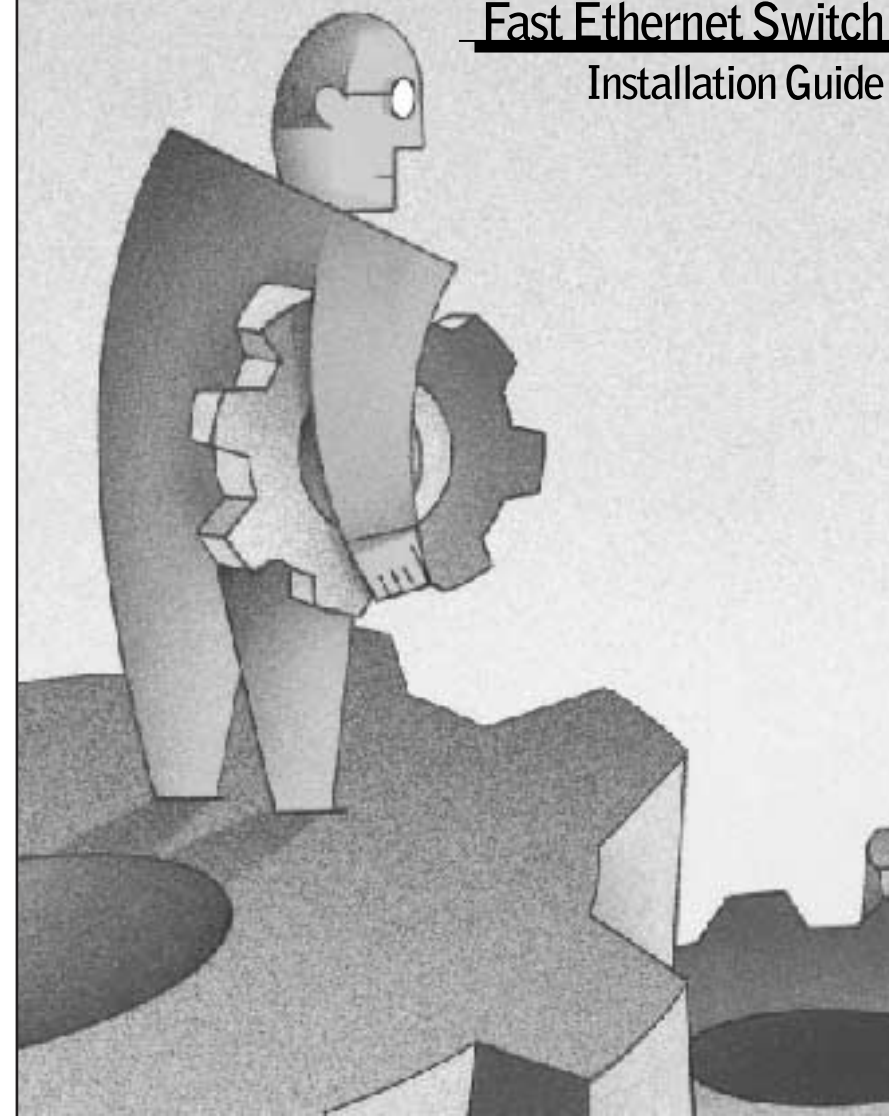


NETGEAR®

MODEL FS 116

Fast Ethernet Switch Installation Guide



NETGEAR®

NETGEAR, Inc.
4500 Great America Parkway
Santa Clara, CA 95054 USA
Phone: 1-888-NETGEAR
www.NETGEAR.com

START HERE

Congratulations on your purchase of the NETGEAR® Model FS116 Fast Ethernet Switch—a cost effective, high-performance network solution designed to support power workgroups operating at 100 megabits per second (Mbps) or 10 Mbps.

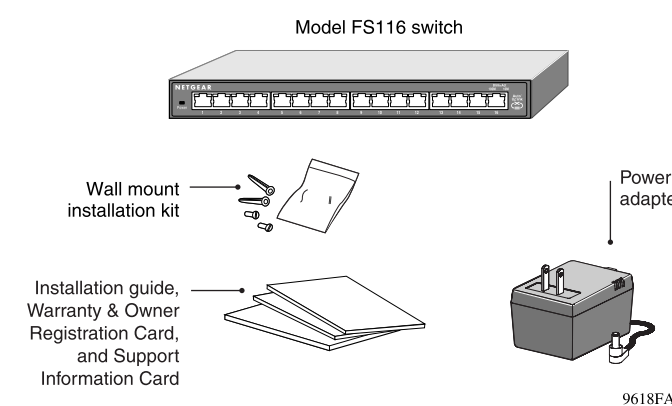
This installation guide describes how to install and use the Model FS116 switch.

FEATURES

The Model FS116 switch has the following features:

- Sixteen RJ-45 connector ports, which are 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. (Each port has built-in LEDs to monitor individual port status.)
- Automatic address learning function to build the packet forwarding information table (The table contains up to 4,000 MAC addresses; that is, the switch can support networks with as many as 4,000 devices.)
- Auto-sensing 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
- Auto Uplink™ in all ports to make the right connection.
- LEDs that provide network traffic status and data transmission speed
- IEEE 802.3u standard compliance, allowing incorporation with other 100BASE-TX Fast Ethernet (100 Mbps) products
- IEEE 802.3i 10BASE-T standard compliance
- Compact, sturdy metal case design that enables easy desktop, wall-mount, or under-desk installation
- No fans for silent operation

PACKAGE CONTENTS

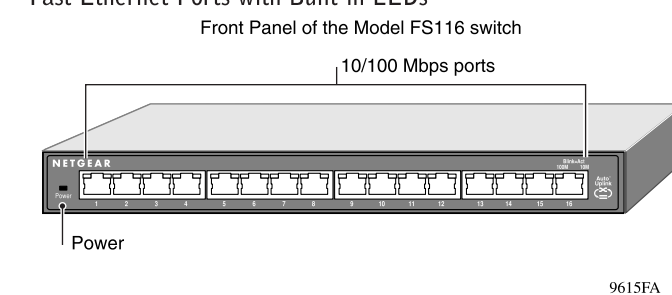


Verify that your package contains the following:

- Model FS116 switch
- Mounting kit (for wall installation)
- This installation guide
- Warranty & Owner Registration Card
- Support Information Card
- Power adapter

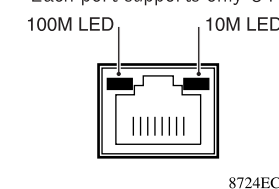
PRODUCT ILLUSTRATION

Fast Ethernet 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 UTP cable using an 8-pin RJ-45 plug. Each port uses RJ-45 connectors that



have two LEDs—the 10M and 100M LED to indicate both link and activity.

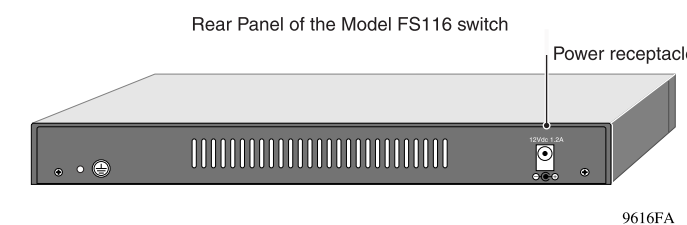
LEDs

This table describes the activity of the Model FS116 switch LEDs.

Label	Color	Activity	Description
PWR (Power)	Green	On	Power is supplied to the switch.
		Off	Power is disconnected.
100M	Green	On	100 Mbps link is established.
		Blinking	Packet transmission or reception is occurring on the port at 100 Mbps.
		Off	No 100 Mbps link established.
10M	Green	On	10 Mbps link is established.
		Blinking	Packet transmission or reception is occurring on the port at 10 Mbps.
		Off	No 10 Mbps link established.

Rear Panel

The rear panel of the Model FS116 switch has a power adapter receptacle for the supplied power adapter.



APPLICATIONS

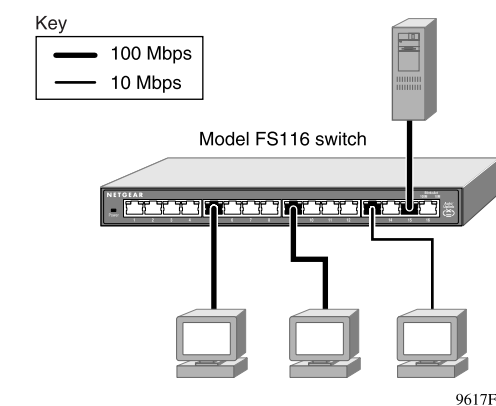
The Model FS116 switch is designed to provide flexibility in configuring your network connections. Each switch can be used as a stand-alone device or can be used with 10 Mbps or 100 Mbps hubs or other interconnection devices in various configurations. The configuration examples in this section illustrate 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 FS116 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.



© 2002 by NETGEAR, Inc. All rights reserved.

Trademarks

NETGEAR®, the Netgear Logo, the Gear Guy, and Everybody's connecting are trademarks or registered trademark of Netgear, Inc. in the United States and/or other countries. Microsoft, Windows, and the Windows logo are trademarks, or registered trademarks of Microsoft, Corporation in the United States and/or other countries. Other brand and product names are trademarks or registered trademarks of their respective holders. Information is subject to change without notice.

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 FS116 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

この装置は、情報処理装置等電波障害自主規制協議会 (V C C I) の基準に基づくクラス B 情報技術装置です。この装置は、家庭環境で使用することを目的としています。この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。取扱説明書に従って正しい取り扱いをして下さい。

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 B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection. 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:

EN 55 022 Statement

This is to certify that the NETGEAR Model FS116 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 B (CISPR 22).

Canadian Department of Communications Radio Interference Regulations

This digital apparatus (NETGEAR Model FS116 Fast Ethernet Switch) does not exceed the Class B 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

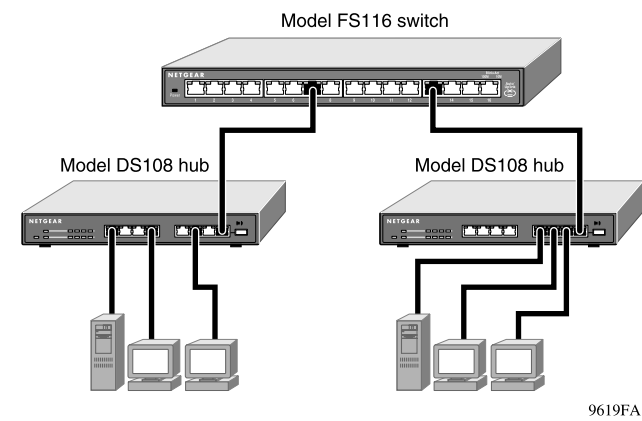
Cet appareil numérique (NETGEAR Model FS116 Fast Ethernet Switch) respecte les limites de bruits radioélectriques visant les appareils numériques de classe B prescrites dans le Règlement sur le brouillage radioélectrique du ministère des Communications du Canada.



M - F S 1 1 6 N A - 0 3

Segment Switching

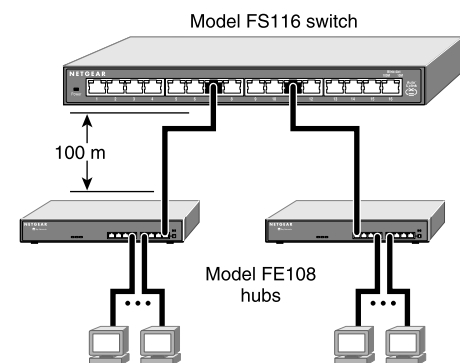
The Model FS116 switch is used as a switch that segments a network into multiple connected pieces, increasing overall bandwidth and throughput. The Model FS116 switch can segment networks that are built with the NETGEAR Model DS108 Dual Speed Hubs.



9619FA

Extending a Network Diameter

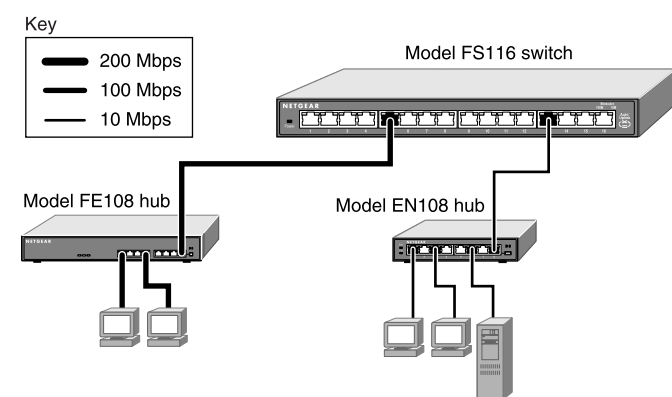
Ethernet specifications limit the length of cable between hubs and PCs to 100 meters (m) for a total of 200 meters. By adding Fast Ethernet switches between hubs, a network is expanded by 200 meters with the addition of each switch. The illustration below shows two NETGEAR Model FE108 Fast Ethernet Hubs integrated with a Model FS116 switch to extend a network.



9620FA

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

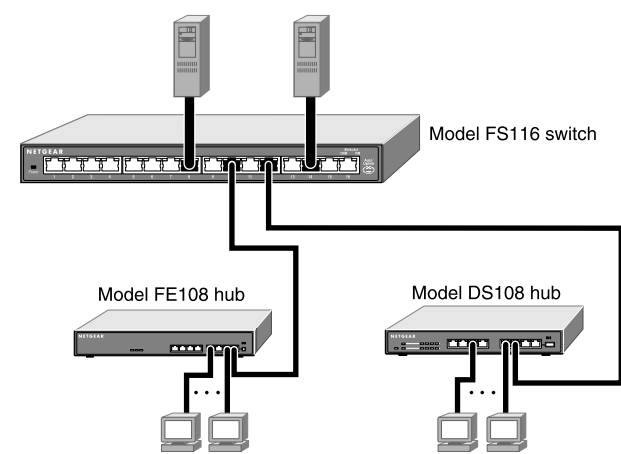
The Model FS116 switch can function as a two-port bridge connecting traditional 10BASE-T Ethernet networks to 100BASE-TX Fast Ethernet networks. Users requiring increased network bandwidth can be upgraded to 100 Mbps while remaining connected to the rest of the network by integrating the Model FS116 Fast Ethernet Switch with the NETGEAR Model EN108 Ethernet Hub and the NETGEAR Model FE108 Fast Ethernet Hub.



9621FA

High-Bandwidth File Servers

The Model FS116 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 FS116 Fast Ethernet Switch can be connected to 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.



9622FA

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 32 and 104°F (0 and 40°C). 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).

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.

CONNECT DEVICES TO THE SWITCH

Before connecting the switch, be sure to review "Applications" 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 m).

2. Connect one end of the power adapter to the power outlet on the rear panel of the switch and the other end of the power adapter cable to the wall outlet.

VERIFY INSTALLATION

When power has been applied to the switch:

- The green Pwr (Power) LED on the front panel is on.
- Either the 10M or the 100M LED is on for each connected port.

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

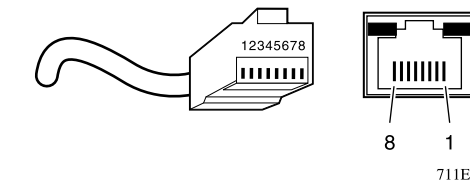
TROUBLESHOOTING INFORMATION

Symptom	Cause	Solution
Neither 100M nor 10M LEDs are lit 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 working. Verify that the network adapter card link LED is on. Make sure the proper cable is installed, and check for miswired cable pairs or loose connectors.
10M LED is on 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 is set for 100 Mbps operation if it is not auto-sensing.

RJ-45 Connector

The RJ-45 connector (shown in the illustration with an RJ-45 plug) is used to connect workstations and switches through UTP cable. The RJ-45 connector accepts four-pair Category 3(10 Mbps) or Category 5(100 Mbps)

UTP cable. Only two pairs are used for 10BASE-T and 100BASE-TX wiring.



RJ-45 Connector Pin Assignment	Normal Assignment	Uplink Assignment: Port 8
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

TECHNICAL SPECIFICATIONS

Specifications	Model FS116 Switch
Network Protocol and Standards Compatibility	IEEE 802.3i 10BASE-T Ethernet IEEE 802.3u 100BASE-TX Fast Ethernet IEEE 802.3x Flow Control Compatible with major network software, including Windows, Netware, and Linux
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
Input Voltage (Power Adapter)	12 V DC 1.2 A
Environmental Specifications	Operating temperature: 32 to 104°F (0 to 40°C) Operating humidity: 90% maximum relative humidity, noncondensing
Electromagnetic Emissions	CE mark, commercial; FCC; Part 15, Class B; EN 55 022 (CISPR 22), Class A; VCCI Class 1 ITE
Electromagnetic Susceptibility	Electrostatic discharge (ESD): IEC 801-2, Level 2/3/4 Radiated electromagnetic field: IEC 801-3, Level 2 Electrical fast transient/burst: IEC 801-4, Level 2 Electrical surge: 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) C-Tick
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): 100 Mbps to 100 Mbps: 20 us, maximum Address database size: 4,000 media access control (MAC) addresses per port Addressing: 48-bit MAC address Queue buffer: 10/100 Mbps ports: 512 K of buffer space for each port

REPLACEMENT POWER ADAPTER

If, for any reason, the power adapter for any of the switches fails, contact NETGEAR immediately to order a replacement adapter. Use the following table when ordering a specific power adapter.

Order code	FS116
PWR-002-004	Power adapter (12 V DC, 1.2 A), North America
PWR-002-005	Power adapter (12 V DC, 1.2 A), Japan
PWR-002-006	Power adapter (12 V DC, 1.2 A), Europe
PWR-002-008	Power adapter (12 V DC, 1.2 A), United Kingdom
PWR-002-010	Power adapter (12 V DC, 1.2 A), Australia

When you are selecting a power supply, please confirm the voltage you need by looking on the power adapter or the back of the switch. If you own an early version of the FS116 that is 5 V, please order the PWR-023-002 power supply. This power supply works for all country versions. Keep your power cord with the wall plug, as you will not receive a replacement cord.