Managed Switch User Manual

Industrial Managed Ethernet Switch

Version 1.3

This document applied to models of
MSM-508,MSM-508FC/FCS/FT



Dec 03, 2020
Please print in double side

TDRS4050601

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Document Control

Date	Author	Version	Description
July 1, 2006	KC Chen	1.0	First draft
Dec 2, 2010	Jerry Chiu	1.1	Add DI/O Wire Connection
Jan 1, 2011	Jerry Chiu	1.2	Modify jumper block label
Dec 3.2020	Moki Liu	1.3	Modify Terminal Block Pin

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Disclaimer

Limited Warranty

All products manufactured by ICP DAS are warranted against defective materials for a period of one year from the date of delivery to the original purchaser. During this period, if a customer is unable to resolve a product problem with ICP DAS Technical Support, a Return Material Authorization (RMA) will be issued. If the product is not under warranty, the customer may have ICP DAS repair the unit on a fee basis or return it.

This warranty is voided if the customer uses the product in an unauthorized or improper way, or in an environment for which it was not designed.

Standards

The Ring Switch meets the following standards:

EMCimmunity - IEC61326-1, IEEE C37.90
EMI emissions - FCC part 15, ICES 003, EN55022; Class B
Electrical safety - UL 508, CSA C22/14; EN61010-1 (IEC1010)

Warning

ICP DAS assume no liability for damages consequent to the use of this product. ICP DAS reserves the right to change this manual at any time without notice. The information furnished by ICP DAS is believed to be accurate and reliable. However, no responsibility is assumed by ICP DAS for its use, nor for any infringements of patents or other rights of third parties resulting from its use.

Safety

Install the Real Time Ring Switch in accordance with local and national electrical codes.

Lightning Danger: Do not work on equipment during periods of lightning activity.

Do not connect a telephone line into one of the Ethernet RJ45 connectors.

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Preface

The advent of Ethernet brings the whole world a new territory. So it does in industrial application. More and more industrial devices and equipment now support Ethernet. To make all these devices and equipment integrated and worked, the Ethernet switch is a key character.

For commercial using, the Ethernet switch is very easy to choose, and also cheap. But, in industrial field application, user must take the environment conditions and field requirement into concern.

Harsh environ, such as extreme high or low temperature, moisture, ground differentials and electrical noise … etc
Requirement of fault-tolerant solution.
For automation and control engineers who have been forced into this IT domain, they really don't want to get too involved with the idiosyncrasies and maintenance of Ethernet networks.

To satisfy these, the *Managed Switch* provides you a rugged, fault-tolerant, plug and play solution.

ICP DAS industrial Switch Series

ICP DAS industrial Ethernet switch has the following series:

NS Series: Network Switch Series, a standard switch with industrial class of quality.
RS Series: Ring Switch Series, a redundant ring switch with industrial class of quality.
Managed Series: A redundant ring switch with industrial class of quality, and provides lots of powerful managed functions.

How to Use this manual

This manual is intended to help user quickly understanding and easily making use of MSM-508 (and other supported products), and the arrangement of chapters and sections follows the steps that user need to take.

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Acronyms

ATM	Acronym for Asynchronous Transfer Mode, a high performance networking technology based on the switching of fixed length, 53 byte cells. ATM switching supports the switching of voice, video, and data; also supports isochronous communication.
BPV	Acronym for Bi-Polar Violation.
B-ISDN	Broadband ISDN. A network standard from the CCITT and ANSI committee. It supports voice, data and video in the same network.
CCITT	Acronym for Consultative Committee, International Telephone and Telegraph. An international standards body responsible for setting international communications standards that allow interoperability among telephony and data communications equipment.
CD (DCD)	Acronym for Carrier Detect (Detect Carrier Detect).
CDDI	The use of unshielded or shielded twisted pair cable to transmit the FDDI signal.
CO	Acronym for Central Office. The local telephone company switch that terminates subscribers' lines for switching and connecting to the public network.
CSMA/CD	Acronym for Carrier Sense Multiple Access with Collision Detection. Access protocol for Ethernet.
CSU	Acronym for Channel Service Unit, a device furnished as an integral part of a digital access line where a user wishes to supply the bipolar signals. It provides the network with protection against user side electrical anomalies such as surges, and provides the user with network clocking.
CTS	Acronym for Clear To Send.
DCE	Acronym for Data Communication Equipment, aka. Data Circuit-Terminating Equipment.
DCR	Acronym for Data Communication Ready.
DS1	Digital Signal, Level 1 is the North American data rate used for T1 carriers. It operates at 1.544Mbps and supports 24 phone lines.
DS2	Digital Signal, Level 2 is the North American data rate used for T2 carriers. It operates at 6.312 Mbps and supports four T1 lines or 96 phone calls
DS3	Digital signal, Level 3 is the North American data rate used for T3 carriers. It operates at 44.736 Mbps and supports 28 T1 lines.
DSU	Acronym for Data Service Unit, a DCE used with digital communications circuits to provide digital data services interface. Located on the users premises, the DSU interfaces directly with the DTE, and provides loop equalization, remote and local test

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	capabilities, and the logic and timing necessary to provide a standard EIA/TIA or CCITT interface. Converts signals between those used at the DTE's serial interface and bipolar signals used on the digital network. Also Network Terminal Unit (NTU).
DTE	Acronym for Data Terminating or Data Terminal Equipment.
DTR	Acronym for Data Terminal Ready.
E1	The European standard for high speed, point to point transmission operating at 2.048 Mbps and defines 64 Kbps sub-channels.
EIA	Acronym for Electronic Industries Association. EIA, a standards body, has a set of standards which includes data communications and interface standards among others.
EMI	Acronym for Electro-Magnetic Interference.
FEP	Stands for Front End Processor. It is an IBM communication controller that routes traffic to and from cluster controllers.
FDDI	Acronym for Fiber Distributed Data Interface, is a shared medium, ring topology LAN that operates at 100 Mbps. It is ANSI standard X3T9.5, using fiber optic cable as the medium.
FPGA	Acronym for Field Programmable Gate Array.
LAN	A local area network is a group of PCs connected over a common medium within a building.
MAC	Acronym for Medium Access Control. A designated hardware address for each device on a LAN or MAN. This address is burnt into The network interface card (NIC) by its manufacturer.
MAN	A metropolitan area network is a group of PCs connected over a common medium within a campus environment or the same city.
NA	Acronym for Numerical Aperture.
OC1	Optical Carrier Signal Level 1 refers to SONET data transmission at 51.840Mbps.
OC3	Acronym for Optical Carrier 3, a transmission rate standard for fiber optic telephony or data communications circuits. OC3 operates at 155 Mbps speed and is part of the SONET hierarchy.
OC12	Optical Carrier Signal Level 12 refers to SONET data transmission at 622.080Mbps.
OSI	(Open Data Interconnection Reference Model) - This is the International Standards Organization (ISO) model of how data communications systems can be interconnected. Communication is partitioned into seven function layers. Each layer builds on the services provided by those under it.
PBX	Acronym for Private Branch Exchange, is a small private version of a phone company's larger central switching office.

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PCM	Acronym for Pulse-Coded Modulation, a means of converting analog to digital form.
RING	Path or channel; usually electrical, where devices along the path receive transmissions sequentially from one device to the next along the ring.
RS-232	An interface used between DTE and DCE employing serial binary data interchange, defined by EIA, aka. EIA-232. Similar to standard V.24 of CCITT.
RS-422	Standard defined by EIA, aka. EIA-422. Deals with the electrical characteristics of balanced voltage digital interface circuits. Similar to standard V.11 of CCITT.
RS-423	Standard defined by EIA, aka. EIA 423. Deals with electrical characteristics of unbalanced voltage digital interface circuits. Similar to standard V.10 of CCITT.
RS-449	Standard defined by EIA, aka. EIA-449. Deals with general-purpose 37- and 9-position interface for data terminal equipment and data circuit-terminating equipment employing serial binary data interchange.
RS-485	Standard defined by EIA, aka. EIA-485. Standard for electrical characteristics of generators and receivers for use in balanced multipoint systems.
RTS	Acronym for Request To Send.
SCADA	Acronym for Supervisory Control and Data Acquisition.
SNMP	Acronym for Simple Network Management Protocol. A standard management protocol used to provide a common means of managing network devices.
SONET	Acronym for Synchronous Optical NETwork, is a hierarchical standard for a high speed (45 Mbps to 2.4 Gbps) transport network.
T1	Transmission rate standard for telephony or data communications circuits. T1 operates at 1.544 Mbps speed. Usually this circuit is subdivided into many 64 Kb channels.
TCP/IP	Acronym for Transmission Control Protocol/Internet Protocol.
WAN	Acronym for Wide Area Network, a computer network interconnected over distances beyond a city or metropolitan area.
802.3	Commonly referred to as Ethernet. It is a local area network protocol that operates at 10Mbps.
802.5	Commonly referred to as Token Ring. Operates at either 4 or 16Mbps.

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Introduction

- Ethernet Switch
- Industrial Ethernet
- Industrial Fiber Optic
- Key Features
- Package Contents

Welcome to **ICP DAS Managed Industrial Ethernet Switch** one of the world's best Industrial Ethernet Switch designed for connecting Ethernet-enabled devices in industrial field applications. This manual is for the ICP DAS Managed Switch.

Overview

The *Managed Industrial Ethernet Switch* is designed upon concepts of reliability, quick recovery, easy configuration, self-healing and SCADA for status monitoring. Besides, all models in *Managed Switch* mechanism is also designed to meet IP30[1] above for working under harsh environment.

Unlike other existing ring switch or managed Ethernet switch on the market, the ICPDAS *Managed Switch* is much more easy to use and absolutely free of software setting.

[1] Ingress Protection, see **"Appendix B"** for detail information.

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Ethernet Switch

Ethernet is an ideal medium to transport large volumes of data, at speed, across great distances. Previously, multiple networks carrying specific protocols were installed side by side to carry out unique tasks. This inevitably led to project costs increasing as additional fiber optic or copper cables were installed to deal with the increasing volume of data. Using Ethernet a single fiber optic cable can carry multiple protocols. Furthermore, manufacturers are exporting their legacy protocols onto Ethernet, designing new IP based communication protocols and providing embedded Web-Pages within devices that offer real-time information using simple tools like Internet Explorer and Netscape Navigator.

Unfortunately, although network hardware has dramatically increased in speed and technology over the past decade the poor perception of Ethernet has remained; namely as being difficult to fault-find and critically being a non-deterministic network. A key development that overcame some of these issues was the advent of the Ethernet Switch.

Early Ethernet networks were based on a hub or repeater. These units have no intelligence and therefore are unable to identify any information contained within the Header frame of an Ethernet packet. This means that it is not capable of determining which port to send the frame to. Therefore, every frame is sent to every port. A network of repeaters and hubs is called a 'Shared Ethernet' or 'Collision Domain'. Various devices will all compete with each other before sending data using 'Carrier Sense Multiple Access / Collision Detect' (CSMA/CD) protocol. This means that only one system is allowed to proceed with a transmission of a frame within a Collision Domain at any one time. This is a major disadvantage when using Hubs and Repeaters within a network.

A switch, like a hub, has to forward and receive packets from one network or device to another. The switch could forward all packets, but if this was the case it would have similar behaviour to a hub. It would be more intelligent if the switch only forwarded packets which needed to travel from one network or device to another. To do this, the switch must learn which devices or networks are connected to each port. In simplistic terms; it needs to learn the destination and source ports of each and every packet received on each individual Switch port. Once learnt, any identically addressed packet will be automatically be forwarded. With today's enhanced processing power the introduction of a Switch has significantly increase network bandwidth.

Industrial Ethernet

Industrial rated Switches are intended to be installed in both harsh climatic environments and noisy electrical installations. Such Switches are an excellent example of true industrial design principles –

- very high operating temperatures (down to -30°C an d up to 75°C)
- dual input power supplies
- wide DC operating voltages

In Roadside and tunnel applications distances between cabinets with a suitable power supply can be challenging. Naturally, fiber optic cable is the preferred solution. Using single mode fiber, runs of up to 85km are possible. Even using standard CAT5e copper cable the Industrial Switch supports the long cable specification and distances of up to 185m are viable. However, the domain of Ethernet has always been controlled by the IT department who normally configured office networks with an iron fist and dictated to the organisation how the network would be designed. Complex network recovery protocols

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like spanning tree, and SNMP to help with fault finding and system analysis were often employed to enhance network resilience. If a network failure occurred the IT department would casually look at repairing the equipment; there was no real rush as it was an office network.

However, with industrial Ethernet you need very fast repair time and with an IT department not readily available on the roadside, maintenance personnel need to be made aware of the fault, find the error and repair it - quickly. To aid this, unique network recovery features are employed to significantly enhance network recovery times. When an IT department requires a level of redundancy a common method is to employ the spanning tree protocol. However, spanning tree can be complex to program and critically can take over 30 seconds to detect and recover from the fault – far to long for critical applications!

ICP DAS Managed Switch incorporates propriety protocols that enable multiple Switches to be placed into a redundant ring. A single Switch, configured as the network focal point will monitor, detect and recover from a fiber or copper link failure within approximately 50mS – for the majority of applications a seamless process. The configuration process of the network focal point is simple as it must be remembered that as the switches are to be installed on the roadside the first to be called to rectify a fault will more than likely be Maintenance personnel.

Module / Feature	ICPDAS Managed Switch	General Managed Switch
Communication Protocol	Modbus/TCP Modbus/RTU	SNMP IGMP
Managed Interface	Serial Console, Utility Web telnet	Serial Console Utility Web telnet
Service	OoS, HTTP, VLAN, SMTP.	QoS, CoS, VPN, FTP, HTTP, HTTPS, SSH, VLAN
Redundancy	Cyber-Ring (Variable recovery time from 100 ms to 1.5s) Spanning Tree.	Trunking, Spanning Tree, Rapid Spanning Tree
Amount of Rings	2	1
Single Coupling	Yes	No
Redundant Coupling	Yes	No
Router/IP sharing	No	Yes
IEEE standards	802.3 802.3x 802.3u 802.1D 802.1p 802.1q	802.3 802.3x 802.3u 802.1D/w 802.1p 802.1q
Alarm	Relay Output Modbus	SNMP
Convenience	Easy to use/configure	N/A

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It is likely that these people will not be fully trained on Ethernet and the protocols that are in operation, nor will they fully understand the principles of SNMP etc. However, with a fault contact, fault LED's and graphical interface implemented they have a multi-level approach to fault finding:

The fault contact is hard-wired to an alarm on a control panel or as an input to a DCS. If a link failure occurs (between two switches or an Ethernet Device) or a network failure occurs the fault contact on the Switches will be energized. The Maintenance Engineer can easily locate the fault.

With the increased use of Ethernet in the field to pass critical data the greater the reliability in network infrastructure. Where multiple rings are configured in a system it is also critical that the links between the rings are also duplicated to provide enhanced redundancy. This can be achieved using Multi-ring Redundancy

Industrial Fiber Optic

Why Fiber Optics?

The utilization of fiber optic data transmission for industrial automation and process control has become increasingly popular over the past decade.

A basic fiber optic system, using an optical transceiver circuit and fiber optic media, offers a wide array of benefits that are not available with traditional copper conductors.

Advantages of Fiber Optic Data Transmission Technology

- High data rate and wide bandwidth
- Immunity to EMI/RFI and lightning damage
- No ground loops
- Low attenuation (data loss)
- Longer distance – up to 1.8 miles (3 km) with Muliti Mode fiber and over 15 miles
- (25 km) with Single Mode fiber
- Small cable diameter fits almost anywhere - requires less duct space
- Light weight
- No sparks if cut – ideal for Hazardous Area applications
- No electric shock hazard
- Secure communications
- Flexible networking topologies
- Corrosion resistant
- Longer life expectancy than copper or coaxial cable
- Economical total system cost

Disadvantages of Electronic Cabling (Twisted Pair (TP), Coax, Twinax)

In selecting the signal/data transmission technology for your Industrial Automation and Process Control networking, the following limitations of electronic cabling should be considered:

- Cabling hassles: weight, routing, size, attenuation and cross-talk
- Distance between terminals and hosts is severely limited
- Large diameter cable fills plenums and conduits
- Needs to be routed away from power cabling
- Poor security
- Limited topologies

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- Cost can be high relative to Fiber

Industrial vs. Commercial

Most process plants and factories have unique requirements for communications networks that differ from those of commercial grade networks. Industrial network components must withstand much harsher environmental conditions that can include extreme temperatures, lightning strikes, electromagnetic interference and, in many instances, installation in hazardous area locations.

Mounting and space requirements can also be an issue since industrial networking components are often installed in the same control panel or cabinet with other measurement and control equipment. At ICP DAS, our goal is to meet the demanding requirements of industrial communication networks. Our industry standard, *Managed Switch* of industrially hardened fiber optic communication products addresses these issues and provides you with optimal solutions for your factory automation and process control needs.

Managed Switch Key Features

- ✓ Connectors locate in front panel, reducing wiring complexity and easy maintenance.
- ✓ Dual input power supply for non-stop connectivity
- ✓ Patent pending Cyber-Ring Protocol
- ✓ Versatile DIN-rail, surface, and wall-mountable design
- ✓ Rugged aluminium case with IP30 rated protection
- ✓ Provides redundant dual DC power inputs with reverse polarity protection and alarm
- ✓ Non-blocking, store-and-forward switching architecture
- ✓ Watch dog
- ✓ Support SCADA via Modbus/TCP or Serial Console for status monitoring
- ✓ Support 2 rings
- ✓ Support multiple single coupling and redundant coupling
- ✓ Provides easy-to-use GUI configuration utility
- ✓ Supports email warning via Simple Mail Transfer Protocol (by GUI configuration
- ✓ utility)
- ✓ Support VLAN, QoS, Port Trunking, TELNET…etc. variety protocols.

Package Contents

- ✓ One Industrial Ethernet Switch
- ✓ Quick Installation
- ✓ Guide User Manual
- ✓ RJ-45 Covers
- ✓ 4PCA-090510 cable line

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Appearance

- Dimensions
- Front Panel
- On Case Quick Guide

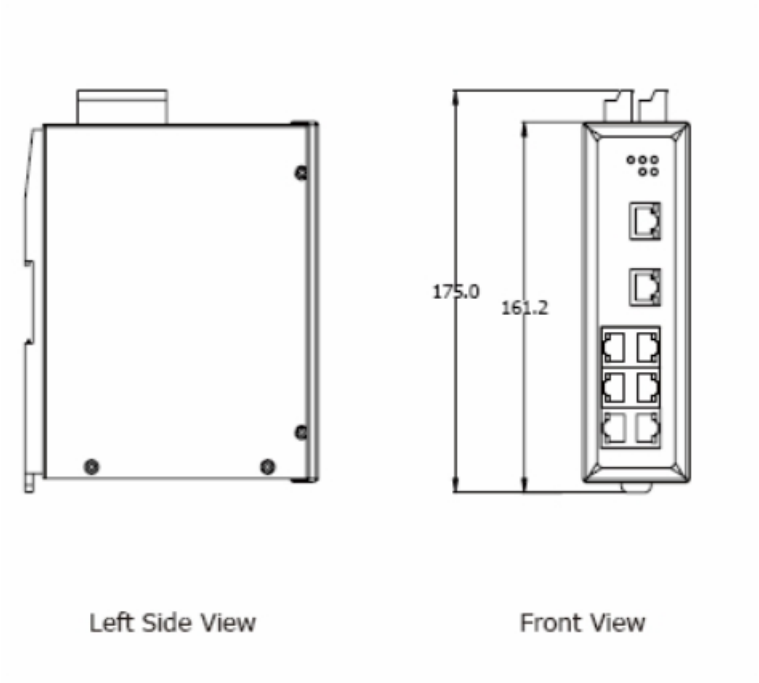
Overview

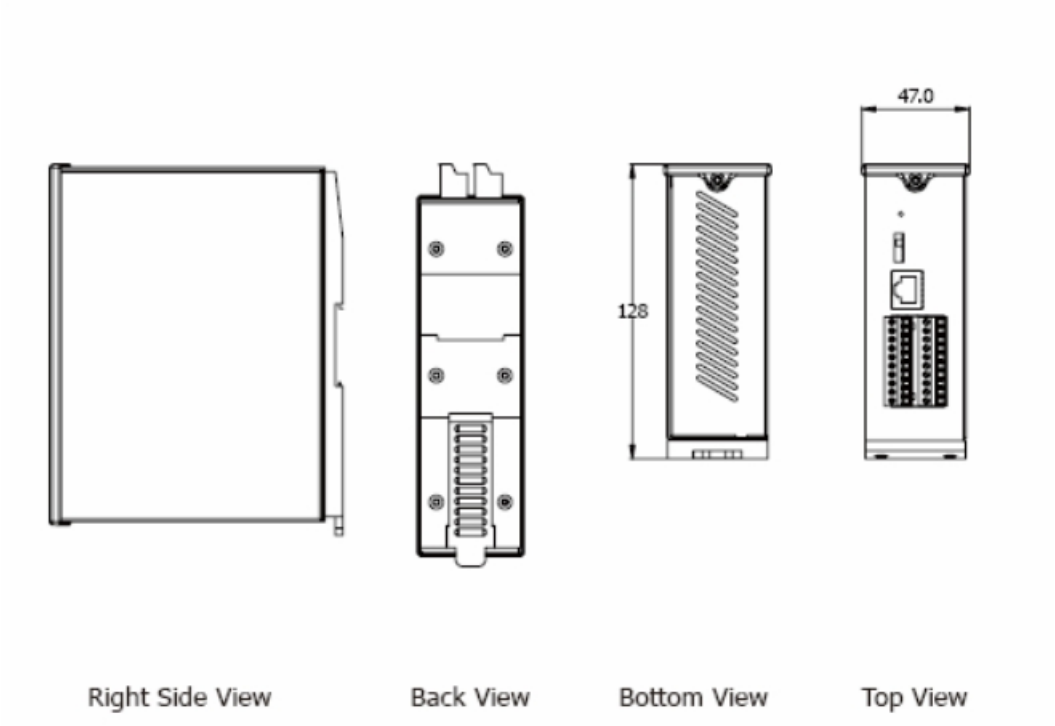
The Managed Switch provides useful interfaces to configure the switch functions. For hardware installation, we provide easy DIN rail mounting, wall mounting modes, and come with aluminum case.

All of connectors are well arranged on the front panel, so it is easier to stack with other devices and to maintain in a small installation space.

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Dimensions





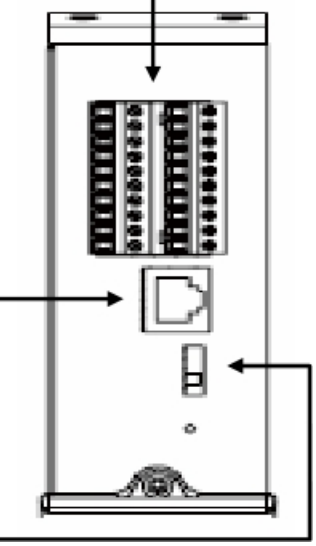
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Front Panel



Terminal block

Left :		Rignt :	
1.	Frame Ground	11.	Frame Ground
2.	Power 2 GND	12.	Power 1 GND
3.	Power 2 +Vs	13.	Power 1 +Vs
4.	Relay (R.COM)	14.	Data-
5.	Relay (R.NO)	15.	Data+
6.	DO #0	16.	DI #0
7.	DO #1	17.	DI #1
8.	DO #2	18.	DI #2
9.	DO GND	19.	DI COM
10.	DO PWR	20.	-



Serial line via Ethernet port

Jumper block

Repair Mode

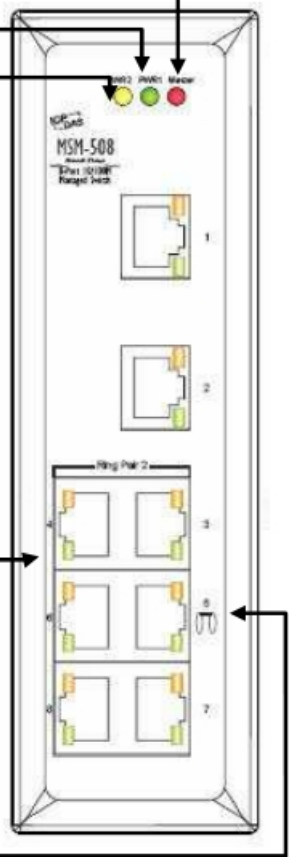
Normal Mode

Upgrade Firmware Mode

Master switch LED indicator

Power 1 LED indicator

Power 2 LED indicator



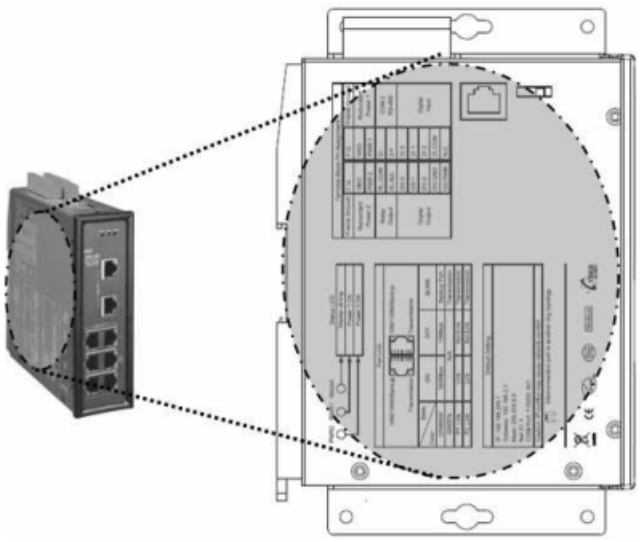
RJ-45 Ethernet ports

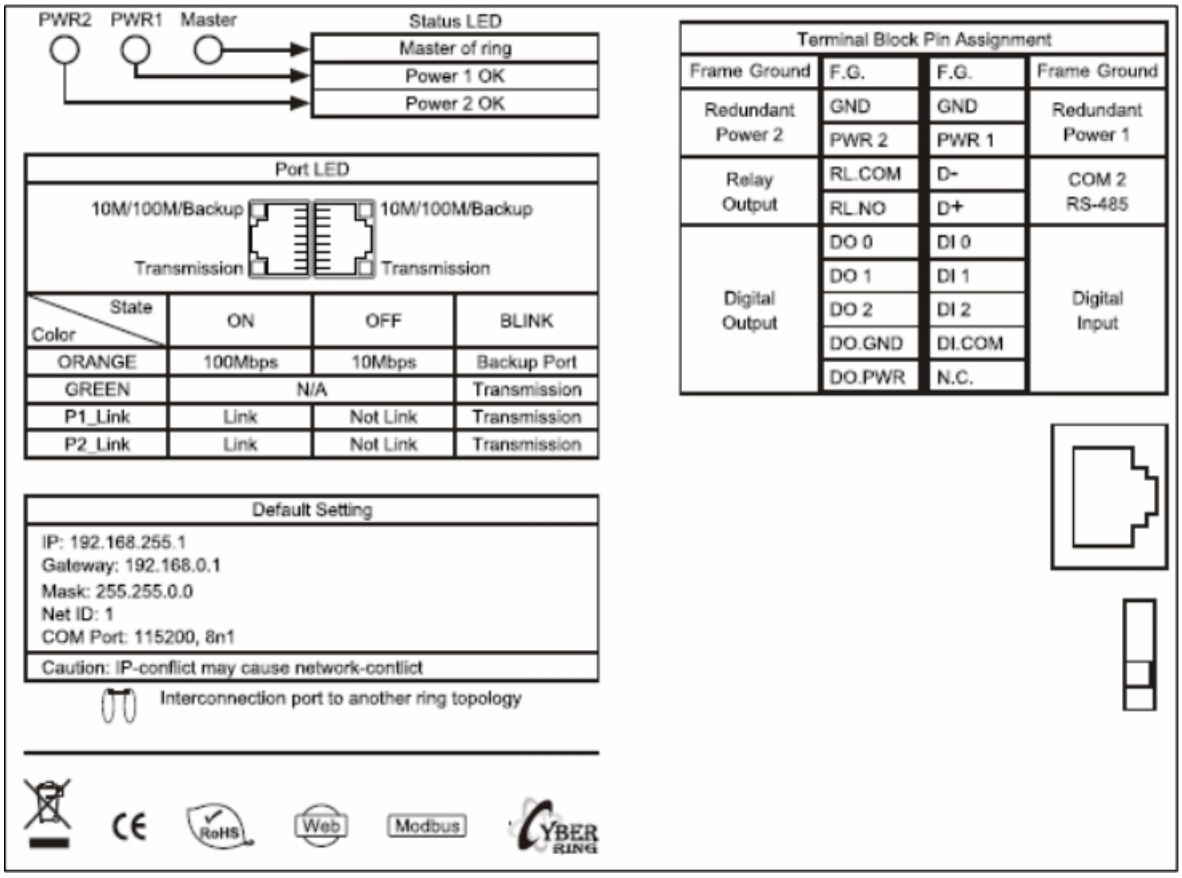
Interconnection port for 2 phase recovering coupling

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On Case Quick Guide

LED status and Default Setting have been printed on left side of front panel. After acquainted with *Managed Switch* features, field engineers could deploy switches quickly by referencing those information.





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Hardware Installation

- DIN-Rail Mounting Installation
- Wall-Mounting Installation
- Connecting Input Power
- Connecting Output Relay
- Connecting Ethernet Ports
- Connecting Fiber Ports

For hardware installation, we provide both easy DIN rail mounting and wall mounting modes.

Overview

Managed Switch support redundant power, output relay and enhanced isolation to make device much robust. With ICP DAS patent DIN-Clip® design, the installation is just as easy as plugging power cord into outlet.

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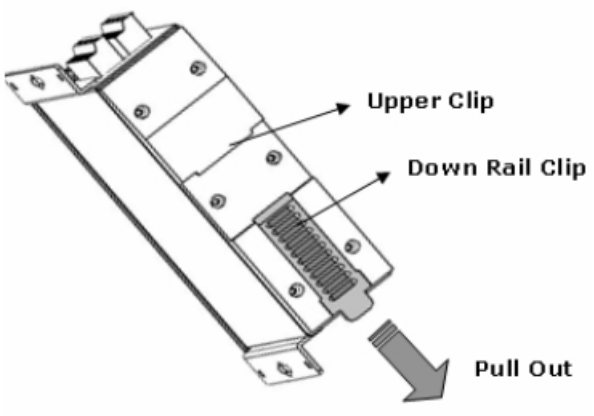
DIN-Rail Mounting Installation



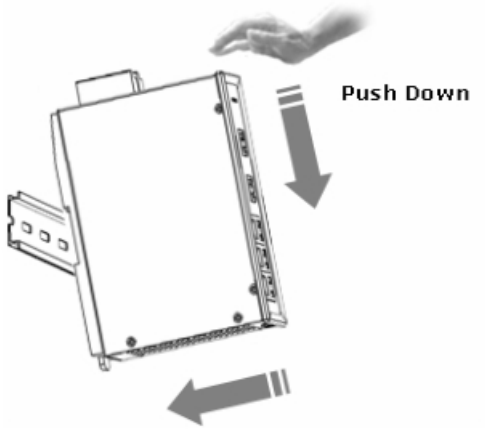


With ICPDAS patent DIN-Clip® design, DIN-Rail mounting installation becomes very easy. Following 3 steps completes installation.

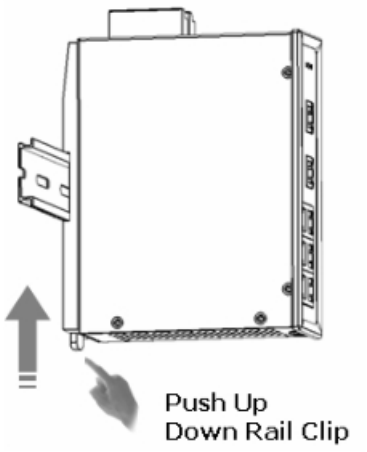
1 Pull the **down rail clip** out.



2 Obliquing the switch and insert the **upper clip** onto the upper lip of the DIN-rail track. Then push down the switch to fit into DIN rail as shown below.



3 Push up **down rail clip** to lock the switch on the DIN rail.

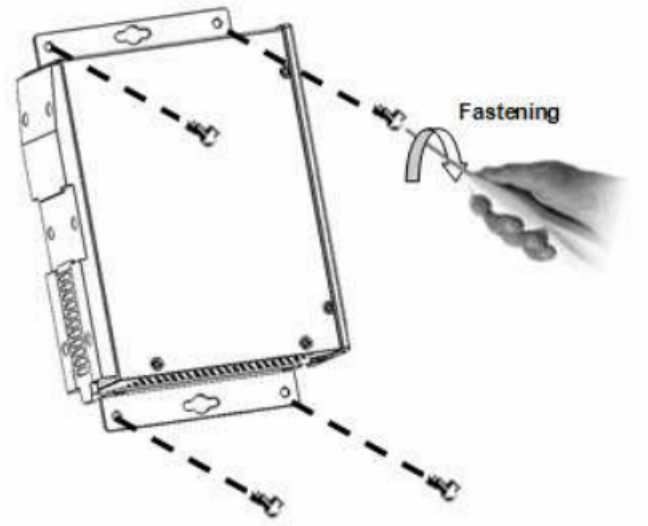


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Wall-Mounting Installation

With ICP DAS patent DIN-Clip® design, Wall-Mounting installation becomes very easy. Following 1 step completes installation.

1 Use the slotted holes at each corner of the wall-mounting clip to attach the unit to the wall or other flat surface. Then fasten it on the wall with screw.

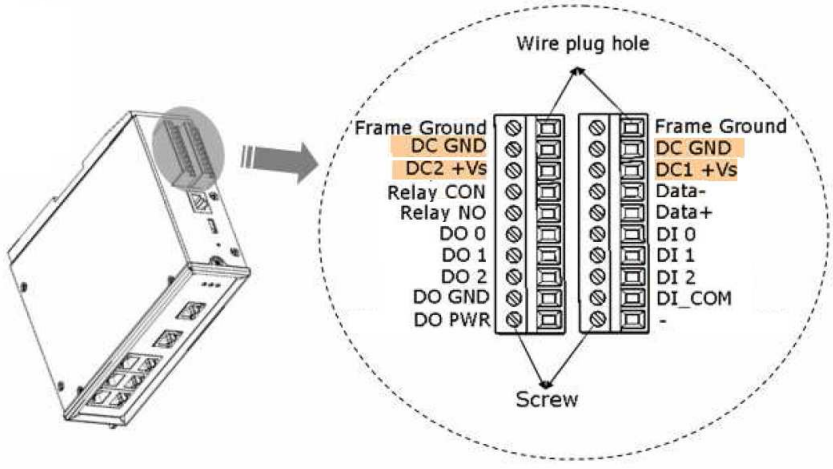


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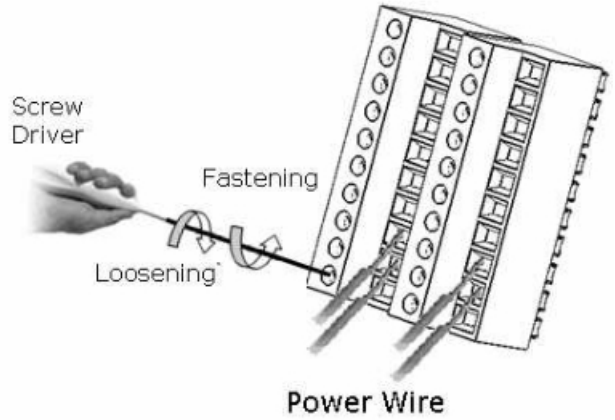
Connecting Input Power

IMPORTANT: *It is good practice to turn off input and load power, and unplug the power terminal block before making wire connections. Otherwise, your screwdriver blade can inadvertently short your terminal connections to the grounded enclosure.*

1 Identify PWR1, GND, PWR2, GND contacts on terminal block. Then identify power wire and ground wire.



2 Insert the wire of your DC supply or Battery supply into the PWN1 and/or PWN2 contacts of the terminal block connector, and fastening the terminal screws to prevent the wires from coming loose.

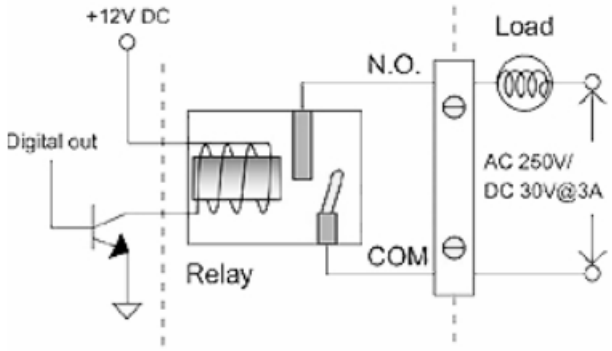


NOTE: *For best reliability, please install both of PWN1 and PWN2 for power redundant.*

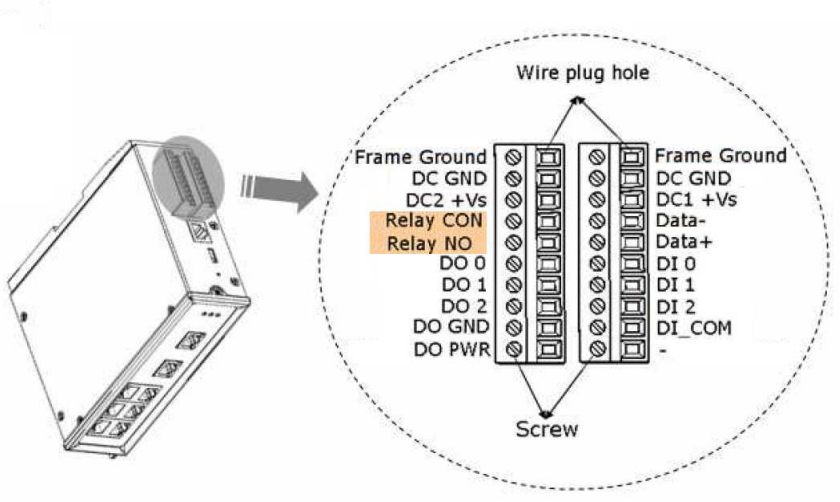
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Connecting Output Relay

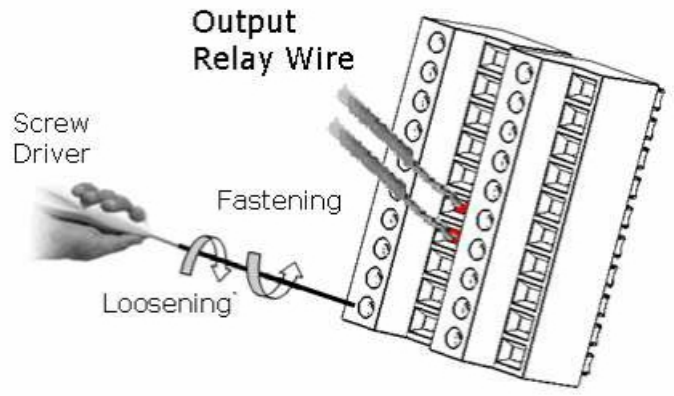
The diagram of output relay:



1 Identify R.NO and R.COM contacts on terminal block.



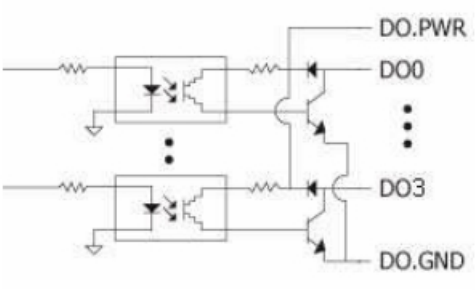
2 Insert the relayed device such as a light bulb or a buzzer pair of wire, and fastening the terminal screws to prevent the wires from coming loose.

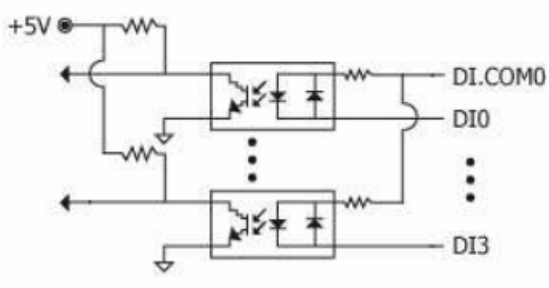


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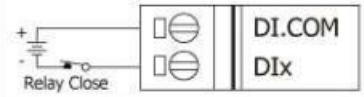
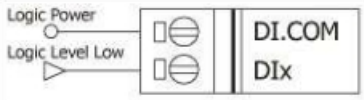
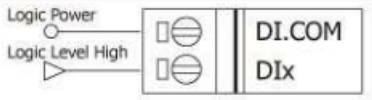
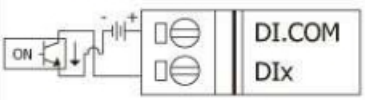
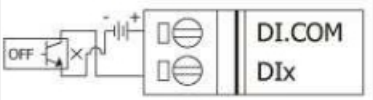
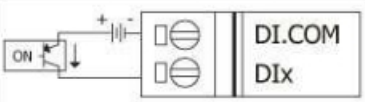
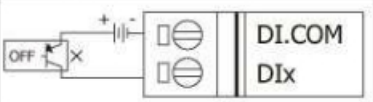
Connecting Digital Input & Output

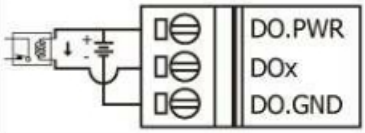
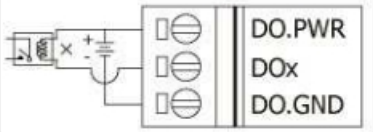
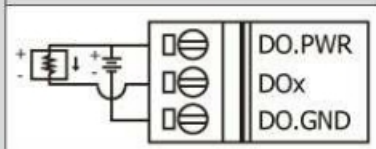
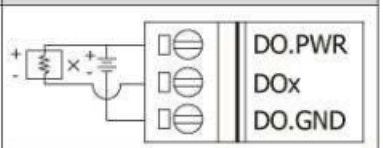
The diagram of digital input and output:





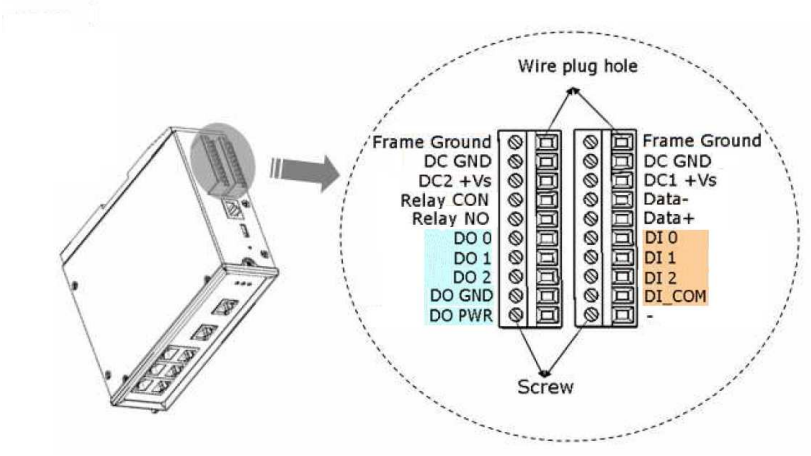
Wire Connection

Input Type	ON State LED ON Readback as 0	OFF State LED OFF Readback as 1
Relay Contact	Relay ON	Relay Off
		
TTL/CMOS Logic	Voltage > 10V	Voltage < 4V
		
NPN Output	Open Collector On	Open Collector Off
		
PNP Output	Open Collector On	Open Collector Off
		

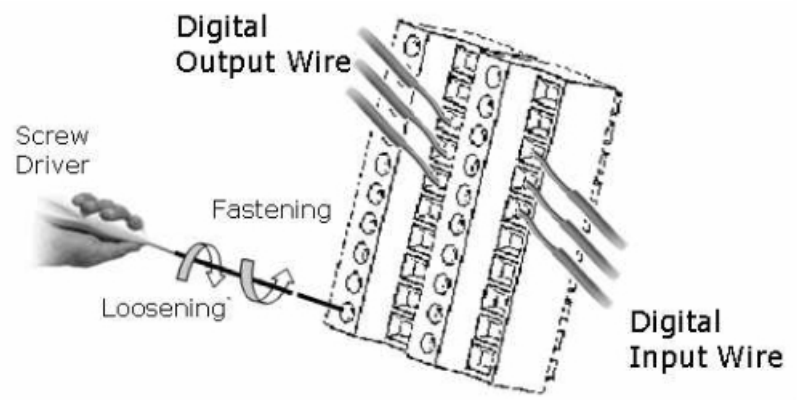
Output Type	ON State LED ON Readback as 1	OFF State LED OFF Readback as 0
Drive Relay	Relay ON	Relay Off
		
Resistance Load		
		

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1 Identify digital input and output contacts on terminal block.



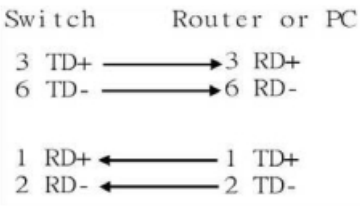
2 Fastening the terminal screws to prevent the wires from coming loose.

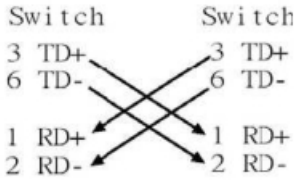


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Connecting Ethernet Ports

Managed Switch includes all RJ-45 ports with automatic MDI/MDI-X crossover, and automatic 10/100Mbps data rate sensing for 10Base-T or 100Base-TX connections. Automatic MDI/MDI-X crossover allows you to connect to other switches, hubs, or workstations, without regard to using straight-through or crossover cabling. The following figures depict the schematic diagram of straight-through and crossover cabling. Note that crossover cables simply cross-connect the transmit lines at each end to the receive lines at the opposite end.





Straight-through Cabling Schematic Crossover Cabling Schematic

Note that Ethernet cables use pins 1, 2, 3, and 6 of an 8-pin RJ45 connector. The signals of these pins are converted by the automatic MDI-X function, as shown in the table below:

Pin MDI-X	Signals	MDI Signals
1	RD+	TD+
2	RD-	TD-
3	TD+	RD+
6	TD-	RD-

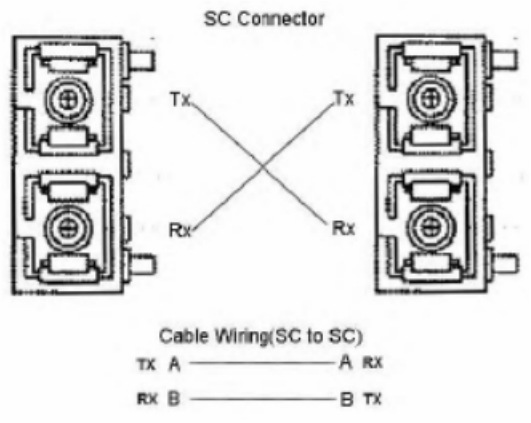
Connect one side of an Ethernet cable into any switch port and connect the other side to your attached device. The green LNK LED will light up when the cable is correctly connected. Always make sure that the cables between the switches and attached devices (e.g. switch, hub, or workstation) are less than 100 meters (328 feet).

Two switches are now up-linked together. If we change the up-link port manually at this time, the MAC address table will change as well. After the MAC address table changes, then the data can be transmitted between these two switches. This period of time is called the MAC address table aging time. The switch's default aging time is 5 minutes, which means that if you manually change the up-link port, you will need to wait up to 5 minutes before the data can be sent. If the aging time is too short, the MAC address table will constantly refresh, resulting in excess consumption of switch computing resources. For this reason, a longer aging time is recommended.

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Connecting Fiber Ports (only for models with fiber port)

The automatic MDI/MDI-X crossover function does not apply to fiber connections, as these must be crossed over manually. To connect the fiber port on one switch to the fiber port of another switch, simply cross-connect the transmit channel at each end to the receive channel at the opposite end as illustrated in the figure below.



These models have two 100Base-FX ports with SC type connectors (in multi-mode and single mode versions).

A fiber segment using single-mode cable must use 9/125 or 10/125 micrometer single-mode fiber cables. For single-mode, the connection distance can be up to 30 km.

A fiber segment using multi-mode must use 50 or 62.5/125 micrometer multi-mode fiber cables. For multi-mode, the connection distance can be up to 2 km.

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Configuration

- One Ring Topology
- Two Rings Coupling
- Two Rings Coupling with Two Phase Recovering

This chapter provide basic techniques to form a redundant ring on your demand.

Overview

To successfully form a robust industrial Ethernet network, the designing of network pattern is the most important stage. A well-designed network pattern could dramatically reduce the risk network failure in critical situation.

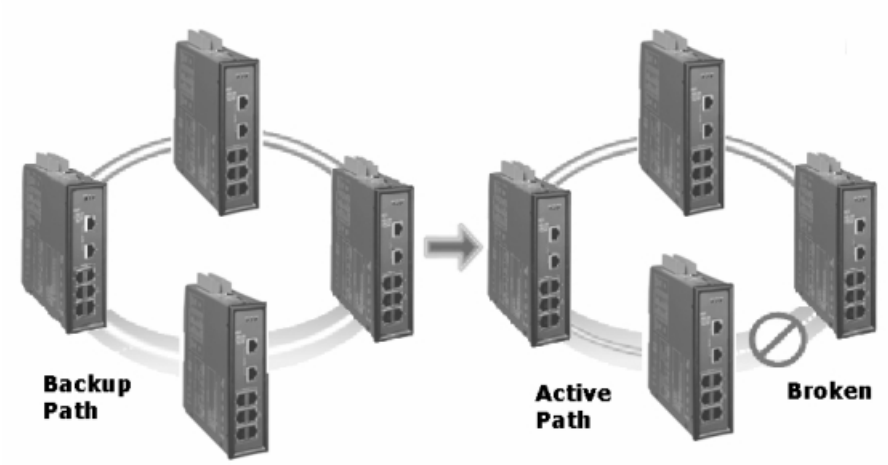
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One Ring Topology

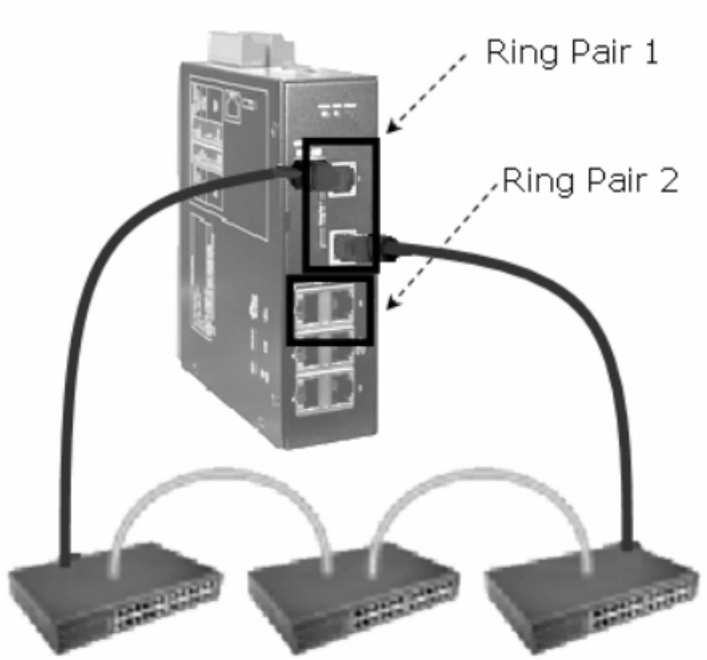


A ring topology ensures the network having **one more chance** to keep connection alive when any connection between 2 switches (nodes) has been broken inside the ring.

When we have formed a ring network, the focal point (master) will choose any one and only one path as **Redundant Path**. It is actually inactive when the ring network works properly. At the moment of any connection failure, the focal point will activate the **Redundant Path** and fire alarm to output relay.



Managed Switch come with 2 ring pair by default. A ring pair can form a ring with other network devices as below:



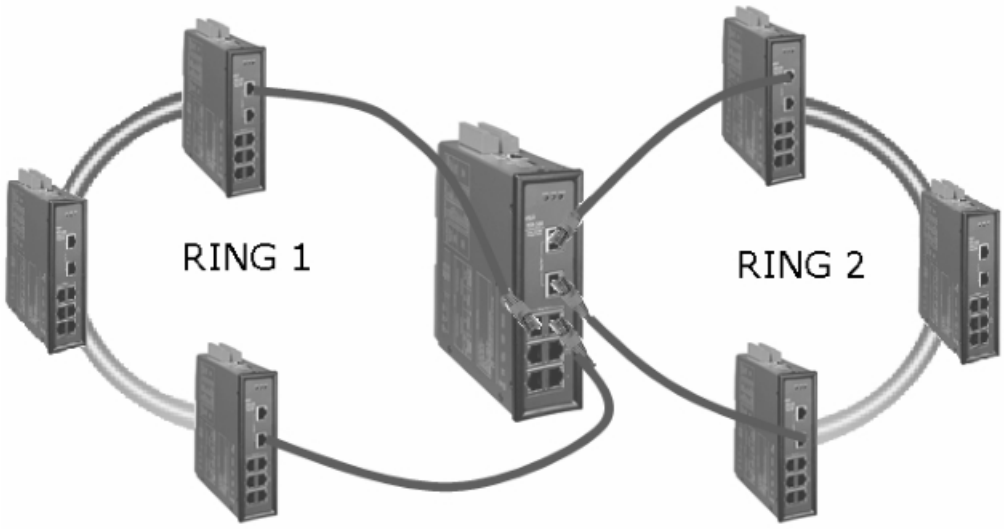
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Two Rings Coupling



As a ring network is a small group of switches by geography, functionalities, or subsystem, 2 or more rings could be coupled together to form a whole picture of industrial network for an integrated system.

Single coupling point uses a switch to bridge 2 rings. Each ring still keeps original ring topology features.



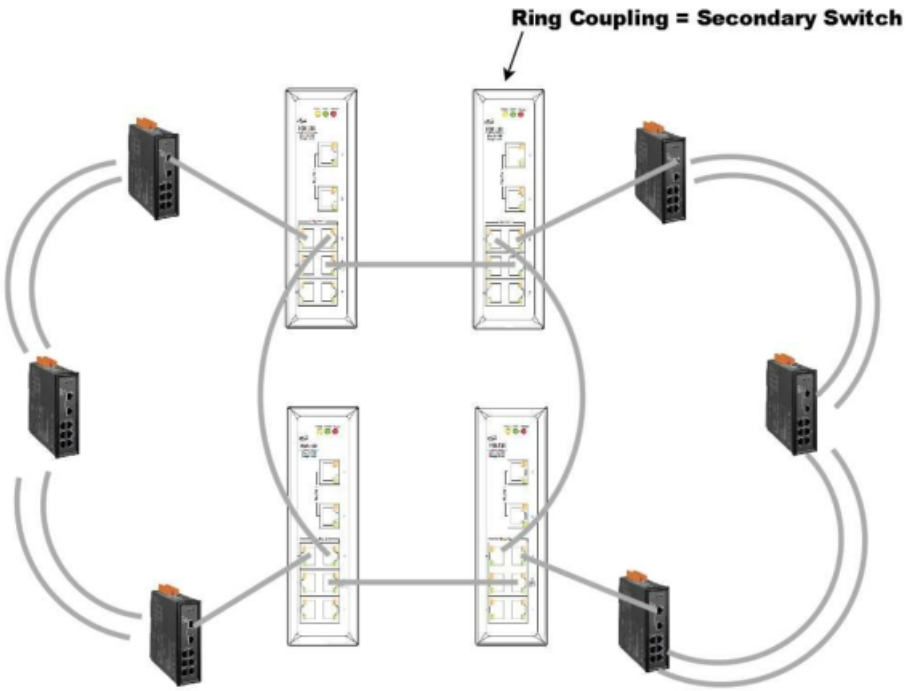
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Two Rings Coupling with Two Phase Recovering



Redundant coupling gives **one more chance** to keep connection alive when any connection between 2 rings has been broken. It is much safe than Single Coupling, but it takes 3 more switches to form Redundant Coupling.

Be sure to use port 5 (interconnection port) to form two phase recovering coupling and only ring pair 2 can be used in this topology.



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Troubleshooting

- No Power to the Switch
- No Link Light on a Switch Port
- Master LED Keep on Flashing

Overview

This chapter includes some information for general troubleshooting as follows:

- ☐ No Power to the Switch
- ☐ No Link Light on a Switch Port
- ☐ Master LED Keep on Flashing

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No power to the switch.

- Check for faulty power cord.
- Check for loose or broken power connections.
- Check connections to ensure the power and ground are attached to the correct terminals.
- Check for power loss or power surges at the AC power outlet.
- Check Voltage of power coming into PWR1 or PWR2 to ensure it is within +10 - +30V DC.
- Ensure there are no shorts between power and ground.

No link light on a switch port.

- Check for faulty or loose Cables(both ends). Visually inspect for loose or faulty connections at all connectors and cables. If that does not correct the problem, try replacing the cable.
- Check the other device to see if it is powered up and operating correctly.
- Try moving the Ethernet cable that has the possible faulty connection to another port in the switch and check for link light.

Master LED keep on Flashing

- Check if the topology is accurate.
- Check if network is functioning properly.
- Check if power supply is connected properly.
- Check if there is devices failure exit (including ring switch or other devices connected to the switch)
- Check if MAC address is duplicated or illegal.
- Check if the length of recovery time (rtime) is adequate; if the recovery time is too short, set a longer time interval.
- Check if the firmware is the newest version , please go to http://www.icpdas.com/download/download-list.htm for downloading newest firmware version.
- Check if the firmware upgrading process is completed. If not, redo the upgrading sequence to complete firmware upgrading process.

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Service Information

We sincerely hope that you never experience a problem with any ICP DAS product. If you do need service, call ICP DAS at 886-3-5973366 and ask for Applications Engineering. Our well-trained specialist will help you to quickly determine the source of the problem. Many problems are easily resolved with a single phone call.

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E- MAIL : SUPPORT @ICPDAS .COM

Contact Worldwide



		TELEPHONE	FAX
Taiwan	Hsinchu Headquarter	886-3-5973366	886-3-5973733
	Banchiao Office	886-2-29500655	886-2-29500807
	Hsintien Office	886-2-89192220	886-2-89192221
	Taichung Office	886-4-23582815	886-4-23589114
	Kaoshiung Office	886-7-2157688	886-7-2162602
USA	USA Office	1-310-517-9888 x101	1-310-517-0998
Europe	Europe Office	0049-711-9 97 37 75	0049-711- 9 97 37 84
Shanghai	Shanghai Office	8621-6247-1722	8621-6247-1725
Beijing	Beijing Office	8610-6298-0933	8610-6296-2890

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Appendix A

Glossaries

ANSI X3T9	Commonly referred to as FDDI. A local area network protocol that operates at 100Mbps.
Asynchronous	Having a variable time interval between successive data or information in the form of characters, operations, events. Transmission in which the data or information is individually synchronized or timed usually by start and stop bits (S/S).
Attenuation	A general term describing the loss of power between two points, measured in decibels per kilometer (dB/km) at a specified wavelength (nm).
Backbone Network	A main or high speed transmission facility or medium usually designed to connect lower speed channels or clusters of terminals. May describe common carrier main transmission path.
Bandwidth	A range of frequencies available for signaling; the differences between the highest and lowest frequencies of a band are expressed in (Hz).
Bridge	A device used to connect two separate LANs or used to divide a large LAN into smaller LANs. Each LAN acts as its own LAN, but uses a bridge device to communicate from one LAN to another.
Bus	Path or channel, usually electrical, with one or more conductors, where all devices are able to receive all transmissions at the same time.
Counter-Rotating Ring	Aka. Self-Healing Ring; has two physical transmission lines or rings with transmitting and receiving signals in each ring travelling in opposite directions. If the line or a device along the ring fails, the ring re-anneals by bypassing the device and or line and forms with the other ring to form a new single ring.
Crosstalk	The unwanted transfer of energy from the disturbing circuit to another called the disturbed circuit. Usually from an adjacent analog channel.
Dispersion	The spreading of light pulses that takes place in multimode fiber optic transmission. Dispersion limits the potential transmission distance because the spread out light pulses reach the destination at different times making the signal unreadable.
Ethernet	Product name for one of the first popular LAN technologies, later standardized as IEEE 802.3.
Fiber Optic Cable	Thin filaments of glass or other transparent material sheathed in an insulator through which a light beam may be transmitted for long distances by means of multiple internal reflections. A waveguide used to transmit digital information.
Flow Control	A method for a receiver to control the information flow from a transmitter. It eliminates data overflow at the receiver.
Full Duplex	A communication method where both ends can transmit and receive simultaneously.
Half Duplex	A communication method where one end transmits while the other end receives, then reverses the process.

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Hub	A device for local area networks (LANs) that is used to interconnect multiple devices over an internal bus.
Jitter	Aka. phase jitter, caused by power line harmonics and perceived in the form of minor phase changes.
Multi-Drop Line	Aka. Multipoint Line, a data link supporting multiple DTE connections, usually with one DTE controlling the link by polling the other DTEs for input and addressing output to the other DTEs. Utilizing frequency division or statistical MUX, a multipoint line can support multiple independent point-to-point channels.
Multimode fiber	An optical fiber that supports more than one propagating mode of light propagation.
Multiplexer	Aka. or Multiplexor or Mux,. A device using several communications channels at the same time, transmits and receives messages and controls communications lines, may be a microprocessor.
Node	A network-connected device, such as a server or PC.
Order Wire	Voice channel used to communicate between two locations.
Packet	A grouping of data, usually consisting of data and an address header prior to being sent over a network.
Point-of Presence (POP)	The physical access location within a specific location of the long distance or common carrier.
Polling	The method used for terminal to controller communications. The controller systematically asks for each terminal if it needs to transmit to the controller.
Protocol	A set of rules for data communication. All devices communicating together must adhere to the same rules.
Router	Similar to a bridge but provides more complex and flexible networking support. It usually also supports WANs.
Single mode fiber	An optical fiber that supports only one mode of light propagation above the cutoff wavelength.
Star	Network in which all terminals are connected through a single point or node, such as a star coupler.
Synchronous Transmission	Having a constant time interval between successive bits of data or information.
Time Division Multiplexing	A type of multiplexer that allocates a defined amount of backbone bandwidth for each connected device.
Time Slot	Unit of backbone bandwidth allocated for each port.
Token Ring	A LAN topology where a control packet or token is passed from station to station in sequential order. The stations wishing to access must wait for the token before transmitting data, in the token ring the next logical station is also the next physical station.
Virtual Path	A software-controlled point-to-point connection between two devices or segments.

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Appendix B

Specifications

Ethernet switch type	Intelligent store & forward
RJ45 ports (shielded)	10/100BaseT(x)
RJ45 speed (auto-negotiating)	10 Mbps or 100 Mbps
RJ45 auto-mdi/mdi-x	All 8 ports
Ethernet protocols supported	All standard IEEE 802.3
Memory bandwidth	3.2 Gbps
Completely compliant	IEEE 802.3, IEEE 802.3u, IEEE802.3x
Full or half duplex operation	Auto-sensing
MAC addresses supported	2K
Ethernet isolation	1500 VRMS 1 minute
Required supply voltage	+12 ~ +48 VDC
Power input isolation	1KV
Power consumption	5 W
(Redundant input terminals)	(typical - all ports active at 100 Mbps)
Operating temperature	-30 ~ +75°C
Storage temperature	-40 ~ +85°C
Vibration	EN 50155 and EN11373.
EMC immunity	EN61326-1 (EN61000-4-2, 3, 4, 5, 6)

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Appendix C

Modbus Table

Switch Status

Address	Status	Address	
10000	Ring Pair 1 Enable	10004	Power 1 Fail
10001	Ring Pair 2 Enable	10005	Power 2 Fail
10002	0 : Ring Protocol 1 : Spanning Tree Protocol	10006	Relay output
10003	Secondary switch	10007	Master

Link Status

Address	Status	Address	
10008	Link on port 1	10016	Link on port 9
10009	Link on port 2	10017	Link on port 10
10010	Link on port 3	10018	Link on port 11
10011	Link on port 4	10019	Link on port 12
10012	Link on port 5	10020	Link on port 13
10013	Link on port 6	10021	Link on port 14
10014	Link on port 7	10022	Link on port 15
10015	Link on port 8	10023	Link on port 16

Forwarding Status

Address	Status	Address	
10024	Port 1 is forwarding	10032	Port 9 is forwarding
10025	Port 2 is forwarding	10033	Port 10 is forwarding
10026	Port 3 is forwarding	10034	Port 11 is forwarding
10027	Port 4 is forwarding	10035	Port 12 is forwarding
10028	Port 5 is forwarding	10036	Port 13 is forwarding
10029	Port 6 is forwarding	10037	Port 14 is forwarding
10030	Port 7 is forwarding	10038	Port 15 is forwarding
10031	Port 8 is forwarding	10039	Port 16 is forwarding

Communication Status

Address	Status	Address	
10040	Port 1 lose pair port	10048	Port 9 lose pair port
10041	Port 2 lose pair port	10049	Port 10 lose pair port
10042	Port 3 lose pair port	10050	Port 11 lose pair port
10043	Port 4 lose pair port	10051	Port 12 lose pair port
10044	Port 5 lose pair port	10052	Port 13 lose pair port
10045	Port 6 lose pair port	10053	Port 14 lose pair port
10046	Port 7 lose pair port	10054	Port 15 lose pair port
10047	Port 8 lose pair port	10055	Port 16 lose pair port

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Digital Input & Output

Address	Status	Address	
10057	Digital Input channel 1	00001	Digital Output channel 1
10058	Digital Input channel 2	00002	Digital Output channel 2
10059	Digital Input channel 3	00003	Digital Output channel 3
10060	Digital Input channel 4	00004	Digital Output channel 4
10061	Digital Input channel 5	00005	Digital Output channel 5
10062	Digital Input channel 6	00006	Digital Output channel 6
10063	Digital Input channel 7	00007	Digital Output channel 7
10064	Digital Input channel 8	00008	Digital Output channel 8

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Appendix E

Ingress Protection (IP)

An IP number is used to specify the environmental protection of enclosures around electronic equipment. These ratings are determined by specific tests.

The IP number is composed of two numbers, the first referring to the protection against solid objects and the second against liquids. The higher the number is, the better the protection.

Note: All ICP DAS *MS Series* devices are manufactured and tested to IEC IP30 standards.

First Number

0	No protection (Sometimes X)
1	Protected against solid objects up to 50mm³
2	Protected against solid objects up to 12mm³
3	Protected against solid objects up to 2.5mm³
4	Protected against solid objects up to 1mm³
5	Protected against dust, limited ingress (no harmful deposit)
6	Totally protected against dust

Second Number

0	No protection (Sometimes X)
1	Protection against vertically falling drops of water (e.g. condensation)
2	Protection against direct sprays of water up to 15 degrees from vertical
3	Protection against direct sprays of water up to 60 degrees from vertical
4	Protection against water sprayed from all directions - limited ingress permitted
5	Protected against low pressure jets of water from all directions - limited ingress permitted
6	Protected against low pressure jets of water, limited ingress permitted (e.g. ship deck)
7	Protected against the effect of immersion between 15cm and 1m
8	Protected against long periods of immersion under pressure

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Appendix F

Accessories

Power Supply (KA-52F/DIN-KA52F)

Features & Specifications

Input Range : 100~250AC

Input Frequency : 50Hz to 60 Hz

Output : 24Vdc/1Amp max.

Output Power : 25Watts

Operating Temperature:0 to 70℃

Storage Temperature : -40 to 85℃

Demension :

65 x 105 x 36mm (KA-52F)

68 x 107 x 50mm (DIN-KA52F)

Part No. Information

KA-52F	24V/1A output power supply
DIN-KA52F	24V/1A output power supply with DIN-Rail Mount

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