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# Catalyst 3900 Token Ring Inter-Switch Link Module Configuration Note

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**March 12, 1998**

This document contains instructions for installing and configuring the Catalyst 3900 Token Ring Inter-Switch Link (ISL) module (product numbers WS-C3900-2ISL and WS-C3900-2ISLF).

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**Note** For information about configuring and maintaining the Catalyst 3900 switch, refer to the *Catalyst 3900 Token Ring Switch User Guide*. This document is available on the Cisco Connection Online, the Cisco Documentation CD-ROM, or in print.

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## Package Contents

Along with this document, your expansion module package should contain one Token Ring ISL module. If this item is missing or damaged, contact the place of purchase.

## Overview

The 2-port, 100 Mbps Token Ring ISL module supports the encapsulation of Token Ring frames on a standard Fast Ethernet link to allow Virtual LANs (VLANs) to be distributed across multiple platforms and devices. The module is available with a fiber or unshielded twisted pair (UTP)/shielded twisted pair (STP) copper media interface. The ports of the ISL module can be connected to the ports of another ISL module in another router or switch.

## Understanding ISL

The Catalyst family of switches provides a means of multiplexing VLANs between switches and routers using ISL on Fast Ethernet or LAN emulation on Asynchronous Transmission Mode (ATM). You can use any combination of these trunk technologies to form enterprise-wide VLANs.

A *trunk* is a physical link that carries the traffic of multiple VLANs between two switches or between a switch and a router, thereby allowing the VLANs to be extended across switches. Trunks use high-speed interfaces such as Fast Ethernet, Fiber Data Distributed Interface (FDDI), or ATM.

ISL was originally developed for Ethernet switches. It uses a Fast Ethernet interface to provide connectivity between switches and extends the VLAN capabilities of the switch by tagging the standard Fast Ethernet frame with the necessary VLAN information. Like ATM, ISL can provide a high-speed link between switches. Unlike ATM, however, ISL forwards the data across the high-speed link without breaking the frames into cells. The frame is sent intact across the ISL connection.

The Token Ring implementation of ISL encapsulates Token Ring frames in Fast Ethernet frames.

## ISL and VLANs

In a Token Ring VLAN, logical ring domains can be formed by defining groups of ports that have the same ring number. The IEEE calls such a port group a Concentrator Relay Function (CRF). On Catalyst switches, such a grouping of Token Ring ports is called a Token Ring CRF (TrCRF).

The domain of interconnected rings is formed using an internal multiport bridge function that the IEEE calls a Bridge Relay Function (BRF). On Catalyst switches, such a grouping of logical rings is called a Token Ring BRF (TrBRF).

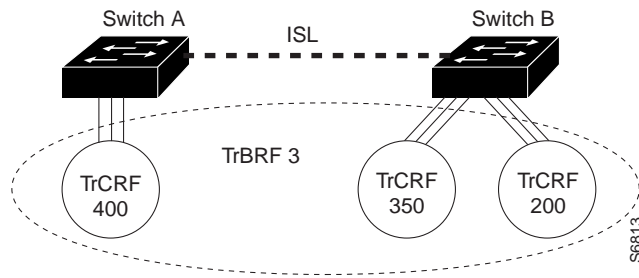
As mentioned in the previous section, ISL allows you to extend VLANs across switches. In a Token Ring environment, you can extend the TrBRF across switches, but not the TrCRF.

If you have an ISL module installed in your Catalyst 3900 Token Ring switch, the following types of TrCRFs can exist in your network: undistributed, backup, and default.

### Undistributed TrCRFs

The *undistributed* TrCRF is the standard type of TrCRF in the Catalyst 3900 switch. The undistributed TrCRF is located on one switch and has a logical ring number associated with it. Multiple undistributed TrCRFs located on the same or separate switches can be associated with a single parent TrBRF. The parent TrBRF acts as a multiport bridge, forwarding traffic between the undistributed TrCRFs. Figure 1 illustrates the undistributed TrCRF.

**Figure 1 Undistributed TrCRFs**



### Backup TrCRFs

The *backup* TrCRF enables you to configure an alternate route for traffic between undistributed TrCRFs located on separate switches that are connected by a TrBRF, in case the ISL connection between the switches becomes inactive.

While a TrBRF can contain multiple TrCRFs, it can contain only *one* TrCRF that is configured as a backup TrCRF. That backup TrCRF can contain only *one* port from each related switch. If, however, you have more than one TrBRF defined on a switch, you can have more than one backup TrCRF defined on a switch; one defined for each TrBRF.

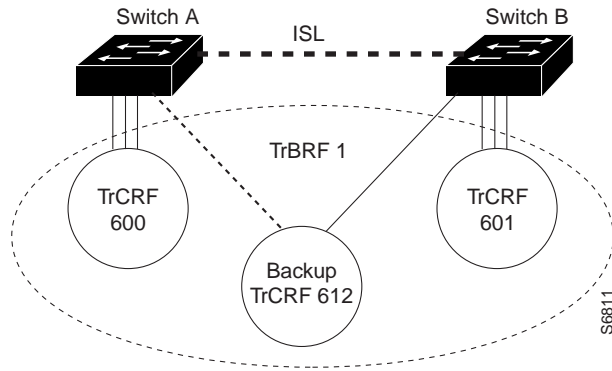
To create a backup TrCRF, create the TrCRF, assign it to the TrBRF that traverses the switches, mark it as a backup TrCRF, and then assign one port on each switch to the backup TrCRF.



**Caution** If the backup TrCRF port is attached to a Token Ring MAU, it will not provide a backup path unless the ring speed and port mode are set by another device. Therefore, it is recommended that you manually configure the ring speed and port mode for the port assigned to the backup TrCRF.

Under normal circumstances, only one port in the backup TrCRF is active. The active port is the port with the lowest MAC address. If the ISL connection between the switches become inactive, the port that is a part of the backup TrCRF on each affected switch will automatically become active, rerouting traffic between the undistributed TrCRFs through the backup TrCRF. When the ISL connection is reestablished, all but one port in the backup TrCRF will be disabled. Figure 2 illustrates the backup TrCRF.

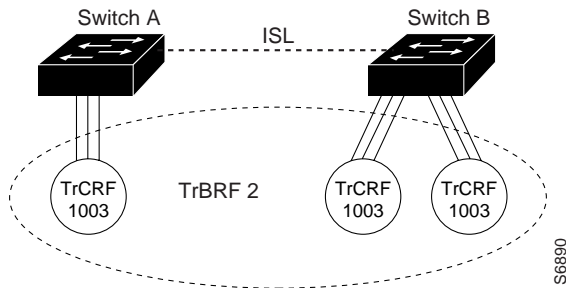
**Figure 2 Backup TrCRF**



**Default TrCRF**

As a rule, TrCRFs cannot span different switches. There is one exception; the default TrCRF (1003). The default TrCRF can contain ports that are located on multiple switches. It is associated with the default TrBRF (1005), which can span switches via ISL. As the default TrCRF is the only TrCRF that can be associated with the default TrBRF, the default TrBRF does not perform any bridging functions, but simply uses source-route switching to forward traffic between the ports of the TrCRF. Figure 3 illustrates the default TrCRF.

**Figure 3 Default TrCRF**



**Duplicate Ring Protocol**

The Cisco Duplicate Ring Protocol (DRiP) runs on Cisco devices that support switched VLAN networking and is used to identify active VLANs and help prevent the configuration of duplicate rings (TrCRFs) across switches.

Through packet advertisements, DRiP maintains the status of TrCRFs. It then uses this information to determine whether there are multiple TrCRFs active in a TrBRF.

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DRiP information is used for the following:

- Enables the switch to filter out excessive All-Routes Explorer (ARE) frames. The DRiP information is used in conjunction with the local configuration to determine which of the TrCRFs configured within a TrBRF have active ports. This information is used on the base switch to correctly to filter AREs and on the ISL module to discard AREs that have already been on an attached ring.
- Detects the configuration of duplicate TrCRFs across switches, which would cause a TrCRF to be distributed across ISL trunks. The DRiP information is used in conjunction with the local configuration information to determine which TrCRFs are already active on the switch. If DRiP determines that a TrCRF is configured on more than one switch, it will disable the ports associated with the TrCRF. In this case, the status of the port displayed on Port Configuration panel will be “Disabled by DRiP”.
- Detects the failure of an ISL path and enables a backup path.

## Using ISL and ATM

While your Catalyst 3900 can contain both an ATM expansion module and an ISL expansion module, you cannot use both in a parallel configuration. If the ATM module and the ISL module are configured for parallel connections, the Spanning-Tree Protocol will allow only one of the trunk ports to be active at a time.

Because ISL is used to propagate VLAN trunking information, it is important for the ISL module to be the active path in an ISL–ATM parallel connection. Therefore, the path cost is calculated based on a 200-Mbps connection, which results in a path cost of 5 and causes the Spanning-Tree Protocol to place the ISL port in forwarding mode and the ATM port in blocked mode.

## VLAN Trunking Protocol

The Cisco VLAN Trunking Protocol (VTP) is used to set up and manage VLANs across an entire management domain. When new VLANs are added to a device (Cisco router or switch) in a management domain, VTP can be used to automatically distribute the information via trunk ports to all of the devices in the management domain. This distribution ensures VLAN naming consistency and connectivity between all devices in the domain by allowing each device in the domain to learn of any new VLANs added to other devices in the domain. VTP advertisements are transmitted on all ISL connections.

The Catalyst 3900 supports VTP Version 2, which includes provisions for the propagation of Token Ring-specific parameters associated with VLANs, such as hop count and bridge numbers.

## Spanning Tree Support

The ISL module supports the Spanning-Tree Protocol at both the TrCRF and the TrBRF level. The Spanning-Tree Protocol that is run on the ISL link depends on the type of TrCRF:

- With an undistributed TrCRF, the Spanning-Tree Protocol specified for the TrBRF is used.
- With a default TrCRF, the Spanning-Tree Protocol specified for the TrCRF is used.

## Switched Port Analyzer

The Catalyst 3900 allows you to configure a Switched Port Analyzer (SPAN) port for monitoring port traffic. This SPAN support allows you to monitor traffic on any of the Token Ring ports. You can define both active and passive monitors.

- An active port monitor allows you to monitor traffic using a customer-supplied monitoring device, such as an RMON probe, or a trace tool, such as a Network General Sniffer. The trace tool monitors only the Link Layer Control (LLC) traffic that is switched by the monitored port. The MAC frames are not monitored.
- A passive port monitor allows you to monitor all the frames on a particular ring, including the MAC frames.

The ISL module does not support passive monitoring. For active monitoring, you can monitor traffic that is processed by the ISL port on a per-TrCRF basis (monitoring only one TrCRF at a time). However, you cannot use the ISL port to monitor other ports.

## TokenChannels

TokenChannels consist of two to eight parallel channels between two Catalyst 3900s. These parallel channels can be used to provide improved performance (compared to regular Token Ring connections) between Catalyst 3900s. ISL ports, however, cannot be used in a TokenChannel.

## Filtering

The ISL module does not support Media Access Control (MAC) or protocol filtering.

## Attaching to a Catalyst 5000 ISL Port

If you want to attach the Catalyst 3900 ISL port to the ISL port of a Catalyst 5000, you must manually configure the ISL port on the Catalyst 5000 for 100 Mbps (using the **set port speed** command) and full-duplex mode (using the **set port duplex** command).

## Physical Characteristics

This section provides an overview of the expansion module physical characteristics.

Figure 4 shows the UTP/STP ISL module.

**Figure 4** UTP/STP ISL Module

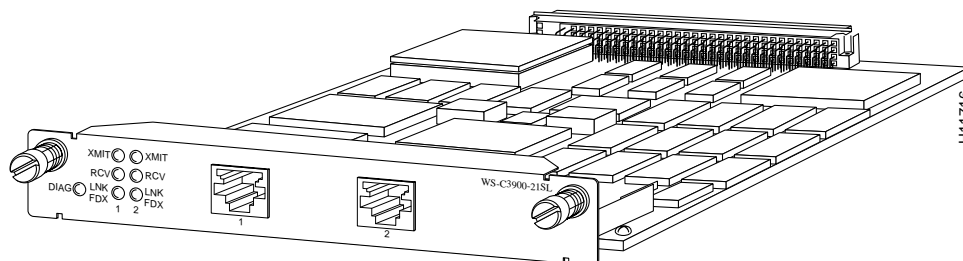
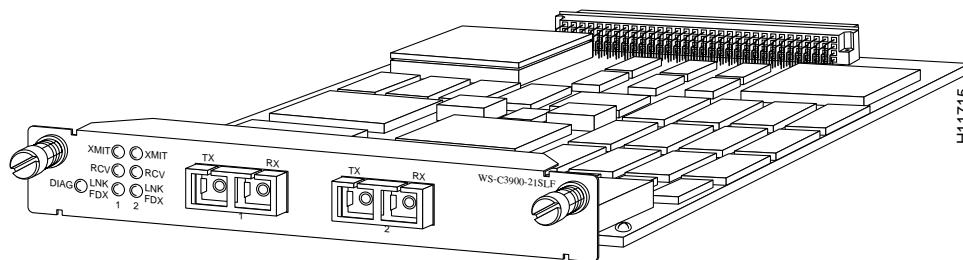


Figure 5 shows the fiber ISL module.

**Figure 5 Fiber ISL Module**



## Module Specifications

This section lists the power requirements, operating parameters, physical dimensions, and standards compliance for the ISL module.

Table 1 lists the power requirements for the ISL module.

**Table 1 Power Requirements**

Power consumption	20watts
Thermal dissipation	68 BTU/hr

Table 2 describes the operating environment for the ISL module.

**Table 2 Operational Parameters**

Temperature	50 F to 104 F (10 C to 40 C)
Relative humidity	8% to 80%
Maximum wet-bulb temperature	81 F (27 C)

Table 3 lists the physical dimensions of the ISL module.

**Table 3 Physical Dimensions**

Width	5.45 in. (138.4 mm)
Depth	8.06 in. (204.7 mm)
Height	1 in. (25.4 mm)
Weight	1 lb (.45 kg)

Table 4 lists the electromagnetic interference (EMI) standards with which the ISL module complies.

**Table 4** EMI Standards

STP	FCC Class A (47 CFR, Part 15), ICES-003 Class A, EN 55022 Class A, CISPR22 Class A, AS/NZS 3548 Class A, and VCCI Class A
UTP	EN 55022 Class B; CISPR22 Class B, AS/NZS 3590 Class B, and VCCI Class B
Fiber	EN 55022 Class B; CISPR22 Class B, AS/NZS 3590 Class B, and VCCI Class B

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**Note** The use of unshielded cables may cause undesired interference in situations where Class B emissions are required.

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## LEDs

There is one status LED for the module. It is the DIAG LED. The DIAG LED is lit during power-up diagnostics. If one of the ports on the module fails the diagnostic tests, the DIAG LED will remain lit. Otherwise, it is off.

There are three status LEDs for each of the ports. Table 5 lists the port LEDs and their meanings.

**Table 5** Port LEDs

LED	State	Meaning
XMT	On	Port is transmitting.
RCV	On	Port is receiving.
LNK/FDX	On	Port is inserted into the network and is functioning in full-duplex mode. This LED is also on briefly at the end of the power-on sequence.

## Installation Considerations

Observe the following cautions when installing an expansion module into an expansion slot of the Catalyst 3900 chassis.



**Caution** Do not touch the components or connectors on the module. Do not touch cable connector pins when the other end of the cable is plugged in. Damage may result from static discharge.



**Caution** During installation, the connector on the expansion module must line up evenly with the connector inside the expansion slot. Misalignment may cause the connector pins to bend. When inserting the expansion module into the expansion slot, be sure that the board is level and that the left and right sides slide evenly into the slot.



**Caution** This module contains static-sensitive devices. Please follow proper electrostatic discharge (ESD) handling procedures (wristband with ground strap and ESD mat) when installing this module in your Token Ring switch chassis.



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## Installing the ISL Expansion Module

To install the module, perform the following steps:

- Step 1** Power off the Catalyst 3900 by unplugging it. The Catalyst 3900 does not have an on/off switch. To power off the Catalyst 3900, you must disconnect the power cord from the rear of the switch.



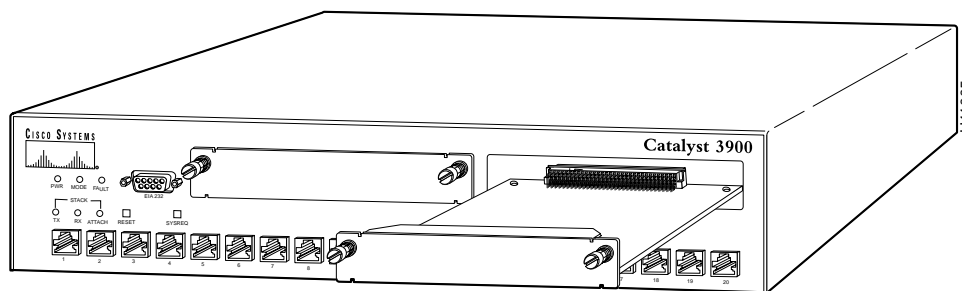
**Warning** Unplug the power cord before you work on a system that does not have an on/off switch.

- Step 2** Remove the expansion slot faceplate by unscrewing the thumbscrews.

- Step 3** Slide the module into the slot, being careful to align the sides of the module with the guide rails (Figure 6). Continue sliding the module into the slot until it is seated in the connector at the back of the slot. When the card is fully seated, the back of the module faceplate will be in contact with the front of the Catalyst 3900.

- Step 4** Secure the card using the two thumbscrews attached to it.

**Figure 6** Installing the Module



## Testing the Installation

After you have installed the module, perform the following steps to verify the installation:

- Step 1** Power on the Catalyst 3900 so that the diagnostics start.
- Step 2** Verify that the Catalyst 3900 diagnostics have been completed successfully. With the Catalyst 3900 ISL expansion module, this is indicated when the DIAG LED is off. Diagnostics can take up to four minutes to complete.

## Cabling the Module Ports to Other Devices

The ISL module's network port is either an RJ-45 or SC-style connector, depending upon the model. The RJ-45 connector uses UTP Ethernet Category 5 cable. The SC connector uses 1300 nm multimode fiber optic cable.

When cabling the ISL module, the polarity of the fiber cable connectors must be "crossed-over." The TX (transmit) connector of one device goes to the RX (receive) connector of the other device. Check the polarity of each side of the fiber-optic cable. Use one side of the fiber-optic cable to connect from the transmit (Tx) side of a dual-port fiber ISL module to the receive (Rx) side of another device. Use the other side of the cable to connect the receive side of the dual-port fiber ISL module to the transmit side of the other device.

**Note** To determine polarity, there are several different conventions that enable you to distinguish the fibers. There may be a difference in color or, on some fiber-optic cables, only one of the fibers has lettering on the insulating sheath. Use the markings as polarity indicators.

Observe the following warnings when cabling an expansion module with fiber-optic cable.



**Warning** Laser radiation is present when the system is open.



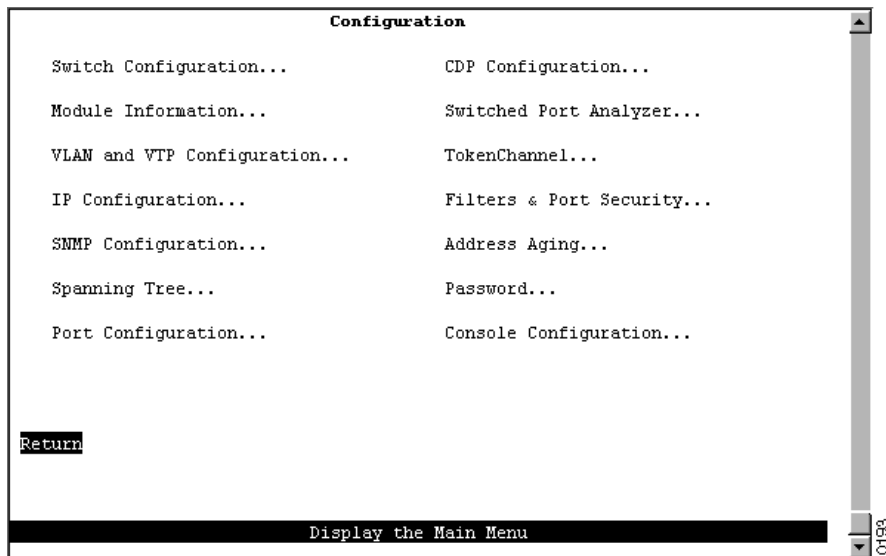
**Warning** Do not stare into the laser beam.

## Configuring the ISL Expansion Module

The Catalyst 3900 allows you to configure the ISL expansion module using its menu-driven interface. This section describes the configuration panels that have been modified for the ISL module. For information about other configuration panels, see the *Catalyst 3900 Token Ring Switch User Guide*.

To access the configuration panels, select **Configuration** from the Main Menu. The Configuration Menu panel (Figure 7) is displayed.

**Figure 7** Configuration Menu Panel

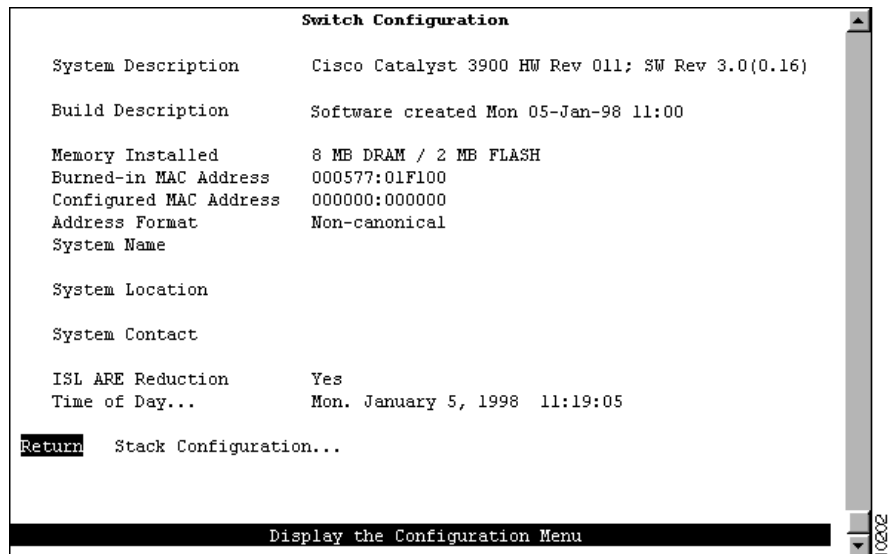


The Switch Configuration, Module Information, VLAN and VTP Configuration, Port Configuration, and Switched Port Analyzer options have been modified to accommodate the configuration of the ISL expansion module.

## Enabling and Disabling ARE Reduction

The Catalyst 3900 allows you to disable the ARE reduction feature provided by the ISL module. To change the current setting for ARE reduction, select **Switch Configuration** on the Configuration Menu. The Switch Configuration panel (Figure 8) is displayed.

**Figure 8**      **Switch Configuration Panel**



The following information is displayed on this panel:

- System Description—Full name and version identification of the system’s hardware.
- Build Description—Version identification of the firmware.
- Memory Installed—Amount (in megabytes) of dynamic memory (DRAM) and Flash memory installed. Information in this field cannot be changed.
- Burned-in MAC Address—Factory-assigned MAC address of the Catalyst 3900. Information in this field cannot be changed.
- Configured MAC Address—MAC address that is configured for the Catalyst 3900. If a locally administered address is assigned to the Catalyst 3900, this field displays that address. Otherwise, the field displays all 0s. To assign a locally administered address, select this field and enter the new address. The new address will take effect the next time the Catalyst 3900 is reset.
- Address Format—Format used for MAC addresses (non-canonical or canonical). Non-canonical is typically used in Token Ring networks and is also known as *most significant bit first*. The two parts of a non-canonical address are separated by a colon. Canonical format is typically used in Ethernet networks and is also known as *least significant bit first*. The two parts of a canonical address are separated by a dash. If you change the address format, the new format will be used for displaying addresses by all switches in the stack and will take effect immediately.
- System Name—Locally assigned name of this Catalyst 3900. This name will appear in Simple Network Management Protocol (SNMP) traps.
- System Location—Location information for this Catalyst 3900. This location will appear in SNMP traps.
- System Contact—Name of system contact for this Catalyst 3900.
- ISL ARE Reduction—Whether the ARE reduction feature for the ISL module is enabled. Possible values are Yes and No. The default is Yes.
- Time of Day—Time according to the internal clock of the Catalyst 3900.

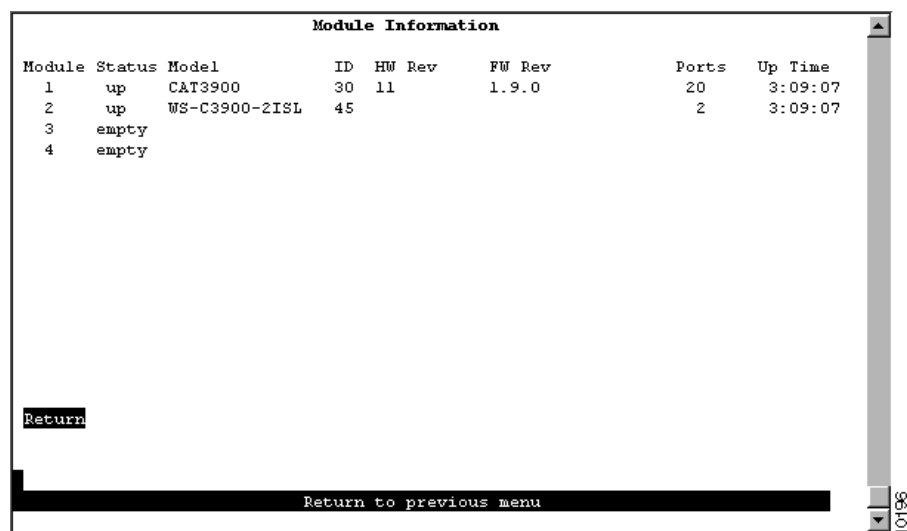
**Note** If this Catalyst 3900 is part of a stack, updates to the Address Format, System Name, System Location, and System Contact are propagated throughout the stack.

To	Select	Then
Change the current settings...	The appropriate parameter...	Specify the new value.
View additional information about the switch...	<b>Stack Information</b>	Refer to the “Viewing Stack Information” section in the <i>Catalyst 3900 Token Ring Switch User Guide</i> .
Save your changes...	<b>Return</b>	

## Viewing Module Information

To view general information about the Catalyst 3900 and any expansion modules installed, select **Module Information** on the Configuration Menu. The Module Information panel (Figure 9) is displayed.

**Figure 9** Module Information Panel



The following information is displayed on this panel:

- **Module**—Module number. The Catalyst 3900 is listed as module 1. Expansion modules are listed as module 2 and module 3. The stack port is listed as module 4.
- **Status**—Indicates whether the module is up, down, or the slot is empty.
- **Model**—Type of module. CAT3900 is listed for the base switch. For other modules, this field displays the product number, such as WS-3900-STACK for the stack module, WS-3900-2ISL for the copper ISL module, or WS-3900-2ISLF for the fiber ISL module.
- **ID**—Identifier of the board in decimal. For a list of possible board IDs, refer to the “Board IDs” section in the “Codes and IDs” appendix of the *Catalyst 3900 Token Ring Switch User Guide*.

- HW Rev—Hardware revision level of the module. For the Stack module, this field displays the hardware revision level of the stack module followed by the revision level of the Proprietary Fat Pipe. A Stack Port module Revision B will be displayed as 0.B.
- FW Rev—Firmware revision level of the module.
- Ports—Number of ports on the module.
- Up Time—Amount of time (in hours, minutes, and seconds) that the module has been up (since the last reset).

You cannot change the information that appears on this panel.

## VTP VLAN Configuration

To define VLANs or view the current definition of an existing VLAN, select **VTP VLAN Configuration** on the VLAN and VTP Configuration panel. The VTP VLAN Configuration panel (Figure 10) is displayed. The VTP VLAN Configuration panel has been modified. The panel now indicates which VLANs (TrBRFs and TrCRFs) are used by the local switch.

**Figure 10 VTP VLAN Configuration Panel**

TrBRF/TrCRF	ID	Brdg/Rng	Ports	Local State
<b>BRF100</b>	100	0x0F		preferred
crf101	101	auto	yes	preferred
<b>BRF200</b>	200	0x0F		preferred
crf201	201	auto	yes	preferred
crf202	202	auto	no	preferred
<b>BRF300</b>	300	0x0F		preferred
crf301	301	auto	yes	preferred
crf302	302	auto	no	preferred
<b>BRF400</b>	400	0x0F		preferred
crf401	401	auto	yes	preferred
crf402	402	auto	no	preferred
crf403	403	auto	no	preferred
crf404	404	auto	no	preferred
<b>BRF500</b>	500	0x0F		preferred
crf501	501	0x01	yes	preferred

Return More View... Add... Change... Change\_Local\_State Delete Sort

Return to previous menu

The following information is displayed on this panel:

- TrBRF/TrCRF—ASCII name associated with the VLAN, which is synonymous with the VLAN's emulated LAN name on LANE trunks.
- ID—Numeric VTP ID, which is synonymous with the VLAN's ISL ID associated with the VLAN packets on ISL trunks.
- Brdg/Rng—Bridge number for TrBRFs or ring number for TrCRFs. The bridge and ring numbers are displayed in hexadecimal.
- Ports—For TrCRFs, indicates whether or not ports have been associated.

- Local State—Indicates whether a VLAN (TrCRF or TrBRF) is used on the local switch. Possible values are not-local, preferred, and automatic.
  - Not-local indicates that the VLAN is not designated for use on the local switch.
  - Preferred indicates that the VLAN is designated for use on the local switch. A preferred VLAN is guaranteed access on the switch. Any TrCRF to which ports on the local switch are assigned is designated as preferred. In addition, you can designate other TrCRFs and TrBRFs as preferred using the Change\_Local\_State option. Up to 63 TrCRFs and 63 TrBRFs can be designated as preferred.
  - Automatic indicates that the VLAN can be used on the local switch if access is available. An automatic VLAN is not guaranteed access on the switch. Automatic VLANs are given access as space is available (if less than 63 VLANs have been designated as preferred).

When setting the local state for a VLAN, keep the following in mind:

- New TrBRFs are assigned a local state of not-local.
- If you add a TrCRF to a TrBRF with a local state of not-local, the TrCRF is assigned a local state of not-local.
- If you add a TrCRF to a TrBRF with a local state of preferred, the TrCRF is assigned a local state of automatic.
- If you add a TrCRF to the preferred list and the parent TrBRF is not already designated as preferred, the local state of the parent TrBRF will also be changed to preferred.
- If you add a TrBRF to the preferred list and its children have a local state of not-local, the local state of the children will be changed to automatic.
- You cannot change the state of any TrBRF that contains a TrCRF in the preferred state.
- You cannot change the state of any TrCRF to which ports are assigned.
- If you remove a TrBRF from the preferred list, the local state will be changed to not-local.
- If you remove a TrCRF from the preferred list, the local state will be changed to automatic (if there are less than 63 TrCRFs that have been granted access through the switch) or not-local.

To	Select	Then
View the current configuration of a VLAN, including a list of associated ports for a TrCRF...	<b>View</b>	Specify the VLAN ID.
Add a new TrBRF VLAN configuration...	<b>Add</b>	Specify the VLAN ID. Select <b>TrBRF</b> . Refer to the “Adding or Changing TrBRF VLAN Parameters” section of the <i>Catalyst 3900 Token Ring Switch User Guide</i> .
Add a new TrCRF VLAN configuration...	<b>Add</b>	Specify the VLAN ID. Select <b>TrCRF</b> . Refer to the “Adding or Changing TrCRF VLAN Parameters” section of the <i>Catalyst 3900 Token Ring Switch User Guide</i> .

<b>To</b>	<b>Select</b>	<b>Then</b>
Change an existing TrBRF VLAN configuration...	<b>Change</b>	Specify the VLAN ID and refer to the “Adding or Changing TrBRF VLAN Parameters” section of the <i>Catalyst 3900 Token Ring Switch User Guide</i> .
Change an existing TrCRF VLAN configuration...	<b>Change</b>	Specify the VLAN ID and refer to the “Adding or Changing TrCRF VLAN Parameters” section of the <i>Catalyst 3900 Token Ring Switch User Guide</i> .
Add or remove a TrBRF or TrCRF from the list of preferred VLANs...	<b>Change_Local_State</b>	Specify the VLAN ID and confirm your request to add or remove the VLAN from the preferred list. Then, press any key to refresh the panel.
Delete a VLAN...	<b>Delete</b>	Specify the VLAN ID.
Display a list of VLANs sorted by VLAN ID...	<b>Sort</b>	Select <b>Sort_by_VLAN_ID</b> .
Save your changes...	<b>Return</b>	

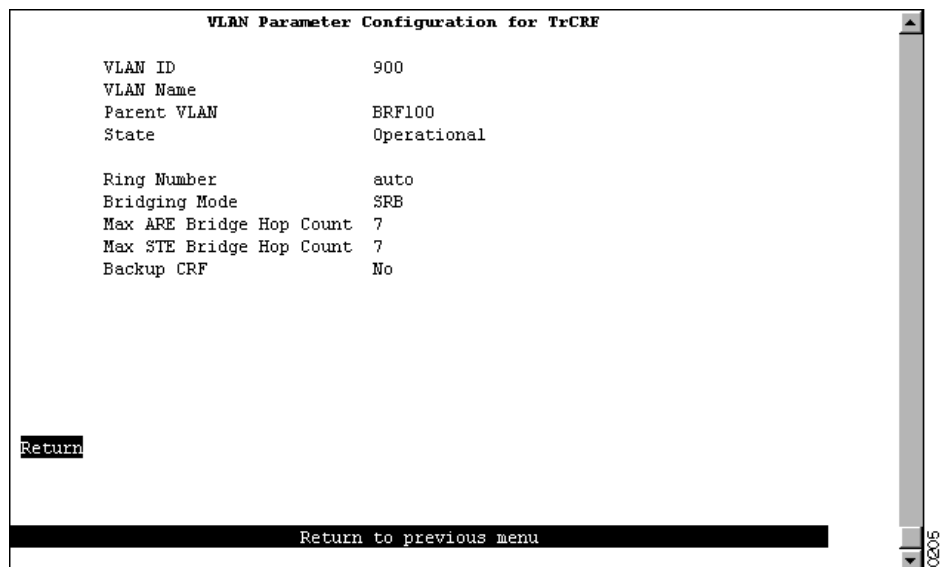
### Adding a Backup TrCRF

As described in the “ISL and VLANs” section, you can configure a TrCRF as a backup path in the event that the ISL link fails. When configuring a backup TrCRF, keep the following in mind:

- Only one port in a TrCRF can be designated as a member of a backup TrCRF.
- Only one TrCRF in a TrBRF can be designated as a backup TrCRF. However, there can be other TrCRFs in a TrBRF.

To add a backup TrCRF, select **Add** on the VLAN Configuration panel, and select **TrCRF**. The VTP VLAN Parameter Configuration panel (Figure 11) is displayed.

Figure 11 VTP VLAN Parameter Configuration Panel



The following information is displayed on this panel:

- VLAN ID—Numeric VTP ID, which is synonymous with the VLAN’s ISL ID associated with the VLANs packets on ISL trunks. Possible values are 1 through 1005.
- VLAN Name—ASCII name associated with the VLAN, which is synonymous with the VLAN’s emulated LAN name on LANE trunks. Up to 32 characters are allowed.
- Parent VLAN—TrBRF to which this VLAN belongs.
- State—Current state of the VLAN. Possible values are Operational and Suspended. VLANs in operational state are functional. VLANs in suspended state do not pass packets. The default is Operational.
- Ring Number—Logical ring number (in hexadecimal format) assigned to this VLAN. Possible values are auto and 01 through FFF. The default is auto, meaning that the ring number will be learned. If the ring number has been learned, the ring number will be displayed in the format A-xxx.
- Bridging Mode—Bridging mode for this VLAN. Possible values are SRB (source-route bridging) and SRT (source-route transparent bridging). The default is SRB.
- Max ARE Bridge Hop Count—Maximum number of hops for ARE frames. Possible values are 1 through 13. The default is 7.
- Max STE Bridge Hop Count—Maximum number of hops for spanning-tree explorer (STE) frames. Possible values are 1 through 13. The default is 7.
- Backup CRF—Whether the TrCRF is to be used as a backup TrCRF. Possible values are No and Yes. The default is No.



## Enabling and Disabling TrCRFs and TrBRFs for the ISL Port

By default, all local TrCRFs and TrBRFs that are defined on a switch when the switch is started (or restarted) are enabled for the ISL port. However, you can disable a TrCRF or TrBRF for the ISL port. To display a list of the current VLAN port assignments and to change any of these assignments, select **Local VLAN Port Configuration** on the VLAN and VTP Configuration panel. The Local VLAN Port Configuration panel (Figure 12) is displayed.

**Figure 12 Local VLAN Port Configuration Panel**

Port	Mode	TrCRF	TrBRF
16	Static	trcrf-default	trbrf-default
17	Static	trcrf-default	trbrf-default
18	Static	trcrf-default	trbrf-default
19	Static	trcrf-default	trbrf-default
20	Static	trcrf-default	trbrf-default
21	Trunk	crf101	BRF100
		crf201	BRF200
		crf301	BRF300
		crf401	BRF400
		crf501	BRF500
23	Trunk	crf202	BRF200
		crf302	BRF300
		crf402	BRF400

Return      More      Change

Return to previous menu

This panel displays the following information about the VLAN port assignments:

- **Port**—Port number.
- **Mode**—VLAN mode of the port. Possible values are Static and Trunk.
- **TrCRF**—TrCRF to which the port is currently assigned. By default, all ports are assigned to trcrf-default. For ISL ports, this field lists the TrCRFs that are enabled for the port. If a TrBRF is enabled for an ISL port but none of the related TrCRFs are enabled for the port, this field displays “none”.
- **TrBRF**—Parent VLAN of the TrCRF to which the port is currently assigned. The default is trbrf-default. For ISL ports, this field lists the TrBRFs that are enabled for the port.

To	Select	Then
Change the TrCRF to which the port is assigned...	<b>Change</b>	Specify the port to change and select the VLAN from the displayed list of TrCRFs.
Change the TrCRFs or TrBRFs enabled for an ISL port ...	<b>Change</b>	Specify the ISL port to change, select the TrBRF from the list of TrBRFs and enable or disable the TrCRF as desired.
Save your changes...	<b>Return</b>	

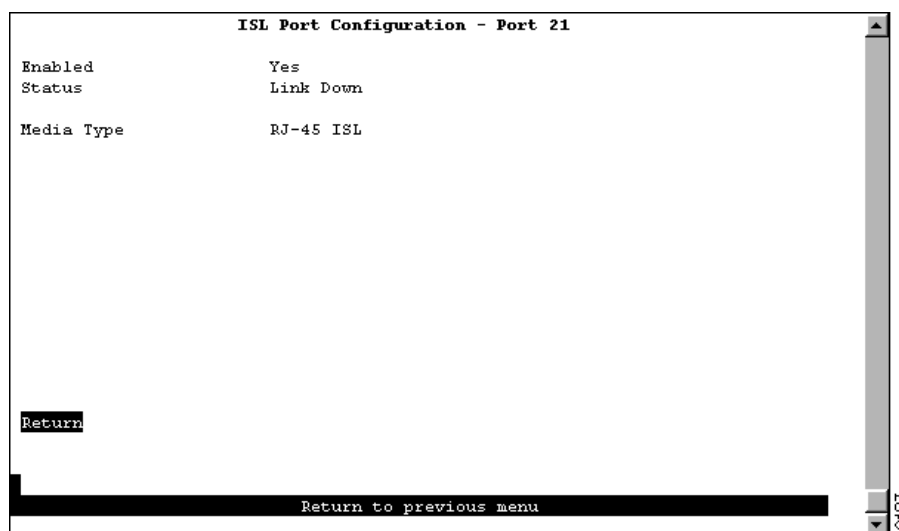
When changing VLAN assignments for an ISL module, keep the following in mind:

- TrBRFs enabled for an ISL port are noted in the TrBRF list with an asterisk.
- To enable a TrBRF for an ISL port, while in the TrBRF list move your cursor to the desired TrBRF and press the space bar.
- To change the enabled state of TrCRF for an ISL port, select the TrBRF (by pressing S) from the TrBRF list and use the space bar to toggle between whether the TrCRF is enabled for the ISL port.
- You cannot select a TrBRF that is not yet enabled for the ISL port. You must first enable the TrBRF for the ISL port.
- If you disable a TrBRF for the ISL port, all TrCRFs for which the TrBRF is a parent are automatically disabled for the ISL port.

## Configuring Port Parameters

To configure port parameters your ISL expansion module, select **Port Configuration** from the Configuration Menu panel. You are prompted to specify the port you want to configure. When you specify a port on an ISL module, the ISL Port Configuration panel (Figure 13) is displayed. The possible port values for the 2-port ISL expansion module are 21 and 23 (if the module is inserted in slot 1) and 25 and 27 (if the module is inserted in slot 2).

**Figure 13 ISL Port Configuration Panel**



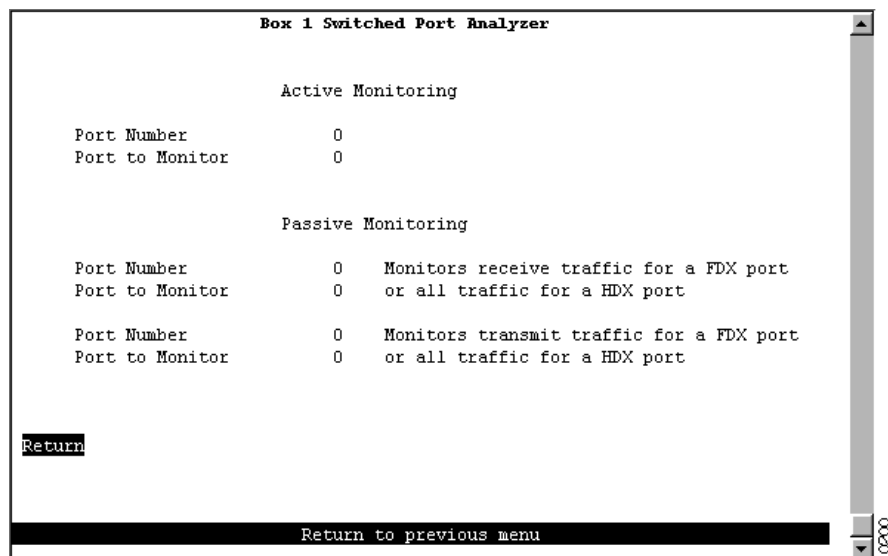
The following information is displayed on this panel:

- Enabled—Indicates whether the ISL port is enabled. Possible values are Yes and No. The default is Yes.
- Status—Current status of the port. Possible values are Link Up, if the module is up and operational, or Link Down, if the module is not up and operational. You cannot change this field.
- Media Type—Connection media of the port. Possible values are RJ-45 ISL and SC Fiber ISL.

## Configuring SPAN for ISL

You can use the Switched Port Analyzer (SPAN) function to perform active monitoring of your ISL module. To configure a SPAN port, select **Switched Port Analyzer** on the Configuration Menu. The Switched Port Analyzer panel (Figure 14) is displayed.

**Figure 14** Switched Port Analyzer Panel



The following information is displayed on this panel:

- Active Monitoring
  - Port Number—Port to which the network analyzer or remote monitoring (RMON) probe will be attached. Possible values are 0 through 28. You cannot, however, specify an ISL port.
  - Port To Monitor—Port that will be monitored. Possible values are 0 through 28. If you specify an ISL port, you will be prompted to select the TrCRF that you want to monitor.
- Passive Monitoring
  - You cannot perform passive monitoring on or with an ISL port.

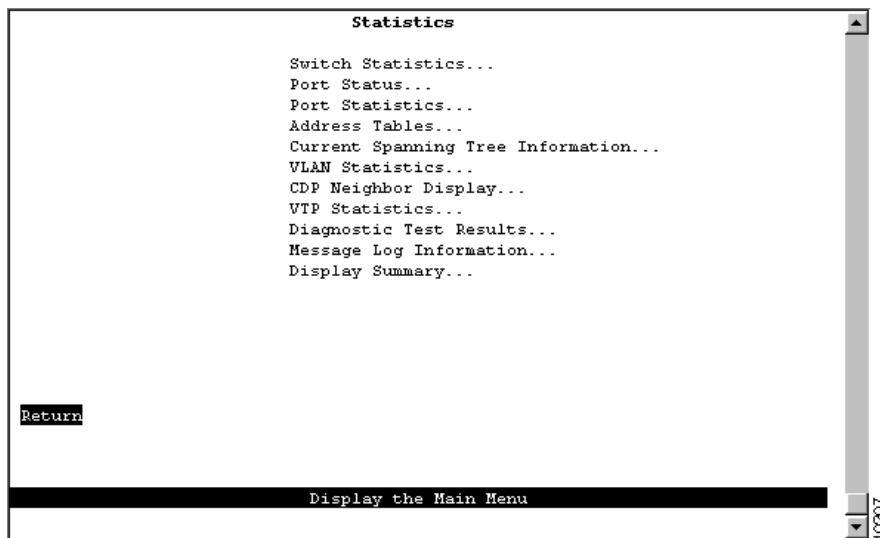
To	Select	Then
Change the current settings...	The appropriate parameter...	Specify the value.
Disable the SPAN port...	<b>Port to Monitor</b>	Specify 0.
Save your changes...	<b>Return</b>	

## Monitoring the ISL Expansion Module

The Catalyst 3900 provides status and statistical information for several aspects of the ISL expansion module. This section describes the status and statistics panels that have been modified for the ISL module. For information about other status and statistics panels, see the *Catalyst 3900 Token Ring Switch User Guide*.

To access the status and statistical information, select **Statistics** on the Main Menu. The Statistics panel (Figure 15) is displayed.

Figure 15 Statistics Panel

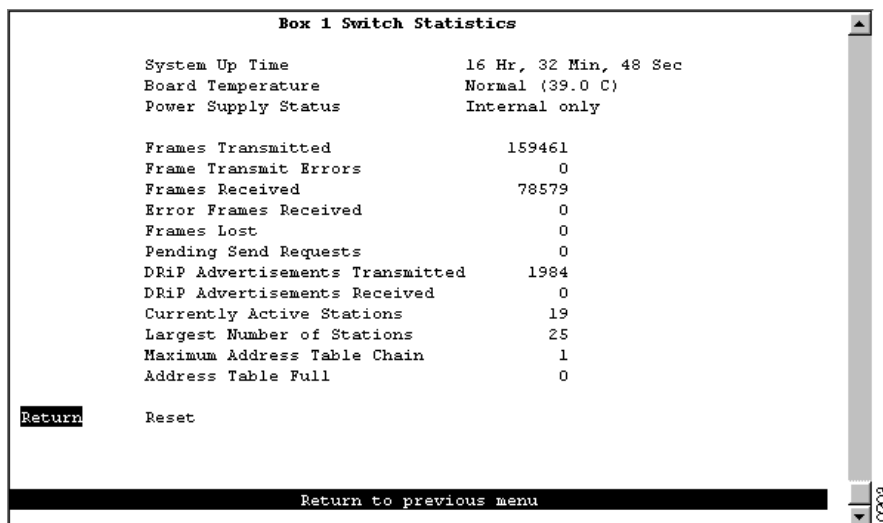


The Switch Statistics, Port Status, and Port Statistics options have been modified to provide information about the ISL expansion module.

## Viewing DRiP Statistics

To view statistics about DRiP, select **Switch Statistics** on the Statistics Menu. The Switch Statistics panel (Figure 16) is displayed. The information on the statistics panels is refreshed approximately every 5 seconds. To reset the information displayed on any of the statistics panels, select **Reset**.

Figure 16 Switch Statistics Panel



---

The following information is displayed on this panel:

- System Up Time—Length of time (in hours, minutes, and seconds) since the last reset or power cycle.
- Board Temperature—Indicates whether the board temperature is Normal or Unacceptably high (over 140°F or 60°C).
- Power Supply Status—Indicates the current status of the power supply. Possible values are:
  - Internal only—The internal power supply is acting as the main power source. The switch is not capable of being connected to a redundant power supply (RPS) unit.
  - Internal w/no backup—The internal power supply is acting at the main power source and either the switch is not connected to an RPS unit or the RPS unit is not operational.
  - Internal w/backup (will reset)—The internal power supply is acting as the main power source and the switch is connected to an RPS unit that is ready to supply backup power in the event that the main source fails. If the power supply is changed from the internal supply to the RPS (due to a failure in the internal supply), the switch will reset.
  - External w/no backup—The RPS unit is acting as the main power source and there is no backup power supply available. This is either because the switch is connected to only one of the RPS DC supplies and the internal power supply has failed or because the switch is connected to two of the RPS DC supplies and one of them has failed.
  - External w/backup (no reset)—The RPS unit is acting as the main power source and is ready to supply backup power. This means that the switch is connected to two of the RPS DC supplies.
- Frames Transmitted—Number of frames transmitted from the Catalyst 3900 control processor.
- Frame Transmit Errors—Number of frames unable to be transmitted by the processor because of transmit errors.
- Frames Received—Number of frames received by the Catalyst 3900 control processor.
- Error Frames Received—Number of frames received that were too long or short.
- Frames Lost—Number of frames dropped because of errors.
- Pending Send Requests—Number of frames in the send queue.
- DRiP Advertisements Transmitted—Number of DRiP advertisements transmitted on the local ISL ports.
- DRiP Advertisements Received—Number of DRiP advertisements received on the local ISL ports.
- Currently Active Stations—Number of entries in the address table, that represent currently active stations, or nodes, on all ports of the Catalyst 3900.
- Largest Number of Stations—Largest number of addresses in the address table at any one time since the last reset or power cycle.
- Maximum Address Table Chain—Largest number of addresses that have hashed to the same location in look-up tables having the same index.
- Address Table Full—Number of times the address table has reached capacity.

## Viewing Port Status

To view status information about the ISL ports, select **Port Status** on the Statistics panel. The Port Status panel (Figure 17) is displayed.

**Figure 17 Port Status Panel**

The screenshot shows a terminal window titled "Port Status". It contains a table with the following data:

Port	TrCRF	TrBRF	Enabled	Ins	Spd	Oper Mode	Fwd Mode
16	trcrf-default	trbrf-default	Yes	No			
17	trcrf-default	trbrf-default	Yes	No			
18	trcrf-default	trbrf-default	Yes	No			
19	trcrf-default	trbrf-default	Yes	No			
20	trcrf-default	trbrf-default	Yes	No			
21	trunking	trunking	Yes	No			
23	trunking	trunking	Yes	No			

Below the table, there is a "Return" label and a highlighted "More" button. At the bottom of the panel, there is a black bar with the text "Display Port Status Summary".

The following information is displayed on this panel:

- Port—Port number.
- TrCRF—Name of the TrCRF to which this port belongs. The panel shows only the first 16 characters of the name. For an ISL port, this field displays trunking.
- TrBRF—Name of the TrBRF to which this port belongs. The panel shows only the first 16 characters of the name. For an ISL port, this field displays trunking.
- Enabled—Indicates whether the port is enabled. Possible values are Yes and No.
- Ins—Indicates whether the port is inserted into the ring. Possible values are Yes and No.
- Spd—Speed of the port in megabits per second. For an ISL port, the only possible value is 100.
- Oper Mode—Operating mode of the port. For an ISL port, the only possible value is FDX.
- Fwd Mode—Forwarding mode of the port. For an ISL port, the only possible value is Store-Fwd.

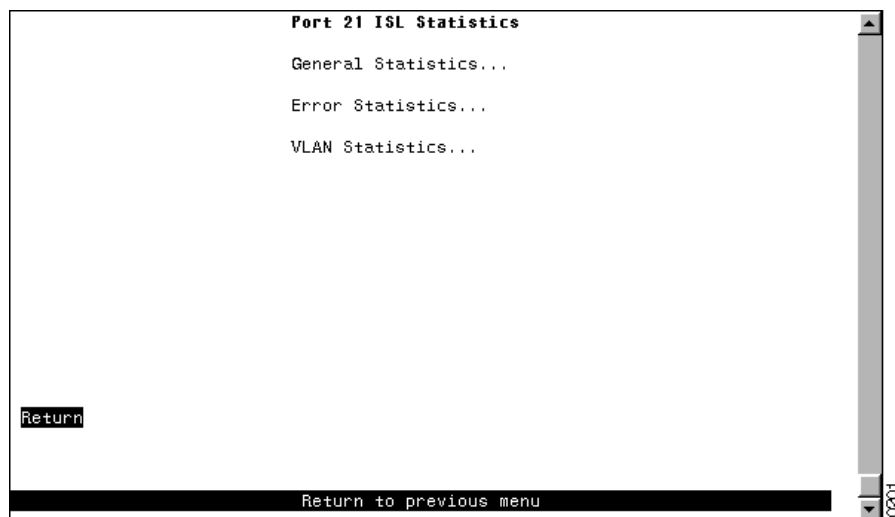
You cannot change any information on this panel.

---

## Viewing Port Statistics

To access statistics about the ISL ports, select **Port Statistics** on the Statistics Menu panel and specify the port identifier of the ISL port. The Port *x* ISL Statistics panel (Figure 18) is displayed.

**Figure 18** Port *x* ISL Statistics Panel



The following options are displayed on this panel:

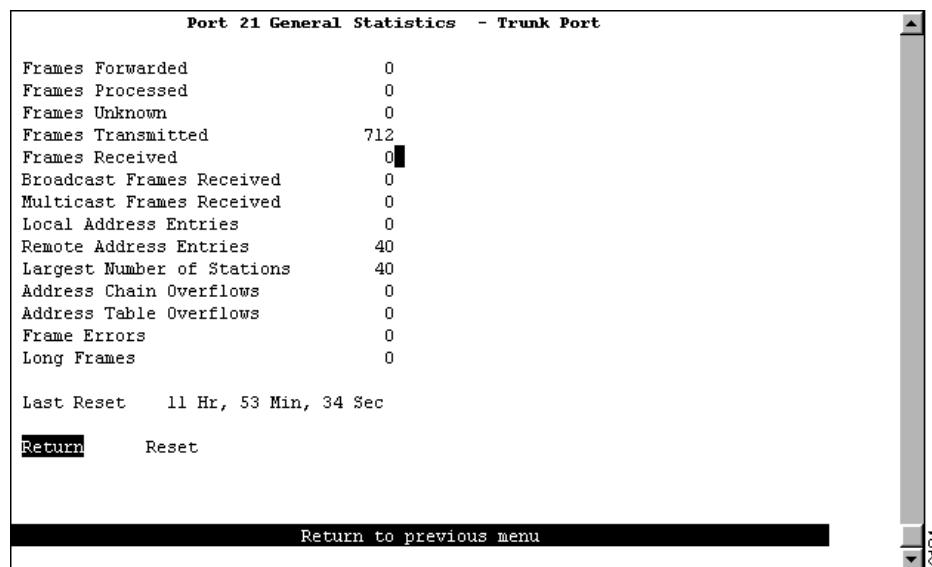
- **General Statistics**—Select this option to display statistical counters pertaining to the traffic processed by the ISL port. Refer to the “Viewing General Statistics” section for more information.
- **Error Statistics**—Select this option to access statistical information about errors detected on the ISL port. Refer to the “Viewing Error Statistics” section for more information.
- **VLAN Statistics**—Select this option to display statistical counters pertaining to the traffic processed by the VLANs to which the ISL port belongs. Refer to the “Viewing VLAN Statistics” section for more information.

### Viewing General Statistics

To view general statistical information about the traffic on the ISL port, select **General Statistics** on the Port *x* ISL Statistics panel. The Port *x* General Statistics panel (Figure 19) is displayed. As the Token Ring ISL module encapsulates Token Ring frames in Ethernet frames, the frame counters on this panel pertain to the Ethernet frames transmitted and received by the ISL module.

The information on the statistics panels is refreshed approximately every 5 seconds. To reset the information displayed on any of the statistics panels, select **Reset**.

**Figure 19 Port x General Statistics Panel**



The following information is displayed on this panel:

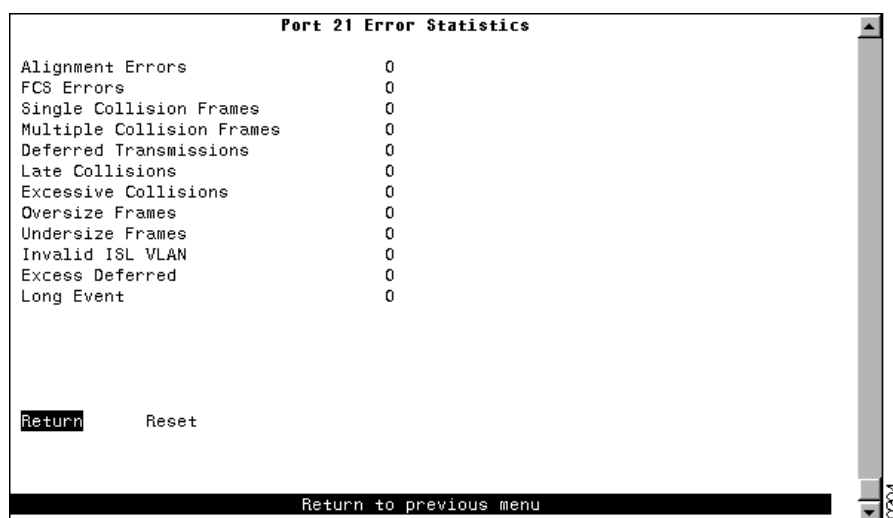
- **Frames Forwarded**—Number of encapsulated Token Ring frames received on this port and forwarded by the Catalyst 3900 hardware or processor.
- **Frames Processed**—Number of encapsulated Token Ring frames received on this port and delivered to the Catalyst 3900 system software for processing.
- **Frames Unknown**—Number of encapsulated Token Ring frames processed by the Catalyst 3900 system software that contained either an unknown source address or unknown destination address.
- **Frames Transmitted**—Number of Ethernet frames transmitted by the ISL port.
- **Frames Received**—Number of Ethernet frames received by the ISL port.
- **Broadcast Frames Received**—Number of Ethernet broadcast frames received without errors.
- **Multicast Frames Received**—Number of Ethernet multicast frames received without errors.
- **Local Address Entries**—Number of addresses on this port that belong to the local segment.
- **Remote Address Entries**—Number of addresses on this port that belong to another segment.
- **Largest Number of Stations**—Largest number of addresses active since the last reset of the Catalyst 3900.
- **Address Chain Overflows**—Number of times an address hash bin has reached the maximum number of entries.
- **Address Table Overflows**—Number of times the address table has reached the maximum number of entries.
- **Frame Errors**—Total number of Ethernet frames received or transmitted by the ISL port that contained errors.
- **Long Frames**—Number of Ethernet frames received that exceed the maximum frame length limit of 24613 bytes.
- **Last Reset**—Time (in hours, minutes, and seconds) since the port statistics were last reset.



## Viewing Error Statistics

To view statistical information about errors detected on the ISL port, select **Error Statistics** on the Port *x* ISL Statistics panel. The Port *x* Error Statistics panel (Figure 20) is displayed. The information on the statistics panels is refreshed approximately every 5 seconds. To reset the information displayed on any of the statistics panels, select **Reset**.

**Figure 20** Port *x* Error Statistics Panel



Port 21 Error Statistics	
Alignment Errors	0
FCS Errors	0
Single Collision Frames	0
Multiple Collision Frames	0
Deferred Transmissions	0
Late Collisions	0
Excessive Collisions	0
Oversize Frames	0
Undersize Frames	0
Invalid ISL VLAN	0
Excess Deferred	0
Long Event	0

Return      Reset

Return to previous menu

The following information is displayed on this panel:

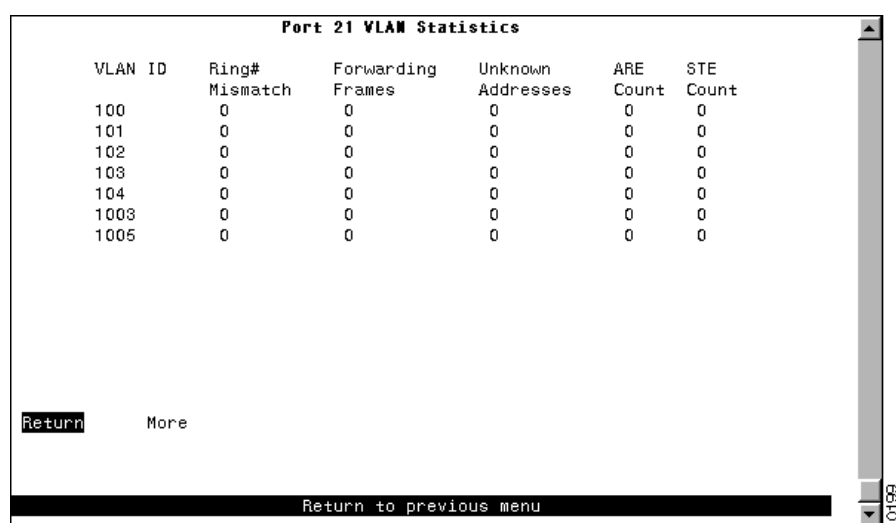
- Alignment Errors—Number of frames received that arrived with a non-integral number of octets and that failed the cyclic redundancy check (CRC).
- FCS Errors—Number of frames received with frame check sequence (FCS) errors.
- Single Collision Frames—Number of frames that were successfully transmitted after a single collision.
- Multiple Collision Frames—Number of frames that were successfully transmitted after more than one collision.
- Deferred Transmissions—Number of frames that were deferred during transmission due to other traffic on the segment. This number does not include frames that were deferred because of a collision.
- Late Collisions—Number of times a collision was detected after more than 512 bytes of the frame had been transmitted.
- Excessive Collisions—Number of times a transmission failed because the number of permitted collisions per transmission has been exceeded.
- Oversize Frames—Number of frames received that exceed the maximum frame length limit. Although ISL allows frames up to 24000 bytes, the Catalyst 3900 currently has a maximum frame length limit of 17800 bytes.
- Undersize Frames—Number of frames received that contained a valid FCS, but that were less than the minimum 64 bytes.
- Invalid ISL VLAN—Number of frames received that contained a source VLAN ID that was unknown (based on the current configuration of the switch).

- Excess Deferred—Number of times the ISL link was constantly busy for longer than 466944 bit times.
- Long Event—Number of times activity on the ISL receive channel exceeded 233472 bit times.

### Viewing VLAN Statistics

To view statistical information about traffic processed on each VLAN by the ISL port, select **VLAN Statistics** on the Port *x* ISL Statistics panel. The Port *x* VLAN Statistics panel (Figure 21) is displayed. The information on the statistics panels is refreshed approximately every 5 seconds. To reset the information displayed on any of the statistics panels, select **Reset**.

**Figure 21** Port *x* VLAN Statistics Panel



The screenshot shows a terminal window titled "Port 21 VLAN Statistics". It contains a table with the following data:

VLAN ID	Ring# Mismatch	Forwarding Frames	Unknown Addresses	ARE Count	STE Count
100	0	0	0	0	0
101	0	0	0	0	0
102	0	0	0	0	0
103	0	0	0	0	0
104	0	0	0	0	0
1003	0	0	0	0	0
1005	0	0	0	0	0

Below the table, there is a "Return" button and the text "More". At the bottom of the terminal window, there is a "Return to previous menu" button.

The following options are displayed on this panel:

- VLAN ID—Numeric identifier of the VLAN.
- Ring # Mismatch—Number of frames received by the ISL module from the AXIS bus in which the expected ring number was not found in the routing information field (RIF).
- Forwarding Frames—Number of frames on this VLAN that were forwarded from the ISL port to the AXIS bus.
- Unknown Address—Number of frames received that contained a destination address that was unknown to the switch.
- ARE Count—Number of ARE frame processed by the port on this VLAN.
- STE Count—Number of STE frames processed by the port on this VLAN.

## Safety Information

This section contains information about working safely with electrical equipment, safety information about the module LEDs, translations of any safety warnings that appear in this document, and electronic emission notices.

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## Safety with Electricity



**Warning** Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or weld the objects to the terminals.

The Catalyst 3900 does not have an on/off switch. To power off the Catalyst 3900, you must disconnect the power cord from the rear of the switch.



**Warning** Unplug the power cord before you work on a system that does not have an on/off switch.

Follow these guidelines when working with equipment powered by electricity:

- Locate the emergency power-off switch for the room in which you are working.
- Before working on the equipment, unplug the power cord.
- Disconnect all power before doing the following:
  - Installing or removing a chassis
  - Performing a hardware upgrade
- Do not work alone when potentially hazardous conditions exist.
- Never assume that power has been disconnected from a circuit. Always check.
- Look carefully for possible hazards in your work area, such as moist floors, ungrounded power extension cables, and missing safety ground wires.
- If an electrical accident occurs, proceed as follows:
  - Use caution.
  - Unplug the power cord.
  - If possible send another person to get medical aid. Otherwise, assess the victim's condition and then call for help.
  - Determine if the victim needs rescue breathing or external cardiac compressions, then take appropriate action.

### Preventing Electrostatic Discharge Damage

Electrostatic discharge can damage or impair electrical circuitry. It occurs when electronic components are handled improperly. Always follow electrostatic discharge prevention procedures when removing or replacing components. Ensure that the chassis is electrically connected to earth ground using an electrostatic discharge mat or a ground wire. Wear an electrostatic discharge-preventive wrist strap, ensuring that it makes good skin contact and is connected to an unpainted surface on the chassis frame. If no wrist strap is available, ground yourself by touching the metal part of the chassis while handling a component.

## LED Safety Information

The ISL module contains LEDs. The expansion module is classified as a Class 1 LED product and is certified to conform to the requirements of EN60825-1:1994 and IEC825-1:1993.

Class 1 laser products are not considered hazardous. The fiber ISL module has embedded Class 3a LED assemblies operating at a nominal wavelength of 850 nanometers and a maximum potential output power of 1.25 milliwatts. The design of the fiber ISL Ring module incorporates engineering features including current limiting, which ensures that there is no human access to LED radiation greater than Class 1 under any set of operating, maintenance, or service conditions, including a single fault.

There are fewer than 0.442 milliwatts propagating in the link or in any portion of the module. Therefore, according to IEC825-2:1993, Hazard Level 1 prevails in all parts of the system.

The LEDs are located on the front face of the module.

## Translated Safety Warnings

Safety warnings appear throughout this publication in procedures that, if performed incorrectly, may harm you. A warning symbol precedes each warning statement.



**Warning** Means *danger*. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

**Waarschuwing** Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van standaard maatregelen om ongelukken te voorkomen. Voor vertalingen van de waarschuwingen die in deze publicatie verschijnen, kunt u het document *Regulatory Compliance and Safety Information* (Informatie over naleving van veiligheids- en andere voorschriften) raadplegen dat bij dit toestel is ingesloten.

**Varoitus** Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista. Tässä julkaisussa esiintyvien varoitusten käännökset löydät laitteen mukana olevasta *Regulatory Compliance and Safety Information* -kirjasesta (määräysten noudattaminen ja tietoa turvallisuudesta).

**Attention** Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant causer des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers posés par les circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions d'avertissements figurant dans cette publication, consultez le document *Regulatory Compliance and Safety Information* (Conformité aux règlements et consignes de sécurité) qui accompagne cet appareil.

**Warnung** Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewußt. Übersetzungen der in dieser Veröffentlichung enthaltenen Warnhinweise finden Sie im Dokument *Regulatory Compliance and Safety Information* (Informationen zu behördlichen Vorschriften und Sicherheit), das zusammen mit diesem Gerät geliefert wurde.

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**Avvertenza** Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti. La traduzione delle avvertenze riportate in questa pubblicazione si trova nel documento *Regulatory Compliance and Safety Information* (Conformità alle norme e informazioni sulla sicurezza) che accompagna questo dispositivo.

**Advarsel** Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du være oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker. Hvis du vil se oversettelser av de advarslene som finnes i denne publikasjonen, kan du se i dokumentet *Regulatory Compliance and Safety Information* (Overholdelse av forskrifter og sikkerhetsinformasjon) som ble levert med denne enheten.

**Aviso** Este símbolo de aviso indica perigo. Encontra-se numa situação que lhe poderá causar danos físicos. Antes de começar a trabalhar com qualquer equipamento, familiarize-se com os perigos relacionados com circuitos eléctricos, e com quaisquer práticas comuns que possam prevenir possíveis acidentes. Para ver as traduções dos avisos que constam desta publicação, consulte o documento *Regulatory Compliance and Safety Information* (Informação de Segurança e Disposições Reguladoras) que acompanha este dispositivo.

**¡Advertencia!** Este símbolo de aviso significa peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considerar los riesgos que entraña la corriente eléctrica y familiarizarse con los procedimientos estándar de prevención de accidentes. Para ver una traducción de las advertencias que aparecen en esta publicación, consultar el documento titulado *Regulatory Compliance and Safety Information* (Información sobre seguridad y conformidad con las disposiciones reglamentarias) que se acompaña con este dispositivo.

**Warning!** Denna varningssymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador. Se förklaringar av de varningar som förekommer i denna publikation i dokumentet *Regulatory Compliance and Safety Information* (Efterrättelse av föreskrifter och säkerhetsinformation), vilket medföljer denna anordning.

## Jewelry Removal Warning



**Warning** Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals.

**Waarschuwing** Alvorens aan apparatuur te werken die met elektrische leidingen is verbonden, sieraden (inclusief ringen, kettingen en horloges) verwijderen. Metalen voorwerpen worden warm wanneer ze met stroom en aarde zijn verbonden, en kunnen ernstige brandwonden veroorzaken of het metalen voorwerp aan de aansluitklemmen lassen.

**Varoitus** Ennen kuin työskentelet voimavirtajohtoihin kytkettyjen laitteiden parissa, ota pois kaikki korut (sormukset, kaulakorut ja kellot mukaan lukien). Metalliesineet kuumenevat, kun ne ovat yhteydessä sähkövirran ja maan kanssa, ja ne voivat aiheuttaa vakavia palovammoja tai hitsata metalliesineet kiinni liitäntänapoihin.

**Attention** Avant d'accéder à cet équipement connecté aux lignes électriques, ôter tout bijou (anneaux, colliers et montres compris). Lorsqu'ils sont branchés à l'alimentation et reliés à la terre, les objets métalliques chauffent, ce qui peut provoquer des blessures graves ou souder l'objet métallique aux bornes.

**Warnung** Vor der Arbeit an Geräten, die an das Netz angeschlossen sind, jeglichen Schmuck (einschließlich Ringe, Ketten und Uhren) abnehmen. Metallgegenstände erhitzen sich, wenn sie an das Netz und die Erde angeschlossen werden, und können schwere Verbrennungen verursachen oder an die Anschlußklemmen angeschweißt werden.

**Avvertenza** Prima di intervenire su apparecchiature collegate alle linee di alimentazione, togliersi qualsiasi monile (inclusi anelli, collane, braccialetti ed orologi). Gli oggetti metallici si riscaldano quando sono collegati tra punti di alimentazione e massa: possono causare ustioni gravi oppure il metallo può saldarsi ai terminali.

**Advarsel** Fjern alle smykker (inkludert ringer, halskjeder og klokker) før du skal arbeide på utstyr som er koblet til kraftledninger. Metallgjenstander som er koblet til kraftledninger og jord blir svært varme og kan forårsake alvorlige brannskader eller smelte fast til polene.

**Aviso** Antes de trabalhar em equipamento que esteja ligado a linhas de corrente, retire todas as jóias que estiver a usar (incluindo anéis, fios e relógios). Os objectos metálicos aquecerão em contacto com a corrente e em contacto com a ligação à terra, podendo causar queimaduras graves ou ficarem soldados aos terminais.

**¡Advertencia!** Antes de operar sobre equipos conectados a líneas de alimentación, quitarse las joyas (incluidos anillos, collares y relojes). Los objetos de metal se calientan cuando se conectan a la alimentación y a tierra, lo que puede ocasionar quemaduras graves o que los objetos metálicos queden soldados a los bornes.

**Warning!** Tag av alla smycken (inklusive ringar, halsband och armbandsur) innan du arbetar på utrustning som är kopplad till kraftledningar. Metallobjekt hettas upp när de kopplas ihop med ström och jord och kan förorsaka allvarliga brännskador; metallobjekt kan också sammansvetsas med kontakterna.

### No On/Off Switch Warning



**Warning** Unplug the power cord before you work on a system that does not have an on/off switch.

**Waarschuwing** Voordat u aan een systeem werkt dat geen aan/uit schakelaar heeft, dient u de stekker van het netsnoer uit het stopcontact te halen.

**Varoitus** Ennen kuin teet mitään sellaiselle järjestelmälle, jossa ei ole kaksiasentokytkintä, kytke irti virtajohto.

**Attention** Avant de travailler sur un système non équipé d'un commutateur marche-arrêt, débrancher le cordon d'alimentation.

**Warnung** Bevor Sie an einem System ohne Ein/Aus-Schalter arbeiten, ziehen Sie das Netzkabel heraus.

**Avvertenza** Prima di lavorare su un sistema che non è dotato di un interruttore on/off, scollegare il cavo di alimentazione.

**Advarsel** Før det skal utføres arbeid på et system som ikke har en av/på-bryter, skal strømledningen trekkes ut.

**Aviso** Antes de começar a trabalhar num sistema que não possua um interruptor ON/OFF, desligue o cabo de alimentação.

**¡Advertencia!** Antes de trabajar sobre cualquier sistema que carezca de interruptor de Encendido/Apagado (ON/OFF), desenchufar el cable de alimentación.

**Warning!** Dra ur nätsladden innan du utför arbete på ett system utan strömbrytare.

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## Laser Radiation Warning



**Warning** Laser radiation is present when the system is open.

**Waarschuwing** Laserstraling wanneer geopend.

**Varoitus** Lasersäteitä aukkojen ollessa avoinna.

**Attention** Production d'un rayonnement laser en position ouverte.

**Warnung** Laserstrahlung in geöffnetem Zustand

**Avvertenza** Emette radiazioni laser quando è aperto.

**Advarsel** Laserstråling er til stede når enheten er åpen.

**Aviso** Radiação laser presente quando aberto.

**¡Advertencia!** Radiación láser cuando está abierto.

**Warning!** Rikta inte blicken in mot strålen.

## Laser Beam Exposure Warning



**Warning** Do not stare into the laser beam.

**Waarschuwing** Niet in de straal staren.

**Varoitus** Älä katso säteeseen.

**Attention** Ne pas fixer le faisceau des yeux.

**Warnung** Nicht direkt in den Strahl blicken.

**Avvertenza** Non fissare il raggio con gli occhi.

**Advarsel** Stirr ikke på strålen.

**Aviso** Não olhe fixamente para o raio.

**¡Advertencia!** No mirar fijamente el haz.

**Warning!** Laserstrålning när enheten är öppen.

## Electronic Emission Notices

This section contains statements pertaining to compliance with electronic emission regulations.

### Federal Communications Commission (FCC) Statements

#### With UTP Cabling

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy 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.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. This company is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with 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.

### **With STP Cabling**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### **Industry Canada Class B Emission Compliance Statement**

This Class B digital apparatus meets the requirements of the Canadian Interference-Causing Equipment Regulations.

### **Avis De Conformite Aux Normes D'industrie Canada**

Cet appareil numerique de la classe B respecte toutes les exigences du Reglement sur le materiel brouilleur du Canada.

### **European Union (EU) Statement**

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. This company cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-Cisco option cards.

This product has been tested and found to comply with the limits for Class B Information Technology Equipment according to CISPR 22 / European Standard EN 55022. The limits for Class B equipment were derived for typical residential environments to provide reasonable protection against interference with licensed communication devices.



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## Japanese Voluntary Control Council for Interference (VCCI) Statement

This is a Class B product based on the standard of the Voluntary Control Council for Interference from Information Technology Equipment (VCCI). If this is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

## Obtaining Service and Support

For service and support for a product purchased from a reseller, contact the reseller. Resellers offer a wide variety of Cisco service and support programs, which are described in the section “Service and Support” in the information packet that shipped with your product.

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**Note** If you purchased your product from a reseller, you can access Cisco Connection Online (CCO) as a guest. CCO is Cisco Systems’ primary, real-time support channel. Your reseller offers programs that include direct access to CCO’s services.

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For service and support for a product purchased directly from Cisco, use CCO.

## Cisco Connection Online

CCO is Cisco Systems’ primary, real-time support channel. SMARTnet customers and partners can self-register on CCO to obtain additional information and services.

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**Note** If you purchased your product from a reseller, you can access CCO as a guest. Your reseller offers programs that include direct access to CCO’s services.

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Available 24 hours a day, 7 days a week, CCO provides a wealth of standard and value-added services to Cisco’s customers and business partners. CCO services include product information, product documentation, software updates, release notes, technical tips, the Bug Navigator, configuration notes, brochures, descriptions of service offerings, and download access to public and authorized files.

CCO serves a wide variety of users through two interfaces that are updated and enhanced simultaneously: a character-based version and a multimedia version that resides on the World Wide Web (WWW). The character-based CCO supports Zmodem, Kermit, Xmodem, FTP, and Internet e-mail, and it is excellent for quick access to information over lower bandwidths. The WWW version of CCO provides richly formatted documents with photographs, figures, graphics, and video, as well as hyperlinks to related information.

You can access CCO in the following ways:

- WWW: <http://www.cisco.com>
- WWW: <http://www-europe.cisco.com>
- WWW: <http://www-china.cisco.com>
- Telnet: [cco.cisco.com](http://cco.cisco.com)
- Modem: From North America, 408 526-8070; from Europe, 33 1 64 46 40 82. Use the following terminal settings: VT100 emulation; databits: 8; parity: none; stop bits: 1; and connection rates up to 28.8 kbps.

For a copy of CCO's Frequently Asked Questions (FAQ), contact [cco-help@cisco.com](mailto:cco-help@cisco.com). For additional information, contact [cco-team@cisco.com](mailto:cco-team@cisco.com).

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**Note** If you need technical assistance with a Cisco product that is under warranty or covered by a Cisco maintenance contract, contact Cisco's Technical Assistance Center (TAC) at 800 553-2447, 408 526-7209, or [tac@cisco.com](mailto:tac@cisco.com).

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Please use CCO to obtain general information about Cisco Systems, Cisco products, or upgrades. If CCO is not accessible, contact 800 553-6387, 408 526-7208, or [cs-rep@cisco.com](mailto:cs-rep@cisco.com).

## Ordering Documentation

Documentation for Cisco products is available in three forms: in a CD-ROM package, printed books, and on the World Wide Web. You have the option of subscribing to the CD ROM package through an update service. Or you can order printed documentation at an additional cost. Refer to the information packet included with the router for detailed ordering information. You can also access Cisco documentation on the World Wide Web URL <http://www.cisco.com>.

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This document is to be used in conjunction with the *Catalyst 3900 Token Ring Switch User Guide* publication.

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