LINKSYS®
A Division of Cisco

24-Port or 48-Port 10/100 + 4-Port 10/100/1000 Gigabit Resilient Clustering Smart Switch with 2 Combo SFPs

Model: SLM224G4S, SLM248G4S

About This Guide

Icon Descriptions

While reading through the User Guide you may see various icons that call attention to specific items. Below is a description of these icons:

NOTE: This check mark indicates that there is a note of interest and is something that you should pay special attention to while using the product.

WARNING: This exclamation point indicates that there is a caution or warning and it is something that could damage your property or product.

WEB: This globe icon indicates a noteworthy website address or e-mail address.

Online Resources

Website addresses in this document are listed without **http://** in front of the address because most current web browsers do not require it. If you use an older web browser, you may have to add **http://** in front of the web address.

Resource	Website
Linksys	www.linksys.com
Linksys International	www.linksys.com/international
Glossary	www.linksys.com/glossary
Network Security	www.linksys.com/security

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Table of Contents

Chapter 1: Introduction

Thank you for choosing the Linksys 24/48-Port 10/100 + 4-Port Gigabit Smart Switch with Resilient Clustering Technology and 2 Combo SFPs.

These switches allow you to expand your network securely. Configuration of the switch is secured using SSL for Web access. User control is secured using 802.1x security using a RADIUS authentication mechanism and can also be controlled using MAC filtering.

Extensive QoS features makes the solution ideal for real-time applications like Voice and Video. The four priority queues together with the Weighted Round Robin and Strict Priority scheduling techniques facilitate efficient co-existence of real-time traffic with data traffic allowing them each to meet their QoS needs. Individual users or applications can be prioritized above others using various Class of Service options—by port, Layer 2 priority (802.1p), and Layer 3 priority (TOS or DSCP). Intelligent Broadcast and Multicast storm control minimize and contain the effects of these types of traffic on regular traffic. IGMP Snooping limits bandwidth-intensive video traffic to only the requestors without flooding to all users. Incoming traffic can be policed and outgoing traffic can be shaped allowing you to control network access and traffic flow.

There are features that allow you to expand and grow your network of switches. Link aggregation allows multiple high-bandwidth trunks between switches to be set up. This also provides a level of reliability in that the system continues to operate if one of the links breaks. Spanning Tree (STP) and Fast Link allow you to build a mesh of switches increasing the availibility of the system.

The rich management functionality of the Smart Switches with Resilient Clustering Technology includes SNMP, RMON, Telnet, and HTTP Management options, allowing you to flexibly integrate and manage these devices in your network.

NOTE: Throughout this User Guide, the term **reset** refers to cycling the power to the Switch; that is, powering the Switch off, then on again.

Chapter 2: Product Overview

SLM224G4S

Front Panel

The Switch's LEDs and ports are located on the front panel.

Front Panel of the SLM224G4S

System (Green/Amber) Lights up green to indicate that the Switch is powered on.

Lights up amber while the Switch is performing a system self-test. Blinks amber if the self-test fails.

LINK/ACT (1-24) (Green) Lights up to indicate a functional 10/100 Mbps network link through the corresponding port (1 through 24) with an attached device. Blinks while the Switch is actively sending or receiving data over that port.

Stack (G1-G4) (Amber) Lights up to indicate that the corresponding port (G1 through G4) is linked to another switch. (Two of these LEDs will be lit if switch stacking is properly configured.)

LINK/ACT (G1-G4) (Green) Blinks when the Switch is actively sending or receiving data over the corresponding port (G1 through G4).

1000M (G1-G4) (Yellow) Lights up to indicate a functional 1 Gbps connection on the corresponding port (G1 through G4) with an attached device.

Ethernet 1-24 The Switch is equipped with 24 auto-sensing, Ethernet network ports, which use RJ-45 connectors. The Fast Ethernet ports support network speeds of 10 Mbps or 100 Mbps. They can operate in half- and full-duplex modes. Auto-sensing technology enables each port to automatically detect the speed of the device connected to it (10 Mbps or 100 Mbps), and adjust its speed and duplex accordingly.

G1-G4 The Switch is equipped with 4 auto-sensing Gigabit Ethernet network ports, which use RJ-45 connectors. The Gigabit Ethernet ports support network speeds of 10 Mbps, 100 Mbps, or 1000 Mbps. They can operate in half- and full-duplex modes. Auto-sensing technology enables each port to automatically detect the speed of the device connected to it (10 Mbps, 100 Mbps, or 1000 Mbps), and adjust its speed and duplex accordingly.

miniGBIC (1-2) The miniGBIC (gigabit interface converter) port is a connection point for a miniGBIC expansion module, so the Switch can be uplinked via fiber to another switch. The MiniGBIC port provides a link to a high-speed network segment or individual workstation at speeds of up to 1000 Mbps.

To establish a Gigabit Ethernet connection using a miniGBIC port, you will need to install a MGBT1, MGBSX1, or MGBLH1 Gigabit expansion module and use Category 5e cabling or fiber optic cabling.

To establish a Fast Ethernet connection using a miniGBIC port, you will need to install a MFEFX1 (100BASE-FX) or MFELX1 (100BASE-LX) 100SFP Transceiver and use fiber optic cabling.

Stack ID Displays the Switch's unit ID number if the Switch is in stack mode.

Stack Master (Amber) Lights up if the switch is the stack Master during stack mode.

NOTE: On the SLM224G4S, MiniGBIC ports are shared with standard ports. If a miniGBIC port is used, then the shared standard port on the Switch cannot be used. The following table defines the shared port mapping of the SLM224G4S Switch.

SLM224G4S Shared Port Mapping

miniGBIC Port	Standard Port
miniGBIC 1	G3
miniGBIC 2	G4

Back Panel

The Console port and power port are located on the back panel of the Switch.

Back Panel of the SLM224G4S

CONSOLE The Console port is a serial port that allows you to connect to a computer's serial port (for configuration purposes) using the provided serial cable. You can use HyperTerminal to manage the Switch using the console port.

POWER The Power port is where you connect the AC power.

SLM248G4S

Front Panel

The Switch's LEDs and ports are located on the front panel.

Front Panel of the SLM248G4S

System (Green/Amber) Lights up green to indicate that the Switch is powered on.

Lights up amber while the Switch is performing a system self-test. Blinks amber if the self-test fails.

LINK/ACT (1-48) (Green) Lights up to indicate a functional 10/100 Mbps network link through the corresponding port (1 through 24) with an attached device. Blinks while the Switch is actively sending or receiving data over that port.

Stack (G1-G4) (Amber) Lights up to indicate that the corresponding port (G1 through G4) is linked to another switch. (Two of these LEDs will be lit if switch stacking is properly configured.)

G1-G4 (Green/Amber) Blinks green when the Switch is actively sending or receiving data at 10/100 Mbps over the corresponding port (G1 through G4).

Blinks yellow when the Switch is actively sending or receiving data at 1000 Gbps over the corresponding port (G1 through G4).

Ethernet 1-48 The Switch is equipped with 48 auto-sensing, Ethernet network ports, which use RJ-45 connectors. The Fast Ethernet ports support network speeds of 10 Mbps or 100 Mbps. They can operate in half- and full-duplex modes. Auto-sensing technology enables each port to automatically detect the speed of the device connected to it (10 Mbps or 100 Mbps), and adjust its speed and duplex accordingly.

G1-G4 The Switch is equipped with 4 auto-sensing Gigabit Ethernet network ports, which use RJ-45 connectors. The Gigabit Ethernet ports support network speeds of 10 Mbps, 100 Mbps, or 1000 Mbps. They can operate in half- and full-duplex modes. Auto-sensing technology enables each port to automatically detect the speed of the device connected to it (10 Mbps, 100 Mbps, or 1000 Mbps), and adjust its speed and duplex accordingly.

miniGBIC (1-2) The miniGBIC (gigabit interface converter) port is a connection point for a miniGBIC expansion module, so the Switch can be uplinked via fiber to another switch. The MiniGBIC port provides a link to a high-speed network segment or individual workstation at speeds of up to 1000 Mbps.

To establish a Gigabit Ethernet connection using a miniGBIC port, you will need to install a MGBT1, MGBSX1, or MGBLH1 Gigabit expansion module and use Category 5e cabling or fiber optic cabling.

To establish a Fast Ethernet connection using a miniGBIC port, you will need to install a MFEFX1 (100BASE-FX) or MFELX1 (100BASE-LX) 100SFP Transceiver and use fiber optic cabling.

Stack ID Displays the Switch's unit ID number if the Switch is in stack mode.

Stack Master (Amber) Lights up if the switch is the stack Master during stack mode.

NOTE: On the SLM248G4S, MiniGBIC ports are shared with Gigabit Ethernet ports. If a miniGBIC port is used, then the shared Gigabit Ethernet port on the Switch cannot be used. The following table defines the shared port mapping of the SLM248G4S Switch.

SLM248G4S Shared Port Mapping

miniGBIC Port	Gigabit Port
miniGBIC 1	Port G3
miniGBIC 2	Port G4

Back Panel

The Console port and power port are located on the back panel of the Switch.

Back Panel of the SLM248G4S

CONSOLE The Console port is a serial port that allows you to connect to a computer's serial port (for configuration purposes) using the provided serial cable. You can use HyperTerminal to manage the Switch using the console port.

POWER The Power port is where you connect the AC power.

Chapter 3: Installation

Overview

This chapter will explain how to connect network devices to the Switch. The following diagram shows a typical network configuration.
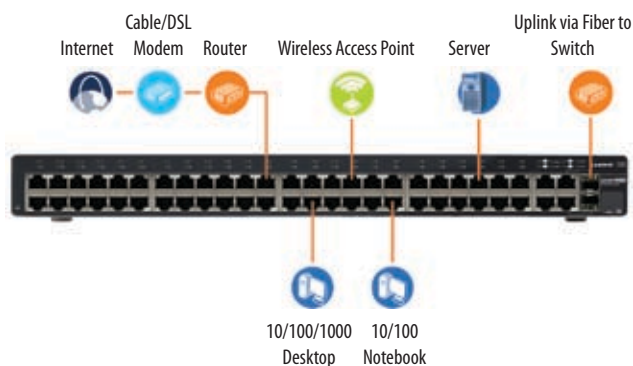
Typical Network Configuration for the SLM248G4S

When you connect your network devices, make sure you do not exceed the maximum cabling distances, which are listed in the following table:

Maximum Cabling Distances

From	To	Maximum Distance
Switch	Switch or Hub	100 meters (328 feet)
Hub†	Hub	5 meters (16.4 feet)
Switch or Hub†	Computer	100 meters (328 feet)

†A hub refers to any type of 100 Mbps hub. A 10 Mbps hub connected to another 10 Mbps hub can span up to 100 meters (328 feet).

Pre-Installation Considerations

Fast Ethernet Considerations

If you are using the Switch for Fast Ethernet (100 Mbps) applications, you must observe the following guidelines:

Full-Duplex Considerations

The Switch provides full-duplex support for its RJ-45 ports. Full-duplex operation allows data to be sent and received simultaneously, doubling a port's potential data throughput. If you will be using the Switch in full-duplex mode, the maximum cable length using Category 5 cable is 328 feet (100 meters).

1000BASE-T Cable Requirements

All Category 5 UTP cables that are used for 100BASE-TX connections should also work for 1000BASE-T, providing that all four wire pairs are connected. However, it is recommended that for all critical connections, or any new cable installations, Category 5e (enhanced Category 5) or Category 6 cable should be used. The Category 5e specification includes test parameters that are only recommendations for Category 5. Therefore, the first step in preparing existing Category 5 cabling for running 1000BASE-T is a simple test of the cable installation to be sure that it complies with the IEEE 802.3ab standards.

Positioning the Switch

Before you choose a location for the Switch, observe the following guidelines:

• Make sure that the Switch is accessible and that the cables can be connected easily.

• Keep cabling away from sources of electrical noise, power lines, and fluorescent lighting fixtures.

• Position the Switch away from water and moisture sources.

• To ensure adequate air flow around the Switch, be sure to provide a minimum clearance of two inches (50 mm).

• Do not stack free-standing Switches more than four units high.

Placement Options

There are two ways to physically install the Switch, either set the Switch on its four rubber feet for desktop placement or mount the switch in a standard-sized, 19-inch wide, 1U-high rack for rack-mount placement.

Desktop Placement

- Attach the rubber feet to the recessed areas on the bottom of the Switch.

- Place the Switch on a desktop near an AC power source.

- Keep enough ventilation space for the switch and check the environmental restrictions mentioned in the *Specifications* Appendix as you are placing the Switch.

- Connect the Switch to network devices according to the Hardware Installation instructions below.

Attaching the Switch's Rubber Feet

Rack-Mount Placement

When rack-mounting the Switch, please observe the following guidelines

- **Elevated Operating Ambient** If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (Tma) specified by the manufacturer.

- **Reduced Air Flow** Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.

- **Mechanical Loading** Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.

- **Circuit Overloading** Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.

- **Reliable Earthing** Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g. use of power strips).

To rack-mount the Switch in any standard 19-inch wide, 1U-high rack, follow the instructions described below.

1. Place the Switch on a hard flat surface with the front panel facing you.

2. Attach a rack–mount bracket to one side of the Switch with the supplied screws and secure the bracket tightly.

Attaching the Brackets

3. Follow the same steps to attach the other bracket to the opposite side.

4. After the brackets are attached to the Switch, use suitable screws to securely attach the brackets to any standard 19-inch rack.

Mounting in Rack

5. Connect the Switch to network devices according to the Hardware Installation instructions below.

Hardware Installation

To connect network devices to the Switch, follow these instructions:

1. Make sure all the devices you will connect to the Switch are powered off.

2. For a 10/100 Mbps device:

   - Connect a Category 5 Ethernet network cable to one of the numbered ports on the Switch.

For a 1000 Mbps device:

- Connect a Category 5e Ethernet network cable to port G1, G2, G3, or G4 on the Switch.

3. Connect the other end of the network cable to a PC or other network device.

4. Repeat steps 2 and 3 to connect additional devices.

5. If you are using a miniGBIC port, then connect a miniGBIC module to a miniGBIC port. For more detailed instructions, refer to "Uplinking the Switch".

6. Connect the supplied power cord to the Switch's power port, and plug the other end into an electrical outlet. When connecting power, always use a surge protector.

⚠️ **IMPORTANT:** Make sure you use the power cord that is supplied with the Switch. Use of a different power cord could damage the Switch.

7. Power on the devices connected to the Switch. Each active port's corresponding LED will light up on the Switch.

Uplinking the Switch

To uplink the Switch using a 1000 Mbps Ethernet port, connect one end of a Cat 5e (or better) Ethernet network cable to a Gigabit port, then connect the other end of the cable into the peripheral device's uplink port. MDI/MDIX will automatically detect the speed and cable type.

To uplink the Switch using the miniGBIC port, connect a miniGBIC module to a miniGBIC port whose shared Ethernet port is not being used (a miniGBIC port and its shared Ethernet port cannot be used at the same time). The following table shows which Ethernet ports are shared with the miniGBIC ports.

Ethernet Ports Shared with miniGBIC Ports

Switch	Port Shared with miniGBIC1	Port Shared with miniGBIC2
SLM248G4S	G3	G4
SLM224G4S	G3	G4

To establish a Gigabit Ethernet connection using a miniGBIC port, you will need to install a MGBT1, MGBSX1, or MGBLH1 Gigabit expansion module and use Category 5e cabling or fiber optic cabling.

To establish a Fast Ethernet connection using a miniGBIC port, you will need to install a MFEFX1 (100BASE-FX) or MFELX1 (100BASE-LX) 100SFP Transceiver and use fiber optic cabling.

The hardware installation is complete. Proceed to "Chapter 5: Configuration Using the Web-based Utility", for directions on how to set up the Switch.

Configuring Stacking Mode

The SLM224G4S and SLM248G4S Switches can operate in either standalone mode or stacking mode. In standalone mode, the switch operates independently of other switches. In stacking mode, multiple Resilient Clustering Smart Switches are connected together to effectively form a single switch. The default operating mode is stacking mode.

A Switch stack can contain any combination of SLM224G4S and SLM248G4S units, with the following limits:

- SLM224G4S only: Maximum of 6 units
- SLM248G4S only: Maximum of 4 units
- SLM224G4S and SLM248G4S: Maximum of 192 10/100 ports (total among all switches)

Each switch in a stack is assigned a unique unit number. These numbers indicate the switch's status in the stack:

- Unit 1: The switch is the Master unit. The master handles the management functions for the entire stack.
- Unit 2: The switch is the Backup Master unit. The backup master automatically becomes the new master if the master fails.
- Unit 3, 4, 5, 6: The switch is a Slave unit. (Depending on the switch models used, 5 and 6 may not be valid.)

The Switches are connected together using a pair of Gigabit ports on each Switch: G1 and G2, G3 and G4, or miniGBIC1 and miniGBIC2. Linksys recommends using Gigabit ports G1 and G2 (the default stacking ports). Connections are made using Category 5e Ethernet network cables.

To set up a stack with six switches, follow these steps:

1. Connect one end of a Category 5e Ethernet network cable to port G1 on Unit 1.

2. Connect the cable's other end to port G2 on Unit 2.

3. Connect one end of a Category 5e Ethernet network cable to port G1 on Unit 2.

4. Connect the cable's other end to port G2 on Unit 3.

5. Connect one end of a Category 5e Ethernet network cable to port G1 on Unit 3.

6. Connect the cable's other end to port G2 on Unit 4.

7. Connect one end of a Category 5e Ethernet network cable to port G1 on Unit 4.

8. Connect the cable's other end to port G2 on Unit 5.

9. Connect one end of a Category 5e Ethernet network cable to port G1 on Unit 5.

10. Connect the cable's other end to port G2 on Unit 6.

11. Connect one end of a Category 5e Ethernet network cable to port G1 on Unit 6.

12. Connect the cable's other end to port G2 on Unit 1.

For a stack with less than 6 switches, the steps are similar except that port G1 of the **last** switch in the stack must be connected back to port G2 of the **first** switch in the stack.

The following is an example of setting up a stacked configuration using three SLM248G4S switches.

1. Connect port G1 on Unit 1 to port G2 on Unit 2.
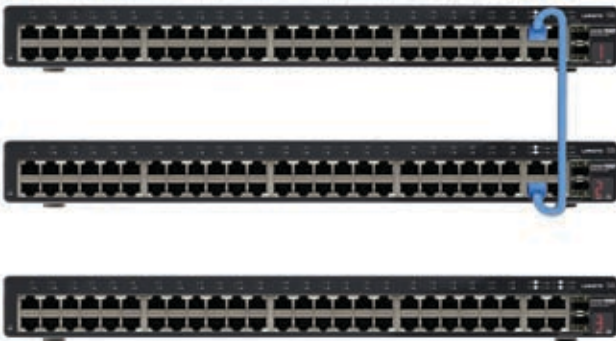
Connect Unit 1 to Unit 2

2. Connect port G1 on Unit 2 to port G2 on Unit 3.
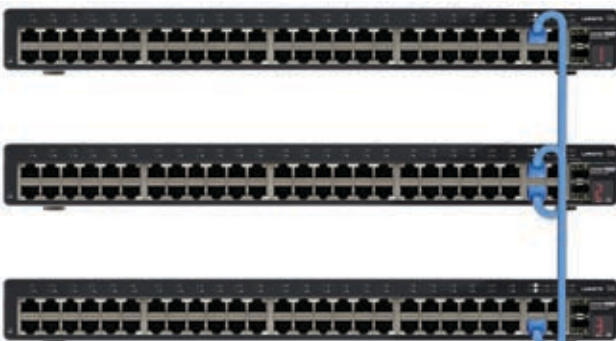
Connect Unit 2 to Unit 3

3. Connect port G1 on Unit 3 to port G2 on Unit 1.
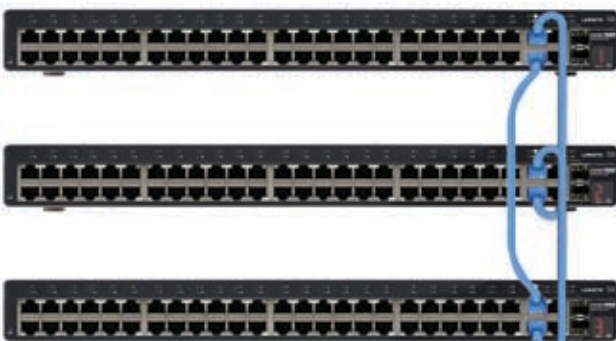
Connect Unit 3 to Unit 1

For detailed information on switch stacking, refer to "Appendix B: About Switch Stacking."

For more information on stack configuration using the Console Interface, refer to "Stack Configuration" and "System Mode" in "Chapter 4: Configuration Using the Console Interface".

For more information on stack configuration using the Web-based Utility, refer to "Setup > Stack Management" in "Chapter 5: Configuration Using the Web-based Utility".

Reassigning a Slave Unit as the Master Unit

You can reassign a slave unit so that it becomes the master unit. To do this, you swap their unit numbers. For example, to make slave unit 5 be the master, you change the master's unit number from 1 to 5 and the slave's unit number from 5 to 1. To change the unit numbers, you can use either the Web-based utility or the console interface.

The following describes the procedure for changing a slave unit into the master unit. In this example, unit 5 is made the master unit.

1. Swap the unit numbers. That is, change the unit number of the current master from 1 to 5, and change the unit number of slave unit 5 from 5 to 1. (The order in which these are performed is not significant.)

2. Power off the new unit 5 (the former master unit).

3. Power off the new master unit 1 (the former slave unit 5) briefly, then power it on again.

4. Power up the new unit 5.

> **NOTE:** If unit 2 (the backup master) is made the master unit, steps 2 through 4 can be skipped.

Replacing a Stacked Switch

To replace one switch in a stack with another switch without having to reboot or power down the stack:

1. Run the Web-based utility.

2. Go to the *Setup > Stack Configuration* screen.

3. Make sure that the **Stacking Ports After Reset** setting matches the type of stacking ports (**Copper Ports** or **Combo Ports**) that are used to connect the switches.

4. Verify that the **Unit No. After Reset** settings specify the correct unit number for the switch being replaced.

5. Click **Save Settings** to save the stack settings.

6. Disconnect the switch being replaced, then connect the new switch using the same stacking ports (copper or combo) as before.

The stack should continue to operate as before.

Chapter 4: Configuration Using the Console Interface

Overview

The Switch features a menu-driven console interface that lets you perform basic switch configuration and easily manage your network. To use the console interface, you either run the HyperTerminal application to configure a serial connection through the Switch's console port, or run a telnet session over an Ethernet connection.

Using the HyperTerminal Application

To access the console interface using HyperTerminal:

1. Click the **Start** button.

2. Select **All Programs** > **Accessories** > **Communications** > **HyperTerminal**.

Start > All Programs > Accessories > Communications > HyperTerminal

3. Enter a name for this connection. Select an icon for the application, then click **OK**.

HyperTerminal Connection Description Screen

4. Select a port to communicate with the switch. Select **COM1** or **COM2**.

HyperTerminal Connect To Screen

5. Set the serial port settings as follows, then click **OK**.

   Bits per Second: **38400**

   Databits: **8**

   Parity: **None**

   Stop bits: **1**

   Flow control: **None**
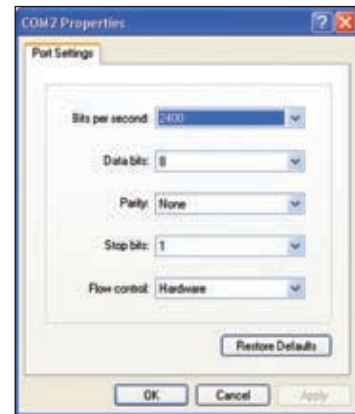
HyperTerminal Properties Screen

6. The *Login* screen appears. Proceed to the "Login" section below.

Using telnet

In addition to using HyperTerminal to operate the console interface through the Switch's console port, you can also use a telnet session to operate the console interface through an Ethernet connection.

1. Click **Start**, then select **All Programs** > **Accessories** > **Command Prompt** to open a command prompt.

2. At the prompt, enter **telnet 192.168.1.254**, then press **Enter**.

3. The *Login* screen appears. Proceed to the "Login" section below.

How to Use the Console Interface

The Console Interface consists of a hierarchical series of menu screens and settings screens. Each menu displays a list of options. Selecting an option brings up a settings screen where you can configure the relevant settings.

To select a menu option, either press the number of the option in the list (for example, press **5** to select **Help** from the *Main Menu*), or use the arrow keys to move up or down the list until the option is highlighted, then press **Enter**.

The lower portion of each settings screen lists the actions and navigation keys. The actions (**Edit**, **Save**, **Quit**) allow you to make changes to the settings. The navigation keys (Arrow Keys, Tab, Backspace, Space, Esc) allow you to highlight and select different items within the screen.

To change a setting, highlight **Edit**, then press **Enter**. Use the arrow keys to highlight the setting to be changed, then enter its new value (or press **Space** to toggle through the list of values). To save your changes and remain in the settings screen, highlight **Save**, then press **Enter**. To return to the previous screen, highlight **Quit**, then press **Enter**. To cancel all changes and return to the previous screen, press **Esc**, then select **Quit**.

Login

The console interface starts by displaying the *Login* screen. The first time you open the console interface, use the default username **admin** and leave the password blank, then press the **Enter** key. You can set a password later from the *User and Password Settings* screen.

Console Login Screen

If you are using HyperTerminal, enter the username and password at the prompts. Then press **Enter** to log in.

If you are using telnet, use the arrow keys to select **Edit** and press **Enter**. Enter the username and password in the respective fields. Then press **Esc** to return to the *Login* screen. Use the arrow keys to select **Execute** and press **Enter** to complete the login process.

Switch Main Menu

After successful login, the *Main Menu* screen appears. This screen displays six menu choices: System Configuration Menu, Port Status, Port Configuration, System Mode, Help, and Log Out.

Main Menu

System Configuration Menu

System Configuration Menu

The *System Configuration Menu* provides the following options:

1. System Information
2. Management Settings
3. User and Password Settings
4. Security Settings
5. IP Configuration
6. File Management
7. Restore System Default Settings
8. Reboot System
9. Stack Configuration
0. Back to Main Menu

System Information

From the *System Information* screen you can check current firmware versions and other general switch information.
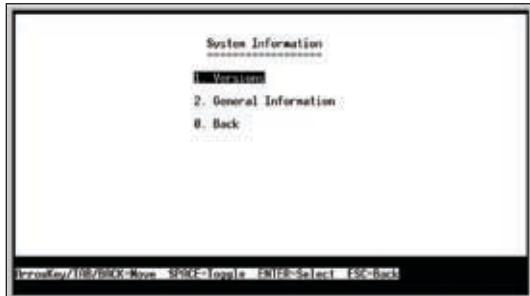
System Information

Versions

The *Versions* screen displays version-related information for each switch in the system.
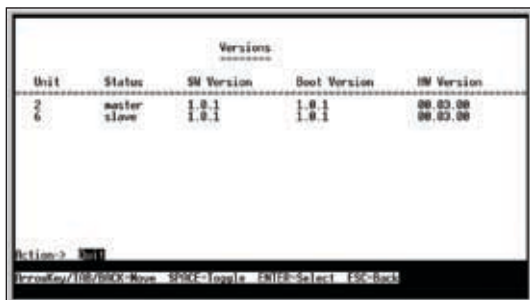
Versions

Unit The unit number of the switch, from 1 to 6.

Status The status of the switch, either master or slave.

Software Version The version number of the software .

Boot Version The version number of the boot file.

Hardware Version The Switch's current hardware setup.

General System Information

The *General System Information* screen displays the System Description, System Up Time, System MAC Address, System Contact, System Name and System Location.

General System Information

Management Settings

The *Management Settings* screen displays the Serial Port Configuration option.

Management Settings

Serial Port Configuration

The *Serial Port Configuration* screen displays the current baud rate setting. To change the baud rate, select **Edit**, then use the spacebar to toggle through the different baud rates. Use the **Save** action to set the new baud rate.

Serial Port Configuration

User & Password Settings

The *User & Password Settings* screen displays all the user accounts defined on the system.
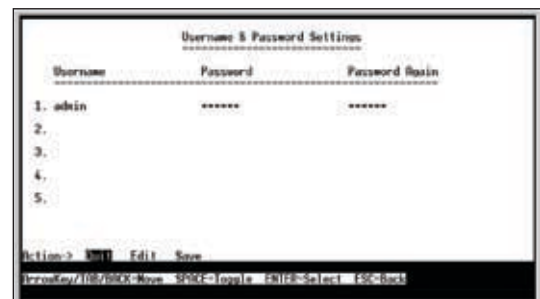
User & Password Settings

The default account is **admin**. You cannot edit this account (its user name and password cannot be changed). For security purposes, Linksys recommends creating at least one user account with a unique user name and password. You can create up to five user accounts total.

(When you create your first user account, it will appear as though you are editing the **admin** account; however, you are only replacing the **admin** account with the new account. The **admin** account is not overwritten or deleted.)

Once you have created a user account, you can edit it (change the user name and/or password) or delete it. If the system contains only one user account and you delete that account, the original **admin** account will reappear in its place. This is because the system must always have at least one account.

To add a new user, use the arrow keys to select **Edit,** press **Enter**, then enter the new account's user name and password in the *Username* and *Password* columns, and re-enter the password in the *Password Again* column to confirm the password.

To delete an existing user account, use the arrow keys to select **Edit,** press **Enter**, then delete the user name in the *Username* column.

To save your changes, press **Esc**, use the arrow keys to select **Save**, then press **Enter**.

Security Settings

The *IP Configuration* screen displays one option: Disable Active Management Access Profile.

Security Settings

Selecting this option will prompt you to confirm that you want to disable the active management access profile.

> ✔ **NOTE:** This setting has no effect when Management Access Rules are not defined.

IP Configuration

The *IP Configuration* screen displays three menu choices: IP Address Settings, HTTP Configuration, and Network Configuration.
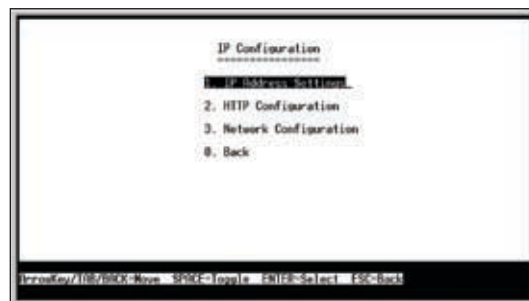
IP Configuration

IP Address Settings

The *IP Address Settings* screen allows you to set the IP information for the Switch.

IP Address Configuration

IP Address This sets the Switch's IP Address. The default setting is **192.168.1.254**. If you change the IP address, verify that the address you enter is correct and does not conflict with another device on the network.

Subnet Mask This combined with the IP Address defines the Switch's network address.

Default Gateway This defines the IP Address for the default gateway of the network.

Management VLAN This is the ID number of the Management VLAN.

DHCP Client The status of the DHCP client is displayed. If you want the Switch to be a DHCP client, then select **ENABLE**. If you want to assign an static IP address to the Switch, then enter the IP settings and select **DISABLE**.

HTTP

The *HTTP* screen allows you to set the Hyper Text Transfer Protocol server (web server) information for the Switch.

HTTP

HTTP Server Enable or disable the Switch's HTTP server function.

HTTP Server port Set the TCP port that HTTP packets are sent and received from.

Network Configuration

The *Network Configuration* screen offers a choice of two tests, Ping and TraceRoute.
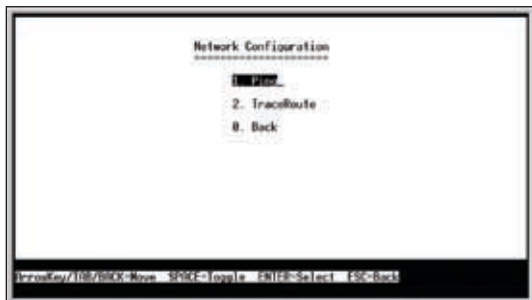
Network Configuration

Ping The *Ping* screen displays the IP address of the location you want to contact.

Ping

Select **Edit** to change the IP address, and select **Execute** to begin the ping test.

After the ping test is complete, the *Ping* screen displays the IP address, status, and statistics of the ping test.

TraceRoute The *TraceRoute* screen displays the IP address of the address whose route you want to trace.

TraceRoute

Select **Edit** to change the IP address, and select **Execute** to begin the traceroute test.

After the traceroute test is complete, the *TraceRoute* screen displays the IP address, status, and statistics of the traceroute test.

File Management

The *File Management* screen allows you to upload or download files, such as the startup configuration, boot, or image file, using a TFTP server.

File Management

Source File Specify the location of the file to transfer. Select one of the following:

- **TFTP** If the file is located on a TFTP server.
- **Image** If the file is a software code file.
- **Startup-config** If the file is a configuration file.

Destination File Specify where the file is to be transferred. Select one of the following:

- **TFTP** If the file is to be uploaded to a TFTP server.
- **Image** If the file is to be downloaded as a software code file.
- **Startup-config** If the file is a configuration file
- **Boot** If the file is a boot file.

File Name Enter the name of the file to be uploaded or downloaded.

IP Address Enter the IP address of the TFTP server that will transfer the file.

Select **Edit** to change the settings. When your changes are complete, press **Esc** to return to the Action menu, and select **Execute** to upload or download the designated file. If you are downloading a new boot image, please follow these steps:

1. Download the new boot code. DO NOT RESET THE DEVICE!

2. Download the new software image.

3. Reset the device now.

Restore System Default Settings

To restore the Switch back to the factory default settings, select **Restore System Default Setting** and press **Enter**. A prompt appears in the lower part of the screen asking you to confirm the requested action. Press **Y** to continue or **N** to cancel the action.

Restore Default

Reboot System

If you want to restart the Switch, select **Reboot System** and press **Enter**. When you are prompted to confirm the action, press **Y** to continue or **N** to cancel the action.

Reboot System

Stack Configuration

The Stack Configuration screen displays information about the switch stack and allows you to change those settings.
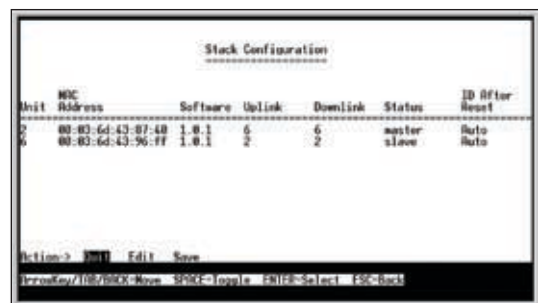
Stack Configuration

Unit   The unit number of the switch, from 1 to 6.

MAC Address   The MAC address of the switch.

Software The version number of the software that runs the switch.

Uplink The ID number of the switch that has an uplink connection to this switch.

Downlink The ID number of the switch that has a downlink connection from this switch.

Status The status of the switch, either master or slave.

ID After Reset The ID number that the Switch will have after the next system reset. Values are **Auto** or **1** to **6**.

Back to Main Menu

Select **Back to Main Menu** to exit the *System Configuration Menu* and return to the *Main Menu* screen.

Port Status

The *Port Status* screen displays status information for each of the switch's ports, consisting of the port number, the port's status, the link status, the port's speed and duplex mode, and flow control status.

The settings on the *Port Status* screen cannot be edited. If you want to change a port's settings, use the *Port Configuration* screen.

Port Status

Port Configuration

The *Port Configuration* screen allows you to change a port's settings. You can enable or disable a port, or set its auto-negotiation status, speed and duplex mode, and flow control status.

Port Configuration

System Mode

The *System Mode* screen displays information about the system mode:

System Mode

Current System Mode This is always set to **Layer 2**.

System Mode The system mode, either **Stack** or **Standalone**. This cannot be changed.

Stacking Mode after Reset This indicates the mode, **Stack** or **Standalone**, that the system will be in following the next system reset. The default mode is **Stack**.

Help

The *Help* screen explains how to navigate the various screens of the console interface.

Help

Logout

Select **Logout** to log out of the console interface.

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Chapter 5: Configuration Using the Web-based Utility

This chapter describes the features included in the Web-based Utility. All features shown in this chapter, unless specifically identified, are included in all Resilient Clustering Smart Switches. Unique features for specific Switches are noted.

> ✓ **NOTE:** The web-based utility is optimized for a screen resolution of 1024 x 768. Internet Explorer version 5.5 or above is required.

To use the utility, open your web browser, enter **http://192.168.1.254** in the *Address* field, then press **Enter**.

Address Bar

> ✓ **NOTE:** The default IP address is **192.168.1.254**. If you have changed the IP address or are using DHCP to assign it, enter the new IP address instead. The computer you use for configuration should be on the same subnet as the Switch.

The *Login* screen appears. Enter **admin** in the *Username* field and enter the password in the *Password* field. If this is the first time you are using the utility, leave the *Password* blank. Then press **OK** to log in. The Setup tab's *Summary* screen appears.

(After you have completed your first login, for security purposes it is recommended that you set a password at a later time. For detailed information on changing the password, refer to section "Admin > User Authentication.")

Login Screen

Each time you log in, the web-based utility first displays the Setup tab's *Summary* screen. To access another screen, you first select the appropriate category from among the 11 tabs that appear at the top of the screen: **Setup**, **Port Management**, **VLAN Management**, **Statistics**, **Security**, **QoS**, **Spanning Tree**, **Multicast**, **SNMP**, **Admin**, and **Logout**. Then, select the desired screen from the list directly below the tab names.

Setup

The Setup tab contains the *Summary*, *Zoom*, *Network Settings*, *Time*, and *Stack Management* screens.

Setup > Summary

The *Summary* screen displays a summary of Switch information. The settings shown cannot be modified from the *Summary* screen; however, many of them can be modified from the Setup tab's *Network Settings* screen.

Setup > Summary

The Summary screen has two sections: *Device Information* and *System Information*. These are described below.

Device Information

System Name Displays the name of the Switch, if one has been entered on the Setup tab's *Network Settings* screen.

IP Address The IP address assigned to the Switch. The Switch's default IP address is **192.168.1.254**. This setting can be configured from the Setup tab's *Network Settings* screen.

Subnet Mask The Subnet Mask assigned to the Switch. The default is **255.255.255.0**. This setting can be configured from the Setup tab's *Network Settings* screen.

DNS Server The IP address of your ISP's server that translates the names of websites into IP addresses. This setting can be configured from the Setup tab's *Network Settings* screen.

Default Gateway The IP address (default **0.0.0.0**) of the gateway router between the Switch and management stations on other network segments. This setting can be configured from the Setup tab's *Network Settings* screen.

> ✓ **NOTE:** The Default Gateway cannot be configured if the system IP address is set to **192.168.1.254**. (The system IP Address is set using Setup > Network Settings.)

Address Mode Specifies whether the Switch's IP address is **Static** or dynamically assigned using **DHCP** (Dynamic Host Configuration Protocol). This setting can be configured from the Setup tab's *Network Settings* screen. The default setting is **Static**.

Base MAC Address Displays the Switch's MAC address.

Jumbo Frame This setting enables or disables Jumbo frames on the Switch. A maximum packet size of 9 KB is supported. Jumbo frames allow data to be transmitted using fewer frames, providing lower overhead, quicker processing time, and fewer interruptions. Select either **Enable** or **Disable** (default).

> ✓ **NOTE:** The Jumbo Frame feature functions only on the Gigabit ports (G1-G4).

Switch Mode After Reset This setting specifies the system mode following a system reset. Select either **Standalone** or **Stackable** (default).

System Information

Model Name Displays the model name of the Switch.

Hardware Version Displays the current hardware version.

Boot Version Displays the current boot version.

Firmware Version Displays the current software version

System Location Displays the location of the system if it has been defined. This setting can be configured from the Setup tab's *Network Settings* screen.

System Contact The name of the administrator appears here, if one has been defined. This setting can be configured from the Setup tab's *Network Settings* screen.

System Up Time Displays the length of time that has elapsed since the Switch was last reset.

Current Time Displays the current time. This setting can be configured from the Setup tab's *Time* screen.

Click **Save Settings** to save your changes. Click **Cancel Changes** to cancel your changes.

Setup > Zoom

The *Zoom* screen depicts the status of all the ports in the system. This screen displays a front-panel view of each Switch. The color of each switch port indicates its status:

Green This port has a connection.

Gray This port has no connection.

Orange The administrator has closed down this port.

Setup > Zoom

Clicking on a port displays the *Port Configuration* screen.

> ✓ **NOTE:** The port colors in the *Zoom* screen are not related to the colors of the port LEDs. The port LEDs display different status information, as described in "Chapter 2: Overview."

Setup > Network Settings

Setup > Network Settings

The *Network Settings* screen allows you to edit the following information.

Identification

System Name Specifies the name of the Switch. Enter the name into the text field provided. By default, the system name is **LS-SLM224G4** or **LS-SLM248G4**.

System Location This is used to enter a description of where the Switch is physically located, such as **3rd Floor**.

System Contact Enter the name of the administrator responsible for the system.

System Object ID This is used for SNMP purposes and is set to **1.3.6.1.4.1.3955.6.5.224(248).2**.

Base MAC Address Displays the Switch's physical address.

IP Configuration

Management VLAN This drop-down menu allows you to select the Management VLAN. The default value is **1**.

⚠️ **WARNING:** If the system IP address (*IP Address* field) is set to **192.168.1.254**, then keep the default values for the *Management VLAN* field (default value: **1**), and the *Default Gateway* field (default value: **0.0.0.0**). These fields must remain set to the default values. Otherwise, you may not be able to access the system.

IP Address Mode Specifies whether the Switch's IP address is **Static** or dynamically assigned using **DHCP** (Dynamic Host Configuration Protocol). Selecting **Static** allows you to enter a static IP address, subnet mask and default gateway using the text field provided. The default setting is Static.

IP Address If you are using a static IP address, enter the IP address here. The Switch's default IP address is **192.168.1.254**.

Subnet Mask If you are using a static IP address, enter the subnet mask for the currently configured IP address. The default subnet mask is **255.255.255.0**.

Default Gateway If you are using a static IP address, enter the IP address of the default gateway. The default value is **0.0.0.0**.

DNS Server If you are using a static IP address, enter the IP address of the DNS server. A second DNS address can be specified in the additional text field provided.

Click **Save Settings** to save your changes. Click **Cancel Changes** to cancel your changes.

Setup > Time

The *Time* screen allows you to configure the time settings for the Switch.

Setup > Time

Local Time

Here you set the system date and time for the Switch. All settings noted as "two-digit" must contain a leading zero if the value is less than 10 (for example, **01** instead of **1**).

Hours Enter the two-digit hour here.

Minutes Enter the two-digit minutes here.

Seconds Enter the two-digit seconds here.

Month Enter the two-digit month here.

Day Enter the two-digit day here.

Year Enter the last two digits of the year here (for example, **07** instead of **2007**).

Time Zone Select your time zone from the drop-down menu. Time zones are identified by the difference between Greenwich Mean Time (GMT) and local time.

Daylight Saving

This is where you configure Daylight Saving Time.

Daylight Saving To enable daylight saving time, check the box, then select either **USA** or **European** to use US or European daylight saving time, respectively. To use a different type of daylight saving time, select **Custom**, then customize the following settings:

- **Time Set Offset** Enter the time difference in minutes for daylight saving time. The default is **60** minutes.

- **From** Enter the starting date for daylight saving time using the format DD/MM/YY.

- **To** Enter the ending date for daylight saving time using the format DD/MM/YY.

- **Recurring** If daylight saving time has fixed start and end dates, check this box and fill in these fields:

  - **From** Specify the day, week, month, and time when daylight saving time will be enabled.

  - **To** Specify the day, week, month, and time when dalight saving time will be disabled.

SNTP Servers

This is where you configure a Simple Network Time Protocol (SNTP) server. SNTP servers are used to set the system time and date automatically at set intervals.

Server1 The IP address of the primary SNTP server.

Server2 The IP address of a secondary SNTP server to be accessed if the primary SNTP server is unavailable.

SNTP Polling Interval Enter the polling interval in seconds. The valid range of values is **60** to **86400**. The default value is **1024** seconds (approx. 17 minutes).

Setup > Stack Management

The *Stack Management* screen allows you to configure the settings for the Switch stack.

Setup > Stack Management

Master Election If you want the system to assign the master unit, keep the default setting, **Automatically**. If you want to specify the master unit yourself, select **Force Master**, then select unit **1** or **2** from the drop-down menu.

✔ **NOTE:** If unit 1 is the master unit and unit 1 becomes unavailable, unit 2 will immediately become the master unit. If unit 1 becomes available again *within* 10 minutes, unit 1 will be restored as the master unit. If unit 1 becomes available *after* 10 minutes, unit 2 will remain the master unit. In this case, to restore unit 1 as the master unit, set Master Election to specify unit 1 as the master unit, then reboot the stack.

Stacking Ports After Reset This indicates which Gigabit ports will be used for stacking when the system is reset. Select either **Copper Ports** (default) or **Combo Ports**.

Unit No. After Reset This is used to change the unit numbers of the switches in the stack when the system is reset. To change a switch's unit number, locate the unit in the *Unit No.* column, then select the new unit number in the *Unit No. After Reset* column.

Port Management

The Port Management tab contains the *Port Settings*, *Link Aggregation*, and *LACP* screens.

Port Management > Port Settings

The *Port Settings* screen displays the settings for the ports on each switch in the system. The information on the *Port Settings* screen is read-only. Click **Detail** to the right of a port's information to edit that port's settings using the *Port Configuration* screen. For detailed information on the *Port Configuration* screen, refer to the "*Port Configuration*" section.

Port Management > Port Settings

The *Port Settings* screen displays the following information. For more information on these settings, refer to the "*Port Configuration*" section.

Unit No. The unit (switch) that you are managing. The default is the Master unit's number. To manage a different unit, select its number from the drop-down menu.

Port The port number (preceded by the unit number). For example, *2/e1* indicates Unit 2, Ethernet Port 1.

Description The user-defined port description.

Administrative Status Select **Down** to take the port offline. When **Up** is selected, the port can be accessed normally.

Link Status The port's operational status. The value is either **Up** (the port has an active connection) or **Down** (the port has no active connection, or has been taken offline by an administrator).

Speed The port's configured rate in Mbps.

Duplex The port's current duplex mode, **Half** or **Full**.

MDI/MDIX The port's MDI/MDIX type. The MDI setting is used if the port is connected to an end station. The MDIX setting is used if the port is connected to a hub or another switch.

Flow Control This is the flow control status of the port. It is active when the port uses Full Duplex Mode.

Type Displays the port type.

LAG This indicates if the port belongs to a LAG.

Port Configuration

The *Port Configuration* screen lets you configure a port's settings. To use this screen, click **Detail** in the *Detail* column on the *Port Settings* screen.

Port Management > Port Settings> Port Configuration

The *Port Configuration* screen contains the following fields ("Read-only" indicates that a field cannot be edited).

Port The port number. To edit the information for another port, select the port from the drop-down menu. (Port numbers consist of either "e" for Ethernet, or "g" for Gigabit, followed by the appropriate number.)

Description The user-defined port description of up to 64 characters. This field is blank by default.

Port Type (Read-only) The port's connection type and speed. The types are:

- **copper** The port has a copper connection.
- **ComboC** The Gigabit port has a copper connection.
- **ComboF** The Gigabit port has a fiber optic connection.

The port speed is prefixed onto the type, for example **10M-copper** indicates a 10 Mbps copper connection.

Admin Status The port's administrative status. Select either **Up** or **Down** to enable or disable traffic forwarding through the port.

Current Port Status (Read-only) The port's connection status, either **Up** or **Down**.

Reactivate Suspended Port If the port has been suspended, select this checkbox to reactivate the port.

Operational Status (Read-only) Displays whether the port is operational or non-operational.

Admin Speed Use this to manually set the port's configured transmission rate in Mbps. You can select **10M**, **100M**, or **1000M** (Gigabit ports only). Before you change this setting, make sure that *Auto Negotiation* is disabled.

Current Port Speed (Read-only) The port's current rate in Mbps.

Admin Duplex The port's duplex mode, either **Full** or **Half**.

Current Duplex Mode (Read-only) The port's current duplex mode.

Auto Negotiation Select **Enable** (default) or **Disable** to enable or disable Auto-Negotiation on the port. Auto-Negotiation allows a port to advertise its transmission rate, duplex mode, and flow control settings to other ports. If you are using an SFP module on a port, Auto Negotiation for that port should be set to Disable.

Current Auto Negotiation (Read-only) The port's current Auto-Negotiation status.

Admin Advertisement Select the speed(s) and duplex mode(s) that the port will advertise. The available speeds are determined by the port type. The following capabilities are supported.

- **Max Capability** The port advertises all speeds and duplex mode settings.

- **10 Half** The port advertises 10 Mbps half-duplex operation.

- **10 Full** The port advertises 10 Mbps full-duplex operation.

- **100 Half** The port advertises 100 Mbps half-duplex operation.

- **100 Full** The port advertises 100 Mbps full-duplex operation.

- **1000 Full** (Gigabit ports only) The port advertises 1000 Mbps full-duplex operation.

Current Advertisement (Read-only) The speed and duplex mode settings that the port is currently advertising.

Neighbor Advertisement (Read-only) The speed and duplex mode settings that the neighbor port (the port to which the selected port is connected) is advertising. If the port has no neighbor port, this field displays "Unknown."

Back Pressure Select **Enable** or **Disable** (default) to enable or disable Back Pressure mode on the port.

Current Back Pressure (Read-only) The current Back Pressure mode on the port.

Flow Control Select **Enable** or **Disable** to manually enable or disable flow control, or select **Auto-Negotiation** for automatic selection of flow control on the port.

Current Flow Control (Read-only) The current flow control setting.

MDI/MDIX Select the port's MDI/MDIX type, either **MDI**, or **MDIX**. The **MDI** setting is used if the port is connected to an end station. The **MDIX** setting is used if the port is connected to a hub or another switch.

Current MDI/MDIX (Read-only) The port's current MDI/MDIX type.

LAG (Read-only) The LAG to which this port belongs, if the port is a LAG member.

Click **Save** to save the settings and leave the screen open. Click **Save & Close** to save the settings and close the screen. Click **Close** to close the screen without saving the settings.

Port Management > Link Aggregation

Port Management > Link Aggregation

You can create multiple links between devices that work as one virtual, aggregate link. This is known as a Link Aggregrated Group (LAG). LAGs offers a dramatic increase in bandwidth for network segments where bottlenecks exist, as well as providing a fault-tolerant link between two devices. You can create up to eight LAGs on the Switch. Each LAG can contain up to eight ports.

LAG The LAG number (1-8).

Description The user-defined description for the LAG.

Admin Status The administrative status of the interface. To change the status, select **Up** to enable the interface, or select **Down** to disable it.

Type Indicates if a LAG has been manually configured (static) or dynamically set through LACP.

Link Status Displays the status of the link.

Speed Displays the port speed.

Duplex Displays the duplex mode.

Flow Control Displays the flow control.

LAG Mode Displays the LAG mode.

Detail To create a new LAG, click **Detail** in the *Detail* column to display the *Link Aggregation* detail screen.

LAG Configuration

The *Link Aggregation* detail screen lets you configure a LAG. You can create a LAG, select its ports, enable/disable the LAG, and set the capability advertisements, speed, duplex mode, and flow control. To use this screen, click **Detail** on the *Port Settings* screen.
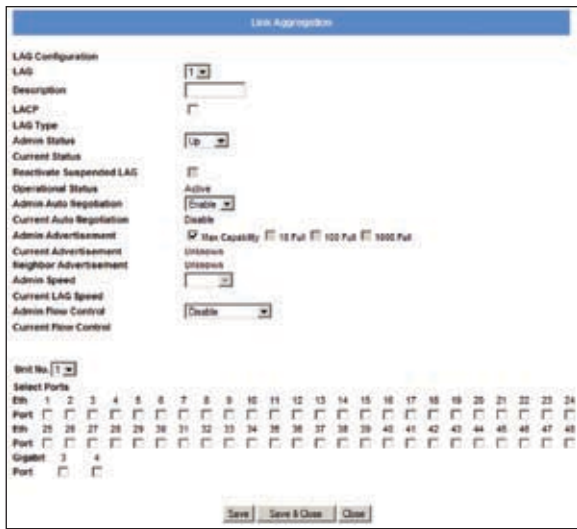
Port Management > Link Aggregation > Detail

LAG The LAG number (**1**-**8**). To display or edit another LAG, select the number from the drop-down menu.

Description The user-defined LAG description of up to 64 characters. This field is blank by default.

LACP Select the checkbox to enable Link Aggregation Control Protocol (LACP).

LAG Type (Read-only) The LAG type. The values are:

- **eth100m** The LAG contains 100 Mbps Ethernet ports.
- **eth1000m** The LAG contains 1000 Mbps Ethernet ports.

Administrative Status The LAG's administrative status. Select either **Up** or **Down** to enable or disable the LAG.

Current Status (Read-only) The LAG's status, either **Up** or **Down**.

Admin Auto Negotiation Select **Enable** (default) or **Disable** to enable or disable Auto-Negotiation on the LAG. Auto-Negotiation allows a LAG to advertise its transmission rate, duplex mode, and flow control settings to other LAGs.

Current Auto Negotiation (Read-only) The LAG's current Auto-Negotiation status.

Admin Speed Use this to manually set the LAG's configured transmission rate in Mbps. You can select **10M**, **100M**, or **1000M** (Gigabit ports only). Before you change this setting, make sure that *Admin Auto Negotiation* is disabled.

Current LAG Speed (Read-only) The LAG's current rate in Mbps.

Admin Flow Control Select **Enable** or **Disable** to manually enable or disable flow control, or select **Auto-Negotiation** for automatic selection of flow control.

Current Flow Control (Read-only) The current flow control setting.

Select Ports To add a port to the LAG, select its checkbox in this section. You can select up to 8 ports per LAG.

Click **Save** to save the settings and leave the screen open. Click **Save & Close** to save the settings and close the screen. Click **Close** to close the screen without saving the settings.

Port Management > LACP

In addition to LAGs that you create by manually grouping ports together, you can also use the Link Aggregation Control Protocol (LACP) to automatically negotiate a LAG link between the Switch and another network device.

The *LACP* screen contains fields for configuring LACP LAGs.

Port Management > LACP

Global Parameter

LACP System Priority The global LACP priority value, from **1** to **65535**. The default value is **1**.

Port Priority

Unit No The number of the unit that you are managing.

Port The port to which the timeout and priority values will be assigned. To configure a different port, select it from the drop-down menu. If the port is not listed, click **Next** in the *LACP Port Table*.

LACP Port Priority Defines the LACP priority value for the port, from **1** to **65535**. The default value is **1**.

LACP Timeout The administrative LACP timeout value. Select either **Short** or **Long** (default).

Admin Key (Read-only) A channel will only be formed between ports with the same admin key. This only applies to ports located on the same switch.

When you are finished entering the settings above, click **Update** to apply the settings.

LACP Port Table

This section provides a read-only display of the current LACP settings. For each port on the currently selected unit, this table displays the Port Priority, LACP Timeout, and Admin Key,

After you are finished setting the LACP parameters, click **Save Settings** to save the settings, or click **Cancel Changes** to cancel your changes.

VLAN Management

A VLAN is a group of ports that can be located anywhere in the network, but communicate as though they belong to the same physical segment.

VLANs help to simplify network management by allowing you to move devices to a new VLAN without having to change any physical connections. VLANs can be easily organized to reflect departmental groups (such as Marketing or R&D), usage groups (such as e-mail), or multicast groups (used for multimedia applications such as videoconferencing). You can create up to 128 VLANs on the Switch.

VLAN Management > Create VLAN

The *Create VLAN* screen lets you create and configure global parameters for VLANs.
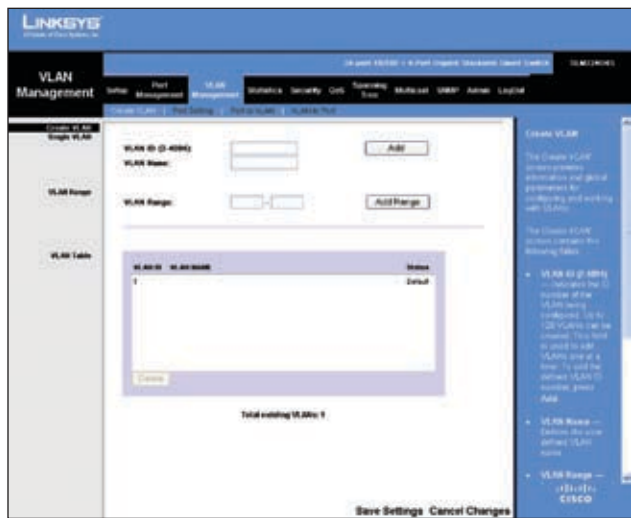
VLAN Management > Create VLAN

Single VLAN

To create a single VLAN, enter the VLAN ID and VLAN Name, up to 32 characters long, and click **Add**.

VLAN ID ID of the VLAN being configured (**2**-**4093**, no leading zeroes).

VLAN Name Name of the VLAN (1 to 32 characters).

VLAN Range

To create a range of VLANs, enter the range of their IDs in the *VLAN Range* fields and then click **Add Range**.

VLAN Table

This lists the ID, name, and status of each configured VLAN, and the total number of VLANs. The VLAN status is either **Static** (user-defined VLAN) or **Default** (default VLAN).

To remove a VLAN or a range of VLANs, select the VLANs in the VLAN Table, then click **Delete**.

VLAN Management > Port Settings

The *Port Settings* screen allows you to manage the ports in a VLAN. The port default VLAN ID (PVID) is configured from the *Port Settings* screen. All untagged packets arriving at a VLAN port are tagged with the port's PVID.

VLAN Management > Port Settings

You can configure VLAN behavior for specific ports, including the accepted frame type, VLAN identifier (PVID), and ingress filtering.

Unit No. The number of the unit that you are managing.

Port The number of the port.

Acceptable Frame Type This specifies the type of frames that the port will accept. If **All** (default) is selected, the port will accept all frame types, including tagged or untagged frames. If **Tagged** is selected, the port accepts only tagged frames. When set to **All**, each untagged frame received is assigned to the specific VLAN that matches the PVID.

PVID Use this field to select the VLAN ID that will be assigned to untagged frames received on the port. Valid IDs are **1** (default) to **4093**. VLAN 4094 is reserved for internal use. VLAN 4095 is defined per standard and industry practice as the Discard VLAN. Frames tagged for the Discard VLAN are dropped.

Ingress Filtering Enables or disables Ingress filtering on the port. Ingress filtering discards packets that do not match port ingress rules. The default is **Enabled**.

LAG Displays the LAG, if any, to which the port belongs. A port's LAG settings override the VLAN port settings.

Click **Save Changes** to save your changes, or click **Cancel Changes** to cancel.

VLAN Management > Port to VLAN

You use the *Port to VLAN* screen to add ports to a VLAN and delete ports from a VLAN. When you add a port to a VLAN, you also specify whether the port is tagged or untagged.

The *Port to VLAN* screen contains a Port Table with VLAN parameters for each port. To add a port to or delete a port from the VLAN, you select the port's appropriate configuration options from this table.

VLAN Management > Port to VLAN

Select VLAN Select the ID of the VLAN whose port membership you are configuring.

Unit No. Select the unit that contains the ports for the VLAN you are configuring.

For each port in the VLAN, select the appropriate configuration option:

* **Tagged** The interface is a member of the VLAN. All packets transmitted by the port will be tagged and will carry VLAN information.

* **Untagged** The interface is a member of the VLAN. All packets transmitted by the port will be untagged and will not carry VLAN information.

* **Excluded** The interface is excluded from the VLAN. This is the default option.

VLAN Management > VLAN to Port

The *VLAN to Port* screen displays each port's VLAN membership information. It is also used to add a port to or delete a port from a VLAN.

Unit No. The unit number that contains the ports whose VLAN information you wish to configure.

Port The number of the port being configured.

Join VLAN To configure the port's VLAN membership, press **Join VLAN** to bring up the *Join VLAN to Port* screen.

VLANs Displays the IDs of the VLANs to which the port belongs. Each VLAN ID ends with "T" if the port is tagged or with "U" if the port is untagged in that VLAN.

LAG Displays the LAG to which the port belongs, if any. If a port belongs to a LAG, it cannot belong to a VLAN. However, the LAG to which the port belongs can be configured to belong to a VLAN.
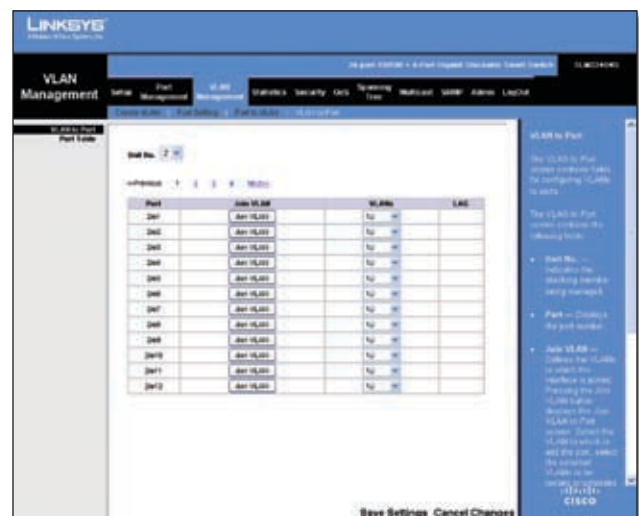
VLAN Management > VLAN to Port

Join VLAN to Port

The *Join VLAN to Port* screen appears when you click **Join VLAN** in the *VLAN to Port* screen. You use this screen to configure the port's VLAN membership.

VLAN Management > VLAN to Port > Join VLAN to Port

Select VLAN This contains two fields. The field on the left lists the IDs of all available VLANs to which the port can belong; the field on the right lists the IDs of the VLANs to which the port already belongs.

Add To add the port to an available VLAN, select the VLAN from the list on the left, then select the desired *Tagging* option and click **Add**. The VLAN ID now ending with "T" or "U" will appear in the list on the right.

Remove To remove the port from a VLAN, select the VLAN from the list on the right and click **Remove**. The VLAN ID will appear in the list on the left without the "T" or "U".

Tagging When you are adding a port to a VLAN, specify whether the port is **Tagged** (default) or **Untagged**.

Click **Save** to save your changes and leave the screen open, **Save & Close** to save your changes and close the screen, or click **Close** to close the screen without saving your changes.

Statistics

The Statistics tab contains the *Interface Statistics* screen, which lets you display statistics for a specified interface.

Statistics > RMON Statistics

Statistics > RMON Statistics

This screen allows you to display RMON statistics for the Ethernet port or LAG that you specify. You can also specify the rate at which the display will be refreshed.

Interface To display statistics for an Ethernet port, select **Unit No.**, then select the desired unit number and port from the drop-down menus. To display statistics for a LAG, select **LAG** and then select the desired LAG from the drop-down menu.

Refresh Rate Select the rate at which to refresh the statistics display. The values are **15 sec**, **30 sec**, **60 sec**, and **No Refresh** (default).

Drop Events Displays the number of dropped events that have occurred on the interface since the device was last refreshed.

Received Bytes (Octets) Displays the number of octets received on the interface since the device was last refreshed. This number includes bad packets and FCS octets, but excludes framing bits.

Received Packets Displays the number of packets received on the interface, including bad packets, Multicast and broadcast packets, since the device was last refreshed.

Broadcast Packets Received Displays the number of good broadcast packets received on the interface since the device was last refreshed. This number does not include Multicast packets.

Multicast Packets Received Displays the number of good Multicast packets received on the interface since the device was last refreshed.

CRC & Align Errors Displays the number of CRC and Align errors that have occurred on the interface since the device was last refreshed.

Undersize Packets Displays the number of undersized packets (less than 64 octets) received on the interface since the device was last refreshed.

Oversize Packets Displays the number of oversized packets (over 1518 octets) received on the interface since the device was last refreshed.

Fragments Displays the number of fragments (packets with less than 64 octets, excluding framing bits, but including FCS octets) received on the interface since the device was last refreshed.

Jabbers Displays the total number of received packets that were longer than 1518 octets. This number excludes frame bits, but includes FCS octets that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral octet (Alignment Error) number. The field range to detect jabbers is between 20 ms and 150 ms.

Collisions Displays the number of collisions received on the interface since the device was last refreshed.

Frames of xx Bytes Number of xx-byte frames received on the interface since the device was last refreshed.

Clear Counters Click **Clear Counters** to reset all the counters on this screen to zero.

Refresh Now Click **Refresh Now** to refresh the display immediately with the latest information.

Statistics > RMON History

The RMON History screen contains information about samples of data taken from ports. For example, the samples may include interface definitions or polling periods.
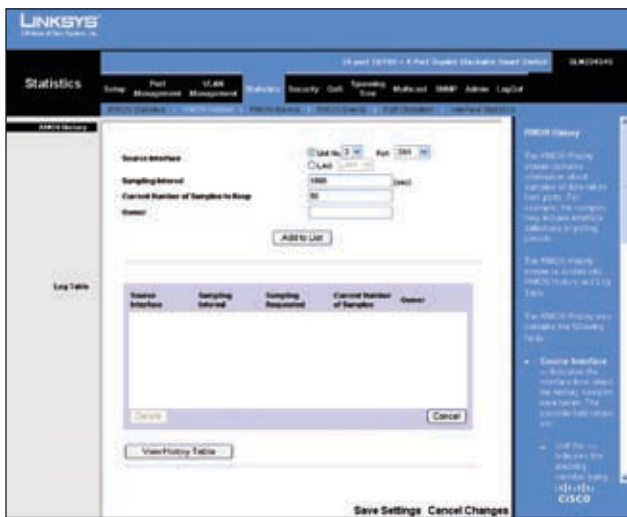
Statistics > RMON History

RMON History

Source Interface Indicates the interface from which the history samples were taken. To specify the interface, select **Unit No.** (default) and specify the unit number and port from the drop-down menus, or select **LAG** and select the LAG number from the drop-down menu.

Sampling Interval Indicates (in seconds) how often samples are taken from the ports. The range is **1** to **3600**. The default is **1800** seconds (30 minutes).

Current Number of Samples to Keep Indicates the number of samples to save.

Owner Displays the RMON station or user that requested the RMON information. Maximum length is 20 characters.

Click **Add to List** to add the configured RMON sampling to the Log Table at the bottom of the screen.

Log Table

Source Interface Displays the interface from which the history samples were taken.

Sampling Interval Indicates the time in seconds that samplings are taken from the port.

Sampling Requested Displays the number of samples to be saved. The range is **1**-**65535**. The default value is **50**.

Current Number of Samples Displays the current number of samples taken.

Owner Displays the RMON station or user that requested the information.

Click **View History Table** to open the *RMON History Table* screen.

To delete an entry from the Log Table, select the entry, then click **Delete**.

RMON History Table

Statistics > RMON History > RMON HIstory Table

The *RMON History Table* screen contains interface specific statistical network samplings. Each table entry represents all counter values compiled during a single sample.

History Entry No. Displays the history table entry number.

Owner Displays the RMON station or user that requested the RMON information. The maximum length is 20 characters.

Sample No. Indicates the sample number from which the statistics were taken.

Received Bytes (Octets) Displays the number of octets received on the interface since the device was last refreshed. This number includes bad packets and FCS octets, but excludes framing bits.

Received Packets Displays the number of packets received on the interface since the device was last refreshed, including bad packets, Multicast and Broadcast packets.

Broadcast Packets Displays the number of good Broadcast packets received on the interface since the device was last refreshed. This number does not include Multicast packets.

Multicast Packets Displays the number of good Multicast packets received on the interface since the device was last refreshed.

CRC Align Errors Displays the number of CRC and Align errors that have occurred on the interface since the device was last refreshed.

Undersize Packets Displays the number of undersized packets (less than 64 octets) received on the interface since the device was last refreshed.

Oversize Packets Displays the number of oversized packets (over 1518 octets) received on the interface since the device was last refreshed.

Fragments Displays the number of fragments (packets with less than 64 octets, excluding framing bits, but including FCS octets) received on the interface since the device was last refreshed.

Jabbers Displays the total number of received packets that were longer than 1518 octets. This number excludes frame bits, but includes FCS octets that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral octet (Alignment Error) number. The field range to detect jabbers is between **20** ms and **150** ms.

**Collisions** Displays the number of collisions received on the interface since the device was last refreshed.

Utilization Displays the percentage of the interface utilized.

Statistics > RMON Alarms

The *RMON Alarm* screen is used to set network alarms. Network alarms occur when a network problem, or event, is detected. Rising and falling thresholds generate events.

Statistics > RMON Alarm

Add Alarm

Alarm Entry Indicates a specific alarm.

Interface Indicates the interface for which RMON statistics are displayed. To specify the interface, select **Unit No.** (default) and specify the unit number and port from the drop-down menus, or select **LAG** and select the LAG number from the drop-down menu.

Counter Name Displays the selected MIB variable.

Sample Type Defines the sampling method for the selected variable and comparing the value against the thresholds. The possible field values are:

• **Absolute** Compares the values directly with the thresholds at the end of the sampling interval.

• **Delta** Subtracts the last sampled value from the current value. The difference in the values is compared to the threshold.

Rising Threshold Displays the rising counter value that triggers the rising threshold alarm. The rising threshold is presented on top of the graph bars. Each monitored variable is designated a color.

Rising Event Displays the mechanism in which the alarms are reported. The possible field values are:

• **LOG** Indicates there is not a saving mechanism for either the device or in the management system. If the device is not reset, the entry remains in the Log Table.

• **TRAP** Indicates that an SNMP trap is generated, and sent via the Trap mechanism. The Trap can also be saved using the Trap mechanism.

• **Both** Indicates that both the Log and Trap mechanism are used to report alarms.

Falling Threshold Displays the falling counter value that triggers the falling threshold alarm. The falling threshold is graphically presented on top of the graph bars. Each monitored variable is designated a color.

Falling Event Displays the mechanism in which the alarms are reported. The possible field values are:

• **LOG** Indicates there is not a saving mechanism for either the device or in the management system. If the device is not reset, the entry remains in the Log Table.

• **TRAP** Indicates that a SNMP trap is generated, and sent via the Trap mechanism. The Trap can also be saved using the Trap mechanism.

• **Both** Indicates that both the Log and Trap mechanism are used to report alarms.

Startup Alarm Displays the trigger that activates alarm generation. Rising is defined by crossing the threshold from a low-value threshold to a higher-value threshold.

Interval Defines the alarm interval time in seconds.

Owner Displays the device or user that defined the alarm.

Click **Add to List** to add an entry to the Alarm Table.

Alarm Table

The Alarm Table lists the alarms that have been defined using the Add Alarm section. The Alarm Table contains a colunn for each field in the Add Alarm section, plus the following column:

Counter Value Displays the current counter value for the particular alarm.

Statistics > RMON Events

The *RMON Events* screen is used to define RMON events.

Statistics > RMON Events

Add Event

Event Entry Displays the event.

Community Displays the community to which the event belongs.

Description Displays the user-defined event description.

Type Describes the event type. Possible values are:

• **None** Indicates that no event occurred.

• **Log** Indicates that the event is a log entry.•Trap. Indicates that the event is a trap.

• **Log and Trap** Indicates that the event is both a log entry and a trap.

Owner Displays the device or user that defined the event.

Click **Add to List** to add the configured RMON event to the Event Table at the bottom of the screen.

Event Table

The Event Table lists all events defined using the *Add Event* fields. The Event Table contains columns for all the *Add Event* fields, plus the following additional column:

Time Displays the time that the event occurred.

Statistics > Port Utilization

Statistics > Port Utilization

The *Port Utilization* screen displays the amount of resources each interface is currently consuming. Ports in green are functioning normally, while ports in red are currently transmitting an excessive amount of network traffic.

Refresh Rate Select the rate at which to refresh the statistics display: **No Refresh** (default), **15 sec**, **30 sec**, or **60 sec**.

Statistics > Interface Statistics

Statistics > Interface Statistics

The *Interface Statistics* screen is used to display statistics for the Ethernet port or LAG that you specify. You can also specify the rate at which the display will be refreshed.

Interface To display statistics for an Ethernet port, select **Unit No.**, then select the desired unit and port from the drop-down menus. To display statistics for a LAG, select **LAG**, then select the desired LAG from the drop-down menu.

Refresh Rate Select the rate at which to refresh the display: **15 sec**, **30 sec**, **60 sec**, or **No Refresh** (default).

Interface

This section displays statistics for the packets transmitted and received on the selected interface.

Receive Statistics Statistics on received packets

- **Total Bytes (Octets)** Displays the number of octets received on the selected interface.
- **Unicast Packets** Displays the number of Unicast packets received on the selected interface.
- **Multicast Packets** Displays the number of Multicast packets received on the selected interface.
- **Broadcast Packets** Displays the number of Broadcast packets received on the selected interface.
- **Packets with Errors** Displays the number of error packets received from the selected interface.

Transmit Statistics Statistics on transmitted packets

- **Total Bytes (Octets)** Displays the number of octets transmitted from the selected interface.
- **Unicast Packets** Displays the number of Unicast packets transmitted from the selected interface.
- **Multicast Packets** Displays the number of Multicast packets transmitted from the selected interface.
- **Broadcast Packets** Displays the number of Broadcast packets transmitted from the selected interface.

Ethernet-like

This section displays the following statistics for the selected interface.

Frame Check Sequence (FCS) Errors Displays the number of FCS errors received on the selected interface.

Single Collision Frames Displays the number of single collision frames received on the selected interface.

Late Collisions Displays the number of late collision frames received on the selected interface.

Oversize Packets Displays the number of oversize packet errors on the selected interface.

Internal MAC Receive Errors Displays the number of internal MAC received errors on the selected interface.

Received Pause Frames Displays the number of received paused frames on the selected interface.

Transmitted Pause Frames Displays the number of paused frames transmitted from the selected interface.

Clear Counters Click the **Clear Counters** button to reset all the counters on this screen to zero.

Security

Security > 802.1x Settings

The *802.1x Settings* screen is used to configure a port's 802.1x authentication settings.
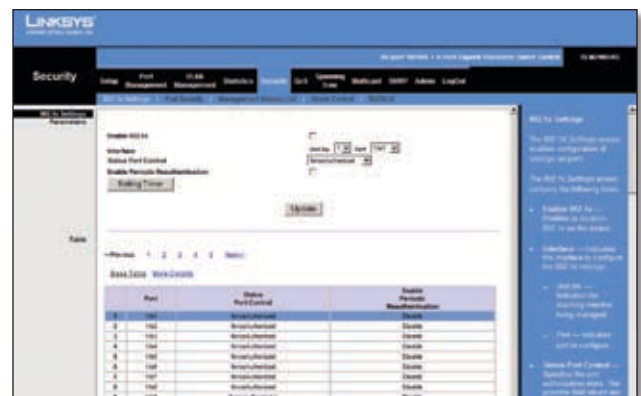
Security > 802.1x Settings

Port-based authentication enables authenticating system users on a per-port basis via an external server. Only authenticated and approved system users can transmit and receive data. Ports are authenticated via a RADIUS server using the Extensible Authentication Protocol (EAP).

Parameters

Enable 802.1x Select the checkbox to enable 802.1x authentication. The default is not enabled.

Interface The interface on which to configure 802.1x.

- **Unit No.** Select the unit number from the drop-down menu.
- **Port** Select the port from the drop-down menu.

Status Port Control Sets the port authentication mode to one of the following options:

- **ForceAuthorized** (Default) Forces the port to grant access to all clients, either dot1x-aware or otherwise.
- **ForceUnauthorized** Forces the port to deny access to all clients, either dot1x-aware or otherwise.
- **Auto** Causes the port authentication mode to be selected automatically.

Enable Periodic Reauthentication Select the checkbox to permit periodic port reauthentication.

Setting Timer Click this button to open the *Setting Timer* screen to configure ports for 802.1x functionality.

Update If you click this button, your changes are saved and appear immediately in the screen's *Table* section.

Table

This part of the *802.1x Settings* screen displays a summary of the settings that appear in the *Parameters* section of the screen. If you click **More Details**, the settings described in the "Setting Timer" section are added to the table.

Click **Save Settings** to apply the changes, or **Cancel Changes** to cancel the changes.

Setting Timer

The *Setting Timer* screen appears when you click **Setting Timer** on the *802.1x Settings* screen. You use the *Setting Timer* screen to configure a port's 802.1x functionality.

Security > 802.1x Settings > Setting Timer

Port Displays the port name.

Reauthentication Period Specifies the number of seconds after which a connected client must be reauthenticated. The range is **300** to **4294967295** seconds. The default value is **3600** seconds.

Quiet Period Specifies the time that a switch port waits after **Max EAP Requests** is exceeded before attempting to acquire a new client. The range is **1** to **65535** seconds. The default is **60** seconds.

Resending EAP Specifies the time that the switch waits for a response to an EAP request/identity frame from the client before retransmitting an EAP packet. The range is **1** to **65535** seconds. The default is **30** seconds.

Max EAP Requests Specifies the maximum number of times the switch port will retransmit an EAP request packet to the client before it times out the authentication session. The range is **1** to **10** times. The default is **2** retries.

Supplicant Timeout Displays the number of seconds that lapses before EAP requests are resent to the supplicant. The range is **1** to **65535** seconds. The default is **30** seconds.

Server Timeout The number of seconds that lapses before the switch resends a request to the authentication server The range is **1** to **65535**. The default is **30** seconds.

Click **Save** to save your changes and leave the screen open. Click **Save & Close** to save your changes and close the screen. Click **Close** to close the screen without saving your changes.

Security > Port Security

The *Port Security* screen is used to configure a port's security settings.

Security > Port Security

Network security can be increased by limiting access on a specific port only to users with specific MAC addresses. MAC addresses can be dynamically learned or statically configured.

Locked port security monitors both received and learned packets that are received on specific ports. Access to the locked port is limited to users with specific MAC addresses. These addresses are either manually defined on the port, or learned on that port up to the point when it is locked. When a packet is received on a locked port, and the packet's source MAC address is not tied to that port (either it was learned on a different port, or it is unknown to the system), the protection mechanism is invoked, and can provide various options. Unauthorized packets arriving at a locked port are either:

- Forwarded
- Discarded
- Cause the port to be shut down

Locked port security also enables storing a list of MAC addresses in the configuration file. The MAC address list can be restored after the device has been reset.

Disabled ports can be reactivated from the *Port Settings* screen of the Port Management tab.

Interface Select **Unit No.** or **LAG**, then select the desired interface from the appropriate drop-down menu.

Lock Interface Select this option to lock the interface. The default is not selected (interface not locked).

Learning Mode Defines the locked port type. This field is enabled only if **Lock Interface** is not selected. The possible values are:

• **Classic Lock** Locks the port using the classic lock mechanism. The port is immediately locked, regardless of how many addresses have already been learned.

• **Limited Dynamic Lock** Locks the port by deleting the current dynamic MAC addresses associated with the port. The port learns up to the maximum number of addresses allowed on the port. Both relearning and aging MAC addresses are enabled.

In order to change the *Learning Mode*, the *Lock Interface* must be unselected. Once the *Learning Mode* is changed, the *Lock Interface* can be reinstated.

Max Entries Specifies the number of MAC addresses that can be learned on the port. This field is enabled only if *Learning Mode* is set to **Limited Dynamic Lock**. The default value is **1**.

Action on Violation Indicates the action to be applied to packets arriving on a locked port. The possible values are:

• **Discard** Discards packets from any unlearned source. This is the default value.

• **Forward** Forwards packets from an unknown source without learning the MAC address.

• **Discard Disable** Discards packets from any unlearned source and shuts down the port. The port remains shut down until reactivated, or until the device is reset.

Enable Trap Enables traps when a packet is received on a locked port.

Trap Frequency The amount of time (in seconds) between traps. The default value is 10 seconds.

Update If you click this button, your changes are saved and appear immediately in the table at the bottom of the *Port Security* screen.

The lower portion of the *Port Security* screen displays a summary of the settings in the upper portion of the screen. The settings are displayed for each of the ports on the Switch.

Click **Save Settings** to apply the changes, or **Cancel Changes** to cancel the changes.

Security > Management Access List

Use the *Management Access List* screen to specify IP addresses that are to be allowed to manage the device, using an IP address and wildcard mask.

Security > IP Access List

Web IP Filtering

The *Management Access List* screen contains two sections, Web IP Filtering and SNMP IP Filtering. These sections are identical except for the types of IP addresses that they relate to.

IP Address Enter the web IP address or SNMP IP address to be allowed.

Wildcard Mask Enter the wildcard mask for the web IP address or SNMP IP address. Wildcard masks specify which bits are used and which bits are ignored. A wild card mask of 255.255.255.255 indicates that no bit is important. A wildcard of 0.0.0.0 indicates that all the bits are important. For example, if the source IP address is 149.36.184.198 and the wildcard mask is 255.36.184.00, the first eight bits of the IP address are ignored, while the last eight bits are used.

Add to List Click this button to save the IP address and Wildcard Mask. The information will appear in the list at the bottom of the screen.

The bottom portions of both the Web *IP Filtering* and *SNMP IP Filtering* sections displays the current IP access list, where each entry consists of an IP Address and Wildcard Mask. To delete an entry from the list, select it and click **Delete**.

Click **Save Settings** to apply the changes, or **Cancel Changes** to cancel the changes.

Security > Storm Control

The *Storm Control* screen is used to configure broadcast and multicast storm control.

Security > Storm Control

Storm Control enables limiting the amount of Multicast and Broadcast frames accepted and forwarded by the Switch. A Broadcast Storm results when an excessive amount of broadcast messages is simultaneously transmitted across a network by a single port. Forwarded message responses are heaped onto the network, straining network resources or causing the network to time out.

To enable Storm Control on a port, you specify the packet type (broadcast/multicast) and maximum transmission rate. The system measures the incoming Broadcast and Multicast frame rates separately on each port and discards frames when the rate exceeds the specified maximum.

Interface Select the unit number and port from which storm control is enabled.

Broadcast Control Select the checkbox to apply Broadcast control on the selected interface. Broadcast control limits the amount of Broadcast packet types to be forwarded. The default is not selected (disabled).

Mode Specifies the Broadcast mode currently enabled on the device. The possible values are:

• **Multicast & Broadcast** Counts Broadcast and Multicast traffic together.

• **Broadcast Only** Counts only Broadcast traffic.

Rate Threshold The maximum rate (packets per second) at which unknown packets are forwarded. The ranges are **70** kbps to **100** Mbps for FE ports, and **3.5** to **100** Mbps for GE ports. The default value is **3500** kbps.

The **Update** button adds the Storm Control settings to the Storm Control table at the bottom of the screen.

Security > RADIUS

The *RADIUS* screen is used to configure a Remote Authorization Dial-In User Service (RADIUS) server for user authentication.

Security > RADIUS

RADIUS servers provide additional security for networks by providing a centralized authentication method for web access. Up to eight RADIUS servers can be configured. The Switch attempts authentication using the listed sequence of servers. The process ends when a server either approves or denies access to a user.

IP Address Enter the IP address of the authentication server.

Priority The server priority. The possible values are **0** to **65535**, where 0 is the highest priority. This priority determines the order in which RADIUS servers are queried when more than one RADIUS server is configured. The default priority is **0**.

Authentication Port Enter the authentication port. The authentication port is used to verify the RADIUS server authentication. The default value is **1812**.

Number of Retries Defines the number of transmitted requests sent to RADIUS server before a failure occurs. The possible values are **1** to **10**. The default is **3**.

Timeout for Reply Defines the amount of the time in seconds the device waits for an answer from the RADIUS server before retrying the query, or switching to the next server. The possible values are **1** to **30**. The default is **3**.

Dead Time Defines the amount of time (minutes) that a RADIUS server is bypassed for service requests. The range is **0** to **2000**. The default is **0** minutes.

Key String Defines the default key string used to authenticate and encrypt all RADIUS communications between the device and the RADIUS server. This key must match the RADIUS encryption.

Source IP Address Defines the source IP address that is used for communication with RADIUS servers.

Usage Type This is the RADIUS server authentication type. The possible values are:

- **Login** (Default value) Indicates that the RADIUS server is used for authenticating user name and passwords.

- **802.1X** Indicates that the RADIUS server is used for 802.1X authentication.

- **All** Indicates that the RADIUS server is used for authenticating user name and passwords, and 802.1X port authentication.

Click **Add to List** to add the RADIUS configuration to the RADIUS table at the bottom of the screen.

Click **Save Settings** to save the changes, or **Cancel Changes** to cancel the changes.

QoS

Network traffic is usually unpredictable, and the only basic assurance that can be offered is best effort traffic delivery. To overcome this challenge, Quality of Service (QoS) is applied throughout the network. This ensures that network traffic is prioritized according to specified criteria, and that specific traffic receives preferential treatment. QoS in the network optimizes network performance and entails two basic facilities:

Classifying incoming traffic into handling classes, based on an attribute, including:

- The ingress interface

- Packet content

- A combination of these attributes

Providing various mechanisms for determining the allocation of network resources to different handling classes, including:

- The assignment of network traffic to a particular hardware queue

- The assignment of internal resources

- Traffic shaping

The terms Class of Service (CoS) and QoS are used in the following context:

- CoS provides varying Layer 2 traffic services. CoS refers to classifying traffic into traffic classes, where each class is handled as an aggregate whole, with no per-flow settings. CoS is usually related to the 802.1p service that classifies flows according to their Layer 2 priority, as set in the VLAN header.

- QoS refers to Layer 2 traffic and above. QoS handles per-flow settings, even within a single traffic class.

The QoS configuration options are *CoS Settings*, *Queue Settings*, *DSCP Settings*, and *Basic Mode*.

QoS > CoS Settings

The *CoS Settings* screen is used to enable or disable CoS.

QoS > CoS Settings

CoS Settings

QoS Mode Indicates if QoS is enabled. The possible values are:

- **Disable** Disables QoS.

- **Basic** Enables QoS. This is the default value.

Class of Service Specifies the CoS priority tag values, where **0** is the lowest and **7** is the highest.

Queue Defines the traffic forwarding queue to which the CoS priority is mapped. Four traffic priority queues are supported.

Click **Restore Defaults** to restore the device factory defaults for mapping CoS values to a forwarding queue.

CoS Default

Unit No. The unit to which the CoS configuration applies.

Default CoS Determines the default CoS value for incoming packets for which a VLAN tag is not defined. The possible field values are **0-7**. The default CoS is **0**.

LAG The LAG to which the port belongs, if relevant. If the port is a member of a LAG, the LAG settings override the port settings.

Click **Save Settings** to save the changes, or **Cancel Changes** to cancel the changes.

QoS > Queue Settings

The *Queue Settings* screen is used to define the QoS queue forwarding types.

QoS > Queue Settings

Strict Priority Indicates that traffic scheduling for the selected queue is based strictly on the queue priority.

WRR Indicates that traffic scheduling for the selected queue is based strictly on the WRR.

Queue Displays the queue (1-4) for which the queue settings are displayed.

WRR Weight Displays the WRR weights to queues.

% of WRR Bandwidth Displays the percentage of bandwidth assigned to the queue. These values are fixed and cannot be modified.

Click **Save Settings** to save the changes, or **Cancel Changes** to cancel the changes.

QoS > DSCP Settings

QoS > DSCP Settings

The *DSCP Settings* screen allows you to map Differentiated Services Code Point (DSCP) values to specific queues.

DSCP Indicates the DSCP value in the incoming packet. Select a DSCP value from the drop-down menu to map that value to the associated queue. You can select the DSCP value for the High, Medium, and Normal priority queues. The DSCP values for the Low priority queue are selected automatically based on the other DSCP values.

Queue The queue (1-4) to which the DSCP value is being mapped.

Click **Save Settings** to save the changes, or **Cancel Changes** to cancel the changes.

QoS > Bandwidth

QoS > Bandwidth

The *Bandwidth* screen allows network managers to define the bandwidth settings for a specified egress or ingress interface. Modifying queue scheduling affects the queue settings globally. The *Bandwidth* screen is not used with the Service mode, as bandwidth settings are based on services.

Queue shaping can be based per queue and/or per interface. Shaping is determined by the lower specified value. The queue shaping type is selected in the Bandwidth screen.

Interface The interface for which the queue shaping information is displayed. Either select **Unit No** and select the unit number and port from the drop-down menus, or select **LAG** and select the LAG number from the drop-down menu.

Enable Ingress Rate Limit Status Indicates if rate limiting is defined on the interface.

Enable Egress Shaping Rate Indicates if rate limiting is enabled on the interface.

Committed Information Rate (CIR) Defines CIR as the queue shaping type. The allowed values are **64** to **62500** Kbps for the 10/100 ports and **64** to **1000000** Kbps for the Gigabit ports.

Committed Burst Size (CBS) Defines CBS as the queue shaping type. The possible field value is **4096** to **15,769,020** bits. Commited Burst Size cannot be configured on FE ports.

Click **Add to List** to add the Bandwidth configuration to the Bandwidth Table at the bottom of the screen.:

QoS > Basic Mode
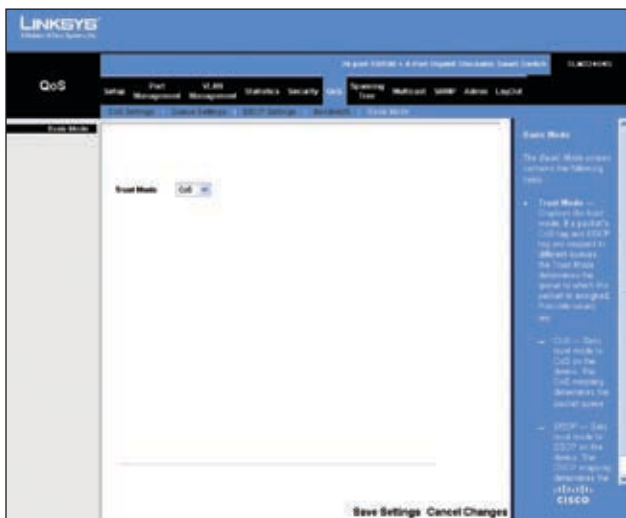
QoS > Basic Mode

The *Basic Mode* screen contains the following fields:

Trust Mode Displays the trust mode. If a packet's CoS tag and DSCP tag are mapped to different queues, the Trust Mode determines the queue to which the packet is assigned. Possible values are:

- **CoS** Sets trust mode to CoS on the device. The CoS mapping determines the packet queue

- **DSCP** Sets trust mode to DSCP on the device. The DSCP mapping determines the packet queue.

Click **Save Settings** to save the changes, or **Cancel Changes** to cancel the changes.

Spanning Tree

Spanning Tree Protocol (STP) provides tree topography for any arrangement of bridges. STP also provides one path between end stations on a network, eliminating loops.

Loops occur when alternate routes exist between hosts. Loops in an extended network can cause bridges to forward traffic indefinitely, resulting in increased traffic and reducing network efficiency.

The Switch supports the **Classic STP** version of STP, which provides a single path between end stations, avoiding and eliminating loops.

Spanning Tree > STP Status

The *STP Status* screen displays the STP status on the Switch. This information is read-only and cannot be modified.

Spanning Tree > STP Status

Spanning Tree State Indicates whether STP is enabled on the device.

Spanning Tree Mode The STP mode by which STP is enabled on the device.

Bridge ID The Bridge priority and MAC address.

Designated Root Identifies the bridge priority and MAC address of the root bridge.

Root Port The port number that offers the lowest cost path from this bridge to the Root Bridge. It is significant when the Bridge is not the Root. The default is **0**.

Root Path Cost The cost of the path from this bridge to the root.

Root Maximum Age (sec) The device Maximum Age Time, which indicates the amount of time in seconds a bridge waits before sending configuration messages. The default is **20** seconds. The range is **6** to **40** seconds.

Root Hello Time (sec) The device Hello Time. The Hello Time indicates the amount of time in seconds a root bridge waits between configuration messages. The default is **2** seconds. The range is **1** to **10** seconds.

Root Forward delay (sec) The device forward delay time. The Forward Delay Time indicates the amount of time in seconds a bridge remains in a listening and learning state before forwarding packets. The default is **15** seconds. The range is **4** to **30** seconds.

Topology Changes Counts The total amount of STP state changes that have occurred.

Last Topology Change The elapsed time since the bridge was initialized or reset, and the last topographic change occurred. The time is displayed in a day hour minute second format, for example, 2 days 5 hours 10 minutes and 4 seconds.

Spanning Tree > Global STP

The *Global STP* screen contains global parameters for STP on the Switch.

Spanning Tree > Global STP

Global Setting

Spanning Tree State Select **Enable** or **Disable** from the drop-down menu to enable or disable STP on the Switch. The default is **Enable**.

BPDU Handling Determines how BPDU packets are managed when STP is disabled on the port or Switch. BPDUs are used to transmit spanning tree information. The possible values are:

• **Filtering** Filters BPDU packets when spanning tree is disabled on an interface.

• **Flooding** Floods BPDU packets when spanning tree is disabled on an interface. This is the default value.

Path Cost Default Values The method used to assign default path costs to STP ports. The possible values are:

• **Short** Specifies a range of 1-65,535 for port path costs.

• **Long** Specifies a range of 1-200,000,000 for port path costs. The default path costs assigned to an interface varies according to the selected method. This is the default value.

Bridge Settings

Priority Specifies the bridge priority value. When switches or bridges are running STP, each is assigned a priority. After exchanging BPDUs, the device with the lowest priority value becomes the Root Bridge. The default value is **32768**. The value must be a multiple of 4096. For example, 4096, 8192, 12288, etc. The range is **0** to **65535**.

Hello Time Specifies the device Hello Time (the amount of time in seconds a root bridge waits between configuration messages). The default is **2** seconds. The range is **1** to **10** seconds.

Max Age Specifies the device Maximum Age Time (the amount of time in seconds that a bridge waits before sending configuration messages). The default is **20** seconds. The range is **6** to **40** seconds.

Forward Delay Specifies the device forward delay time (the amount of time in seconds a bridge remains in a listening and learning state before forwarding packets). The default is **15** seconds. The range is **4** to **30** seconds.

Choose settings for the Hello Time, Max Age, and Forward Delay parameters so that both of the following are true:

$$\text{Max Age} \geq 2 \times (\text{Hello Time} + 1)$$
$$2 \times (\text{Forward Delay} - 1) \geq \text{Max Age}$$

Click **Save Settings** to save the changes, or **Cancel Changes** to cancel the changes.

Spanning Tree > STP Port Settings

The *STP Port Settings* screen allows network administrators to assign STP settings to specific interfaces.

Spanning Tree > STP Port Settings

Interface Indicates the port or LAG on which STP is enabled. Select either **Port** (default) or **LAG**, then select the interface from the drop-down menu.

Enable STP Select this to enable STP on the port. The default is Enabled.

Port Fast Indicates if Fast Link is enabled on the port. If Fast Link mode is enabled for a port, the Port State is automatically placed in the Forwarding state when the port link is up. Fast Link optimizes the STP protocol convergence. STP convergence can take 30-60 seconds in large networks. The possible values are **Enable**, **Auto**, and **Disable**. The default is **Disable**.

Port State Displays the current STP state of a port. If enabled, the port state determines what forwarding action is taken on traffic. Possible port states are:

- **Disabled** STP is currently disabled on the port. The port forwards traffic while learning MAC addresses.
- **Blocking** The port is currently blocked and cannot forward traffic or learn MAC addresses.
- **Listening** The port is in Listening mode. The port cannot forward traffic nor can it learn MAC addresses.
- **Learning** The port is in Learning mode. The port cannot forward traffic, but can learn new MAC addresses.
- **Forwarding** The port is in Forwarding mode. The port can forward traffic and learn new MAC addresses.

Speed Displays the speed at which the port is operating.

Path Cost Indicates the port contribution to the root path cost. The path cost is adjusted to a higher or lower value, and is used to forward traffic when a path being rerouted. The default value is **2000000** for a 10M port, **200000** for a 100M port, and **20000** for a 1G port or a LAG.

Default Path Cost When selected the default path cost is implemented. The default is unselected.

Priority Priority value of the port. This value influences the port choice when a bridge has two ports connected in a loop. The range of values is **0** -**240**. The default is **128**.

Designated Bridge ID Displays the bridge priority and the MAC Address of the designated bridge.

Designated Port ID Displays the selected port's priority and interface.

Designated Cost Displays the cost of the port participating in the STP topology. Ports with a lower cost are less likely to be blocked if STP detects loops.

Forward Transitions Displays the number of times the port has changed from the Blocking state to Forwarding state.

Click **Update** to update the screen with your changes.

Click **Save Settings** to save the changes, or **Cancel Changes** to cancel the changes.

Multicast

Multicast configuration options include IGMP Snooping, Bridge Multicast, and Bridge Multicast Forward All.

Multicast > IGMP Snooping

Multicast > IGMP Snooping

When IGMP Snooping is enabled globally, all IGMP packets are forwarded to the CPU. The CPU analyzes the incoming packets and determines:

- Which ports want to join which Multicast groups
- Which ports have Multicast routers generating IGMP queries
- Which routing protocols are forwarding packets and Multicast traffic

Ports requesting to join a specific Multicast group issue an IGMP report, specifying that Multicast group is accepting members. This results in the creation of the Multicast filtering database.

The *Bridge Multicast Forward All* screen contains two sections, IGMP Global and VLAN IGMP Settings. These sections and the fields they contain are described below.

IGMP Global

Enable IGMP Snooping Select this option to enable IGMP Snooping on the device. IGMP Snooping can be enabled only if Bridge Multicast Filtering is enabled. The default is **disabled** (option not selected).

VLAN IGMP Settings

VLAN ID Select the VLAN ID from the drop-down menu.

IGMP Status Select this option to enable IGMP snooping on the VLAN. Default is **disabled** (option not selected).

Auto Learn Select this option to enable Auto Learn on the device. If Auto Learn is enabled, the device automatically learns where other Multicast groups are located. The default is **enabled** (option is selected).

Host Timeout Indicates the amount of time host waits to receive a message before timing out. The default time is **260** seconds.

MRouter Timeout Indicates the amount of the time the Multicast router waits to receive a message before it times out. The default value is **300** seconds.

Leave Timeout Indicates the amount of time the host waits, after requesting to leave the IGMP group and not receiving a Join message from another station, before timing out. If a Leave Timeout occurs, the switch notifies the Multicast device to stop sending traffic The Leave Timeout value is either user-defined, or an immediate leave value. The default timeout is **10** seconds.

Click **Update** to update the screen with your changes.

Click **Save Settings** to save the changes, or **Cancel Changes** to cancel the changes.

Multicast > Bridge Multicast

The *Bridge Multicast* screen displays the ports and LAGs attached to the Multicast service group in the Ports and LAGs tables. The Port and LAG tables also reflect the manner in which the port or LAGs joined the Multicast group.

Multicast > Bridge Multicast

Ports can be added either to existing groups or to new Multicast service groups. The *Bridge Multicast* screen permits new Multicast service groups to be created. The Bridge Multicast screen also assigns ports to a specific Multicast service address group.

The *Bridge Multicast* screen contains the following fields:

VLAN ID Identifies a VLAN to be configured to a Multicast service.

Bridge Multicast Address Identifies the Multicast group MAC address/IP address.

Bridge IP Multicast Displays the port that can be added to a Multicast service.

Interface, Gigabit, LAG Lists switch interfaces and LAGs that can be added to a Multicast service. The configuration options are as follows:

- **Static** Indicates the port is user-defined.
- **Dynamic** Indicates the port is configured dynamically.
- **Forbidden** Forbidden ports are not included the Multicast group, even if IGMP snooping designated the port to join a Multicast group.
- **None** The port is not configured for Multicast service.

Click **Add to List** to add the configured static multicast address to the table at the bottom of the screen.

Click **Show All** to display all multicast addresses on all VLANs in the table at the bottom of the screen.

Click **Save Settings** to save the changes, or **Cancel Changes** to cancel the changes.

Multicast > Bridge Multicast Forward All

The *Bridge Multicast Forward All* screen contains fields for attaching ports or LAGs to a device that is attached to a neighboring Multicast router or switch.

Multicast > Bridge Multicast Forward All

Once IGMP Snooping is enabled, Multicast packets are forwarded to the appropriate port or VLAN.

The Bridge Multicast Forward All screen contains the following fields:

VLAN ID Displays the VLAN for which Multicast parameters are displayed.

Interface Interfaces with the following configuration options:

- **Static** The port is user-defined.
- **Dynamic** The port is configured dynamically.
- **None** The port is not configured for Multicast service.

Gigabit Gigabit ports with the following configuration options:

- **Static** The Gigabit port is user-defined.
- **Dynamic** The Gigabit port is configured dynamically.
- **None** The Gigabit port is not configured for Multicast service.

LAG LAGs with the following configuration options:

- **Static** The LAG is user-defined.
- **Dynamic** The LAG is configured dynamically.
- **None** The LAG is not configured for Multicast service.

Click **Save Settings** to save the changes, or **Cancel Changes** to cancel the changes.

SNMP

The SNMP tab includes the following screens: Global Parameters, Views, Group Profile, Group Membership, Communities, Notification Filter, and Notification Recipient.

SNMP > Global Parameters
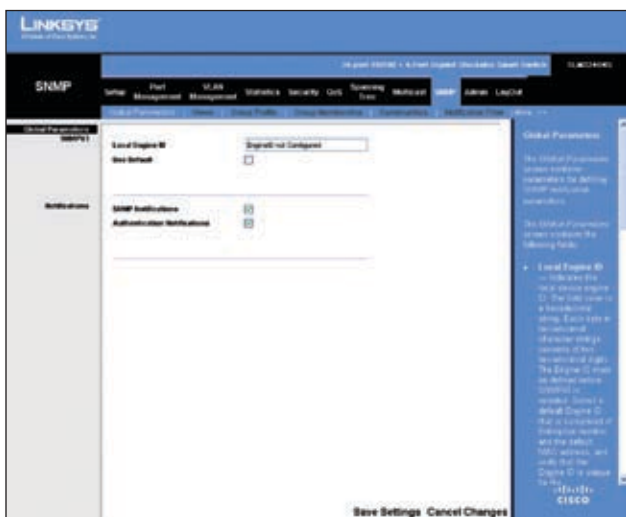
SNMP > Global Parameters

The Global Parameters screen contains parameters for defining SNMP notification parameters.

Local Engine ID Indicates the local device engine ID. The field value is a hexadecimal string. Each byte in hexadecimal character strings consists of two hexadecimal digits. Each byte can be separated by a period or a colon. The Engine ID must be defined before SNMPv3 is enabled. For stand-alone devices, select a default Engine ID that is comprised of Enterprise number and the default MAC address. For a stacked system, configure the Engine ID, and verify that the Engine ID is unique for the administrative domain. This prevents two devices in a network from having the same Engine ID.

Use Default Uses the device generated Engine ID. The default Engine ID is based on the device MAC address and is defined per standard as:

- **First 4 octets** First bit = 1, the rest is IANA Enterprise number.
- **Fifth octet** Set to 3 to indicate the MAC address that follows.
- **Last 6 octets** MAC address of the device.

SNMP Notifications Indicates if the device can send SNMP notifications.

Authentication Notifications Indicates if SNMP Authentication failure notification is enabled on the device.

SNMP > Views

The SNMP Views screen provides access or block access to device features or feature aspects. For example, a view can be defined that states that SNMP Group A has Read Only (R/O) access to Multicast groups, while SNMP Group B has Read-Write (R/W) access to Multicast groups. Feature access is granted via the MIB name, or MIB Object ID.

SNMP > Views

View Name Displays the user-defined views. The options are as follows:

- **Default** Displays the default SNMP view for read and read/write views.

- **DefaultSuper** Displays the default SNMP view for administrator views.

Subtree ID Tree Indicates the device feature OID included or excluded in the selected SNMP view. The options to select the Subtree are as follows:

- **Select from List** Select the Subtree from the list provided.

- **Insert** Enables a Subtree not included in the Select from List field to be entered.

View Type Indicates if the defined OID branch will be included or excluded in the selected SNMP view.

Click **Add to List** to add the Views configuration to the Views Table at the bottom of the screen.

SNMP > Group Profile

The Group Profile screen allows you to create SNMP groups and assign SNMP access control privileges to SNMP groups. Groups allow network managers to assign access rights to specific device features, or features aspects.

SNMP > Group Profile

Group Name Displays the user-defined group to which access control rules are applied. The field range is up to 30 characters.

Security Model Defines the SNMP version attached to the group. The possible field values are:

- **SNMPv1** SNMPv1 is defined for the group.

- **SNMPv2** SNMPv2 is defined for the group.

- **SNMPv3** SNMPv3 is defined for the group.

Security Level Defines the security level attached to the group. Security levels apply to SNMPv3 only. The possible field values are:

- **No Authentication** Indicates that neither the Authentication nor the Privacy security levels are assigned to the group.

- **Authentication** Authenticates SNMP messages, and ensures the SNMP messages origin is authenticated.

- **Privacy** Encrypts SNMP messages.

Operation Defines the group access rights. The possible field values are:

- **Read** The management access is restricted to read-only, and changes cannot be made to the assigned SNMP view.

- **Write** The management access is read-write and changes can be made to the assigned SNMP view.

- **Notify** Sends traps for the assigned SNMP view.

SNMP > Group Membership

The Group Membership screen provides information for assigning SNMP access control privileges to SNMP groups.

SNMP > Group Membership

User Name Provides a user-defined local user list.

Engine ID Indicates either the local or remote SNMP entity to which the user is connected. Changing or removing the local SNMP Engine ID deletes the SNMPv3 User Database.

- **Local** Indicates that the user is connected to a local SNMP entity.

- **Remote** Indicates that the user is connected to a remote SNMP entity. If the Engine ID is defined, remote devices receive inform messages.

Group Name Contains a list of user-defined SNMP groups. SNMP groups are defined in the SNMP Group Profile page.

Authentication Method Use this to enable or disable Authentication between the SNMP Agent on the Switch and the SNMP Manager.

- **None** Disables authentication between the SNMP Agent on the Switch and the SNMP Manager.

- **MD5 Password** Enables authentication using HMAC-MD5-96 password authentication.

- **SHA Password** Enables authentication using HMAC-SHA-96 password authentication.

- **MD5 Key** Enables authentication using the HMAC-MD5 algorithm.

- **SHA Key** Enables authentication using HMAC-SHA-96 authentication.

Password Defines the local user password. Local user passwords can contain up to 159 characters.

Authentication Key Defines the HMAC-MD5-96 or HMAC-SHA-96 authentication level. The authentication and privacy keys are entered to define the authentication key. If only authentication is required, 16 bytes are defined. If both privacy and authentication are required, 32 bytes are defined. Each byte in hexadecimal character strings is two hexadecimal digits. Each byte can be separated by a period or a colon.

Privacy Key Defines the Privacy Key (LSB). If only authentication is required, 20 bytes are defined. If both privacy and authentication are required, 36 bytes are defined. Each byte in hexadecimal character strings is two hexadecimal digits. Each byte can be separated by a period or colon.

Click **Add to List** to add the Group Membership configuration to the respective table at the bottom of the screen.

SNMP > Communities

The *Communities* screen is used to define SNMP communities. The *Communities* screen contains the following three areas: Communities, Basic Table and Advanced Table.

SNMP > Communities

SNMP Management Station Defines the management station IP address for which the advanced SNMP community is defined. There are two definition options: either select the first radio button and enter the management station IP address in the field (default), or select **All** to include all management station IP addresses.

Community String Defines the password used to authenticate the management station to the device.

Basic Enables SNMP Basic mode for a selected community and contains the following fields:

Access Mode Defines the access rights of the community. The possible field values are:

- **Read Only** Management access is restricted to read-only, and changes cannot be made to the community.

- **Read Write** Management access is read-write and changes can be made to the device configuration, but not to the community.

- **SNMP Admin** User can access all device configuration options, and can modify the community.

View Name Contains a list of user-defined SNMP views.

Advanced Enables SNMP Advanced mode for a selected community and contains the following fields:

Group Name Defines advanced SNMP communities group names.

Click **Add to List** to add the Communities configuration to the respective Table at the bottom of the screen.

Base Table

Management Station Displays the management station IP address for which the basic SNMP community is defined.

Community String Displays the password used to authenticate the management station to the device.

Access Mode Displays the access rights of the community.

View Name Displays the user-defined SNMP view.

Advanced Table

Management Station Displays the management station IP address for which the basic SNMP community is defined.

Community String Displays the password used to authenticate the management station to the device.

Group Name Displays advanced SNMP communities group name.

SNMP > Notification Filter

The *Notification Filter* screen permits filtering traps based on OIDs. Each OID is linked to a device feature or a feature aspect. The *Notification Filter* screen also allows network managers to filter notifications.

SNMP > Notification Filter

Filter Name Contains a list of user-defined notification filters.

New Object Identifier Subtree Displays the OID for which notifications are sent or blocked. If a filter is attached to an OID, traps or informs are generated and sent to the trap recipients. Object IDs are selected from either the Select from List or the Object ID List. There are two configuration options:

• **Select from List** Select the OID from the list provided.

• **Object ID** Enter an OID not offered in the Select from List option.

Filter Type Indicates whether informs or traps are sent regarding the OID to the trap recipients.

• **Excluded** Restricts sending OID traps or informs.

• **Included** Sends OID traps or informs.

Click **Add to List** to add the Notification Filter configuration to the Notification Filter Table at the bottom of the screen.

SNMP > Notification Recipient

The *Notification Recipient* screen contains information for defining filters that determine whether traps are sent to specific users, and the trap type sent. SNMP notification filters provide the following services:

• Identifying Management Trap Targets

• Trap Filtering

• Selecting Trap Generation Parameters

• Providing Access Control Checks

SNMP > Notification Recipient

Recipient IP Indicates the IP address to whom the traps are sent.

Notification Type Defines the notification sent. The possible field values are:

• **Traps** Indicates traps are sent.

• **Informs** Indicates informs are sent.

SNMPv1,2 Enables SNMPv1,2 as the Notification Recipient. Either SNMPv1,2 or SNMPv3 can be enabled at any one time, but not both at the same time. If SNMPv1,2 is enabled, the *Community String* and *Notification Version* fields are enabled for configuration:

Community String Identifies the community string of the trap manager.

Notification Version Determines the trap type. The possible field values are:

• **SNMP V1** Indicates SNMP Version 1 traps are sent.

• **SNMP V2** Indicates SNMP Version 2 traps are sent.

SNMPv3 Enables SNMPv3 as the Notification Recipient. Either SNMPv1,2 or SNMPv3 can be enabled at any one time, but not both at the same time. If SNMPv3 is enabled, the *User Name* and *Security Level* fields are enabled for configuration:

User Name Defines the user to whom SNMP notifications are sent.

Security Level Defines the means by which the packet is authenticated. The possible field values are:

- **No Authentication** Indicates the packet is neither authenticated nor encrypted.

- **Authentication** Indicates the packet is authenticated.

- **Privacy** Indicates the packet is both authenticated and encrypted.

UDP Port Displays the UDP port used to send notifications. The default is **162**.

Filter Name Indicates if the SNMP filter for which the SNMP Notification filter is defined.

Timeout Indicates the amount of time (seconds) the device waits before resending informs. The default is **15** seconds.
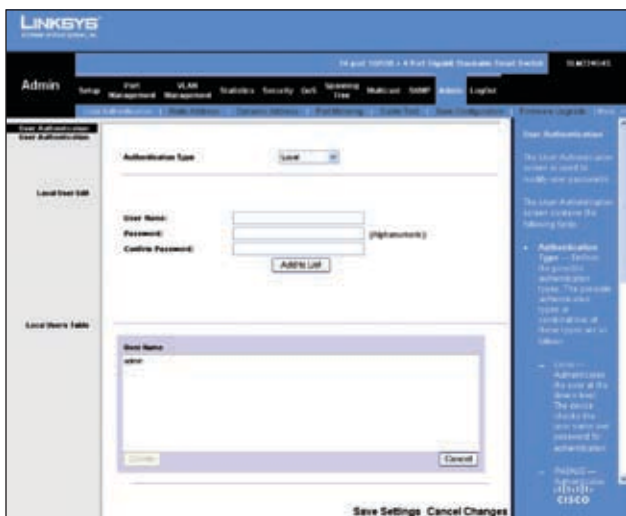
Retries Indicates the amount of times the device resends an inform request. The default is **3** seconds.

Click **Add to List** to add the Notification Recipient configuration to the relevant table at the bottom of the screen.

Admin

The Admin tab provides access to system administration settings and tools. It includes the following screens:

Admin > User Authentication

Admin > User Authentication

The *User Authentication* screen is used to modify user account information. You can modify the password or user name for an existing account, or create additional accounts.

User Authentication

Authentication Type Defines the user authentication methods. Combinations of all the authentication methods can be selected. The possible field values are:

- **Local** Authenticates the user at the device level. The device checks the user name and password for authentication.

- **RADIUS** Authenticates the user at the RADIUS server.

- **None** Assigns no authentication method to the authentication profile.

Local User Edit

User Name Displays the user name.

Password The password for the specified User Name. For security purposes, the password is not displayed; instead, a "*" is displayed for each character. The password must be between 1 and 159 characters in length.

Confirm Password Confirms the password when you change an existing password or create a new one (for a new User Name). The password entered into this field must be exactly the same as the password entered in the *Password* field.

Add to List/Update The name of this button depends on the function being performed. When you create a new user name, it is **Add to List**; when you edit an existing password or user name, it is **Update**. For detailed information on its use, refer to the "Local Users Table" section below.

Local Users Table

The Local Users Table at the bottom of the screen lists all existing user names (for security purposes, passwords are not displayed). You use this table to edit or delete existing user names and/or passwords, as described below.

Create a new user name

Make sure no entry is selected in the Local Users Table. If one is selected, click **Cancel**. Enter the new user name in the *User Name* field, and the password in the *Password* and *Confirm Password* fields. Then click **Add to List** to add a new entry to the Local Users Table.

Change a password

Highlight the associated user name in the Local Users Table. The *User Name*, *Password*, and *Confirm Password* fields will then be populated for editing. Enter the new password in the *Password* field, then enter it again in the

Confirm Password Field. Then click **Update** to save the changes to the Local Users Table.

Change a user name

Highlight the user name in the Local Users Table. The *User Name*, *Password*, and *Confirm Password* fields will then be populated for editing. Modify the user name in the *User Name* field, then click **Update** to update the entry in the Local Users Table.

Delete a user name

Select the user name from the table, then click **Delete**.

If you accidentally select the wrong entry in the table, click **Cancel** to unselect the highlighted user name.

Click **Save Settings** to save the changes, or **Cancel Changes** to cancel the changes.

Admin > Static Address

Admin > Static Address

The *Static Address* screen lets you assign a static address to a specific Switch interface. A static address is bound to its assigned interface and cannot be moved. If a static address is seen on an interface to which it is not assigned, the address is ignored and is not written to the address table.

A list of all static addresses on the Switch appears at the bottom of the screen. The top part of the screen contains the following fields for creating static address entries:

Interface The interface that is associated with the static address. Select **Port** or **LAG**, then select the desired interface from the accompanying drop-down menu.

MAC Address This is the physical address that is being mapped to the specified interface.

VLAN ID The VLAN ID number (**1**-**4094**) of the configured VLAN that is associated with the specified interface. If you use this field the *VLAN Name* field is disabled.

VLAN Name The name of the VLAN associated with the specified interface. If you use this field, the *VLAN ID* field is disabled.

Status The static address type. The possible values are::

- **Permanent** (Default) Keep the entry permanently.

- **Delete on Reset** Delete the entry when the Switch is reset.

- **Delete on Timeout** Delete the entry when a timeout occurs. The default timeout period is 300 seconds.

- **Secure** The entry is defined for locked ports.

After you have entered the information listed above, click **Add to List**. The static address will then appear in the list of static addresses. To delete a static MAC address from the list, select the entry in the list, then click **Delete**.

Admin > Dynamic Address

Admin > Dynamic Address

The *Dynamic Address* screen lets you query the Dynamic Address Table to find specific dynamic MAC addresses, or display MAC addresses associated with a specific interface or VLAN. Query criteria include interface type, MAC address, VLAN, and table sort key. You can also set the Dynamic MAC Address Table's address aging parameter or clear the table.

Address Aging Specifies the amount of time (in seconds) that a MAC address remains in the Dynamic MAC Address table before it times out, if no traffic from the source is detected. The default value is **300** seconds.

Clear Table If selected, this clears the MAC Address table.

Query

Interface Use this to query the table for a specific port or LAG. Select **Port** or **LAG** and select the interface from the drop-down menu.

MAC Address Use this to query the table for a specific MAC address. Enter the MAC address in the field.

VLAN ID Use this to query the table for a specific VLAN ID. Enter the VLAN ID in the field.

Address Table Sort Key Specifies how the search results will be sorted—by **Address**, **VLAN**, or **Interface**.

Specify the search criteria (Interface, MAC Address, or VLAN) and the sort method for the search results, then click **Query** to display the dynamic addresses matching the search criteria.

Admin > Port Mirroring

Port mirroring monitors and mirrors network traffic by forwarding copies of incoming and outgoing packets from one port to a monitoring port. Port mirroring can be used as diagnostic tool and/or a debugging feature. Port mirroring also enables switch performance monitoring.

Network administrators configure port mirroring by selecting a target port to which the packets are copied, and the source port(s) from which the packets are copied. Port mirroring supports a maximum of one target port and four source ports.

Admin > Port Mirroring

Set the following attributes for port mirroring using the *Port Mirroring* screen.

Target Port The port that will mirror the traffic on the source port.

Source Port The port whose traffic will be monitored.

Type Allows you to select which traffic to mirror to the target port; receive, transmit, or both.

- **RxOnly** (Default) Mirror only received traffic.

- **TxOnly** Mirror only transmitted traffic.

- **Both** Mirror both received and transmitted traffic.

Specify the source port, the traffic type to be mirrored, and the target port, then click **Add to List**. The mirror session is displayed in the text box.

Admin > Cable Test

The *Cable Test* screen uses Time Domain Reflectometry (TDR) technology to test the quality and characteristics of a copper cable attached to a port. The cable being tested can be up to 120 m in length. Before you can perfom the test, the port to which the cable is connected must be in the down state.

Admin > Cable Test

The *Cable Test* screen contains the following fields.

Unit No. The unit to which the test cable is connected.

Port The port to which the test cable is connected.

Test Result The results of the test. Possible values are:

- **OK** The cable passed the test.

- **No Cable** No cable is connected to the port.

- **Open Cable** The cable is connected on only one side.

- **Short Cable** A short has occurred in the cable.

- **Undefined** The test could not be properly performed.

Last Update Displays when the last cable test was performed on the port.

Test Click this to start testing the cable attached to the port. The test results will appear in the *Test Result* column.

Admin > Cable Test - Gigabit Ports

Advanced (Gigabit ports only) Click the **Advanced** button to open the *Copper Cable Extended Feature* screen. The *Copper Cable Extended Feature* screen contains the following fields.

• **Cable Status** Displays the cable status.

• **Speed** Indicates the speed at which the cable is transmitting packets.

• **Link Status** Displays the current link status.

• **Pair** The pair of cables under test.

• **Distance to Fault** Indicates the distance between the port and where the cable error occurred.

• **Status** Displays the cable status.

• **Cable length** Displays the cable length.

• **Channel** Displays the cable's channel.

• **Polarity** Automatic polarity detection and correction allows for automatic adjustment of wiring errors on all RJ-45 ports.

• **Pair Skew** Reaction or transmission time in nanoseconds for the selected cable pair and given cable length.

• **Test Now** Press this button to begin the cable test.
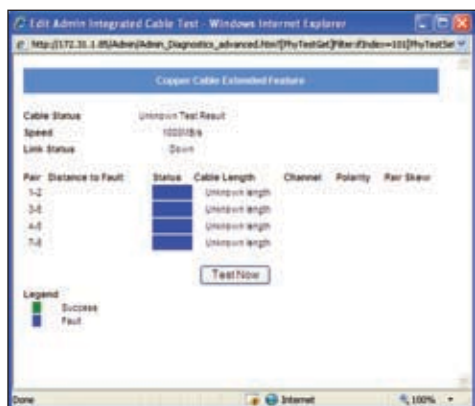
Admin > Cable Test - Gigabit Ports > Copper Cable Extended Feature

Admin > Save Configuration
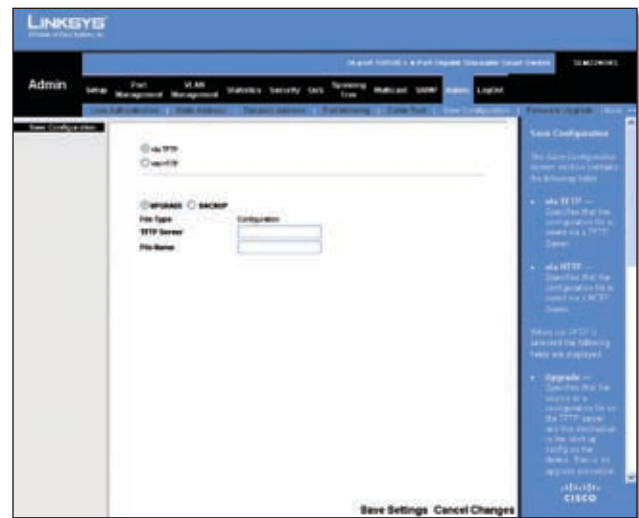
Admin > Save Configuration

The *Save Configuration* screen allows you to upload Switch configuration files to a TFTP server, or to download saved Switch configuration files from a TFTP server or from your computer via the HTTP interface.

Via TFTP Select this to upload to or download from a TFTP server. When you select this option, the following fields are displayed.

• **UPGRADE** Select this option to restore the Switch configuration from the file located on a TFTP server.

 • **TFTP Server** Enter the TFTP Server IP Address that contains the source file to download.

 • **File Name** Enter the name of the configuration file on the TFTP Server.

• **BACKUP** To back up the Switch configuration to a TFTP server, enter the TFTP server address.

 • **TFTP Server** Enter the TFTP Server IP Address to which the configuration file will be saved.

 • **File Name** Enter the name of the configuration file. The default is none (blank).

Via HTTP Select this to download a configuration file to the Switch from your computer using the HTTP interface. (HTTP only supports the upgrade operation. You cannot back up the configuration file using HTTP.) When you select this option, the following field is displayed.

• **Source File** Enter the name and path of the file or click **Browse** to locate the configuration file.

Click **Save Settings** to begin the download or upload.

After you have downloaded the configuration file to the Switch during an upgrade, the configuration file's settings will not take effect until the system is rebooted.

Admin > Firmware Upgrade
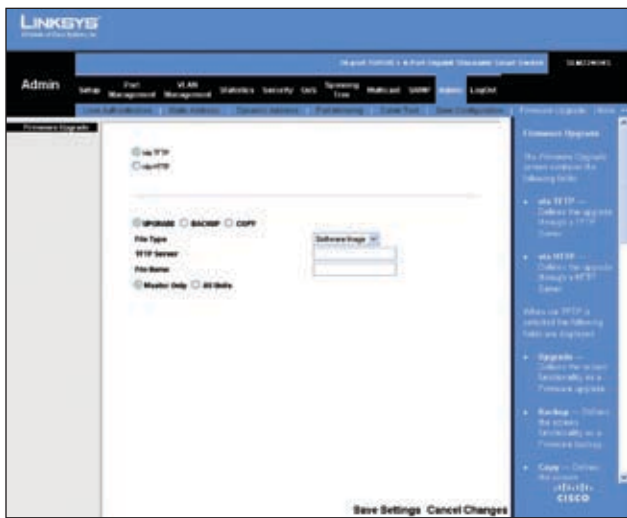
Admin > Firmware Upgrade

The *Firmware Upgrade* screen allows you to download firmware upgrade files from a TFTP server, or from your computer via the HTTP interface.

Via TFTP Select this to download from or upload to a TFTP server. When you select this option, the following fields are displayed.

- **UPGRADE** Select this option to upgrade the switch from a file located on a TFTP server.

  - **File Type** Select the type of file to download, either **Software Image** or **Boot Code**.

  - **TFTP Server** Enter the TFTP Server IP Address that contains the source file to upgrade from.

  - **File Name** Enter the name of the upgrade file on the TFTP Server.

- **BACKUP** To back up the firmware to a TFTP server, enter the TFTP server address.

  - **TFTP Server** Enter the TFTP Server IP Address to which the firmware file will be saved.

  - **File Name** Displays the name of the firmware file. This field cannot be edited.

Via HTTP Select this to download an upgrade file using the HTTP interface. When you select this option, the following field is displayed:

- **Source File** Enter the name and path of the file or click **Browse** to locate the upgrade file.

Click **Save Settings** to begin the download or upload.

Admin > Reboot

The *Reboot* screen is used to reset one Switch or the entire stack. From the drop-down menu, select the unit number or **Stack**, then click **Reboot**, then click **OK** to confirm. The configuration settings are automatically saved before the system reboots.

Admin > Reboot

Admin > Factory Default

The *Factory Default* screen allows network managers to reset the Switch to the factory defaults shipped with the switch. This results in erasing the configuration file.

> **NOTE:** Restoring factory defaults erases all current configuration settings. You can save a copy of your configuration settings beforehand using the Admin > Save Configuration screen.

Admin > Factory Default

To restore the factory defaults, click **Reset Default**, then click **OK** to confirm. Then restart the Switch by going to the Admin > Reboot screen; once there, select the master unit number (if applicable), click **Reboot**, then click **OK**.

Admin > Logging

Admin > Logging

The System Logs allow you to view device events in real time, and recording the events for later usage. System Logs record and manage events and report errors or informational messages.

Event messages have a unique format, as per the SYSLOG protocols recommended message format for all error reporting. For example, Syslog and local device reporting messages are assigned a severity code, and include a message mnemonic, which identifies the source application generating the message. It allows messages to be filtered based on their urgency or relevancy. Each message severity determines the set of event logging devices that are sent per each event logging.

Enable Logging If this option is selected, device global logs for Cache, File, and Server Logs are enabled. The default is enabled.

• **Emergency** The system is not functioning.

• **Alert** The system needs immediate attention.

• **Critical** The system is in a critical state.

• **Error** A system error has occurred.

• **Warning** A system warning has occurred.

• **Notice** The system is functioning properly, but system notice has occurred.

• **Informational** Provides device information.

• **Debug** Provides detailed information about the log. If a Debug error occurs, contact Customer Tech Support.

If you enable Logging, use the checkboxes to set the level of event messages to be logged to RAM (Memory Logs) and flash memory (Flash Logs), then click **Save Settings**.

Admin > Server Logs

The Server Logs screen contains information for viewing and configuring the Remote Log Servers. New log servers can be defined, and the log severity sent to each server.

Admin > Server Logs

Server Specifies the server to which logs can be sent.

UDP Port (1-65535) Defines the UDP port to which the server logs are sent. The possible range is **1** to **65535**. The default value is **514**.

Facility Defines a user-defined application from which system logs are sent to the remote server. Only one facility can be assigned to a single server. If a second facility level is assigned, the first facility is overridden. All applications defined for a device utilize the same facility on a server. The default value is **Local 7**. The range of values is **Local 0** to **Local 7**.

Description Provides a user-defined server description.

Minimum Severity Indicates the minimum severity from which logs are sent to the server. For example, if Notice is selected, all logs from a Notice severity and higher are sent to the remote server.

Click **Add to List** to add the Server Log configuration to the Server Log Table at the bottom of the screen.

Admin > Memory Logs

The *Memory Log* screen displays all system logs in the chronological order that they are saved in RAM (Cache).

Log Index Displays the log number.

Log Time Displays the date and time of log generation.

Severity Displays the log severity.

Description Displays the log message text.

Admin > Memory Logs

Admin > Flash Logs

The *Flash Log* screen contains information about log entries saved to the Log File in flash memory, including the time the log was generated, the log severity, and a description of the log message. The Message Log is available after reboot.

Admin > Flash Logs

Log Index Displays the log number.

Log Time Displays the date and time at which the log was generated.

Severity Displays the log severity.

Description Displays the log message text.

Logout

The Logout tab is used to terminate the login session. When you select the Logout tab, the following dialog box asks you to verify if you want to log out.

Logout Verification

Select **Yes** to log out of the web-based configuration utility.

Appendix A:
About Gigabit Ethernet and Fiber Optic Cabling

Gigabit Ethernet

Gigabit Ethernet runs at speeds of 1Gbps (Gigabit per second), ten times faster than 100Mbps Fast Ethernet, but it still integrates seamlessly with 100Mbps Fast Ethernet hardware. Users can connect Gigabit Ethernet hardware with either fiber optic cabling or copper Category 5e cabling, with fiber optics more suited for network backbones. As the Gigabit standard gradually integrates into existing networks, current computer applications will enjoy faster access time for network data, hardware, and Internet connections.

Fiber Optic Cabling

Fiber optic cabling is made from flexible, optically efficient strands of glass and coated with a layer of rubber tubing, fiber optics use photons of light instead of electrons to send and receive data. Although fiber is physically capable of carrying terabits of data per second, the signaling hardware currently on the market can handle no more than a few gigabits of data per second.

Fiber cables come with two main connector types. The most commonly used fiber optic cable is multi-mode fiber cable (MMF), with a 62.5 micron fiber optic core. Single-mode fiber cabling is somewhat more efficient than multi-mode but far more expensive, due to its smaller optic core that helps retain the intensity of traveling light signals. A fiber connection always require two fiber cables: one transmits data, and the other receives it.

Each fiber optic cable is tipped with a connector that fits into a fiber port on a network adapter, hub, or switch. In the USA, most cables use a square SC connector that slides and locks into place when plugged into a port or connected to another cable. In Europe, the round ST connector is more prevalent.

For Gigabit Ethernet, you must use the Linksys MGBT1, MGBSX1, or MGBLH1 miniGBIC modules with the Linksys Gigabit Switches. The MGBSX1 and the MGBLH1 require fiber cabling with LC connectors, and the MGBT1 requires a Category 5e Ethernet cable with an RJ-45 connector.

For Fast Ethernet, you must use the MFEFX1 (100BASE-FX) or MFELX1 (100BASE-LX) SFP transceivers.

Appendix B:
About Switch Stacking

A switch may operate in one of two modes: **Stack** or **Standalone**. You can select either mode during software boot or using the web-based utility's *Setup > Summary* screen, with the new mode taking effect after the unit is reset. The factory default is **Stack** mode.

Standalone Mode

A switch operating in Standalone mode runs as an independent, single unit. All ports of a standalone switch operate as normal Ethernet links. A Standalone switch does not participate in a Stack even if physically connected to a Stack.

Stack Mode

A switch operating in Stack mode is not an independent unit, but a member of an organized group of switches known as a Stack. A Stack consists of one Master control switch, a Master Backup switch, and up to four Stack Member SLM224G4S switches, or up to two Stack Member SLM248G4S switches.

- As a special case, a unit in Stack mode not connected to any other units may operate as a "stack–of-one".

✓ **NOTE:** When a unit is in Stack mode, two of its ports are reserved for use with stacking links, and cannot be used for regular network connections.

Two ports of each unit in Stack mode (ports G1 and G2) are reserved for stacking links, and cannot be used for regular network connections.

Stack Building Quick Start

Stacking allows you to build a switch with many more ports than would be available in a single unit. The stack is managed by one of the units called the Master and all the other units serve as ports only.

When building a stack there are two distinct cases:

- Building a stack from scratch
- Adding units to a running (operational) stack to make it bigger

Normal (Self-Ordering) Stack

The easiest way to build a stack is to have the switches' automatically determine their order in the stack.

Building a New Stack

To build a new self-ordering stack, use a group of switches, each of which is set to the factory defaults.

All that is necessary to do is to connect the units physically (through the stacking ports, using standard Ethernet cables) and turn the units on. After a short interval the stack will become operational with one of the units selected as the Master of the stack. The unit selected as Master will be indicated by the Stack Master LED on its front panel lit amber. If a serial console connection is desired, the serial cable should be connected to the console port of the unit serving as stack Master.

If the units to be used in building the new stack were used before then it is highly recommended to reset them back to factory default (by holding the reset button for at least 10 seconds) and proceeding as described above.

Adding Units to a Running Stack

Restore the factory defaults to each of the units to be added to the stack. Then connect the units physically to the stack and turn the units on. After a short while the new units will become stack members.

Manually Ordered Stack

The system administrator can manually decide which unit will be the Master. To do that the system administrator has to assign a unique Unit ID from 1 to 6 (1 to 4 for SLM248G4S-only stacks) to each stack member.

✓ **NOTE:** It is highly recommended that if any unit is assigned its Unit ID manually, then all the units be assigned their Unit IDs manually.

It is NOT recommended to have a mixed case with some Unit IDs assigned manually, and others automatically allocated at runtime by the stack Master (even though such a mixed stack may well function flawlessly).

Building a New Stack

Reset all of the units to the factory defaults and build the stack as described above in "Normal (Self-Ordering) Stack". Then, when the stack is operational, assign each unit with its desired number, making sure no duplicates exist, and reset the stack.

Adding Units to a Running Stack

Restore the factory defaults to each of the units to be added to the stack. Then, connect the units physically to the stack and turn the units on. After a short while they will become stack members, but will have auto-assigned Unit IDs. Assign each such unit its desired Unit ID (using

the Console port, Telnet or Web-based Utility) and reset the units to make this assignment permanent.

The unit that is assigned number 1 will act as the Master; this is indicated by the Stack Master LED on its front panel being lit amber. The unit that is assigned number 2 will act as the Backup Master.

Stack Resiliency

A stack's topology may be either Ring or Chain. The best practice is to configure the stack in Ring topology, due to its higher resiliency in case of unit failure or stacking link failure.

Additionally, if a redundant power supply is used, it is recommended to make sure that the Master and Backup Master units are connected to the redundant power supply.

Advanced Stacking

In order to understand the operation of the stack it is necessary to understand two key concepts:

- Unit IDs, and how they are allocated
- Stack unit start up process

Unit IDs

Each unit in a stack has an assigned unique Unit ID number. Unit ID numbers are meaningful as follows:

- The unit that is assigned Unit ID=1 will serve as the **Stack Master**. All other units will be stack members.

  The stack Master provides a single point of control, configuration and management for the entire stack, and stores the configuration for all stack members (which themselves do not store any configuration information at all).

- The unit that is assigned Unit ID=2 is a special stack member, which serves as the **Stack Backup Master**.

  A stack Backup Master, in addition to being a stack member, serves as a Backup in case the stack Master fails or is disconnected for any reason. If that should happen, the Backup Master takes over the role of stack Master for the remaining stack members.

  To make this possible, the stack Master will store a copy of the active configuration on the Backup Master, but this copy will only be used if and when it takes over the role of stack Master. Note that only the configuration file is copied. Any dynamically filled tables, e.g. addresses learned, are not copied from the Master to the Backup Master. If the Backup Master takes over the role of stack Master, it will start building its own dynamic tables from scratch.

- Units that are assigned Unit IDs 3-6 (SLM224G4S) or Unit IDs 3-4 (SLM248G4S) are called **Stack Members**.

  A stack member will only operate as a member of the stack under the direction of an operational stack Master (or a Backup Master that has taken over the role).

  Stack members are not directly manageable and configurable, and must be managed through the stack Master, and do not contain any meaningful configuration information (not even their own configuration). If an operational master is not present and reachable, these units will not be functional.

- **Master Enabled** units

  Units that are assigned a unit ID number of 1 or 2 are called **master enabled** units. Only master enabled units participate in master election (see below) whenever they are initiated, inserted into a new stack or lose connectivity with the existing master. Only master enabled units can become the stack master or backup master. Units with assigned IDs of 3-6 (SLM224G4S) or 3-4 (SLM248G4S) can become neither a master nor a backup master unless this is done manually by the system administrator or they are reset to the factory default first.

Unit ID Allocation

Units are shipped from the factory with no Unit ID, and must be assigned a unique Unit ID before they can operate as part of a stack. Unit ID numbers are assigned to units in one of two ways:

- Assigned by the system administrator, in which case they can only be changed manually by the system administrator
- Allocated to a stack member unit by the stack Master during system initialization

In general, a unit that was assigned a Unit ID will tend to keep this number even after it is rebooted. The stack Master may reallocate Unit IDs during system initialization to resolve duplicate Unit ID conflicts (see below). Manually assigned Unit IDs cannot be changed by the stack Master, even if they are in conflict.

Unit ID assignment/change takes effect only during system initialization and does not take place during run-time of the system.

Units of a stack do not have to be numbered in sequence or in order, and may be interconnected as desired, as long as each unit has a unique ID and at least one unit of the stack serves as stack Master.

Stack Units Startup Process

Whenever a unit in stack mode is initialized (powered up or rebooted) it goes through the same exact process, consisting of the following three steps:

1. Master Discovery/Election.

2. Unit ID allocation by the Master (including duplicate Unit ID conflict resolution)

3. Unit/port configuration by the Master

Master Discovery

Whenever a unit in stack mode initializes, its behavior will depend on its Unit ID (if any).

- If the unit does not have a current Unit ID (that is, the unit is in factory default mode).

  If there is a master, the unit performs Unit ID Allocation (refer to section "Unit ID Allocation and Duplicate Unit ID Conflict Resolution"), where it will get a number from the master. If there is no master, then it will participate in Master-election, and may even end up as the new master or backup master.

- If the unit's current Unit ID is 1 or 2 (previously allocated, perhaps even in a different stack), then the unit will participate in the Master election.

- If the unit has a current Unit ID (previously allocated, perhaps even in a different stack), it will try to use this number in the new stack. If the unit's current Unit ID is 3-6 (3-4 for SLM248G4S), then it will try and connect to the running stack Master, and will not proceed to the next stage until contact with the Master is made. In particular, such units will NOT participate in the Master election process, and if no Master is present, the units will be effectively shut down.

Both the master and all other stack units carry out a continuous process of master discovery by frequently exchanging stack control messages. This allows them to discover whenever a unit fails or becomes unreachable.

Master Election

Whenever a unit (or more than one) in stack mode comes up, one of the units is elected to be the stack Master. The unit selected as Stack Master is chosen as follows:

1. If a unit in the stack was set to "Force Master" by the system administrator, that unit will be the stack Master. Only master enabled stack units, i.e. unit ID=1 or unit ID=2 can be selected as "Force Master".

2. Otherwise, if the stack contains units whose unique Unit ID is either 1 or 2, then one of these two units will be the stack Master. It does not matter if the Unit

ID was originally assigned automatically or manually. (Such units are called Master-enabled units).

- If there is only one such unit, it will be selected as the stack Master (even if its Unit ID=2).

- If there are two such units, the two units will decide which of them is the Master by checking:

  - Which one has been running for a longer time (in increments of 10 minutes). The unit running for a longer time will be the stack Master.

  - If they have been running for the same amount of time, Unit ID=1 will be the stack Master.

  - If both units have been running for the same amount of time and both units have the same Unit ID, the unit with a lower MAC address will be selected as stack Master.

3. Otherwise, if the stack contains one or more units without a current Unit ID (that is to say in factory default state), then the stack Master will be one of these units. The unit selected to be the Master will be the one running for the longest time (in increments of 10 minutes) or, if all units are running for the same amount of time, the one with the lowest MAC address.

The end result of Master Election is that the stack has a stack Master. The Stack master has unit ID=1 and the Backup Master, if it exists, unit ID=2. Alternatively, the Stack master has unit ID=2 and the Backup Master, if it exists, unit ID=1.

If a Master-enabled (Unit ID=1 or 2) unit is added to a stack and turned on, then when it comes up, it will invoke master-election, even though the rest of the stack already has an elected master. Because it is new, it will lose the election and join as a member or backup master.

Unit ID Allocation and Duplicate Unit ID Conflict Resolution

Once a stack Master is elected, it will allocate Unit IDs to units that do not have a currently assigned Unit ID (that is, units in factory default mode).

In addition, the stack Master will try to resolve all cases of units with duplicate Unit IDs. This is done by changing the Unit IDs of offending units that have a duplicate current Unit ID, provided that there are available, unused Unit IDs.

In the case of a merged stack scenario, units that were initially in the sub-group of the Master that remained as Master will have the same unit IDs as they had before. Members of the other sub-group will be renumbered.

If the conflict occurs after the units reboot then the following will take place:

- If both duplicate units are in auto (self ordering) mode, then the unit ID will be decided by the Mac address. The unit with the lower Mac will keep its unit ID. The other will be reassigned a new unit ID.

- If one of the duplicates is in auto (self ordering) mode and the other unit is in manual mode then the manual mode unit will keep its ID and the other will be reassigned a new unit ID.

- If both duplicate units are in manual mode then both of them will be shut down.

If the stack Master is able to allocate a unique Unit ID to each unit, then all units can operate as a stack. If the stack Master is unable to allocate a Unit ID to any unit, that unit is effectively shut down and will not participate in the stack.

In particular, units with a conflicting manually set Unit ID number will be shut down because the Master cannot override the system administrator's assignment to resolve the conflict.

If there are more units than the maximum number allowed in a stack and the incoming units are already in factory default state (which means they do not have unit ID assigned) then a Master will be elected following Master Discovery and Master Election processes. All other units will remain shut down. Please note that in some extreme cases, due to a race condition during the boot process, some of the units might be connected and join the stack.. If the incoming units already have a unit ID then none of them will join the stack and all will be left in shutdown mode (since there is no way to know which of them are preferable).

> **NOTE:** If a unit is shut down, its stacking links will be inactive. Moreover, if the stacking units are connected in a chain topology, the shutdown of one unit breaks the chain and may cause other units to be shut down if they have no active link to the Master unit.

Unit and Port Configuration

At this point, each unit in the stack has a unique Unit-ID; one of the units is the stack Master, and, possibly, one of the units serves as Backup Master. The stack Master will now configure each of the member units and its ports according to the configuration file present on the Master.

If the stack has a Backup Master the configuration file will also be copied to the Backup Master.

Once all the units and ports are configured, the stack will go into normal operational mode. If any change is made to the system configuration, the change will be stored by the stack Master and will be copied to the Backup Master (if it exists).

User Controls

Using either the CLI or the graphical user interface (GUI), the user can configure the following settings:

- Set the operational mode of the unit (which will take effect after next reboot) – Standalone or Stack.

- Force a unit to be the stack Master after the next reset

- Assign a static Unit ID, or, allow the unit to be renumbered.

Stacking Examples

Replacing a Failed Stack Member in a Running Stack

In this example, a non-master unit fails in a running stack. When notified of the failure, a system administrator removes the failed unit and replaces it with another one.

When the unit fails, the stack Master detects (via the ongoing Master Discovery process) that the unit no longer responds, and directs all other stack members to route unit-to-unit traffic around the failed unit using the ring topology of the stacking connections. At the same time the stack Master notifies the system administrator (using SYSLOG messages and SNMP traps) of the failure.

When the failed unit is disconnected from the stack, all traffic will already be routed around it, and as long as all other stacking connections are left intact, the stack should continue to run.

When a new unit is inserted in the stack and powered up, the following will happen:

1. The incoming unit, being in stack mode, will perform **Master discovery**, and perhaps participate in a **Master Election**, as described above for any stacking-mode unit powering up.

   - If the incoming unit has a Unit ID of 1 or 2, i.e. it is a master enabled unit, it will initiate a Master Election. However, since the running stack Master has a longer run time, it will remain elected as the stack Master and the incoming unit will not become a new stack Master.

   - If the incoming unit has a Unit ID of 3 to 6 (3 to 4 for SLM248G4S), it will try to become a member unit of the stack subject to the already running stack Master, and Master Election will not take place.

2. The stack Master at this stage will carry out a **Unit ID allocation and conflict resolution** process.

- If the incoming unit did not have an assigned Unit ID (that is, it was in factory default mode), it will be assigned the lowest available Unit ID by the Master. It is strongly recommended that automatic assigned unit ID mode be used since it provides better resiliency to the stack.

- If the incoming unit already has an assigned Unit ID, and that Unit ID is unused in the current stack, the incoming unit will keep its assigned Unit ID and the Master will apply to it any configuration relevant to that Unit ID.

- If the incoming unit already has an assigned Unit ID, and that Unit ID conflicts with a unit ID in the current stack, the Master will reallocate a new Unit ID to the incoming unit, giving it the lowest available Unit ID (assuming, of course, that the incoming unit does not have a manually assigned Unit ID, which the Master cannot change).

- If the incoming unit cannot be assigned an available Unit ID for any reason (in the case of unit replacement that can only happen if the incoming unit has a manually assigned Unit ID), then it will be effectively shut down—that is, it will not be joined to the stack.

3. The stack Master will now carry out **Unit and port configuration** for the incoming unit.

   - Any configuration information the Master has that is relevant to the number assigned to the incoming unit will be applied. In particular, if the incoming unit was assigned the same Unit ID of the unit it replaces, then it will receive the same configuration as the failed unit, to the extent possible.

   If the incoming unit is identical in makeup to the replaced unit, the entire configuration of the replaced unit will be applied to the incoming one and the stack will go back to the state it was in before unit failure. However, sometimes the incoming unit is not identical to the unit that failed in these cases. The stack Master will apply the configuration in the following manner:

   - If a 24-port unit replaces a failed 48-port unit, then the ports of the incoming unit will be configured according to the way the first 24 ports of the failed unit were configured.

     (Note that the configuration of all 48 ports of the failed unit is remembered, even though only the first 24 are currently applied. If, in the future, a 48 port unit is inserted and assigned the same Unit ID, it will be configured as the original failed 48-port unit was configured).

- If a 48-port unit replaces a 24-port unit, then the first 24 ports of the incoming unit will be configured according to the way the ports of the failed unit were configured, and the rest of the ports of the incoming unit will be configured at default settings.

- If the units (the failed one and its replacement) had/have uplink ports, then the first uplink of the incoming unit will be configured as was the first uplink of the failed unit, and so on.

Stack Master Failure and Replacement

In this example, the master unit fails in a running stack. When notified of the failure, a system administrator removes the failed unit and replaces it with another one.

When the unit fails, the stack Backup Master detects (via the ongoing monitoring Master Discovery process) that the master unit no longer responds and takes over as the stack master. The backup master directs all other stack members to route unit-to-unit traffic around the failed unit using the ring topology of the stacking connections. At the same time the stack Backup Master notifies the system administrator (using SYSLOG messages and SNMP traps) of the failure.

When the failed unit is disconnected from the stack, all traffic will already be routed around it, and as long as all other stacking connections are left intact, the stack should continue to run.

When a new unit is inserted in the stack and powered up, the following will happen:

1. The incoming unit will perform **Master discovery**, and perhaps participate in a **Master Election**, as described above.

   - If the incoming unit has a Unit ID of **1** or **2** (that is, the unit is a master-enabled unit), then Master Election will be initiated. However, since the running stack Backup Master has a longer run time, assuming that it has been running for more then 10 minutes, it will remain elected as the stack Master and the incoming unit will not become a new stack Master. This may result in an incoming unit using Unit ID=1, and serving as the stack backup master, while the already running unit with Unit ID=2 remains the active stack master.

2. The stack Master at this stage will carry out a **Unit ID allocation and conflict resolution** process.

   - If the incoming unit did not have an assigned Unit ID (that is, it was in factory default mode), it will be assigned the lowest available Unit ID by the Master. It is strongly recommended that automatic assigned unit ID mode be used since it provides better resiliency to the stack.

- If the incoming unit already has an assigned Unit ID, and that Unit ID is unused in the current stack, the incoming unit will keep its assigned Unit ID and the Master will apply to it any configuration relevant to that Unit ID.

- If the incoming unit already has an assigned Unit ID, and that Unit ID conflicts with a unit ID in the current stack, the Master will reallocate a new Unit ID to the incoming unit, giving it the lowest available Unit ID (assuming, of course, that the incoming unit does not have a manually assigned Unit ID, which the Master cannot change).

- If the incoming unit cannot be assigned an available Unit ID for any reason (in the case of unit replacement that can only happen if the incoming unit has a manually assigned Unit ID), then it will be effectively shut down—that is, it will not be joined to the stack.

3. The stack Master will now carry out **Unit and port configuration** for the incoming unit.

- Any configuration information the Master has that is relevant to the number assigned to the incoming unit will be applied. In particular, if the incoming unit was assigned the same Unit ID of the unit it replaces, then it will receive the same configuration as the failed unit, to the extent possible, as described in section "Replacing a Failed Stack Member in a Running Stack" above.

Splitting a Stack

In this example, let us assume that a working stack is split into two groups, either by failure of a stacking link connecting two units in the stack or by a failed unit in a chain topology which causes disconnection between two units in the stack. In this case we should consider each subgroup as an independent running stack configuration. For each subgroup three suboptions will be considered:

- Both the Master unit and the Backup master unit are part of the subgroup.

- Either the Master unit or the Backup master unit are part of the subgroup.

- Neither the Master unit nor the Backup Master unit are part of the subgroup.

The following describes what happens within each subgroup for each of these three suboptions.

Subgroup Contains Both Master Unit and Backup Master Unit

- Nothing changes, except the master sees the missing units as having been removed, and routes traffic around them, as described in section "Replacing a Failed Stack Member in a Running Stack" above.

- Since this subgroup contains both master and backup, the subgroup works, and the other subgroup will not work. Refer to step 3 below for detailed information.

- The sequence of actions is as follows:

  a. The Master Discovery, Master Election and Unit ID Allocation & Duplicate Unit ID Conflict Resolution processes will be executed.

  b. Any configuration information that the Master has that is relevant to the units remaining in the subgroup will remain unchanged.

  c. Topology information (the information for each unit on how to send traffic to any other unit in the stack) managed by the master will include only units that are reachable (connected) following the split.

  d. The subgroup continues to work as before, except that the number of the unit is lower than prior to the split.

  e. No unit ID changes are made in either subgroup.

  f. The Master notifies the system administrator (using SYSLOG messages and SNMP traps) of the removed units and ports which belong to the unreachable units and will be reported as 'not present'.

Subgroup Contains Either Master Unit or Backup Master Unit

- If the Master unit remains in this subgroup, this is the same as described in section "Replacing a Failed Stack Member in a Running Stack" above. If the Backup Master unit remains in this subgroup, then this is the same as section "Stack Master Failure and Replacement" above.

- It should be emphasized that if the stack is split into two parts, one with the master and one with the backup, both parts will work.

- The sequence of actions is as follows:

  a. The Master Discovery, Master Election and Unit ID Allocation & Duplicate Unit ID Conflict Resolution processes will be executed.

  b. If the subgroup contains the Master unit, the stack Master notices (using the master detection process) that some units no longer respond. At the same time the stack Master notifies the system administrator (using SYSLOG messages and SNMP traps) of the removed units and ports which belong to the unreachable units and will be reported as 'not present'.

  c. If the subgroup contains the Backup Master unit, the Backup Master will see as a case of Master failure and take over and manage the remaining units as a stack, while keeping its number as it was

before the split. Since the Backup Master was not acting as a master prior to the split, it will initiate a topology database and port-learning process. Traffic might be halted for a short period of time until synchronization (unit and port configuration) is completed. New units learned by the Backup Master will notify the system administrator (using SYSLOG messages and SNMP traps).

d. In either case (steps b and c above), the subgroup will continue to work as it did before the split, except that the number of units is lower than prior to the split.

e. No unit ID changes are made in either subgroup.

f. Each new stack will have a Master (one has the original Master, the other has the Backup). They thus operate as two separate stacks, both having the same configuration and hence the same IP address.

⚠ **WARNING:** Both resulting stacks will have the same IP Address. This may lead to problems on the network, since there would be no way for users to connect to one of the stacks through its IP address.

Subgroup Contains Neither Master Unit nor Backup Master Unit

Please note that this is exactly the same as the case of a failed master, where no backup is available.

• In this case the units with ID 3-6 (3-4 for SLM248G4S) in this subgroup will not renumber themselves, and will remain shut down until a stack Master enabled unit is connected, and starts to operate as stack master. It is the responsibility of the Master-discovery process to see that the master is gone.

• In this subgroup, the units lose connection with the Master. Since they started as a running stack and none of them are in factory default mode, renumbering will not take place, and even a Reset of the units will not affect unit ID assignment (As noted above, units can be renumbered only by a stack Master).

• No unit ID changes are made in either subgroup.

Again it should be emphasized that none of the units in either half of the stack will renumber themselves.

Merging Two Stacks

In this example, the user would like to merge two working stacks and create one stack out of those two stacks. In this example one should distinguish between two scenarios:

• The incoming units are turned off before insertion and then powered back up afterward

• The two stacks are kept running during the insertion (for example, the stacking cables of the two stacks are connected)

Incoming Units Turned Off Before Insertion, then Turned On After Insertion

This is exactly the same as inserting units into a running stack (refer to "Replacing a Failed Stack Member in a Running Stack"). The only difference is that more than one unit will be inserted into the stack and therefore for each unit inserted to the stack the same process will be executed.

Both Stacks Kept Running During Insertion

If each of the joined stacks has a Master unit, both Master units will perform Master discovery and participate in a Master Election, as described above. One of the Master units will be selected as the Master unit—for the merged stack. The criteria for choosing the master are:

• Force Master

• System Up Time

• Lowest Unit ID

• Lowest MAC

The process of master selection between the two master units is as follows:

• If force master is enabled then the unit which is forced is chosen.

• Up time is measured by quantities of periods of 10 minutes. If the number of 10 minute periods is higher for one of the units then this unit is chosen.

• If both units have the same up time (measured in periods of 10 minutes) the unit with the lowest unit ID is elected.

• If both Master unit IDs are equal the unit with the Lower MAC is chosen.

• The Master unit that loses its "mastership" in the Master election process will be renumbered if the unit ID was dynamically allocated. renumbering will now allocate it a new number by the new Master, as a stack member, or possibly Backup Master. It should be emphasized that in no case will there be two units with the same Unit ID at the end of this process.

• The Master unit that loses its mastership in the Master election process will be shut down if the unit ID was manually allocated. It is recommended that the administrator configure it to auto-assigned Unit ID before reconnecting it to the stack.

It should be emphasized that when two stacks are combined, all of the configuration information for one of the stacks will be lost. Only the surviving master (after the discovery/election process completes) will maintain its configuration information.

The best practice to combine two stacks is to reset the switches in one stack to the factory defaults and then add the switches as described in the "Adding Units to a Running Stack" subsection of section "Normal (Self-Ordering) Stack)."

• If one of the merged stacks had neither a Master unit nor a Backup Master unit, then units belonging to this group will be inserted into the stack in the exact way as described in section "Replacing a Failed Stack Member in a Running Stack" above. The Master will either connect the running units to the stack using the current numbers or will renumber them as necessary. The process described in section ""Replacing a Failed Stack Member in a Running Stack" applies to this case as well.

It should be emphasized that any time two stacks are combined into one stack, there is no way to maintain the configuration for both sets of switches. All dynamic information of the units that belong to the portion of the stack that was not reelected to be the master will be relearned.

Stacking Cable Failure

In this example, let us assume that stacking connection cables failed and caused a stack split, as described in section "Splitting a Stack." When the stacking cable connection is fixed and units are reconnected, it results in merging two stacks as described in section "Merging Two Stacks."

This scenario is feasible only if the topology of the stack is Chain topology. Single stacking cable failure will not cause a stack split if a Ring topology is used.

Inserting Too Many Units

In this example, a user tries to insert too many units into a stack.

1. All units (existing and newly inserted) are powered on at the same time:

   • A Master is elected following the Master Discovery and Master Election processes.

   • All other units will shut down.

   ✓ **NOTE:** In some extreme cases, due to a race condition during the boot process, some of the units might be connected and join the stack.

2. A running group of units is added to an existing stack, assuming each one of the stack groups has an elected Master. The total of existing units and inserted units would exceed the maximum allowed number of units in a stack, which is 6 units for SLM224G4S, or 4 units for SLM248G4S:

   • Master Detection and Master Election processes would determine the master out of one of two combined stacking groups.

   • When switches are added to a running stack, the Unit ID Allocation and Duplicate ID Conflict Resolution process will detect an error if too many switches are present in the stack, and no changes will be made to units that originally belonged to the group managed by the newly elected master. The original switches will retain their ID assignments and configurations. The units that originally belonged to the group managed by the master that lost its master status will be shut down.

Standalone Unit Inserted into a Running Stack

Since the unit is in standalone mode it will not participate in a master discovery process (it will not look for a master and will not respond to master queries). As a result it will not join the stack but will continue to run as a standalone manageable unit.

The ports that are connected to the other units' stacking links will not pass any traffic, and the master will consider them as failed stacking links and route all traffic around them.

Appendix C: Glossary

This glossary contains some basic networking terms you may come across when using this product.

WEB: For additional terms, please visit the glossary at **www.linksys.com/glossary**

Access Mode Specifies the method by which user access is granted to the system.

Access Point A device that allows wireless-equipped computers and other devices to communicate with a wired network. Also used to expand the range of a wireless network.

Access Profiles Allows network managers to define profiles and rules for accessing the device. Access to management functions can be limited to user groups, which are defined by the following criteria:

• Ingress interfaces

• Source IP address and/or Source IP subnets.

ACE Filters in Access Control Lists (ACL) that determine which network traffic is forwarded. An ACE is based on the following criteria:

• Protocol

• Protocol ID

• Source Port

• Destination Port

• Wildcard Mask

• Source IP Address

• Destination IP Address

ACL (Access Control List) Access Control Lists are used to grant, deny, or limit access devices, features, or applications.

Auto-negotiation Allows 10/100 Mbps or 10/100/1000 Mbps Ethernet ports to automatically establish the optimal duplex mode, flow control, and speed.

Back Pressure A mechanism used with Half Duplex mode that enables a port not to receive a message.

Bandwidth The transmission capacity of a given device or network.

Bandwidth Assignments Indicates the amount of bandwidth assigned to a specific application, user, and/or interface.

Baud Indicates the number of signaling elements transmitted each second.

Best Effort Indicates that traffic is assigned to the lowest priority queue, and packet delivery is not guaranteed.

Bit A binary digit.

Boot To start a device and cause it to start executing instructions.

Browser An application program that provides a way to look at and interact with all the information on the World Wide Web.

Bridge A device that connect two networks. Bridges are hardware specific, however they are protocol independent. Bridges operate at Layer 1 and Layer 2 levels.

Broadcast Domain Devices sets that receive broadcast frames originating from any device within a designated set. Routers bind Broadcast domains, because routers do not forward broadcast frames.

Broadcast Storm An excessive amount of broadcast messages simultaneously transmitted across a network by a single port. Forwarded message responses are heaped onto the network, overloading network resources or causing the network to time out.

Burst A packet transmission at faster than normal rates. Bursts are limited in time and only occur under specific conditions.

Burst Size Indicates the burst size transmitted at a faster than normal rate.

Byte A unit of data that is usually eight bits long

Cable Modem A device that connects a computer to the cable television network, which in turn connects to the Internet.

CBS (Committed Burst Size) Indicates the maximum number of data bits transmitted within a specific time interval.

CIR (Committed Information Rate) The data rate is averaged over a minimum time increment.

Class Maps An aspect of Quality of Service system that is comprised of an IP ACL and/or a MAC ACL. Class maps are configured to match packet criteria, and are matched to packets in a first-fit fashion.

Combo Ports A single logical port with two physical connections, including an RJ-45 connection and a SFP connection.

Communities Specifies a group of users which retain the same system access rights.

CoS (Class of Service) The 802.1p priority scheme. CoS provides a method for tagging packets with priority information. A CoS value between 0-7 is added to the Layer II header of packets, where zero is the lowest priority and seven is the highest.

DDNS (Dynamic Domain Name System) Allows the hosting of a website, FTP server, or e-mail server with a fixed domain name (e.g., www.xyz.com) and a dynamic IP address.

Default Gateway A device that forwards Internet traffic from your local area network.

DHCP (Dynamic Host Configuration Protocol) A networking protocol that allows administrators to assign temporary IP addresses to network computers by "leasing" an IP address to a user for a limited amount of time, instead of assigning permanent IP addresses.

DHCP Clients An Internet host using DHCP to obtain configuration parameters, such as a network address.

DHCP Server An Internet host that returns configuration parameters to DHCP clients.

DNS (Domain Name Server) The IP address of your ISP's server, which translates the names of websites into IP addresses.

Domain A specific name for a network of computers.

Download To receive a file transmitted over a network.

DSL (Digital Subscriber Line) An always-on broadband connection over traditional phone lines.

DSCP (DiffServ Code Point) Provides a method of tagging IP packets with QoS priority information.

Dynamic IP Address A temporary IP address assigned by a DHCP server.

EIGRP (Enhanced Interior Gateway Routing Protocol) Provides fast convergence, support for variable-length subnet mask, and supports multiple network layer protocols.

Encryption Encoding data transmitted in a network.

Ethernet IEEE standard network protocol that specifies how data is placed on and retrieved from a common transmission medium.

Firmware The programming code that runs a networking device.

Flow Control Enables lower speed devices to communicate with higher speed devices. This is implemented by the higher speed device refraining from sending packets.

FTP (File Transfer Protocol) A protocol used to transfer files over a TCP/IP network.

Full Duplex The ability of a networking device to receive and transmit data simultaneously.

GARP (General Attributes Registration Protocol) Registers client stations into a multicast domain.

Gateway A device that interconnects networks with different, incompatible communications protocols.

GBIC (GigaBit Interface Converter) A hardware module used to attach network devices to fiber-based transmission systems. GBIC converts the serial electrical signals to serial optical signals and vice versa.

GVRP (GARP VLAN Registration Protocol) Registers client stations into a VLANs.

Half Duplex Data transmission that can occur in two directions over a single line, but only one direction at a time.

HTTP (HyperText Transport Protocol) The communications protocol used to connect to servers on the World Wide Web.

HTTPS (HyperText Transport Protocol Secure) An extension to the standard HTTP protocol that provides confidentiality by encrypting the traffic from the website. By default this protocol uses TCP port 443.

ICMP (Internet Control Message Protocol) Allows the gateway or destination host to communicate with the source host. For example, to report a processing error.

IGMP (Internet Group Management Protocol) Allows hosts to notify their local switch or router that they want to receive transmissions assigned to a specific multicast group.

IP (Internet Protocol) A protocol used to send data over a network.

IP Address The address used to identify a computer or device on a network.

IPCONFIG A Windows 2000 and XP utility that displays the IP address for a particular networking device.

IPSec (Internet Protocol Security) A VPN protocol used to implement secure exchange of packets at the IP layer.

ISP (Internet Service Provider) A company that provides access to the Internet.

Jumbo Frames Enable transporting identical data in fewer frames. Jumbo Frames reduce overhead, lower processing time, and ensure fewer interrupts.

LAG (Link Aggregated Group) Aggregates ports or VLANs into a single virtual port or VLAN.

LAN The computers and networking products that make up your local network.

MAC (Media Access Control) Address The unique address that a manufacturer assigns to each networking device.

Mask A filter that includes or excludes certain values, for example parts of an IP address.

Mbps (MegaBits Per Second) One million bits per second; a unit of measurement for data transmission.

MD5 (Message Digest 5) An algorithm that produces a 128-bit hash. MD5 is a variation of MD4, and increases MD4 security. MD5 verifies the integrity of the communication and authenticates the origin of the communication.

MDI (Media Dependent Interface) A cable used for end stations.

MDIX (Media Dependent Interface with Crossover) A cable used for hubs and switches.

MIB (Management Information Base) MIBs contain information describing specific aspects of network components.

Multicast Transmits copies of a single packet to multiple ports.

Network A series of computers or devices connected for the purpose of data sharing, storage, and/or transmission between users.

NMS (Network Management System) An interface that provides a method of managing a system.

OID (Object Identifier) Used by SNMP to identify managed objects. In the SNMP Manager/Agent network management paradigm, each managed object must have an OID to identify it.

Packet A unit of data sent over a network.

Ping (Packet INternet Groper) An Internet utility used to determine whether a particular IP address is online.

Policing Determines if traffic levels are within a specified profile. Policing manages the maximum traffic rate used to send or receive packets on an interface.

Port The connection point on a computer or networking device used for plugging in cables or adapters.

Port Mirroring Monitors and mirrors network traffic by forwarding copies of incoming and outgoing packets from one port to a monitoring port.

Power over Ethernet (PoE) A technology enabling an Ethernet network cable to deliver both data and power.

QoS (Quality of Service) Provides policies that contain sets of filters (rules). QoS allows network managers to decide how and what network traffic is forwarded according to priorities, application types, and source and destination addresses.

RADIUS (Remote Authentication Dial-In User Service) A protocol that uses an authentication server to control network access.

RJ-45 (Registered Jack-45) An Ethernet connector that holds up to eight wires.

RMON (Remote Monitoring) Provides network information to be collected from a single workstation.

Router A networking device that connects multiple networks together.

RSTP (Rapid Spanning Tree Protocol) Detects and uses network topologies that allow a faster convergence of the spanning tree, without creating forwarding loops.

Server Any computer whose function in a network is to provide user access to files, printing, communications, and other services.

SMTP (Simple Mail Transfer Protocol) The standard e-mail protocol on the Internet.

SNMP (Simple Network Management Protocol) A widely used network monitoring and control protocol.

SSH Secure Shell. A utility that uses strong authentication and secure communications to log in to another computer over a network.

SSL (Secure Socket Layer) Encryption technology for the Internet used to provide secure transactions, such as the transmission of credit card numbers for e-commerce.

Static IP Address A fixed address assigned to a computer or device that is connected to a network.

STP (Spanning Tree Protocol) Prevents loops in network traffic. The Spanning Tree Protocol (STP) provides tree topography for any arrangement of bridges. STP provides one path between end stations on a network, eliminating loops.

Subnet (Sub-network) Subnets are portions of a network that share a common address component. In TCP/IP networks, devices that share a prefix are part of the same subnet. For example, all devices with a prefix of 157.100.100.100 are part of the same subnet.

Subnet Mask An address code that determines the size of the network.

Switch Filters and forwards packets between LAN segments. Switches support any packet protocol type.

TACACS+ (Terminal Access Controller Access Control System Plus) Proprietary Cisco enhancement to Terminal Access Controller Access Control System (TACACS). Provides additional support for authentication, authorization, and accounting.

TCP (Transmission Control Protocol) A network protocol for transmitting data that requires acknowledgement from the recipient of data sent.

TCP/IP (Transmission Control Protocol/Internet Protocol) A set of instructions PCs use to communicate over a network.

Telnet A user command and TCP/IP protocol used for accessing remote PCs.

TFTP (Trivial File Transfer Protocol) A version of the TCP/IP FTP protocol that has no directory or password capability.

Throughput The amount of data moved successfully from one node to another in a given time period.

Trunking Link Aggregation. Optimizes port usage by linking a group of ports together to form a single trunk (aggregated groups).

TX Rate Transmission Rate.

UDP (User Data Protocol) Communication protocol that transmits packets but does not guarantee their delivery.

Upgrade To replace existing software or firmware with a newer version.

Upload To transmit a file over a network.

URL (Uniform Resource Locator) The address of a file located on the Internet.

VLAN (Virtual Local Area Networks) Logical subgroups that constitute a Local Area Network (LAN). This is done in software rather than defining a hardware solution.

WAN (Wide Area Network) Networks that cover a large geographical area.

Wildcard Mask Specifies which IP address bits are used, and which bits are ignored. A wild card mask of 255.255.255.255 indicates that no bit is important. A wildcard of 0.0.0.0 indicates that all the bits are important.

For example, if the destination IP address is 149.36.184.198 and the wildcard mask is 255.36.184.00, the first two bits of the IP address are used, while the last two bits are ignored.

Appendix D:
Specifications

SLM224G4S/SLM248G4S

Specifications

Ports	24 or 48 RJ-45 connectors for 10BASE-T, 100BASE-TX, and 1000BASE-T with 2 shared SFP slots and 2 Gigabit ports
Buttons	None
Cabling Type	UTP CAT 5 or better for 10BASE-T/100BASE-T, UTP CAT 5e or better for 1000BASE-T
LEDs	Power, Link/Act, Speed

Performance

Switching Capacity	**SLM224G4S:** 12.8 Gbps non-blocking
	SLM248G4S: 17.6 Gbps non-blocking
MAC Table Size	8K
Number of VLANs	128

Stacking

Stack Operation	SLM224G4S: Up to 6 in stack (max. 192 ports with SLM248G4S)
	SLM248G4S: Up to 4 in stack (max. 192 ports with SLM224G4S)
	Hot Insertion and removal
	Ring and Chain stacking options
	Master and Backup master for resilient stack control
	Auto-numbering or manual configuration of units in stack

Management

Web User Interface	Built-in Web UI for easy browser-based configuration (HTTP)
SNMP	SNMP versions 1, 2c, 3 Support for traps
SNMP MIBs	RFC1213 MIB-2, RFC2863 Interface MIB, RFC2665 Ether-like MIB, RFC1493 Bridge MIB, RFC2674 Extended Bridge MIB (P-bridge, Q-bridge), RFC2819 RMON MIB (groups 1,2,3,9 only), RFC2737 Entity MIB, RFC 2618 RADIUS Client MIB
RMON	Embedded Remote Monitoring (RMON) software agent supports four RMON groups (history, statistics, alarms, and events) for enhanced traffic management, monitoring, and analysis
Firmware Upgrade	Web Browser upgrade (HTTP) and TFTP upgrade
Port Mirroring	Traffic on a port can be mirrored to another port for analysis with a network analyzer or RMON probe
Other Management	Switch Audit Log DHCP Client BootP SNTP Xmodem upgrade Cable Diagnostics Port Mirroring PING

Security Features

IEEE 802.1x	802.1X - RADIUS Authentication. MD5 Encryption
Access Control	ToS/DSCP

Availability

Link Aggregation	Link Aggregation using IEEE 802.3ad LACP Up to 8 ports in up to 8 trunks
Storm Control	Broadcast and Multicast
Spanning Tree	IEEE 802.1D Spanning Tree, Fast Linkover
IGMP Snooping	IGMP (v1/v2) Snooping provides for fast client joins and leaves of multicast streams and limits bandwidth-intensive video traffic to only the requestors.

QoS

Priority levels	4 Hardware queues
Scheduling	Priority Queueing and Weighted Round Robin (WRR)
Class of Service	Port-based 802.1p VLAN priority-based IPv4 IP precedence/ToS/DSCP

Layer 2

VLAN   Port-based and 802.1q-based VLANs

HOL Blocking   Head of line blocking prevention

Jumbo frame   Supports up to 9K byte frames

Standards

                          802.3 10BASE-T Ethernet,
                          802.3u 100BASE-TX Fast Ethernet,
                          802.3ab 1000BASE-T Gigabit Ethernet,
                          802.3z Gigabit Ethernet,
                          802.3x Flow Control

Environmental

Dimensions   **SLM224G4S:**
(W x H x D)   16.93" x 1.75" x 8.00"
                          (430 x 44.45 x 203.3 mm)

                          SLM248G4S:
                          17.32" x 1.75" x 13.81"
                          (440 x 44.45 x 350.8 mm)

Unit Weight   **SLM224G4S**: 4.25 lb (1.927 kg)
                          SLM248G4S: 8.77 lb (3.98 kg)

Power   100-240V 0.5A

Certification   FCC Part15 Class A, CE Class A,
                          UL CSA (CSA22.2), CE mark, CB

Operating Temp.   32 to 104ºF (0 to 40ºC)

Storage Temp.   -4 to 158ºF (-20 to 70ºC)

Operating Humidity   20 to 95% Noncondensing

Storage Humidity   5 to 90% Noncondensing

Specifications are subject to change without notice.

Appendix E:
Warranty Information

Limited Warranty

Linksys warrants this Linksys hardware product against defects in materials and workmanship under normal use for the Warranty Period, which begins on the date of purchase by the original end-user purchaser and lasts for the period specified for this product at **www.linksys.com/warranty**. The internet URL address and the web pages referred to herein may be updated by Linksys from time to time; the version in effect at the date of purchase shall apply.

This limited warranty is non-transferable and extends only to the original end-user purchaser. Your exclusive remedy and Linksys' entire liability under this limited warranty will be for Linksys, at its option, to (a) repair the product with new or refurbished parts, (b) replace the product with a reasonably available equivalent new or refurbished Linksys product, or (c) refund the purchase price of the product less any rebates. Any repaired or replacement products will be warranted for the remainder of the original Warranty Period or thirty (30) days, whichever is longer. All products and parts that are replaced become the property of Linksys.

Exclusions and Limitations

This limited warranty does not apply if: (a) the product assembly seal has been removed or damaged, (b) the product has been altered or modified, except by Linksys, (c) the product damage was caused by use with non-Linksys products, (d) the product has not been installed, operated, repaired, or maintained in accordance with instructions supplied by Linksys, (e) the product has been subjected to abnormal physical or electrical stress, misuse, negligence, or accident, (f) the serial number on the Product has been altered, defaced, or removed, or (g) the product is supplied or licensed for beta, evaluation, testing or demonstration purposes for which Linksys does not charge a purchase price or license fee.

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Obtaining Warranty Service

If you have a question about your product or experience a problem with it, please go to **www.linksys.com/support** where you will find a variety of online support tools and information to assist you with your product. If the product proves defective during the Warranty Period, contact the Value Added Reseller (VAR) from whom you purchased the product or Linksys Technical Support for instructions on how to obtain warranty service. The telephone number for Linksys Technical Support in your area can be found in the product User Guide and at **www.linksys.com**. Have your product serial number and proof of purchase on hand when calling. A DATED PROOF OF ORIGINAL PURCHASE IS REQUIRED TO PROCESS WARRANTY CLAIMS. If you are requested to return your product, you will be given a Return Materials Authorization (RMA) number. You are responsible for properly packaging and shipping your

product to Linksys at your cost and risk. You must include the RMA number and a copy of your dated proof of original purchase when returning your product. Products received without a RMA number and dated proof of original purchase will be rejected. Do not include any other items with the product you are returning to Linksys. Defective product covered by this limited warranty will be repaired or replaced and returned to you without charge. Customers outside of the United States of America and Canada are responsible for all shipping and handling charges, custom duties, VAT and other associated taxes and charges. Repairs or replacements not covered under this limited warranty will be subject to charge at Linksys' then-current rates.

Technical Support

This limited warranty is neither a service nor a support contract. Information about Linksys' current technical support offerings and policies (including any fees for support services) can be found at:
www.linksys.com/support.

This limited warranty is governed by the laws of the jurisdiction in which the Product was purchased by you.

Please direct all inquiries to: Linksys, P.O. Box 18558, Irvine, CA 92623.

Appendix F:
Regulatory Information

FCC Statement

This equipment has been tested and complies with the specifications for a Class A digital device, pursuant to 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. These limits are designed to provide reasonable protection against harmful interference when equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

> **WARNING:** You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

Safety Notices

- Caution: To reduce the risk of fire, use only No.26 AWG or larger telecommunication line cord.
- Do not use this product near water, for example, in a wet basement or near a swimming pool.
- Avoid using this product during an electrical storm. There may be a remote risk of electric shock from lightning.

> **WARNING:** This product contains lead, known to the State of California to cause cancer, and birth defects or other reproductive harm. Wash hands after handling.

Industry Canada Statement

This Class A digital apparatus complies with Canadian ICES-003.

Operation is subject to the following two conditions:

1. This device may not cause interference and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Avis d' Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 d' Industrie Canada.

Le fonctionnement est soumis aux conditions suivantes :

1. Ce périphérique ne doit pas causer d'interférences;
2. Ce périphérique doit accepter toutes les interférences reçues, y compris celles qui risquent d'entraîner un fonctionnement indésirable.

User Information for Consumer Products Covered by EU Directive 2002/96/EC on Waste Electric and Electronic Equipment (WEEE)

This document contains important information for users with regards to the proper disposal and recycling of Linksys products. Consumers are required to comply with this notice for all electronic products bearing the following symbol:

English - Environmental Information for Customers in the European Union

European Directive 2002/96/EC requires that the equipment bearing this symbol ⌧ on the product and/or its packaging must not be disposed of with unsorted municipal waste. The symbol indicates that this product should be disposed of separately from regular household waste streams. It is your responsibility to dispose of this and other electric and electronic equipment via designated collection facilities appointed by the government or local authorities. Correct disposal and recycling will help prevent potential negative consequences to the environment and human health. For more detailed information about the disposal of your old equipment, please contact your local authorities, waste disposal service, or the shop where you purchased the product.

Български (Bulgarian) - Информация относно опазването на околната среда за потребители в Европейския съюз

Европейска директива 2002/96/EC изисква уредите, носещи този символ ⌧ върху изделието и/или опаковката му, да не се изхвърля т с несортирани битови отпадъци. Символът обозначава, че изделието трябва да се изхвърля отделно от сметосъбирането на обикновените битови отпадъци. Ваша е отговорността този и другите електрически и електронни уреди да се изхвърлят в предварително определени от държавните или общински органи специализирани пунктове за събиране. Правилното изхвърляне и рециклиране ще спомогнат да се предотвратят евентуални вредни за околната среда и здравето на населението последствия. За по-подробна информация относно изхвърлянето на вашите стари уреди се обърнете към местните власти, службите за сметосъбиране или магазина, от който сте закупили уреда.

Ceština (Czech) - Informace o ochraně životního prostředí pro zákazníky v zemích Evropské unie

Evropská směrnice 2002/96/ES zakazuje, aby zařízení označené tímto symbolem ⌧ na produktu anebo na obalu bylo likvidováno s netříděným komunálním odpadem. Tento symbol udává, že daný produkt musí být likvidován odděleně od běžného komunálního odpadu. Odpovídáte za likvidaci tohoto produktu a dalších elektrických a elektronických zařízení prostřednictvím určených sběrných míst stanovených vládou nebo místními úřady. Správná likvidace a recyklace pomáhá předcházet potenciálním negativním dopadům na životní prostředí a lidské zdraví. Podrobnější informace o likvidaci starého vybavení si laskavě vyžádejte od místních úřadů, podniku zabývajícího se likvidací komunálních odpadů nebo obchodu, kde jste produkt zakoupili.

Dansk (Danish) - Miljøinformation for kunder i EU

EU-direktiv 2002/96/EF kræver, at udstyr der bærer dette symbol ⌧ på produktet og/eller emballagen ikke må bortskaffes som usorteret kommunalt affald. Symbolet betyder, at dette produkt skal bortskaffes adskilt fra det almindelige husholdningsaffald. Det er dit ansvar at bortskaffe dette og andet elektrisk og elektronisk udstyr via bestemte indsamlingssteder udpeget af staten eller de lokale myndigheder. Korrekt bortskaffelse og genvinding vil hjælpe med til at undgå mulige skader for miljøet og menneskers sundhed. Kontakt venligst de lokale myndigheder, renovationstjenesten eller den butik, hvor du har købt produktet, angående mere detaljeret information om bortskaffelse af dit gamle udstyr.

Deutsch (German) - Umweltinformation für Kunden innerhalb der Europäischen Union

Die Europäische Richtlinie 2002/96/EC verlangt, dass technische Ausrüstung, die direkt am Gerät und/oder an der Verpackung mit diesem Symbol versehen ist ⌧, nicht zusammen mit unsortiertem Gemeindeabfall entsorgt werden darf. Das Symbol weist darauf hin, dass das Produkt von regulärem Haushaltmüll getrennt entsorgt werden sollte. Es liegt in Ihrer Verantwortung, dieses Gerät und andere elektrische und elektronische Geräte über die dafür zuständigen und von der Regierung oder örtlichen Behörden dazu bestimmten Sammelstellen zu entsorgen. Ordnungsgemäßes Entsorgen und Recyceln trägt dazu bei, potentielle negative Folgen für Umwelt und die menschliche Gesundheit zu vermeiden. Wenn Sie weitere Informationen zur Entsorgung Ihrer Altgeräte benötigen, wenden Sie sich bitte an die örtlichen Behörden oder städtischen Entsorgungsdienste oder an den Händler, bei dem Sie das Produkt erworben haben.

Eesti (Estonian) - Keskkonnaalane informatsioon Euroopa Liidus asuvatele klientidele

Euroopa Liidu direktiivi 2002/96/EÜ nõuete kohaselt on seadmeid, millel on tootel või pakendil käesolev sümbol ⌧, keelatud kõrvaldada koos sorteerimata olmejäätmetega. See sümbol näitab, et toode tuleks kõrvaldada eraldi tavalistest olmejäätmevoogudest. Olete kohustatud kõrvaldama käesoleva ja ka muud elektri- ja elektroonikaseadmed riigi või kohalike ametiasutuste poolt ette nähtud kogumispunktide kaudu. Seadmete korrektne kõrvaldamine ja ringlussevõtt aitab vältida võimalikke negatiivseid tagajärgi keskkonnale ning inimeste tervisele. Vanade seadmete kõrvaldamise kohta täpsema informatsiooni saamiseks võtke palun ühendust kohalike ametiasutustega, jäätmekäitlusfirmaga või kauplusega, kust te toote ostsite.

Español (Spanish) - Información medioambiental para clientes de la Unión Europea

La Directiva 2002/96/CE de la UE exige que los equipos que lleven este símbolo ⌧ en el propio aparato y/o en su embalaje no deben eliminarse junto con otros residuos urbanos no seleccionados. El símbolo indica que el producto en cuestión debe separarse de los residuos domésticos convencionales con vistas a su eliminación. Es responsabilidad suya desechar este y cualesquiera otros aparatos eléctricos y electrónicos a través de los puntos de recogida que ponen a su disposición el gobierno y las autoridades locales. Al desechar y reciclar correctamente estos aparatos estará contribuyendo a evitar posibles consecuencias negativas para el medio ambiente y la salud de las personas. Si desea obtener información más detallada sobre la eliminación segura de su aparato usado, consulte a las autoridades locales, al servicio de recogida y eliminación de residuos de su zona o pregunte en la tienda donde adquirió el producto.

Ελληνικά (Greek) - Στοιχεία περιβαλλοντικής προστασίας για πελάτες εντός της Ευρωπαϊκής Ένωσης

Η Κοινοτική Οδηγία 2002/96/EC απαιτεί ότι ο εξοπλισμός ο οποίος φέρει αυτό το σύμβολο ⌧ στο προϊόν και/ή στη συσκευασία του δεν πρέπει να απορρίπτεται μαζί με τα μικτά κοινοτικά απορρίμματα. Το σύμβολο υποδεικνύει ότι αυτό το προϊόν θα πρέπει να απορρίπτεται ξεχωριστά από τα συνήθη οικιακά απορρίμματα. Είστε υπεύθυνος για την απόρριψη του παρόντος και άλλου ηλεκτρικού και ηλεκτρονικού εξοπλισμού μέσω των καθορισμένων εγκαταστάσεων συγκέντρωσης απορριμμάτων οι οποίες παρέχονται από το κράτος ή τις αρμόδιες τοπικές αρχές. Η σωστή απόρριψη και ανακύκλωση συμβάλλει στην πρόληψη πιθανών αρνητικών συνεπειών για το περιβάλλον και την υγεία. Για περισσότερες πληροφορίες σχετικά με την απόρριψη του παλιού σας εξοπλισμού, παρακαλώ επικοινωνήστε με τις τοπικές αρχές, τις υπηρεσίες απόρριψης ή το κατάστημα από το οποίο αγοράσατε το προϊόν.

Français (French) - Informations environnementales pour les clients de l'Union européenne

La directive européenne 2002/96/CE exige que l'équipement sur lequel est apposé ce symbole ⌧ sur le produit et/ou son emballage ne soit pas jeté avec les autres ordures ménagères. Ce symbole indique que le produit doit être éliminé dans un circuit distinct de celui pour les déchets des ménages. Il est de votre responsabilité de jeter ce matériel ainsi que tout autre matériel électrique ou électronique par les moyens de collecte indiqués par le gouvernement et les pouvoirs publics des collectivités territoriales. L'élimination et le recyclage en bonne et due forme ont pour but de lutter contre l'impact néfaste potentiel de ce type de produits sur l'environnement et la santé publique. Pour plus d'informations sur le mode d'élimination de votre ancien équipement, veuillez prendre contact avec les pouvoirs publics locaux, le service de traitement des déchets, ou l'endroit où vous avez acheté le produit.

Italiano (Italian) - Informazioni relative all'ambiente per i clienti residenti nell'Unione Europea

La direttiva europea 2002/96/EC richiede che le apparecchiature contrassegnate con questo simbolo ⌧ sul prodotto e/o sull'imballaggio non siano smaltite insieme ai rifiuti urbani non differenziati. Il simbolo indica che questo prodotto non deve essere smaltito insieme ai normali rifiuti domestici. È responsabilità del proprietario smaltire sia questi prodotti sia le altre apparecchiature elettriche ed elettroniche mediante le specifiche strutture di raccolta indicate dal governo o dagli enti pubblici locali. Il corretto smaltimento ed il riciclaggio aiuteranno a prevenire conseguenze potenzialmente negative per l'ambiente e per la salute dell'essere umano. Per ricevere informazioni più dettagliate circa lo smaltimento delle vecchie apparecchiature in Vostro possesso, Vi invitiamo a contattare gli enti pubblici di competenza, il servizio di smaltimento rifiuti o il negozio nel quale avete acquistato il prodotto.

Latviešu valoda (Latvian) - Ekoloģiska informācija klientiem Eiropas Savienības jurisdikcijā

Direktīvā 2002/96/EK ir prasība, ka aprīkojumu, kam pievienota zīme ⌧ uz paša izstrādājuma vai uz tā iesaiņojuma, nedrīkst izmest nešķirotā veidā kopā ar komunālajiem atkritumiem (tiem, ko rada vietēji iedzīvotāji un uzņēmumi). Šī zīme nozīmē to, ka šī ierīce ir jāizmet atkritumos tā, lai tā nenonāktu kopā ar parastiem mājsaimniecības atkritumiem. Jūsu pienākums ir šo un citas elektriskas un elektroniskas ierīces izmest atkritumos, izmantojot īpašus atkritumu savākšanas veidus un līdzekļus, ko nodrošina valsts un pašvaldību iestādes. Ja izmešana atkritumos un pārstrāde tiek veikta pareizi, tad mazinās iespējamais kaitējums dabai un cilvēku veselībai. Sīkākas ziņas par novecojuša aprīkojuma izmešanu atkritumos jūs varat saņemt vietējā pašvaldībā, atkritumu savākšanas dienestā, kā arī veikalā, kur iegādājāties šo izstrādājumu.

Lietuvškai (Lithuanian) - Aplinkosaugos informacija, skirta Europos Sąjungos vartotojams

Europos direktyva 2002/96/EC numato, kad įrangos, kuri ir ⌧ kurios pakuotė yra pažymėta šiuo simboliu (įveskite simbolį), negalima šalinti kartu su nerūšiuotomis komunalinėmis atliekomis. Šis simbolis rodo, kad gaminį reikia šalinti atskirai nuo bendro buitinių atliekų srauto. Jūs privalote užtikrinti, kad ši ir kita elektros ar elektroninė įranga būtų šalinama per tam tikras nacionalinės ar vietinės valdžios nustatytas atliekų rinkimo sistemas. Tinkamai šalinant ir perdirbant atliekas, bus išvengta galimos žalos aplinkai ir žmonių sveikatai. Daugiau informacijos apie jūsų senos įrangos šalinimą gali pateikti vietinės valdžios institucijos, atliekų šalinimo tarnybos arba parduotuvės, kuriose įsigijote tą gaminį.

Malti (Maltese) - Informazzjoni Ambjentali għal Klijenti fl-Unjoni Ewropea

Id-Direttiva Ewropea 2002/96/KE titlob li t-tagħmir li jkun fih is-simbolu ⌧ fuq il-prodott u/jew fuq l-ippakkjar ma jistax jintrema ma' skart muniċipali li ma ġiex isseparat. Is-simbolu jindika li dan il-prodott għandu jintrema separatament minn ma' l-iskart domestiku regolari. Hija responsabbiltà tiegħek li tarmi dan it-tagħmir u kull tagħmir ieħor ta' l-elettriku u elettroniku permezz ta' faċilitajiet ta' ġbir appuntati apposta mill-gvern jew mill-awtoritajiet lokali. Ir-rimi b'mod korrett u r-riċiklaġġ jgħin jipprevjeni konsegwenzi negattivi potenzjali għall-ambjent u għas-saħħa tal-bniedem. Għal aktar informazzjoni dettaljata dwar ir-rimi tat-tagħmir antik tiegħek, jekk jogħġbok ikkuntattja lill-awtoritajiet lokali tiegħek, is-servizzi għar-rimi ta' l-iskart, jew il-ħanut minn fejn xtrajt il-prodott.

Magyar (Hungarian) - Környezetvédelmi információ az európai uniós vásárlók számára

A 2002/96/EC számú európai uniós irányelv megkívánja, hogy azokat a termékeket, amelyeken, és/vagy amelyek csomagolásán az alábbi címke ⌧ megjelenik, tilos a többi szelektálatlan lakossági hulladékkal együtt kidobni. A címke azt jelöli, hogy az adott termék kidobásakor a szokványos háztartási hulladékelszállítási rendszerektõl elkülönített eljárást kell alkalmazni. Az Ön felelõssége, hogy ezt, és más elektromos és elektronikus berendezéseit a kormányzati vagy a helyi hatóságok által kijelölt gyűjtõredszereken keresztül számolja fel. A megfelelõ hulladékfeldolgozás segít a környezetre és az emberi egészségre potenciálisan ártalmas negatív hatások megelõzésében. Ha elavult berendezéseinek felszámolásához további részletes információra van szüksége, kérjük, lépjen kapcsolatba a helyi hatóságokkal, a hulladékfeldolgozási szolgálattal, vagy azzal az üzlettel, ahol a terméket vásárolta.

Nederlands (Dutch) - Milieu-informatie voor klanten in de Europese Unie

De Europese Richtlijn 2002/96/EC schrijft voor dat apparatuur die is voorzien van dit symbool ⌧ op het product of de verpakking, niet mag worden ingezameld met niet-gescheiden huishoudelijk afval. Dit symbool geeft aan dat het product apart moet worden ingezameld. U bent zelf verantwoordelijk voor de vernietiging van deze en andere elektrische en elektronische apparatuur via de daarvoor door de landelijke of plaatselijke overheid aangewezen inzamelingskanalen. De juiste vernietiging en recycling van deze apparatuur voorkomt mogelijke negatieve gevolgen voor het milieu en de gezondheid. Voor meer informatie over het vernietigen van uw oude apparatuur neemt u contact op met de plaatselijke autoriteiten of afvalverwerkingsdienst, of met de winkel waar u het product hebt aangeschaft.

Norsk (Norwegian) - Miljøinformasjon for kunder i EU

EU-direktiv 2002/96/EF krever at utstyr med følgende symbol ⌧ avbildet på produktet og/eller pakningen, ikke må kastes sammen med usortert avfall. Symbolet indikerer at dette produktet skal håndteres atskilt fra ordinær avfallsinnsamling for husholdningsavfall. Det er ditt ansvar å kvitte deg med dette produktet og annet elektrisk og elektronisk avfall via egne innsamlingsordninger slik myndighetene eller kommunene bestemmer. Korrekt avfallshåndtering og gjenvinning vil være med på å forhindre mulige negative konsekvenser for miljø og helse. For nærmere informasjon om håndtering av det kasserte utstyret ditt, kan du ta kontakt med kommunen, en innsamlingsstasjon for avfall eller butikken der du kjøpte produktet.

Polski (Polish) - Informacja dla klientów w Unii Europejskiej o przepisach dotyczących ochrony środowiska

Dyrektywa Europejska 2002/96/EC wymaga, aby sprzęt oznaczony symbolem ⌧ znajdującym się na produkcie i/lub jego opakowaniu nie był wyrzucany razem z innymi niesortowanymi odpadami komunalnymi. Symbol ten wskazuje, że produkt nie powinien być usuwany razem ze zwykłymi odpadami z gospodarstw domowych. Na Państwu spoczywa obowiązek wyrzucania tego i innych urządzeń elektrycznych oraz elektronicznych w punktach odbioru wyznaczonych przez władze krajowe lub lokalne. Pozbywanie się sprzętu we właściwy sposób i jego recykling pomogą zapobiec potencjalnie negatywnym konsekwencjom dla środowiska i zdrowia ludzkiego. W celu uzyskania szczegółowych informacji o usuwaniu starego sprzętu, prosimy zwrócić się do lokalnych władz, służb oczyszczania miasta lub sklepu, w którym produkt został nabyty.

Português (Portuguese) - Informação ambiental para clientes da União Europeia

A Directiva Europeia 2002/96/CE exige que o equipamento que exibe este símbolo no produto e/ou na sua embalagem não seja eliminado junto com os resíduos municipais não separados. O símbolo indica que este produto deve ser eliminado separadamente dos resíduos domésticos regulares. É da sua responsabilidade eliminar este e qualquer outro equipamento eléctrico e electrónico através das instalações de recolha designadas pelas autoridades governamentais ou locais. A eliminação e reciclagem correctas ajudarão a prevenir as consequências negativas para o ambiente e para a saúde humana. Para obter informações mais detalhadas sobre a forma de eliminar o seu equipamento antigo, contacte as autoridades locais, os serviços de eliminação de resíduos ou o estabelecimento comercial onde adquiriu o produto.

Română (Romanian) - Informaţii de mediu pentru clienţii din Uniunea Europeană

Directiva europeană 2002/96/CE impune ca echipamentele care prezintă acest simbol pe produs şi/sau pe ambalajul acestuia să nu fie casate împreună cu gunoiul menajer municipal. Simbolul indică faptul că acest produs trebuie să fie casat separat de gunoiul menajer obişnuit. Este responsabilitatea dvs. să casaţi acest produs şi alte echipamente electrice şi electronice prin intermediul unităţilor de colectare special desemnate de guvern sau de autorităţile locale. Casarea şi reciclarea corecte vor ajuta la prevenirea potenţialelor consecinţe negative asupra sănătăţii mediului şi a oamenilor. Pentru mai multe informaţii detaliate cu privire la casarea acestui echipament vechi, contactaţi autorităţile locale, serviciul de salubrizare sau magazinul de la care aţi achiziţionat produsul.

Slovenčina (Slovak) - Informácie o ochrane životného prostredia pre zákazníkov v Európskej únii

Podľa európskej smernice 2002/96/ES zariadenie s týmto symbolom na produkte a/alebo jeho balení nesmie byť likvidované spolu s netriedeným komunálnym odpadom. Symbol znamená, že produkt by sa mal likvidovať oddelene od bežného odpadu z domácností. Je vašou povinnosťou likvidovať toto i ostatné elektrické a elektronické zariadenia prostredníctvom špecializovaných zberných zariadení určených vládou alebo miestnymi orgánmi. Správna likvidácia a recyklácia pomôže zabrániť prípadným negatívnym dopadom na životné prostredie a zdravie ľudí. Ak máte záujem o podrobnejšie informácie o likvidácii starého zariadenia, obráťte sa, prosím, na miestne orgány, organizácie zaoberajúce sa likvidáciou odpadov alebo obchod, v ktorom ste si produkt zakúpili.

Slovenčina (Slovene) - Okoljske informacije za stranke v Evropski uniji

Evropska direktiva 2002/96/EC prepoveduje odlaganje opreme, označene s tem simbolom – na izdelku in/ali na embalaži – med običajne, nerazvrščene odpadke. Ta simbol opozarja, da je treba izdelek odvreči ločeno od preostalih gospodinjskih odpadkov. Vaša odgovornost je, da to in preostalo električno in elektronsko opremo odnesete na posebna zbirališča, ki jih določijo državne ustanove ali lokalna uprava. S pravilnim odlaganjem in recikliranjem boste preprečili morebitne škodljive vplive na okolje in zdravje ljudi. Če želite izvedeti več o odlaganju stare opreme, se obrnite na lokalno upravo, odpad ali trgovino, kjer ste izdelek kupili.

Suomi (Finnish) - Ympäristöä koskevia tietoja EU-alueen asiakkaille

EU-direktiivi 2002/96/EY edellyttää, että jos laitteistossa on tämä symboli itse tuotteessa ja/tai sen pakkauksessa, laitteistoa ei saa hävittää lajittelemattoman yhdyskuntajätteen mukana. Symboli merkitsee sitä, että tämä tuote on hävitettävä erillään tavallisesta kotitalousjätteestä. Sinun vastuullasi on hävittää tämä elektroniikkatuote ja muut vastaavat elektroniikkatuotteet viemällä tuote tai tuotteet viranomaisten määräämään keräyspisteeseen. Laitteiston oikea hävittäminen estää mahdolliset kielteiset vaikutukset ympäristöön ja ihmisten terveyteen. Lisätietoja vanhan laitteiston oikeasta hävitystavasta saa paikallisilta viranomaisilta, jätteenhävityspalvelusta tai siitä myymälästä, josta ostit tuotteen.

Svenska (Swedish) - Miljöinformation för kunder i Europeiska unionen

Det europeiska direktivet 2002/96/EC kräver att utrustning med denna symbol på produkten och/eller förpackningen inte får kastas med osorterat kommunalt avfall. Symbolen visar att denna produkt bör kastas efter att den avskiljts från vanligt hushållsavfall. Det faller på ditt ansvar att kasta denna och annan elektrisk och elektronisk utrustning på fastställda insamlingsplatser utsedda av regeringen eller lokala myndigheter. Korrekt kassering och återvinning skyddar mot eventuella negativa konsekvenser för miljön och personhälsa. För mer detaljerad information om kassering av din gamla utrustning kontaktar du dina lokala myndigheter, avfallshanteringen eller butiken där du köpte produkten.

WEB: For additional information, please visit **www.linksys.com**

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Appendix G:
Contact Information

Linksys Contact Information	
Website	http://www.linksys.com
Support Site	http://www.linksys.com/support
FTP Site	ftp.linksys.com
Advice Line	800-546-5797 (LINKSYS)
Support	800-326-7114
RMA (Return Merchandise Authorization)	http://www.linksys.com/warranty

NOTE: Details on warranty and RMA issues can be found in the Warranty section of this Guide.

Free Manuals Download Website

http://myh66.com

http://usermanuals.us

http://www.somanuals.com

http://www.4manuals.cc

http://www.manual-lib.com

http://www.404manual.com

http://www.luxmanual.com

http://aubethermostatmanual.com

Golf course search by state

http://golfingnear.com

Email search by domain

http://emailbydomain.com

Auto manuals search

http://auto.somanuals.com

TV manuals search

http://tv.somanuals.com