ForeRunner 200E/LE
ATM Adapters for the Macintosh
User's Manual

MANU0179-01 - Rev. A - April, 1997

Software Version 4.1.x

FORE Systems, Inc.

1000 FORE Drive

Warrendale, PA 15086-7502

Phone: 412-742-4444

FAX: 412-772-6500

URL: http://www.fore.com

Legal Notices

U.S. Government Restricted Rights. If you are licensing the Software on behalf of the U.S. Government ("Government"), the following provisions apply to you. If the Software is supplied to the Department of Defense ("DoD"), it is classified as "Commercial Computer Software" under paragraph 252.227-7014 of the DoD Supplement to the Federal Acquisition Regulations ("DFARS") (or any successor regulations) and the Government is acquiring only the license rights granted herein (the license rights customarily provided to non-Government users). If the Software is supplied to any unit or agency of the Government other than DoD, it is classified as "Restricted Computer Software" and the Government's rights in the Software are defined in paragraph 52.227-19 of the Federal Acquisition Regulations ("FAR") (or any successor regulations) or, in the cases of NASA, in paragraph 18.52.227-86 of the NASA Supplement to the FAR (or any successor regulations).

This publication is provided by FORE Systems, Inc. "as-is" without warranty of any kind, either express or implied, including, but not limited to, the implied warranties or conditions of merchantability or fitness for a particular purpose. FORE Systems, Inc. shall not be liable for any errors or omissions which may occur in this publication, nor for incidental or consequential damages of any kind resulting from the furnishing, performance, or use of this publication.

Information published here is current or planned as of the date of publication of this document. Because we are improving and adding features to our products continuously, the information in this document is subject to change without notice.

RESTRICTED RIGHTS LEGEND. Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.227-7013 (October 1988) and FAR 52.227-19 (June 1987).

FCC CLASS A NOTICE

WARNING: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void this user's authority to operate this equipment.

NOTE: The *ForeRunner* and *ForeRunnerLE* adapters have been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of the equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

DOC CLASS A NOTICE

This digital apparatus does not exceed Class A limits for radio noise emission for a digital device as set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le present appareil numerique n'emet pas de bruits radioelectriques depassant les limites applicables aux appareils numeriques de la class A prescrites dans le reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

CE *NOTICE*

Marking by the symbol **CE** indicates compliance of this system to the EMC (Electromagnetic Compatibility) directive of the European Community and compliance to the Low Voltage (Safety) Directive. Such marking is indicative that this system meets or exceeds the following technical standards:

- EN 55022 - "Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment."
- EN 50082-1 - "Electromagnetic compatibility - Generic immunity standard Part 1: Residential, commercial, and light industry."
- IEC 1000-4-2 - "Electromagnetic compatibility for industrial-process measurement and control equipment Part 2: Electrostatic discharge requirements."
- IEC 1000-4-3 - "Electromagnetic compatibility for industrial-process measurement and control equipment Part 3: Radiate electromagnetic field requirements."
- IEC 1000-4-4 - "Electromagnetic compatibility for industrial-process measurement and control equipment Part 4: Electrical fast transient/burst requirements."

CERTIFICATIONS

ETL certified to meet Information Technology Equipment safety standards UL 1950, CSA 22.2 No. 950, and EN 60950.

Japan VCCI conformity.

ForeRunnerLE 25 -

この装置は、第二種情報処理装置（住宅地域又はその隣接した地域において使用されるべき情報処理装置）で住宅地域での電波障害防止を目的とした情報処理装置等電波障害自主規制協議会(VCCI)基準に適合しております。
しかし、本装置をラジオ、テレビジョン受信機に近接してご使用になると、受信障害の原因となることがあります。
取扱説明書に従って正しい取り扱いをして下さい。

This equipment is in the Class 2 category (Information Technology Equipment to be used in a residential area or an adjacent area thereto) and conforms to the standards set by the Voluntary Control Council For Interference by Information Technology Equipment aimed at preventing radio interference in such residential area. When used near a radio or TV receiver, it may become the cause of radio interference. Read the instructions for correct handling.

ForeRunnerLE 155 and PCA-200EMAC -

この装置は、第一種情報処理装置（商工業地域において使用されるべき情報処理装置）で商工業地域での電波障害防止を目的とした情報処理装置等電波障害自主規制協議会(VCCI)基準に適合しております。
従って、住宅地域またはその隣接した地域で使用すると、ラジオ、テレビジョン受信機等に受信障害を与えることがあります。
取扱説明書に従って正しい取り扱いをして下さい。

This equipment is in the Class 1 category (Information Technology Equipment to be used in commercial and/or industrial areas) and conforms to the standards set by the Voluntary Control Council For Interference by Information Technology Equipment aimed at preventing radio interference in commercial and/or industrial areas.Consequently, when used in a residential area or in an adjacent area thereto, radio interference may be caused to radios and TV receivers, etc. Read the instructions for correct handling.

TRADEMARKS

Table of Contents

Preface

The intent of this manual is to supply users of the *ForeRunner*™ and *ForeRunnerLE*™ adapters for the Macintosh with all the necessary information to successfully install the FORE adapter card and accompanying software. This document also provides general product information, network configuration information and information on software administration capabilities. This document was created for users with various levels of experience. If you have any questions or problems with the installation, please contact FORE Systems' Technical Support.

Chapter Summaries

Chapter 1 - Introduction - Provides an overview of ATM, LAN Emulation, the FORE adapter hardware and software, and general information to prepare for the installation of the FORE adapter card.

Chapter 2 - Hardware Installation - Guides you through the installation of your FORE adapter card. Included are hardware installation instructions and product registration information.

Chapter 3 - Software Installation - Guides you through the installation of the FORE adapter card software for the Mac OS. Included are software installation instructions and requirements.

Chapter 4 - Network Interface Administration - Provides network configuration information such as using InFOREmation Center, assigning an IP address, and configuring your workstation for using Open Transport over ATM.

Appendix A - LED Indicators - Describes the physical and functional capabilities of the LED indicators on the endplate of the adapter.

Appendix B - Troubleshooting - Describes troubleshooting techniques for the FORE adapter.

Technical Support

In the U.S.A., you can contact FORE Systems' Technical Support by any one of four methods:

1. If you have access to Internet, you may contact FORE Systems' Technical Support via e-mail at the following address:

   support@fore.com

2. You may FAX your questions to "support" at:

   412-742-7900

3. You may send questions, via U S Mail, to the following address:

   FORE Systems, Inc.
   1000 FORE Drive
   Warrendale, PA 15086-7502

4. You may telephone your questions to "support" at:

   1-800-671-FORE

   or:

   412-635-3700

Technical support for customers outside the U.S.A. should be handled through your local distributor.

No matter which method is used for technical support, please be prepared to provide the serial number(s) of the product(s) and as much information as possible describing your problem / question.

Important Information Indicators

To call your attention to safety and otherwise important information that must be reviewed to insure correct and complete installation, as well as to avoid damage to the adapter or your system, FORE Systems utilizes the following *WARNING/ CAUTION/NOTE* indicators.

WARNING statements contain information that is critical to the safety of the operator and/or the system. Do not proceed beyond a ***WARNING*** statement until the indicated conditions are fully understood or met. This information could prevent serious injury to the operator and/or damage to the adapter, the system, or currently loaded software, and will be indicated as:

WARNING!

Hazardous voltages are present. To lessen the risk of electrical shock and danger to personal health, follow the instructions carefully.

Information contained in **CAUTION** statements is important for proper installation/operation. Compliance with **CAUTION** statements can prevent possible equipment damage and/or loss of data and will be indicated as:

CAUTION

You risk damaging your equipment and/or software if you do not follow these instructions.

Information contained in **NOTE** statements has been found important enough to be called to the special attention of the operator and will be set off from the text as follows:

Steps 1, 3, and 5 are similar to the installation for the computer type above. Review the previous installation procedure before installation in your particular model.

Safety Agency Compliance

This preface provides safety precautions to follow when installing a FORE Systems, Inc., product.

Safety Precautions

For your protection, observe the following safety precautions when setting up your equipment:

- Follow all warnings and instructions marked on the equipment.
- Never push objects of any kind through openings in the equipment. Dangerous voltages may be present. Conductive foreign objects could produce a short circuit that could cause fire, electric shock, or damage to your equipment.

Symbols

The following symbols appear in this book.

CAUTION

If instructions are not followed, there is a risk of damage to the equipment.

WARNING!

Hazardous voltages are present. If the instructions are not heeded, there is a risk of electrical shock and danger to personal health.

Modifications to Equipment

Do not make mechanical or electrical modifications to the equipment. FORE Systems, Inc., is not responsible for regulatory compliance of a modified FORE product.

1 Introduction

This chapter provides an overview of the ATM Standard and the FORE Systems' *ForeRunner* family of ATM adapters for the Macintosh:

- *ForeRunnerLE* 25 and 155 Mbps adapters for the PCI bus (also referred to as the LE adapters).
- *ForeRunner* PCA-200EMAC and PCA-200MAC adapters for the PCI bus (also referred to as the PCA adapters).

This chapter also details the hardware and software requirements of the FORE adapter card and lists the contents of the FORE adapter package.

1.1 Overview of the ATM Standard

Asynchronous Transfer Mode, or ATM, is a communication architecture based on the switching of small fixed length packets of data called *cells*. In ATM, all data is transferred in 53-byte cells. Each cell has a 5-byte header that identifies the cell's route through the network and 48-bytes containing user data. This user data in turn carries any headers or trailers required by higher level protocols.

Perhaps the single most important advantage offered by ATM, in addition to the speed at which data is transferred, is its open-ended growth path. ATM is not locked into a single physical medium or speed. The fixed-size ATM cell allows traffic from multiple sources (simultaneous video, audio, and data communication) to be switched to multiple destinations by fast ATM switches. For example, a *ForeRunner* ASX-1000 ATM Switch can connect up to 96 users and has an aggregate capacity of 10 gigabits per second. Larger LANs can be built by interconnecting multiple *ForeRunner* ATM switches.

1.2 The PCA-200EMAC Adapters

The PCA-200EMAC, shown in Figure 1.1 is a high-performance adapter designed for use in Macintosh desktop computers and servers. The PCA adapters provide ATM connectivity for the Macintosh and is able to support evolving signalling and AAL standards.

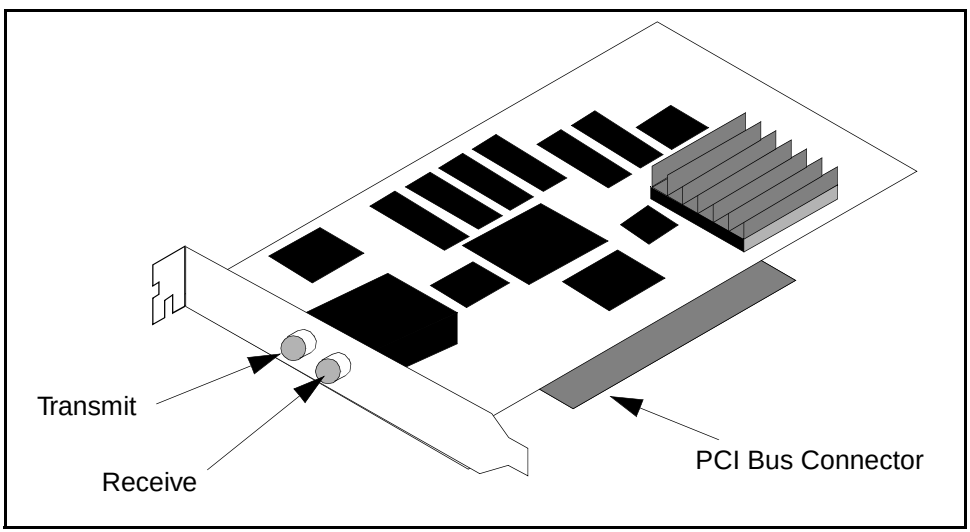

Figure 1.1 - PCA-200EMAC Adapter

1.2.1 Hardware Overview

The *ForeRunner* PCA-200EMAC adapters feature FORE's Advanced Cell Processing Architecture which utilizes a dedicated embedded Intel i960 RISC processor along with special-purpose AAL 5 and 3/4 Segmentation and Reassembly (SAR) hardware and scatter-gather DMA. The PCA adapters are bus master devices and support 32-bit wide PCI data transfers and PCI block transfers of up to 64 bytes. With the PCA adapters, Macintosh users can add ATM networking capabilities to their applications, leaving the low-level ATM cells processing, segmentation and reassembly, and signalling to the adapter hardware and device driver.

1.3 The *ForeRunnerLE* Adapters

The *ForeRunnerLE* 25 and 155 Mbps adapters, shown in Figure 1.2, are high-performance, single-slot ATM adapters. They use a 32-bit, 33 MHz PCI-bus architecture with integrated SAR and PCI-bus mastering capabilities. Using single-sided SMT technology, the adapter consists of three basic elements, the SAR+PCI bus interface, the physical media chip, and the physical media interface.

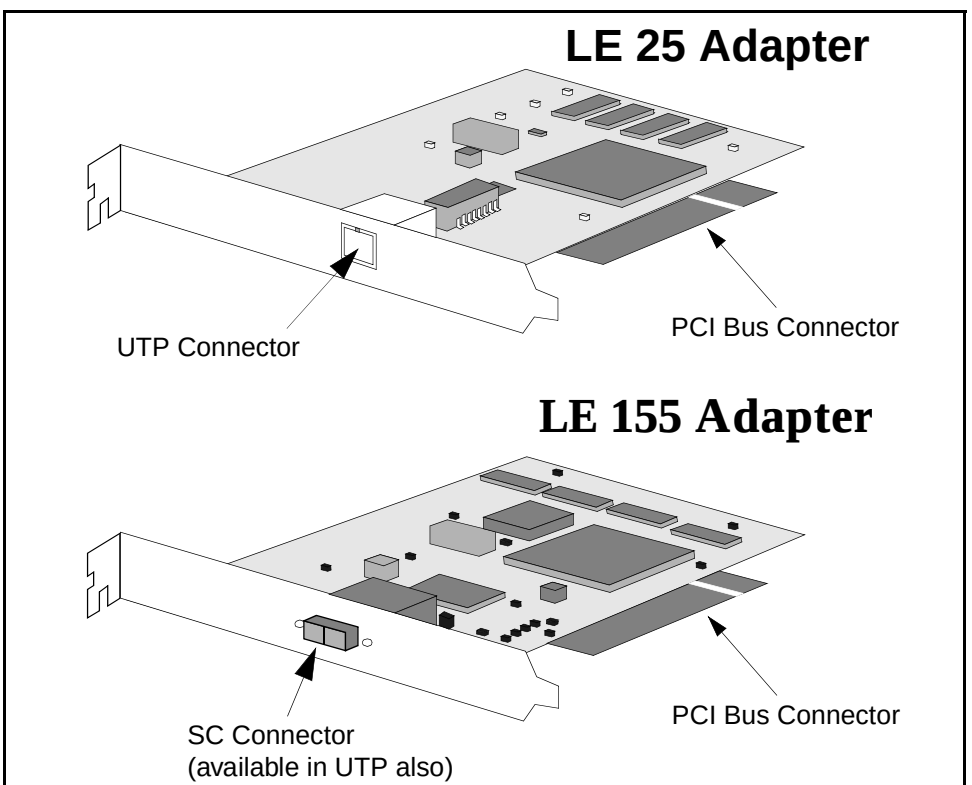

Figure 1.2 - *ForeRunnerLE* 25 and 155 MBps Adapters

1.4 Hardware Requirements

The requirements for the FORE ATM adapters for the Macintosh are shown in Table 1.1.

Table 1.1 - Adapter Requirements

Adapter	Bus Requirement	Minimum RAM
ForeRunner PCA-200EMAC	Full-size PCI 2.0/2.1 Bus-Master Slot	24 MB
ForeRunnerLE		

1.5 Software Overview

FORE Systems' *ForeThought* 4.1 LAN Emulation software is compliant with the ATM Forum's *LAN Emulation Over ATM Version 1.0* specification. This allows a Macintosh with the FORE card to join an emulated LAN (an ELAN) over an ATM network. The ELAN provides communication of data among all its members, just as in a physical LAN. Major advantages include high-performance network throughput delivered to applications, AppleTalk support, and the flexibility for future upgrades. Features include support for the UNI protocol (version 3.0 or 3.1) and the ability to select the Ethernet MTU size (from 1516, 4544, 9234, 18190).

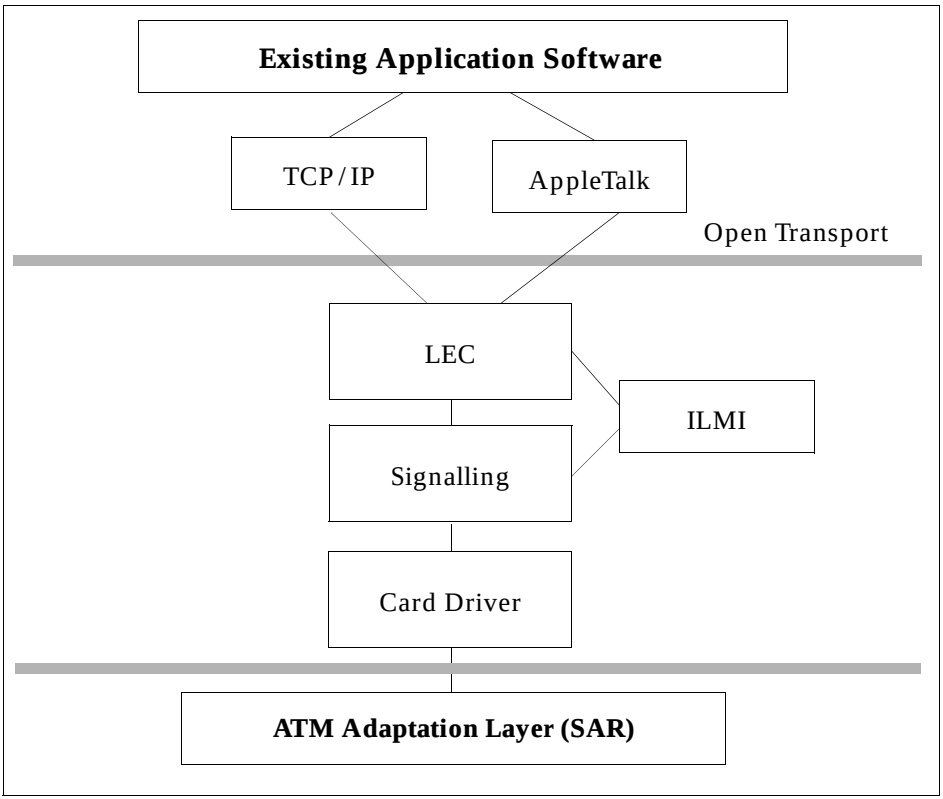

Figure 1.3 - FORE Macintosh Driver Advanced Cell Processor Architecture

1.5.1 Driver Architecture

The FORE adapter's advanced cell processor architecture provides optimized on-board cell processing functions, including segmentation and reassembly. The software device driver provides a high-performance packet-level interface to the cell-processing engine. The driver identifies the data packets to be communicated over ATM; the cell-processing engine does the rest.

1.6 Software Requirements

The following software requirements apply to the *ForeRunner* and *ForeRunnerLE* adapters and device driver in your Macintosh system:

The following are requirements to ensure proper installation of the software:

- At least 1.5MB space on target drive
- A bus compliant with the PCI 2.0 or 2.1 specification
- A minimum of 24MB RAM
- Mac OS 7.5.3 or higher
- Open Transport 1.1 or higher
- The adapter card must be installed

1.7 LAN Emulation Overview

FORE System's *ForeThought* 4.1 LAN Emulation software is compliant with the ATM Forum's *LAN Emulation Over ATM Version 1.0* specification. LAN Emulation (LANE) allows higher level protocols and LAN applications to interoperate, without modifications, with an ATM network. The components of the emulated LAN (ELAN), running on the ATM network, work together to emulate an Ethernet LAN. The ELAN components resolve MAC addresses to ATM addresses, replace the connectionless operation of legacy LANs with point-to-point connections, and provide broadcast and multicast services. The ELAN consists of a LAN Emulation Client (LEC) running on each host in the ELAN, and the following LANE Services:

- the LAN Emulation Server (LES)
- the Broadcast and Unknown Server (BUS)
- the LAN Emulation Configuration Server (LECS)

In *ForeThought* 4.1, the LANE services operate on a FORE Systems switch or SunOS workstation.

In order to understand *ForeThought* 4.1, it is important to understand how these components work together to provide LAN Emulation.

1.7.1 The ELAN Components

The ELAN includes a number of components:

LAN Emulation Client (LEC) - Runs on the workstation that has the FORE card installed. Communicates with other ELAN components to establish communications with other hosts in the ELAN. You can control the functions of the LEC with the InFOREmation Center (described in Chapter 4).

LAN Emulation Configuration Server (LECS) - Runs on a SunOS workstation or on a FORE Systems switch. Maintains information about all ELANs on the physical ATM network, and which LECs can join which ELANs. When the LEC successfully communicates with the LECS, the LECS provides a list of ELANs which the LEC can join.

LAN Emulation Server (LES) - Runs on a SunOS workstation or on a FORE Systems switch. Maintains information about the LECs within a single ELAN and performs address resolution.

Broadcast and Unknown Server (BUS) - Runs on a SunOS workstation or on a FORE Systems switch. Provides services allowing broadcasts, multicast, and unknown unicasts within a single ELAN.

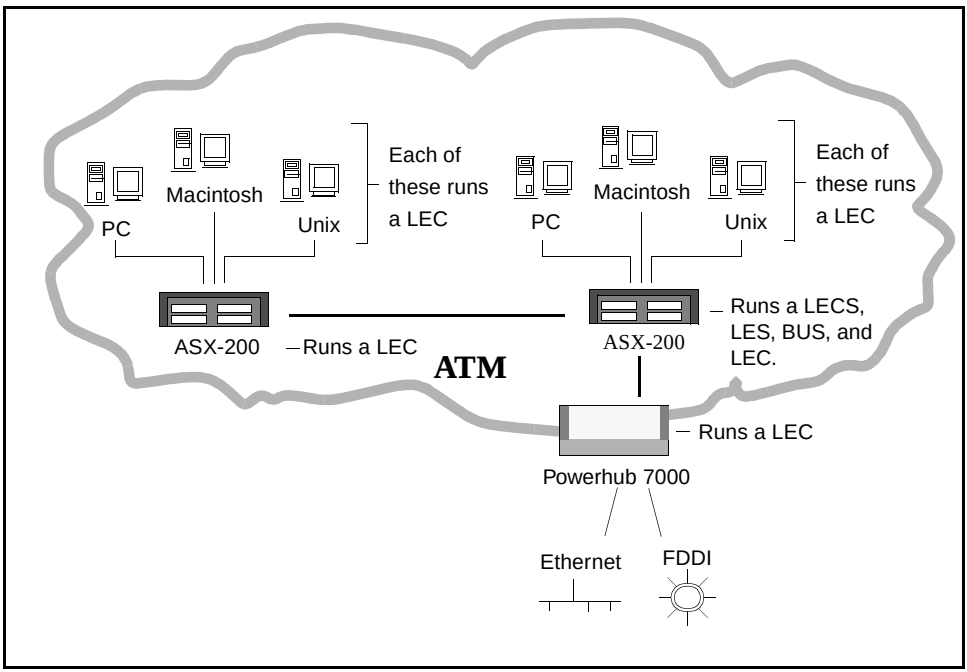

Figure 1.4 - An Example of an ELAN

1.7.2 The LEC Connection Process

The LEC running on the workstation goes through the following process when it initializes (when you start up the machine):

1. The LEC obtains its own ATM address via address registration.

   If registration is not available or you choose not to use it, you can manually specify the ATM address using the InFOREmation Center.

2. The LEC establishes a connection to the LECS. It gets the address of the LECS through the well-known address or the well-known Permanent Virtual Circuit (0,17).

   If the address is not available through these methods, or you choose not to use them, you can manually specify the address of the LECS using the InFOREmation Center.

3. The LEC requests the information necessary to join a specified ELAN or the default ELAN. The LECS has information about available ELANs and about what ELANs each LEC can join, and which ELAN the LEC should attempt to join first.

   If the LECS is not available, or if you choose not to use it, you can manually specify ELANs using the InFOREmation Center.

4. The LEC contacts the LES associated with the ELAN it wants to join and registers its MAC-NSAP address. It also contacts the BUS associated with the ELAN. At this point the LEC is connected to the ELAN and the host can exchange data via the ELAN as if it were an Ethernet network.

All this activity happens automatically. You can use the InFOREmation Center (described in Chapter 4) to view information about the ELAN configuration and change that information.

1.7.3 Failover ELANs

To ensure that a single service failure does not cripple the entire ELAN, *ForeThought* 4.1 supports a simple LES and BUS failover mechanism. Rather than associating a single LES and BUS pair with a single ELAN, the LEC maintains an ordered list of LES and BUS pairs for each ELAN. While the LEC is only interacting with one LES at a time, it is ready to move to the next LES and BUS in the list if the current LES fails. If it is using a backup LES and BUS pair, the LEC periodically checks if the primary LES and BUS pair are available again. If they are, the LEC resumes the connection to the primary pair.

1.7.4 Configurable MTU Size

ForeThought 4.1 allows you to specify the MTU size that the adapter will use when communicating with the ELAN. The MTU size can be configured to 1516, 4544, 9234, or 18190 bytes. The MTU size must match that of the ELAN to which you are connecting.

1.7.5 Automatic ELAN Selection

To simplify configuration of the ELAN, *ForeThought* 4.1 allows automatic ELAN selection. If the LECS has been configured to provide the required information, and you accept the default option of automatic ELAN selection when you configure the ELAN driver, the host initially attempts to join the ELAN specified by the LECS.

The host successfully joins the ELAN if the following conditions are met:

- the LECS is available
- the proper LES address for the ELAN has been specified in the LECS
- the ELAN type is Ethernet
- the MTU size of the ELAN matches that configured on the host
- the LES and BUS are available.

Although the LECS can provide the name of the ELAN to the end host, the LECS cannot supply the host's TCP/IP address for the interface. If you are using automatic ELAN selection and TCP/IP, you must still get the appropriate TCP/IP address for your host on that ELAN.

1.8 Fiber Specifications

The PCA and LE 155 adapters are available with multi-mode fiber optic connectors. Multi-mode fiber specifications require:

- Core diameter: 62.5 um
- Fiber diameter: 125 um
- Wavelength: 1300 nm
- Connector styles: SC or ST
- Maximum distance: approximately 2 km
- Loss characteristic: less than 3 dB/km

For the 100 Mbps TAXI-based adapter, fiber should be installed according to FDDI specifications. Typically, the fiber will be the 62.5/125 um graded multi-mode fiber with a loss characteristic of 3 dB/km.

The *ForeRunnerLE* 25 adapters are ***not*** available with multi-mode fiber connectors.

1.9 UTP Specifications

The PCA and LE adapters are available with UTP category 5 connectors. The LE adapters are also available with UTP category 3 connectors. The cable specifications are shown in Table 1.2.

Table 1.2 - UTP Cable Specifications

Description	Value
AWG	24
Impedance (Ω)	100 ±15%
Attenuation (dB / 1000 ft. Max)	25 dB @ 16 mHz 52 dB @ 62.5 mHz 67 dB @ 100 mHz
Maximum Run	100 m[a] *
Connector Style	RJ-45

a. Within the 100 meter run, a maximum of two connections is permissible.

The pinouts for the RJ-45 connector are shown in Table 1.3.

Table 1.3 - RJ-45 Pinouts

Number	Transmit/Receive
1	Transmit (+)
2	Transmit (-)
3 - 6	Not Used
7	Receive (+)
8	Receive (-)

1.10 Unpacking Information

Upon receipt of, and before opening your FORE adapter card, inspect the package for any damage that may have occurred during shipping. If the package shows any signs of external damage or rough handling, notify your carrier's representative.

When unpacking the FORE adapter card be sure to keep all original packing materials. They may be needed for storing, transporting, or return of the product.

CAUTION

All products returned to FORE Systems, under warranty, must be packed in their original packing materials.

The *ForeRunner* adapter package contains the following:

- *ForeRunner* PCA-200EMAC, PCA-200MAC, or *ForeRunnerLE* Adapter
- *ForeThought* software CD, including quick start information
- *ForeRunner*™ 200E/LE ATM Adapters for the Macintosh User's Manual (this manual)
- Release notes describing improvements and known issues in this release

If any of the above items are missing or damaged, please contact FORE Systems' Technical Support immediately, as described in "Technical Support" on page ii of the Preface.

CAUTION

To avoid equipment damage due to electrostatic discharge, use an anti-static grounding strap when handling this, or any other electronic components. Handle the adapter only by the edges, avoiding all components and metal parts.

2 Hardware Installation

This section is designed to guide you through the installation of the *ForeRunner* Macintosh adapters. These adapters are listed in Table 2.1. The procedures in this chapter contain step-by-step instructions for the successful installation of the adapter card into an available PCI slot in your system. This chapter also contains handling and registration information. It is strongly suggested that you read all of this information carefully before attempting installation.

Table 2.1 - *ForeRunner* and *ForeRunnerLE* Macintosh Adapters

Adapter	Bus Requirement
ForeRunnerLE 25 and 155Mbps adapters (also referred to as the LE adapter)	PCI 2.0/2.1 Bus Master Slot
ForeRunner PCA-200EMAC and PCA-200MAC adapters (also referred to as the PCA adapters)	

2.1 Required Tools

Installation of the FORE adapter card may require an anti-static grounding strap and flat-head screwdriver, depending on the system in which the card is to be installed.

2.2 General Hardware Installation Procedures

Installation of the FORE adapter card into an available Macintosh system PCI slot is a simple procedure. The installation procedure differs slightly for the various system models. Please refer to the section that applies to your system for detailed instructions.

WARNING! It is highly recommended that you use a grounding strap when handling this, or any computer components.

Handle the FORE adapter card only by the edges, avoiding all components and metal parts.

2.3 Shutting Down the System

Before installing the FORE adapter, you must shut down your Macintosh.

The system should be halted using the following routine:

1. Save all work and quit any applications.
2. Select the **Shut Down** command from the Special menu in the Finder.

For additional information about shutting down your Macintosh, please refer to the Macintosh User's Guide.

2.4 PowerMac 8500, 9500 and Similar Models

The following installation procedure applies to the Power Macintosh 8500 and 9500, and similar models housed in the mini-tower case.

The *Technical Information* booklet that came with your Macintosh system contains information regarding the power consumption of the unit. The combined power consumption of the PCI cards must not exceed the limits specified in the booklet.

A regular flat head screwdriver is required for this procedure. Place the system on a flat, sturdy work surface that has adequate space for both the unit and cover after removal. Make sure the power to the system is OFF before opening the system box.

Leaving the computer plugged in while installing the PCA adapter grounds the computer and helps guard against problems with static electricity.

2.4.1 Opening the System Unit

1. Place the system on a flat, sturdy work surface with adequate space on which to work.
2. While wearing the grounding strap, loosen the four large screws at the corners of the back panel with a screwdriver (refer to Figure 2.1). Do not try to remove the screws or the back panel.
3. Remove the cover from the computer by sliding the cover away from the back panel an inch or two. Then raise the cover straight up and off the computer.

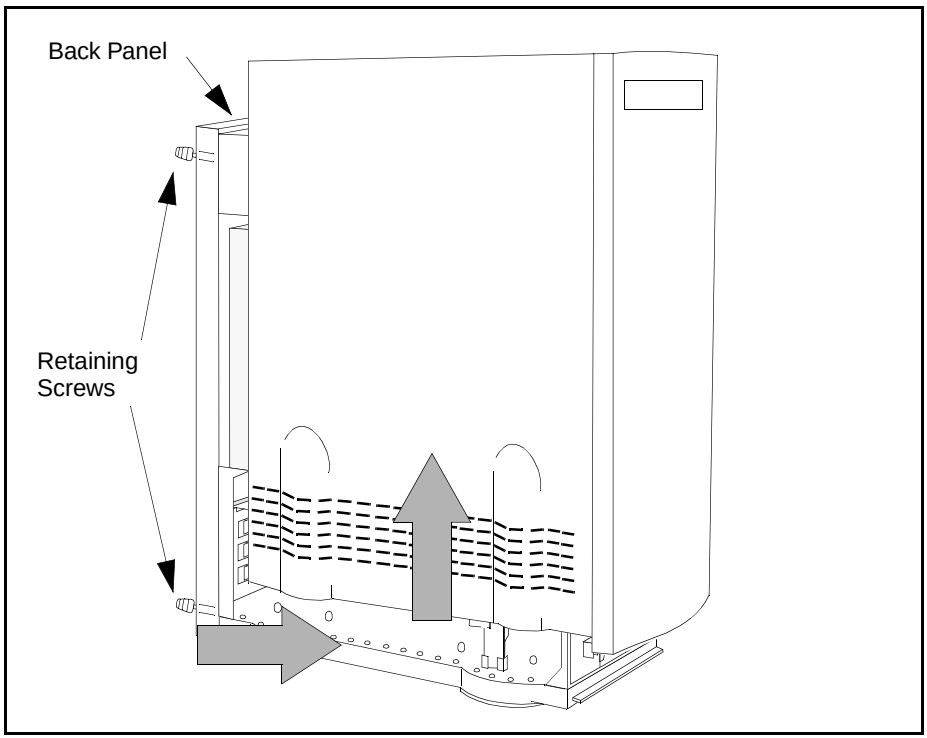

Figure 2.1 - Removing the Cover

4. Touch the metal part of the power supply case inside the computer to discharge static electricity. Always do this before you touch any parts or install components inside the computer.
5. (PowerMac 9500 only) The PowerMac 9500 includes an auxiliary fan positioned below the power supply, as shown in Figure 2.1. Lower this fan. Squeeze the upper sides of the fan with your thumb and forefinger and pull down. The fan should lower down at a 90 degree angle.
6. (PowerMac 8500 only) The PowerMac 8500 includes an expansion card clip, as shown in Figure 2.2. Remove the expansion card clip. Grasp the clip handles with your thumb and forefinger and squeeze. The clip should pull straight out of the case.

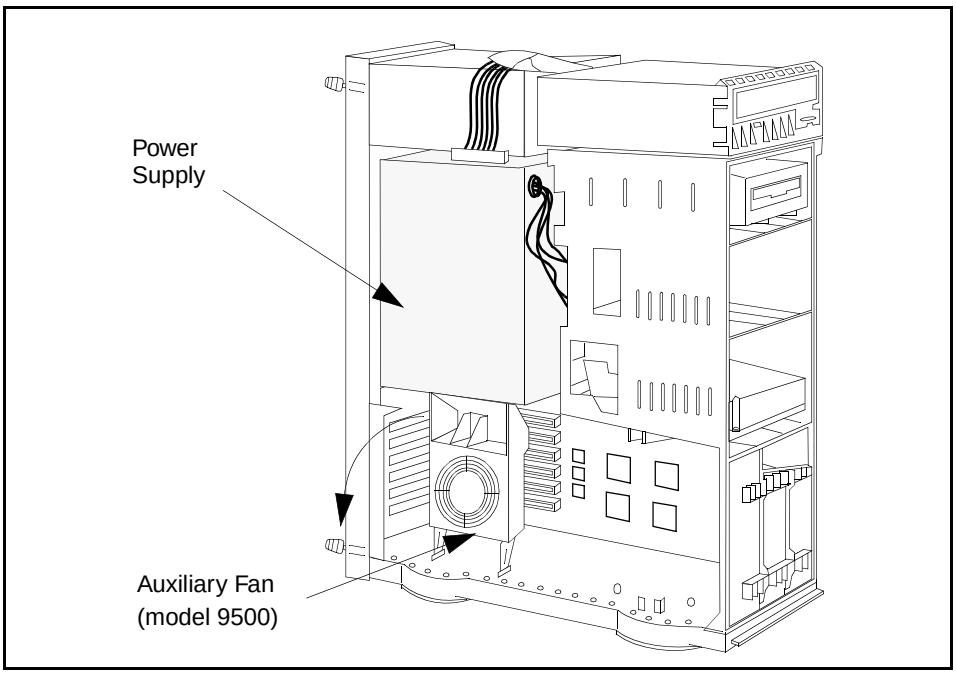

Figure 2.1 - Macintosh Chassis (model 9500)

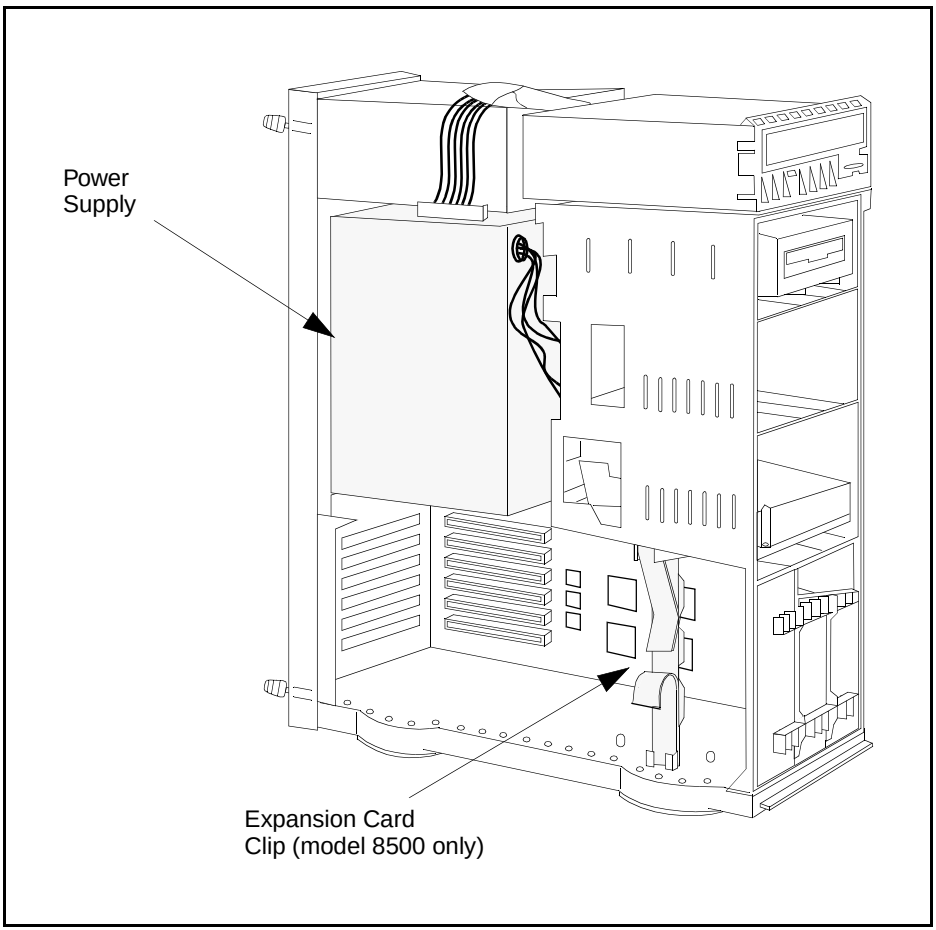

Figure 2.2 - Macintosh Chassis (model 8500)

2.4.2 Installing the Adapter Card

1. Remove the dummy backplate of the desired PCI slot from the back panel of the system.
2. Remove the FORE adapter card from its static-proof bag. Hold the card by its edges to avoid touching the card components.
3. Align the connector side of the card parallel to the PCI expansion slot.
4. Slide the mounting plate's tabs into the slots on the back panel.
5. After aligning the tabs, gently press the adapter card into place. Use of excessive force could cause damage to the FORE card or the Macintosh system unit.
6. Reassemble the Macintosh:
    - For a PowerMac 9500 type unit, go to "Reassembly Procedure (PowerMac 9500)" on page 2-8.
    - For a PowerMac 8500 type unit, go to "Reassembly Procedure (PowerMac 8500)" on page 2-8.

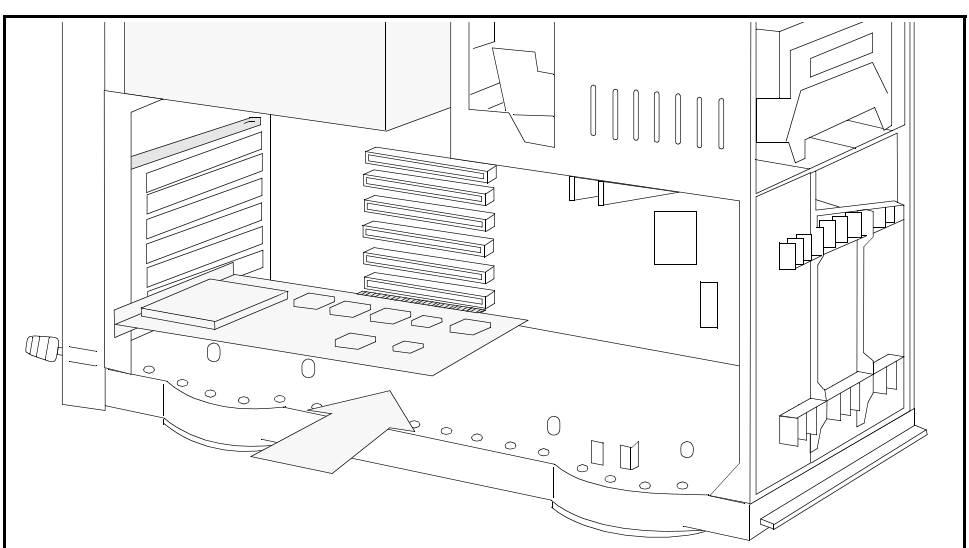

Figure 2.3 - Macintosh FORE Adapter Card Installation

2.4.3 Reassembly Procedure (PowerMac 9500)

1. Raise and snap the auxiliary fan back into position.
2. Replace the cover on the computer. Lower the cover onto the case and push it back against the rear panel.
3. Tighten the four screws on the back panel.

WARNING! Make sure the cover is replaced before restarting the computer.

2.4.4 Reassembly Procedure (PowerMac 8500)

1. Replace the expansion card clip. Put the bottom of the clip in first, and then make sure any installed PCI cards fit into the corresponding slots on the clip.

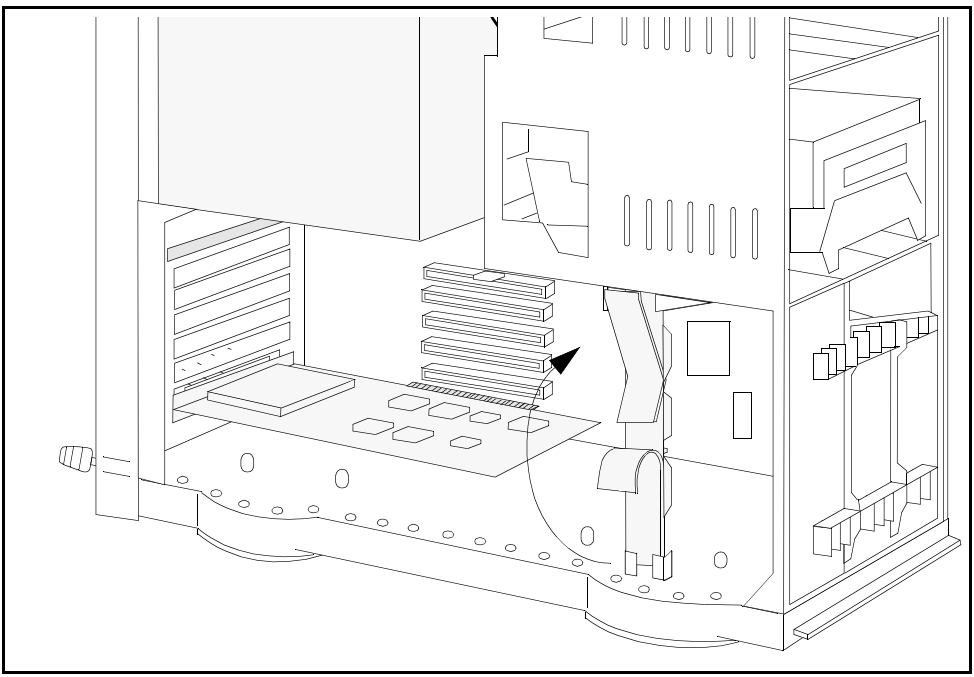

Figure 2.4 - Replacing the Card Clip

WARNING!

Make sure the expansion card clip is replaced after the installation. Failure to do so may damage your FORE card and void your warranty.

2.5 PowerMac 7200, 7500 and Similar Models

The following installation procedure applies to the Power Macintosh 7200, 7500 and similar models housed in the desktop case.

The *Technical Information* booklet that came with your Macintosh system contains information regarding the power consumption of the unit. The combined power consumption of the PCI cards must not exceed the limits specified in the booklet.

A regular flat head screwdriver is required for this procedure. Place the system on a flat, sturdy work surface that has adequate space for both the unit and cover after removal. Make sure the power to the system is OFF before opening the system box.

Leaving the computer plugged in while installing the FORE adapter grounds the computer and helps guard against problems with static electricity.

2.5.1 Opening the System Unit

1. If there is a monitor on top of the computer, disconnect it and set it aside for this procedure.
2. Put on a grounding strap, and attach it to a metal part of the Macintosh chassis.
3. Press the two release buttons under the front panel and simultaneously slide the cover forward about two inches (refer to Figure 2.5).

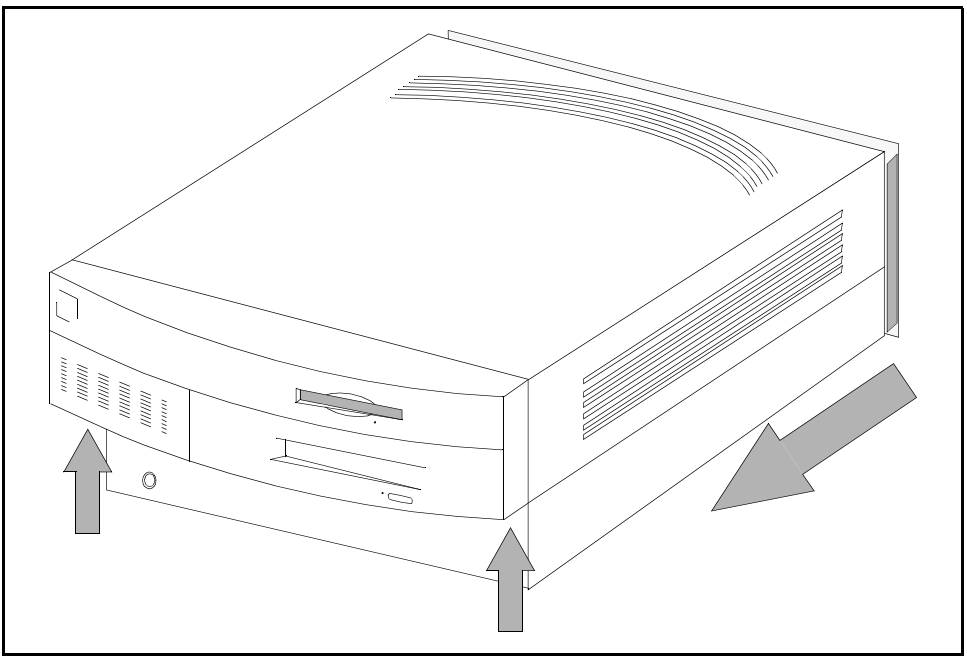

Figure 2.5 - Releasing the Cover

4. Lift the cover straight up to remove it, as shown in Figure 2.6.
5. Set the cover aside.

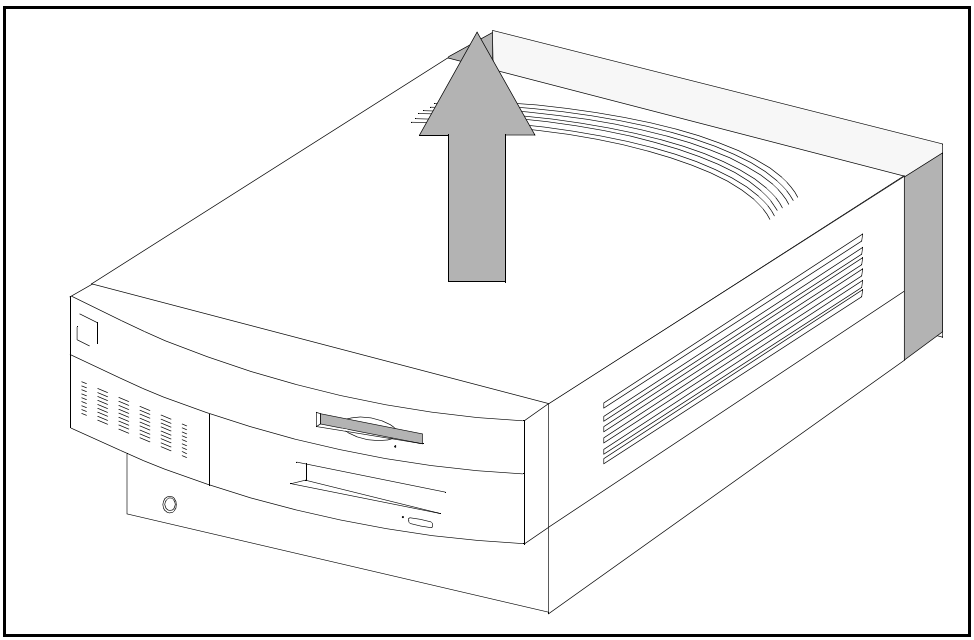

Figure 2.6 - Removing the Cover

2.5.2 Installing the PCA or LE Adapter Card

1. Touch the metal part of the power supply case inside the computer to discharge static electricity.

NOTE Always do this before touching any parts or installing any components in the unit.

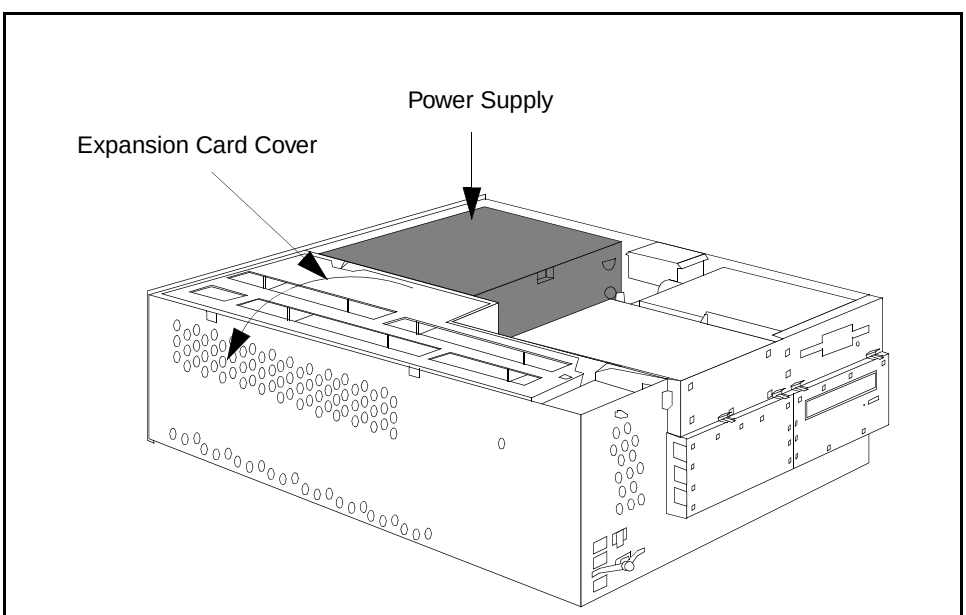

Figure 2.7 - The Expansion Card Cover and Power Supply

2. Flip the expansion card cover open.
3. Remove the port access cover from any of the unused PCI slots. Push the port access cover in with one hand while pulling it up with the other hand.

4. Remove the PCA or LE adapter card from its static-proof bag. Handle the card by its edges, being careful not to touch the connectors.
5. Align the FORE adapter card over the open slot, with the two fiber optic connectors pointing towards the backplate opening.
6. Make sure that the back of the FORE adapter (towards the front of the Macintosh) fits in the card guides.
7. Press down firmly on the adapter card to mate the connectors. Use of excessive force could cause damage to the FORE card or your system unit.

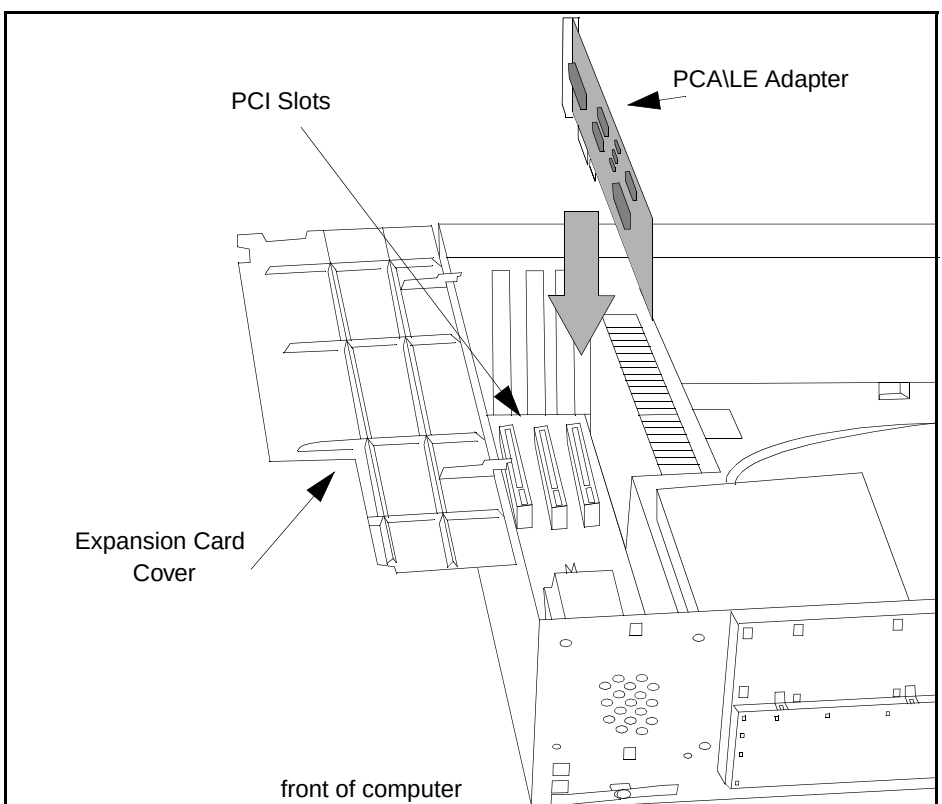

Figure 2.8 - Installing the PCA or LE Adapter Card

2.5.3 Reassembly Procedure

1. Snap the expansion card cover back into place.
2. Hold the cover above the chassis, with the cover about two inches from the back of the computer to allow for the proper alignment of the locking tabs.
3. Slide the cover towards the back of the chassis until the locking tabs are properly engaged.

Do not force the cover and chassis together. If they do not easily seat, check to assure that the locking tabs are correctly situated.

2.6 Connecting the Adapter

After installing the FORE adapter in your system, connect the appropriate cables to the receive and transmit connectors. You may then power up your Macintosh system.

Chapter 3 explains how to load the FORE ATM software onto your system. Once the software is installed, you'll be able to determine if the cables of the FORE adapter card are properly connected.

3 Software Installation

This chapter details the installation procedures for the *ForeThought* ATM adapter software and device drivers.

3.1 About the Installer

The *ForeThought* software uses the Apple Installer, which provides three installation options:

Easy Install	Enables you to automatically install all FORE software features based on the adapter card or cards installed on your Macintosh. The program defaults to Easy Install.
Custom Install	Enables you to select specific FORE software features and adapter scenarios to install on your Macintosh.
Custom Remove	Enables you to remove specific FORE software features installed on your Macintosh.

Use the pop-up menu at the top left corner of the Install FORE Software window to switch between these options.

Turn on Apple Guide to view information about the items you see on the screen.

3.2 Easy Install Software Installation Procedure

The FORE Software, Utility Files, installation and administration programs are contained on the *ForeThought* software CD.

NOTE If you must install the files from a diskette, refer to the Readme file on the CD for information about creating a Macintosh installation diskette.

To load the software onto your system:

1. Insert the *ForeThought* software CD into the system's CD-ROM drive. The `Install ForeThought` window opens on your desktop (Figure 3.1.)

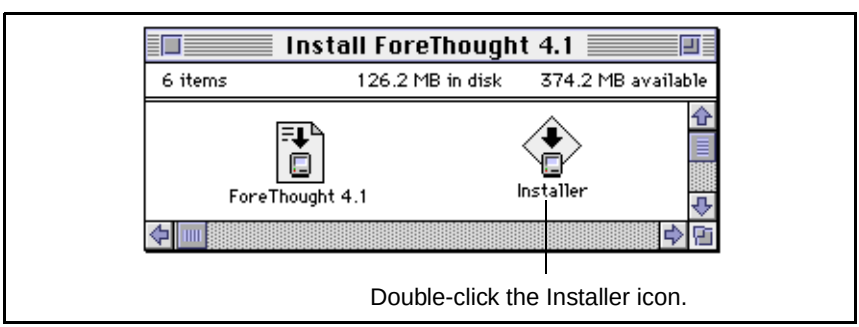

Figure 3.1 - ForeThought 4.1 Installation Window

2. Double-click on the `Installer` icon. The *ForeThought* 4.1 splash screen appears, as shown in Figure 3.2.

NOTE Do not double-click the `ForeThought 4.1` icon. *ForeThought* 4.1 requires the Installer included in the `Install ForeThought 4.1` folder. If you double-click the `ForeThought 4.1` icon, it might discover another Installer, causing a failed installation attempt. You can drag the ForeThought 4.1 icon onto the Installer icon within the `Install ForeThought 4.1` folder.

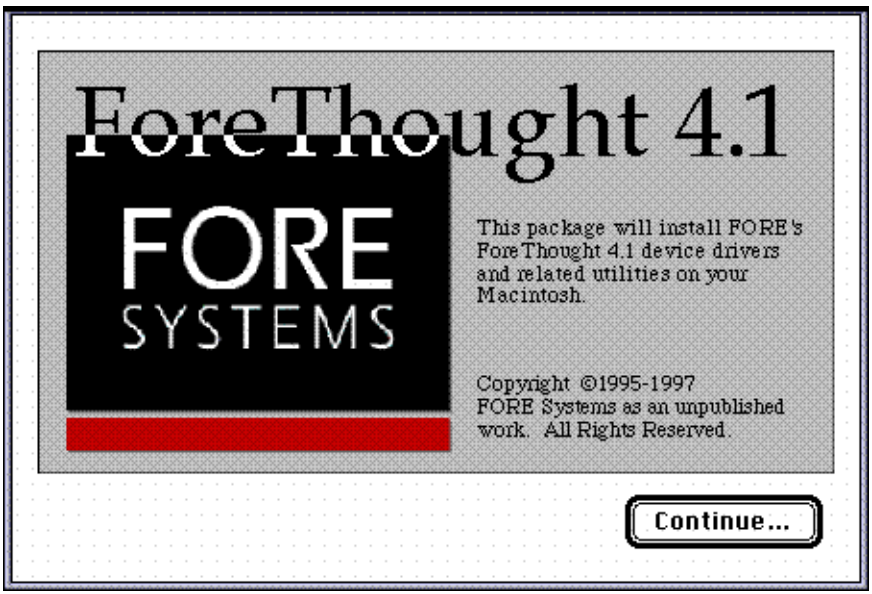

Figure 3.2 - ForeThought 4.1 Splash Screen

3. Click **`Continue`** to proceed. The `Install FORE Software` window in the default Easy Install mode appears (Figure 3.3).

   Easy Install places the FORE ATM driver in the Extensions folder under the System folder. A separate folder is created in the top directory of the hard disk for the FORE *ForeThought* Utilities, which contains the InFOREmation Center (described in Chapter 4). In addition, Easy Install in *ForeThought* 4.1 automatically removes *ForeThought* 4.0 software. If you wish to maintain both versions on your machine, you must use Custom Install described in “Custom Install Software Installation Procedure” on page 3-7.

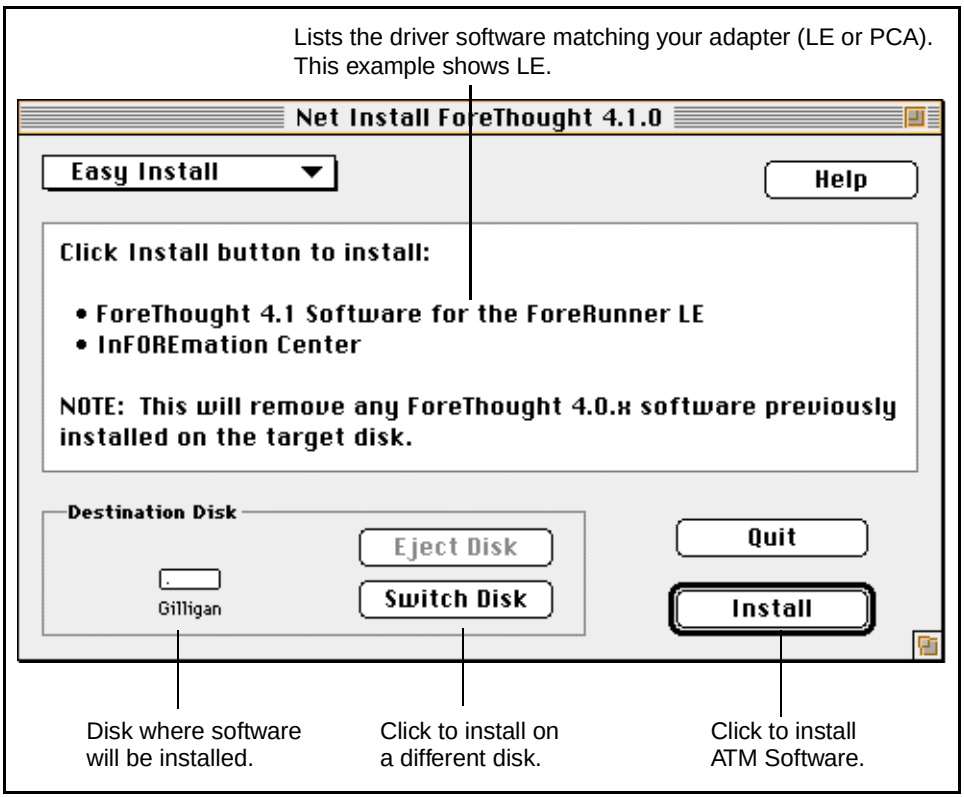

Figure 3.3 - Install FORE Software Window

NOTE Easy Install automatically determines the type of FORE adapter card you have physically installed in your machine.

4. Click **Install** and follow the instructions on your screen.

NOTE

FORE Software cannot install on an active start-up disk while other applications are running. A warning appears to let you know that other applications are running.

5. Click **Continue** to allow the system to automatically close the running applications for you, or **Cancel** to quit the install and close the applications yourself.
6. Click **OK** to return to the Install FORE Software window. If you click **Continue**, an In Progress screen, shown in Figure 3.4 appears.

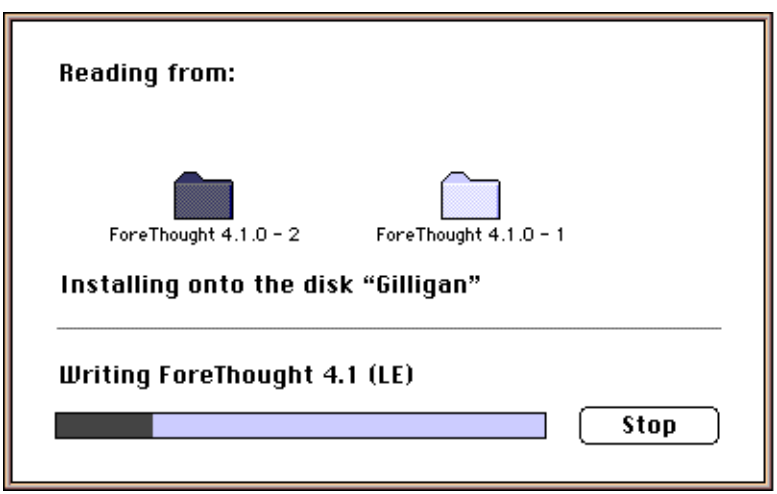

Figure 3.4 - Installation In Progress Screen

NOTE

Clicking **Cancel** at this point terminates the installation process and returns you to the Install FORE Software window.

When the installation process completes successfully, a restart prompt appears, as shown in Figure 3.5.

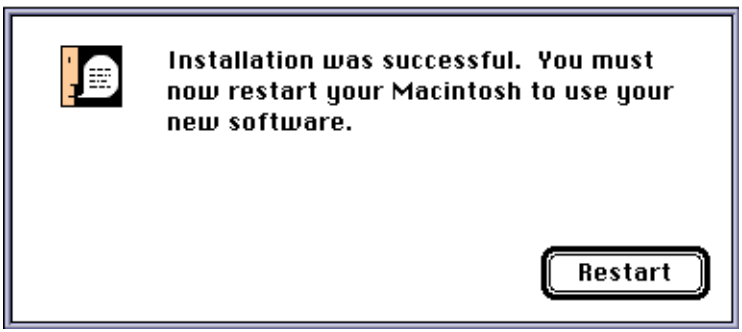

Figure 3.5 - Restart Prompt

7. Click **`Restart`** to conclude the installation.

To monitor driver information and configure parameters, use the InFOREmation Center utility, as described in Chapter 4.

3.3 Custom Install Software Installation Procedure

If you have special hardware and/or software considerations, you may want to use the Custom Install feature. Special considerations may include:

- Installing the software before installing the adapter card.
- Retaining *ForeThought* 4.0 files on your machine.

To perform a Custom Install:

1. Follow the installation procedure outlined in "Easy Install Software Installation Procedure" on page 3-2, steps 1 through 3. The `Install FORE Software` window in the default Easy Install mode appears (Figure 3.6).

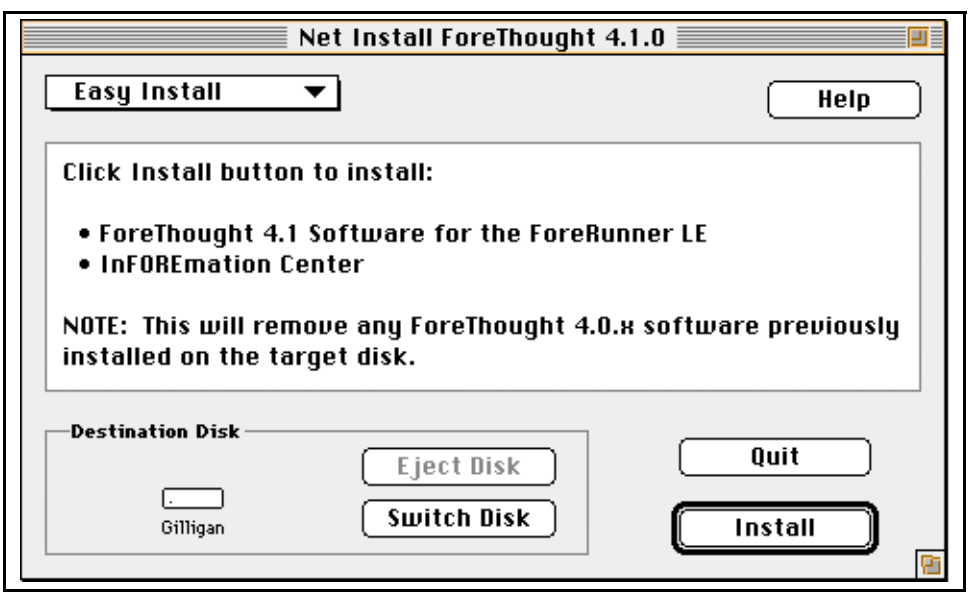

Figure 3.6 - Install FORE Software Window - Easy Install Mode

2. Click on the down-arrow of the `Easy Install` field to pull down a list of selections.

3. Highlight `Custom Install` and release the mouse button. The `Install FORE Software` window appears in Custom Install mode (Figure 3.7).

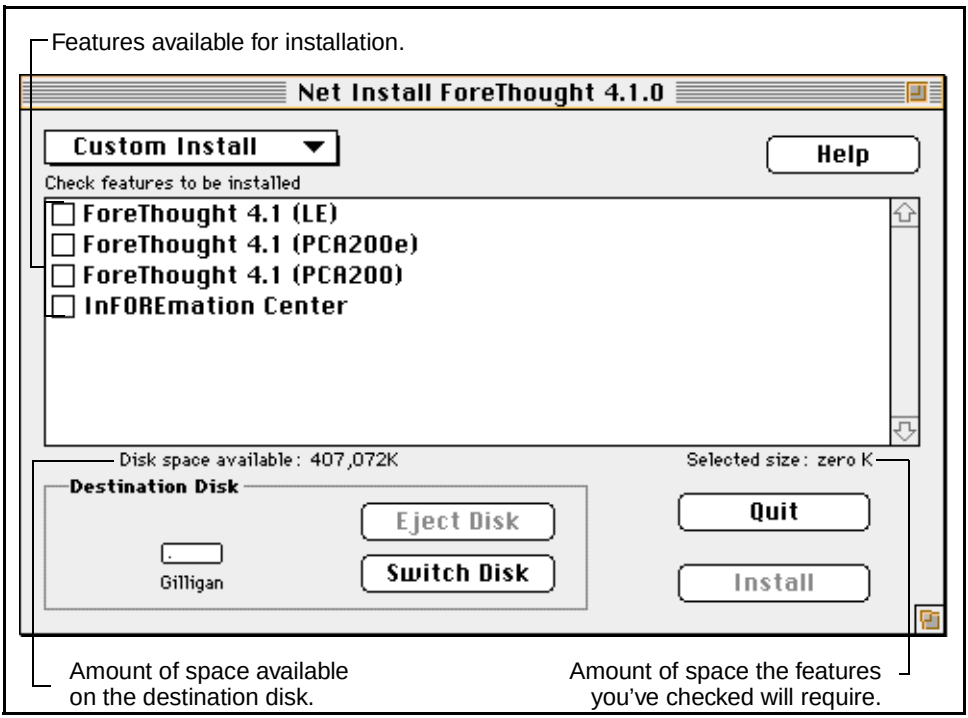

Figure 3.7 - Install FORE Software Window - Custom Install Mode

4. Click **OK** to return to the Install FORE Software window in Custom Install mode.
5. Click the checkboxes of the features you wish to install on the Destination Disk.

NOTE

Be sure to **always** click the `InFOREmation Center` checkbox when performing a Custom Install. This folder contains the InFOREmation Center utility (described in Chapter 4).

6. Click **Install** and follow the instructions on your screen.

NOTE

FORE Software cannot install on an active start-up disk while other applications are running. A prompt appears to let you know that other applications are running.

7. Click **Continue** to allow the system to automatically close the running applications for you, or **Cancel** to quit the install and close the applications yourself.
8. Click **OK** to return to the Install FORE Software window. If you click **Continue**, an In Progress screen, shown in Figure 3.8 appears.

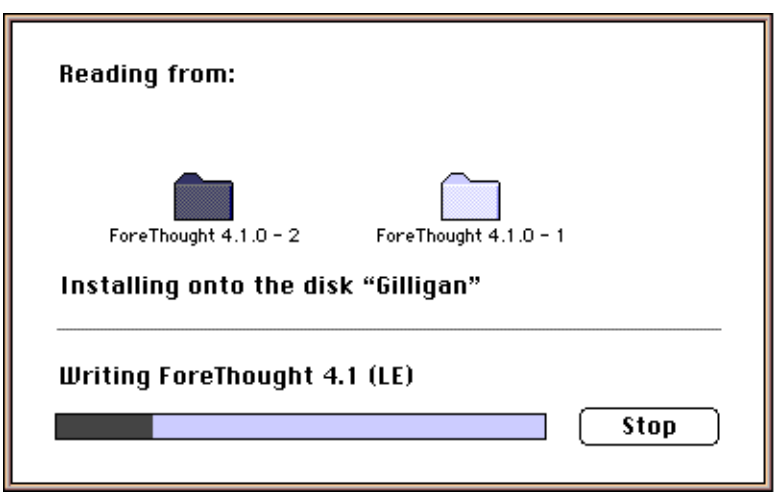

Figure 3.8 - Installation In Progress Screen

NOTE

Clicking **Stop** at this point terminates the installation process and displays the Install FORE Software window.

When the installation process completes successfully, a restart prompt appears.

9. Click **Restart** to conclude the installation.

To monitor driver information and configure parameters, use the InFOREmation Center utility, as described in Chapter 4.

3.4 Custom Remove Software Feature

You may want to remove certain components of FORE software due to changing system requirements or to manage your disk space more efficiently.

To remove FORE software installed on your Macintosh:

1. Follow the procedure outlined in "Easy Install Software Installation Procedure" on page 3-2, steps 1 through 3. The `Install FORE Software` window in the default Easy Install mode appears (Figure 3.9).

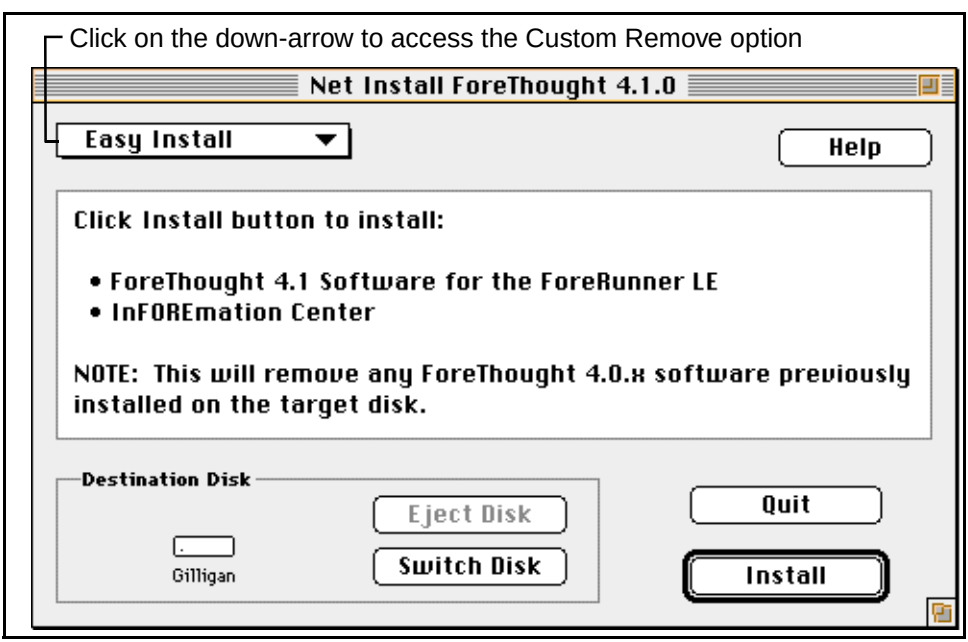

Figure 3.9 - Install FORE Software Window - Easy Install Mode

2. Click on the down-arrow of the `Easy Install` field to pull down a list of selections.
3. Highlight `Custom Remove` and release the mouse button. The Install FORE Software window appears in Custom Remove mode (Figure 3.10).

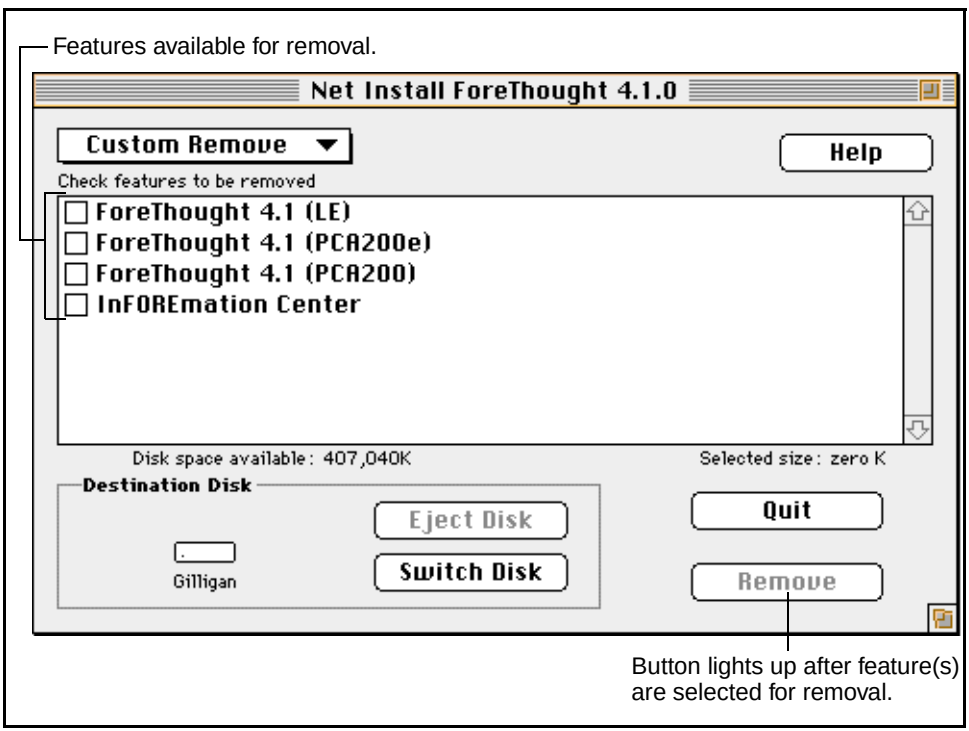

Figure 3.10 - Install FORE Software Window - Custom Remove Mode

4. Click **OK** to return to the Install FORE Software window in Custom Remove mode.
5. Click the checkboxes of the features you wish to remove from the Destination Disk.

6. Click **Remove** and follow the instructions on your screen.

   When the removal process completes successfully, a restart prompt appears, as shown in Figure 3.11.

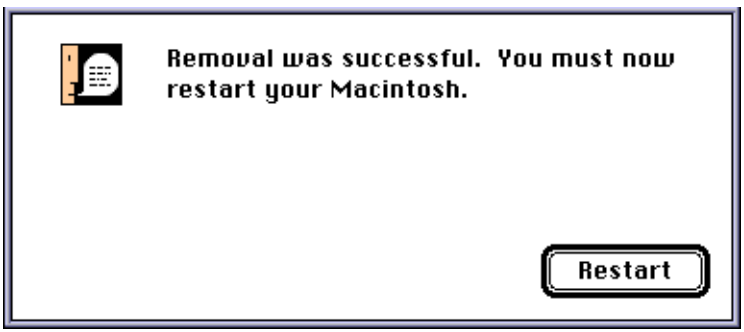

Figure 3.11 - Restart Prompt

7. Click **Restart** to conclude the removal procedure.

4 Network Interface Administration

This chapter provides network configuration information for the FORE ATM Macintosh driver, including:

- Using the InFOREmation Center
- Configuring your driver
- Configuring your workstation to use AppleTalk and TCP/IP over FORE's ATM software

This chapter assumes a working knowledge of TCP/IP, and, in particular, IP addressing and routing issues.

4.1 The InFOREmation Center

The InFOREmation Center is a cross-platform user interface which provides the management link to the Macintosh LAN Emulation 1.0 driver. Through it you can manage driver configuration and display driver status information.

The InFOREmation Center interface consists of two information windows:

- The VLAN Information window
- The Adapter Information window

which allow you to:

- View and edit information about your current VLAN connections and LAN Emulation (LANE) services

and the Driver Preferences menu which allows you to:

- Configure MTU size and OC3 options
- Configure the local ATM address
- Configure signalling version
- Configure the LECS's ATM address
- Automatically select an ELAN
- Manually add an ELAN

4.1.1 Starting the InFOREmation Center

To start the InFOREmation Center, double-click on the InFOREmation Center icon in the *InFOREmation Center* folder, shown in Figure 4.1.

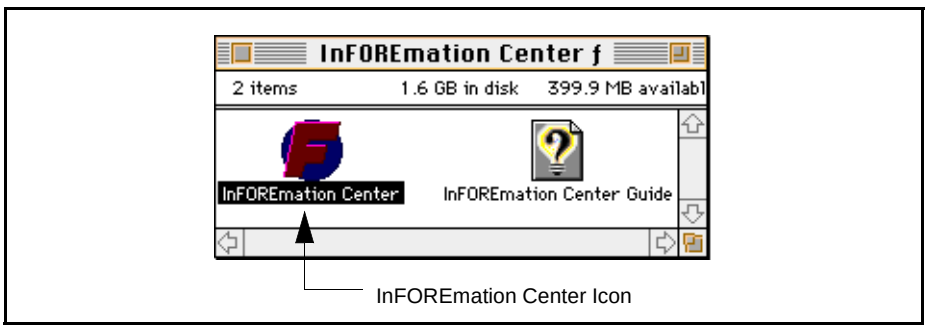

Figure 4.1 - InFOREmation Center Folder

4.1.2 Menus in the InFOREmation Center

The menus presented by the InFOREmation Center are:

Apple Icon - Allows you to display the About InFOREmation Center splash screen.

File - Allows you to **Close** the InFOREmation Center if it's open, or **Quit** it at the end of a session.

Edit - Allows you to **Undo**, **Cut**, **Copy**, **Paste**, and **Clear** text within dialogs containing edit fields; or select **Driver Preferences...** to configure the driver parameters.

Windows - Allows you to select the **VLAN Information** (also displayed by default when the application starts) or **Adapter Information** windows to view and edit the VLAN or adapter parameters.

Options - Allows you to **Set Refresh Intervals...** or **Refresh Windows Now** for either the VLAN or Adapter parameters, or **Clear Adapter Statistics** to zero at any time.

4.2 The VLAN Information Window

Figure 4.2 shows the VLAN Information window. It provides a wide range of information about current ATM connections and ELANs. The VLAN Information window is accessed through the `Windows` menu.

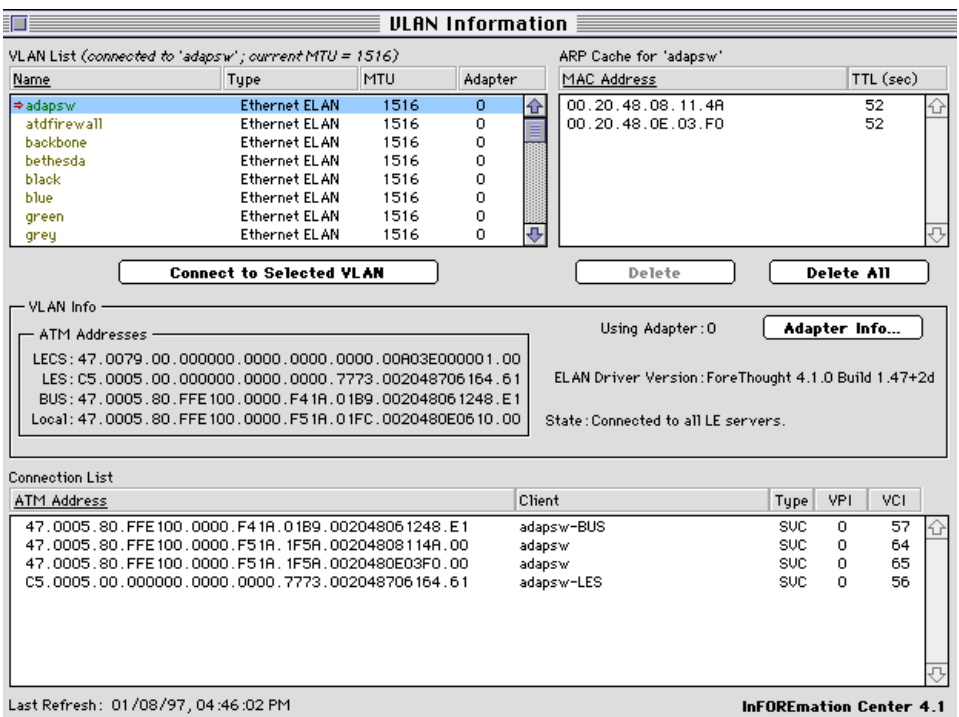

Figure 4.2 - The VLAN Information Window

From the VLAN Information window, you can:

- View the ELANs available to this machine. The ELANs are color-coded to correspond with their individual connectivity state:

Green	Full connectivity: connected to the LES and BUS.
Yellow	Partial connectivity: knowledge of the LES address.
Red	No knowledge of the LES address.

- Select the ELAN to be used by single-clicking on it in the list of ELANs and clicking the **Connect to Selected ELAN** button. The ELAN that is currently used is indicated by the red => arrow symbol.
- View ARP Cache entries for an ELAN by single-clicking on it in the list of ELANs.
- View information about the LEC and the currently-used ELAN in the VLAN Info for'xxx' portion of the window.
- View information about all connections currently in use by the host in the Connection List portion of the window.

4.2.1 The VLAN List

This list displays information about the ELANs the machine can access, as shown in Figure 4.3.

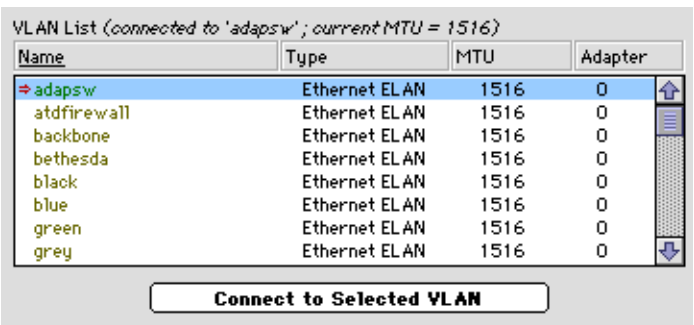

Figure 4.3 - VLAN List Portion of the VLAN Information Window

Name The `name` assigned to a specific ELAN. The name is color coded as described on page 4-4.

Type Indicates `Ethernet`, `Token Ring`, or `Unknown` (if the Type was not indicated by the LECS).

MTU Maximum Transmission Unit indicates, in bytes, the largest packet data unit size that is transmittable. The four fixed values for MTU—`1516`, `4544`, `9188`, and `18190`—are set using the Adapter Configuration submenu under the Driver Configuration menu. This field indicates `Unknown` if the MTU size was not indicated by the LECS.

Adapter Indicates the FORE adapter that the ELAN is using. The current release will always default to `0`.

All lists in the VLAN Information window are sortable by the list heading. ***Single-clicking*** on `Name` will re-sort the entries by name, `Type` by type, etc.

Single-clicking to highlight an ELAN's line entry in the VLAN List displays the corresponding ARP Cache and VLAN Information.

4.2.1.1 Connect to Selected VLAN Button

Single-clicking an ELAN entry displays pertinent information about that ELAN. Clicking the Connect to Selected VLAN button establishes the connection to the VLAN. This connection is indicated by the red => arrow symbol to the left of the VLAN name.

The Macintosh host can only join Ethernet ELANs with an MTU size that matches that set on the host (as described in “Configuring MTU Size” on page 4-23).

4.2.1.2 Connecting to an ELAN with “Unknown” Type or MTU Size

You can attempt to connect to a VLAN that is listed with an Unknown Type or MTU size (indicating that the LECS did not specify the type or MTU size of the ELAN). However, if the MTU size of that ELAN does not match that specified on your host, the host will not complete the connection, in order to avoid conflicts due to MTU size.

4.2.2 ARP Cache

This table displays the MAC Addresses for other hosts on the same ELAN with which this host is currently communicating, as shown in Figure 4.4. The window's header identifies the VLAN Name.

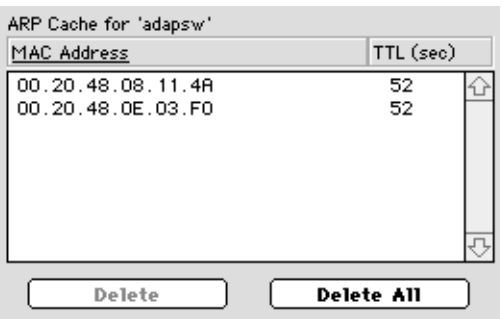

Figure 4.4 - ARP Cache Portion of the VLAN Information Window

MAC Address The MAC address of the host on the specified ELAN.

TTL (sec) "Time to Live" or the amount of time, in seconds, allotted for the ARP cache entry. If no data traffic moves across the cache entry in the allotted time, the cache entry disappears from the ARP Cache window.

Single-clicking a line entry in the ARP Cache window flags, with a single arrow **->**, a corresponding entry in the Connection List (see below.)

4.2.2.1 Delete Button

This button, when single-clicked, removes the highlighted entry from the ARP Cache, and is active only after an ARP Cache entry has been highlighted.

4.2.2.2 Delete All Button

This button, when single-clicked, removes all ARP Cache entries for a specific VLAN, and is active only when there is at least one entry in the ARP Cache.

4.2.3 VLAN Info Window

This window displays general information about the selected VLAN.

4.2.3.1 ATM Address Window

The ATM Address window, shown in Figure 4.5, provides the ATM addresses of the VLAN's LANE service components as well as the LEC itself.

LECS The LAN Emulation Configuration Server.

LES The LAN Emulation Server.

BUS The Broadcast and Unknown Server.

Local The LAN Emulation Client (i.e., this machine.)

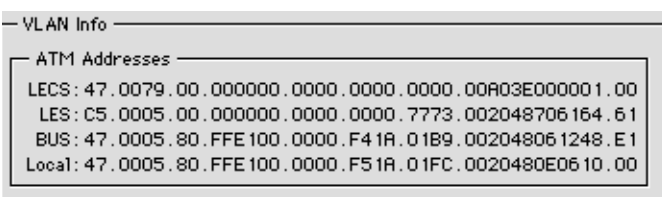

Figure 4.5 - ATM Address Window

4.2.3.2 VLAN Information Fields

These fields, shown in Figure 4.6, provide global information about the LEC, ELANs, adapters, and driver.

Using Adapter Field — Indicates the installed adapter in use. For the current release, this field defaults to `0`.

ELAN Driver Version — Indicates the driver version number.

Failover Index — Indicates the index number and range of a failover ELAN the LEC may elect to join to facilitate a resilient LES and BUS. If the selected ELAN is not a failover ELAN, this field will not be displayed.

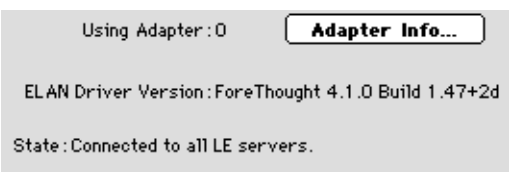

Figure 4.6 - VLAN Information Fields

Discovered ELAN Name Indicates (when displayed) that an ELAN's actual name differs from the one known to the LEC. This field is not displayed if the actual name matches the configured name of the ELAN.

State Indicates the last operation of the LEC. Possible messages are listed in Section 4.2.3.3 and described in greater detail in Appendix B, "Troubleshooting".

4.2.3.3 Messages in the State Field

The following messages may be displayed in the State field. The LEC is successfully communicating with the LES and the ELAN, the message

`Connected to all LE servers`

is displayed. If you have not yet attempted to join the ELAN, the message `Suspended (not started)` is displayed. The following messages describe a temporary status of the LEC when it is waiting for a response from one of the LANE services:

`Waiting for LECS connection`

`Waiting for ATM address`

`Trying LECS request on PVC 17`

`Waiting for LECS response on SVC`

`Waiting for LES connection`

`Waiting for LES JOIN response`

`Waiting for BUS connection`

`Waiting for BUS PMP connection`

If the specified attempt fails, refer to Appendix B, "Troubleshooting" for detailed explanations of the nature of each problem and possible solutions.

4.2.3.4 Adapter Info... Button

This button, when single-clicked, displays the Adapter Information window. This window presents the information for the adapter associated with the highlighted VLAN. The Adapter Information window is also accessible through the `Windows` menu of the InFOREmation Center by clicking on `Adapter Information`.

4.2.4 Connection List

This window displays all of the ATM connections currently in use by this host, as shown in Figure 4.7. Selecting an entry in the ARP Cache window flags a corresponding connection entry in the Connection List with an arrow ->. The Connection List will auto-scroll to the relevant entry if it is not within view. Connection List entries **cannot be selected** within their own window—they are accessible only through the ARP Cache window.

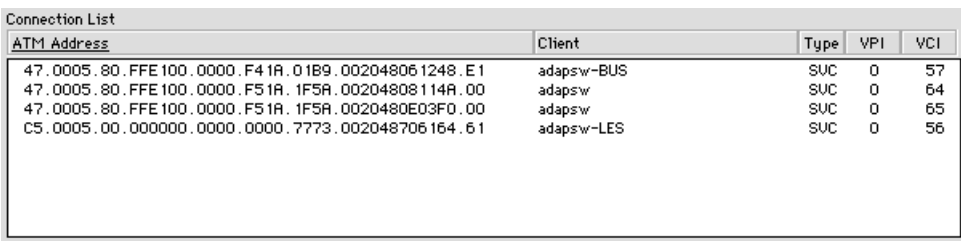

Figure 4.7 - VLAN List Portion of the VLAN Information Window

ATM Address The ATM Address of the connection.

Client The ELAN the connection resides on, if applicable.

Type Indicates connection types. SVC for switched virtual circuit or PVC for permanent virtual circuit.

VPI Virtual Path Identifier.

VCI Virtual Channel Identifier.

All connections in the *ForeThought* 4.1 release use AAL5.

4.2.4.1 Unknown Connection Status

If a connection is currently being set up or removed, InFOREmation Center cannot determine the VCI and displays a question mark (?) in the VCI field, as shown in Figure 4.8.

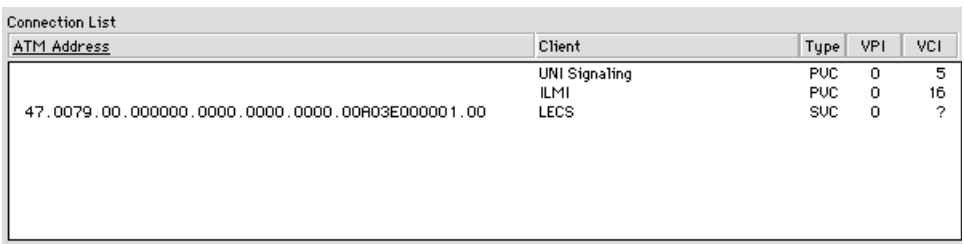

Figure 4.8 - Connection List with Unknown VCI

4.3 Adapter Information Window

The Adapter Information window, shown in Figure 4.9, displays general adapter information and data statistics for the adapter connection. The window is opened by either selecting **`Adapter Information`** from the `Windows` menu in the InFOREmation Center or single-clicking the **`Adapter Info`** button on the VLAN Information window.

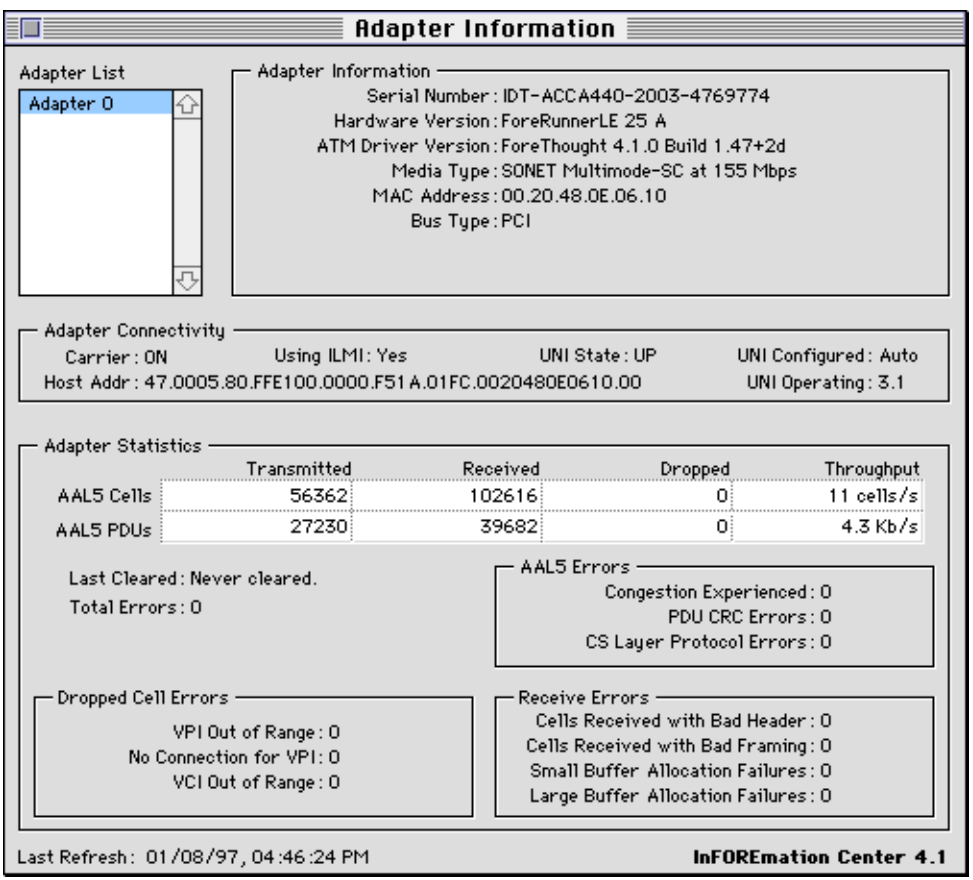

Figure 4.9 - Adapter Information Window

4.3.1 Adapter List

This list indicates the number assigned by the system to the adapter, as shown in Figure 4.10. In the current version, this list is defaulted to `Adapter 0`.

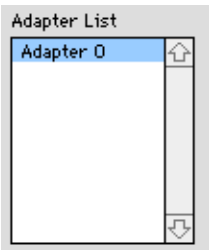

Figure 4.10 - Adapter List Table

4.3.2 Adapter Information Table

This table displays general information about the adapter specified in the Adapter List field, as shown in Figure 4.11. This information is automatically recorded in this field when the system is booted up. In the current version, the information displayed in the Adapter Information field will always refer to default Adapter 0.

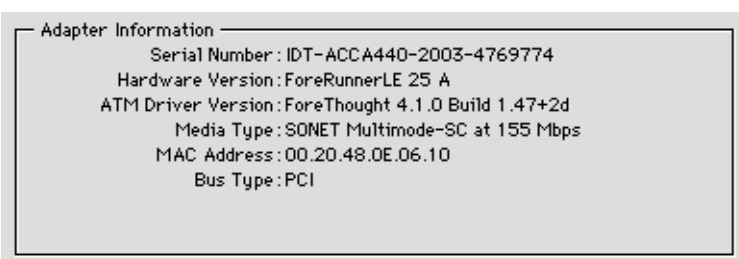

Figure 4.11 - Adapter Information Table

Serial Number The adapter card's encoded serial number which is also stencilled on its face.

Hardware Version The adapter card's name and model.

ATM Driver Version The driver version number. For the current release, this field defaults to `4.1.0`.

Media Type The physical media or cable type that connects the adapter to the switch. The FORE adapters are available for a variety of media.

MAC Address The MAC address of the driver.

Bus Type The Bus type, `PCI`.

OC3 Options Framing Type and Empty Cell Insertion options, if a PCA-200EMAC adapter with an OC3 connector is used. The field string has four possibilities: `SONET`, `Unassigned`; `SONET, Idle`; `SDH, Unassigned`; or `SDH, Idle`.

`SONET` and `SDH` indicate the possible framing types.

`Unassigned` indicates that the adapter inserts unassigned cells when the cells are empty. This is the ATM Forum and ANSI standard.

`Idle` indicates that the adapter inserts idle cells when the cells are empty. This is the ITU-T standard.

Typically, `SONET, Unassigned` is used in the United States and `SDH, Idle` is used in Europe.

4.3.3 Adapter Connectivity Table

This table displays general adapter connectivity information including the machine's connection status, its ATM address, and the configuration method.

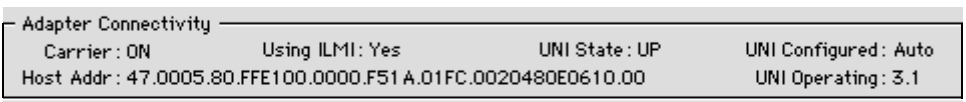

Figure 4.12 - Adapter Connectivity Table in Adapter Information Window

Carrier — `On` means the driver is successfully communicating with the network and is physically installed; `Off` means the driver is not communicating with the network and that the physical connection should be checked.

Using ILMI — `Yes` indicates that the driver is using the ILMI protocol; `No` means that ILMI has been deactivated for the driver.

UNI State — `UP` indicates there is signalling to the switch. `DOWN` indicates there is not.

Host Addr — The ATM address of the LEC. If ILMI has not found it, the field will read `Unknown (attempting to register)` until it is located.

UNI Configured — Automatically entered as `3.0` or `3.1` if connection is manually configured; `Auto` if configured through ILMI.

UNI Operating — Either `3.0` or `3.1` if UNI version is known; `Auto` if ILMI is currently determining which version to use.

4.3.4 Adapter Statistics Table

This table displays statistical information for ATM traffic and transmission errors, as shown in Figure 4.13.

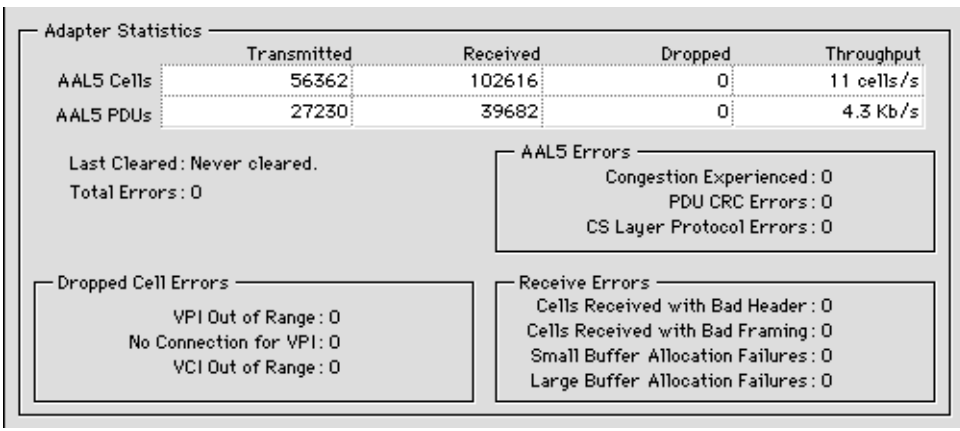

Figure 4.13 - Adapter Statistics Table

The statistical information includes cells and packet data units (PDUs):

- Transmitted
- Received
- Dropped
- Throughput

Error statistics are broken down into three categories:

- AAL Type 5
- Dropped Cell
- Receive

AAL Type 5 Errors:

- Congestion Experienced — Traffic Overflow
- PDU CRC Errors — Data Error Checking
- CS Layer Protocol Errors — PDU errors

Dropped Cell Errors:

- VPI Out of Range Drops
- No Connection for VPI Drops
- VCI Out of Range Drops

Receive Errors:

- Cells Received with Bad Header
- Cells Received with Bad Framing
- Small Buffer Allocation Failures
- Large Buffer Allocation Failures

4.4 Refresh Options

The InFOREmation Center's Refresh Options allow you to set window refresh intervals, implement immediate data refreshes, and clear statistical information at any time. These options are accessed through the `Options` menu of the InFOREmation Center.

4.4.1 Setting Refresh Intervals

Use the Set Refresh Interval dialog, shown in Figure 4.14, to set how often the InFOREmation Center automatically updates its displayed information.

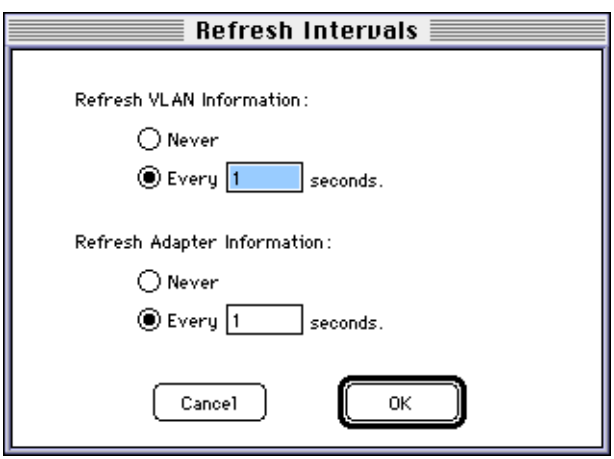

Figure 4.14 - Set Refresh Interval Dialog

To set the Refresh Intervals:

1. Select the `Set Refresh Intervals...` menu option from the Options menu. The Set Refresh Intervals dialog box is displayed, as shown in Figure 4.14.
2. Select either the VLAN `Information` or `Adapter Information` field by clicking the appropriate button.

3. Enter a positive integer value into the selected field. (The default interval is 10 seconds.)
4. Click **OK** to implement the settings or **Cancel** to withdraw the changes and revert back to the original settings.

You may choose to not refresh one or both windows by clicking on the appropriate **Never** button.

4.4.2 Refresh Windows Now

Use the **Refresh Windows Now** menu option to immediately update data, as opposed to waiting for the Refresh interval as described in the previous section.

To refresh a window:

1. Select the Refresh Windows Now option from the Options menu.
2. Release the mouse button. The window is refreshed.

4.4.3 Clear Adapter Statistics

Use the **Clear Adapter Statistics** menu option to clear the statistical information displayed in the Adapter Statistics table. This menu option can be selected only when the Adapter Information window is displayed onscreen.

To clear adapter statistics:

1. Select the Clear Adapter Statistics menu option from the Options menu.
2. Release the mouse button. The adapter statistics are reset to zero.

The date and time the adapter statistics were last cleared are displayed in the Last Cleared field on the Adapter Information window. If they have never been cleared, Never cleared is displayed in this field.

4.5 Configuring Your Driver

After installing the *ForeThought* 4.1 software, you may need to configure the adapter drivers. You will only need to do this if the default values for the driver parameters are not acceptable for your site.

You must configure the drivers if one or more of the following are true:

- You are not using the default MTU size of 1516
- You are using SDH framing and require Idle empty cell insertion
- You are not using ILMI. In this case you must manually configure the host's ATM address and UNI version (if not using UNI 3.0)
- You are not using the well-known LECS address or PVC (0,17). In this case you must manually configure the LECS address.
- You are not using the LECS. In this case you must manually enter the name of the ELAN to which the driver connects and the LES's ATM address

Contact your system administrator to determine if the default values are acceptable and values for any parameters you may have to configure.

4.5.1 Adapter Configuration

The Adapter Configuration tab, shown in Figure 4.15, allows you to configure several adapter driver settings. This tab is accessed through the `Edit` menu of the InFOREmation Center under the `Driver Preferences...` menu selection.

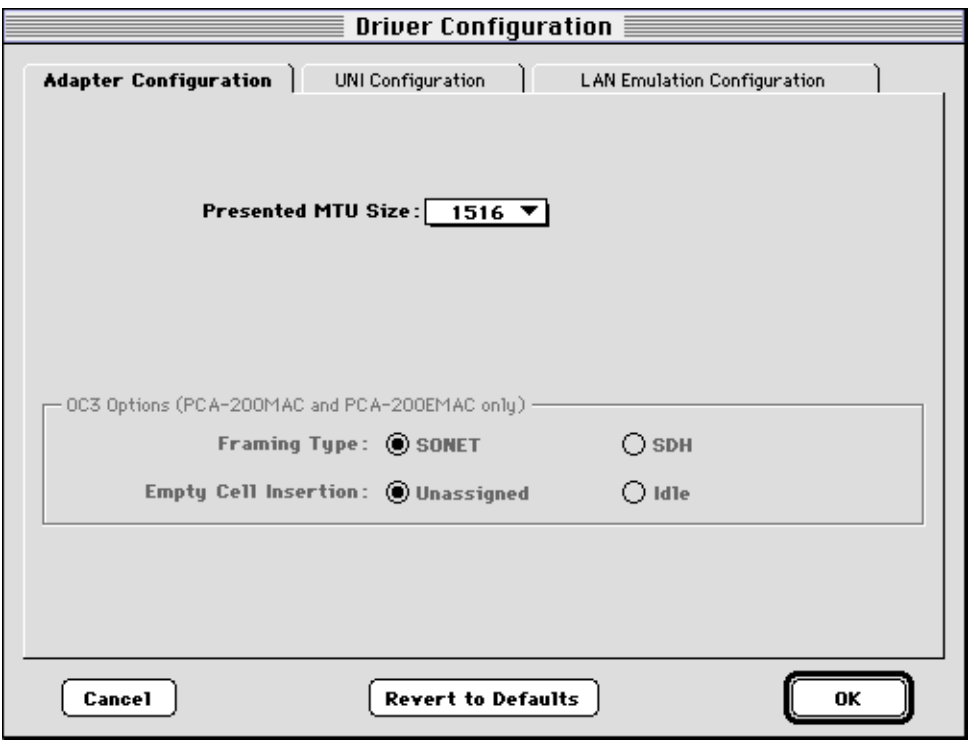

Figure 4.15 - Adapter Configuration Tab

4.5.1.1 Configuring MTU Size

This field allows you to set the MTU size in bytes via a pull-down menu. MTU sizes for available VLANs are specified in the VLAN List. In nearly all cases, the preferred MTU setting will be 1516 bytes. You can only join those VLANs with MTU sizes matching the setting specified through this tab.

To modify this setting to join a VLAN, use the following procedure:

1. Click `Driver Preferences...` on the `Edit` menu. The Adapter Configuration tab appears, as shown in Figure 4.15.
2. Click on the down-arrow of the `Presented MTU Size` field to pull down a list of selections.
3. Highlight the appropriate MTU size value and release the mouse button. The selected value will now appear within the tab.
4. Click **`OK`** to proceed. A prompt appears, indicating that you must restart your machine for these changes to take effect.
5. Click **`OK`** to proceed. The Driver Configuration screen disappears.
6. Restart the machine to implement changes.

Click the **`Cancel`** button anytime to quit the Adapter Configuration tab. Click the **`Revert to Defaults`** button to return to the 1516 byte default setting.

4.5.1.2 Configuring OC3 Options

This field allows you to set the optical carrier framing (SONET or SDH) and empty cell insertion (Unassigned or Idle) options, if you are using a PCA adapter with an OC3 connector. These options should be set to correspond to the network preferences as directed by your system administrator.

To modify these settings use the following procedure:

1. Click Driver Preferences... on the Edit menu. The Adapter Configuration tab appears.
2. Click the buttons of the OC3 options you wish to set.
3. Click **OK** to proceed. A prompt appears, indicating that you must restart your machine for these changes to take effect.
4. Click **OK** to proceed. The Driver Configuration screen disappears.
5. Restart the machine to implement changes.

Click the **Cancel** button anytime to quit the Adapter Configuration tab. Click the **Revert to Defaults** button to return to the original settings.

4.5.2 UNI Signalling Configuration

The UNI Configuration tab, shown in Figure 4.16, allows you to configure the LEC's ATM address automatically or manually and the UNI signalling version in the same manner. This tab is accessed through the `Edit` menu of the InFOREmation Center under the `Driver Preferences...` menu selection.

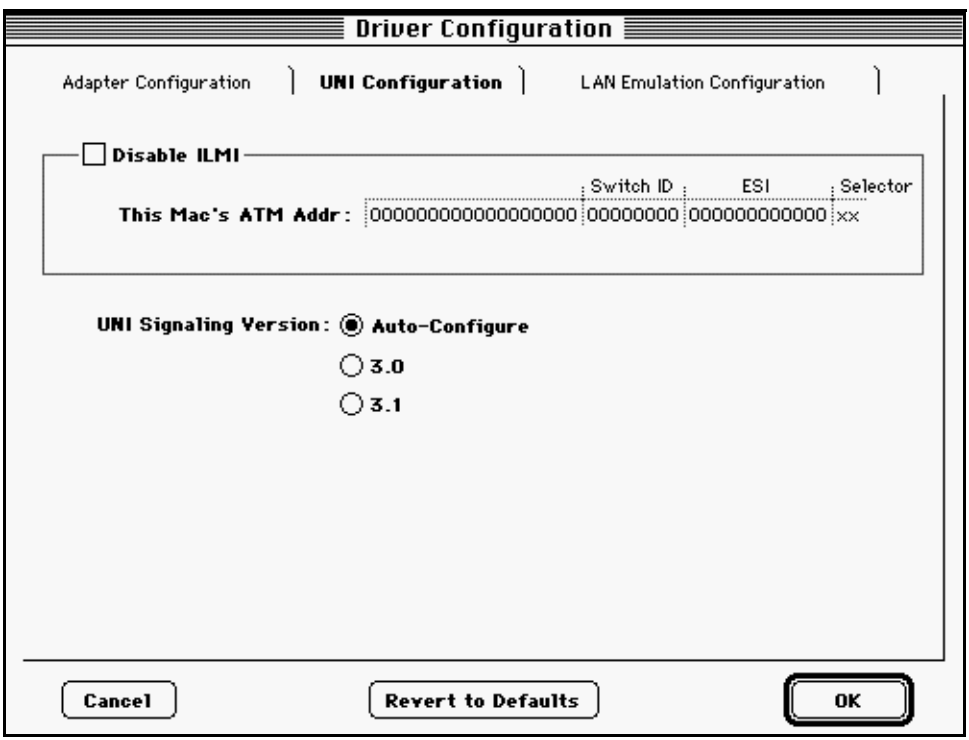

Figure 4.16 - UNI Configuration Tab

4.5.2.1 Configuring the LEC's ATM Address

This field allows you to configure the LEC's ATM address (in NSAP format) either automatically (the default method) or manually. To manually configure the LEC's ATM address use the following procedure:

1. Click `Driver Preferences...` on the `Edit` menu. The Driver Configuration window appears.
2. Click the UNI Configuration tab as shown in Figure 4.16. This is shown in default mode, i.e., ILMI is enabled.
3. Specify whether or not to use ILMI address registration. If you choose not to use ILMI registration (which provides automatic configuration) and want to manually type the ATM address supplied by your system administrator, click on the **`Disable ILMI`** button. The prompt shown in Figure 4.17 appears, if you have selected the `Auto-Configure` option for UNI.

Figure 4.17 - ILMI Deactivation Alert Screen

4. Click **`OK`** to proceed.

5. An "X" will appear in the `Disable ILMI` checkbox and `This Mac's ATM Addr:` field is highlighted. Enter the ATM address in this field. Note that this field has a few special properties:
    - Each part of the address (prefix, switch ID, End System Identifier) is a separate field.
    - As you finish entering one part of the address, you are automatically advanced to the next part. You don't have to tab to continue the next part of the address.
    - If you are copying the entire ATM address from elsewhere, you can copy it into the first part of address field, and all parts are copied to their respective areas automatically.
    - The selector byte is generated automatically and cannot be specified.
6. Click **OK** when you have finished entering the ATM address. The prompt shown in Figure 4.18 appears.

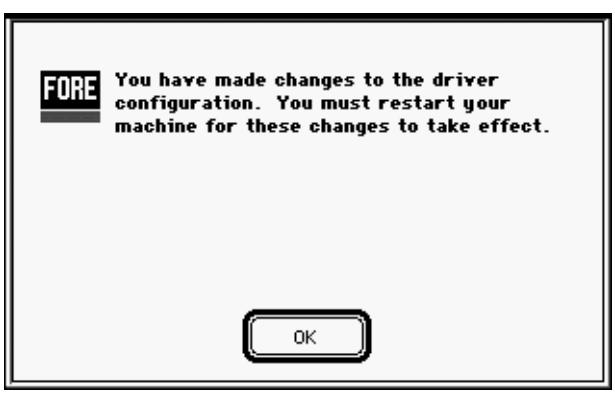

Figure 4.18 - Driver Configuration Change Alert Screen

7. Click **OK** to proceed. The Driver Configuration screen disappears.
8. Restart the machine to implement changes.

Click the **Cancel** button anytime to quit the UNI Configuration tab. Click the **Revert to Defaults** button to return to the default settings.

4.5.2.2 Configuring UNI Signalling Version

This field allows you to select a UNI signalling version. The default is **Auto-Configure**. Choosing Auto-Configure causes the driver to communicate with the switch via ILMI to determine the appropriate UNI version.

To manually configure UNI signalling use the following procedure:

1. Click `Driver Preferences...` on the `Edit` menu. The Driver Configuration window appears.
2. Click the UNI Configuration tab as shown in Figure 4.16.
3. Click either the `3.0` or `3.1` button.
4. Click **OK**. A prompt appears, indicating that you must restart your machine for these changes to take effect.
5. Click **OK** to proceed. The Driver Configuration screen disappears.
6. Restart the machine to implement changes.

Click the **Cancel** button anytime to quit the Adapter Configuration tab. Click the **Revert to Defaults** button to return to the original settings.

4.5.3 LAN Emulation Configuration

The LAN Emulation Configuration tab, shown in Figure 4.19, allows you to determine how to communicate with the LECS (if your site is using one), configure a LECS address, and add the manual ELAN. This tab is accessed through the `Edit` menu of the InFOREmation Center under the `Driver Preferences...` menu selection.

When using the LECS, the host relies on the information from the LECS to determine the ELAN-type and MTU size for the ELAN. The host can only join an ELAN if it is an Ethernet ELAN and the MTU size matches that set on the host (as described in “Configuring MTU Size” on page 4-23).

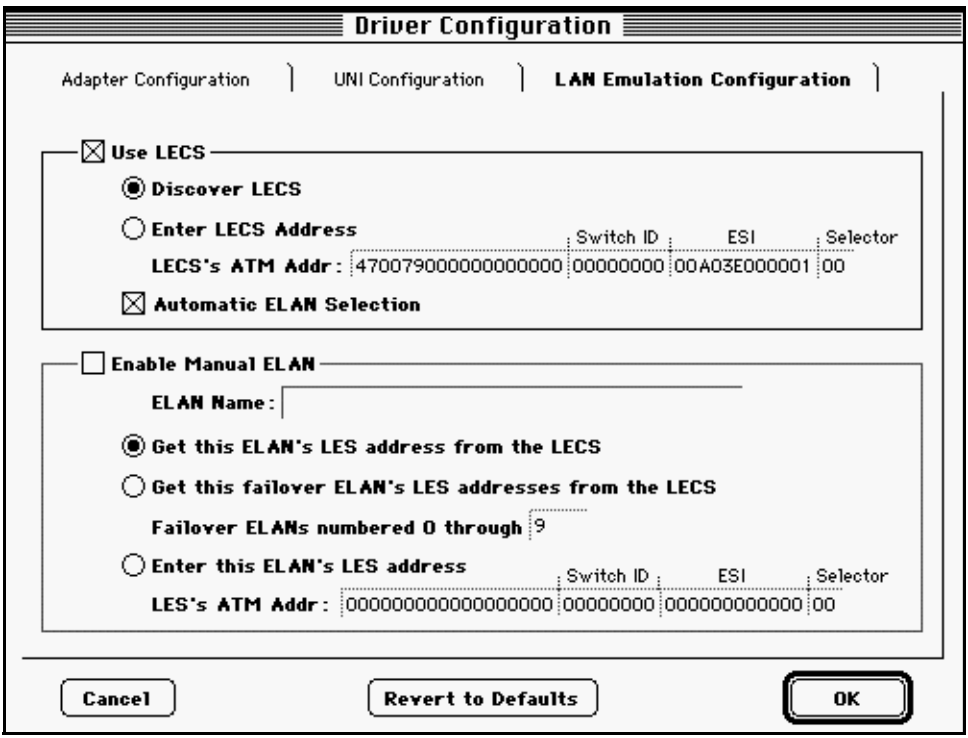

Figure 4.19 - LAN Emulation Configuration Tab

4.5.3.1 Configuring the LECS's ATM Address

This field allows you to configure the LECS's ATM address (in NSAP format.)

To configure the LECS's ATM address use the following procedure:

1. Click `Driver Preferences...` on the `Edit` menu. The Driver Configuration window appears.
2. Click the LAN Emulation Configuration tab as shown in Figure 4.19. This is shown in default mode, i.e., `Use LECS` is enabled.

If your network doesn't use a LECS (as might be determined by your system administrator) the `Use LECS` button would be disabled and all selections in this area of the screen would be dimmed.

3. Determine whether the LEC should use a LECS; if so specify whether the LEC should attempt to discover the LECS automatically. If you don't use the `Discover LECS` option, you must specify the ATM address (NSAP format) of the LECS.

   If the LEC cannot discover the LECS, or the address you manually enter is inaccessible, the LEC attempts to contact the LEC through the well-known Permanent Virtual Circuit (0,17).

4. Click **`OK`**. The prompt appears, asking you to restart your machine to implement the changes to driver configuration.
5. Click **`OK`** to proceed. The Driver Configuration screen disappears.
6. Restart the machine to implement changes.

Click the **`Cancel`** button anytime to quit the LAN Emulation Configuration screen. Click the **`Revert to Defaults`** button to return to the original settings.

4.5.3.2 Automatically Selecting an ELAN

ForeThought 4.1 allows Automatic ELAN Selection. This feature is selectable only if the `Use LECS` button has been selected.

If the `Automatic ELAN Selection` button is checked, the host is automatically connected to the first ELAN the LECS returns. This ELAN is the first ELAN in the `Match.Ordering` statement set in the LECS configuration file on the switch or workstation running the LECS.

The host joins the ELAN only if it is Ethernet and the MTU size matches that set on the host (as described in "Configuring MTU Size" on page 4-23).

If the `Automatic ELAN Selection` button is not checked, the host is reconnected to the last ELAN with which it established connectivity.

4.5.3.3 Manually Adding an ELAN

You can manually add one ELAN connection, using the following procedure:

1. Click `Driver Preferences...` on the `Edit` menu. The Driver Configuration window appears.
2. Click the LAN Emulation Configuration tab as shown in Figure 4.19.
3. Click the `Enable Manual ELAN` button.
4. Specify the ELAN Name. If you don't specify an ELAN name, and the LECS is used, the ELAN will be assigned a LES address based on the first ELAN name provided by the LECS.
5. Choose whether the LEC gets the ELAN's LES address from the LECS or if you will enter it manually.
    - If obtaining the address from the LECS, click the **`Get this ELAN's LES address from the LECS`** button.
    - If not, click the **`Enter this ELAN's LES address`** button and manually enter the LES's ATM address.
6. If you are adding a failover ELAN, click the **`Get this failover ELAN's LES address from the LECS`** button and specify the number of ELANs in the failover sequence. The range is `1` to `9`.
7. Click **`OK`**. The new ELAN appears in the VLAN List in the VLAN Information window.

4.6 Using Open Transport AppleTalk

To connect your Macintosh to the AppleTalk network using FORE's ATM driver, the following are required:

- AppleTalk must be active in the Chooser dialog box.
- The correct slot must be selected for the FORE ATM driver in the Apple-Talk control panel.

NOTE

Because the ATM driver is emulating an Ethernet driver, the ATM adapter is listed in the Apple Talk control panel as an Ethernet adapter in the physical slot that actually contains the ATM adapter.

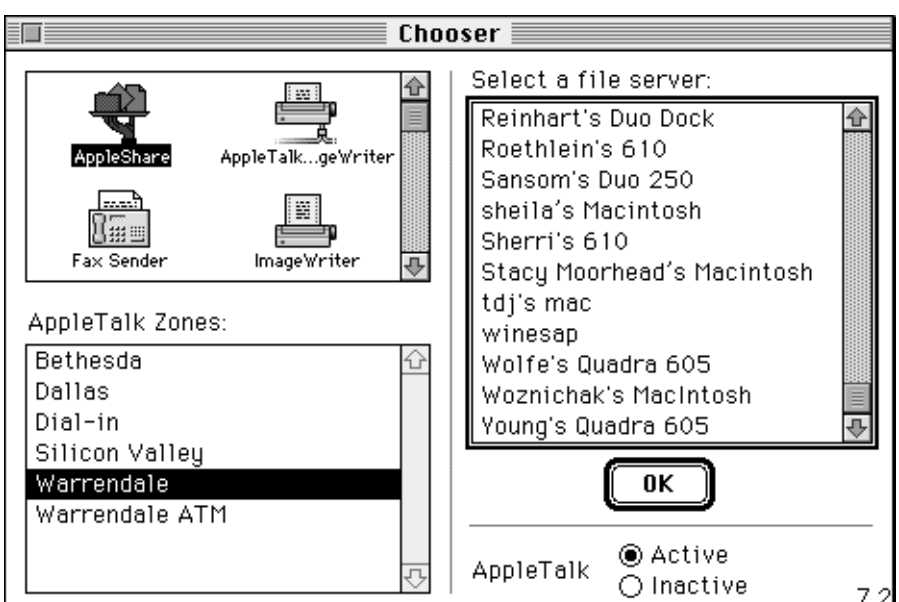

Figure 4.20 - Chooser Window with AppleTalk Active

The Chooser window displays the icons for the available device options such as printers, sharing, and various AppleTalk zones that have been set up.

1. Select `Chooser` from the Apple menu to check that AppleTalk is active. If it is not, click the AppleTalk Active button.
2. Use the AppleTalk control panel (found under the Apple menu) to select the slot containing the FORE ATM driver (denoted by Ethernet slot B1 in Figure 4.21). Note that the ATM adapter is listed as an Ethernet adapter because it is using LAN Emulation to emulate an Ethernet connection.

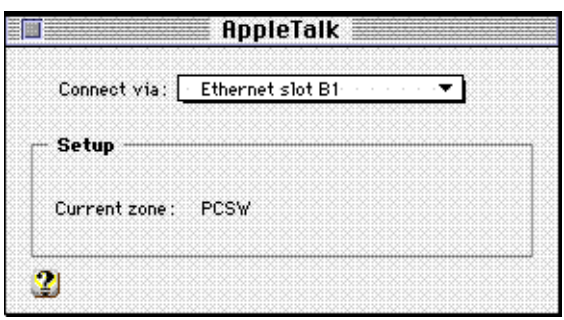

Figure 4.21 - Open Transport AppleTalk Control Panel

3. Close the AppleTalk Control Panel.

4.7 Using Open Transport TCP/IP

To connect your Macintosh to the Open Transport TCP / IP network using FORE's ATM driver, use the following procedure:

1. Open the TCP / IP control panel to select the slot containing the FORE ATM driver (denoted by Ethernet slot B1 in Figure 4.22). Note that the ATM adapter is listed as an Ethernet adapter because it is using LAN Emulation to emulate an Ethernet connection.

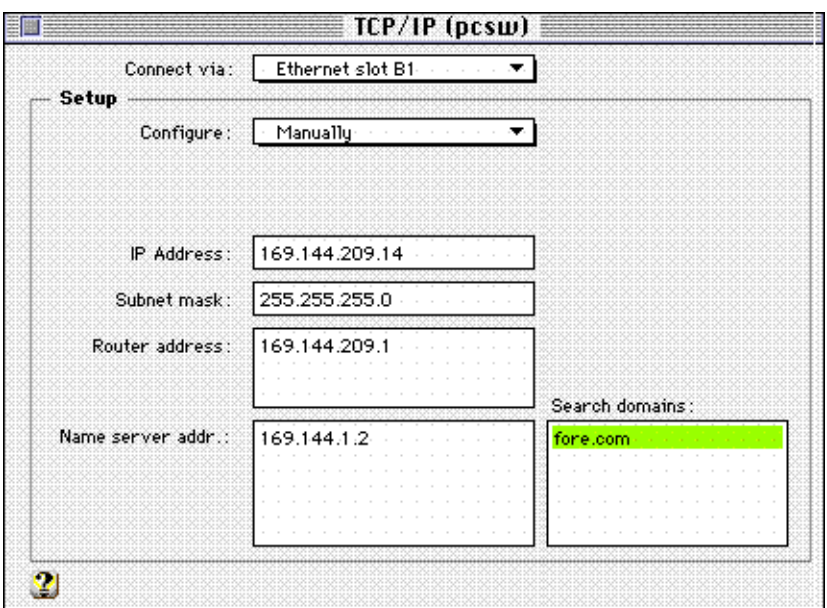

Figure 4.22 - Open Transport TCP / IP Control Panel

2. Change the IP address shown to your unique IP address on your ATM network.

Make sure the `Configure` menu is set to `Manually`.

3. If you have an ATM-based gateway available, enter that address in the Router address field shown in Figure 4.22.

APPENDIX A LED Indicators

This Appendix describes the physical and functional capabilities of the LED indicators on the adapter end plate.

A.1 LED Locations

The figures below show the appearance of the end plate for ST, SC, and UTP connectors. Note that the *ForeRunnerLE* 25 Mbps adapters are available with UTP connectors only.

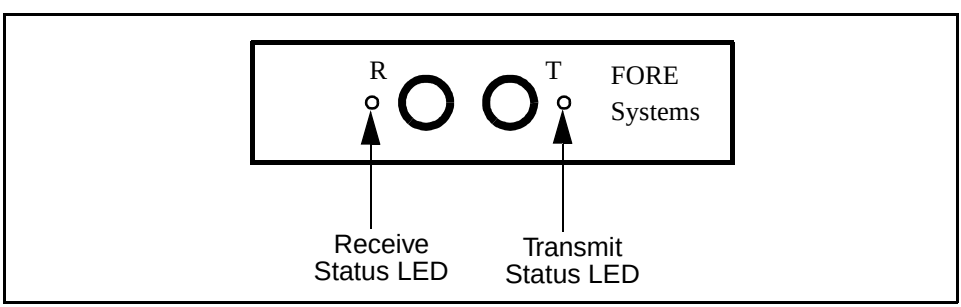

Figure B.1 - ST Connector End Plate Configuration

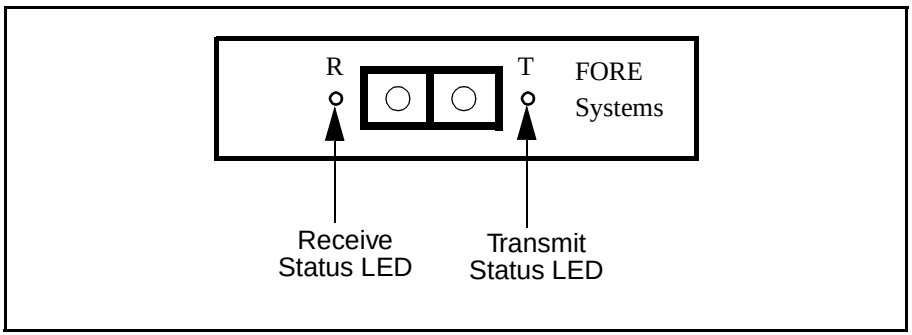

Figure B.2 - SC Connector End Plate Configuration

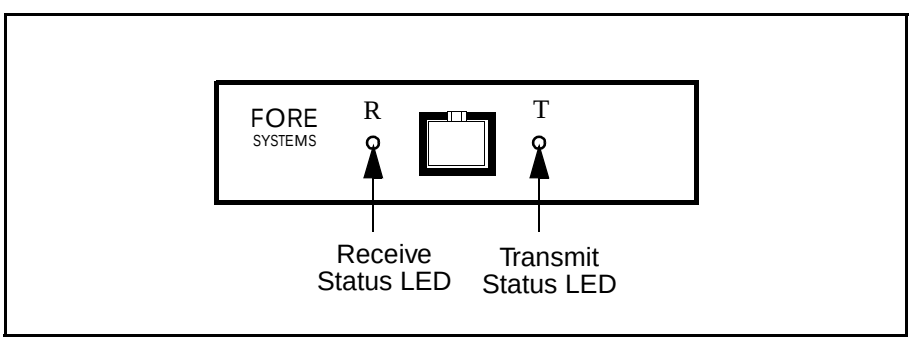

Figure B.3 - UTP Connector End Plate Configuration

A.2 LED Descriptions

The meanings of the LED indicators are described in Table 1.1, “Transmit LED,” on page 3 and Table 1.2, “Receive LED,” on page 3.

Table 1.1 - Transmit LED

LED Color	Meaning
green	Transmitting data
off	Idle
yellow	SONET alarm condition declared (indicates trouble with the receiving device)

Table 1.2 - Receive LED

LED Color	Meaning
green	Receiving data
off	Idle
red	No carrier
yellow	No carrier (*ForeRunnerLE* 155)

APPENDIX B Troubleshooting

B.1 Troubleshooting Procedures

If your workstation is unable to communicate with another workstation, use the following procedures to check for possible solutions. Most procedures involve using the InFOREmation Center to review the status of the adapter driver. Additional procedures involve checking possible problems that the InFOREmation Center cannot reveal.

B.1.1 Start the InFOREmation Center

To start the InFOREmation Center, select it from the FORE Utilities folder.

When you start the InFOREmation Center, the VLAN Information window (shown in Figure B.4) appears. From this window, you can get a wide range of information about the status of your adapter and your ELAN connections. The following sections describe what to check in this window.

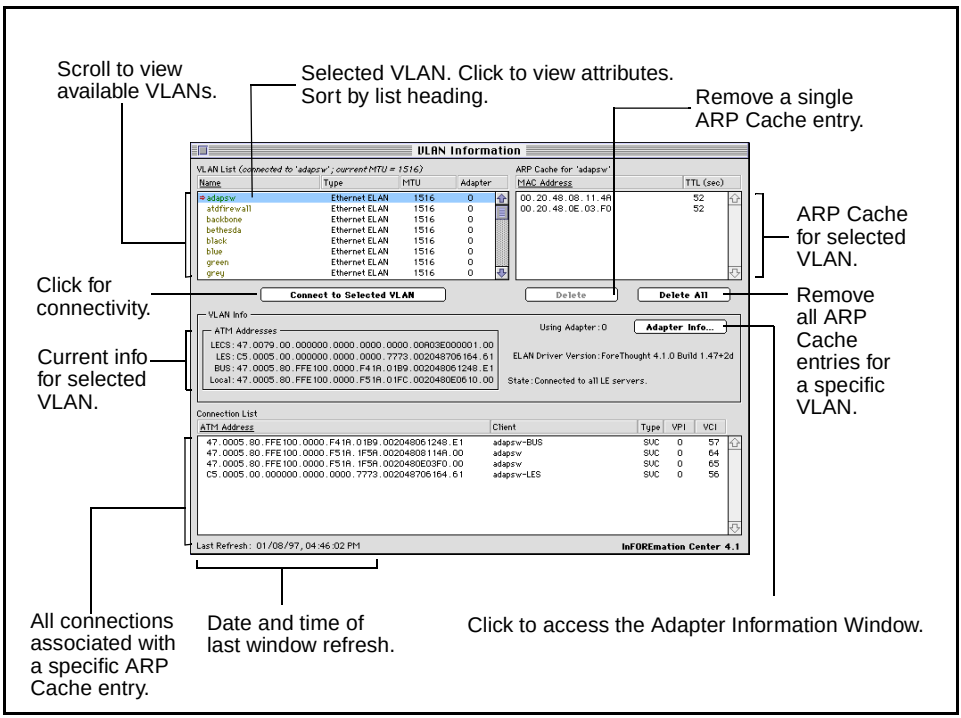

Figure B.4 - The VLAN Information Window

2.1.1.1 Is the adapter using the correct ELAN?

The current ELAN is indicated by a red hash mark (>>) in the list of available ELANs in the upper left corner of the LEC Information window. Is this the ELAN you want to use? If not, double-click on the correct ELAN in the list.

2.1.1.2 Is the adapter connected to the LANE Services?

To check this, check the color of the ELAN entry in the VLAN List table:

Green	Indicates full connectivity (connected to the LES and BUS).
Yellow	Indicates partial connectivity (knowledge of the LES address).
Red	Indicates no knowledge of connectivity.

2.1.1.3 What is the ELAN State?

Check the current state of the selected ELAN by looking at the `ELAN State` field. This field indicates any problem the LEC may have had in communicating with the LAN services.

If the LEC has successfully communicated with the LAN services, the message `Connected to all LE servers` appears in this field.

The following messages describe a temporary status of the LEC when it is currently attempting to perform an action:

- Waiting for LECS connection
- Waiting for ATM address
- Trying LECS request on PVC 17
- Waiting for LECS response on SVC
- Waiting for LES connection
- Waiting for LES JOIN response
- Waiting for BUS connection
- Waiting for BUS PMP connection

If the specified attempt fails, one of the following messages is displayed, indicating that the LEC encountered some kind of problem:

Waiting to retry after ATM address changed - Your machine's ATM address changed, and the driver is restarting the ELAN. This shouldn't happen repeatedly: If it ***does*** happen repeatedly, it probably indicates an ILMI problem, where ILMI is continually registering and un-registering your machine's ATM address.

Possible solution - Contact your system administrator.

Waiting to retry after LECS failed to respond - The LECS failed to respond to a request in a reasonable amount of time. Probably the LECS is experiencing problems.

Possible solution - Contact your system administrator to check the status of the LECS.

Waiting to retry after LECS failed to find ELAN - The LECS didn't recognize the ELAN name; probably you typed the incorrect ELAN name, or the LECS database has been corrupted.

Possible solution -

- Check that the name you entered for the ELAN is correct.
- Contact your system administrator to check the status of the LECS.

Waiting to retry after LES address changed - The LECS database indicates a new LES address for the ELAN, so the ELAN is being shutdown and restarted to connect to the new LES. This shouldn't happen repeatedly.

Possible solution - If this occurs repeatedly, contact your system administrator to check the status of the LES and LECS.

Waiting to retry after LISTEN request failed - An attempt to setup for receiving incoming ATM connections failed. This is an internal error.

Possible solution - Contact FORE technical support.

Waiting to retry after SDU (memory) allocation failed - Out of kernel memory.

Possible solution - Reboot your machine and try again.

Waiting to retry after ran out of VCs (to LES) - Out of ATM resources, probably at the switch, but perhaps at the client.

Possible solution - Reboot your machine and try again.

Waiting to retry after buffer alloc (JOIN) failed - Out of kernel memory on the host machine.

Possible solution - Reboot your machine and try again.

Waiting to retry after LES connection dropped - The LES has become unavailable.

Possible solution - Contact your system administrator to check the status of the LES.

Waiting to retry after failed to connect to LES - The LES doesn't appear to be running, or, if manually configured, the LES's ATM address may have been typed incorrectly.

Possible solution - Check that you have correctly entered the ATM address of the LES.

Waiting to retry after JOIN request timed out - The LES may be experiencing problems.

Possible solution - Contact your system administrator to check the status of the LES.

Waiting to retry after LE_ARP for BUS failed - The LES may be configured incorrectly, or, more likely, the LES is currently experiencing problems.

Possible solution - Contact your system administrator to check the status of the LES.

Waiting to retry after ran out of VCs (to BUS) - The host machine or the switch is out of VC resources.

Possible solution - Reboot the machine and try again.

Waiting to retry after BUS connection dropped - The BUS recently crashed.

Possible solution - Contact your system administrator to check the status of the BUS.

Waiting to retry after failed to connect to BUS - The BUS is experiencing problems or the LES was started with the wrong address for the BUS.

Possible solution - Contact your system administrator to check the status of the LES and BUS.

B.1.2 Display the Adapter Information

After checking the ELAN status in the VLAN Information window, display the Adapter Information by clicking on the **`Adapter Info`** button on the VLAN `Information` window. The Adapter Information window is shown in Figure B.5.

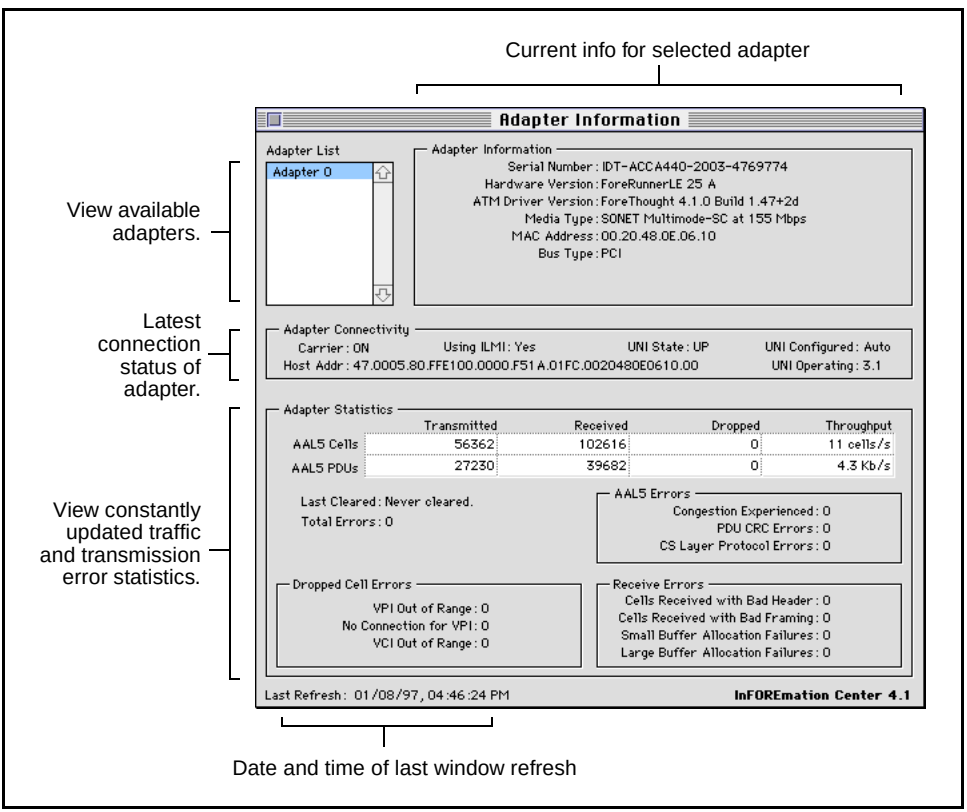

Figure B.5 - Adapter Information Window

2.1.2.1 Is the adapter receiving a carrier signal?

To check this, check the `Carrier` field of the Adapter Information window.

2.1.2.2 Is the adapter sending and receiving AAL 5 cells?

Check the values for AAL 5 cells sent and received. If these values are increasing, and cells are not being dropped, you should have a good connection to the switch.

If not, recheck the adapter installation and the connection status. Check that the adapter is connected to the correct port on the switch. If these connections are all correct, it is possible the adapter hardware is bad.

2.1.2.3 Has the adapter registered via ILMI?

(Applies only if your site is using ILMI.) Check the value of the `Host Addr` field in the Adapter Connectivity table. If it reads `Unknown (attempting to register)`, check with your system administrator to determine if ILMI is functioning properly.

B.1.3 Additional Troubleshooting

2.1.3.1 Is the adapter plugged into the correct port on your switch?

The media type used by the adapter (SONET, OC-3, UTP) must match that of the port it plugs into in the switch.

Possible solution - Contact your system administrator for switch information, if appropriate.

2.1.3.2 Is there a static NSAP route for the adapter on the switch?

If you're not using ILMI, the system administrator must have set up a static NSAP route for the adapter on the switch.

Possible solution - Contact your system administrator for switch information, if appropriate.

Index