

# MOXA *NSwitch Outdoors*

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## User's Manual

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# MOXA *N*Switch *O*utdoors User's Manual

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# Table of Contents

<b>Chapter</b>		
<b>Chapter 1</b>	<b>Introduction .....</b>	<b>1-1</b>
	Overview.....	1-2
	Package Checklist.....	1-2
	Features.....	1-3
<b>Chapter 2</b>	<b>How to Use NSwitch Outdoors.....</b>	<b>2-1</b>
	How MOXA NSwitch Outdoors Operates .....	2-2
	Fiber Port.....	2-2
	Dual-Speed Functionality and Switching .....	2-2
	Switching, Filtering, and Forwarding .....	2-3
	Switching and Address Learning.....	2-3
	Auto-Negotiation and Speed-Sensing.....	2-3
	Front Panel.....	2-4
	Connecting Ethernet Media, and Special Strain-Relief Feature .....	2-4
	Connecting Fiber Optic SC-type, “Snap-In” .....	2-5
	LED Display .....	2-6
	Power Input.....	2-6
	Connecting a DC Power Source .....	2-6
	Connecting an AC Power Source .....	2-7
	Installation .....	2-8
	Locating MOXA NSwitch Outdoors .....	2-8
	Troubleshooting.....	2-9
<b>Chapter 3</b>	<b>Technical Information .....</b>	<b>3-1</b>
	Pin Assignments and Cable Wiring .....	3-2
	Pin Assignment for Switch Ports.....	3-2
	Straight Through Cable Wiring—Switch Port to NIC or Uplink Port.....	3-2
	Cross Over Cable Wiring—Switch Port to Switch Port .....	3-3
	Specifications.....	3-4
	Ordering Information.....	3-5
	Regulatory Notices .....	3-6
	FCC Statement.....	3-6
	European Compliance Information.....	3-6

**Chapter 4    Service Information..... 4-1**  
MOXA Internet Services .....4-2  
Problem Report Form .....4-3  
Return Procedure .....4-4



# 1

## Introduction

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Welcome to Moxa NSwitch Outdoors, a rugged Industrial Ethernet Switch designed for use in critical outdoor and factory-type environments.

- ❑ **Overview**
- ❑ **Package Checklist**
- ❑ **Features**

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## Overview

There is currently a move to use TCP/IP Ethernet technology in settings far removed from the air-conditioned comfort of the business office. This means that it may be necessary to install network devices in such diverse settings as in or near a factory building, next to a traffic light, or even in a remote mountain tunnel. But this calls for a different type of network equipment required to withstand the extreme environmental conditions that accompany such applications.

MOXA NSwitch Outdoors is an Industrial Ethernet Switch designed to work well in outdoor or factory-type environments. It runs reliably in very extreme temperatures, from -40°C to 70°C (something that commercial switches simply can't match), and its rugged steel casing is designed to keep problem elements, such as smoke, spiders, and insects, from reaching the switch's interior. This means that this plenum rated switch will not be damaged by smoke produced when nearby equipment catches fire. And when placed in waterproof metal enclosures, such as NEMA 4 boxes, MOXA NSwitch Outdoors can be used in all-weather environments. Another important factor to consider is reliability. Equipment placed in an outdoor environment is often located in remote or hard to reach places, and consequently should run trouble free for many years. MOXA NSwitch Outdoors has an extremely long MTBF (Mean Time Before Failure) of more than 15 years, unbeatable when compared to competitors' products, guaranteeing minimal maintenance effort for maximal operation hours.

With six RJ45 ports, and two additional 100BaseFX ports used to cascade multiple switches that belong to the same network, MOXA NSwitch Outdoors is ideal for connecting disconnected pockets of devices that should logically all belong to the same network. For example, one switch could be installed to connect Ethernet devices at one busy intersection, with fiber optic cable used to cascade to another switch located at a different intersection. The same strategy could be used to connect switches attached to different parts of the same building, or switches located on different buildings. An important benefit to using fiber optic cable to cascade between switches is that this type of cable is immune to electrical interference caused by lightning, power transformers, and the switching on and off of large motors.

## Package Checklist

MOXA NSwitch Outdoors is shipped with the following items. If any of these items is missing or damaged, please contact your customer service representative for assistance.

- MOXA NSwitch Outdoors
- User's Manual
- MOXA Product Warranty booklet

## Features

- ❑ Extended operating temperature, from -40°C to 70°C, suitable for outdoor industrial applications.
- ❑ Comes in models with various power sources: -48 VDC, 24 VDC, or 5 VDC; AC power usable with ETP unit.
- ❑ Rugged, sealed 18-gauge high-strength steel case prevents problem elements from reaching the interior of NSwitch Outdoors.
- ❑ Provides two 100BaseFX fiber ports used to cascade units belonging to the same network system.
- ❑ Six 10/100BaseT RJ45 ports for cost effective and fast network expansion.
- ❑ Auto-sensing 10/100 Mbps and full/half duplex for very easy installation.



# 2

## How to Use NSwitch Outdoors

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This chapter includes instructions on how to install and use MOXA NSwitch Outdoors.

- ❑ **How MOXA NSwitch Operates**
- ❑ **Front Panel**
- ❑ **LED Display**
- ❑ **Power Input**
- ❑ **Installation**
- ❑ **Troubleshooting**

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## How MOXA NSwitch Outdoors Operates

In this section, we describe some of the basic factors involved in the operation of MOXA NSwitch Outdoors.

### Fiber Port

MOXA NSwitch Outdoors' Ethernet fiber switched ports operate at a fixed 100 Mbps speed and full-duplex mode to provide the best performance. The fiber ports are factory-built as either a multi-mode or single-mode SC connector. A yellow label on the fiber port connector indicates that it is single-mode; the absence of a yellow label indicates the port is multi-mode. The 100 Mbps fiber ports are switched ports, and perform as a domain, providing a high bandwidth backbone connection and supporting long fiber cable distances (up to 2 km multi-mode, or 20 km single-mode) for installation versatility.

### Dual-Speed Functionality and Switching

MOXA NSwitch Outdoors has six 10/100 Mbps RJ45 switched ports, and two 100 Mbps fiber ports. The architecture supports a dual-speed switching environment, with two built-in full-duplex "future-proof" fiber ports. The six RJ45 copper ports all have auto-negotiation capability.

The switched RJ45 ports are full/half duplex and auto-sense the transmission speed. When the connected device transmits at 10 Mbps, NSwitch Outdoors automatically follows all the rules associated with 10 Mbps Ethernet configurations. Even though 10 Mbps users share a 10 Mbps traffic domain, they can still communicate with 100 Mbps users connected to a 100 Mbps domain. Similarly, 100 Mbps traffic obeys the rules of a 100 Mbps Ethernet, and is fully capable of communicating with 10 Mbps domains.

All MOXA NSwitch Outdoors units are plug-and-play devices. Software configuration is not required at installation, or during maintenance. The half/full duplex mode for the switched RJ45 ports is user dependent and changes (by auto-negotiation) to full or half duplex, depending on which transmission speed is supported by the attached device. The switch's internal functions are described below.

### Switching, Filtering, and Forwarding

Each time a packet arrives at one of the switched ports, a decision is made to either filter or forward the packet. Packets with source and destination addresses belonging to the same port segment will be filtered, constraining those packets to one port, and relieving the rest of the network from the need to process them. A packet with destination address on another port segment will be forwarded to the appropriate port, and will not be sent to the other ports where it is not needed. Packets that are used in maintaining the operation of the network (such as the occasional multi-cast packet) are forwarded to all ports.

MOXA NSwitch Outdoors operates in the store-and-forward switching mode, which eliminates bad packets and enables peak performance to be achieved when there is heavy traffic on the network.

### Switching and Address Learning

MOXA NSwitch Outdoors units have an address table that can hold up to 16K of node addresses, and are suitable for use with large networks. They are self-learning, so that as nodes are added or removed, or moved from one segment to another, the switch automatically keeps up with new node locations.

An address-aging algorithm causes the least-used addresses to be deleted in favor of newer, more frequently used addresses. To reset the address buffer, power down the unit and then power it back up.

### Auto-Negotiation and Speed-Sensing

All six RJ45 ports independently support auto-negotiation for speeds in the 10BASE-T and 100BASE-TX modes, with operation according to the IEEE 802.3u standard. This means that some nodes could be operating at 10 Mbps, while at the same time, other nodes are operating at 100 Mbps.

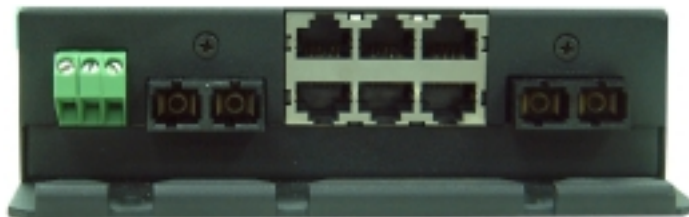
Auto-negotiation takes place when an RJ45 cable connection is made, and then each time a LINK is enabled. NSwitch Outdoors advertises its capability for using either 10 Mbps or 100 Mbps transmission speeds, with the device at the other end of the cable expected to similarly advertise. Depending upon what type of device is connected, this will result in agreement to operate at either 10 Mbps or 100 Mbps speed.

When the 'LNK/ACT' LED is ON, steady ON indicates a normal network LINK, but with no traffic, whereas blinking ON indicates the port is transmitting/receiving. In general, the port will have auto-negotiated for the operating speed. (If an NSwitch Outdoors RJ45 port is connected to a non-negotiating device, it will default to 10 Mbps speed and half-duplex mode, as required by the IEEE 802.3u standard).

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## Front Panel

The front panel of MOXA NSwitch Outdoors has 6 RJ45 twisted-pair ports and two 100 Mbps full-duplex fiber ports, one on each side of the RJ45 ports, as shown in the accompanying pictures.



Front panel—OS5008/24V model




Front panel—OS5008/5V model

## Connecting Ethernet Media, and Special Strain-Relief Feature

Moxa NSwitch Outdoors can be connected to the following three media types: 100Base-TX, 10BASE-T, and 100BASE-FX. CAT 5 cables should be used when making 100BASE-TX connections. When the ports are used as 10BASE-T ports, CAT 3 may be used. In either case, the maximum distance for unshielded twisted pair cabling is 100 meters (328 ft). For the fiber port's 100BASE-FX multi-mode, 50/125 or 62.5/125 micron cabling can be used, whereas for single-mode, 9/125 micron cabling should be used. Fiber cabling supports much longer cable distances and higher bandwidths as compared to copper wiring.


<b>Media</b>	<b>IEEE Standard</b>	<b>Connector</b>
Twisted Pair (CAT 3 or 5)	10BASE-T	RJ-45
Twisted Pair (CAT 5)	100BASE-TX	RJ-45
Fiber (Multi-mode)	100BASE-FX	SC
Fiber (Single-mode)	100BASE-FX	SC

 *NOTE: It is recommended that high quality CAT. 5 cables (which work for both 10 Mbps and 100 Mbps) be used whenever possible in order to provide flexibility in a mixed-speed network, since MOXA NSwitch Outdoors ports are auto-sensing for either 10 and 100 Mbps. Keep in mind that the auto-sensing function senses the network transmission rate—it does not sense cable type.*

### Connecting Fiber Optic SC-type, “Snap-In”

The following procedure applies to installations using SC-type fiber connectors, and to ports using multi-mode SC fiber connectors.

1. Before connecting the fiber optic cable, remove the protective dust cap/plug from the end of the fiber connectors, exposing the port’s orifice. Save the dust cover/plug for future use, such as when the fiber cable needs to be unplugged for servicing.
2. Wipe the ends of the dual connectors clean with a soft cloth or lint-free lens tissue dampened with alcohol. **Make certain the connectors are clean before completing the connection.** After that, insert the square male connector into the SC female jack of the fiber port connector until it clicks and secures.

 *NOTE: One strand of the duplex fiber optic cable may be coded using color bands at regular intervals; you should use the color-coded strand on the associated ports at each end of the fiber optic cable segment.*

3. Connect the Transmit (TX) port on the MOXA NSwitch Outdoors Fiber port to the Receive (RX) port of the remote device. Begin with the color-coded strand of the cable for this first TX-to-RX connection. Note that the two male square-end SC cable strands can be fastened together to plug as a unit.
4. Connect the Receive (RX) port to the Transmit (TX) port of the remote device. Use the non-color coded fiber strand for this.
5. The LINK LED for the fiber connector will illuminate when a proper connection has been established at both ends (and when the unit’s power is ON). If the LINK LED is not lit after connecting the cable, the usual cause is improper cable polarity. Swap the fiber cables at the fiber connector to remedy the situation.

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## LED Display

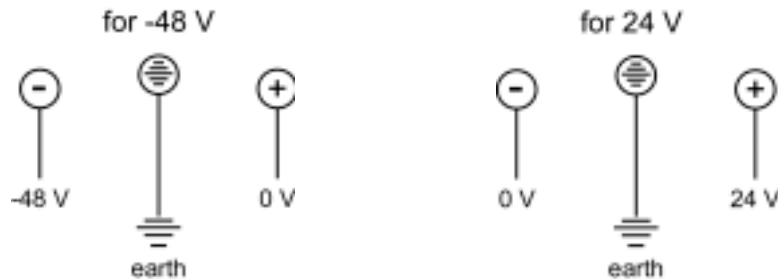
The table below indicates the function of each LED.

LED	Color	Description
Power	GREEN	Power is Applied
	OFF	Power is OFF
Self Test	ON	Controller HW Error
	OFF	No Errors; Normal Operation
LNK/ACT	ON	Link between ports established
	OFF	No Link between ports
	Blinking	Data is being transmitted
F/H	ON	Port is full duplex
	OFF	Port is half duplex
10/100	ON	Port is 100 Mbps
	OFF	Port is 10 Mbps

## Power Input

### Connecting a DC Power Source

The DC power plug connector is located on the left front of the MOXA NSwitch Outdoors unit. The switch is designed for power input of 20 – 70 VDC auto-ranging, and can support general use -48 VDC or 24 VDC. Refer to the figures below to see how to attach power cables to the unit.



### Connecting an AC Power Source

NSwitch Outdoors is a rugged switch used mainly for Industrial and Outdoor Ethernet applications at extreme temperatures, and supports universal AC power input from 85 – 275 VAC, 50 – 60 Hz through a separate Power Source unit, called the OS-ETP. The wide range of AC power input qualifies this product for use worldwide, in almost any temperature environment. The AC power source (OS-ETP) provides a rugged power supply enclosed in a metal case that also acts as a heat sink, enabling extended application temperatures to be accommodated. The OS-ETP also includes surge protection to withstand AC power surges, such as might result from nearby lightning strikes. Shock and vibration characteristics enable use in transportation applications such as ships, trains, and roadside boxes. The DC power output cord comes with a military-style screw-lock female plug for secure attachment to NSwitch Outdoors.

**Input Voltage:** 85 – 264 VAC, 47 – 63 Hz, auto-ranging

**AC Power Connector:** IEC-type, male recessed

**Power Output:** 5 VDC, 3 Amps max

**Input Fuse for overload and short protection:**


3 AG type, 0.5 Amp (spare included)

**Power Capacity:** 15 watts output, 70% min. efficiency

**Surge Protection:** over 150 joules, with clamping at 800V, 50A min.

**Operating Shock and Vibration:**

meets Bellcore GR-63-CORE Sections 4.4.1 and 4.4.3

 *NOTE: For best results at high temperatures, fasten the metal case of the OS-ETP unit so that it is in contact with a vertical surface (such as pedestal) that has good heat conducting properties. Remove rubber feet, if present, to enhance metal-to-metal contact and provide the best heat transfer away from the PSX-A unit.*

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## Installation

This section provides instructions on how and where to install your MOXA NSwitch Outdoors unit.

### Locating MOXA NSwitch Outdoors

The location of NSwitch Outdoors depends on the physical layout of the network. We describe here the type of setting that you must prepare. The rugged 18-gauge steel case, which acts as a heat sink, will protect the switch from accidental damage in many workplace settings. Install the unit so that the metal case of the unit is in contact with another metal surface (such as a pedestal in the earth or an equipment enclosure box) which does not exceed the ambient rating of the unit. You may use any 20 – 70 VDC three-wire (+, GND, -) power source that is located within the range of the site at which NSwitch Outdoors will be placed. If you will need to monitor the switch's top-cover status LEDs, then be sure to leave the switch's top surface open to view.

#### Mounting NSwitch Outdoors on a Horizontal Surface

MOXA NSwitch Outdoors can be easily mounted on a metal tabletop, shelf, or any suitable horizontal surface, but must be secured with the appropriate screws. Do not place the unit on any kind of rubber “feet” or other material that insulates it from the supporting metal surface. The full temperature rating of the unit cannot be achieved if it is not properly mounted on metal.

#### Mounting NSwitch Outdoors on a Vertical Surface

Because of its 18-gauge high-strength steel casing, MOXA NSwitch Outdoors is relatively heavy. This means that when mounting the switch on a vertical surface, it is extremely important to choose a strong metal surface on which to mount the switch. It is essential that NSwitch Outdoors is attached to a metal surface, since the metal surface provides strong support and aids heat transfer from the case.

When NSwitch Outdoors is mounted on a vertical surface, the switch is usually oriented so that the cable connectors are on the bottom, with strong screws used to attach the switch to the vertical supporting surface. The base plate of the switch has four pre-cut screw holes, with two at the front and two at the rear of the base plate. As an aid in drilling pilot holes on the supporting surface, note that the spacing for the mounting screws, measured from the centers of the screw holes, is a rectangle with approximate dimensions of  $8.25 \times 21$  cm. Four user-supplied screws should be used to attach the NSwitch Outdoors base plate to the vertical mounting surface.

### Cable strain relief

MOXA NSwitch Outdoors is designed for use in harsh environments, with the extended temperature feature qualifying them to be used at roadside traffic data collection and control stations, high temperature industrial plants, plenums, and ceiling locations in commercial buildings. They are usually mounted vertically with the cables hanging out the bottom. To protect the cables, a cable strain relief feature is built into the package design.

MOXA NSwitch Outdoors has a tie wrap holder built into the base plate of the unit. The tie wrap holder can be used for cable strain relief, with the strain relief feature applicable to power cables as well as to Ethernet cables (both twisted-pair copper and fiber). Cable tie-wraps can secure the cables and can be attached to the base plate HOOK provided at the bottom-front of the unit. If someone or something pulls on the attached cable, the tie-wrap cable strain relief feature protects the cable connection from coming loose. This feature provides a more reliable and robust installation and operation of the switch.



## Troubleshooting

All MOXA Industrial Ethernet products are designed to provide reliability and consistently high performance in all network environments.

Should problems arise during installation or operation, please refer to this section to help locate, identify, and correct these types of problems. The suggestions listed below should be followed before contacting your supplier. If you are unsure of the procedures described in this section, or if NSwitch Outdoors is not performing as expected, do not attempt to repair the unit yourself. Instead, contact your supplier for assistance or contact MOXA Customer Support directly.

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## Before Calling for Assistance

1. If you encounter problems when installing or operating NSwitch Outdoors, refer to the Installation section of this chapter. Also, check to make sure that the various network components are operating correctly.
2. Check the cables and connectors to ensure that they have been properly connected and that the cables and wires have not been crimped or impaired in some way during installation. This is an extremely important point, since about 90% of network downtime can be attributed to problems with wiring and connectors.
3. Make sure that a power cord is properly attached to each NSwitch Outdoors unit. Use the PWR LEDs to verify each unit is receiving power.
4. If the problem is isolated to a network device other than the MOXA NSwitch Outdoors unit, it is strongly recommended that the problem device be replaced with a device which is known to be operating correctly. After replacing the faulty device, verify that the problem has been corrected. If not, go to Step 5 below.

If the problem has been corrected, then NSwitch Outdoors and its associated cables are functioning properly.

5. If the problem continues after completing Step 4 above, contact your NSwitch Outdoors supplier, or if the supplier is unknown, contact MOXA directly. We may be contacted by fax, phone, or e-mail.

# 3

## Technical Information

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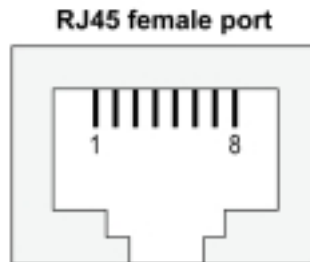
This chapter includes technical information about your new MOXA NSwitch Outdoors.

- ❑ **Pin Assignments and Cable Wiring**
- ❑ **Specifications**
- ❑ **Ordering Information**
- ❑ **Regulatory Notices**

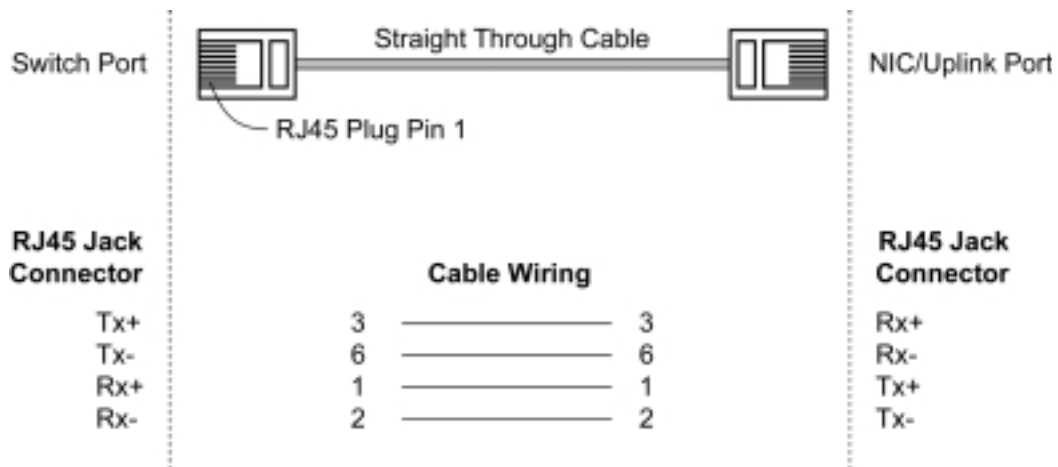
## Pin Assignments and Cable Wiring

### Pin Assignment for Switch Ports

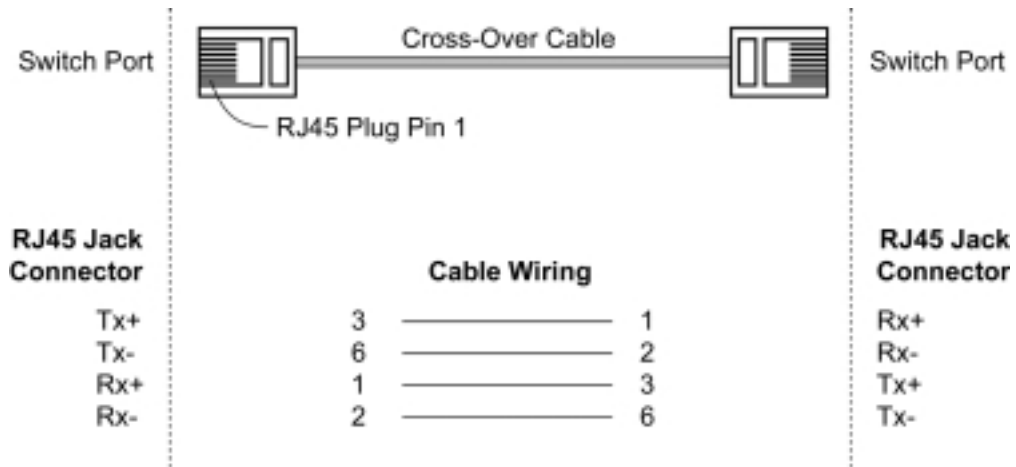
Pin	Signals
1	Rx+
2	Rx-
3	Tx+
4	----
5	----
6	Tx-
7	----
8	----



### Straight Through Cable Wiring—Switch Port to NIC or Uplink Port



### Cross Over Cable Wiring—Switch Port to Switch Port



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## Specifications

### *Interface*

RJ45 ports	6 ports for 10/100BaseT(X)
Fiber ports	2 SC fiber ports for 100BaseFX
LED Indicators	Power, Self-test, 100BaseTX (On = 100 MB; Off = 10 MB),
LNK/ACT	LED, F/H LED (ON for full-duplex mode, OFF for half-duplex)

### *Technology*

Standards	IEEE802.3u, IEEE802.3
Performance	Auto Negotiation speed and F/H duplex mode for each RJ45 10/100BaseT(X) port
Processing type	Store and Forward, with IEEE802.3x full duplex, non-blocking flow control
Forwarding and filtering rate	148800 pps for 100M; 14880 pps for 10M
Packet buffers	1 MB
Address Table size	16 K nodes
Latency	Less than 5 $\mu$ s (not including packet time)
Distance	20 km for Single mode fiber; 2 km for Multi mode fiber

### *Power*

OS5008/24V Input	20 – 70 VDC auto-ranging, floating + and - lugs
OS5008/5V Input	5 VDC, screw-lock connector, typically for use with ETP Power Source rated at 15W for a temperature range of -40°C to 70°C
Power Consumption	10W typical

### *Mechanical*

Enclosure	Rugged 18-gauge high-strength steel case
Dimensions	14.6 × 4.3 × 22.5 cm (W × D × H)
Weight	1.6 kg

### *Environment*

Ambient Temperature	-40 – 70°C (-40 – 160°F)
Cold Start	down to -20°C
Storage Temperature	-40 – 85°C (-40 – 185°F)
Ambient Relative Humidity	10 – 95% (non-condensing)
Operating Altitude	up to 15,000 ft (4572 m)
Regulatory Approvals	FCC, CE, UL, C/UL
Operating Shock and Vibration	Meets Bellcore GR-63-CORE Sections 4.4.1 and 4.4.3
MTBF	15+ years, Bellcore Method
WARRANTY	Five years

## Ordering Information

### *Models*

OS5008/24V-MM-SC

Includes:

- Industrial Ethernet Switch with 2 multi mode 100BaseFX ports, SC type connector
- 20 – 70 VDC auto-ranging power input
- Extended operating temperature, from –40°C to 70°C

OS5008/24V-MS-SC

Includes:

- Industrial Ethernet Switch with 1 multi mode and 1 single mode 100BaseFX port, SC type connector
- 20 – 70 VDC auto-ranging power input
- Extended operating temperature, from –40°C to 70°C

OS5008/24V-SS-SC

Includes:

- Industrial Ethernet Switch with 2 single mode 100BaseFX ports, SC type connector
- 20 – 70 VDC auto-ranging power input
- Extended operating temperature, from –40°C to 70°C

OS5008/5V-MM-SC

Includes:

- Industrial Ethernet Switch with 2 multi mode 100BaseFX ports, SC type connector
- 5 VDC, screw-lock connector, power input
- Extended operating temperature, from –40°C to 70°C

OS5008/5V-MS-SC

Includes:

- Industrial Ethernet Switch with 1 multi mode and 1 single mode 100BaseFX port, SC type connector
- 5 VDC, screw-lock connector, power input
- Extended operating temperature, from –40°C to 70°C

OS5008/5V-SS-SC

Includes:

- Industrial Ethernet Switch with 2 single mode 100BaseFX ports, SC type connector
- 5 VDC, screw-lock connector, power input
- Extended operating temperature, from –40°C to 70°C

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*All Models include*

- 6 10/100BaseTx ports
- User's Manual

OS-ETP

Includes:

- Extended Temperature Power
- Rated at 15W at a temperature range of -40°C to 70°C
- 5 VDC, screw-lock connector, power output

## **Regulatory Notices**

### **FCC Statement**

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference.
- (2) This device must accept any interference received, including interference that may cause undesired operation.

### **European Compliance Information**

Warning: This is a class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

# 4

## Service Information

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This chapter shows you how to contact Moxa, both for information about this and other products, and how to report problems.

- ❑ **MOXA Internet Services**
- ❑ **Problem Report Form**
- ❑ **Return Procedure**

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## MOXA Internet Services

Customer satisfaction is our number one concern. To ensure that customers receive the full benefit of our products, Moxa Internet Services has been set up to provide technical support, driver updates, product information, and user's manual updates.

The following services are provided

E-mail for technical support ..... [service@moxa.com.tw](mailto:service@moxa.com.tw)

FTP site for free driver updates ..... <ftp://ftp.moxa.com> or

..... <ftp://ftp.moxa.com.tw>

user ID ..... *ftp*

password ..... *your\_email\_address*

World Wide Web (WWW) Site for product information:

..... <http://www.moxa.com> or

..... <http://www.moxa.com.tw>

## Problem Report Form

### *MOXA NSwitch Outdoors*

<b>Customer name:</b>	
<b>Company:</b>	
<b>Tel:</b>	<b>Fax:</b>
<b>Email:</b>	<b>Date:</b>

1. **Moxa Product:**  OS5008/24V-MM-SC  OS5008/24V-MS-SC  OS5008/24V-SS-SC  
 OS5008/5V-MM-SC  OS5008/5V-MS-SC  OS5008/5V-SS-SC  
 OS-ETP
2. **Serial Number:** \_\_\_\_\_

**Problem Description:** Please describe the symptoms of the problem as clearly as possible, including any error messages you see. We may need to follow your description to reproduce the symptoms, so please give a complete description of the problem.

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## Return Procedure

For product repair, exchange, or refund, the customer must:

- ❖ Provide evidence of original purchase.
- ❖ Obtain a Product Return Agreement (PRA) from the sales representative or dealer.
- ❖ Fill out the Problem Report Form (PRF). Include as much detail as possible for a shorter product repair time.
- ❖ Carefully pack the product in an anti-static package, and send it, pre-paid, to the dealer. The PRA should be visible on the outside of the package, and include a description of the problem, along with the return address and telephone number of a technical contact.