Catalyst 5000 Series

This chapter provides information on the Catalyst 5000 series switching system. The information is organized into the following sections:

- Product Overview
- Standard Features
- Product Numbers
- Configuration Worksheet

Note Documentation for the Catalyst 5000 series is available in two forms: on a CD-ROM called Cisco Connection Documentation, Enterprise Series and printed books. A CD and hard-copy installation documentation ship with each chassis, and a configuration note ships with each component ordered. All configuration notes are available on the CD. Additional CDs and a subscription CD update service are also available.

You can also access Cisco technical documentation on the World Wide Web URL http://www.cisco.com. For more information, see the chapter "Documentation" at the end of the catalog.

Product Overview

The Catalyst 5000 series is a modular switching system that provides high-density switched Ethernet and Fast Ethernet interfaces for wiring closet and data-center applications. The Catalyst 5000 series system provides virtual LAN networking and optional multilayer switching with Cisco Internetwork Operating System (Cisco IOS) software functionality. The modular design allows you to dedicate 10-Mbps Ethernet and 100-Mbps Fast Ethernet connections to existing LAN segments or high-performance workstations and servers using unshielded twisted-pair (UTP), shielded twisted-pair (STP), and fiber-optic cable. The switch architecture includes a single integrated 1.2 gigabits-per-second data switching backbone that supports wire-speed switched Ethernet and Fast Ethernet users across a wide range of backbone interfaces including Fast Ethernet, Fiber Distributed Data Interface (FDDI), and ATM.

The five-slot, modular chassis of the Catalyst 5000 series features fault-tolerant power with a dual AC power supply option and a full complement of hot-swappable interface modules. (Hot-swappable means that all system components can be removed, added, or changed without rebooting or taking the system off line.) The five module slots support the required Supervisor Engine and, in the remaining four slots, any of the following interface modules:

- 24 interfaces—10BaseT (10-Mbps Ethernet)
- 48 interfaces—10BaseT (10-Mbps Ethernet) Group Switching
- 12 interfaces—10BaseFL (10-Mbps Ethernet, MMF)
- 12 interfaces—Auto-negotiating 10/100BaseTX (100-Mbps Fast Ethernet, MMF)
- 12 interfaces—100BaseFX (100-Mbps Fast Ethernet)
- 12 interfaces—100BaseFX (100-Mbps Fast Ethernet, 6 SMF/6 MMF)
- One dual attachment station—100-Mbps CDDI/FDDI
- Dual PHY interface—155-Mbps ATM (limit of three modules only)

The new 12-port 100BaseFX single-mode/multimode fiber switching module provides six single-mode and six multimode fiber connections for connecting switching systems across a campus or across a city.

The ATM LAN Emulation dual PHY module delivers fault tolerance for critical network applications via two unique features:

- Dual Homed ATM
  Dual PHY ATM allows network administrators to deploy redundant connections from one uplink port. Similar to FDDI dual homing, the Catalyst 5000 dual PHY module provides link redundancy by duplicating the data link with a primary and secondary interface. If connectivity is lost on the primary interface, due to either link failure or loss of ILMI communication, data connectivity automatically switches over to the redundant secondary interface.
- LAN Emulation Server Redundancy
  Each Catalyst 5000 ATM LANE module delivers redundant LANE services using Cisco's LANE simple server redundancy protocol (SSRP). LAN Emulation SSRP provides redundancy for all of the server components in LAN Emulation—the LAN emulation configuration server (LECS), the LSN emulation server (LES), and the broadcast and unknown server (BUS). Cisco's SSRP allows the enterprise-wide deployment of ATM by removing LANE servers as a single point of failure.

The Supervisor Engine enables Layer 2 switching and network management. This module contains two Fast Ethernet interfaces to connect to workstations, servers, switches, and routers. The Catalyst 5000 series system can accommodate up to 192 group switched Ethernet interfaces, 96 switched Ethernet interfaces, and up to 50 Fast Ethernet interfaces.

The 10BaseT 48-port group switching Ethernet module provides a method to divide users into managed switch groups. Group switching combines hub costing and network management on one module; it is an alternative to shared-media hubs. Each module has four 10BaseT Ethernet segments with groups of 12 users per segment (48 interfaces per module). You can switch each group of 12 ports to any Catalyst 5000 VLAN. The 10BaseT Ethernet switch module supports 24 dedicated segments; each can be assigned to a different VLAN. The 10/100BaseTX module supports auto-negotiation, which sets the

appropriate speed and duplex mode (half or full) for the switched connection and adapter interface. This variety of interface modules offers the flexibility to accommodate today's dynamic network topologies and the scalability to meet bandwidth, speed, and application advancements today and in the future.

The Catalyst 5000 series system has a number of features that contribute to its superior traffic management capabilities. The switch is fully nonblocking for 10-Mbps Ethernet and is capable of switching over 1 million packets per second. Ethernet to Ethernet, Fast Ethernet, or ATM packet latency is less than 10 microseconds. Ethernet to FDDI packet latency is 100 microseconds. The data switching bus supports three priority queues so that you can define priorities on a per-port basis.

The Catalyst 5000 series system supports the formation of workgroups within and between other Catalyst 5000 series switches. One thousand VLANs can be maintained across switching and routing platforms through Fast Ethernet, CDDI/FDDI, and ATM connections. Any Fast Ethernet interface on the Catalyst 5000 series system can be configured as an InterSwitch Link (ISL) to support multiple VLANs. Note that all VLANs support the IEEE 802.1d spanning-tree algorithm for fault-tolerant connections. ATM supports VLANs by emulating the LANs into virtual circuits. FDDI supports 802.10 for multiple VLANs.

The switch can be configured through a command-line interface or a GUI-based management application. The command-line interface can be accessed out-of-band by an ASCII terminal or modem and in-band using Telnet or SNMP commands through any LAN or ATM interface. CiscoWorks for Switched Internetworks network management application can be used to query all Cisco products, including the Catalyst 5000 series system physical view, as well as configure, monitor, and troubleshoot the system. The VlanDirector management application allows you to perform drag-and-drop configuration of your network based on logical user groups and display an enterprise-wide logical view of these groups. The TrafficDirector management application allows you to monitor and troubleshoot networks using standard RMON technology.

Standard Features

The Catalyst 5000 series base system includes the following standard features:

- Five-slot system chassis
- Supervisor Engine:
  - High-performance, low latency 1.2-Gbps switching backplane with tri-level priority
  - Hardware-based support for static entries and self-learning of the 16,000 active MAC addresses and associated VLANs in the bridge lookup table
  - 25-MHz 68EC040 network management processor
  - Two Fast Ethernet interfaces (full or half-duplex), which can be ISL trunks
  - Fully integrated support for 1000 VLANs
  - Console port (female DCE EIA/TIA-232)
  - 8-MB DRAM
  - 4-MB Flash EPROM for downloadable microcode and software upgrades

  - 256-KB NVRAM
  - 192-KB packet buffer per interface
  - Self-diagnostics at startup and runtime
  - Environmental monitoring
- AC power supply
- Power cord
- Rack-mounting hardware
- Cable management system
- Optional second AC power supply:
  - Extends individual power supply by load sharing
  - Allows you to complement dual sources of prime power

Figure 111 Catalyst 5000 Series Front Panel

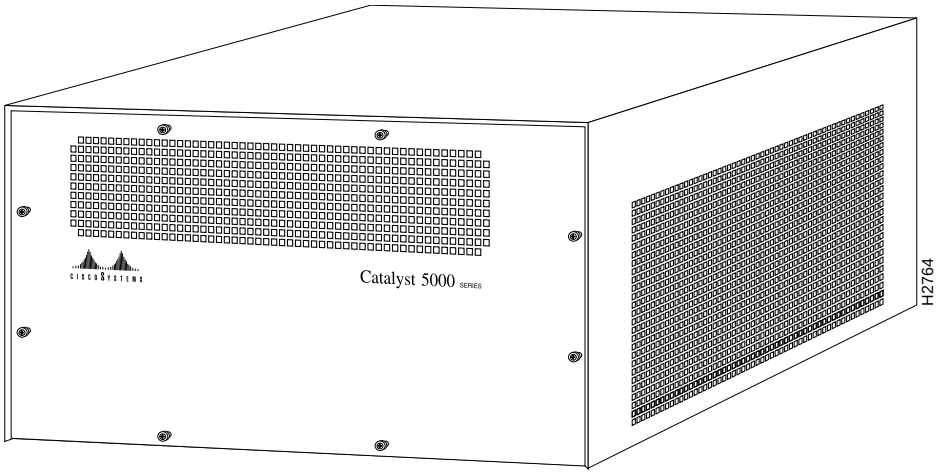


Figure 112 Catalyst 5000 Series Rear Panel

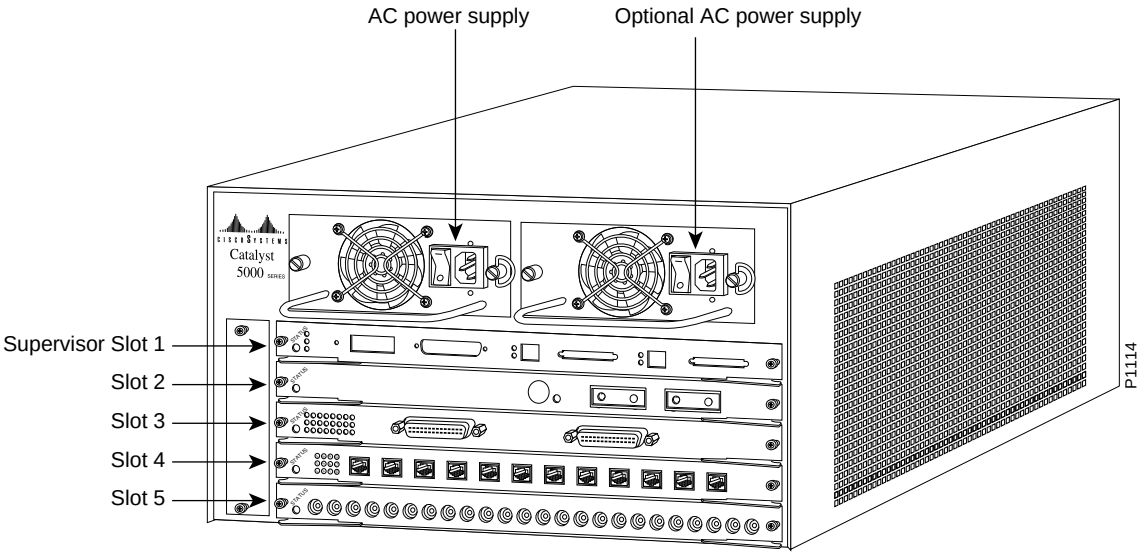


Table 248 Catalyst 5000 Series Summary of Features

Characteristics	Description
Placement	Rack-mounted, front or back (standard 19-inch rack)
Switching backplane	1.2-Gbps, supports over 1 million packets per second (pps)
Memory	4-MB Flash memory 8-MB DRAM 256-KB NVRAM 512-KB EPROM
Interfaces	Supervisor console: DB-25 (female) Supervisor 100BaseTX: RJ-45 (female), MII [1](female) Supervisor 100BaseFX: MMF (SC), SMF (SC) 10BaseT: RJ-21 (female, Telco) 10BaseFL: ST (female) 100BaseTX: RJ-45 (female) 10/100BaseTX: R5-45 (female) 100BaseFX: MMF (SC), SMF (SC) CDDI: RJ-45 (female) FDDI: MMF (MIC), SMF (ST) Optical bypass switch connector: 6-pin mini-DIN ATM:RJ-45, MMF (SC), SMF (SC)
Duplex	10-Mbps Ethernet: Full or half duplex 100-Mbps Fast Ethernet: Full or half duplex 10/100-Mbps Fast Ethernet: Auto-negotiated speed and duplex FDDI: Half duplex ATM: Full duplex
Network management	Cisco Discovery Protocol VLAN Trunk Protocol SNMP agent v1 (RFC 1155-1157) SNMP MIB II (RFC 1213) Telnet Client RMON (4 groups) Ethernet MIB (RFC 1398) Interface Table (RFC 1573) Bridge MIB (1493) FDDI MIB (RFC 1512) SMT 7.3 (RFC 1285) AToMIC MIB (RFC 1695) ILMI MIB Cisco Workgroup MIB LEC MIB (ATM Forum LANE v1.0) Cisco LECS MIB Cisco LES/BUS MIB

Characteristics	Description
Maximum station-to-station cabling distance	10BaseT Ethernet: Category 5 UTP: 328' (100 m) 10BaseFL Ethernet: 62.5/125-micron fiber: 1.24 miles (2 km) 100BaseTX Fast Ethernet: Category 5 UTP: 328' (100 m) 10/100BaseTX Fast Ethernet: Category 5 UTP: 328' (100 m) 100BaseFX Fast Ethernet: 62.5/125 multimode fiber (400 m half duplex, 2 km full duplex) 8.7/125 single mode fiber (10 km full or half duplex) CDDI: Category 5 UTP: 328' (100 m) FDDI: 62.5/125 multimode fiber, 2 km 8.7/125 single mode fiber, 10 km ATM LAN emulation module UTP: Category 5 UTP: 328' (100 m) ATM LAN emulation module multimode fiber: 62.5/125 micron fiber, 2 km ATM LAN emulation module single mode fiber: 8.7/125 micron fiber 10 km
Fiber optical specifications	The following multimode specifications are applicable to Catalyst 5000 line modules WS-X5005, WS-X5011, WS-X5155, WS-X5114, WS-X5101, WS-X5158: Transmitter output power: –19 to –14 dBm Receiver sensitivity: –32.5 to –14 dBm Wavelength: 1270 to 1380 nm Optical source: LED Maximum span: 2 km The following single-mode specifications are applicable to Catalyst 5000 line modules WS-X5006, WS-X5157, WS-X5114, and WS-X5154: Transmitter output power: –4 to –8 dBm Receiver sensitivity: –32.5 to –8 dBm Wavelength: 1261 to 1360 nm Optical source: LASER Maximum span: 10 km The following single-mode specifications are applicable to the Catalyst 5000 line module WS-X5104: Transmitter output power: –4.0 to–7.0 dBm Receiver sensitivity: –33 to –14dBm Optical source: LASER Maximum span: 30 km
Agency approvals	FCC Class A (47 CFR Part 15) EN 55022A Class B on shielded UTP VCCI Class 1 on UTP VCCI Class 2 on shielded UTP UL 1950 CSA-C22.2 No. 950 93 EN 60950 CE Mark on shielded UTP
LEDs	Status LED on each module shows successful completion, minor and major failure of power-up diagnostics Link Good LED shows status of any interface Switch Load LEDs show backplane utilization
Dimensions (H x W x D)	10.4 x 17.21 x 18.14" (26.2 x 42.5 x 44.5 cm)

1. MII = Media-independent interface.

Table 249 Catalyst 5000 Series Environmental Specifications

Description	Specification
Weight	Minimum: 43 lb (19.5 kg) Maximum: 88 lb (39 kg) Average shipping: 60 lb (27.2 kg)
AC input voltage	8.0 Amps @ 100-127 VAC 60 Hz 4.0 Amps @ 200-240 VAC 50 Hz Power consumption: 376W Heat dissipation: 562.5W, 1919.83 Btu/hour, KVA = .8

Product Numbers

This section describes the product numbers associated with the Catalyst 5000 series. If a Cisco product number ends with an equal sign (=), the item can be ordered only as a spare. If a product number does not end with an equal sign, the item can be ordered as a spare or as a configurable part of a system order. When you order a product as a spare, remember to include the equal sign.

Table 250 Catalyst 5000 Series Product Numbers

Description	Product Number
Base system (chassis, Supervisor Engine, one power supply)	WS-C5000
Single AC power supply	WS-C5008A
Optional redundant AC power supply	WS-C5008A/2
Supervisor Engine 100BaseFX (MMF)	WS-X5005
Supervisor Engine 100BaseFX (SMF)	WS-X5006
Supervisor Engine 100BaseTX	WS-X5009
Ethernet switching module (10BaseT)	WS-X5010
Group Ethernet switching module (10BaseT)	WS-X5020
Ethernet switching module (10BaseFL)	WS-X5011
Fast Ethernet switching module (10/100BaseTX, auto-negotiation)	WS-X5213
Fast Ethernet switching module (100BaseFX, 12 ports MMF)	WS-X5111
Fast Ethernet switching module (100BaseFX, 6 ports MMF, 6 ports SMF)	WS-X5114
CDDI module (UTP)	WS-X5103
FDDI module (multimode)	WS-X5101
FDDI module (single mode)	WS-X5104
ATM LAN emulation module, dual PHY, UTP	WS-X5156
ATM LAN emulation module, dual PHY, MMF[1]	WS-X5158
ATM LAN emulation module, dual PHY, SMF	WS-X5157
Catalyst 5000 ATM LANE (UTP, RJ-45)	WS-X5153
Catalyst 5000 ATM LANE (Single-mode, SC)	WS-X5154
Catalyst 5000 ATM LANE (Multimode, SC)	WS-X5155

Description	Product Number
Catalyst 5000 Software upgrade	WS-SW-C5000
Catalyst 5000 RMON agent license	WS-C5K-EMS-LIC
Catalyst 5000 release 2.1 memory upgrade	MEM-C5K-4M-V21
SMARTnet	CON-SNT-WS-C5001
Documentation	See the chapter “Documentation” at the end of the catalog

1. For cable and connector information, see the section “ATM Cable Specifications” in the chapter “Cables and Transceivers.”

Catalyst 5000 Wiring Layouts

The following illustrations provide examples of commonly used wiring layouts for the Catalyst 5000 series.

Figure 113 180-Degree Male Telco Connector (for WS-X5020 and WS-X5010 10BaseT modules)

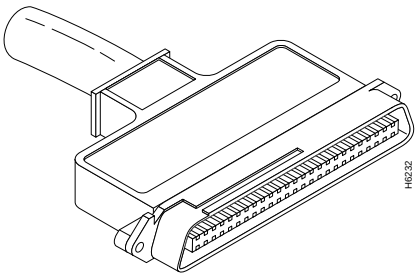


Figure 114 90-Degree Male Telco Connectors (for WS-X5010 10BaseT modules only)

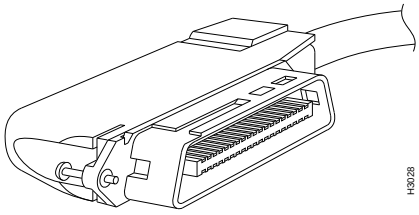


Figure 115 Velcro Ties for Fastening 90-Degree Telco Connector Cables

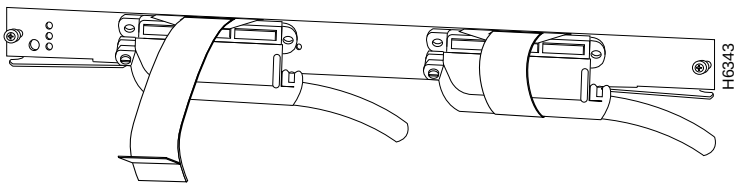
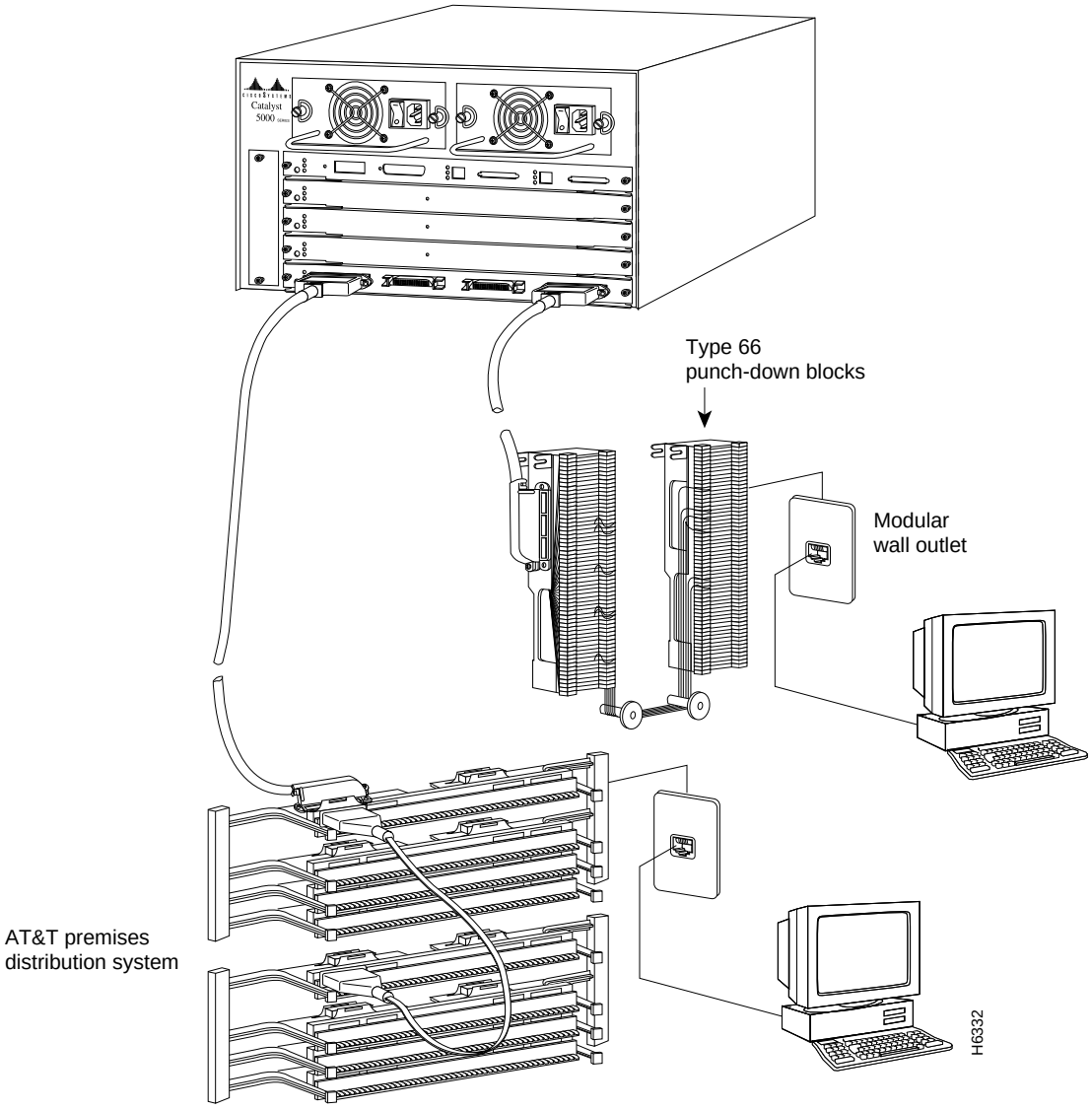


Figure 116 Catalyst 5000 With a 48-Port Group Switching 10BaseT Module Using 180-Degree Telco Connectors

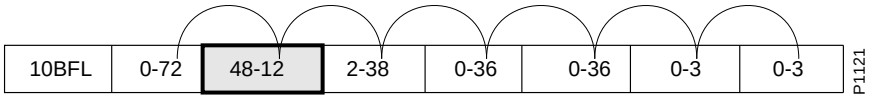


Configuration Worksheet

The Catalyst 5000 series system has many options. Use the Catalyst 5000 series Configuration Worksheet that follows to help you plan your order or to upgrade an existing system. One blank worksheet is provided, and you can make extra copies as needed.

The worksheet provides a chart to help you calculate maximum configurations. To use the chart, first select your primary interface choice from the left column (10BaseT, 10BaseFL,10/100BaseTX, or 100BaseFX). Then read across to determine configuration options. The bold boxes denote the maximum number of ports available for your primary interface choice.

For example, if you select 10BaseFL in the left column, the chart shows that the system can support a maximum of 48 to a minimum of 12 10BaseFL ports. If you choose the lowest end of the range (12 10BaseFL ports), you can look at the other columns of the same row to see how many of each of the other interface you can add. Notice that you have room left for 72 10BaseT ports, 38 100BaseTX ports, 36 10/100BaseTX ports, 36 100BaseFX ports, 3 ATM ports, or 3 FDDI ports, as follows:



On the other hand, if you choose the highest end of the range (48 10BaseFL ports), you have room left for 0 10BaseT ports, 2 100BaseTX ports, 0 10/100BaseTX ports, 0 100BaseFX ports, 0 ATM ports, or 0 FDDI ports. Note that the number range in the shaded boxes lists the highest number of ports first; this is to clarify the relationship to the number range in the other boxes, which range from low to high. As the number of your primary interface ports increases, the number of available ports on the other interface decreases.

Catalyst 5000 Series Configuration Worksheet

Circle your choices:

Chassis:	Catalyst 5000
AC power supply:	WS-C5008 ❒
Optional dual AC power supply:	WS-C5008/2 ❒
Rack-mounting hardware:	Standard

AC Power cord: U.S. (CAB-7KAC)—standard if not specified; Australia (CAB-7KACA); Italy (CAB-7KACI); Europe (CAB-7KACE); U.K. (CAB-7KACU)

Switching and Backbone Modules (Maximum One Per Slot)	**Product Number**	**Slot 1**	**Slot 2**	**Slot 3**	**Slot 4**	**Slot 5**
Catalyst 5000 5-slot chassis	WS-C5000					
Supervisor Engine 100BaseFX (MMF)	WS-X5005					
Supervisor Engine 100BaseFX (SMF)	WS-X5006					
Supervisor Engine 100BaseTX	WS-X5009					
Catalyst 5000 Ethernet switching module (10BaseT)	WS-X5010					
Catalyst 5000 Group Switching Ethernet module (10BaseT)	WS-X5020					
Catalyst 5000 Ethernet switching module (10BaseFL)	WS-X5011					
Catalyst 5000 Fast Ethernet switching module (10/100BaseTX)	WS-X5213					
Catalyst 5000 Fast Ethernet switching module (100BaseFX, MMF)	WS-X5111					
Catalyst 5000 Fast Ethernet switching module (100BaseFX, MMF/SMF)	WS-X5114					
Catalyst 5000 FDDI module (multimode)	WS-X5101					
Catalyst 5000 FDDI module (single mode)	WS-X5104					
Catalyst 5000 CDDI module (UTP)	WS-X5103					
Catalyst 5000 ATM LAN emulation module (dual PHY multimode)*	WS-X5158					
Catalyst 5000 ATM LAN emulation module (dual PHY single mode)*	WS-X5157					
Catalyst 5000 ATM LAN emulation module (dual PHY UTP)*	WS-X5156					
Optional AC power supply (installed in chassis)	WS-C5008A/2					
SMARTnet	CON-SNT-WS-C5001					

Maximum Configuration:

	10BT	10BFL	10/100BTX	100BFX	ATM	FDDI
10BT	192-24	0-36	0-36	2-38	0-3	0-3
10BFL	0-72	48-12	0-36	2-38	0-3	0-3
100BTX	0-96	0-48	0-48	2-38	0-3	0-4
10/100BTX	0-96	0-36	48-12	2-38	0-3	0-3
100BFX	0-72	0-36	0-36	50-2	0-3	0-3

P1098

* Limit of 3 modules