CHAPTER 1

Product Overview

This chapter gives an overview of the Cisco ATM SBus adapter. The Cisco ATM SBus adapter is a network interface card designed to be easily installed in an SBus slot of several types of Sun SPARCstations, servers, and SPARC-compatible systems. One of the most important functions of the Cisco ATM SBus adapter is to perform the segmentation and reassembly of data for transmission on an ATM network.

The adapter segments outgoing data into cells and transmits them to an ATM switch for forwarding to their destination. The same adapter reassembles received cells into a Protocol Data Unit (PDU) that can be processed by a protocol stack.

The workstation in which you are installing the adapter will be an endpoint in your ATM network. An ATM network is a point-to-point and point-to-multipoint, switched environment that requires the setting up of connections between the ATM endpoints. For one endpoint to communicate with another endpoint, a virtual connection must be defined between them. The creation of a virtual connection can be done manually by defining Permanent Virtual Connections (PVCs) or dynamically using Switched Virtual Connections (SVCs).

Adapter Features

The Cisco ATM SBus adapter features a highly integrated design. It contains several high-performance features to reduce internal data flow and minimize overhead imposed on the host processor.

To maximize throughput, the Cisco ATM SBus adapter supports 32-bit wide data transfers and data bursts of up to 32 bytes. Bus mastering minimizes host processor intervention.

Additional features and benefits of the Cisco ATM SBus adapter include:

- ATM Forum compliance, which provides maximum interoperability.
- Easy installation into any SBus-based workstation.
- High-performance, single-slot design.
- A choice of either fiber or copper interface cards for greater system flexibility. Figure 1-1 shows the Cisco ATM SBus adapter with the multimode fiber interface. Figure 1-2 shows the Cisco ATM SBus adapter with the copper interface.
- Built-in DMA bus mastering capabilities to reduce CPU overhead.
- 32-bit bus interface and burst mode capabilities for maximum transfer rates, which results in greater speed and efficiency.
- Higher data transfer rate and superior data reliability.
- Full-duplex 155-Mbps synchronous optical network (SONET) or synchronous data hierarchy (SDH) interface assures configuration flexibility.
- Software that supports connectivity with existing networks through IP over ATM (RFC 1577).
- Software modules for full ATM connectivity, including user network interface (UNI) 3.0 signaling, Interim Local Management Interface (ILMI), and ATM ARP.
- Visual LED status indicators, LINK OK and FRAME ERR, which provide instant feedback during installation.

Figure 1-1 Cisco ATM SBus Adapter—Fiber-Optic with SC-Type Connector

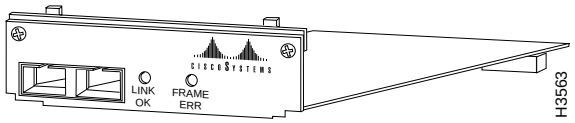
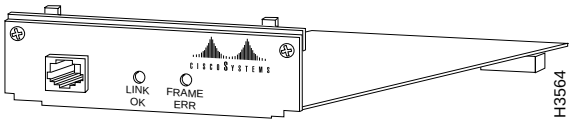


Figure 1-2 Cisco ATM SBus Adapter—Copper with RJ-45 Connector



Hardware Overview

The Cisco ATM SBus adapter features a compact design that fits conveniently into a single SBus slot. Two LED indicators are used to monitor link and frame status.

The Cisco ATM SBus adapter uses the Universal Test & Operations Physical Interface for ATM (UTOPIA) interface for transferring data between the segmentation and reassembly (SAR) and the SONET framer components.

The transmit UTOPIA interface is a byte-wide interface used by the SAR for transmitting data to the SONET framer. The SAR continuously transmits cells to the framer. If the SAR has nothing to send, the SAR inserts null cells into the SONET payload.

The receive UTOPIA interface is a byte-wide interface used by the SAR for receiving data from the framer. The SAR continuously receives cells from the framer. The SAR drops the unassigned and null cells.

The receive FIFO increases performance on the receive UTOPIA path. This, in addition to the FIFO in the SAR, reduces the chance of packets being dropped because of bus latency.

The received data from the transceiver is connected to a clock recovery chip. The clock recovery chip uses a 19.44 MHz oscillator. It recovers the 155.54 MHz clock and the receive data from the receive data. The recovered clock is connected to the SONET framer. The clock recovery chip also generates a 155.54 MHz clock for the SONET framer to be used as the transmit clock.

The FCode EPROM is used to store the open boot command for the SBus adapter and parameters such as the hardware revision, serial number, physical layer type, and base MAC address.

Transmitting Data

To transmit data, a host application must place data within the host data buffers. The host builds multiple data packets within its allocated memory. A data packet consists of one or more buffers and is a maximum of 64 KB. A typical data packet contains the application payload data (information data blocks), host protocol headers, and any other protocol-related overhead. After a single data packet is built, the host issues a command to the SAR to transmit the data packet.

Once the command is received, the SAR switches from a slave to the master, gaining control of the host SBus. Consequently, the SAR begins transferring 48-byte blocks of data, using a combination of 32- and 16-byte bursts or three 16-byte bursts. The transmit adaptation layer processor within the segmentation and reassembly (SAR) chip processes all functions related to the ATM adaptation layer and adds four bytes of ATM header information to each cell. Next, this four-byte header and Header Error Correction (HEC) place holder byte are concatenated with the 48-byte payload and stored in the transmit FIFO.

These 53-byte ATM cells are transferred from the SAR to the SONET framer chip via the UTOPIA interface. The HEC byte is calculated using the four-byte header, which then replaces the HEC placeholder byte, completing the 53-byte ATM transmit cell (five for the header and 48 for data). Next, the 48-byte payload field within the ATM cell is scrambled using a self-synchronizing scrambler polynomial. Then the SONET framer chip generates and multiplexes a SONET header with multiple ATM cells and builds the STS-3c synchronous payload envelope (SPE). SPE is scrambled and converted into serial data.

Receiving Data

When an ATM cell is received, a clock recovery circuit is used to recover the clock from the data stream. The SONET framer chip receives a SONET frame every 125 microseconds. This serial data stream is converted into byte-wide data. The SONET frame is unscrambled and checked for parity, and the SONET header/ATM cells are demultiplexed. Finally, the ATM cells are unscrambled, the HEC is checked, and the byte-wide information is passed to the output buffer (FIFO).

The ATM cells are transferred from the output buffer to the SAR at the host frequency rate. The SAR decodes the header virtual circuit identifier (VCI) and virtual path identifier (VPI) and assembles the packet in host memory.

The SAR control memory is a work space that supports the transmit and receive DMA state tables. The 128 KB of SAR memory can ideally support up to 2,000 virtual connections.

LED Indicators

The Cisco ATM SBus adapter contains two LED indicators on the faceplate to monitor link and frame status. The green LED monitors the physical link layer activity. The yellow LED monitors frame status. Definition of the LED status is presented in Table 1-1.

Table 1-1 Cisco ATM SBus Adapter LED Indicators

Color	Status	Indication
Green	On	Normal condition. Indicates that the adapter is receiving a valid physical-layer signal.
Green	Off	Indicates that adapter is not receiving an adequate signal (for example, the device is not connected, the cable or connector is not functioning properly, or the device at the other end is not transmitting a signal.)
Yellow	On	Indicates a link framing erro.
Yellow	Off	Normal condition. Indicates that the adapter is receiving valid link-level STS-3c or STM-1 frames.

Software Overview

The following software and features are provided to support the Cisco ATM SBus adapter:

- Cisco ATM SBus adapter driver. Driver software that resides on the host system (where the adapter is installed). This driver provides the connection for the adapter, the operating system and protocol stacks, and the user's application software. CATM is the name of the driver.
- catmlancfg. Configuration utility used to initialize VLANs when the workstation is booted up. This software package provides an interface to dynamically manage ATM network configurations.

- amtstat. This software package provides an interface to dynamically manage and diagnose the currently running ATM adapter, including configuration of VLANs.
- Each adapter's unique IEEE 802.2 48-bit MAC address can be used in the 48-bit ESI field of the ATM address.

Host System Requirements

This section describes the hardware and software requirements of host systems in which Cisco ATM SBus adapters can be installed.

Hardware Requirements

The Cisco ATM SBus adapter is designed to be installed in any available SBus M slot in a SPARCstation or SPARCserver. Examples of compatible systems include:

- SPARCstation IPC, IPX, Classic, LX
- SPARCstation 5, 10, 20
- SPARCserver 1000, 2000

Software Requirements

The SPARCstation where the adapters is installed must be running SunOS Version 4.1.3 or Solaris Version 2.3 or higher. There must be 32 MB of RAM (minimum) available.

Unpacking Information

Each Cisco ATM SBus adapter should arrive in good condition. Before unpacking the adapter and accessories, check for any obvious damage to the packaging and notify your carrier immediately upon receipt.

The following items are included with each adapter:

- *Cisco ATM SBus Adapter User Guide*
- Protective cap for fiber-optic connectors
- Antistatic wrist strap
- *Welcome to the World of Networking*
- A warranty package

If any item is missing or damaged, immediately contact Cisco Systems Customer Service.

Technical Specifications

Table 1-2 provides the product specifications.

Table 1-2 Cable Specifications

Description	Specifications
Physical Specifications:	
Height	1.1 in. (2.86 cm)
Depth	5.775 in. (14.67 cm)
Width	3.3 in. (8.4 cm)
Weight	3.7 oz (104 g)
Power Requirements (max)	
UTP	2.0A @ 5 V, 10 Watts
Fiber	2.2 A @ 5V, 11 Watts

Description	Specifications
Environmental conditions	
Operating temperature	32˚ to 122˚ F (0˚ to 50˚ C)
Nonoperating temperature	-4˚ to 140˚ F (-20˚ to 60˚)
Humidity	10% to 90%, noncondensing
Regulatory compliance	
Copper (WA-C402)	FCC Part 15, Subpart J Class A
Fiber (WA-C401)	FCC Part 15, Subpart J Class B, EN55022 Class B
Interface	
Copper[1]	• EIA/TIA-568 straight-through Category 5 data-grade unshielded twisted-pair (UTP) cable[2] • Modular RJ-45 connector • Multilevel transmission MLT-3 • 330 feet (100 m) maximum cable length (from adapter to switch, including patch cords and jumpers) • 155.54 Mbps line speed
Fiber	• 62.5/125-micron multimode fiber • Multimode SC-type fiber-optic connector (0.5” spacing) • 1.2 miles (2 km) maximum transmission distance • 1260-1360 nm transmission wavelength • -19 dbm fiber-coupled power • 155.54 Mbps line speed
SBus Compatibility	Meets IEEE 1496 specification, occupies a single SBus slot
Status Indicators	LEDs for link status and physical link error. Refer to Table 1-1 for specific descriptions of LEDs.
Operating Systems	SunOS 4.1.3, Solaris 2.3/2.4

Description	Specifications
Maximum number of VCIs	1800
IP ATM Support	Complies with RFCs 1483, 1577, and 1755; includes an ATM ARP server that runs in the host system

1. 155-C5-UTP-PMD equipment can only be connected to other 155-C5-UTP-PMD equipment.
2. Do *not* share services (such as voice and data) on the same cable. ATM requires two of the four pairs in the UTP cable. The remaining two pairs cannot be used for other applications.