



**Industrial 5-Port Fast Ethernet Switches  
with SFP Slot and optional 4 PoE PSE Ports**

Basic Model: KSD-541  
PoE Model: KSD-541-P

**Installation Guide**



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#### **TRADEMARKS**

Ethernet is a registered trademark of Xerox Corp.

#### **WARNING:**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual may cause harmful interference in which case the user will be required to correct the interference at his own expense.

#### **NOTICE:**


- (1) The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
- (2) Shielded interface cables and AC power cord, if any, must be used in order to comply with the emission limits.

#### **CISPR A COMPLIANCE:**

This device complies with EMC directive of the European Community and meets or exceeds the following technical standard.

EN 55022 - Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment. This device complies with CISPR Class A.

#### **CE NOTICE**

Marking by the symbol  indicates compliance of this equipment to the EMC directive of the European Community. Such marking is indicative that this equipment meets or exceeds the following technical standards:

EN 55022: Limits and Methods of Measurement of Radio Interference characteristics of Information Technology Equipment.

EN 50082/1: Generic Immunity Standard -Part 1: Domestic Commercial and Light Industry.

EN 60555-2: Disturbances in supply systems caused by household appliances and similar electrical equipment - Part 2: Harmonics.

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# 1. Introduction

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The switches are 5-port Fast Ethernet switches which are featured with four copper ports and one combo port. The combo port comes with one RJ-45 and one SFP slot. The SFP slot can be mounted with a fiber transceiver optionally to support a fiber connection.



For more coming PoE (Power Over Ethernet) applications, the PoE switch model is equipped with PoE design in four copper ports. With proper 48VDC power supply, it is able to deliver power to four PoE PD devices via Cat.5 cables. This guide describes the installation information about two models as follows:

**Basic Model** Industrial 5-port Fast Ethernet switch with SFP slot

**PoE Model** Industrial 5-port Fast Ethernet switch with SFP slot and PoE feature

In summary, the switch provides the following advantages:

## **Plug and Play**

No configuration is required in using the switch. With the featured auto-negotiation function, the switch can detect and configure the connection speed and duplex automatically. The switch also provides auto MDI/MDI-X function, which can detect the connected cable and switch the transmission wire pair and receiving pair automatically. This auto-crossover function can simplify the type of network cables used.

## **Fiber Connectivity**

For fiber connection, the SFP slot can be installed with an optional SFP optical fiber transceiver to support one fiber connection when needed.

## **Power over Ethernet**

For PoE applications, four IEEE 802.3af-compliant PoE PSE ports are provided in four copper ports. Each PSE port can deliver +48VDC power to one PoE PD (Powered Device) via the connected Cat.5 cable.

## **Industrial Features**

For industrial environment, the devices are designed with the following enhanced features exceeding that of commercial Ethernet switches:

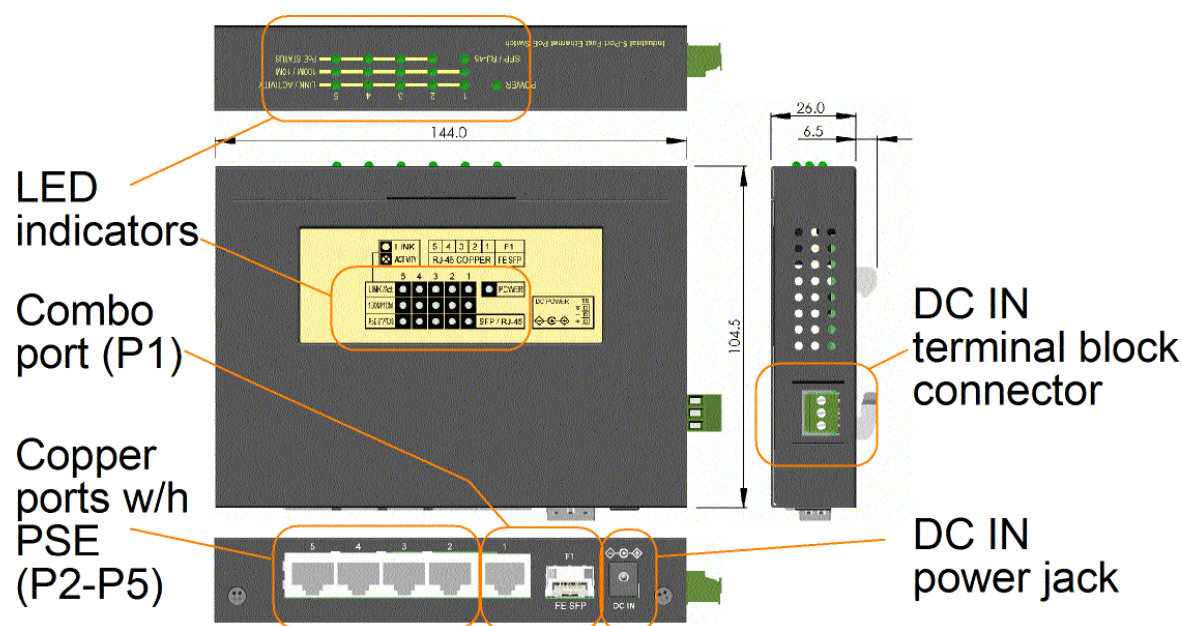
- High and wide operating Temperature
- Power input interface: Industrial screw terminal block and DC power jack for external commercial power adapter as option
- Screw panel and DIN rail mounting support for industrial enclosure
- Industrial-rated Emission and Immunity performance

## 1.1 Features

- Provides 5 10/100Mbps RJ-45 and one 100Mbps SFP slot
- All copper ports support auto-negotiation and auto-MDI/MDI-X detection
- Provides full wire speed forwarding
- Supports IEEE 802.3x flow control for full-duplex and backpressure for half-duplex
- Provides SFP slot for optional optical fiber connection
- Provides four IEEE 802.3af-compliant PoE PSE ports
- Provides two types of power supply interfaces - DC Jack and terminal block
- Supports stand-alone, wall, Din-Rail, and panel mounting
- Industrial-rated emission and immunity performance

## 1.2 Product Panels

The following figure illustrates the faces of the switch:



## 1.3 LED Indicators

<u>LED</u>	<u>Function</u>
POWER	Power status
LINK/ACT	Port link status and activities (Port 1 - Port 5)
100M/10M	Port speed status (Port 1 - Port 5)
PoE STATUS	Port PoE power status (Port 2 - Port 5)
SFP/RJ-45	Port 1 SFP / RJ-45 selection status

## 1.4 Specifications

### **Copper Ports w/h PSE (P2-P5)**

Compliance	IEEE 802.3 10Base-T, IEEE 802.3u 100Base-TX
Connectors	Shielded RJ-45 jacks
Pin assignments	Auto MDI/MDI-X detection
Configuration	Auto-negotiation
Transmission rate	10Mbps, 100Mbps
Duplex support	Full/Half duplex
Network cable	Cat.5 UTP
Power over Ethernet	IEEE 802.3af-compliant PSE (function equipped in PoE Model only)

### **Combo Port (P1)**

Compliance	IEEE 802.3 10Base-T, IEEE 802.3u 100Base-TX/100Base-FX
Interface Selection	Fiber is selected if an SFP fiber transceiver is installed in SFP slot

### **Copper Interface**

Connector	Shielded RJ-45 jack
Pin assignments	Auto MDI/MDI-X detection
Configuration	Auto-negotiation or software control
Transmission rate	10Mbps, 100Mbps
Duplex support	Full/Half duplex
Network cable	Cat.5 UTP

### **Fiber Interface**

Connector	SFP slot for optional SFP type fiber transceivers
Configuration	100Mbps, Full duplex
Far End Fault Support	Enabled
Network cables	MMF 50/125 60/125, SMF 9/125
Eye safety	IEC 825 compliant

### **Switch Functions**

MAC Addresses Table	1K entries
Forwarding & filtering	Non-blocking, full wire speed
Switching technology	Store and forward
Maximum packet length	1536 bytes
Flow control	IEEE 802.3x pause frame base for full duplex operation Back pressure for half duplex operation
Broadcast Storm	Protection design

### **Power over Ethernet Function (PoE Model)**

PSE Pin 4,5	Positive of power voltage (Typical 48VDC)
PSE Pin 7,8	Negative of power voltage (Typical 48VDC)
Discovery PD resistance	15K ~ 33K
PD Classification	Class 0 ~ 4
Power delivery	15.4W max. (per port)
Protection	Under voltage protection Over voltage protection Over current detection

### **DC IN Power Input**

Interfaces	DC IN Jack ( -D 6.3mm / + D 2.0mm) DC IN Terminal Block (screw type)
Operating Input Voltages	+6 ~ 60VDC
Power Consumption	3W max. @7.5V (No PoE output)
PoE Function	Operating input voltage: +43V ~ 54V (Typical 48V)
DC IN Jack Interfaces	Power jack -D 6.3mm / + D 2.0mm
DC IN Terminal Block	Pins: + / - / GND

### **Mechanical**

Dimension (base)	144 x 104.5 x 26 mm
Housing	Enclosed metal with no fan
Mounting Support	Din-rail mounting, Panel mounting, Wall mounting, Desktop mounting

### **Environmental**

Operating Temperature	Typical -20°C ~ 70°C
Storage Temperature	-20°C ~ 85°C
Relative Humidity	10% ~ 90%

### **Electrical Approvals**

FCC	Part 15 rule Class A
CE	EMC, CISPR22 Class A
Safety	IEC60950-1 / EN60950



## 2. Installation

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### 2.1 Unpacking

The product package contains:

- The switch unit
- One product CD-ROM

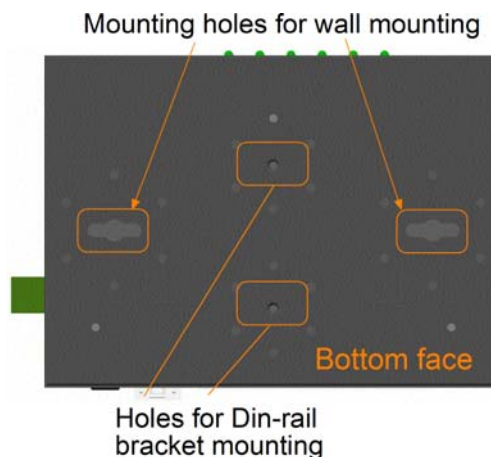
### 2.2 Safety Cautions

To reduce the risk of bodily injury, electrical shock, fire, and damage to the product, observe the following precautions.

- Do not service any product except as explained in your system documentation.
- Opening or removing covers may expose you to electrical shock.
- Only a trained service technician should service components inside these compartments.
- If any of the following conditions occur, unplug the product from the electrical outlet and replace the part or contact your trained service provider:
  - The power cable, extension cable, or plug is damaged.
  - An object has fallen into the product.
  - The product has been exposed to water.
  - The product has been dropped or damaged.
  - The product does not operate correctly when you follow the operating instructions.
- Do not push any objects into the openings of your system. Doing so can cause fire or electric shock by shorting out interior components.
- Operate the product only from the type of external power source indicated on the electrical ratings label. If you are not sure of the type of power source required, consult your service provider or local power company.

### 2.3 Mounting the Switch on a Wall

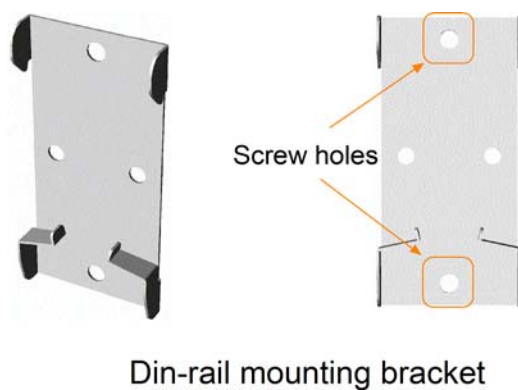
The switch can be mounted on a desktop or shelf or a wall. Make sure that there is proper heat dissipation from and adequate ventilation around the device. Do not place heavy objects on the device.



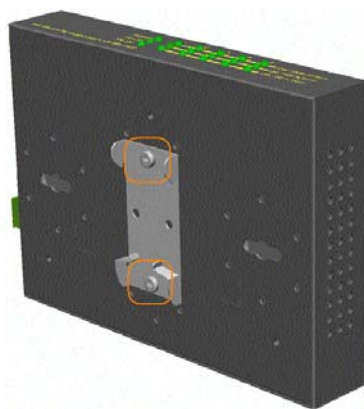
## 2.4 Din-Rail Mounting

The steps to mount the switch on a Din-rail are:

One Din-rail mounting bracket is provided in the product package as shown below:



Install the bracket on the bottom of the switch unit.

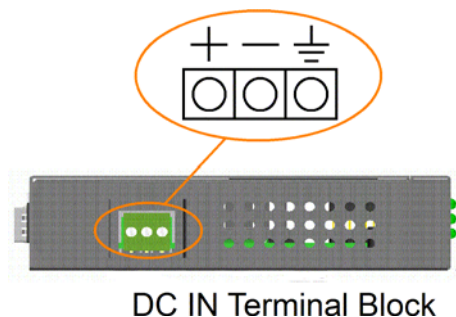


Mount the device on a Din-rail.





## Using Terminal Blocks



Three terminal contacts are provided:

Vdc Positive (+) terminal

Vdc Negative (-) terminal

Chassis ground

\* Working Vdc for general application: +6V ~ +60VDC

\* Working Vdc for PoE application : +43V ~ +54VDC (Typ. 48V)

One 3P terminal plugs are provided together with the switch. The plug is shown below:

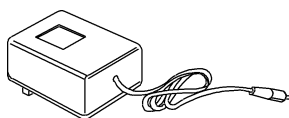


Power wires : 24 ~ 12AWG (IEC 0.5~2.5mm<sup>2</sup>)

Install the power source wires with the plug properly. Then, plug in the terminal block socket.

## Using DC Power Jack

When an external power system is not available, the switch provides a DC jack to receive power from typical AC-DC power adapter alternatively.



AC Power Adapters:

Non-PoE applications

PoE applications

Optional commercial rated adapters are available for purchasing.

Rated output DC7.5V 0.5A / 1A / 1.2A

Rated input 100V ~ 240VAC, Output 48VDC / 24W (About 20-21W is reserved for PoE PDs connected.)

*Note: \* Before you begin the installation, check the AC voltage of your area. The AC power adapter which is used to supply the DC power for the unit should have the AC voltage matching the commercial power voltage in your area.*

*\* For PoE applications, make sure the rated output power meets the required voltage and power consumption required by all connected PD devices. Refer to sec. 3.3 for more information.*

## 3. Making Connections

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### 3.1 Making UTP Connections

The copper ports support the following connection types and distances:

#### Network Cables

10BASE-T: 2-pair UTP Cat. 3,4,5 , EIA/TIA-568B 100-ohm

100BASE-TX: 2-pair / 4-pair UTP Cat. 5, EIA/TIA-568B 100-ohm

Link distance: Up to 100 meters

#### Auto MDI/MDI-X Function

This function allows the port to auto-detect the twisted-pair signals and adapts itself to form a valid MDI to MDI-X connection with the remote connected device automatically. No matter a straight through cable or crossover cable is connected, the ports can sense the receiving pair automatically and configure itself to match the rule for MDI to MDI-X connection. It simplifies the cable installation.

#### Auto-negotiation Function

The ports are featured with auto-negotiation function and full capability to support connection to any Ethernet devices. The port performs a negotiation process for the speed and duplex configuration with the connected device automatically when each time a link is being established. If the connected device is also auto-negotiation capable, both devices will come out the best configuration after negotiation process. If the connected device is incapable in auto-negotiation, the switch will sense the speed and use half duplex for the connection.

### 3.2 Making Fiber Connection

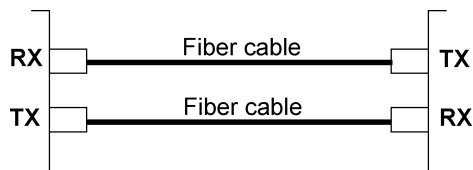
The SFP slot must be installed with an SFP fiber transceiver for making fiber connection. Your switch may come with an SFP transceiver pre-installed when it is shipped.

To install an SFP fiber transceiver into the SFP slot, the steps are:

1. Turn off the power to the switch.
2. Insert the SFP fiber transceiver into the SFP slot. Normally, a bail is provided for every SFP transceiver. Hold the bail and make insertion.
3. Until the SFP transceiver is seated securely in the slot, place the bail in lock position.
4. Turn on the power to the switch.

#### Connecting Fiber Cables

LC connectors are commonly equipped on most SFP transceiver modules. Identify TX and RX connector before making cable connection. The following figure illustrates a connection example between two fiber ports:



Make sure the Rx-to-Tx connection rule is followed on the both ends of the fiber cable.

#### Network Cables

Multimode (MMF) - 50/125, 62.5/125

Single mode (SMF) - 9/125

### 3.3 Making PoE Connections

This section describes how to make a connection between a PSE port and a PoE PD device. For the PoE switch model, Port 2, Port 3, Port 4 and Port 5 are equipped with PoE PSE function. The ports are enabled to deliver power together with network signal to a connected powered device via Cat.5 cable.

To make a PoE connection, the following check points should be noted:

1. For safety reason, the connected PoE PD (Powered Device) must be a IEEE 802.3af-compliant device. Incompliant devices are not supported by the PoE switch model.
2. The Cat.5 cables used for the connections must be 4-pair cables. The power is sent over the spare pairs (4,5) (7,8) of the cable. The maximum distance supported is 100 meters.
3. The DC IN power voltage supplied to the switch must be within the following range to make PoE function working.

**DC IN voltage range for PoE applications : +43V ~ +54V**

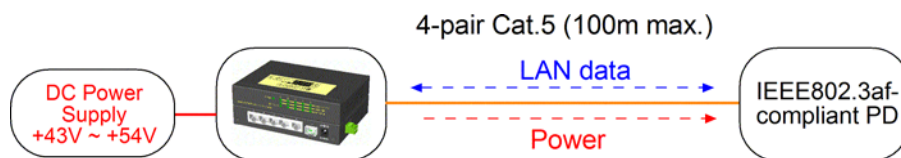
4. The DC IN power supplied to the switch must meet the following calculation:

**DC IN power = Sum of all connected PD power required + 3 watts**

The PSE ports are equipped with the following capabilities:

1. Detection for an IEEE 802.3af compliant PD.
2. No power is supplied to a device which is classified non-IEEE 802.3af complaint PD.
3. No power is supplied when no connection exists on the port.
4. The power is cut off immediately from powering condition when a disconnection occurs.
5. The power is cut off immediately from powering condition when overload occurs.
6. The power is cut off immediately from powering condition when overcurrent occurs.
7. The power is cut off immediately from powering condition when short circuit condition occurs.

The figure below illustrates a connection example:



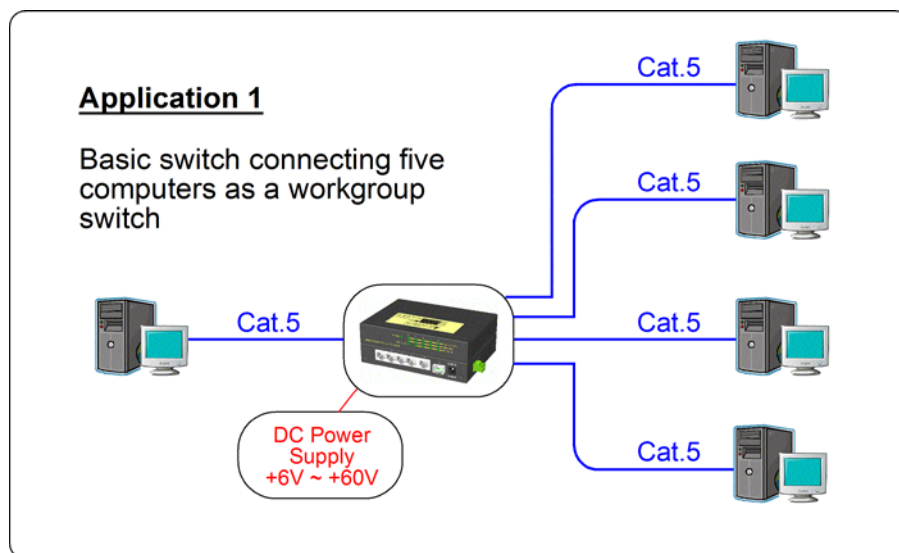
### 3.4 LED Indication

LED	Function	State	Interpretation
POWER	Power status	ON	The power is supplied to the switch.
		OFF	The power is not supplied to the switch.
LINK/ACT	Port link status	ON	A port link is established. (No traffic)
		BLINK	Port link is up and there is traffic.
		OFF	Port link is down.
100M/10M	Port speed status	ON	Speed 100M is selected.
		OFF	Speed 10M is selected.
PoE STATUS	Port PoE power	ON	PoE power is delivered on the port.
		OFF	PoE power is shut down.
SFP/RJ-45	Port1 status	ON	SFP is used on Port 1.
		OFF	RJ-45 is used on Port 1.

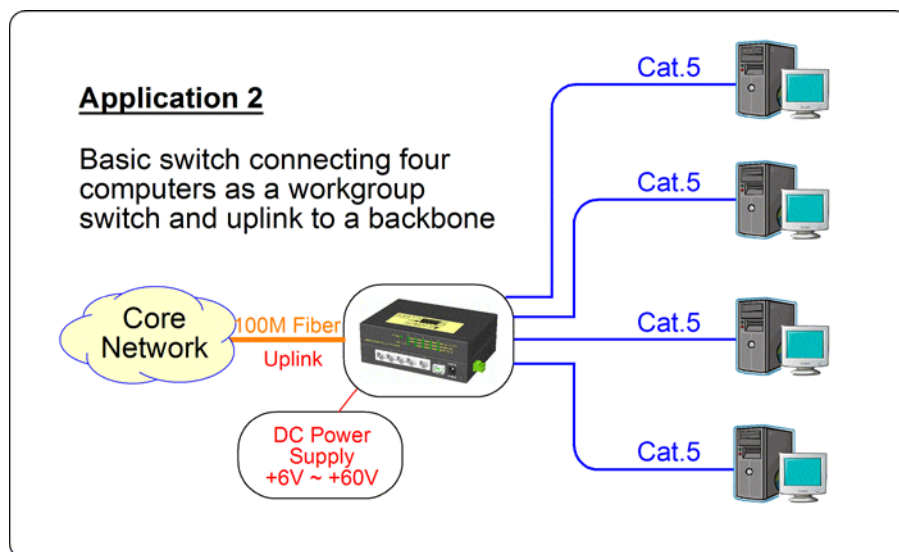
## 4. Applications

### 4.1 Applications with Basic Switch Model

The following figure illustrates a basic switch model connects five computers via Cat.5 cables.



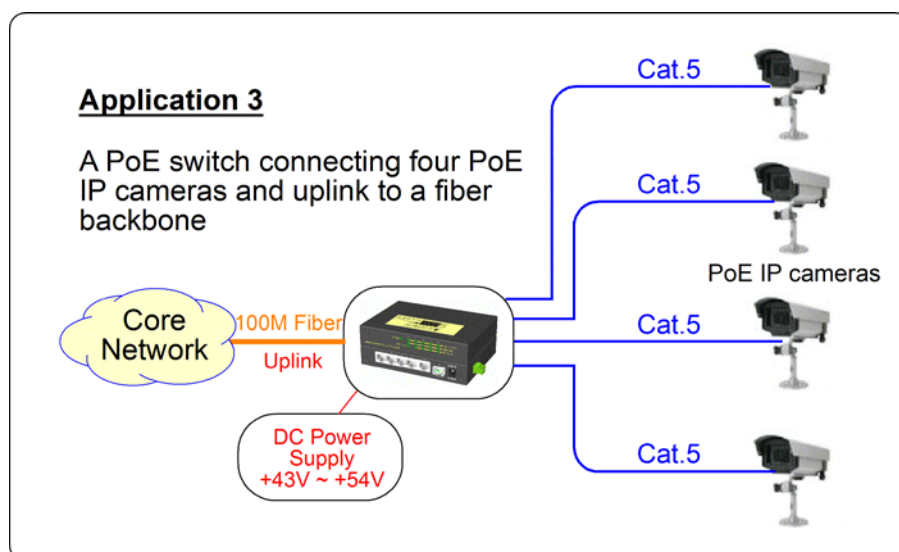
The following figure illustrates a basic switch model connects four computers via Cat.5 cables and uplink to a fiber backbone network.



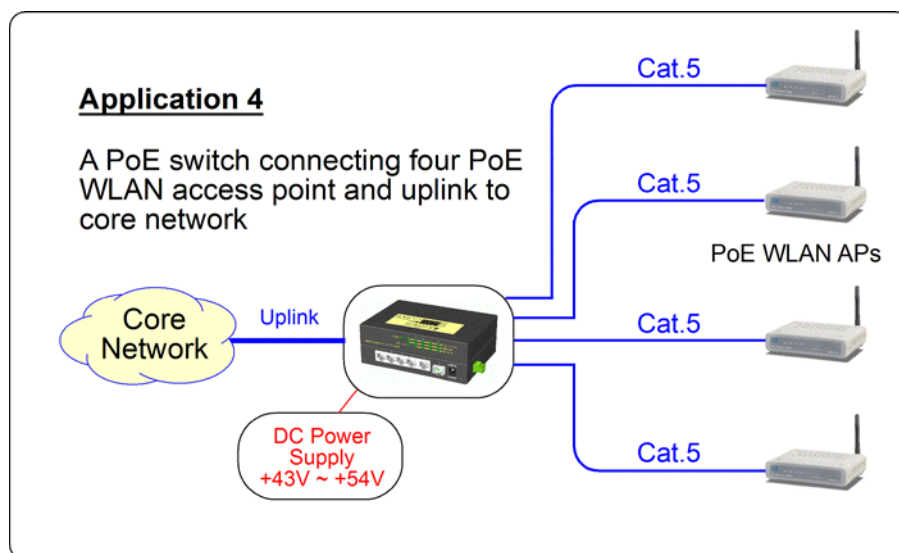


## 4.2 Applications with PoE Switch Model

The figure below illustrates a PoE switch connects four PoE IP cameras via Cat.5 cables and uplinks to a fiber backbone:



The figure below illustrates a PoE switch connects four PoE WLAN access points via Cat.5 cables and uplinks to a backbone:



The figure below illustrates a PoE switch powered by a 48V DC power adapter connects four PoE media converters via Cat.5 cables and uplinks to a fiber backbone:

