

Multiport T1/E1 ATM Port Adapters with Inverse Multiplexing over ATM for the Cisco 7200 and 7500 Series Routers

INVERSE MULTIPLEXING OVER ATM (IMA) PORT ADAPTERS FOR THE CISCO 7200 AND 7500 SERIES ROUTERS OFFER A COST-EFFECTIVE SOLUTION TO INCREASE BANDWIDTH AND EXTEND MULTISERVICE CAPABILITIES TO REGIONAL OFFICES AND LARGE BRANCHES WITH ATM. BY AGGREGATING T1 OR E1 COMMUNICATIONS LINKS USING STANDARDS-BASED IMA, SERVICE PROVIDERS AND ENTERPRISE CUSTOMERS CAN NOW TAKE ADVANTAGE OF GREATER BANDWIDTH FLEXIBILITY AS WELL AS THE ADVANCED QUALITY-OF-SERVICE (QoS) FEATURES AVAILABLE WITH AN ATM WAN INFRASTRUCTURE.

IMA is an ATM Forum specification that provides a cost-effective and scalable alternative to T3/E3 services by offering service providers and enterprise customers the ability to leverage widely available T1 services over ATM, and interoperate with other vendors' standards-based equipment. Multiport T1/E1 IMA can provide organizations with highly desired fractional T3/E3 bandwidth connectivity so critical in situations where DS3 or OC-3 fiber communications links are either cost prohibitive or unavailable.

Enterprise customers can take advantage of IMA bandwidth flexibility on the Cisco 7200 series routers to provide an affordable LAN-to-WAN connectivity solution in the regional office or large branch office, and wherever they deploy ATM edge applications. The greater overall bandwidth, and the incremental nature in which bandwidth capacity can be added as needed, support the rapidly growing multiservice needs of today's enterprise.

Service providers can deliver critical integrated ATM services combining voice, video, and data with ATM QoS features. With multiport IMA deployed as customer premises

equipment (CPE) edge equipment, network service providers can deliver unmatched flexibility and a wide range of services to their customers.

Features at a Glance

- Supported on all Cisco 7200 and 7500 platforms
- Supported on Cisco 7500 Versatile Interface Processors (VIPs) 2–40, 2–50, and higher
- Supports eight T1/E1 ATM User-Network Interface (UNI) ports
- Supports up to four active IMA groups
- IMA mix mode supported, (UNI ports +IMA groups on single port adapter)
- Supports ATM Forum IMA Version 1.0 (af-phy-0086.000)
- Supports up to 16-Mbps full-duplex bandwidth with eight-port E1 IMA network module
- Supports unspecified bit rate (UBR), (MCR), variable bit rate (VBR), and available bit rate (ABR) ATM classes of service
- Integrated channel service unit/data service unit (CSU/DSU) on T1 versions available



- Integrated DSU for E1 versions available
- Supports ATM Forum UNI 3.0, UNI 3.1, and UNI 4.0 signaling
- Supports ATM adaptation layer 5 (AAL5)
- RFC 1483 support for multiple encapsulations over ATM
- RFC 1577 support for routing over ATM
- Maximum of 4096 virtual circuits (VCs) per port adapter, 512 VCs per interface
- Maximum differential delay tolerance of up to 250 ms for T1 and 190 ms for E1
- F4 and F5 Operation, Administration, and Maintenance (OAM) cell support
- Supports cyclic redundancy check (CRC) 32 error checking of AAL5, and CRC10 checking of OAM cells
- IMA is ATM Forum Version 1.0 standard compliant (AF-PHY-0086.000) for multivendor interoperability.
- IMA supports integrated CSU/DSU on T1 versions and integrated DSU on E1 versions.
- Links can be added or deleted from an IMA group without service disruption.
- IMA supports automatic link recovery without loss of data.
- Supports Internet Engineering Task Force (IETF) Point-to-Point Protocol (PPP) over ATM
- Supports Integrated Local Management Interface (ILMI)
- ATM Alarm Signals Supported, Loss of signal (LoS), Loss of frame (LoF), Loss of signaling multiframe, Loss of CRC multiframe, Reception of remote alarm signal, Remote multiframe alarm signal, Alarm Indication signal (AIS)
- Efficient prioritization of mission-critical data is provided by ATM QoS features.

IMA Benefits

- Multiport T1/E1 with IMA provides high value ATM access in the range of 1.5 to 16 Mbps (eight-port E1).
- Multiport T1/E1 IMA provides a migration path to higher bandwidth without the need to change transport facilities as capacity is expanded to meet changing requirements.
- IMA provides greater internetworking design flexibility and scalability for LAN-to-WAN connectivity.

Product Numbers and Descriptions

Table 1 Multiport T1/E1 ATM Product Numbers and Descriptions

Product Number	Description
PA-A3-8T1IMA	Eight-port T1 ATM port adapter with IMA
PA-A3-8E1IMA	Eight-port E1 ATM port adapter with IMA

Cable Specifications

Male RJ-45 connections are standard for the T1 and E1 versions. The T1/E1 ATM network modules support either 100-ohm (T1 twisted-pair) or 120-ohm (E1 twisted-pair) connections. A common RJ-45 connector is used for the E1 120-ohm and the T1 100-ohm connections.

Note: If 75-ohm (impedencey rating) is desired, connectivity is maintained by using a Cisco Systems cable adapter.

See the following URL for details:

http://www.cisco.com/warp/partner/synchronicd/cc/cisco/mkt/core/7500/prodlit/922_pp.htm

Bandwidths Supported

- PA-A3-8T1IMA: From 1.544 to 12.352 Mbps, in 1.544-Mbps increments
- PA-A3-8E1IMA: From 2.048 to 16.384 Mbps, in 2.048-Mbps increments

T1 Interfaces

- Line rate: 1.544 Mbps 50 bps
- Line code: binary 8-zero substitution (B8ZS) per ANSI T1.408 T1 also supports alternate mark inversion (AMI) line coding
- Line framing: extended Superframe (ESF) format (ESF 24-frame multiframe) per ANSI T1.408
- Input jitter tolerance: per ATT TR 62411
- Output jitter generation: per ATT TR62411 using normal mode sync
- Physical layer alarms: LoS, out of frame (OOF), AIS remote defect identification (RDI)

E1 Interfaces

- Line rate: 2.048 Mbps + 50 bps
- Line code: HDB3, alternate mark inversion (AMI)
- Line framing: 16-frame multiframe per ITU G.704
- Input jitter tolerance: per ITU G.823 for 2.048-Mbps operation
- Output jitter generation: per ITU G.823 for 2.048-Mbps operation
- Physical layer alarms: LoS, OOF, AIS, RDI

Supported MIBs and RFCs

This feature supports the following Management Information Bases (MIBs):

- IMA MIB (ATM Forum, AF-PHY-0086.000) (Optional part of MIB not supported)
- DS1/E1 MIB (as defined in RFC 1406)
- Chassis MIB

For descriptions of supported MIBs and how to use MIBs, see the Cisco MIB Web site on Cisco Connection Online (CCO) at <http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>.

This feature supports the following RFCs:

- RFC 1460
- RFC 1573—ifGeneralGroup and ifStackGroup from the Interfaces Group of MIB-II. Interface MIB support for IMA is not available.
- F4 (virtual path) and F5 (virtual connection) OAM cell segment and end-to-end flows, RDI, and AIS

Regulatory Approvals

- UL 1950
- FCC Part 15, Class A

ATM Internetworking

- Multiprotocol encapsulation with support for Logical Link Control/Subnetwork Access Protocol (LLC/SNAP) encapsulation and virtual circuit (VC) multiplexing (IETF RFC 1483)
- Classical IP and Address Resolution Protocol (ARP) over ATM; client and ARP server (IETF RFC 1577; IETF RFC 1755; IETF RFC 1626)
- IETF PPP over ATM
- Tag Switching

ATM Forum Specifications

- AF-PHY-0086.000—IMA 1.0 specification
- AF-PHY-0016—DS1/ESF and B8ZS specification
- AF-PHY-0064—E1/G.704 framing specification
- ITU.I432—UNI physical-layer specification
- ITU.I432.3—physical-layer specifications for T1/E1
- ITU.I431
- ATM Forum UNI 3.0, 3.1, and 4.0 signaling for point-to-point and point-to-multipoint SVCs
- ATM Forum UNI 4.0 signaling for ABR SVCs
- ATM Forum ILMI for address prefix acquisition and ATM service address registration with UNI-compliant switches throughout the ATM network



Corporate Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100

European Headquarters
Cisco Systems Europe
11, Rue Camille Desmoulins
92782 Issy Les Moulineaux
Cedex 9
France
www.cisco.com
Tel: 33 1 58 04 60 00
Fax: 33 1 58 04 61 00

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-7660
Fax: 408 527-0883

Asia Pacific Headquarters
Cisco Systems Australia, Pty., Ltd
Level 17, 99 Walker Street
North Sydney
NSW 2059 Australia
www.cisco.com
Tel: +61 2 8448 7100
Fax: +61 2 9957 4350

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