, TELNET, SNMP, and OPC.

    10/100Base-TX, self-adaptive Ethernet ports (full/half duplex), support auto MDI/MDI-X connection

    100Base-FX full duplex multi mode/single mode redundant fiber ports

    The fiber ring network redundancy technology with recovery time of less than 50ms, raising

the reliability of system communication

IEEE802.3/802.U/802.3X store and forward

Support IGMP Snooping, port mirroring, port trunking, broadcast storm control, DT-Ring, DT-Ring+, RSTP, VLAN, ACL, SNMP

802.1P, IP TOS, DSCP priorities

Alarm function

FTP-based online software update, easy for user's device management and renewal

2. **Industrial Power Design**

Support industrial power input: 24VDC(18~36VDC), 48VDC(36~72VDC), 110VDC(66~154VDC), 220VAC/DC(132~300VAC/176~400VDC)

Power input with over-current, over-voltage and EMC protection

Redundant power inputs raise the system reliability

3. **Rugged design**

Single-ribbed aluminum case design for heat dissipation (no fans); reliable operation at -40℃ to +85℃

Solid and sealed aluminum case with IP40 protection class, and is able to work in harsh and dangerous industrial environments

DIN-Rail and wall-mounting installation

1.3 Packing list and unpacking check

1. **Packing list**

Please refer to the packing list

2. **Unpacking check**

Before opening the case, place it stably, pay attention to the direction of the packing case and ensure its right side is facing upward, so as to prevent SICOM3000 falling from the case after opening it. If using a hard object to open the case, do not over extend the hard object into the case to avoid damage of the equipments inside it.

After opening the case, please check the amount of SICOM3000 equipments according to the packing list and check the appearance quality of SICOM3000.

⚠ Warning:

For the built-in precise parts of the equipment, please handle with care and avoid strenuous vibration to avoid affecting the performances of equipments.

Chapter 2: Performance Specifications

2.1 System Specifications

The system performance specifications of SICOM3000 industrial Ethernet switch are shown in Table 2-1.

Table 2-1 System Specifications

Specifications	SICOM3000
Quantity of RJ45 port	6×10 /100Base-TX
Quantity of redundant Gigabit fiber or copper ports	2×1000Base-SFP port
Quantity of redundant 100M fiber or copper ports	2×100Base-FX-SM/MM or 2×10/100Base-TX
System performance	Standards: IEEE802.3, IEEE 802.3x, IEEE 802.3u, IEEE 802.1w, IEEE 802.1d, IEEE 802.1p, IEEE 802.1q, IEEE 802.3z, IEEE 802.3ab Store-and-Forward speed: 1488100pps; Max. filtering speed: 1488100pps Switching mode: Store-and-Forward System switching bandwidth: 5.6G Electromagnetic compatibility interference: EN55022 Electromagnetic compatibility immunity: EN50082-2
TP port parameters	Physical port: shielded RJ45 RJ45 port: 10/100Base-TX, supporting auto-negotiation Port standard: in line with IEEE802.3 standard Transmission distance: <100m
Fiber port parameters	Optical power: >-13dbm (SM)　>-20dbm (MM) Receiving sensitivity: <-28dbm (SM)　<-35dbm (MM) Wave length: 1310nm (SM)　1550nm (SM)　1310 nm (MM) Transmission distance: 40-80km(SM) 　　　　　　　　　　<2km (MM) (Gigabit),　<5km (MM) (100M) Connector type: LC, SC/FC/ST Transmission speed: 1.25Gbps (Gigabit), 125Mbps (100M)
Power supply	Input voltage: dual power input, 24VDC (18~36VDC), 48VDC (36~72VDC),　　110VDC　(66~154VDC),　　220VAC/DC

	(132~300VAC/176~400VDC) Input power consumption: <10W Over-current Protection: built-in
Mechanical parameters	Physical dimensions (height×width×depth): 140 ㎜×75 ㎜×123 ㎜ (excluding the dimensions of Din-Rail and wall-mounting components) Mounting mode: Din-Rail and Wall mounting Heat removal method: Single-ribbed aluminum case without fans. Outlet type: front outlet for services and top outlet for power, network management, protection grounding, alarm Shell protection class: IP40 Weight: 1.2kg
Ambient conditions	Operating temperature: -40℃～85℃ Storage temperature: -40℃～85℃ Humidity: 0～95% (non-condensing）

2.2 Service Interface

1. 6 or 8 10/100Base-TX RJ45 ports. Each RJ45 port has self-adaptive function, capable of automatically configuring between 10Base-T and 100Base-TX, between full duplex and half duplex mode, supporting MDI/MDI-X auto-connection. The max transmission distance is 100m.

2. 2 pairs of redundant 100Base-FX SM/MM fiber ports and the maximum throughput of each pair is 100Mbps with compulsory 100M full duplex working mode. Support fiber line redundancy technology with recovery time of less than 50ms.

3. 2 pairs of redundant 1000Base-LX SM/MM fiber ports or 1000Base-TX RJ45 ports and the maximum throughput of each pair is 1000Mbps with compulsory 1000M full duplex working mode. Support line redundancy technology with recovery time of less than 50ms.

4. Comply with IEEE802.3/802.3U/802.3X/802.3Z/ab

5. Meanings of RJ45 ports' indicators: yellow lamp – rate indicator; on:100M, off: 10M;

   green lamp – connection state indicator, on: effective network connection; blink: network activities; off: no connection. After one minute of all lights on, enter the state described above.

2.3 Service Functions

The service functions of SICOM3000 mainly include:

LED Indicator

The LEDs in front panel of SICOM3000 indicate the port status including transmitting rate, link status and system status.

Layer-2 Switching

The two commonly used switching technologies: Cut-Through and Store-and-Forward. In Cut-Through, as soon as the switch receive a frame header, it is immediately forwarded without any error checking and processing; in Store-and-Forward, after receiving and storing the complete frame, error checking is conducted before forwarding. Store-and-forward is most widely used switching technology and it is also adopted by SICOM3000.

VLAN

VLAN will divide a network into multiple logical networks. Data packets cannot be transmitted between different VLANs so as to control the broadcast domain and segment flow and improve the network performance, security and manageability. SICOM3000 series supports IEEE802.1q VLAN tag. It can be divided into up to 4094 VLANs based on ports. The VLAN division can be realized via WEB, CLI. VLAN Tag packet is transmitted transparently.

QoS function

IEEE 802.1p is the most widely used priority solution in LAN environment. SICOM3000 series supports 802.1p standard, as well as IP TOS and DSCP priority configurations. When the terminal connected to SICOM3000 doesn't support these three priorities and user wants to set different priorities to services in different ports, this function can be used to do port-based configuration. This configuration only affects the data packets without priorities in the ports. Each port of SICOM3000 support 4-level priority configuration (highest, high, low, and lowest).

Port Trunking

SICOM3000 series industrial Ethernet switch can aggregate several physical ports into a logical port, then these ports have same rate, duplex mode and VLAN ID. Port Trunking can be configured in a single switch with max 4 Port Trunkings, This function can reduce the network traffic congestion and enhance fault-tolerance performance.

Port mirroring (Port sniffing)

Be capable of mirroring the data packets in a port to another port for real time monitoring the communication data.

Configure Port Working Modes

SICOM3000 series is able to configure the working mode of all ports through network management: self adaptive, 10M/half-duplex, 100M/half-duplex, 10M/full-duplex, 100M/full-duplex, etc

Configure Port Traffic Flow

SICOM3000 series can configure the TX and RX rate of all ports via the management software. For port of 100Mbps, it can be set as 128K, 256K, 512K, 1M, 2M, 10M, 50M, 100M. For Gigabit port, it can be set as 100M, 500M, and 1000M.

Static Multicast Communication

Adding multicast users by the way of manually adding static multicast table, compared to dynamic multicast, is more simple, reliable and faster without the need of protocols. The multicast data can be forwarded by configuring static multicast forwarding tables. Users can manually configure the multicast communication according to their own requirements. Static multicast communication cannot be used with IGMP simultaneously.

IGMP

IGMP is Internet Group Multicast Protocol. SICOM3000 series offers IGMP monitoring and query functions. Data packets can be transmitted to multi necessary host computers and prevent overloading. It solves the problems of bandwidth occupation when broadcasting.

Broadcast Storm Control

When too much broadcast packets are transmitted in the network, they will take up so much bandwidth that cause a network timeout. It is called network storm. SICOM3000 support broadcast data packets, multicast data packets and broadcast storm control and discard the broadcast data packets that exceed user's time limit setting.

DT-Ring

DT-Ring is Kyland's proprietary communication protocol. It determines the state of ring & port by inspecting the ring port state, so as to ensure the redundant network won't form a ring and achieve a fast and reliable Ethernet redundant ring to meet the high requirements of industrial communications.

DT-Ring+

DT-Ring+, based on DT-Ring, is also Kyland's proprietary communication protocol which is to make a backup between two rings and determine ring & port state by the ID of backup device so as to ensure the redundant network won't form a ring. This function guarantees a fast and

reliable redundant ring to meet high requirements in the field of industrial communication.

RSTP

SICOM3000 has RSTP and STP functions which offer network redundancy protection for the switch's network. RSTP can achieve all functions of STP with an extra function of reducing the delay time from blocking to forwarding in the port in order to resume the network communication ASAP.

ACL

ACL (Access Control List) use protocols to set the source or target MAC addresses so as to define the access rules. It can limit the network traffic, enhance network performance and control the communication flow. ACL is the basic security method to network access.

Alarm Output

Alarm function includes port alarm and ring alarm which can be enabled by management software. The alarm information is displayed on the network management interface.

SNMP

SNMP（Simple Network Management Protocol）offers a frame structure for low level network management. SNMP protocol is used widely. Many kinds of networking devices, software and system adopt it because it is easy to be realized, free, and can be used to control various devices.

RMON

RMON is a standard monitoring regulation, used to switch the network monitoring data between network monitors and console system. It offers more selections for network operators to choose the suitable console and network monitor for special requirements. It is a supplementation to SNMP function and is especially useful for monitoring and managing LAN. The purpose of developing RMON is to provide statistic result of information flow and analyze network parameters so as to work out a comprehensive network diagnoses, plan and regulation.

By RMON, users can do operation among SNMP management stations and monitoring agents. Furthermore, it can offer a standard for a group of MIB to collect the network statistics which is not available via SNMP. RMON realizes early network diagnoses by using powerful alarm group, which allows setting thresholds for key network parameters so as to automatically send alarm signal to central management console.

Chapter 3: Hardware Structure

3.1 System Structure
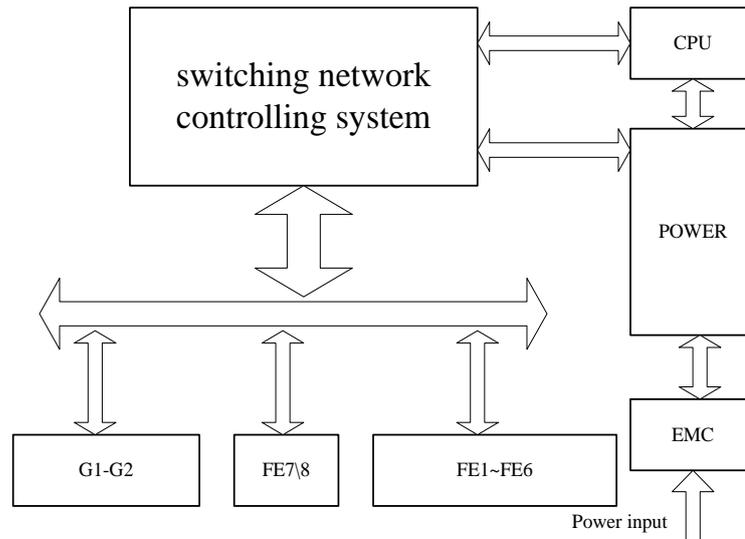
The hardware structure of SICOM3000 is as Figure 3-1:

Figure 3-1 Hardware Structure

The system hardware includes:

1 . High performance ASIC chip technology is applied in the switching network controlling system, providing layer two wire-speed forwarding of data packets

2 . Fiber ports use optical transceiving modules with stable performance

3 . Industrial power supply with over-current, over-voltage and EMC protection

4 . All TP ports with EMC protection

3.2 Device Structure

3.2.1　Case

SICOM3000 case is DIN-Rail or wall mounting type structure. The entire unit adopts six-side-enclosed design with protection class up to IP40. The case's left and right sides are made of single-ribbed aluminum, which are a part of the heat dissipation system. The single ribbed structure doubles the heat dissipation area and the heat generated during the unit's working is dissipated into the air with high efficiency via it with the form of radiation and

convection, which greatly enhance the high temperature resistance performance of equipment. Discard the traditional form of axial fan for heat dissipation, reduce power consumption of the entire unit and increase the stability of the system. The figuration of SICOM3000 case is shown in Figure 3-2.

Its contour dimension (excluding the dimensions of DIN-Rail and wall mounting components) is 140 ㎜× 75 ㎜×123 ㎜,（height ×width× depth）
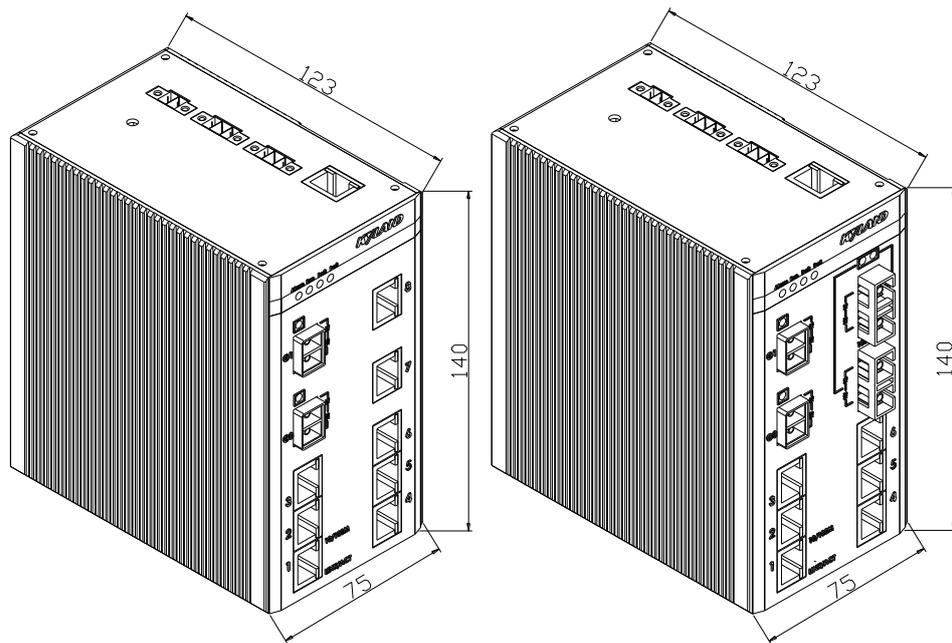
a.　SICOM3000-2GX-8T　　　　　　　　b. SICOM3000-2GX-2S(M)-6T

Figure 3-2 Case dimensions of SICOM3000 series

Warning: The shell of this switch is a part of the heat dissipation system of the unit. It may get hot during working, so never touch the shell when the equipment is working to avoid burning.

3.2.2 Front Panel

SICOM3000 Industrial Ethernet switch's front panel has 2 Gigabit SFP ports, 2 pairs of 100M fiber ports, 8 or 6 10/100Base-TX RJ45 ports and indicators showing system and port operation status. Its structure is shown as Figure 3-3：
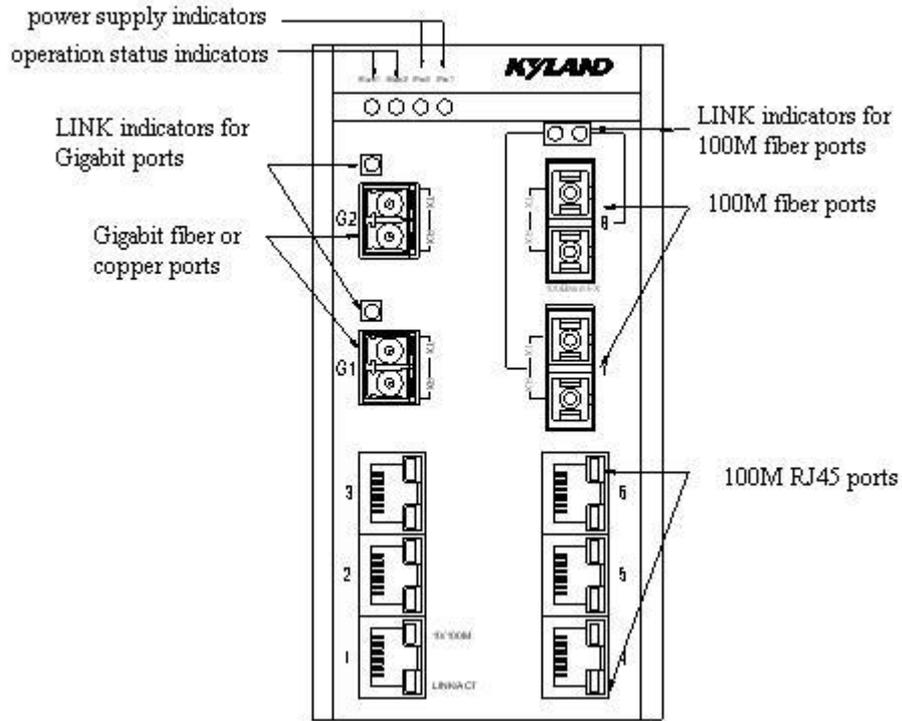
Figure 3-3 SICOM3000's front panel

Gigabit SFP ports

SICOM3000 series has 2 Gigabit SFP ports, supporting 2 pairs of redundant 1000Base-LX full duplex SM/MM ports or 2 1000Base-TX RJ45 ports with the port number G1 and G2. The SFP ports adopt SFP modules (LC connector for fiber port, RJ45 connector for TP port). Fiber ports should be used in pairs (TX and RX are a pair). TX port is for transmission, connected to receiving port RX in another remote switch; RX port is for receiving, connected to the transmitting port TX in its pair in the same switch. The 2 pairs of redundant 1000Base-LX fiber ports can form a redundant fiber ring network with the recovery time of less than 50ms, which effectively increase the reliability of network operation. The SFP modules are shown in the below Figure 3-4.


a. RJ45 connector   b. LC connector

Figure 3-4: SFP plugabe modules

Gigabit SFP modules plug and play steps:

- There are two breaks on the SFP module with LC connector and one break on the module with RJ45 connector

- Inserting: Inserting the end of module without breaks into the SFP slot in the switch until you hear a sound.

- Pulling out: Put down the handle in the SFP module, forming a 90 degree angle with the breaks, then use the handle to pull out the SFP module from the SFP slot.
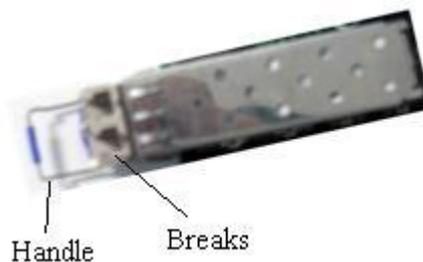
100M fiber ports

SICOM3000 series has 2 pairs of redundant 100Base-FX full duplex SM/MM fiber ports with the port number 7 and 8, supporting SC/ST/FC connector. Fiber ports should be used in pairs. TX and RX is a pair. TX port is for transmission, connected to the receiving port RX in another remote switch; RX port is for receiving, connected to the transmitting port TX in its pair in the same switch. The 2 pairs of redundant 100Base-FX fiber ports can form a redundant fiber ring network with the recovery time of less than 50ms, which increase the reliability of network operation. Meanwhile ports 7 and 8 can be designed to redundant RJ45 copper ports.

Ethernet RJ45 ports

SICOM3000 series has 6 10/100Base-TX Ethernet RJ45 ports with port numbers 1 to 6. Each of them has self-adaptive function, supporting MDI/MDI-X auto-connection. They can be connected to terminal equipments, severs, hubs or other switches by straight-through or cross-over cables. Each port supports IEEE802.3x self adaptation, so the most suitable transmitting mode (full/half duplex) and data transmitting rate (10Mbps/100Mbps) can be automatically selected. If the devices connected to these RJ45 ports do not support self-adaptation, these ports will transmit data at suitable rate and the transmitting mode is default as half duplex.

LED indicators

The LED indicators in the front panel of SICOM3000 can indicate system operation status and

port status in order to find and settle faults. Table 3-1 shows the meanings of LEDs in the front panel.

Table 3-1 LED indicators

LED	State	Description
system status LEDs		
RUN1	Blinking 1Hz	Switch operates normally, G1, G2 are set as slaves
	Blinking 4Hz	Switch operates normally, G1, G2 are set as masters
	OFF	Switch does not operate
RUN2	Blinking 1Hz	Switch operates normally, port 7 and 8 are set as slaves
	Blinking 4Hz	Switch operates normally, port 7 and 8 are set as master
POWER1	ON	POWER1 is connected and operates normally.
	OFF	POWER1 is not connected or operates abnormally.
POWER2	ON	POWER2 is connected and operates normally.
	OFF	POWER2 is not connected or operates abnormally.
Gigabit fiber port status LEDs (fiber ports G1 and G2)		
LINK/ACT	On	Effective network connection in the port
	Blinking	Network activities in the port
	Off	No effective network connection in the port
100M fiber port status LEDs（fiber ports 7 and 8）		
LINK/ACT	On	Effective network connection in the port
	Blinking	Network activities in the port
	Off	No effective network connection in the port
Ethernet RJ45 port status LEDs		
Each RJ45 Ethernet port has two indicators, a yellow lamp and a green lamp. The yellow lamp indicates port rate, and the green lamp indicates port connection state.		
10M/100M (Yellow)	On	100M working state（i.e. 100Base-TX）
	Off	10M working state (i.e. 10Base-T）
LINK/ACT （Green）	On	Effective network connection in the port
	Blinking	Network activities in the port
	Off	No effective network connection in the port

3.2.3 Top panel (24VDC, 48VDC)

The top panel of SICOM3000 industrial Ethernet switch has two power input terminals for power redundancy, relay alarm output terminal, grounding protection terminal, etc. Its structure is as figure 3-6.
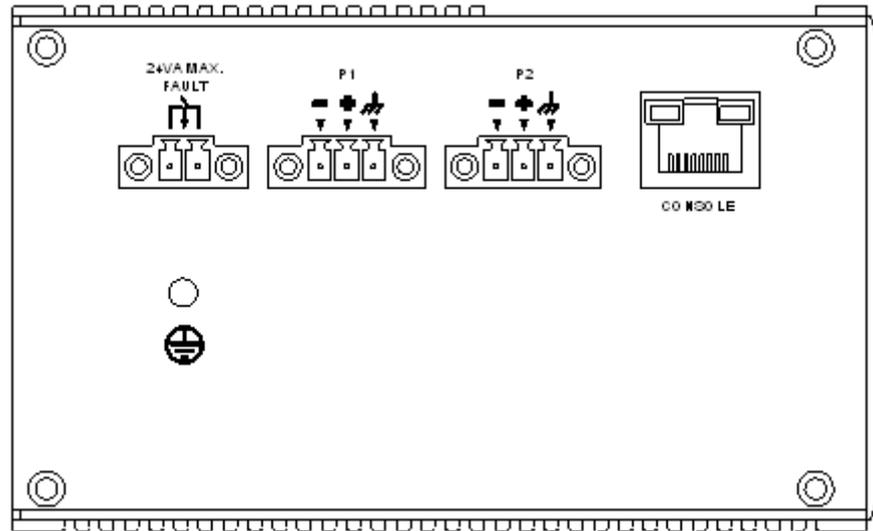
Figure 3-6 Top panel of SICOM3000

Power input terminal (3.81mm spacing)

SICOM3000 has two power input terminals (P1 and P2) with redundant power input function, supporting 24VDC and 48VDC power input. P1 and P2 can be used singly, or both connect with external DC power supply systems to offer power to SICOM3000, so if one of the two power supply sources fails, the equipment can keep running, which enhance the reliability of network operation. Three-wire 3.81mm spacing terminal is used for power connection with multi-strand power cables which section is not less than 0.75 ㎜ ^{2}.

Connection sequence is shown in Figure 3-7. Wire connection and mounting steps are as follows:

1．Strip 5mm-long sheath from power cable and twist the bare copper wires into a bunch;

2．Use a 2.5 ㎜ one-slot screwdriver to unscrew the "power cable locking screw", insert the power cable into the hole at the terminal tail, and tighten the "power cable locking screw";

3．Insert the power input terminal into the slot for power supply in the switch and use a 2.5mm one-slot screwdriver to tighten the two "terminal locking screws" to firmly connect the terminal with the switch.
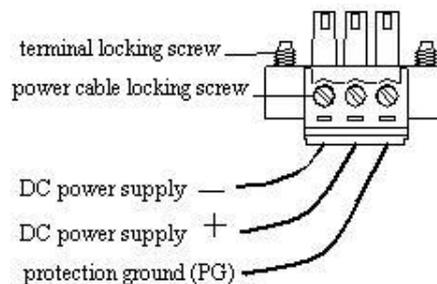

Figure 3-7 the connecting sequence of 3.81mm spacing terminal

Relay alarm output terminal

This relay terminal is a group of normally open contacts and its appearance look the same with power input terminal. In the normal working state without alarm, this terminal is disconnected. When any power supply fails, this terminal is connected. This terminal can be connected with external alarm lamp or alarm buzzer so as to alarm the operator in time. The max power voltage for this relay terminal is DC350V and the max input current is 120mA. Figure 3-8 shows a connection with an external alarm lamp, and the connecting method with other device is the same. The cable connection and mounting steps is the same with power input terminal.
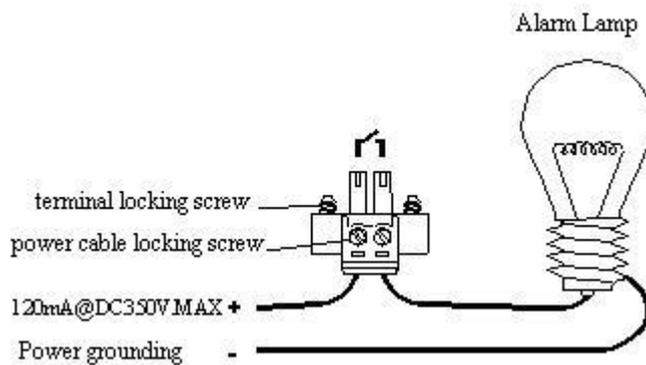

Figure 3-8 alarm terminal connecting with a alarm lamp

3.2.4 Top panel (110VDC, 220VAC/DC)

The top panel of SICOM3000 industrial Ethernet switch has a power input terminal and an relay alarm output terminal, protection grounding terminal, CONSOLE port. Its structure is shown in Figure 3-9,
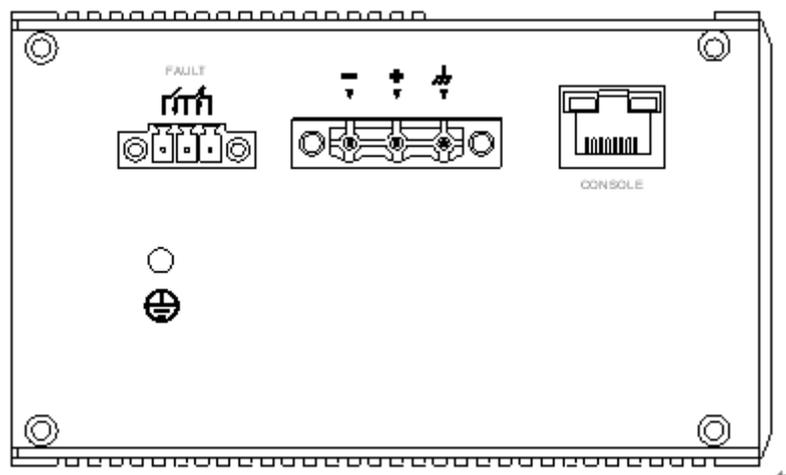

Figure 3-9 Top panel structure

Power input terminal (7.62mm spacing)

When the power supply is 110VDC or 220VAC/DC, use this kind of terminal to connect power cables with multi-strand power cables which section is not less than 0.75 ㎜². The cable sequence is indicated in Figure 3-10 and the connection and mounting steps are as follows.

1. Strip 5mm-long sheath from power cable and twist the bare copper wires into a bunch;

2. Use a 2.5 ㎜ one-slot screwdriver to unscrew the "power cable locking screw", insert the power cable into the hole at the terminal tail, and tighten the "power cable locking screw";

3. Insert the power input terminal into the slot for power supply in the switch and use a 2.5mm one-slot screwdriver to tighten the two "terminal locking screws" to firmly connect the terminal with the switch.
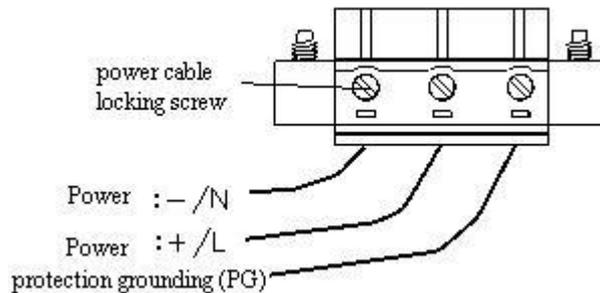

Figure 3-10 the connecting sequence of 7.62mm spacing terminal

Alarm relay output terminal

This terminal is used for alarm output when the power supply fails. When the power is supplied smoothly, the normally open contact of the alarm relay is on and the normally closed contact is off; when the power supply is cut off, the normally open contact is off and the normally closed contact is on. The relay alarm is outputted through the green three-core 3.81mm spacing terminal.
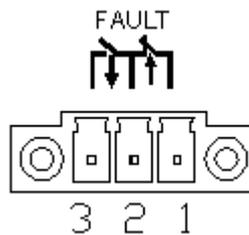

Figure 3-11 Alarm output terminal

Note: NO. 1 and 2 are normally-closed contacts and NO.2 and 3 are normally-open contacts. When the device is powered on smoothly, NO.1 and 2 contacts are off and NO.2 and 3 contacts

are in short circuit; when the power supply fail, NO.1 and 2 contacts are in short circuit and NO.2 and 3 contacts are off.

The electrical parameters of the external interface of relay:

Max Switching Voltage   250VAC,220VDC

Max Switching Current   2A

Max Switching Power   60W

RS232 Network management interface（CONSOLE）

The network management interface of SICOM3000 is a shielded RJ45 connector and its interface communication standard is 3-wire RS232. Users can use a network management cable with one end bearing RJ45 plug and the other end DB9F plug to connect the network management interface with the 9-pin serial port in the control computer. Operate the hyper terminal in the control computer to configure SICOM3000 by CLI command. The cable connecting sequence is shown in Figure 3-12.
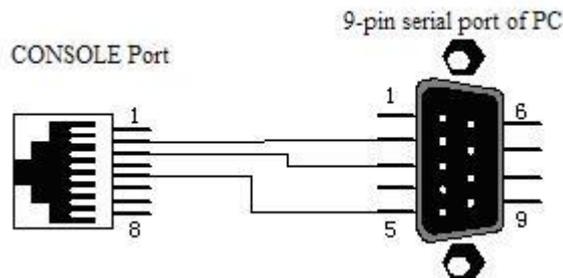

Figure 3-12 CONSOLE wiring sequence

Chapter 4 Hardware Installation

4.1 Installation requirement

SICOM3000 series industrial Ethernet switch can be installed on 35mm standard DIN-Rail or mounted on the wall or in a cabinet.

Before installation, make sure all conditions match the installation requirements below.

1．Power supply: SICOM3000 supports redundant 24VDC(18VDC~36VDC) power input, and support 48VDC (36~72VDC), 110VDC (66~154VDC), 220VAC/DC (132~300VAC/ 176~400VDC) power input.

2．Environment: operating temperature: -40℃～85℃; Relative humidity (non-condensing) 0％～95%

3．Earthing resistance: <5Ω

4．Make sure all fiber units are ready for use

5．Avoid direct sunshine, heating device and strong EMC area

6．SICOM3000 provides components for DIN-Rail installation and user need to prepare the DIN-Rail. For wall-mounting, user should buy the installation components and let screws, nuts and other tools ready.

7．Check whether there are cables and connectors needed.

4.2 Mainframe installation

4.2.1 DIN-Rail installation

35mm standard DIN-Rail installation is very convenient for most industrial applications. When you take SICOM3000 out of the packing box, the aluminum connecting seat for Din-Rail has been attached in the rear panel. Before mounting, make sure the following is ready.

1．Make sure the DIN-Rail is fixed stably and there is enough space for SICOM3000.

2．Ensure you are using a proper power voltage for SICOM3000

After selecting the location for installation, mounting SICOM3000 to DIN-Rail as the following steps:

1．Insert the top of the DIN-Rail into the slot of the connecting seat in SICOM3000

2．Put the whole Din-Rail into the seat along the direction showed in Figure 4-1a

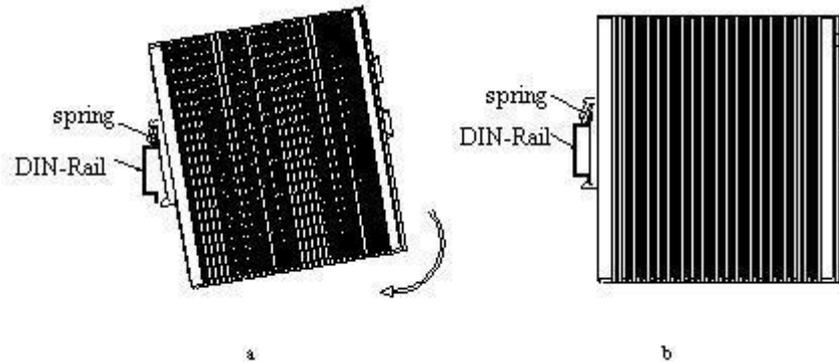3．Check whether the equipment is completely mounted on the DIN-Rail

Figure 4-1 DIN-Rail installation

4.3 Cable connection

After the installation of SICOM3000, the next step is to connect the cables.

1．Connecting service interface

SICOM3000 offers 10/100Base-TX RJ45 ports to connect with terminal equipments by straight-through cables, and to connect with network devices by cross-over cables.

2．Connecting power

Use the proper power supply voltage listed on the product label. After finishing other cables connection, connect the power.

4.4 Optical Fiber Connection

SICOM3000 provides 2 pairs of redundant 100Base-FX full duplex SM/MM fiber ports which can form fiber redundant ring network. When the failure occurs in the network, the recovery time is within 50ms. The fiber ports support LC, SC/ST/FC connector.

⚠ CAUTION ：

Laser is used to transmit signals in fiber cables. Routine operation do not harm to eyes, but do not directly look at the fiber port when the switch is powered on.

The connecting steps are as follows

1．Remove the rubber caps of the fiber ports and keep them for protecting the ports when they are not used.

2．Check whether the ports are clean. Dirty ports might affect the transmitting quality. Use wet handkerchiefs or cotton balls to sweep the cable connectors.

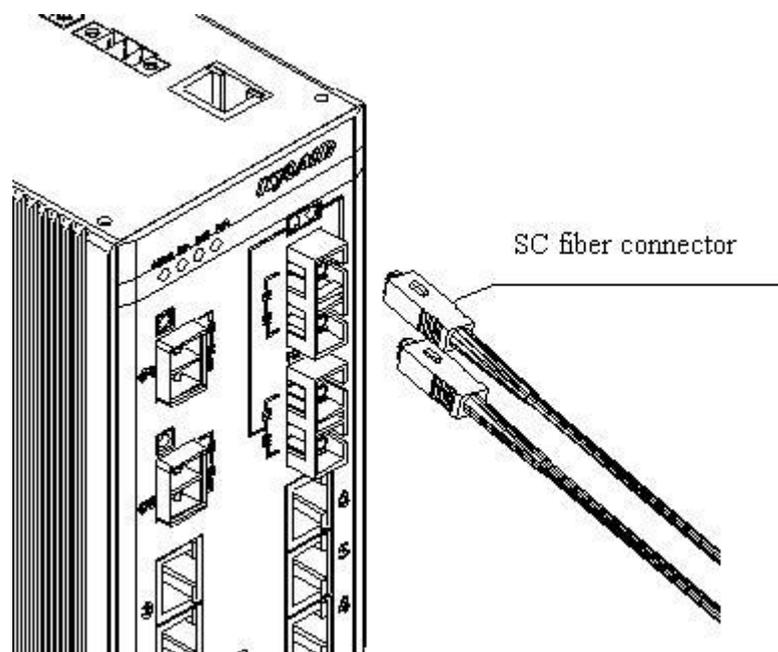3．Connect the fiber cables to fiber ports, shown as picture 4-2

Figure 4-2: Fiber cable connection

4．After connection, check the corresponding LINK/ACT indicator in the front panel of switch. If the indicator goes on, it means an effective connection.

4.5 Cable Wiring

Cable wiring should meet the following requirements:

1．Before cable wiring, check whether the specifications, models and quantities of all cables comply with the construction drawing design and contract requirements.

2．Before cable wiring, it is necessary to check whether there are damaged cables and whether the cables are accompanied by ex-factory records and vouchers attesting their quality such as quality assurance certificate etc.

3．The specifications, quantities, route directions and laying position of the cables to be laid

should meet the design requirements of construction drawings. The laying length of each cable should be determined according to its actual position.

4．No intermediate break or joint is allowed for the cables to be laid.

5．User's cables and power cable should be laid separately.

6．Inside walkways, the cables should be properly arranged in good order, with uniform, smooth and flat turnings.

7．Cables should be straightly laid in cable channels. Extruding of cable from cable channels to block other outlet or inlet holes is not allowed. The cables at the outlet part of cable channel or at turnings should be bundled and fixed.

8．If cables, power line and grounding conductor are laid in the same channel, cables, power line and grounding conductor should be not folded or blended together. If a cable line is overly long, coil and place it in the middle of the cabling rack, do not let it cover on other cables.

9．When laying the pigtail, avoid knotting of optical fiber cable, minimize the amount of turnings and avoid turnings with overly small radius. Bundle pigtails in proper tightness and avoid too tightly bundling. If laid on a cabling rack, it should be placed separately from other cables.

10.There must be the relevant marks at both ends of cable and the information on the marks should be explicit to facilitate maintenance.

⚠ Attention:

When laying pigtails, prevent optical fiber cable from knotting, minimize the amount of turnings and avoid turnings with too small radius, because turning with too small radius will result in serious consumption of optical signal of links, affecting communication quality.

Chapter 5: Test Methods

5.1 Self inspection

When the equipment is powered on, all service indicators in the front panel will blink one time, showing that all ports are working smoothly. Then the corresponding POW indicators keep on and RUN indicators blink.

5.2 TP Port Test

As shown in Figure 5-1, after SICOM3000 is powered on, respectively connect two TP ports in the switch to two test computers by straight-through cables, and send the "ping" command to each other. If both of them receive complete command without packet loss and the corresponding yellow light of the port keep on (PC work on 100M) or keep off (PC work on 10M) and the corresponding green light blink, they mean that these two TP ports are in good conditions. Test other TP ports as the same way. The PING command example is as follows.
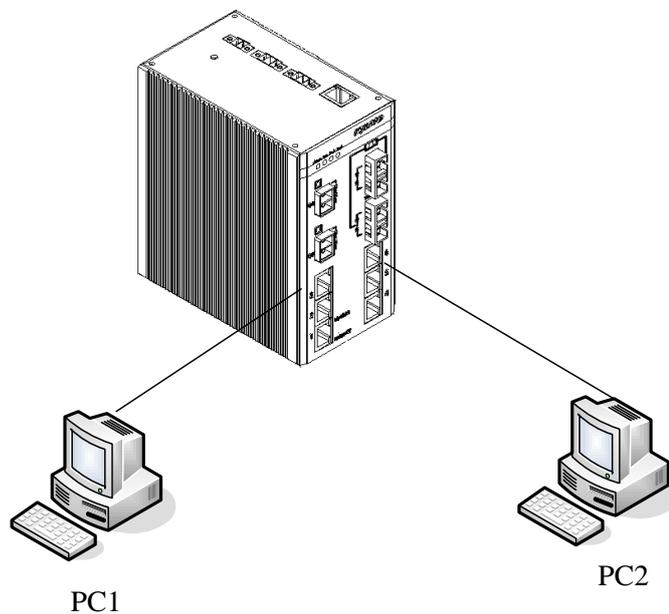

PC2

PC1

Figure 5-1 TP port test

5. 3 Fiber Port Test

As shown in Figure 5-2, firstly two units of SICOM3000 are connected to a fiber chain network. Then connect any RJ45 port in each device with test computers by straight-through cables and send Ping command to each other. They can both get command without packet loss and the corresponding LINK/ACT indicators of the fiber ports go on, showing the testing fiber ports work well. In the same way, test other pairs of fiber ports. The PING command example is as follows.
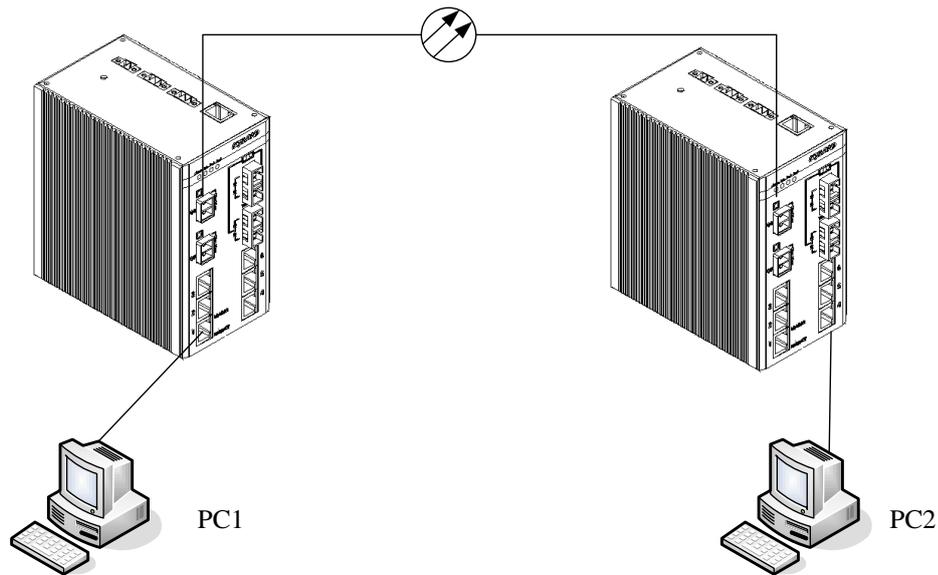

PC1   PC2

Figure 5-2 Fiber port test

PING command example：

Suppose the IP address of test computer 1 is 192.168.100.10 and the test computer 2 is 192.168.100.11. Click the "Begin" menu on the test computer 1, select the "Operation" item, input "cmd" (WIN2000) or "command" (WIN98/95), and send ping 192.168.100.11 –l 1000 –t; (-1 means the number of bytes of sending packets, -t means keep sending the data);

Operate the "Begin" menu on the test computer 2, select the "Operation" item. input "cmd" (WIN2000) or "command" (WIN98/95), and send ping 192.168.100.10 –l 1000 –t.

Test computer 1 returns "Reply from 192.168.100.11：bytes=1000 time<10ms TTL=128", Test computer 2 returns "Reply from 192.168.100.10：bytes=1000 time<10ms TTL=128". Ten minutes later, use CTL+C command to get the packet loss rate. If the rate is "0", it shows that the equipment are running well.

Chapter 6: Networking and Configurations

6.1 Networking

SICOM3000 industrial Ethernet switch provides 6 10/100Base-TX RJ45 ports, each of which can provide direct links to the terminal devices, or be connected to another industrial Ethernet switch/hub before terminal devices as shared links. SICOM3000 has 2 pairs of uplinked redundant 1000Base-LX SM/MM fiber ports which can be used to form Gigabit backbone redundant fiber ring network with the recovery time of less than 50ms. Meanwhile, SICOM3000 provides 2 pairs of down linked redundant 100Base-FX SM/MM fiber ports or 2 10/100Based-TX RJ45 ports which can form 100M redundant ring network with the recovery time of less than 50ms. SICOM3000 can be widely used in the fields of power, transportation, energy, water treatment, factory automation, etc.

The most typical networking topology of SICOM3000 is redundant ring network. SICOM3000 can form the redundant fiber ring network as shown in Figure 6-1, in which one device is set as master and the rest are slaves. The recovery time of re-communication is less than 50ms.
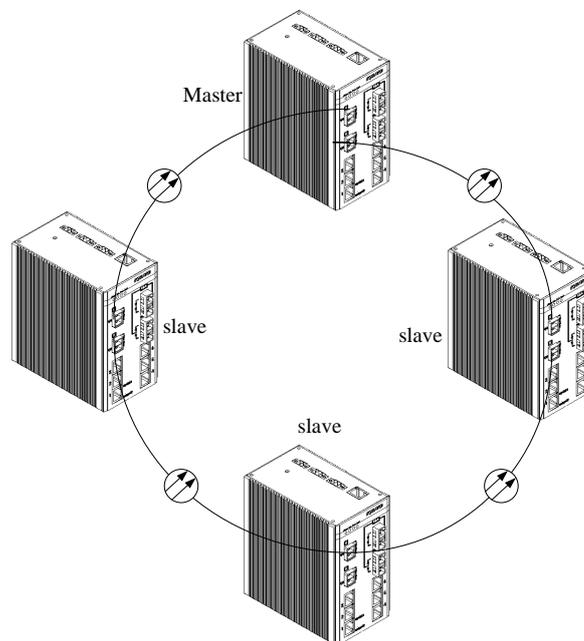

Figure 6-1 the redundant fiber ring network of SICOM3000

6.2 System configuration

SICOM3000 industrial Ethernet switch is an integrative structure with the fixed configuration of

6 10/100Base-TX RJ45 ports, the optional configuration of 2 pairs of redundant 1000M SFP ports and port number 7 and 8 which can be 100Base-FX fiber ports or 100Base-TX RJ45 ports. Fiber ports can be single mode or multi mode and power supply voltages support 24VDC (18~36VDC), 48VDC(36~48VDC), 110VDC(66~154VDC), 220VAC/DC (132~300VAC/176~400VDC). Detailed configuration and models are shown in Table 6-1

Table 6-1 Configuration table of SICOM3000

Models	Description	Power supply
SICOM3000-2GX-2S(M)-6TX	2 Gigabit SFP ports, 2×100Base-FX-SM/MM (FC/SC/ST connector), 6×10/100Base-TX	24VD, 48VDC Redundant power supply; 110VDC 220VAC/DC
SICOM3000-2GX-8TX	2 Gigabit SFP ports, 8×10/100Base-TX	
SICOM3000-2GX-6TX	2 Gigabit SFP ports, 6×10/100Base-TX	
SICOM3000-2S(M)-6TX	2× 100Base-FX-SM/MM (FC/SC/ST connector) 6× 10Base-T/100Base-TX	
SICOM3000-8TX	8 ×10Base-T/100Base-TX	
SICOM3000-6TX	6× 10Base-T/100Base-TX	

Appendix A: Twisted-pair and Pin Distribution

For the connection of 10Base-T/100Base-TX, the twisted-pair must have two pair cable. Each pair is distinguished with two different colors. For example, one strand is green, and the other is the alternate of green and white stripes. RJ-45 connector should be equipped at both ends of the cable.

⚡ Warning:

Don't insert a telephone plug into any RJ-45 port. Only use twisted-pair with RJ45 connectors at both ends conforming to FCC standard.

Fig. A-1 Shows how the connector of RJ-45 is numbered please make sure that the inserting direction is correct.
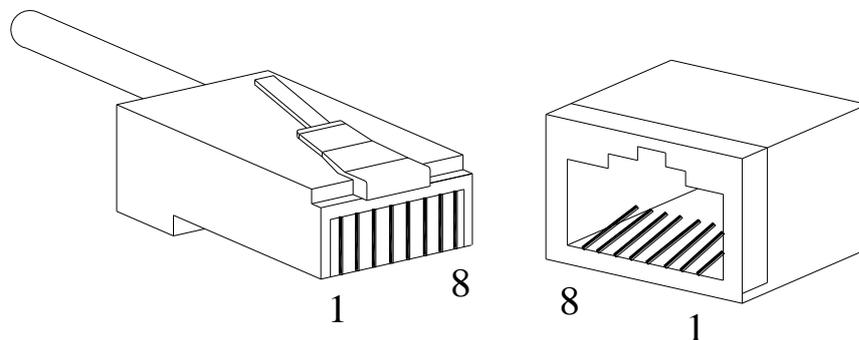

Figure A-1 Connector of RJ-45

Pin distribution of 10Base-T/100Base-TX

Unshielded twisted- pair (UTP) or shielded twisted-pair (STP) will be used for the connection of RJ-45: for the connection of 10Mbps, category 3, 4 and 5 of 100 ohm will be used, and cat.5 of 100 ohm will be used for 100Mbps. Additionally, do make sure that the connecting length of any twisted-pair shall not exceed 100 meter.

Port of RJ-45 supports automatic MDI/MDI-X operation, PC or server may be connected by straight-through cable, or connect with other switch or hub. In straight-through cable, pin 1, 2, 3 and 6 at one end of the cable are connected to pin 1, 2, 3 and 6 at the other end of the straight-through cable respectively. Cross-over cable must be used for switch or hub with MDI-X port. The pin distribution of 10Base-T/100Base-TX is listed in the table A-1.

Table A-1 Pin distribution of 10Base-T/100Base-TX

Pin	MDI-X signal name	MDI signal name
1	Receiving data ＋（RD+）	Output data＋（TD+）
2	Receiving data －（RD-）	Output data －（TD-）
3	Output data ＋（TD+）	Receiving data＋（RD+）
6	Output data－（TD-）	Receiving data －（RD-）
4，5，7，8	Unused	Unused

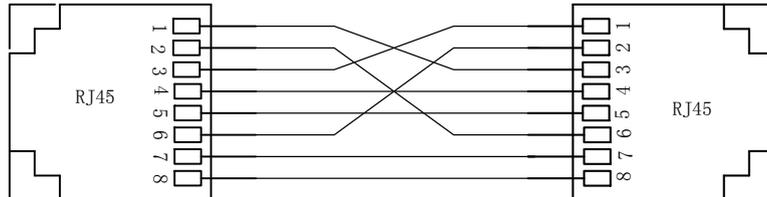Note: "+""-"denoting cable polarity.

Definition of straight-through cable from RJ45 (8-pin) to RJ45 (8-pin)
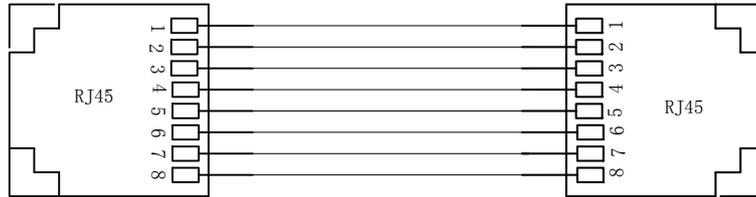
The connection sequence is in turn: Orange-white, Orange, Green-white, Blue, Blue-white, Green, Brown-white and Brown

Figure A-2　Cable sequence of straight-through cable

Definition of Cross-over cable from RJ45 (8-pin) to RJ45 (8-pin)

The connection sequence is in turn: Orange-white, Orange, Green-white, Blue, Blue-white, Green, Brown-white and Brown
Green-white, Green, Orange-white,　Blue, Blue-white,　Orange, Brown-white and Brown

Figure A-3 Cable sequence of cross-over cable

Appendix B: Cable Type and Specifications

The cable type and specifications are shown as table B-1:

Table B-1 Cable type and specification

Cable	Type	Max. length	Connector
10Base-T	Cat 3,4 and 5 100ohm UTP	100m	RJ-45
100Base-TX	Cat 5 -100ohmUTP	100m	RJ-45
100Base-FX	50/125 or 62.5/125μm core multi-mode fiber（MMF）	5km（1310nm MM）	SC/FC/ST
100Base-FX	9/125μm single-mode fiber（SMF）	40km（1310nm SM） 80km (1550nm SM)	SC/FC/ST
1000Base-T	Cat 5-100 ohm UTP	100m	RJ-45
1000Base-LX	9μm or 10μm core single-mode fiber (1310nm)	5km	LC
1000Base-LX	50/125 or 62.5/125μm core multi-mode fiber (850nm)	550m	LC

Appendix C: Glossary

Terminology	Explanation
10Base-T	Twisted-pair standard of Cat3, Cat4 and Cat5 in IEEE specification for 10Mbps Ethernet
100Base-TX	Twisted-pair standard of Cat5 or above in IEEE specification for 100Mbps Fast Ethernet
100Base-ＦX	Fast Ethernet which uses one pair of multi-mode or single mode optical fiber to transmit.
1000Base-T	Gigabit Ethernet which using Cat.5 UTP as transmission medium, max effective transmission distance is up to 100m. U
1000Base-LX	Gigabit Ethernet which uses one pair of multi-mode or single mode optical fiber to transmit.
Adaptive	A characteristic that is automatically configured to adaptive mode for the speed, duplex and traffic control port.
Bandwidth	The information capacity that the channel can transmit. For instance, the bandwidth of the Fast Ethernet is 100Mbps（bit per second）.
Baud Rate	It expresses the signaling rate which is defined as the change times of the status for the electric or optical transmission medium within 1 second.
Bridge	One of network equipments which run on the layer2 in the OSI layer7 model, and it can be connected to the LAN or network segment which uses the same protocol. It presents the automatic network address learning and network configuration function.
Broadcast	One data packet is sent to all equipments on the network.
Broadcast storm	Restless forward broadcast frame or multicast frame on bridge caused by the bridge ring.

Full Duplex	Use switches to set up the point to point connection among nodes in the LAN and allow them to receive and send data packet at the same time.
Half Duplex	The communication for two nodes can only move toward one direction at the same time, but cannot move toward both directions.
MDI	It is the Medium Dependent Interface, in which, one Ethernet port is taken as the receiving terminal to connect to the port of other equipment.
MDI-X	Medium Dependent Interface Cross-over