Managing the AXIS Shelf

The AXIS Release 3.0 allows the user to perform the following management functions:

- Use a terminal or workstation to issue commands to configure, monitor and manage the AXIS resources in a network. The recommended method for managing most of the AXIS functions is through StrataView Plus Rel 8.2 via the inband link from the BPX network.
- Transfer files between a workstation and AXIS to configure statistics types for collection and to collect those statistics from the shelf.
- Transfer files between a workstation and AXIS to download firmware into the AXIS shelf.
- Transfer files between a workstation and AXIS to backup or restore shelf configuration files.

To perform these user interface functions, AXIS Release 3.0 offers a variety of physical access paths and a variety of protocols. Depending upon the function to be performed, there are four physical access methods that can be used as follows:

- Serial line access through the RS-232 Maintenance Port of the ASC.
- Serial line access through the RS-232 Control Port on the ASC using Serial Line IP [SLIP].
- Ethernet access through the AUI LAN port.
- Inband access through eight dedicated virtual connections over the BPX network to the BNM.

The protocols that can be employed are:

- **CLI** (Maintenance Port, Control Port, LAN port, and Inband)—All these ports except the maintenance port use Telnet to access the Command Line Interface (CLI).
- **TCP/IP TFTP** (Control Port, LAN port, Inband)—This is used for transferring files between a workstation and AXIS. This protocol is used for configuring and collecting statistics and configuration files and for downloading firmware to AXIS.
- UDP/IP SNMP (Control Port, LAN port, Inband)—This is used to configure, monitor and manage the AXIS resources using SNMP Get and Set commands. The user can use StrataView Plus or other registered SNMP Managers.

A matrix of permissible user interface combinations in Release 2 is shown in Table 3-1.

UI Function	Physical Access Path	TCP/IP Protocols Used
Enter Commands using CLI	ASC Maintenance Port	None
	ASC Control Port	SLIP, TCP, Telnet
	In-band BNM T3 Port	IP, TCP, Telnet
	LAN Port	IP, TCP, Telnet
Configure/Collect Statistics and Configuration Files	ASC Control Port	SLIP, TCP, TFTP
	In-band BNM T3 Port	IP, TCP TFTP
		IP, TCP, TFTP
	LAN Port	
Enter Commands using SNMP	ASC Control Port	SLIP, UDP, SNMP
	In-band BNM T3 Port	IP, UDP, SNMP
	LAN Port	IP, UDP, SNMP
Download Firmware	ASC Control Port	SLIP, TCP, TFTP
	In-band BNM T3 Port	IP, TCP, TFTP
	LAN Port	IP, TCP, TFTP

Table 3-1 UI Function/Access Path/Protocol Combinations

Maintenance Port

The maintenance port is the upper RS-232 connector on the ASC line module. The connector is DB-25 (female). With serial line access via the maintenance port, the user interface prompt appears once the dumb terminal is connected and the system is powered up. No special software is required and the connection is made through a standard (not null modem) cable. This arrangement is shown in Figure 3-1. Entering commands via a dumb (or emulated) terminal is the only use for the Maintenance Port. The maintenance port is configured for 8 data bits, no parity, one stop bit and 9600 bps.



Figure 3-1 Maintenance Port Access

Control and LAN Ports

The control port is the middle RS-232 connector on the ASC line module. The connector is an RS-232 DB-25 (female). For this type of connectivity, the control terminal (PC or workstation) must support TCP/IP using a SLIP serial connection and the control port must have been previously configured with an IP address. The control terminal can be connected either locally or remotely using modems. When entering command line commands through the control port, the user interface prompt appears when user performs a Telnet login to the port's IP address.

The LAN Port on the ASC is an Ethernet AUI port.

The Control and LAN Ports support Telnet (for CLI), TFTP and SNMP sessions as indicated in Table 3-1. Use of the Control Port is shown in Figure 3-2.

If you have multiple devices to which you want to log into to configure, you might want to connect your workstation or PC to a terminal server, that can dial out to multiple devices. Figure 3-3 illustrates a possible scenario for terminal server control port access.

How the LAN port is connected is shown in Figure 3-4



Figure 3-2 Control Port Access

Figure 3-3 Control Port Access Via a Terminal Server



Inband Access

Inband access uses a portion of the bandwidth of the AXIS/BPX T3 connection by reserving a number of ATM virtual connections for network management functions. For this type of connectivity, the control terminal (PC or workstation) is connected through the BPX network and must support TCP/IP and the inband port on the BNM must have been previously configured with an IP address. When using the inband port to enter CLI commands, the user interface prompt appears when the user performs a Telnet login to the port's IP address.



User Accounts and Privilege Levels

AXIS systems have security features built-in to prevent unauthorized use of the system. The security features require that each user on the system must have a valid account (specified by a userid), password and privilege level.

The combination of account, password, and privilege level determine which commands the user can execute.

Before a user can be logged in, the user must have a previously assigned account, password and privilege level. The account (userID) and privilege level are assigned using the **adduser** command. There is a default password which is used the first time a user logs in. When logged in, the user can change the password to a personal password with the **cnfpwd** configure password command.

Accounts

Each user is assigned an account which is known by its userID which is specified as a parameter in the **adduser** command. The userID consists of up to 12 alphanumeric characters including letters, numbers, a hyphen, and an underscore. UserIDs are case sensitive.

When a user attempts to log in, the system prompts for a valid userID.

AXIS permits one superuser account and 63 user accounts, AXIS ships with a pre-configured superuser account (which can also be changed by Superuser).

Privilege Levels

Each account is assigned a privilege level when the account is established with the **adduser** command. Only an already established user can execute the **adduser** command to open a new account and then can only specify a privilege level of the new account at the same or lower level than his or her own privilege level.

All commands have an assigned privilege level and a command can only be executed by a user whose privilege level is equal to or above the privilege level of the command. There is one superuser privilege level and 6 user levels designated 1 through 6 (with 1 being the highest).

Passwords

A default password is used the first time a user logs in (see the release notes for details of the default password). Once a user is logged on, the user can change his or her own password using the **cnfpwd** command

The password must consist of from 6 to 15 characters. Only letters, numbers, a hyphen, an underscore and spaces are allowed. The password is case-sensitive. For security, the password is not displayed as it is entered.

When a user attempts to log in, the system prompts for a valid password after the userID prompt has been entered. The user must respond with the account's valid password.

Setting Up Management Connectivity to the AXIS Shelf

The following paragraphs describe how to setup the various user interface access paths. Initiating commands to the shelf involves providing the correct user password.

Login Procedure

When no user is logged into the system the prompt is:

login:

To login, the user must respond to the **login:** prompt by entering his or her userID followed by the ENTER key. This causes the following prompt:

password:

The user must respond with the appropriate password followed by the ENTER key, the first time a new user logs on, the system requires a password to be entered. A user can change his or her password at any time. When a correct password has been entered, the following prompt appears:

card number:

Enter the slot number of the card to receive the commands followed by the ENTER key. The normal command prompt will appear and commands for the specified card/slot can be entered.

To issue commands to another module, the user must issue the cc (change card) command:

cc slotnumber

followed by the ENTER key.

Note The slot number should be from 3 to 14. ASC cards reside in slots 3 and 4. FRSM cards in 5 to 14. Slot 15 and 16 are SRM cards and cannot be accessed directly; slot 1 and 2 are BNM cards and cannot be accessed directly. Commands for the BNM and SRM cards are addressed to the ASC.

Connecting via the Maintenance Port

- 1 After setting up and powering up AXIS (see Chapter 5), a CLI login: prompt appears on the terminal connected to the maintenance port.
- 2 Login as described above. Upon successful login, the standard CLI prompt showing the node name assigned to the shelf, the shelf number, logged in slot number, logged in card type and status is displayed.

(nodeName.shelf#.slot#.cardType.cardStatus>), for example:

myshelf.1.6.FRSM.a > (FRSM in slot 6 with active status).

3 At the nodeName.shelf#.slot#.cardType.cardStatus> prompt, CLI commands can be entered.

Setting Up IP Addresses for Control Port, LAN Port or Inband Access

Before you can access AXIS using the control port, LAN port or inband virtual connection, you must configure IP addresses for each of these destinations on the ASC card. To configure IP addresses, proceed as follows:

- 1 Establish a CLI connection to the shelf (either over the maintenance port or a port which has previously been configured with an IP address
- 2 At the login: prompt, enter your userid, at the **password:** prompt, enter your password and at the **card number:** prompt, enter the slot number (3 or 4)of the ASC card, for example:

card number:3

The following prompt appears:

nodeName.shelf#.slot#.cardType.cardStatus>

3 At this prompt, enter a **cnfifip** command to configure the control port, LAN port or inband port IP address.

Note The cnfifip command is entered in the format cnfifip "-ip <ip address> -if <interface type> -msk <subnet mask address> -bc <broadcast address>"

where <ip address> specifies an IP address for the destination port in dotted decimal format, <interface type> is specified as 28 for the control port, 37 for the inband port and 26 for the LAN port, <subnet mask address> and <broadcast address> specify the mask and broadcast addresses in dotted decimal format.

For the Control Port and Ethernet port the AXIS is now configured for you to access the unit via the specified port. See the Connecting via the Control Port section and Connecting via the LAN port section for details. For inband access, you need a connection across the network. See the Connections via an Inband Connection section for details.

Connecting via the Control Port

Using a PC via the COM port

- 1 Setup the Control Port on AXIS using **cnfifip** with and interface type of 28 as described above.
- 2 Make sure the PC has TCP/IP installed and is configured for SLIP communication.
- 3 Configure the PC COM port to match that of control port (data rate, parity, etc.).
- 4 Using the Control Port IP address, ping AXIS to check connectivity.
- **5** Start the Telnet application for entering CLI commands, the SNMP manager application for managing AXIS through SNMP commands, or start the TFTP application to configure or collect statistics.

Using a Terminal Server

If the workstation used for entering commands is to be connected over a terminal server:

- 1 Setup the Control Port on AXIS using **cnfifip** with an interface type of 28 as described in Setting Up IP Addresses for Control Port, LAN Port or Inband Access above.
- 2 Make sure the terminal server has TCP/IP installed and is configured for SLIP communication.
- 3 Configure the terminal server RS-232 port to match that of control port (data rate, parity, etc.).
- **4** Setup the IP address of the Control Port of the terminal server (RS-232) to that of AXIS Control Port ID address.
- **5** Using the Control Port IP address, ping from the X-Term workstation to AXIS to check connectivity.
- **6** Using the Control Port IP address of the AXIS shelf as the destination address, start the Telnet application for entering CLI commands, the SNMP manager application for managing AXIS through SNMP commands, or start the TFTP application to configure or collect statistics. If the communication link hangs while in Telnet, enter the ^[two-key sequence.

Connecting via an Inband Connection

Before you can access AXIS using the inband method, you must set up or add a connection across the network. To configure a connection to AXIS that will terminate on the inband port of the ASC card, proceed as follows:

- 1 Configure the AXIS Inband IP address using **cnfifip** with an interface type 37 as described in Setting Up IP Addresses for Control Port, LAN Port or Inband Access above.
- **2** Management connection end-points are already configured on the AXIS shelf. The reserved end-points for management purposes in Rel 2 are VPI = 3, and VCI = 8 to 15.
- **3** Add a connection from the BNI connected to the management terminal (directly or indirectly) to the BNI in the BPX connected to the AXIS shelf using a destination address of VPI = 3, and VCI = 8 to 15.
- **4** Using the Inband IP address of the AXIS shelf as the destination address, start the TELNET application for entering CLI commands, the SNMP manager application for managing AXIS through SNMP commands, or start the TFTP application to configure or collect statistics.

Connecting via the LAN Port

The LAN port allows the shelf to be connected to an Ethernet network through using an appropriate transceiver. Thus a workstation connected to the Ethernet network can communicate directly with the AXIS. The port should be given an IP address to allow TCP/IP protocols to be used.

- 1 Setup the LAN on AXIS using **cnfifip** with an interface type of 26 as described above.
- **2** Make sure the Ethernet workstation has TCP/IP installed and is configured for TCP/IP communication.
- **3** Start the Telnet application for entering CLI commands, the SNMP manager application for managing AXIS through SNMP commands, or start the TFTP application to configure or collect statistics.

The Command Line Interface (CLI)

The Command Line Interface (CLI) uses a simple alphanumeric terminal and employs the concept of a system prompt to which the user types in commands.

The CLI also employs the concept of a user being logged into a particular module (slot) in the AXIS shelf and all commands entered are assumed to apply to that module (slot). In this way the CLI can be used for managing both the core cards and the service modules.

For security, logging in involves entering a correct pre-assigned password which allows the user access only to commands of a specified privilege level or below.

For information on performing some of the management functions using the StrataView Plus Connection Manager and Equipment Manager, see StrataCom's StrataView Plus User's Guide.

One command that must be entered using the CLI is the Configure Interface IP address (cnfifip). Since a control station, including StrataView Plus, uses an IP address to communicate with the shelf, the various ports on the shelf must first be assigned IP addresses using the cnfifip command.

Each CLI command and its syntax and privilege level is provided in the AXIS Command Reference Manual.

Establishing the AXIS to BPX Connection

This step must be performed on the BPX at BOTH ends of the connection ("A" and "B"). This connection is established only once per shelf.

On the BPX:

1 Perform an **uptrk** command on enable the T3 line to AXIS.

For trunk number, specify the BNI trunk number used for the AXIS T3 line.

2 Perform a **cnftrk** command.

This command configures the physical line parameters of the T3 line connecting the BNI in the BPX and BNM in the AXIS shelf. See the StrataCom Command Reference manual for details.

3 Perform an addshelf command to enable the port to AXIS.

For trunk number, specify the BNI trunk number used for the AXIS T3 line. For shelf-type, specify "A" for AXIS, specify the vpi (between 5 and 14) and vci (between 6 and 271) in the vpi and vci fields respectively.

Note The total number of cells for all queues should not exceed 10,000.

AXIS Management through SNMP

AXIS provides the ability to manage the shelf through Simple Network Management Protocol (SNMP) commands. These commands are issued from an SNMP Manager which accesses the AXIS shelf either through the Ethernet port, the control port, or inband connection.

Each ASC and service module in the shelf contains an SNMP agent and a Management Information Base (MIB) for that module. The SNMP agent responds to GET, GET NEXT and SET commands from the SNMP Manager, thereby providing the user with the ability to interrogate and update the MIB.

- All messages from the SNMP Manager are checked for the correct Community String as follows:
- Messages to the active ASC must have a community string of AXIS_ASC_ACTIVE
- Messages to the standby ASC must have a community string of AXIS_ASC_STANDBY
- Messages to service module must have a community string of AXIS_SM_xx (where xx is the service module slot number (5 through 14))
- Messages to the active BNM must have a community string of AXIS_BNM_ACTIVE
- Messages to the standby ASC must have a community string of AXIS_BNM_STANDBY

Structure of the MIBs

The AXIS MIB resides with an object ID of *axis* under the *strataCom* branch of the SNMP tree structure (1.3.6.1.4.1.351.110) as shown in Figure 3-6. The AXIS MIB consists of five major sections, namely, axisSystem, cardGeneric, cardSpecific, axisLines and axisServices.

Figure 3-6 Axis MIB Tree Structure

axisSystem

The axisSystem section consists of three sub-sections. The first is axisShelf which contains information about the shelf as a whole such as nodename, time, date, etc.. The second is the axisAsm which contains the shelf alarm table. This table contains the threshold, severity and status of alarms in the shelf. The third is the axis redundancy group and contains information about the redundant configurations within the shelf.

cardGeneric

The cardGeneric section contains objects that are common to all card types. This section contains five sub-sections. The first is cardInformation and contains card type, card slot, serial number, hardware and firmware revision number, etc. The second is cardInterface which contains a list of physical interfaces and service types available on a card. The third is cardSelfTest which contains a selftest enable/disable object, the interval between selftests and the results of the last selftest. The fourth is controlMsgCounter which contains the current values of the control SAR counters (control frames transmitted and received, control cells discarded, etc.). The fifth is sarChannelCounter which contains the current values of the counters are for ATM cells and are maintained on a per VC basis.

cardSpecific

This section contains objects that are specific to a particular type of card. The cardSpecific section contains seven sub-sections. The first is bnmClockConfig and contains the primary and secondary clock sources, the status and impedance of the external T1/E1 clock input. The second is bnmAddressTranslation and contains shelf, slot and channel mapping data. The third is bnmATMCounters and contains the ATM counters on the BNM card. These counters contain the current values of ATM cells transmitted, ATM cells received, etc. The fourth contains ASC LMI signaling information. The fifth is currently unused. The sixth contains service module feature information and the seventh contains service module rate control configuration data.

axisLines

The axisLines section consists of four subsections. The first is serialInterface and contains information about the serial (maintenance and control ports) lines in the shelf. The second is ethernetInterface and contains information about the Ethernet LAN port in the shelf. The third and fourth are dsx1 and dsx3 which contain information about configuration, alarm configuration, alarm status and counters for the DS1 and DS3 lines.

axisServices

The axisServices sections consists of the AXIS service. This section contains information about frame relay channel configurations, configurable parameters, and LMI signalling. This section also contains similar MIB objects for ATM services.

The services for frame relay are further organized as shown in Figure 3-7



used to compile the MIB into an SNMP Manager. The AXIS MIB (and hence the AXIS shelf) can also be managed from StrataView Plus (Release 8.1). For complete details of managing the shelf from StrataView Plus, refer to the StrataView Plus manual.

Note AXIS MIB variables are identified as read-write or read only. Read-write variable can be accessed by both GET and SET SNMP commands. Read only variable can be accessed by GET commands only.

When setting an AXIS MIB variable in a table, the "enable" variable must also be set in the same SNMP PDU.

The TFTP User Interface

AXIS Release 2 supports the transfer of data files between the shelf and a workstation using Trivial File Transfer Protocol (TFTP). The functions provided by these file transfers are the configuring and collection of statistics and the downloading of AXIS firmware.

In order to perform a file transfer the workstation must establish connectivity with the shelf either through the control port (using SLIP) or through the Inband port. In both cases TCP/IP protocol is employed and the shelf must be assigned an IP address. For details of how to establish connectivity, refer to Setting Up Management Connectivity to the AXIS Shelf.

Upgrading Firmware

AXIS shelves are shipped with the latest version of the firmware already pre-loaded. AXIS firmware upgrades can be downloaded over the network from StrataCom's ISC (International Support Center). Firmware and firmware upgrades for the AXIS shelf are also distributed as a Firmware Media Kit on diskettes. The contents of the kit are:

- ASC Firmware
- FRSM Firmware
- AUSM Firmware
- CESM Firmware
- AIMNM Firmware
- AXIS MIB

TFTP, either through the Control Port or Inband ATM, is used for downloading firmware from a workstation into the AXIS modules.

The host uses the following command sequence to download the firmware as follows.

1 tftp <dest_IP_add>,

where dest_IP_add is the IP address of the AXIS shelf (Ethernet port, control port, or inband VCC depending upon the method of access) receiving the downloaded firmware.

- 2 tftp> bin
- 3 tftp> put <source_file_name> <dest_file_name>,

where source_file_name is the name of firmware source file and can be any name the user has chosen to store the firmware.

dest_file_name is the name of file to which the firmware is to be downloaded, this must be:

AXIS_SM_1_<slot#>.FW for downloading to a service module, for example,

AXIS_SM_1_9.FW will download firmware to the service module in slot 9.

AXIS_ASC_ACTIVE.FW for downloading to the active ASC.

AXIS_ASC_STANDBY.FW for downloading to the standby ASC.

If the download process is disrupted for a timeout or other such errors, re-start the TFTP download process without resetting the AXIS shelf.

If there is a hardware or system failure that requires resetting the card being downloaded, the firmware must be downloaded using the backup boot procedure. This is a two step procedure. First download the boot firmware and then download the on-line firmware. If a backup boot procedure becomes necessary, contact StrataCom Product Support for assistance.

After the firmware file has been transferred completely and successfully, the module should be reset for the downloaded firmware to take effect.

Configuring and Collecting Statistics

Configuring statistics specifies to the shelf which statistic counters are to be collected. A file is constructed which lists the statistic counters to be collected and is downloaded into the shelf using TCP/IP TFTP.

Collecting statistics causes the statistics to be transferred as a data file to the workstation. The workstation first requests the statistics and the AXIS shelf responds by uploading the statistic file to the workstation. A list of statistics counters for each card type is provided in Appendix C.

The method of collecting statistics in AXIS conforms to the standard StrataCom method which is also employed in IPX and BPX nodes. As such StrataCom's StrataView Plus (Release 7.2 and later) supports the standard TFTP method of configuring and collecting statistics and can be used as the workstation which is attached to AXIS for this purpose. StrataView Plus provides a convenient and easy-to-use graphical user interface (GUI) for both configuring the statistics to be collected and actually collecting those statistics from the AXIS shelf. Using StrataView Plus relieves the user of knowing and constructing the file formats required for correctly transferring the statistics files.

Each type of statistic collected in StrataCom networks is categorized under a major grouping known by an object type name and an object type number and minor grouping known as a sub-type. Within the sub-type, the statistic has a statistic type number. For example, the statistic "ATM Cell Header HEC Errors" has an object type name of IPX-ATM, an object type of 2, a sub-type of 1 and a statistic type of 45. This combination of groups and type number uniquely identify a particular type of statistic.

Configuring Statistics

Each AXIS statistic can be configured individually for collection. To configure statistics, the workstation transfers a file (filename = enable.stats) using TFTP to AXIS which specifies those statistic types to be collected. The specified statistics are grouped by Object Type, then Object Sub-type. Multiple Object types each containing multiple Object Sub-types each containing multiple Statistic types can be specified in one file.

Collecting Statistics

To collect statistics from the AXIS shelf, the workstation uses TFTP to issue a request in the form:

Get Nodename.mmddyyhhmm, where

- Nodename is the node name given to the AXIS shelf
- mmddyyhhmm is the date/time expressed in GMT.

Upon receipt of this message, the shelf responds with a file containing the collected statistics.

Statistics Collection File Format

Field Description	Field Size
Fixed Header Section	
Domain number of AXIS shelf	1 byte
Node number of AXIS shelf	1 byte
Release number (example, 725a for release 7.2.5.A)	4 bytes
Status byte	1 byte
Peak Flag	1 byte
File collection interval	1 byte
Bucket interval	1 byte
Number of Object Types	1 byte
Data Dependent Section	
Object Type identifier	1 byte
Number of Object Sub-types	2 bytes
Object Sub-type identifier	1 byte
Key information	variable length
Number of Stat types	1 byte
Stat type	1 byte
Stat value	4 bytes
Peak value	4 bytes
REPEAT Stat type, Stat value and Peak value for each bucket until number of stat types is satisfied	n bytes
REPEAT Object Sub-type section	n bytes
REPEAT Object type section	n bytes

Table 3-2 Format of statistics collection file

Configuration Save and Restore

AXIS provides Save and Restore functions which are performed using the TFTP facility.

The Save function allows a user to copy a service module's current configuration file (which is saved on a disk on the ASC) to a network file system. The Restore function allows a user to copy a service module's configuration file from the network file system to the ASC's disk. Using these functions, the configuration files for AXIS service modules can be backed up to an independent network system and later restored if the configuration files in the AXIS shelf become lost or corrupted or if the configuration is to be restored to a previous version.

Save TFTP Command Format

The TFTP Get command is used to save a configuration as follows:

<UNIX> tftp <AXIS ip address>

> bin

>get configuration filename

where configuration filename is:

AXIS_SM_1_<slot number>.PRI.<service user password>

For example:

get AXIS_SM_1_5.serviceuser

will save the configuration file for the service module in slot 5.

Restore TFTP Command Format

The TFTP Put command is used to save a configuration as follows:

<UNIX> tftp <AXIS ip address>

> bin

>put configuration filename

where configuration filename is:

AXIS_SM_1_<slot number>.PRI.<service user password>