

# Passport 4400

## Multiservice Access Switch Family



### Passport 4400 Series Features and Benefits:

- **Enhanced bottom line through the cost saving benefits of unified networking**
- **Lower total cost of ownership through simplified deployment and maintenance**
- **Flexible voice integration with support for Voice over Frame Relay, Voice over IP, or both**
- **Proven user acceptance of integrated voice via toll-quality ClearVoice\* technology**
- **Scalable to thousands of nodes**
- **End-to-end network management**

The Nortel Networks Passport\* 4400 series of Multiservice Access Switches supports Voice over Frame Relay (VoFR) and Voice over IP (VoIP), and utilizes advanced technology to integrate voice, fax, modem, video, local area network (LAN), and legacy data traffic over a single wide area network (WAN) link.

The Passport 4400 series provides an efficient, reliable, and easily managed WAN access solution with sophisticated compression and bandwidth management, and superior Quality of Service (QoS) for networks ranging in size from small point-to-point to thousands of nodes. Powerful networking features and flexibility provide a superior branch WAN solution to support new business applications.

To cut corporate communications costs without sacrificing voice quality, the Passport 4400 series incorporates Nortel Networks advanced ClearVoice\* toll-quality voice compression technology. Nortel Networks' ClearVoice voice compression is based on International Telecommunications Union (ITU) standard audio compression codecs, silence suppression with comfort noise generation and echo cancellation.

These advanced technologies eliminate long distance toll and tie line charges, reduce reoccurring monthly WAN bandwidth charges, cut capital equipment costs through consolidation, and reduce overall cost of ownership through simplified installation and maintenance.

The Passport 4400 Multiservice Access Switch family delivers on Nortel Networks' promise of a fully unified infrastructure by extending the wide area to the branch for an end-to-end, high-performance, multi-service networking solution.

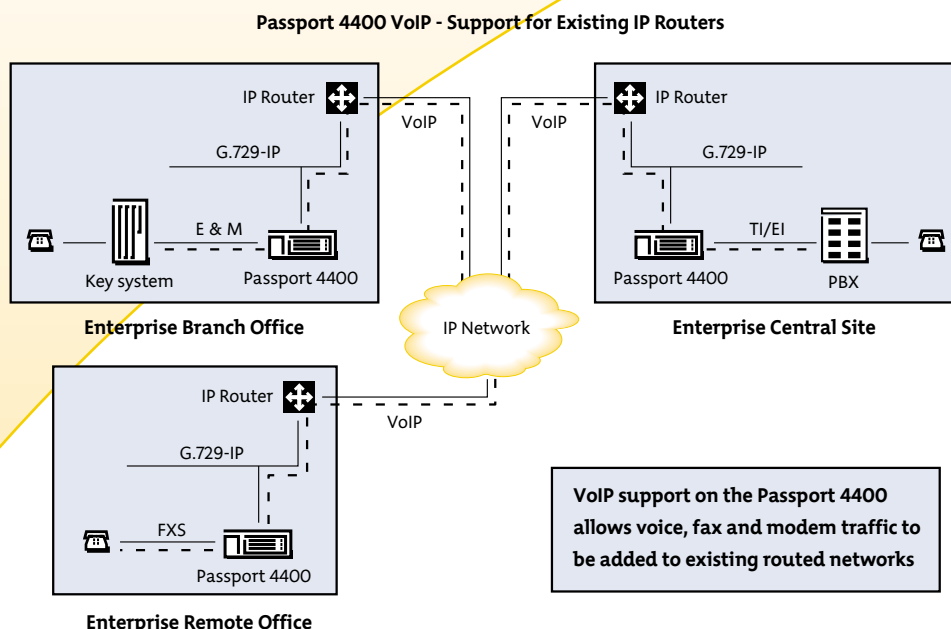
The Passport 4400 series includes the Passport 4430, 4450, 4455 and 4460 models. The Passport 4400 product line can be used to build small to medium-sized networks, or provide branch and remote office access devices for Passport 6400 and 7400 backbone networks, supporting varying degrees of connectivity and performance for large networks.

The Passport 4430 model provides the lowest cost solution for branch office termination. The Passport 4450 provides added termination capacity for larger branch and small regional offices. The Passport 4455 model provides additional performance to address the needs of large regional and small central site requirements. The Passport 4460 model delivers the performance and voice termination capacity to address the central site requirements of small to medium-sized networks. For large networks, central site traffic termination can be provided via the Passport 6400 series.

The Passport 4400 series utilizes a highly efficient, standards-based link protocol called Passport Access Network Link (PANL), which optimizes link utilization (generally the most significant cost component for branch access) for multimedia traffic.

The Passport 4400 series of Multiservice Access Switches is complemented by its interoperability with the Nortel Networks Passport 6400 series of Enterprise Network Switches and the Nortel Networks Passport 7400 series of Asynchronous Transfer Mode (ATM) Multiservice Switches that provide high fan-out solutions for large enterprise and carrier service providers.

Figure 1: Small/medium enterprise network application using the Passport 4400 series.



## OVERVIEW

### Modular Design Allows for Added Services and Network Growth

The Passport 4400 series of Multiservice Access Switches is modular, allowing various expansion cards to be added to easily customize and expand services. Users can select the most cost-effective option for each site while planning for future growth.

The Passport 4460 is the newest member of the Passport 4400 family. It provides the same flexibility as the other Passport 4400 models in a very low-profile, compact design. All Passport 4460 modules can be accessed externally, for greater ease of installation and maintenance. The modular design includes a 1U height chassis, dual processors, WAN modules common with Passport 2430 and 5430 Multiservice Access Switches, dual 10/100 Base-T Ethernet ports, and warm-pluggable PCMCIA flash memory allowing for easy software upgrades.

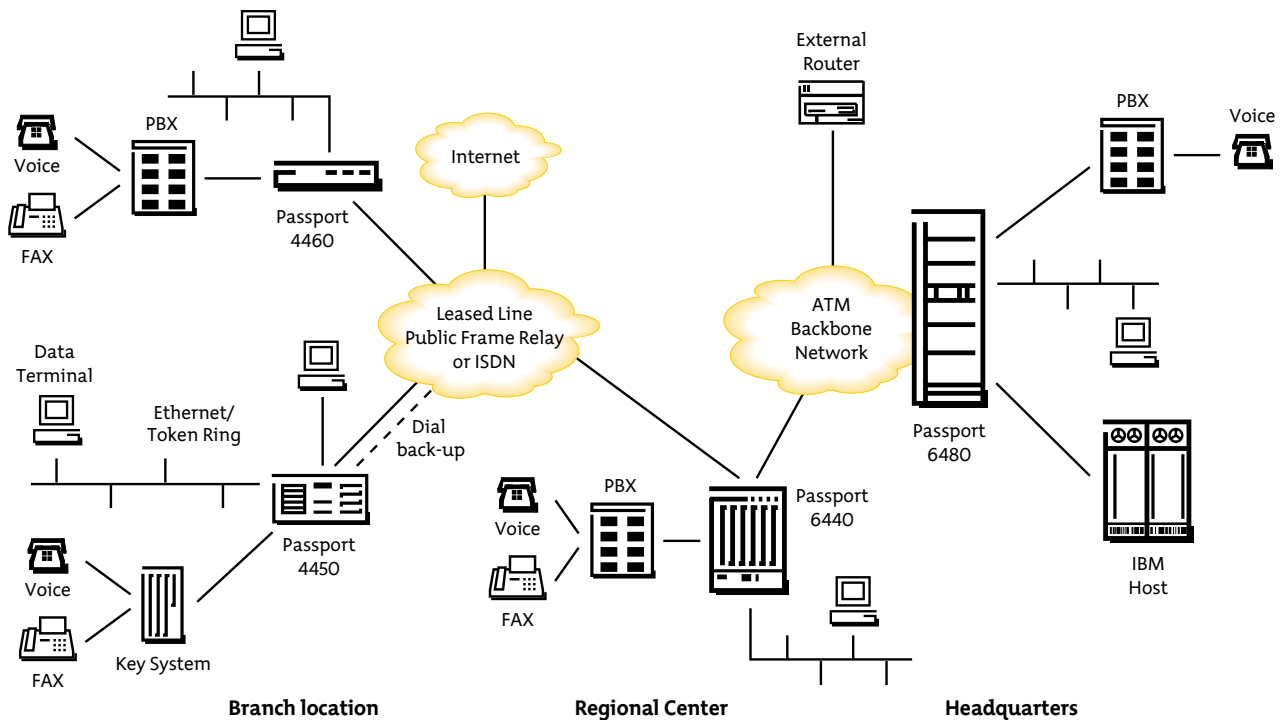
### Sophisticated Traffic Management

The Passport 4400 series prioritizes traffic based on application importance and delay sensitivity. The traffic management system allows mission-critical traffic to be transmitted according to priority, and delay-sensitive traffic (such as voice and video) to be transmitted with sufficient quality. To accomplish this, the Passport 4400 series uses a fair-weighted queuing scheme. The queuing scheme provides a minimum throughput (user configurable) for lower-priority traffic, so that such traffic cannot be starved by large volumes of high-priority traffic, even when priority is given to real-time and urgent traffic.

### Toll-Quality Voice

The Passport 4400 series can support up to 60 voice channels, using award-winning ClearVoice technology from Nortel Networks. Based on the ITU-T G.729 voice compression standard, the ClearVoice technology uses powerful digital signal processing (DSP) to provide toll-quality voice compression down to 8 Kbit/s.

Figure 2: Large network featuring service integration and interworking between the Passport 4400 and 6400 series.



When coupled with silence suppression and speech activity detection, the average bandwidth consumed is reduced to 4.8 Kbit/s while maintaining the same high-quality voice. Average usage of each telephone circuit reduces the long-term average bandwidth to 1.2 Kbit/s. The Passport 4460 supports additional voice standards, including G.729A, G.729B and G.711.

#### Flexible IP Services

Powerful Passport 4400 series features alleviate the pressure that network operators face from surging Internet Protocol (IP) traffic caused by ever-expanding LAN, intranet, and extranet applications, and ever-widening Internet access. These features enable network managers to confidently and comfortably deploy new applications that will grow their business and generate incremental revenue.

The integrated routing capabilities of the Passport 4400 series allows for complete IP/IPX services between branch and central sites, as well as to the Internet. Sophisticated traffic prioritization features provide QoS for delay sensitive traffic like Systems Network Architecture (SNA) data.

Additionally, Nortel Networks intelligent routing technology and standards-based hardware compression provides efficient use of the WAN bandwidth.

In larger networks, the Passport 4400 series routes to the proven Virtual Network Switching (VNS) feature on a Passport 6400/7400 series backbone. The backbone VNS feature eliminates routing at intermediate backbone nodes, minimizing the processing load to provide high performance under demanding conditions.

#### Extensive Legacy Data Support

The Passport 4400 series supports data services such as X.25 switching, Frame Relay DCE, asynchronous traffic, SNA / Synchronous Data Link Control (SDLC), SNA over Ethernet, and Token Ring source route bridging. It incorporates the proven strengths of the Nortel Networks SNA Data Link Routing (DLR), to allow businesses to migrate their SNA networks to a dynamic, switched environment without impacting the existing network configuration.

#### Complete WAN Services

The Passport 4400 series supports Frame Relay, IP, Integrated Services Digital Network (ISDN) Basic Rate Interface (BRI) and leased lines—the most popular worldwide carrier facilities—and provides dynamic bandwidth management and QoS for mission-critical services. If a link or node failure occurs, the Passport 4400 series provides a backup WAN link, either over the Public Switched Telephone Network (PSTN)—whether ISDN or analog—or using Frame Relay. These flexible and reliable options support a broad range of customer environments.

#### Device Management Tools

The Java-based Install Tool includes Install Wizards, making basic configuration and setup of Passport 4400 multiservice access switches even easier. The Web-based Configurator provides complete device configuration and monitoring from a Web browser, as an alternative to the Command Line Interface. The Mass Deployment and Reporting Tool simplifies configuration of larger Passport 4400 networks and provides comprehensive configuration reports from selected units.

## BENEFITS

### Enables Business Growth and New Applications

Passport 4400 Multiservice Access Switches provide the flexibility to meet expansion requirements and to adapt to various applications. The Passport 4400 series supports legacy as well as “leading-edge” networking technologies. This enables graceful migration paths for applications supported in the branch today and in the future.

### Savings Without Sacrifice Through Consolidated WAN Services

Passport 4400 Multiservice Access Switches efficiently integrate voice, fax, modem, video, local area network (LAN) and legacy data traffic over a single carrier facility to maximize utilization of purchased bandwidth. Nortel Networks ClearVoice technology delivers quality voice over consolidated connections. Features such as hardware data compression, SNA and X.25 spoofing, and fax demodulation can dramatically reduce bandwidth requirements.

### Lower Total Cost of Ownership

To simplify network provisioning, Passport 4400 Multiservice Access Switches offer a choice of configuration tools. The Java-based Install Tool with built in wizards allows even less-technical personnel to bring Passport 4400 switches up to basic

operation, usually eliminating the need to send technical personnel to remote sites. The Configurator serves up HyperText Markup Language (HTML) pages to offer a point-and-click configuration alternative to the traditional Command Line Interface. The Mass Deployment and Reporting Tool simplifies the deployment of larger networks and provides an easy way to obtain a unit's configuration.

Once a network is operational, features such as Network Address Server/Network Address Client (NAS/NAC) provide automatic registration with a directory server, virtually eliminating the need for manual intervention associated with network adds/moves.

The Passport 4460 switch further reduces the overall cost of ownership. Its sleek 1U (1.75 inch, 4.4 cm) height design requires less rack space. Also, all modules are accessible externally, simplifying module adds/swaps. Warm-pluggable flash reduces the time required for software updates.

### End-to-End Network Management

The Passport 4400 series is manageable by Simple Network Management Protocol (SNMP)-based management platforms, Nortel Networks Preside\* network management application, Open Management System for Passport (OMS-P), and Optivity\* Network Management System (NMS) network management platforms.

Nortel Networks' network management offerings allow customers to manage all their network components — from backbone switches out to the customer premise — from a single network management system.

### Scalability

Passport 4400 switches support network sizes from small point-to-point networks to thousands of nodes when used in conjunction with the Nortel Networks Passport 6400/7400 series of network switches.

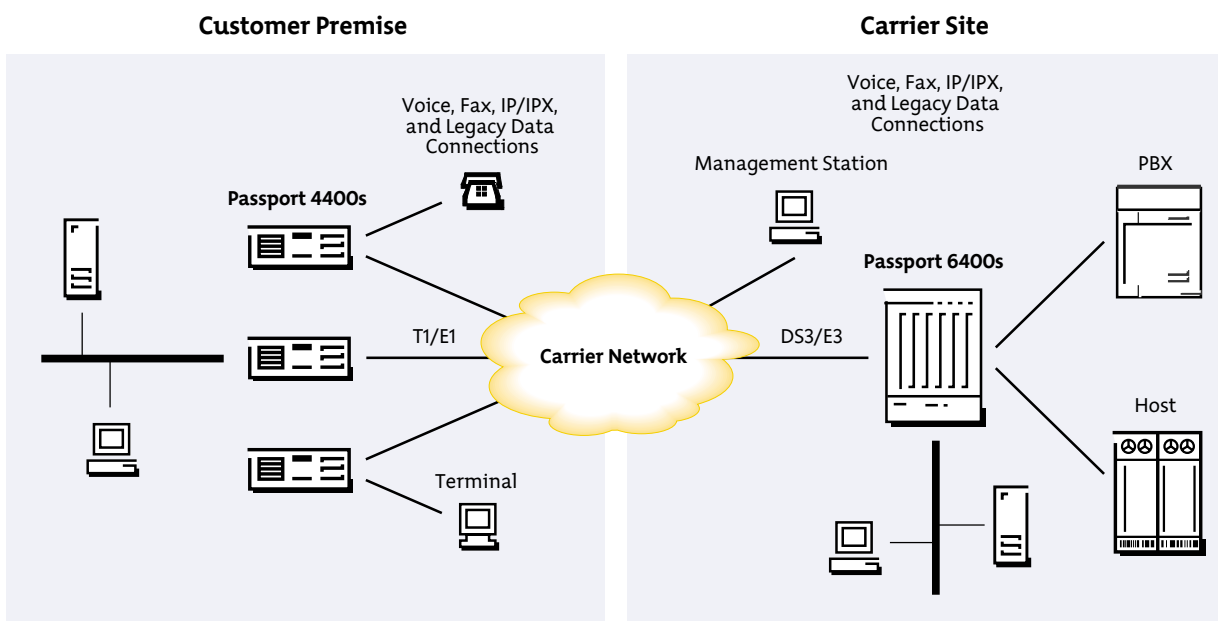
Integration with the Passport network switches includes both backbone switching and central site traffic termination. (See Figure 2).

Application quality and integrity is provided via four levels of configurable Quality of Service (QoS) for voice, fax, and data traffic.

### Flexibility and Investment Protection

The Passport 4400 series offers investment protection of existing telephony/legacy data equipment, such as PBXs and SNA controllers, through re-use of such equipment to consolidate data/voice traffic over Frame Relay, leased line, ISDN or IP connections. In addition, the new Passport 4460 switch offers further investment protection through support of common WAN modules with the Passport 2430 and 5430 Multiservice Access Switches.

Figure 3: Carrier Managed Service Application



## Feature Summary

**Table 1: Feature summary for Passport 4400 Series. Platform dependent (see platform comparison in Technical Specifications)**

### System Features

Status and diagnostic LEDs on each module  
Standard FRF.9 Hardware data compression  
Industry standards supported:  
FRF.1, FRF 3.1, FRF.11, FRF.12, RFC 1490, ITU-T I.233.1, ITU-T Q.922, ITU-T I.933 Annex A, ANSI TI.617 Annex G, RFC 1315, RFC 1405, ITU G.729, ITU G.729A, ITU G.729B, ITU G.711, Group 3 fax, Super Group 3 fax, ITU G.165, ITU G.168)

### LAN

10BASE-T & 10/100BASE-T Mbit/s Ethernet  
Integrated IP/IPX routing  
Static routing, RIP, RIPV2, OSPF and SRB routing protocols  
Transparent bridging for all other protocols  
Standard RFC 1490 IP encapsulation with BAN for SNA  
SNA over Ethernet (LLC 2)

### Legacy Data Module (Passport 4430/50/55 platforms only)

Auto sensing V.24, X.21, V.35, V.11  
SNA over SDLC, X.25/QLLC, Token Ring SRB  
SNA Spoofing and switching  
SNA multidrop  
Token Ring 4 Mbit/s or 16 Mbit/s  
X.25 switching  
Async PAD: X.3/X.28/X.29

### High Speed Data Module & Integrated Serial Port

Autosensing V.24, X.21, V.35, V.11  
SNA over SDLC  
SNA Spoofing and switching  
SNA Multidrop  
X.25 switching  
Asynchronous Transport over TCP/IP  
Frame Relay DCE  
Transparent HDLC, SDLC  
Synchronous bit transparent services  
PANL

### WAN

56K/64K CSU/DSU  
T1 CSU/DSU  
E1 DSU; G.703/G.704 interface; 120 ohm twisted pair and 75 ohm coax versions  
V.35/X.21/V.24 serial module  
ISDN TA  
U interface (North America)  
S/T interface (Europe, Japan, Australia)

### Digital Voice

T1 Voice Module  
One or two DSX-1 and DS-1 Interfaces  
DACS functionality with true drop & insert (Passport 4460 only)  
24 compressed or passthrough voice channels  
Two data ports for drop & insert  
E1 Voice Module  
One or two G.703/G.704 interfaces with 75 & 120 ohm interface on each module  
DACS functionality with true drop & insert (Passport 4460 only)  
30 compressed or passthrough voice channels  
Two data ports for drop & insert  
ISDN BRI Voice Module  
One or two BRI S/T interfaces  
Two switched voice channels per BRI interface  
ETSI Q.SIG signaling

### Analog Voice

Each Analog Voice Module supports:  
FXS (phone set); FXO (PBX extension); E & M (PABX Trunk) type I, II, IV, and V  
One, two or four voice ports  
RJ11 and RJ11C modular ports  
Voice Fax Switching Module - Provides network and PSTN access to fax machine

## Feature Summary (cont.)

**Table 1: Feature summary for Passport 4400 Series. Platform dependent (cont.)**  
(see platform comparison in Technical Specifications)

<p><b>Voice Signaling</b></p> <p>Switched voice calls between any two Passport 4400 devices in the network, between a Passport 4400 and a Passport 6400 or locally switched between voice ports on a Passport 4400.</p> <p>FXS loop and ground start, FXO loop start</p> <p>Digital Wink start</p> <p>Switchhook Flash for call transfer, conferencing, etc.</p> <p>ARD (Auto Ring Down) for Financial Trader/Broker and Voice Mail Applications</p> <p>E&amp;M Wink Start, Ron Tron, Immediate start</p> <p>ETSI Q.SIG on ISDN BRI voice module</p> <p>CAS (R2 Q.421, tie trunk, tie invert, DC5B, inverted DC, pulsed DC, R2/V1, R2/V2, tie trunk seize acknowledge)</p> <p>Transparent CCS (8:1 compression on signaling channel)</p>	<p><b>Voice Compression/Background Noise Regeneration</b></p> <p>ITU G.729/G.729A CS-ACELP (8 Kbit/s), G.711 PCM (64 Kbit/s), G.729B Speech Activity Detection/Background Noise Regeneration.</p>
	<p><b>Fax Demodulation</b></p> <p>Standard on each voice channel</p> <p>V.27, V.29, V.17 using 1.2 Kbit/s to 9.6 Kbit/s</p> <p>Modems and Super Group-3 fax supported via ITU G.711</p> <p>Auto-detects fax calls to trigger demodulation</p>
	<p><b>Software Upgrade</b></p> <p>Via built-in dual bank flash RAM (4430/50/55)</p> <p>Via PCMCIA flash card (4460)</p> <p>Stores two independent software versions</p>

## Technical Specifications

**Table 2: Technical Specifications for Passport 4400 Series.**

	Passport 4460	Passport 4455/4450	Passport 4455/4450 (with redundant power supply)	Passport 4430
<b>Number of Slots</b>	5	5	5	3
<b>Dimensions</b>				
Height	1.75 in. (4.4 cm)	6.5 in. (16.5 cm)	8.0 in. (20.0 cm)	4.75 in. (12.1 cm)
Width	17.25 in. (43.8 cm)	17.5 in. (44.5 cm)	17.5 in. (44.5 cm)	17.5 in. (44.5 cm)
Depth	13.0 in (33 cm)	12.0 in. (30.5 cm)	12.0 in. (30.5 cm)	12.0 in. (30.5 cm)
Weight	13.0 lbs (5.9 kg)	17.1 lbs (7.8 kg)	20.1 lbs (9.1 kg)	13.7 lbs (6.2 kg)
<b>Power Options</b>	100-240 VAC -5% + 10% 43-63 hz 65 W 36-72 VDC @ 3A max	100-240 VAC -5% + 10% 43-63 hz 160 Watts Max 36-72 VDC @ 3A Max	100-240 VAC -5% + 10% 43-63 hz 200 Watts Max	100-240 VAC -5% + 10% 43-63 hz 135 Watts Max
<b>Operating Environment</b>				
Temperature				
Operating:	32 to 122 degrees F (0 to 50 degrees C)			
Storage:	-40 to 158 degrees F (-40 to 70 degrees C)			
Relative Humidity				
Operating:	10-90% non-condensing			
Storage:	0-95% non-condensing			
<b>Redundant Power</b>	Yes	Yes	Yes	N/A
<b>Electromagnetic Compatibility</b>	For all models: FCC Part 15, Level A; C.R.C., c, 1374; EN 55022; EN 50082-1, 2, 3, 4			

## Technical Specifications (cont.)

Table 2: Technical Specifications for Passport 4400 Series. (cont.)

Feature	Passport 4460	Passport 4455	Passport 4450	Passport 4430
Typical Application	Medium/Large Branch, Small Regional, or Small Central Site	Medium/Large Branch, Small Regional, or Small Central Site	Medium/Large Branch Site	Small Branch Site
WAN Connections	Up to 7 physical, 24 virtual	Up to 19	Up to 19	Up to 19
LAN Connections	Up to 2	Up to 1	Up to 1	Up to 1
LAN Interfaces	Ethernet 10/100Base-T	Ethernet 10BASE-T, TokenRing via Legacy Data Module	Ethernet 10BASE-T, Token Ring via Legacy Data Module	Ethernet 10BASE-T, Token Ring via Legacy Data Module
IP Services	IP/IPX routing; RIP, RIPv2 and OSPF routing protocols	IP/IPX routing; RIP, RIPv2, OSPF and SRB routing protocols	IP/IPX routing; RIP, RIPv2, OSPF and SRB routing protocols	IP/IPX routing; RIP, RIPv2, OSPF and SRB routing protocols
Voice Connections	Up to 60	Up to 32	Up to 32	Up to 18
Voice Interfaces	FXS (Loop and Ground Start), T1/E1, ISDN BRI; Voice over Frame Relay and Voice over IP	FXS (Loop Start), FXO, E&M, T1/E1, ISDN BRI; Voice over Frame Relay and Voice over IP	FXS (Loop Start), FXO, E&M, T1/E1, ISDN BRI; Voice over Frame Relay and Voice over IP	FXS (Loop Start), FXO, E&M, T1/E1, ISDN BRI; Voice over Frame Relay and Voice over IP
Voice Standards	G.729, G.729A, G.729B, G.711, G.165/G.168-compliant echo canceller	G.729, G.165	G.729, G.165	G.729, G.165
Fax Support	Super G3 and G3	G3; Voice/Fax Switching Module	G3; Voice/Fax Switching Module	G3; Voice/Fax Switching Module
Serial Data Connections	Up to 5	Up to 17	Up to 17	Up to 17

Note: Above values are independent maximums.



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