

Multi-service Access Concentrators



AAC-3



CellSMART



AAC-2

AAC[™] Multi-service Access Concentrators

cost-effectively connect voice, video and data traffic to private Wide Area Networks and public ATM and Frame Relay services worldwide. Supporting multiple protocols, physical interfaces and a wide range of bandwidth requirements, AAC and CellSMART[®] products allow organizations and service providers to consolidate hybrid facilities for reduced costs and more efficient management of broadband networks.

Features

- Scalable architecture provides flexibility as network requirements change
- Multi-service access in a single device reduces recurring monthly access costs
- Large variety of available interfaces supply serial ports, Frame Relay and T1/E1, NxT1/E1 IMA, T3/E3, and OC-3/STM-1 to deliver specific services for customer applications
- Standards compliance with ATM Forum, Telcordia, NEBS Level 3, ITU-T and Frame Relay Forum ensures multi-vendor interoperability
- SNMP and Telnet allow management from local and remote sites
- Comprehensive ATM WAN service management for monitoring ATM services

AAC-3®, AAC-2™, and CellSMART®

Description

The AAC family offers a flexible, modular architecture, allowing you to choose the most cost-effective service for each application and manage everything from a single platform. Each AAC contains slots for Protocol Modules (PM) that determine the traffic type—ATM, Frame Relay or Ethernet—and Physical Layer Modules (PLM) that determine the physical interface. The broad array of available Protocol and Physical Layer Modules meets the needs of a variety of customers, including enterprise, service provider, government and military.

The AAC family comprises three models to deliver a full range of access options at a variety of price points.

- ▶ The **AAC-3** offers the highest levels of connectivity and scalability, supporting speeds ranging from T1/E1 to OC-3c/STM-1. Its modular chassis supports up to seven PM/PLM pairs, making it an ideal hubbing device for enterprise networks or a port fan-out device for service distribution.

- ▶ The **AAC-2** provides economical integration of services over public and private networks at speeds ranging from T1/E1 to OC-3c/STM-1. Its smaller chassis supports up to three PM/PLM pairs, making it suitable for mid-sized locations that need to connect voice, video and data traffic to the WAN.

- ▶ The **CellSMART 200** IMA series is ideal for medium- to high-speed data applications that require NxT1/E1 access using Inverse Multiplexing for ATM (IMA). A variety of models are available with V.35, HSSI, Ethernet, T3/E3 or OC-3c/STM-1 user ports.

The high port density and modular architecture lets each network grow and upgrade at a minimal cost. As service or application needs change, customers just add or switch modules while maintaining a common chassis and management interface. For instance, using an Octal IMA Physical Layer Module, you can steadily add T1/E1 circuits as your bandwidth needs increase. When eight T1 or E1 lines become insufficient, you can switch to a T3/E3 Physical Layer Module. You do not need to replace the Protocol Module, because it can now be paired with the new T3/E3 Physical Layer Module.

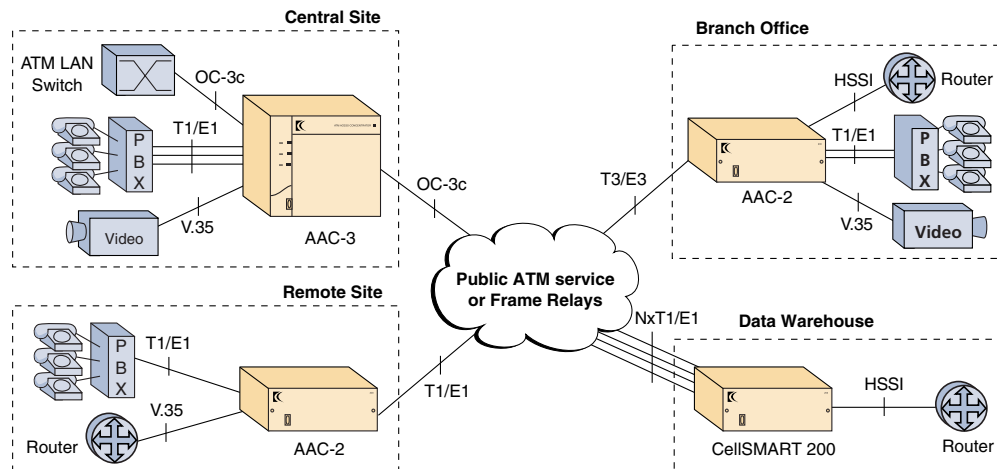


Figure 1: The AAC family of multi-service access concentrators connects central, branch and remote locations via public ATM or Frame Relay services.

AAC-3®, AAC-2™ and CellSMART®

Applications

The wide array of Physical Layer Modules and Protocol Modules supports old and new applications alike. On the user side, legacy interfaces such as V.35/EIA-530 Packet and T1/E1 CBR protect your investment in existing routers, codecs, LAN switches and PBXs. Interfaces such as HSSI, T3/E3 and OC-3c/STM-1 ensure support for newer bandwidth-intensive applications.

On the network side, AACs connect to WANs at speeds ranging from T1/E1 to OC-3c/STM-1. And to fill the gap between T1/E1 and T3/E3, ATM Forum-compliant Inverse Multiplexing for ATM (IMA) is available. The IMA module aggregates up to eight T1 or E1 lines into a single, logical link operating at up to 16 Mbps. The module uses a round-robin algorithm to divide traffic evenly across multiple links. Furthermore, if one or more links fails, the traffic is automatically redistributed among the remaining links, providing redundancy in the network.

The AAC family also offers numerous options for each protocol. For ATM UNI, both the Cell Protocol Module (PM) and the Enhanced Shaping Cell PM are available. The Cell PM is optimized for full throughput on high-speed private networks and local router or switch interfaces. The Enhanced

Shaping Cell PM is designed for use with public ATM services, shaping each connection to ensure the traffic complies with carrier service level agreements.

Multiple PMs are available for Frame Relay services, ATM DXI, PPP and HDLC packet traffic. The Quad Packet and Quad Packet/CBR PMs support packet traffic over T1/E1 and low-speed V.35. The Packet PM supports packet traffic over T3/E3, HSSI, and high-speed V.35. All PMs support Frame Relay Link Management and Frame Relay-to-ATM Service Interworking (FRF.8) and Network Interworking (FRF.5).

For circuit emulation, there are four or eight ports of structured or unstructured data transfer options. The Quad Packet/CBR PM supports up to four ports of unstructured circuit emulation on T1/E1 or V.35. The Octal CES PM supports up to eight ports of structured or unstructured T1/E1, up to four ports of unstructured V.35 or one port of unstructured T3/E3 or HSSI. The Octal CES PM also supports an Adaptive Timing option.

The Ethernet PM and PLM pair supports RFC 1483/AAL5 bridging with the Spanning Tree Protocol. The modules are designed for full-speed, point-to-point Ethernet connections over ATM.

Physical Layer Modules Protocol Modules	Cell PM	Quad Cell PM	Enhanced Shaping Cell PM	Octal CES PM	Packet PM	Quad Packet PM	Quad Packet/CBR PM	Quad Ethernet PM
	(10200)	(10202)	(10204)	(10207)	(10201)	(10205)	(10203)	(10206)
DS3 PLM (10300)	•		•	•	•			
HSSI PLM (10301)				•	•			
Quad DSX-1 PLM (10302)		•				•	•	
Tri V.35/530 & DSX PLM (10303)						•	•	
OC-3c/STM1 MM PLM (10304)	•		•					
OC-3c/STM1 SM PLM (10305)	•		•					
E3 PLM (10306)	•		•	•	•			
Quad E1 PLM (10307)		•				•	•	
Tri V.35/530 & E1 PLM (10308)						•	•	
Quad V.35/530 PLM (10309)				•	•	•	•	
J2 PLM (10310)	•		•					
Quad Ethernet PLM (10311)								•
Octal DSX-1 PLM (10314)				•				
Octal E1 PLM (10315)				•				
Octal DS1 PLM (10317)				•				
Octal DS1 IMA PLM (10318)	•		•					
Octal E1 IMA PLM (10319)	•		•					

Figure 2: AAC PM/PLM compatibility matrix.

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	OC-3/STM-1 SM or MM	T3/E3	J2	IMA T1/E1	T1/E1	V.35, X.21 EIA-530	HSSI	Ethernet
ATM UNI	•	•	•	•	•			
ATM DXI		•			•	•	•	
Frame Relay		•			•	•	•	
HDLC or PPP		•			•	•	•	
SMDS DXI		•			•	•	•	
SMDS SNI		•			•			
Ethernet								•
CBR (CES)		•			•	•	•	

Figure 3: The AAC family supports numerous user and network interfaces.

Element Management

The AAC family supports local and remote access via in-band or out-of-band connections. All products include an embedded SNMP agent and standard and enterprise MIBs, compatible with SNMP-based management systems. You can also Telnet to the devices via the Ethernet port on the Integrated System Controller or an in-band ATM/Frame Relay connection. The native user interface is menu driven, making port and connection configuration quick and easy.

Traffic Management

You can maximize the utilization of expensive wide-area bandwidth with AAC traffic management features. The Enhanced Shaping Cell Protocol Module performs traffic shaping on a per-VC and per-VP basis, ensuring that traffic meets the rates contracted with your carrier. This prevents cell discard and retransmissions, improving the overall use of available bandwidth. Connections exit the module through a weighted-fair queuing (WFQ) mechanism that ensures each connection gets scheduled bandwidth, even in the presence of congestion. The system uses early-packet discard (EPD) to reduce congestion quickly and to maximize network utilization.

Other AAC modules increase bandwidth utilization by reallocating idle CBR bandwidth. The Octal CES module monitors the CAS voice on/off hook status and V.35/CBR handshake signals. When a

connection goes idle, the system can terminate the cell stream so that the bandwidth can be used by other VBR connections.

Performance Monitoring

AAC systems collect extensive statistics, including port and cell utilization, cell and packet discard, and physical line errors. You can view the information in table or graphical form. With this information you can monitor network performance, anticipate growth in bandwidth requirements and troubleshoot problems in both the local and wide area networks. The products also support a full range of loopbacks including line, local, and payload. In OC-3/STM-1 networks, you can insert BIP and AIS errors to test sections of that link.

Standards Compliance

AAC products comply with the relevant standards of the ATM Forum, ITU-T, Bellcore/Telcordia, the Frame Relay Forum, and the SMDS Interest Group. This alleviates compatibility issues in multi-vendor networks and reduces the risks associated with proprietary solutions.

ATM Forum specification compliance includes ATM UNI 3.0 and 3.1; Traffic Management 4.0 with support for CBR, rt-VBR, nrt-VBR and UBR QoS categories; Circuit Emulation Services 2.0 with support for structured or unstructured CES; and Inverse Multiplexing for ATM (IMA) 1.1/1.0

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AAC Service Data Module (SDM) Supports ATM Managed Services

The Service Data Module for the AAC acts as a Visual Networks[®] Analysis Service Element (ASE). Specifically designed to support NxT1/E1 IMA or DS3/E3 ATM networks, it monitors user-specified ATM ports and circuits, and communicates service performance data and events to Visual UpTime[®].

Kentrox and Visual Networks enable service providers to introduce WAN Performance Management Services based on industry-proven hardware and software solutions. Service providers can offer customers a variety of new managed service options and a higher degree of flexibility for hybrid ATM/Frame Relay networks.

- Monitors up to 512 VCs
- Monitors ATM traffic on user-specified ports and VCs, up to a maximum aggregate rate equivalent to a bi-directional DS3
- Provides data for Visual UpTime Event Processor, Troubleshooting, and Planning and Reporting tool sets
- Provides valuable bandwidth utilization details with protocol analysis and top host statistics
- Sends SNMP traps regarding AAC events to Visual UpTime

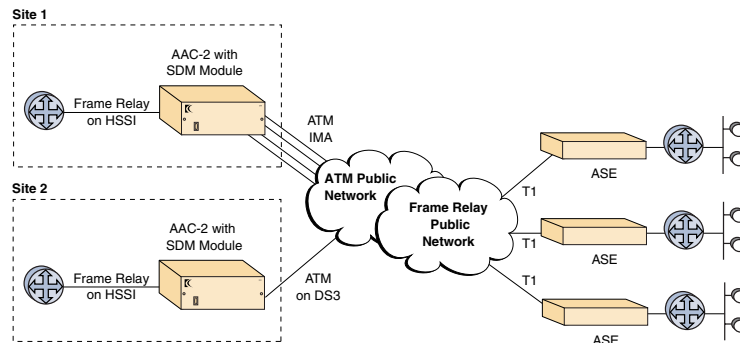


Figure 4: AAC acting as an ASE for Visual UpTime.

SLA Monitoring

The Service Data Module for the AAC can be configured to supply Frame Relay Service Level Agreement (SLA) measurements to Kentrox ServicePoint[™] and FrameVision[™] devices in ATM and Frame Relay mixed networks. The AAC responds to Frame PING messages (FPING) sent by ServicePoint and FrameVision devices delivering the following:

- Round-trip Delay
- End-to-end Delay
- Frame Delivery Ratio
- Data Delivery Ratio
- Frames Dropped, Received and Transmitted

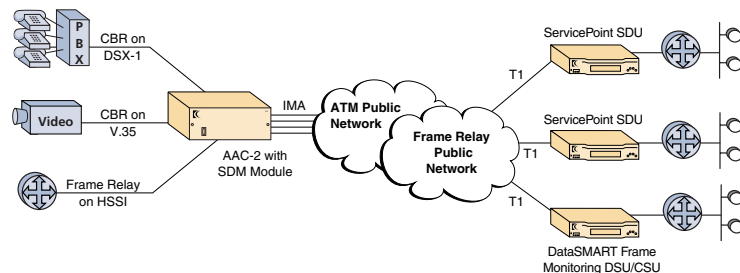


Figure 5: Providing SLA data by responding to FPING messages.

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Specifications

AAC-3 CHASSIS

Dimensions (H x W x D): 13.95" x 17.32" x 19" (354.3 x 440 x 482.6 mm)

Weight: 60 lbs. (27 kg)

Mounting: Available for 19-inch or 23-inch standard equipment racks

Operating Temperature: 32° F to 104° F, ambient (0° C to 40° C)

Operating Humidity: 5% to 95%, non-condensing

AAC-2 AND CELLSMART 200 CHASSIS

Dimensions (H x W x D): 6.95" x 17.32" x 19" (176.5 x 440 x 482.6 mm)

Weight: 29 lbs. (13.2 kg)

Mounting: Available for 19-inch or 23-inch standard equipment racks

Operating Temperature: 32° F to 104° F, ambient (0° C to 40° C)

Operating Humidity: 5% to 95%, non-condensing

EMI/ESD/SAFETY

EMI: FCC Part 68, FCC Part 15, Class A, EN55022 Class B

Immunity: EN55024

Safety: UL1950, EN60950, CSA 22.2 No 950 - M95

NEBS: Level 3 certified

SWITCHING BACKPLANE

Cell bus: Dynamic time-allocated, output buffered per port or connection

Maximum system throughput: 524 Mbps (1,168,000 cells/second)

Connections: 8192 VCCs, 512 VPCs, 512 Multicast

POWER SYSTEM

AAC-3: Dual redundant power system. Modular power supplies, field replaceable with unit powered. Monitored with alarms/traps on failure. Forced-air cooled. Supports mixed use of AC/DC power modules.

AAC-2 and CellSMART 200: Single power system. Modular power supply. Monitored with alarms/traps on failure. Forced-air cooled. Supports use of AC/DC power modules.

AC power supply modules: 120/240 VAC (85 to 264 volts), 50/60Hz +/- 3Hz

DC power supply modules: -48 VDC (42 to 60 VDC)

MANAGEMENT ACCESS

Control port: VT100 via RS232 port on front panel (Additional RS232 port on the Integrated System Controller)

Ethernet port: SNMP or Telnet

In-band: SNMP or Telnet

Telnet sessions: Up to 4 concurrently with the Integrated System Controller

Common Modules

INTEGRATED SYSTEM CONTROLLER (ISC)

Clock sources: Internal reference oscillator or recovered from user-specified physical port

Clock fallback: User-selectable primary and secondary clock source with automatic fallback and recovery

Internal reference: Oscillator Stratum 4 or better

Power loss protection: Loss of all input line power will not affect the configuration settings; performance data will be maintained for 12 hours upon loss of power

Alarm: Critical, Major, and Minor alarm indicators are viewable from the rear

Contact closure for audible and visual alarms

ACO (Automatic Cut Off) button disables audible alarms

Configuration backup: Pluggable Type II compact flash

Management access: Ethernet port and DTE asynchronous port for dial-up modem (in addition to front panel port)

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Common Modules (continued)

ALARM MODULE

Indicators: Critical, Major and Minor alarm indicators are viewable from the front

Alarm: ACO (Automatic Cut Off) button disables audible alarms

Configuration backup: Flash

SERVICE DATA MODULE (SDM)

System indicators: Critical, Major and Minor

SDM Indicators: SDM status and monitored traffic

Alarm: ACO (Automatic Cut Off) button disables audible alarms and ACO indicator

Configuration backup: 1 Mbyte non-volatile configuration on memory controlled by ISC module

Traffic monitoring: Monitors up to 512 VCs.

Maximum monitoring throughput: Monitors VCs with a maximum aggregate rate equivalent to bi-directional DS3 with 200-byte packets. Traffic greater than bi-directional DS3 is subject to discard.

Select Protocol Modules

See the PM/PLM compatibility matrix on page 3 for available Protocol and Physical Layer Module combinations

CELL PROTOCOL MODULE

Protocols supported: ATM UNI, SMDS SNI

Connections: 256 VPCs, 4096 VCCs or combinations thereof up to 4096 total connections

QoS categories: CBR, nrt-VBR and rt-VBR

Output queuing: Separate CBR and VBR output queues with traffic and congestion management capability.

Total queue depth: 4700 cells

Maximum burst size: 32, 105, 210 or maximum cells

Cell emission scheduling: Per port for VBR traffic only or aggregate (CBR and VBR) traffic

Congestion management: Early packet discard (EPD) and 4 VBR priorities, CBR not subject to congestion, Partial Packet Discard (PPD)

ENHANCED SHAPING CELL PROTOCOL MODULE

Protocols supported: ATM UNI

Connections: 256 VPCs, 1023 VCCs or combinations of up to 1023 total connections, 94 VPLs

QoS categories: CBR, rt-VBR, nrt-VBR, UBR+, UBR

Output queuing: Total queue depth 128K cells, allocated between VCCs and VPCs

Cell emission scheduling: Per VC for all connections, nrt-VBR, UBR+ and UBR scheduled via a weighted-fair queuing (WFQ) mechanism

Congestion management: Partial and early packet discard (EPD) implemented per VC

QUAD CELL PROTOCOL MODULE

Protocols supported: ATM UNI, SMDS SNI

Connections: 256 VPCs, or 1024 VCCs or combinations of up to 1024 total connections

QoS categories: CBR, nrt-VBR and rt-VBR

Output queuing: Separate CBR & VBR output queues, with traffic and congestion management capabilities

Congestion management: Early packet discard (EPD) and 4 VBR priorities, CBR not subject to congestion, Partial Packet Discard (PPD)

PACKET PROTOCOL MODULE/QUAD PACKET PROTOCOL MODULE

Protocols supported: Frame Relay, ATM DXI, HDLC, PPP, SMDS DXI

Frame Relay connections:

Packet PM: 2048 VCCs (AAL5) or DLCIs

Quad Packet PM: 512 VCCs (AAL5) or DLCIs per port

Services supported: FRF.5, FRF.8 (1490 to 1483 translation) and FRLM

Congestion management: Partial and early packet discard (EPD) and 4 VBR priorities

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Select Protocol Modules (continued)

OCTAL CES PROTOCOL MODULE

Protocols supported: Structured or unstructured circuit emulation over AAL1
Dynamic bandwidth allocation based on CAS signaling, idle code detection, or V.35 control signals
Connections: 32 unicast or multicast per port, 256 per module
Output queuing: User-selectable depth of CDV absorption queue to 1 ms
Clocking: Synchronous or asynchronous (Adaptive)
Logical bundles: 1 DS0 to 24 DS0s (T1) or 31 DS0s (E1)

QUAD ETHERNET PROTOCOL MODULE

Bridging performance:
Filtering and forwarding rate: 14,880 pps each direction, each port, half-duplex
Address table: 4096 addresses per module (1024 static entries per AAC system)
Spanning Tree protocol: Per IEEE 802.1 D
LLC Encapsulation: Using AAL 5 per RFC 1483

Select Physical Layer Modules

See the PM/PLM compatibility matrix on page 3 for available Protocol and Physical Layer Module combinations

OCTAL IMA DS1 AND E1 PHYSICAL LAYER MODULES

Interface connector: RJ48C
Line rate: T1 - 1.544 Mbps per port
E1 - 2.048 Mbps per port
IMA rate: T1 - 1.536 to 12.288 Mbps
E1 - 1.984 to 15.872 Mbps
Differential delay: Up to 200 ms
ACP sync cells: User selectable at 32, 64, 128 or 256 cells
Link adjustment: Automatic adjustment on link failure or recovery

OCTAL DS1, DSX-1 AND E1 PHYSICAL LAYER MODULES

Interface connector: RJ48C
Line rate: DS1 (includes CSU) - 1.544 Mbps per port
DSX-1 - 1.544 Mbps per port
E1 - 2.048 Mbps per port
Channelization: NxDS0 up to full line rate

QUAD DSX-1/E1 PHYSICAL LAYER MODULE

Interface connector: DA15
Line rate: DSX-1 - 1.544 Mbps per port; E1 - 2.048 Mbps per port
Fractionalization: NxDS0 up to full line rate

QUAD V.35/EIA-530 PHYSICAL LAYER MODULE

Interface connector: DB25
Electrical: V.35, RS449, EIA-530, X.21
Line speed: 64 Kbps to 2.048 Mbps on each of four ports or up to 8.192 Mbps on one port

HSSI PHYSICAL LAYER MODULE

Interface connector: TIA/EIA-613 standard 50 position
Line speed: 1 Mbps to 52 Mbps

Continued on next page

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Select Physical Layer Modules (continued)

DS3 AND E3 PHYSICAL LAYER MODULES

Interface connector: 75 ohm coaxial BNC

Line rate: DS3 - 44.736 Mbps

E3 - 34.386 Mbps

OC-3C/STM1 SINGLE AND MULTI-MODE PHYSICAL LAYER MODULES

Interface connector: Duplex SC

Line speed: 155.52 Mbps

Wavelength: 1310 nm (single-mode or multi-mode)

QUAD ETHERNET PHYSICAL LAYER MODULE

Data rates: 10 Mbps (per port) half duplex

Number of ports: 4

Interface connectors: RJ4

Ordering Information

Description	Catalog Number
Chassis and Power Supplies	
AAC-3 Eight Slot Chassis	10000
AAC-3 DC Power Supply	10101
AAC-3 AC 120 Volt Power Supply	10100
AAC-3 AC 240 Volt Power Supply	10102
AAC-3 AC 120/240 Volt Power Supply	10103
AAC-2 Four Slot Chassis	10001
AAC-2 DC Power Supply	10111
AAC-2 AC 120 Volt Power Supply	10110
AAC-2 AC 240 Volt Power Supply	10112
AAC-2 AC 120/240 Volt Power Supply	10113
Common Modules	
AAC Alarm Module	10011
AAC Service Data Module (SDM)	10013
AAC Integrated System Controller with 3.2.0 software	10022-320
Protocol Modules	
AAC Cell Protocol Module	10200
AAC Packet Protocol Module	10201
AAC Quad Cell Protocol Module	10202
AAC Quad Packet / CBR Protocol Module	10203
AAC Enhanced Shaping Cell Protocol Module	10204
AAC Quad Packet Protocol Module	10205
AAC Quad Ethernet Protocol Module	10206
AAC Octal CES/CBR Protocol Module	10207

AAC-3[®], AAC-2[™], and CellSMART[®]

Ordering Information

Description	Catalog Number
Physical Layer Modules	
AAC DS3 Physical Layer Module	10300
AAC HSSI Physical Layer Module	10301
AAC Quad DSX-1 Physical Layer Module	10302
AAC Tri V.35/EIA-530/X.21 and one DSX-1 Physical Layer Module	10303
AAC OC-3c/STM1 MM Fiber Physical Layer Module	10304
AAC OC-3c/STM1 SM Fiber Physical Layer Module	10305
AAC E3 Physical Layer Module	10306
AAC Quad E1 Physical Layer Module	10307
AAC Tri V.35/EIA-530/X.21 and one E1 Physical Layer Module	10308
AAC Quad V.35/EIA-530/X.21 Physical Layer Module	10309
AAC J2 Physical Layer Module	10310
AAC Quad 10Base-T Ethernet Physical Layer Module	10311
AAC Octal (8-port) DSX-1 Physical Layer Module	10314
AAC Octal (8-port) E1 Physical Layer Module	10315
AAC Octal (8-port) DS1 (CSU) Physical Layer Module	10317
AAC Octal (8-port) IMA DS1 Physical Layer Module, FW 2.0.0	10318-200
AAC Octal (8-port) IMA E1 Physical Layer Module, FW 2.0.0	10319-200
CellSMART 200 ATM IMA Systems	
CellSMART 201t, ISC DS1 Octal IMA to HSSI, 120V AC	20001-310
CellSMART 201e, ISC E1 Octal IMA to HSSI, 240V AC	20002-310
CellSMART 202t, ISC DS1 Octal IMA to V.35,(6 Mbps), 120V AC	20003-310
CellSMART 202e, ISC E1 Octal IMA to V.35 (8 Mbps), 240V AC	20004-310
CellSMART 203t, ISC DS1 Octal IMA to 10Base-t, 120V AC	20005-310
CellSMART 203e, ISC E1 Octal IMA to 10Base-t, 240V AC	20006-310
CellSMART 204t, ISC DS1 Octal IMA to OC-3c/STM-1, 120V AC	20007-310
CellSMART 204e, ISC E1 Octal IMA to OC-3c/STM-1, 240V AC	20008-310
CellSMART 205t, ISC DS1 Octal IMA to DS-3, 120V AC	20009-310
CellSMART 205e, ISC E1 Octal IMA to E3, 240V AC	20010-310

AAC-3®, AAC-2™ and CellSMART®

Ordering Information

Description	Catalog Number
Accessories	
AAC-3 Fan Tray Assembly (Spare)	10080
AAC-3 23" Rack Mount Brackets	10081001
AAC-2 23" Rack Mount Brackets	10081010
AAC Blank Panel, 1 Slot (Spare)	10082
AAC-3 Blank Panel, Power Supply (Spare)	10084
AAC-3 Cable Management Bar	10087
AAC-2 Enhanced NEBS Baffle Kit	10088
AAC Manual Set, CD (Spare)	10090-310
AAC/CellSMART Planning Guide, printed	5000548
AAC/CellSMART Installation Guide, printed (spare)	5000549
AAC/CellSMART User's Guide, printed	5000550
Memory Cards with Software	
AAC ISC Back-up Software Compact Flash Type 2	10038-320
AAC Octal IMA Firmware 2.0.0 Compact Flash Type 2	10036-200
Power Cords	
North America, Korea, Taiwan	90000
European Community	90001
United Kingdom	90002
Italy	90003
Australia	90004
Japan	90005

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