D-Link® DES-1016D

16-Port 10/100Mbps
Ethernet Switch

Manual

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ABOUT THIS GUIDE

Congratulations on your purchase of the DES-1016D 16-port 10/100Mbps Fast Ethernet Switch. This device integrates 100Mbps Fast Ethernet and 10Mbps Ethernet network capabilities into one highly flexible solution.

Purpose

This guide discusses how to install your DES-1016D.

Terms/Usage

In this guide, the term "**Switch**" (first letter upper case) refers to your 16-port 10/100Mbps Fast Ethernet Switch, and "**switch**" (first letter lower case) refers to other Ethernet switches.

Overview of this User's Guide

Introduction. Describes the Switch and its features.

Unpacking and Installation. Helps you get started with the basic installation of the Switch.

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

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

INTRODUCTION

This chapter describes the features of the DES-1016D and some background information about Ethernet/Fast Ethernet switching technology.

Fast Ethernet Technology

Ethernet, along with its speedier counterpart Fast Ethernet, is the most popular networking standard in use today. 100BaseT Fast Ethernet is an extension of the 10BaseT Ethernet standard, designed to raise the data transmission capacity of 10BaseT from 10Mbits/sec to 100Mbits/sec. An important strategy incorporated by 100BaseT is its use of the Carrier Sense Multiple Access with Collision Detection (CSMA/CD) protocol - which is the same protocol that 10BaseT uses - because of its ability to work with several different types of cable, including basic twisted-pair wiring. Both of these features play an important role in network considerations, and they make 100BaseT an attractive migration path for those networks based on 10BaseT. 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

Switching is a cost-effective way of increasing the total network capacity available to users on a LAN. If an Ethernet network begins to display symptoms of congestion, low throughput, slow response times, and high rates of collision, installing a switch to an network can preserve much or all of the existing network's cabling and workstation interface card infrastructure while still greatly enhancing the throughput for users. A switch is a viable solution even if demanding applications, such as multimedia production and video conferencing, are on the horizon. The most promising techniques, as well as the best return on investment, could well consist of installing the right mixture of Ethernet switches.

A switch increases capacity and decreases network loading by dividing a local area network into different LAN *segments*. Dividing a LAN into multiple segments is one of the most common ways of increasing available bandwidth. If segmented correctly, most network traffic will remain within a single segment, enjoying the full-line speed bandwidth of that segment.

Switches provide full-line speed, dedicated to bandwidth for all connections. This is in contrast to the hubs, which use the traditional shared networking topology, where the connected nodes contend for the same network bandwidth. When two switching nodes are communicating, they are connected with a dedicated channel between them, so there is no contention for network bandwidth with other nodes. As a result, the switch reduces considerably the likelihood of traffic congestion.

For Fast Ethernet networks, a switch is an effective way of eliminating the problem 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 hubs and 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.

Features

The DES-1016D is a high-performance switch designed specifically for environments where traffic on the network and the number of users increase continuously.

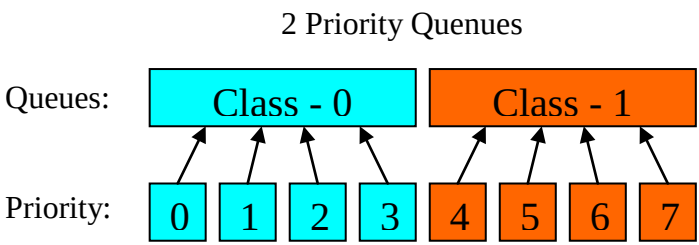
- ✓ **16-port 10/100Mbps Ethernet Switch with RJ-45 connectors**
- ✓ **Supports Auto-negotiation of speed and duplex modes for each port**
- ✓ **Supports Auto-MDI/MDIX on each port, eliminating the need for cross over cables or uplink ports**
- ✓ **Wire-speed reception and transmission**
- ✓ **Store-and-Forward switching method**
- ✓ **Supports 8K MAC addresses**
- ✓ **Supports 256KBytes (2Mbits) RAM for data buffering**
- ✓ **Front-panel diagnostic LEDs**
- ✓ **IEEE 802.3x flow control for full-duplex**
- ✓ **Back pressure flow control for half-duplex**
- ✓ **Supports IEEE 802.1p QoS, 4 Queues (Strict Mode)**
- ✓ **Compliance with IEEE802.3az Energy-Efficient-Ethernet (EEE)**

IEEE802.1P QOS

The DES-1016D Switches support 802.1p priority queuing Quality of Service. The implementation of QoS (Quality of Service) and benefits of using 802.1p priority queuing are described here.

Advantages of QoS

QoS is an implementation of the IEEE 802.1p standard that allows network administrators a method of reserving bandwidth for important functions that require a large bandwidth or have a high priority, such as VoIP (voice-over Internet Protocol), web browsing applications, file server applications or video conferencing. Not only can a larger bandwidth be created, but other less critical traffic can be limited, so bandwidth can be saved. The Switch has separate hardware queues on every physical port to which packets from various applications are mapped to and assigned a priority. The illustration below shows how 802.1P priority queuing is implemented on the Switch. The eight IEEE 802.1P priority levels defined by the standard are mapped to the four class queues used in the Switch.



Mapping QoS on the Switch

The picture above shows the default priority setting for the Switch. Class-3 has the highest priority of the four priority queues on the Switch. In order to implement QoS, the user is required to instruct the Switch to examine the header of a packet to see if it has the proper identifying tag tagged. Then the user may forward these tagged packets to designated queues on the Switch where they will be emptied, based on priority.
"The DUT support strict mode for 802.1p QoS. The untagged pkt will follow the priority 0 to work (i.e. class 1)."

Understanding QoS

The Switch has four priority queues. These priority queues are labeled as 3, the high queue to 0, the lowest queue. The eight priority tags, specified in IEEE 802.1p are mapped to the Switch's priority tags as follows:

- Priority 0 is assigned to the Switch's Q1 queue.
- Priority 1 is assigned to the Switch's Q0 queue.
- Priority 2 is assigned to the Switch's Q0 queue.
- Priority 3 is assigned to the Switch's Q1 queue.
- Priority 4 is assigned to the Switch's Q2 queue.
- Priority 5 is assigned to the Switch's Q2 queue.
- Priority 6 is assigned to the Switch's Q3 queue.
- Priority 7 is assigned to the Switch's Q3 queue.

The Switch uses strict priority for Scheduling. Strict priority-based scheduling, any packets residing in the higher priority queues are transmitted first.

UNPACKING AND SETUP

Unpacking

Open the shipping cartons of the DES-1016D and carefully unpack its contents. The carton should contain the following items:

- ✓ **One DES-1016D 16-port 10/100Mbps Fast Ethernet Switch**
- ✓ **One AC power cord and power cord clip**
- ✓ **Four rubber feet to be used for shock cushioning**
- ✓ **Screws and two mounting brackets**
- ✓ **Quick Installation Guide**

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

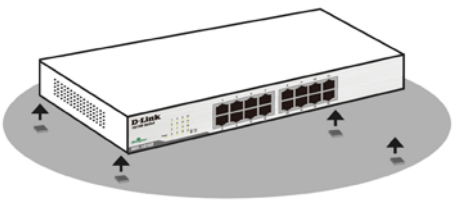
Setup

The setup of the DES-1016D can be performed by using the following steps:

- ✓ **The surface must support at least 11 lbs (5 kg).**
- ✓ **The power outlet should be within 6 feet (1.42 meters) of the device.**
- ✓ **Visually inspect the power cord and see that it is secured fully to the AC power outlet.**
- ✓ **Make sure that there is adequate ventilation around the Switch.**
- ✓ **Do not place heavy objects on the Switch.**

Desktop Installation

When installing the DES-1016D on a desktop or shelf, the rubber feet included with the device should be attached first, to minimize scratching or scarring of the surface on which the Switch is placed. Attach these cushioning feet on the bottom at each corner of the device. Allow enough ventilation space between the device and the objects around it.

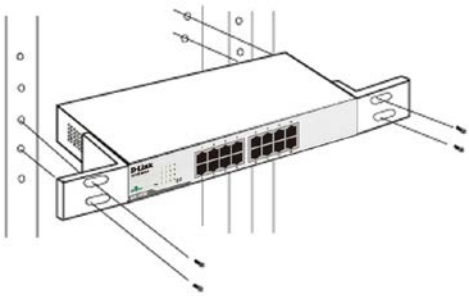


Fast Ethernet Switch installed on a Desktop or Shelf

Rack Mounting

The DES-1016D can be mounted in an EIA standard-size 19-inch rack, in a wiring closet with other equipment. Attach the mounting brackets on each side of the Switch's front panel (as shown in the illustration below), and secure them with the screws provided.

Attaching the mounting brackets to the Switch

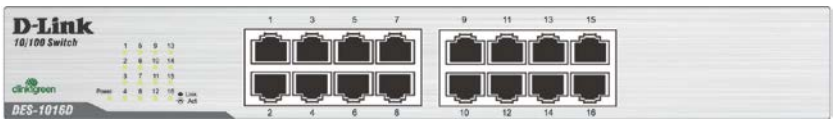


Installing the Switch in an equipment rack

IDENTIFYING EXTERNAL COMPONENTS

Front Panel

The figure below shows the front panels of the switch.

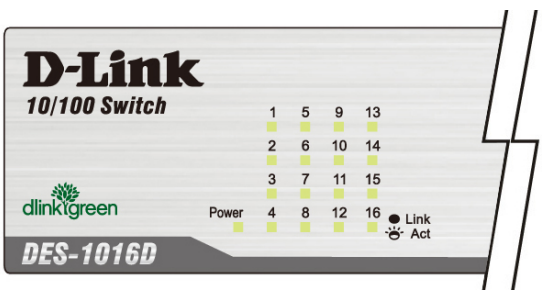


16-port 10/100Mbps Fast Ethernet Switch

✓

✓ **LED Indicator Panel**

Refer to the next chapter for detailed information about each of the switch's LED indicators.



- **Power (PWR)**

This green LED indicator illuminates when the switch is receiving power; otherwise, it is off.

- **Link / Activity**

This green LED indicator illuminates when the port is connected to a Fast Ethernet or Ethernet station; the indicator blinks when transmitting or receiving data.

✓ **Twisted-Pair Ports**

These ports support automatic MDI/MDIX crossover detection function providing true 'plug and play' connectivity, which eliminates the need for crossover cables or uplink ports. Any port can be simply plugged to a server, workstation, or hub using the usual straight-through, twisted-pair cable.

Power Input on Rear Panel

The power cable connection is located on the rear panel of the Switch.

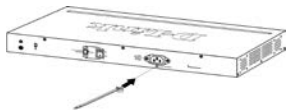
Rear panel view of the Switch

Switch power input is provided by and internal universal power supply (100-240VAC, 50-60Hz).
The AC power connector is a standard three-pronged connector that supports the power cord. Please see the Power On section below for instructions on how to properly connect the Switch to a power source.

Installing Power Cord Clip

To prevent accidental removal of the AC power cord, it is recommended to install the ower cord clip together with the power cord.

A. With the rough side facing down, insert the Tie Wrap into the hole below the power socket.



Insert Tie Wrap to the Switch

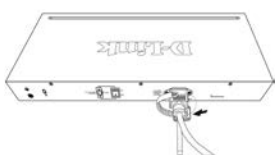
B. Plug the AC power cord into the power socket of the Switch.

Connect the power cord to the Switch

C. Slide the Retainer through the Tie Wrap until the end of the cord.

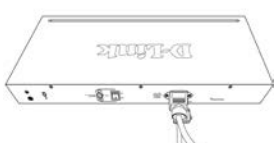
Slide the Retainer through the Tie Wrap

D. Circle the tie of the Retainer around the power cord and into the locker of the Retainer.



Circle around the power cord

E. Fasten the tie of the Retainer until the power cord is secured.



Secure the power cord

Kensington Security Slot

DES-1016D has been giving customers the best option for physical security through a Kensington Security Slot in the rear panel. The Kensington Security Slot adds value to DES-1016D by offering customers a simple, built-in security solution.

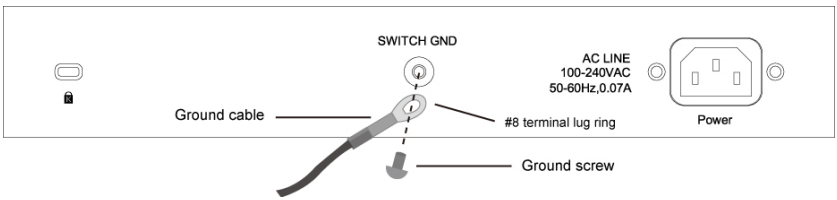
Grounding the Switch

This section describes how to connect the switch to ground. You must complete this procedure before powering your switch.

Required Tools and Equipment

- Ground screws (included in the accessory kit): One M4 x 6 mm (metric) pan-head screw
- Ground cable (not included in the accessory kit): The grounding cable should be sized according to local and national installation requirements. Depending on the power supply and system, a 12 to 6 AWG copper conductor is required for U.S installation. Commercially available 6 AWG wire is recommended. The length of the cable depends on the proximity of the switch to proper grounding facilities.
- A screwdriver (not included in the accessory kit)

The following steps let you connect the switch to a protective ground:
Step 1: Verify if the system power is off.
Step 2: Use the ground cable to place the #8 terminal lug ring on top of the ground-screw opening, as seen in the figure below.
Step 3: Insert the ground screw into the ground-screw opening.
Step 4: Using a screwdriver, tighten the ground screw to secure the ground cable to the switch.
Step 5: Attach the terminal lug ring at the other end of the grounding cable to an appropriate grounding stud or bolt on rack where the switch is installed.
Step 6: Verify if the connections at the ground connector on the switch and the rack are securely attached.



TECHNICAL SPECIFICATIONS

General	
Standards	IEEE 802.3 10BASE-T Ethernet IEEE 802.3u 100BASE-TX Fast Ethernet IEEE 802.1p Compliance
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	10BASET: 2-pair UTP Cat. 3,4,5, EIA/TIA- 568 100-ohm STP 100BASE-TX: 2-pair UTP Cat. 5, EIA/TIA-568 100-ohm STP
Number of Ports	16 x 10/100Mbps Auto-MDI/MDIX ports
Physical and Environmental	
AC inputs	100 to 240 VAC, 50 or 60 Hz internal universal power supply
Power Consumption	2.1 Watts.
Temperature	Operating: 0° ~ 40° C (32º to 104º F), Storage: -10° ~ 70° C (14º to 158º F)
Humidity	Operating: 10% ~ 90%, Storage: 5% ~ 90%
Dimensions	Width x Depth x Height 280 x 125.8 x 44 mm (11.0 x 5.0 x 1.7 inches)
EMI:	Class A: FCC, CE, VCCI, C-Tick, BSMI, CCC
Safety	cUL, CB, LVD, BSMI, CCC

Performance	
Transmits Method:	Store-and-forward
RAM Buffer:	2Mbits per device
Filtering Address Table:	8K entries per device
Packet Filtering/ Forwarding Rate:	10Mbps Ethernet: 14,880/pps 100Mbps Fast Ethernet: 148,809/pps
MAC Address Learning:	Automatic update

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