5-Port 10/100Mbps Fast Ethernet Switch
with 802.3af splitter built-in

FSD-5O4PE

User's Manual

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Revision

PLANET SOHO Switches User's Manual

FOR MODEL: FSD-504PE

Part No: 2010-A33170-000

Table of Contents

ABOUT THIS GUIDE

Thank you for purchasing the FSD-504PE, 5-Port 10/100Mbps Fast Ethernet Switch with 802.3af splitter built-in. This device integrates 100Mbps Fast Ethernet and 10Mbps Ethernet network capabilities in a highly flexible desktop package and also offers dual power system, DC power and IEEE802.3af in-line power over Ethernet.

Purpose

This manual discusses how to install your FSD-504PE. 5-Port 10/100Mbps Fast Ethernet Switch w/802.3af splitter built-in.

Terms/Usage

In this manual, the term "Switch" (first letter upper case) refers to your 5-Port 10/100Mbps Ethernet Switch, and "switch" (first letter lower case) refers to other Ethernet switches. This manual provides the information you need to install and configure the FSD-504PE

Overview of this User's Manual

Chapter 1, Introduction: Describes the Switch and its features.

Chapter 2, Unpacking and Setup: Helps you get started with the basic installation of the Switch.

Chapter 3, Identifying External Components: Describes the front panel, rear panel and LED indicators of the Switch.

Chapter 4, Connecting the Switch: Tells how you can connect the Switch to your Ethernet network.

Appendix 5, Technical Specifications: Lists the technical (general, physical and environmental, and performance) specifications of the Switch.

Appendix A, RJ-45 Pin Specification: Describes the RJ-45 receptacle/connector and the straight and crossover cable connector.

Appendix B, Switch Operation: Describes how the switch works in details.

Appendix C, Troubleshooting: Describes some information for symptom could encountered.

Chapter 1 INTRODUCTION

This chapter describes the features of the Switch and some background information about Fast Ethernet switching technology.

Fast Ethernet Technology

The growing importance of LANs and the increasing complexity of desktop computing applications are fueling the need for high performance networks.

A number of high-speed LAN technologies have been proposed to provide greater bandwidth and improve client/server response times. Among them, 100Base-TX (Fast Ethernet) provides a non-disruptive, smooth evolution from 10Base-T technology. The non-disruptive and smooth evolution nature, and the dominating potential market base, virtually guarantee cost effective and high performance Fast Ethernet solutions in the years to come.

100Mbps Fast Ethernet is a standard specified by the IEEE 802.3 LAN committee. It is an extension of the 10Mbps Ethernet standard with the ability to transmit and receive data at 100Mbps, while maintaining the CSMA/CD Ethernet protocol. Since the 100Mbps Fast Ethernet is compatible with all other 10Mbps Ethernet environments, it provides a straightforward upgrade and takes advantage of the existing investment in hardware, software, and personnel training.

Switching Technology

Another approach to pushing beyond the limits of Ethernet technology is the development of switching technology. A switch bridge Ethernet packets at the MAC address level of the Ethernet protocol transmitting among connected Ethernet or Fast Ethernet LAN segments.

Switching is a cost-effective way of increasing the total network capacity available to users on a local area network. A switch increases capacity and decreases network loading by dividing a local area network into different segments, which don't compete with each other for network transmission capacity.

The Switch acts as a high-speed selective bridge between the individual segments. The Switch, without interfering with any other segments, automatically forwards traffic that needs to go from one segment to another. By doing this the total network capacity is multiplied, while still maintaining the same network cabling and adapter cards.

For Fast Ethernet networks, a switch is an effective way of eliminating problems of chaining hubs beyond the "two-repeater limit." A switch can be used to split parts of the network into different

collision domains, making it possible to expand your Fast Ethernet network beyond the 205-meter network diameter limit for 100Base-TX networks. Switches supporting both traditional 10Mbps Ethernet and 100Mbps Fast Ethernet are also ideal for bridging between the existing 10Mbps networks and the new 100Mbps networks.

Switching LAN technology is a marked improvement over the previous generation of network bridges, which were characterized by higher latencies. Routers have also been used to segment local area networks, but the cost of a router, the setup and maintenance required make routers relatively impractical. Today switches are an ideal solution to most kinds of local area network congestion problems.

Power over Ethernet Technology

The Switch also supports IEEE802.3af in-line power technology. Power over Ethernet Technology is using the un-used UTP wire to transmit the power over the Cat-5 UTP to the remote end-node.

Follow the IEEE802.3/802.3u Ethernet standard, 100Base-TX and 10Base-T will only use 2-pair of the UTP cable for data transmission and receiving (refer to Appendix B for more). And Power over Ethernet, however, will used the un-used 2-pair of UTP Cat. 5 cable for power transmission. The power transmission either can be a direct current without any detection/ protection or can also deploy the new standard IEEE802.3af.

Two devices required in this technology, injector and splitter. The injector combine the Ethernet signal and 48VDC currents through UTP cable to the remote end. And splitter split out the two things to the device, DC power to turn on the device and others for data sending / receiving. IEEE802.3af uses the protection circuit to detect the support features of remote end-node in a very short time. If the remote-end reply the injector with 802.3af supported signal, the injector will then provide the DC current over the wire to power on the Switch. Otherwise, the Switch will never be turned on.

Features

☐ The Switch were designed for easy installation and high Performance in an environment where traffic on the network and the number of user increase continuously.

☐ The Switch with their small, compact size was specifically designed for small to middle workgroups. The Switch can be installed where space is limited; moreover, it provides immediate access to a rapidly growing network through a wide range of user-reliable functions.

☐ The Switch is ideal for deployment with multiple high-speed servers for shared bandwidth

10Mbps or 100Mbps workgroups. With the highest bandwidth 200Mbps (100Mbps full-duplex mode), any port can provide workstations with a congestion-free data pipe for simultaneous access to the server.

☐ The Switch is expandable by cascading two or more switches together. As all ports support 200Mbps, the Switch can be cascaded from any port and to any number of switches.

☐ The Switch is a perfect choice for site planning to upgrade to Fast Ethernet in the Ethernet workgroups can connect to the Switch now, and change adapters and hubs anytime later without needing to change the Switch or reconfigure the network.

☐ The Switch support IEEE802.3af, which can easily install the Switch in any place where AC adapter is not required. Through the UTP wire, the power of the Switch can be managed from the central/backbone and also without fear of power shutdown.

☐ The Switch combine dynamic memory allocation with store-and- forward switching to ensure that the buffer is effectively allocated for each port, while controlling the data flow between the transmit and receive nodes to guarantee against all possible packet loss.

☐ The Switch is an unmanaged 10/100 Fast Ethernet Switch that offers solutions in accelerating small Ethernet workgroup bandwidth.

Other key Features are:

☐ Auto MDI/MDI-X on each port for Uplink to another switch, hub or repeater.

☐ Store and forward switching scheme capability. As the result of complete frame checking and error frame filtering, this scheme prevents error packages from transmitting among segments.

☐ NWay Auto-negotiation for any port. This allows for auto-sensing of speed (10/100Mbps) thereby providing you with automatic and flexible solutions in your network connections.

☐ Flow control for any port. This minimizes dropped packets by sending out collision signals while the port's receiving buffer is full. Note that flow control is only available in half-duplex mode.

☐ Data forwarding rate per port is at wire-speed for 100Mbps speed.

☐ Data forwarding rate per port is at wire-speed for 10Mbps speed.

☐ Data filtering rate eliminates all error packets, runts, etc., per port at wire-speed for 100Mbps speed.

☐ Data filtering rate eliminates all error packets, runts, etc., per port at wire-speed for 10Mbps speed.

☐ 2K active MAC address entry table per port with self-learning and table-aging for the Switch.

Chapter 2 UNPACKING AND SETUP

This chapter provides unpacking and setup information for the Switch.

Unpacking

Open the shipping cartons of the Switch and carefully unpacks its contents. The carton should contain the following items:

☐ One 5-Port 10/100Mbps Ethernet Switch

☐ One External power adapter (optional, vary on model)

☐ This User's manual

If any item is found missing or damaged, please contact your local reseller for replacement.

Setup

The setup of the Switch can be performed using the following steps:

☐ The surface must support at least 1.5 kg for the Switch.

☐ [Option] Confirm with the network administrator for the information of the POE device if the Switch is plan to connect with a **802.3af** in-line power hub or switch

☐ [Option] The power outlet should be within 1.82 meters (6 feet) of the Switch.

☐ [Option] Visually inspect the DC power jack and make sure that it is fully secured to the power adapter.

☐ Make sure that there is proper heat dissipation from and adequate ventilation around the Switch.

☐ Do not place heavy objects on the Switch.

Notice: To prevent from device damage, please use the bundled AC Adapter before power on your Switch. And never use any other non-802.3af POE device to port #1 of the Switch.

Chapter 3 IDENTIFYING EXTERNAL COMPONENTS

This section identifies all the major external components of the Switch. Both the front and rear panels are shown followed by a description of each panel's feature.

Panel

The figures below show the panels of the switch.
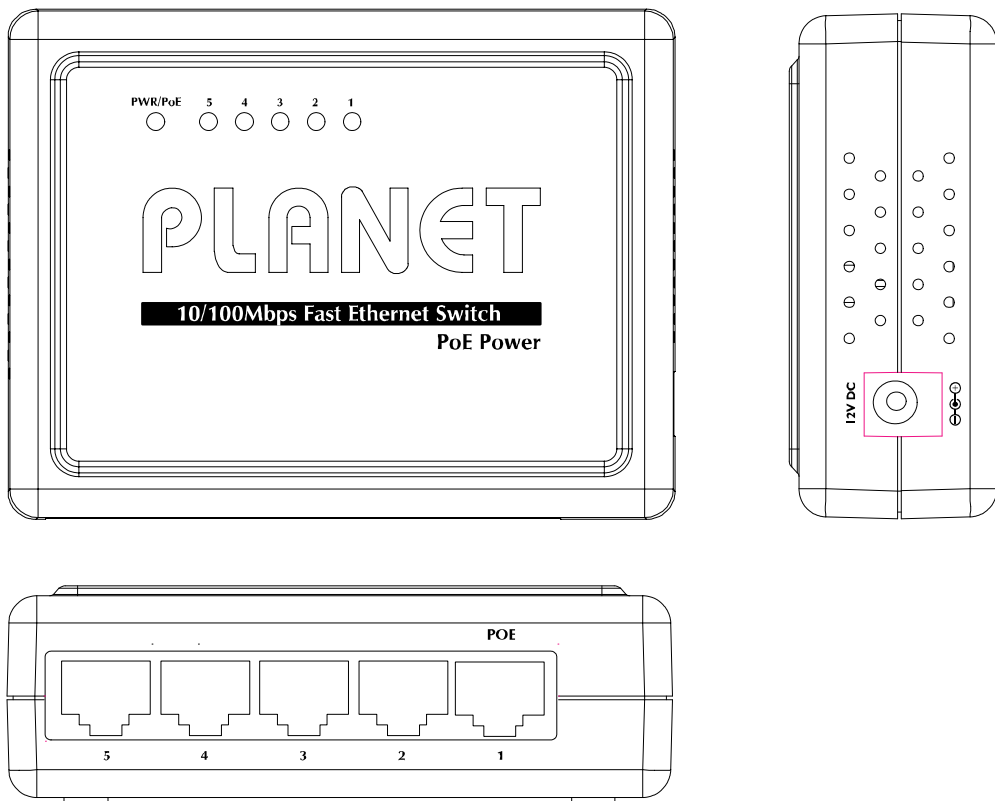
Panels of FSD-504PE

Please refer to the LED panel section for detailed information about each of the switch's LED indicators.

DC Power Jack:	Power is supplied through an external AC power adapter. Check the technical specification section for information about the AC power input voltage. Since the switch does not include a power switch, plugging its power adapter into a power outlet will immediately power it on.
POE	The Switch supports two power systems, 12VDC or powered from POE. Port # 1 supports 802.3af in-line power. Either power system can be deployed to the Switch at a time. And 12VDC will not active if POE port and POE power is in use.
Numbered MDI/MDI-X Jacks:	Use these jacks to connect stations to the Switch. These are numbered MDI/MDI-X jacks, which mean, you can use ordinary straight or crossover twisted-pair cables to connect user machines and servers to the switch through them.

Note:

1. The Switch is a power-required device, it means, the Switch will not work until it is powered. If your networked PCs will need to transmit data all the time, please consider use an UPS (Uninterrupted Power Supply) for your Switch either through POE port or DC 12V. It will prevent you from network data loss.
2. In some area, installing a surge suppression device may also help to protect your Switch from being damaged by unregulated surge or current to the Switch or the power adapter if DC12V power is in use.
3. Consult the network administrator for the information of 802.3af Power over Ethernet. Port#1 only accept 802.3af power supply, connect with any other non-standard 802.3af equipments to it may cause the Switch malfunction.

LED Indicators:

PWR/PoE	This indicator lights green when the Switch is receiving 12VDC power and lights orange when receiving 48VDC PoE power, otherwise, it is off.
LNK/ACT	This indicator light green when the port is connected to an Ethernet or Fast Ethernet station, if the indicator is blinking green, it will be transmitting or receiving data on the network.

Chapter 4 CONNECTING THE SWITCH

This chapter describes how to connect the Switch to your Fast Ethernet network.

PC to Switch

A PC can be connected to the Switch via a two-pair Category 3, 4, 5 UTP/STP straight cable. The PC (equipped with a RJ-45 10/100Mbps phone jack) should be connected to any of the 5 numbered port.

The LED indicators for PC connection depend on the LAN card capabilities. If LED indicators are not light after making a proper connection, check the PC LAN card, the cable, the Switch conditions and connections.

The following are LED indicator possibilities for a PC to Switch connection:

- ☐ The LINK/ACT and 100 LED indicators light green for hookup to 100Mbs.

- ☐ LNK/ACT lights green, while 100 LED off for hookup to 10Mbps speed.

Hub to Switch

A hub (10 or 100Base-TX) can be connected to the Switch via a two-pair Category 3, 4, 5 UTP/STP straight or crossover cable. The connection is accomplished from the hub Uplink (MDI-X) or normal (MDI) port to any of the Switch (MDI/MDI-X) ports:

A. 10Base-T Hub

For a 10Base-T hub, the Switch LED indicators should light up as the following:
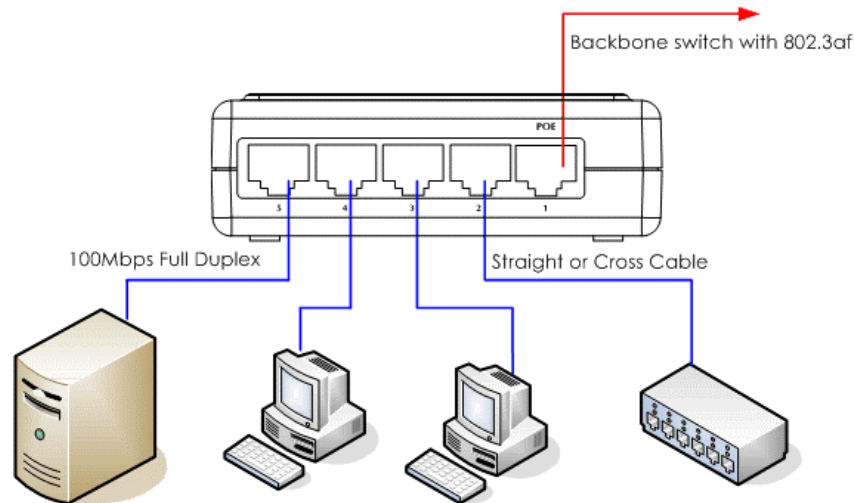
100 LED indicator is OFF.

LNK/ACT LED indicator lights green.

B. 100Base-TX Hub

For a 100Base-TX hub, the Switch LED indicators should light up as the following:

LNK/ACT,100 LED indicators light green.

Powered from POE hub / switch

Port#1 of the Switch support IEEE802.3af power over Ethernet, you can direct connect the Switch to the 802.3af in-line power devices like 802.3af POE hub, Ethernet Switches that with 802.3af POE Ethernet port.

A Category 5 UTP cable with 4-pair wire is required from POE hub to your FSD-504PE. Once the Switch connect with POE device like PLANET POE-150, 1-Port 802.3af injector or POE hub, the "POE" indicator of the Switch will turns on to indicate it get the power from the remote POE injector. And the Switch will start its POST (Power on self test) process and start to work.
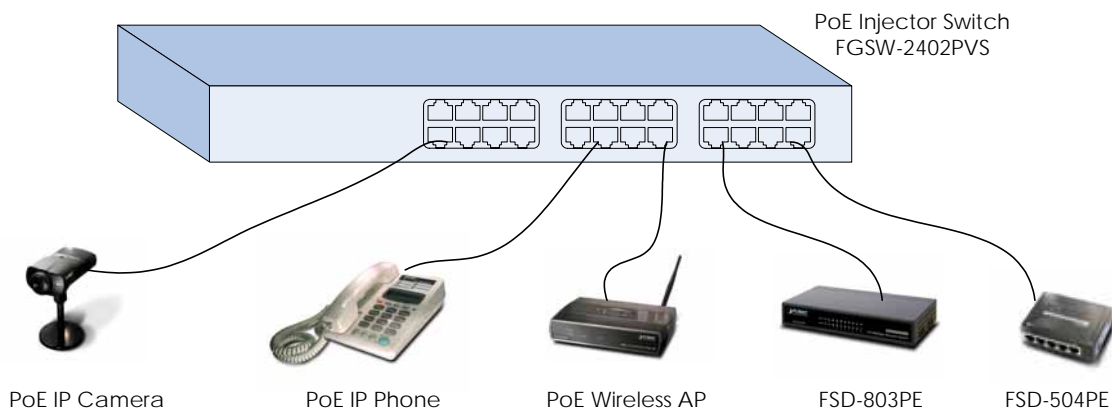
Getting the power from central POE injector, the FSD-504PE shall works without fear of remote power breakdown. As soon as the local PCs also installed with UPS, it shall guarantee the true un-interrupted network accessing.

Switch to Switches (other devices)

The Switch can be connected to another switch or other devices (routers, bridges, etc.) via a two-pair Category 3, 4, 5 UTP/STP straight or crossover cable. However, powered from POE port

will require four-pair Cat 5/5e UTP/STP cable.

When using straight or crossover cable, this is done from the any (MDI/MDIX) port of the Switch (Switch A) to any of the 10Mbps or 100Mbps (MDI-X) port of the other switch (switch B) or other devices.

The LNK/ACT, 100 LED indicators light green for hookup to 100Mbps speed or only LNK/ACT light green for hookup to 10Mbps speed.

Port Speed & Duplex Mode

After plugging the selected cable to a specific port, the system uses auto-negotiation to determine the transmission mode for any new twisted-pair connection:

If the attached device does not support auto-negotiation or has auto-negotiation disabled, an auto-sensing process is initiated to select the speed and set the duplex mode to half-duplex.

Chapter 5 TECHNICAL SPECIFICATIONS

| Model	FSD-504PE
Standards	IEEE802.3 10Base-T Ethernet IEEE802.3u 100Base-TX Fast Ethernet IEEE802.3af Power over Ethernet
Protocol	CSMA/CD
Data Transfer Rate	Ethernet: 10Mbps (half duplex), 20Mbps (full duplex); Fast Ethernet: 100Mbps (half duplex), 200Mbps (full duplex)
Topology	Star
Network Cables	EIA/TIA- 568 100-ohm STP (max. 100 m); 10BaseT: 2-pair UTP Cat. 3,4,5; 100Base-TX: 2-pair UTP Cat. 5; POE: 4-pair UTP Cat. 5
Number of Ports	5 x 10/100Mbps ports
DC inputs	DC jack: DC 12V/500mA max. POE (port#1): DC48V / 150mA max.
Power Consumption	1.8watt max. / 6BTU per hour
POE Port	1; Port # 1
Pint contact of POE port	Contact 4, 5, 7,8; power injection auto-detect by IEEE802.3af
Temperature	Operating: 0 ~ 50 degree C, Storage: -10 ~ 70degree C
Humidity	Operating: 10% ~ 90%, Storage: 5% ~ 90%
Dimensions (W x D x H, mm)	93 x 70 x 30
EMI	FCC Class B, CE
Performance	
Transmit Method:	Store-and-forward
Filtering Address Table:	2K entries per device
Packet Filtering/Forwarding Rate:	10Mbps Ethernet: 14,880/pps 100Mbps Fast Ethernet: 148,800/pps
MAC Address Learning:	Automatic update

APPENDIX A RJ-45 PIN SPECIFICATION

When connecting your FSD-series 10/100Mbps Ethernet Switch to another switch, a bridge or a hub, a straight or crossover cable is necessary. Each port of the Switch supports auto-MDI/MDI-X detection. That means you can directly connect the Switch to any Ethernet devices without making a crossover cable.

The following table and diagram show the standard RJ-45 receptacle/ connector and their pin assignments:

RJ-45 Connector pin assignment		
Contact	MDI Media Dependant Interface	MDI-X Media Dependant Interface -Cross
1	TX + (transmit)	Rx + (receive)
2	TX - (transmit)	Rx - (receive)
3	Rx + (receive)	TX + (transmit)
4, 5*	Not used	
6	Rx - (receive)	TX - (transmit)
7, 8*	Not used	

Note: Contact 4, 5, 7, 8 is not used for port # 2 to port #8. And will be used in port#1 (POE port) for IEEE802.3af power transmission.

The standard cable, RJ-45 pin assignment
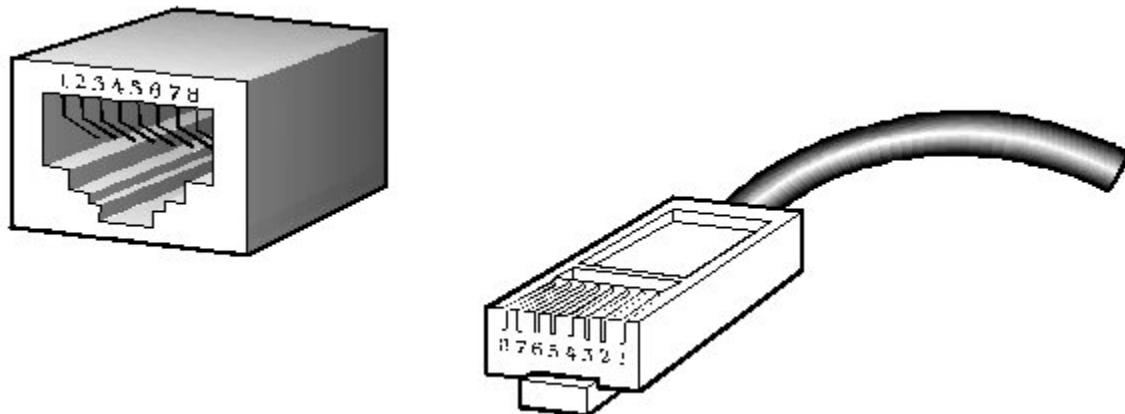
The standard RJ-45 receptacle/connector

There are 8 wires on a standard UTP/STP cable and each wire is color-coded.   The following shows the pin allocation and color of straight cable and crossover cable connection:

Straight Cable

```
1  2  3  4  5  6  7  8  SIDE 1
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
1  2  3  4  5  6  7  8  SIDE 2
```

SIDE 1	SIDE 2
1 = White/Orange	1 = White/Orange
2 = Orange	2 = Orange
3 = White/Green	3 = White/Green
4 = Blue	4 = Blue
5 = White/Blue	5 = White/Blue
6 = Green	6 = Green
7 = White/Brown	7 = White/Brown
8 = Brown	8 = Brown

Cross Over Cable

```
1  2  3  4  5  6  7  8  SIDE 1

1  2  3  4  5  6  7  8  SIDE 2
```

SIDE 1	SIDE 2
1 = White/Orange	1 = White/Green
2 = Orange	2 = Green
3 = White/Green	3 = White/Orange
4 = Blue	4 = Blue
5 = White/Blue	5 = White/Blue
6 = Green	6 = Orange
7 = White/Brown	7 = White/Brown
8 = Brown	8 = Brown

Figure A-1: Straight-Through and Crossover Cable

Please make sure your connected cable are with same pin assignment and color as above picture before deploying the cables into your network.

APPENDIX B SWITCH OPERATION

Address Table

The Switch is implemented with an address table. This address table composed of many entries. Each entry is used to store the address information of some node in network, including MAC address, port no, etc. The information comes from the learning process of Ethernet Switch.

Learning

When one packet comes in from any port, the Ethernet Switch will record the source address, port no. and the other related information in address table. These information will be used to decide either forwarding or filtering for future packets.

Forwarding & Filtering

When one packet comes from some port of the Ethernet Switch, it will also check the destination address besides the source address learning. The Ethernet Switch will lookup the address table for the destination address. If not found, this packet will be forwarded to all the other ports except the port which this packet comes in. And these ports will transmit this packet to the network it connected. If found, and the destination address is located at different port from this packet comes in, the Ethernet Switch will forward this packet to the port where this destination address is located according to the information from address table. But, if the destination address is located at the same port with this packet comes in, when this packet will be filtered. Thereby increasing the network throughput and availability

Store-and-Forward

Store-and-Forward is one type of packet-forwarding techniques. A Store-and-Forward Ethernet Switch stores the incoming frame in an internal buffer, do the complete error checking before transmission. Therefore, no error packets occurrence, it is the best choice when a network needs efficiency and stability.

The Switch scans the destination address from the packet header, searches the routing table provided for the incoming port and forwards the packet, only if required. The fast forwarding makes the switch attractive for connecting servers directly to the network, thereby increasing throughput and availability. However, the switch is most commonly used to segment existing hubs, which nearly always improves overall performance. A Ethernet Switch can be easily configured in any Ethernet network environment to significantly boost bandwidth using conventional cabling and adapters.

Due to the learning function of the Ethernet switch, the source address and corresponding port number of each incoming and outgoing packet are stored in a routing table. This information is subsequently used to filter packets whose destination address is on the same segment as the source address. This confines network traffic to its respective domain, reducing the overall load on the network.

The Switch performs "Store-and-forward" therefore, no error packets occur. More reliably, it reduces the re-transmission rate. No packet loss will occur.

Auto-Negotiation

The STP ports on the Switch have built-in "Auto-Negotiation." This technology automatically sets the best possible bandwidth when a connection is established with another network device (usually at Power On or Reset).

This is done by detect the modes and speeds at the second of both device is connected and capable of. Both 10Base-T and 100Base-TX devices can connect with the 100Base-TX port in either Half- or Full-Duplex mode.

If attached device is:	100Base-TX port will set to:
10Mbps, no auto-negotiation	10Mbps
10Mbps, with auto-negotiation	10/20Mbps (10Base-T/Full-Duplex)
100Mbps, no auto-negotiation	100Mbps
100Mbps, with auto-negotiation	100/200Mbps (100Base-TX/Full-Duplex)

Appendix C Troubleshooting

1. **Power LED does not turns on?**

   Ans:

   The Switch supports two power sources, 12VDC and 802.3af, please check which kind of power system deployed.
   a) Powered from POE: please check with network administrator if the POE injector device is complied with 802.3af standard and well connected to port#1 of the Switch with 4-pair UTP cable within 100 meters. FSD-504PE will detect the signal from 802.3af POE device and response to get the 48VDC power. Connect with non-802.3af complied injector to port#1 could damage the Switch permanently
   b) Powered from 12VDC: the Switch supports 12VDC AC adapter. Please check the AC adapter complies with 12V DC output. Incorrect DC power to the Switch, higher voltage could damage the Switch, and lower voltage will not power on the Switch.

2. **POE LED always blinking and can not boot up the Switch?**

   Ans:

   The Switch only requires one power source, i.e. from POE or from 12V DC. By default, POE will be the first priority. However, if the POE device cannot provide sufficient power from the injector, or 12V DC power is just removed from the DC-jack, the "POE" LED will blink.
   a) Powered from POE: please consult the network administrator if the POE device can provide the sufficient current or not.
   b) Powered from 12VDC then POE: please remove all the power connection, i.e. both DC plug and port#1. And re-connect the port#1 to force the Switch detect its power system again.

3. **Performance is not good?**

   Ans:

   Please check the duplex setting of the Switch and the connected device, if the connected device does not support Auto-Negotiation, please set the device to forced half-duplex mode. Otherwise, the performance could be poor due to the incorrect duplex mode setting.
   Please also check the PCs in the network, for some times, if one of the PCs sending abnormal broadcast to the network it will also affect the overall network performance. You can check the LED of the switch to diagnose the symptom. Remove all the connection and plug-in one by one, if the LNK/ACT LED is blinking all the time (never stop), please isolate this PC and see if the performance will goes back to normal if the reset PCs are connected back to the switch.

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