Product Introduction

This chapter describes the features and the environmental requirements of the Cisco Catalyst 1800 Token Ring switch. It also provides an overview of the design and operation of this switch.

This chapter contains the following sections:

- Product Description
- Software Features
- Hardware Features
- Environmental Specifications
- Modes of Operation
- Catalyst 1800 Hardware
- Power Subsystem
- Token Ring Connections
- LED Definitions
- Power-On Self Test

Product Description

The Catalyst 1800 switch is a Token Ring packet-switching device that dramatically increases performance, flexibility, and management of Token Ring installations. The Catalyst 1800 switch inserts into existing Token Ring topologies without disrupting operation of the network and provides the following benefits:

- Increases throughput and decreases latency of the backbone connection
- Improves performance on each individual Token Ring
- Provides for the segregation of 4 and 16 megabit per second (Mbps) nodes allowing the 16-Mbps nodes to run at maximum speed
- Provides server centralization while maintaining logical server dedication to a specific ring
- Enhances network security
- Optimizes network management using standard tools such as SNMP (Simple Network Management Protocol) and RMON (Remote Network Monitoring)

Software Features

The following list summarizes the software features of the Catalyst 1800 switch:

- Supports up to 8,000 MAC addresses in the forwarding database
- Is IEEE 802.5 compliant
- Supports software selection of ring speeds of either 4 Mbps or 16 Mbps on a per port basis, independent of the other ports
- Supports SRB, TB, SRT, and SR/TLB
- Provides self diagnostics at power-up
- Supports field-upgradeable software images using TFTP or the Xmodem protocol over the serial port
- Supports NetBIOS name caching for reduction of broadcast explorer frames
- Supports RMON
- Supports IEEE 802.1d and IBM Spanning-Tree Protocols
- Supports Simple Network Management Protocol (SNMP v1) including the applicable objects of MIB-II (RFC 1213), Bridge MIB (RFC 1493), SRT Bridge MIB (RFC 1525), and 802.5 Transmission MIB (RFC 1231)
- Supports Cisco Systems' proprietary Management Information Base (MIB) to allow the switch to be completely configurable using SNMP
- Supports source routing End System (ES) receipt of management frames sent by the network
- Provides time-of-day port security, which locks out ports on a per hour/day/week schedule
- Provides MAC address and protocol-type filtering

Telnet Support

You can run up to four Telnet sessions at one time from a Catalyst 1800 switch. Together with local console access, this means you can run up to five concurrent sessions. All configuration is on a last-touched basis; that is, the last person to set up a configurable parameter wins, no matter what the input source was (for example, Telnet session #2, console and/or SNMP access).

No configuration for Telnet is required. You only need to specify an IP address.

RMON Capabilities

RMON (Remote Network Monitoring) is an industry-standard method for providing network statistics monitoring using SNMP. It also collects fault, performance, and configuration statistics. It can monitor continuously, even when communication with the management station is not possible or efficient. RMON can then notify the management station when an exceptional condition occurs.

In conjunction with SNMP, the Catalyst 1800 provides RMON data by setting up alarms, events, and logs for a target port or particular statistical value. Ordinarily, the SNMP client would have to continuously poll the Catalyst 1800 for this information, waiting for the value to change. This causes increased traffic through the network.

With RMON, you can monitor a particular statistic internally by the switch, and when it reaches a threshold, send a trap to the client. This monitoring method reduces traffic between the SNMP client and the Catalyst 1800 switch.

RMON is enabled when an RMON group status is set to create by the SNMP RMON client. It is deleted when that same status is set to invalid. The status is an RMON object available per group/per port.

Note   Access to RMON is only available via SNMP management applications supporting RFC 1757 and RFC 1513. You cannot access RMON via the Catalyst 1800 console interface; however, the console statistics provide similar information.

The following two sections explain the RMON features in the RFC 1757 and RFC 1513 groups supported by the current release.

RFC 1757

Support for RFC 1757 includes the following:

- Statistics. For information about media-specific statistics, see "RFC 1513."
- History control (up to 16)
- Alarms (up to 32)
- Events (up to 64)
- Log (up to 10 per event)
- Host control (up to 16 physical ports simultaneously)
- Host Entry/Host Time (up to 8K entries total, any port)
- Host Top N control (up to 16 simultaneous reports)
- Host Top N entry (up to 8K entries total, any port)

RFC 1513

Support for RFC 1513 includes the following:

- MAC-layer statistics (up to 16 physical ports simultaneously)
- Promiscuous statistics (up to 16 physical ports simultaneously)
- MAC-layer history (up to 16 snapshots per physical port)
- Promiscuous history (up to 16 snapshots per physical port)
- SR statistics (up to 16 physical ports simultaneously)
- Ring Station group (up to 16 physical ports simultaneously)
- Ring Station Order group (up to 8K entries total, any port)
- Ring Station Config group (up to 8K entries total, any port)

Hardware Features

The following list summarizes the hardware features of the Catalyst 1800 switch:

- Supports 8 and 16 TR ports (or 12 TR ports with FDDI)

- Supports STP/UTP (Shielded Twisted Pair/Unshielded Twisted Pair) cabling using shielded RJ-45 connectors

- Supports central address forwarding for up to 8,000 entries

- Provides on-board storage of configuration parameters in nonvolatile RAM

- Supports per port address filtering of 512 entries

- Provides 1 MB of Flash memory

- Provides on-board PROM for board configuration data and MAC addresses

- Provides per port LEDs

- Supports redundant power supplies

- Supports FDDI

Environmental Specifications

The following two tables provide information about the Catalyst 1800 switch's physical characteristics and operating specifications.

Note EIA/TIA-232 was known as recommended standard RS-232 before its acceptance as a standard by the Electronic Industries Association (EIA) and Telecommunications Industry Association (TIA).

Table 1-1   Physical Characteristics

Characteristic	Description
Physical dimensions	3.5 in. (8.9 cm) high by 17 in. (43.2 cm) wide by 21 in. (53.3 cm) deep
Ports	8 or 16 shielded/unshielded RJ-45 (12 ports with FDDI)
Console interface	1 DB-9 EIA/TIA-232
Ring speeds	4 or 16 Mbps
Power supply	1 or 2 replaceable units

Table 1-2   Operating Specifications

Specification	Value
Operating temperature	32˚ to 104˚F (0˚ to 40˚C) ambient room temperature
Relative humidity	0% to 90% noncondensing
Power requirements	60 to 120 watts 90 to 230 volts @ 50 to 60 hertz

Mounting Options

The Catalyst 1800 switch can either be rack mounted or placed on a desktop.

Modes of Operation

The Catalyst 1800 switch is capable of supporting up to 16 Token Ring ports. The 16 physical ports on the Catalyst 1800 switch may be configured for 1 to 16 logical ring groups, where each group is defined by a segment number (that is, a ring number). Each logical segment group is then part of a source route/source route transparent (SR/SRT) group, bridged internally to the other logical segment group(s).

In summary, there are physical ports, logical segment groups (consisting of one or more physical ports) and multiple SR/SRT groups in each Catalyst 1800 switch. For detailed information about SR/SRT technology, refer to the appendix "Token Ring Switching."

The Catalyst 1800 switch also supports Source Route/Translational Bridging (SR/TLB) mode for FDDI. For more information about this mode, see the appendix "Token Ring Switching."

Single Ring Mode

In single ring mode, each physical port is part of the same logical ring group which is defined by a single segment number. Each port connects to a physical ring which can have one or more nodes connected to it. Logically, all nodes connected to all ring segments in a logical ring group see themselves as connected to the same ring. When all the ports of the Catalyst 1800 switch are configured to be part of a Single Ring, all frames (source routed and transparent) are switched to the appropriate destination port, based upon their MAC Destination Address (DA). Additionally, you may interconnect multiple Catalyst 1800 switches in this mode by connecting a single port between each device via a concentrator.

Any segment that is part of a logical Single Ring group can have connections to other rings through either external bridges or routers. The Spanning-Tree Protocol is not available in Single Ring mode; therefore, you should ensure that no loops in the topology exist.

Multiring Mode

In multiring mode, you can internally connect logical ring groups via a user-defined bridge port pair. You can configure the Catalyst 1800 switch so that each port connects to a unique ring for a total of 16 rings. You can then establish rings between pairs of logical segment groups. You can also create a fully meshed network so that each logical segment group is connected to every other group.

You can also configure the Catalyst 1800 switch to create secure fire walls by not establishing these links between groups. Traffic is not forwarded between logical segment groups that do not have a bridge pair between them.

Note Links are defined automatically. Links between logical segment groups are disabled manually.

Catalyst 1800 Hardware

The Catalyst 1800 hardware is easily installed and maintained through the front and rear of the system. Therefore, no access is needed or allowed from the top, bottom or sides of the system. You can mount the Catalyst 1800 switch in a 19-inch rack or stack multiple switches on a desktop.

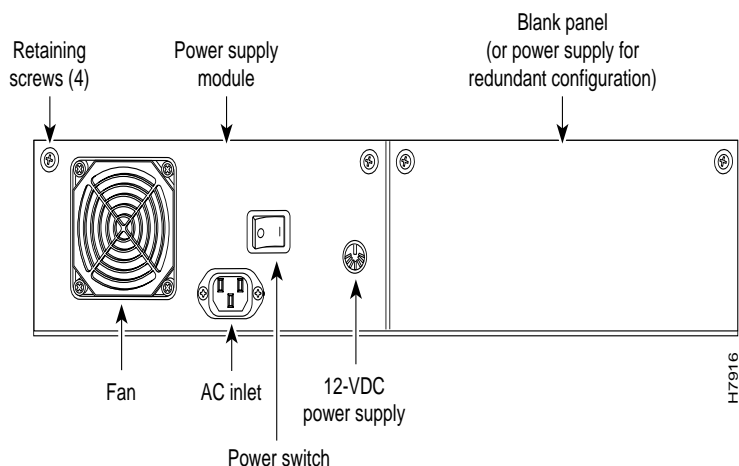**Figure 1-1   Front View of the Catalyst 1800 Switch**
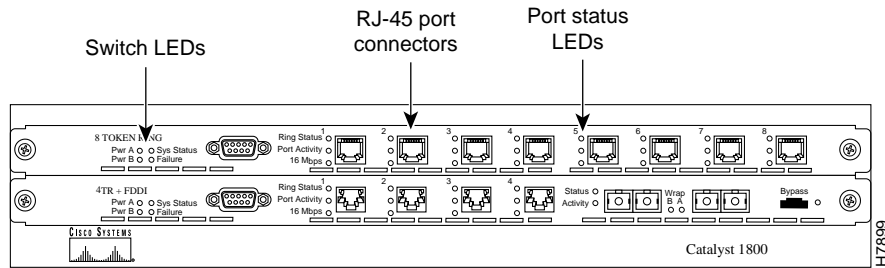
The power connections are from the rear of the system and all network connections are from the front of the system. The switched Token Ring ports use shielded RJ-45 connectors, supporting either unshielded twisted pair (UTP) or shielded twisted pair (STP) cabling without requiring configuration changes. Each port supports 4 Mbps or 16 Mbps ring speeds, configurable through the system software. The console port, a DB-9 EIA/TIA-232 connector located on the front of the system, supports local switch management. For pinouts of the console port connector see "DB-9 Connectors" in the appendix "Installation and Maintenance."

Power-on diagnostics are built into the Catalyst 1800 switch and run each time the device is powered on or reset through software. These diagnostics test all of the resources in the Catalyst 1800 switch. The overall status of the Catalyst 1800 switch is indicated by the LEDs to the left of the console port: Power OK, System Status, and Failure Detection. Each Token Ring port also has port specific status LEDs to the left of the associated port connector that indicate: Ring Status, Port Activity, and Ring Speed. (See the section "LED Definitions" for more information.)

Power Subsystem

You must access the power subsystem from the rear of the chassis. The rear of the chassis has two identical slots, each of which can hold one power supply. If you are viewing the Catalyst 1800 switch from the rear, as it is shown in Figure 1-2, then power supply A is on the left and power supply B is on the right. All power supplies are identical and can be installed in either slot.

Figure 1-2   Rear View of the Catalyst 1800 Switch

Each supply supports a fully configured chassis. Two supplies share the load of the system and each supply acts as a hot standby to the other. If a single supply fails, the alternate supply continues to provide power to the Catalyst 1800 switch with no disruption to operation. The status of each power supply can be seen from the front of the Catalyst 1800 switch and is monitored by the software. A single LED is dedicated to each supply and illuminates when the supply is operational. If the supply fails or is not turned on, this LED is not illuminated.

Each supply has its own AC inlet. You must ensure that the AC line remains within the tolerances specified for proper operation. For optimal reliability, each line should be run on a separate AC circuit or you should use an uninterruptable power supply (UPS).

There is also a 12 VDC output connector. This connection is intended to power optional external devices that may be offered by Cisco Systems or third-party vendors.

Token Ring Connections

All of the switched Token Ring ports have an identical physical interface. Standard shielded RJ-45 Token Ring interface connectors are provided on the front of the Catalyst 1800 switch. The hardware has been designed to support UTP cables, Categories 3 and 5, and STP cables, Type 1. No configuration changes or switch settings are required for the different cable types. The following table provides guidelines to follow while you are designing connections to the network.

Table 1-3   Token Ring Connection Guidelines

Cable Type	Maximum Stations	Longest Lobe
For 4 Mbps Ring Speed:		
STP Type 1	260	984 feet (300 m)
UTP Category 5	150	820 feet (250 m)
UTP Category 3	100	492 feet (150 m)
For 16 Mbps Ring Speed:		
STP Type 1	250	492 feet (150 m)
UTP Category 5	150	394 feet (120 m)
UTP Category 3	100	328 feet (100 m)

Each port presents an active MAC interface that is suitable for connection directly into a wire center or Media Access Unit (MAU). For connecting a server or workstation directly into the Catalyst 1800 switch, you can use a MAU or the direct attach ports of the FDDI Uplink (FDU) option module.

LED Definitions

The following table describes the light emitting diodes (LED) on the front panel of the Catalyst 1800 switch.

Table 1-4   Front Panel LED Definitions

LED	Color	Function	On	Off
Pwr A	Green	Indicates status of Power Supply A	Operating properly	Failed or not present
Pwr B	Green	Indicates status of Power Supply B	Operating properly	Failed or not present
System Status	Green	Indicates the operational status of the Catalyst 1800 switch	Operating properly	Failed or off
Failure	Red	Indicates failure of the Catalyst 1800 switch	Failure detected	Normal status

The following table describes the light emitting diodes (LEDs) next to each individual port on the Catalyst 1800 switch.

Table 1-5   Port LEDs

LED	Color	Function	On	Off
Ring Status (per port)	Green	Indicates operational state of port	Indicates port is enabled	Indicates port is disabled
Port Activity (per port)	Green	Indicates activity of port	Frame being transferred	Port idle
16 Mbps (per port)	Green	Indicates operating speed of port	16 Mbps	4 Mbps

Power-On Self Test

The power-on self test (POST) executes each time you reset the system through the console interface or if there is a power cycle. The POST runs a series of tests on the following components and states:

- Processors

- Shared memory

- Clock operational status

- LED summary

- Console port

- Flash memory

- Token Ring interface logic

If the Failure LED turns red during the POST, this indicates the unsuccessful completion of one of the above tests. If this condition occurs, contact the Cisco Systems Technical Assistance Center (TAC).

Note   Token Ring port errors are reported through the console interface and SNMP. The Failure LED does not illuminate when port errors occur.

FDDI Uplink Option (FDU)

The following subsections describe these features of the Cisco Systems Catalyst 1800 FDDI Uplink (FDU) Option.

- Catalyst 1800 FDU Product Description

- FDU Hardware Features

- FDU Modes of Operation

- FDU Ports Types

- FDU Software Features

- FDU Longest Spans

- Dual Attachment Station (DAS) with Media Interface Connectors (MIC)

- FDU LED Definitions

Catalyst 1800 FDU Product Description

The Catalyst 1800 FDDI Uplink (FDU) option supports the network applications and special features described in the following subsections:

Network Applications

The Catalyst 1800 FDU option enables network managers to scale connectivity where needed. Typical network applications include:

- Interconnection of multiple Catalyst 1800 switches, which allows for higher density switched networks and/or distributed Token Ring switching

- Connection to a campus or site backbone, as well as interoperability with other FDDI-attached devices or networks. These include bridges, switches, and routers.

- Connection to high-demand resources, such as centralized servers in a server farm configuration. The FDDI ring can support high-speed connectivity for back-end functions, such as tape back-up or disk mirroring.

Translation Features

In addition to providing versatile network applications, the Catalyst 1800 FDU option supports the following features:

- Token Ring and FDDI translational switching. The Catalyst 1800 switch implements SR/TLB mode when sending traffic between a Token Ring port and the FDDI port.This means that any device connected to the FDDI ring can communicate with any other device attached to one of the Catalyst 1800 switch's Token Rings. Many switches use an encapsulation technique when sending traffic over their FDDI ports. With this method, only another switch from the same manufacturer can interpret the packet. A Token Ring device connected to the Catalyst 1800 switch can communicate with any type of server attached directly to the FDDI ring, regardless of the manufacturer.

  In addition, this same Token Ring device can communicate with an Ethernet node attached to the FDDI ring, via a router or an Ethernet switch.

- SR/TLB conversion mode support for FDDI. In this mode, Token Ring end-systems that converse with source-routed frames can communicate with FDDI end-systems that converse with transparent frames.

FDU Hardware Features

In addition to the Catalyst 1800 Token Ring hardware features listed previously in this chapter, the hardware features of the Catalyst 1800 FDU include the following:

- An FDDI SRT chip for performing filtering of source routed frames and validating transparent FDDI frames

- LEDs for FDDI port status and activity. For dual attachment stations (DAS), there are wrap and bypass switch LEDs.

The following sections describe other hardware features in more detail.

Switching Engine Features

The following is a brief summary of switching engine features supported by the FDU:

- Dual i960 processor design. The FDU supports the Intel i960 Cx processor for increased performance.

- Flash memory storage. The product is shipped with 1 MB of Flash memory as the standard configuration.

- ID PROM. The ID PROM is programmed at the factory and contains board configuration data and MAC addresses.

- Real-time clock calendar and temperature monitor. The real-time clock calendar provides accurate time keeping for up to ten years in the absence of power.

- Page burst DMA engine. The DMA engine is part of the FDDI system interface and can be used for fast data transfers over the bus for efficient communications between two boards.

FDDI Port Features

The following is a brief summary of FDDI port features:

- Direct attach. Each Token Ring port supports station and direct attach. This feature requires a direct attach cable. For information about the direct attach cable, refer to the appendix "Direct Attach Cable for the FDU."

- Bypass switch support. The FDU supports an optical bypass switch using a standard 6 position MTE connector. The presence of a bypass switch is automatically detected by software.

- LED indicators. The FDU port has status and activity LEDs, including wrap indicators for DAS ports. There is also an LED that indicates a bypass condition when a bypass switch is activated.

- Catalyst 1800 address filtering

- Full translational switching. Any device connected to the Catalyst 1800 FDU can communicate with any other device attached to one of the Catalyst 1800 switch's Token Rings.

FDU Software Features

In addition to the Token Ring software features described previously in this chapter, the software features of the Catalyst 1800 FDU option include the following:

- Allows FDDI port configuration for both single ring and multiring modes

- Supports up to 8,000 MAC addresses in the forwarding database

- Supports FDDI MIB RFC 1512 . This allows you to completely configure the board using SNMP.

- Provides SRB, TB, SRT, transparent bridging, and SR/TLB support for the FDDI port

- Provides translational bridging between the Token Ring ports and the FDDI port

- Supports FDDI updates made to the IEEE 802.1d Spanning-Tree Protocol for transparently switched topologies

- Provides X3T95 FDDI Station Management (SMT) v7.3 support

- Allows automatic enabling and disabling of the FDDI port for every hour of the week

- Provides FDDI console menus for accessing configuration and statistics

- Allows port prioritizing of the FDDI port

FDU Modes of Operation

The FDU modes of operation are identical to those described previously for the Catalyst 1800 switch, with the following exceptions:

- With an FDU module, a Catalyst 1800 chassis can support up to 12 Token Ring ports.

- The FDDI port supports the SR/TLB port type. For detailed information about SR/TLB, refer to the appendix "Token Ring Switching."

FDU Ports Types

FDDI Station Management (SMT) defines four types of ports: A, B, M, and S. Dual-attach stations have both an A and B port. Single-attach stations have only one S port. Concentrator modules can have many M ports that connect to other stations' A, B, and S ports. The FDU supports the A and B port types.

The following table lists the rules suggested by SMT:

Table 1-6   SMT FDU Port Rules

Port Type	Can Connect to. . .
A	B, M
B	A, M
M	A, B, S
S	M

Dual Attachment Station Configuration

Connecting the FDU to another Dual Attachment Station (DAS) requires that the A port connects to the B port of another DAS, and the B port may connect to the A port of yet another DAS. Figure 1-3 illustrates this configuration.

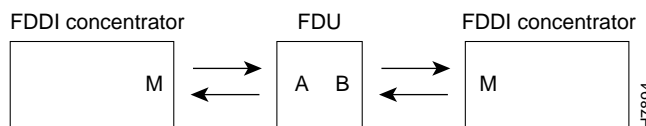**Figure 1-3   FDU with Other Dual Attachment Stations (DAS)**
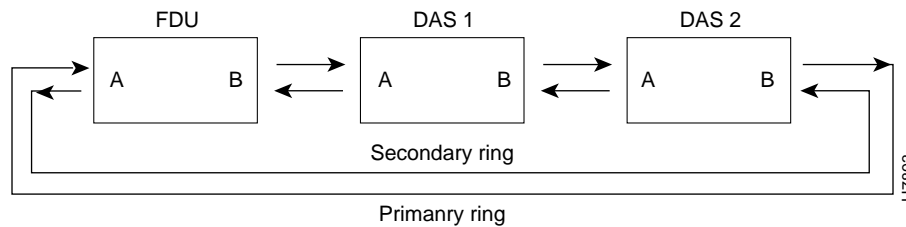
Dual-Homing Configuration

The FDU's FDDI A and B ports can also be connected to the M ports of an FDDI concentrator. Connecting the A and B ports to M ports results in SMT determining which port (A or B) should be used for network traffic. The port not selected is used if a problem occurs with the selected port. This network configuration is known as *dual-homing*.
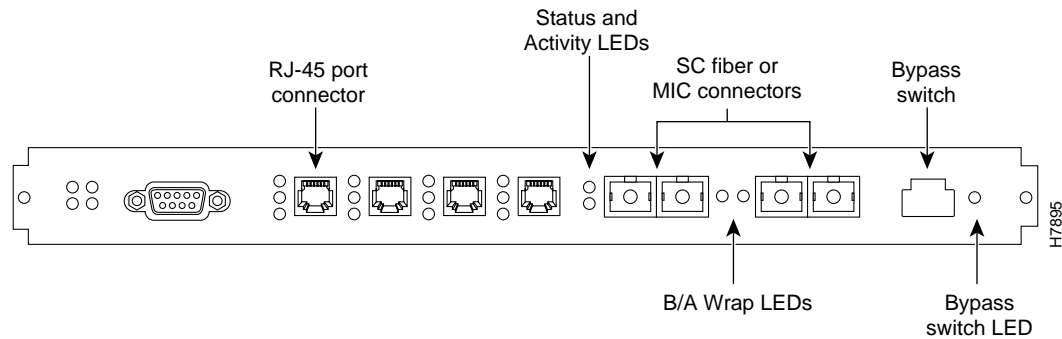
Figure 1-4 illustrates dual-homing.

Figure 1-4   Configuration of an FDU with FDDI Concentrators

Dual Attachment Station (DAS) with Media Interface Connectors (MIC)

Figure 1-5 shows a sample DAS with dual MIC interface connectors.

Figure 1-5   Catalyst 1800 FDU DAS with Dual MIC Interface Connections

The power connections are made from the rear of the system. All network connections are made from the front of the system. Each fiber connection port supports a 100 Mbps ring speed. The console port, a DB-9 EIA/TIA-232 connector located on the front of the system, supports local switch management. For pinouts of the console port connector, see "DB-9 Connectors" in the appendix "Installation and Maintenance."

The overall status of the DAS with two MIC connections is indicated by the LEDs to the left of the console port: Power A, Power B, Status, Activity, and Failure Detection. Other LEDs indicate wrapping between the A and B fiber connector ports and the bypass condition. (For more information, see the section "FDU LED Definitions.")

The Bypass switch is used to skip a station on a dual ring if the station is turned off, without causing the ring to wrap.

FDU Longest Spans

The maximum circumference of an FDDI ring is 200 km. The maximum distance between FDDI stations is 2 km. The maximum number of stations for all fiber types is 500. There is no minimum distance between station spans.

The following table provides distance guidelines to follow when designing connections to the network.

Table 1-7　　　　FDU Cabling Distance Guidelines

Cable Type	Longest Span
PMD (Multimode Fiber)	2 Km.
LCF-PMD (Low-cost Multimode Fiber)	500 meters

FDU LED Definitions

The following table describes the LEDs next to each FDDI port on the front panel of the Catalyst 1800 FDU. For a description of the general LEDs common to both the Token Ring and the FDU, see the previous section "LED Definitions."

Table 1-8　　　　LED Definitions

LED	Color	Function	If on . . .	If off . . .
Status	Green	Shows the operational state of the port	The port is enabled.	The port is disabled.
Activity	Green	Shows the activity of the port	A frame is being received or transferred.	The port is idle.
Wrap A	Amber	Shows whether wrap mode is on for the A FDDI port	Wrap mode is enabled for the A FDDI port.	Wrap mode is disabled for the A FDDI port.
Wrap B	Amber	Shows whether wrap mode is onfor the B FDDI port	Wrap mode is enabled for the B FDDI port.	Wrap mode is disabled for the B FDDI port.
Bypass	Amber	Shows whether bypass mode is on	Bypass mode is enabled.	Bypass mode is disabled.