



**DES-1218 / DES1226**

***10/100/1000 Mbps***

***Switch with optional Gigabit module***

***User's Guide***

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RECYCLABLE

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2. Heben Sie diese Anleitung für den spätern Gebrauch auf.
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This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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Este es un producto de Clase A. En un entorno doméstico, puede causar interferencias de radio, en cuyo caso, puede requerirse al usuario para que adopte las medidas adecuadas.

## Attention!

Ceci est un produit de classe A. Dans un environnement domestique, ce produit pourrait causer des interférences radio, auquel cas l'utilisateur devrait prendre les mesures adéquates.

## Attenzione!

Il presente prodotto appartiene alla classe A. Se utilizzato in ambiente domestico il prodotto può causare interferenze radio, nel cui caso è possibile che l'utente debba assumere provvedimenti adeguati.

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# ABOUT THIS GUIDE

This User's Guide provides instruction for installing the Switch, making the proper connections to an Ethernet network, and setting the configurations using the built-in console interface.

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## Conventions

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For simplicity, this documentation uses the terms "Switch" (first letter upper case) to refer to both the DES-1218 and DES-1226 Ethernet Switch, and "switch" (first letter lower case) to refer to all Ethernet switches, including the DES-1218 and DES-1226. When a distinction between the two models is necessary, the model number will be given to distinguish between them.

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## Overview of this User's Guide

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- ◆ 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/Fast Ethernet network.
- ◆ Chapter 5, *Switch Management*. Talks about Local Console Management via the RS-232 DCE console port and other aspects about how to manage the Switch.
- ◆ Chapter 6, *Management Concepts*. A more detailed discussion of some of the management features of the Switch including, Port Trunk Groups, VLANs, and IEEE 802.1p Priority Queues.
- ◆ Appendix A, *Technical Specifications*. Lists the technical specifications of the switch.
- ◆ Appendix B, *Cables and Connectors*. Describes the RJ-45 receptacle/connector, straight and crossover cables and standard pin assignments.
- ◆ Appendix C, *Cable Lengths*. Contains chart for fiber-optic and copper cable maximum distances.



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# INTRODUCTION

This section describes the features of the Switch, as well as giving some background information about Fast Ethernet, Gigabit Ethernet, and switching technology.

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## 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 are proposed to provide greater bandwidth and improve client/server response times. Among them, Fast Ethernet, or 100BASE-T, provides a non-disruptive, smooth evolution from 10BASE-T technology.

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 Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Ethernet protocol.

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## Gigabit Ethernet Technology

Gigabit Ethernet is an extension of IEEE 802.3 Ethernet utilizing the same packet structure, format, and support for CSMA/CD protocol, full duplex, flow control, and management objects, but with a tenfold increase in theoretical throughput over 100Mbps Fast Ethernet and a one hundred-fold increase over 10Mbps Ethernet. Since it is compatible with all 10Mbps and 100Mbps Ethernet environments, Gigabit Ethernet provides a straightforward upgrade without wasting a company's existing investment in hardware, software, and trained personnel.

The increased speed and extra bandwidth offered by Gigabit Ethernet is essential to coping with the network bottlenecks that frequently develop as computers and their buses get faster and more users use applications that generate more traffic. Upgrading key components, such as your backbone and servers to Gigabit Ethernet can greatly improve network response times as well as significantly speed up the traffic between your subnetworks.

Gigabit Ethernet enables fast optical fiber connections to support video conferencing, complex imaging, and similar data-intensive applications. Likewise, since data transfers occur 10 times faster than Fast Ethernet, servers outfitted with Gigabit Ethernet NIC's are able to perform 10 times the number of operations in the same amount of time.

In addition, the phenomenal bandwidth delivered by Gigabit Ethernet is the most cost-effective method to take advantage of today and tomorrow's rapidly improving switching and routing internetworking technologies.

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## Switching Technology

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Another key development pushing the limits of Ethernet technology is in the field of switching technology. A switch bridges 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 making it possible for a local area network to be divided into different *segments* which don't compete with each other for network transmission capacity, giving a decreased load on each.

The switch acts as a high-speed selective bridge between the individual segments. Traffic that needs to go from one segment to another (from one port to another) is automatically forwarded by the switch, without interfering with any other segments (ports). This allows the total network capacity to be multiplied, while still maintaining the same network cabling and adapter cards.

For Fast Ethernet or Gigabit 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, for example, making it possible to expand your Fast Ethernet network beyond the 205 meter network diameter limit for 10BASE-TX networks. Switches supporting both traditional 10Mbps Ethernet and 100Mbps Fast Ethernet are also ideal for bridging between existing 10Mbps networks and 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 and the setup and maintenance required make routers relatively impractical. Today's switches are an ideal solution to most kinds of local area network congestion problems.

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## DES-1218/DES-1226 10/100/1000 Mbps Switch

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### ***General Description of Switch***

The Switch is equipped with unshielded twisted-pair (UTP) cable ports providing dedicated 10 or 100 Mbps bandwidth. The DES-1218 has 16 UTP ports, the DES-1226 has 24 UTP ports. Both models include one MDI-X/MDI-II convertible port (port 1x) that can be used for uplinking to another switch. These ports can be used for connecting PCs, servers, and hubs. The dual speed ports use standard twisted-pair cabling and are ideal for segmenting networks into small, connected subnetworks. Each port can support up to 200 Mbps of throughput in full-duplex mode.

In addition, the Switch can be fitted with an optional 2 port Gigabit Ethernet module to uplink to a server or network backbone.



- ◆ RS-232 DCE console port for Switch management

## Ports

- ◆ 16 or 24 High-performance ports for connecting to end stations, servers and hubs (MDI-X 10/100 Ethernet UTP ports and 1 MDI-X/MDI-II Uplink port).
- ◆ All UTP ports can auto-negotiate between 10Mbps/100Mbps, half-duplex, or full duplex and flow control.
- ◆ One front panel slide-in module interface for the DES-122G 2 port 1000BASE-SX (SC type connector), DES-122GL 2 port 1000BASE-LX, DES-122GB 2 port GBIC, DES-122T 2 port 1000BASE-T, and DES-122GM 2 port 1000BASE-SX (MTRJ type connector) for connecting to another switch, server or network backbone.
- ◆ RS-232 DCE Diagnostic port (console port) for setting up and managing the Switch via a connection to a console terminal or PC using a terminal emulation program.

## Optional Gigabit Extension Modules

### 1000BASE-SX (SC) Module (DES-122G)

- ◆ 1000BASE-SX (with SC type connector) Gigabit Ethernet ports
- ◆ Fully compliant with IEEE802.3z
- ◆ Support Full-duplex operation only
- ◆ IEEE 802.3x compliant Flow Control support for full-duplex
- ◆ Per port packet buffer: 2Mbytes

### 1000BASE-LX (SC) Module (DES-122GL)

- ◆ 1000BASE-LX (with SC type connector) Gigabit Ethernet ports
- ◆ Fully compliant with IEEE802.3z
- ◆ Support Full-duplex operation only
- ◆ IEEE 802.3x compliant Flow Control support for full-duplex
- ◆ Per port packet buffer: 2Mbytes

### GBIC Gigabit Ethernet Module (DES-122GB)

- ◆ GBIC Gigabit Ethernet ports
- ◆ Support Full-duplex operation only
- ◆ IEEE 802.3x compliant Flow Control support for full-duplex
- ◆ Per port packet buffer: 2Mbytes

*Note: This module requires using a GBIC converter. Contact your D-Link vendor for either the DGS-701 1000BASE-SX GBIC FTR-8519-3A (Finisar) or DGS-702 1000BASE-LX GBIC FTR-1319-3A (Finisar).*

### 1000BASE-T Module (DES-122T)

- ◆ 1000BASE-T Gigabit Ethernet ports
- ◆ Fully compliant with IEEE802.3ab
- ◆ Support Nway Auto-negotiation for full-duplex operation

- ◆ Support Auto-negotiation for flow-control
- ◆ IEEE 802.3x compliant Flow Control support for full-duplex
- ◆ Back pressure flow control support for half-duplex mode
- ◆ Per port packet buffer: 2Mbytes

**1000BASE-SX (MT-RJ) Module (DES-122GM )\***

- ◆ 1000BASE-SX (with MT-RJ type connector) Gigabit Ethernet ports
- ◆ Fully compliant with IEEE802.3z
- ◆ Support Full-duplex operation only
- ◆ IEEE 802.3x compliant Flow Control support for full-duplex
- ◆ Per port packet buffer: 2Mbytes

\*DES-122GM is not available as of this writing, July 2000.

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# UNPACKING AND SETUP

This chapter provides unpacking and setup information for the Switch Fast Ethernet/Gigabit Switch.

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## Unpacking

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Open the shipping carton of the switch and carefully unpack its contents. The carton should contain the following items:

- ◆ One DES-1218 or DES-1226 Stand-alone Switch
- ◆ One AC power cord
- ◆ This User's Guide CD-ROM
- ◆ Registration card
- ◆ Mounting Kit (two brackets and screws)
- ◆ Four rubber feet with adhesive backing
- ◆ RS-232 Console Cable

If any item is found missing or damaged, please contact your local D-Link Reseller for replacement.

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## Setup

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The site where you install the Switch may greatly effect its performance. Please follow these guidelines for setting up the switch.

- ◆ Install the switch on a sturdy, level surface that can support at least 3 kg of weight. Do not place heavy objects on the switch.
- ◆ The power outlet should be within 1.82 meters (6 feet) of the switch.
- ◆ Visually inspect the power cord and see that it is fully secured to the AC power port.
- ◆ Make sure that there is proper heat dissipation from and adequate ventilation around the switch. Leave at least 10 cm of space at the front and rear of the switch for ventilation.
- ◆ Install the switch in a fairly cool and dry place. See Appendix A, Technical Specifications, for the acceptable temperature and humidity operating ranges.
- ◆ Install the switch in a site free from strong electromagnetic field generators (such as motors), vibration, dust, and direct exposure to sunlight.
- ◆ When installing the switch on a level surface, attach the rubber feet to the bottom of the device. The rubber feet cushion the switch, protect the casing from scratches and prevent it from scratching other surfaces.



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## Desktop or Shelf Installation

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When installing the switch on a desktop or shelf, the rubber feet included with the switch should first be attached. Attach these cushioning feet on the bottom at each corner of the device. Allow enough ventilation space between the switch and any other objects in the vicinity.

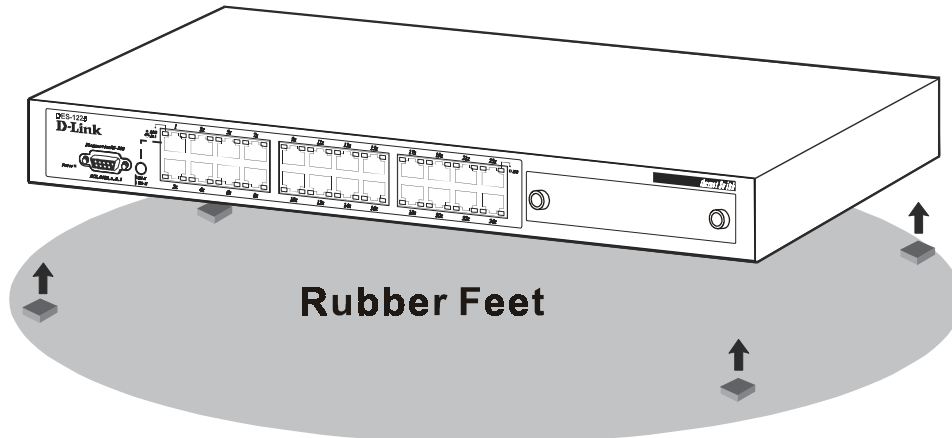


Figure 2-1 DES-1226 Switch installed on a Desktop or Shelf

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## Rack Installation

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The Switch can be mounted in a standard 19" rack. Use the following diagrams to guide you.

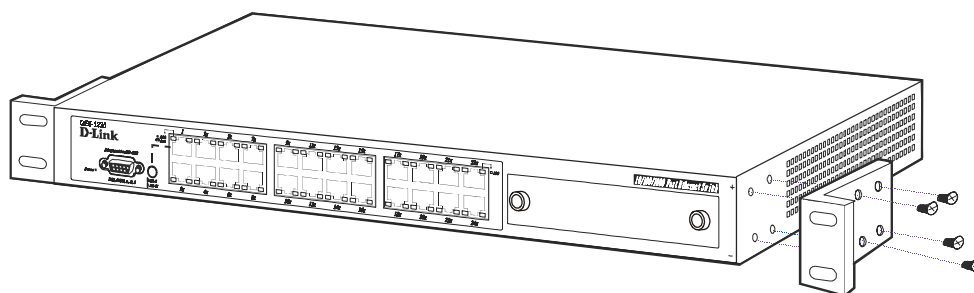


Figure 2-2 Fasten Mounting Brackets to Switch

Fasten the mounting brackets to the Switch using the screws provided. With the brackets attached securely, you can mount the Switch in a standard rack as shown in Figure 2-3 on the following page.

Mounting the Switch in a standard 19" rack.

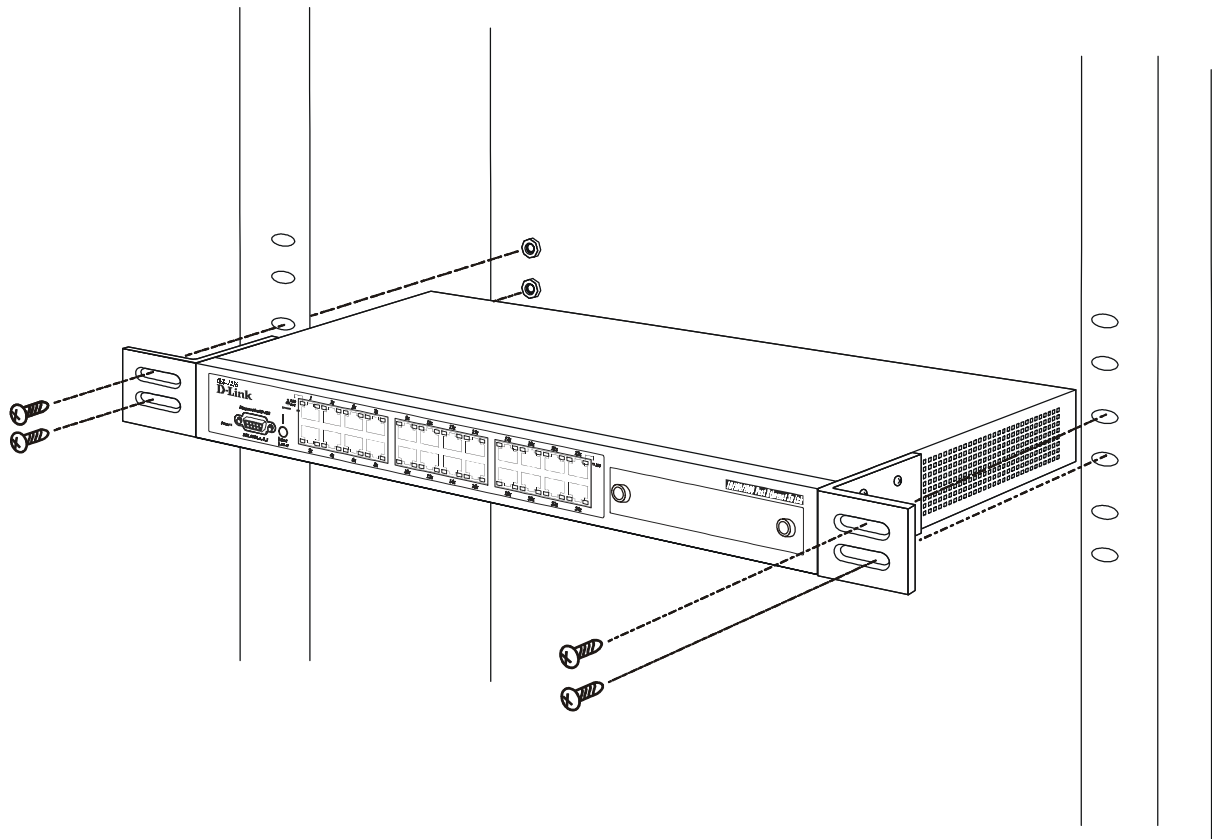


Figure 2-3 DES-1226 Switch in Rack

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## Power on

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Plug one end of the AC power cord into the power connector of the switch and the other end into the local power source outlet.

After the Switch is powered on, the LED indicators will momentarily blink. This blinking of the LED indicators represents a reset of the system.

### ***Power Failure***

As a precaution, in the event of a power failure, unplug the switch. When power is resumed, plug the switch back in.

## IDENTIFYING EXTERNAL COMPONENTS

This chapter describes the front panel, rear panel, optional plug-in modules, and LED indicators of the Switch.

### Front Panel

The front panel of the Switch consists of LED indicators for power and for each port, an RS-232 communication port, 16 (DES-1218) or 24 (DES-1226) 10/100 Mbps twisted-pair ports and a slot for installing an optional 2 port Gigabit Ethernet module.

#### DES-1218

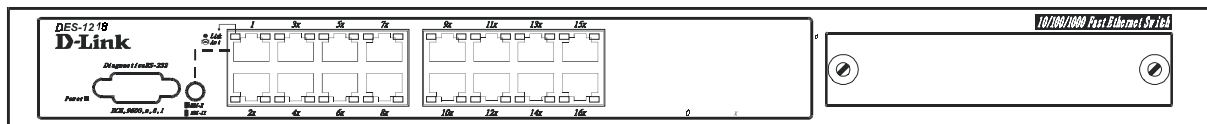
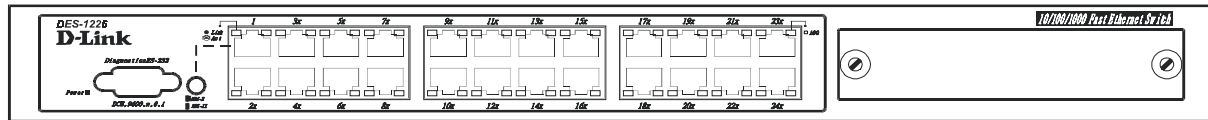


Figure 3-1. Front panel view of the DES-1218

## DES-1226



**Figure 3-2. Front panel view of the DES-1226**

- ◆ An RS-232 DCE console port for setting up and managing the switch via a connection to a console terminal or PC using a terminal emulation program.
- ◆ 16 or 24 high-performance, NWay Ethernet ports all of which operate at 10/100 Mbps for connections to end stations, servers and hubs. All ports can auto-negotiate between 10Mbps or 100Mbps, full or half duplex, and flow control.
- ◆ MDI-X/MDI-II button for port 1x located between the RS-232 DCE console port and the RJ-45 UTP ports. This port can be put in uplink (MDI-II) position by pushing the button in.
- ◆ Slot for optional 2 port Gigabit Ethernet module.

## Rear Panel

The rear panel contains the AC power connector. The AC power connector is a standard three-pronged connector that supports the power cord. Plug-in the female connector of the provided power cord into this socket, and the male side of the cord into a power outlet. Supported input voltages range from 100 ~ 240 VAC at 50 ~ 60 Hz.



**Figure 3-3. Rear panel view of the Switch.**

## Side Panels

The right side panel of the Switch contains two system fans. The left side panel contains heat vents.

The system fans are used to dissipate heat. The sides of the system also provide heat vents to serve the same purpose. Do not block these openings, and leave at least 6 inches of space at the rear and sides of the switch for proper ventilation. Be reminded that without proper heat dissipation and air circulation, system components might overheat, which could lead to system failure.

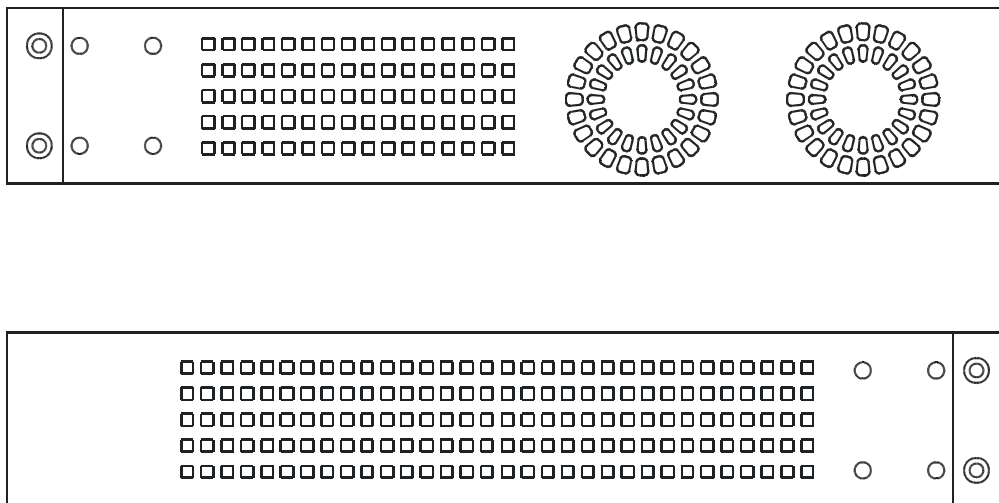


Figure 3-4 Side Panels (the right side panel is pictured on top)

## LED Indicators

- ◆ **Power** The Power LED will light green after the switch is powered on to indicate the ready state of the device.
- ◆ **Link/Act** Located on the upper left corner of each twisted pair port, this LED indicates a valid link (steady green) and will blink when data is being transmitted via that port connection.
- ◆ **10/100 Mbps** On the upper right corner of each twisted pair port, this LED will light when the connection speed is operating at 100 Mbps. An unlit LED indicates a connection speed of 10 Mbps.
- ◆ **Link** (Optional 2 Port Gigabit Ethernet Module) Steady green indicates valid link. Port speed must be designated 1000F for this to light.
- ◆ **Act** (Optional 2 Port Gigabit Ethernet Module) Blinking Green indicates activity on port.

## CONNECTING THE SWITCH

This chapter describes how to connect the DES-1218/1226 to your Fast Ethernet network.

### Switch to End Node

End nodes include PCs outfitted with a 10, 100 or 10/100 Mbps RJ-45 Ethernet/Fast Ethernet Network Interface Card (NIC) and most routers. The RJ-45 UTP ports on NICs and most routers are MDI-II. When using a normal straight-through cable, an MDI-II port must connect to an MDI-X port.

An end node can be connected to the Switch via a two-pair Category 3, 4, 5 UTP/STP straight cable (be sure to use Category 5 UTP or STP cabling for 100 Mbps Fast Ethernet connections). The end node should be connected to any of the ports (1x - 16x on the DES-1218, 1x - 24x on the DES-1226) of the Switch. Port 1x is an uplink port if the MDI-X/MDI-II button is pushed in. An end node should not be connected to the uplink port unless using a crossover cable.

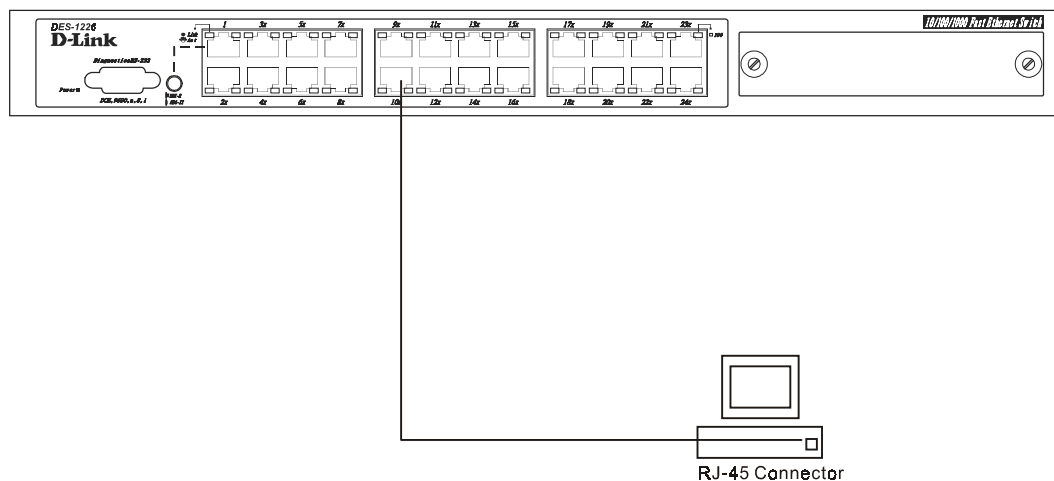


Figure 4-1. Switch connected to an End Node

The **Link/Act** LEDs for each UTP port light green when the link is valid. The LED on the right side of the port indicates port speed, it will light for 100 Mbps connections only. A blinking LED on the left side indicates packet activity on that port.

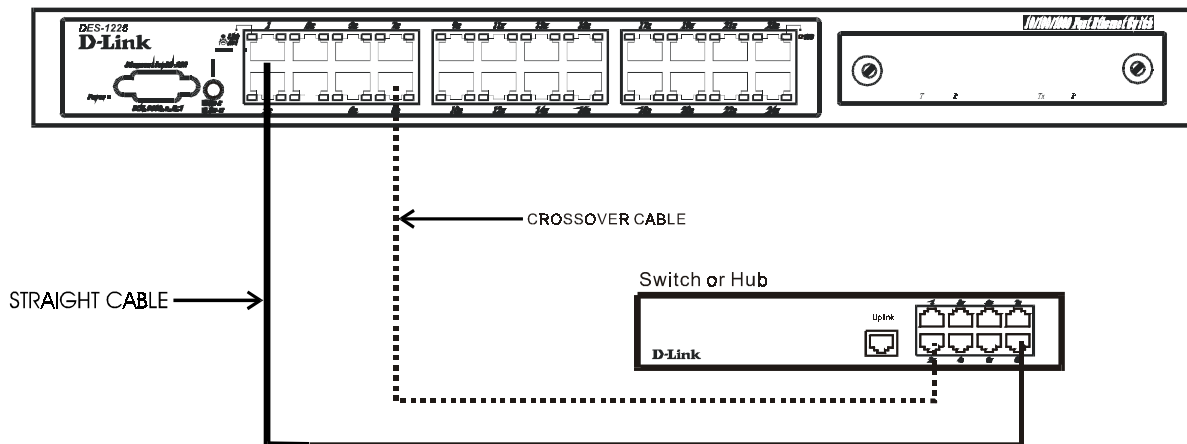
## Switch to Hub or Switch

These connections can be accomplished in a number of ways. The most important consideration is that when using a normal, straight-through cable, the connection should be made between a normal crossed port (Port 1x, 2x, 3x, etc.) and an uplink (port 1x in MDI-II mode) port. If you are using a crossover cable, the connection must be made from uplink to uplink, or from a crossed port to another crossed port.

- ◆ A 10BASE-T hub or switch can be connected to the Switch via a two-pair Category 3, 4 or 5 UTP/STP straight cable.
- ◆ A 100BASE-TX hub or switch can be connected to the Switch via a two-pair Category 5 UTP/STP straight cable.

If the other switch or hub contains an unused uplink port, we suggest connecting the other device's uplink (MDI-II) port to any of the switch's (MDI-X) ports using a normal straight-through cable, as shown below.

If the other device does not have an unused uplink port, make the connection with a normal straight-through cable from the designated MDI-II port on the switch to any normal crossed port on the hub. Alternatively, if you have a crossover cable you can save the MDI-II (uplink) port for other connections and make this one from a crossed port to another crossed port.



**Figure 4-2. Switch connected to a normal (non-Uplink) port on a hub or switch using a straight or crossover cable**

## Connecting to Network Backbone or Server

The slide-in module Gigabit Ethernet ports are ideal for uplinking to a network backbone or network server. These ports operate at 1000 Mbps in full-duplex mode.

Connection to the Gigabit Ethernet ports are made using fiber optic cable or Cat-5 copper cable, depending on the type of port. A valid connection is indicated when the Link LED is lit.

DES-1218 with 2 Port 1000BASE-SX Slide-in Module.

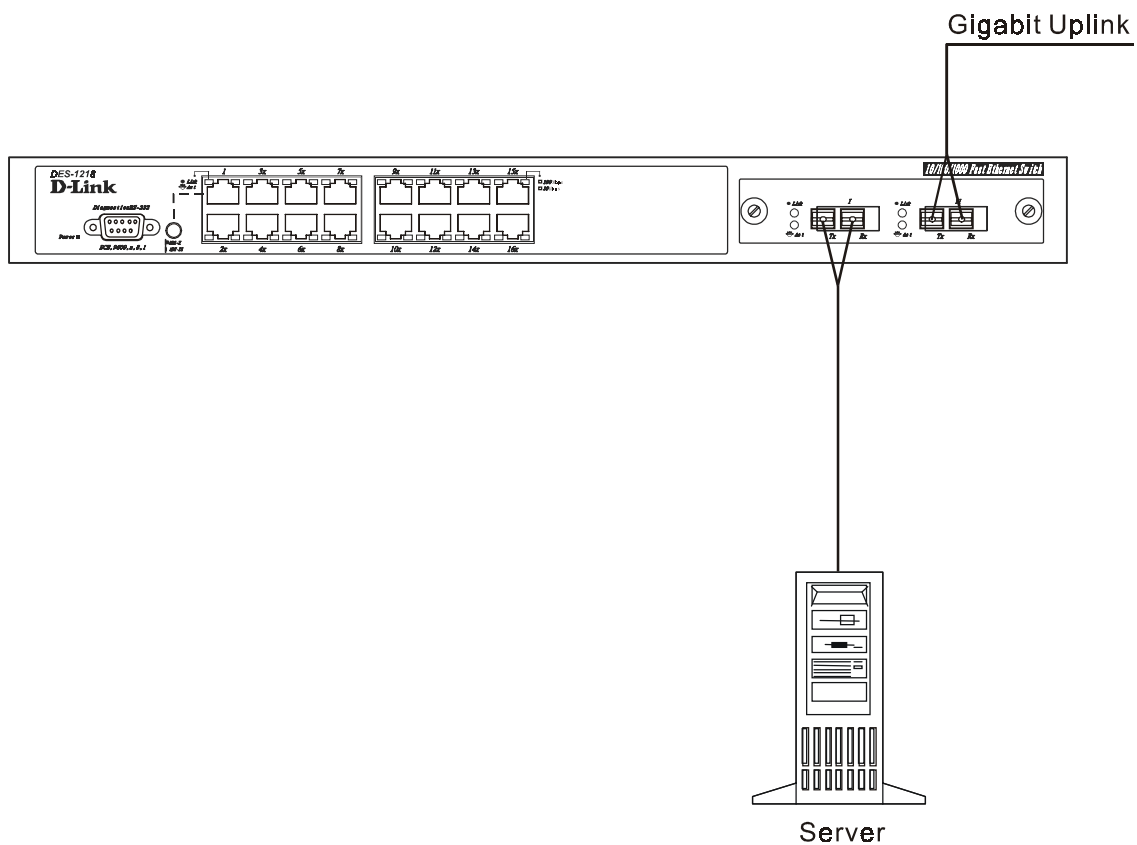


Figure 4-3 Gigabit Uplink Connection



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# SWITCH MANAGEMENT

---

This chapter discusses the features used to manage the Switch, and explains important points regarding these features. Configuring the Switch is discussed in detail.

---

## Local Console Management

---

Local console management involves the administration of the Switch via a direct connection to the RS-232 DCE console port. This is an Out-Of-Band connection, meaning that it is on a different circuit than normal network communications, and thus works even when the network is down.

The local console management connection involves a terminal or PC running terminal emulation software to operate the switch's built-in console program. Using the console program, a network administrator can manage and control the functions of the Switch.

### **Console port (RS-232 DCE)**

Out-of-band management requires connecting a terminal, such as a VT-100 or a PC running terminal emulation program (such as HyperTerminal, which is automatically installed with Microsoft Windows) a to the RS-232 DCE console port of the Switch. Switch management using the RS-232 DCE console port is called *Local Console Management* to differentiate it from management done via management platforms, such as D-View, HP OpenView, etc.

The console port is set for the following configuration:

- ◇ Baud rate: 9,600
- ◇ Data width: 8 bits
- ◇ Parity: none
- ◇ Stop bits: 1
- ◇ Flow Control None

Make sure the terminal or PC you are using to make this connection is configured to match these settings.

If you are having problems making this connection on a PC, make sure the emulation is set to VT-100. *You will be able to set the emulation by clicking on the **File** menu in your HyperTerminal window, click on **Properties** in the drop down menu and click the **Settings** tab, here you will find the **Emulation** options.* If you still don't see anything, try hitting <Ctrl> + r to refresh the screen.

```

Console - HyperTerminal
File Edit View Call Transfer Help

DES-1226
=====

Port Speed FlowCtrl Port Speed FlowCtrl Port Speed FlowCtrl
1 < Auto> < Enable> 2 < Auto> < Enable> 3 < Auto> < Enable>
4 < Auto> < Enable> 5 < Auto> < Enable> 6 < Auto> < Enable>
7 < Auto> < Enable> 8 < Auto> < Enable> 9 < Auto> < Enable>
10 < Auto> < Enable> 11 < Auto> < Enable> 12 < Auto> < Enable>
13 < Auto> < Enable> 14 < Auto> < Enable> 15 < Auto> < Enable>
16 < Auto> < Enable> 17 < Auto> < Enable> 18 < Auto> < Enable>
19 < Auto> < Enable> 20 < Auto> < Enable> 21 < Auto> < Enable>
22 < Auto> < Enable> 23 < Auto> < Enable> 24 < Auto> < Enable>

Giga Switch Module: 2 Port 1000Base-SX
Port 25: Speed <1000F> FlowCtrl < Enable>
Port 26: Speed <1000F> FlowCtrl < Enable>

Trunk MemberPorts Trunk MemberPorts Trunk MemberPorts Trunk MemberPorts
1 [ - ] 2 [ - ] 3 [ - ] 4 [ - ]
5 [ - ] 6 [ - ] 7 [ - ]

=====Page 1==

Tab=Next Item BackSpace=Previous Item Space=Toggle Ver A1-1.00
Ctrl+W=Apply Ctrl+D=Reset to Default Ctrl+R=Refresh Ctrl+P=Next Page

```

**Figure 5-1. Management Console Screen**

Once you have connected to the console port on the switch, you should see a window like that pictured in Figure 5-1. If the screen appears but is blank, press “Control” and “R” (Ctrl+R) simultaneously to refresh the screen. Use this screen to perform all the available management functions.

## User Interface

The command keys are displayed on the bottom of screen, move the cursor the correct position to change function setting. The command keys are described below:

**Tab** – move the cursor to the next item

**Back Space** – move the cursor to previous item

**Space** – toggle, select

**Ctrl+r, Enter** – screen refresh

**Ctrl+d** – all feature settings are reset the default values.

**Ctrl+w** – apply and configuration settings. Use this command to let the settings take effect. This will also save the settings data to the EEPROM in the switch.

## Software Features

The device provides the ability to configure the port speed, flow control, link aggregation, port monitor, 802.1p priority queues, and VLAN group.

### Port Speed - 10/100 Mbps UTP

You can select the desired Speed and Duplex for each port. Possible settings include: *Auto*, *10F*, *10H*, *100F*, and *100H* where the number *10* or *100* is the speed in Mbps, and the *H* or *F* designates half-duplex or full-duplex. Choosing *Auto* enables NWay auto-negotiation to automatically configure the port speed to match the highest speed attainable by the device being connected. The port speed default setting is *Auto*.

### Port Speed – Gigabit Ethernet Ports

1000BASE-SX fiber ports can operate in 1000 Mbps Full-duplex (*1000F*) only.

1000BASE-T ports offer four possible settings: *Auto*, *100H*, *100F*, and *1000F*.

When *Auto* is chosen, NWay will negotiate three settings:

- ◆ Speed - 100/1000 (100 Mbps connections are attainable for hardware version A2 only)
- ◆ Duplex - Full/Half (Half-duplex mode is only available for 100 Mbps connections in hardware version A2 only)
- ◆ IEEE 802.3x Flow Control – *Enable/Disable*

**Note:** The hardware version (A1 or A2) can be found in the lower right-hand corner of the management console screen.

### Flow Control

Toggles flow control *Enable* or *Disable*. It is useful during periods of heavy network activity when the Switch's buffers can receive too much traffic and fill up faster than the Switch can forward the information. In such cases, the Switch will intervene and tell the transmitting device to pause to allow the information in the port buffer to be sent. The flow control default setting is *Enable*.

### Port Trunk Groups

The Switch supports the use of port trunk groups. Each trunk group may contain 2 to 4 ports as members for a potential bit rate of up to 800 Mbps per trunk group. See the discussion of **Port Trunk Groups** in Chapter 6 for more detailed information about port trunk groups.

### Port Monitor

Allows you to select a port to monitor activity for analysis. The Monitored Port will mirror all activity to the Monitoring Port. This feature is useful for analyzing traffic in ports where acute traffic congestion or other problems may exist.

## Priority Queues

This feature allows you to customize packet traffic handling to the particular needs of your network. Configure this setting for packets passing through the port, using IEEE 802.1p priority tagging. These settings are universal, that is, they are for all ports on the Switch. Four priority levels may be assigned with Queue 3 being the highest priority queue, and Queue 0 being the lowest priority queue.

**Note:** The settings you assign to the queues, numbers 0-7, represent the IEEE 802.1p priority tag number. Do not confuse these settings with port numbers.

The highest priority queue, Queue 3, should be reserved for data in which latency can have adverse effects on the function of an application, such as video or audio data, where latency can produce distorted sounds and images. Packets in the lower priority queues will be processed with less urgency. See the discussion on **IEEE 802.1p Priority** and management of priority queues in Chapter 6.

Figure 5-2 shows how priority queues might be assigned. Access the Priority Queue settings on the second page of the console management screen

```

Console - HyperTerminal
File Edit View Call Transfer Help

DES-1226
=====

Port Monitoring: Monitored Port [■] Monitoring Port [ ]

802.1p Priority Queue: Queue0: [0-3] Queue1: [4-5] Queue2: [6-6] Queue3: [7-7]

      12345678 90123456 78901234 56          12345678 90123456 78901234 56
VLAN1 [-----] [-----] [-----] [---] VLAN2 [-----] [-----] [-----] [---]
VLAN3 [-----] [-----] [-----] [---] VLAN4 [-----] [-----] [-----] [---]
VLAN5 [-----] [-----] [-----] [---] VLAN6 [-----] [-----] [-----] [---]
VLAN7 [-----] [-----] [-----] [---] VLAN8 [-----] [-----] [-----] [---]
VLAN9 [-----] [-----] [-----] [---]

=====Page 2==
Tab=Next Item BackSpace=Previous Item Space=Toggle Ver A1-1.00
Ctrl+W=Apply Ctrl+D=Reset to Default Ctrl+R=Refresh Ctrl+P=Next Page

```

**Figure 5-2 Example of Priority Queue Assignments**

## VLAN Group

Up to 9 port-based virtual LAN (VLAN) groups can be designated for the switch. Individual ports can exist in two or more VLANs simultaneously, so VLAN groups can overlap or intersect. For a more detailed discussion of VLANs, see Chapter 6.

Using the space bar, select each port that you would like to be included in the assigned VLAN. A "v" under the port number indicates the port is in the designated VLAN group. Figure 5-3 gives an example of different VLANs assigned to different ports. Notice that a port may be a member of more than one VLAN.

```

Console - HyperTerminal
File Edit View Call Transfer Help

DES-1226
=====

Port Monitoring: Monitored Port [■]      Monitoring Port [ ]

802.1p Priority Queue: Queue0: [0-3] Queue1: [4-5] Queue2: [6-6] Queue3: [7-7]

      12345678 90123456 78901234 56          12345678 90123456 78901234 56
VLAN1 [vvvvvvvvv ----- vv]  VLAN2 [vvv----- vvv----- ----- vv]
VLAN3 [----- vvvvvvvvv ----- vv]  VLAN4 [---vvvvv ---vvvvv ----- vv]
VLAN5 [----- ----- vvvvvvvvv vv]  VLAN6 [----- ----- vvvv----- --]
VLAN7 [----- ----- vvvv --]  VLAN8 [----- ----- ----- --]
VLAN9 [----- ----- ----- --]

-----Page 2-----

Tab=Next Item  BackSpace=Previous Item  Space=Toggle  Ver A1-1.00
Ctrl+W=Apply  Ctrl+D=Reset to Default  Ctrl+R=Refresh  Ctrl+P=Next Page

```

**Figure 5-3 Port-based VLANs**

**Note:** In order to use VLAN segmentation in conjunction with port trunk groups, you must first set the port trunk group(s), and then you may configure VLAN settings. If you wish to change the port trunk grouping with VLANs already in place, you will need to reconfigure the VLAN settings after changing the port trunk group settings.

# MANAGEMENT CONCEPTS

This chapter discusses some of the important management concepts used to manage the Switch. The functions dealt with in this chapter include Port Trunk Groups, VLAN network segmentation, and IEEE 802.1p Priority Queues.

## Port Trunk Groups

Port trunk groups are used to combine a number of ports together to make a single high-bandwidth data pipeline.

The DES-1218 supports up to 5 trunk groups, the DES-1226 can utilize up to 7 trunk groups. With up to 4 ports in each group, a potential bit rate of 800 Mbps can be achieved.

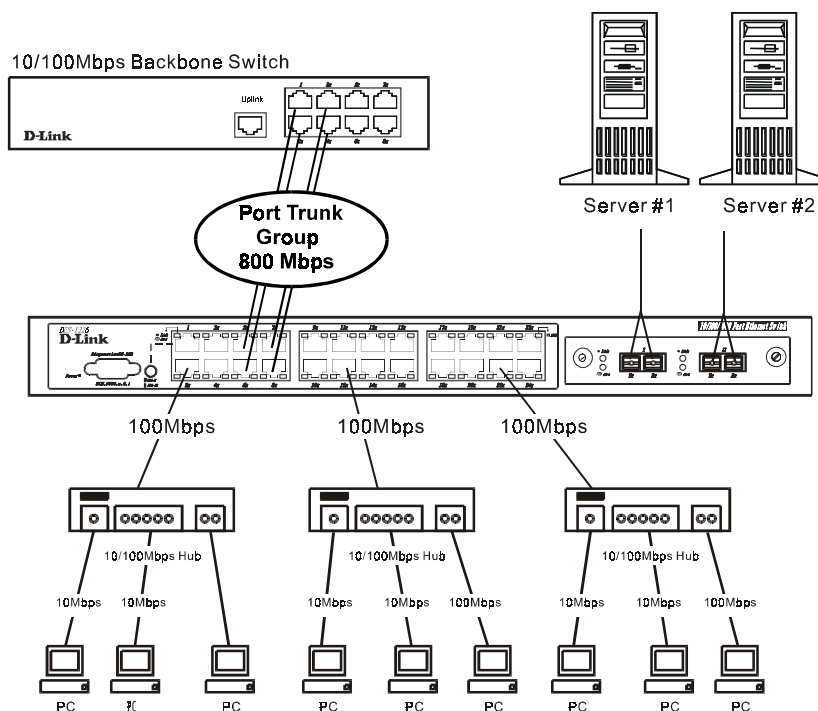


Figure 5-4 Example of Port Trunk Group

The switch treats all ports in a trunk group as a single port. Data transmitted to a specific host (destination address) will always be transmitted over the same port in a trunk group. This allows packets in a data stream to arrive in the same order they were sent. A trunk connection can be made with any other switch that maintains host-to-host data streams over a single trunk port. Switches that use a load-balancing scheme and send packets of a host-to-host data stream over multiple trunk ports cannot have a trunk connection with the Switch.

**Note:** If the two Gigabit Ethernet ports are used as a trunk group and either port is disconnected, packets intended for the disconnected port will be dropped.

## IEEE 802.1p Priority

---

Priority Tagging is a function defined by the IEEE 802.1p standard designed to provide a means of managing traffic on a network where many different types of data may be transmitted simultaneously. It is intended to alleviate problems associated with the delivery of time critical data over congested networks. The quality of applications that are dependent on such time critical data, such as video conferencing, can be severely and adversely effected by even very small delays in transmission.

Network devices that are in compliance with the IEEE 802.1p standard have the ability to recognize the priority level of data packets. These devices can also assign a priority label or tag to packets. Compliant devices can also strip priority tags from packets. This priority tag determines the packet's degree of expeditiousness and determines the queue to which it will be assigned.

Priority tags are given values from 0 to 7 with 0 being assigned to the lowest priority data and 7 being given to the highest. The highest priority tag 7 is generally only used for data associated with video or audio applications, which are sensitive to even slight delays, or for data from specified end users whose data transmissions warrant special consideration.

The Switch allows you to further tailor how priority tagged data packets are handled on your network. Using queues to manage priority tagged data allows you to specify its relative priority to suit the needs of your network. There may be circumstances where it would be advantageous to group two or more differently tagged packets into the same queue. Generally however, it is recommended that the highest priority queue, Queue 3, be reserved for data packets with a priority value of 7. Packets that have not been given any priority value are placed in Queue 0 and thus given the lowest priority for delivery.

A weighted round robin system is employed on the Switch to determine the rate at which the queues are emptied of packets. The ratio used for clearing the queues is 15:7:3:1. This means that the highest priority queue, Queue 3, will clear 15 packets for every 7 packets cleared from Queue 2, 15 packets for every 3 packets from Queue 1, and 15 packets for every 1 packet from Queue 0.

Remember, the priority queue settings on the Switch are for all ports, and all devices connected to the Switch will be effected. This priority queuing system will be especially beneficial if your network employs switches with the capability of assigning priority tags.

---

## VLANs

---

VLANs are a collection of users or ports grouped together in a secure, autonomous broadcast and multicast domain. Membership to a VLAN is not restricted by a physical location and can be defined across multiple LAN switches.

Port-based VLANs allow a network to be segmented in order to reduce the size of broadcast domains. All packets entering a VLAN will only be forwarded to the ports that are members of that VLAN. This even includes Multicast frames and unknown unicast frames.

Another benefit of VLANs is that you can change the network topology without physically moving stations or changing cable connections. Stations can be 'moved' simply by changing VLAN settings from one VLAN (the sales VLAN, for example) to another VLAN (the marketing VLAN). This allows VLANs to accommodate network moves, changes and additions with the utmost flexibility.

VLANs can also provide a level of security to your network. Port-based VLANs allow you to configure ports to not accept packets from outside of the VLAN.

## **Port-based VLANs**

Port-based VLANs limit traffic that flows into and out of switch ports. Thus, all devices connected to a port are members of the VLAN(s) the port belongs to, whether there is a single computer directly connected to a switch, or an entire department.

On port-based VLANs, NICs do not need to be able to identify 802.1Q tags in packet headers. NICs send and receive normal Ethernet packets. If the packet's destination lies on the same segment, communications take place using normal Ethernet protocols. Even though this is always the case, when the destination for a packet lies on another switch port, VLAN considerations come into play to decide if the packet gets dropped by the switch or delivered.

### **VLAN Segmentation**

Take for example a packet that is transmitted by a machine on Port 1 that is a member of VLAN 2. If the destination lies on another port (found through a normal forwarding table lookup), the switch then looks to see if the other port (Port 10) is a member of VLAN 2 (and can therefore receive VLAN 2 packets). If port 10 is not a member of VLAN 2, then the packet will be dropped by the switch and will not reach its destination. If Port 10 is a member of VLAN 2, the packet will go through. This selective forwarding feature based on VLAN criteria is how VLANs segment networks. The key point being that Port 1 will only transmit on VLAN 2.

Network resources such as printers and servers however, can be shared across VLANs. This is achieved by setting up overlapping VLANs. That is ports can belong to more than one VLAN groups. Setting VLAN 1 members are port 1,2,3,4 and VLAN 2 members are 1,5,6,7. The Port 1 is belonging to two VLAN groups. The port 8, 9, 10 are not configured to any VLAN group. This means port 8,9,10 are the same VLAN group.

### **VLAN and Trunk Groups**

The members of a trunk group have the same VLAN setting. Any VLAN setting on the members of a trunk group will apply to the other member ports.

**Note:** In order to use VLAN segmentation in conjunction with port trunk groups, you must first set the port trunk group(s), and then you may configure VLAN settings. If you wish to change the port trunk grouping with VLANs already in place, you will need to reconfigure the VLAN settings after changing the port trunk group settings.





# TECHNICAL SPECIFICATIONS

General											
<b>Standards:</b>	IEEE 802.3 10BASE-T Ethernet IEEE 802.3u 100BASE-TX Fast Ethernet IEEE802.3z 1000BASE-SX/1000BASE-LX IEEE802.3ab 1000BASE-T IEEE 802.3x Flow Control IEEE 802.1p Priority Queue ANSI/IEEE Std 802.3 NWay auto-negotiation										
<b>Protocol:</b>	CSMA/CD										
<b>Data Transfer Rate:</b>	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;"><b>Ethernet:</b></td> <td style="width: 50%;"><b>Fast Ethernet:</b></td> </tr> <tr> <td>10 Mbps (half duplex)</td> <td>100Mbps (half duplex)</td> </tr> <tr> <td>20 Mbps (full duplex)</td> <td>200Mbps (full duplex)</td> </tr> <tr> <td colspan="2">Gigabit Ethernet:</td> </tr> <tr> <td colspan="2">2000 Mbps (full-duplex only)</td> </tr> </table>	<b>Ethernet:</b>	<b>Fast Ethernet:</b>	10 Mbps (half duplex)	100Mbps (half duplex)	20 Mbps (full duplex)	200Mbps (full duplex)	Gigabit Ethernet:		2000 Mbps (full-duplex only)	
<b>Ethernet:</b>	<b>Fast Ethernet:</b>										
10 Mbps (half duplex)	100Mbps (half duplex)										
20 Mbps (full duplex)	200Mbps (full duplex)										
Gigabit Ethernet:											
2000 Mbps (full-duplex only)											
<b>Topology:</b>	Star										
<b>Network Cables</b>											
<b>10BASE-T:</b>	UTP Category 3,4,5 (100 meters max.) EIA/TIA- 568 100-ohm STP (100 meters max.)										
<b>100BASE-TX:</b>	UTP Cat. 5 (100 meters max.) EIA/TIA-568 100-ohm STP (100 meters max.)										
<b>1000BASE-T:</b>	UTP Cat. 5e (100 meters max.) UTP Cat. 5 (100 meters max.) EIA/TIA-568B 100-ohm STP (100 meters max.)										
<b>1000BASE-SX:</b>	50/125µm Multimode Fiber-optics (550 meters max.) 62.5/125µm Multimode Fiber-optics (275 meters max.)										
<b>1000BASE-LX:</b>	50/125µm Multimode Fiber-optics (550 meters max.) 62.5/125µm Multimode Fiber-optics (550 meters max.) 9µm Single-mode Fiber-optics (Infineon Fiber Transceiver 10 km max.) Long Haul Single-mode Fiber-optics (DES-122GB Extension Module, 70 km max.)										

General	
<b>Number of Ports:</b>	DES-1218: 16 x10/100 Mbps MDI-X ports (including port 1x shared MDI-II) DES-1226: 24 x10/100 Mbps MDI-X ports (including port 1x shared MDI-II) 2 x 1000 Mbps
<b>Media Interface Exchange:</b>	MDI-II RJ-45 shared with port 1x

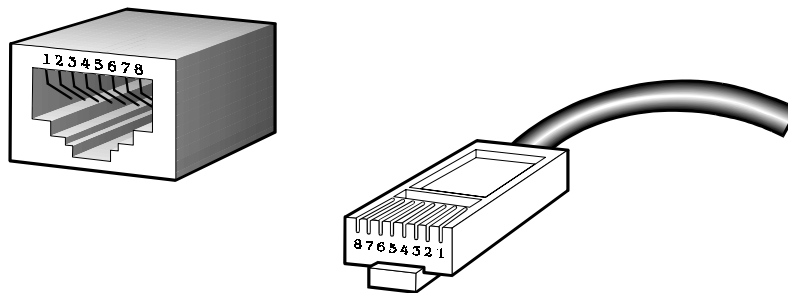
Physical and Environmental	
<b>AC input</b>	100 - 240 VAC, 50 - 60 Hz , 1.A Max, Internal universal power supply
<b>Power Consumption:</b>	DES-1218: 21 watts maximum, DES-1226: 26 watts maximum
<b>DC Fans:</b>	2 built-in 40 x 40 mm fans
<b>Operating Temperature:</b>	32 ° ~ 122 °F (0 ° ~ 50 °C)
<b>Storage Temperature:</b>	-13 ° ~ 131 °F (-25 ° ~ 55 °C)
<b>Humidity:</b>	5% ~ 95% non-condensing
<b>Dimensions:</b>	DES-1218/DES-1226: 441mm x 207mm x 44mm (19" rack mount, 1U)
<b>Weight:</b>	DES-1218: 2.6 Kg                      DES-1226: 2.7 Kg
<b>EMI:</b>	CE Class A, C-Tick Class A, FCC Class A, VCCI Class A, BSMI Class A
<b>Safety:</b>	UL/CUL ( UL 1950/CSA 950), TUV/GS (EN 60950)

Performance	
<b>Transmission Method:</b>	Store-and-forward
<b>RAM Buffer:</b>	DES-1218: 8 Mb bytes      DES-1226: 10 Mb bytes
<b>MAC Address Table:</b>	17 Kb entries per device
<b>Packet Filtering/Forwarding Rate:</b>	1,488,100 pps per port (for 1000Mbps) 148,810 pps per port (for 100Mbps) 14,880 pps per port (for 10Mbps)

## CABLES AND CONNECTORS

When connecting the Switch to another switch, a bridge or hub, a crossover cable is necessary. Please review these products for matching cable pin assignment.

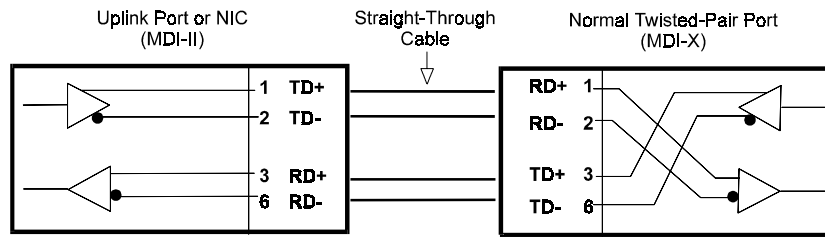
The following diagrams and tables show the standard RJ-45 receptacle/connector and their pin assignments.



The standard RJ-45 port and connector

RJ-45 Pin Assignments		
Contact	MDI-X Port	MDI-II Port
1	RD+ (receive)	TD+ (transmit)
2	RD- (receive)	TD- (transmit)
3	TD+ (transmit)	RD+ (receive)
4	Not used	Not used
5	Not used	Not used
6	TD- (transmit)	RD- (receive)
7	Not used	Not used
8	Not used	Not used

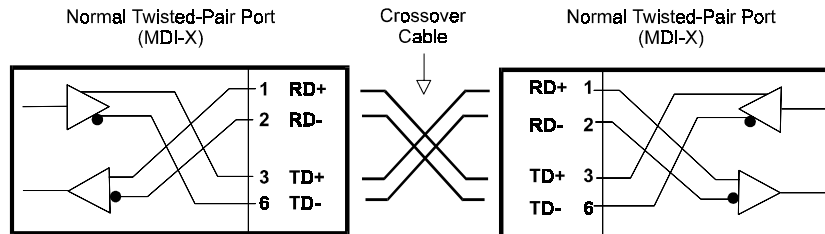
The standard RJ-45 pin assignments



**Straight cable for use with MDI-II to MDI-X connections**

With a crossover cable, two pairs of wires are switched at one connector end. Carry out the following steps to create a customized, crossover twisted-pair cable:

1. Leave one end of the cable as is, with the RJ-45 connector intact. The wiring at just one end of the cable needs to be modified.
2. At the other end of the cable, connect wires 1 and 2 to contacts 3 and 6, respectively. Likewise, connect wires 3 and 6 to contacts 1 and 2. Refer to the following diagram:



**Crossover cable for use with MDI-X to MDI-X and/or MDI-II to MDI-II connections**



## CABLE LENGTHS

Use the following table to as a guide for the maximum cable lengths.

Standard	Media Type	MHz/km Rating	Maximum Distance
<b>1000BASE-SX</b>	50/125µm Multimode Fiber	400	500 Meters
	50/125µm Multimode Fiber	500	550 Meters
	62.5/125µm Multimode Fiber	160	220 Meters
	62.5/125µm Multimode Fiber	200	275 Meters
<b>1000BASE-LX</b>	50/125µm Multimode Fiber	400	550 Meters
	50/125µm Multimode Fiber	500	550 Meters
	62.5/125µm Multimode Fiber	500	550 Meters
	9µm Single-mode Fiber		5,000 Meters
<b>1000BASE-T</b>	Category 5e UTP Cable		100 Meters
	Category 5 UTP Cable		
<b>100BASE-TX</b>	Category 5 UTP Cable (100Mbps)		100 Meters
<b>10BASE-T</b>	Category 3 UTP Cable (10Mbps)		100 Meters



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BBS: 1-949-455-1779, 1-949-455-9616  
URL: www.dlink.com E-MAIL: tech@dlink.com, support@dlink.com



## Registration Card

**Print, type or use block letters.**

Your name: Mr./Ms \_\_\_\_\_  
 Organization: \_\_\_\_\_ Dept. \_\_\_\_\_  
 Your title at organization: \_\_\_\_\_  
 Telephone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 Organization's full address: \_\_\_\_\_  
 \_\_\_\_\_  
 Country: \_\_\_\_\_  
 Date of purchase (Month/Day/Year): \_\_\_\_\_

Product Model	Product Serial No.	* Product installed in type of computer (e.g., Compaq 486)	* Product installed in computer serial No.

(\* Applies to adapters only)

*Product was purchased from:*

Reseller's name: \_\_\_\_\_  
 Telephone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 Reseller's full address: \_\_\_\_\_  
 \_\_\_\_\_

**Answers to the following questions help us to support your product:**

- 1. Where and how will the product primarily be used?**  
 Home  Office  Travel  Company Business  Home Business  Personal Use
- 2. How many employees work at installation site?**  
 1 employee  2-9  10-49  50-99  100-499  500-999  1000 or more
- 3. What network protocol(s) does your organization use ?**  
 XNS/IPX  TCP/IP  DECnet  Others \_\_\_\_\_
- 4. What network operating system(s) does your organization use ?**  
 D-Link LANsmart  Novell NetWare  NetWare Lite  SCO Unix/Xenix  PC NFS  3Com 3+Open  
 Banyan Vines  DECnet Pathwork  Windows NT  Windows NTAS  Windows '95  
 Others \_\_\_\_\_
- 5. What network management program does your organization use ?**  
 D-View  HP OpenView/Windows  HP OpenView/Unix  SunNet Manager  Novell NMS  
 NetView 6000  Others \_\_\_\_\_
- 6. What network medium/media does your organization use ?**  
 Fiber-optics  Thick coax Ethernet  Thin coax Ethernet  10BASE-T UTP/STP  
 100BASE-TX  100BASE-T4  100VGAnyLAN  Others \_\_\_\_\_
- 7. What applications are used on your network?**  
 Desktop publishing  Spreadsheet  Word processing  CAD/CAM  
 Database management  Accounting  Others \_\_\_\_\_
- 8. What category best describes your company?**  
 Aerospace  Engineering  Education  Finance  Hospital  Legal  Insurance/Real Estate  
 Manufacturing  
 Retail/Chainstore/Wholesale  Government  Transportation/Utilities/Communication  VAR  
 System house/company  Other \_\_\_\_\_
- 9. Would you recommend your D-Link product to a friend?**  
 Yes  No  Don't know yet
- 10. Your comments on this product?** \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

PLEASE  
PLACE STAMP  
HERE

**TO:** \_\_\_\_\_  
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**D-Link®**

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