

AXEL Platine Terminal

Ethernet TCP/IP Models

TCP/IP AX3000 USER'S MANUAL

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| | |
|---|-----------|
| INTRODUCTION | 1 |
| 1 - A LOOK AT THE AX3000..... | 5 |
| 1.1 - TERMINAL FUNCTION | 6 |
| 1.2 - PRINT AND TERMINAL SERVER..... | 6 |
| 1.3 - TOOLS AND STATISTICS | 7 |
| 1.4 - EXAMPLE CONFIGURATION..... | 8 |
| 2 - FIRST BOOT-UP AND QUICK SET-UP | 9 |
| 2.1 - OVERVIEW..... | 10 |
| 2.2 - STANDARD QUICK SET-UP..... | 11 |
| 2.3 - QUICK SET-UP WITH DHCP AND DNS PROTOCOLS..... | 12 |
| 3 - INTERACTIVE SET-UP..... | 15 |
| 3.1 - SETTING A BASIC NETWORK ENVIRONMENT | 16 |
| 3.1.1 - <i>AX3000 Interface</i> | 17 |
| 3.1.2 - <i>Host Management</i> | 17 |
| 3.1.3 - <i>Router Management</i> | 18 |
| 3.2 - SETTING A DHCP/DNS NETWORK ENVIRONMENT | 19 |
| 3.2.1 - <i>AX3000 Interface</i> | 20 |
| a) "Enable DHCP" is set to "No"..... | 20 |
| b) "Enable DHCP" is set to "Yes" | 20 |
| 3.2.2 - <i>DNS Protocol</i> | 22 |
| 3.2.3 - <i>Host Management</i> | 22 |
| 3.2.4 - <i>Router Management</i> | 24 |
| 3.3 - SETTING SCREEN, KEYBOARD AND MOUSE | 25 |
| 3.3.1 - <i>The Screen</i> | 25 |
| 3.3.2 - <i>The Keyboard</i> | 26 |
| 3.3.3 - <i>The Mouse</i> | 27 |
| 3.4 - SETTING EACH SESSION | 28 |
| 3.4.1 - <i>Connection Settings</i> | 29 |
| 3.4.2 - <i>Virtual Terminal Settings</i> | 31 |
| 3.4.3 - <i>Copy a Session</i> | 33 |
| 3.5 - AUXILIARY PORTS..... | 34 |
| 3.5.1 - <i>Setting the AUX1 and AUX2 Serial Ports</i> | 34 |
| 3.5.2 - <i>Setting the Parallel Port</i> | 36 |
| 3.5.3 - <i>Connecting a Printer</i> | 36 |
| 3.5.4 - <i>Connecting a Serial Terminal</i> | 37 |
| 3.5.5 - <i>Connecting other Peripherals</i> | 38 |
| 3.5.6 - <i>Other Uses</i> | 39 |

| | |
|---|-----------|
| a) Using the rsh Command to Print..... | 39 |
| b) Using printd and rty Legacy Services | 40 |
| 3.6 - MULTI-SESSION AND STATUS LINE | 40 |
| 3.6.1 - <i>Maximum Number of Sessions</i> | 41 |
| 3.6.2 - <i>Multi-Session Keystroke</i> | 41 |
| 3.6.3 - <i>Status Line</i> | 41 |
| 3.7 - PASSWORD | 41 |
| 3.7.1 - <i>Using the Password</i> | 42 |
| 3.7.2 - <i>Entering Set-Up</i> | 42 |
| 4 - USING THE AX3000 | 45 |
| 4.1 - TURNING ON THE AX3000 | 46 |
| 4.2 - USING MULTI-SESSION..... | 47 |
| 4.2.1 - <i>Opening or Switching Sessions</i> | 47 |
| 4.2.2 - <i>Disconnecting Sessions</i> | 48 |
| 4.3 - LOCKING THE SCREEN..... | 48 |
| 4.4 - TURNING OFF THE AX3000..... | 49 |
| 4.5 - AX3000 HOT-KEYS | 51 |
| 5 - INSTALLING UNDER UNIX/LINUX..... | 53 |
| 5.1 - TEXT MODE SESSION (TELNET OR TTY)..... | 54 |
| 5.1.1 - <i>Setting a Session</i> | 54 |
| 5.1.2 - <i>Using Telnet of Tty for a Terminal Session</i> | 55 |
| a) The telnet Protocol | 55 |
| b) The tty Protocol | 56 |
| 5.1.3 - <i>Selecting the Pre-defined Configuration</i> | 56 |
| 5.1.4 - <i>Customising the Emulation</i> | 57 |
| a) Emulation General Parameters..... | 58 |
| b) Programmable Keys | 60 |
| 5.1.5 - <i>Colouring Mode</i> | 61 |
| a) Standard Colouring Mode..... | 63 |
| b) Enhanced Colouring Mode | 64 |
| 5.1.6 - <i>Underline Attribute Management</i> | 65 |
| a) Using the Monitor as a Monochrome Monitor | 65 |
| b) Using the Colouring Mode | 66 |
| c) Using Underline Attribute in Colour Mode | 66 |
| 5.1.7 - <i>Login Script</i> | 66 |
| a) Enabling a Login Script..... | 66 |
| b) Example..... | 67 |
| 5.1.8 - <i>The Multi-Shell</i> | 68 |
| a) Installation | 68 |
| b) Setting-Up the AX3000 | 68 |

| | |
|---|-----------|
| c) Using the Multi-Shell | 68 |
| 5.2 - GRAPHICAL MODE SESSION (VNC) | 70 |
| 5.2.1 - <i>Setting-Up a VNC Session</i> | 70 |
| 5.2.2 - <i>Configuring VNC on the Unix/Linux Server</i> | 72 |
| a) VNC Terminals with Login | 74 |
| b) VNC Terminal without Login | 76 |
| 5.3 - CONTROLLING PRINTERS | 77 |
| 5.3.1 - <i>The tty Protocol</i> | 77 |
| 5.3.2 - <i>The rsh Command</i> | 78 |
| 5.3.3 - <i>Using Transparent Mode</i> | 78 |
| 5.4 - THE AXEL TTY SERVER | 79 |
| 5.4.1 - <i>Overview</i> | 79 |
| 5.4.2 - <i>Installing an AXEL tty server</i> | 80 |
| 5.4.3 - <i>Using an AXEL tty server</i> | 81 |
| a) Overview | 81 |
| b) Running the Axel Tty Server | 82 |
| 5.4.4 - <i>The axttyd Mechanism</i> | 82 |
| 5.4.5 - <i>Uninstalling</i> | 83 |
| 5.5 - REMOTE ADMINISTRATION | 83 |
| 5.5.1 - <i>Rebooting the AX3000</i> | 83 |
| 5.5.2 - <i>Resetting an AX3000 resource (screen session or aux. port)</i> | 83 |
| 5.5.3 - <i>Editing the AX3000 Settings</i> | 84 |
| 5.5.4 - <i>Setting-Up the AX3000</i> | 84 |
| 5.5.5 - <i>Downloading Firmware</i> | 84 |
| 5.5.6 - <i>Viewing AX3000 Statistics</i> | 85 |
| 6 - INSTALLING UNDER OS/400 | 87 |
| 6.1 - 5250 SCREEN SESSION | 88 |
| 6.1.1 - <i>Keyboard Type</i> | 88 |
| a) Setting-Up the Keyboard Type | 88 |
| b) In event of problems | 89 |
| 6.1.2 - <i>Setting a Session</i> | 89 |
| 6.1.3 - <i>Customising the 5250 Emulation</i> | 90 |
| a) 5250 Emulation General Parameters | 91 |
| b) Remapping 5250 Functions to PC Keyboards | 92 |
| 6.1.4 - <i>Setting-Up the Auto-Signon Function</i> | 94 |
| 6.1.5 - <i>Setting-Up the Mouse</i> | 94 |
| 6.2 - USING THE AX3000 | 95 |
| 6.2.1 - <i>The 5250 Status Line</i> | 95 |
| 6.2.2 - <i>Using the Keyboard</i> | 96 |
| 6.2.3 - <i>Programming Function Keys (Macro Feature)</i> | 98 |
| a) Programming a Function Key | 98 |

| | |
|--|------------|
| b) Processing a key sequence..... | 99 |
| 6.2.4 - <i>The Mouse</i> | 100 |
| 6.3 - 5250 PRINTER..... | 100 |
| 6.3.1 - <i>Setting-Up the Prt5250 Protocol</i> | 101 |
| 6.3.2 - <i>Using the Printer</i> | 103 |
| 6.3.3 - <i>In Event of Problems</i> | 103 |
| a) Parallel Printer Connection..... | 104 |
| b) Prt5250 Settings..... | 104 |
| c) Prt5250 Session is Refused by the AS/400..... | 104 |
| 6.4 - REMOTE ADMINISTRATION..... | 105 |
| 6.4.1 - <i>Rebooting the AX3000</i> | 105 |
| 6.4.2 - <i>Resetting an AX3000 resource (screen session or aux. port)</i> | 106 |
| 6.4.3 - <i>Editing the AX3000 Settings</i> | 106 |
| a) Under Windows..... | 106 |
| b) Under OS/400..... | 107 |
| 6.4.4 - <i>Setting-Up the AX3000</i> | 107 |
| 6.4.5 - <i>Downloading a Firmware</i> | 107 |
| 6.4.6 - <i>Editing AX3000 Statistics</i> | 108 |
| 6.5 - FURTHER OPTIONS..... | 108 |
| 6.5.1 - <i>Turning-Off the AX3000</i> | 108 |
| 6.5.2 - <i>Reconnection Problem</i> | 108 |
| 7 - INSTALLING UNDER OS/390..... | 111 |
| 7.1 - 3270 SCREEN SESSION..... | 112 |
| 7.1.1 - <i>Setting a Session</i> | 113 |
| 7.1.2 - <i>Customising the 3270 Emulation</i> | 114 |
| 7.2 - USING THE TERMINAL..... | 115 |
| 7.2.1 - <i>The 3270 Status Line</i> | 115 |
| 7.2.2 - <i>Using a PC/AT Keyboard (102/105 keys)</i> | 116 |
| 7.2.3 - <i>Programming Function Keys (Macro Feature)</i> | 117 |
| a) Programming a Function Key..... | 118 |
| b) Processing a key sequence..... | 119 |
| 7.3 - REMOTE ADMINISTRATION..... | 119 |
| 8 - INSTALLING UNDER WINDOWS..... | 121 |
| 8.1 - RDP SCREEN SESSION..... | 122 |
| 8.1.1 - <i>Setting-Up the AX3000</i> | 122 |
| a) RDP General Parameters..... | 123 |
| b) Automatic Logon and Auto-Run..... | 125 |
| 8.1.2 - <i>Configuring the Windows Server</i> | 126 |
| a) Encryption Level..... | 127 |
| b) Automatic Logon..... | 128 |

| | |
|--|------------|
| c) Idle Session Limit | 129 |
| 8.1.3 - Administering the Windows Server: closing Phantom Sessions | 131 |
| 8.2 - USING THE AX3000 | 132 |
| 8.2.1 - Opening an RDP Session | 132 |
| 8.2.2 - Closing an RDP Session | 132 |
| a) Log Off from the Desktop | 132 |
| b) Disconnect from the Desktop | 132 |
| c) Disconnect from the AX3000 Keyboard | 132 |
| 8.2.3 - Turning-Off the AX3000 | 133 |
| 8.3 - MANAGING PRINTERS | 133 |
| 8.3.1 - Setting-Up the AX3000 | 134 |
| 8.3.2 - Setting-Up the Windows Server | 134 |
| 8.4 - REMOTE ADMINISTRATION | 135 |
| 8.4.1 - Rebooting the AX3000 | 135 |
| 8.4.2 - Resetting an AX3000 resource (screen session or aux. port) | 135 |
| 8.4.3 - Editing the AX3000 Settings | 136 |
| 8.4.4 - Setting-Up the AX3000 | 136 |
| 8.4.5 - Downloading a Firmware | 137 |
| 8.4.6 - Editing AX3000 Statistics | 137 |
| 9 - TOOLS AND STATISTICS | 139 |
| 9.1 - THE PING COMMAND | 140 |
| 9.2 - CONNECTION MANAGEMENT | 140 |
| 9.3 - STATISTICS | 142 |
| 9.3.1 - Ethernet Statistics | 143 |
| 9.3.2 - TCP Server and TCP Client Statistics | 144 |
| 9.3.3 - DHCP Client Statistics | 146 |
| 10 - REMOTE SET-UP | 147 |
| 10.1 - OVERVIEW | 148 |
| 10.2 - AX3000 REMOTE SET-UP | 149 |
| 10.3 - OBTAINING A CONFIGURATION | 149 |
| 10.4 - ERROR MESSAGES | 150 |
| 11 - DOWNLOADING FIRMWARE | 155 |
| 11.1 - OVERVIEW | 156 |
| 11.1.1 - Downloading Protocols | 156 |
| 11.1.2 - Under Unix | 157 |
| 11.1.3 - Under Linux | 157 |
| 11.1.4 - Under OS/400 | 158 |
| 11.1.5 - Under Windows | 159 |
| 11.1.6 - About Firmware Files | 159 |

| | |
|--|------------|
| 11.2 - DOWNLOADING BY TFTP PROTOCOL | 159 |
| 11.2.1 - Remote Administration | 159 |
| 11.2.2 - Downloading Through Set-Up | 161 |
| 11.3 - DOWNLOADING BY BOOTP AND TFTP PROTOCOLS | 161 |
| 11.3.1 - Remote Administration | 163 |
| 11.3.2 - Downloading Through Set-Up | 163 |
| 11.4 - THE DOWNLOAD PROCESS | 164 |
| 11.4.1 - The bootp Stage | 164 |
| 11.4.2 - The tftp Stage | 164 |
| 11.5 - IN CASE OF PROBLEMS | 165 |
| 11.5.1 - The bootp Stage | 165 |
| 11.5.2 - The tftp Stage | 166 |
| APPENDIX | 169 |
| A.1 - USING THE INTERACTIVE SET-UP | 170 |
| A.1.1 - Enter the Set-Up | 170 |
| A.1.2 - Navigation | 171 |
| a) The Horizontal General Menu | 171 |
| b) Vertical Menus | 171 |
| c) Dialog Boxes | 172 |
| A.1.3 - Enter Data | 172 |
| A.1.4 - Special Notation | 173 |
| A.1.5 - Exiting the set-up | 173 |
| A.2 - NETWORK OVERVIEW | 174 |
| A.2.1 - Ethernet Addresses | 174 |
| A.2.2 - IP Address | 174 |
| A.2.3 - Router | 175 |
| A.3 - LPD PRINTERS | 178 |
| A.3.1 - Unix | 178 |
| a) Using lpd under IBM AIX V3.x | 178 |
| b) Using lpd under IBM AIX V4.x | 178 |
| c) Using lpd under SCO UNIX | 179 |
| A.3.2 - OS/400 | 179 |
| A.3.3 - Windows | 180 |
| A.4 - THE DHCP PROTOCOL | 180 |
| A.4.1 - Overview | 181 |
| A.4.2 - Setting-Up the AX3000 | 181 |
| A.4.3 - Using the AX3000 | 182 |
| A.4.4 - Errors | 182 |
| a) Boot Time Failure | 182 |
| b) Re-negotiation Failure | 183 |
| A.5 - THE DNS PROTOCOL | 184 |

| | |
|--|-----|
| A.5.1 - Overview | 184 |
| A.5.2 - Resolution Strategy..... | 185 |
| A.5.3 - Resolution Method..... | 186 |
| A.5.4 - Messages Displayed on the AX3000 Screen | 187 |
| A.6 - REMOTE SET-UP CONFIGURATION FILE FORMAT..... | 188 |
| Header..... | 190 |
| Ethernet Parameters..... | 190 |
| TCP/IP Parameters..... | 191 |
| AUX1 and AUX2 Parameters | 192 |
| Parallel Port Parameters..... | 195 |
| Multi-session Parameters..... | 196 |
| Terminal Parameters | 197 |
| Session Parameters | 198 |
| End of File..... | 202 |
| A.7 - SETTING THE IP ADDRESS BY A PING COMMAND..... | 202 |
| A.8 - ADMINISTRATION COMMAND LIST | 204 |
| A.9 - SELECTING TCP/IP OR SERIAL MODE..... | 205 |
| A.9.1 - Serial Mode | 205 |
| a) Enabling the Serial Mode | 205 |
| b) Quick Set-Up..... | 205 |
| c) Interactive Set-Up | 205 |
| d) Operation | 206 |
| A.9.2 - TCP/IP Mode..... | 206 |
| a) Enabling the TCP/IP Mode..... | 206 |
| b) Setting-Up and Operation | 206 |
| A.10 - GOING FURTHER... .. | 207 |
| A.10.1 - The 'mss' and 'window' Parameters..... | 207 |
| A.10.2 - The 'Time to Live' Parameter | 208 |
| A.10.3 - The 'TCP port Assignment' Parameter | 208 |
| A.10.4 - The 'Nagle's Algorithm' Parameter | 209 |
| A.10.5 - The 'Telnet Break Code' | 209 |
| A.10.6 - The 'IP Addr. Set by Ping' Parameter | 209 |
| A.10.7 - The 'Rejection Threshold' Parameter | 209 |
| A.10.8 - The 'Scan Frequency (800x600)' Parameter..... | 210 |
| A.10.9 - The 'AUX1/AUX2 Frequency Tuning' Parameter | 210 |
| A.10.10 - The '2 stop bits on AUX1' Parameter..... | 210 |
| A.10.11 - The 'Supplemental Signals to Handle' Parameter | 211 |
| A.10.12 - The 'Operating Mode' Parameter..... | 211 |
| A.11 - DEFAULT FACTORY SET-UP AND QUICK SET-UP | 211 |
| A.12 - HARDWARE AND FIRMWARE INFORMATION..... | 215 |
| A.12.1 - Hardware Information | 215 |
| A.12.2 - Firmware Information..... | 215 |

| | |
|---------------------------------------|-----|
| a) General Firmware Information | 216 |
| b) Available Emulations | 216 |
| c) Possible Firmware Options | 217 |
| d) Negative Firmware Options | 218 |

INTRODUCTION

This manual provides the information required to operate and maintain the AX3000.

The manual is organised into the following chapters and appendices:

Chapter 1: A look at the AX3000

Introduction to the AX3000's main features.

Chapter 2: Quick set-up

The quick set-up procedure provides a fast and reliable AX3000 installation.

Chapter 3: Interactive set-up

Description of the embedded interactive set-up. This procedure can be used to set up the network environment, the 8 virtual terminals (i.e. sessions) and the 3 auxiliary ports.

Chapter 4: Using the AX3000

How to use the multi-session feature and how to shutdown the AX3000.

Chapter 5: Installing under Unix/Linux

AX3000 installation under UNIX and description of the Unix/Linux dedicated features (tty server, multi-shell, VNC server...).

Chapter 6: Installing under OS/400

AX3000 installation under OS/400 and description of the 5250 dedicated features.

Chapter 7: Installing under OS/390

AX3000 installation under OS/390 and description of the 3270 dedicated features.

Chapter 8: Installing under Windows

AX3000 installation under Windows and description of the Windows dedicated features.

Chapter 9: Tools and statistics

Description of the embedded AX3000 tools (ping, statistics, etc).

Chapter 10: Remote set-up

An AX3000's settings can be stored in a script (a text file). This script can be used to set-up additional AX3000 terminals.

Chapter 11: Firmware downloading

How to download the AX3000 firmware by using the tftp and bootp protocols.

Chapter 12: TCP/IP or serial operating mode

How to select the operating mode (serial or TCP/IP).

Appendices:

The following appendices give more detailed information:

- A.1 - Using the AX3000 interactive set-up
- A.2 - Network overview (Ethernet address, IP address and routers)
- A.3 - Adding an LPD printer within an operating system
- A.4 - DHCP protocol
- A.5 - DNS protocol
- A.6 - Remote set-up configuration file format
- A.7 - Setting the IP address by a ping command
- A.8 - Administration command list
- A.9 - Selecting TCP/IP or serial mode
- A.10 - Going further...
- A.11 - Default factory set-up and quick set-up
- A.12 - Hardware and firmware information

CHAPTER 1

A LOOK AT THE AX3000

This chapter introduces the main features of the AXEL TCP/IP terminal.

1.1 - TERMINAL FUNCTION

Each TCP/IP AXEL terminal can operate as up to **eight concurrent and independent virtual terminals**.

With this virtual terminal capability, an AX3000 can provide multiple connections across a network. Each virtual terminal can be:

- connected to any TCP/IP networked host,
- with a specific protocol (telnet, tty, vnc or rdp),
- set, using independent parameters (emulation, function keys, colour video attributes, etc).

Keystrokes can be easily programmed to open or flip between sessions.

The number of virtual terminals per AX3000 can be set between 1 and 8.

Note: the AX3000's operating mode (serial or TCP/IP) can be selected through the Set-Up menu. The AX3000 can act as a serial terminal or a TCP/IP terminal.

1.2 - PRINT AND TERMINAL SERVER

The three AX3000 auxiliary ports can be managed either:

- by a network service: LPD and PRT5250 for printers, TELNET CLIENT for serial terminals and TTY for other peripherals.

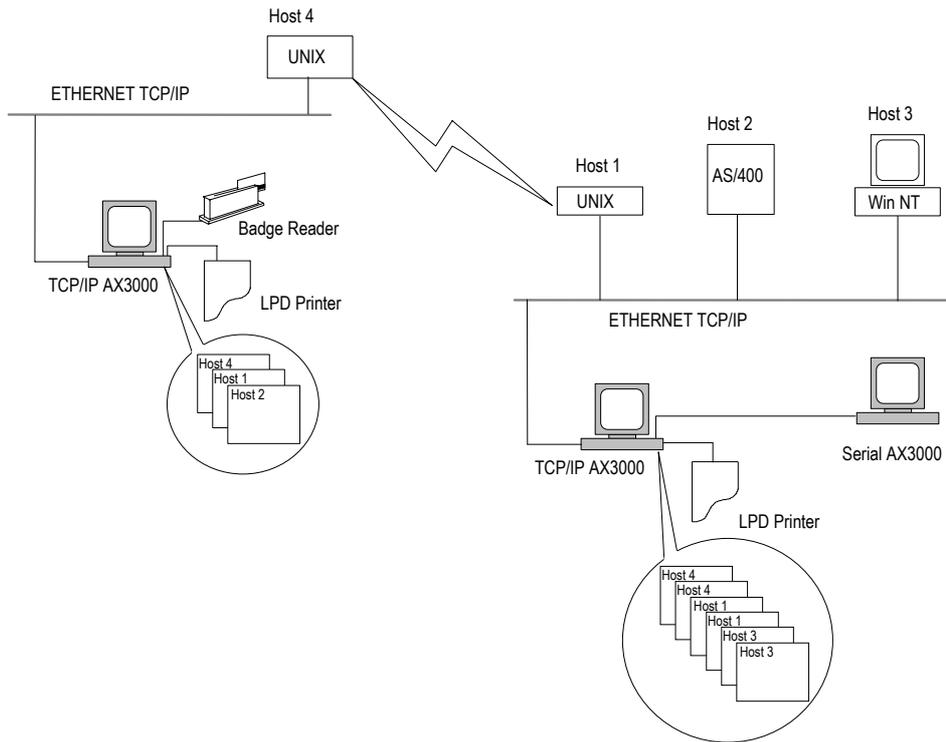
- by escape sequences: compatible with serial terminals.

1.3 - TOOLS AND STATISTICS

Embedded AX3000 tools provide the following features:

- ping,
- remote set-up,
- statistical environment,
- firmware downloading.

1.4 - EXAMPLE CONFIGURATION



CHAPTER 2

FIRST BOOT-UP AND QUICK SET-UP

This chapter gives the information needed to use the 'Quick Set-Up' feature.

2.1 - OVERVIEW

The AX3000 terminal provides a quick set-up feature which allows a fast and reliable installation. This quick set-up feature:

- is automatically called when the AX3000 is powered up for the first time,
- can be accessed at any time from the interactive set-up.

The quick set-up is dedicated to a typical environment, comprising:

- only one host
- an optional router
- virtual terminals, all set identically
- an optional printer.

Note: following a quick set-up, the AX3000 settings are those of the default factory set-up, modified by the quick set-up parameters (see Appendix A.11).

Parameters required in the quick set-up box depend on the AX3000 firmware.

Two cases are distinguished:

- standard firmware
- DNS/DHCP firmware

2.2 - STANDARD QUICK SET-UP

With a standard firmware the quick set-up box is the following:

| Quick Set-Up | |
|-----------------------------|---------------|
| AX3000 | |
| Keyboard Type | PC |
| Keyboard | English |
| Number of Sessions | 4 |
| Pre-defined Configuration | 5250 |
| NET | |
| AX3000 IP Address | 192.168.1.245 |
| Default Router | ..... |
| Host Name | ..... |
| Host IP Address | ..... |
| PRINTER | |
| Enable | |
| Printer Name | |
| Manufacturer type and model | |
| VALID | INFO |
| CANCEL | |

Quick set-up parameters:

- **Keyboard:** keyboard nationality. The new value is immediately enabled (so that the following parameters can easily be entered).
- **Number of sessions:** maximum number of sessions. These sessions are automatically associated with the host described above.
- **Configuration:** virtual terminal settings. This choice is selected from a list.
- **AX3000 IP address**
- **Default router:** optional router IP address.
- **Host Name:** name of the only accessible host
- **Host IP address**
- **Enable:** Configuring printers attached to AX3000. If 'Pre-defined Configuration' is set to 5250 and a hostname is defined, PRT5250 (telnet printing) is automatically selected. If not LPD is the default printing system. This setting can easily be changed through interactive set-up.
- **Printer Name** (accessible only if "Enable" is set): this is the printer name at the operating system level.
- **Manufacturer Type and Model** (accessible only with Prt5250): printer type and model.

2.3 - QUICK SET-UP WITH DHCP AND DNS PROTOCOLS

With a DHCP/DNS firmware the quick set-up box is the following:

| Quick Set-Up | | |
|-----------------------------|---------------|--------|
| AX3000 | | |
| Keyboard Type | PC | |
| Keyboard | English | |
| Number of Sessions | 4 | |
| Pre-defined Configuration | 5250 | |
| NET | | |
| AX3000 IP Address | 192.168.1.245 | |
| Default Router | ..... |  |
| Host Name | ..... |  |
| Host IP Address | ..... |  |
| PRINTER | | |
| Enable | | |
| Printer Name | | |
| Manufacturer type and model | | |
| VALID | INFO | CANCEL |

Quick set-up parameters:

- **Keyboard:** keyboard nationality. The new value is immediately enabled (so that the following parameters can easily be entered).
- **Number of sessions:** maximum number of sessions. These sessions are automatically associated with the host described above.
- **Configuration:** virtual terminal settings. This choice is selected from a list.
- **Enable DHCP:** two possible values:
 - **yes:** the DHCP protocol is run when the set-up is exited. The DHCP function is automatically set to get both the AX3000 IP address and other DHCP options (netmask, default router, etc).
 - **no:** parameters are manually entered (in addition, AX3000 Name (FQDN) is not accessible).
- **AX3000 IP address:** it must be entered if DHCP is disabled.
- **Default router:** optional router IP address.
- **1st DNS Server IP Address:** optional DNS server IP address
- **AX3000 Name (FQDN):** this optional parameter (see appendix A.5) allows an AX3000 to be identified by this name if both a DHCP server and a Dynamic DNS server are available.

- **Host Name:** if the IP address of a host is not given, this name will be resolved by DNS (if a DNS server is given).
- **Host IP address:** if this field is left blank, DNS will be used to resolve the hostname.
- **Enable:** Configuring printers attached to AX3000. If 'Pre-defined Configuration' is set to 5250 and a hostname is defined, PRT5250 (telnet printing) is automatically selected. If not LPD is the default printing system. This setting can easily be changed through interactive set-up.
- **Printer Name** (accessible only if "Enable" is set): this is the printer name at the operating system level.
- **Manufacturer Type and Model** (accessible only with PRT5250): printer type and model.

For more information about DHCP and DNS, please refer to appendices A.4 and A.5.

CHAPTER 3

INTERACTIVE SET-UP

This chapter describes AX3000 installation using the interactive set-up procedure.

Use the following keystroke combination to enter the interactive set-up:



Note: the set-up can be password-protected, in which case the password must be entered to access the quick set-up dialog box. For more information, see Chapter 3.7.

Appendix A.1 explains how to use the interactive set-up.

3.1 - SETTING A BASIC NETWORK ENVIRONMENT

This chapter deals with the AX3000 setting **without** the use of DHCP and DNS protocols. The topics are described:

- AX3000 interface (IP address and netmask),
- host table,
- router table.

Setting-up an AX3000 with DHCP and/or DNS protocol is described in Chapter 3.2.

Note: for more information and explanations about network operations (IP addresses, net masks, routers, etc) see Appendix A.2.

3.1.1 - AX3000 Interface

Select the **[Configuration]→[TCP/IP]→[Interface]** dialog and enter the following parameters:

- **IP Address:** AX3000 identifier (a.b.c.d),
- **Net Mask:** a net mask handles sub-nets. The net mask is set to the default value of the IP address class (no sub-net).

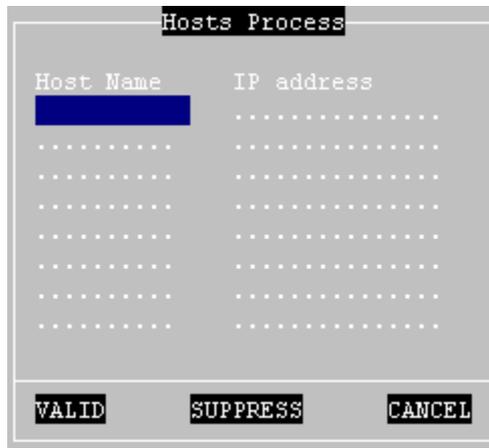
3.1.2 - Host Management

A host is a TCP/IP machine (UNIX, AS/400, etc) to which the AX3000 can open connections (telnet and tty)

A host must be identified with two parameters:

- a name: an alphanumeric character string beginning with a letter,
- an IP address.

Select the **[Configuration]→[TCP/IP]→[Hosts]** dialog to configure the host table:



Add a Host: move the highlight cursor to a vacant line and enter the name and IP address of the host.

Delete a Host: select the [DELETE] button and select, from the menu, the host to be deleted.

Change a Host: move the highlight cursor over the name or IP address of the host and enter the new value.

Select the [OK] button to exit the dialog. Any incomplete host definitions will automatically be deleted).

3.1.3 - Router Management

A router is either a special electronic unit, or a suitably configured host computer, which enables data to be sent across two or more distinct physical networks.

One router can be nominated as the 'default router' and then used to access any networks. Use of a default router simplifies site network administration. The default router is only identified by its IP address.

However additional routers can also be declared, to reach specific destination hosts or networks. Any such router must be identified with 3 parameters:

- the router's IP address.
- the destination IP address.
- the destination type (a simple host or an entire network).

Select the [Configuration]→[TCP/IP]→[Routers] dialog to configure the router table:

| Routers Process | | |
|-----------------|----------------------|---------------|
| Default Router | <input type="text"/> | |
| Gateway IP addr | Target IP addr | Target Type |
| | | |
| | | |
| | | |
| VALID | SUPPRESS | CANCEL |

Default Router: to specify a default router, enter its IP address. If a default router is not required, leave this field blank

To Add a Router: move the highlight bar to a vacant line and enter the router parameters.

To Delete a Router: select the [DELETE] button and select the router to be deleted from the menu.

To Change a Router: move the highlight cursor over a router parameter and enter the new value.

3.2 - SETTING A DHCP/DNS NETWORK ENVIRONMENT

Notes:

- the DHCP protocol is available with any AX3000 TCP/IP terminal.
- the DNS protocol is only available with AX3000 models 60/60E and 65/65E.

This chapter deals with the AX3000 setting **with** the use of DHCP or/and DNS protocols. The topics described are:

- AX3000 interface (DHCP, IP address and netmask),
- DNS protocol,
- host table,
- router table.

Setting-up an AX3000 with DHCP and/or DNS protocol is described in Chapter 3.2.

Note: more information and explanations are given by the following appendices:

- Appendix A.2: Ethernet addresses, IP addresses, net masks and routers,
- Appendix A.4: DHCP protocol,
- Appendix A.5: DNS protocol.

3.2.1 - AX3000 Interface

The AX30000 interface characteristics are:

- the IP address,
- the netmask,
- the name.

To set the AX3000 interface select the **[Configuration]→[TCP/IP]→[Interface]** menu. A dialog box as shown below is displayed:

| Ethernet Interface | |
|-----------------------|---------------------------|
| Enable DHCP | Yes |
| DHCP Option List | |
| AX3000 Netmask | Yes |
| Default Router | Yes |
| DNS Servers | No |
| 1st DNS Search Domain | No |
| DHCP Parameters | |
| Enhanced Parameters | <Space> |
| Ethernet Interface | |
| AX3000 IP Address | 192.168.1.245 <DHCP> |
| AX3000 Netmask | 255.255.255.0 <DHCP> |
| AX3000 Name <FQDN> | ax3001.terminals.axel.com |
| VALID | CANCEL |

Usage of this AX3000 Interface Box depends on whether or not the DHCP protocol is enabled.

a) "Enable DHCP" is set to "No"

Only the 'AX3000 IP Address' and 'AX3000 Netmask' parameters are available. These two parameters MUST be entered.

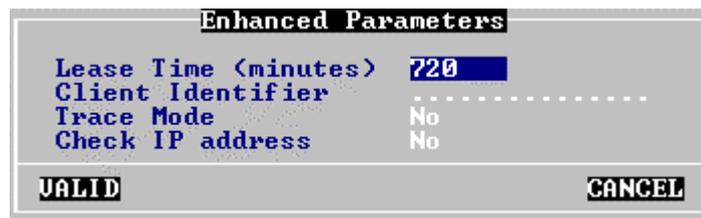
b) "Enable DHCP" is set to "Yes"

The 'AX3000 IP Address' field is inaccessible and the following DHCP Option List allows certain parameters to be automatically assigned by DHCP:

- AX3000 Netmask,
- Default router: see Chapter 3.2.4,
- DNS Servers: see Chapter 3.2.2,
- 1st DNS Search Domain: see Chapter 3.2.2.

The "**AX3000 Name (FQDN)**" (Fully Qualified Domain Name) is an optional parameter allowing an AX3000 to be identified by this name if both a DHCP server and a Dynamic DNS server are available. At the boot time the AX3000 broadcasts a DHCP request to obtain its IP address. Within this DHCP request the AX3000 specifies its name. If the DHCP server is correctly set, it will both give an IP address to the AX3000 and inform the DNS server a new device is available. Refer to Figure 1.1, the AX3000 name is "ax3001.terminals.axel.com" and its IP address is 192.168.1.245.

When <Space> is pressed on "**Enhanced Parameters**" a dialog box as shown below is displayed:



| Enhanced Parameters | |
|----------------------|---------------|
| Lease Time (minutes) | 720 |
| Client Identifier | ..... |
| Trace Mode | No |
| Check IP address | No |
| VALID | CANCEL |

The parameters of the DHCP Enhanced Box are:

- **Lease Time (minutes):** lease time value requested by the AX3000 from the DHCP server. Depending on the DHCP server settings this parameter may be ignored. The AX3000 automatically renews the lease when it expires.
- **Client Identifier:** when a static IP address is needed (i.e. for the AX3000's print server), the AX3000 Ethernet address is generally used to identify the AX3000. Some DHCP servers allow this character string as an alternative identifier.
- **Trace Mode:** in the event of problems this mode allows the data exchanged between the AX3000 and the DHCP server to be visualised. The trace data is displayed directly on the AX3000 screen without any consideration of current use (i.e. messages may 'pollute' the AX3000 display at any time).
- **Check IP Address:** when the offered IP address is received, the AX3000 can check that it's not already in use.

3.2.2 - DNS Protocol

To set the DNS protocol, select the **[Configuration]**→**[TCP/IP]**→**[DNS]** menu. A dialog box as shown below is displayed:

| DNS Parameters | |
|---------------------------|--------------------|
| DNS Servers | |
| 1st DNS Server IP address | 192.168.1.180 |
| 2nd DNS Server IP address | 192.168.1.162 |
| Default DNS Domains | |
| 1st Domain | servers.axel.com |
| 2nd Domain | terminals.axel.com |
| 3rd Domain | ..... |
| Enhanced Parameters | |
| Trace Mode | No |
| VALID | CANCEL |

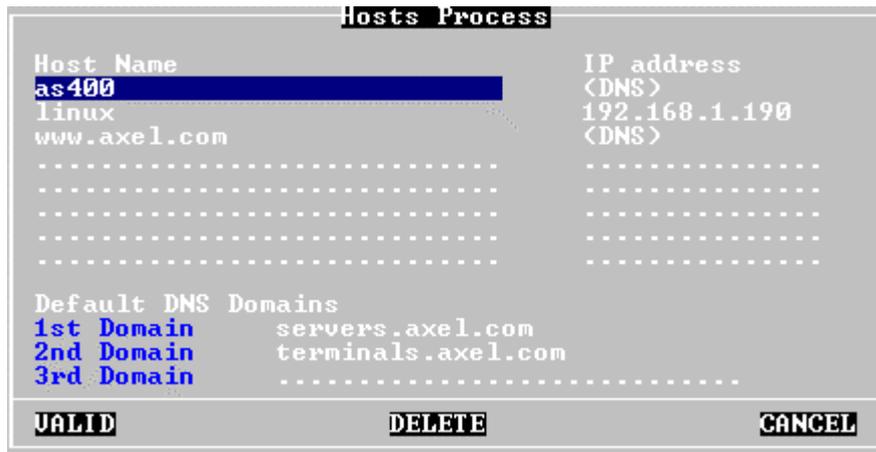
The parameters of the DNS box are:

- **DNS Servers:** to resolve a name, the AX3000 sends DNS requests to a DNS server. The IP address of this DNS server must be known. The AX3000 set-up procedure allows two DNS servers to be set.
Note: if 'DNS Servers' is enabled in the AX3000 Interface box (see Chapter 3.2.1) these two parameters are supplied by DHCP and cannot be accessed here.
- **Default DNS Domains:** these domains can be used during the resolving operation (see Chapter 3.2.3 and Appendix A.5).
Note: if the '1st DNS Search Domain' is enabled in the AX3000 Interface box (see Chapter 3.2.1) the '1st Domain' parameter is automatically set and cannot be accessed here.

3.2.3 - Host Management

A host is a TCP/IP machine (UNIX, AS/400, etc) to which the AX3000 can open connections (telnet, tty and VNC).

To configure the host table, select the **[Configuration]→[TCP/IP]→[Hosts]** menu. A dialog box as shown below is displayed:



The host server definition depends on whether or not DNS is enabled (see Chapter 3.2.2):

- **No DNS:** a host is identified by both an alphanumeric character string beginning with a letter AND an IP address.
- **With DNS:** a host is defined only by its name. This name can be either a full name (www.axel.com) or an incomplete name (as400). Its IP address is resolved later. (See Appendix A.5).

Add a Host: move the highlight cursor to a vacant line and enter the name and either its IP address or set DNS.

Delete a Host: select the host and press [DELETE].

Change a Host: move the highlight cursor over the name or IP address of the host and enter the new value.

Note: the default DNS domains, previously defined through the DNS box are displayed for information (they can not be modified).

To Delete a Router: select the router to be deleted from the menu and press [DELETE].

To Change a Router: move the highlight cursor over a router parameter and enter the new value.

3.3 - SETTING SCREEN, KEYBOARD AND MOUSE

Select the [Configuration]→[Terminal]→[General] menu to access the following dialog box:

| General Parameters | |
|-------------------------|-----------------|
| Screen | |
| Screen Type | Colour |
| Enhanced Screen Mode | |
| Screen Saver | Yes |
| Password | <Space> |
| Delay (minutes) | 1 |
| Keyboard | |
| Keyboard Type | PC |
| Nationality | American |
| NUM Led Initialisation | On |
| CAPS Led Initialisation | Off |
| Beep | Long |
| Repeat Key Delay | Medium (500 ms) |
| Repeat Key Speed | Medium |
| Peripheral | |
| Default Port | AUX1 |
| Mouse | PS/2, detected |
| VALID | CANCEL |

This dialog box allows to set the screen, the keyboard and the mouse.

3.3.1 - The Screen

Screen parameters:

- **Screen Type:** the available values depend on the AX3000 model and the firmware options:
 - **CRT Standard Monitor:** colour VGA/SVGA monitor,
 - **TFT Flat Screen** (not available on models 55 and 55E),

- **CRT monochrome** (firmware option BLW),
- **CRT grey-scale** (firmware option BLW),
- **CRT reverse monochrome** (firmware option BLW).
- **Enhanced Screen Mode**: this parameter allows a special VGA mode (colour or underline attribute or double-size characters) to be selected. This VGA mode must be enabled separately for each session where the mode is required.
- **Screen Saver**: this function automatically either blacks out the monitor display (after a certain time of inactivity) or allows the screen to be locked during the AX3000 use:
 - **no**: function disabled.
 - **yes**: function enabled. The display is restored when either the keyboard is used or data is received from the host.
 - **yes keyboard only**: function enabled. The display is only restored when the keyboard is used.
- **Password** (available only if the screen saver feature is set): the lock screen feature is only available if a password is entered. Press <Space> to enter the password. For more information about the lock screen feature, see Chapter 4.3.
- **Number of Minutes** (available only if the screen saver feature is set): delay before the monitor is turned off or locked.

3.3.2 - The Keyboard

Keyboard parameters:

- **Keyboard Type** (available only with the I52 firmware option): two keyboard types are available:
 - "PC": PC/AT keyboard (102/105 keys)
 - "AS400 (F24)": 5250 keyboard (122 keys).

- **Nationality:** select the nationality from the following list:

| |
|--------------|
| American |
| English |
| French |
| Belgian |
| Dutch |
| German |
| Swiss Ger. |
| Swiss Fr. |
| Italian |
| Spanish |
| Luxembourg |
| Portuguese |
| Greek |
| Turk (Q & F) |
| Iceland |
| Czech |
| Finnish |
| Brazilian |
| Estonian |

- **'NUM' LED Initialisation:** this led lights when the AX3000 is switched on
- **'CAPS' LED Initialisation:** this led lights when the AX3000 is switched on
- **Beep:** enable or disable and set the duration of the bell sound (values: no, short or long).
- **Repeat Key Delay:** select the automatic delay from when a key is held down before it starts to auto-repeat (values: no, low, medium or high).
- **Repeat Key Speed** (enabled only if the automatic repeat is set): select the automatic repeat speed when a key is held down (values: low, medium or high).

3.3.3 - The Mouse

Note: the PS/2 port is only available on AX3000 models 60, 60E, 65 and 65E. For the other models, only the AUX2 serial port can be used for connection a serial mouse.

The **Mouse** parameter allows to set the mouse port:

- **none**: no mouse
- **PS/2**: no additional setting is needed.
- **AUX2**: for more information see Chapter 3.5.1.

The mouse will be available at the next AX3000 boot time.

Depending on the emulation, the use of the mouse has to be declared within the session profile ("General Parameters" box). See Chapter 5.1.4 or 6.1.5.

3.4 - SETTING EACH SESSION

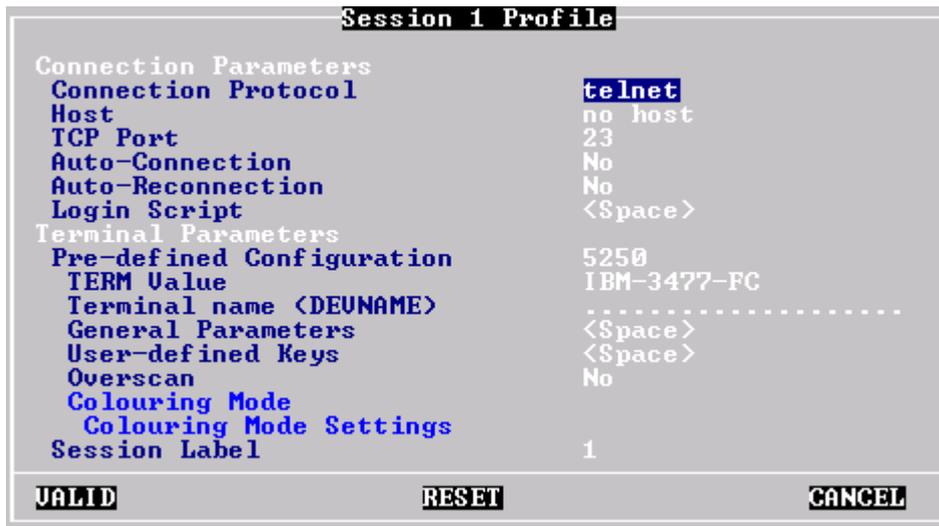
The AX3000's built-in multi-connection capability allows simultaneous access to up to 8 different hosts on one or more Ethernet networks.

Note: the session number is set via the multi-session dialog (see Chapter 4).

These independent sessions each have:

- a connection: TCP/IP protocol and associated host
- a virtual terminal: emulation, function key values, number of lines, etc

Select the **[Configuration]**→**[Terminal]**→**[Session X]** dialog (where **X** is the session number) to configure the session settings:



Note: the **[RESET]** button allows to set default values for the session "Terminal Parameters" (TERM variable, terminal name, general parameters, etc.).

3.4.1 - Connection Settings

These protocols are available to open a session on a host:

- **telnet:** this protocol is provided as standard with most operating systems, such as Unix, Linux, OS/400 and OS/390.
- **tty:** this Axel protocol is available only under UNIX. It allows a pre-defined pseudo-terminal to be associated with each connection. The tty connection is then treated as if it was a serial terminal connected to a multi I/O board. For more information, see Chapter 5.1.
- **vnc:** this is a Unix/Linux graphical remote desktop protocol. For more information, see Chapter 5.2.
- **vnc:** this is a Windows graphical remote desktop protocol. For more information, see Chapter 8.

A connection is characterised by the following parameters:

- **Connection Type:** telnet, tty or vnc.
- **Host:** host name, selected from a menu (see Chapter 3.1.2 or 3.2.3). If this field is left blank, the host name will have to be entered for each connection.
- **TCP Port:** numeric identifier of the service (telnet, tty or vnc) on the target host. The TCP Port default value is 23 for telnet, 2048 for tty and 5901 for vnc.
- **Auto-Connection:** if this parameter is set to 'yes', the connection will be automatically established when the AX3000 is powered. Otherwise, the user can press <Alt><Fx> to establish the connection.
- **Auto-Reconnection:** if this parameter is set to 'yes', a new connection is automatically established after a disconnection. Otherwise, the user can press <Alt><Fx> to establish a new connection.
- **Login Script:** a "login script" can be set to automatically enter user names and passwords at the login prompt. For more information, see chapter of each operating system.

3.4.2 - Virtual Terminal Settings

The main parameter of a virtual terminal is the **Pre-defined Configuration**. This parameter is selected from a list:

```
ANSI
ANSI DOS
UNIX SCO 3.2.2
UNIX SCO 3.2.4
SCO OPENSERVR
XENIX SCO
UNIX SVR4
ANSI INTERACTIVE
ANSI RS 6000
ANSI MOS
ANSI DATA GENERAL
UNIXWARE 7
LINUX
VT220
VT52
VT AS400
HFT
REAL 32
PCTERM THEOS
WYSE 60
ANSI SLNET
SM9400
SM9412
TWIN SERVER
ATO300
TVI 950
QVT
C332
3151
5250
3270
```

Note: these emulations are available as firmware options (see appendix A.12).

Selection of a pre-defined configuration resets all virtual terminal parameters to the pre-defined configuration default values (emulation, function keys, etc). Virtual terminal parameters can then be further adjusted:

- **General Parameter:** this dialog box allows the display parameters (column, row, character set, etc) and keyboard parameters (scancode or ASCII mode) to be set. For more information, see Chapter 5.1.4 (Unix/Linux), Chapter 6.1.3 (OS/400) or Chapter 7.1.2 (OS/390).
- **TERM Value** (only available with telnet): the value of this environment variable is 'negotiated', between the host and the AX3000. The following table shows the default values according to the pre-defined configurations:

| pre-defined configuration | TERM |
|---------------------------|--------------|
| ANSI | ansi |
| ANSI DOS | ansi |
| UNIX SCO 3.2.2 | ansi |
| UNIX SCO 3.2.4 | ansi |
| SCO OPENSERVR | ansi |
| XENIX SCO | ansi |
| UNIX SVR4 | AT386 |
| ANSI INTERACTIVE | AT386 |
| ANSI RS6000 | hft-c-old |
| ANSI MOS | ansi |
| ANSI DATA GENERAL | ansi |
| UNIXWARE 7 | AT386-ie |
| LINUX | linux |
| VT220 | vt220 |
| VT52 | Vt52 |
| VT220 | vt220 |
| VT AS400 | VT220 |
| HFT | hft-c |
| WYSE 60 | wyse60 |
| ANSI SLNET | ansi |
| SM94xx | in9400-uv |
| ATO300 | vt220 |
| TVI 950 | tvi950 |
| QVT | qvt119+ |
| 3151 | ibm3151 |
| 5250 | IBM-3477-FC |
| 3270 | IBM-3278-2-E |

- **Terminal Name (DEVNAME):** only for 5250 and 3270 emulations. This optional name identifies the connection at the system level.

- **Programmable Keys** (available only in ASCII mode): this dialog box allows the values of 48 function keys, the numeric pad and other special keys to be defined. For more information, see Chapter 5.1.4 (Unix/Linux) or Chapter 6.1.3 (OS/400).
- **Overscan** (available only for a colour monitor): an overscan colour is selected by setting this parameter to 'yes' and by using the keys <+> and <-> (64 colours available).
- **Colouring Mode** (available only for a colour monitor): this feature can be **disabled** or enabled in **standard** mode (5 colouring attributes) or in **enhanced** mode (16 colouring attributes). For more information, see Chapter 5.1.5.
- **Colouring Mode Settings** (available only if the colouring mode is enabled): this dialog box allows to change the colour (foreground and background) associated with video attributes (normal, reverse, underscore, etc).
- **Session Label**: this character string (10 characters max.) is used to identify the session on the AX3000 TCP/IP status line or when no session is connected (see Chapter 4.1 - 'idle screen' explanation).

3.4.3 - Copy a Session

This function allows one session (connection settings and virtual terminal settings) to be copied to one or more additional sessions.

Select the **[Configuration]→[Terminal]→[Copy/Paste]** dialog. The following parameters must be entered:

- the source session: enter the number (from 1 to 8)
- the destination session(s): these may be specified either by:
 - the number of a single destination session or
 - a list of numbers (e.g.: 1,3,4) or
 - the keyword **'all'**, specifying all the other sessions.

IMPORTANT: if a destination session is already open its session will not be immediately updated (i.e. the modifications are not dynamic). The new settings of each destination session will apply the next time that session is opened.

3.5 - AUXILIARY PORTS

The AX3000 auxiliary ports can be controlled:

- through a network service (lpd, tty, prt5250, etc). The management of the three auxiliary ports is independent of the active screen session.
- by escape sequences (transparent mode). This provides compatibility with applications running on serial terminals.

Note: unlike the parallel port, which is self-configuring, the two serial ports must be set (transmission rate, handshake, etc) before they can be used.

3.5.1 - Setting the AUX1 and AUX2 Serial Ports

Select the **[Configuration]**→**[Aux. Ports]**→**[AUXx]** dialog box to configure each auxiliary serial port:

```
Serial Port AUX2
Net Service
Associated Service          None
Net Service Parameters
Line Parameters
Operating Mode              Printer
Speed                       9600
Format                      8/1/No
Test Device Presence        No
Handshake for Transmission  XON/XOFF <11h/13h>
Handshake for Reception
VALID          TEST          CANCEL
```

The **[TEST]** button allows communication between the AX3000 auxiliary port and the device to be tested. Whatever the auxiliary port status (TCP/IP connection established or not), when this button is 'pressed', data is sent from the AX3000 port to the device.

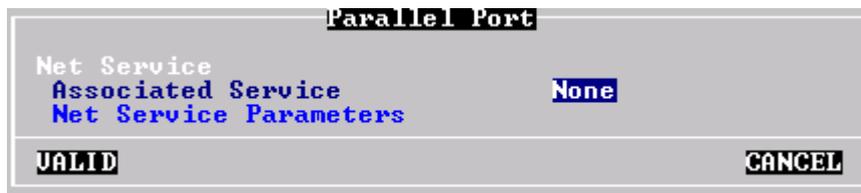
Note: when a new value is given to a parameter (speed, handshake, etc.), the AX3000 Set-Up must be exited (with saving settings) before testing the port.

The following parameters can be set:

- **Associated Service:** selecting the protocol which control the auxiliary port (for more information, see Chapter 3.5.3 and following).
- **Net Service Parameter:** for more information, see Chapter 3.5.3 and following.
- **Operating Mode:** four modes are available:
 - **Printer:** data flow takes place one way only (from the AX3000 to the serial peripheral device). However handshaking between the peripheral and the AX3000 is performed.
 - **Bi-directional Device:** Used to control peripherals such as bar code readers, touch screens, etc
 - **Mouse (AUX2 port only):** support for a 2-button serial mouse. Communication parameters (baud rate, stop bit, etc) are disabled.
Note: the 'associated service' must be set to 'none'.
 - **ASCII to EBCDIC** (only available with the I52 firmware option): this mode allows data received by the auxiliary port to be placed in the keyboard buffer.
Note: the 'associated service' must be set to 'none' and this port must be set as the AX3000 default auxiliary port (select the [Configuration]→[Terminal]→[General] menu).
- **Speed:** selected from a list (from 300 to 115,200 bits per second).
- **Format:** data format is selected from a list: data length (7 or 8 bits), stop bit and parity (none, odd or even).
- **Test Device Presence:** the CTS signal can be used by the AX3000 to detect the peripheral's presence.
- **Handshake for Transmission:** handshake used by the peripheral to control the AX3000's data flow.
- **Handshake for Reception** (available only in bi-directional mode): handshake used by the AX3000 to control the peripheral's data flow.

3.5.2 - Setting the Parallel Port

Select the **[Configuration]**→**[Aux. Ports]**→**[Parallel]** dialog box to configure the parallel port:



The **[TEST]** button allows communication between the AX3000 auxiliary port and the parallel device to be tested. Whatever the auxiliary port status (TCP/IP connection established or not), when this button is 'pressed', data is sent from the AX3000 port to the device.

The following parameters can be set:

- **Associated Service:** selecting the protocol which control the auxiliary port (for more information, see Chapter 3.5.3 and following).
- **Net Service Parameter:** for more information, see Chapter 3.5.3 and following.

3.5.3 - Connecting a Printer

This chapter deals with the operations needed to set-up the AX3000 for an LPD printer. But other protocols are available to handle a printer:

- **Prt5250:** dedicated to OS/400 (see Chapter 6.3),
- **tty:** dedicated to Unix/Linux (see Chapter 3.5.5).

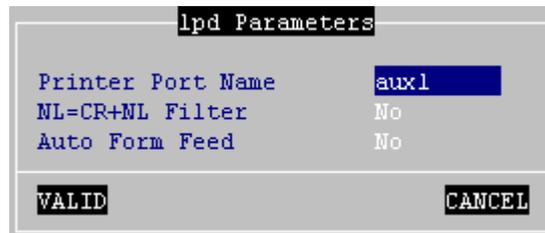
The embedded LPD print server allows the remote printer to be accessed as a standard system printer.

An lpd printer can be configured with 3 parameters:

- an IP address (the AX3000's IP address),
- an identifier for the auxiliary port (character string),
- an optional filter to pre-process the file before printing (but generally this processing is done at the operating system level).

To set the LPD service on an auxiliary port, select the **[Configuration]→[Ports aux.]→[xxx]** dialog and enter the following parameters:

- **Associated Service:** select lpd.
- **Net Service Parameters:** press <Space> to access the following dialog box:



| lpd Parameters | |
|-------------------|------|
| Printer Port Name | aux1 |
| NL=CR+NL Filter | No |
| Auto Form Feed | No |
| VALID CANCEL | |

- **Printer Port Name:** this is the port identifier. Sometimes the same name is used for the printer at the operating system level.
- **NL=CR+NL Filter:** The line feed character 0x0A can be mapped to carriage return + line feed 0x0D 0x0A,
- **Auto Form Feed:** The form feed character 0x0C can be sent to eject the last page at the end of printing.

Note: if the auxiliary port used for printing is a serial port, set the 'Printer' operating mode.

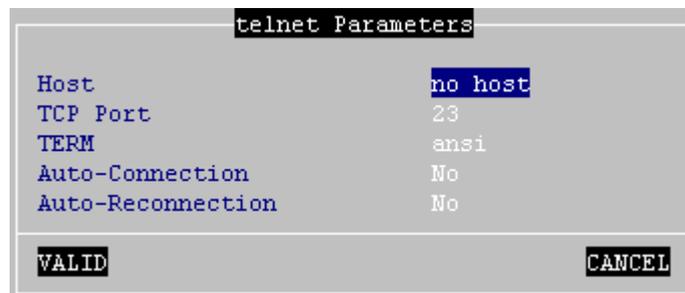
For more information about lpd printers, see Appendix A.3.

3.5.4 - Connecting a Serial Terminal

Two serial terminals can be attached to the AX3000's serial ports. The terminals communicate with the target host(s) using the AX3000's embedded telnet service.

To configure the telnet service for the chosen serial auxiliary port, select the **[Configuration]→[Ports aux.]→[AUXx]** dialog and enter the following parameters:

- **Associated Service:** select telnet.
- **Net Service Parameters:** press <Space> to access the following dialog box:



| Parameter | Value |
|-------------------|---------|
| Host | no host |
| TCP Port | 23 |
| TERM | ansi |
| Auto-Connection | No |
| Auto-Reconnection | No |

- **Host:** name of the host selected from a menu (see Chapter 3.1.2 or 3.2.3).
- **TCP Port:** numeric identifier of the telnet service on the target host. The TCP Port default value is 23.
- **TERM Value:** the value of this variable is 'negotiated', between the host and the AX3000.
- **Auto-Connection:** if this parameter is set to 'yes', the connection will be automatically established when the AX3000 is powered-up. Otherwise, the user can press any key on the serial terminal keyboard to establish the connection.
- **Auto-Reconnection:** if this parameter is set to 'yes', a new connection is automatically established after a disconnection. Otherwise, the user can press any key on the serial terminal keyboard to establish a new connection.

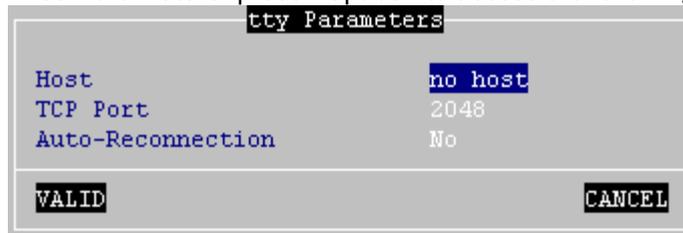
Note: the serial auxiliary port used must be configured for 'bi-directional' operating mode.

3.5.5 - Connecting other Peripherals

The tty service provides bi-directional control of the device.

To set the tty service on the xxx auxiliary port, enter the following parameters in the **[Configuration]→[Ports aux.]→[xxx]** dialog box:

- **Associated Service:** select tty.
- **Net Service Parameters:** press <Space> to access the following box:



| tty Parameters | |
|-------------------|---------|
| Host | no host |
| TCP Port | 2048 |
| Auto-Reconnection | No |
| VALID CANCEL | |

- **Host:** name of the host selected from a menu (see Chapter 3.1.2 or 3.2.3).
- **TCP Port:** numeric identifier of the tty service on the target host. The TCP Port default value is 2048.
- **Auto-Reconnection:** if this parameter is set to 'yes', a new connection is automatically established after a disconnection. Otherwise, the AX3000 must be power-cycled.

Note: Axel provides a **UNIX utility** by which pseudo-terminals may be associated with AX3000 serial ports. The AX3000 ports then appear as local UNIX ports. For more information, see Chapter 5.4.

3.5.6 - Other Uses

a) Using the rsh Command to Print

The embedded rcmd service allows files to be printed through the rsh command (or rcmd command, according to the operating system in use).

To set the rcmd service on the required auxiliary port, select the rcmd service from the **[Configuration]→[Aux. Ports]→[xxx]** dialog box. Then enter the name of the associated printer port.

For more information about the rsh command, refer to Appendix 5.3.2.

b) Using *printd* and *rtty* Legacy Services

The *rtty* and *printd* services have been used in the past, under the UNIX *axconf* utility, to control printers and bi-directional peripherals. To maintain backward compatibility they are still available, but the *lpd* and *tty* services should always be used in preference.

Note: the *rtty* service can also be used with the Axel daemon (*axtyd*) under UNIX (see Chapter 5.4).

3.6 - MULTI-SESSION AND STATUS LINE

The multi-session dialog box controls the following AX3000 parameters:

- the maximum number of sessions (i.e. simultaneous connections),
- special hot keys to flip between sessions,
- the TCP/IP status line.

Select the **[Configuration]**→**[Terminal]**→**[Multi-session]** dialog box:

| Multi-Session Parameters | |
|----------------------------|-----|
| Session | |
| Number of Sessions | 4 |
| Number of Pages | 1 |
| Keys for Switching Session | |
| Introducer | Alt |
| Session 1 Key | F1 |
| Session 2 Key | F2 |
| Session 3 Key | F3 |
| Session 4 Key | F4 |
| Multi-Screen Keys | |
| Status Line | |
| Enable | No |
| VALID CANCEL | |

3.6.1 - Maximum Number of Sessions

Generally the AX3000 controls four screens simultaneously. (This number can be greater if none of these options are used VNC, RDP and I52). This number of screens can be used for:

- **multiple sessions** (i.e. multiple simultaneous TCP/IP connections),
- **multiple pages per session.**

Note: when the dialog has been completed, the system checks that the total number of sessions and additional pages is eight or less. If it exceeds the maximum, an error message is displayed.

3.6.2 - Multi-Session Keystroke

A multi-session keystroke is composed of:

- one or more modifier keys, selected from a list and applicable to all sessions:

| |
|----------------|
| SHIFT |
| ALT+SHIFT |
| ALT |
| CTRL+SHIFT |
| CTRL |
| CTRL+ALT |
| CTRL+ALT+SHIFT |

- one specific key for each session. Select by pressing this key.

3.6.3 - Status Line

A label on the status line (i.e. the 26th line at the bottom of the screen) can be used to identify each session. The label can be either the name of the associated host or a user-defined label (see Chapter 3.4.2).

Note: the frequency used is not supported by certain monitors.

3.7 - PASSWORD

Access to the set-up procedure can be controlled by a password.

3.7.1 - Using the Password

Select the **[Configuration]**→**[Advance]**→**[Password]** dialog box to enter, change or delete the set-up password:



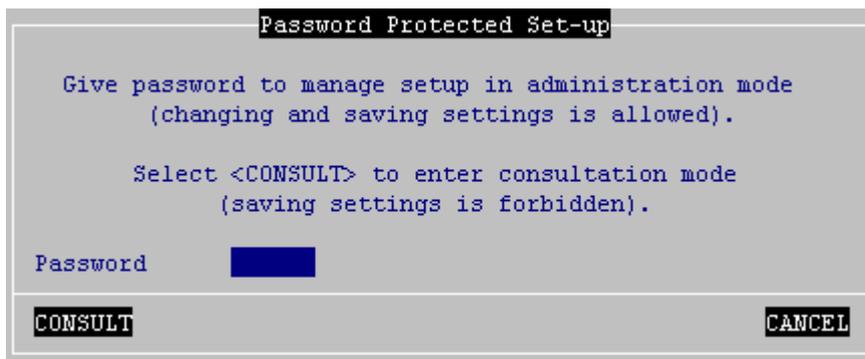
The screenshot shows a dialog box titled "Password Modification". It contains three lines of text: "Enter Current Password", "Enter New Password", and "Please, Confirm". There is a blue rectangular input field to the right of the "Enter New Password" line.

Enter the following parameters:

- **Enter the current password:** Only if the set-up is already password protected, you will be asked to enter the current password.
- **Enter the new password:** enter a new password of maximum five characters, or press <CR> if no password is required.
- **Please, confirm:** re-enter the identical password.

3.7.2 - Entering Set-Up

If the set-up is password protected, the following dialog box will be displayed the next time access is attempted:



The screenshot shows a dialog box titled "Password Protected Set-up". It contains the following text: "Give password to manage setup in administration mode (changing and saving settings is allowed).", "Select <CONSULT> to enter consultation mode (saving settings is forbidden).", and "Password" followed by a blue rectangular input field. At the bottom, there are two buttons: "CONSULT" on the left and "CANCEL" on the right.

Three operations are permitted:

- enter the password to access the set-up
- press **<Esc>** or select the [CANCEL] button to exit set-up mode
- select the [CONSULTATION] button to access the set-up without using the password. All set-up operations will be permitted but **it will not be possible to save the modifications in non-volatile memory.**

IMPORTANT: if the password is forgotten, the super password 'yaka' can be used.

CHAPTER 4

USING THE AX3000

This chapter covers use of the AX3000.

4.1 - TURNING ON THE AX3000

When the AX3000 is turned-on, some connections may be opened automatically:

- screen connections: if the 'auto-connection' parameter is set to 'yes',
- auxiliary port connections: if the associated service is tty, telnet or prt5250 (and the 'auto-connection' parameter is set to 'yes').

If a terminal session is opened, the first of the AX3000 active sessions will be displayed.

If no terminal session is active, an 'idle screen' is displayed. For example:

```
<Alt><F1> → session xxx  
<Alt><F2> → session yyy  
<Alt><F3> → .....
```

In the above example:

- The maximum number of sessions is 3.
- The user has to press <Alt><Fx> to open a session
- The strings xxx in session 1 and yyy in session 2 are either the session label (if one has been defined in the set-up), or the associated host name.
- Session 3 is 'host free'. Each time the user opens the session (<Alt><F3>), a host name will be requested.

4.2 - USING MULTI-SESSION

AXEL TCP/IP terminals provide **multiple and concurrent connections**. This feature allows simultaneous access to multiple hosts and applications.

4.2.1 - Opening or Switching Sessions

To switch between sessions, use the following keystroke combination:

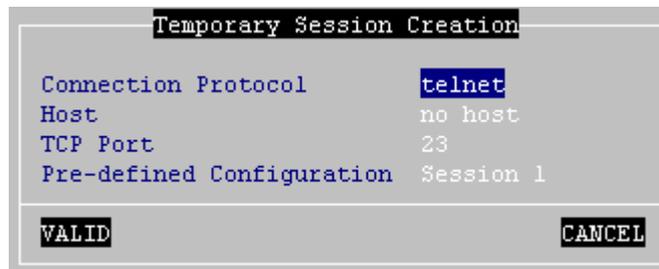


Where **<Fx>** represents one of the **<F1>** to **<F8>** function keys corresponding to the session number required.

Note: these keystrokes can be changed (see Chapter 3.6.2)

The terminal will flip to this session if it is already open. Otherwise the session will need to be opened. There are two possibilities:

- if the session is associated with a host: a connection (telnet or tty) will be automatically opened on this host.
- if the session is 'hostfree', the following dialog box will be displayed:



The parameters required to make a host free connection are:

- **Connection Type:** select telnet, tty, vnc or rdp.
- **Host:** select the name of the host from a menu (see Chapter 3.1.2 or 3.2.3) or enter the IP address of the host
- **TCP Port:** enter the port number for telnet (or tty) on the target host
- **Configuration:** select the pre-defined configuration from a list.

4.2.2 - Disconnecting Sessions

A session can be disconnected by one of two ways:

- a system command
example: under Unix, exit (or <Ctrl><D>),
- <Ctrl><Alt><Shift><D>. This keystroke is locally processed by the AX3000 and works regardless the operating system.

When the user closes the current session (<Ctrl><D> on UNIX) the behaviour of the AX3000 depends on how the '**auto-reconnection**' parameter is set for the current session.

If this parameter is set to '**yes**', a new connection is immediately and automatically established within the current session.

If this parameter is set to '**no**', the AX3000 displays the first of the remaining active sessions. If there are no remaining active sessions (for example, because the last active view has been disconnected), the 'idle screen' is displayed.

4.3 - LOCKING THE SCREEN

For security reasons, it could be useful for the AX3000 operator to lock the screen when he goes out for a short time. (Instead of having to log-out).

Note: the lock screen means the AX3000 screen is cleared (but the current sessions are still connected). There is no way to enter the AX3000 Set-Up or to switch the session. The only way to take the control is entering the proper password.

The lock screen feature is associated with the screen saver function and must be enabled through the AX3000 Set-Up (see Chapter 3.3.1).

Two methods are available to lock a screen:

- **automatically**: when the terminal is idle (keyboard or screen) during a certain time, the AX300 blacks out the monitor display. The display is automatically restored as soon as a key is pressed. A dialog box allowing the screen unlock is displayed.
- **manually**: the <Ctrl><Alt><Shift><S> keystroke (or the <Ctrl><Alt><S> with a 5250 keyboard) allows to lock immediately the screen.

The unlock-screen dialog box is the following:



Two operations are possible:

- entering the password to unlock the screen. Two passwords can be used: the screen saver password and the set-up password (see Chapter 3.7).
- resetting the AX3000. If the password is forgotten, the only way is selecting the [Shutdown] button. After power-cycling it, the AX3000 administrator will be able to modify or remove the screen saver password.

Note: to get a high level security, it's better to set a password for the AX3000 Set-Up (see Chapter 3.7).

4.4 - TURNING OFF THE AX3000

A careful check should be made before turning off the TCP/IP AX3000 if TCP/IP connections are active. The operating system cannot detect a TCP/IP device being turned-off, so the current TCP/IP connections remain active and the associated UNIX processes become 'orphans'. While the presence of one or two orphan processes may be harmless, repeatedly creating orphan processes will affect system performance.

It is even preferable not to turn off the TCP/IP AX3000 when a login prompt is displayed (something which is commonly done with dumb UNIX terminals). This is because a telnet connection has been opened and will then become an orphan process. The following examples illustrate how the TCP/IP AX3000 differs from a conventional dumb terminal:

- if the 'auto-reconnect' parameter is set to 'yes', a stable stage cannot be reached on the AX3000. New telnet connections will repeatedly be opened.
- Under OS/400, it is impossible to exit the login stage, because there is no way to close the current telnet session.

To allow graceful shutdown, an AX3000 shutdown function is available. Use the following keystroke combination:



Note: this keystroke is not available from an RDP session.

A warning message is displayed:



If the user confirms, all active connections (screen and auxiliary port) are closed. A few seconds later, the user is informed that the AX3000 may be turned off.

4.5 - AX3000 HOT-KEYS

The AX3000 hot-keys are listed in the following table. (These hot-keys are locally processed by the AX3000. They are independent of emulation).

| PC-Keyboard | 5250-Keyboard | Action |
|-----------------------|----------------------|--|
| <Ctrl><Alt><Esc> | <Rest><Alt><Esc> | Entering the AX3000 Set-Up |
| <Alt><Fx> | <Alt><Fx> | Opening or switching session (these hot-key can be modified) |
| <Alt><+> | <Alt><+> | Opening or switching next session |
| <Alt><-> | <Alt><-> | Opening or switching previous session |
| <Ctrl><Alt><Shift><S> | <Rest><Alt><S> | Locking the screen. |
| <Ctrl><Alt><Pause> | <Rest><Alt><Pause> | Sending a break code. Note: only available in telnet protocol. |
| <Ctrl><Alt><Prt Scr> | <Rest><Alt><Prt Scr> | Performs a screen dump to the auxiliary port set as default. |
| <Ctrl><Alt><Shift><D> | <Rest><Alt><D> | Closing the current session |
| <Ctrl><Alt><Shift><K> | <Rest><Alt><K> | Changing the keyboard type (PC↔AS/400) |
| <Ctrl><Alt> | <Rest><Alt> | Shutdown the AX3000. Note: not available from an RDP session. |

CHAPTER 5

INSTALLING UNDER UNIX/LINUX

This chapter covers AX3000 installation under Unix/Linux.

5.1 - TEXT MODE SESSION (TELNET OR TTY)

5.1.1 - Setting a Session

To set a profile session, enter the AX3000 Set-Up and select the **[Configuration]→[Terminal]→[Session X]** menu (where X is the session number to be configured). The following box is displayed:

```
Session 1 Profile

Connection Parameters
Connection Protocol    telnet
Host                  no host
TCP Port               23
Auto-Connection       No
Auto-Reconnection     No

Terminal Parameters
Pre-defined Configuration  ANSI
TERM Value                 ansi
General Parameters        <Space>
User-defined Keys         <Space>
Overscan                   No
Colouring Mode             Disabled
  Colouring Mode Settings
Session Label              1

VALID                      CANCEL
```

These parameters are:

- **Connection Type:** select 'telnet' or 'tty'. See Chapter 5.1.2.
- **Host:** press <Space> to select the host from a list
- **TCP Port:** 23 for telnet and 2048 for tty.
- **Auto-Connection**
- **Auto-Reconnection**
- **Configuration:** see Chapter 5.1.3
- **TERM Value:** see Chapter 5.1.3
- **General Parameters:** pressing <Space> displays a dialog box which lets certain emulation parameters be changed. For more information see Chapter 5.1.4.
- **User-defined Keys:** pressing <Space> displays a dialog box which lets certain keys be remapped. For more information see Chapter 5.1.4.
- **Overscan:** the overscan colour
- **Session Label:** session identification located on the TCP/IP status line.

Save and exit the set-up. The AX3000 is ready for use.

5.1.2 - Using Telnet of Tty for a Terminal Session

Two protocols are available to open a connection for a terminal session: **telnet** and **tty**.

a) The telnet Protocol

The telnet server is a standard module of a Unix/Linux TCP/IP stack. An AX3000 can therefore immediately open a client telnet session, without additional software or any alteration of Unix/Linux settings.

Main characteristics of a telnet session:

- dynamic allocation of pseudo-terminals (ptty),
- System access is controlled by a 'login', which is generated by the telnetd daemon,
- The value of the TERM environment variable is negotiated after the login stage.

b) The tty Protocol

The tty server is a Axel proprietary protocol. An additional software is needed (see Chapter 5.4).

Main characteristics of a tty session:

- pre-defined allocation of pseudo-terminals (ptty),
- UNIX access is controlled by a 'login', which is generated by the init daemon (controlled by the **/etc/inittab** file).

The Unix/Linux host must run the AXEL tty server daemon (**axttyd**). The configuration file **axttyd** must contain a list of AX3000 sessions and the ptty's associated with each.

Each session is identified by the name of the AX3000 (from the **/etc/hosts** file) and a special keyword (**sessx** where **x** is the session number). For example:

| | | | |
|-------|-------|-------------|-------------|
| axel1 | sess1 | /dev/ptyp12 | /dev/ttyp12 |
| axel1 | sess2 | /dev/ptyp13 | /dev/ttyp13 |
| axel2 | sess2 | /dev/ptyp2 | /dev/ttyp2 |

A terminal session controlled by the tty server acts as a serial terminal attached to a multi I/O board. The **/etc/inittab** file must therefore be modified to launch the **getty** command for each pseudo-terminal.

Example: add the following line to get a login on **/dev/ttyp12**:

```
p12:23:enable:/etc/getty -t60 /dev/ttyp2 m
```

This modification will take effect after invoking the following command:

```
# init q<CR>
```

For more information about the Axel tty server, refer to Chapter 5.4.

5.1.3 - Selecting the Pre-defined Configuration

The AX3000 provides a pre-defined, embedded configuration for each of the major Unix/Linux platforms.

Select the **[Configuration]→[Terminal]→[Session X]** dialog box to set the pre-defined configuration. Then select the **'Predefined Configuration'** parameter and press <Space>. The following table shows the recommended, pre-defined configurations for the various operating systems:

| Operating Systems | Pre-defined Configuration |
|-------------------|---------------------------|
| UNIX SCO 3.2v2 | UNIX SCO 3.2.2 |
| UNIX SCO 3.2v4 | UNIX SCO 3.2.4 |
| Open Server SCO | SCO OPENSERVER |
| Xenix SCO | XENIX SCO |
| IBM AIX 3.x | ANSI RS6000 |
| IBM AIX 4.x | HFT |
| Unix Ware 7 | UNIXWARE 7 |
| LINUX | LINUX |
| UNIX Interactive | ANSI INTERACTIVE |
| SUN - Solaris 2.x | ANSI SVR4 |
| Others | ANSI, VT220 or WYSE 60 |

Note: selecting a pre-defined configuration updates the value of the TERM environment variable. However, this value can then be modified further (see Chapter 3.4.2).

5.1.4 - Customising the Emulation

Various emulation parameters can be modified but generally the default values are the most suitable.

To customise the emulation, enter the AX3000 Set-Up and select the session profile (**[Configuration]→[Terminal]→[Session X]** menu). Two groups of parameters control emulation settings:

- General Parameters: emulation behaviour,
- User-defined Keys: associating character strings to keyboard keys.

a) Emulation General Parameters

Within the 'Session Profile' box, select 'General Parameters' and press <Space>. The following box is displayed:

| Emulation SCO OPENSERVER | | | |
|--------------------------|-----------|------------------------|-----------|
| Display | | Keyboard | |
| Character Set | PC-437 | Coding | ASCII |
| Columns | 80 | CAPS Key Mode | Caps Lock |
| Rows | 25 | Composed Characters | Remote |
| Vertical Scrolling | Yes | Operating Mode | |
| WRAP | Yes | Answer Back | ..... |
| CR=CR+LF | No | Monitor Mode | No |
| Cursor Shape | Underline | Remote Terminal Set-Up | Yes |
| Tabulations | <Space> | Enhanced Screen Mode | |
| Auxiliary Port | | Blink allowed | No |
| End Sequence | \1B[4i | | |
| VALID | | CANCEL | |

These parameters are:

- **Character Set:** the available character sets depend on which pre-defined configuration is selected.
- **Number of Lines:** height of the screen (24, 35 or 43 lines).
- **Number of Columns:** width of the screen (80 or 132 columns).
- **Vertical Scrolling:** whether the AX3000 display scrolls, when the cursor is moved down when at the bottom of the screen:
 - yes: the display scrolls up
 - no: the cursor re-appears on the first (top) line.
- **Wrap:** behaviour of the AX3000 when the cursor reaches the last column of the screen:
 - yes: the next characters wrap round onto the start of the next line
 - no: each new character overwrites the last character on the line.
- **CR=CR+LF:** AX3000 behaviour when 0x0Dh is received:
 - yes: 0x0D is mapped to 0x0D and 0x0A
 - no: no specific processing is done
- **Cursor Aspect:** three aspects are available (line, half-block and block).
- **Tabulations:** a dialog box appears in which tab stops can be set.
- **Coding:** two keyboard mode are available (ASCII and scancode).

- **CAPS Key Mode:** set the CAPS LOCK to behave in either of three ways:
 - Caps Lock: each alphabetical key sends the corresponding upper case letter. To unlock this mode press the <CAPS> key.
 - Shift Lock: each key send the same character sent by pressing <Shift><This key>. To unlock this mode press a <Shift> key.
 - Uppercase: each key send the upper character if it is present. Otherwise, this is the lower character (upper-case letter if possible) which is sent. To unlock this mode press the <CAPS> key.
- **Composed Characters** : this parameter (only available in ASCII mode) sets the keyboard behaviour for diacritical characters (for example: ^ + e = ê):
 - no: no specific processing is done
 - local: composite characters are locally processed by the AX3000
 - remote: SCO specific mode (mapchan).
- **Euro Code:** this parameter is only available if the current character set is not PC858 or ISO8859-15 (These 2 character sets include the Euro symbol). The three values are:
 - no: no specific processing is done
 - standard: the Euro symbol replaces the international currency symbol '¤' within the current character set.
 - custom: any character can be replaced by the Euro symbol within the current character set (use the decimal notation to enter the Euro ASCII code).
- **End Sequence:** to stop transparent printing mode
- **Answer Back:** session identifier (10 character max.).
- **Monitor Mode:** the monitor mode is used to examine the data received by the AX3000:
 - no: monitor mode disabled.
 - yes, hexadecimal value
 - yes, symbol
- **Remote Terminal Set-Up:** enable or disable the use of escape sequences to set terminal parameters from the host computer.
- **Enhanced Screen Mode:** enable or disable the display of double-size characters or colour underline attribute.
- **Blink Allowed:** if blink attribute is disabled, 16 background colours can be used (instead of the 8 normally available).
- **Mouse Allowed:** enable/disable the mouse within this session.

b) Programmable Keys

Note: the programmable key function is only available in keyboard ASCII mode.

Within the 'Session Profile' box, select 'Programmable Keys' and press <Space>. The following box is displayed:

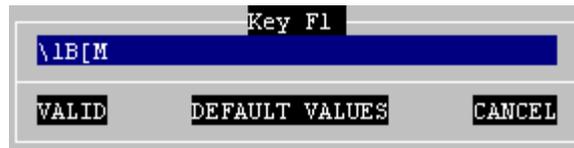
| User-defined Keys | | | |
|-------------------|-----------|------------|-----------------|
| F1 \1B[M | F17 \1B[c | F33 \1B[s | Home \1B[H |
| F2 \1B[N | F18 \1B[d | F34 \1B[t | ↑ \1B[A |
| F3 \1B[O | F19 \1B[e | F35 \1B[u | PgUp \1B[I |
| F4 \1B[P | F20 \1B[f | F36 \1B[v | - |
| F5 \1B[Q | F21 \1B[g | F37 \1B[w | ← \1B[D |
| F6 \1B[R | F22 \1B[h | F38 \1B[x | 5 \1B[E |
| F7 \1B[S | F23 \1B[i | F39 \1B[y | → \1B[C |
| F8 \1B[T | F24 \1B[j | F40 \1B[z | + + |
| F9 \1B[U | F25 \1B[k | F41 \1B[0 | End \1B[F |
| F10 \1B[V | F26 \1B[l | F42 \1B[[| ↓ \1B[B |
| F11 \1B[W | F27 \1B[m | F43 \1B[\\ | PgDn \1B[G |
| F12 \1B[X | F28 \1B[n | F44 \1B[] | Ins \1B[L |
| F13 \1B[Y | F29 \1B[o | F45 \1B[^ | Del \1B[7F |
| F14 \1B[Z | F30 \1B[p | F46 \1B[_ | ESC \1B |
| F15 \1B[a | F31 \1B[q | F47 \1B[` | BackSP BS (08h) |
| F16 \1B[b | F32 \1B[r | F48 \1B[(| . |

VALID DEFAULT VALUES MEMORY CANCEL

There are three groups of programmable keys:

- from F1 to F48: function keys used singly or with a modifier key. Example for ANSI emulations:
 - F1 to F12: <Fx>
 - F13 to F24: <Shift><Fx>
 - F25 to F36: <Ctrl><Fx>
 - F37 to F48: <Ctrl><Shift><Fx>
- numeric pad with Number Lock off
- special keys: Esc, Backspace and the dot of the locked numeric pad.

To enter a programmable key value select the key label then press <Space>. The following dialog box is displayed:



The main field is used to enter the programmable key value. ASCII codes lower than 20h can be entered as '\xx' (where xx is the hexadecimal value of the ASCII code).

Note: for the 'Backspace' key and the numeric pad dot, a toggle is only available (two possible values for each key).

Memory usage for programming keys is limited to:

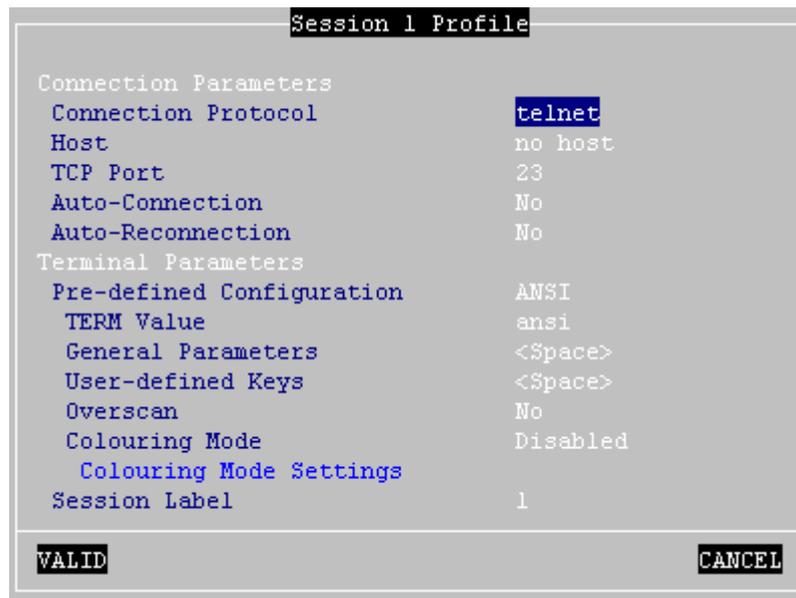
- 32 bytes maximum for any single key,
- 255 bytes maximum for a whole session.

5.1.5 - Colouring Mode

A background colour, plus a foreground colour for each monochrome character attribute or graphics character, may be set through the Colouring Mode. This function allows monochrome applications to be displayed in colour.

Note: the colouring mode is not available for the VNC protocol and both the 5250 and 3270 emulations.

The colouring mode is set within the session profile ([**Configuration**]→**[Terminal]**→**[Session X]** menu):



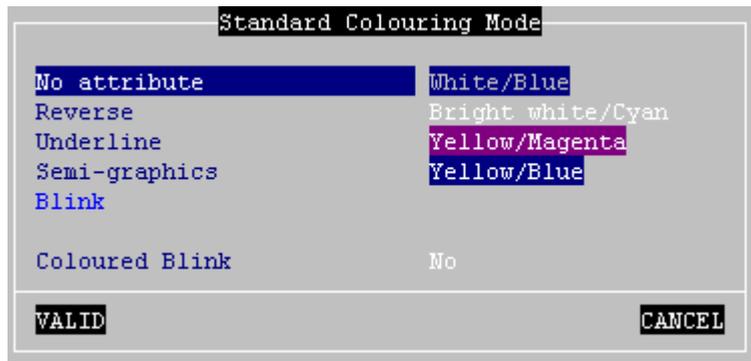
The "**Colouring Mode**" parameter offers 2 values:

- standard: 6 colouring attributes
- enhanced: 16 colouring attributes

To customise the colouring mode, select the "**Colouring Mode Settings**" parameter and press <Space>. The dialog box depends on which colouring mode is chosen.

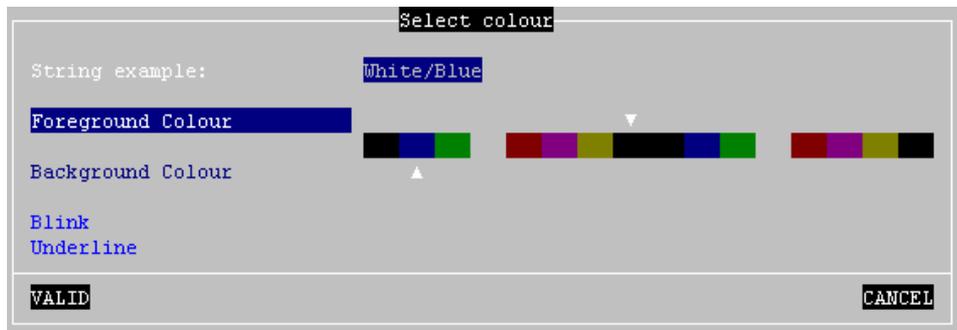
a) Standard Colouring Mode

The dialog box for the standard colouring mode is:



The available colouring attributes are normal, reverse video, underline, semi-graphics and blink (optional).

To set a colouring attribute, select it and press <CR>. The following dialog box appears:



Note: the blink and underline parameters are disabled in standard colouring mode.

b) Enhanced Colouring Mode

This mode (available only with **ENH** firmware option) enables background colour, foreground colour and the display of the underline and blink to be set for each and any attribute.

Example: the multiple attribute **Blink+Reverse** can be displayed with red foreground, green background, no blinking and underline enabled.

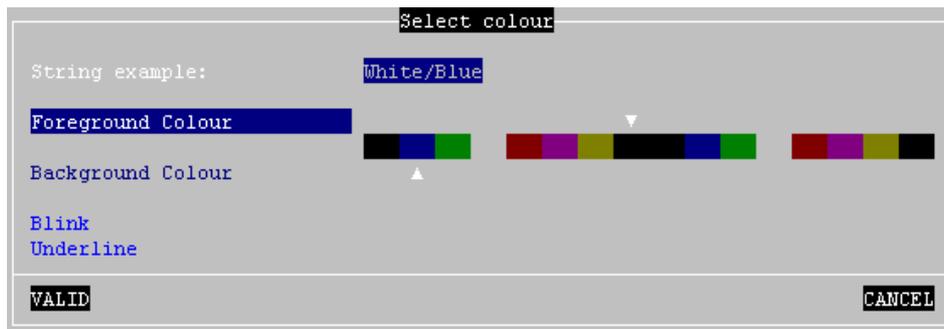
The dialog box for enhanced colouring mode is:



Colouring mode parameters:

- **Blink allowed:** if this parameter is set to 'no', 16 background colours are available. Otherwise, only 8 background colours are allowed.
- **Underline allowed:** if this parameter (which requires enhanced screen mode) is set to 'yes', the underline attribute can be displayed but only 8 foreground colours are available. Otherwise, there is no underline attribute but 16 foreground colours.

To set a colouring attribute, select it and press <CR>. The following dialog box appears:



According to the **Blink allowed** and **Underline allowed** parameters, 8 or 16 foreground and background colours are available and the **Blink** and **Underline** parameters are enabled or disabled.

5.1.6 - Underline Attribute Management

The reverse video attribute, the bold attribute and the blinking attribute are supported by all VGA monitors. However, the underline attribute is only supported by **monochrome VGA monitors**.

If the underline attribute is essential with a colour VGA monitor, one of the following three methods can be used, but note that each entails the loss of some other display capability.

a) Using the Monitor as a Monochrome Monitor

This method allows all the monochrome attributes to be used but entails the loss of all colour.

The monitor is set to operate as a monochrome monitor. All AX3000 sessions appear in monochrome and the AX3000 colouring mode is totally unavailable.

To set a VGA colour monitor to monochrome, enter the set-up, set **[Configuration]**→**[Terminal]**→**[General]**→**[Screen Type]** to 'Monochrome'.

b) Using the Colouring Mode

The AX3000 colouring mode is used to provide different foreground and background colours for each monochrome attribute. Thus, although no underline appears on the screen, normal and underlined text can be distinguished by different background colours.

The benefit of this method is that the colouring mode is dedicated to a single session. Sessions with different colours, or with the native colours of a software package, can be run on the same AX3000.

For more information about colouring mode, see Appendix 5.1.5

c) Using Underline Attribute in Colour Mode

An AX3000 set-up parameter allows the underline attribute to be displayed in colour mode, but this disables the bold attribute.

This is a good way to display underlining if the bold attribute is not used by the software in question.

Enter the AX3000 set-up, and perform the following two steps:

- select the **[Configuration]**→**[Terminal]**→**[General]** dialog and set the 'Enhanced Screen Mode' parameter to 'Underline'.
- for each session select the **[Configuration]**→**[Terminal]**→**[Session X]** →**[General Parameters]** dialog and set the 'Enhanced Screen Mode' parameter to 'Yes'.

5.1.7 - Login Script

The "login script" can be set to automatically enter user names and passwords at the login prompt.

Note: the "login script" feature is provided as a firmware option (name: SRI).

a) Enabling a Login Script

To associate a login script with a session, enter the AX3000 Set-Up and select **[Configuration]**→**[Terminal]**→**[Session X]**. In this dialog box (see Chapter

3.4.1), the "Login Script" parameter is used to enter the script commands.

Note: if the "Script Login" parameter is not present, then either the AX3000 hardware is too old (only 2Kb of NVRAM) or the "SRI" firmware option is not loaded.

The login script is a character string with the following characteristics:

- Maximum 60 characters.
- The string is composed of tokens. The NULL character (encoded by \00) is used as a token-separator. A string must contain an even number of tokens.
- Any character except a NULL can compose a token.
- A string can contain as many tokens as needed.
- Odd tokens are characters expected by the AX3000.
- Even tokens are characters sent by the AX3000 after the expected token has been received.

A login script looks like:

```
aaaaaa\00bbbbbb\00cccccc\00dddddd
```

b) Example

With the following script:

```
login:\00root\0D\00password:\00mypwd\0D
```

When the session is opened (<Alt><Fx>), the AX3000 acts as:

- Waiting for "login:".
- After "login:" has been received, the AX3000 sends "root"+<CR>.
Note: as for the programmable keys, ASCII codes lower than 20h can be entered as '\xx' (where xx is the hexadecimal value of the ASCII code. Examples: Escape is \1B and <CR> is \0D.
- Waiting for "password:".
- After "password:" has been received, the AX3000 sends "mypwd"+<CR>.

Note: Whilst a login script is running, the AX3000 keyboard is locked. In the event of a problem (wrong expected token), press <Esc> to skip the login script and to unlock the keyboard.

5.1.8 - The Multi-Shell

The AXEL multi-shell software allows multiple telnet sessions on the same host, with the same user name, without demanding multiple logons. This is done by running the AXEL **tcpmsh** program from a UNIX shell. This supports up to eight duplicated sessions.

Operating example: you could run four multi-shell sessions (or «views») across each of two telnet connections to different hosts. Function keystroke combinations could be used to hot-key between the different telnet connections (<Alt><Fx>) and different multi-shell views (<Ctrl><Fx>).

a) Installation

Copy to **/usr/bin** and rename as 'tcpmsh' the appropriate binary. Example for IBM AIX:

```
# cp tcpmsh.AIX /usr/bin/tcpmsh <CR>
```

b) Setting-Up the AX3000

Use of multiple views within a single telnet session must be set through the AX3000 set-up.

The AX3000 supports eight virtual screens, which may be shared, between telnet sessions and multi-shell views. In the AX3000 set-up, multi-shell views are referred to as «pages per session» or «page/session»).

The AX3000 default factory set-up is 8 telnet sessions and 1 page/session.

To change this configuration, enter AX3000 Set-Up (<Ctrl><Alt><Esc>) and select the **[Terminal]→[Multi-session]** dialog. Tune the two parameters **number of sessions** and **number of Pages/Session**.

c) Using the Multi-Shell

To run tcpmsh, the syntax is:

```
$ tcpmsh [-options] <CR>
```

The main tcpmsh options are:

- **b**: selecting generic names of pseudo-terminals:
 - b 0 (default): using tty x (x is any decimal value from 0 to 63),
 - b 1: using tt y x (x is any hexadecimal value from 0 to 3Fhex),
 - b 2: using tt y x , tt y q x , tt y r x and tt y s x (x is any hexadecimal value from 0 to F).
- **c**: a different overscan colour is associated with each view
- **f file**: initial commands. This command file has a maximum of eight lines. Each line lists the command associated with one view. If a view does not have an initial command, its associated line must start with a dash character (2Dhex character)
- **h**: online help
- **L label**: each view is associated with the character string 'label/ n ' (is n is the view number. This label is displayed on the TCP/IP status line.
- **l**: the line 25 acts as a status line which specifies the active session and the number of declared views.
- **m**: silent mode
- **n nbr**: maximum number of view (default 2).
- **p file**: fixed set of tt y . This file has a maximum of eight lines. Each line lists the tt y **slave part** associated with one view.
- **S str**: str is the required shell (sh, ksh, etc).
- **x nbr**: nbr is the size of each circular buffer associated with one view.

When the AXEL multi-shell program is run, help messages are displayed (tcpmsh version, maximum number of views, etc)

The program creates only the first view (view 1). A pseudo-terminal is automatically associated with this view.

This view is a copy, of the shell within which the tcpmsh program was run, and the **.profile** script is executed for this view.

To create a new view or to move to an existing view, use the following keystroke combinations:

- **<Ctrl><F1>**: view 1
-
- **<Ctrl><F8>**: view 8

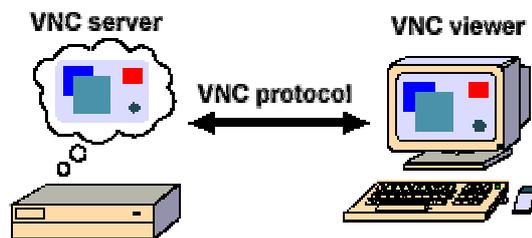
If a view does not already exist, the `tcpmsh` program allocates a pseudo-terminal, launches the view and runs `.profile`.

To delete a view, move to it (`<Ctrl><Fx>`) and exit the shell (by typing `exit` or pressing `<Ctrl><D>`). The `tcpmsh` software releases the associated pseudo-terminal and moves to the first view.

If the deleted view was the only active view, the program terminates.

5.2 - GRAPHICAL MODE SESSION (VNC)

The VNC protocol enables a remote graphical display on the Axel-VNCviewer. The image is constructed, maintained and updated within the Unix server's frame buffer, and transmitted across the TCP/IP network.



Note: this protocol is public and the associated software is free. For more information please see <http://www.uk.research.att.com/vnc>.

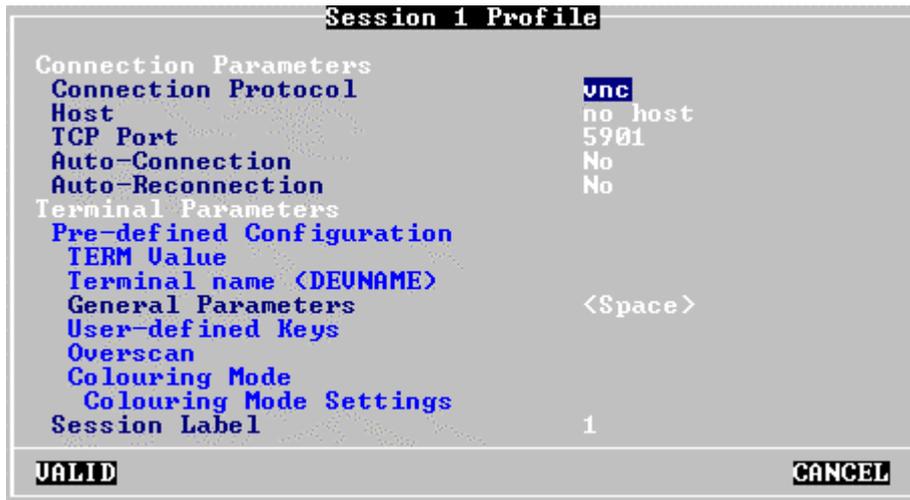
Note: the VNC protocol is only available with certain AX3000 models with the VNC firmware option.

The following is a quick description of the VNC installation procedure. For more information please read *AX3000 TCP/IP - Installing and Using the Axel-VNCviewer*.

5.2.1 - Setting-Up a VNC Session

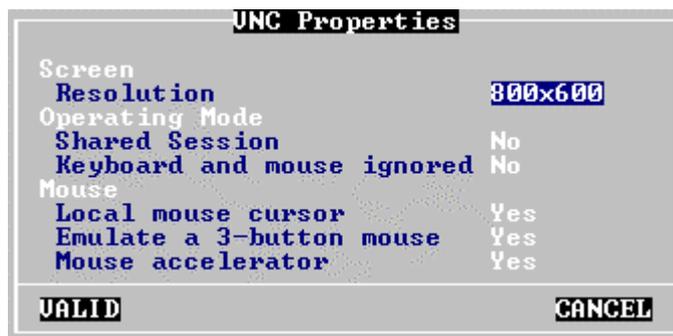
To set-up a VNC session, select **[Configuration]**→**[Terminal]**→**[Session X]**

(where X is the session number). The following dialog box is displayed:



Set the following parameters:

- **Protocol:** vnc
- **Host:** the hostname on which the Xvnc daemon is run
- **TCP Port:** numeric value associated with the display (see next chapter).
- **Auto Connection:** Yes or No.
- **Auto Reconnection:** Yes or No.
- **General Parameters:** press <Space> to display the following box:



These parameters are:

- **Resolution:** the default resolution of a VNC session is 800x600. Press <Space> to change to 1024x768.
- **Shared Session** and **Keyboard and Mouse Ignored:** these parameters allow several VNC terminals to share the same graphical display.
- **Local Mouse Cursor:** if 'yes', the local mouse cursor location is indicated by a little square pointer (2x2 pixels). This could be useful when the local mouse cursor location is different from the VNC cursor location (for example when the Unix/Linux box or the network are overloaded).
- **Emulate a 3-button Mouse:** if 'yes', the mouse middle button is emulated by clicking both left and right buttons.
- **Mouse Accelerator:** if 'yes', the AX3000 speeds up the mouse cursor.

Notes:

- The mouse is automatically enabled when a VNC session is set. The default mouse port is PS/2 (if this port exists) or AUX2. See Chapter 3.3.3.
- After exiting set-up, we advise a power-cycle of the AX3000.

5.2.2 - Configuring VNC on the Unix/Linux Server

Warning: it is assumed that the X11 environment is already installed (utilities, directories and files) on the Unix/Linux server.

Mount the Axel CD-ROM and copy the following files onto the hard disk:

- **axvnc** (VNC configuration utility, on CD supplied, under /bin). Copy axvnc to /etc. Set execute permission by invoking **chmod +x axvnc**.
- **Xvnc** (VNC server, on CD supplied, under /bin). Copy and rename as 'Xvnc' the appropriate binary (Xvnc.SCO, Xvnc.LINUX, Xvnc.UW7, Xvnc.AIX) to a local directory (i.e. /usr/local/bin). Set execute permission by invoking **chmod +x Xvnc**.

The **axvnc** configuration utility can be used to easily set up the Unix/Linux server. This script has been certified for Linux, SCO OpenServer, Open Unix 8, UnixWare 7, Sun OS and HP-UX environments.

Note: for more information (i.e. for manual VNC configuration) please read *Installing and Using the Axel-VNCviewer*.

The axvnc utility must be run from the graphical Unix/Linux console by invoking **/etc/axvnc**.

The first operation performed by axvnc is to check the system has the necessary components for correct VNC operation:

```
AXEL VNC UTILITY (V1.2-0)
-----
Checking system configuration:
- Operating System:
  --> Linux (runlevel 5)
- VNC server (Xvnc):
  --> OK
- Misc Utilities:
  --> OK
- X11 font:
  --> unix/:-1
Press <CR>
```

Note: if the default font paths given by the O.S are not needed, use the '-nofp' option when axvnc is run.

The second screen gives two choices:

- The user being presented with a standard Unix/Linux desktop following a graphical login.
- The ability to run a program or script without running the X display manager. (For example 'rdesktop' or 'netscape' can be run without an underlying display manager reducing memory and CPU requirements).

```
AXEL VNC UTILITY (V1.2-0)
-----

This utility allows you to set-up Unix/Linux to run automatically at boot time
Xvnc servers. For each display, a different resolution and a different
number of colors can be chosen.

An Xvnc daemon can be used:
- either to get a graphical login and to access a desktop (KDE, GNOME, etc.)
- or to run automatically an X software (netscape, rdesktop, etc.)

Select the method (<L>ogin or <A>ny software):
```

a) VNC Terminals with Login

This method offers a standard Linux/Unix "login box" on the VNC terminal. This logon (username + password) allows the AX3000 user to be identified and given their respective desktop

The procedure to set up a login session can vary on the display manager used. (See below)

Display Manager KDE 2.2

For KDE 2.2, VNC terminals can be declared either through /etc/inittab or the environment (x)inetd.

There are two main differences:

- inittab gives each terminal its own unique TCP port (5901, 5902, etc.).
- (x)inetd requires only one TCP port for each type of terminal (example: 5950 for all 800x600 and 256-colour terminals).

Note: a more precise list of differences is given in Chapter 6.6.

This chapter deals only with the (x)inetd method. For more information about the inittab method, consult the Section 'Other Display Managers'.

```

After selecting the (x)inetd method, a similar screen is displayed:
(x)inetd and /usr/share/config/kdm/kdmrc will be modified.
Please confirm: Y

*** Checking INET environment (/etc/services and /etc/xinetd.d/vnc)
800x600 - 8 bpp (port 5950): OK
800x600 - 16 bpp (port 5951): OK
1024x768 - 8 bpp (port 5952): OK
1024x768 - 16 bpp (port 5953): OK

*** Checking XDMCP (/usr/share/config/kdm/kdmrc)
xdmcp has been already enabled !

```

The four 5950, 5951, 5952 and 5953 TCP ports have been set to handle VNC connections.

Other Display Managers

The following screen allows the removal/addition of a VNC terminal with Login:

```

MANAGING GRAPHICAL DISPLAY FILE

Contents of /etc/inittab:
:1 Xvnc 800x600 - 8 bpp      :16 free      :31 free
:2 Xvnc 1024x768- 8 bpp    :17 free      :32 free
:3 busy                    :18 free      :33 free
:4 free                    :19 free      :34 free
:5 free                    :20 free      :35 free
:6 free                    :21 free      :36 free
:7 free                    :22 free      :37 free
:8 free                    :23 free      :38 free
:9 free                    :24 free      :39 free
:10 free                   :25 free      :40 free
:11 free                   :26 free      :41 free
:12 free                   :27 free      :42 free
:13 free                   :28 free      :43 free
:14 free                   :29 free      :44 free
:15 free                   :30 free      :45 free

<A>dd a display / <D>elete a display / <M>odify a display settings / <Q>uit
Enter your choice (A, D, M or Q):

```

A VNC terminal with Login is defined by:

- its display number: this is the VNC session TCP port (1=5901, 2=5902...),
- its resolution: 800x600 or 1024x768,
- its number of supported colour bits: 8 bits/pixel.

Notes:

- Depending on the operating system, the Xvnc daemon will be launched either from the Xservers file or /etc/inittab.
- If the entry of a display is described as 'busy' it means a VNC terminal WITHOUT login is assigned to that port.

b) VNC Terminal without Login

The terminal can be configured to run a dedicated application. (i.e. an inter/intranet terminal running only Netscape, or a Windows terminal automatically running an RDP client. In this case it is not necessary to run the X display manager and login.)

The following screen allows the addition or removal of a VNC terminal without Login (the application is automatically run):

```
MANAGING GRAPHICAL DISPLAY FILE

Contents of /etc/inittab:
:1 busy                :16 free
:2 busy                :17 free
:3 (800x600 - 8) /usr/local/bin/a... :18 free
:4 free                :19 free
:5 free                :20 free
:6 free                :21 free
:7 free                :22 free
:8 free                :23 free
:9 free                :24 free
:10 free               :25 free
:11 free               :26 free
:12 free               :27 free
:13 free               :28 free
:14 free               :29 free
:15 free               :30 free

<A>dd a display / <D>elete a display / <M>odify a display settings / <Q>uit
Enter your choice (A, D, M or Q):
```

A VNC terminal without Login is defined by:

- its display number: this is the VNC session TCP port (1=5901, 2=5902...),
- its resolution: 800x600 or 1024x768,
- its number of supported colour bits: 8 bits/pixel,
- the dedicated application (absolute pathname and parameters).

Notes:

- The Xvnc server and application are run by the **RunScriptVNC** script which is automatically created by axvnc. The RunScriptVNC scripts are launched through /etc/inittab.
- If an entry in the display table is 'busy', it means the VNC terminal WITH login is assigned to this port.

5.3 - CONTROLLING PRINTERS

Three auxiliary ports are provided by the AX3000 (2 serial and 1 parallel). These ports are independently controlled so up to three printers can be attached to the AX3000.

A printer is generally controlled by a network service:

- **tty protocol**: this is an Axel proprietary protocol. A printer controlled by the tty protocol is seen as a local printer.
- **LPD protocol**: this service (RFCs 1048 and related) is provided as a standard feature by major operating systems (Unix/Linux, NT, etc.). The main benefit of this protocol is an LPD printer can be shared by different operating systems.
- **rsh command**: this command allows the contents of a file to be redirected over the network.

In addition, a printer can also be controlled in "transparent mode" (by embedded escape sequences, like a printer attached to a serial terminal).

The following covers the tty protocol, the rsh command and the transparent mode. For more information about LPD printers, refer to Appendix A.3.

5.3.1 - The tty Protocol

The tty server is a Axel proprietary protocol. An additional piece of software is needed (see Chapter 5.4).

The Unix/Linux host must run the AXEL tty server daemon (`axtttyd`). The configuration file `axtttyd` must contain a list of AX3000 auxiliary ports and the pttys associated with each.

Each auxiliary port using the tty protocol (see Chapter 3.5.5) is identified by the name of the AX3000 (from the `/etc/hosts` file) and a special keyword. For example:

| | | | |
|-------|----------|-------------|-------------|
| axell | aux1 | /dev/ptyp12 | /dev/ttyp12 |
| axell | aux2 | /dev/ptyp13 | /dev/ttyp13 |
| axel2 | parallel | /dev/ptyp2 | /dev/ttyp2 |

An auxiliary port controlled by the tty server is seen as a Unix/Linux local port (like a multi I/O board).

Data can be sent to an auxiliary port by:

- either a redirection to the ttyp (example: "cat file > /dev/ttyp12")
- or declaring a local printer attached to the ttyp (/dev/ttyp12). This printer is used through the lp command.

5.3.2 - The rsh Command

The rsh command (or rcmd on SCO OpenServer) can be used to print a file.

The rsh parameters are:

- the hostname or the IP address of the device,
- a keyword which is the AX3000 auxiliary port name. This name has been set through the AX3000 Set-Up (see Chapter 3.5.6).

To print a file, the rsh command reads data from 'standard input' (`stdin`) and sends this data to one of the AX3000's auxiliary ports. For example:

```
$ rsh axname parallel < file <CR>
```

In this example, `axname` is the name of the AX3000 (refer to `/etc/hosts` file) and `parallel` is the Printer Port Name of the AX3000 auxiliary port.

5.3.3 - Using Transparent Mode

One of the three auxiliary ports should be selected as the default printer port which will be controlled by escape sequences.

Select the **[Configuration]**→**[Terminal]**→**[General]** dialog and set the 'default printer port'.

This default port can only be used if no network service (lpd, tty, etc) is currently using it.

Note: the default printer port is also used to perform local printing of the screen using the **<Prt Scr>** key.

5.4 - THE AXEL TTY SERVER

5.4.1 - Overview

The TTY server emulates a multi i/o board connection over a TCP/IP connection. For example using this service a remote printer attached to an Axel terminal is accessed by Unix as a local printer via `/dev/ttyp4`, which may be preferable over using LPD in certain circumstances. Similarly the Axel terminal can be accessed via a predetermined and fixed `/dev/ttyp`, which in certain cases may be preferable over using telnet.

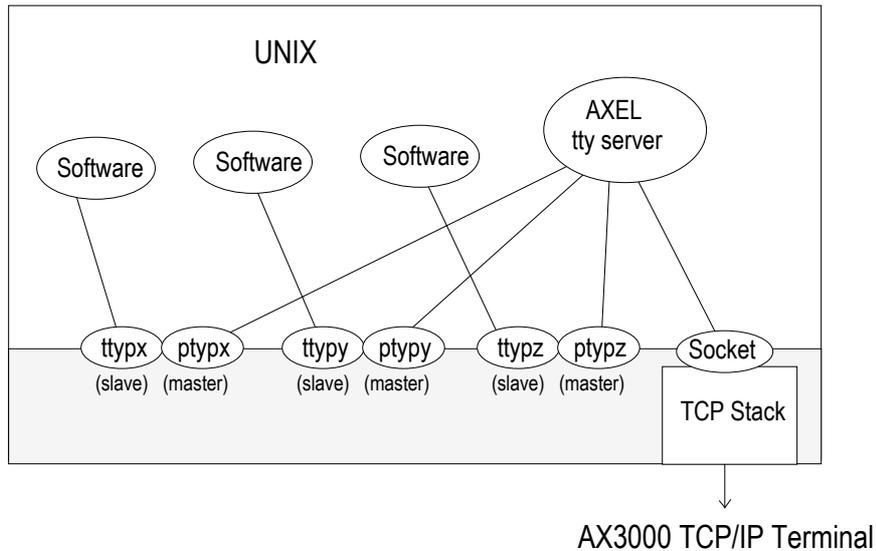
The AXEL tty server is a UNIX daemon (axttyd). The axttyd daemon must be used with the AX3000 **tty** or **rtty** network service.

The AXEL tty server creates a 'pipe' between pseudo devices on the UNIX host (`/dev/ttypx`) and AX3000 resources (sessions and/or auxiliary ports). This 'pipe' lets Unix treat the Axel sessions and auxiliary ports as local resources.

Note about pseudo-terminals: a pseudo-terminal is composed of two parts: a master file and a slave file. UNIX supports two possible styles for naming pttys:

- one master and x slaves (AT&T style): the master filename is **`/dev/ptmx`** and the slave filenames are **`/dev/pts/xxx`** (where **xxx** is a number).
- x masters and x slaves (Berkeley style): the master filename is **`/dev/ptypxxx`** and the slave filenames are **`/dev/ttypxxx`** (where **xxx** is the same number for master and slave).

The following drawing shows the Unix/Linux mechanisms:



5.4.2 - Installing an AXEL tty server

Copy to `/etc` and rename as `axttyd` the appropriate binary. Example for IBM AIX:

```
# cp axttyd.AIX /etc/axttyd <CR>
```

Note: the source file and the **makefile** are also provided. If the binary file required for your operating system is not provided, it can be generated.

Copy the AXEL association file (**axfile**) into the `/etc` directory:

To launch the AXEL tty server automatically, whenever the host is booted, copy into the boot directory the **S91axel** file (for Unix) or the **S91axtty** file (for Linux).

The **S91axel** or **S91axtty** files launch the AXEL tty server. If parameters other than the default are required, this command line can be edited.

5.4.3 - Using an AXEL tty server

a) Overview

The AXEL tty server uses a configuration file which lists all authorised associations between AX3000 resources and UNIX ptty's. Each entry in this file contains four parameters:

- AX3000 hostname (see */etc/hosts*)
- the AX3000 resource, which depends on which network service is used:
 - tty on auxiliary port: **aux1, aux2, parallel,**
 - tty on terminal session: **sess1, sess2, ..., sess8**
 - rty on auxiliary port: encoded by a TCP port
- the master file of the pty (*/dev/ptty* or */dev/ptmx*)
- the slave file of the pty (*/dev/ttyp*, */dev/pts/xxx* or a link file automatically created by *axttyd*).

For example:

| #AX3000 | Resource | Master | Slave |
|---------|----------|--------------------|--------------------|
| axel1 | aux1 | <i>/dev/ptyp12</i> | <i>/dev/ttyp12</i> |
| axel1 | aux2 | <i>/dev/ptmx</i> | <i>/dev/pts/13</i> |
| axel2 | 2050 | <i>/dev/ptyp0</i> | <i>/dev/ttyp0</i> |
| axel2 | sess1 | <i>/dev/ptmx</i> | <i>/dev/axel</i> |
| axel2 | sess2 | <i>/dev/ptyp2</i> | <i>/dev/ttyp2</i> |

Notes:

- Lines beginning with '#' are ignored.
- Association lines 1, 2, 4 and 5 use the tty service, and association line 3 uses rty service.
- Association line 4 uses a link file (*/dev/axel*). This file is linked with an undefined slave *ttyp* (*/dev/pts/xxx*). This link file is automatically created when *axttyd* is run.

Errors (syntax error, unknown AX3000 hostname, pty not available, etc) are recorded in a log file.

b) Running the Axel Tty Server

The command to start the AXEL tty server is:

```
/etc/axttyd [-f file] [-l log] [-n port] [-hbFUk] &
```

- b: use a buffer for received data.
- f: configuration file (default: /etc/axfile).
- F: tty buffers are flushed when the tty connection is established.
- h: on-line help.
- l: log file (default: /tmp/axttylog).
- n: TCP port (default: 2048) for connections using the tty service.
- U: only uni-directional dataflow is supported. Data from the network is dropped.
- k: turn-off keepalive function.

Note: take care to add the '&' character at the end of line.

The AXEL tty server can be started either from the UNIX command line or at boot time (from **S91axel** or **S91axtty**).

All authorised associations, connections and disconnections will be recorded in the specified log file.

5.4.4 -The axttyd Mechanism

The axttyd daemon performs the following steps:

- **init stage:** association file checking (errors are reported in the log file) and associated pty opening (masters and slaves),
- **rtty stage:** for each rtty association, a child process is created. Each child process listens on the associated pty. When data is received a socket is opened on the AX3000 auxiliary port. Bi-directional communication is then enabled. If no data is sent or received for any one minute interval, the connection is closed. It will be opened again, the next time data is received from the pty.
- **tty stage:** when all the rtty child processes are created, the axttyd daemon listens on the TCP/IP socket (generally 2048). For each connection request (from an AX3000 tty service), a child process is created. This process controls communication between the pty and the AX3000 resource (session or auxiliary port).

5.4.5 - Uninstalling

Remove the AXEL files and kill the AXEL tty server process (signal TERM):

```
# kill -TERM pid<CR>
```

where `pid` is the process ID of the AXEL tty server.

5.5 - REMOTE ADMINISTRATION

The following rsh commands allow an AX3000 to be controlled over the network. (on SCO OpenServer the rsh command is called `rcmd`).

5.5.1 - Rebooting the AX3000

To reboot an AX3000 over the network, invoke the following command:

```
# rsh axname ax_reboot password
```

Where:

- `axname` : AX3000 name (/etc/hosts) or IP address,
- `ax_reboot` : command for AX3000 reboot,
- `password` : specify the set-up password if set.

5.5.2 - Resetting an AX3000 resource (screen session or aux. port)

The reset feature allows:

- a network service to be stopped and restarted
- to apply new serial line settings (data transfer rate, handshake, etc.).

The supported resources are:

- screen sessions: `sess1`, `sess2`, ..., `sess8`
- auxiliary ports: `aux1`, `aux2` and `parallel`.

Use the following command to reset a resource:

```
# rsh axname ax_sinit password res
```

Where:

- axname : AX3000 name (/etc/hosts) or IP address,
- ax_sinit : command to reset the resource,
- password : specify the set-up password if set,
- res : resource name (ex: sess1).

5.5.3 - Editing the AX3000 Settings

The whole AX3000 set-up can be obtained by invoking the following command:

```
# rsh axname setup_get > /tmp/axel
```

or a partial set-up can also be obtained (only used set-up parameters are sent):

```
# rsh axname setup_get_lite > /tmp/axel
```

Where:

- axname : AX3000 name (/etc/hosts) or IP address,
- setup_get : command for getting the whole set-up,
- setup_get_lite : command for getting the partial set-up.

For more information about these commands, refer to Chapter 10.

5.5.4 - Setting-Up the AX3000

The contents of a file is used to set-up the AX3000:

```
# rsh axname setup_send password < /tmp/axel
```

Where:

- axname : AX3000 name (/etc/hosts) or IP address,
- setup_send : command for set-up the AX3000,
- password : specify the set-up password if set.

For more information about this command, refer to Chapter 10.

5.5.5 - Downloading Firmware

To download an AX3000 firmware through TFTP:

```
# rsh axname ax_download password /axfirm/axel 192.168.1.2 192.168.1.1
```

To download an AX3000 firmware through BOOTP and TFTP:

```
# rsh axname ax_download password
```

Where:

- axname : AX3000 name (/etc/hosts) or IP address,
- ax_download : command for firmware downloading,
- password : specify the set-up password if set.
- /axfirm/axel : path and name of the firmware file,
- 192.168.1.2 : TFTP Server IP address,
- 192.168.1.1 : optional router IP address.

Messages are displayed on the target AX3000 (See Chapter 11.4).

5.5.6 - Viewing AX3000 Statistics

Some AX3000 statistics can be obtained by invoking the following command:

```
# rsh axname ax_getstat
```

Where:

- axname : AX3000 name (/etc/hosts) or IP address,
- ax_getstat : command for getting statistics.

CHAPTER 6

INSTALLING UNDER OS/400

This chapter covers AX3000 installation under OS/400.

This chapter is dedicated to the operation of the AX3000 in the OS/400 environment. For more general information about the AX3000 (network and session settings, instructions for users, etc) please refer to the previous chapters.

The AX3000 is able to handle both 5250 screen sessions (tn5250 emulation) and printers (protocols Prt5250 and LPD).

Note: these 5250 protocols are only available with the I52 firmware option.

6.1 - 5250 SCREEN SESSION

The IBM 5250 emulation type developed by Axel is IBM-3477-FC.

This emulation provides all the features of an IBM 5250 terminal. Especially:

- enhanced 5250 telnet protocol (TN5250E): compliant with the RFCs 1205 and 2877 (terminal name negotiation, terminal type negotiation, etc.),
- colour support,
- screen sizes: 24x80 and 27x132,
- 5250 status line.

6.1.1 - Keyboard Type

a) Setting-Up the Keyboard Type

The AX3000 supports both a 5250 (122 keys) and a PC/AT keyboard (102/105 keys). The keyboard type is not auto-detected.

To set the keyboard type, enter the AX3000 Set-Up and select the **[Configuration]→[Terminal]→[General]** menu. Set the "Keyboard Type" to "PC" or "AS400 (F24)" in the displayed box

Press **<Alt><Rest><SetUp>** to enter the AX3000 Set-Up with an AS400 keyboard.

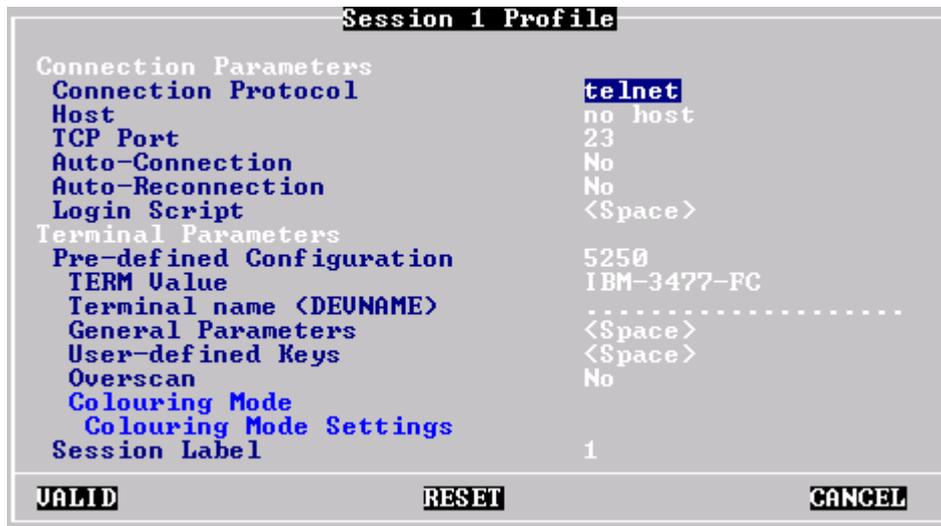
b) In event of problems

If the AX3000 setting is not consistent (a PC keyboard is attached but a 5250 keyboard is declared, or vice versa), the keyboard won't work.

A specific keystroke allows the keyboard type to be dynamically toggled. This keystroke is **<Ctrl><Alt><Shift><K>** with a PC keyboard, and **<Rest><Alt><K>** with a 5250 keyboard.

6.1.2 - Setting a Session

To set a profile session, enter the AX3000 Set-Up and select the **[Configuration]→[Terminal]→[Session X]** menu (where X is the session number to be configured). The following box is displayed:



These parameters are:

- **Connection Type:** select telnet
- **Host:** press <Space> to select the host from a list
- **TCP Port:** enter 23.
- **Auto-Connection**
- **Auto-Reconnection**
- **Login Script:** press <Space> to set the Auto-Signon function (see Chapter 6.1.4).
- **Configuration:** press <Space> to select '5250'
- **TERM Value:** IBM-3477-FC
- **Terminal Name (DEVNAME):** if this name is left blank, the OS/400 will associate a dynamic name to this terminal (i.e.: QPADEV001).
- **General Parameters:** pressing <Space> displays a dialog box which lets certain emulation parameters be changed. See the next chapter for more information.
- **User-defined Keys:** pressing <Space> displays a dialog box which lets certain keys be remapped. See the next chapter for more information.
- **Overscan:** select the overscan colour
- **Session Label:** session identification located on the TCP/IP status line.

Save and exit the set-up. The AX3000 is ready for use.

6.1.3 - Customising the 5250 Emulation

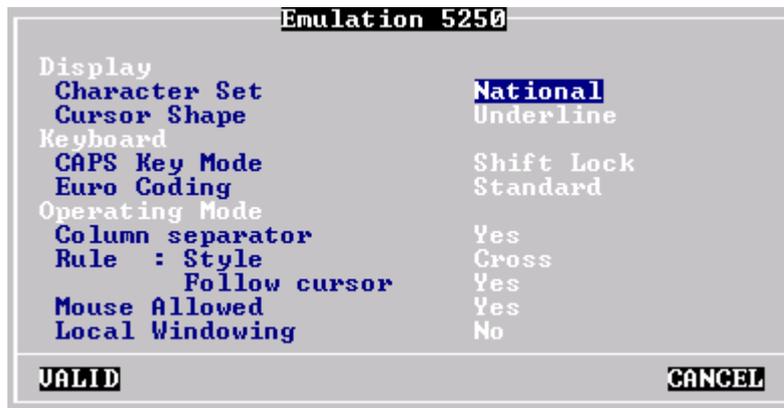
Various 5250 emulation parameters can be modified but generally the default values are the most suitable.

To customise the 5250 emulation, enter the AX3000 Set-Up and select the session profile (**[Configuration]**→**[Terminal]**→**[Session X]** menu). Two groups of parameters control 5250 emulation settings:

- General Parameters: 5250 emulation behaviour,
- User-defined Keys: mapping 5250 functions to PC keyboard keys.

a) 5250 Emulation General Parameters

Within the 'Session Profile' box, select 'General Parameters' and press <Space>. The following box is displayed:



These parameters are:

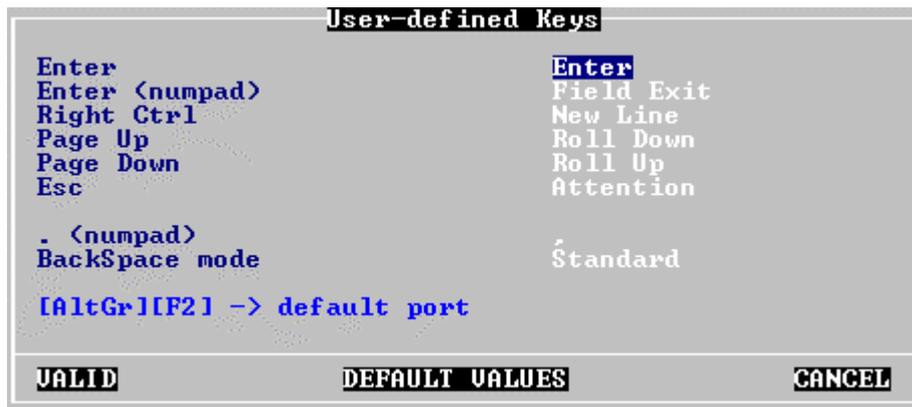
- **Character Set:** the two possible values are:
 - national (some characters are keyboard nationality dependent),
 - multinational.
- **Cursor Shape:** three possible values: underline, half-block or block.
Note: to change the cursor shape from a 5250 session press <Alt><F11> (or <Alt Gr><F11> with a PC keyboard).
- **CAPS Key Mode:** set the CAPS LOCK to behave in either of three ways:
 - Caps Lock: each alphabetical key sends the corresponding upper case letter. To unlock this mode press the <CAPS> key.
 - Shift Lock: each key send the same character sent by pressing <Shift><This key>. To unlock this mode press a <Shift> key.
 - Uppercase: each key send the upper character if it is present. Otherwise, this is the lower character (upper-case letter if possible) which is sent. To unlock this mode press the <CAPS> key.
- **Euro Coding:** Euro symbol support. The three possible values are:
 - no: no specific processing is done
 - standard: the Euro symbol replaces the international currency symbol '¤' within the current character set.

- custom: any character can be replaced by the Euro symbol within the current character set (use the decimal notation).
 - **Column Separator:** the two possible values are:
 - no: this video attribute is not displayed.
 - yes: this video attribute is displayed, but due to VGA limitations, it is displayed as underlining.
 - **Rule: Type:** the "rule" function allows the cursor to be located easily among other characters. Three types of rules are available:
 - cross: a horizontal line and a vertical line indicate the cursor location,
 - horizontal: a horizontal line is displayed at the cursor line,
 - vertical: a vertical line is displayed at the cursor column.
- Press <Rule> (or <Alt Gr><F12> with a PC keyboard) to enable/disable the rule function from a 5250 session.
- **Follow cursor:** two values:
 - yes: rule follows the cursor,
 - no: rule doesn't move.
 - **Mouse Allowed:** enable/disable the mouse within this session (see Chapter 6.1.5).
 - **Local Windowing:** this parameter (only available if !NFU firmware option is not set) sets the window display mode. Two values:
 - no: windows are displayed with the original characters ('.' and ':'),
 - yes: windows are displayed with "real" frames.

b) Remapping 5250 Functions to PC Keyboards

Most 5250 functions can be accessed through a PC keyboard (102 or 105 keys). See the related table in Chapter 6.2.2. However it is possible to remap some 5250 functions.

Within the 'Session Profile' box. Select "User Defined Key" and press <Space>. The following box is displayed:



These parameters are:

- <Enter>, <Enter (numpad)>, <Right Ctrl>, <Page Up> and <Page Down>: a list is used to set these key values (Enter, Field Exit, New Line, Roll Down and Roll Up).
- Note:** the same value can be used for several keys.
- **Esc:** two functions are available for these key:
 - "Attention" (and <Shift><Esc> is "System Request")
 - "System Request " (and <Shift><Esc> is "Attention")
- <.> (numpad): the two available values are the dot (.) and the comma (,).
- **Backspace Mode:** the two available values are:
 - standard: move cursor left
 - suppress: deleting the character on the left of the cursor location
- <Alt Gr><F2> -> **default port:** setting a character string. When the default auxiliary port mode is set as "ASCII to EBCDIC", this character string is sent to this port when <Alt Gr><F2> is pressed.

6.1.4 - Setting-Up the Auto-Signon Function

The Auto-Signon function allows a user to open a connection without entering related profile parameters (username, password, etc.). The Auto-Signon box is accessed by **[Configuration]**→**[Terminal]**→**[Session X]** (see Chapter 6.1.2):

This box allows a value to be entered for each parameter displayed within an AS/400 Signon Screen:

- **Username**
- **Password** (available only if 'Username' is not empty): press <Space> to enter the password.
- **Program/Procedure** (available only if 'Username' is not empty).
- **Menu** (available only if 'Username' is not empty).
- **Current Library** (available only if 'Username' is not empty).

6.1.5 - Setting-Up the Mouse

The mouse can be either connected to the PS/2 port (if this port exists) or to the serial AUX2 port.

The mouse declaration depends on the mouse port:

- PS/2 port: select **[Configuration]**→**[Terminal]**→**[General]**. Within this box, set 'Mouse' to 'PS/2'.
- AUX2 port: select **[Configuration]**→**[Terminal]**→**[General]**. Within this box, if 'Mouse' parameter exists set it to 'AUX2'. Then, select **[Configuration]**→**[Ports aux.]**→**[AUX2]**. Within this box, set "Associated Service" to "none" and "Operating Mode" to "Mouse".

The mouse must be enabled for each session. This is done through the session profile (**[Configuration]**→**[Terminal]**→**[Session X]**). Within this box, select

"General Parameters" and press <Space>. Within this box, set "Mouse Enabled" to "Yes". See Chapter 6.1.3.

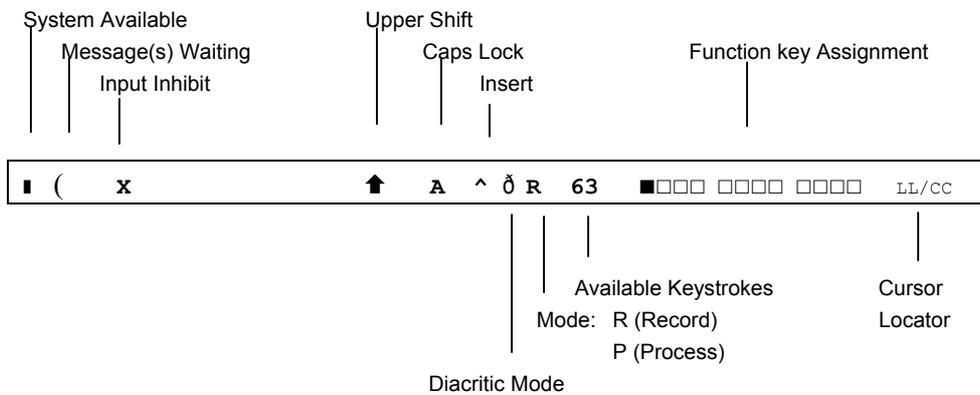
The mouse will be available after rebooting.

6.2 - USING THE AX3000

6.2.1 - The 5250 Status Line

Note: the 5250 status line is different than the AX3000 TCP/IP status line. (The AX3000 TCP/IP status line displays information about current connected sessions. This line can be enabled/disabled through the AX3000 Set-Up).

The 5250 status line is displayed at the bottom of the screen and gives the following information:



The status symbols are described in the following table.

| Symbol | Name | Meaning |
|--------|--------------------|--|
| ■ | System Available | The host system is operating and available |
| (| Message(s) Waiting | This symbol, and a beep, indicate the host system has one or more messages for the terminal. |
| x | Input Inhibit | This symbol is displayed when: - the host system is processing the last input - the host system is very busy - the host system detects an error condition |
| ↑ | Upper Shift | <Shift> is currently pressed |
| Ⓐ | Caps Lock | The keyboard is in Caps Lock mode |
| ^ | Insert | The insert mode is enabled (<Inser> key) |
| ø | Diacritic Mode | This symbol is displayed when the diacritic mode is enabled. This mode is automatically set when a composed character is currently entered (^ + e = ê) |
| Ⓜ | Record | The "Record" mode is set (see Chapter 6.2.3) |
| Ⓟ | Process | The "Process" mode is set (see Chapter 6.2.3) |
| LL/CC | Cursor Locator | LL and CC indicate the row and column where the cursor is located |

6.2.2 - Using the Keyboard

Two types of keyboard can be used with the AX3000: a PC/AT (102/105-key) or a 5250 (122-key) keyboard.

The following tables list the 5250 functions (moving the cursor, system functions, etc) and the Axel functions (entering the set-up, etc) accessed from these keyboard.

5250 Functions:

| 5250 Functions | 5250 Keyboard | PC/AT Keyboard |
|----------------------------------|----------------------|---|
| Attention | <Attn> | <Esc> or <Alt Gr><Pause> |
| Back tabulation | <\|←> or <Shift><→> | <Shift><Tab> |
| Clear end of field | <ErInp> | <End> |
| Clear all fields | <Alt><Clear> | <Pause> |
| Cursor shape (see Chapter 1.2.3) | <Cursor> | <Alt Gr><F11> |
| Duplication | <Dup> | <Shift><Insert> |
| Enter | <Enter> | <Enter> |
| Euro symbol | <Alt><E> | <Alt Gr><E> |
| Execute macro | <Exec> | <Alt Gr><F5> |
| F1...F12 | <F1>...<F12> | <F1>...<F12> |
| F13...F24 | <F13>...<F24> | <Shift><F1>...<Shift><F12> |
| Fast left | <Shift><←> | <Shift><←> |
| Fast right | <Shift><→> | <Shift><→> |
| Field - | <Field -> | <-> (numpad) |
| Field + | <Field +> | <+> (numpad) |
| Field Exit | <Field Exit> | <Entr> (numpad) |
| Help | <Help> | <Alt Gr><F1> |
| Hexa | <Alt><Help> | <Alt Gr><F7> |
| Home of field | <Alt><Rule> | <Home> |
| New Line | <↓> | <Ctrl Right> |
| Print (local mode) | <Rest><Alt><Print> | <Ctrl><Alt><Prt Scr> |
| Print (Print HOST mode) | <Print> | <Prt Scr> |
| Record Macro | <Record> | <Alt Gr><F4> |
| Reset | <Rest> | <Ctrl Left> |
| Roll Down | <Shift><↓> | <Page Up> or <Shift><↓> |
| Roll Up | <Shift><↑> | <Page Down> or <Shift><↑> |
| Rule (see Chapter 1.2.3) | <Rule> | <Alt Gr><F12> |
| System Request | <Shift><Attn> | <Shift><Esc> or <Alt Gr><Prt Scr> |
| Tabulation | <->\|> | <Tab> |

Note: it is possible to remap the keystrokes written in bold (see Chapter 6.1.2)

Axel Functions:

| Axel Function | 5250 Keyboard | PC/AT Keyboard |
|-------------------------------|----------------------|-----------------------|
| AX3000 Shutdown | <Rest><Alt> | <Ctrl><Alt> |
| AX3000 Set-Up | <Rest><Alt><SetUp> | <Ctrl><Alt><Esc> |
| Disconnecting the session | <Rest><Alt><D> | <Ctrl><Alt><Shift><D> |
| Sending data to the aux. port | <Alt right><F2> | <Alt Gr><F2> |

6.2.3 - Programming Function Keys (Macro Feature)

The Axel 5250 emulation allows function keys to be programmed. For example a series of keystrokes can be recorded and played back by pressing a single key.

The recorded data is stored in non-volatile memory so is not affected by switching off.

Recorded keystrokes can be assigned to any of the 24 function keys (<F1> to <F12> or <Shift><F1> to <Shift><F12>).

a) Programming a Function Key

To record a series of keystrokes proceed as follows:

- press **<Alt Gr><F4>** to set the record mode,
- press any of the 24 function keys to which you want to assign,
- type the key sequence you want to save,
- press **<Alt Gr><F4>** to exit the record mode.

Notes:

- Maximum Keystrokes Recorded: for each session there is a maximum of 127 keystrokes recordable. Each individual function key has a maximum of 63 keystrokes recordable.
- To delete a recorded function key, you have to record an empty key sequence.

Example:

- 1 -Press <Alt Gr><F4> to set the Record mode. The 5250 status line is set in reverse video mode and the following information is displayed (the 24 boxes are the 24 function keys, a solid box means that data is recorded):

```
MEMOR          127 ■■■■ ■■■■ ■■■■ ■■■■ ■■■■ ■■■■ ■■■■ 17/21
```

- 2 -Press one of the function keys (<F1> to <F12> or <Shift><F1> to <Shift><F12>). The 5250 status line is set in normal mode and the following information is displayed:

```
R 127 F1          17/21
```

Note: 'R' indicates the Record mode. The second field is the maximum keystrokes that can be recorded for this session (max. 127). The third field is the selected function key.

- 3 -Type the key sequence. Note the keystroke counter shows the remaining keystrokes that can be recorded for this function key (max. 63). As you type this counter is decreased.
- 4 -To exit the Record mode, press <Alt Gr><F4>.

b) Processing a key sequence

To execute a series of keystrokes that have been recorded:

- press <Alt Gr><F5> to set the Process mode,
- press the recorded function key,
- the key sequence is processed.

Example:

- 1 -Press <Alt Gr><F5> to set the Process mode. The 5250 status line is set in reverse video mode and the following information is displayed (the 24 boxes are the 24 function keys, a solid box means that data is recorded):

```
EXEC          ■■■■ ■■■■ ■■■■ ■■■■ ■■■■ ■■■■ ■■■■ 17/21
```

- 2 -Press the recorded function key (<F1> to <F12> or <Shift><F1> to <Shift><F12>). The 5250 status line is set in normal mode and the following information is displayed (the 'P' symbol indicates the Process mode). The key sequence is processed:

```
P          17/21
```

Note: during the process mode, the input is inhibited.

6.2.4 - The Mouse

Four mouse actions are possible:

- **left-click**, two possible actions are possible depending on the character string under the mouse cursor:
 - If the character string is a function key label, this function key is sent (keystroke emulation).
 - Otherwise the text cursor is moved to the mouse cursor location.
- **double left-click**, two possible actions are possible depending on the character string under the mouse cursor:
 - If the character string is a function key label, this function key is sent (keystroke emulation).
 - Otherwise the character string + <Enter> are sent (keystroke emulation).
- **right-click**: roll up is sent (keystroke emulation).
- **double right-click**: roll down is sent (keystroke emulation).

Note: identifying the character string under the mouse cursor

The character string delimiters are:

- video attributes,
- and the following EBCDIC codes: 00, 40, 4A, 4B, 4C, 4D, 4E, 5A, 5C, 5D, 5E, 60, 61, 6B, 6E, 6F, 7A, 7E, C0 and D0.

Example for the character string "F3=Exit":

- left-click or double-left-click on "F" or "3": <F3> is sent
- double-left-click on "E": Exit + <Enter> is sent.

6.3 - 5250 PRINTER

Three auxiliary ports are provided by the AX3000 (2 serial and 1 parallel). Because these ports are independently controlled, up to three printers can be attached to the AX3000.

These printers can be controlled by one of two protocols:

- **Prt5250**: this service (RFC 2877) is OS/400 oriented. A printer controlled by this service is seen as a standard spooled system printer device.
- **LPD**: this service (RFCs 1048 and related) is provided as a standard feature by major operating systems (Unix/Linux, NT, etc.). The main benefit of this protocol is an LPD printer can be shared by different operating systems. But LPD restrictions are:
 - the printer must be manually added to OS/400,
 - the printer is accessed through an outqueue (and not a device),
 - the printer job manipulation is not fully supported.

Normally the Prt5250 protocol is preferred. (No printer declaration is needed at OS/400 level), but the LPD protocol allows the printer to be shared between different operating systems. Choose the protocol which best fits your needs.

This chapter describes only the Prt5250 protocol. For more information about the LPD protocol, refer to Appendix A.3.

6.3.1 - Setting-Up the Prt5250 Protocol

To set the Prt5250 service, enter the AX3000 Set-Up and select **[Configuration]**→**[Aux. Ports]**→**[xxx]**.

In the displayed box, set the "Associated Service" to "Prt5250", then select "Net Service Parameters" and press <Space>. The following box is displayed:

| Prt5250 Parameters | | |
|----------------------------------|-----------|---------------|
| Host | | no host |
| Advanced | | <Space> |
| Printer Name..... | DEVNAME | ..... |
| Queue for writer messages..... | MSGQNAME | QSYSOPR |
| MSGQNAME library..... | MSGQLIB | *LIBL |
| Font Identifier..... | FONT | 11 |
| Host print transform..... | TRANSFORM | Yes |
| Manufacturer type and model..... | MFRTYPMDL | *NONE |
| Paper source 1..... | PPRSRC1 | *MFRTYPMDL |
| Paper source 2..... | PPRSRC2 | *NONE |
| Envelope hopper..... | ENUVELOPE | *NONE |
| ASCII 899 support..... | ASCII899 | No |
| WCST name..... | WCSTNAME | ..... |
| WCST library..... | WCSTLIB | ..... |
| VALID | | CANCEL |

These parameters are:

- **Host:** the hostname to which the AX3000 opens a printer connection (press <space> to get a list of available hosts).
This parameter must be entered.
- **Advanced:** access to a group of parameters. The default values of these parameters are suitable for most of the use.
- **Printer Name (DEVNAME):** printer device name.
This parameter must be entered
- **Queue for Writer Messages (MSGQNAME):** message queue name to which the printer messages will be sent.
Default value: QSYSOPR
- **MSGQNAME Library (MSGQLIB):** associate message queue library.
*Default value: *LIBL*
- **Font Identifier (FONT):** font number (3, 4 or 5 digits).
Default value: 011
- **Host Print Transform (TRANSFORM):** this parameter is not available. its value is always 'yes'.
- **Manufacturer Type and Model (MFRTYPMDL):** enter the printer driver name (ex: *NONE, *HP4, *NECP2...).
*Default value: *NONE*

- **Paper Source 1 (PPRSRC1)**: selected through list.
Default value: *MFRTYPMDL
- **Paper Source 2 (PPRSRC2)**: selected through list.
Default value: *NONE
- **Envelope hopper (ENVELOPE)**: describes the paper source 3 (selection through list).
Default value: *NONE
- **ASCII 899 support (ASCII899)**: specifies if the code page ASCII 899 is supported by the printer.
Default value: *NO
- **WSCST name (WSCSTNAME)**: qualified name of the customising object.
- **WSCST library (WSCSTLIB)**: associated library.

Note: if the auxiliary port used for printing is a serial port, set the 'Printer' operating mode and set the associated parameters (baud rate, handshake, etc).

6.3.2 - Using the Printer

The Prt5250 service is a client service. This means that each Prt5250 auxiliary port opens a connection to the AS/400 when the AX3000 is powered-on. From the AS/400, a printer is available once the associated Prt5250 connection is established.

A printer handled through the Prt5250 service is seen as a standard spooled OS/400 printer and is managed through standard system commands:

```
====> GO PRINTER
```

6.3.3 - In Event of Problems

Nothing is printed: this is a quick test to check the hardware (AX3000 parallel/serial port, cable and printer):

- Disconnect the network cable
- Set the "Associated Service" from LPD or Prt5250 to 'None' for the port being tested. Set default printer in **[Configuration]→[Terminal]→[General]** to the port to be tested.
- Save changes, power cycle and enter set-up.
- Press <Print Scrn> The set-up screen should be printed.

If not there is a basic hardware problem that needs to be fixed. Check cable, check cable is attached to correct port in back of AX3000 etc.

When the AX3000 printer is not "seen" by the OS/400 spooler the following problems can be suspected.

a) Parallel Printer Connection

With a parallel printer, the Prt5250 session is established only if the printer is powered-on and ready to print.

Note: certain AX3000 models offer also a serial DB25 port. Check the printer is really attached to the AX3000 parallel port.

b) Prt5250 Settings

Check the host used by the Prt5250 service is the AS/400 host. Then, in the "Advanced" box ensure the "Auto-connection" and "Auto-reconnection" parameters are set to "Yes".

c) Prt5250 Session is Refused by the AS/400

To establish why a Prt5250 session has been refused, enter the AX3000 Set-Up and select the menu **[Diagnostics]→[Connections]**.

Within the displayed dialog box, select the REFRESH button and press <CR>. Read the information displayed for the printer port (AUX1, AUX2 or PARA).

Note: if no information is displayed, double-check that the auxiliary port is associated with the right AS/400 host.

When the connection status continually cycles through CLOSED to CONNECT and there is no error number displayed at the end of the line, the device name is already used by another connection.

If the Prt5250 connection status is 'closed' in the displayed box, an error number is displayed at the end of the line.

The main error codes are:

- **8903** (Device not valid for session): the printer name is used for another connection.
- **8925** (Creation of device failed): during the printer creation operation, at least one parameter is detected wrong (ex.: non-existing printer model).
- **8928** (Change of device failed): during the printer modification operation (reconnection with different parameters), at least one parameter is detected wrong (ex.: non-existing printer model).
- **8930** (Message queue does not exist.): the message queue or its library doesn't exist.
- **AX01** (Terminal type not recognized): the TERM variable (by default IBM-3812-1) associated with the AX3000 auxiliary port is not correct.

Note: all possible errors are listed in the RFC 2877.

6.4 - REMOTE ADMINISTRATION

The following commands allow an AX3000 to be controlled over the network.

Note: most of the following examples describe the OS/400 command **runrmtcmd**, but remote administration commands can also be invoked with a Unix/Linux or a Windows command (**rsh**).

6.4.1 - Rebooting the AX3000

To reboot an AX3000 over the network, invoke the following command:

```
===> RUNRMTCMD CMD('AX_REBOOT password') RMTLOCNAME('192.168.1.241' *IP)
```

Where:

- AX_REBOOT : command for AX3000 reboot,
- password : specify the set-up password if set,
- 192.168.1.241 : AX3000 IP address.

6.4.2 - Resetting an AX3000 resource (screen session or aux. port)

The reset feature allows:

- to stop and restart the associated network service
- to apply new serial line settings (data transfer rate, handshake, etc.).

The supported resources are:

- screen sessions: SESS1, SESS2, ..., SESS8
- auxiliary ports: AUX1, AUX2 and PARALLEL.

Use the following command to reset a resource:

```
==> RUNRMTCMD CMD('AX_SINIT password RESS') RMTLOCNAME('192.1.1.241' *IP)
```

Where:

- AX_REBOOT : command for AX3000 resource reset,
- password : specify the set-up password if set,
- 192.1.1.241 : AX3000 IP address.
- RESS : resource name (ex: SESS1).

6.4.3 - Editing the AX3000 Settings

a) Under Windows

The whole AX3000 set-up can be obtained by invoking the following command:

```
c:\> rsh 192.168.1.241 setup_get > /tmp/axel
```

or a partial set-up can also be obtained (only used set-up parameters are sent):

```
c:\> rsh 192.168.1.241 setup_get_lite > /tmp/axel
```

Where:

- 192.168.1.241 : AX3000 IP address,
- setup_get : command for getting the whole set-up,
- setup_get_lite : command for getting the partial set-up.

For more information about these commands, refer to Chapter 10.

b) Under OS/400

The whole AX3000 set-up can be obtained by invoking the following command:

```
===> RUNRMTCMD CMD(SETUP_GET) RMTLOCNAME('192.168.1.241' *IP)
```

or a partial set-up can also be obtained (only used set-up parameters are sent):

```
===> RUNRMTCMD CMD(SETUP_GET_LITE) RMTLOCNAME('192.168.1.241' *IP)
```

Where:

- SETUP_GET : command for getting the whole set-up,
- SETUP_GET_LITE : command for getting the partial set-up,
- 192.168.1.241 : AX3000 IP address.

For more information about these commands, refer to Chapter 10.

6.4.4 - Setting-Up the AX3000

No OS/400 command allows the contents of a set-up file to be sent over the network. The following example describes the use of rsh Windows command:

```
c:\> rsh 192.168.1.241 setup_send password < /tmp/axel
```

Where:

- 192.168.1.241 : AX3000 IP address,
- setup_send : command for set-up the AX3000,
- password : specify the set-up password if set.

For more information about this command, refer to Chapter 10.

6.4.5 - Downloading a Firmware

To download an AX3000 firmware through TFTP:

```
===> RUNRMTCMD CMD('AX_DOWNLOAD password /axfirm/ax3000 192.168.1.180')  
RMTLOCNAME('192.168.1.241' *IP)
```

To download an AX3000 firmware through BOOTP and TFTP:

```
===> RUNRMTCMD CMD('AX_DOWNLOAD password /axfirm/ax3000 192.168.1.180')
```

Parameters of the RUNRMTCMD command:

- AX_DOWNLOAD : command for firmware downloading,
- password : specify the password if the set-up is password-protected,
- /axfirm/ax3000 : path and name of the firmware file,
- 192.168.1.180 : AS/400 IP address,
- 192.168.1.241 : AX3000 IP address.

Messages are displayed on the target AX3000 (See Chapter 11.4).

6.4.6 - Editing AX3000 Statistics

Some AX3000 statistics can be obtained by invoking the following command:

```
===> RUNRMTCMD CMD (AX_GETSTAT) RMTLOCNAME ('192.168.1.241' *IP)
```

Where:

- AX_GETSTAT : command for getting statistics,
- 192.168.1.241 : AX3000 IP address.

6.5 - FURTHER OPTIONS

6.5.1 - Turning-Off the AX3000

A careful check should be made before turning off the TCP/IP AX3000 (an operating system cannot detect a TCP/IP device being turned-off).

To allow graceful terminal shutdown use the <Ctrl><Alt> keystroke combination.

6.5.2 - Reconnection Problem

If an AX3000 5250 session is set with a specific DEVNAME, problems can occur if it is not cleanly shutdown before being switched off (see Chapter 6.4.1)

When a TCP/IP device is switched off (without closing current telnet session), the operating system (OS/400) cannot detect this and the OS/400 will refuse

two connections with the same DEVNAME.

This problem can be solved by tuning **'keepalive'** function of the OS/400 Telnet Server. The keepalive function allows sessions to time out. Keepalive probes are automatically sent by the OS/400 host when a connection has been idle for a specified time. If the TCP/IP peripheral does not respond, the connection is dropped. The socket is released and applications associated with the connection are killed.

Note: to check the status of sockets, use the OS/400 `netstat` command.

By default, the keepalive time out value is very high (sometimes infinite). So this value must be decreased to allow the OS/400 to check regularly the TCP/IP connection status. Invoke the following command to change this value (xxx are seconds):

```
====> CHGTELNA TIMMRKTIMO (xxx)
```

This modification will take effect after restarting the telnet server:

```
====> ENDTCP SVR SERVER (*TELNET)
====> STRTCP SVR SERVER (*TELNET)
```

It is recommended that Users are educated to power down the AX3000 in an orderly manner as described in Chapter 4.4 to avoid this issue arising.

IMPORTANT: using a small keepalive value can prevent routers from dropping the ISDN line and cause high connection bills.

CHAPTER 7

INSTALLING UNDER OS/390

This chapter covers AX3000 installation under OS/390 zSeries.

This chapter is dedicated to the operation of the AX3000 in the OS/390 environment. For more general information about the AX3000 (network and session settings, instructions for users, etc) please refer to the previous chapters.

Note: the 3270 protocol is only available with the I32 firmware option.

7.1 - 3270 SCREEN SESSION

The IBM 3270 emulation type developed by Axel is IBM-3477-FC.

This emulation provides all the features of an IBM 3270 terminal. Especially:

- the 3270 telnet protocol (TN3270): compliant with the RFC 1646,
- enhanced 3270 telnet protocol (TN3270E): compliant with the RFCs 2355 for the display support (no printer support),
- the device type negotiated by the AX3000 is IBM-3278-2-E:
 - colour support,
 - screen sizes: 24x80,
 - 3270 status line.

7.1.1 - Setting a Session

To set a profile session, enter the AX3000 Set-Up and select the **[Configuration]→[Terminal]→[Session X]** menu (where X is the session number to be configured). The following box is displayed:

```

Session 1 Profile
Connection Parameters
Connection Protocol      telnet
Host                    no host
TCP Port                23
Auto-Connection         No
Auto-Reconnection       No
Terminal Parameters
Pre-defined Configuration 3270
TERM Value              IBM-3278-2-E
Terminal name <DEVNAME>  .....
General Parameters      <Space>
User-defined Keys
Overscan                No
Colouring Mode
Colouring Mode Settings
Session Label           1
VALID CANCEL

```

These parameters are:

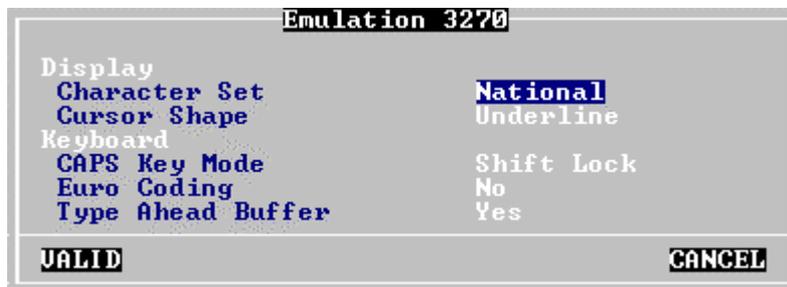
- **Connection Type:** select telnet
- **Host:** press <Space> to select the host from a list
- **TCP Port:** enter 23.
- **Auto-Connection**
- **Auto-Reconnection**
- **Configuration:** press <Space> to select '3270'
- **TERM Value:** IBM-3278-2-E
- **Terminal Name (DEVNAME):** this optional name identifies the terminal connection at the OS/390 level.
- **General Parameters:** pressing <Space> displays a dialog box which lets certain emulation parameters be changed. See next chapter.
- **Overscan:** select the overscan colour
- **Session Label:** session identification located on the TCP/IP status line.

Save and exit the set-up. The AX3000 is ready for use.

7.1.2 - Customising the 3270 Emulation

Various 3270 emulation parameters can be modified but generally the default values are the most suitable.

To customise the 3270 emulation, enter the AX3000 Set-Up and select the session profile ([**Configuration**]→[**Terminal**]→[**Session X**] menu). Then select 'General Parameters' and press <Space>. The following box is displayed:



These parameters are:

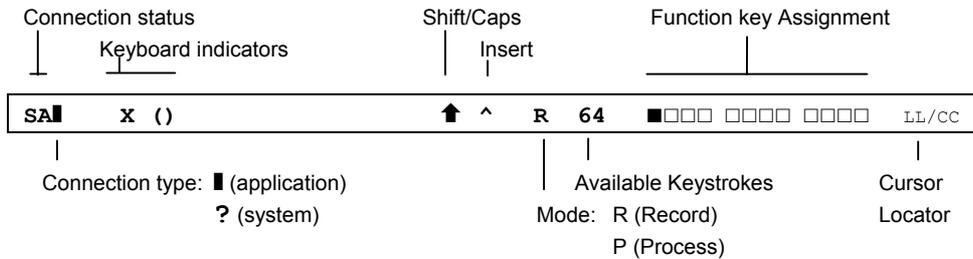
- **Character Set:** the two possible values are:
 - national (some characters are keyboard nationality dependent),
 - multinational.
- **Cursor Shape:** three possible values: underline, half-block or block.
- **CAPS Key Mode:** set the CAPS LOCK to behave in either of two ways:
 - Caps Lock: only alphabetical keys are affected. To unlock this mode press the <CAPS> key.
 - Shift Lock: each key sends either the corresponding upper case letter or the shifted (upper) character. To unlock this mode press the <Shift> key.
- **Euro Coding:** Euro symbol support. The three possible values are:
 - no: no specific processing is done
 - standard: the Euro symbol replaces the international currency symbol '¤' within the current character set.
 - custom: any character can be replaced by the Euro symbol within the current character set (use the decimal notation to enter the Euro EBCDIC code).
- **Type Ahead Buffer:** enable/disable the keyboard buffer.

7.2 - USING THE TERMIMAL

7.2.1 - The 3270 Status Line

Note: the 3270 status line is different than the AX3000 TCP/IP status line. (The AX3000 TCP/IP status line displays information about current connected sessions. This line can be enabled/disabled through the AX3000 Set-Up).

The 3270 status line is displayed at the bottom of the screen and gives the following information:



The status symbols are described in the following tables.

Connection Symbols

| Symbol | Meaning |
|--------|---|
| s | Connection with host is established |
| A | Connection is non-SNA |
| ■ | Connection to an application (Lu-Lu) |
| ? | Connection to the system (not an application) |

Keyboard Symbols

| Symbol | Meaning |
|---------|---|
| X () | Keyboard is disabled |
| X | Only <Enter> is disabled |
| X ⌘ > | Error: too much data entered. Press <Reset> |
| X ⌘ NUM | Error: numeric value must be entered. Press <Reset> |
| X ←⌘→ | Error: invalid cursor position. Press <Reset> |

Mode Symbols

| Symbol | Meaning |
|--------|---|
| ↑ | <Shift> is currently pressed or the keyboard is in Caps Lock mode |
| ^ | The insert mode is enabled (<Inser> key) |
| R | The "Record" mode is set (see Chapter 6.2.3) |
| P | The "Process" mode is set (see Chapter 6.2.3) |
| LL/CC | LL and CC indicate the row and column where the cursor is located |

7.2.2 - Using a PC/AT Keyboard (102/105 keys)

The IBM 3270 emulation enables a PC/AT keyboard to be used for operation as a 3270 terminal.

The first twelve 3270 function keys are accessed through <F1> to <F12>. The F13 to F24 function keys are accessed through <Shift><F1> to <Shift><F12>.

The following table lists the other useful keys:

| 3270 Functions | PC/AT keyboard |
|---------------------------|-----------------------------|
| Fast cursor move to right | <Alt><right arrow> |
| Fast cursor move to left | <Alt><left arrow> |
| Backspace | <BackSP> |
| Tab | <Tab> |
| BackTab | <Shift><Tab> |
| Home | <Home> |
| Newline | <Enter> |
| EOF | <End> |
| Erase Input | <Alt><End> |
| Insert mode | <Insert> |
| Delete | <Del> |
| Duplicate | <Shift><Insert> |
| Field Mark | <Shift><Home> |
| System | <Alt><Syst> or <Shift><Esc> |
| Attention | <Alt><Pause> or <Esc> |
| Reset | <Ctrl left> |
| Clear | <Pause> |
| PA1 | <PgUp> |
| PA2 | <PgDn> |
| PA3 | <Shift><PgUp> |
| PF1 | <F1> |
| PF13 | <Shift><F1> or <Esc> |
| Enter | <Right Ctrl> or <Num Entr> |
| <Record> | <Alt Gr><F4> |
| <Exec> | <Alt Gr><F5> |
| Euro Symbol | <Alt Gr><E> |

7.2.3 - Programming Function Keys (Macro Feature)

The Axel 3270 emulation allows function keys to be programmed. For example a series of keystrokes can be recorded and played back by pressing a single key.

The recorded data is stored in non-volatile memory so is not affected by

switching off.

Recorded keystrokes can be assigned to any of the twelve function keys (<F1> to <F12>).

a) Programming a Function Key

To record a series of keystrokes proceed as follows:

- press <Alt Gr><F4> to set the record mode,
- press any of the 12 function keys to which you want to assign,
- type the key sequence you want to save,
- press <Alt Gr><F4> to exit the record mode.

Notes:

- Maximum Keystrokes Recorded: for each session there is a maximum of 127 keystrokes recordable. Each individual function key has a maximum of 63 keystrokes recordable.
- To delete a recorded function key, you have to record an empty key sequence.

Example:

- 1 - Press <Alt Gr><F4> to set the Record mode. The 3270 status line is set in reverse video mode and the following information is displayed (the 12 boxes are the 12 function keys, a solid box means that data is recorded):

```
MEMOR          ■□□□ □□□□ □□□□          17/21
```

- 2 - Press one of the function keys (from <F1> to <F12>). The 3270 status line is set in normal mode and the following information is displayed:

```
R 127 F1          17/21
```

Note: 'R' indicates the Record mode. The second field is the maximum keystrokes that can be recorded for this session (max. 127). The third field is the selected function key.

- 3 - Type the key sequence. Note the keystroke counter shows the remaining keystrokes that can be recorded for this function key (max. 63). As you type this counter is decreased.
- 4 - To exit the Record mode, press <Alt Gr><F4>.

b) Processing a key sequence

To execute a series of keystrokes that have been recorded:

- press <Alt Gr><F5> to set the Process mode,
- press the recorded function key,
- the key sequence is processed.

Example:

- 1 -Press <Alt Gr><F5> to set the Process mode. The 3270 status line is set in reverse video mode and the following information is displayed (the 12 boxes are the 12 function keys, a solid box means that data is recorded):

```
EXEC                               ■□□□ □□□□ □□□□ 17/21
```

- 2 -Press the recorded function key (from <F1> to <F12>). The 3270 status line is set in normal mode and the following information is displayed (the 'P' symbol indicates the Process mode). The key sequence is processed:

```
                                   P 17/21
```

Note: during the process mode, the input is inhibited.

7.3 - REMOTE ADMINISTRATION

The remote administration command is rsh (or rexec). This command is available with most of operating systems.

Examples of use (Windows rsh command) are described in Chapter 8.4.

CHAPTER 8

INSTALLING UNDER WINDOWS

This chapter covers AX3000 installation under Windows

This chapter is dedicated to the operation of the AX3000 in the Windows environment. For more general information about the AX3000 (network and session settings, instructions for users, etc) please refer to the previous chapters.

Note: the RDP protocol is only available with the RDP firmware option.

8.1 - RDP SCREEN SESSION

The AX3000 allows up to four concurrent and independent sessions:

- one in graphical mode (RDP 4 compatible protocol) and/or
- three in text mode (telnet or tty protocol). Multiple emulations are available: ANSI, VT, WYSE, 5250 3270....

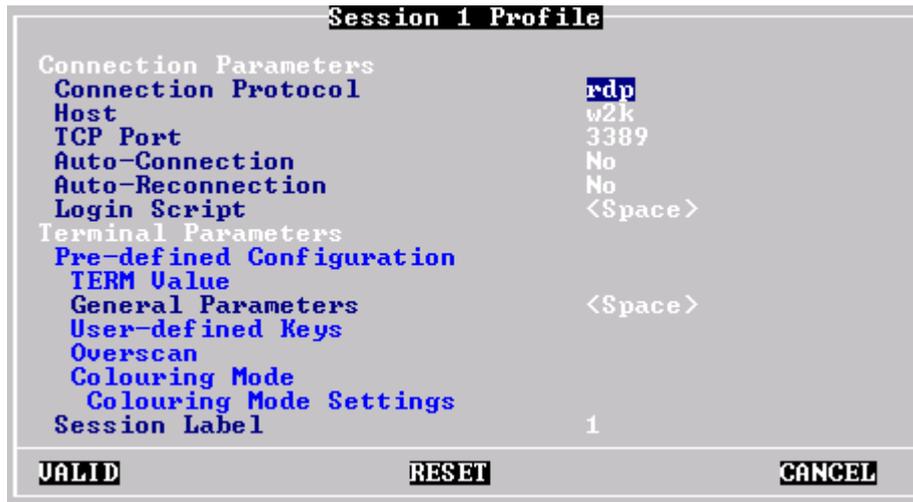
8.1.1 - Setting-Up the AX3000

The RDP protocol (Remote Desktop Protocol), designed by Microsoft, is the native protocol to connect graphical terminals to a Microsoft Windows Operating System.

The RDP protocol enables a remote graphical display on the AX3000. The image is constructed, maintained and updated within the server (Windows NT4 Terminal Server Edition, Windows 2000 Server and Windows 2000 Advanced Server).

To set the RDP session, enter the AX3000 Set-Up and select the **[Configuration]→[Terminal]→[Session X]** menu (where X is the session

number to be configured). The following box is displayed:



Set the following parameters:

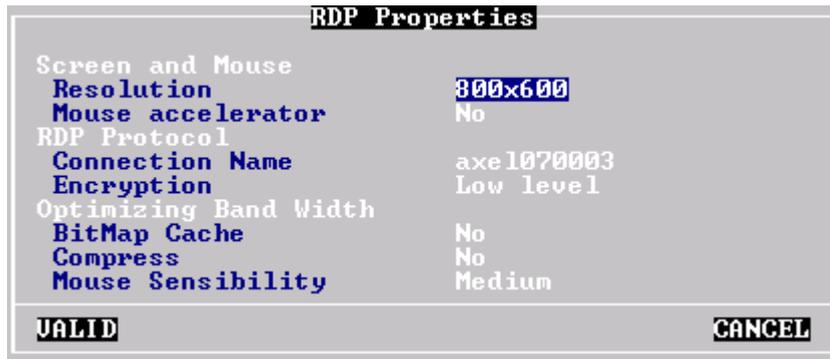
- **Protocol:** rdp
- **Host:** the Windows hostname (previously defined through the menu [Configuration]→[TCP/IP]→[Hosts]).
- **TCP Port:** 3389
- **Auto Connection:** yes or no.
- **Auto Reconnection:** yes or no.
- **Login Script:** press <Space> to set the "Automatic Logon" function and/or the "Auto-Run" function. See Sub-Chapter b) for more information..
- **General Parameters:** pressing <Space> displays a dialog box which lets certain parameters be changed (resolution, mouse, etc.). See the next sub-chapter for more information.
- **Session Label:** session identification located on the TCP/IP status line.

Note: after exiting set-up power-cycle the AX3000.

a) RDP General Parameters

Within the 'Session Profile' box, select 'General Parameters' and press

<Space>. The following box is displayed:



These parameters are:

- **Resolution:** the default resolution of a RDP session is 800x600. Press <Space> to change.
 - **Mouse Accelerator:** if 'yes', the AX3000 speeds up the mouse cursor.
 - **Connection Name:** this character string identifies the AX3000 within the Windows Operating System. By default this name is 'axelxxyzz' (where xxyzz are the last 3 bytes of the AX3000 Ethernet MAC address).
 - **Encryption:** encryption type supported by the AX3000. Three values are possible (for more information see Chapter 8.1.2):
 - No: only non-encrypted connections are accepted.
 - Low Level: only one-direction encrypted connections are accepted. (Data sent by Windows is encrypted).
 - Medium Level: both-direction and one-direction encrypted connections are accepted.
- Note: for performance reasons, prefer the low level settings
- **Bitmap Cache:** enabling the bitmap cache function allows the AX3000 to store images (icon, buttons, etc) locally. This can both improve the AX3000 performance and decrease network traffic.
 - **Compress:** compression allows Windows to send compressed data. This optimises bandwidth. But this also decreases the AX3000 performances (Data must be uncompressed before being processed).

- **Mouse Sensibility:** with a "Low" mouse sensibility, less mouse events are sent to Windows. This optimises bandwidth. (But the mouse motion can be affected).

b) Automatic Logon and Auto-Run

Within the 'Session Profile' box, select 'Login Script' and press <Space>. The following box is displayed:

The screenshot shows a dialog box titled "Auto-signon". It contains the following fields and values:

| | |
|-------------------|------------|
| Logon | |
| Username | [Blue bar] |
| Automatic Logon | No |
| Password | [Blue bar] |
| Domain | ..... |
| Application | [Blue bar] |
| Autorun | No |
| Command | [Blue bar] |
| Working Directory | [Blue bar] |

At the bottom of the dialog, there are two buttons: "VALID" and "CANCEL".

These parameters are:

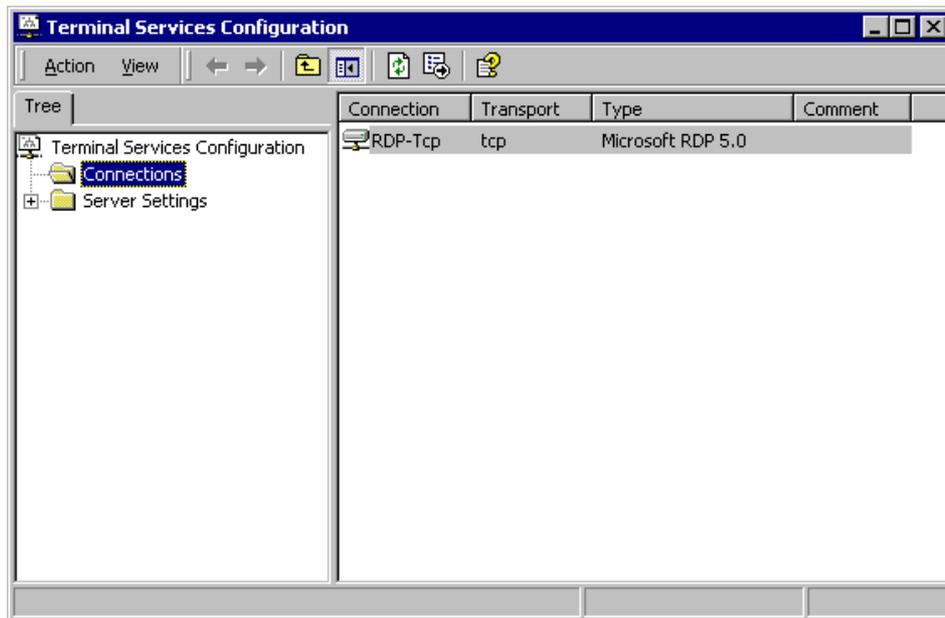
- **Username:** this is the default value for the username field of the Login screen.
- **Automatic Logon:** set this parameter to 'Yes' to get an automatic logon. For more information about the auto-login, see Chapter 8.1.2.
- **Password** (available only if 'Automatic Logon' is set to 'Yes'): press <Space> to enter the password.
- **Domain:** this is the default value for the Windows domain field of the Login screen.
- **Auto-Run:** by default the Terminal Services connection offers a Windows desktop. To automatically launch a program set this parameter to 'Yes' and complete the following fields.
- **Command** (available only if 'Auto-Run' is set to 'yes'): the program path and file name of the program to be launched.
Example: %SystemRoot%\system32\cmd.exe
- **Working Directory** (available only if 'Auto-Run' is set to 'yes'): program working directory.
Example: D:\

8.1.2 - Configuring the Windows Server

Warning: it is assumed that the requested licences and the Terminal Server service are already installed on the server. For more information, please consult the Microsoft documentation.

The RDP server configuration is done through the "Terminal Services Configuration" utility (on the 'Administrative Tools' folder).

When this utility is run the dialog box below is displayed:



To configure the RDP server, select 'Connections' in the left panel, the double-click the line 'RDP-Tcp' on the right panel. Another dialog box is displayed. It allows setting:

- the encryption level,
- the automatic logon,
- the idle session limit.

a) Encryption Level

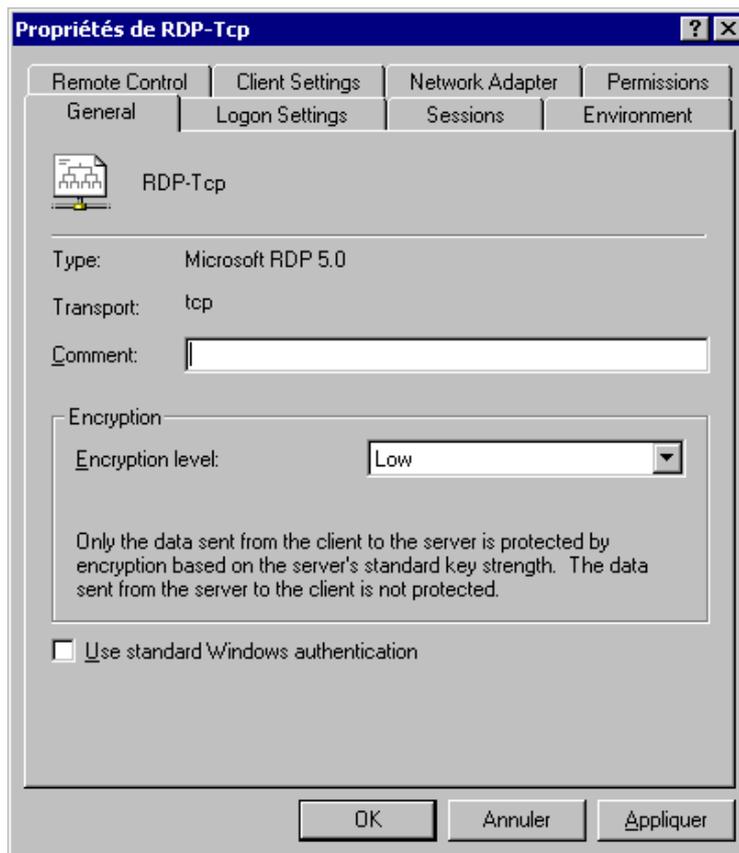
The data flow between the RDP server and the RDP client is generally encrypted. Three encryption level are available:

- **low**: only the data flow from the client to the server is encrypted.
- **medium**: data flowing in both directions (from the client to the server and from the server to the client) is encrypted..
- **high**: as the medium level the two data flows are encrypted. But the encryption key is stronger

The level low is supported by the AX3000, so the server encryption level must be set to low (the default value is medium).

Note: despite its name low encryption level is a very satisfactory security level. Indeed within a Server↔Terminal communication, only data sent by the terminal are critical (password, confidential code, etc). The unencrypted data sent from the server is the physical screen display, i.e. coloured pixels and not text.

To modify the encryption level, within the 'RDP-Tcp Properties' box, click on the 'General' tab. The following information is displayed:



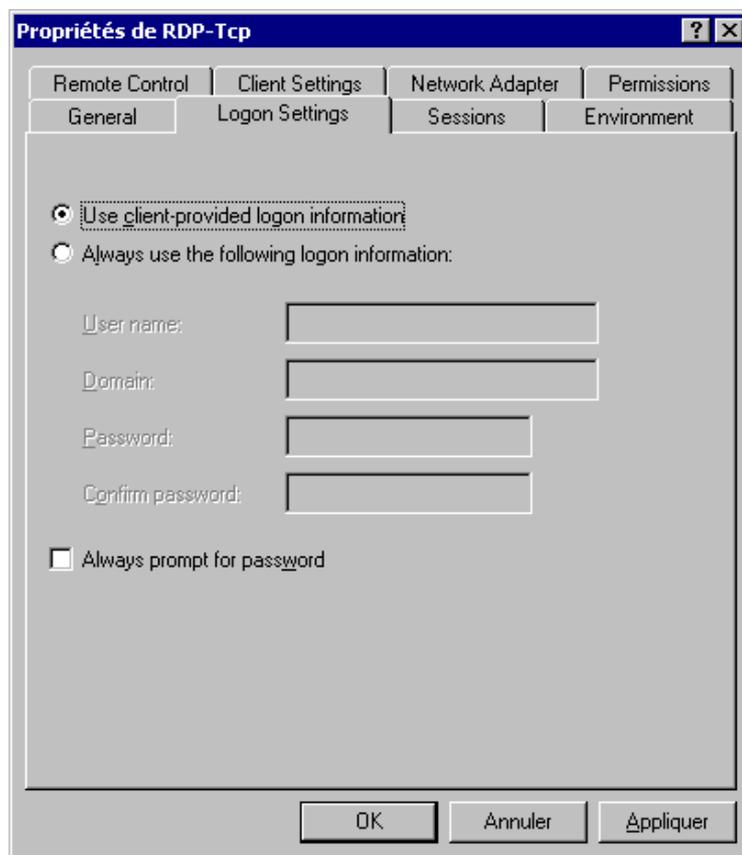
Set the 'Encryption level' parameter to 'Low'.

b) Automatic Logon

Information needed to a logon (username, domain name and password) can be provided by the RDP terminal. This saves manually entering this information at every login.

This feature must be enabled at the RDP server level (by default an automatic password is not processed by the server).

To allow automatic logon, within the 'RDP-Tcp Properties' box, click on the 'Logon Settings' tab. The following information is displayed:



Disable the 'Always prompt for password' check box.

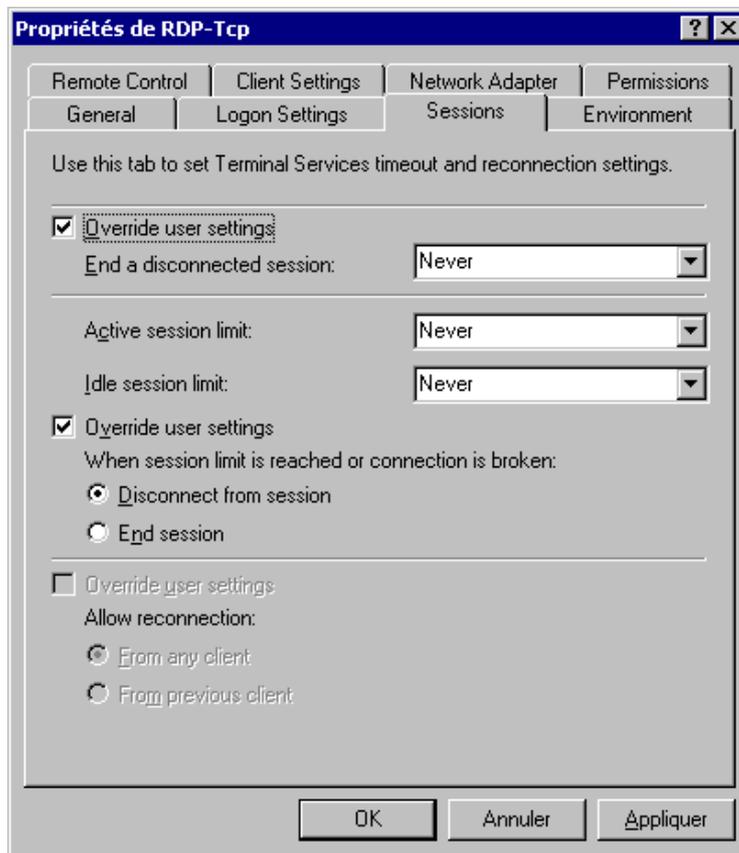
c) Idle Session Limit

When the AX3000 is turned off without care, then current TCP/IP connections

remain active on the server side (see Chapter 8.2.2).

To avoid these 'phantom' sessions, an automatic clean mechanism is offered. This destroys sessions idle for a certain time.

The idle session disconnection can be set either at the user settings level (see the User Properties dialog box) or at a global level. For this second method, within the 'RDP-Tcp Properties' box, click on the 'Sessions' tab. The following information is displayed:



Enable the 'Override user settings' check box and set the required delay for the

'Idle session limit' parameter.

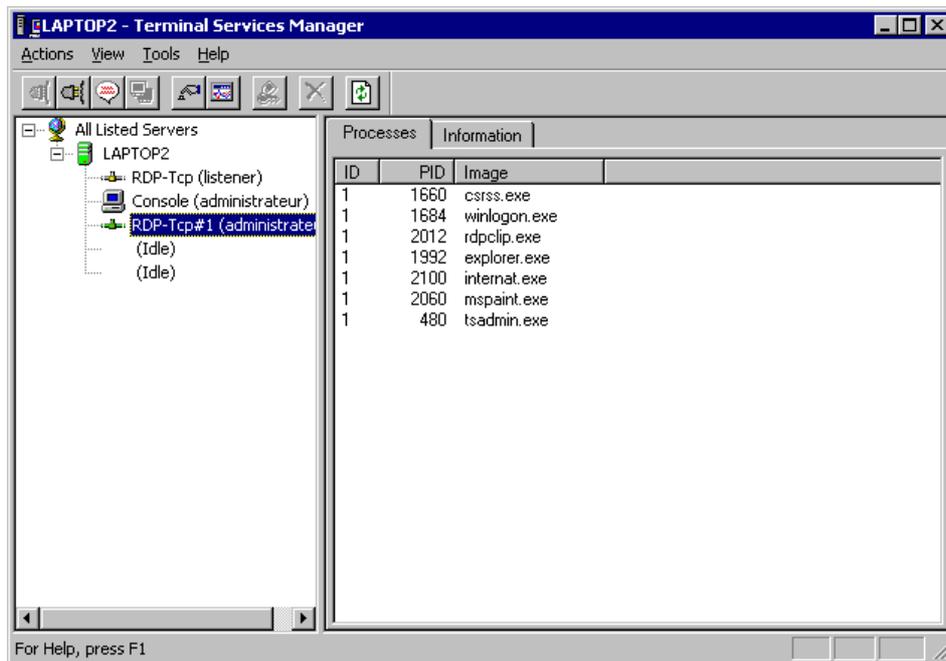
Warning: an idle session can be either a 'phantom' session or real used session on which no action has been perform for a certain time (for example over lunch time). Be care to set an appropriate delay for the terminals use.

8.1.3 - Administering the Windows Server: closing Phantom Sessions

When the AX3000 is turned off without logging out, the current TCP/IP connection remains active on the server side (see Chapter 8.2.2).

To close such sessions, use the "Terminal Services Manager" utility (on the 'Administrative Tools' folder).

When this utility is run, a dialog box as shown below is displayed:



On the left panel, select the session to be killed, then right-click. Within the

displayed menu, select 'Disconnect' command. After a confirmation, the selected session will be closed and will be removed from the session list.

8.2 - USING THE AX3000

8.2.1 - Opening an RDP Session

On successful connection, the AX3000 displays the graphical login screen or the desktop if the automatic-logon function is set.

8.2.2 - Closing an RDP Session

When a session is closed, the AX3000 either reconnects to the same session, displays the 'idle screen', or flips to the first active session.

Three cases of disconnection can be distinguished.

a) Log Off from the Desktop

From the '**Start**' menu, select '**Shut Down**'. Within the list, select '**Log off xxx**'. The Windows Operating System disconnects this RDP session (at the TCP/IP level), ends active applications and closes the desktop.

b) Disconnect from the Desktop

From the '**Start**' menu, select '**Shut Down**'. Within the list, select '**Disconnect**'. The Windows Operating System disconnects this RDP session (at the TCP/IP level).

But in this case, the current environment (desktop and running applications) are not closed. The user will be able to retrieve this environment the next time the connection is opened.

c) Disconnect from the AX3000 Keyboard

The **<Ctrl><Alt><Shift><D>** keystroke (locally processed by the AX3000) allows the current session to be disconnected and works regardless the

protocol or emulation.

As above, the RDP session is disconnected (at the TCP/IP level) but the current environment (desktop and running applications) are not closed. The user will be able to retrieve this environment the next time the connection is opened.

8.2.3 -Turning-Off the AX3000

When the AX3000 is turned off without logging out some problems may occur.

What are the consequences if the AX3000 is turned off when an RDP session is connected ?

The Windows Operating System cannot detect a TCP/IP device being turned-off, so the current RDP connections remain active at the operating system level.

If the operating system doesn't provide a automatic procedure which allows sessions to be timed out, these 'phantom' connections will stay alive until the next operating system reboot.

To avoid this there are two possible methods:

- using a time-out to close idle session - See Chapter 8.1.2,
- disconnecting manually the phantom session(s) - See Chapter 8.1.3.

8.3 - MANAGING PRINTERS

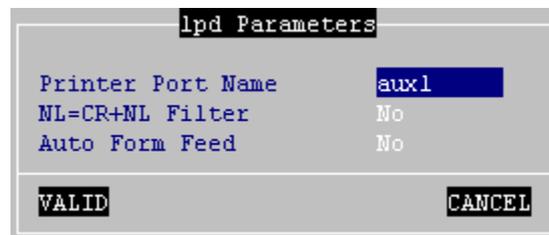
Three auxiliary ports are provided on the AX3000 (2 serial ports and 1 parallel port). Each of these ports is independent and can be accessed through different network protocols

The AX3000 offers an embedded LPD protocol. This protocol is available in most operating systems and allows one or more printers connected to the AX3000 to be accessed as network printers. (i.e. these printers are controlled through the spooler and are available for all authorised users).

8.3.1 - Setting-Up the AX3000

To set the LPD service on an auxiliary port, select the **[Configuration]→[Ports aux.]→[xxx]** dialog and enter the following parameters:

- **Associated Service:** select lpd.
- **Net Service Parameters:** press <Space> to access the following dialog box:



| lpd Parameters | |
|-------------------|------|
| Printer Port Name | aux1 |
| NL=CR+NL Filter | No |
| Auto Form Feed | No |
| VALID CANCEL | |

- **Printer Port Name:** this is the port identifier. Normally the same name is used for the printer at the operating system level.
- **NL=CR+NL Filter:** The line feed character 0x0A can be mapped to carriage return + line feed 0x0D 0x0A,
- **Auto Form Feed:** The form feed character 0x0C can be sent to eject the last page at the end of printing.

Note: if the auxiliary port used for printing is a serial port, set the 'Printer' operating mode.

8.3.2 - Setting-Up the Windows Server

To add a printer, select the **'Add printer'** icon (in the 'Start'→'Settings'→'Printers' menu).

Within the displayed dialog box, select **'Local printer'** (Disable the Plug-And-Play detection). Click on 'Next'.

Within the next dialog box, select **'Create a new port'** and select **'LPR Port'**. Click on 'Next'.

Note: if 'LPR Port' is not available, you need to install **'Print Services for Unix'**.

Finally within the next dialog box, enter the two requested parameters:

- name or address of the server providing LPD: AX3000 IP address
- name of printer or print queue of that server: this is the '**Printer Port Name**' AX3000 Set-Up parameter (see Chapter 2.2).

When this printer is added, all print jobs sent to this printer are automatically redirected to the AX3000.

8.4 - REMOTE ADMINISTRATION

The remote administration command is rsh (or rexec). This command is available with most of operating systems.

The following examples described the use of the Windows rsh command.

8.4.1 - Rebooting the AX3000

To reboot an AX3000 over the network, invoke the following command:

```
c:\> rsh 192.168.1.241 ax_reboot password
```

Where:

- 192.168.1.241 : AX3000 IP address,
- ax_reboot : command for AX3000 reboot,
- password : specify the set-up password if set.

8.4.2 - Resetting an AX3000 resource (screen session or aux. port)

The reset feature allows:

- to stop and restart the associated network service
- to apply new serial line settings (data transfer rate, handshake, etc.).

The supported resources are:

- screen sessions: sess1, sess2, ..., sess8
- auxiliary ports: aux1, aux2 and parallel.

Use the following command to reset a resource:

```
c:\> rsh 192.168.1.241 ax_sinit password ress
```

Where:

- 192.168.1.241 : AX3000 IP address,
- ax_sinit : command to reset the resource,
- password : specify the set-up password if set,
- ress : resource name (ex: sess1).

8.4.3 - Editing the AX3000 Settings

The whole AX3000 set-up can be obtained by invoking the following command:

```
c:\> rsh 192.168.1.241 setup_get > /tmp/axel
```

or a partial set-up can also be obtained (only used set-up parameters are sent):

```
c:\> rsh 192.168.1.241 setup_get_lite > /tmp/axel
```

Where:

- 192.168.1.241 : AX3000 IP address,
- setup_get : command for getting the whole set-up,
- setup_get_lite : command for getting the partial set-up.

For more information about these commands, refer to Chapter 10.

8.4.4 - Setting-Up the AX3000

The contents of a file is used to set-up the AX3000:

```
c:\> rsh 192.168.1.241 setup_send password < /tmp/axel
```

Where:

- 192.168.1.241 : AX3000 IP address,
- setup_send : command for set-up the AX3000.
- password : specify the set-up password if set.

For more information about this command, refer to Chapter 10.

8.4.5 - Downloading a Firmware

To download an AX3000 firmware through TFTP:

```
c:\> rsh 192.168.1.241 ax_download password /axfirm/ax3 192.168.1.1
```

To download an AX3000 firmware through BOOTP and TFTP:

```
c:\> rsh 192.168.1.241 ax_download password
```

Where:

- 192.168.1.241 : AX3000 IP address,
- ax_download : command for firmware downloading,
- password : specify the set-up password if set.
- /axfirm/ax3 : path and name of the firmware file,
- 192.168.1.1 : TFTP server IP address.

Messages are displayed on the target AX3000 (See Chapter 11.4).

8.4.6 - Editing AX3000 Statistics

Some AX3000 statistics can be obtained by invoking the following command:

```
c:\> rsh 192.168.1.241 ax_getstat
```

Where:

- 192.168.1.241 : AX3000 IP address.
- ax_getstat : command for getting statistics.

CHAPTER 9

TOOLS AND STATISTICS

This chapter describes the embedded AX3000 tools.

The AX3000 provides the following features:

- the ping command
- connection management
- a statistics environment

Note: these functions are accessed from the AX3000 interactive set-up.

9.1 - THE PING COMMAND

The ping command is used to check for the presence of a live TCP/IP device. Select the **[Diagnostics]**→**[Ping]** dialog from the AX3000 set-up, then enter the IP address or the name of the TCP/IP peripheral.

After a few seconds, the status of the TCP/IP device will be displayed (alive or not alive).

9.2 - CONNECTION MANAGEMENT

During AX3000 installation, connection failures can be caused by wrong settings.

Select the **[Diagnostics]**→**[Connection state]** dialog to check the status of all defined connections:

| Connection State | | | | | | | |
|------------------|--------|--------|------|---------------|------|---------------|--|
| SESSIONS | | | | | | | |
| Num | Type | State | Host | Host IP Addr. | Port | Configuration | |
| 1 | telnet | Closed | hp | 192.168.1.249 | 23 | SCO OPENSERVR | |
| 2 | telnet | Closed | hp | 192.168.1.249 | 23 | SCO OPENSERVR | |
| 3 | telnet | Closed | hp | 192.168.1.249 | 23 | SCO OPENSERVR | |
| 4 | telnet | Closed | hp | 192.168.1.249 | 23 | SCO OPENSERVR | |
| 5 | telnet | Closed | hp | 192.168.1.249 | 23 | SCO OPENSERVR | |
| 6 | telnet | Closed | hp | 192.168.1.249 | 23 | SCO OPENSERVR | |
| 7 | telnet | Closed | hp | 192.168.1.249 | 23 | SCO OPENSERVR | |
| 8 | telnet | Closed | hp | 192.168.1.249 | 23 | SCO OPENSERVR | |

| AUXILIARY PORTS | | | |
|-----------------|---------|--------|-------------------|
| Port | Service | State | Other Information |
| aux1 | None | Closed | |
| aux2 | None | Closed | |
| parallel | lpd | Closed | parallel |

REFRESH
CLOSE CONNECTIONS
EXIT

For each session, the following information is displayed:

- **No**: session number (from 1 to 8).
- **Type**: possible values are telnet, tty, vnc or rdp.
- **State**: the possible values are:
 - Established: the session is connected,
 - Closed: the session has ended,
 - Syn sent: connection request in progress,
 - Time Wait: connection close in progress.
- **Host and IP Addr Host**: the associated host.
- **Port**: the TCP port used for the session (this is usually 23 for telnet, 2048 for tty and 59xx for vnc).
- **Configuration**: the associated pre-defined configuration.

For each auxiliary port, the following information is displayed:

- **Port**: the name of the port: AUX1, AUX2 or Parallel
- **Service** and **Other**: information about the associated network service:
 - lpd: printer port name and optional filter,
 - rcmd: printer port name,
 - telnet: associated host, TCP port, TERM and connection flags,
 - tty: associated host, TCP port and connection flag,
 - prt5250: associated host, TCP port, printer name and AS/400 connection status,
 - printd or rtty: TCP port and optional filter.
- **State**: see above for the possible values.

A connection can be manually closed by selecting the [CLOSE CONNECTION] button.

Note: to refresh the information displayed, select the [REFRESH] button.

9.3 - STATISTICS

An AX3000 monitors network performance from the time it is switched on.

To view network statistics, select the **[Diagnostics]→[Statistics]** menu, then select the group of statistics to be examined.

Note: network statistics can now be examined by using the rsh (or rcmd) command:

```
$ rcmd axname ax_getstat <CR>
```

Note: in the following dialog box, the [REFRESH] button may be used at any time to update the information displayed.

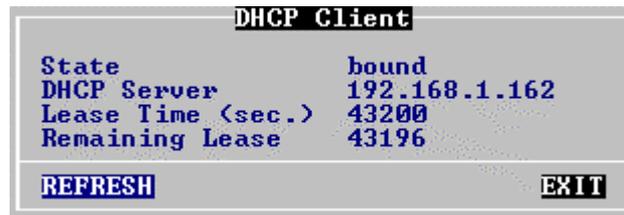
9.3.1 - Ethernet Statistics

The following information is displayed:

| Ethernet Statistics | |
|-------------------------|-------------|
| Correct Frames | |
| Output | 0 |
| Input | 0 |
| Errors | |
| AX3000 Resources | |
| Memory Overflow | 0 |
| Queue Overflow | 0 |
| Frame Integrity (cable) | |
| Bad Header | 0 |
| Bad CRC | 0 |
| Noise | 0 |
| Other | |
| Output Time-out | 0 |
| Collisions | 0 |
| Bad Size | 0 |
| Other Information | |
| Hardware Interrupts | 0 |
| Unknown Frame Type | 0 |
| REFRESH | EXIT |

9.3.3 - DHCP Client Statistics

The DHCP client statistics contain information about DHCP operating mode:



In the above dialog box, the following information is given:

- **State:** the current DHCP state. The possible states are:
 - **selecting:** searching a DHCP server (broadcast)
 - **requesting:** requesting an IP address from the DHCP server which answered 'selecting'
 - **bound:** search has been successfully completed (IP address has been set)
 - **free:** DHCP protocol is not enabled or DHCP protocol failed
 - **renewing:** renewing the leased IP address to the DHCP server which answered 'selecting'
 - **rebinding:** renewing the leased IP address to any DHCP server (broadcast)
- **DHCP Server:** IP address of the DHCP server.
- **Lease Time (seconds):** amount of time of the leased IP address. For BOOTP protocol, the value is 'infinity'.
- **Remaining Lease:** remaining time before lease expires. For BOOTP protocol, the value is 'infinity'.

Note: to refresh the 'Remaining Lease' information, select the [REFRESH] button.

CHAPTER 10

REMOTE SET-UP

This chapter covers remote set-up of the TCP/IP AX3000.

10.1 - OVERVIEW

This feature enables an AX3000 to be set up remotely, using the a remote administration command. A text file (provided as an argument to the remote administration command) defines the value of some or all set-up parameters. It can either be:

- created with a text editor or
- obtained by a remote administration command on an AX3000 already set-up.

The remote administration command depends on the operating system. Refer to the Chapter 5.5 (Unix/Linux), the Chapter 6.4 (OS/400) or the Chapter 7.3 (OS/390).

The remote administration command parameters are:

- the name or the IP address of the AX3000,
- a command: one of the 3 following keywords:
 - **setup_send** : set-up an AX3000,
 - **setup_get** : get an AX3000 configuration,
 - **ax_reboot** : reset an AX3000.

Note: to access an AX3000 with the **rsh** command, the IP address of the AX3000 must already have been set

10.2 - AX3000 REMOTE SET-UP

To set-up an AX3000 remotely, use the '**setup_send**' command. Example for Unix/Linux:

```
# rsh axname setup_send password < conf_file
```

Notes:

- The next chapter explains how to create the configuration file **conf_file**, either using a text editor or using the '**setup_get**' command on an existing terminal. Appendix A.6 contains a detailed description of the configuration file.
- **password**: specify the password if the set-up is password-protected.

The message 'Store set-up in progress...' is displayed on the operator's console while the remote command is processing. If a connection problem occurs, a time-out error message is displayed.

When the configuration has been successfully completed, the message 'OK, set-up updated' is displayed on the operator's console. If other messages are displayed, refer to Chapter 10.4.

The AX3000 must read this new set-up before it will take effect. This can be achieved either by power-cycling the AX3000 or by the following '**ax_reboot**' command. Example for Unix/Linux:

```
# rsh axname ax_reboot password
```

Note about password: specify the password if the set-up is password-protected.

The message 'Reboot in progress...' is then displayed on the operator's console, the AX3000 is reset and the new set-up is implemented. If a connection problem occurs, a time-out error message is displayed.

10.3 - OBTAINING A CONFIGURATION

To obtain the configuration from an existing AX3000 terminal, use the

'**setup_get**' command (or '**setup_get_lite**' command). This command sends a list of all AX3000 parameters to standard output. Example for Unix/Linux:

```
# rsh axname setup_get > /tmp/file<CR>
```

The message 'Load set-up in progress...' is displayed on the operator's console when the **rsh** command is processing. If a connection problem occurs a time-out error message is displayed.

When the set-up parameters have been loaded, the message 'OK, set-up sent' is displayed on the operator's console. If other messages are displayed, refer to chapter 10.4.

The configuration file lists each set-up parameter. Refer to Appendix A.6 for a detailed description of this file.

10.4 - ERROR MESSAGES

There are two types of error:

- fatal errors: numbered from 100 to 113,
- warning errors: numbered from 200 to 213.

10.4.1 - Fatal Errors

Fatal errors stop the remote command. The following fatal errors may occur:

ERR 101: header label expected.

Command: **setup_send**

Cause: the AXEL header label (BEGIN_AX_SETUP) is not the first line of the configuration file.

Consequence: the AX3000 set-up is not modified.

Solution: check the file. Replace it with a correct configuration file.

ERR 102: bad header label protocol version.

Command: **setup_send**
Cause: the protocol version (included in the header label) cannot be processed by the current AX3000 firmware.
Consequence: the AX3000 set-up is not modified.
Solution: use a configuration file with a compatible protocol.

ERR 103: trailer label not found. Default factory set-up reloaded

Command: **setup_send**
Cause: the trailer label (END_AX_SETUP) is not found. (Either this label is not included in the configuration file or the connection failed).
Consequence: the default factory set-up is reloaded (to replace the inconsistent configuration caused by the missing trailer label).
Solution: add this label to the end of file and run the command again.

ERR 104: Can not get complete set-up (rcmd command aborted).

Command: **setup_get**
Cause: a network problem has occurred or the command has been killed or aborted.
Consequence: the set-up obtained by the command is invalid (the trailer label is missing).
Solution: run the command again.

ERR 105: invalid rcmd command.

Command: ---
Cause: the keyword is unknown.
Consequence: no effect.
Solution: use the correct keyword (**setup_send**, **setup_get** or **ax_reboot**).

ERR 106: cmos busy.

Command: **setup_send**
Cause: another command (**setup_get** or **setup_send**) is running, or another user has entered set-up on the target AX3000.
Consequence: no effect.
Solution: Either wait for a few seconds and repeat the command, or arrange for the other user to exit set-up on the target AX3000.

ERR 113: password required

Command: **setup_send, ax_reboot** and **ax_download**
Cause: the AX3000 Interactive Set-Up is password-protected. This password hasn't be specified within the command.
Consequence: no effect.
Solution: use the right password.

ERR 114: invalid password

Command: **setup_send, ax_reboot** and **ax_download**
Cause: the AX3000 Interactive Set-Up is password-protected. This right password hasn't be specified within the command.
Consequence: no effect.
Solution: use the right password.

10.4.2 - Warning Error Messages

Warning error messages do not stop the command but indicate a problem (such as a syntax error). The following warnings may occur:

ERR 201: xxx: unknown parameter name.

Command: **setup_send**
Cause: the set-up parameter (xxx) is unknown.
(e.g.: s1_screencolumn instead of s1_screen_column).
Consequence: the set-up parameter is ignored. The current value of this parameter is retained.
Solution: check the spelling of the set-up parameter (Appendix A.6).

ERR 202: xxx: invalid value.

Command: **setup_send**
Cause: the value assigned to this set-up parameter (xxx) is not valid (example: multi_nbpge=10).
Consequence: the set-up parameter is ignored. The current value of this parameter is retained.
Solution: check the possible values of this parameter (Appendix A.6).

ERR 203: xxx: no place to store udk value.

Command: **setup_send**
Cause: not enough memory to store the udk_xxx parameter (udk stands for User-Defined Key; a function key for example).
Consequence: the default value of this udk parameter is restored.

ERR 204: line(s) after the trailer label ignored.

Command: **setup_send**
Cause: END_AX_SETUP is not the last line of the file.
Consequence: the lines after the trailer label are ignored. The AX3000 set-up is updated.
Solution: delete these lines.

ERR 211: service name/number error. Service(s) may be reset.

Command: **setup_send**
Cause: Other services, such as print or tty, use the same identifier (TCP port or name).
Consequence: to get a consistent configuration, some services have been removed.
Solution: check service identifier values.

ERR 212: host error. Host(s) may be reset.

Command: **setup_send**
Cause: host parameters are missing or two host names are identical.
Consequence: to get a consistent configuration, some hosts may have been removed.

Solution: check the host configuration.

ERR 213: too many sessions or pages. Page number set to 1.

Command: **setup_send**

Cause: eight screens are supported by the AX3000. This resource is shared by sessions and pages (i.e. $\text{multi_nb_session} * \text{multi_nb_page} \leq \text{max. session}$).

Consequence: to get a consistent configuration, the `multi_nbpage` parameter is set to one.

Solution: check the number of sessions and pages.

ERR 214: Associate host not found. Association reset.

Command: **setup_send**

Cause: a session is associated with a non existing host.

Consequence: to get a consistent configuration, this session is not associated with a host.

Solution: check the host configuration.

ERR 215: `s%_udk_xxx` and following: no place to store udk value.

Command: **setup_send**

Cause: not enough memory to store a group of programmable keys.

Consequence: the default values of these keys are restored.

ERR 216: Too many RDP sessions. Only the first one is available.

Command: **setup_send**

Cause: more than one RDP session are set (only one is allowed).

Consequence: only the first RDP session is kept.

Solution: remove the extra RDP sessions.

ERR 217: RDP and VNC resolution conflict. VNC session is set to 800x600.

Command: **setup_send**

Cause: when the RDP session is set to 800x600, the VNC session(s) can't be set to 1024x768.

Consequence: the VNC session(s) are set to 800x600.

Solution: modify the VNC sessions.

CHAPTER 11

DOWNLOADING FIRMWARE

This chapter explains how to upgrade TCP/IP AX3000 firmware over a network.

Firmware can be downloaded, for example to add or improve AX3000 features.

11.1 - OVERVIEW

11.1.1 - Downloading Protocols

Firmware can be downloaded in one of two ways:

- **tftp** protocol: the operator must enter the location of the firmware file.
- **bootp and tftp** protocol: this is an automatic procedure. The necessary parameters will already be available from a bootp server.

Whichever method is used, the firmware file is downloaded from a host (called the tftp host). Following this the AX3000 is automatically reset and the new firmware is enabled.

These two methods can be run either:

- using the remote administration command from any network host or
- through the set-up of the AX3000 that is to be upgraded.

11.1.2 - Under Unix

These 2 protocols are included, but the default configuration does not launch the tftp and bootp daemons. To enable these protocols perform the following:

- modify the file **/etc/inetd.conf** by removing the '#' comment character, from the beginning of the line(s) associated with **tftp** and/or **bootps**
Note: for tftp, take care to use the 'public' mode (within inetd.conf, the 'user' field must be 'nouser' or 'nobody' and the tftpd daemon **must be launched without** the '-s /tftpboot' parameter).
- reboot the UNIX host (or send the signal 1 to the `inetd` process).

Examples of TFTP declarations:

SCO OpenServer

```
tftp dgram udp wait nouser /etc/tftpd tftpd
```

AIX 4.x

```
tftp dgram udp nowait nobody /usr/sbin/tftpd tftpd -n
```

LINUX

```
tftp dgram udp wait root /usr/sbin/tcpd in.tftpd /
```

UNIXWARE 7

```
tftp dgram udp wait nobody /usr/sbin/in.tftpd in.tftpd
```

11.1.3 - Under Linux

First, check the tftp package is already installed. The tftp protocol works through the xinetd daemon. Check if xinetd is running. If not, enable xinetd.

A file **'tftp'** should be present in **/etc/xinetd.d**. This file contains the tftp server settings. Check the content of the file is as shown below:

```

service tftp
{
    socket_type          = dgram
    protocol             = udp
    wait                = yes
    user                 = root
    server               = /usr/sbin/in.tftpd
    server_args         = /
    disable             = no
}
    
```

Reboot if you modified any of these settings.

Note: for a legacy Linux version, see the Chapter 11.1.2.

11.1.4 - Under OS/400

The TFTP protocol is available as a standard feature on OS/400, but must be correctly set to match with the AX3000 requirements.

1 - Create a directory

```

===> CRTDIR DIR('axfirm')
    
```

2 - Copy the firmware file (for example ax3000) on /axfirm.

3 - Change the directory "/axfirm" QTFTP user's rights:

```

===> CHGAUT OBJ('/axfirm') USER(QTFTP) DTAAUT(*RX) OBJAUT(*NONE)
    
```

4 - Change the file "/axfirm/ax3000" QTFTP user's rights:

```

===> CHGAUT OBJ('/axfirm/ax3000') USER(QTFTP) DTAAUT(*RX) OBJAUT(*NONE)
    
```

5 - User's right can be checked by invoking:

```

===> WRKLNK OBJ('/axfirm')
===> WRKLNK OBJ('/axfirm/ax3000')
    
```

6 - Change the default TFTP directory:

```
====> CHGTFTP ALTSRCDIR('/axfirm')
```

7 - Stop and restart the TFTP server

```
====> ENDTCPFSVR (*TFTP)
====> STRTCPSVR (*TFTP)
```

Then download the firmware from the AX3000 interactive set-up (see next chapter).

11.1.5 - Under Windows

Windows operating systems don't include as a standard feature the tftp and bootp protocols. In this case, these 2 protocols must be bought and installed as additional software.

11.1.6 - About Firmware Files

The correct firmware file must be downloaded for your AX3000 hardware. If FK3 firmware file is downloaded into FK5 hardware, the download process will fail (error 13, see Chapter 11.5).

For more information, refer to Appendix A.12.

11.2 - DOWNLOADING BY TFTP PROTOCOL

To download firmware using the tftp protocol, the firmware file location (filename and tftp host IP address) must be given.

11.2.1 - Remote Administration

The remote administration command depends on the operating system. Refer to the Chapter 5.5 (Unix/Linux), the Chapter 6.4 (OS/400) or the Chapter 7.3 (OS/390).

Example for Unix/Linux:

```
# rsh ax3001 ax_download password /usr/firm 192.168.1.249
```

Note about password: specify the password if the set-up is password-protected. (The same password it used).

The message 'Downloading in progress...' is displayed on the operator's console if the download runs correctly.

Possible errors (displayed on the operator's console):

- ERR 105: invalid rcmd command: incorrect keyword (check the syntax and spelling).
- ERR 108: invalid number of parameters: bad parameter number (2 or 3 parameters are required after the keyword).
- ERR 109: invalid file length: the filename is too long (more than 31 characters).
- ERR 110: invalid server: the tftp host name is unknown (not listed in the AX3000 set-up).
- ERR 111: invalid router: the router name is unknown (not listed in the AX3000 set-up).

Note: other error messages may also be displayed (connection timed-out, for example). Refer to the UNIX system manuals for explanations.

For more information about the download process, see Chapter 11.4.

11.2.2 - Downloading Through Set-Up

Enter AX3000 Set-Up (<Ctrl><Alt><Esc>) and select the [Download] menu. The following dialog box is displayed:

| Firmware Downloading | |
|----------------------|---------------|
| Protocol | tftp |
| File to Download | ..... |
| AX3000 IP Address | 192.168.1.241 |
| tftp Server IP Addr. | ..... |
| tftp Router IP Addr. | ..... |
| VALID CANCEL | |

Enter the following parameters:

- **Protocol:** select tftp,
- **Filename:** path and name of the firmware file, Anti-slashes of this character string must be doubled. For instance: C:\\AXEL\\FIRM.
- **AX3000 IP:** this is an IP address only used during the downloading operation. It can differ from the current IP address,
- **tftp Host IP:** name or IP address of the tftp host,
- **tftp Router IP** (optional): name or IP address of a router via which the tftp host can be reached.

When the [OK] button is selected, the download operation begins.

For more information about the download process see Chapter 11.4.

11.3 - DOWNLOADING BY BOOTP AND TFTP PROTOCOLS

This procedure is divided into 2 steps:

- bootp: obtaining firmware file information,
- tftp: downloading firmware file.

The bootp protocol is used get the location (IP address of the tftp host and filename) of the firmware file. This information is obtained by means of a broadcast.

Information concerning this firmware file must have been configured within the selected UNIX host (known as the bootp host).

Prerequisites for bootp:

- the bootpd process must be run on the bootp host.
- the bootpd configuration file (**/etc/bootptab**) must list an entry for every AX3000 which can download firmware.
- the bootp host must be directly accessed by the AX3000 (not via a router). Otherwise, a bootp relay host must be set up.

The main capabilities of the bootpd configuration file are as follows:

- tc: network description
- ht: network type
- sa: IP address of tftp host
- gw: optional router
- ha: Ethernet address of the AX3000
- ip: IP address of the AX3000 (this address is only used during the downloading operation)
- bf: full firmware file name (path included)

Examples of bootp configuration files:

a) When the AX3000 and the tftp host are on the same network

```
net:hn:df=/etc/btdump:ht=ethernet:sa=192.168.1.252:to=auto:
axell:tc=net:ht=ethernet:ha=00A034000001:ip=192.168.1.242:bf=/tmp/axel:
```

b) When the AX3000 accesses the tftp host via a router

```
net:hn:df=/etc/btdump:ht=ethernet:sa=192.1.1.243:to=auto:
net1:tc=net:sm=255.255.255.000:gw=192.168.1.252:
axell:tc=net1:ht=ethernet:vm=rfc1048:ha=00A034000001:ip=192.168.1.242:bf=
/usr/axel/firm9645:
```

IMPORTANT: if a problem occurred during a previous download operation (whatever method was used), the firmware of the target AX3000 may have been erased. To restore valid firmware, the bootp+tftp protocol will automatically be run when this target AX3000 is switched on.

11.3.1 - Remote Administration

The remote administration command depends on the operating system. Refer to the Chapter 5.5 (Unix/Linux), the Chapter 6.4 (OS/400) or the Chapter 7.3 (OS/390).

Example for Unix/Linux:

```
# rsh ax3001 ax_download password
```

Note about password: specify the password if the set-up is password-protected. (The same password is used)

The message 'Downloading in progress...' will be displayed on the operator's console if downloading can be performed (AX3000 and tftp host reachable, firmware file found, etc).

Note: error messages can also be displayed (connection timed-out for example). For explanations refer to UNIX manuals.

For more information about the download process, see Chapter 11.4

11.3.2 - Downloading Through Set-Up

Enter AX3000 Set-Up (<Ctrl><Alt><Esc>) and select the **[Download]** menu. Set the **Protocol** parameter to **bootp**. When the **[OK]** button is selected, the download operation begins.

For more information about the download process, see Chapter 11.4.

11.4 - THE DOWNLOAD PROCESS

During the download operation, the following messages are displayed on the AX3000 monitor.

11.4.1 - The bootp Stage

```
AX BOOTP V1.1a
Flash Key 3
```

If a response is received to the bootp broadcast request, information about the firmware file location will be displayed:

```
AX3000 IP: 192.168.1.242
bootp server name: vangogh
bootp relay IP: 0.0.0.0
tftp server IP: 192.1.1.254
file name: /axel/firm0210
tftp router IP: 192.168.1.252
```

```
AX BOOTP V1.1a
Flash Key 3
```

Next, an automatic connection to the tftp host will then be made, in order to download the firmware file.

11.4.2 - The tftp Stage

```
AX TFTP V1.1a
Flash Key 3
```

If the download can be performed, the current firmware is erased and the following message is displayed on the AX3000 monitor:

```
Erasing code...
```

Then, the selected firmware file is downloaded (each dot represents 512 bytes):

```

Loading code
.....
.....
.....
.....
.....
code loaded
    
```

Finally, the AX3000 is automatically reset and the new firmware is enabled.

IMPORTANT: The AX3000 IP layer, used for the tftp protocol, does not handle the fragmentation/defragmentation process. Therefore, if a router fragments frames (mtu lower than 600 bytes), the AX3000 will not be able to perform the download.

If any problems occur, see the next section.

11.5 - IN CASE OF PROBLEMS

This section discusses possible problems. The error list is not exhaustive ; if an unlisted error occurs, please contact your AXEL distributor.

After an error, the AX3000 should be power-cycled.

11.5.1 - The bootp Stage

If an error occurs, the following message is displayed on the AX3000 monitor:

```

Bootp errno: xxx
- xxx is the error number.
    
```

Possible errors:

- 0: Ethernet board not responding.
- 1: no response to the bootp broadcast request (the bootp host is unreachable or not correctly set-up).

11.5.2 - The tftp Stage

A tftp error message can originate from either the tftp host or the AX3000.

Depending on the error, the AX3000 firmware may be erased. If this happens the firmware code will be automatically downloaded (bootp+tftp protocol) the next time the AX3000 is power-cycled.

Tftp Host Errors:

```
tftp errno: xxx label
```

- xxx is the error number,
- label is the error message. This label is sent by the tftp host and is generated by UNIX running on the tftp host.

Possible errors:

- 1: File not found
- 2: Access violation
- 3: Disk full or allocation exceeded
- 4: Illegal TFTP operation
- 5: Unknown transaction Identifier
- 6: File already exists
- 7: Illegal TFTP operation
- 0: User-defined error

For more information, refer to UNIX manuals.

Tftp AX3000 Errors:

```
tftp errno: xxx
```

- xxx is the error number.

Possible errors:

- 10: Ethernet board not responding.
- 11: no response to the tftp broadcast request (the tftp host is unreachable or not correctly set-up).
- 12: network error.
- 13: the firmware file does not correspond to AX3000 firmware or is not compatible with the AX3000 model.

- 14: the firmware file size is less than 256 bytes. This indicates that the file is not an AX3000 firmware file.
- 15: checksum error on the firmware file.

AX3000 Flash Memory Errors:

```
flash errno: xxx
```

- xxx is the error number.

Possible errors:

- 0: flash erasing failure
- 1: flash programming failure
- 2: checksum error (invalid firmware file)
- 3: segment descriptor programming failure

APPENDIX

The following appendices give information about:

- A.1 - Using the AX3000 interactive set-up
- A.2 - Network overview (Ethernet address, IP address and routers)
- A.3 - Adding an LPD printer within an operating system
- A.4 - DHCP protocol
- A.5 - DNS protocol
- A.6 - Remote set-up configuration file format
- A.7 - Setting the IP address by a ping command
- A.8 - Administration command list
- A.9 - Selecting TCP/IP or serial mode
- A.10 - Going further...
- A.11 - Default factory set-up and quick set-up
- A.12 - Hardware and firmware information

A.1 - USING THE INTERACTIVE SET-UP

A.1.1 - Enter the Set-Up

The following command sequence is used to enter AX3000 Set-Up:

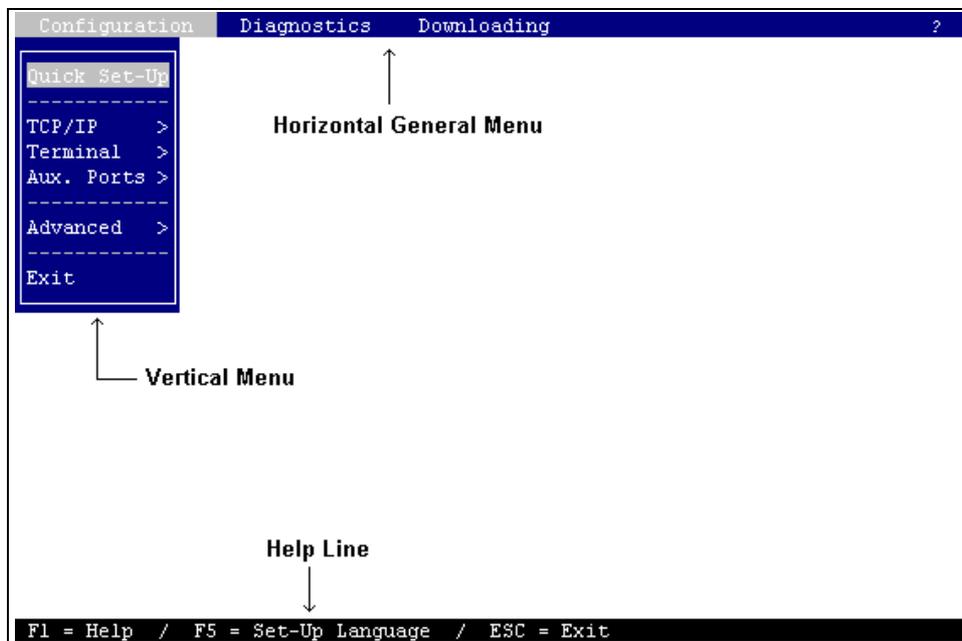


Note: the set-up can be password-protected, in which case the password must be entered to access the quick set-up dialog box. For more information, see Chapter 3.6.

The AX3000 set-up comprises a horizontal general menu, which calls vertical menus or dialog boxes.

A help line is located in the bottom of the screen.

The AX3000 set-up screen appears as follows:



A.1.2 - Navigation

a) The Horizontal General Menu

Move through the menu with horizontal arrow keys. A different vertical menu will be displayed automatically as each item is traversed.

b) Vertical Menus

Move through vertical menus with vertical arrow keys. Confirm the selected command by pressing **<CR>**.

Note: the symbol '>', beside a vertical menu item, indicates that it is a sub-menu. Expand the sub-menu with the <CR> key, then move through it with vertical arrow keys.

c) Dialog Boxes

Move through dialog boxes with vertical arrow keys.

Two type of fields are distinguished in a dialog box:

- button: press <CR> to perform the associated action.
- parameter: two types of value occur:
 - a free value (numeric or character string): the data capture mode is automatically enabled (see the next chapter).
 - a discrete value: press <SPACE> to show the permitted values or to display a list of values. Move through lists with vertical arrow keys; confirm the selected value by pressing <CR>. Press <Esc> to cancel.

Use the <Tab> key to move directly from the parameter field to the button field.

Select the [OK] button to save modifications and exit the dialog box. Select the [CANCEL] button or press <Esc> to exit the dialog box without saving modifications.

A.1.3 - Enter Data

When a 'free value' parameter field is selected, a value must be entered (it cannot be selected from a list).

Note: to indicate 'free value' mode, the cursor blinks at the beginning of the field.

During this mode the following keys are enabled:

- **<CR>**: confirmation
- **<Esc>**: abandon your changes
- **<horizontal arrows>** move the cursor within the character string
- **<Home>** and **<End>**: move the cursor directly to the beginning or the end of the string
- ****: delete the character at the cursor position
- **<Backspace>**: delete the character before the cursor position
- **<Insert>**: one of two editing modes:
 - insertion (default): the cursor takes the form of a blinking line or
 - overwrite: the cursor takes the form of a blinking block.

To enter characters with an ASCII code lower than 20 hexadecimal, use a backslash ('\') before the hexadecimal value. For instance, the 'Esc z' sequence can be encoded by '\1Bz'.

Note: when the character string is longer than the length of the field, two indicators are displayed at the left and at the right of the field.

A.1.4 - Special Notation

The set-up is a sequence of menus and sub-menus. Define an action by the path followed through the set-up tree (hierarchy), using the following notation:

[item1]→[item2]→[action]

For example, to perform the above **action**, select **item1** in the main menu, then select **item2** in the sub-menu.

A.1.5 - Exiting the set-up

To exit the set-up, select **[Configuration]→[Quit]**.

If changes have been made while in the set-up, a dialog box appears:

- select **[YES]** to save the modifications and exit the set-up. The new AX3000 settings will then be stored in NVRAM (non-volatile memory).
- select **[NO]** to abandon your changes and exit the set-up.

A.2 - NETWORK OVERVIEW

A.2.1 - Ethernet Addresses

AX3000 terminals (like other devices equipped for Ethernet networking) have a unique hardware address which is issued by the manufacturer and cannot thereafter be modified. This address is in the form of six hexadecimal bytes, separated by colons, thus:

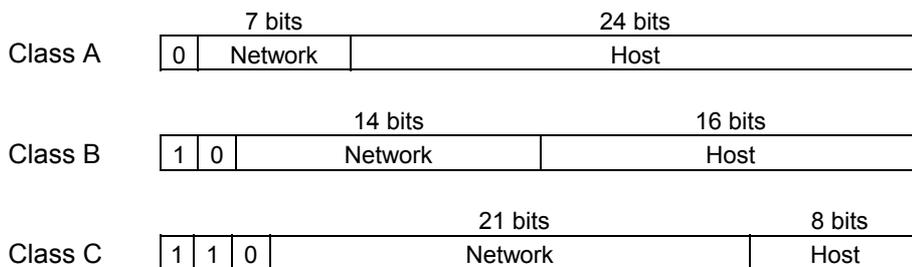
AX3000 Ethernet address format:
00:A0:34:xx:xx:xx

Select the '?' command in the horizontal menu of the AX3000 set-up to see the AX3000 Ethernet address.

A.2.2 - IP Address

Every device connected to an Ethernet network must have a single 32-bit address which encodes both the network and the host ID. Internet addresses (sometimes called «IP addresses») are usually written as four decimal numbers separated by decimal points ('.' character).

There are three main classes of IP address:



Thus every IP address occupies 4 bytes and contains both:

- a network address, and
- a host address.

Note: all devices attached to the same network must have the same class and the same network address. Each must have a **different** host address.

For example: an AX3000 connected, over a network, to a host with an IP address 192.1.168.40 (class C: three bytes for the Network address) must have the three first bytes of its address set to 192.1.168. The fourth byte cannot be equal to 40.

A.2.3 - Router

Depending on the network topology, the AX3000 and the host may be installed on different physical networks and linked through one or several routers.

Two types of router can be used to access remote networks:

- a default router: this router knows how to reach many remote networks.,
- specific routers: in charge of one remote network.

The default router is only identified by an IP address.

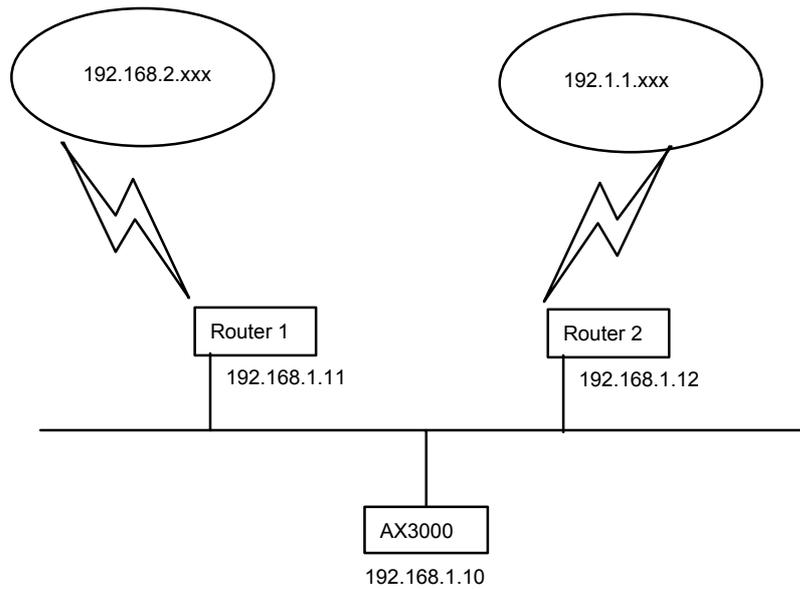
The specific routers are identified by the following parameters:

- **Router IP address**: this router must be connected to the same network as the AX3000.
- **Destination IP Address**: IP address of the host or the network to be reached.
- **Destination Type**: two values:
 - **Host**: the destination is a single host,
 - **Network**: the destination is a whole local network (the class mask is applied to this IP address).

Notes:

- At the AX3000 level, the routing algorithm uses a specific router to reach the destination. If no specific router fits, the default router is used.
- The AX3000 doesn't support ICMP REDIRECT requests (dynamic routers are not supported).

Example 1: router 1 is used to reach the 192.168.2.xxx network and router 2 is used to reach the 192.1.1.xxx network:



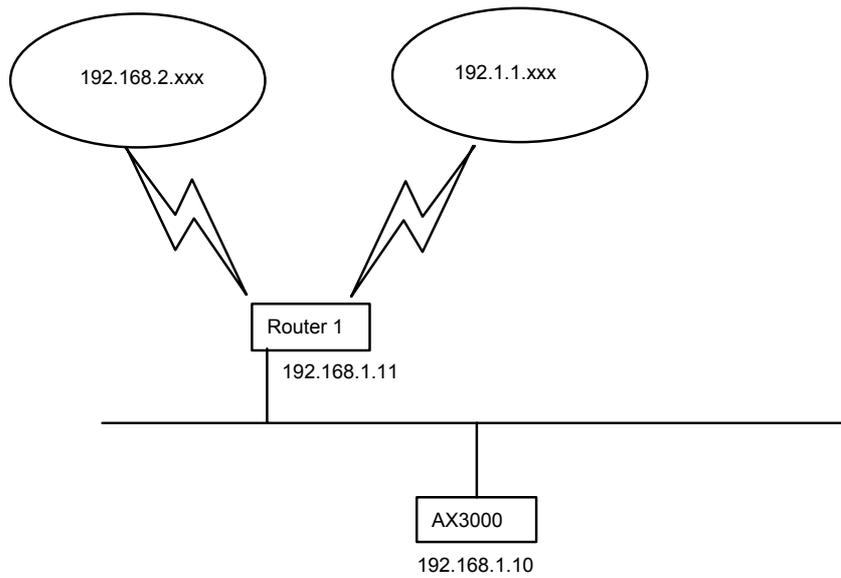
The AX3000 route table will show the following:

```

Routers Process
Default Router .....
Gateway IP addr  Target IP addr  Target Type
192.168.1.11     198.168.2.0     Net
192.168.1.12     192.1.1.0       Net
.....          .....          .....
VALID           SUPPRESS        CANCEL

```

Example 2: router 1 is used to reach both networks (192.168.2.xxx and 192.1.1.xxx):



The AX3000 route table is:

| Routers Process | | |
|-----------------|-----------------|---------------|
| Default Router | 192.168.1.11 | |
| Gateway IP addr | Target IP addr | Target Type |
| | | |
| | | |
| | | |
| VALID | SUPPRESS | CANCEL |

A.3 - LPD PRINTERS

This appendix gives the information needed to add an LPD printer within your operating system. For more information, refer to your system manuals.

A.3.1 - Unix

Use the appropriate UNIX system management tool to add a remote printer. At least, two parameters are requested:

- the name of the remote host: enter the AX3000's hostname (refer to */etc/hosts*),
- the name of the printer: this is the **Printer Port Name** entered when the AX3000 was set up.

Run the **lp** command to use this printer.

Note: some options of the **lp** command (number of copies, banner, etc) cannot be used, because the AX3000 is not a UNIX server and has no hard disk on which to run a spooler.

a) Using lpd under IBM AIX V3.x

Enter the SMIT fast path **smit mkrque**. Four parameters are required:

- **Name of Queue to Add:**
 - ⇒ name of the printer accessed by the **lp** command
- **Destination Host for Remote Jobs:**
 - ⇒ hostname of the AX3000 (refer to */etc/hosts*)
- **Name of Queue on Remote Printer:**
 - ⇒ '**Printer Port Name**' associated with the AX3000's port
- **Name of Device to Add:**
 - ⇒ device name of printer on AIX

b) Using lpd under IBM AIX V4.x

Enter the SMIT fast path **smit spooler** then select '**Add a Print Queue**' and '**Remote**'.

Printers can be added using either of two methods:

- **Standard Processing:** AIX sends a raw file to the AX3000. Three parameters are required:
 - **Name of Queue to Add:** name of the printer accessed by the lp command
 - **Destination Host for Remote Jobs:** hostname of the AX3000 (refer to /etc/hosts)
 - **Name of Queue on Remote Printer:** this is the 'Printer Port Name' associated with the AX3000's port

- **Local Filter:** AIX passes the file to the printer through a formatting filter. The first parameter required is the type of printer. Select this from the list of supported printers. Three parameters are required:
 - **Name of Queue to Add:** name of the printer accessed by the lp command
 - **Destination Host for Remote Jobs:** hostname of the AX3000 (refer to /etc/hosts)
 - **Name of Queue on Remote Printer:** this is the 'Printer Port Name' associated with the AX3000's port

Note: Use of the Local Filter method is strongly recommended.

c) Using lpd under SCO UNIX

Run **scoadmin** and select **[Printer]→[Printer Manager]**. Then select **[Printer]→[Add Remote...]→[UNIX]**. A dialog box is displayed. Two parameters are required:

- **Host:** hostname of the AX3000 (refer to /etc/hosts)
- **Printer:** this is the 'Printer Port Name' associated with the AX3000's port

Note: an AX3000 filter may be needed.

A.3.2 - OS/400

On OS/400, a network printer handled by lpd is called an 'outqueue'.

To add a system printer invoke the following command (AXPRT01 is the OS/400 printer name):

```
===> CRTDEVPRT DEVD(AXPRT01) DEVCLS(*VRT) TYPE(3812) MODEL(1) FONT(11)
```

To associate this printer with the AX3000 LPD port, you have to change its outqueue:

```
===> CHGOUTQ OUTQ(AXPRT01) RMTSYS(*INTNETADR) RMTPRTO('PARALLEL')
CNNTYPE(*IP) DESTTYPE(*OTHER) TRANSFORM(*YES) MFRTPMDL(*NECP2)
INTNETADR('192.168.1.240')
```

where:

- AXPRT01 : OS/400 outqueue name
- PARALLEL : AX3000 Printer Port Name
Uppercase letters are required
- *NECP2 : printer model (here a NEC type P2)
- 192.168.1.240 : AX3000 IP address

Note: if the outqueue is not started, invoke the STRRMTWTR command.

At the OS/400 level this printer is seen as an outqueue and is not allowed to control it as a device. (For example, it is not possible to start or stop the printer).

A.3.3 - Windows

See Chapter 8.3.

A.4 - THE DHCP PROTOCOL

DHCP (Dynamic Host Configuration Protocol) is an industry standard protocol that lets a DHCP server (Unix, Windows, AS/400, etc.) allocate temporary IP addresses and other network parameters to terminals and PCs when they are powered on. This can greatly simplify managing large networks.

A.4.1 - Overview

Here is a brief description of Axel's implementation DHCP:

- At boot time the AX3000 broadcasts DHCP requests to find the DHCP server.
- If a DHCP server is found and correctly set-up, an IP address, and subsequently other parameters are given to the AX3000.
- Before accepting the IP address the AX3000 can be set to check that the IP address given really is free (ARP protocol).
- The IP address offered is given temporarily. This duration is called the 'Lease Time'.
- If a lease time has been entered through the AX3000 Set-Up, this lease time is offered to the DHCP server, which may or may not accept this value.
- The AX3000 is expected to renew its lease before the lease expires. Once the lease has expired the AX3000 is no longer permitted to use the assigned IP address.
- Generally an IP address is dynamically assigned out of a pool of IP addresses. However static IP addresses can be associated to AX3000s (for instance when the AX3000's print server is used). This association is performed either by using the AX3000 Ethernet address or by using a 'Client Identifier' (which is a character string entered through the AX3000 Set-Up).
- The DHCP protocol can be considered as a superset of the BOOTP protocol. IP addresses can also be offered to AX3000s by a BOOTP server (in this case the 'lease time' is infinite).
- The AX3000 DHCP client protocol is compliant with RFCs 1533 and 1541.

This section deals only with the AX3000 DHCP protocol use. To set-up and enable a DHCP server please read your operating system's manual.

A.4.2 - Setting-Up the AX3000

DHCP protocol is set through either the AX3000 Quick Set-Up or the AX3000 Interactive Set-up. For more information, see Chapters 2.2 and 3.2

A.4.3 - Using the AX3000

If the DHCP protocol is enabled the AX3000 automatically requests an IP address on boot and the following dialog box is displayed:

```
DHCP: searching, please wait
```

Note: the search can be aborted by entering the set-up.

If a DHCP (or BOOTP) server is available an IP address is given after a few seconds. This dialog box is then cleared and the AX3000 follows its normal behaviour: either the set-up idle is displayed (no automatic session is set) or an automatic connection is opened.

Further 'lease time' re-negotiations are totally invisible to the AX3000 user. Only error messages are displayed (see next chapter).

Note: enter the set-up to find out the AX3000 IP address or other parameters offered by the DHCP server.

A.4.4 - Errors

a) Boot Time Failure

The AX3000 automatically searches for a DHCP server on booting. If after 30 seconds no DHCP (or BOOTP) server answers the following dialog box is displayed:

```
DHCP NEGOTIATION FAILED

Please contact your network administrator

Press <F11> to reboot
```

At this stage two options are available:

- <F11>: rebooting the AX3000 to run the DHCP search again.
- <Ctrl><Alt><Esc>: entering the set-up to modify AX3000 settings.

b) Re-negotiation Failure

The lease time must be regularly re-negotiated (except if the IP address has been offered by a BOOTP server).

If a re-negotiation fails the following dialog box is displayed:

```
WARNING: DHCP REBINDING TOO LONG

The AX3000 could be disconnected in 2 minutes
Please log-off before automatic shutdown

Press <F11> to clear this message
```

This indicates that in two minutes the AX3000 will no longer be permitted to use the leased IP address and the session will be terminated

If after these two minutes, the re-negotiation has still failed, the following dialog box is displayed:

```
DHCP REBINDING FAILED

Please contact your network administrator

Press <F11> to reboot
```

All current sessions (telnet, tty, lpd, etc.) will have been closed (i.e. lost).

Note: the AX3000 Trace Mode allows a trace of data exchanged between the AX3000 and the DHCP server (see Chapter 3.2.1). This is useful to diagnose problems.

A.5 - THE DNS PROTOCOL

The DNS protocol (Domain Name System) allows names to be 'resolved' by the AX3000. Resolving is retrieving an IP address associated with a name.

A.5.1 - Overview

A domain (computer network) can be considered as a tree, with branches (nodes) such as hubs, switches, routers, print servers etc, and leafs, for example PCs, terminals and printers.

The domain system makes no distinction between the use of interior nodes and the leafs, and this documentation uses the term "nodes" to refer to both. (i.e. any network resource).

Each node has a name (**Label**) which must be unique to other nodes at the same level, but not necessarily unique within the whole network.

Label syntax:

- Permissible characters are letters (a..z to A..Z), numbers (0..9) and the hyphen (-).
- A Label must begin by a letter and be ended by a letter or a number.
- The resolution is not case-sensitive.

The domain name of a node is the list of the labels on the path from the node to the root of the tree. A dot is used to separate each label. Two types of host names can be distinguished within the AX3000:

- **A full name:** one or more dots are included in the name.
Example: "www.axel.com"
- **An incomplete name:** no dots are used. The resolution procedure concatenates, another character string to this name (the default DNS domain name). For more information see Chapter 3.2.2.
Example: "as400" is concatenated with "servers.axel.com" to create a full name of "as400.servers.axel.com"

A host name is only resolved if the IP address is needed. (i.e. to open a session or to ping).

Note: a name is resolved for each connection attempt, even if its IP address

has been obtained by a previous resolution.

A.5.2 - Resolution Strategy

To resolve a name, a DNS request is sent by the AX3000. A DNS request contains the destination DNS server IP address and the name to be resolved.

To resolve a name possibly more than one DNS request is needed (if one or more default DNS domains are defined). The resolution process is stopped either when the AX3000 receives a positive response from a DNS server (success: an IP address is associate to this name) or when all the DNS requests has been sent and no positive response has been received (failure: the name is not resolved).

The order of the requests sent to resolve a hostname is called the resolution strategy.

The resolution strategy depends on both:

- whether or not a domain name is declared,
- whether the name to resolve is complete.

If no default DNS domain is defined in the AX3000 Set-Up, the resolution is done with the name itself regardless of whether the name is full or not.

If one or more default DNS domains are defined, the resolution strategy depends on the name:

- Full name: the resolution is first done with this name. If unsuccessful new resolutions are performed by concatenating the full name with the defined DNS domains.
- Incomplete Name: the resolutions are first done with the defined default DNS domains. If unsuccessful a new resolution is performed with this incomplete name.

Example of name resolutions: looking at the host table in Chapter 3.2.3 the name resolution attempts are:

- **as400:** this is not a full name, the resolution is first made with the first DNS domain (as400.servers.axel.com). Then, in event of failure, with the second DNS domain (as400.terminals.axel.com). Then, in event of failure, the resolution is made with the name itself (as400).

- **linux**: an IP address is associated. No DNS resolution.
- **www.axel.com**: this is a full name. The resolution is first made with the name itself (www.axel.com). Then, in event of failure, the resolution is made with the first DNS domain (www.axel.com.servers.axel.com). Then, in event of failure, with the second DNS domain (www.axel.com.terminals.axel.com).

A.5.3 - Resolution Method

To resolve a name, the AX3000 sends DNS requests to the DNS server(s).

If a DNS server sends back a positive response, then the IP address is found and the resolution operation is completed. If not two cases of failure are possible:

- **Receiving a negative response**: the name is not known by this DNS server. The AX3000 will retry with a new DNS request or with the second DNS server.
 - **No response (time-out)**: after a few seconds the DNS server has not sent back a response. The AX3000 resends the same request to the DNS server.
- Note**: after 4 time-out errors on the same DNS server, this server is "removed" from the resolution operation.

Note: if a response previously considered as a time-out error is received, this response is treated as a valid response (positive or negative).

The AX3000 requests a **recursive search** to the DNS servers (and not iterative search). This means that the DNS server must search itself for a DNS server which is able to resolve the required name.

The resolution operation depends on the number of DNS servers. These are the steps for a one-server resolution and a two-server resolution.

One DNS Server:

- 1 -A DNS request is sent to the server.
- 2 -In event of no response, this request is sent again (4 times max.).
- 3 -In event of negative answer, the resolution is aborted.
- 4 -If other requests can be sent (default DNS domains are defined), go back to step 1.

Two DNS Servers:

- 1 -A DNS request is sent to the server 1.
- 2 -In event of no response from server 1, this request is sent to the server 2.
- 3 -In event of no response from server 2, go back to step 1 (4 times max.).
- 4 -In event of negative answer from any server, the resolution is aborted.
- 5 -If other requests can be sent (using default DNS domains are defined), go back to step 1.

Example: looking at the screen shots of the Chapters 3.2.2 and 3.2.3, these are the DNS requests sent to resolve "as400" with 2 DNS servers and 2 default DNS domains (of course this process is stopped if one DNS server sends back a positive response):

- "as400.servers.axel.com" to DNS server 1
- "as400.servers.axel.com" to DNS server 2
- "as400.terminals.axel.com" to DNS server 1
- "as400.terminals.axel.com" to DNS server 2
- "as400" to DNS server 1
- "as400" to DNS server 2

A.5.4 - Messages Displayed on the AX3000 Screen

To open a session the AX3000 must resolve the host name (if no IP address has been associated through the set-up).

This is a screen-shot example when the resolution successes:

```
Connecting to as400.servers.axel.com:23 (Telnet)...
Session number 1
Resolving...
Resolved: 192.168.1.180
Connected
```

Explanation: the AX3000 attempts to resolve "as400.servers.axel.com". The resolution process returns the IP address which is 192.168.1.180.

In the event of a problem, the "Resolved: a.b.c.d" message is replaced by an error message. For example:

```
Connecting to as400.servers.axel.com:23 (Telnet)...
Session number 1
Resolving...
Srv: domain not found
Press <Ctrl><Alt><Shift><D> to close this session
```

Error messages: error messages reported by the DNS server begins with Srv. Error messages from the terminal begin with "Loc". The main messages are:

- **Srv: domain not found:** the name doesn't exist within this domain.
- **Srv: refused query:** the DNS servers refuses to respond to the request. This could be due to a DNS server security function.
- **Loc: no DNS server defined:** no DNS server has been defined through the AX3000 Set-Up.
- **Loc: name syntax error:** the syntax of the name to resolve is not correct (for example two consecutive dots: as400..servers).
- **Loc: timeout:** no DNS server responds
- **Loc: no memory:** due to a temporary memory overload, the AX3000 can not process the name resolution. Retry later.

When the resolution fails, the session must be manually closed. This is done by pressing <Ctrl><Alt><Shift><D>.

A.6 - REMOTE SET-UP CONFIGURATION FILE FORMAT

A configuration file can list some or all AX3000 set-up parameters.

The configuration file begins with the header label (BEGIN_AX_SETUP) and ends with the trailer label (END_AX_SETUP).

Example:

```
BEGIN_AX_SETUP V1.1
# this is a comment
tcp_host1_name=vangogh
...
END_AX_SETUP
```

Note: lines beginning with '#' are treated as comments and ignored.

The set-up parameters may be grouped as follows:

| | |
|----------------|--|
| Ethernet: | Ethernet interface parameters, |
| TCP/IP: | network environment, |
| AUX1 Port: | port service and communication parameters, |
| AUX2 Port: | port service and communication parameters, |
| Parallel Port: | port service, |
| Multi-session: | session numbers, hot keys, etc |
| Terminal: | global parameters (screen, keyboard, etc), |
| Session 1: | session 1 parameters, |
| ... | |
| Session 8: | session 8 parameters. |

Several formats are available for set-up parameter values:

| | |
|--------------------|--|
| List: | the possible values are listed (the character '\|' is used as a separator). Example: (yes \| no). |
| Number: | maximum and minimum values are given. |
| IP address format: | the IP address format is a.b.c.d. |
| Character string: | maximum length is given. Note: an ASCII character can be represented by its hexadecimal ASCII code, preceded by a backslash character (e.g.: \1B represents Escape and \\ represents a backslash). |
| 8-colour format: | the 8 available colours are black, red, green, brown, blue, magenta, cyan and white. |
| 16-colour format: | the 8 additional available colours are grey, lt-magenta, lt-green, hi-white, lt-blue, lt-red, lt-cyan and yellow. |

In the following parameter lists, the possible values are bracketed after each set-up parameter.

A configuration file can either be created using a text editor, or obtained from an already configured TCP/IP AX3000 (by using **setup_get** remote command).

When a configuration file is obtained from an AX3000, the inactive parameters (undefined hosts, print server unused, colouring mode disabled, etc) are commented out.

The sample configuration file, shown in the following pages, is typical of a file obtained from an already configured AX3000. Notes and headings have been inserted for clarification and would not appear in the file.

Header

```
BEGIN_AX_SETUP V1.1
#####
#           TCP/IP AX3000 Platine Terminal           #
#                                                    #
# Ethernet address: 00:A0:34:00:27:10                #
# Firmware: FK5.BV2.1a/TCP.FR.0210a.STD            #
#####
#
# RESET_CMOS
```

Note: the `RESET_CMOS` command allows all the set-up parameters (except the AX3000 IP address) to be reset. When the configuration file is obtained from an AX3000, this `RESET_CMOS` command is displayed as a comment.

Ethernet Parameters

```
ethernet_dhcp_used=no           (yes | no)
ethernet_dhcp_axname            (character string, 64 char max.)
#ethernet_ipaddr=192.168.1.241  (address IP format)
#ethernet_netmask=255.255.255.0 (address IP format)
ethernet_dhcp_netmask           (yes | no)
ethernet_dhcp_defrouter         (yes | no)
ethernet_dhcp_DNSserver         (yes | no)
ethernet_dhcp_srchdomain        (yes | no)
```

| | |
|---------------------------|----------------------------------|
| ethernet_dhcp_leasetime | (number) |
| ethernet_dhcp_clientid | (character string, 10 char max.) |
| ethernet_dhcp_tracemode | (yes \| no) |
| ethernet_dhcp_checkipaddr | (yes \| no) |
| ethernet_noise=low | (low \| high) |

Notes:

- When a configuration file is obtained from an AX3000, the ethernet_ipaddr and ethernet_netmask parameters are commented out (in order that the file may be used for configuring other AXEL Terminals).
- The DHCP parameters are listed only with the DHC or DNS option.
- The DNS parameters are listed only with the DNS option.

TCP/IP Parameters

| | |
|--------------------------------|----------------------------------|
| ethernet_dns_servIP1 | (address IP format) |
| ethernet_dns_servIP2 | (address IP format) |
| ethernet_dns_domain1 | (character string, 64 char max.) |
| ethernet_dns_domain2 | (character string, 64 char max.) |
| ethernet_dns_domain3 | (character string, 64 char max.) |
| tcp_dns_tracemode=no | (yes \| no) |
| tcp_host1_name=vangogh | (character string, 64 char max.) |
| tcp_host1_ip=192.168.1.252 | (address IP format) |
| tcp_host2_name=picasso | (character string, 64 char max.) |
| tcp_host2_ip=192.168.1.248 | (address IP format) |
| tcp_host3_name=pablo | (character string, 64 char max.) |
| tcp_host3_ip=192.168.1.249 | (address IP format) |
| tcp_host4_name=vangogh | (character string, 64 char max.) |
| tcp_host4_ip=192.168.1.250 | (address IP format) |
| #tcp_host5_name= | (character string, 64 char max.) |
| #tcp_host5_ip= | (address IP format) |
| #tcp_host6_name= | (character string, 64 char max.) |
| #tcp_host6_ip= | (address IP format) |
| #tcp_host7_name= | (character string, 64 char max.) |
| #tcp_host7_ip= | (address IP format) |
| #tcp_host8_name= | (character string, 64 char max.) |
| #tcp_host8_ip= | (address IP format) |
| tcp_router1_ip=192.168.1.252 | (address IP format) |
| tcp_router1_target=192.1.1.252 | (address IP format \| default) |

```

tcp_router1_mask=255.255.255.0 (address IP format)
tcp_router2_ip=192.168.1.253 (address IP format)
tcp_router2_target=192.18.1.2 (address IP format | default)
tcp_router2_mask=255.255.255.0 (address IP format)
tcp_router3_ip=0.0.0.0 (address IP format)
tcp_router3_target=default (address IP format | default)
tcp_router3_mask=0.0.0.0 (address IP format)
#tcp_router4_ip= (address IP format)
#tcp_router4_target= (address IP format | default)
#tcp_router4_mask= (address IP format)
tcp_mss=512 (number, lower than 2049)
tcp_window=1000 (number, lower than 2049)
tcp_ttl=255 (number, lower than 256)
tcp_setport=fixed (fixed | random)
tcp_nagle=disable (disable | enable)
tcp_ping_setip=yes (yes | no)

```

Note: if a configuration file is obtained from an AX3000, undefined hosts and routers are commented out.

Router explanation:

- The `tcp_router%_ip` parameter is the router IP address, the `tcp_router%_target` parameter is the target host (or network) IP address and the `tcp_router%_mask` parameter is an optional network mask used to reach the target network.
- The default router is encoded by `tcp_router%_ip` set to `0.0.0.0`, `tcp_router%_target` set to `default` and `tcp_router%_mask` set to `0.0.0.0`.

AUX1 and AUX2 Parameters

In the following section of the file, for ease of reading the auxiliary port number (1 or 2) has been represented by the '%' character. In a real configuration file, the parameters for each auxiliary port would, of course, be listed.

```

aux%_service=none (none | rtty | printd | lpd
                  rcmd | rtelnet | tty | Prt5250)
aux%_service_name=aux1 (character string, 8 char max.)
aux%_service_num=2048 (number)

```

```

aux%_filter_nl=no                (yes | no)
aux%_auto_ff=no                  (yes | no)
aux%_associate_host=vangogh      (character string, 64 char max.)
aux%_associate_term=ansi         (character string, 8 char max.)
aux%_associate_autoconn=yes      (yes | no)
aux%_associate_reconn=yes        (yes | no)
aux%_associate_devname=PRN       (character string, 10 char max.)
aux%_associate_msgqname=QSYSOPR (character string, 10 char max.)
aux%_associate_msgqlib=*LIBL    (character string, 10 char max.)
aux%_associate_font=l1          (character string, 10 char max.)
aux%_associate_mfrypmdl=*NONE   (character string, 10 char max.)
aux%_associate_pprsrc1=         (character string, 10 char max.)
aux%_associate_pprsrc2=*NONE   (character string, 10 char max.)
aux%_associate_envelope=*NONE   (character string, 10 char max.)
aux%_associate_ascii899=no      (yes | no)
aux%_associate_wscstname=       (character string, 8 char max.)
aux%_associate_wscstlib=       (character string, 8 char max.)
aux%_use=bi-directional         (printer | bi-directional)
aux%_speed=38400                (300 | 600 | 1200 | 2400 | 4800
                                9600 | 19200 | 38400 | 57600
                                115200)

aux%_data                        (7-1-none | 7-1-odd | 7-1-even
                                8-1-none | 8-1-odd | 8-1-even)

aux%_tx_hdsk=dtr                 (none | xon-xoff | xpc | dtr)
aux%_rx_hdsk=dtr                 (none | xon-xoff | xpc | dtr)
aux%_detect=none                 (none | cts)
aux%_frequency=standard          (standard | +1 | -1)

```

Note: Depending on the associated service (aux%_service), some parameters can be inactive. They are unmarked in the following table and commented out in the configuration file:

| parameter aux%... | Available Services | | | | | | | |
|--------------------|--------------------|--------|------|-----|------|-------|-----|---------|
| | none | printd | rtty | lpd | rcmd | rtnet | tty | Prt5250 |
| service name | | | | ✓ | ✓ | | | |
| service_tcpport | | ✓ | ✓ | | | ✓ | ✓ | ✓ |
| filter_nl | | ✓ | ✓ | ✓ | | | | |
| auto_ff | | | | ✓ | | | | |
| associate_host | | | | | | ✓ | ✓ | ✓ |
| associate_term | | | | | | ✓ | | ✓ |
| associate_autoconn | | | | | | ✓ | | ✓ |
| associate_reconn | | | | | | ✓ | ✓ | ✓ |
| associate_devname | | | | | | | | ✓ |
| associate_msgqname | | | | | | | | ✓ |
| associate_msgqlib | | | | | | | | ✓ |
| associate_font | | | | | | | | ✓ |
| associate_mfrtypmd | | | | | | | | ✓ |
| associate_pprsrc1 | | | | | | | | ✓ |
| associate_pprsrc2 | | | | | | | | ✓ |
| associate_envelope | | | | | | | | ✓ |
| associate_ascii899 | | | | | | | | ✓ |
| associate_wscstna | | | | | | | | ✓ |
| associate_wscstlib | | | | | | | | ✓ |

Parallel Port Parameters

```
parallel_service=none          (none | rtty | printd | lpd | rcmd
                                Prt5250)
parallel_service_name=parallel (character string, 8 char max.)
parallel_service_num=2050      (number)
parallel_filter_nl=no          (yes | no)
parallel_auto_ff=no            (yes | no)
parallel_associate_host=vangogh (character string, 64 char max.)
parallel_associate_term=ansi    (character string, 8 char max.)
parallel_associate_autoconn=yes (yes | no)
parallel_associate_reconn=yes   (yes | no)
parallel_associate_devname=     (character string, 10 char max.)
parallel_associate_msgqname=    (character string, 10 char max.)
parallel_associate_msgqlib=     (character string, 10 char max.)
parallel_associate_font=11      (character string, 10 char max.)
parallel_associate_mfrypmdl=    (character string, 10 char max.)
parallel_associate_pprsrcl=     (character string, 10 char max.)
parallel_associate_pprsrcl2=    (character string, 10 char max.)
parallel_associate_envelope=    (character string, 10 char max.)
parallel_associate_ascii899=no  (yes | no)
parallel_associate_wscstname=   (character string, 8 char max.)
parallel_associate_wscstlib=    (character string, 8 char max.)
parallel_operating_mode=        (optimised | standard)
parallel_sup_signals=           (none | select | paper | both)
```

Note: Depending on the associated service (`parallel_service`), some parameters can be inactive. They are unmarked in the following table and commented out in the configuration file:

| | Available Services | | | | | | |
|--|--------------------|--------|------|-----|------|-----|---------|
| | none | printd | rtty | lpd | rcmd | tty | Prt5250 |
| <code>parallel_service_name</code> | | | | ✓ | ✓ | | |
| <code>parallel_service_tcpport</code> | | ✓ | ✓ | | | ✓ | ✓ |
| <code>parallel_filter_nl</code> | | ✓ | ✓ | ✓ | | | |
| <code>parallel_auto_ff</code> | | | | ✓ | | | |
| <code>parallel_associate_host</code> | | | | | | ✓ | ✓ |
| <code>parallel_associate_reconn</code> | | | | | | ✓ | ✓ |
| <code>parallel_associate_autoconn</code> | | | | | | | ✓ |
| <code>parallel_associate_devname</code> | | | | | | | ✓ |
| <code>parallel_associate_msgqname</code> | | | | | | | ✓ |
| <code>parallel_associate_msgqlib</code> | | | | | | | ✓ |
| <code>parallel_associate_font</code> | | | | | | | ✓ |
| <code>parallel_associate_mfrtypmd</code> | | | | | | | ✓ |
| <code>parallel_associate_pprsrc1</code> | | | | | | | ✓ |
| <code>parallel_associate_pprsrc2</code> | | | | | | | ✓ |
| <code>parallel_associate_envelope</code> | | | | | | | ✓ |
| <code>parallel_associate_ascii899</code> | | | | | | | ✓ |
| <code>parallel_associate_wscstna</code> | | | | | | | ✓ |
| <code>parallel_associate_wscstlib</code> | | | | | | | ✓ |

Multi-session Parameters

```

multi_nbsession=4           (number in range 1 to 8)
multi_nbpage=2             (number in range 1 to 8)
multi_statusline=yes      (yes | no)
multi_intro=alt            (alt | shift | ctrl | alt-shift
                           ctrl-shift | ctrl-alt
                           ctrl-alt-shift)

multi_s1=112              (number in range 2 to 123)
multi_s2=112              (number in range 2 to 123)
multi_s3=112              (number in range 2 to 123)

```

```

multi_s4=112          (number in range 2 to 123)
multi_s5=112          (number in range 2 to 123)
multi_s6=112          (number in range 2 to 123)
multi_s7=112          (number in range 2 to 123)
multi_s8=112          (number in range 2 to 123)

```

Terminal Parameters

```

term_screen=CRT-standard      (CRT-standard | TFT |
                               black-white | grey-levels |
                               paper-white)

term_screen_enhanced=no      (no | underline | doublesize)
term_keyboard=french         (french | german | italian
                               spanish | belgian | english
                               american | portuguese | dutch
                               swiss-german | swiss-french |
                               turk-q | turk-f | iceland)

term_screensaver=yes         (no | yes | yes-kbd-only)
term_screensaver_delay=2     (number lower than 31)
term_screensaver_password=   (character string, 5 char max.)
term_screen_frequency=2      (standard | number lower than 4)
term_numlock=on              (on | off)
term_capslock=on             (on | off)
term_beeper=long             (no | long | short)
term_keydelay=mediun         (low | medium | high)
term_keyspeed=low            (low | medium | high)
term_language=french         (french | english)
term_defaultport=aux1        (none | aux1 | aux2 | parallel)
#term_operating_mode=tcp/ip   (tcp/ip | serial)
term_mouse_mode=PS2          (nothing | PS2 | serial)

```

Note: when a configuration file is obtained from an AX3000:

- the value of `term_operating_mode` is commented out.
- `term_screensaver_delay` is commented out when the value of `term_screensaver` is no,
- `term_screensaver_password` is always commented out.

Session Parameters

In the following section of the file, for ease of reading the session number (1 to 8) has been represented by the '%' character. In a real configuration file, the parameters for each session would, of course, be listed.

```
s%_associate_protocol=telnet      (telnet | tty | vnc | rdp)
s%_associate_host=vangogh        (character string, 64 char max.)
s%_associate_tcpport             (number)
s%_associate_term=ansi           (character string, 10 char max.)
s%_associate_devname=           (character string, 20 char max.)
s%_associate_username=          (character string, 10 char max.)
#s%_associate_password=         (character string, 10 char max.)
s%_associate_progname=          (character string, 10 char max.)
s%_associate_menuname=          (character string, 10 char max.)
s%_associate_libname=           (character string, 10 char max.)
s%_associate_label=view 1       (character string, 10 char max.)
s%_associate_autoconn=yes       (yes | no)
s%_associate_reconn=yes        (yes | no)
s%_associate_script=            (character string, 60 char max.)
s%_predefined_setup=ansi       (ansi | ansi dos | unix sco 3.2.2
                                unix sco 3.2.4 | sco openserver
                                xenix sco | unix svr4 | ansi mos
                                ansi interactive | ansi rs 6000
                                ansi data general | vt220 | vt52
                                c332 | vt as400 | sm9400 | sm9412
                                ato300 | hft | 5250 | 3270)

s%_screen_crlf=yes              (yes | no)
s%_screen_line=25               (25 | 24+1)
s%_screen_column=80             (80 | 132)
s%_screen_codepage=437          (437 | 850 | 860 | 8859 | 8859-sg
                                dec-multi | iso-7 | sm9400
                                ato300 | greek | 861 | 857 )

s%_eurocode=                    (no | euro ASCII code)
s%_screen_scroll=yes            (yes | no)
s%_screen_wrap=yes              (yes | no)
s%_screen_cursor=block          (line | half-block | block)
s%_screen_overscan=09           (no | number in range 0 to 63)
s1_screen_enhanced=no           (no | doublesize | underline)
```

| | |
|-------------------------------|-----------------------------------|
| s%_fctn_monitor=no | (no \| symbol-mode \| hexa-mode) |
| s%_fctn_termprg=no | (yes \| no) |
| s%_fctn_endprn=\1B[4i | (character string, 6 char max.) |
| s%_fctn_colsep=yes | (yes \| no) |
| s%_fctn_rule-style= | (horizontal \| vertical \| cross) |
| s%_fctn_rule-move= | (yes \| no) |
| s%_fctn_localwin=yes | (yes \| no) |
| s%_kbd_code=scancode | (ascii \| scancode) |
| s%_kbd_capsmode=caps-lock | (caps-lock \| shift-lock) |
| s%_kbd_localcompose=no | (no \| remote \| local) |
| s%_mouse_enable=yes | (yes \| no) |
| s%_vnc_geometry= | (800x600 \| 1024x768) |
| s%_vnc_shared=no | (yes \| no) |
| s%_vnc_noinput=no | (yes \| no) |
| s%_vnc_localmouse=yes | (yes \| no) |
| s%_vnc_emulbutton=yes | (yes \| no) |
| s%_vnc_mouseaccel=yes | (yes \| no) |
| s%_rdp_geometry=1024x768 | (800x600 \| 1024x768) |
| s%_rdp_mouseaccel=no | (yes \| no) |
| s1_rdp_msesensibility=medium | (low \| medium \| high) |
| s%_rdp_connectionname= | (character string, 20 char max.) |
| s%_rdp_encryption=auto | (auto \| yes \| no) |
| s%_rdp_cachebitmap=yes | (yes \| no) |
| s%_rdp_compression=yes | (yes \| no) |
| s%_rdp_username= | (character string, 64 char max.) |
| s%_rdp_autologon=no | (yes \| no) |
| #s%_rdp_password= | (character string, 16 char max.) |
| s%_rdp_domain= | (character string, 16 char max.) |
| s%_rdp_autorun=no | (yes \| no) |
| s%_rdp_progname= | (character string, 128 char max.) |
| s%_rdp_pathname= | (character string, 128 char max.) |
| s%_color_mode=yes | (yes \| no \| enhanced) |
| s%_color_mode=yes | (yes \| no) |
| s%_normal_foregrnd=lt-green | (16-colour format) |
| s%_normal_backgrnd=black | (8-colour format) |
| s%_reverse_foregrnd=lt-red | (16-colour format) |
| s%_reverse_backgrnd=white | (8-colour format) |
| s%_underscore_foregrnd=yellow | (16-colour format) |
| s%_underscore_backgrnd=black | (8-colour format) |

```

s%_graphics_foregrnd=hi-white (16-colour format)
s%_graphics_backgrnd=magenta (8-colour format)
#s%_enhanced_foregrndxxx=white (16-colour format)
#s%_enhanced_backgrndxxx=blue (16-colour format)
#s%_enhanced_blinkxxx=no (yes | no)
#s%_enhanced_underlxxx=no (yes | no)
s%_tab= X X X X X X X
(char string, 132 max., X=tabu.)

s%_udk_f1= (character string, 32 char max.)
s%_udk_f2= (character string, 32 char max.)
s%_udk_f3= (character string, 32 char max.)
s%_udk_f4= (character string, 32 char max.)
s%_udk_f5= (character string, 32 char max.)
s%_udk_f6= (character string, 32 char max.)
s%_udk_f7= (character string, 32 char max.)
s%_udk_f8= (character string, 32 char max.)
s%_udk_f9= (character string, 32 char max.)
s%_udk_f10= (character string, 32 char max.)
s%_udk_f11= (character string, 32 char max.)
s%_udk_f12= (character string, 32 char max.)
s%_udk_f13= (character string, 32 char max.)
s%_udk_f14= (character string, 32 char max.)
s%_udk_f15= (character string, 32 char max.)
s%_udk_f16= (character string, 32 char max.)
s%_udk_f17= (character string, 32 char max.)
s%_udk_f18= (character string, 32 char max.)
s%_udk_f19= (character string, 32 char max.)
s%_udk_f20= (character string, 32 char max.)
s%_udk_f21= (character string, 32 char max.)
s%_udk_f22= (character string, 32 char max.)
s%_udk_f23= (character string, 32 char max.)
s%_udk_f24= (character string, 32 char max.)
s%_udk_f25= (character string, 32 char max.)
s%_udk_f26= (character string, 32 char max.)
s%_udk_f27= (character string, 32 char max.)
s%_udk_f28= (character string, 32 char max.)
s%_udk_f29= (character string, 32 char max.)
s%_udk_f30= (character string, 32 char max.)
s%_udk_f31= (character string, 32 char max.)

```

| | |
|-----------------------|--|
| s%_udk_f32= | (character string, 32 char max.) |
| s%_udk_f33= | (character string, 32 char max.) |
| s%_udk_f34= | (character string, 32 char max.) |
| s%_udk_f35= | (character string, 32 char max.) |
| s%_udk_f36= | (character string, 32 char max.) |
| s%_udk_f37= | (character string, 32 char max.) |
| s%_udk_f38= | (character string, 32 char max.) |
| s%_udk_f39= | (character string, 32 char max.) |
| s%_udk_f40= | (character string, 32 char max.) |
| s%_udk_f41= | (character string, 32 char max.) |
| s%_udk_f42= | (character string, 32 char max.) |
| s%_udk_f43= | (character string, 32 char max.) |
| s%_udk_f44= | (character string, 32 char max.) |
| s%_udk_f45= | (character string, 32 char max.) |
| s%_udk_f46= | (character string, 32 char max.) |
| s%_udk_f47= | (character string, 32 char max.) |
| s%_udk_f48= | (character string, 32 char max.) |
| s%_udk_ins= | (character string, 32 char max.) |
| s%_udk_end= | (character string, 32 char max.) |
| s%_udk_dn= | (character string, 32 char max.) |
| s%_udk_pgdn= | (character string, 32 char max.) |
| s%_udk_left= | (character string, 32 char max.) |
| s%_udk_five= | (character string, 32 char max.) |
| s%_udk_right= | (character string, 32 char max.) |
| s%_udk_home= | (character string, 32 char max.) |
| s%_udk_up= | (character string, 32 char max.) |
| s%_udk_pgup= | (character string, 32 char max.) |
| s%_udk_minus= | (character string, 32 char max.) |
| s%_udk_plus= | (character string, 32 char max.) |
| s%_udk_del= | (character string, 32 char max.) |
| s%_udk_esc= | (character string, 32 char max.) |
| s%_udk_dot= | (. \| ,) |
| s%_udk_backspace= | (\08 \| \7F \| ansi \| sm9400) |
| s%_idk_enter= | (Enter \| Roll-Down \| Roll-Up \| Field-Exit \| New-Line) |
| s%_idk_pgup=Roll-Down | (Enter \| Roll-Down \| Roll-Up \| Field-Exit \| New-Line) |
| s%_idk_pgdn=Roll-Up | (Enter \| Roll-Down \| Roll-Up \| Field-Exit \| New-Line) |

```

s%_idk_np-enter=Field-Exit      (Enter | Roll-Down | Roll-Up |
                                Field-Exit | New-Line)
s%_idk_right-ctrl=New-Line      (Enter | Roll-Down | Roll-Up |
                                Field-Exit | New-Line)
s%_idk_dot=,                    (, | .)
s%_idk_backspace=Standard       (Standard | backspace)
s%_idk_esc=Attention            (Attention | SystReq)
s%_idk_AltGrF2=                 (character string, 20 char max.)

```

Notes:

- The `s%_predefined_setup` parameter automatically sets all the session parameters with proper values.
- When the configuration file is obtained from an already configured AX3000:
 - parameters referring to non-valid sessions are commented out.
 - the standard colouring mode parameters are commented out if the `s%_color_mode` parameter is set to `no` or to `enhanced`.
 - the enhanced colouring mode parameters are commented out if the `s%_color_mode` parameter is set to `no` or to `yes` (standard).
 - user-defined keys that are set to their default values (e.g. in `s%_predefined_setup`) are commented out.
 - the RDP password parameter (`s%_rdp_password`) is empty and is commented out.
 - the 5250 password parameter (`s%_associate_password`) is empty and is commented out.

End of File

The configuration file must be ended with the following trailer label:

```
END_AX_SETUP
```

If this trailer label is missing, from the configuration file used to set-up an AX3000, the fatal error message `ERR 103` will be issued in response to the `rsh` command and the default factory set-up will be reloaded.

A.7 - SETTING THE IP ADDRESS BY A PING COMMAND

A new feature with version 'e' firmware enables the system manager to

remotely assign an initial IP address to a brand new terminal, or remotely change an existing IP address.

The procedure is to manually modify the ARP table of your computer (Unix, Linux, Windows...). An ARP table entry is composed of IP addresses and Ethernet MAC address". The command below associates an arbitrary IP address to the terminal's hard coded MAC address. The MAC address is printed on the base of each terminal. With its updated ARP table your computer is able to access the AX3000. To set the new IP address the terminal must be pinged twice.

Using under Unix/Linux:

Run the following command to associate the AX3000's Ethernet address xx:xx:xx:xx:xx:xx with the IP address a.b.c.d (this command updates the ARP table):

```
# arp -s a.b.c.d xx:xx:xx:xx:xx:xx
```

Run a ping command:

```
$ ping a.b.c.d
```

The first ping requests are not acknowledged. But after few seconds the AX3000 is rebooted and replies the ping requests. The AX3000 is now set with the a.b.c.d IP address.

Using under Windows:

The procedure is the same than Unix/Linux except for the Ethernet address notation ('-' are used as separators instead of ':'). The command is:

```
C:\> arp -s a.b.c.d xx-xx-xx-xx-xx-xx
```

Run one or more ping commands (4 ping requests are sent by ping command):

```
C:\> ping a.b.c.d
```

Note: if required this function can be disabled by setting the 'IP Addr. Set by Ping' parameter to 'no'. For more information, refer to Appendix A.10.6.

A.8 - ADMINISTRATION COMMAND LIST

Several administration commands are offered by the AX3000. These commands are launched by using a remote administration command (**rsh** for example) which is available as standard features from most major operating systems.

The following table lists the available AX3000 administration commands:

| Command | Description |
|-------------|---|
| ax_reboot | Rebooting the AX3000. Example: rsh ax3000 ax_reboot [password] More information: chapter 10.2 |
| ax_sinit | Resetting an AX3000 resource (screen session or aux. port) Example: rsh ax3000 ax_sinit [password] sess1 |
| setup_get | Requesting the AX3000 Set-Up. Example: rsh ax3000 setup_get > file More information: chapter 10.3 |
| setup_send | Setting-up the AX3000 through a text file. Example: rsh ax3000 setup_send [password] < file More information: chapter 10.2 |
| ax_download | Requesting an AX3000 firmware downloading. Example: rsh ax3000 ax_download [password] 192.1.1.1 file More information: chapter 10 |
| ax_version | Requesting the AX3000 firmware revision. Example: rsh ax3000 ax_version |
| ax_getstat | Requesting the AX3000 statistics. Example: rsh ax3000 ax_getstat More information: chapter 9.3 |

Note: these commands are also available with uppercase characters (ax_version and AX_VERSION are the same command).

A.9 - SELECTING TCP/IP OR SERIAL MODE

Two operating modes are offered by the TCP/IP AX3000:

- TCP/IP (default mode): direct connection to the Ethernet TCP/IP network by using the network connector (RJ45 or BNC).
- Serial: asynchronous connection (RS-232) given by the AUX1 port.

The operating mode selection is done through the AX3000 interactive set-up.

A.9.1 - Serial Mode

Description of the procedure to reconfigure the AX3000 to enable serial connection.

a) Enabling the Serial Mode

Enter the AX3000 Set-Up (<Ctrl><Alt><Esc>) and select the **[Configuration]**→**[Advanced]**→**[Operating Mode]** menu. The displayed dialog box specifies the current operating mode (TCP/IP) and gives the choice to 'keep this mode' or to select the 'serial' mode.

Select the 'serial' mode. Note the displayed information box that informs you to power-cycle the AX3000 for changes to take effect.

b) Quick Set-Up

The following parameters are needed by the serial mode quick set-up:

- Keyboard: keyboard nationality,
- Configuration: emulation,
- Speed: from 300 to 115200 bauds,
- Handshake: DTR, XON/XOFF, etc.

The quick set-up is automatically called after the serial mode is set. The quick set-up can also be called through the interactive set-up.

c) Interactive Set-Up

The **[configuration]** menu offers the following commands:

- Quick Set-Up: see above

- Terminal: terminal characteristics (keyboard and monitors parameters, emulation, colouring mode, etc.)
- Main Port (DB25): speed, handshake, etc.
- Auxiliary Port (RJ45): port mode, speed, handshake, etc.

The **[Download]** menu allows AX3000 firmware to be downloaded through the network connector (bootp and tftp protocols).

Note: the 'remote set-up' feature is not available with the AX3000 serial mode.

d) Operation

When the serial mode is set, the TCP/IP AX3000 acts as the AX3000 model 40B.

For more information (Unix settings, multi-screen parameters, etc.), please refer the AX3000 model 40B literature.

A.9.2 - TCP/IP Mode

Description of the procedure to configure the AX3000 terminal for TCP/IP Ethernet mode from serial mode.

a) Enabling the TCP/IP Mode

Enter the AX3000 Set-Up (<Ctrl><Alt><Esc>) and select the **[Configuration]**→**[Advanced]**→**[Operating Mode]** menu. The displayed dialog box specifies the current operating mode (serial) and gives the choice to 'keep this mode' or to select the 'TCP/IP' mode.

Select the 'TCP/IP' mode. Note the displayed information box that informs you to power-cycle the AX3000 for changes to take effect.

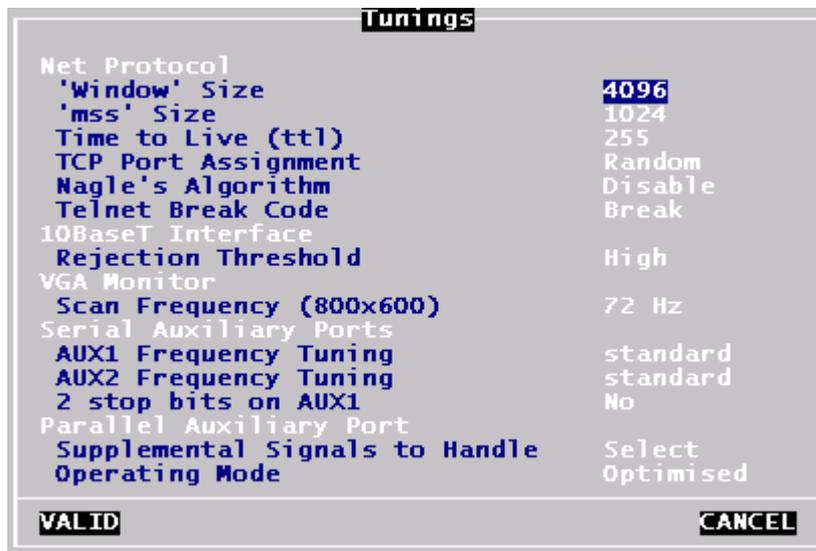
b) Setting-Up and Operation

Refer to the previous chapters in this document.

A.10 - GOING FURTHER...

This chapter describes some special AX3000 operating parameters. Usually the default values are suitable, but occasionally these parameters will have to be modified.

All these parameters are listed in a specific dialog box in menu **[Configuration]→[Advanced]→[Tunings]**:



A.10.1 - The 'mss' and 'window' Parameters

These two parameters are the AX3000 resources allocated to telnet and tty screen sessions for receiving network data:

- **mss** (maximum segment size) is the largest segment of TCP data. This size is negotiated with the server at the connection time.
- **window** is the reception windows size (i.e. the size of the buffer on which the TCP data is stored).

It is not advisable to modify these two values unless the input data flow is not continuous (i.e. the data flow pauses and resumes regularly during scrolling).

Note: new values are used for the next TCP/IP connection (no need to power-cycle the AX3000).

A.10.2 - The 'Time to Live' Parameter

This parameter controls the 'to live' time of the datagram to prevent it being looped forever due to routing errors. Routers decrement the TTL of every datagram as it traverses from one network to another and when its value reaches 0 the packet is dropped.

This parameter doesn't impact the AX3000 performance.

Note: a new ttl value takes immediately effect.

A.10.3 - The 'TCP port Assignment' Parameter

The AX3000 resources (screen sessions and auxiliary ports) are identified by numeric values called TCP ports.

The TCP port assignment can be either random or fixed.

By default this is random which means the AX3000 TCP ports are different after every re-boot. On booting the AX3000 generates a new base value. This value (x) is between 1024 and 3072. The AX3000 resources are: session 1 = x, session 2 = x+1, ..., session 8 = x+7, port aux1 = x+8, port aux2 = x+9 and port parallel x+10.

The main benefit of this method is that if the AX3000 is suddenly powered off (power cut for example), at the next boot time, the connections are immediately accepted by the server. (i.e. the sessions are hooked on different sockets because the TCP ports are different). However this does create 'phantom' sessions, as the initial sessions are still active from the server's perspective, and must be killed by the server.

This can be done with the 'keepalive' process, manually killing or rebooting.

In some situations it may be beneficial to have always the same TCP port for an AX3000 resource (to avoid phantom sessions or to identify connections). This is the fixed port assignment. With this method the AX3000 resources are always: session 1 = 1024, session 2 = 1025, ..., session 8 = 1031, port aux1 = 1032, port aux2 = 1033 et port parallel 1034.

Note: changing this method takes effect at the next AX3000 boot time.

A.10.4 - The 'Nagle's Algorithm' Parameter

The Nagle's Algorithm controls behaviour of the output network dataflow of a TCP/IP device. This algorithm allows the number of datagrams sent by the AX3000 to decrease. However a certain latency may be noticeable due to the caching of data before transmission.

This algorithm is disabled to prioritise performance. However some operating systems require this function to be enabled.

Note: enabling/disabling this operating mode takes effect for the next TCP/IP connection (no need to power off the AX3000).

A.10.5 - The 'Telnet Break Code'

For the telnet session, the **<Ctrl><Alt><Pause>** hotkey sends a 'break' code to the host. This break code is defined by the RFC 854, this is 'IAC BREAK'.

If needed, this break code value can be modified. The extra values are:

- AO (Abort Output),
- IP (Interrupt process),
- none (<Ctrl><Alt><Pause> generates no code).

Note: a new break code value takes immediately effect.

A.10.6 - The 'IP Addr. Set by Ping' Parameter

This parameter allows or disables the AX3000 IP Address to be set by a ping command. (see Appendix A.7).

Note: a new value takes immediately effect.

A.10.7 - The 'Rejection Threshold' Parameter

Changing the value of this parameter (high → low) increases the AX3000 reception sensitivity. This allows the AX3000 to try to accept weak network signals (due to low quality wire, excessive length, etc).

In the event of erratic disconnections, this parameter can be modified (if too many incorrect frames are received, disconnections may occur). It is recommended that this parameter is modified with caution, as the more sensitive the AX3000 is to data reception, the more sensitive it is to external

interference. It is recommended to check cable.

Note: changing this parameter takes effect at the next AX3000 boot time.

A.10.8 - The 'Scan Frequency (800x600)' Parameter

Note: available only with a VNC or RDP AX3000.

This parameter allows the 800x600 VGA monitor frequency to be changed. (For 1024x768 the resolution is always 60 Hz.) Two frequencies are available: 60 Hz or 72 Hz.

By default, the frequency is 72 Hz. If this is not supported by the VGA monitor, set it to 60 Hz.

Note: the frequency modification takes immediately effect.

A.10.9 - The 'AUX1/AUX2 Frequency Tuning' Parameter

The base frequency (Baud rate) used for the transmission in all serial devices, (9600 bits per second, for instance) is set by a quartz crystal. If the reference frequency of the quartz crystal is incorrect the base frequency may differ from the nominal value. Communication fails if the difference between the AX3000 base frequency and the device base frequency is too large.

If this problem is suspected (the data transmitted or received on an auxiliary serial port is not correct whatever the baud rate or the cable length) try the alternative values of the auxiliary port frequency.

Note: the frequency modification takes immediately effect.

A.10.10 - The '2 stop bits on AUX1' Parameter

The AX3000 supports 1 or 2 stop bits for its AUX1 serial port to accommodate legacy peripherals.

By enabling this parameter the '2-stop-bit' format becomes available for the AUX1 port only and the 1-stop-bit format is disabled.

Note: this operating mode modification takes immediately effect.

A.10.11 - The 'Supplemental Signals to Handle' Parameter

The AX3000 checks the printer status by reading both the "Busy" and "Select-In" signals before printing.

The AX3000 will not transmit data for printing if the printer handles only the "Busy" signal,

This parameter determines whether the "Select-In" and/or "Paper Empty" signals will be selected in addition to the "Busy" signal (which is always used).

Note: the signal modification takes immediately effect.

A.10.12 - The 'Operating Mode' Parameter

Data is usually sent to the parallel port through a method based on 'interrupts'. This makes efficient use of the AX3000 CPU.

In event of problems (no printing or a very slow printing), it is possible to change this parallel port management and to send data by a 'polling' method. To enable this method, set the "Operating Mode" parameter to "Standard".

Note: the parallel port management modification takes immediately effect.

A.11 - DEFAULT FACTORY SET-UP AND QUICK SET-UP

Quick Set-Up allows an AX3000 to be rapidly updated for immediate use.

Two steps can be distinguished during the terminal reset:

- AX3000 default settings are loaded,
- the AX3000 settings are updated with the quick set-up information.

In the list below the parameters shown in **bold type** are issued from the quick set-up.

TCP/IP:

- Enable DHCP: **from the quick set-up**
- AX3000 IP Address: **from the quick set-up**
- AX3000 Net mask: **depends on the AX3000 IP address or from DHCP**
- host: **a single host from the quick set-up**
- Router: **from the quick set-up or from DHCP**
- DNS server: **server #1 from the quick set-up or servers #1 and #2 from DHCP**
- DNS search domain: **domain #1 from the quick set-up or from DHCP**
- Special parameters:
 - mss: 800 (4096 if VNC, RDP or I52)
 - window: 512 (1024 if VNC, RDP or I52)
 - ttl: 255
 - TCP port: random (pre-defined if I52)
 - noise: high
 - Nagle's algorithm: disabled (except if TWS)

Screen:

- Type: **given by an auto detection (colour or monochrome)**
- Enhanced screen mode: no
- Screen saver: no
- VGA frequency: standard

Keyboard:

- Type: **from the quick set-up**
- Nationality: **from the quick set-up**
- 'Num' led init: on
- 'Caps' led init: off
- Beep: short
- Repetition key delay: medium
- Repetition key speed: medium

Terminal:

- Number of session: **from the quick set-up**
- Number of page/session: 1
- Flip between session: <Alt><Fx>
- TCP/IP status line: no
- For each session:
 - Connection protocol: **from the quick set-up** (telnet, VNC or RDP)
 - host: **from the quick set-up**
 - TCP port: 23 (telnet), 5901 (VNC) or 3389 (RDP)
 - auto connection: no
 - auto reconnection: no
 - login script: no
 - Pre-defined configuration: **from the quick set-up**
 - General parameters: **from the pre-defined configuration**
 - TERM value: **from the pre-defined configuration**
 - Programmable keys: **from the pre-defined configuration**
 - colouring mode: no
 - session label: ' x ' (where x is the session number)

AUX1 Auxiliary Port:

- Operating mode: printer
- Speed: 9600
- Format: 8/1/none
- Handshake for transmission: XON/XOFF
- Handshake for reception: none
- Test device presence: no
- AUX frequency: standard
- 2 stop bits: no

AUX2 Auxiliary Port:

- Operating mode: **from the quick set-up** (mouse if VNC, otherwise printer)
- Speed: 9600
- Format: 8/1/none
- Handshake for transmission: XON/XOFF
- Handshake for reception: none
- Test device presence: no
- AUX frequency: standard

Parallel Auxiliary Ports:

- Supplemental signal: select

AUX1, AUX2 and parallel Auxiliary Ports:

- Net service: **from the quick set-up (optional: LPD or PRT5250 for one of the 3 ports)**
- LPD service settings:
 - Printer name: **from the quick set-up**
 - filter: no
 - auto form feed: no
- PRT5250 service settings:
 - host: **from the quick set-up**
 - TCP port: 23
 - TERM: IBM-3812-1
 - auto connection: yes
 - auto reconnection: yes
 - Printer name: **from the quick set-up**
 - Queue for Writer Messages: QSYSOPR
 - MSGQNAME Library: *LIBL
 - Font Identifier: 011
 - Manufacturer Type and Model: **from the quick set-up**
 - Paper Source 1: *MFRTYPMDL
 - Paper Source 2: *NONE
 - Envelope hopper: *NONE
 - ASCII 899 support: *NO
 - WSCST name: no value
 - WSCST library: no value

Other functions:

- operating mode: TCP/IP
- password: none

A.12 - HARDWARE AND FIRMWARE INFORMATION

To get the AX3000 firmware and hardware revisions, use one of the following:

- Enter the AX3000 interactive set-up, and select '?',
- Get the AX3000 set-up by issuing the **setup_get** remote command (the revision is included in the text file banner):
rsh axname setup_get > file
- Use the following **ax_version** remote command to get the revision directly:
rsh axname ax_version

A.12.1 - Hardware Information

The AX3000 hardware information is **FKx-BVyyy**:

- **FKx** is the electronic board code (FK stands for Flash Key)
- **BVyyy** is the boot code version (the boot code is the non-erasable part of the flash memory)

There are currently five different generations of hardware in the field:

- FK3: former production hardware of models 55, 55E and 56
- FK5: former production hardware of models 55, 55E and 56
- **FK11: current production hardware of models 55, 55E and 56**
- FK7: former production hardware of models 65
- FK13: former production hardware of models 65 and 65E
- **FK14: current production hardware of models 65 / 65E (PS/2 mouse)**
- **FK15: current production hardware of models 60 / 60E**

Note: the correct firmware file must be downloaded for your AX3000 hardware. Example: if FK3 firmware file is downloaded into FK5 hardware, the download process will fail.

A.12.2 - Firmware Information

The AX3000 firmware revision is composed of:

- a general firmware descriptor (until ':')
- available emulations (until '-')
- possible firmware options

Examples:

- TCP.FR.0210e:RDP&STD
- TCP.XX.0210e:I52&ANS!NFU
- TCP.XX.0210e:VNC&STD&QVT-SRI!DNS

a) General Firmware Information

The beginning of the firmware version is **FCT.NA.yywwi**:

- **FCT** is the AX3000 operating mode:
 - TCP stands for both TCP/IP and serial modes,
 - SER stands for serial mode.
- **NA** is the firmware nationality (code is ISO compliant). The main nationalities are:
 - XX: International (except for the following countries)
 - BR: Brazil
 - CZ: Czechoslovakia
 - EE: Estonia
 - FI: Finland
 - FR: France
 - GR: Greece
 - IS: Iceland
 - PT: Portugal
 - SI: Slovenia
 - TR: Turkey
- **yywwi** is the year and the week number of the firmware creation following by an alphabetical index (for instance: 0210a).

Note: three parameters depend on the firmware nationality:

- The set-up message nationality (FR: French messages, other: English messages),
- The possible presence of a national keyboard and associated character set. For instance, the Turkish environment (keyboards and character set) is only available with the 'TR' firmware.
- The default keyboard nationality (FR: France, XX: North American, TR: Turkey, etc).

b) Available Emulations

The emulations or protocols included in an AX3000 firmware are indicated by

the following options:

- RDP** graphics protocol for Windows (models 60, 60E, 65 and 65E)
- VNC** graphics protocol for Unix/Linux (models 65 and 65E)
- STD** stands for ANSI, VT2 and WYS
- I52** 3252 emulation
- I32** 3270 emulation
- ANS** ANSI-based emulations
- VT2** VT220 emulation
- WYS** Wyse 60/120 emulation
- V52** VT52 emulation
- HFT** HFT emulation
- ATO** ATO300 emulation
- SM9** SM9400/SM9412 emulation
- THE** Theos emulation
- QVT** QVT 119+ emulation
- TVI** TVI 910 emulation
- SLN** SLNET emulation
- TWS** Twin Server emulation
- I51** 3151 emulation
- R32** REAL32 emulation
- 332** C332 emulation

c) Possible Firmware Options

After the emulation specification, firmware option(s) can be met. A '-' is used as separator between supported emulation (see above) and these options. A '&' is used as separator between two options.

The main firmware options are:

- ENH** enhanced colouring mode
- SRI** login script
- PAL** private VGA palette for each text session
- BLW** legacy monitor modes (monochrome, grey-level, monochrome reverse)
- MSE** mouse support
- F24** 24-fctn-keys keyboard (implicit for I52)
- F20** 20-fctn-keys keyboard (available for VT2)
- 43L** 43-line mode support
- DNL** downloadable font support

- PFK** <F1> to <F4> remapped to the num pad (available for VT2 & WYS)
- HPV** specific value for <F1> to <F4> (available for VT2)
- AGA** alpha-graphics mode with ANSI emulations (models 65 and 65E)
- AGV** alpha-graphics mode with VT emulations (models 65 and 65E)
- AGW** alpha-graphics mode with WYSE emulations (models 65 and 65E)
- ALG** alpha-graphics mode (obsolete option)

d) Negative Firmware Options

When multiple-option firmware is requested, and due to memory reasons, some standard options have to be removed. Removed options are signified by a '!'. Possible options are:

- DHC** DHCP protocol (standard feature of models 55 and 55E)
- DNS** DNS and DHCP protocols (standard feature of models 60, 60E, 65 and 65E)
- NFU** no local windowing support and no continuous underline (standard features of the 5250 emulation)

PERSONAL NOTES

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