3Com®

ATMLINK™ SBUS ADAPTER INSTALLATION GUIDE

Software version 1 Beta

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CONTENTS

FIGURES

TABLES

ABOUT THIS GUIDE

Introduction

This guide provides instructions on installing the drivers, diagnostics, and management software for 3Com® ATMLink™ SBus adapters on UNIX platforms. This manual covers software installation on Solaris 2.3 and 2.4 operating systems.

The procedures in this manual describe the installation of the adapter software and drivers, initial hardware diagnostics and set up of the system's initial Virtual Channel Connections (VCCs).

If the information in the release notes shipped with your product differs from the information in this guide, follow the release notes.

How to Use This Guide

The following table shows where to find specific information.

If you are looking for:	Turn to:
Installation overview flowchart and checklist	Chapter 1
SBus adapter hardware installation	Chapter 2
Adapter software installation	Chapter 3
System configuration	Chapter 4
Hardware diagnostics	Chapter 5
Troubleshooting procedures	Chapter 6
Technical specifications for the adapters	Chapter 7
Information about 3Com's customer support services	Appendix A

Conventions

Table 1 and Table 2 list conventions that are used throughout this guide.

Table 1 Text Conventions

Convention	Description
“Enter” vs. “Type”	When the word “enter” is used in this guide, it means type something, then press the Return or Enter key. Do not press the Return or Enter key when an instruction simply says “type.”
“Syntax” vs. “Command”	When the word “syntax” is used in this guide, it indicates that the general form of a command syntax is provided. You must evaluate the syntax and supply the appropriate port, path, value, address, or string; for example: Enable RIPIP by using the following syntax: `SETDefault !<port> -RIPIP CONTrol = Listen` In this example, you must supply a port number for !<port>. When the word “command” is used in this guide, it indicates that all variables in the command have been supplied and you can enter the command as shown in text; for example: Remove the IP address by entering the following command: **`SETDefault !0 -IP NETaddr = 0.0.0.0`** *For consistency and clarity , the full form syntax (upper- and lowercase letters) is provided. However, you can enter the abbreviated form of a command by typing only the uppercase portion and supplying the appropriate port, path, address, value, and so forth. You can enter the command in either upper- or lowercase letters at the prompt.*
Text represented as `screen display`	`This typeface` is used to represent displays that appear on your terminal screen, for example: `NetLogin:`
Text represented as **`commands`**	**`This typeface`** is used to represent commands that you enter, for example: **`SETDefault !0 -IP NETaddr = 0.0.0.0`**
Keys	When specific keys are referred to in the text, they are called out by their labels, such as “the Return key” or “the Escape key,” or they may be shown as [Return] or [Esc]. If two or more keys are to be pressed simultaneously, the keys are linked with a plus sign (+), for example: Press [Ctrl]+[Alt]+[Del].
Italics	*Italics* are used to denote *new terms* or *emphasis*.

Table 2 Notice Icons

Icon	Type	Description
	Information Note	Information notes call attention to important features or instructions.
	Caution	Cautions contain directions that you must follow to avoid immediate system damage or loss of data.
	Warning	Warnings contain directions that you must follow for your personal safety. Follow all instructions carefully.

1 PRODUCT DESCRIPTION

Adapter Description

3Com® ATMLink™ SBus adapters are network interface cards that provide ATM network connectivity for your workstation or server. These adapters provide a high performance architecture using a custom Application Specific Integrated Circuit (ASIC) chip. The ASIC chip implements the ATM Adaptation Layer 5 (AAL5) protocol to map Protocol Data Units (PDUs) into the information field of ATM cells and vice versa.

One of the adapter's most important functions is to perform the segmentation and reassembly of data for transmission on the 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 PDU that can be processed by a protocol stack.

Each node in which an adapter is installed will be an endpoint in your ATM network. The ATM network is a switched environment that requires the manual or automatic set up of connections between the ATM endpoints. In order for one endpoint to communicate with another endpoint, a virtual channel must be defined between them. The creation of virtual channels can be done manually by defining Permanent Virtual Connections (PVCs) or dynamically using Switched Virtual Connections (SVCs). This release supports using PVCs to setup your ATM network..

Hardware Overview

All of the 3Com adapters are single-slot and provide a high performance architecture using a custom chip. The ASIC chip implements the AAL5 protocol to map PDUs into the information field of ATM cells and vice versa. The adapters support the following features:

- High-performance 155.52 Mbps ATM connectivity
- AAL5 and raw ATM traffic support
- Integrated segmentation and reassembly (SAR)
- High performance convergence sublayer support
- Extensive variable bit rate (VBR) capabilities
- Comprehensive traffic and congestion control capabilities
- SONET/SDH (STS-3c/STM-1) physical layer support
- Multi-mode fiber-optic physical interface
- Operation and maintenance (OAM) cell support
- Custom designed available bit rate (ABR) capabilities

At the core of 3Com hardware is a custom-designed segmentation and reassembly (SAR) ASIC. The ASIC enhances performance by providing a hardware solution for the more complex functions of the ATM protocol. Functions such as the SAR and the common part convergence sublayer (CPCS) of AAL-5 are implemented in the ASIC.

Each virtual connection (VC) can be configured as an AAL5 connection or can be configured to transmit and receive raw data traffic. Raw data traffic consists of user-defined cell formats, as opposed to those formatted by the ASIC to conform to the AAL5 layer.

The ASIC also includes a high performance Direct Memory Access (DMA) engine and slave copy capabilities. By designing a DMA engine specific to the ATM environment, we are providing the network with maximum throughput by avoiding some of the limitations of the I/O architecture, that is, the host bus.

Multi-mode Fiber, 155 Mbps Adapters

The ATMLink SBus-155 adapters provide up to 155 Mbps bandwidth over multi-mode fiber optic cable for up to 2 kilometers. The physical interface uses STS-3c/STM-1 framing at 155.52 Mbps in accordance with Synchronous Optical NETwork (SONET) and Synchronous Digital Hierarchy (SDH) standards. The ATMLink SBus-155 adapter is equipped with an SC style optical fiber connector.

Adapter LEDs

The port on each adapter is equipped with an LED that indicates proper cable connection. This LED is helpful when connecting cabling because it indicates when the cables have been connected correctly. On the ATMlINK SBus-155, the LED is labeled “FRM.” The LED is lit when the adapter is receiving a valid SONET/SDH format signal. The LED will remain unlit if connected to a non-SONET/SDH format signal.

The LED will be lit when the adapter is in diagnostic loopback mode regardless of what is connected to the adapter.

Software Overview

3Com adapters ship with a full complement of software that includes the following packages:

- Driver software that resides on the host system where the adapter is installed. The driver provides the connection between the adapter and the user’s application software.
- ATMLink Configuration Manager (atmlcm) software that provides a command-line interface for managing the ATM network configuration.
- ATMLink Diagnostics (atmldiag) software designed to provide detailed diagnostic information in a command-line format.
- User-Network Interface (UNI) 3.0 signalling software to provide the connection protocols needed for implementing Switched Virtual Connections (SVCs).
- Software supporting ILMI Address Registration.

Each adapter’s unique IEEE 802.2 48-bit MAC address can be used in the 48-bit ESI field of the ATM address.

The adapter software provides classical IP over ATM per IETF RFC 1577. Transparent TCP/IP protocol stacks are supported using the 3Com software for creating permanent virtual channels.

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

Installation Flowchart and Checklists

The flowchart in shows the high-level steps for installing the ATMLink SBus adapter and its software. Table 1-1 describes the requirements for each step.

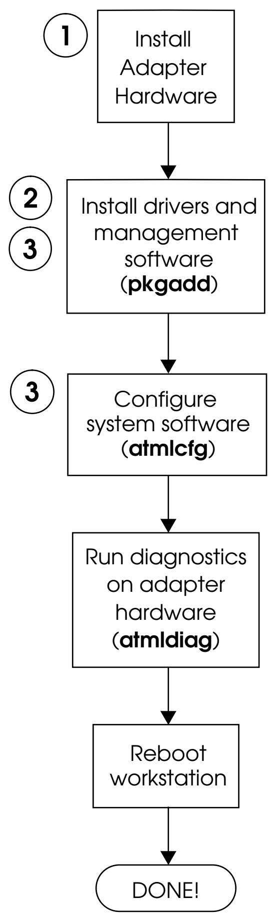

Figure 1-1 Flowchart for Installing the ATMLink SBus Adapter

Table 1-1 Requirements for Installing the ATMLink SBus Adapter

1 Hardware Installation Procedure Requirements:

- SBus adapter installation documentation for the Sun system in which the adapter is to be installed.
- Root login access to the system.
- Anti-static grounding strap (included with adapter).
- Phillips screwdrivers.

2 Software Installation Procedure Requirements:

- SPARCstation, server or compatible with Solaris 2.3, 2.4, or SunOS 4.1.3 (**uname -rs** displays OS version). Note whether or not your system is a SuperSPARC.
- 3Com SBus adapter *installed in the system.*
- At least 4.2 Mbytes available in the software installation directory */usr*.
- A local tape drive for 8mm tape; tape device name should be **/dev/rmt/***num.*
- Familiarity with **pkgadd** installation utility.
- Ensure that */usr/sbin* is in your path.

3 Adapter and PVC Configuration Requirements

- IP address and hostname for each adapter interface (one for LANE, one for CIP). Addresses must be on a separate subnetwork from the host's network (HINT – use the convention: *nodename***_atm#**)
- Subnet masks for the new IP networks being used
- If creating PVCs, a VCI for each connection and transmit and receive rates that will be configured on each PVC.
- For SVCs, an IP address and hostname for an ATM ARP Server
- LAN Emulation Server IP address and hostname

2 SBUS ADAPTER INSTALLATION

Installation Preparation

This chapter describes the procedures for installing a 3Com ATMLink SBus adapter in the following types of Sun Workstations:

- SPARCstation IPC/IPX
- LX or SPARCclassic
- SPARCstation 1, 1+ and 2
- SPARCstation 5
- SPARCstation 10
- SPARCstation 20
- Sun compatible systems
- SPARCserver1000 and 2000

WARNING: *To avoid possible damage to components on the adapter card or your system, use the anti-static grounding wrist strap when handling the adapter.*

System Shutdown

If the Sun system in which the adapter is to be installed is currently running, you must shut down and power off the system. This process, as well as the installation procedure, requires root access to the system.

Use the UNIX **init** command to shut down your system. If you are installing the adapter in a server, be sure to notify the users of the system of the impending shutdown. We recommend that you halt your system using the following procedure.

To shut down the Sun system, execute the following procedure.

1 Save any work and quit all applications.

If you are using OpenWindows or Motif, it is advisable to exit the windowing system environment.

2 Log in as the *root* user and issue the Solaris **init** command as shown in the following example:

```
% su
Password: (input root password)
# cd /
# /usr/sbin/init -i0

<The system will sync the filesystems and shutdown >
ok
```

3 When the system is shutdown, power off the system components in the following order:

a Turn off all external drives and peripherals including printers and modems.

b Turn off the system unit, but leave it plugged into the outlet in the wall.

c Turn off the monitor.

Once the power to the system is off, the next step is to open the workstation's system unit or the server chassis and install the SBus adapter. The following section contains the procedure for adapter installation in your Sun system.

Adapter Installation Procedure

This section provides a general procedure for installing the 3Com ATMLink SBus adapter in the SBus slot of a Sun Workstation. Before performing this procedure, you should have already prepared your system as described in "System Shutdown" at the beginning of this chapter.

For detailed procedures that describe the installation of new hardware in Sun Workstations and servers, refer to the *Desktop Sparc Hardware Owner's Guide* from Sun Microsystems, Inc.

CAUTION: *Before opening the system unit on any Sun system, make sure that the power switch is in the Standby (⏻) or the Off (0) position. The green LED on the front panel should not be lit and the fan should not be running.*

CAUTION: *Do not disconnect the power cord from the system unit's power receptacle when installing internal components. The power cord should be left plugged into a grounded outlet to provide a grounding path.*

The basic steps for installing the adapter in any type of workstation consist of:

1 Opening the system unit

2 Inserting the adapter in an SBus slot

3 Reassembling the system unit

4 Powering up the system

For steps 1, 3, and 4, refer to the appropriate hardware documentation for your system. The following procedure describes step 2 above, the installation of the adapter in the open system unit.

To install the adapter in your workstation or server, follow these steps:

1 Detach all cables except the power cord from the back of the system unit.

Make sure that the power to the system unit is off.

2 Position the system unit on a table with the rear panel facing you.

3 Open the system unit of the workstation or server by following the procedures in the system's hardware manual.

4 Attach the grounding strap provided with the adapter to your wrist:

a With the adhesive side towards your skin, wrap the grounding strap around your wrist twice.

b Attach the adhesive copper strip to the metal casing of the power supply in the system unit.

5 Remove the dummy backplate from the desired opening on the back panel of the system unit.

Refer to the system's documentation for the detailed procedure on the removal of the backplate from the back panel opening.

6 Remove the adapter from the antistatic container and hold the card by the edges.

If the adapter has a protective cover over the fiber-optic connectors, you must remove it before attempting to install or remove the card from the system. The adapter could break if the cover is left in place during installation or removal.

7 Your system may require that you remove the bracket on the end of the adapter prior to installing it in the system unit as shown in Figure 2-1.

Refer to the specific system documentation for details on the installation of SBus adapters in your system.

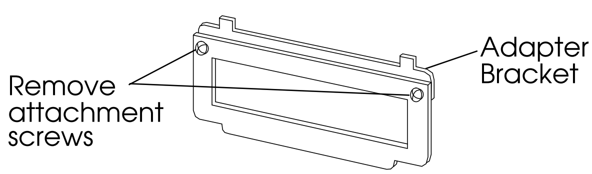

Figure 2-1 Removing the Adapter Bracket

8 Insert the adapter at a downward angle into the opening in the back panel, with the network connectors protruding through the opening.

The adapter will not function in a "slave-only" slot. Refer to the hardware documentation for your system to determine which slots are slave-only.

9 Press the adapter against the back panel, then gently press the other end of the adapter into the connector on the main board.

CAUTION: *Do not force the adapter into the connector; if it does not snap securely into place, lift it up and realign it before pressing it into the connector again.*

10 Reassemble the system unit following the procedures documented in the workstation or server's hardware manual.

System Power-up

After you have successfully installed the adapter and reassembled the workstation's system unit, reconnect the cables for any peripheral devices. Turn the power on starting with any external drive units. Next, turn on the monitor and then the system unit.

If the host system does not boot, power off the machine, re-seat the adapter, and reboot again. If the system still does not boot, power it off, remove the adapter and reboot the system. If it comes up without the adapter installed, the adapter may be defective. Contact 3Com Customer Service.

The software provided with the adapters includes the ATMLink Diagnostics (**atmldiag**) utility that allows you to verify adapter functionality. Even if the host system boots, we still recommend that you use the diagnostic software described later in this guide to verify that the adapter's initialization code and hardware are operating properly.

The next chapter provides procedures for loading the adapter software from tape onto your system. Once the software is loaded, execute the diagnostics procedure in Chapter 5 to verify the adapter functionality. For a full description of all of the tests available through the **atmldiag** utility, refer to the on-line manual pages or issue the **help** command when running the utility.

3 SOFTWARE INSTALLATION

Installation Overview

This chapter describes the installation and initial configuration of the software for the 3Com ATMLink SBus adapter. The software is designed to be installed in a UNIX Sun system running Solaris 2.3 or 2.4 operating system.

The adapter driver software and on-line manual pages are provided on an 8mm, low-density tape that can be read by any 8mm tape drive. Also included on the tape are the ATMLink Diagnostics and Configuration Management software.

The installation procedure, which begins in the section “Solaris Software Installation” later in this chapter, consists of two parts:

- Installing the software using **pkgadd**
- Running the adapter configuration script.

Adapter configuration includes choosing IP addresses, setting netmasks, and setting up initial PVCs (if desired).

The information required for this configuration is listed in the checklists provided in the section “Installation Flowchart and Checklists” in Chapter 1. Refer to these checklists before continuing with the installation.

CAUTION: *Do not install the software on a system that does not have the adapter installed. Driver installation will fail if the adapter is not installed.*

Signalling, ILMI and LAN Emulation

During the installation procedure, you will be asked whether or not to install signalling, ILMI, and LAN Emulation software. The signalling software consists of the Signalling Daemon (**atmlsd**) and other modules. If you choose to install signalling, the appropriate executables will be loaded. The signalling software will allow the adapter to communicate with a switch to dynamically create Switched Virtual Connections (SVCs).

You will next be asked whether or not to install Interim Local Management Interface (ILMI) software. This software provides an ATM address registration function. In order for a switch and end-station to communicate when creating SVCs, they need to have a common communication protocol and to know each other's address.

The ILMI function uses the Simple Network Management Protocol (SNMP) for communication between the devices. With ILMI enabled, the switch and end-station can exchange SNMP *set* requests to determine their ATM addresses. The ATM address of an end-station consists of a network prefix provided by the switch plus a unique End Station Identifier (ESI). When the two devices are first booted, they will exchange the network prefix and ESI to create a unique address for the adapter.

Optionally, signalling can be enabled and ILMI not enabled. This may be necessary if the switch does not support ILMI yet. If this is the case, the ATM addresses will have to be set manually for the adapter and in the switch. Refer to the flowchart in Figure 3-1 to determine whether or not you will have to manually configure the addresses.

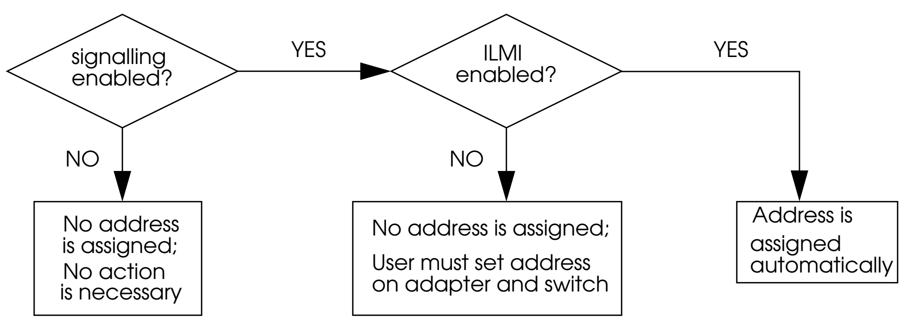

Figure 3-1 ATM Configuration Decision Flowchart

During the installation, you will also be asked whether you want to load the LAN Emulation software. If your switch supports LAN Emulation, you will want to enable it.

Customizing the Installation Process

The installation procedure described in the section "Solaris Software Installation" provides basic instructions for installing the software on a single system in which an adapter is installed. You may also be installing adapters in multiple systems, or you may want to use the Solaris GUI interface to the application package installation utility (**swmtool**). You can also change the base directory where the software is installed.

After the initial adapter installation, you may decide to move the adapter to another slot. This section describes the "nonstandard" installation operations.

Installing Multiple Adapters

You may have several systems in which you have installed adapters and you want to load the software from a tape drive on a central system or server. In this case, it may be advantageous to perform the **pkgadd** process from a disk file rather than a local tape drive.

To do this, you need to copy the package from the tape drive onto a NFS mounted directory. Use the following command to load the software:

```
pkgadd -d device -s spooldir
```

where:

`device` is the path name of the tape device (for example, /dev/rmt/0).

`spooldir` is an NFS mounted filesystem large enough to hold the contents of the tape (for the standard release this is about 1.5 MB).

After executing this command, use `pkgadd -d spooldir` to install the driver software on each system in which an adapter is installed. When the command is complete, you can remove the package instance from `spooldir`. For more information, consult the appropriate Sun documentation on the application package utility.

Using Sun's Installation Tool (swmtool)

Solaris operating systems provide a graphical interface to the application package installation called **swmtool**. To use this interface with our package, you must first transfer the contents of the tape to a disk file as described in the previous section.

After the package is loaded, the **swmtool** may then be used to install the package. Refer to the application package utility documentation for complete instructions on how to use the **swmtool**.

Moving the Adapter to a New Slot

If you need to move an adapter to a different SBus slot, you will need to take special steps. This will only be necessary if the adapter driver software has been installed and the system has been rebooted. Even after the adapter is removed from a slot, the Sun system will "remember" which slot the adapter was in originally.

You can tell the system the new slot position by running the script **/usr/atml/bin/atm_reset_instance** and then rebooting the system. This script will clean up the */etc/path_to_inst* file and allow the system to recognize the adapter in a different slot.

Solaris Software Installation

The adapter software provided for Solaris is stored on the installation media in an Application Package format and is installed using the Solaris Application Package Utility (**pkgadd**). You should be familiar with the Application Package Utility before attempting the installation of this software. For a complete description of the procedures and commands used in the Package Utility, consult the appropriate Sun documentation.

The **pkgadd** utility automatically creates the directory structure (*/usr/atml*) in which the software files are loaded. It also checks to see if there is sufficient disk space available to load the software. To execute the **pkgadd** command, you must log in as *root* user and ensure that */usr/sbin* is in your path.

You can use the **pkginfo** command to list the files on the installation medium. For a detailed description of the options and output from this command, refer to the **pkginfo** (1) manual page. This command is used in the following procedures to list the contents of the installation media.

The syntax of the **pkgadd** command is as follows:

```
pkgadd -d device [pkg_id ]
```

where:

device is required and specifies the full path name to the device on which the package resides.

pkg_id is the package identifier of the software package(s) to be loaded. If this argument is omitted, all the packages on the tape will be listed in a menu.

CAUTION: *If you are loading a software upgrade or need to reload the adapter software, you will need to remove the existing software first. Refer to "Removing Adapter Software" later in this chapter.*

Solaris Installation Procedure

The following procedure describes the installation of the adapter software on a single Sun workstation or server running Solaris 2.3 or 2.4. For information on multiple adapter installation, please refer to "Customizing the Installation Process" later in this chapter.

To install the adapter drivers and other software, follow these steps:

1 Log in as *root* on the installation system.

```
stingray%     su root
Password:     <input root password >
stingray#
```

2 Enter the **pkgadd** command to load the package as shown in the following example.

```
stingray#        pkgadd -d /dev/rmt/0
```

It takes about 20 seconds to load the software. When complete, the following information is displayed:

```
The following packages are available:
 1 ATMLink     3Com ATMLink ATM Software for Solaris 2.3
               (sparc) 1.1
```

3 The next prompt asks which packages you want to install from the tape.

Press <*Enter*> to accept the default selection.

```
Select package(s) you wish to process (or 'all' to
process all packages). (default: all) [?,??,q]:          <Enter >

Processing package instance <ATMLink> from
</dev/rmt/0>

3Com ATMLink ATM Software for Solaris 2.3, (SPARC) v1.1

<Copyright information is displayed          >
```

CAUTION: *Before continuing with the installation, ensure that all mandatory Solaris OS patches (Patch number 101318-50 or greater) have been installed.*

4 You are then prompted for the installation directory to be used.

The directory */usr* is the base directory, but you can specify the name of the subdirectory (*atml* is the default).

```
Using </usr> as the package base directory.
  +------------------------------------------------------------+
  | Ensure that your system is updated with all mandatory patches.|
  | See the Release Notes for more information.                |
  +------------------------------------------------------------+

Do you want to continue? default: y [y,n,?,q]<          Enter  >

Under /usr, where should ATMLink software be installed?
default: atml [?,q]          <Enter  >
```

5 The next prompt asks whether or not to install the manual pages, and if so, where.

```
Should the manual pages for this package be installed?
default:y [y,n,?,q]          y

Where should manual pages be installed? default:
/usr/man [?,q] <       Enter  >
```

6 The next prompt asks if you want to install the adapter drivers.

CAUTION: *Do not install the drivers if the adapter is not already installed in the workstation.*

```
Should drivers included in this package be installed
[y,n,?,q]       y
```

7 The next prompt tells you to install the SuperSPARC driver if you have a SuperSPARC system.

Performance may be degraded if the standard drivers are loaded on the system. Note that this prompt has no default: you must specify whether to load the driver.

```
  For better performance on SPARCstation 10 and 20
  (and clones), SPARCserver 1000, and SPARCcenter
  2000 only, you should install the SuperSPARC driver.

Install the SuperSPARC version of the driver? [y,n,?,q]        n
```

8 The next prompt asks if you want to enable the signalling function.

If you answer "**n**", then skip to Step 11

```
Should UNI 3.0 Signalling be installed? default: n
[y,n,?,q]     y
```

9 If you answered "**y**" to signalling, the next prompt asks if you wish to install LAN Emulation. .

```
Should LAN Emulation be installed? default: n [y,n,?,q]        y
```

10 The next prompt asks if you want to configure ILMI Address Registration.

```
Should ILMI Address Registration be conf          igured? default:n
[y,n,?,q]     y
```

- If you answer "**yes**" to this prompt, you can skip to Step 11.
- If you answer "**n**", you will be prompted to manually configure the network prefix of the ATM address for the adapter. This script will also store the address information in the file */etc/opt/ATMLink/cfg* and the file *<nodename>.boot* . This file will be used to configure the adapter address each time the host station is rebooted.

The network prefix consists of from 1 to 26 hexadecimal characters, with at least one dash. If less than 26 characters are entered, the number is padded with trailing zeros.

```
 +--------------------------------------------------------------+
| Since you are not using ILMI, you must specify the network   |
| pref      ix. The network pref          ix is 26-digits and may be of the    |
| following formats:                                            |
|                                                               |
|   +---+------+---+---------+------+------+------+             |
|   | 39| DCC  |DFI|   AA    |RSRVD |  RD  | AREA |   DCC  |
|   +---+------+---+---------+------+------+------+             |
|                                                               |
|   +---+------+---+---------+------+------+------+             |
|   | 47| ICD  |DFI|   AA    |RSRVD |  RD  | AREA |   ICD  |
|   +---+------+---+---------+------+------+------+             |
|                                                               |
|   +---+-------------------+------+------+------+              |
|   | 45|       E.164       |RSRVD |  RD  | AREA |   E.164  |
|   +---+-------------------+------+------+------+              |
|      (three dashes represent one octet)                       |
|                                                               |
|   Example: 45-012149913884000000000000 (dash is required)    |
+--------------------------------------------------------------+

ATM network address pref          ix:  [?,q]          39-1234567890000000000000000
```

- The next prompt asks you to verify the address you entered. You can answer “**n**” and retype the address if it is not correct.

```
Is 39-1234567890000000000000000 the correct network
pref  ix? default: y [y,n,?,q]                  y
```

11 A final prompt explains that the installation executes scripts that require super-user permissions. Answer the continuation question with a "**y**".

```
## Processing package information.
## Processing system information.
## Verifying disk space requirements.
## Checking for conflicts with packages already installed.
## Checking for setuid/setgid programs.

This package contains scripts which will be executed with
super-user permission during the process of installing this
package.

Do you want to continue with the installation of this
package [y,n,?]    y
```

Several files are listed as they are loaded…

```
+------------------------------------------------------------+
| Post-installation Instructions                              |
+------------------------------------------------------------+

  Be sure to add /usr/atml/bin to your path.
```

12 After the files are successfully loaded, you are reminded to edit your *path* environment variable (usually set in your *.login* , *.profile* , or *.cshrc* file) to include the */usr/atml/bin* directory. For example, in the C-shell, add the following line:

set path = ($path /usr/atml/bin)

Also, if the directory in which the manual pages were installed is other than */usr/man,* add the path to your MANPATH variable.

13 A message is displayed describing the process for configuring the adapter software. You can run the script **atmlconfig** that will prompt you for the information required for configuration.

```
If an adapter card was installed on this system, then
  unique hostnames and IP addresses for each ATM interface
  must be placed in this system's /etc/hosts file. In
  addition, the new hostnames must be put in the
  /etc/opt/ATMLink/cfg/hostname.atmlip<n> and
  /etc/opt/ATMLink/cfg/hostname.atmle<n>
  files where n is the instance number of the adapter
  corresponding to each of the hostnames.

  Also, if you are using any nameservice such as NIS, NIS+,
  DNS, etc.,
    1) add the ATM hostnames to the naming service(s)
    2) add the "atmlnm" entry from /etc/services
       on this system to the nameservices master, or, if it
       is the master, remake the maps on this system.
    3) if you installed Signalling, add the "atmlsd"
       entry from /etc/services on this system to the
       nameservices master, or, if it is the master,
       remake the maps on this system.
  Refer to Sun documentation for more information on name
  services.

  The installation procedure will allow you to update
  the following files:

    /etc/hosts
    /etc/opt/ATMLink/cfg/atm_hosts
    /etc/opt/ATMLink/cfg/stingray
    /etc/opt/ATMLink/cfg/hostname.atmlip<n>
    /etc/opt/ATMLink/cfg/hostname.atmle<n>

  Optionally, you can update them by hand.

  In either case, you should update the files BEFORE you
  reboot this system. If you would like to update them now,
  run the "atmlconfig" program located in
  /usr/atml/bin.
+------------------------------------------------------------+
```

The information about updating the name service master refers to systems that are using a central server. Refer to the appropriate Sun documentation on the administration of Sun name services.

14 You will be prompted when the software has been successfully loaded. At the next prompt, answer with “**q**” to exit the utility:

```
Installation of <ATMLink> was successful.

The following packages are available:
 1  ATMLink   3Com ATMLink ATM Software for
              Solaris 2.3 (sparc) 1.0

Select package(s) you wish to process (or 'all' to process
all packages). (default: all) [?,??,q]:                    q

*** IMPORTANT NOTICE ***
       This machine must now be rebooted in order to
      ensure sane operation.  Execute
              shutdown -y -i6 -g0
      and wait for the "Console Login:" prompt.
```

Though the pkgadd script indicates that you must reboot the system to multi-user mode, do not reboot until after performing the configuration procedures and diagnostic procedures detailed in the next two chapters

4 SYSTEM CONFIGURATION

Configuration Overview

After you have installed an adapter and the accompanying software, you will need to configure the adapter and its host system to communicate on the ATM network. There are three possible situations:

- You may be configuring a new ATM network with all new workstations and switches
- You may have an existing ATM network to which you are adding a workstation
- You could be adding a new adapter to a workstation that is already operating on an ATM network

This chapter presents some basic ATM concepts that must be fully understood in order to successfully create an ATM network or integrate a workstation or a new adapter into the ATM network.

The flow chart shown in Figure 4-1 on page -2 shows the three possible configuration scenarios. Depending on what you are trying to configure, you will need to do some manual updates of files, but most of the operations shown in this flowchart involve running the **atmlcfg** configuration utility.

The shaded areas indicate separate sections which include the various configuration procedures. The key shows the page numbers where each of the procedures begin. Simply refer to the sections you need to perform the configuration operations you need.

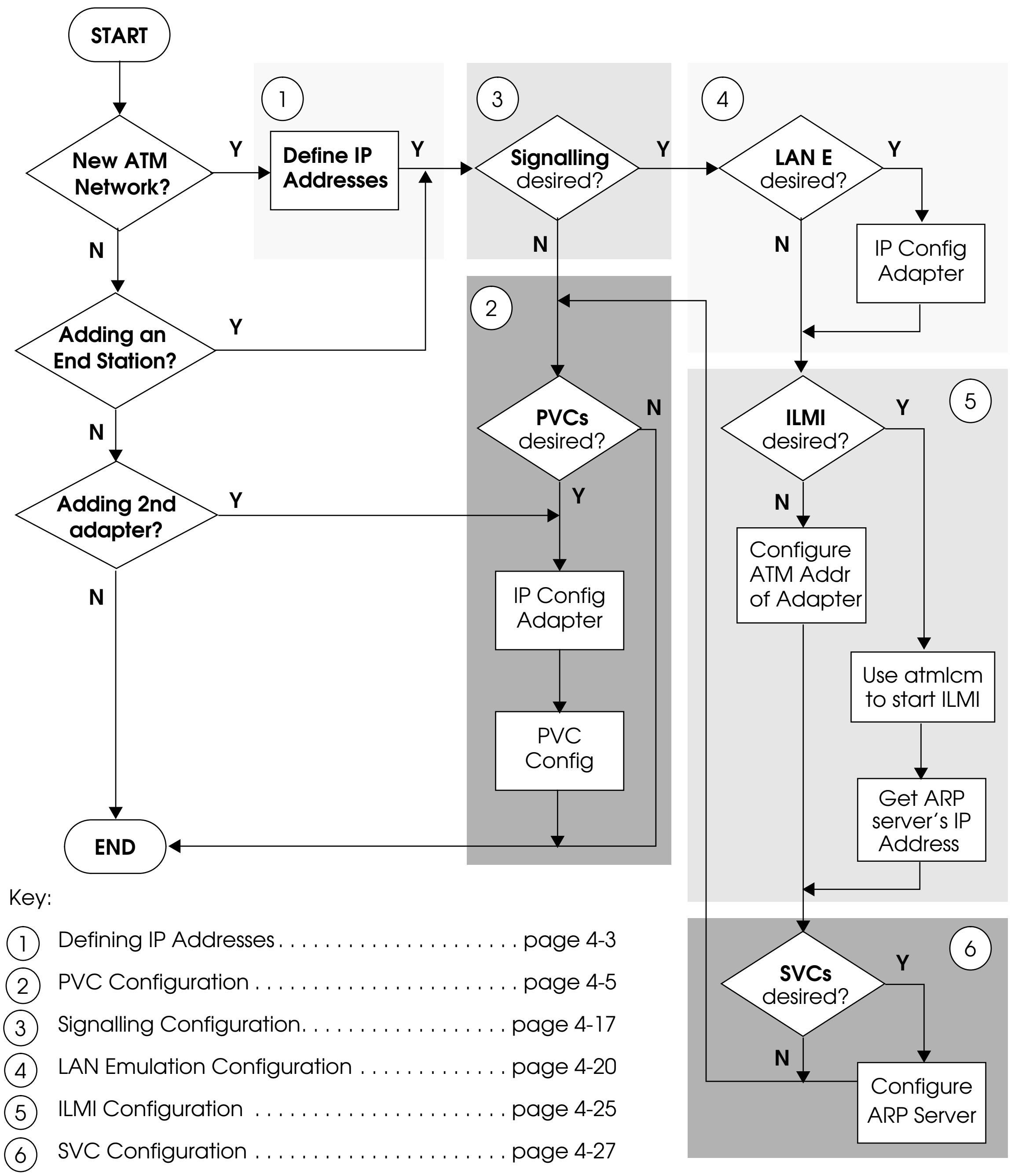

Figure 4-1 ATM Network Configuration Flowchart

Defining IP Addresses

If you are just configuring a brand new IP network, the first step is to apply to the Internet Authority Board (IAB) for IP addresses. The IAB is responsible for ensuring that each site with Internet access has a unique set of IP addresses that it can assign to its network nodes. You may have a block of addresses that you can use, or a single Class A or Class B address that you can "subnet" using a subnet mask (described in the next section).

CAUTION: *The IP addresses for your ATM adapters must be on a separate subnetwork from any Ethernet, Token Ring, or FDDI network you have currently configured at your site.*

Multiple ATM adapters at your site can be on the same subnetwork as each other. However, multiple ATM adapters installed in a single workstation must be on separate networks (they cannot be on the same subnetwork). Furthermore, each adapter may be configured with multiple interfaces (one for Classical IP and one for LAN Emulation). You need to assign an IP address for each of your ATM network adapter(s).

IP addresses for end-stations (nodes on the network) are entered into the */etc/hosts* file by a *root* user. However, the IP addresses for the adapter interfaces can be specified when you run the **atmlconfig** configuration script.

Use of the Subnet Mask

Along with the IP address, a subnet mask must be defined for the ATM network. The subnet mask (also called IP netmask) is used to specify the part of an IP address that designates the network and the part that designates the nodes or hosts on the network.

The subnet mask is used by routers, bridges, and other devices on the network to route packets. The network part of the IP address tells the device whether the destination for the packet is on its same network. Once the correct network for the packet is found, the host portion is used to determine the packet's destination (or source).

Each bit in the subnet mask that is non-zero indicates that the corresponding bit of the IP address is part of the network designator. Each bit set to zero indicates that the corresponding bit of the IP address designates a network node.

In the example shown in Figure 4-2, the first three octets are set to "255" (all ones). When this netmask is applied to an IP address, it indicates that the first three octets of the IP address identify the network. Likewise, the final octet of the netmask is zero, indicating that the last octet of the IP address identifies nodes on the network

	Network			Node
Subnet Mask:	255	.255	.255	.0
IP Address:	194	.86	.24	.10

Figure 4-2 Relationship of IP Address to Subnet Mask

Normally, the subnet mask is written as decimal numbers separated by periods, or "dots". Figure 4-3 shows the equivalent binary form of the subnet mask. Specifying "255" for an octet is equivalent to setting all 8 bits to 1 (on).

	Network				Node
Subnet Mask:	255	.255	.255	.240	
Binary:	11111111	11111111	11111111	1111	0000

Figure 4-3 Defining a Subnet using Subnet Mask

The netmask shown in Figure 4-2 would provide addresses for up to 256 nodes on the 194.86.24 network. To have more networks and fewer nodes on each network, you can set some of the bits in the last octet of the netmask to 1. The bits set to 1 would designate networks.

In the example in Figure 4-3, only the last four bits of the last octet are used to number the nodes on the network. Using just the last four bits only allows 16 nodes per network. However, the first four bits of the octet allow the designation of 16 more subnetworks than were available before.

The netmask for each network interface (Ethernet, ATM, etc.) is defined in the */etc/netmasks* file. You will need to edit this file and add an entry for each ATM adapter you install at your site. All of the network interfaces currently installed and configured in a workstation can be listed by typing **ifconfig -a**. This command is described in more detail in the installation procedure.

PVC Configuration

Until signalling is fully defined, one of the key operations in configuring your ATM network is the creation of permanent virtual connections (PVCs) between each pair of ATM endpoints.

In the example shown in Figure 4-4, a connection has been established between workstation Saturn and workstation Pluto through an ATM switch. Saturn also has a connection defined between itself and Venus. Venus has a connection from itself through the switch to Pluto and between itself and Saturn.

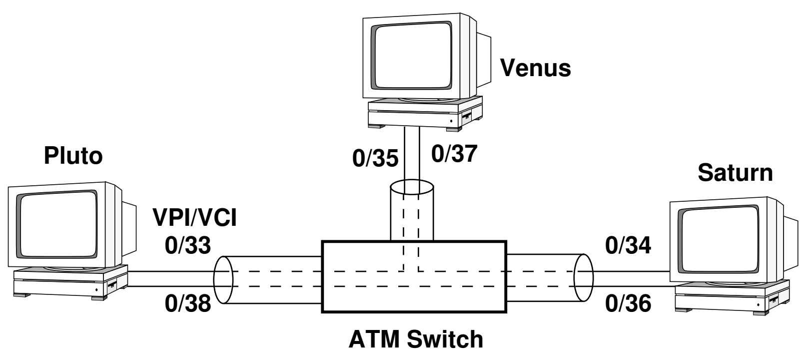

Figure 4-4 Configuring Permanent Virtual Connections

In most ATM networks, each adapter will be connected to an ATM switch that has specific PVCs already configured. However, it is possible to connect an adapter directly to another adapter in a different workstation for use in testing the connection. If you are connecting the adapter to a switch and the switch is not already configured, you should set up the desired PVCs in the switch before you attempt to configure the adapter. Refer to the switches' documentation for PVC creation procedures.

When using , you will be prompted for specific information that will be used to set up one or more PVCs. This information is stored in the PVC configuration file.

The PVC configuration file is originally created by the installation script when you install the adapter software. The file is named after your workstation's nodename and consists of **atmlcm create** commands. When you reboot the workstation, the adapter management software uses the configuration file to automatically create the permanent virtual connections from *that host only* . If there are commands in the file to create connections from remote hosts, they will be ignored.

The **create** command was designed to allow you to use a central PVC configuration file containing all connections for all of the hosts on your ATM network. Then you can distribute that file to all of the nodes. When new connections need to be made, you can edit the original file and redistribute it to the other nodes.

The **create** command provides several options that allow you to configure each connection. The basic information that you will need to determine for each connection is:

- Port number, if more than one adapter is installed
- VPI/VCI number
- IP address or hostname of the ATM adapter that you are connecting to
- Transmit and receive rates
- Encapsulation method

These concepts are described in the following sections.

Determining Data Transmission Rates

For each connection, you can specify a maximum peak data transmission rate or a Peak Cell Rate (PCR). This rate is commonly expressed in cells per second (cps), though it can be specified in Mbps or kbps. (Note that the adapter software interprets kilobits as 1000 bits as opposed to 1024 bits. Megabits = 1,000,000 bits.)

The PCR that you specify for a connection only indicates the maximum rate and does not have to be exact. However, the sum of all of the transmit rates specified for a SONET adapter must be less than 353,208 cps (~149 Mbps). For the TAXI adapter, the rates must add up to less than 231,482 cps (~98 Mbps).

When creating connections, the minimum transmit rate that can be specified for an individual connection is 191 cps (~80 Kbps), though there is no minimum for receive rates. These rates are lower than the specified line rate of 155.52 Mbps and 100 Mbps because of framing overhead at the physical layer.

Avoiding the Traffic Police

The most important thing about specifying rates is to avoid cell losses caused by switch congestion. Some switches may even enforce a certain rate on the different VCCs – this is usually referred to as "policing" or Usage Parameter Control (UPC).

If UPC is in effect in a switch and a VCC exceeds the configured rate, the switch may drop cells from that VCC. This will cause errors at the receiving end station and degraded performance.

If UPC is not in effect, the switch will only drop cells in case of congestion. For example, congestion will occur if two end stations are sending data to another end station and the sum of the rates of the two VCCs exceeds the line rate of the link to the end station.

When creating PVCs through the ATM network, the rates of each VCC should be calculated so that all connections can be active simultaneously without congestion. The 3Com adapters support this by allowing a rate to be assigned to each active VCC. The transmit rate should be configured to be less than or equal to the rate of the connection through the switch. The transmit rate should also be less than or equal to the receive rate configured for the receiving endpoint.

However, you may wish to take advantage of the fact that connections are idle some of the time. You can "overbook" the bandwidth of the link by assigning rates that add up to greater than the maximum available bandwidth. The benefit is that the active connections get the best available bandwidth. However, you run the risk of congestion and subsequent cell loss. The 3Com adapters support overbooking through the use of the "best effort" option on each VCC.

Efficient's Traffic Shaping Scheme

To provide flexibility in configuring your connections, the software allows you specify the transmission rates in several ways:

- You can specify a single value to be used as both the receive and transmit rates for a connection. This may be necessary for certain devices that require a particular bandwidth (bridges, routers);
- You can specify "max" as the rate for one or both rates. This allows the software to choose the maximum remaining available bandwidth when the connection is established;
- For transmit rates only, you can specify a "requested" and "acceptable" rate;
- Best effort can be specified to prevent the software from looking at the available bandwidth. That is, you are given the requested rate, regardless of how much bandwidth is left.

Requested and Accepted Transmit Rates

When you specify a transmit rate for a connection, the device driver performs a calculation and assigns a rate based on cell boundaries. Therefore, your *requested* transmit rate for a connection may or may not be on one of these cell boundaries. By default, the atmlcm software will "round down" to the next closest boundary (or to the next cell boundary within the available bandwidth). For example, if you request a transmit rate of 10,000 cps, the driver may assign a rate of 9766 (depending on the adapter).

For most applications, rounding down for the transmit rate will be sufficient, particularly if this makes the transmit rate less than the receive rate on the other end of the connection. However, you can control whether the driver rounds up or down by specifying an *acceptable* rate.

The acceptable rate is used with the requested rate to specify that, if the requested rate is not available, this is the minimum (or maximum) rate that is acceptable. If the acceptable rate is greater than the requested, the software will round up when allocating bandwidth for a connection. If the acceptable rate is less than the requested, the software will round down.

For example, if you specify a requested rate of 100 Mbps and an acceptable rate of 50 Mbps, the rate selected will be between 50 and 100 Mbps, but it will be as close to 100 Mbps as possible.

You may get an "out of range" error message on the **create** command, if you happen to choose a requested rate and an acceptable rate that both fall within two cell boundaries. It is best to try and specify acceptable rates that are at least 1400 cps above or below the requested rates.

Also, you should not try to set the requested and acceptable rates to the same value (since there is no reason to do so). This will also cause an out of range message, unless you happen to select a rate that is exactly on a cell boundary.

Choosing Encapsulation Methods

RFC 1483 describes the various data encapsulation methods. Encapsulation refers to methods of carrying connectionless interconnect traffic, such as bridged and routed Protocol Data Units (PDUs) over an ATM network. There are currently two methods supported:

- Multiplex multiple protocols over a single ATM virtual circuit
- Assume that each protocol is carried over a separate ATM VC

To send multiple protocols over a single VC, a Logical Link Control (LLC) header is prefixed onto the PDU, which identifies the protocol of the PDU. This method is referred to as "LLC Encapsulation." The alternative method performs higher-layer multiplexing implicitly by ATM VCs. This is referred to as "VC Based Multiplexing."

The **create** command provides options that allow you to specify "**snap**" or "**nosnap**." The "snap" terminology refers to an IEEE 802.1a SubNetwork Attachment Point (SNAP) header that follows the LLC header on the PDU. The "**snap**" option enables LLC Encapsulation, and "**nosnap**" disables it. If not specified, LLC encapsulation is enabled for each connection.

Changing the encapsulation type for one connection changes it on all connections on that port. All connections on a port must use the same encapsulation type

PVC Configuration Procedure

The **atmlcfg** utility allows the configuration of Classical IP addresses and subnet masks used for PVCs on new ATM adapters installed on your system. You can also configure PVCs that will be placed in a PVC Configuration file. The PVC Configuration file will be read whenever the system is rebooted and will re-create the PVCs specified in the file.

Optionally, you can manually edit the */etc/hosts* file with the IP addresses and hostnames of new adapters. To simplify the naming of the adapters, it is recommended that you use the convention:

nodename_ atm #

where *nodename* is the symbolic name of the host workstation and # is the instance number of the adapter (starting with 1 for the first one installed, incrementing by one for each one subsequently installed). For example, the first adapter installed in host "flipper" would have instance number zero. The recommended hostname for the adapter would be **flipper_atm1**.

1 Log on as the *root* superuser to the host system that contains the adapter software.

2 Execute the **atmlcfg** utility:

```
stingray# cd /usr/atml/bin
stingray# ./atmlcfg

   +------------------------------------------------------------+
   | This script steps you through the process of configuring   |
   | your new ATM adapter(s). For each adapter you may choose    |
   | to configure specific information depending on what        |
   | installation options you have selected. Please             |
   | refer to the Adapter Installation Guide for detailed       |
   | information on installation options.                       |
   +------------------------------------------------------------+
```

A few paragraphs are displayed describing steps to be taken after you exit this script. These steps are included later in this procedure.

3 At the next prompt, asking whether to configure the adapters now, answer "**y**".

```
Do you want to configure the host and adapter(s) now?
default:y [y,n,?,q] y
```

4 Next, the main menu of the script is displayed. You will want to choose option "**1**" to configure the IP addresses.

```
   Please choose one of the following:

      0 -- Done with configuration
      1 -- Configure Classical IP (RFC 1577) network interface and PVCs
      2 -- Configure LAN Emulation, LANE network interface, and LECS
      3 -- Configure SVC support (RFC 1755)
      4 -- Configure signalling support
      5 -- Configure ILMI

Which do you want to do? default: 1 [0-5,?,q] 1

   +--------------------------------------------------------------+
   | You have chosen to run Classical IP which means you must      |
   | choose a unique hostname and IP address for the CIP network   |
   | interface. All IP interface addresses must be on a separate   |
   | subnet. Be sure to specify a separate subnet for this address.|
   | After the network interfaces are properly configured, you     |
   | will be asked if you want to any PVCs to be automatically     |
   | created at system boot time.                                  |
   +--------------------------------------------------------------+
```

5 The next prompt allows you confirm that you are not insane and really want to configure IP.

```
Do you want to configure the host and adapter(s) for Classical
IP now? default: y [y,n,?,q] y
```

6 Next, enter the adapter instance number for this system:

```
   If this is the first ATM adapter in this system, its instance
   number is 1.

Number for this instance of adapter? default: 1 [1-16,?,q] 1
```

7 The next prompt asks for the hostname that you want to assign to this interface. A suggested hostname is displayed, based on the nodename and the instance number of the adapter. To accept the default name, just press *<Enter>*.

```
Hostname for this CIP ATM interface (encip1)? default:
perch_atm1 [?,q] <Enter>
```

8 Next, you are prompted to enter the IP address for the interface.

```
IP address for ATM interface (encip1)? default: [?,q] 198.93.23.2
```

9 As a result, the information you have entered is displayed and you are prompted to confirm your inputs. If you answer that the information is correct, it is written to the appropriate files.

```
   +-----------------------------------------------------------+
   | ATM Interface Name and IP Address Information              |
   +-----------------------------------------------------------+

   ATM Adapter Number:              1

   ATM CIP Interface Name:          perch_atm1
   ATM CIP Interface IP Address:   198.93.23.2

Is this information correct? default: y [y,n,?] y
```

If you answer "**n**", the next prompt asks if you wish to reenter the information. If you answer "**y**", the same prompts are displayed again. If you say "**n**", the script continues and the information is not written to the files.

10 If you verified that the information entered was correct, the files are updated and you are asked if you wish to configure another adapter.

```
Updating /etc/opt/ATMLink/cfg/hostname.encip1 ...

Configure another adapter? default: y [y,n,?,q] n
```

The next messages introduce the PVC configuration section. PVC configuration can be performed from this script or by using the **atmlcm** utility later. You are prompted whether or not you wish to add PVCs to the PVC configuration file now.

```
   +-----------------------------------------------------------+
   | If you have installed Classical IP on at least one        |
   | ATM adapter, you will may provide information about PVC   |
   | connections which are automatically created by the system |
   | at boot time.                                             |
   +-----------------------------------------------------------+

   +--------------------------------------------------------+
   |  PVC Configuration                                     |
   +--------------------------------------------------------+

   The PVC configuration file is read by the host system when
   it boots to automatically create the permanent virtual
   connections defined in it. The file can be edited by hand
   at a later time, or you can add connection definitions now.

Do you want to add connection entries into the configuration
file now? default: y [y,n,?,q] y
```

11 To create a PVC you need to enter the hostname or IP address of the adapter in the other end-station to which you are connecting.

```
   +--------------------------------------------------------+
   | PVC Connection Configuration                            |
   +--------------------------------------------------------+

   The connection configuration file for this system is:
   /etc/opt/ATMLink/cfg/perch

Hostname or ip address to which to create a connection:  [?,q]
sword_atm1
```

12 Next, you are prompted for the port number (instance number) of the adapter.

```
Port number to use from 1 to 16, default: 1 [1-16,?,q] 1
```

13 Select a VCI number for the connection. Remember that VCI 0-31 are reserved.

```
VCI to use from 32 to 1023, default: 32 [32-1023,?,q] 32
```

14 The next section provides some information about selecting the transmit rate for the connection. In this script, you can only specify "**max**" or an absolute rate.

To specify a requested and acceptable rate for this connection, you must edit the file after the script is complete.

If you want to specify an absolute rate, answer the next prompt with "**n**". You will be prompted for the rate.

```
  The transmit rate is specified in units of megabits per second.
  Instead of a numeric value, "max" can be specified to request
  the entire available bandwidth. Note that the transmit rate
  should match the receive rate for the host at the other end of
  the connection.

Do you want to use the max available bandwidth for this
connection? default: y [y,n,?,q] y
```

The next prompt will ask if you want the system to try for the "best effort" on the transmit rate.

```
Use best effort on transmit? default: y [y,n,?,q] y
```

15 Next, you must specify the receive rate for the connection. For receive, you can only specify an absolute rate (in megabits per second) or "max." You will also be asked whether or not to use best effort.

```
 The receive rate is specified in units of megabits per second.
  Instead of a numeric value, "max" can be specified to request
  the entire available bandwidth. Note that the receive rate
  should match the receive rate for the host at the other end of
  the connection.

Do you want to use the max available bandwidth for this
connection? default: y [y,n,?,q] y

Use best effort on receive? default: y [y,n,?,q] y
```

16 When the connection configuration is complete, the information you have entered is displayed and you are asked if you want to add this information to the PVC configuration file. If you answer the prompt with

"**n**", steps 10-15 are repeated. If you answer "**y**," you will be prompted to configure another adapter.

```
+-----------------------------------------------------------+
| Configuration File Setup: Connection Information          |
+-----------------------------------------------------------+

Connect to:        sword_atm1
VCI:                 32
Port:                1
Transmit rate:     max best_effort
Receive rate:      max best_effort

Add this entry to the PVC config file? default: y [y,n,?,q] y

Add another entry? default: y [y,n,?,q] n
```

17 If you answer "**n**" to the last prompt, the main script menu is displayed. You can exit the script or refer to the procedures for configuring the other ATM functions listed.

18 After you complete the PVC configuration, you need to ensure that the interface's hostname is recognized by the system by performing the following steps:

a Update the "hosts", "services" and "netmask" maps on your directory service Master Server so that all hosts using the service will be updated with the new interface name.

b Edit the file */etc/nsswitch.conf* and list "files" before "nis" on the "hosts", "services" and "netmasks" entries.

Example: File /etc/nsswitch.conf

```
#
# /etc/nsswitch.nis:
#
# An example file that could be copied over to /etc/nsswitch.conf; it
# uses NIS (YP) in conjunction with files.
#
# "hosts:" and "services:" in this file are used only if the /etc/netconfig
# file contains "switch.so" as a nametoaddr library for "inet" transports.

# the following two lines obviate the "+" entry in /etc/passwd and /etc/group.
passwd:       files nis
group:        files nis

# consult /etc "files" only if nis is down.
hosts:        files nis dns [NOTFOUND=return]       <------  Changed
networks:     files nis [NOTFOUND=return]           <------
protocols:    nis [NOTFOUND=return] files
rpc:          nis [NOTFOUND=return] files
ethers:       nis [NOTFOUND=return] files
netmasks:     files nis [NOTFOUND=return]         <------
bootparams:   nis [NOTFOUND=return] files
publickey:    nis [NOTFOUND=return] files

netgroup:     nis

automount:    files nis
aliases:      files nis

# for efficient getservbyname() avoid nis
services:     files nis
sendmailvars:     files
```

Signalling Configuration

The signalling software consists of the Call Control Daemon (**atmlsd**) and other modules.The signalling software will allow the adapter to communicate with a switch to dynamically create Switched Virtual Connections (SVCs) and to perform LAN Emulation and ILMI functions, if they are enabled.

Using the **atmlcfg** utility, you can configure the system so that signalling is enabled or disabled whenever the system is rebooted.

Signalling, SVCs, and LAN Emulation are only supported on the first adapter installed in a workstation.

1 Log on as the *root* superuser to the host system that contains the adapter software.

2 Execute the **atmlcfg** utility:

```
stingray# cd /usr/atml/bin
stingray# ./atmlcfg

  +------------------------------------------------------------+
  | This script steps you through the process of configuring   |
  | your new ATM adapter(s). For each adapter you may choose   |
  | to configure specific information depending on what        |
  | installation options you have selected. Please             |
  | refer to the Adapter Installation Guide for detailed       |
  | information on installation options.                       |
  +------------------------------------------------------------+
```

3 A few paragraphs are displayed describing steps to be taken to configure IP addresses. At the first prompt, asking whether to configure the adapters now, answer “**y**”.

```
Do you want to configure the host and adapter(s) now?
default:y [y,n,?,q] y
```

4 Next, the main menu of the script is displayed. You will want to choose option "**4**" to configure the IP addresses.

```
   Please choose one of the following:

      0 -- Done with configuration
      1 -- Configure Classical IP (RFC 1577) network interface and PVCs
      2 -- Configure LAN Emulation, LANE network interface, and LECS
      3 -- Configure SVC support (RFC 1755)
      4 -- Configure signalling support
      5 -- Configure ILMI

Which do you want to do? default: 1 [0-5,?,q] 4
```

5 The next prompt asks if you want to enable signalling. If you answer "**n**", you will be prompted to see if you want to disable signalling. If you answer "**y**", a prompt is displayed indicating that signalling will be enabled upon system restart.

```
Do you want to ENABLE signalling support now? default:
n [y,n,?,q] y

   Signalling support has been enabled and will be available
   after the next system restart.


   Please choose one of the following:

      0 -- Done with configuration
      1 -- Configure Classical IP (RFC 1577) network interface and PVCs
      2 -- Configure LAN Emulation, LANE network interface, and LECS
      3 -- Configure SVC support (RFC 1755)
      4 -- Configure signalling support
      5 -- Configure ILMI

Which do you want to do? default: 1 [0-5,?,q]
```

6 At this point, you can either exit the script, or refer to the procedures for configuring the other ATM functions.

LAN Emulation Configuration

The LAN Emulation function provides the capability to emulate services of existing LANs across an ATM network. LAN stations today can send data without first creating connections. One of the big benefits of LAN emulation is that it provides the appearance of a connectionless network that most users are familiar with. It also allows end-stations to connect to an ATM network while software applications interact as if they were on a traditional LAN.

One or more emulated LANs can run on the same ATM network, though they must remain independent of each other. As with a physical LAN, users cannot communicate across emulated LAN boundaries. Such communication is only possible through bridges or routers (possibly implemented in the same end-station).

Each emulated LAN must be one of two types: Ethernet (IEEE 802.3) or Token Ring (IEEE 802.5). An emulated LAN consists of the following components:

- A set of LAN Emulation Clients (LECs)
- One LAN Emulation Service consisting of:
  - one LE Configuration Server (LECS)
  - one LE Server (LES)
  - a Broadcast Unknown Server (BUS)

The LEC is part of an ATM end-station. The LES can be part of an end-station or a switch and may be distributed over a number of stations. The 3Com adapters provide drivers and daemons to implement a LAN Emulation Client (LEC). However, no LES software is provided with the adapter.

The LAN Emulation function uses ILMI and Q2931 signalling to determine the address of the LE Configuration Server and to provide MAC addresses to the LECS. Therefore, you will need to configure and enable signalling and ILMI in order for LAN Emulation to work.

This is a very brief description of LAN Emulation. For complete details on the processes used by the LAN Emulation function, please refer to the *LAN Emulation Over ATM Specification, Version 1.0*.

To configure the system to use LAN Emulation, you can use the **atmlcfg** utility to:

- Enable or disable LAN Emulation support
- Specify a hostname and IP address for the LE interface on the adapter (these must be on a separate network from any other interface on the adapter)
- Configure the ATM address for the LECS. The utility will provide a “well-known” address for the LECS that you can use by default.

The following procedure steps you through the LAN Emulation configuration.

1 Log on as the *root* superuser to the host system that contains the adapter software.

2 Execute the **atmlcfg** utility:

```
stingray# cd /usr/atml/bin
stingray# ./atmlcfg

   +------------------------------------------------------------+
   | This script steps you through the process of configuring   |
   | your new ATM adapter(s). For each adapter you may choose   |
   | to configure specific information depending on what        |
   | installation options you have selected. Please             |
   | refer to the Adapter Installation Guide for detailed       |
   | information on installation options.                       |
   +------------------------------------------------------------+
```

A few paragraphs are displayed describing steps to be taken to configure IP addresses.

3 At the first prompt, asking whether to configure the adapters now, answer “**y**”.

```
Do you want to configure the host and adapter(s) now?
default:y [y,n,?,q] y
```

4 Next, the main menu of the script is displayed. Choose option “**2**” to configure LAN Emulation.

```
   Please choose one of the following:

     0 -- Done with configuration
     1 -- Configure Classical IP (RFC 1577) network interface and PVCs
     2 -- Configure LAN Emulation, LANE network interface, and LECS
     3 -- Configure SVC support (RFC 1755)
     4 -- Configure signalling support
     5 -- Configure ILMI

Which do you want to do? default: 1 [0-5,?,q] 2
```

5 The next prompt asks if you want to enable LAN Emulation. If you answer “**n**”, you will be prompted to see if you want to disable LAN Emulation. If you answer “**y**”, a prompt is displayed indicating that LANE will be enabled upon system restart.

```
Do you want to ENABLE LAN Emulation support now? default:
n [y,n,?,q] y

   LAN Emulation support has been enabled and will be
   available after the next system restart.
```

6 Next, a message is displayed describing the steps necessary to configure the LANE network interface on the adapter. If you want to continue with the configuration, enter “**y**” at the prompt.

The LAN Emulation IP interface must be on a separate subnet from any other network IP interfaces in the end-station.

```
+-----------------------------------------------------------+
| You have chosen to run LAN Emulation which means you must  |
| choose a unique hostname and IP address for the LANE       |
| network interface. All IP interface addresses must be on a |
| separate subnet. Be sure to specify a separate subnet for  |
| this address. In addition, you must configure the location |
| for the LAN Emulation Configuration Server. After the      |
| network interfaces are properly configured, you will be    |
| asked to configure the LECS.                               |
+-----------------------------------------------------------+

Do you want to configure the host and adapter for LAN Emulation
now? default: y [y,n,?,q] y
```

7 The next prompt asks for the hostname and IP address that you want to assign to the LANE interface.

```
Name for this LANE ATM interface (enle1)? default:
perch_lane1 [?,q] <Enter>

IP address for ATM interface (enle1)? 192.94.73.2
```

8 The information you have entered is displayed and you are asked to verify that it is correct. If you answer "**y**" to this prompt, the information

is written to the configuration files. If you answer “**n**”, you are prompted to see if you want to reenter the information.

```
+------------------------------------------------------------+
| ATM Interface Name and IP Address Information              |
+------------------------------------------------------------+

ATM Adapter Number:              1


ATM LANE Interface Name:         perch_lane1

ATM LANE Interface IP Address: 192.94.73.2

Is this information correct? default: y [y,n,?] y
```

9 Finally, you are prompted to enter the ATM address for the LAN Emulation Configuration Server.

```
+------------------------------------------------------------+
| If you have installed LAN Emulation on at least one        |
| ATM adapter, you will need to provide information about    |
| the LAN Emulation Client Configuration and the location    |
| of the LAN Emulation Configuration Server.                 |
| This configuration is only done once for each system.      |
+------------------------------------------------------------+

Do you want to configure the LAN Emulation Configuration Server
now? default: y [y,n,?,q] y
```

10 The next prompt asks if you want to use the well-known ATM address for the LECS. If you answer "**n**" to this prompt, you will be prompted to enter an ATM address for the LECS.

```
   +--------------------------------------------------------+
   | LAN Emulation Client (LEC) Configuration /             |
   | LAN Emulation Configuration Server (LECS) Location     |
   +--------------------------------------------------------+

Use the well-known ATM address for the LECS? default:
y [y,n,?,q] y
```

11 If you selected the well-known address, it is displayed and you are asked to verify if it is correct. If you answer "**n**" to this prompt, you are asked if you want to re-enter the LECS ATM address. Otherwise, the LECS address is written to the configuration file.

```
   +--------------------------------------------------------+
   | LEC Configuration Information                          |
   +--------------------------------------------------------+

   LECS ATM address:    47007900000000000000000000a03e00000100

Is this information correct? default: y [y,n,?,q] y
```

That's it! You can either exit the script here or refer to the procedures for configuring the other ATM functions.

ILMI Configuration

The adapter software implements the UNI 3.0 Interim Local Management Interface (ILMI). This function uses the Simple Network Management Protocol (SNMP) to allow communication between end-stations and switches.

In version 3.0.x of the software, the main purpose of ILMI is "address registration". In order for a switch to communicate with an end-station, it needs to know the ATM address of the adapter in the end-station.

Likewise, the end-station must also know the network prefix associated with the switch port before it can set its ATM address in the switch.

ILMI provides the capability for the switch and end-station to trade information about the switches' network prefix and the end-station's ATM addresses using SNMP *set* requests. The end-station creates its ATM address from a "network prefix" provided by the switch, plus its own unique end-station identifier (ESI).

Using the **atmlcfg** utility, ILMI support can be configured to be enabled or disabled upon system restart. You can also use the **atmlcm** utility later to stop and restart ILMI or to configure parameters used by the function. However, if you change the enabled/disabled state of ILMI using **atmlcm**, it will only be in effect until the system is rebooted. Then whatever has been configured using **atmlcfg** (ILMI enabled or disabled) will take effect.

1 Log on as the *root* superuser to the host system that contains the adapter software.

2 Execute the **atmlcfg** utility. A few paragraphs are displayed describing steps to be taken to configure IP addresses.

3 At the first prompt, asking whether to configure the adapters now, answer "**y**".

```
Do you want to configure the host and adapter(s) now?
default:y [y,n,?,q] y
```

4 Next, the main menu of the script is displayed. Choose option “**5**” to configure ILMI.

```
   Please choose one of the following:

      0 -- Done with configuration
      1 -- Configure Classical IP (RFC 1577) network interface and PVCs
      2 -- Configure LAN Emulation, LANE network interface, and LECS
      3 -- Configure SVC support (RFC 1755)
      4 -- Configure signalling support
      5 -- Configure ILMI

Which do you want to do? default: 1 [0-5,?,q] 5
```

5 The next prompt asks if you want to enable ILMI support. If you answer “**n**”, you will be prompted to see if you want to disable ILMI. If you answer “**y**”, a message is displayed indicating that ILMI will be enabled upon system restart.

```
Do you want to ENABLE ILMI support now? default: n [y,n,?,q] y

   ILMI support has been enabled and will be
   available after the next system restart.
```

6 The main menu is then re-displayed. You can exit the script or continue with the configuration of other ATM functionality.

SVC Configuration

The 3Com adapters support the RFC 1577/1755 implementation of Switched Virtual Channels (SVCs). This means that, whenever data is transferred by the end-user (by FTP or ping, for example), SVCs are automatically created. This is done using the signalling and ILMI functions. Therefore, even if you configure SVC support, the signalling and ILMI functions need to be configured and enabled in order for the system to automatically create SVCs.

With SVCs configured, the user can issue a command to an ATM IP address (or hostname) and the SVC to that end-station is automatically created for the duration of the data transfer. In order to create an SVC when given a hostname or IP address, the system uses an ATM Address Resolution Protocol (ARP) server.

The ATM ARP server keeps a table that maps the IP addresses to the ATM addresses of the adapter interfaces. The communication process is shown in Figure 4-5.

1 When the end-station gets a request to send data to an IP address, it checks in */usr/atml/cfg* called *server1577.encip#*, where the # is the adapter instance number. This file contains the ATM hostname of the ARP server.

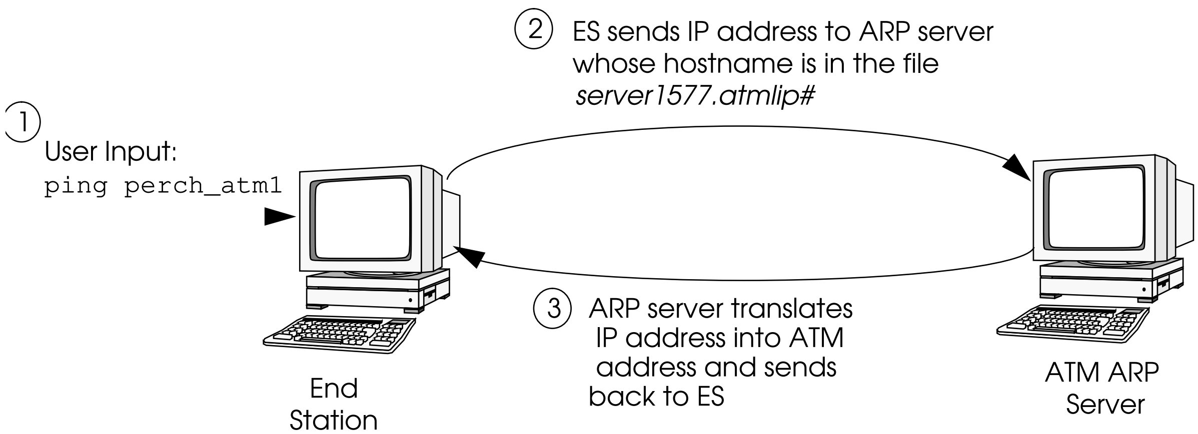

Figure 4-5 SVC Address Resolution from ARP Server

1 The end-station sends a request to the ARP server to translate the IP address.

2 The ARP server looks up the IP address in the ARP table and returns the 40-character hexadecimal ATM address of the destination end-station.

Only <u>one</u> ATM ARP server should be defined on your network. Your network may already have an ARP server that is used for your existing LAN, but you define a new ARP server to be used specifically for ATM.

The ARP server is defined using the **atmlcfg** utility which creates the *server1577.encip#* file.

Also, the ARP server must have an ATM adapter installed and configured before you attempt this configuration procedure.

1 Log on as the *root* superuser to the host system that contains the adapter software.

2 Execute the **atmlcfg** utility. A few paragraphs are displayed describing steps to be taken to configure IP addresses.

3 At the first prompt, asking whether to configure the adapters now, answer "**y**".

```
Do you want to configure the host and adapter(s) now?
default:y [y,n,?,q] y
```

4 Next, the main menu of the script is displayed. Choose option "**3**" to configure SVC support.

```
    Please choose one of the following:

      0 -- Done with configuration
      1 -- Configure Classical IP (RFC 1577) network interface and PVCs
      2 -- Configure LAN Emulation, LANE network interface, and LECS
      3 -- Configure SVC support (RFC 1755)
      4 -- Configure signalling support
      5 -- Configure ILMI

  Which do you want to do? default: 1 [0-5,?,q] 3
```

5 Next, you need to confirm that you want to configure SVC support by answering "**y**" to the prompt.

```
Do you want to configure the host and adapter for SVC support
now? default: y [y,n,?,q] y

   +-------------------------------------------------------------+
   | You have chosen to configure SVC Support (RFC 1755) which      |
   | means you must choose an ATM hostname and ATM address for the |
   | ATM ARP server for the network interface.                          |
   +-------------------------------------------------------------+
```

6 You will next be prompted for the hostname of the ATM adapter interface that is installed in the ARP server.

```
Enter ATM ARP Server hostname: stingray_atm1
```

7 Then you need to enter the ATM address of the adapter in the ARP server. You can get this address by running **atmlcm** on the ARP server.

a Open a remote shell to the ARP server system and run **atmlcm**.

b Issue the **show** or **show address** command.

c Copy the address from the display and paste it into the script prompt.

```
Enter ATM ARP Server ATM address :
39-0000-00-000000-0000-0000-0000-00:20:ea:00:05:67-00
```

8 The next display shows the information you have entered. You are asked to verify the information. If you answer "**n**", you will asked if you want to re-enter the data. If not, the main menu is displayed.

If you answer “**y**”, messages are displayed showing the data being written to the configuration files.

```
+-----------------------------------------------------------+
 | ATM ARP Server Hostname and ATM Address                         |
 +-----------------------------------------------------------+

 ATM Adapter Number:              1

 ATM ARP Server Hostname:        stingray_atm1
 ATM ARP Server ATM Address:
  39-0000-00-000000-0000-0000-0000-00:20:ea:00:05:67-00

Is this information correct? default: y [y,n,?]

Updating /etc/opt/ATMLink/cfg/server1577.atmlip1 ...

Updating ATM Hosts File ...
```

9 The main menu is then re-displayed. You can exit the script or continue with the configuration of other ATM functionality.

5 HARDWARE DIAGNOSTICS

Diagnostic Overview

The 3Com diagnostic software provides simple diagnostic tests to verify that the adapter hardware and drivers are installed and functioning properly.

Adapter Test Procedure

The ATMLink diagnostics utility for UNIX provides a command-line interface that can be used to test certain functions of the adapter. The following procedure uses three ATMLink diagnostics commands to perform an initial test on the adapter. For a full description of this utility, refer to the manual pages that were included with the adapter.

To initially test adapter functionality, follow these steps:

1. Log on as *root* to the workstation that contains the adapter.
2. Change to the software installation directory.
3. Start the diagnostic utility by executing the **atmldiag** command. To run diagnostics on a particular adapter, issue the command **atmldiag -c** *adapternum*, where *adapternum* is **0** for the first one installed, and **1** for the next, etc.

   If another **atmldiag** session is being executed on the same card or the controller does not exist, the following message will be displayed:

```
# atmldiag -c 0
SYSTEM ERROR : Device busy
# atmldiag -c 8
SYSTEM ERROR : No such device or address
```

```
# atmldiag
Info for controller #   0   (flipper)
 Factory ESI Address - 00:20:ea:00:03:f5
 Serial No.            - 1013
 SBus Slot Id          - 0x00000002
 Board Id               - 0x00000042
 Description           - ATMLink_SBus-155s : 155 Mbps SONET/SDH Multi-Mode Fibre
 Driver Version       - 2.1
 Diagnostic Version   - 2.1
 Fcode Version         - 0.1

Info for controller #   1   (flipper)
 Factory ESI Address - 00:20:ea:00:04:12
 Serial No.            - 1042
 SBus Slot Id          - 0x00000002
 Board Id               - 0x00000042
 Description           - ATMLink_SBus-155s : 155 Mbps SONET/SDH Multi-Mode Fibre
 Driver Version       - 2.1
 Diagnostic Version   - 2.1
 Fcode Version         - 0.1

Enter controller no. = 0
```

Otherwise, information about each adapter installed in the system is displayed and you will be prompted for the controller number to test.

4 When you select a controller number as shown above, the following information is displayed for that controller.

```
-----------------------------------------------------------


Info for controller #   0   (flipper)
 Factory ESI Address - 00:20:ea:00:03:f5
 Serial No.            - 1013
 SBus Slot Id          - 0x00000002
 Board Id               - 0x00000042
 Description           - ATMLink_SBus-155s : 155 Mbps SONET/SDH Multi-Mode Fibre
 Driver Version       - 2.1
 Diagnostic Version   - 2.1
 Fcode Version         - 0.1

atmldiag:flipper:0#
```

5 If desired, list the **atmldiag** command set using the **help** command as shown in Figure 5-1.

```
atmldiag:flipper:0# help
3Com ATM Adapter Diagnostic Program.

General commands supported :

info            -  Display network interface controller general information.
fcode_fetch     -  Fetch FCODE info and save it to a file.
fcode_update    -  Load FCODE information from file.
dump            -  Dump the contents of MIDWAY regs, PHY regs and SAR
                    memory to a file.
modify          -  Modify the contents of SAR memory.
display         -  Display the contents of SAR memory, MIDWAY regs or PHY regs.
line_loop       -  Set the phy in high speed line loopback.
log_level       -  Set the diagnostics log level.
loop            -  Loop on specified list of diagnostic commands.
quit            -  Quit diagnostic program.

Specific diagnostic commands supported:

selftest        -  Execute Self Test diagnostic tests.
hbi_slave       -  Execute Host Bus Interface Slave diagnostic tests.
hbi_dma         -  Execute Host Bus Interface DMA diagnostic tests.
hbi_int         -  Execute Host Bus Interface Interrupt diagnostic tests.
eeprom          -  Execute EEPROM diagnostic test.
midway          -  Execute MIDWAY diagnostic tests.
sar_mem         -  Execute basic SAR Memory diagnostic tests.
sar_mem_e       -  Execute extended SAR Memory diagnostic tests.
phy             -  Execute phy diagnostic test.
atm_internal    -  Execute ATM Internal Loopback tests.
atm_external    -  Execute ATM External Loopback tests, (loopback cable
                    required).

For help on a specific command,type "help" followed by command name.
atmldiag:flipper:0#
```

Figure 5-1 **atmldiag** Command Line “help” Listing

6 Execute the adapter self-test, which automatically executes each of the tests shown in Figure 5-1 except for the "`hbi_int`," "`sar_mem_e`" and the "`atm_external`" tests.

```
atmldiag:flipper:0# selftest
Sun Aug 14 16:02:31 1994
Self Tests: function 0 all self tests.
PASSED
atmldiag:flipper:0#
```

If there are virtual connections currently configured on the adapter, the following message will be displayed when you try to run the self-test.

```
atmldiag:flipper:0# selftest
Sun Aug 14 16:02:31 1994
Self Tests: function 0 all self tests.
SYSTEM ERROR: Device busy
```

You must then exit the **atmldiag** utility and issue the **atmlcm** "**delete all**" command to flush the connections. Then execute the **atmldiag** utility and **selftest** again.

```
atmldiag:flipper:0# quit
# atmlcm delete all
# atmldiag -c 0
atmldiag:flipper:0# selftest
Sun Aug 14 16:02:31 1994
Self Tests: function 0 all self tests.
PASSED
atmldiag:flipper:0#
```

7 Execute the SAR memory test using the following command:

```
atmldiag:flipper:0# sar_mem_e
Sun Aug 14 16:02:31 1994
Extended Segmentation and Reassembly Tests: function 0
all extended sar memory tests.
PASSED
atmldiag:flipper:0#
```

8 Finally, if you have an external loopback cable, you can use the **atm_external** command to test the external ATM connection to the adapter.

a Attach the loopback cable to the adapter ports connecting transmit to receive.

b Issue the following command:

```
atmldiag:flipper:0# atm_external
Sun Aug 14 16:02:31 1994ATM External Tests: function
0 all external atm tests.
PASSED
atmldiag:flipper:0#
```

9 If any of the diagnostic tests fail, contact 3Com Customer Service at the numbers provided in Appendix B.

10 If the adapter passed all of the above tests, remove the loopback cable and connect the adapter ports to your ATM switch.

11 Type "**q**" or "**quit**" to exit the diagnostic utility, then enter "**init 6**" on Solaris or "**reboot**" on SunOS to reboot your machine.

```
atmldiag:flipper:0# quit
Sun Aug 14 16:02:31 1994ATM External Tests: function 0
all external atm tests.
PASSED
# init 6
(system reboots)
```

6 TROUBLESHOOTING

This chapter presents answers to some commonly asked questions about the adapter hardware and software installation.

The system wouldn't reboot after I installed the adapter and turned it on.

Reopen the system unit and check to see that the adapter is properly seated before trying to reboot the system again.

On Solaris, I tried to run the software installation procedure and it failed with the following messages:

```
drvconfig: System call 'modctl_modconfig' failed: No
  such device or address
Warning: Driver (atmlnd) configuration failed.
 System could not install the driver.
pkgadd: ERROR: class action script did not complete
  successfully

Installation of <ATMLink> failed.
```

You must install the adapter hardware in the workstation *before* you install the adapter driver software. Use the software removal procedure for your type of operating system, install the adapter, and attempt to install the software again.

I installed and configured the adapter, and tried to reboot the workstation and it hung. It appears the Ethernet port in the workstation quit working. I can't ping it and my NFS mounts no longer work.

This indicates a problem with the way the netmask is set for the IP addresses you have assigned to the ATM adapter. Remove the adapter from the workstation and reboot it. If it comes up, it is probably the netmask setting. Be sure that the IP address you assigned to the ATM adapter is on a ***completely different network*** than the host network.

I have moved the adapter to another slot in the machine and now the instance numbers are out of sync. How do I reset them?

In the Solaris OS, you can tell the system the new slot position by running the script /usr/atml/bin/atm_reset_instance and then rebooting the system. This script will clean up the */etc/path_to_inst* file and allow the system to recognize the adapter in a different slot.

I tried to run atmlcm, and got the following response:

```
walleye# /usr/atml/bin/atmlcm
atmlcm System Error : Connection refused
atmlcm:???:1>
```

I also got a message on the system console saying:

inetd[160]: atmlnm/tcp: unknown service

This indicates that the yellow pages-type name service (NIS, NIS+, etc.) has not been updated properly. Check your Sun documentation for information on updating the */etc/services* and */etc/inetd.conf* files.

7 TECHNICAL SPECIFICATIONS

Cabling Overview

On multi-mode fiber adapters, take care to protect optical connectors against dust and physical contact with all other objects. Never touch the ends of the cables.

All disconnected optical connectors must be covered with dust protecting caps, as shown in Figure 7-1. Do not remove these caps until immediately before mounting the adapter in the chassis.

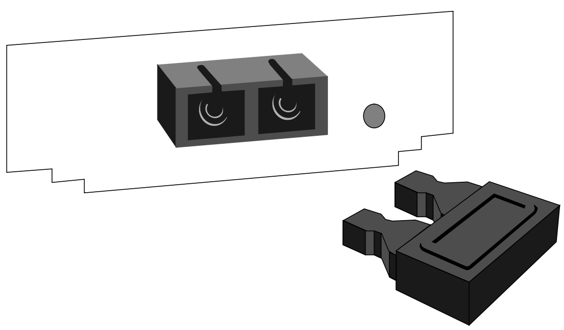

Figure 7-1 Fiber Optic Dust Protecting Cap

When no optical cable is connected to the adapter, the protective cap supplied with the adapter should be plugged in to protect the optical transceiver.

When connecting optical cables between the adapter and the switch, care must be taken so that the transmitter cable of the switch is connected to the receiver connector on the adapter. Likewise, the switch's receiver cable must be connected to the transmitter connector on the adapter.

When using simplex (single) SC connectors, ensure that the transmitter connector from the switch is attached to the connector marked "RX ," and the receiver connector from the switch is attached to the connector marked "TX ."

When using duplex SC connector assembly, the connector can only be plugged in the correct way.

Be careful not to twist or bend the optical cable to the point where it may break the glass fiber inside the cable.

SBus Adapter Specifications

The following tables describe the physical and environmental specifications of the 3Com SBus adapters.

Table 7-1 ATMLink SBus-155 Technical Specifications

SBus Interface	Size	Single slot adapter
	SBus Frequency	16 to 25 MHz
	Bus master	32 bit bus master capability, up to 64 byte burst size.
Optical Interface	Connector	SC style optical interface
	Multi-Mode Fiber (MMF)	
	Core diameter Cladding diameter Min. modal bandwidth	62.5 µm 125 µm 500 MHz*km
	Operating distance	0 to 2 km
	Line code	NRZ
	Data rate	155.52 Mbit per second
	Rate tolerance	±100 ppm
Transmitter	Transmitter type	LED
	Wavelength	1260 to 1360 nm
	Max Spectral width	200 nm
	Mean Launched power	–20 to –14 dBm
	Minimum extinction ratio	10 dB
	Maximum rise time	3 ns

Table 7-1 ATMLink SBus-155 Technical Specifications

Receiver	Min sensitivity	–30 dBm
	Max overload	–14 dBm
	Path power penalty	1 dB
Power		Maximum 1.5 amps @ +5V ± 5% Maximum 0 amps @ ±12V
Temperature		Operating: 0 to 70° C Non-operating, storage: -40 to 100° C
Humidity		5% to 95% noncondensing

A TECHNICAL SUPPORT

3Com provides easy access to technical support information through a variety of services. This appendix describes these services.

On-line Technical Services

3Com offers worldwide product support seven days a week, 24 hours a day, through the following on-line systems:

- 3Com Bulletin Board Service (3ComBBS)
- World Wide Web Site
- Ask3Com℠ on CompuServe®
- 3ComFacts℠ Automated Fax Service

3Com Bulletin Board Service

3ComBBS contains patches, software, and drivers for all 3Com products, as well as technical articles. This service is available via modem seven days a week, 24 hours a day. To reach the service, set your modem to 8 data bits, no parity, and 1 stop bit. Call the telephone number nearest you:

Country	Baud Rate	Telephone Number
Australia	up to 14400 baud	(61) (2) 955 2073
France	up to 14400 baud	(33) (1) 69 86 69 54
Germany	up to 9600 baud up to 9600 baud	(49) (89) 627 32 188 (49) (89) 627 32 189
Hong Kong	up to 14400 baud	(852) 537 5601
Italy (fee required)	up to 9600 baud	(39) (2) 273 00680
Japan	up to 14400 baud	(81) (3) 3345 7266
Singapore	up to 14400 baud	(65) 534 5693

Country	Baud Rate	Telephone Number
Taiwan	up to 14400 baud	(886) (2) 377 5838 (886) (2) 377 5840
U.K.	up to 14400 baud	(44) (144) 227 8278
U.S.	up to 14400 baud	(1) (408) 980 8204

World Wide Web Site

Access the latest networking information on 3Com's World Wide Web site by entering our URL into your Internet browser:

`http://www.3Com.com/`

This service features news and information about 3Com products, customer service and support, 3Com's latest news releases, selected articles from 3TECH™ , 3Com's award-winning technical journal, and more.

Ask3Com on CompuServe

Ask3Com is a CompuServe-based service containing patches, software, drivers, and technical articles about all 3Com products, as well as an interactive forum for technical questions. To use Ask3Com, you need a CompuServe account.

To use Ask3Com:

1 Log on to CompuServe.

2 Enter go threecom

3 Press [Return] to see the Ask3Com main menu.

3ComFacts Automated Fax Service

3Com Corporation's interactive fax service, 3ComFacts, provides data sheets, technical articles, diagrams, and troubleshooting instructions on 3Com products 24 hours a day, seven days a week. Within this service, you may choose to access CardFacts® for adapter information, or NetFacts® for network system product information.

- CardFacts provides adapter installation diagrams, configuration drawings, troubleshooting instruction, and technical articles.

  Document 9999 provides you with an index of adapter documents.

- NetFacts provides data sheets and technical articles on 3Com Corporation's hub, bridge, router, terminal server, and software products.

  Document 8888 provides you with an index of system product documents.

Call 3ComFacts using your touch-tone telephone. International access numbers are:

Country	Fax Number
Hong Kong	(852) 537 5610
U.K.	(44) (144) 227 8279
U.S.	(1) (408) 727 7021

Local access numbers are available within the following countries:

Country	Fax Number
Australia	800 123853
Denmark	800 17319
Finland	98 001 4444
France	05 90 81 58
Germany	0130 8180 63

Country	Fax Number
Italy	1678 99085
Netherlands	06 0228049
Norway	800 11062
Sweden	020 792954
U.K.	0800 626403

Support from Your Network Supplier

If additional assistance is required, contact your network supplier. Many suppliers are authorized 3Com service partners who are qualified to provide a variety of services, including network planning, installation, hardware maintenance, application training, and support services.

When you contact your network supplier for assistance, have the following information ready:

- Diagnostic error messages
- A list of system hardware and software, including revision levels
- Details about recent configuration changes, if applicable

If you are unable to contact your network supplier, see the following section on how to contact 3Com.

Support from 3Com

If you are unable to receive support from your network supplier, technical support contracts are available from 3Com.

In the U.S. and Canada, call (800) 876-3266 for customer service.

If you are outside the U.S. and Canada, contact your local 3Com sales office to find your authorized service provider:

Country	Telephone Number
Australia (Sydney)	(61) (2) 959 3020
(Melbourne)	(61) (3) 653 9515
Belgium	(32) (2) 7164880
Brazil	(55) (11) 241 1571
Canada	(905) 882 9964
France	(33) (1) 69 86 68 00
Germany	(49) (89) 6 27 32 0
Hong Kong	(852) 868 9111
Italy	(39) (2) 273 02041
Japan	(81) (3) 3345 7251

Country	Telephone Number
Mexico	(525) 531 0591
Netherlands	(31) (3) 402 55033
Singapore	(65) 538 9368
South Africa	(27) (11) 803 7404
Spain	(34) (1) 3831700
Sweden	(46) (8) 632 91 00
Taiwan	(886) (2) 577 4352
United Arab Emirates	(971) (4) 349049
U.K.	(44) (1628) 897000

Returning Products for Repair

A product sent directly to 3Com for repair must first be assigned a Return Materials Authorization (RMA) number. A product sent to 3Com without an RMA number will be returned to the sender unopened, at the sender's expense.

To obtain an RMA number, call or fax:

Country	Telephone Number	Fax Number
U.S and Canada	(800) 876 3266, option 2	(408) 764 7120
Europe	(44) (1442) 278000	(44) (1442) 236824
Outside Europe, U.S. and Canada	(1) (408) 492 1790	(1) (408) 764 7290

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INDEX

LIMITED WARRANTY

HARDWARE: 3Com warrants its hardware products to be free from defects in workmanship and materials, under normal use and service, for the following lengths of time from the date of purchase from 3Com or its Authorized Reseller:

Internetworking products	One year
Network adapters	Lifetime
Ethernet stackable hubs and Unmanaged Ethernet fixed port repeaters	Lifetime* (One year if not registered)
*Power supply and fans in these stackable hubs and unmanaged repeaters	One year
Other hardware products	One year
Spare parts and spares kits	90 days

If a product does not operate as warranted during the applicable warranty period, 3Com shall, at its option and expense, repair the defective product or part, deliver to Customer an equivalent product or part to replace the defective item, or refund to Customer the purchase price paid for the defective product. All products that are replaced will become the property of 3Com. Replacement products may be new or reconditioned. Any replaced or repaired product or part has a ninety (90) day warranty or the remainder of the initial warranty period, whichever is longer.

3Com shall not be responsible for any software, firmware, information, or memory data of Customer contained in, stored on, or integrated with any products returned to 3Com pursuant to any warranty.

SOFTWARE: 3Com warrants that the software programs licensed from it will perform in substantial conformance to the program specifications therefor for a period of ninety (90) days from the date of purchase from 3Com or its Authorized Reseller. 3Com warrants the magnetic media containing software against failure during the warranty period. No updates are provided. 3Com's sole obligation hereunder shall be (at 3Com's discretion) to refund the purchase price paid by Customer for any defective software products, or to replace any defective media with software which substantially conforms to 3Com's applicable published specifications. Customer assumes responsibility for the selection of the appropriate applications program and associated reference materials. 3Com makes no warranty that its software products will work in combination with any hardware or applications software products provided by third parties, that the operation of the software products will be uninterrupted or error free, or that all defects in the software products will be corrected. For any third party products listed in the 3Com software product documentation or specifications as being compatible, 3Com will make reasonable efforts to provide compatibility, except where the non-compatibility is caused by a “bug” or defect in the third party's product.

STANDARD WARRANTY SERVICE: Standard warranty service for hardware products may be obtained by delivering the defective product, accompanied by a copy of the dated proof of purchase, to 3Com's Corporate Service Center or to an Authorized 3Com Service Center during the applicable warranty period. Standard warranty service for software products may be obtained by telephoning 3Com's Corporate Service Center or an Authorized 3Com Service Center, within the warranty period. Products returned to 3Com's Corporate Service Center must be pre-authorized by 3Com with a Return Material Authorization (RMA) number marked on the outside of the package, and sent prepaid, insured, and packaged appropriately for safe shipment. The repaired or replaced item will be shipped to Customer, at 3Com's expense, not later than thirty (30) days after receipt by 3Com.

WARRANTIES EXCLUSIVE: IF A 3COM PRODUCT DOES NOT OPERATE AS WARRANTED ABOVE, CUSTOMER’S SOLE REMEDY SHALL BE REPAIR, REPLACEMENT, OR REFUND OF THE PURCHASE PRICE PAID, AT 3COM’S OPTION. THE FOREGOING WARRANTIES AND REMEDIES ARE EXCLUSIVE AND ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, EITHER IN FACT OR BY OPERATION OF LAW, STATUTORY OR OTHERWISE, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. 3COM NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH THE SALE, INSTALLATION, MAINTENANCE OR USE OF ITS PRODUCTS.

3COM SHALL NOT BE LIABLE UNDER THIS WARRANTY IF ITS TESTING AND EXAMINATION DISCLOSE THAT THE ALLEGED DEFECT IN THE PRODUCT DOES NOT EXIST OR WAS CAUSED BY CUSTOMER'S OR ANY THIRD PERSON'S MISUSE, NEGLECT, IMPROPER INSTALLATION OR TESTING, UNAUTHORIZED ATTEMPTS TO REPAIR, OR ANY OTHER CAUSE BEYOND THE RANGE OF THE INTENDED USE, OR BY ACCIDENT, FIRE, LIGHTNING, OR OTHER HAZARD.

LIMITATION OF LIABILITY: IN NO EVENT, WHETHER BASED IN CONTRACT OR TORT (INCLUDING NEGLIGENCE) SHALL 3COM BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, INDIRECT, SPECIAL, OR PUNITIVE DAMAGES OF ANY KIND, OR FOR LOSS OF REVENUE, LOSS OF BUSINESS, OR OTHER FINANCIAL LOSS ARISING OUT OF OR IN CONNECTION WITH THE SALE, INSTALLATION, MAINTENANCE, USE, PERFORMANCE, FAILURE, OR INTERRUPTION OF ITS PRODUCTS, EVEN IF 3COM OR ITS AUTHORIZED RESELLER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES

Some states do not allow the exclusion of implied warranties or the limitation of incidental or consequential damages for consumer products, so the above limitations and exclusions may not apply to you. This warranty gives you specific legal rights which may vary from state to state.

GOVERNING LAW: This Limited Warranty shall be governed by the laws of the state of California.

3Com Corporation

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