

# **Moxa EtherDevice™ Switch**

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## **EDS-405 User's Manual**

**Fifth Edition, June 2008**



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# **Moxa EtherDevice™ Switch**

## **EDS-405 User's Manual**

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**Appendix A    Product Specifications..... A-1**

Welcome to Moxa EDS-405 Series, the new generation of EtherDevice™ Switch that comes with “Moxa Turbo Ring,” developed by Moxa for industrial Ethernet switches. With this plug-n-play ring redundancy solution, your industrial automation and control applications can operate non-stop.

The following topics are covered in this chapter:

- ❑ **Overview**
- ❑ **Package Checklist**
- ❑ **Product Features**
- ❑ **Panel Layout of EDS-405**
- ❑ **Panel Layout of EDS-405-MM/SS-SC**
- ❑ **Panel Layout of EDS-405-MM-ST**

# Overview

EDS-405 Series, the new generation of EtherDevice™ Switch, includes 4 models: EDS-405, EDS-405-MM-SC, EDS-405-SS-SC, and EDS-405-MM-ST, referred to collectively as EDS-405. EDS-405 is a 5-port Ethernet switch specially designed for industrial automation and control systems. It comes with the plug-n-play Moxa Turbo Ring, which is used to establish an Ethernet redundant ring topology. Turbo Ring can begin transmitting automatically over a redundant path in under 300 ms, increasing the reliability of your system.

The built-in relay output function helps you monitor each port's link status, each power input's status, and the health of the Turbo Ring topology. This relay output warning function enables your maintenance engineers to react promptly to emergency situations.

Commercial Ethernet switches need 3 to 5 minutes to recover the connection when you unplug your device from one port, and then plug it into another port for field diagnosis. The Line-Swap Fast Recovery feature responds in less than 1 second, allowing you to complete your diagnosis in a much shorter time period.

EDS-405 has a wide operating temperature range of -40 to 75°C, and is designed to withstand a high degree of vibration and shock. The rugged hardware design makes EDS-405 perfect for ensuring that your Ethernet equipment can withstand critical industrial applications, such as in hazardous locations (UL/cUL Class 1 Division 2 and ATEX Class 1 Zone 2), and complies with FCC, TÜV, UL, and CE Standards.

The redundant dual DC power inputs give you extra assurance that your switch will operate non-stop, and the versatile installation options—by DIN-Rail or wall mounting—makes it easy to fit EDS-405 into any environment.

## Package Checklist

Moxa EDS-405 is shipped with the following items:

### *Standard Accessories*

- 1 Switch: EDS-405, EDS-405-MM-SC, EDS-405-SS-SC, or EDS-405-MM-ST
- EDS-405 User's Manual
- Product Warranty Booklet
- Protective caps for unused ports

### *Optional Accessories*

- WK-46 Wall Mounting Kit

*NOTE: Notify your sales representative if any of the above items is missing or damaged.*

## Product Features

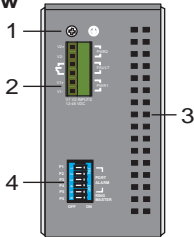
EDS-405 has the following features:

- Plug-n-play, ring redundancy solution (recovery time < 300 ms)
- Relay output alarm for power failure, port break, or Turbo Ring break.
- 10/100M, full/half-duplex, MDI/MDI-X auto-sensing for 100BaseT(X) port
- Redundant dual DC power inputs
- Line-Swap Fast Recovery (patent pending)
- DIN-Rail or optional wall mounting
- Operating temperature ranges from 0 to 60°C, or extended operating temperature from -40 to 75°C for “-T” models



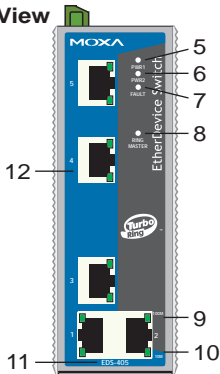
## Panel Layout of EDS-405

Top View



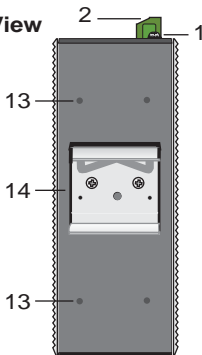
1. Grounding screw
2. Terminal block for power input PWR1/PWR2 and relay output
3. Heat dissipation orifices
4. Dip switches

Front View



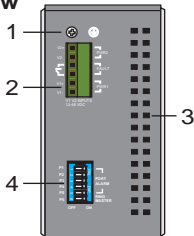
5. Power input PWR1 LED
6. Power input PWR2 LED
7. Fault LED
8. Ring Master LED
9. TP port's 100 Mbps LED
10. TP port's 10 Mbps LED
11. Model Name
12. 10/100BaseT(X) Port
13. Screw hole for optional wall mounting kit
14. DIN-Rail kit

Rear View



## Panel Layout of EDS-405-MM/SS-SC

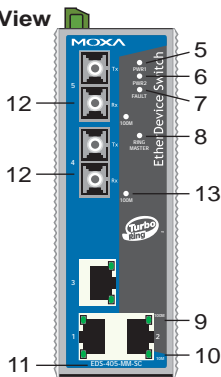
Top View



NOTE: The appearance of EDS-405-SS-SC is identical to EDS-405-MM-SC.

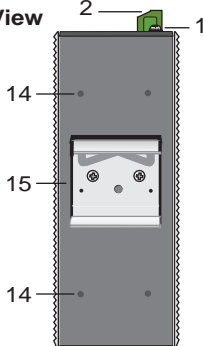
1. Grounding screw
2. Terminal block for power input PWR1/PWR2 and relay output
3. Heat dissipation orifices
4. Dip switches

Front View



5. Power input PWR1 LED
6. Power input PWR2 LED
7. Fault LED
8. Ring Master LED
9. TP port's 100 Mbps LED
10. TP port's 10 Mbps LED
11. Model Name
12. 100BaseFX Port (Single/Multi Mode)
13. FX port's 100 Mbps LED

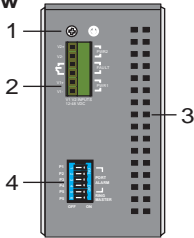
Rear View



14. Screw hole for optional wall mounting kit
15. DIN-Rail kit

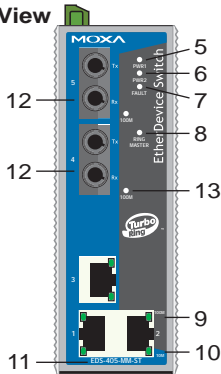
## Panel Layout of EDS-405-MM-ST

Top View



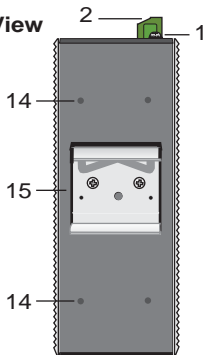
1. Grounding screw
2. Terminal block for power input PWR1/PWR2 and relay output
3. Heat dissipation orifices
4. Dip switches

Front View



5. Power input PWR1 LED
6. Power input PWR2 LED
7. Fault LED
8. Ring Master LED
9. TP port's 100 Mbps LED
10. TP port's 10 Mbps LED
11. Model Name
12. 100BaseFX Port (Multi Mode)
13. FX port's 100 Mbps LED

Rear View



14. Screw hole for optional wall mounting kit
15. DIN-Rail kit

# 2

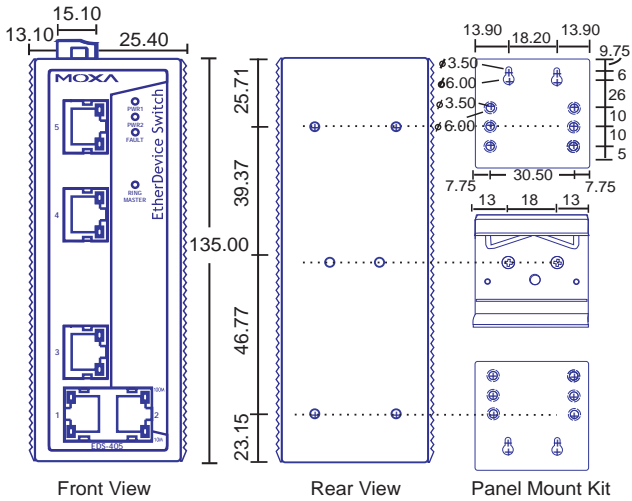
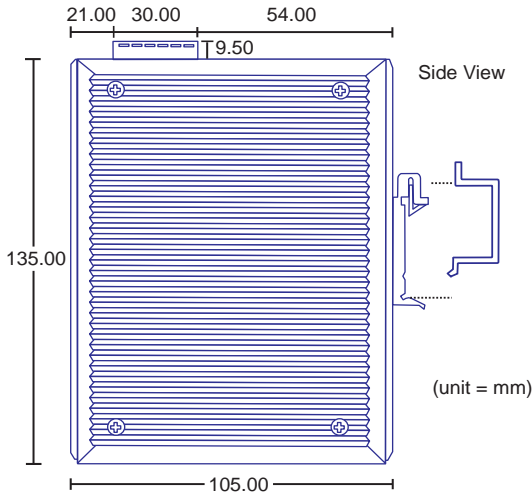
## Installing EDS-405

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This chapter includes information about how to install EDS-405. The following topics are covered:

- ❑ **Mounting Dimensions**
- ❑ **DIN-Rail Mounting**
- ❑ **Wall Mounting (Optional)**

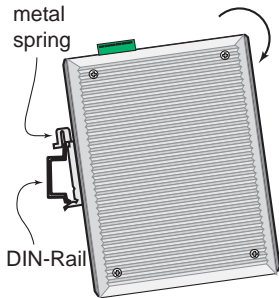
# Mounting Dimensions



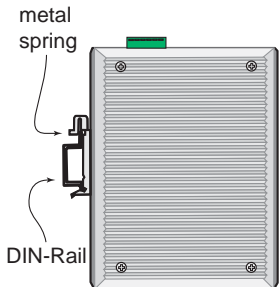
## DIN-Rail Mounting

The aluminum DIN-Rail attachment plate should already be fixed to the back panel of EDS-405 when you take it out of the box. If you need to reattach the DIN-Rail attachment plate to EDS-405, make sure the stiff metal spring is situated towards the top, as shown in the figures below.

1. Insert the top of the DIN-Rail into the slot just below the stiff metal spring.



2. The DIN-Rail attachment unit will snap into place as shown below.

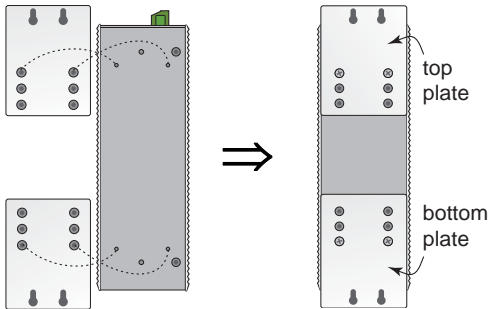


3. To remove EDS-405 from the DIN-Rail, simply reverse Steps 1 and 2 above.

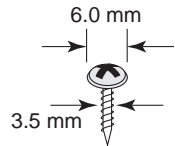
## Wall Mounting (Optional)

For some applications, you will find it convenient to mount EDS-405 on the wall, as illustrated below.

1. Remove the aluminum DIN-Rail attachment plate from EDS-405's rear panel, and then attach the wall mounting plates, as shown in the diagram below.

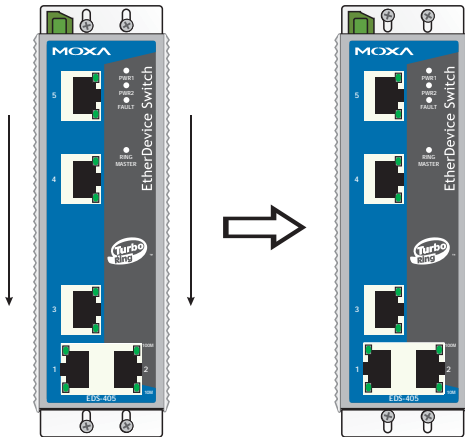


2. Mounting EDS-405 on the wall requires 4 screws. Use EDS-405, with wall mount plates attached, as a guide to mark the correct locations of the 4 screws. The heads of the screws should be less than 6.0 mm in diameter, and the shafts should be less than 3.5 mm in diameter, as shown in the figure below. Do not screw the screws in all the way—leave about 2 mm to allow room for sliding the wall mount panel between the wall and the screws.



**NOTE** Before tightening the screws into the wall, make sure the screw head and shank size are suitable by inserting the screw into one of the keyhole-shaped apertures of the Wall Mounting Plates.

- Once the screws are fixed in the wall, insert the four screw heads through the large parts of the keyhole-shaped apertures, and then slide Moxa EDS-405 downwards, as indicated below. Tighten the four screws for stability.





# 3

## Wiring EDS-405

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This chapter includes information about wiring EDS-405. The following topics are covered:

- ❑ **Wiring Requirements**
- ❑ **Grounding EDS-405**
- ❑ **Wiring the Alarm Contact**
- ❑ **Wiring the Redundant Power Inputs**
- ❑ **Communication Connections**
  - 10/100BaseT(X) Ethernet Port Connection
  - 100BaseFX Fiber Port Connection

# Wiring Requirements

In this section, we point out several items that you should pay attention to before proceeding with your installation.



### WARNING

Do not disconnect modules or wires unless the power supply has been switched off or the area is known to be non-hazardous. The devices may only be connected to the supply voltage shown on the type plate. The devices are designed for operation with a Safety Extra-Low Voltage. Thus, they may only be connected to the supply voltage connections and to the signal contact with the Safety Extra-Low Voltages (SELV) in compliance with IEC950/ EN60950/ VDE0805.




### WARNING

Substitution of components may impair suitability for Class I, Division 2 and Zone 2. These devices must be supplied by a SELV source as defined in Low Voltage Directive 73/23/EEC and 93/68/EEC.



### WARNING

This equipment has been evaluated as EEx nC IIC T4 equipment under DEMKO Certificate No. 03 ATEX 0324537U. Each module is marked  II 3G and is suitable for use in Zone 2 Explosive Atmospheres. The device must be installed in a minimum IP 54 enclosure as defined in IEC 60529 and EN 60529.



### ATTENTION

This unit is a built-in type. When the unit is installed in another piece of equipment, the equipment enclosing the unit must comply with fire enclosure regulation IEC 60950/EN60950 (or similar regulation).



### ATTENTION

#### **Safety First!**

Be sure to disconnect the power cord before installing and/or wiring your Moxa EtherDevice Switch.



### ATTENTION

#### **Wiring Caution!**

Calculate the maximum possible current in each power wire and common wire. Observe all electrical codes dictating the maximum current allowable for each wire size. If the current goes above the maximum ratings, the wiring could overheat, causing serious damage to your equipment.

You should also pay attention to the following items:

- Use separate paths to route wiring for power and devices. If power wiring and device wiring paths must cross, make sure the wires are perpendicular at the intersection point.
- **NOTE:** Do not run signal or communication wiring and power wiring in the same wire conduit. To avoid interference, wires with different signal characteristics should be routed separately.

- You can use the type of signal transmitted through a wire to determine which wires should be kept separate. The rule of thumb is that wiring that shares similar electrical characteristics can be bundled together.
- Keep input wiring and output wiring separate.
- Where necessary, it is strongly advised that you label wiring to all devices in the system.

## Grounding EDS-405

Grounding and wire routing help limit the effects of noise due to electromagnetic interference (EMI). Run the ground connection from the ground screw to the grounding surface prior to connecting devices.



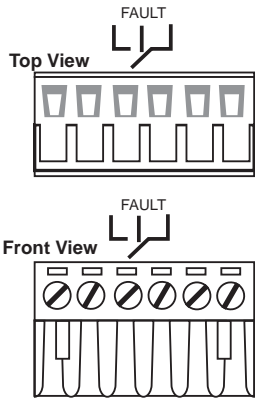
### ATTENTION

This product is intended to be mounted to a well-grounded mounting surface such as a metal panel.

## Wiring the Alarm Contact

The Alarm Contact consists of the two middle contacts of the terminal block on EDS-405's top panel. To wire the Alarm Contact, use 2 wires and connect one end of the wires to EDS-405's alarm contract. The other end of the 2 wires should be connected to your alarm devices.

We will explain the meaning of the two contacts used to connect the Alarm Contact in the following section.



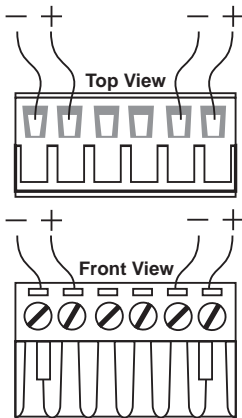
**FAULT:** The two middle contacts of the 6-contact terminal block connector are used to detect both power faults and port faults. The two wires attached to the Fault contacts form an open circuit when:

- 1. EDS-405 has lost power from one of the DC power inputs, OR
- 2. One of the ports for which the corresponding PORT ALARM Dip Switch is set to ON is not properly connected, OR
- 3. EDS-405 becomes the Ring Master of this Turbo Ring after the Turbo Ring was broken.

If none of these 3 conditions occur, the Fault circuit will be closed.

## Wiring the Redundant Power Inputs

The top right and left two contacts and the bottom two contacts of the 6-contact terminal block connector on EDS-405’s top panel are used for EDS-405’s two DC inputs. Top and front views of one of the terminal block connectors are shown here.



### **STEP 1:**

Insert the negative/positive DC wires into the V-/V+ terminals.

### **STEP 2:**

To keep the DC wires from pulling loose, use a small flat-blade screwdriver to tighten the wire-clamp screws on the front of the terminal block connector.

### **STEP 3:**

Insert the plastic terminal block connector prongs into the terminal block receptor, which is located on EDS-405's top panel.

EDS-405 has dual power inputs that can be connected simultaneously to live DC power sources. If one power source fails, the other live source acts as a backup, and automatically supplies all of Moxa EDS-405's power needs.

## Communication Connections

EDS-405-MM-SC/ST has 3 10/100BaseT(X) Ethernet ports, and 2 100BaseFX, multi-mode fiber ports (SC/ST-type connector). EDS-405-SS-SC has 3 10/100BaseT(X) Ethernet ports and 2 100BaseFX, single-mode fiber ports (SC-type connector). EDS-405 has 5 10/100BaseT(X) Ethernet ports.

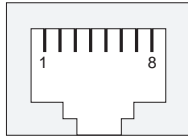
### 10/100BaseT(X) Ethernet Port Connection

The 10/100BaseT(X) ports located on the front panel of EDS-405 are used to connect to Ethernet-enabled devices.

Below we show pinouts for both MDI (NIC-type) ports and MDI-X (HUB/Switch-type) ports, and also show cable wiring diagrams for straight-through and cross-over Ethernet cables.

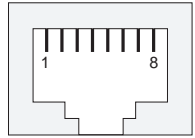
### RJ45 (8-pin, MDI) Port Pinouts

8-Pin	Description
1	Tx+
2	Tx-
3	Rx+
6	Rx-

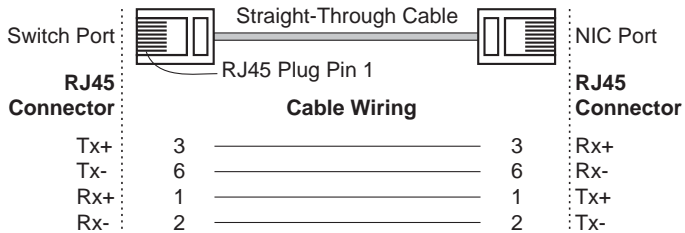


### RJ45 (8-pin, MDI-X) Port Pinouts

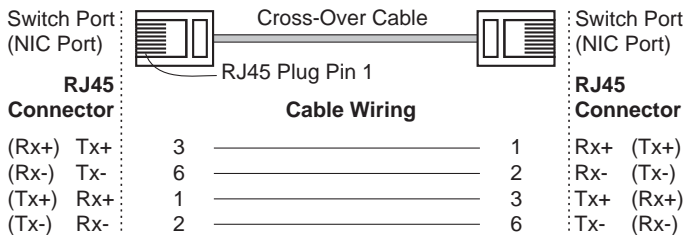
8-Pin	Description
1	Rx+
2	Rx-
3	Tx+
6	Tx-



### RJ45 (8-pin) to RJ45 (8-pin) Straight-Through Cable Wiring



### RJ45 (8-pin) to RJ45 (8-pin) Cross-Over Cable Wiring

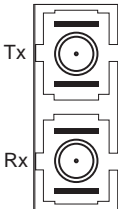


## 100BaseFX Fiber Port Connection

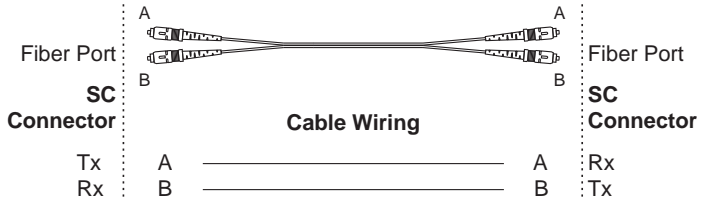
The concept behind the SC/ST port and cable is quite straightforward. Suppose you are connecting devices I and II. Contrary to electrical signals, optical signals do not require a circuit in order to transmit data. Consequently, one of the optical lines is used to transmit data from device I to device II, and the other optical line is used to transmit data from device II to device I, for full-duplex transmission.

All you need to remember is to connect the Tx (transmit) port of device I to the Rx (receive) port of device II, and the Rx (receive) port of device I to the Tx (transmit) port of device II. If you are making your own cable, we suggest labeling the two sides of the same line with same letter (A-to-A and B-to-B, as shown below).

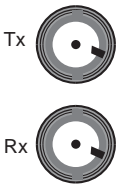
### SC-Port Pinouts



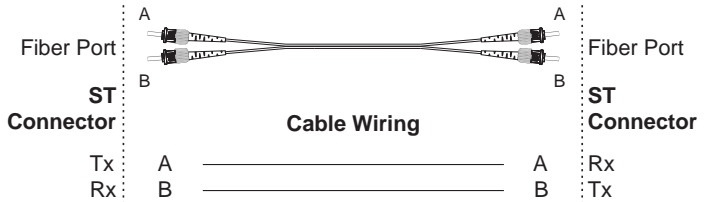
### SC-Port to SC-Port Cable Wiring



### ST-Port Pinouts



### ST-Port to ST-Port Cable Wiring







**ATTENTION**

This is a Class 1 Laser/LED product. Do not stare directly into the Laser/LED beam.

## How to Use EDS-405

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In this chapter, we give a general idea of how to use EDS-405. Some users will simply want to plug in the power, connect the switch to their Ethernet-enabled devices, and then go to work right away. Other users will want to utilize EDS-405's basic device management functions, whereas some will want to make full use of EDS-405's advanced device management functions.

This chapter includes the following sections:

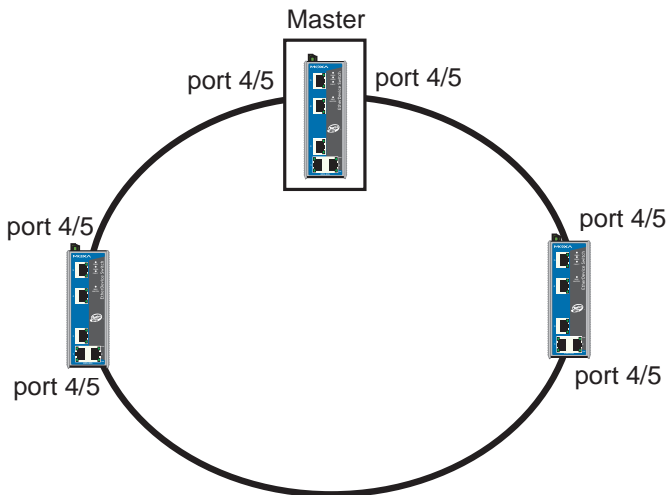
- ❑ **Supported Ethernet Network Topologies**
  - Redundant Ring Topology
  - Star-Wired Topology
- ❑ **Moxa Turbo Ring Setup**
- ❑ **Front Panel LED Indicators**
- ❑ **Dip Switch Settings**
- ❑ **Upgrading the Firmware**
- ❑ **Basic Switching Function**
  - Auto MDI/MDI-X Connection
  - Fiber Ports
  - Dual Speed Functionality and Switching
  - Switching, Filtering, and Forwarding
  - Switching and Address Learning
  - Auto-Negotiation and Speed Sensing

## Supported Ethernet Network Topologies

### Redundant Ring Topology

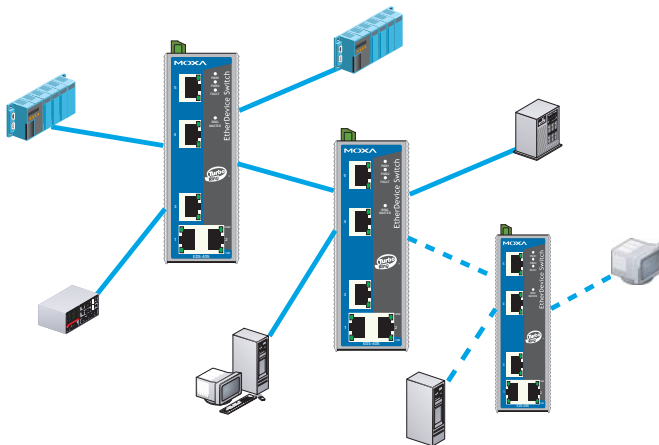
Moxa developed the proprietary Turbo Ring protocol for better network reliability and faster recovery time. Moxa Turbo Ring's recovery time is less than 300 ms compared to a 3- to 5-minute recovery time for commercial switches, decreasing the possible loss caused by network failures in an industrial setting.

The Turbo Ring protocol identifies one switch as the “master” of the network, and then automatically blocks packets from traveling through any of the network's redundant loops. In the event that one branch of this ring becomes disconnected from the rest of the network, the Turbo Ring protocol automatically readjusts the ring (if possible) so that the part of the network that was disconnected can reestablish contact with the rest of the network. The actual topology of the redundant ring, i.e., which segment will be blocked, is determined by the number of EDS-405s that make up the ring.



## Star-Wired Topology

EDS-405 can also be used to form a star-wired topology, as shown below. Since ports 4 and 5 of EDS-405 are programmed to recognize the Turbo Ring topology immediately, when using a star-wired topology, you might have to wait for the EDS-405s to negotiate and recognize that port 4 and port 5 are not being used to form a Turbo Ring topology.



**NOTE** EDS-405 is a switch with plug-and-play ring redundancy. Ports 4 and 5 are designated as the ports that should be used to form a Turbo Ring Topology. However, you can use port 4 or port 5 for other purposes. For example, such as when EDS-405 is connected to a star-wired topology. In this case, you might need to wait several seconds before data transmission begins, since EDS-405 needs to negotiate and recognize that port 4 and port 5 are not being used to form a Turbo Ring topology while it is booting up.

# Moxa Turbo Ring Setup

EDS-405 is the first plug-n-play unmanaged redundant Ethernet switch in the world. EDS-405's ports 4 and 5 are used to form a Turbo Ring. When forming the ring, connect either port 4 or 5 of one switch to port 4 or 5 of a neighboring switch. EDS-405 does not support ring coupling.

There are 6 Dip Switches on the top panel of EDS-405. The default setting of the Dip Switches is OFF. Dip Switches 1 to 5 are for enabling Port Alarms.

Dip Switch 6 is for enabling the EDS-405 to be the Ring Master, and for enabling the Turbo Ring break alarm. To designate a Ring Master, enable any EDS-405 on the network to be the Ring Master of the Turbo Ring by setting its Dip Switch 6 to ON. If you accidentally set more than one EDS-405's Dip Switch 6 to ON, then those EDS-405s whose Dip Switch 6 is set to ON will auto-negotiate to determine which one will be the Ring Master. If you don't enable any EDS-405 to be the Ring Master by setting Dip Switch 6 to ON, Turbo Ring protocol will choose the EDS-405 that has the smallest MAC address range to be the Ring Master. Another function for Dip Switch 6 is to enable the Turbo Ring break alarm.

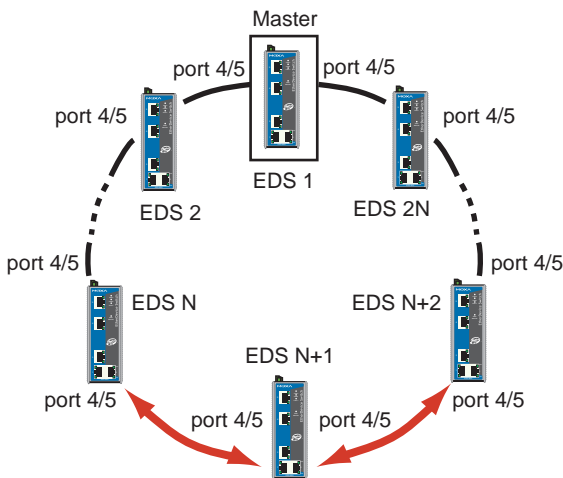
<p><b>NOTE</b> All managed EDS Series and EDS-405 Series switches have the Turbo Ring feature. However, If you wish to use different models of switch in the same Turbo Ring, you will need to upgrade the firmware for the managed EDS Series switch, and EDS-405. To do this, download the latest version of firmware and utility for the managed EDS Series switch that is compatible with EDS-405, and the latest firmware and utility for EDS-405, from <a href="http://www.moxa.com">www.moxa.com</a>, and then upgrade the firmware of all of the switches in the ring. If you have any questions about this procedure, contact the Moxa Technical Support Team.</p>
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In order to give users a convenient and straightforward means of identifying which of Moxa's Industrial Ethernet products support Turbo Ring, we have designed an easily identifiable Turbo Ring logo. The catch phrase, "Self-Healing Ethernet," which appears at the bottom of the logo, emphasizes Turbo Ring's function. That is, Turbo Ring automatically re-establishes network connectivity when one segment of the network is disconnected.

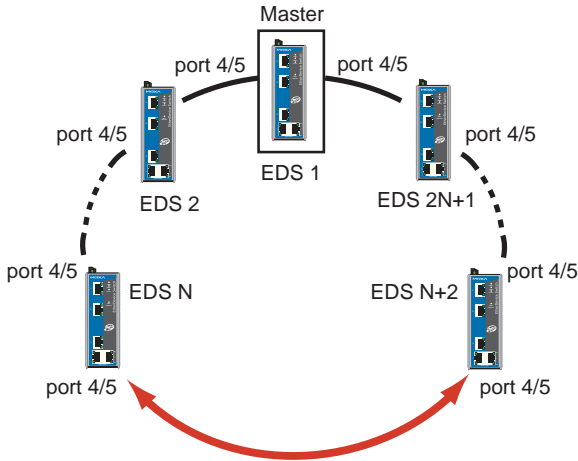
**NOTE** EDS-405's ports 4 and 5 are used to form the Turbo Ring. When forming the Turbo Ring, connect port 4 or 5 of one EDS-405 to port 4 or 5 of the adjacent EDS-405.

**When the number of EDS units in the Turbo Ring is even.**



If there are  $2N$  EDS units (an even number) in the Turbo Ring, then the backup segment is one of the two segments connected to the  $(N+1)$ st EDS (i.e., the EDS unit directly opposite the Master, as shown in the figure).

**When the number of EDS units in the Turbo Ring is odd.**



If there are  $2N+1$  EDS units (an odd number) in the Turbo Ring, then the backup segment is the segment directly opposite the Master (i.e., the segment connecting the  $(N+1)$ st and  $(N+2)$ nd EDS units, as shown in the figure).

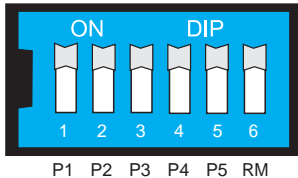
## Front Panel LED Indicators

LED	Color	Status	Description
PWR1	Amber	On	Power is being supplied to power input PWR1.
		Off	Power is <b>not</b> being supplied to power input PWR1.
PWR2	Amber	On	Power is being supplied to power input PWR2.
		Off	Power is <b>not</b> being supplied to power input PWR2.
FAULT	Red	On	When the corresponding PORT alarm is enabled, and the port's link is inactive.
		Off	When the corresponding PORT alarm is enabled and the port's link is active, or when the corresponding PORT alarm is disabled.
RING MASTER	Green	On	When the EDS-405 is the Master of this Turbo Ring.
		Blinking	When the EDS-405 is Ring Master of the Turbo Ring, and the Turbo Ring is broken.
10M (TP)	Green	On	TP port's 10 Mbps link is active.
		Blinking	Data is being transmitted at 10 Mbps.
		Off	TP port's 10 Mbps link is inactive.
100M (TP)	Green	On	TP port's 100 Mbps link is active.
		Blinking	Data is being transmitted at 100 Mbps.
		Off	100BaseTX Port's link is inactive.
100M (FX)	Green	On	FX port's 100 Mbps is active.
		Blinking	Data is being transmitted at 100 Mbps.
		Off	100BaseFX port is inactive.



# Dip Switch Settings

## EDS-405 Series Dip Switches



### Set to ON:

#### **P1-P5 (Default is Off)**

Enables the corresponding PORT Alarm. If the port's link fails, the relay will form an open circuit and the fault LED will light up.

#### **RM (Default is Off)**

Enables this EDS-405 to be the Ring Master in a Turbo Ring topology, and enable the Turbo Ring break alarm. If the EDS-405 is the Master of this Turbo Ring, and the Turbo Ring is broken, the relay will form an open circuit.

### Set to Off:

**P1-P5** Disables the corresponding PORT Alarm. The relay will form a closed circuit and the Fault LED will never light up.

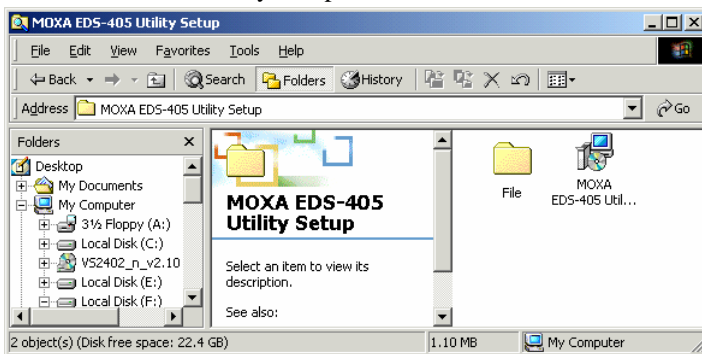
**RM** Disables this EDS-405 from being the Ring Master in a Turbo Ring topology, and disables the Turbo Ring break alarm. If the EDS-405 is the Master of this Turbo Ring, and the Turbo Ring is broken, the relay will form a closed circuit.

**NOTE** If you do not enable any of the EDS-405s to be the Ring Master, Turbo Ring will automatically choose the EDS-405 with the smallest MAC address range to be the Ring Master. If you accidentally enable more than one EDS-405 to be the Ring Master, these EDS-405s will auto-negotiate to determine which one will be the Ring Master.

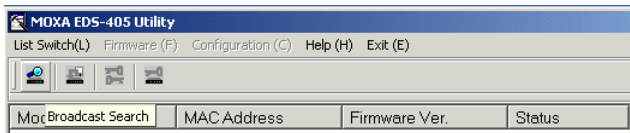
## Upgrading the Firmware

Follow the procedures given below to upgrade EDS-405’s firmware.

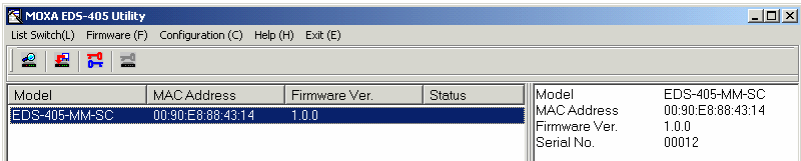
1. Download the EDS-405 Utility zip file from [www.moxa.com](http://www.moxa.com).
2. Unzip the EDS-405 Utility zip file.
3. Run the EDS-405 Utility Setup file.



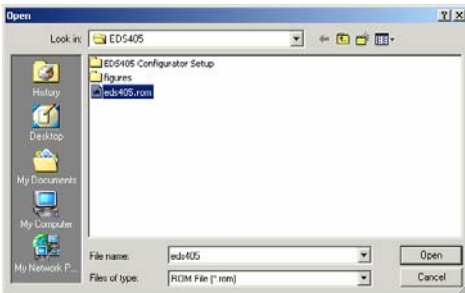
4. After the installing the EDS-405 Utility, make sure that the EDS-405 is correctly installed and connected as described in Chapter 3.
5. Select **Broadcast Search** from the EDS-405 Utility to locate the EDS-405.



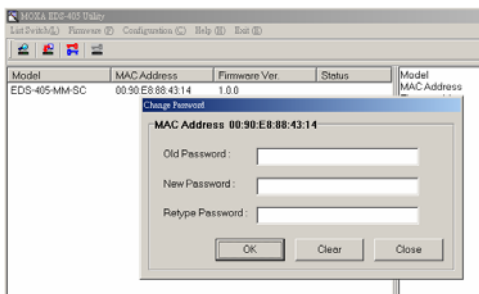
6. After the EDS-405 has been located, and appears in the EDS-405 Utility window, select the EDS-405 and then select **Upgrade Firmware**.



7. After you click on the **Upgrade Firmware** button, the next window that opens will ask you to locate the EDS-405.rom file you just downloaded.



8. Locate the EDS-405.rom file and click on **OPEN** to start upgrading the new version of the firmware.
9. After the firmware has been upgraded, click on **OK** to refresh the information displayed in the EDS-405 Utility window.
10. In order to protect the EDS-405 from unauthorized modifications, you might want to change EDS-405's password. To do this, select the EDS-405, click on the **Change Password** icon, enter the new password as required, and then click on **OK**.



## Basic Switching Function

### Auto MDI/MDI-X Connection

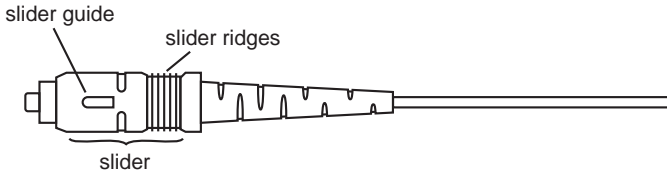
The Auto MDI/MDI-X function allows users to connect EDS-405's 10/100BaseTX ports to any kind of Ethernet device, without paying attention to the type of Ethernet cable being used for the connection. This means that you can use either a straight-through cable or cross-over cable to connect the EDS-405 to Ethernet devices.

Auto MDI/MDI-X also gives you an easy way to cascade or up-link two more switches. For some commercial products, a dedicated uplink port is required to cascade to another switch, and you must swap the pin assignments by setting a dip switch to MDI-X mode. With auto MDI/MDI-X, you can cascade from any port, and use either a straight-through or cross-over cable to cascade from one switch to another.

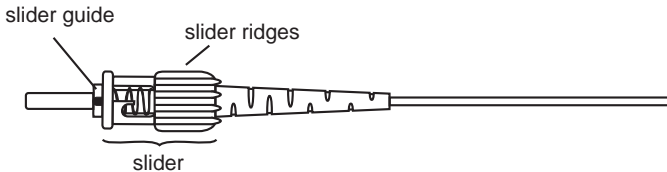
### Fiber Ports

The EDS-405-MM and EDS-405-SS's 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 a multi-mode or single mode SC/ST connector. Consequently, you should use fiber cables that have SC/ST connectors at both ends. When plugging the connector into the port, make sure the slider guide is positioned to the right side so that it fits snugly into the port.

### SC Connector



### ST Connector



The 100 Mbps fiber ports are switched ports and perform as a domain. They provide a high bandwidth backbone connection that supports long fiber cable distances for installation versatility.

## Dual Speed Functionality and Switching

EDS-405's 10/100 Mbps switched RJ45 port auto negotiates with the connected device for the fastest data transmission rate supported by both devices. All models of EDS-405 Series are plug-and-play devices, so that software configuration is not required at installation, or during maintenance.

## 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 to maintain the operation of the network (such as the

occasional multi-cast packet) are forwarded to all ports. EDS-405 Series products operate 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

EDS-405 Series products have an address table that can hold up to 1000 node addresses, making them suitable for use with large networks. The address tables are self-learning, so that as nodes are added or removed, or moved from one segment to another, EDS-405 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 of EDS-405's RJ45 Ethernet ports independently support auto-negotiation for 10BaseT and 100BaseTX modes, with operation according to the IEEE 802.3u standard. This means that some nodes could be operating at 10 Mbps, while other nodes are operating simultaneously at 100 Mbps.

Auto-negotiation takes place when an RJ45 cable connection is made, and then each time a LINK is enabled. EDS-405 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 on what type of device is connected, this will result in agreement to operate at a speed of either 10 Mbps or 100 Mbps.

If an EDS-405 RJ45 Ethernet 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.



# Product Specifications

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## Technology

Standards	IEEE802.3, 802.3u, 802.3x
Processing Type	Store and Forward, with IEEE802.3x full duplex, back pressure flow control
Address Table Size	1K uni-cast addresses

## Interface

LED Indicators	Power, Fault, 10/100M, Ring Master
DIP Switch	Port break alarm mask, Ring master
Alarm Contact	One relay output with current carrying capacity of 1A @ 24 VDC
RJ45 Ports	10/100BaseT(x) auto negotiation speed, F/H duplex mode, and auto MDI/MDI-X connection
Fiber Ports	100BaseFX ports (SC/ST connector)

## Optical Fiber

	Multi mode	Single mode, 15	Single mode, 40	Single mode, 80
Distance, km	5	15	40	80
Wavelength, nm	1300	1310	1310	1550
Min. TX Output, dBm	-20	-15	-5	-5
Max. TX Output, dBm	-14	-6	0	0
Sensitivity, dBm	-34 to -30	-36 to -32	-36 to -32	-36 to -32
Recommended Diameter (Core/Cladding), $\mu$ m	50/125	9/125	9/125	9/125
	(1 dB/km, 800 MHz*km)			

# EDS-405 User's Manual

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## Power Requirements

Power Input	12 to 48 VDC, redundant dual DC power inputs
Connection	Removable terminal block
Overload Current Protection	Present
Reverse Polarity Protection	Present

## Mechanical

Casing	IP30 protection, metal case
Dimensions	53.6 x 135 x 105 mm (W x H x D)
Weight	0.65 kg
Installation	DIN-Rail, wall mounting (optional)

## Environmental

Operating Temperature	0 to 60°C (32 to 140°F), -40 to 75°C (-40 to 167°F) for -T models
Storage Temperature	-40 to 85°C (-40 to 185°F)
Ambient Relative Humidity	5 to 95% (non-condensing)

## Regulatory Approvals

Safety	UL60950 (E212360), UL 508, CSA C22.2 No. 60950, EN60950
Hazardous Location	UL/cUL Class I, Division 2, Groups A, B, C and D (E238559) ATEX Class I, Zone 2, EEx nC IIC (03CA24537)
EMI	FCC Part 15, CISPR (EN55022) class A
EMS	EN61000-4-2 (ESD), level 3; EN61000-4-3 (RS), level 3; EN61000-4-4 (EFT), level 3; EN61000-4-5 (Surge), level 3; EN61000-4-6 (CS), level 3
Shock	IEC60068-2-27
Freefall	IEC60068-2-32
Vibration	IEC60068-2-6
Warranty	5 years