NETGEAR

Fast Ethernet Switch

MODEL **FS** 102
MODEL **FS** 104
MODEL **FS** 108

Installation Guide
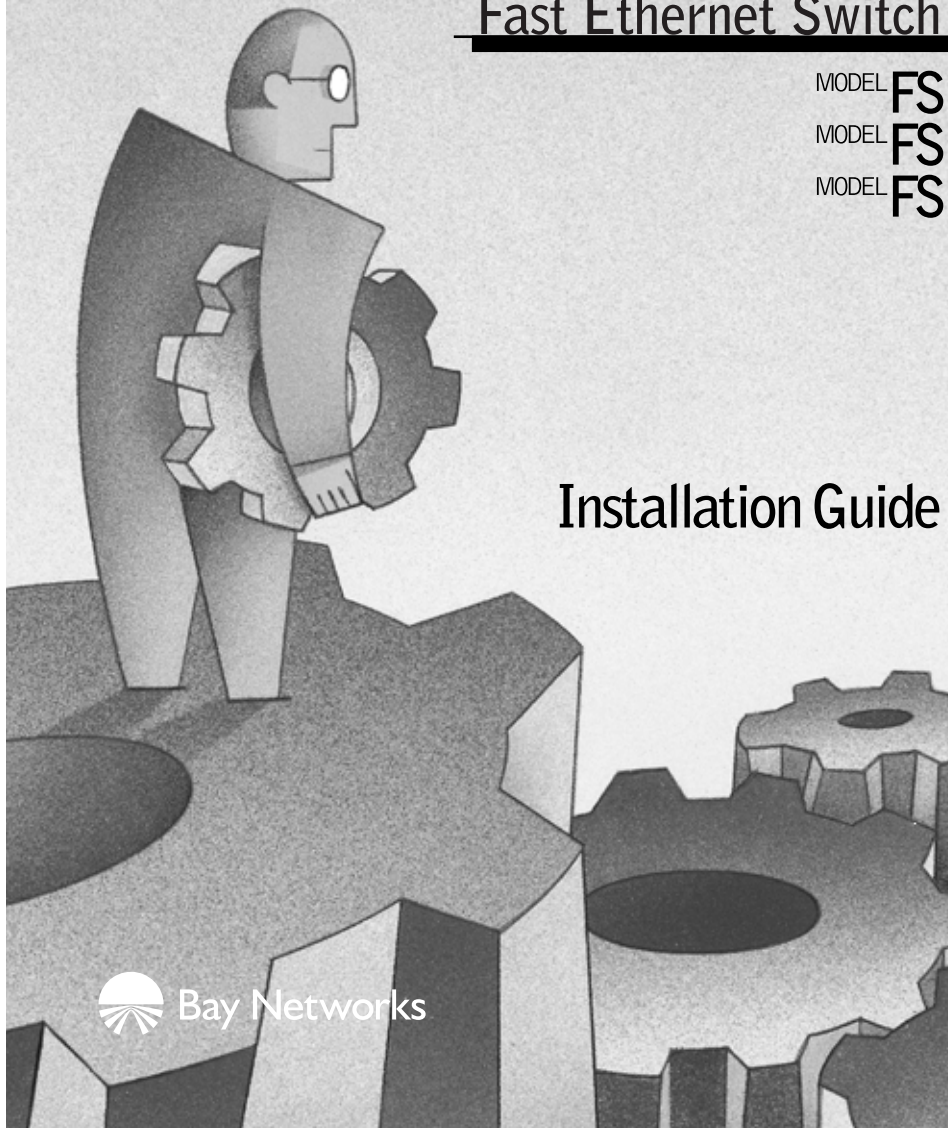
Bay Networks

▷ Start Here

Congratulations on your purchase of the NETGEAR™ Model FS102, Model FS104, or Model FS108 Fast Ethernet Switch—a low-cost, high-performance network solution designed to support power workgroups operating at 10 megabits per second (Mbps) or 100 Mbps.

In this installation guide that describes how to install and use the switches, all three switches are referred to collectively as the Model FS102/FS104/FS108 switch. Each switch is listed individually when information is provided that refers to a specific model.
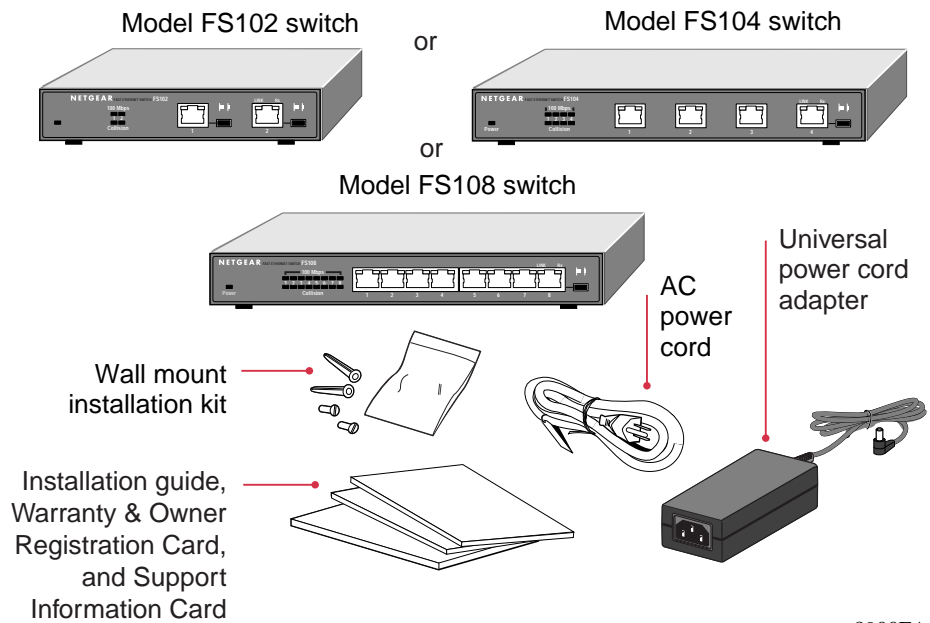
▷ Features

The Model FS102/FS104/FS108 switch has the following features:

- Two (Model FS102 switch), four (Model FS104 switch), and eight (Model FS108 switch) vista automatic speed-sensing 10/100 Mbps Ethernet ports that provide fast information exchange, resource sharing, and client or peer-to-peer communication using standard Category 5 unshielded twisted pair (UTP) cable
- Automatic address learning function to build the packet forwarding information table (The table contains up to 8,000 MAC addresses; that is, the switch can support networks with as many as 8,000 devices.)
- Autosensing full-duplex or half-duplex mode of operation (Full-duplex mode doubles throughput of point-to-point connections by letting individual ports transmit and receive concurrently when the connecting device also supports full-duplex mode.)
- Wire-speed filtering and forwarding to support the "traffic cop" function by directing traffic to the appropriate port or network segment without slowing down the traffic
- 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 another switch or hub using a standard, straight-through cable.)
- Two vista RJ-45 connector ports on the Model FS102 switch, four vista RJ-45 connector ports on the Model FS104 switch, and eight vista RJ-45 connector ports on the Model FS108 switch (Each port has built-in LEDs to monitor individual port status.)
- LEDs that provide network traffic status and data transmission speed
- IEEE 8023u standard compliance, allowing incorporation with other 100BASE-TX Fast Ethernet (100 Mbps) products
- IEEE 802.3 10BASE-T standard compliance
- Compact, sturdy metal case design that enables easy desktop, wall-mount, or under-desk installation

▷ Package Contents

Model FS102 switch   or   Model FS104 switch

or

Model FS108 switch

Wall mount installation kit

AC power cord

Universal power cord adapter

Installation guide, Warranty & Owner Registration Card, and Support Information Card
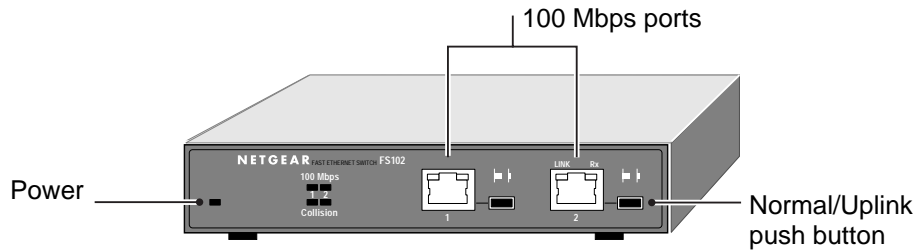
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Verify that your package contains the following:

- Model FS102, Model FS104, or Model FS108 switch
- Mounting kit (for wall installation)
- This installation guide
- Warranty & Owner Registration Card
- Support Information Card
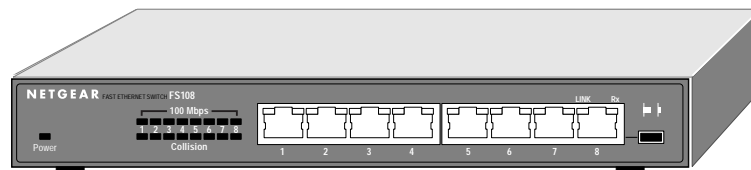- AC power cord and universal power cord adapter

Model FS102, Model FS104, Model FS108 Fast Ethernt Switch Installation Guide

▶ Product Illustration

Front Panel of the Model FS102 switch

100 Mbps ports

Power

Normal/Uplink
push button

Front Panel of the Model FS104 switch
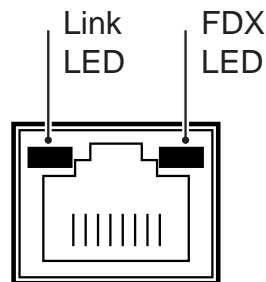
Front Panel of the Model FS108 switch

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Fast Ethernet Vista Ports with Built-in LEDs

All of the ports on the switch are 10/100 Mbps Ethernet ports. The network access speed for the ports is automatically sensed and displayed on the front panel by the 100 Mbps LEDs.

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.

Link
LED

FDX
LED

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LEDs

This table describes the activity of the Model FS102/FS104/FS108 switch LEDs.

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

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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 either of the Ethernet ports on the Model FS102 switch, port 4 on the Model FS104 switch, or port 8 on the Model FS108 switch. These ports are configured for normal wiring to connect to a PC when the push button position is out. 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.
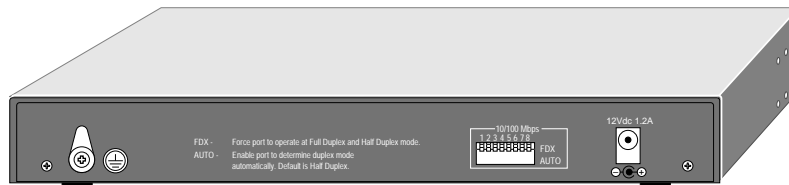
Rear Panel

The rear panel of the Model FS102/FS104/FS108 switch has full-duplex (FDX) and auto-duplex (AUTO) toggle switches and a power adapter receptacle for the supplied power adapter.

Rear Panel of the Model FS102 switch

Power receptacle

Rear Panel of the Model FS104 switch

Rear Panel of the Model FS108 switch

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FDX/AUTO Duplex Toggle Switches

Full-duplex mode is supported for all 10/100 Mbps ports and allows the 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 of operation, the 10/100 Mbps port operates in either full- or half-duplex, depending on the operating mode of the remote port. If the remote port cannot provide the proper signal to indicate its capability, the 10/100 Mbps port on the switch defaults to half-duplex mode. Repeaters and hubs use a common collision domain for all communications and cannot communicate in full-duplex mode. The associated 10 Mbps port on the switch should be set to auto-duplex operation when connecting to these types of devices.

One toggle switch is assigned to each 10/100 Mbps port and can be set to full-duplex (FDX) mode or auto-duplex (AUTO) mode.

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▶ Applications

The Model FS102/FS104/FS108 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 various network environments using other NETGEAR products. 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.

Although the examples illustrate specific switches, any of the switches can be used in the network configurations shown.

Desktop Switching

The Model FS108 switch is used as a desktop switch to build a small network that enables users to have 100 Mbps access to a file server.
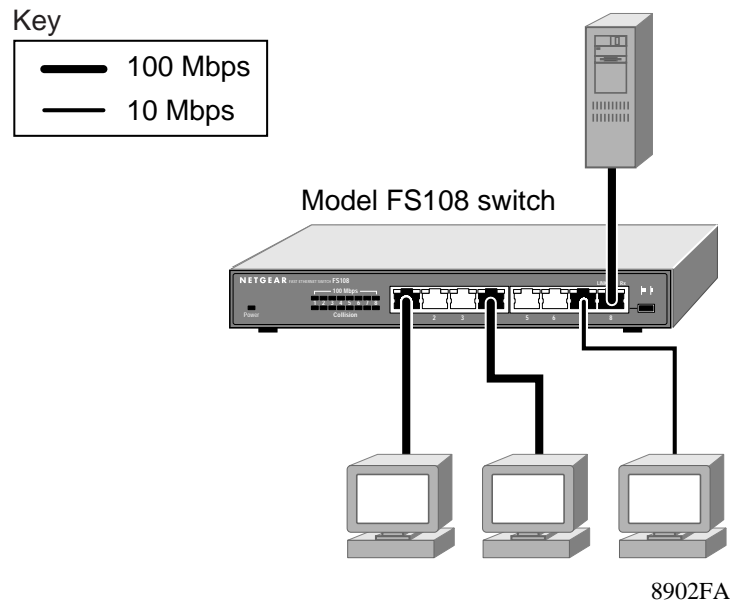
If a full-duplex adapter card is installed in the server or PC, a 200 Mbps connection is possible on the port where the server or PC is connected.

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Segment Switching

The Model FS108 switch is used as a switch that segments a network into multiple connected pieces, increasing overall bandwidth and throughput. The Model FS108 switch can segment networks that are built with the NETGEAR Model DS108 Dual Speed Hubs.

Model FS108 switch

Model DS108 hub   Model DS108 hub
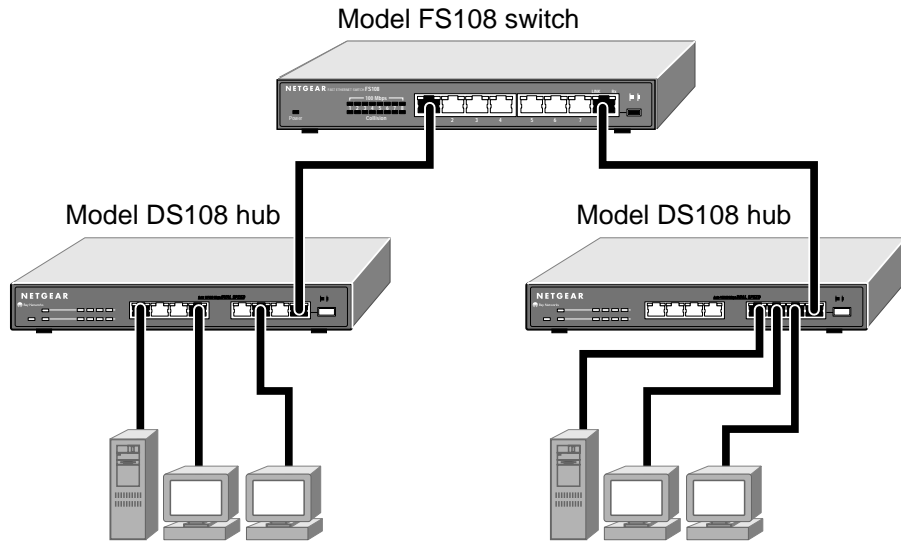
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Extending a Network Diameter

Ethernet specifications limit the length of cable between hubs and PCs to 100 meters (m) for a total of 200 meters. By adding Fast Ethernet switches between hubs, a network is expanded by 200 meters with the addition of each switch. The illustration below shows two NETGEAR Model FE108 Fast Ethernet Hubs integrated with a Model FS108 switch to extend a network.

Model FS108 switch

100 m

Model FE108
hubs

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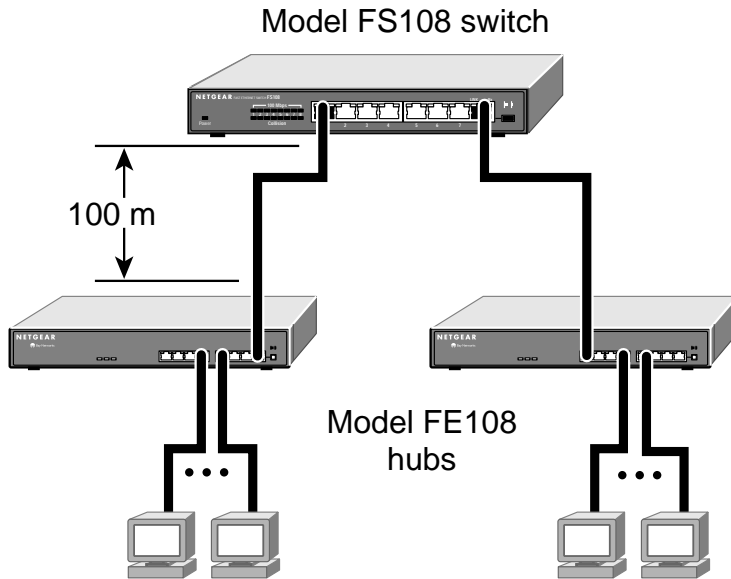
Bridging from 10BASE-T to 100BASE-TX Networks

The Model FS108 switch can function as a two-port bridge connecting traditional 10BASE-T Ethernet networks to 100BASE-TX Fast Ethernet networks. Users requiring increased network bandwidth can be upgraded to 100 Mbps while remaining connected to the rest of the network by integrating the Model FS108 Fast Ethernet Switch with the NETGEAR Model EN108 Ethernet Hub and the NETGEAR Model FE108 Fast Ethernet Hub.

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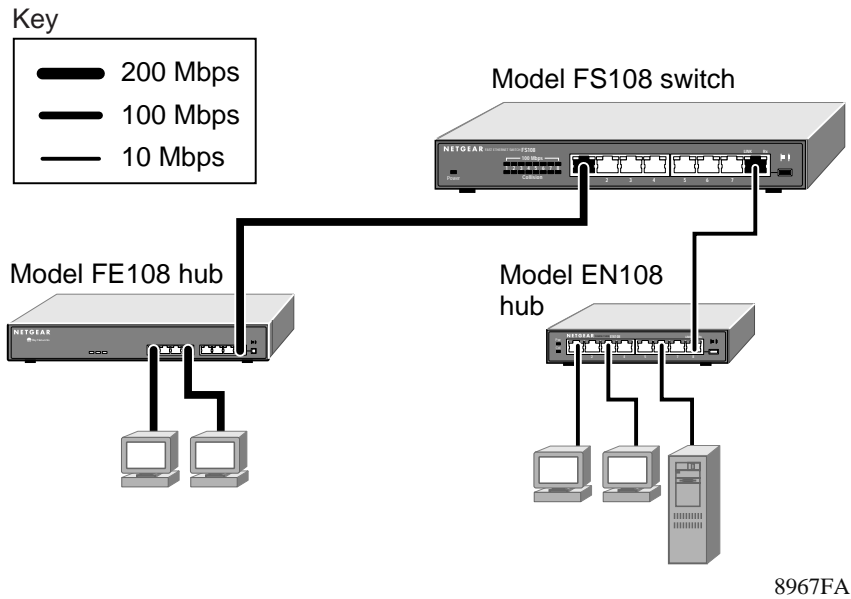
High-Bandwidth File Servers

The Model FS104 switch increases bandwidth for workgroups and strengthens network throughput when accessing high-volume file servers. The switch provides parallel communication between each of the ports. This method of communication allows multiple conversations to occur concurrently, expands overall throughput, and allows key servers or other heavily used devices to be available to more users. The Model FS104 Fast Ethernet Switch can be integrated with a NETGEAR Model FE108 Fast Ethernet Hub and a NETGEAR Model DS108 Dual Speed Hub. A full-duplex configurable adapter card installed in the server provides up to 200 Mbps maximum data throughput.

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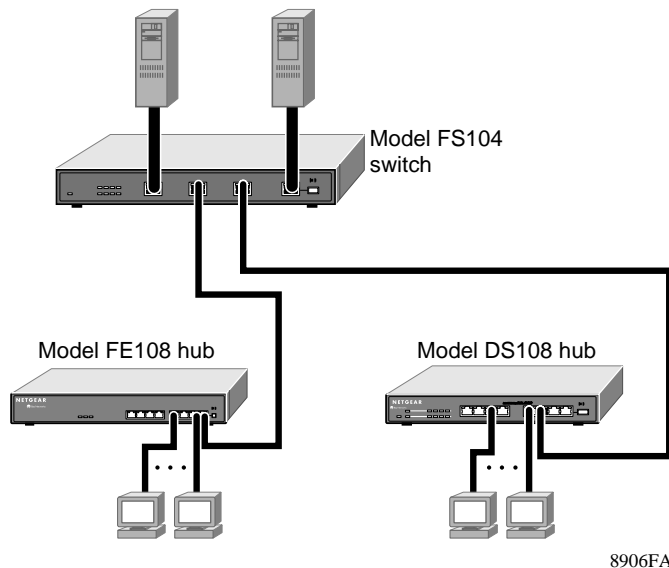
1 Prepare the Site

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 photocopy 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 on a wall, measure the distance between the mounting holes on the back of the switch and mark the wall to match the location of the mounting holes on the switch. At the marks, screw into the wall the two screws in the mounting kit included in your package contents. Choose a location that is near the devices to be connected, is close to an electrical outlet, and provides at least 2 inches of space all around the switch for ventilation.

3 Connect Devices to the Switch

Before connecting the switch, be sure you review "Applications" for to determine 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).

2. **Set the Normal/Uplink push button.**

   The Normal/Uplink push button eliminates the need to use a crossover twisted pair cable for daisy-chaining or cascading. Use the following guidelines to configure port 1 and port 2 on the Model FS102 switch, port 4 on the Model FS104 switch, or port 8 on the Model FS108 switch for uplink or normal wiring:

   • Configure the port for normal wiring if the port is to be connected to an uplink-wired device, such as a network station or a PC.

   • Configure the port for uplink wiring if the port is to be connected to a normal-wired device, such as a 100 Mbps hub or another switch.

   The remaining (normal) ports on the switch cannot be configured for uplink wiring. If you are using one of these ports to connect to another normal port, you must use a crossover twisted pair cable to connect the two ports. Refer to "Cable and Connector Information" for information about crossover twisted pair cable and straight-through twisted pair cable.

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3. **Set the FDX or AUTO toggle switches on the rear panel for the selected duplex mode.**

   A hub and repeater use a common collision domain for all communications and cannot support full-duplex mode. When connecting any of the 10/100 Mbps ports on the switch to a hub, set the port to AUTO. The switch must also be set to AUTO when connecting to any device that does not use NWay autonegotiation to detect the operating mode. Setting the toggle switch to AUTO will cause the port to default to half-duplex mode when connecting to a port that does not use autonegotiation.

   When connecting to a PC, a server, or another switch, the duplex setting for the port must be the same as the duplex setting on the PC, server, or other switch.

   To set the 10/100 Mbps ports for the selected duplex mode:

   • Move the toggle switch into the down position (to AUTO) for auto-duplex mode. The 10/100 Mbps ports will negotiate and automatically determine the duplex mode based on the mode of the connected port. If the connected port cannot autonegotiate, the 10/100 Mbps port will default to half-duplex mode. The factory setting of the duplex toggle switches is AUTO.

   • Move the toggle switch into the up position (to FDX) for full-duplex mode.The duplex switch must be set to FDX if you are connecting to legacy full-duplex 100 Mbps devices that do not generate signals indicating duplex mode. If the duplex switch is set to AUTO mode, the 10/100 Mbps ports will default to half-duplex mode because the port does not receive the proper signal.

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.**

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.

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▷ Troubleshooting Information

| Symptom	Cause	Solution
Green Link LED is off on an active port.	Port connection is not functioning.	Make sure the attached device is powered and there is a proper UTP connection at that end. Make sure the network adapter card installed in the PC is in working condition. Verify that the network adapter card is100 Mbps capable and that the 100 Mbps LED and Link LEDs are on at the network adapter card in the PC. Make sure the proper cable is installed, and check for miswired cable pairs or loose connectors.
Green Link LED is intermittent on an active port.	Port connection is not functioning.	Make sure the port termination at both the switch and the device end is correct. Check the crimp on the RJ-45 connectors. In a Fast Ethernet operation, the quality of the crimp on the connector is important. It is also important that only Category 5 cable is used and that it is certified for 100 Mbps operation. Make sure the length of the UTP cable from the switch to the device does not exceed 328 feet (100 meters). Using cable test equipment, make sure the cable meets the crosstalk, attenuation, and impedance specifications as required by the 100BASE-TX standard. Refer to "Cable and Connector Information" for information about cable specifications.
Green Link LED is off on ports 1 or 2 on the Model FS102 switch, port 4 on the Model FS104 switch, or port 8 on the Model FS108 switch.	Port connection is not functioning.	Check the Normal/Uplink push button on the front panel. If you are using a straight-through cable connected to a PC or other MDI-wired device, make sure the Normal/Uplink push button is set in the Normal position. If you are using a straight-through cable connected to a router or another switch, make sure the Normal/Uplink push button is set in the Uplink position. Try the alternate position of the Normal/Uplink push button to turn the Link LED on. Refer to "Cable and Connector Information" for cable information.
Green 100 Mbps LED is off when operating in a Fast Ethernet network.	Port is operating in 10 Mbps mode.	Make sure the adapter card is capable of 100 Mbps operation and set for 100 Mbps operation if it is not autosensing.
Green Link LED is on and Green FDX LED is off when connected to a full duplex network.	Port is operating in half-duplex mode.	Make sure the duplex switch on the Model FS102/FS104/FS108 switch is set for full-duplex operation. Make sure the connected device is capable of full-duplex transmission.

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Symptom	Cause	Solution
Yellow Rx/Tx Collision LED is blinking excessively.	Data collision is occurring on the port.	The port and switch might be functioning correctly. However, check the following to make sure that excessive collisions are normal (as in most Ethernet networks) and not caused by: • Incorrect cabling or connectors • Wiring techniques • Mismatched duplex operating mode settings
Green FDX LED is off when you have set the port to operate in full-duplex mode.	Port is operating in half-duplex mode.	Make sure the connected device is able to operate at half-duplex mode and check the specifications of the connected device to make sure it has the ability to signal the operating mode. Verify that the connected device is operational. If the connected device is an adapter card, make sure you have an adapter card that is capable of 100 Mbps operation and set to 100 Mbps if it is not autosensing.

▷ Cable and Connector Information

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.

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

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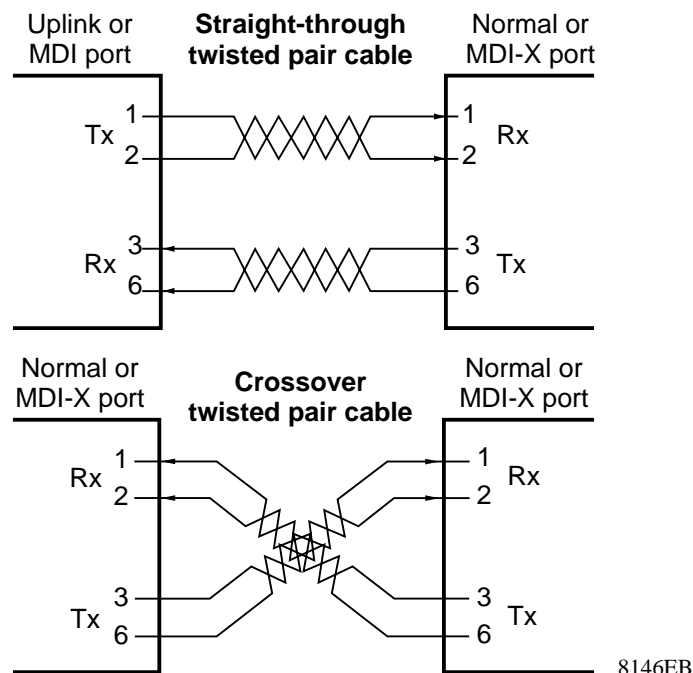
RJ-45 Connector

The RJ-45 connector (shown in the illustration with an RJ-45 plug) is used to connect workstations and switches through unshielded twisted pair cable. The RJ-45 connector accepts four-pair Category 3 or Category 5 UTP cable. Only two pairs are used for 10BASE-T wiring.

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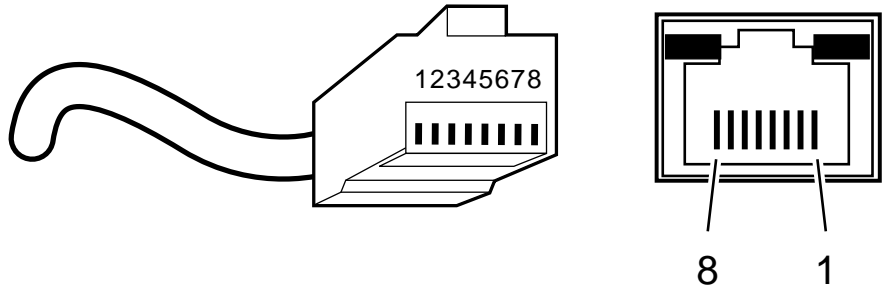
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RJ-45 Connector Pin Assignment	Normal Assignment:	Uplink Assignment: Port 1 or 2 on the Model FS102 Switch Port 4 on the Model FS104 Switch Port 8 on the Model FS108 Switch
1	Input Receive Data +	Output Transmit Data +
2	Input Receive Data -	Output Transmit Data -
3	Output Transmit Data +	Input Receive Data +
6	Output Transmit Data -	Input Receive Data -
4, 5, 7, 8	Not used	Not used

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▶ Technical Specifications

General Specifications	Model FS102 Switch	Model FS104 Switch	Model FS108 Switch
Network Protocol and Standards Compatibility	ISO/IEC 802-3 (ANSI/IEEE 802.3i) 10BASE-T Ethernet IEEE 802.3u, IEEE802.3x 100BASE-TX, Fast Ethernet		
Data Rate	100 Mbps with 4B/5B encoding and MLT-3 physical interface for 100BASE-TX 10 Mbps differential Manchester encoded		
Interface	RJ-45 connector for 10BASE-T or 100BASE-TX Ethernet interface		
Power Consumption	8 W	15.2 W	12 W
Input Voltage (Power Adapter)	12 V dc	12 V dc	5 V dc
Physical Specifications			
Dimensions:	6.2 x 1.06 x 4.1 in. 15.8 x 2.7 x 10.3 cm	9.27 x 1.06 x 4.1 in. 23.5 x 2.7 x 10.3 cm	9.27 x 1.06 x 4.1 in. 23.5 x 2.7 x 10.3 cm
Weight:	1.09 lb; 0.50 kg	1.60 lb; 0.73 kg	1.60 lb; 0.73 kg
Environmental Specifications			
Operating temperature:	0° to 40° C (32° to 104° F)		
Operating humidity:	90% maximum relative humidity, noncondensing		
Electromagnetic Emissions	CE mark, commercial; FCC Part 15, Class A; EN 55 022 (CISPR 22), Class A; VCCI Class 1 ITE		
Electromagnetic Susceptibility			
	CE mark, commercial	CE mark, commercial	CE mark, commercial
Electrostatic discharge (ESD):	IEC 801-2, Level 2/3/4	IEC 801-2, Level 2/3/4	IEC 801-2, Level 2/3/4
Radiated electromagnetic field:	IEC 801-3, Level 2	IEC 801-3, Level 2	IEC 801-3, Level 2
Electrical fast transient/burst:	IEC 801-4, Level 2	IEC 801-4, Level 2	IEC 801-4, Level 2
Electrical surge:	IEC 801-5, Level 2	IEC 801-5, Level 2	IEC 801-5, Level 2
Safety Agency Approvals for Power Adapter	CE mark, commercial UL listed (UL 1950) CSA certified (CSA 22.2 #950) TUV licensed (EN 60 950) T-Mark	CE mark, commercial UL listed (UL 1950) CSA certified (CSA 22.2 #950) TUV licensed (EN 60 950) T-Mark	CE mark, commercial UL listed (UL 1950) CSA certified (CSA 22.2 #950) TUV licensed (EN 60 950) T-Mark
Performance Specifications			
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:	8,000 media access control (MAC) addresses per port		
Addressing:	48-bit MAC address		
Queue buffer:	10/100 Mbps ports: 1 MB of buffer space for each port		10/100 Mbps ports: 128 k of buffer space for each port

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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 FS102/104/108 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

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 when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy. If it is not installed and used in accordance with the instruction manual, it may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case users will be required to take whatever measures may be necessary to correct the interference at their own expense.

EN 55 022 Statement

This is to certify that the NETGEAR Model FS102/104/108 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).

> ⚠ This is a Class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take appropriate measures.

Canadian Department of Communications Radio Interference Regulations

This digital apparatus (NETGEAR Model FS102/104/108 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 FS102/104/108 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.

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