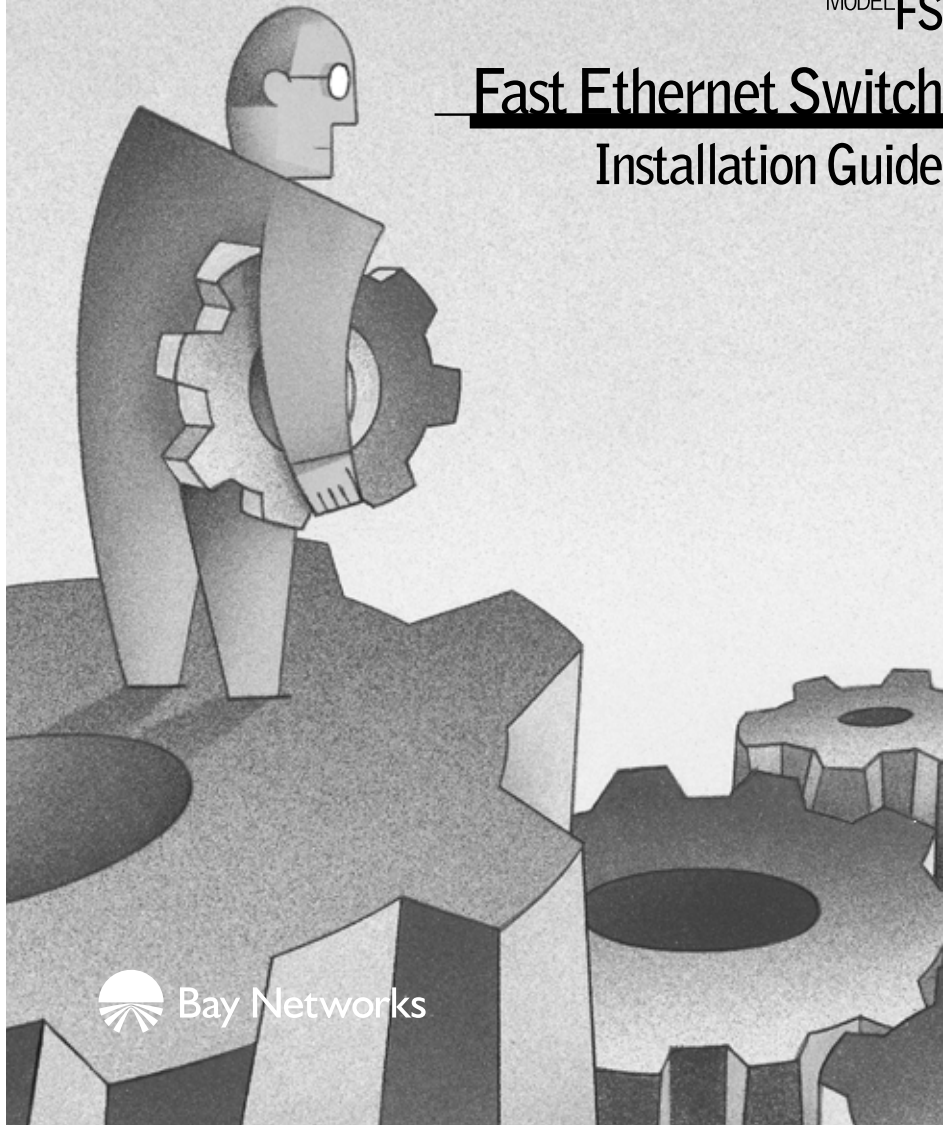


# NETGEAR

MODEL FS 516  
MODEL FS 524

## Fast Ethernet Switch Installation Guide



 Bay Networks



## Start Here

The NETGEAR™ Model FS516 16-Port Fast Ethernet Switch and Model FS524 24-Port Fast Ethernet Switch provide you with a low-cost, high-performance network solution and are designed to support power workgroups operating at either 10 megabits per second (Mbps) or 100 Mbps.

Ethernet switches provide private, dedicated, 10 Mbps (or 100 Mbps) capacity to each connected PC/server or hub/workgroup segment, which is significantly higher than in a shared environment. The higher bandwidth enables the use of applications such as multimedia, imaging, video, or high-performance client-server functions among users who are spread out over the network.

With both the Model FS516 switch and the Model FS524 switch, improvement is accomplished very easily, with no change to the desktop (the network interface cards or software and the network wiring). As a result, the performance upgrade and the applications it enables are obtained very quickly and at a low cost.



## Features

The Model FS516 and Model FS524 switches have the following key features:

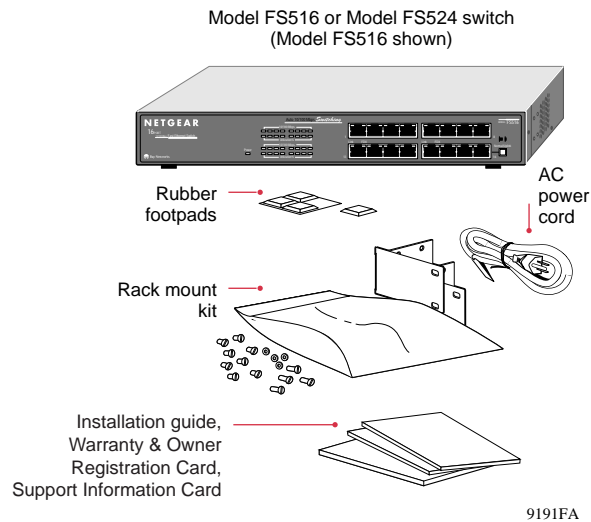
- Sixteen (Model FS516) or twenty-four (Model FS524) automatic speed-sensing (autosensing) 10/100 Mbps Ethernet ports to provide fast information exchange, resource sharing, and client or peer-to-peer communication using simple Category 5 unshielded twisted pair (UTP) cable
- Automatic address learning function to build the packet-forwarding information table

The table contains up to 4,000 MAC addresses for the Model FS516 and up to 8,000 MAC addresses for the Model FS524 (that is, the switch can support networks with as many as 8,000 devices).

- Switch-selectable autonegotiating or full-duplex mode of operation  
Full-duplex mode doubles throughput of point-to-point connections by letting individual ports transmit and receive concurrently when the other end also supports full-duplex mode. The default is half-duplex if the connected device does not support N-way negotiation. The duplex toggle switch can be set to full-duplex if the connected port is operating at full-duplex mode.
- Wire-speed filtering and forwarding to provide “traffic cop” function by directing traffic to the appropriate route without slowing down the traffic  
Store-and-forward forwarding node to minimize erroneous packets on the network
- Half-duplex backpressure
- Easy Plug-and-Play installation with no software to configure, which saves time and minimizes the potential for configuration errors

- Normal/Uplink push button to simplify network extension  
The switch can be connected to a hub using a simple, straight-through cable.
- Protocol independence and compatibility with all common protocols such as TCP/IP, NetWare, DECnet, and Microsoft Networks
- Vista RJ-45 network ports with built-in LEDs to monitor individual port status

## ▶ Package Contents



Verify that your package contains the following:

- Model FS516 or Model FS524 switch
- Rubber footpads for tabletop installation
- This installation guide
- Rack mount kit for 19-inch rack installation
- Warranty & Owner Registration Card
- Support Information Card
- Power cord

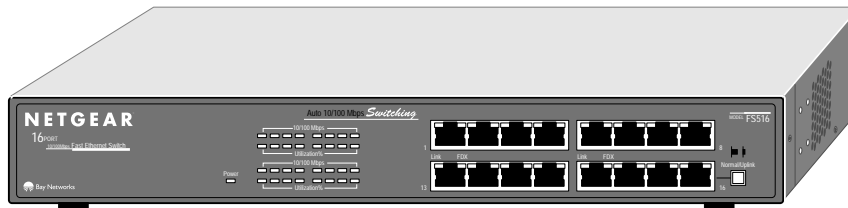


## Product Illustration

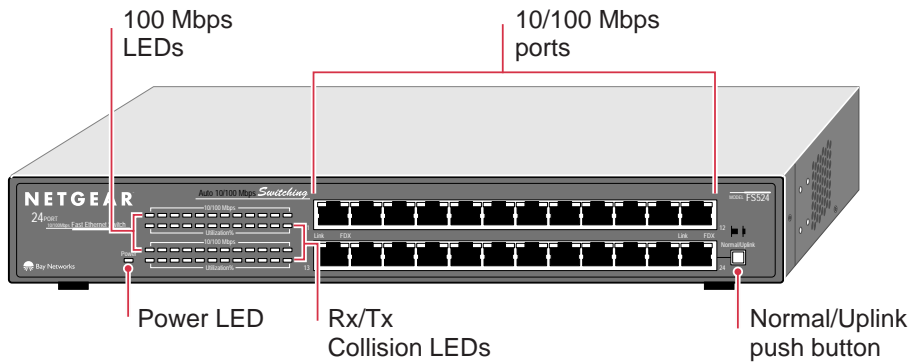
### Front Panel

The front panel of the Model FS516/FS524 switch contains the following LEDs that correspond to each network port located on the hub: Rx/Tx/Collision and 100 Mbps. Each vista RJ-45 network port has its own Link LED (located at the top left corner of each 10/100 Mbps port), and full-duplex (FDX) LED (located at the top right corner of each 10/100 Mbps port).

**Front Panel of the Model FS516 Switch**



**Front Panel of the Model FS524 Switch**



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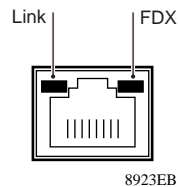
## LEDs

The table below describes the activity of the LEDs.

Label	Color	Activity	Description
Pwr (Power)	Green	On Off	Power is supplied to the switch. Power is disconnected.
Rx/Tx/Collision	Green	Blinking	Packet transmission or reception is occurring on the port. The blinking action corresponds to the number of packets that are transmitted or received.
	Yellow	Blinking	Data collisions are occurring on the port. The blinking corresponds to the number of collisions. When a collision occurs, the connected device pauses and transmits again after waiting a specified time.
100 Mbps	Green	On	The port is operating in 100 Mbps mode.
		Off	The port is operating in 10 Mbps mode.
Link	Green	On	A valid link is established on the port.
		Off	A link is not established on the port.
FDX	Green	On	The port is operating in full-duplex mode.
		Off	The port is operating in half-duplex mode.

### Vista RJ-45 Network Ports with Built-in LEDs

All of the ports on the switch are 10/100 Mbps capable autosensing Ethernet ports. Each port supports only unshielded twisted pair (UTP) cable using an 8-pin RJ-45 plug. Each port uses vista RJ-45 connectors that have two LEDs—the Link LED and the FDX LED.

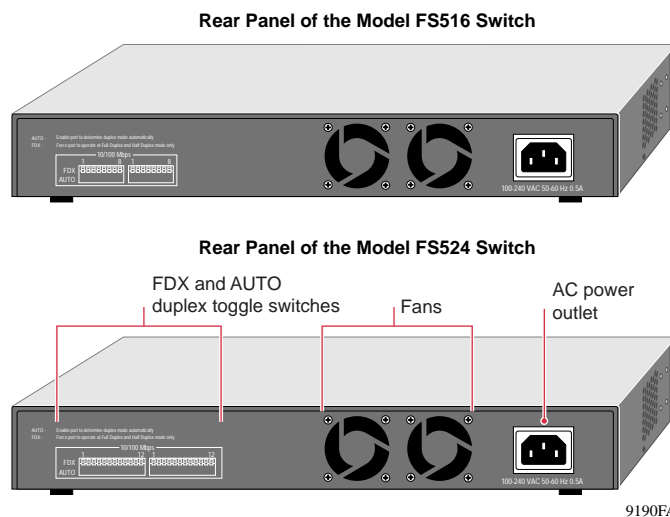


### Normal/Uplink Push Button

The Normal/Uplink push button on the front panel of the switch allows you to select uplink (MDI) or normal (MDI-X) wiring for port 16 on the Model FS516 switch and port 24 on the Model FS524 switch. These ports are configured for normal wiring to connect to a PC when the push button is in the out position. When the push button is pressed in, these ports are configured for uplink wiring to connect to another switch or to a hub, using a straight-through twisted pair cable.

## Rear Panel

The rear panel of the Model FS516/FS524 switch has full-duplex (FDX) and auto-duplex (AUTO) toggle switches, fans for cooling, and a standard AC power receptacle for the supplied power cord.



## FDX/AUTO Duplex Toggle Switches

Full-duplex mode is supported for all 10/100 Mbps ports and allows a port to transmit and receive data at the same time. Full-duplex operation applies only to point-to-point access (for example, when a switch is connected to a PC, a server, or another switch).

Setting the toggle switch to AUTO on the 10/100 Mbps port enables the port to determine duplex mode automatically. In this mode, the 10/100 Mbps port operates in either full- or half-duplex mode, depending on the operating mode of the remote port. If supported by the remote node, the port will establish a 100 Mbps full-duplex link as the default. If the remote port cannot provide the proper signal to indicate its own capability, the 10/100 Mbps port on the switch defaults to half-duplex mode. Because repeaters and hubs use a common collision domain for all communications and cannot communicate in full-duplex mode, the associated 10/100 Mbps port on the switch should be set to auto-duplex operation when connecting to these types of devices.

Setting the toggle switch to FDX on the 10/100 Mbps port enables the port to determine the speed but will set the duplex mode to full-duplex.

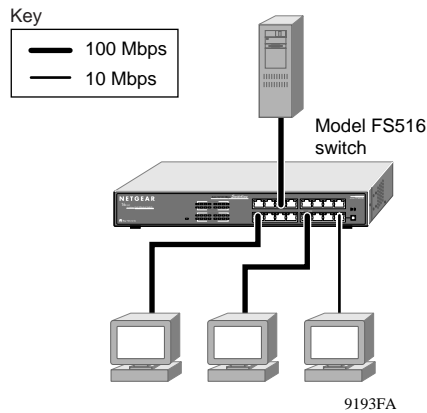


## Applications

The Model FS516/FS524 switch is designed to provide flexibility in configuring your network connections. Each switch can be used as a standalone device or can be used with 10 Mbps or 100 Mbps hubs or other interconnection devices in various configurations. The configuration examples in this section illustrate the integration of the switches in network environments of all sizes and types. These examples include a network of a few workstations connected to a printer or a segmented network with multiple users or workgroups and other networking devices.

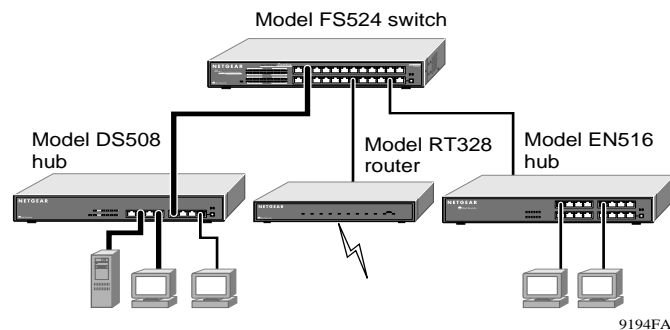
### Desktop Switching

The Model FS516/FS524 switch is used as a desktop switch to build a small network that enables users to have 100 Mbps access to a file server. If a full-duplex adapter card is installed in the server or PC, a 200 Mbps connection is possible on the port where the server or PC is connected.



### Segment Switching and Bridging from 10 Mbps to 100 Mbps

The Model FS516/FS524 switch is used to segment a network into multiple connected pieces, increasing overall bandwidth and throughput. Both switch models can segment networks that are built with the NETGEAR Model DS508 and Model EN516 hubs and can function as bridges connecting traditional 10BASE-T Ethernet networks to 100BASE-TX Fast Ethernet networks.



## 1 Prepare the Site

Before you begin installing your switch, prepare the installation site. Make sure your operating environment meets the operating environment requirements of the equipment.

Characteristic	Requirement
Temperature	Ambient temperature between 0° and 40° C (32° and 104° F). No nearby heat sources such as direct sunlight, warm air exhausts, or heaters.
Operating humidity	Maximum relative humidity of 90%, noncondensing.
Ventilation	Minimum 2 inches (5.08 cm) on all sides for cooling. Adequate airflow in room or wiring closet.
Operating conditions	At least 6 feet (1.83 m) to nearest source of electromagnetic noise (such as photocopier machine or arc welder).
Power	Adequate power source within 6 feet (1.83 m).

## 2 Install the Switch

To install your switch on a flat surface, you do not need any special tools. Be sure the switch is positioned with at least 2 inches of space on all sides for ventilation.

To install the switch in a rack, first attach the mounting brackets to the side of the switch. Insert the screws provided in the rack mount kit through each bracket and into the bracket mounting holes in the switch. Tighten the screws with a #1 Phillips screwdriver to secure each bracket. Align the mounting holes in the brackets with the holes in the rack and insert two pan-head screws with nylon washers through each bracket and into the rack. Tighten the screws with a #2 Phillips screwdriver to secure the switch in the rack.



## 3 Connect Devices to the Switch

Before connecting the switch, be sure you review “Applications” for information about determining the appropriate configuration for your networking needs.

To connect the switch:

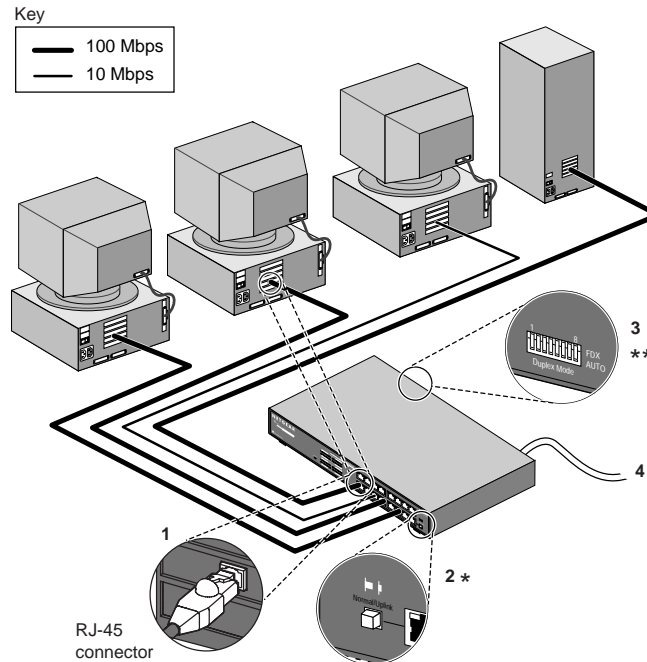
1. **Connect the devices to the 10/100 Mbps ports on the switch, using Category 5 UTP cable and an RJ-45 plug.**



Note: Ethernet specifications limit the cable length between your PC or server and the switch to 328 feet (100 meters) in length.

2. **Set the Normal/Uplink push button.**
3. **Set the FDX/AUTO toggle switches on the rear panel for the selected duplex mode (the default setting is AUTO).**
4. **Connect one end of the DC power adapter cable to the power outlet on the rear panel of the switch and the other end of the power adapter cable to the wall outlet.**

Refer to the following illustration when connecting the switch. Each of the preceding steps has a corresponding reference number in the illustration.



\* Normal/Uplink push button set to the Normal position for connection to the server.

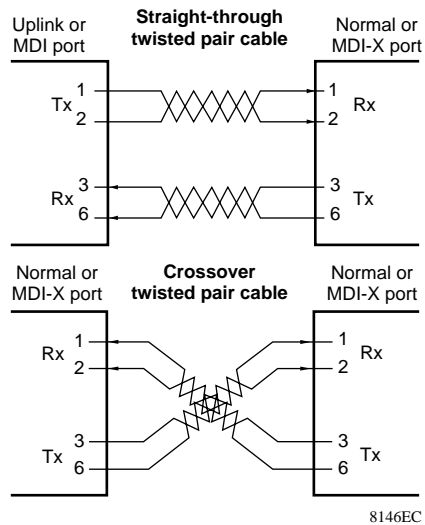
\*\* For a typical configuration, set toggle switches to AUTO. For more information, refer to "FDX/AUTO Duplex Toggle Switches."

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## Twisted Pair Cables

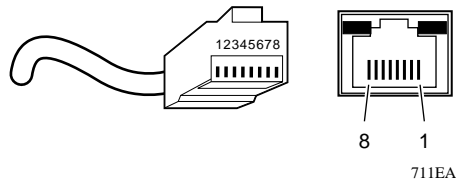
For two devices to communicate, the transmitter of each device must be connected to the receiver of the other device. The crossover function is usually implemented internally as part of the circuitry in the device. Most ports on switches and repeaters have media-dependent interfaces with crossover ports. These ports are referred to as MDI-X or normal ports. Computer and workstation adapter cards are usually media-dependent interface ports referred to as MDI or uplink ports.

These two figures illustrate the use of straight-through and crossover twisted pair cables.



## RJ-45 Connector

The RJ-45 connector (shown in the illustration with an RJ-45 plug) is used to connect workstations, hubs, and switches through unshielded twisted pair cable. The RJ-45 connector accepts four-pair Category 3 or Category 5 UTP cable.



RJ-45 Connector Pin Assignment	Normal Assignment on Ports 1-8, 1-16, or 1-24	Uplink Assignment on Port 8, 16, or 24
1	Input Receive Data +	Output Transmit Data +
2	Input Receive Data -	Output Transmit Data -
3	Output Transmit Data +	Input Receive Data +
6	Output Transmit Data -	Input Receive Data -
4, 5, 7, 8	Not used	Not used

## 4 Verify Installation

When power has been applied to the switch:

- The green Pwr (Power) LED on the front panel is on.
- The green Link LED on each connected port is on.

When the switch is connected and operating, refer to the table in “LEDs” for information about the LEDs and their activity.

## Troubleshooting Information

Symptom	Cause	Solution
Power LED is off.	No power is received at the hub.	Check the power cord connections for the switch and the connected device. Check for a defective adapter card, cable, or port by testing them in an alternate environment where all products are functioning. Make sure all cables used are correct and comply with Ethernet specifications.
Link LED is off or intermittent.	Port connection is not functioning.	Check the crimp on the RJ-45 connectors and make sure that the plug is properly inserted and locked into the port at both the switch and the connecting device. Make sure all cables used are correct and comply with Ethernet specifications.
File transfer is slow or performance degradation is a problem.	Half- or full-duplex setting on the NETGEAR switch and the connected device are not the same.	Make sure the 10/100 Mbps port is set to auto-duplex (AUTO) mode when connecting the switch to a repeater or hub.
One or more components are malfunctioning.	Not all system components are properly installed.	Test the components in an alternate environment where all other components are functioning properly.
A segment or device is not recognized as part of the network.	One or more devices are not properly connected, or cabling does not meet Ethernet guidelines.	Verify that the cabling is correct. Be sure all cable connectors are securely positioned in the required ports. Straight-through cables should be used for all standard twisted pair connections. Make sure all devices are connected to the network. Equipment may have been accidentally disconnected.
Rx/Tx/Collision LED is blinking yellow	Collisions are occurring on the connected segment.	This situation is normal in Ethernet operation when ports/segments are configured for half-duplex mode.
	Duplex modes are mismatched.	Recheck the duplex toggle switch settings and the remote link configuration.



## Technical Specifications

General Specifications	Model FS516 Fast Ethernet Switch	Model FS524 Fast Ethernet Switch
<b>Network Protocol and Standards Compatibility</b>	ISO/IEC 802-3 (ANSI/IEEE 802.3i) 10BASE-T Ethernet IEEE 802.3u, 100BASE-TX Fast Ethernet	
<b>Data Rate</b>	100 Mbps with 4B/5B encoding and MLT-3 physical interface for 100BASE-TX 10 Mbps differential Manchester encoded	
<b>Interface</b>	RJ-45 connector for 10BASE-T or 100BASE-TX Ethernet interface	
<b>Power Consumption</b>	42 W	
<b>Input Voltage (Power Adapter)</b>	100–240 V AC	
<b>Physical Specifications</b>		
Dimensions:	13.0 x 1.7 x 8.0 in. 33.0 x 4.3 x 20.7 cm	
Weight:	5.5 lb; 2.5 kg	6.0 lb; 2.6 kg
<b>Environmental Specifications</b>		
Operating temperature:	0° to 40° C (32° to 104° F)	
Operating humidity:	90% maximum relative humidity, noncondensing	
<b>Electromagnetic Emissions</b>	CE mark, commercial; FCC Part 15 Class A; EN 55 022 (CISPR 22), Class A; VCCI Class A	
<b>Electromagnetic Compliance</b>		
Electrostatic discharge (ESD):	CE mark, commercial FCC Part 15 Class A	
Radiated electromagnetic field:	VCCI Class A	
Electrical fast transient/burst:	EN 55022 (CISPR 22) Class A, EN50082-1	
Electrical surge:	C-Tick	
<b>Safety Agency Approvals</b>	UL listed (UL 1950), cUL TUV licensed (EN 60 950), IEC 950	
<b>Performance Specifications</b>		
Frame filter rate:	14,800 frames/second, maximum on 10 Mbps port 148,000 frames/second, maximum on 100 Mbps port	
Frame forward rate:	14,800 frames/second, maximum on 10 Mbps port 148,000 frames/second, maximum on 100 Mbps port	
Network latency (using 64-byte packets):	10 Mbps to 10 Mbps: 73 microseconds maximum 10 Mbps to 100 Mbps: 26 microseconds maximum 100 Mbps to 10 Mbps: 62 microseconds maximum 100 Mbps to 100 Mbps: 15 microseconds maximum	
Address database size:	4,000 media access control (MAC) addresses	8,000 media access control (MAC) addresses
Addressing:	48-bit MAC address	
Queue buffer:	64 KB memory per port	512 KB memory per port

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### **Trademarks**

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### **Statement of Conditions**

In the interest of improving internal design, operational function, and/or reliability, NETGEAR reserves the right to make changes to the products described in this document without notice.

NETGEAR does not assume any liability that may occur due to the use or application of the product(s) or circuit layout(s) described herein.

### **Certificate of the Manufacturer/Importer**

It is hereby certified that the NETGEAR Model FS516/FS524 Fast Ethernet Switch has been suppressed in accordance with the conditions set out in the BMPT-AmtsblVfg 243/1991 and Vfg 46/1992. The operation of some equipment (for example, test transmitters) in accordance with the regulations may, however, be subject to certain restrictions. Please refer to the notes in the operating instructions.

Federal Office for Telecommunications Approvals has been notified of the placing of this equipment on the market and has been granted the right to test the series for compliance with the regulations.

### **Voluntary Control Council for Interference (VCCI) Statement**

This equipment is in the first category (information equipment to be used in commercial and/or industrial areas) and conforms to the standards set by the Voluntary Control Council for Interference by Data Processing Equipment and Electronic Office Machines that are aimed at preventing radio interference in commercial and/or industrial areas.

Consequently, when this equipment is used in a residential area or in an adjacent area thereto, radio interference may be caused to equipment such as radios and TV receivers.

### **Federal Communications Commission (FCC) Compliance Notice: Radio Frequency Notice**

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

This device may not cause harmful interference.

This device must accept any interference received, including interference that may cause undesired operation.

**Note:** 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 in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

### **EN 55 022 Declaration of Conformance**

This is to certify that the NETGEAR Model FS516/FS524 Fast Ethernet Switch is shielded against the generation of radio interference in accordance with the application of Council Directive 89/336/EEC, Article 4a. Conformity is declared by the application of EN 55 022 Class A (CISPR 22).

**Canadian Department of Communications Radio Interference Regulations**

This digital apparatus (NETGEAR Model FS516/FS524 Fast Ethernet Switch) does not exceed the Class A limits for radio-noise emissions from digital apparatus as set out in the Radio Interference Regulations of the Canadian Department of Communications.

**Règlement sur le brouillage radioélectrique du ministère des Communications**

Cet appareil numérique (NETGEAR Model FS516/FS524 Fast Ethernet Switch) respecte les limites de bruits radioélectriques visant les appareils numériques de classe A prescrites dans le Règlement sur le brouillage radioélectrique du ministère des Communications du Canada.

# NETGEAR

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