EtherFast II
10/100 Hubs

***Use this guide to install these
Linksys Products:***

EtherFast II 10/100
16-Port Rack-
Mountable Hub
(EF2H16)

EtherFast II 10/100
24-Port Rack-
Mountable Hub
(EF2H24)

User Guide

LINKSYS®

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Introduction

Instant EtherFast II 10/100 Hub

EASY TO SET UP--EASY TO MAINTAIN
The EtherFast II 10/100 Hubs from Linksys are the second generation in the Instant EtherFast Series that quickly set the standard for economical network expansion. Since they are ready to run right out of the box and feature easy rack-mount installation, your network will be up and running in no time. Extensive use of advanced VLSI technology ensures that each EtherFast II 10/100 Hub will function with unsurpassed reliability, allowing your business to operate with a minimum of down-time.

MEETING THE NEEDS OF EXPANDING NETWORKS
In today's fast-paced business world, growth can easily out-pace resources-- that's why the EtherFast II Series is such a great solution. The built-in uplink port and fiber optic expansion slot mean that your network is ready to expand along with your business needs, and with up to 24 auto-sensing ports, you have the freedom to combine low-cost 10Mbps computers with high-speed 100Mbps workstations, saving you thousands of dollars. It's this combination of flexibil- ity, reliability, and performance that make the EtherFast II Series "The Affordable High-Performance Network Solution."

Planning Your Network

Overview

The rules that govern how nodes and hubs are distributed across a network are important to ensure the integrity of your data. Cabling specifications, distance limits, and other topology rules must be followed in order to avoid collisions, data loss, and downed network connections.

The 10/100 Hub is equipped with RJ-45 ports that can automatically adjust to either 10Mbps or 100Mbps speeds. Each port can operate at either speed, completely independent of the other ports' speeds, and can be connected to a workstation, file server, print server, hub, or another node with twisted-pair cabling.

Although there are different grades of cabling, you must use EIA 568 Category 5 unshielded twisted-pair (UTP), or better, for each connection you make, and each cable should not exceed **100 meters**, (328 feet), in length. Category 5 cabling can be obtained at most computer stores, or you can crimp your own. See page 8 for cabling specifications. Here are some important cabling rules to follow:

· Computers should never be connected directly together on a network. They should **always** be connected to a hub.

· Only **two** 100Mbps Fast Ethernet hubs can be cascaded, (or *uplinked*), together. To cascade more than 2 100Mbps hubs, a switch or a repeater must be used.

· The maximum length for a Category 5 cable between a 100BaseTX or 10BaseT workstation and a hub is **100 meters** (328 feet).

· The maximum distance between 2 100BaseTX hubs without a switch is **5 meters** (16.4 feet).

· The maximum distance between 2 10BaseT hubs, (or a 10BaseT hub and an Auto-Sensing hub), is **100 meters** (328 feet).

Package Contents for the EtherFast II 10/100 Hub (16 and 24-Port Model)

- EtherFast II 10/100 Hub
- Rack Mounting Hardware
- AC Power Cord
- User Guide

About Fast Ethernet

As the demand for desktop video, multimedia development, imaging, and other speed-intensive applications continues to rise, the need for high performance, fault tolerant LAN technology will become more critical.

Standard **Ethernet**, which has been the most popular networking technology to date with a maximum data throughput of **10Mbps (Megabits per second)**, is becoming insufficient to handle the latest video, multimedia, and other speed-intensive client/server LAN applications.

Among the solutions to the problem of network speed, **Fast Ethernet** has emerged as the most viable and economical. Capable of sending and receiving data at **100Mbps**, it is more than fast enough to handle even the most demanding video and other real-time applications.

Although there are a number of different competing Fast Ethernet implementations, **100BaseTX** is by far the most popular. Operating on two pairs of Category 5 unshielded twisted-pair (UTP) cabling, 100BaseTX supports high speed signaling and is relatively inexpensive. Because it uses four wires for data transmission and the same packet format, packet length, error control, and management information as 10BaseT, 100BaseTX can be made to communicate with slower 10BaseT equipment when routed through a switch.

This **backwards compatibility** is one of 100BaseTX's major advantages over other forms of Fast Ethernet; it allows critical, speed-dependent network segments to be upgraded to 100BaseTX speeds as needed without re-wiring, refitting, and retraining an entire site. Networks can now mix both slow and fast network segments for different users or departments. Publishing, R&D, video, multimedia, or accounting departments can enjoy a 100Mbps pace, while other corporate segments can operate at slower and more affordable 10Mbps speeds.

Every port on your 10/100 Hub is capable of running at either 10Mbps or 100Mbps, allowing you to mix and match economical 10BaseT hardware with high performance 100Mbps network cards, hubs, switches, and other equipment.

Getting to Know the 10/100 Hub
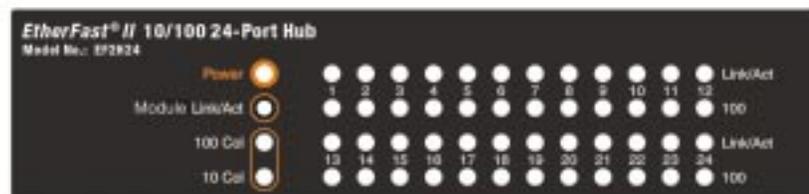
LEDs

Power	LED will be lit whenever the hub is receiving power.
10 Col	When lit, this LED indicates that collisions are being encountered at 10Mbps.
100 Col	When lit, this LED indicates that collisions are being encountered at 100Mbps. Some collisions are normal. If your network experiences an excessively high collision level, verify that your cabling is good, and that there are no cabling coils, cross-overs, or breaks
100	LED will be lit if a given port is operating at 100Mbps.
Link/Act	LED will be lit or flickering if a given port is sending or receiving data; will not be lit if the port is not connected to a node.
Module Link/Act	LED will be lit if the optional expansion module is installed; flickering when receiving or transmitting data.

Optional Fiber Expansion Module

Each 10/100 16 and 24-Port rack mountable hub comes with a fiber optic expansion slot which accepts an optional 100BaseFX fiber optic module for connecting to high-speed fiber cabling. If you purchased an optional fiber optic expansion module, set it up by following the setup instructions included in the Appendix of this guide, (page 11).

Mounting the Hub

Each hub is equipped with mounting hardware that can be used to secure it in a stationary or movable 19" rack. To mount the brackets to the hub, line up the holes on the bracket with the holes on the side of the hub (make sure that the flange on the bracket is to the rear), then fasten the bracket to the hub using the screws provided.

> *Note:* Screws required for installing the hub in your rack are not included with the mounting hardware.

Connecting Nodes to the 10/100 Hub

The 10/100 Hub can be connected to either 10Mbps or 100Mbps PCs, work-stations, file servers, print servers, or other hardware. When powered up, each of the hub's 10/100 ports will automatically adjust to the proper speed, as determined by the speed of the hardware or node connected to the port.

Connect each of your PCs, workstations, file servers, print servers, or other network nodes to the 10/100 Hub one by one. Each node should be connected to the hub with a straight-through, Category 5 cable with RJ-45 connectors. Each cable should be less than 100 meters (328 feet), in length. Ready-to-use network cables of various lengths can be purchased at most computer stores. If you wish to crimp your own cabling for custom sites or lengths, see page 9 for cabling specifications.

When connecting a PC to a hub, either the computer or the hub must be pow-ered **OFF**. If both the computer and the hub are turned on while the connec-tion is completed, the network will act erratically and you must reset the hub (see page 7).

Uplinking the Hub

Each EtherFast II 10/100 Hub has a *crossover* button (labeled **MDI/MDIX**) on the front of the hub that allows you to connect with other hubs, switches, or routers. To activate the uplinking capability, make sure that the **MDI/MDIX** button is **not** depressed. Insert one end of a straight-through RJ-45 cable into port #1 and the other end into the desired device. The 10/100 Hub will automatically determine the optimum speed of the device being attached to it.

> *Note:* When the **MDI/MDIX** button is depressed, the port will function normally.

Powering on the Hub

To power on the hub, plug the supplied AC electrical power cord into the back of the hub. The hub will put itself through a series of diagnostic tests -- which shouldn't take more than just a few seconds -- then begin scanning the ports for live nodes. The installation is complete.

Resetting the Hub

To reset the hub, unplug the unit for at least three seconds then plug it back in. The hub is reset.

Appendix

Twisted-Pair Cabling

There are different grades, or categories, of twisted-pair cabling. Category 5 is the most reliable and is highly recommended. Category 3 is a good second choice. Straight-through cables are used for connecting computers to a hub. Crossover cables are used for connecting a hub to another hub (there is an exception: some hubs have a built-in uplink port that is crossed internally, which allows you to link or connect hubs together with a straight-through cable instead).

RJ-45 Color Chart

Wire 1 — White with an Orange Stripe
Wire 2 — Orange
Wire 3 — White with a Green Stripe
Wire 4 — Blue
Wire 5 — White with a Blue Stripe
Wire 6 — Green
Wire 7 — White with a Brown Stripe
Wire 8 — Brown

You can buy pre-made Category 5 cabling, or cut and crimp your own. Category 5 cables can be purchased or crimped as either straight-through or crossover cables. A Category 5 cable has 8 thin, color-coded wires inside that run from one end of the cable to the other. All 8 wires are used. In a straight-through cable, wires 1, 2, 3, and 6 at one end of the cable are also wires 1, 2, 3, and 6 at the other end. In a crossover cable, the order of the wires change from one end to the other: wire 1 becomes 3, and 2 becomes 6. See the diagrams on the next page for more detailed information on straight-through and crossover cabling.

straight-through cable		crossed cable	
Wire	Becomes	Wire	Becomes
1	1	1	3
2	2	2	6
3	3	3	1
6	6	6	2

To determine which wire is wire number 1, hold the cable so that the end of the plastic RJ-45 tip (the part that goes into a wall jack first) is facing away from you. Face the clip down so that the copper side faces up (the springy clip will now be parallel to the floor).When looking down on the copper side, wire 1 will be on the far left.

spring clip on bottom
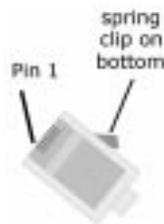
Pin 1

Crimping Your Own Network Cables

• **Straight-Through Cabling**

Pins 4, 5, 7 and 8 are not used
Receive (3 & 6)
Transmit (1 & 2)
Transmit (1 & 2)
Receive (3 & 6)
Pins 4, 5, 7 and 8 are not used

Straight-Through

Pin number	Wire Color
Pin 1	Orange/White
Pin 2	Orange
Pin 3	Green/White
Pin 4	Blue
Pin 5	Blue/White
Pin 6	Green
Pin 7	Brown/White
Pin 8	Brown

Wire	Becomes
1	1
2	2
3	3
6	6

•**Cross-Over Cabling**

Pins 4, 5, 7 and 8 are not used
Receive (3 & 6)
Transmit (1 & 2)
Receive (3 & 6)
Transmit (1 & 2)
Pins 4, 5, 7 and 8 are not used

Crossed-Over

Pin number	Wire Color
Pin 1	Orange/White
Pin 2	Orange
Pin 3	Green/White
Pin 4	Blue
Pin 5	Blue/White
Pin 6	Green
Pin 7	Brown/White
Pin 8	Brown

Wire	Becomes
1	3
2	6
3	1
6	2

How to Install An Add-On Module

Follow these steps to install the add-on modules in the EtherFast II 10/100 Hub (**EF2H16** or **EF2H24**).

1. Power off the hub and remove the AC power cord from the hub.

2. Remove all RJ-45 cables from the all the ports in the hub and if the hub is on a rack remove the hub from the rack

3. Using a Phillips screw driver, remove the screws holding the small cover panel on the back of the hub. The size of the panel is about 8.1cm by 3.5cm (3.1" x 1.4"). You will need the screws to secure the add-on module later.

4. Ground yourself properly and remove the add-on module from its package.

5. Hold the module so the chips and the components on the add-on module are facing up. If the module has a daughter board (a bigger board mounted on the main board of the add-on module), the bottom of the daughter board should be facing up. Insert the module into the back of the hub.

6. The add-on module will slide in until it comes to a stop. Push the module to make sure it makes a proper connection. **Note**: Do not use too much force, you can bend the metal panel on the add-on module.

7. Secure the module in place with the two screws.

8. If used on a rack, mount the hub back on the rack. Reconnect the RJ-45 cables and the AC Power cord. **Note**: do not connect any cables to the port(s) that will be used by the add-on Module (see page 11 to find which ports can't be used when using an add-on module).

9. Connect your Fiber cable or RJ-45 cable to the add-on Module. Turn on the hub.

Fiber Optic Modules

Two different Fiber Optic modules are available for the rack-mountable 10/100 Hub (EF2H16 and EF2H24):

EF2HSC: 100BaseFX 1-Port Transceiver Module (SC)
EF2HST: 100BaseFX 1-Port Transceiver Module (ST)

Each Fiber port has two connectors, a transmit (TX) and a receive (RX). To connect two modules together, you must run a Multi-mode fiber cable from the transmit connector on one module to the receive connector on the other. If you are looking at the back of the hub, the connector on the right is the receiver and the connector on the left is the transmitter. The connectors are also labeled on the top of the fiber port. These labels can not be seen after the module is installed, so make sure that you look before you slide it in.

Each Distance Extender Modules has a switch on the back for Full Duplex or Half Duplex. The switch must be set to Half Duplex at all times, when connecting to another Distance Extender or a Transceiver module. The Link LED will light up when there is a connection made, and the Activity (ACT) LED will flicker while data is being transmitted or received.

> *Note: The duplexing switch (located on the back of the hub) should be set in **Half Duplex** mode. The 10/100 Hubs do not function in full duplex mode.*

A maximum of **2** Transceivers can be connected together in one segment. When two hubs are connected via Transceivers together, the same rule of cascading two 100Mb hubs applies to them. To cascade another hub to these two hubs (using RJ-45), a switch or repeater must be used.

The Distance Extender is a **switched port**. This means another 100Mb hub can be cascaded (with RJ-45) to the hub that has a Distance Extender Module installed. Two Distance Extender modules can be connected together **only** at Half Duplex. Do **NOT** set either or both of the Distance Extender modules to Full Duplex. The 10/100 Hubs will not communicate at Full Duplex.

When using fiber, the noise loss has to be calculated. Also, always use the same type of fiber connector (SC or ST) for your fiber cables. If you are using ST-type connectors and you introduce an SC-type connector module, an SC to ST converter has to be obtained, or the ST connector may be replaced by an SC Connector

Note: Changing connectors should be done professionally, using the proper tools. If you have never worked with fiber cabling, seek the help of an experienced professional.

The following table shows the distance limitation when connecting the Linksys Fiber modules:

Distance (meters/ft)	Cable type	Module in Hub A	Module in hub B
208/672	Multi-Mode 62.5/125uM Fiber Optic Cable	EF2HSC or EF2HST, SC or ST Type 100BaseFX Fiber Distance Extender	EF2HSC, EF2HST SC or ST Type Fiber Transceiver Module
412/1330 (Half Duplex)	Multi-Mode 62.5/125uM Fiber Optic Cable	EF2HSC or EF2HST SC or ST Type Fiber Distance Extender	EF2HSC, EF2HST SC or ST Type Fiber Distance Extender

The following illustration is an example of how to connect two rack-mountable EtherFast II 10/100 Hubs together using fiber optic cabling. Notice that both hubs are equipped with 100BaseFX 1-Port Distance Extender modules. The distance extender modules allow data to be sent up to 208 meters (672 feet).

For a full explanation of fiber optic cabling distance rules, see the chart on page 12.

Maximum distance 0f 208 meters
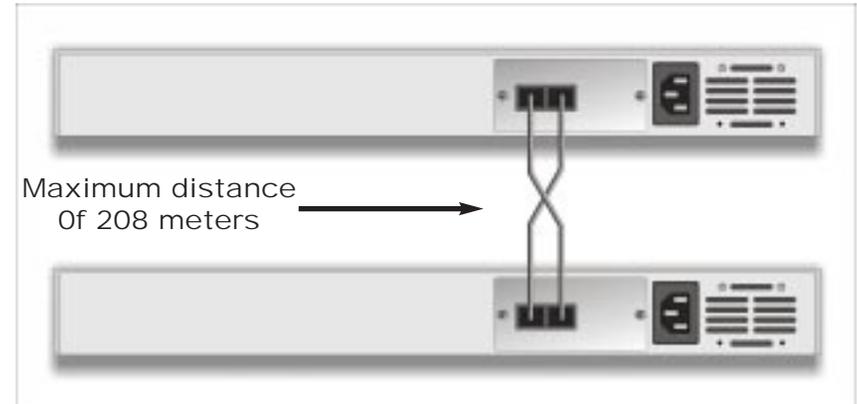
Specifications

Model Number:	EF2H16
	EF2H24
Standards:	IEEE 802.3 and IEEE 802.3u
Protocol:	CSMA/CD
Ports:	16 or 24 RJ-45, depending on model;
	One 100BaseFX fiber optic expansion slot
Speed:	10Mbps or 100Mbps
LEDs:	Power, 10Col, 100Col, 100Mbps, Link/Activity,
	Module Link/Activity
Cabling:	Category 5 UTP (or better)

Environmental

Dimensions:	17.25" x 7" x 1.75"
Unit Weight:	6.6 lbs.
Certifications:	FCC Class A, CE Mark, Commercial
	UL and CSA listed
Power:	90-250VAC, 50-60Hz
Power Consumption:	30 Watts
Operating Temperature:	32°F to 131°F (0°C to 55°C)
Storage Temperature:	-40°F to 158°F (-40°C to 70°C)
Operating Humidity:	10% to 85% Non-Condensing
Storage Humidity:	5% to 90% Non-Condensing

Customer Support

For help with the installation or operation of your EtherFast 10/100 Hub, contact Linksys Customer Support at one of the phone numbers or Internet addresses below.

Customer Support	800-326-7114
	949-261-1288
Fax	949-261-8868
E-mail	support@linksys.com
Web	http://www.linksys.com
FTP Site	ftp.linksys.com

Linksys Warranty Information

Note: You must have your proof of purchase and a barcode from the product's packaging on hand when calling. Return requests can not be processed without proof of purchase.

Linksys guarantees that every 10/100 Hub is free from physical defects in material and workmanship under normal use for five (5) year from the date of purchase. If the product proves defective during this warranty period, contact Linksys Customer Support to obtain a Return Authorization number. When returning a product, mark the Return Authorization number clearly on the outside of the package and include your original proof of purchase.

IN NO EVENT SHALL LINKSYS' LIABILITY EXCEED THE PRICE PAID FOR THE PRODUCT FROM DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF THE PRODUCT, ITS ACCOMPANYING SOFTWARE, OR ITS DOCUMENTATION. LINKSYS OFFERS NO REFUNDS FOR ITS PRODUCTS.

Tampering with or disassembling this product voids its warranty.

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