StrataCom IGX

This chapter provides information on the StrataCom Integrated Gigabit switch (IGX). The information is organized into the following sections:

- Product Overview
- Standard Features
- Service Provider Solutions
- StrataCom IGX Specifications
- Product Numbers

Note Documentation for the StrataCom IGX 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 StrataCom IGX is a standards-based, scalable ATM switch. Highly versatile, the IGX supports a wide range of narrowband and broadband applications for enterprise networks and public service providers. The IGX provides the same core ATM capabilities and advanced networking features of the StrataCom BPX Service Node.

The IGX is available with 8-, 16-, or 32-slot configurations allowing you to add capacity as demand increases without facing high equipment replacement costs. In a multiservice public ATM environment, you can launch new services in a cost-effective way and expand system capacity as market demand grows. The IGX lets you migrate from narrowband speeds to broadband ATM on the same platform providing unmatched WAN investment protection. IGX systems are available as standalone units or can be rack-mounted with other equipment.

The StrataCom IGX represents a new generation of ATM switches specifically developed to deliver the benefits of ATM today for new applications, while seamlessly replacing legacy systems. Today, the IGX difference is its ability to provide functional equivalence to legacy systems, provide high-speed, high-performance new interfaces, and operate in a private or hybrid ATM environment. Tomorrow its ability to migrate to as yet unwritten standards and operate in a widespread public ATM environment will prevent still another platform change and maintain today's investment.

The StrataCom IGX product family consists of the IGX 8, IGX 16 and IGX 32 multiservice ATM switches. IGXs seamlessly integrate with IPX, BPX, AXIS, INS, and FastPAD platforms under StrataSphere management, to provide multiband ATM solutions from the access to the core layer with integrated network management and call processing.

System Architecture

The StrataCom IGX uses a 1.2-Gbps cell switching redundant bus to pass ATM cells between optionally redundant adaptation and trunking modules within the system. This architecture allows any amount of bandwidth to be assigned to any slot, and makes the IGX the only system in its class with more than 16 slots for greater scalability.

Hardware, firmware, and software are architected for maximum availability, even during maintenance windows. Availability design features, common to all switching systems, include the following:

- 100 percent component redundancy
- Extensive background diagnostics
- "Hot" card swapping
- Rapid power fail recovery
- Background software download
- Firmware, not hardware, upgrades (remote download)
- Class B EMI certified enclosures
- Hard and soft alarm interfaces, including "call home"
- Minimum internal cabling
- Integrated grounding wrist straps

All switches use a midplane design with front cards performing processing functions and back cards providing interfacing and physical connectivity. This allows most system maintenance to be performed at the front cards, without disconnecting interface cables.

Standard Features

The StrataCom IGX includes the following features:

- Networking Features
- Voice Services
- Circuit Switched Data Services
- Frame Relay Services
- ATM Services
- Trunk Resources

Networking Features

The common ATM architecture throughout the product line provides common multiband/ATM network-wide support for advanced networking features, including the following:

- AutoRoute—connection management

  AutoRoute end-to-end connection management software automatically routes and reroutes virtual connections over optimal paths through the network. It keeps traffic moving over the shortest paths while guaranteeing quality of service for each connection. AutoRoute automatically reroutes virtual circuits to alternate paths in the event of a trunk or switch failure. AutoRoute also tracks resources designated to individual connections to prevent overloading of individual trunks, ensuring high levels of network reliability and availability. AutoRoute eliminates the need to manually manage virtual circuits and allocate bandwidth, reducing network operating costs.

- OptiClass—class of service features

  The OptiClass class of service feature offers enterprise network managers and service providers up to several classes of service that can be assigned to specific connections. With OptiClass, minimum bandwidth guarantees may be assigned for each connection, ensuring that services are delivered with the appropriate quality of service required. Together with AutoRoute, OptiClass automatically ensures quality of service for each application, resulting in higher performance and throughput. With OptiClass, unused bandwidth on network trunks and ports is also made available to any connection that can use it. OptiClass also gives network managers the flexibility to easily add new services, enabling service providers to more quickly deploy new services.

- ForeSight—traffic management and congestion avoidance

  ForeSight bandwidth optimization and congestion avoidance software continuously monitors trunk utilization to adjust bandwidth to all connections, proactively avoids queuing delays, and virtually eliminates cell loss. It enables up to 95 percent utilization of network bandwidth, compared with the 50 percent to 70 percent utilization experienced when open-loop mechanisms are used alone in non-ForeSight ATM and frame-switching systems.

This allows a service provider to deliver additional services, resell spare capacity, and scale the network without large additional capital investment. It permits enterprise network managers to significantly reduce networking costs while delivering greater network functionality and higher application performance. It ensures maximum bandwidth to all connections while proactively avoiding the possibility of queuing delays and cell discard. ForeSight is the industry's first implementation of the new rate-based traffic management specification defined by the ATM forum, and the only such mechanism available for Frame Relay.

- FairShare—per-virtual-circuit queuing and rate scheduler

  FairShare is a patented per-virtual-circuit queuing and rate scheduler. It allocates bandwidth fairly among network users by providing a virtual "firewall" between connections and service classes. Unlike a shared buffer scheme, per-virtual-circuit queuing prevents one misbehaving connection from affecting the performance of others.

- Voice activity detection—ATM voice adaptation

  Voice activity detection (VAD) uses the latest digital signal processing techniques to distinguish between silence and speech on a voice connection. VAD only generates traffic (cells) onto the network during speech, and so typically achieves at least a 2:1 saving. This is possible because most voice conversations are 60 percent silence; we listen while the other person speaks, and we pause between sentences. Together, adaptive differential pulse code modulation (ADPCM) and VAD over ATM achieve up to 8:1 savings over uncompressed voice traffic.

- Repetitive Pattern Suppression (RPS)—circuit data compression

  RPS increases efficiency of data connections up to 128 Kbps. This algorithm effectively compresses data by up to 4:1 times by removing repetitive patterns such as "7E" flags sent by devices when they have no new traffic. Repetitive patterns are reproduced at the far end of RPS connections, so connected devices remain unaffected.

Voice Services

StrataCom IGX systems provide efficient, high-quality voice connectivity to digital PABX through standard interfaces. The IGX is the industry's first ATM switch with voice using both voice compression and silence suppression (VAD).

Voice Compression

ADPCM mathematically compresses voice signals for two- to four-fold savings over uncompressed voice traffic. When combined with VAD, up to 8:1 compression can be achieved. Echo cancellation is also integrated.

Standard Voice Switching

Voice switching between PBXs using standard common channel signaling protocols including Q.SIG and DPNSS can be achieved in conjunction with the INS integrated network call processing server. With this feature, each voice channel is dynamically routed on a per-call basis, and advanced PBX features such as transfer and camp-on are extended across the network, even if trunking is achieved through an ATM cloud. This provides better resource utilization and better voice quality than a typical tandem switched network.

Fax and Modem Services

IGX voice services transparently support facsimile and modem communications by disabling or stepping-down compression. As with voice transmission, this technique ensures efficient, high-quality transmission.

Voice Service Modules

Channelized voice modules (CVM) are available for the IGX with E1, T1, Y1, or ADPCM voice compression interfaces. Voice activity detection (VAD), which provides silence suppression, is standard on these interfaces. Optional call switching is also available.

Circuit Switched Data Services

Time-division multiplexing (TDM) transport service, flexible clocking, and circuit switched data service modules are features of circuit switched data services.

TDM Transport Service

IGX systems provide circuit switched data connectivity for legacy data transport through transparent, fixed delay, fixed throughput, zero discard point-to-point data connections over ATM. Speed options range from 1200 bps to 2.048 Mbps (asynchronous from 1.2 Kbps to 19.2 Kbps) using standard RS232, V.35, X.21, T1 and E1 interfaces. The IGX supports both dedicated port and channelized circuit emulation (from voice service circuit interfaces).

Flexible Clocking

StrataCom IGX includes options for external or internal clocking on a port-by-port basis. Also, the “software break-out box” feature allows the Electronics Industries Association (EIA) control leads on any data port of any node in the network to be viewed and manipulated in real time from the StrataView Plus network management console.

Circuit Switched Data Service Modules

The circuit switched data services include the following modules:

- LDM module
  - RS-232
  - Up to 19.2 Kbps per port
  - Up to 8 ports
  - Asynchronous/synchronous
- HDM module
  - V.35, X.21, V.36, RS-449, RS-422
  - Up to 1.344 Mbps per port
  - Up to 4 ports
  - Synchronous
- CVM module
  - Channelized data input
  - Up to 8 X DS0 per bundle, full T1/E1 with TDM transport license
  - DS0(A)

Frame Relay Services

Standards-compliant Frame Relay services from StrataCom IGX systems achieve high throughput, low delay, low discard, connectivity for LAN interconnect and legacy FRAD traffic. Port speed options range from 56 Kbps to 2.048 Mbps. Standard interfaces include V.35, X.21, channelized T1 and channelized E1, for up to 31 logical ports per physical port.

Fully Standards-compliant

All IGX Frame Relay port types conform to all aspects of the nonswitched Frame Relay services (PVC services) defined in ANSI T1 .606/.607/.617/.618 and CCITT I.122/Q.933 standards, and support a full implementation of the Local Management Interface (LMI) and enhancements incorporated in ANSI and ITU standards. Discard eligible (DE), forward explicit congestion notification (FECN), and backward explicit congestion notification (BECN) bit handling conforms with all standard definitions. ISDN access is supported in conjunction with the INS call processing server.

Fair, High Performance

All IGX Frame Relay port types support ForeSight traffic management and congestion avoidance algorithm and FairShare user firewalling with per-virtual-circuit queuing and rate scheduling for high performance and management of fairness among users.

Seamless Interworking

All IGX Frame Relay ports seamlessly interwork with IGX and BPX ATM ports. IGX is the industry's only platform that uses the traffic management technology specified by the ATM Forum to ensure true, seamless interworking. Interworking connections support ForeSight traffic management and congestion control and FairShare user firewalling.

Integrated FRAD Ports

IGX Frame Relay ports support an integrated FRAD or frame forwarding capability for efficient transport of SDLC-framed traffic over Frame Relay on all port types at speeds up to 2.048 Mbps. Like repetitive pattern suppression (RPS) for clear channel data, frame forwarding does not generate ATM cells into the network when no new frames are present. This saves otherwise wasted bandwidth resources.

Frame Relay Service Module

The Frame Relay Service module includes the following features:

- Up to 2 Mbps/card
- V.35, X.21, V.36, RS 449 X 4
- T1/E1 X 1
- Clear channel or channelized input

ATM Services

The StrataCom IGX ATM services include broadband connectivity, seamless interworking, and fair, high performance.

Connectivity

Standards-compliant ATM services from IGX systems support high-performance, CBR, VBR, and ABR connections with their associated classes of service. Standard interfaces include OC-3, T3/E3, and T1/E1.

Seamless Interworking

All IGX ATM ports seamlessly interwork with IGX, IPX, and AXIS Frame Relay ports. IGX is the industry's only platform that uses the traffic management technology specified by the ATM forum to ensure true, seamless interworking. Interworking connections support ForeSight traffic management and congestion control and FairShare user firewalling.

Fair, High Performance

All IGX ATM port types support traffic management features. FairShare user firewalling with per-virtual-circuit queuing and rate scheduling for high performance and management of fairness among users is also supported.

ATM Service Module

The ATM line module includes the following features:

- T3/E3
- Port (UNI 3.0)
- Trunk
- CBR, VBR, ABR

Trunk Resources

Trunk resources include ATM switching and transmission, and networking resource modules.

ATM Switching and Transmission

All IGX services are supported by standard ATM narrowband and broadband trunk resources. The IGX system supports a wide variety of networking options including multipoint logical trunking through public ATM services for seamless hybrid networking. IGX systems support trunk speeds from 128 Kbps to OC-3 and FastPAD access trunk connectivity from 9.6 Kbps to 2 Mbps. IGX systems can be fully interconnected in a logical mesh through public ATM services or provide edge switching in and out of such services. The IGX can network to FastPAD systems over public Frame Relay services at up to 2 Mbps. IGX systems also support the IPX FastPacket trunk protocol for seamless connectivity with IPXs at smaller sites.

Networking Resource Modules

The networking resource modules include the following features:

- Trunking Front module (NTM) for IPX connectivity
  - T1, E1, Y1 and subrate
  - Fractional
- Broadband ATM Trunk module (BTM)
  - E3, T3, T2, 6 Mbps
  - Fully CCITT ATM-compliant
  - Multipoint
  - ATM service compatible

- FastPAD Trunk module (FTM)
  - FastPAD connection
  - Up to 512 Kbps per FastPAD
  - Frame Relay service compatible
- Alarm Relay module (ARM)
  - T3/E3
  - Port (UNI 3.0)
  - Trunk
  - CBR, VBR, ABR

Enterprise Backbone Networking Solutions

Bandwidth-hungry LAN interconnect traffic is rapidly increasing as applications are becoming more distributed and complex. PCs are becoming more and more powerful. And LAN switching is bringing greater bandwidth to individual desktops. The wide area is increasingly the bottleneck in the enterprise environment. Legacy WAN systems such as TDMs and frame switches cannot provide the efficiency of throughput required over existing infrastructure to achieve the required performance improvement. The IGX can provide advantages over a switched router backbone.

Enterprise networks have, to date, been built with subrate, T1, and E1 circuits. With further international deregulation and the global shift toward fiber-optic transmission, particularly in metropolitan areas, the number of services available to build an enterprise infrastructure has increased dramatically. And again, the legacy systems such as TDMs and frame switches just don't have the throughput or interfaces to take advantage of dark fiber in the cities, or ATM services in the wide area.

The IGX is the ideal solution to improve efficiency over existing infrastructure and take advantage of new services; it provides the performance advantages of ATM together with the interfaces and complex networking software to mix and network existing traffic with emerging traffic. And IGX has the capacity to support all projected user requirements, which makes IGX a safe investment.

Seamless Hybrid Networking with IGX

The IGX ATM architecture, including multipoint ATM trunking, allows you to take advantage of attractively tariffed WAN services available from OC-3 speed leased lines to T1/E1 ATM services for a complete, seamless hybrid networking solution.

The product line of FastPAD, IPX, IGX, and BPX, along with INS and StrataSphere network management, provides a complete wide-area solution with growth capability for the foreseeable future and seamless interworking from low-speed access to a broadband OC-12 core.

A Future in the ATM World

ATM will gradually become widespread such that networks can be completely “logical,” with all nodes virtually connected to each other. With multipoint virtual trunking today, IGX guarantees your future in the ATM world.

Service Provider Solutions

ATM presents service providers with the opportunity to provision emerging services such as Frame Relay and low speed ATM, together with existing services such as X.25, SNA and Internetworking, over a common, more efficient infrastructure. IGX is the ideal solution for the service provider because it provides a mix of service interfaces and access interfaces for legacy service equipment and addresses the key issues of resource efficiency and multivendor service management. IGX delivers the same service attributes as the BPX combination, together with narrowband trunking capabilities. And IGX provides sufficient capacity for most service locations, passing off to the BPX combinations as throughput requirements grow to exceed 1.2 Gbps.

IGX and Frame Relay Services

Cisco is the largest global supplier of Frame Relay service equipment to service providers. The IGX is fully interoperable with the BPX systems used at larger sites and by medium and large carriers, and provides full Frame Relay to ATM service interoperability.

All Cisco-based Frame Relay services are differentiated from others by one key attribute: performance. Frame Relay services provide lower delay, higher throughput and lower discard rates than any alternatives, while allowing the service provider to oversubscribe provisioned bandwidth by a much higher ratio—the key advantage of frame switching over cell switching.

IGX and X.25 Services

Cisco brings significant performance improvements to many of the world’s X.25 networks today. This can be achieved with the IGX using the Frame Relay protocol trunk option available for many types of X.25 service switches. Logical full-mesh PVC connectivity between X.25 nodes using Frame Relay interconnectivity with ForeSight eliminates the store-and-forward transit packet delays, streamlines the internodal protocols, and allows provisioned trunk bandwidth to be operated at much higher utilization. Service providers have achieved 30 percent to 35 percent reduction in delay, 30 percent reduction in equipment costs, and a 30 percent reduction in provisioned bandwidth using this technique.

IGX and Legacy Value-Added Network Services

The performance and cost savings benefits of ATM can be achieved for legacy value-added network (VAN) services such as SNA and EDI using the frame forwarding and circuit-switched data capabilities of the IGX. Frame forwarding allows any SDLC-based data to be transported point-to-point with the same efficiency and ForeSight congestion avoidance as Frame Relay traffic. Circuit switched data channels can be compressed using RPS at connection speeds up to 128 Kbps for up to 8:1 savings.

IGX for the VAN

The small footprint, rack mount capability, remote diagnostics, and AC or DC power options of the IGX make it the ideal VAN service platform where many locations are actually rented from third parties and not constantly manned by VAN personnel. Homologated worldwide and support by StrataCom's direct or third-party maintenance partners, the IGX can quickly be deployed to virtually any national or global service location. And with multipoint ATM service trunking capabilities, the IGX allows VANs to take advantage of attractively tariffed ATM services as they emerge.

StrataSphere ATM Management

ATM systems present a whole new set of challenges to network management environments. ATM networks are faster, support an order of magnitude for more connections, and have access to more usage data than any previous types of systems. For the enterprise and VAN user, ATM networks can be expensive to operate if overprovisioned, and are complex to design as each connection's use of provisioned bandwidth is calculated taking utilization into account.

StrataSphere is the industry's first robust, scalable management environment for ATM systems. As such, it is designed to address the major issues surrounding network management, which must be addressed for ATM deployment:

- Cost allocation

  As the costs of higher speed wide-area networks increase with bandwidth, so there is greater demand within enterprises and VANs for cost justification and allocation to those users actually utilizing the bandwidth.

- Network administration

  ATM's more complex environment, greater number of connections, and wide variety of services make network administration a potentially impossible task.

- Resource planning

  ATM networks are complex to design, analyze, maintain, and plan for.

Scalability

Cost allocation, network administration, and resource planning issues all relate to the scalability requirement for ATM network management. Common to the product portfolio, StrataSphere is designed to scale from the few-node user to the multithousand-node carrier service network, and specifically addresses these key issues.

Management Architecture and Standards

StrataSphere revolves around a Telecommunications Management Network (TMN)-compatible structured architecture optimized for scalable ATM system management. First, a significant amount of intelligence is distributed to the elements themselves, allowing fast, distributed rerouting and real-time service quality management. Elements collect and archive granular historical statistics (not simple counters), and provide standard, open interfaces to information. Interface protocols extend beyond SNMP, which is too real-time intensive and has excessively high overhead, to TFTP, which is optimized for bulk data transfer, and can upload one million usage statistics per hour per management station. StrataSphere also supports Telnet for direct nodal access.

Element and network management functions are provided by the StrataView Plus system, which can manage all network elements seamlessly. StrataView Plus in turn provides open interfaces for other StrataSphere tools, and for higher level service management processes.

StrataSphere Tools

StrataSphere BILLder provides standard billing record generation for usage-based billing applications. Formats supported include Bellcore AMA. StrataSphere Modeler and Optimizer are sophisticated network modeling and analysis tools for ATM system design and incremental design. Modeler includes the capability to upload a live network configuration model from StrataView Plus, and Optimizer includes a documented, open API for integration with third-party design tools and tariff databases.

StrataView Plus: Resource Management and Control

StrataView Plus provides a new level of management capabilities for efficient, productive management of communications resources. The industry's first resource manager for ATM environments, StrataView Plus can manage all aspects of the smallest access networks and the largest multiband ATM networks. It collects extensive traffic statistics, provides open interfaces to this information, and continuously monitors network resource performance. For logistics management, it provides powerful remote viewing, diagnostic, control, and maintenance capabilities.

Open Management

Operating within the HP OpenView and IBM NetView multivendor management environments, StrataView Plus supports a suite of open interfaces for access to management information, including the following:

- Standard management integration protocols interfaces, including SNMP
- SQL access to the Informix relational traffic database
- X-terminal access for multiple operators into StrataView Plus management agents
- Craft interface for terminals and simple tools

ATM system management can be integrated within the multivendor environment using third-party applications in conjunction with the StrataView Plus application. Otherwise, integration management interfaces and software tools can achieve fault, configuration, performance, and security management through the open management interfaces.

Connection Management

Connection management is perhaps the most challenging issue in ATM system management; ATM systems support so many connections that it can become impossible to administer and manage them. The StrataSphere Connection Manager leverages StrataCom's extensive customer experience in ATM system management, and provides intuitive forms/menus-based connection configuration and management. For automated provisioning systems, the Connection Manager also supports an SNMP "Service Proxy" for integration.

Network Partitioning and Customer Network Management

StrataView Plus seamlessly integrates into third-party applications for logical network partitioning and/or customer network management. Several of the industry's popular virtual private network (VPN) platforms already support device libraries. Some logical partitioning is also possible through hyperscript-filtered database access using WINGZ.

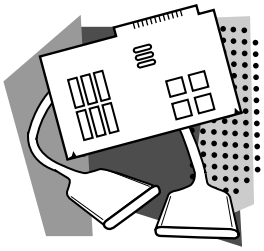
StrataCom IGX Specifications

Table 223 provides StrataCom IGX specifications.

Table 223 IGX Specifications

Characteristic	Description
Platforms	IGX 8 8-slot unit, rack mount or free-standing 1.2 Gbps cell switching bus CISPR B EMI certified IGX 16 16-slot unit, rack mount or free-standing 1.2 Gbps cell switching bus CISPR B EMI certified IGX 32 32-slot unit, rack mount or free-standing 1.2 Gbps cell switching bus CISPR B EMI certified
Power	Distributed 48V DC power conversion on modules 220/240 VAC AC-DC converter, 1:N redundant
Control processors	Network Processor Module (NPM) 68040 CPU System Clock module (SCM), internal or external clocking
Alarm modules	Alarm Relay module (ARM) 8 normally open contacts 6 normally closed contacts
Voice service modules	Channelized Voice and Data module (CVM) 32-, 24- and 16-Kbps ADPCM voice compression (ITU G.721, G.723 and G.726) Voice activity detection (VAD) Integrated FAX/high-speed modem detection and echo cancellation Supports T1, E1, Japanese TTC interfaces
Circuit switched data service modules	High-speed Data module (HDM) Up to 4 channels, each up to 1.344 Mbps Supports RS-232, V.35, RS-422, RS-449, X.21/V.36 interfaces Repetitive pattern suppression to 128 Kbps Low-Speed Data module (LDM) Up to 8 channels, totaling 8x19.2 Kbps Supports RS-232 interface Repetitive pattern suppression to 19.2 Kbps

Characteristic	Description
Frame Relay service modules	Frame Relay module (FRM) Up to four channels, totaling 2.048 Mbps Conforms with CCITT 1.122 (ANSI T1/S1) T1.606—Services description of Frame Relay bear service T1.606 addendum—Congestion management T1.617 (Annex D)—Signaling specification for Frame Relay T1.618—Core aspects of Frame Relay Includes fully standard handling of DE, FECN and BECN bits Supports V.35, RS 422, RS 449, X.21/V.36, and T1/E1 (channelized and nonchannelized) interfaces
Network trunking modules	Network Trunking front module (NTM) Trunk speeds from 128 Kbps to 2.048 Mbps Supports T1/E1, Japanese Y trunk interfaces Broadband ATM Trunk module (BTM) ITU 53-byte cell standard Supports T3/E3 and HSSI interfaces Multipoint logical trunking over ATM service FastPAD Trunk module (FTM) FastDLC, FrameClass, Frame Relay service compatible, protocol FastPAD trunk speeds from 9.6 Kbps to 512 Kbps Supports V.35, T1, E1, X.21 interfaces



Product Numbers

Table 224 lists the product numbers you can use to order StrataCom IGX products, accessories, and spares.

Table 224 IGX Product Numbers

Description	Product Numbers
IGX Products	
IGX 8, 8-slot, NPM, SCM	IGX8
IGX 8, standalone, NPM, SCM	IGX8-SA
IGX 16, 16-slot, NPM, SCM	IGX16
IGX 16, standalone, 16-slot, NPM, SCM	IGX16-SA
IGX 32, 32-slot, NPM, SCM	IGX32
IGX 32, standalone, 32-slot, NPM, SCM	IGX32-SA
IGX Processor Group	
Network Processor module—16-MB DRAM	IGX-NPM-16
Redundant Network Processor module—16-MB DRAM	IGX-NPM-16-R
Network Processor module—32-MB DRAM	IGX-NPM-32
Network Processor module—32-MB DRAM	IGX-NPM-32=
SCM with Ethernet and LEC back card	IGX-SCM
SCM with Ethernet and LEC back card	IGX-SCM=

Description	Product Numbers
IGX Alarm Relay Group	
Alarm Relay module	IGX-ARM
Alarm relay interface back bard	BC-512011
IGX Trunk Groups	
Network Trunk module for the IGX 8	IGX8-NTM
Network Trunk module	IGX-NTM
Back card/T1 (BC-T1)	BC-6271A
Back card/subrate (BC-SR)	BC-6083A-SR
Back card/E1 (BC-E1)	BC-6171A-E1
Back card/Y1 (BC-Y1)	BC-550150-Y1
Broadband Trunk module	IGX-BTM/B
T3 Back card for Broadband Trunk module	BC-571110A-T3
E3 Back card for Broadband Trunk module	BC-571210A-E3
IGX Port Groups	
High-speed synchronous data module	IGX-HDM
HDM back card/RS232D (SDI-RS232D)	BC-5084B-RS232
HDM back card/V.35 (SDI-V.35)	BC-5082A-V35
HDM back card /RS449 (SDI-RS449)	BC-5083A-RS449
Low-Speed Data module	IGX-LDM
LDM back card/4-port/RS232C (LDI4)	BC-5286A-RS232
LDM back card/8-port/RS232C (LDI8)	BC-5287A-RS232
LDM back card/4-port/DDS (LDI4/DDS)	BC-5288A-DDS
Channelized Voice module ADPCM for the IGX 8	IGX8-CVM
CVM ADPCM with integrated T1 echo canceler for the IGX 8	IGX8-CVM-T1EC
CVM ADPCM with integrated E1 echo canceler for the IGX 8	IGX8-CVM-E1EC
Channelized Voice module ADPCM for the IGX 16 and IGX 32	IGX-CVM
CVM ADPCM with integrated T1 echo canceler for the IGX 16 and IGX 32	IGX-CVM-T1EC
CVM ADPCM with integrated E1 echo canceler for the IGX 16 and IGX 32	IGX-CVM-E1EC
Back card/E1 (BC-E1)	BC-6171A
Back card/T1 (BC-T1)	BC-6271A-T1
Back card J1 (BC-J1)	BC-550100-J1
Frame Relay module for the IGX 8	IGX8-FRM
Frame Relay module—6 channels for the IGX 8	IGX8-FRM-6
Frame Relay module—31 channels for the IGX 8	IGX8-FRM-31
Frame Relay module for the IGX 16 and IGX 32	IGX-FRM
Frame Relay module—6 channels for the IGX 16 and IGX 32	IGX-FRM-6
Frame Relay module—31 channels for the IGX 16 and IGX 32	IGX-FRM-31
Frame Relay module for use with port concentrator shelf	IGX-FRM-2

Description	Product Numbers
Frame Relay interface (FRI-V.35)	BC-6251B-V35
Frame Relay interface (FRI-T1)	BC-6252A-T1
Frame Relay interface (FRI -E1)	BC-6253A-E1
Frame Relay interface (FRI-X.21)	BC-6254A-X21
Frame Relay interface X.21 back card for FRM-2 and PCS	BC-6355A-X21
IGX Port Concentrator Shelf	
110V, 44-port PCS unit with V.28 interfaces	PCS-NA-S-V28
110V, 44-port PCS unit with V.11 interfaces	PCS-NA-S-V11
110V, 44-port PCS unit with V.35 interfaces	PCS-NA-S-V35
220V, 44-port PCS unit with V.28 interfaces	PCS-INTL-S-V28
220V, 44-port PCS unit with V.11 interfaces	PCS-INTL-S-V11
220V, 44-port PCS unit with V.35 interfaces	PCS-INTL-S-V35
240V, 44-port PCS unit with V.28 interfaces	PCS-UK-S-V28
240V, 44-port PCS unit with V.11 interfaces	PCS-UK-S-V11
240V, 44-port PCS unit with V.35 interfaces	PCS-UK-S-V35
PCS shelf only with 110 VAC power supply	PCS-NA
PCS shelf only with 220 VAC power supply	PCS-INTL
PCS shelf only with 240 VAC power supply	PCS-UK
PCS module with 1 V.11 and 11 V.28 interfaces	PCS-V28
PCS module with 12, V.11 interfaces	PCS-V11
PCS module with 1, V.11 and 11 V.35 interfaces	PCS-V35
RS232M25—RS232M25	CABLE-V28
RS232M25—X.21/V.11 DB15/M	CABLE-V11
RS232M25—V.35/M34	CABLE-V35
RS232M25—V.35/M34	CABLE-SPV35
RS232M25—RS422/M37	CABLE-X21DTE
RS232M25—RS422/M37	CABLE-X21DCE
IGX Power Cords	
IGX 8 power cord, North America, 8 ft. 125V/15A	CAB-217994
IGX 16/32 power cord with CEI 23 16/V11 plug	CAB-590071
IGX 16/32 power cord with CEE 7/7 plug	CAB-590072
IGX 16/32 power cord with AS 3112 plug	CAB-590073
IGX 16/32 power cord with BS 1363 plug	CAB-590074
IGX 16/32 power cord with NEMA L6-20 twistlock plug	CAB-590076
IGX Spares and Accessories	
400W power supply module for the IGX 8	IGX8-PS-AC
Single AC Input power option rack	IGX8-AC1
Dual AC Input power option rack	IGX8-AC2

Description	Product Numbers
Single AC 875W power supply; single AC input (nonredundant)	IGX16-AC1-1
Dual AC 875W power supply; single AC input (redundant)	IGX16-AC2-1
Dual AC 875W power supply; dual AC input (redundant)	IGX16-AC2-2
Dual AC 875W power supply; single AC input (nonredundant)	IGX32-AC2-1
Quad AC 875W power supply; dual AC input (redundant)	IGX32-AC4-2
Additional 875W AC power supply for the IGX 16 or IGX 32	IGX-PS-AC
DC power option nonredundant for the IGX 8	IGX8-DC-1
DC power option redundant for the IGX 8	IGX8-DC-2
Power entry module - DC for the IGX 16 and IGX 32	IGX-PEM
IGX 8 cooling unit and fan tray	IGX8-COOL=
IGX 16 or IGX 32 upper cooling unit	IGX-UCOOL=
IGX 16 or IGX 32 lower cooling unit	IGX-LCOOL=
Includes the three required power supply cables for 1 or 2 shelves	IGX-CABSET=
Exhaust Plenum for the IGX 16 or IGX 32	IGX-PLENUM=
PEM back card—DC for the IGX 16 or IGX 32	IGX-PEMBC=
SCM/NPM local (utility) bus	IGX-BUS=
IGX Software Licenses	
System software license 7277 for IGX 16, and 32	IGX-SW-7277
System software license 7281 for IGX 16, and 32	IGX-SW-7281
System software license 812 for IGX 8	IGX8-SW-812
IGX Feature Licenses	
Frame Relay ForeSight software license per T1/E1	IGX-FS-1
RPS software license for IGX 8	IGX8-LIC-RPS
RPS software license for IGX 16 and 32	IGX-LIC-RPS
Priority bumping software license for IGX 8,16 and 32	IGX-LIC-PBS
Configuration save and restore software license	IGX-LIC-CSR
Multiuser configuration sessions	IGX-LIC-MUC