

DES-1100-16/24

MANUAL

EASYSMART SWITCH



WIRED

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About This Guide

This guide provides instructions to install the D-Link Fast Ethernet EasySmart Switch DES-1100-16/24, how to use the Web Utility, and to configure Web-based Management step-by-step.



Note: The model you have purchased may appear slightly different from the illustrations shown in the document. Refer to the Product Instruction and Technical Specification sections for detailed information about your switch, its components, network connections, and technical specifications.

This guide is mainly divided into four parts:

1. Hardware Installation: Step-by-step hardware installation procedures.
2. Getting Started: A startup guide for basic switch installation and settings.
3. Smart Console Utility: An introduction to the central management system.
4. Configuration: Information about the function descriptions and configuration settings.

Terms/Usage

In this guide, the term “Switch” (first letter capitalized) refers to the EasySmart Switch, and “switch” (first letter lower case) refers to other Ethernet switches. Some technologies refer to terms “switch”, “bridge” and “switching hubs” interchangeably, and both are commonly accepted for Ethernet switches.



A **NOTE** indicates important information that helps a better use of the device.



A **CAUTION** indicates potential property damage or personal injury.

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1 Product Introduction

Thank you and congratulations on your purchase of D-Link EasySmart Switch Products.

D-Link's next generation EasySmart Ethernet switch series blends plug-and-play simplicity with exceptional value and reliability for small and medium-sized business (SMB) networking. All models are housed in a new style rack-mount metal case with easy-to-view front panel diagnostic LEDs.

DES-1100-16

16-Port 10/100Mbps EasySmart Switch

Front Panel

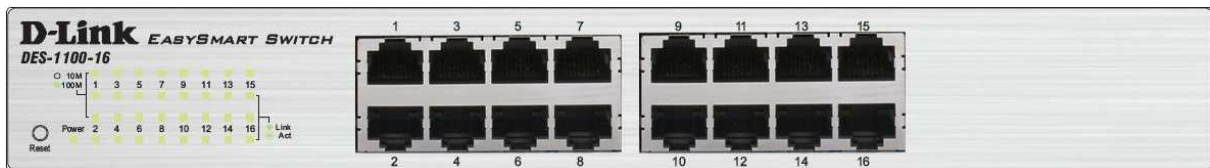


Figure 1 – DES-1100-16 Front Panel

Power LED: The Power LED lights up when the Switch is connected to a power source.

Link/Act/Speed LED (Ports 1-16):

Flashing: Indicates a network link through the corresponding port.

Blinking: Indicates that the Switch is either sending or receiving data to the port.

Green: Indicates that the port is running at 100M.

Light off: Indicates that the port is running at 10M.

Reset: By pressing the Reset button the Switch will change back to the default configuration and all changes will be lost.

Rear Panel

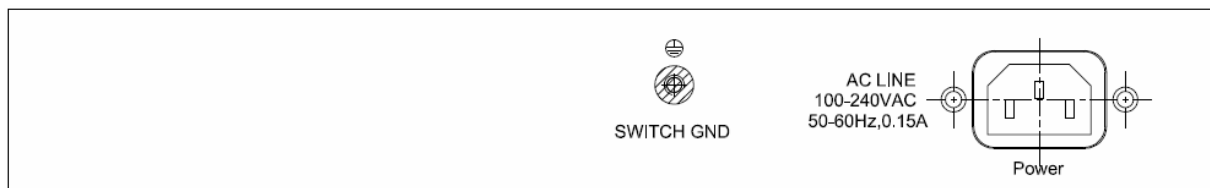


Figure 2 – DES-1100-16 Rear Panel

Power: The power port is where to connect the AC power cord.

DES-1100-24

24-Port 10/100Mbps EasySmart Switch

Front Panel

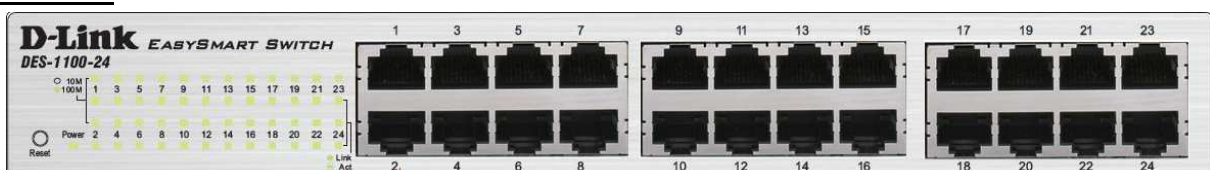


Figure 3 – DES-1100-24 Front Panel

Power LED: The Power LED lights up when the Switch is connected to a power source.

Link/Act/Speed LED (Ports 1-24):

Flashing: Indicates a network link through the corresponding port.

Blinking: Indicates that the Switch is either sending or receiving data to the port.

Green: Indicates that the port is running at 100M.

Light off: Indicates that the port is running at 10M.

Reset: Press the reset button to reset the Switch back to the default settings. All previous changes will be lost.

Rear Panel



Figure 4 – DES-1100-24 Rear Panel

Power: Connect the supplied AC power cable to this port.

2 Hardware Installation

This chapter provides unpacking and installation information for the D-Link EasySmart Switch.

Step 1: Unpacking

Open the shipping carton and carefully unpack its contents. Please consult the packing list located in the User Manual to make sure all items are present and undamaged. If any item is missing or damaged, please contact your local D-Link reseller for replacement.

- One D-Link EasySmart Switch
- One AC power cord
- Four rubber feet
- Screws and two mounting brackets
- One accessory kit for a ground screw
- One Multi-lingual Getting Started Guide
- One CD with User Manual and SmartConsole Utility program

If any item is found missing or damaged, please contact the local reseller for replacement.

Step 2: Switch Installation

For safe switch installation and operation, it is recommended that you:

- Visually inspect the power cord to see that it is secured fully to the AC power connector.
- Make sure that there is proper heat dissipation and adequate ventilation around the switch.
- Do not place heavy objects on the switch.

Desktop or Shelf Installation

When installing the switch on a desktop or shelf, the rubber feet included with the device must be attached on the bottom at each corner of the device's base. Allow enough ventilation space between the device and the objects around it.

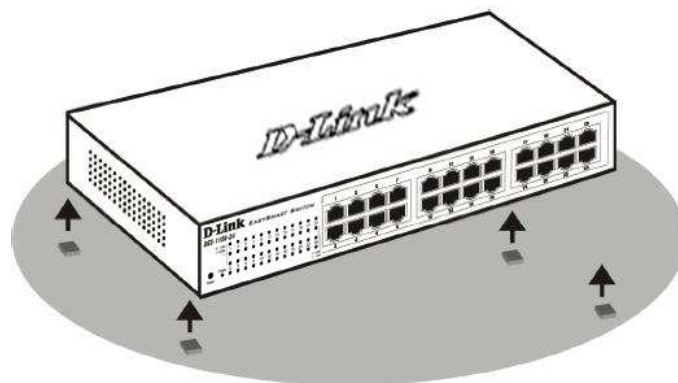


Figure 5 – Attach the adhesive rubber pads to the bottom

Rack Installation

The switch can be mounted in an EIA standard size 11-inch rack, which can be placed in a wiring closet with other equipment. To install, attach the mounting brackets to the switch's side panels (one on each side) and secure them with the screws provided (please note that these brackets are not designed for palm size switches).



Figure 6 – Attach the mounting brackets to the Switch

Then, use the screws provided with the equipment rack to mount the switch in the rack.

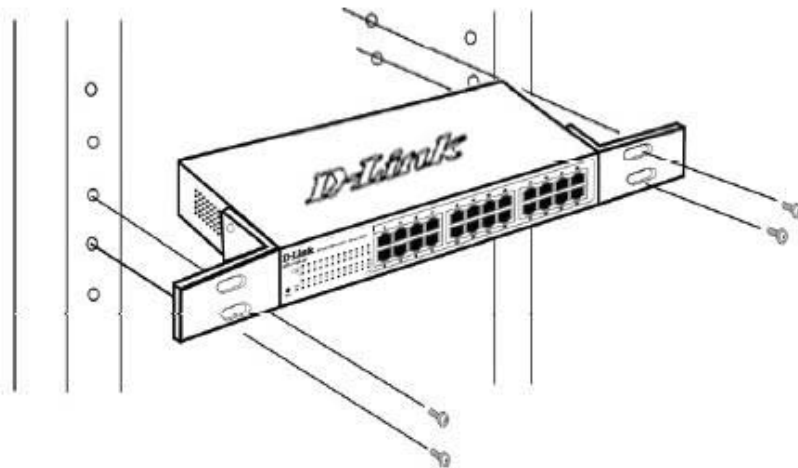


Figure 7 – Mount the Switch in the rack or chassis

Please be aware of following safety Instructions when installing:

- A) 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 (T_{ma}) specified by the manufacturer.
- B) 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.
- C) Mechanical Loading - Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.
- D) 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.
- E) 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)."

Step 3 – Plugging in the AC Power Cord

Users may now connect the AC power cord into the rear of the switch and to an electrical outlet (preferably one that is grounded and surge protected).

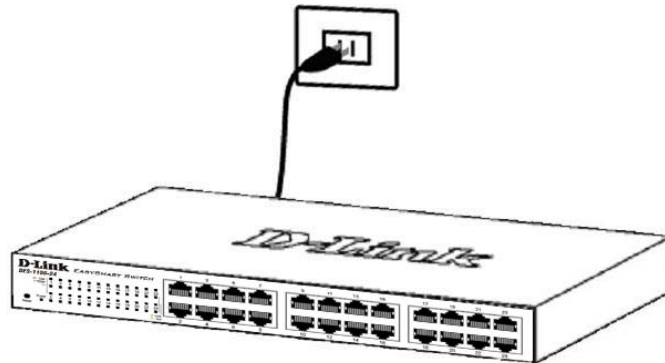


Figure 8 –Plugging the switch into an outlet

Power Failure

As a precaution, the switch should be unplugged in case of power failure. When power is resumed, plug the switch back in.

Grounding the Switch

This section describes how to connect the EasySmart Switch to ground. You must complete this procedure before powering your switch.

Required Tools and Equipment

- Ground screws (included in the accessory kit): One M4 x 6 mm (metric) pan-head screw
- Ground cable (not included in the accessory kit): The grounding cable should be sized according to local and national installation requirements. Depending on the power supply and system, a 12 to 6 AWG copper conductor is required for U.S installation. Commercially available 6 AWG wire is recommended. The length of the cable depends on the proximity of the switch to proper grounding facilities.
- A screwdriver (not included in the accessory kit)

The following steps let you connect the switch to a protective ground:

Step 1: Verify if the system power is off.

Step 2: Use the ground cable to place the #8 terminal lug ring on top of the ground-screw opening, as seen in the figure below.

Step 3: Insert the ground screw into the ground-screw opening.

Step 4: Using a screwdriver, tighten the ground screw to secure the ground cable to the switch.

Step 5: Attach the terminal lug ring at the other end of the grounding cable to an appropriate grounding stud or bolt on rack where the switch is installed.

Step 6: Verify if the connections at the ground connector on the switch and the rack are securely attached.

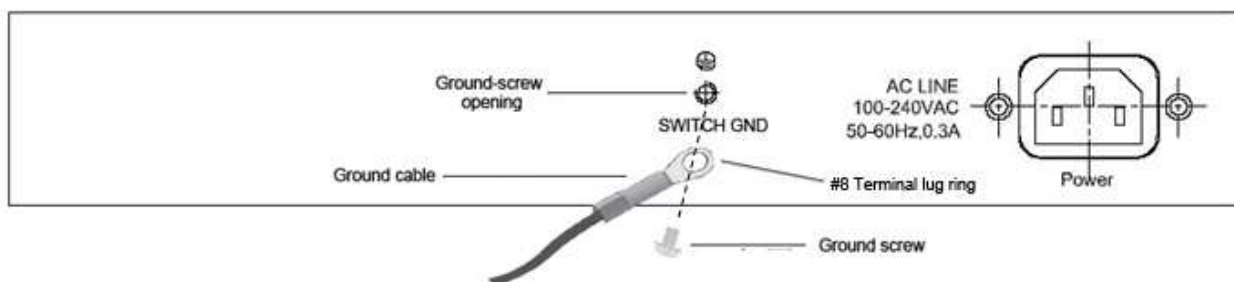


Figure 9 –Ground cable, screw and #8 terminal lug ring

3 *Getting Started*

This chapter introduces the management interface of D-Link EasySmart Switch.

Management Options

The D-Link EasySmart Switch can be managed through any port on the device by using the Web-based Management or through any PC using the SmartConsole Utility.

Each switch must be assigned its own IP Address, which is used for communication with Web-Based Management. The PC's IP address should be in the same range as the switch. Each switch can allow only one user to access the Web-Based Management at a time.

The PC should have an IP address in the same range as the switch. Each switch can allow one user to access to the Web-Based Management at a time.

However, if you want to manage multiple D-Link EasySmart Switches, the SmartConsole Utility is a more convenient choice. By using the SmartConsole Utility, you do not need to change the IP address of your PC and it is easier to initialize multiple EasySmart Switches.

Please refer to the following installation instructions for the Web-based Management and the SmartConsole Utility.

Using Web-based Management

After a successful physical installation, you can configure the Switch, monitor the network status, and display statistics using a web browser.

Supported Web Browsers

The embedded Web-based Management currently supports the following web browsers:

- Internet Explorer 6 or higher
- Netscape 8 or higher
- Mozilla
- Firefox 1.5/2.0 or higher

Connecting to the Switch

You will need the following equipment to begin the web configuration of your device:

1. A PC with a RJ-45 Ethernet connection
2. A standard Ethernet cable

Connect the Ethernet cable to any of the ports on the front panel of the switch and to the Ethernet port on the PC.

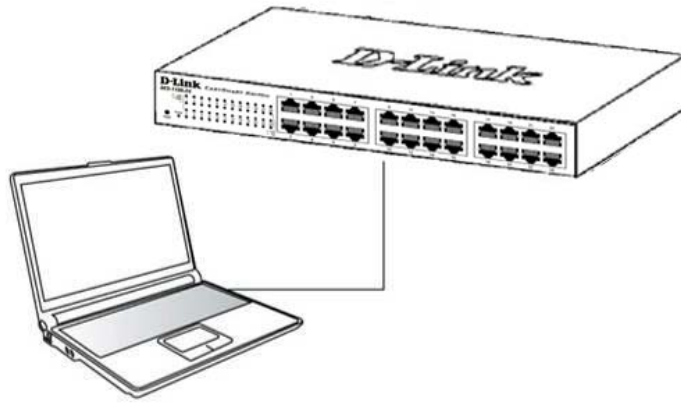


Figure 10 –Connected Ethernet cable

Login Web-based Management

In order to login and configure the switch via an Ethernet connection, the PC must have an IP address in the same subnet as the switch. For example, if the switch has an IP address of **10.90.90.90**, the PC should have an IP address of **10.x.y.z** (where x/y is a number between 0 ~ 254 and z is a number between 1 ~ 254), and a subnet mask of **255.0.0.0**. There are two ways to launch the Web-based Management, you may either click the Web Access button at the top of the SmartConsole Utility or open the web browser and enter **10.90.90.90** (the factory-default IP address) in the address bar. Then press <Enter>.

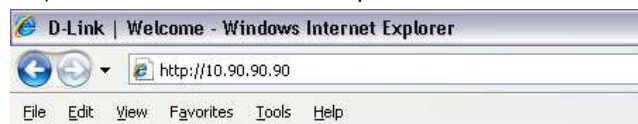


Figure 11 –Enter the IP address 10.90.90.90 in the web browser



NOTE: The switch's factory default IP address is 10.90.90.90 with a subnet mask of 255.0.0.0 and a default gateway of 0.0.0.0.

The web configuration can also be accessed through the SmartConsole Utility. Open the SmartConsole Utility and double-click the switch as it appears in the Monitor List. This will automatically load the web configuration in your web browser.

When the following logon dialog box appears, enter the password then click **OK**. The default password is **admin**.



Figure 12 – Logon Dialog Box

SmartConsole Utility

The SmartConsole Utility included in the installation CD is a program for discovering D-Link Smart Switches and EasySmart Switches within the same L2 network segment connected to your PC. This tool is only for computers running Windows 2000, Windows XP, or Windows Vista x64/86 operating systems. There are two options for the installation of the SmartConsole Utility; one is through the autorun program on the installation CD and the other is manual installation.



NOTE: Please be sure to uninstall any existing SmartConsole Utility from your PC before installing the latest SmartConsole Utility.

Option 1: Follow these steps to install the SmartConsole Utility via the autorun program on the installation CD.

1. Insert the Utility CD into your CD-Rom/DVD-Rom Drive.
2. The autorun program will appear automatically.
3. Click on the "Install SmartConsole Utility" button and an installation wizard will guide you through the process.
4. After successfully installing the SmartConsole Utility, you can open the utility by clicking Start > Programs > D-Link SmartConsole Utility.
5. Connect the Smart Switch to the same L2 network segment of your PC and use the SmartConsole Utility to discover the Smart Switches.

Option 2: Follow these steps to install the SmartConsole Utility manually.

1. Insert the Utility CD into your CD-Rom/DVD-Rom Drive.
2. From the Start menu on the Windows desktop, click Run.
3. In the Run dialog box, type D:\D-Link SmartConsole Utility\setup.exe (where D:\ represents the drive letter of your CD-Rom or DVD-Rom) and click OK.
4. Follow the on-screen instructions to install the utility.
5. Upon completion, go to Start > Programs > D-Link SmartConsole Utility and open the SmartConsole Utility.
6. Connect the Smart Switch to the same L2 network segment of your PC and use the SmartConsole Utility to discover the Smart Switches.

For detailed explanations of SmartConsole's functions, please refer to Chapter 4 SmartConsole Utility

4 SmartConsole Utility

The D-Link SmartConsole Utility allows the administrator to quickly discover all D-Link Smart Switches and EasySmart Switches which are in the same domain of the PC, collect traps and log messages, and quick access to basic configurations of the switch.

The SmartConsole Utility consists of three parts, **Device Configurations** at the top, **Device List** as the main body, and **SmartConsole Settings** at the left.

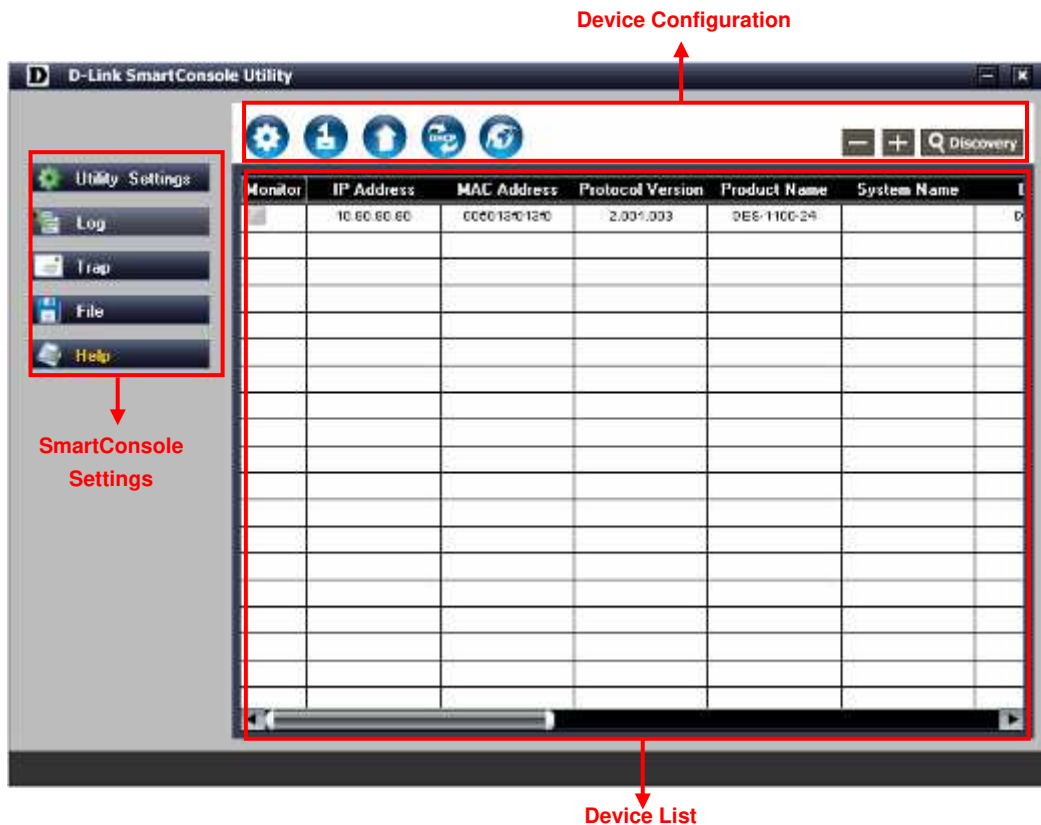


Figure 13 – SmartConsole Utility

SmartConsole Settings

The SmartConsole Settings at the left has five icons, **Utility Settings**, **Log**, **Trap**, **File**, and **Help**.

Utility Settings

Click this icon to launch the Utility Settings window. **Refresh time** refreshes the devices which were selected as monitored device in the Device List. Choices include **15 secs**, **30 secs**, **1mins**, **2mins**, and **5 mins** for selecting the monitoring time intervals. **Utility Group Interval** establishes the intervals (in seconds) that the Switch will be discovered in the SmartConsole Device List.



Figure 14– SmartConsole Utility Settings



NOTE: If the Group Interval is set to 0, IGMP Snooping must be disabled in the Switch or the switches will not be discovered.

Log

Click this icon to launch the Log window. Click **View Log** to show the events of the SmartConsole Utility and the device. **Date/Time** indicates when the message was received, **IP** denotes where it comes from and **Status** shows the content of this log message. Click **Clear Log** to clear all log entries. Click **OK** to exit.



Figure 15 – SmartConsole Log

Trap

Click this icon to launch the Trap window. Click **View Trap** to show the events of the SmartConsole Utility and the device. **Date/Time** indicates when the trap message was received, **IP** denotes where it comes from and **Status** shows the content of this trap message. Click **Clear Trap** to clear all entries. Click **OK** to exit



Figure 16 – SmartConsole Trap

The trap icon in the SmartConsole Settings will change while receiving new trap messages. Please see below for detailed description.

Icon	Description
	No new traps
	New traps was received

File

By clicking on this icon you will see below options:



Figure 17 – SmartConsole File

Monitor Save: Records the setting of the Device List as default for the next time the SmartConsole Utility is used.

Monitor Save As: Records the setting of the Device List in an appointed filename and file path.

Monitor Load: Manually load a Device List setting file.

Help

Click this icon to launch the SmartConsole Info window.

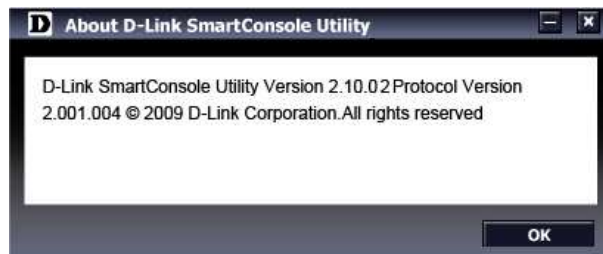


Figure 18 – SmartConsole Help

Device Configuration

The Device Configuration in the SmartConsole Utility has five icons:



Device Settings



Device Password Manager



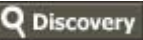
Multi Firmware Upgrade



DHCP Refresh



Web Access

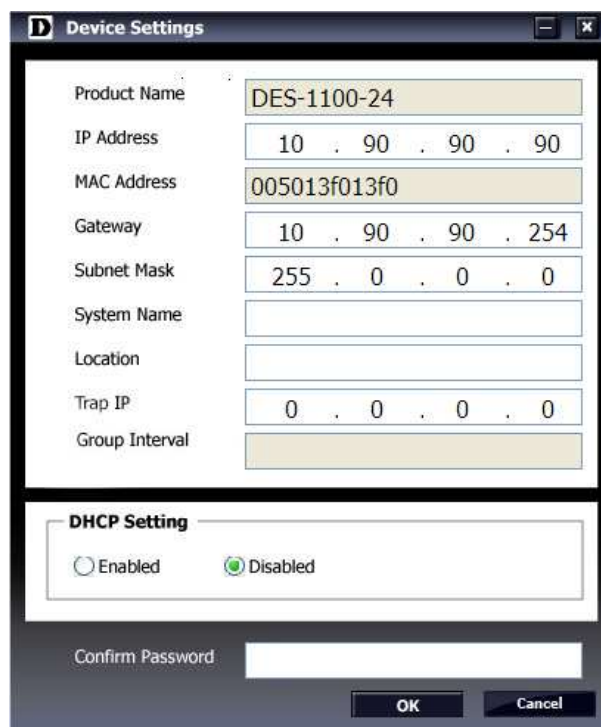
and the , ,  device buttons for the Device List.



Device Settings

Select a switch from the Device List. Click on this icon to launch the Device Settings window. Here you can configure the Product Name, IP Address, Gateway, Subnet Mask, System Name, Location, Trap Host IP, and DHCP Client Setting of the Switch.

To apply the configuration, insert the correct device password in the Confirm Password box and then click **OK**.



Product Name	DES-1100-24
IP Address	10 . 90 . 90 . 90
MAC Address	005013f013f0
Gateway	10 . 90 . 90 . 254
Subnet Mask	255 . 0 . 0 . 0
System Name	
Location	
Trap IP	0 . 0 . 0 . 0
Group Interval	

DHCP Setting

☐ Enabled ☒ Disabled

Confirm Password

OK Cancel

Figure 19 – SmartConsole Device Settings



NOTE: The EasySmart Switch automatically sends out discovery packets to maintain the connection between the devices and SmartConsole Utility. Therefore, ensure to configure the **Group Interval** setting.



Device Password Manager

Select a switch from the Device List. Click on this icon to launch the Device Password Manager window. Here you can enter a new password and confirm it.



Figure 20 – SmartConsole Device Password Manager



Multi Firmware Upgrade

The EasySmart switches' firmware cannot be upgraded by clicking the **Multi Firmware Upgrade** button via SmartConsole Utility.



Figure 21 – Firmware Upgrade error message



DHCP Refresh:

If a DHCP-client enabled switch in the Device List shows the default IP is still used, it means the device did not receive an IP address from the DHCP server successfully. Select that switch and click the DHCP refresh icon. Enter the correct Device Password and then **click OK**. The device will renew the IP address from the DHCP server.



Figure 22 – DHCP Refresh



Web Access

Select a switch from the Device List. Click this icon to launch your internet browser (eg. The Internet Explorer). Here you can configure the Switch through the Web-based Management utility. You may also get into the Web-based Management by double-clicking the device in the device list.

Add(+), Delete(-) and Discover the device

Click the **Discovery** button to display all the Web Smart and EasySmart switches located in the same domain with the management PC.

Click the **+** and insert a device IP address to add a device into Discover List, or select a device and click the **-** button to remove it.

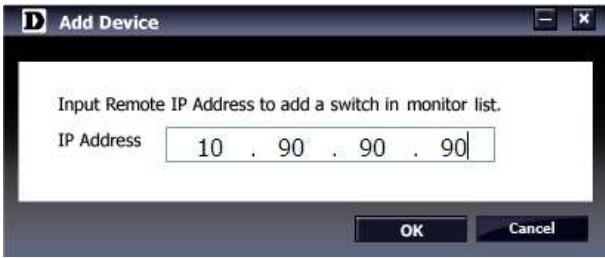


Figure 23 – SmartConsole Add device



Figure 24 – SmartConsole Delete device

Device List

This list displays all discovered Web Smart and EasySmart switches on the network.

[illegible]

Figure 25 – SmartConsole Device List

Definitions of the Device List features:

Monitor: Check the Monitor box and the SmartConsole will collect the trap and log data from the device. The  in the monitor means the device was discovered by SmartConsole. Click the icon to have the device keep updating the information such as system log or trap to the SmartConsole Utility. The icon will become .

When the device was detected as not reachable, the icon will change to . Please check if the power or the cable of this device is disconnected.

IP Address: Displays the current IP addresses of devices.

MAC Address: Displays the device MAC Addresses.

Protocol version: Displays the software version of the Utility.

Product Name: Displays the device product name.

System Name: Displays the appointed device system name.

DHCP: Specify if the device gets the IP address from a DHCP server.

Location: Displays where the appointed device location.

Trap IP: Displays the IP address of host where the Trap information will be sent to.

Subnet Mask: Displays the Subnet Mask setting of the device.

Gateway: Displays the Gateway setting of the device.

Device Group Interval: Displays the intervals (in seconds). This feature is not available for EasySmart switches.

Firmware version: Displays the current Firmware version of this device.

LLDP: Displays the LLDP (Link Layer Discovery Protocol) status of the device. This feature is available only for PoE models of Web Smart switches.

SNMP: Displays the SNMP status of the device. This is not available for EasySmart switches.



NOTE: If the devices are marked red in the device list, it means that the devices require upgrading firmware again.

5 Configuration

The features and functions of the D-Link EasySmart Switch can be configured for optimum use through the Web-based Management Utility.

Web-based Management

After a successful login you will see the screen below:

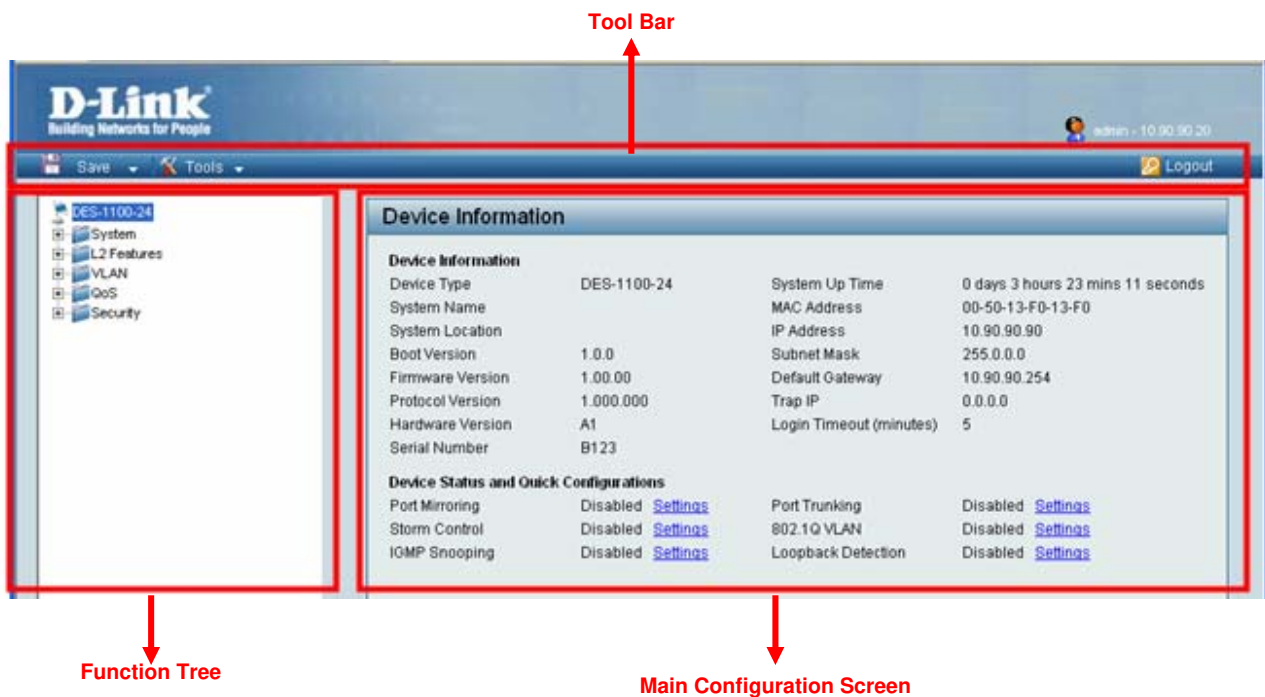


Figure 26 – Web-based Management

Above is the Web-based Management screen. The three main areas are the **Tool Bar** on top, the **Function Tree**, and the **Main Configuration Screen**.

The **Tool Bar** provides a quick and convenient way for essential utility functions like firmware and configuration management.

By choosing different functions in the **Function Tree**, you can change all the settings in the **Main Configuration Screen**. The main configuration screen will show the current status of your Switch by clicking the model name on top of the function tree.

At the upper right corner of the screen the username and current IP address will be displayed.

Under the username is the **Logout** button. Click this to end this session.



NOTE: If you close the web browser without clicking the **Logout** button, it will be seen as an abnormal exit and the login session will still be occupied.

Finally, by clicking on the D-Link logo at the upper-left corner of the screen you will be redirected to the local D-Link website.

Tool Bar > Save Menu

The Save Menu provides Save Configuration.



Figure 27 – Save Menu

Save Configuration

Select to save the entire configuration changes you have made to the device to switch's non-volatile RAM.



Figure 28– Save Configuration

Tool Bar > Tool Menu

The Tool Menu offers global function controls such as Reset System, Reboot Device, Firmware Upgrade and Configuration Backup & Restore.



Figure 29 – Tool Menu

Reset System

Provide a safe reset option for the Switch. All configuration settings in non-volatile RAM will be reset to factory default and then the Switch will reboot.

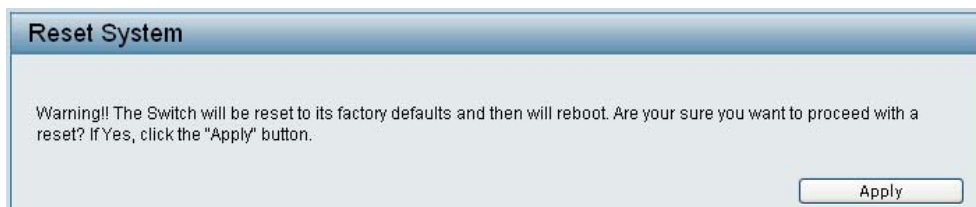


Figure 30 – Tool Menu > Reset System

Reboot Device

Provide a safe way to reboot the system. Click **Reboot** to restart the switch.



Figure 31 – Tool Menu > Reboot Device

Firmware Upgrade

Allows an existing firmware file to be uploaded to the Switch; upgrade the firmware from your local drive of PC.

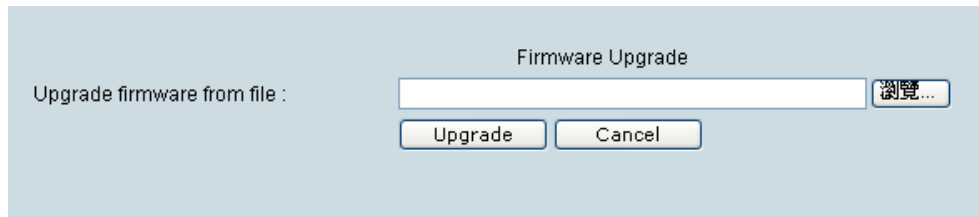


Figure 32 – Tool Menu > Firmware upgrade

Click **Browse** to browse your inventories for a saved firmware file. And then click **Upgrade** to restore the selected firmware file.



CAUTION: Do not disconnect the PC or remove the power cord from device until upgrade is complete. The Switch may crash if the Firmware Upgrade is incomplete.

Configuration Backup & Restore

Allow the current configuration settings to be saved to a file (not including the password), and if necessary, you can restore configuration settings from the file.



Figure 33 – Tool Menu > Configure Backup and Restore

Backup or restore the configuration file to or from your local drive.

Click **Backup** to save the current settings to your disk.

Click **Browse** to browse your inventories for a saved backup settings file.

Click **Restore** after selecting the backup settings file you want to restore.



Note: Switch will reboot after restore and all current configurations will be lost

Function Tree

All configuration options on the switch are accessed through the Setup menu on the left side of the screen. Click on the setup item that you want to configure. The following sections provide more detailed description of each feature and function.

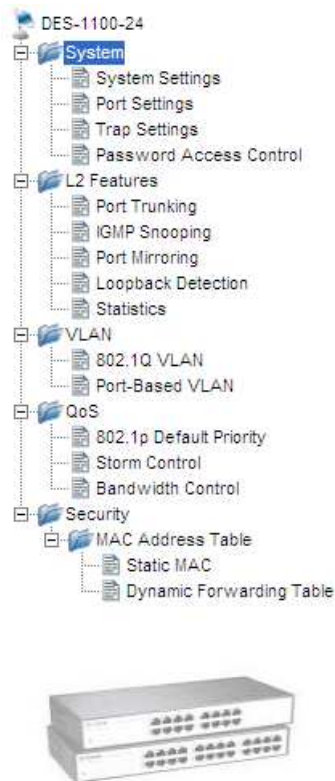


Figure 34 –Function Tree

Device Information

The **Device Information** provides an overview of the switch which includes essential information such as firmware, hardware and IP address.

It also offers an overall status of common software features:

Port Mirroring: Click **Setting** > **L2 Features** > **Port Mirroring**. By default this feature is disabled.

Storm Control: Click **Setting** > **QoS** > **Storm Control**. By default this feature is disabled.

IGMP Snooping: Click **Setting** > **L2 Features** > **IGMP Snooping**. By default this feature is disabled.

Port Trunking: Click **Setting** > **L2 Features** > **Trunking Setting**. By default this feature is disabled.

802.1Q VLAN: Click **Setting** > **VLAN** > **802.1Q Management VLAN**. By default this feature is disabled.

Loopback Detection: Click **Setting** > **L2 Features** > **Loopback Detection**. By default this feature is disabled.

Device Information			
Device Information			
Device Type	DES-1100-24	System Up Time	0 days 0 hours 15 mins 25 seconds
System Name		MAC Address	00-50-13-F0-13-F0
System Location		IP Address	10.90.90.90
Boot Version	1.0.0	Subnet Mask	255.0.0.0
Firmware Version	1.00.00	Default Gateway	10.90.90.254
Protocol Version	1.000.000	Trap IP	0.0.0.0
Hardware Version	A1	Login Timeout (minutes)	5
Serial Number	B123		
Device Status and Quick Configurations			
Port Mirroring	Disabled	Port Trunking	Disabled
Storm Control	Disabled	802.1Q VLAN	Disabled
IGMP Snooping	Disabled	Loopback Detection	Disabled

Figure 35 – Device Information

System > System Settings

The System Setting allows the user to configure the IP address and the basic system information of the Switch.

IP Information: There are two ways for the switch to obtain an IP address: Static and DHCP (Dynamic Host Configuration Protocol).

When using static mode, the **IP Address**, **Subnet Mask** and **Gateway** can be manually configured. When using DHCP mode, the Switch will first look for a DHCP server to provide it with an IP address (including network mask and default gateway) before using the default or previously entered settings. By default the IP setting is static mode with IP address is **10.90.90.90** and subnet mask is **255.0.0.0**.

System Information: By entering a **System Name** and **System Location**, the device can more easily be recognized through the SmartConsole Utility and from other EasySmart devices on the LAN.

Login Timeout: The Login Timeout controls the idle time-out period for security purposes, when there is no action for a specific time span in the Web-based Management. If the current session times out (expires), the user is required a re-login before using the Web-based Management again. Selective range is from 3 to 30 minutes, and the default setting is 5 minutes.

System Settings	
IP Information	
☒ Static ☐ DHCP	
IP Address	10 90 90 90
Subnet Mask	255 0 0 0
Gateway	10 90 90 254
Apply	
System Information	
System Name	
System Location	
Login Timeout(3-30minutes)	5
Apply	

Figure 36 – System > System Setting

System > Port Settings

In the Port Setting page, the status of all ports can be monitored and adjusted for optimum configuration. By selecting a range of ports (**From Port** and **To Port**), the **Speed** can be set for all selected ports, effective by clicking **Apply**. Press the **Refresh** button to view the latest information.

Port	Link Status	Speed	Flow Control
1	100M Full	Auto	Disabled
2	Down	Auto	Disabled
3	100M Full	Auto	Disabled
4	Down	Auto	Disabled
5	Down	Auto	Disabled
6	Down	Auto	Disabled
7	Down	Auto	Disabled
8	Down	Auto	Disabled
9	Down	Auto	Disabled
10	Down	Auto	Disabled
11	Down	Auto	Disabled
12	Down	Auto	Disabled
13	Down	Auto	Disabled
14	Down	Auto	Disabled
15	Down	Auto	Disabled
16	Down	Auto	Disabled

Figure 37 – System > Port Setting

Speed: Copper connections can operate in Forced Mode settings (100M Full, 100M Half, 10M Full, 10M Half), Auto, or Disabled. The default setting for all ports is **Auto**.



NOTE: Be sure to adjust port speed settings appropriately after changing connected cable media types.

Link Status: Reporting **Down** indicates the port is disconnected.

Flow Control: You can enable this function to mitigate the traffic congestion. Ports configured for full-duplex use 802.3x flow control, half-duplex ports use backpressure flow control. The default setting is disabled.

System > Trap Settings For SmartConsole

By configuring the Trap Setting, it allows SmartConsole Utility to monitor specified events on this EasySmart Switch. By default, Trap Setting is disabled. When the Trap Setting is enabled, enter the **Destination IP** address of the managing station that will receive trap information.

Trap Settings for SmartConsole

Trap ☐ Enabled ☒ Disabled

Destination IP

System Event ☐ Device Bootup ☐ Illegal Login

Twisted Pair Port Event ☐ Link Up/ Link Down

Firmware Upgrade State ☐ Upgrade Success/ Upgrade Failure

Figure 38 – System > Trap Setting

Select the event message(s) to be sent out to the managing station.

System Event: The system level messages contain:

Device Bootup - System boot-up information

Illegal Login - Events of incorrect password logins and records the IP of the source PC

Twisted pair Port Link Up/Link Down: Copper port connection information

Firmware Upgrade State: Information of firmware upgrade - success or failure

System > Password Access Control

Setting a password is a critical tool for managers to secure the EasySmart Switch. After entering the old password and the new password two times, click **Apply** for the changes to take effect.

Figure 39 shows the 'Password Access Control' web interface. It has a title bar 'Password Access Control' and three text input fields labeled 'Old Password', 'New Password', and 'Confirm Password'.

Figure 39 – System > Password Access Control

L2 Features > Port Trunking

The Trunking function allows the switch to combine two or more ports together to increase bandwidth. Select the **Trunking Groups**, choose the **Members** to be grouped together, and then click **Apply** to activate the selected **Trunking Groups**. Up to two Trunking Groups may be created, each supporting up to four ports.

Disable - Removes all the members in this trunk group.

Figure 40 shows the 'Port Trunking Settings' web interface. It includes a 'Port Trunking' section with 'Enabled' and 'Disabled' radio buttons and an 'Apply' button. Below is a grid for selecting 'Trunking Groups' (checkboxes) and 'Members' (checkboxes for Ports 1-24). A note states: 'Note: Maximum Groups: 2, Maximum Members Per Group: 4.' At the bottom is a 'Trunking list' table with columns 'ID' and 'Ports', showing two entries: ID 01 with ports 1, 3, 4 and ID 02 with no ports listed. Each entry has a 'Delete' button.

ID	Ports	Delete
01	1, 3, 4	Delete
02		Delete

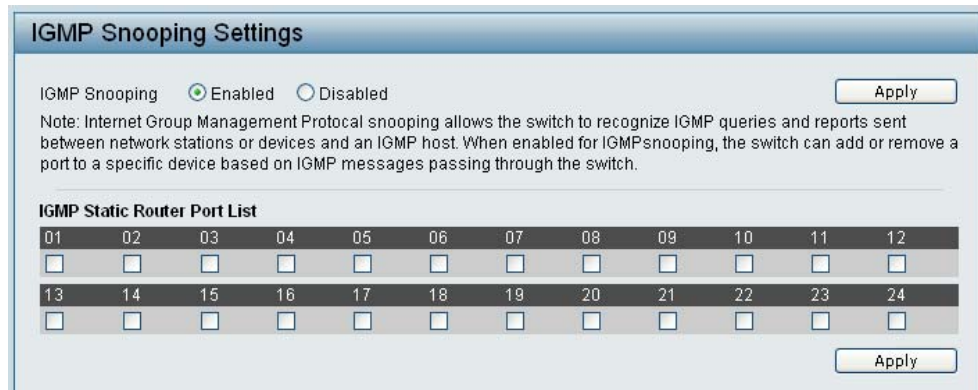
Figure 40- L2 Features > Port Trunking Settings

L2 Features > IGMP Snooping

With Internet Group Management Protocol (IGMP) snooping, the EasySmart Switch can make intelligent multicast forwarding decisions by examining the contents of each frame's Layer 2 MAC header.

By default, IGMP is disabled. If enabled, the EasySmart switch can recognize IGMP queries and reports sent between network stations or devices and an IGMP host. With IGMP snooping enabled, the EasySmart switch will forward multicast traffic only to the connections that have members attached.

If the IGMP server is not able to send out query control message automatically, a static router port may be required to be configured manually. Select the ports to be assigned as router ports for IGMP snooping in the **IGMP Static Router Port List**, and click **Apply** for changes to take effect.



IGMP Snooping Settings

IGMP Snooping ☒ Enabled ☐ Disabled Apply

Note: Internet Group Management Protocol snooping allows the switch to recognize IGMP queries and reports sent between network stations or devices and an IGMP host. When enabled for IGMP snooping, the switch can add or remove a port to a specific device based on IGMP messages passing through the switch.

IGMP Static Router Port List

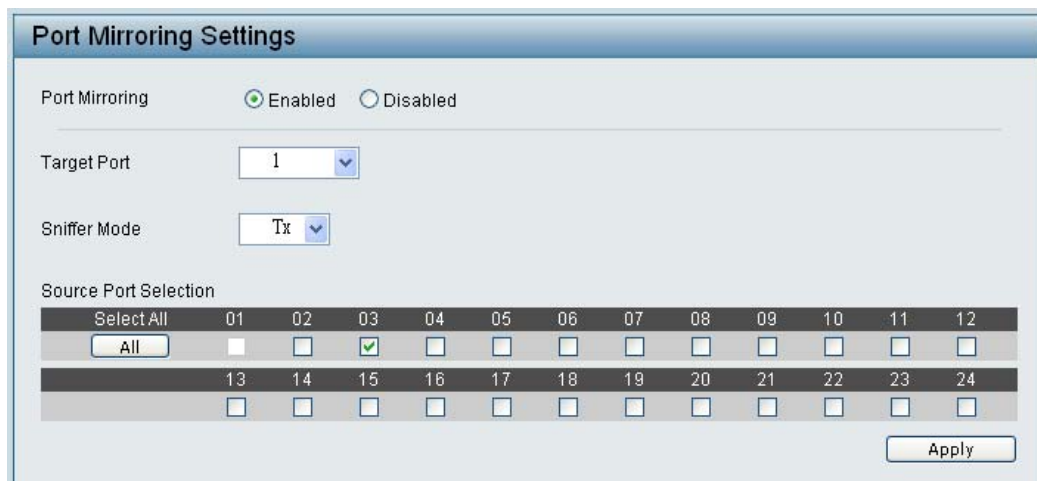
01	02	03	04	05	06	07	08	09	10	11	12
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
13	14	15	16	17	18	19	20	21	22	23	24
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Apply

Figure 41 – L2 Features > IGMP Snooping setting

L2 Features > Port Mirroring

Port Mirroring is a method of monitoring network traffic that forwards a copy of each incoming and/or outgoing packet from one port of the Switch to another port where the packet can be studied. This enables network managers to better monitor network performances.



Port Mirroring Settings

Port Mirroring ☒ Enabled ☐ Disabled

Target Port

Sniffer Mode

Source Port Selection

Select All	01	02	03	04	05	06	07	08	09	10	11	12
All	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	13	14	15	16	17	18	19	20	21	22	23	24
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Apply

Figure 42 –L2 Features > Port Mirroring

Selection **Sniffer Mode** for the Source Ports are as follows:

TX (transmit) mode: Duplicates the data transmitted from the source port and forwards it to the Target Port. Click “all” to include all ports into port mirroring.

RX (receive) mode: Duplicates the data that received from the source port and forwards it to the Target Port. Click “all” to include all ports into port mirroring.

Both (transmit and receive) mode: Duplicate both the data transmitted from and data sent to the source port, and forwards all the data to the assigned Target Port. Click “all” to include all ports into port mirroring.



NOTE: The target ports will stop mirroring packets if there are unknown tags or destination packets sent out by source ports.

L2 Features > Loopback Detection

The Loopback Detection function is used to detect the loop created by a specific port while Spanning Tree Protocol (STP) is not enabled in the network, especially when the down links are hubs or unmanaged

switches. The Switch will automatically shutdown the port and sends a log to the administrator. The Loopback Detection port will be unlocked when the Loopback Detection **Recover Time** times out. The Loopback Detection function can be implemented on a range of ports at a time. You may enable or disable this function using the pull-down menu.

Port	Loopdetect Detection State	Loop Status
1	Disabled	Normal
2	Disabled	Normal
3	Disabled	Normal
4	Disabled	Normal
5	Disabled	Normal
6	Disabled	Normal
7	Disabled	Normal
8	Disabled	Normal
9	Disabled	Normal
10	Disabled	Normal

Figure 43 – L2 Features > Loopback Detection

Loopback Detection State: Use the drop-down menu to enable or disable loopback detection. The default is *Disabled*.

Interval (1-32767): Set a Loop detection Interval between 1 and 32767 seconds. The default is 1 seconds.

Recover Time (0 or 60-1000000): Time allowed (in seconds) for recovery when a Loopback is detected. The Loop Detection Recover Time can be set at 0 seconds, or 60 to 1000000 seconds. Entering 0 will disable the Loop Detection Recover Time. The default is 60 seconds.

From Port: The beginning of a consecutive group of ports may be configured starting with the selected port.

To Port: The ending of a consecutive group of ports may be configured starting with the selected port.

State: Use the drop-down menu to toggle between *Enabled* and *Disabled*. Default is *Disabled*.

Click **Apply** to implement changes made.

L2 Features > Statistics

The Statistics screen displays the status of each port packet count. It offers several options such as **Receive Packet & Transmit Packet**, **Transmit Packet & Collision**, **Receive Packet & Drop Packet** and **Receive Packet & CRC Packet**.

Port	
1	

Figure 44 – L2 Features > Statistics menu

Receive Packet & Transmit Packet: Number of packets received and transmitted successfully.

Statistics		
Counter Selection	Receive Packet & Transmit Packet	
	Refresh All	Clear All Counters
Port	Receive Packet	Transmit Packet
1	126	94
2	0	0
3	0	0
4	0	0
5	0	0
6	0	0
7	0	0
8	0	0
9	0	0
10	0	0
11	0	0
12	0	0
13	0	0
14	0	0
15	0	0
16	0	0
17	0	0
18	0	0

Figure 45 – L2 Features > Statistics menu

Transmit Packet & Collision: Number of transmit packets resulting in collision.

Statistics		
Counter Selection	Transmit Packet & Collision	
	Refresh All	Clear All Counters
Port	Transmit Packet	Collision
1	0	0
2	0	0
3	0	0
4	0	0
5	88	0
6	0	0
7	0	0
8	0	0
9	0	0
10	0	0
11	0	0
12	0	0
13	0	0
14	0	0
15	0	0
16	0	0
17	0	0
18	0	0

Figure 46 – L2 Features > Statistics menu

Receive Packet & Drop Packet: Number of receive packets resulting in drop packets.

Statistics		
Counter Selection	Receive Packet & Drop Packet	Refresh All Clear All Counters
Port	Receive Packet	Drop Packet
1	0	0
2	0	0
3	0	0
4	0	0
5	119	0
6	0	0
7	0	0
8	0	0
9	0	0
10	0	0
11	0	0
12	0	0
13	0	0
14	0	0
15	0	0
16	0	0
17	0	0
18	0	0

Figure 47 – L2 Features > Statistics menu

Receive Packet & CRC Packet: Number of receive packets resulting in CRC error.

Statistics		
Counter Selection	Receive Packet & CRC Packet	Refresh All Clear All Counters
Port	Receive Packet	CRC Packet
1	0	0
2	0	0
3	0	0
4	0	0
5	118	0
6	0	0
7	0	0
8	0	0
9	0	0
10	0	0
11	0	0
12	0	0
13	0	0
14	0	0
15	0	0
16	0	0
17	0	0
18	0	0

Figure 48 – L2 Features > Statistics menu

Refresh All: Refreshes the details collected and displayed.

Clear All Counters: Resets the details displayed.

VLAN > 802.1Q VLAN

A VLAN is a group of ports that can be anywhere in the network, but communicate as though they were in the same area.

VLANs can be easily organized to reflect department groups (such as R&D, Marketing), usage groups (such as e-mail), or multicast groups (multimedia applications such as video conferencing), and therefore help to simplify network management by allowing users to move devices to a new VLAN without having to change any physical connections.

By default, 802.1Q VLAN is disabled. With 802.1Q VLAN enabled, the VLAN VID 1 is created by default with an empty VLAN name field and all ports are configured as “Untagged” members.

The 802.1Q VLAN configuration is accomplished in three steps:

- Enabling 802.1Q VLAN function
- Creating a new VID group and assigning ports as Untagged, Tagged or Not Member.
- Configuring the PVID of access VLAN

Add VID: Click to create a new **VID** group, assigning ports from 1 to 24 as **Untagged**, **Tagged**, or **Not Member**. **VLAN VID** is a unique number (between 1 and 4094) that identifies a particular VLAN. A port can be untagged in only one **VID**. To save the VID group, click **Apply**. You can also change the name according to the desired groups.

PVID settings: Port VLAN ID (PVID) is an identification that encompasses a particular switch port's identification and VLAN membership. This identification is used to classify the incoming untagged frames. Click to configure the PVID of a port.

Figure 49 – VLAN > 802.1Q VLAN > Default Setting

Port	Select All	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Untagged	All																								
Tagged	All																								
Not Member	All																								

VID	VLAN Name	Untagged VLAN Ports	Tagged VLAN Ports	VLAN Rename	Delete VID
1		01,02,03,04,05,06,07,08,09,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24		Rename	Delete VID

Figure 50 – VLAN > 802.1Q VLAN > Add VID

Port	01	02	03	04	05	06	07	08	09	10	11	12
PVID	1	1	1	1	2	3	4	1	1	1	1	1

Port	13	14	15	16	17	18	19	20	21	22	23	24
PVID	1	1	1	1	1	1	1	1	1	1	1	1

Figure 51 – VLAN > 802.1Q VLAN > Assign PVID

Rename: Click to rename the VLAN group.

Delete VID: Click to delete the VLAN group.

802.1Q VLAN ☒ Enabled ☐ Disabled Apply

(Maximum Entries :32)

PVID settings Add VID

VID	VLAN Name	Untagged VLAN Ports	Tagged VLAN Ports	VLAN Rename	Delete VID
1		01,02,03,04,05,06,07,08, 09,10,11,12,13,14,15,16, 17,18,19,20,21,22,23,24		Rename	Delete VID
2			01,02	Rename	Delete VID

Figure 52 – VLAN > 802.1Q VLAN > VLAN Table



NOTE: When 802.1Q VLAN is enabled, the Port-Based VLAN settings will be reset to default.

VLAN > Port-Base VLAN

Port-Based VLANs are the simplest and most common form of VLAN. It assigns the appliance LAN ports to VLANs, effectively transforming the appliances. You can assign multiple ports to the same VLAN, or each port to a separate VLAN.

Port-Based VLAN ☒ Enabled ☐ Disabled Apply

(Maximum Entries :32)

VLAN Name : (Name should be less than 10 characters)

	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Member	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Cancel Apply

VLAN Index	VLAN Name	VLAN member port	VLAN Rename	Delete VLAN
1		01,02,03,04,05,06,07,08, 09,10,11,12,13,14,15,16, 17,18,19,20,21,22,23,24	Rename	Delete VLAN
2	marketing	01,02,03	Rename	Delete VLAN

Figure 53 – VLAN >Port-Based VLAN Settings

Add VLAN: Click to create a new VLAN name and to select VLAN ports. The VLAN name should be less than 10 characters. To save the members in a group, click **Apply**.

Rename: Click to rename the VLAN group.

Delete VID: Click to delete the VLAN group.



NOTE: When **Port-Based VLAN** is enabled, the 802.1Q VLAN settings will be reset to default. By default, all ports are untagged.

QoS > 802.1p Default Priority

QoS is an implementation of the IEEE 802.1p standard that allows network administrators to reserve bandwidth for important functions that require a larger bandwidth or that might have a higher priority, such as VoIP (voice-over Internet Protocol), web browsing applications, file server applications or video conferencing. Thus with larger bandwidth, less critical traffic is limited, and therefore excessive bandwidth can be saved.

The following figure displays the status of Quality of Service priority levels of each port, higher priority means the traffic from this port will be first handled by the switch. For packets that are untagged, the switch will assign the priority depending on your configuration.

IEEE 802.1p Default Priority Settings

From Port: 01 To Port: 16 Priority: High [Apply]

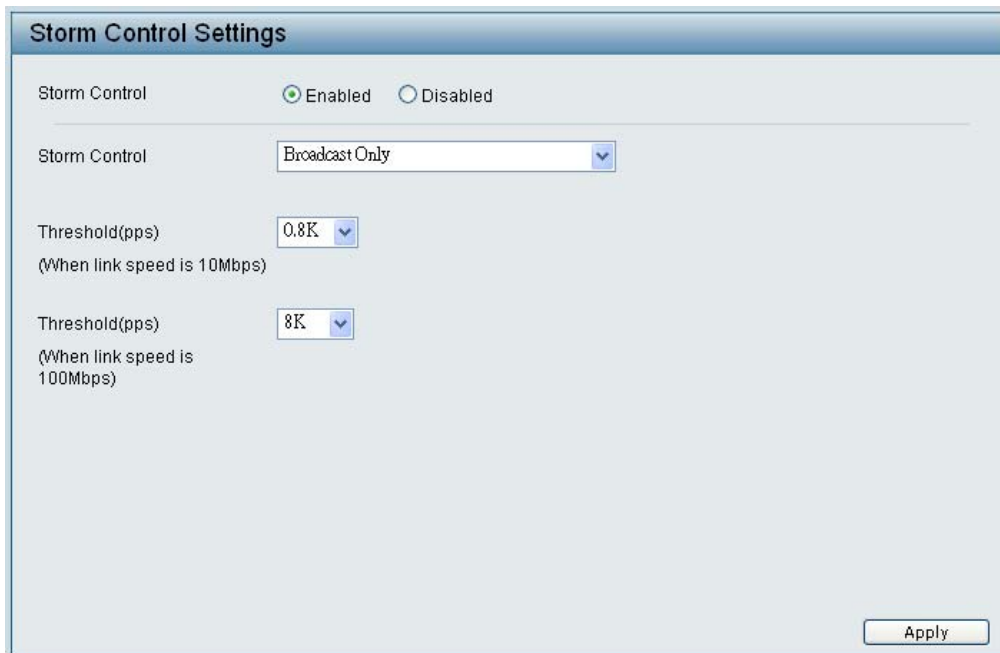
Port	Priority
01	Low
02	Low
03	High
04	High
05	High
06	High
07	Low
08	Low
09	Low
10	Low
11	Low
12	Low
13	Low
14	Low
15	Low
16	Low

For ingress untagged packets, the per port "Default Priority" settings will be applied to packets of each port to provide port-based traffic prioritization.
For ingress tagged packets, D-Link EasySmart Switches will refer to their 802.1p information and prioritize them with 2 different priority queues.

Figure 54 – QoS > 802.1p Default Priority

QoS > Storm Control

The Storm Control feature provides the ability to control the receive rate of broadcast, multicast, and unknown unicast packets. Once a packet storm has been detected, the Switch will drop packets coming into the Switch until the storm has subsided.



Storm Control Settings

Storm Control ☒ Enabled ☐ Disabled

Storm Control Broadcast Only

Threshold(pps)
(When link speed is 10Mbps) 0.8K

Threshold(pps)
(When link speed is 100Mbps) 8K

Apply

Figure 55 – QoS > Storm Control

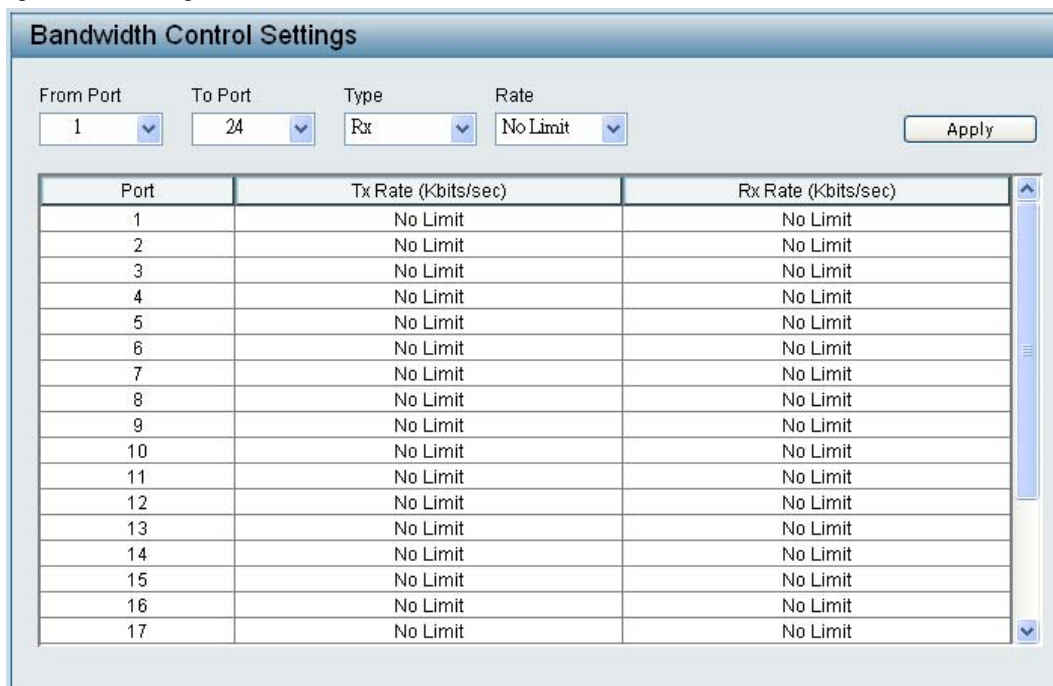
Storm Control Type: User can select the different Storm type from Broadcast Only, Multicast & Broadcast, and Multicast & Broadcast & Unknown Unicast.

Threshold (pps): If storm control is enabled (by default it is disabled), the threshold can be set from 0.8 to 12.6Kbits per second at 10Mbps speed, and 8 ~ 126Kbits per second at 100Mbps speed.

Click **Apply** for the settings to take effect.

QoS > Bandwidth Control

The Bandwidth Control page allows network managers to define the bandwidth settings for a specified port's transmitting and receiving data rates.



Bandwidth Control Settings

From Port 1 To Port 24 Type Rx Rate No Limit Apply

Port	Tx Rate (Kbits/sec)	Rx Rate (Kbits/sec)
1	No Limit	No Limit
2	No Limit	No Limit
3	No Limit	No Limit
4	No Limit	No Limit
5	No Limit	No Limit
6	No Limit	No Limit
7	No Limit	No Limit
8	No Limit	No Limit
9	No Limit	No Limit
10	No Limit	No Limit
11	No Limit	No Limit
12	No Limit	No Limit
13	No Limit	No Limit
14	No Limit	No Limit
15	No Limit	No Limit
16	No Limit	No Limit
17	No Limit	No Limit

Figure 56 – QoS > Bandwidth Control

From Port / To Port: A consecutive group of ports may be configured starting with the selected port.

Type: This drop-down menu allows you to select between *RX* (receive), *TX* (transmit), and *Both*. This setting will determine whether the bandwidth ceiling is applied to receiving, transmitting, or both receiving and transmitting packets.

No Limit: This drop-down menu allows you to specify that the selected port will have no bandwidth limit. *Enabled* disables the limit.

Rate: This drop-down menu allows you to select data rate from 512Kbps to 65536Kbps.

Click **Apply** to set the bandwidth control for the selected ports.

Security > MAC Address Table > Static MAC

This feature provides two distinct functions. The **Disable Auto Learning Excluding Uplink Port** table allows turning off the function of learning MAC address automatically, if a port isn't specified as an uplink port (for example, connects to a DHCP Server or Gateway). By default, this feature is Off (disabled).

Figure 57 – Security > Static Mac Address

To initiate the removal of auto-learning for any of the uplink ports, click **On** to enable this feature, and then select the port(s) for auto learning to be disabled.

The **Static MAC Address Setting** table displays the static MAC addresses connected, as well as the VID. Click **Add Mac** to add a new MAC address, you also need to select the assigned Port number, enter both the Mac Address and VID and Click **Apply**. Click **Delete** to remove one entry or click **Delete all** to clear the list. You can also copy a learned MAC address from **Dynamic Forwarding Table** (please refer to **Security > MAC Address Table > Dynamic Forwarding Table** for details).

By disabling Auto Learning capability and specify the static MAC addresses, the network is protected from potential threats like hackers because traffic from illegal MAC addresses will not be forwarded by the Switch.

Security > MAC Address Table > Dynamic Forwarding Table

For each port, this table displays the MAC address learned by the Switch. To add a MAC address to the Static Mac Address List, click the **Add** checkbox, and then click **Apply** associated with the identified address.

Dynamic Forwarding Table Settings

Port: All Find Select All Clean all

ID	Port	MAC Address	Type	Add
1	3	00-18-8B-BA-80-8B	Dynamic	☐
2	3	00-11-09-D3-50-9C	Dynamic	☐
3	3	00-15-F2-3E-E0-FA	Dynamic	☐
4	3	00-06-1B-D3-A1-7B	Dynamic	☐
5	3	00-1F-16-33-F1-DC	Dynamic	☐
6	3	00-1C-F0-67-81-F5	Dynamic	☐
7	3	00-1D-72-98-C2-AC	Dynamic	☐
8	3	00-0C-6E-55-52-D3	Dynamic	☐
9	3	00-15-F2-4F-B3-0A	Dynamic	☐
10	3	00-13-D3-EC-13-0C	Dynamic	☐
11	3	00-26-18-A0-D3-99	Dynamic	☐
12	3	00-26-18-50-D4-5A	Dynamic	☐
13	3	00-22-F3-C7-C4-D5	Dynamic	☐
14	3	00-D0-2B-53-A5-0A	Dynamic	☐

Page: 01 Pre Page Next Page Apply

Figure 58 – Security > Dynamic Forwarding Table

Appendix A - Ethernet Technology

This chapter will describe the features of the D-Link EasySmart Switch and provide some background information about Ethernet/Fast Ethernet/Gigabit Ethernet switching technology.

Gigabit Ethernet Technology

Gigabit Ethernet is an extension of IEEE 802.3 Ethernet utilizing the same packet structure, format, and support for CSMA/CD protocol, full duplex, and management objects, but with a tenfold increase in theoretical throughput of over 100-Mbps Fast Ethernet and a hundredfold increase over 10-Mbps Ethernet. Since it is compatible with all 10-Mbps and 100-Mbps Ethernet environments, Gigabit Ethernet provides a straightforward upgrade without wasting existing investments in hardware, software, or trained personnel.

The increased speed and extra bandwidth offered by Gigabit Ethernet is essential to help solving network bottlenecks that frequently develop as more advanced computer users and newer applications continue to demand greater network resources. Upgrading key components, such as backbone connections and servers to Gigabit Ethernet technology can greatly improve network response times as well as significantly speed up the traffic between subnets.

Gigabit Ethernet enables fast optical fiber connections to support video conferencing, complex imaging, and similar data-intensive applications. Likewise, since data transfers occur 10 times faster than Fast Ethernet, servers outfitted with Gigabit Ethernet NIC's are able to perform 10 times the number of operations in the same amount of time.

In addition, the phenomenal bandwidth delivered by Gigabit Ethernet is the most cost-effective method to take advantage of today and tomorrow's rapidly improving switching and routing internetworking technologies. And with expected advances in the coming years in silicon technology and digital signal processing that will enable Gigabit Ethernet to eventually operate over unshielded twisted-pair (UTP) cabling, outfitting your network with a powerful 1000-Mbps-capable backbone/server connection which will create a flexible foundation for the next generation of network technology products.

Fast Ethernet Technology

The growing importance of LANs and the increasing complexity of desktop computing applications are fueling the need for high performance networks. A number of high-speed LAN technologies have been proposed to provide greater bandwidth and improve client/server response times. Among them, 100BASE-T (Fast Ethernet) provides a non-disruptive, smooth evolution from the current 10BASE-T technology. The non-disruptive and smooth evolution nature, and the dominating potential market base, virtually guarantees cost-effective and high performance Fast Ethernet solutions.

100Mbps Fast Ethernet is a standard specified by the IEEE 802.3 LAN committee. It is an extension of the 10Mbps Ethernet standard with the ability to transmit and receive data at 100Mbps, while maintaining the CSMA/CD Ethernet protocol. Since the 100Mbps Fast Ethernet is compatible with all other 10Mbps Ethernet environments, it provides a straightforward upgrade and utilizes existing investments in hardware, software, and personnel training.

Switching Technology

Another approach to push beyond the limits of Ethernet technology is the development of switching technology. A switch bridges Ethernet packets at the MAC address level of the Ethernet protocol transmitting among connected Ethernet or Fast Ethernet LAN segments.

Switching is a cost-effective way of increasing the total network capacity available to users on a local area network. A switch increases capacity and decreases network loading by dividing a local area network into different segments which won't compete with each other for network transmission capacity.

The switch acts as a high-speed selective bridge between the individual segments. The switch, without interfering with any other segments, automatically forwards traffic that needs to go from one segment to another. By doing this the total network capacity is multiplied, while still maintaining the same network cabling and adapter cards.

Appendix B - Technical Specifications

Hardware Specifications

Key Components / Performance

- Switching Capacity:
 - DES-1100-16: 3.2Gbps
 - DES-1100-24: 4.8Gbps
- Max. Forwarding Rate
 - DES-1100-16: 2.38Mpps
 - DES-1100-24: 3.57Mpps
- Forwarding Mode: Store and Forward
- Packet Buffer memory: 1.75 Mbits
- Flash Memory: 2M Bytes

- Up to 2 queues per port
- Bandwidth Control
- Storm Control

Management

- Web-based GUI or SmartConsole Utility
- Configuration backup / restoration via Web-based management
- Firmware upgrade via Web-based management
- Reset, Reboot system
- Factory reset by clicking reset button

Port Functions

- 16/24 10/100BaseTX ports compliant with the following standards:
 - IEEE 802.3
 - IEEE 802.3u
 - Supports Full/half-Duplex operations

Physical & Environment

- AC input, 100~240 VAC, 50/60Hz, internal universal power supply
- Acoustic Value:
 - DES-1100-16/24: 0dB (Fan-less)
- Operation Temperature 0~40°C
- Storage Temperature -10~70°C
- Operation Humidity: 10%~95% RH
- Storage Humidity: 5%~95% RH

Emission (EMI) Certifications

- FCC class A
- CE Class A
- VCCI Class A

Safety Certifications

- cUL, LVD

Features

L2 Features

- Supports up to 8K MAC address
- IGMP snooping
- Loopback Detection
- Port Mirroring
- Port Trunking

VLAN

- 802.1Q VLAN standard (VLAN Tagging)
- Port-Based VLAN

QoS (Quality of Service)

- 802.1p priority,

Appendix C – Rack mount Instructions

Safety Instructions - Rack Mount Instructions - The following or similar rack-mount instructions are included with the installation instructions:

- A) 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.
- B) 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.
- C) Mechanical Loading - Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.
- D) 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.
- E) 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).

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