

# *SunLink X.25 8.0.2 PAD User's Guide*

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## *Preface*

---

This manual tells you how to use the `pad` program that is shipped with SunLink X.25. We presume you have some familiarity with the SunOS™ or Solaris™ environment—to the extent you are able to change directories and enter commands at a system prompt.

This document is *not* a configuration guide. Configuration instructions are contained in the *SunLink X.25 8.0.2 Configuration Guide*. This manual assumes that SunLink X.25 has already been configured according to the instructions.

Chapter 1, “Overview” presents an overview of the SunLink X.25 support for the PAD-related recommendations, X.3, X.28, and X.29.

Chapter 2, “Basic Use of the `pad` Program” describes the simplest use of the `pad` program. We expect that most users will need only the information in this chapter.

Chapter 3, “Advanced Use of the `pad` Program” covers the needs of those whose remote hosts and application require more than the simplest configuration.

Chapter 4, “Command Reference” provides an alphabetical list of all PAD commands with descriptions.

Appendix A, “The PAD (X.3) Parameter Set” provides a list of the PAD (X.3) parameters with their default values and valid ranges. Again, this material is primarily for reference.

---

The glossary lists terms and acronyms used in this manual, with their definitions.

## *Terminology Convention*

Networks that support the X.25 standard are known by many names and acronyms. This manual uses the term *Packet-Switched Data Network* (and the acronym, PSDN) to refer to any public or private packet-switching network that makes available X.25 services to its users.

## *Typographic Conventions*

We use the following typographic conventions:

`Typewriter font`

Represents what the system prints on your workstation screen and is used for program, script, and file names.

**Boldface typewriter font**

Indicates literal user input, typically commands and responses to prompts that you can type in exactly as printed in this manual.

**Boldface font**

Emphasizes information within the text.

*Italic font*

Indicates variables or parameters that you replace with an appropriate word or string. Also used for emphasis.

`hostname%`

Represents your system's prompt for a non-privileged user's account.

Boxes...

```
hostname% ls *.txt
answer.txt
```

...contain text that represents interactive sessions. User input is indicated by **boldface typewriter font**. Boxes can also contain text that represents part of a configuration file or program output.

---

## *Product Documentation*

The other documents in this SunLink X.25 document set are:

- *SunLink X.25 8.0.2 Programmer's Guide*  
*Part No.: 801-6287-11*
- *SunLink X.25 8.0.2 Reference Manual*  
*Part No.: 801-6285-11*
- *SunLink X.25 8.0.2 Configuration Guide*  
*Part No.: 801-6284-11*



# Overview

<i>The X.3, X.28, and X.29 Standards</i>	<i>page 1-2</i>
<i>Implementation of the PAD-related Standards</i>	<i>page 1-2</i>
<i>The pad Program and the PAD Daemon</i>	<i>page 1-3</i>

This chapter briefly describes the `pad` program that is shipped and automatically installed with SunLink X.25. The information in this chapter is background in nature; it is not required for the use of the program.

From a user's point of view, the `pad` program has two components:

- software that acts as a virtual terminal, from which you can connect to a PAD
- software that performs the function of a PAD

PAD stands for packet assembler/disassembler. A PAD is a translation device that assembles packets from the characters it receives from an asynchronous terminal (a character-mode DTE or DTE-C, in CCITT terms) and forwards those packets on a virtual circuit across a PSDN to a remote host. In the reverse direction, a PAD receives packets from the remote host, across a PSDN, and disassembles those packets into a character stream that can be read by a connected asynchronous terminal.

## 1.1 *The X.3, X.28, and X.29 Standards*

The X.3, X.28, and X.29 standards are the three CCITT recommendations that relate to the use of a PAD. These standards grew out of users' need to establish sessions between their asynchronous, character-oriented terminals and synchronous, packet-mode hosts, across a PSDN.

X.3 defines characteristics such as data rate, character echo, editing, and flow control of the PAD for a given DTE-C. The set of terminal characteristics controlled by a PAD are referred to as "The PAD Parameters." Appendix A, "The PAD (X.3) Parameter Set" lists these parameters.

X.28 specifies an exchange of commands and signals between the terminal and the PAD. Examples of this interaction are a user request for status on a virtual call (terminal-to-PAD) and indication of a connected call (PAD-to-terminal).

X.29 defines how the remote host and the PAD exchange and negotiate the settings of the PAD parameters to allow for communication between host and terminal. There are times when the host must tell the PAD how to operate with a particular application.

## 1.2 *Implementation of the PAD-related Standards*

SunLink X.25 implements the X.3, X.28, and X.29 standards in the following ways:

- The PAD software in SunLink X.25 enables a Sun™ workstation to act as a PAD, controlling the characteristics of the virtual terminal, which is created when you invoke the `pad` program. The PAD software supports all of the X.3 (PAD) parameters.
- The PAD software supports the three types of commands defined by X.28:
  - the PAD command signals (terminal user's instructions to the PAD)
  - PAD service signals (PAD's responses to command signals)
  - cleared virtual circuit indication signals (sent from the PAD to the terminal)
- The PAD daemon, documented in the *SunLink X.25 System Administrator's Guide*, implements the functions defined in X.29, enabling a Sun workstation, acting as a packet-mode host, to control the parameters of a remote PAD.

Figure 1-1 illustrates where the PAD-related standards come into play in a host-to-terminal communication.

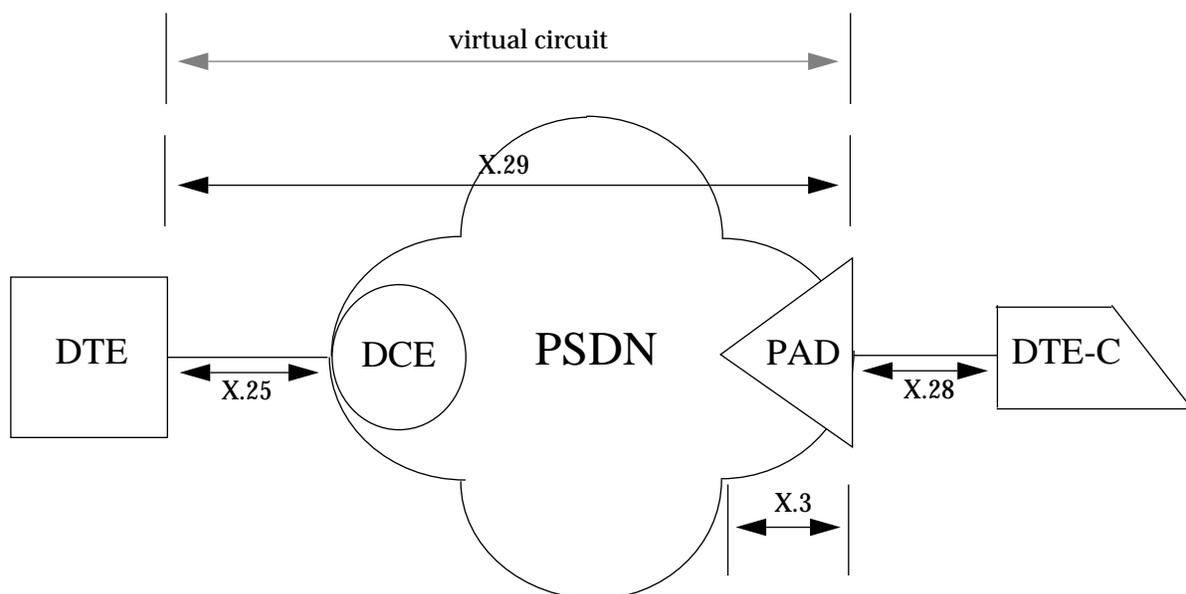


Figure 1-1 Role of X.3 (PAD), X.29, and X.28 in host-terminal interaction

### 1.3 The `pad` Program and the PAD Daemon

The SunLink X.25 `pad` program and PAD daemon are complementary halves of a complete terminal-to-host communication across a PSDN or LAN. These two functions are described as follows:

- The `pad` program allows Sun workstations to connect to a remote host (in CCITT terms, a packet-mode DTE ) across a PSDN or LAN. In this function, the Sun machine plays the role of a character-mode terminal (in CCITT terms, a DTE-C). In addition to providing a virtual terminal function, the software also functions as a PAD, which allows you to set the characteristics of your virtual terminal. The PAD software also can respond to the character-display requirements of applications running on the remote host.
- The PAD daemon allows a Sun workstation to act as a host to character-mode terminals (virtual or real) that are connected to the Sun machine across a PSDN. In its role as a packet-mode DTE, the Sun can respond to remote PADs and can have virtual terminal sessions with a variety of Sun and non-Sun machines. As a remote host, the PAD daemon can support applications running on the machine running X.25 or on other machines on the TCP/IP network.

Configuration of the PAD daemon is described in the *SunLink X.25 8.0.2 Configuration Guide*.

The value of the `pad` program and PAD daemon is multiplied by the fact that the SunLink X.25 machine, on top of which the programs run, is available to any workstation on the same TCP/IP internetwork, which has the following benefits:

- Using the `pad` program, any workstation user on the internetwork can `rlogin` to a machine running SunLink X.25 and then use `pad` on that machine to establish a virtual terminal session across a PSDN or LAN with a remote host.
- Using the PAD daemon, any device acting as a remote DTE-C can establish a terminal session with the SunLink X.25 machine. With this session established, the remote terminal user can use `rlogin`, `telnet`, or `dnalgin` to access a variety of Sun and non-Sun resources on the TCP/IP internetwork.

The `pad` program and PAD daemon support multiple, simultaneous virtual terminal sessions, in both PAD-to-host (PAD) and host-to-terminal (PAD daemon) directions.

## Basic Use of the `pad` Program

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<i>A First Step: Obtaining and Setting Terminal Type</i>	<i>page 2-2</i>
<i>Invoking the <code>pad</code> Program: the Simplest Case</i>	<i>page 2-3</i>
<i>Closing a Connection</i>	<i>page 2-4</i>

This chapter explains the simplest use of the `pad` program—where your system administrator has set up a PAD hosts database with appropriate profiles. In this case, to connect to a remote host you need only specify a hostname when using the `pad` command.

Chapter 3, “Advanced Use of the `pad` Program,” contains instructions for situations whenre you need to set parameters before connecting to the remote host.

We assume your system administrator has correctly installed and configured SunLink X.25, according to the procedures in the *SunLink X.25 8.0.2 Configuration Guide*. Also, your system administrator must start SunLink X.25 successfully on each link you intend to use before you invoke `pad`.

---

**Note** – The steps described here apply whether you are working locally or remotely.

---

## 2.1 A First Step: Obtaining and Setting Terminal Type

If the remote host to which you are connecting with `pad` requires that you set your terminal type after logging in to that host (this includes remote hosts running the Solaris environment), do the following:

1. Before invoking `pad`, enter the following command:

```
localhost% set | grep term
```

This command responds with output such as `term sun-cmd` or `term vt100`. The second word (`sun-cmd` or `vt100` in our examples) is the terminal type. Record this type so that you can enter it after you log in to the remote host.

2. Later, after you have used `pad` to connect to the remote host, enter the `set` and `tput` commands shown below to set the local terminal type on the remote host.

For example, if your local terminal type is `sun-cmd` and the remote host is a Sun running SunOS 5.x and using the Bourne shell, enter the following commands at the remote host's prompt:

```
remotehost% set TERM=sun-cmd
remotehost% export TERM
remotehost% /usr/bin/tput reset
```

If the remote host is running SunOS 4.x, use `tset` (with no arguments) rather than `tput`. If the remote host is not a Sun machine, check with the system administrator of the remote network to find out which command to use to set your terminal type.

The `set` command, as used above, sets the built-in shell variable `TERM` to your terminal type. The second command, `tput` (or `tset`), determines the type of terminal involved, then performs necessary initializations and mode settings. See the `tput` or `tset` man page if you are interested in the technical details.

## 2.2 Invoking the `pad` Program: the Simplest Case

The following instructions presume that your system administrator has set up a PAD hosts database for the user community. This hosts database includes appropriate PAD profiles for the hosts in the database. These instructions also presume that the PAD profile is correct for the application you will be using on the remote host.

**1. Obtain the name of the remote host to which you will be connecting from your system administrator.**

This name is the name of a host spelled exactly as the system administrator entered it in the PAD hosts database.

**2. Change directories to the location of the `pad` program:**

```
localhost% cd /opt/SUNWconn/bin
```

As a convenience to the user community, your system administrator should add the directory path where `pad` is stored to the `PATH` variable in your local environment. The *SunLink X.25 Installation Guide* has instructions for doing this.

**Note** - The directory `/opt/SUNWconn/bin` is the default directory where `pad` is stored. If your system administrator stored `pad` in a directory different from the default, specify that non-default directory.

In the following examples, we assume that `.` (a period, meaning the current working directory) is in your path.

### 3. Invoke `pad`, specifying the hostname obtained in Step 1.

```
localhost% pad hostname
```

An alternative to the command above is to invoke `pad` with no arguments, then specify the hostname, as follows:

```
localhost% pad
PAD: call chamrousse
Connecting...Connected
login:
```

If you are connecting to a machine running the Solaris environment, following entering your login and password, be sure to set your terminal type. Section 2.1, “A First Step: Obtaining and Setting Terminal Type” explains how to do this.

If you do not receive the `Connected` message, it indicates that something is incorrect with your PAD or X.25 configuration, or that the X.25 link to the remote host is not up.

## 2.3 Closing a Connection

To close the connection to the remote host and quit the `pad` program, do the following:

If you made the connection by entering `pad hostname` when you `logout`, you return to the system prompt. If you made the connection by entering a `call` command at the `PAD:` prompt, you return to `PAD:` prompt upon `logout`.

### 1. Log off the remote host.

```
remotehost% logout
User eve logged out at 1630 4 May 1994
PAD:
```

The `logout` command above is an example of a command used in a Solaris environment. Obtain from your system administrator the command you use for your particular remote host.

With some hosts this is sufficient to close the connection, while with others it is not. If your logging out closes the connection, skip the following step.

---

**2. Enter the `clear` command.**

```
PAD:clear
Connection closed
PAD:
```

**3. Enter the `quit` command.**

```
PAD:quit
localhost%
```

If you want to connect to a host rather than quitting the `pad` program, you can enter a `call` command as described in the previous subsection.



## Advanced Use of the `pad` Program



<i>A First Step: Obtaining and Setting Terminal Type</i>	<i>page 3-2</i>
<i>The <code>pad</code> Command and Call Modes</i>	<i>page 3-3</i>
<i>Specifying PAD Parameters</i>	<i>page 3-5</i>
<i>Specifying Echoing Mode</i>	<i>page 3-6</i>
<i>Viewing the PAD Hosts Database</i>	<i>page 3-7</i>
<i>Using <code>pad</code> to Connect to a Remote Host</i>	<i>page 3-8</i>
<i>Specifying Numeric Addresses</i>	<i>page 3-9</i>
<i>Closing a Connection</i>	<i>page 3-12</i>
<i>Example Session</i>	<i>page 3-13</i>

This chapter describe uses of the `pad` program that require you to specify one or more parameter values. If your system administrator has configured the `pad` program so that you need only connect and disconnect to the remote host, without setting any parameters in between, refer to Chapter 2, “Basic Use of the `pad` Program”. This chapter covers situations where you need to set parameters before connecting to the remote host.

This chapter assumes that SunLink X.25, has been installed and configured according to the procedures in the *SunLink X.25 8.0.2 Configuration Guide*, and that SunLink X.25 is running on each link you intend to use.

The steps described here apply alike whether you are sitting at your local machine entering commands or are logged in to a remote machine (via the SunOS `rlogin` command) that is running SunLink X.25.

---

**Note** – The examples in this chapter use the path `/opt/SUNWconn/bin` as the default directory where `pad` is stored. If your system administrator stored `pad` in a directory different from the default, specify that non-default directory. The examples also assume that `.` (a period, meaning the current working directory) is in your path.

---

This chapter concludes with an example `pad` session.

## 3.1 *A First Step: Obtaining and Setting Terminal Type*

If the remote host to which you are connecting with `pad` requires that you set your terminal type after logging in to that host (this includes remote hosts running the Solaris environment), do the following:

### 1. **Before invoking `pad`, enter the following command:**

```
localhost% set | grep term
```

This command responds with output such as `term sun-cmd` or `term vt100`. The second word (`sun-cmd` or `vt100` in our examples) is the terminal type. Record this type so that you can enter it after you log in to the remote host.

**2. Later, after you have used `pad` to connect to the remote host, enter the `set` and `tset` commands shown below to set the local terminal type on the remote host.**

For example, if your local terminal type is `sun-cmd` and the remote host is a Sun running SunOS 5.x and using the Bourne shell, enter the following commands at the remote host's prompt:

```
remotehost% set TERM=sun-cmd
remotehost% export TERM
remotehost% /usr/bin/tput reset
```

A technical aside: The steps shown above are required because the X.29 protocol—the protocol that operates between the PAD and the remote host—does not provide for the transferring of terminal type and the number of rows to the remote host.

If the remote host is running SunOS 4.x, use `tset` (with no arguments) rather than `tput`. If the remote host is not a Sun machine, you must obtain from the system administrator of the remote host a command to use to set your terminal type.

The `set` command, as used above, sets the built-in shell variable `TERM` to your terminal type. The second command, `tput` (or `tset`), determines the type of terminal involved, then performs necessary initializations and mode settings. See the `tput` or `tset` man page if you are interested in the technical details.

## 3.2 The `pad` Command and Call Modes

The `pad` program has two modes of operation:

- *call mode*: When you are in call mode, the characters you type are sent to the remote host. This is the mode you use to communicate with a remote application.
- *command mode*: When you are in command mode, the characters you type are sent to the `pad` program. In this mode, you enter commands to specify how the `pad` program will process (or not process) characters you enter in call mode.

From call mode, to enter command mode, you enter the key sequence: `Ctrl-p a`, that is, you press the `Ctrl` and `p` key simultaneously, then press `a`. This sequence is referred to as the break-in sequence, because the sequence enables you to interrupt (break in to) your session with a remote host to enter `pad`.

commands. (The `pad` program has a `breakin` command that allows you to change this sequence. Chapter 4, “Command Reference,” lists and describes the `pad` commands.)

From command mode, to enter call mode, you enter a `call` command with a valid hostname or address, then `login` to the remote host. If you are already in logged in to a remote host and use `Ctrl-p a` to go into command mode, to return to call mode, simply press `Return` on an empty line.

---

**Note** – Remember these two key sequences: `Ctrl-p a` to go into command mode, `Return` (on an empty line) to return to call mode from command mode.

---

If you invoke `pad` with no arguments, you go into command mode:.

As a convenience to the user community, your system administrator should add the directory path where `pad` is stored to the `PATH` variable in your local environment. The *SunLink X.25 Installation Guide* has instructions for doing this.

```
localhost% cd /opt/SUNWconn/bin
localhost% pad
PAD:      you're now in command mode
```

Then, after you enter a `call` command and have connected to a remote host, you go into call mode:.

```
PAD: call chamrousse
Connecting...Connected
login:      you're now in call mode
```

While in call mode, you can, at any time, enter the break-in sequence to go into command mode:

```
PAD: call chamrousse      you're now in command mode
Connecting...Connected
login: eve                you're now in call mode
Password: password not displayed
remotehost% myapp
<Ctrl-p><a>
PAD:                      you're now back in command mode
```

At the `PAD:` prompt you can enter any of a number of commands (such as `call` or `breakin`) that control the communication among your terminal, the PAD software that is part of SunLink X.25, and the remote host. Some of these commands are covered in the remaining subsections in this chapter. Chapter 4, “Command Reference,” covers the entire set of `pad` commands in reference fashion.

Once in command mode, to return to call mode, simply press Return on an empty line.

```
remotehost%
<Ctrl-p><a>
PAD: <Return>           you're now in command mode
remotehost%           you're now back in call mode
```

### 3.3 Specifying PAD Parameters

Remote hosts and applications require certain settings for the 22 PAD (X.3) parameters defined in the 1984 standard (Appendix A, “The PAD (X.3) Parameter Set,” presents a list with descriptions). For most of these parameters, the `pad` program has default settings that are appropriate for 80% or more of remote host connections. However, there are certain parameters for which the settings are unpredictable among different combinations of remote hosts and applications.

The SunLink X.25 configuration tool, `x25tool`, allows you to customize a set of PAD parameters for a specific host, so that that set will be in effect each time you connect to that host. See the chapter on PAD configuration in the *SunLink X.25 8.0.2 Configuration Guide* for instructions on how to do this.

You can modify parameter settings before or after making a connection to a remote host. An application on a remote host can change those settings to work properly with your terminal. On terminating, the application should return any changed parameters to their previous settings. If it does not, you might have to re-enter the `pad` commands you used prior to invoking the application.

You may need to set parameters determine how characters will be echoed to your terminal (PAD parameters 2, 4, 10, and 15). For character echoing, `pad` has the `message`, `transparent`, and `native` commands, corresponding to the three echoing modes supported. These commands are covered in detail in the following subsection.

## 3.4 Specifying Echoing Mode

The SunLink X.25 configuration tool, `x25tool`, allows you to set the echoing parameters for a specific host, so that those settings will be in effect each time you connect to that host. See the chapter on PAD configuration in the *SunLink X.25 8.0.2 Configuration Guide* for instructions on how to do this.

The term echoing refers to how the characters you type are displayed on your terminal. The `pad` program supports the following echoing modes:

### *message* (the default)

The PAD echoes characters you type and has complete control of your terminal. In *message* mode, the PAD collects everything you type on one line up until you press Return or enter an 81st character on a line. The PAD then sends the line to the remote host. This is the appropriate mode when you are interacting with a remote host at the operating system level. Because the PAD performs the echo and line-editing functions, *message* mode places the least burden on the remote host and on the network of the three echoing modes.

### *transparent*

The PAD echoes and allows editing of characters you type, but does not format output characters. Of the three echoing modes, this is the least commonly used.

### *native*

The remote host, rather than the PAD, echoes the characters you type. The host has total control of your terminal, including input editing and output format. This is the appropriate mode for use with many screen-oriented applications. Because the host, rather than the PAD, performs echoing and line-editing functions, *native* mode places the greatest burden on the remote host and on the network of the three echoing modes.

At the PAD: prompt, you set the echoing modes with `message`, `transparent`, and `native` commands. For example, assume that immediately after logging in to a remote host, an application that requires native mode be in effect. You enter the following:

```
localhost% cd /opt/SUNWconn/bin
localhost% pad givry
Calling...Connected
givry login: <your login>
Password: <password is not displayed>
givry%
<Ctrl-p><a>
PAD: native
PAD: <Return>
givry%
```

To return to message mode, you enter Ctrl-P a to go in to command mode, then invoke `message`:

```
<Ctrl-p><a>
PAD: message
PAD: <Return>
givry%
```

### 3.5 Viewing the PAD Hosts Database

The PAD hosts database is a list of remote hosts with their associated parameters that your system administrator creates with the SunLink X.25 configuration tool, `x25tool`. To view the list of hosts, you use the `hosts` command at the PAD: prompt. For example:

```
localhost% cd /opt/SUNWconn/bin
localhost% pad
PAD: hosts
```

The `pad` program responds:

```
HOSTS AVAILABLE
Name:  ecosais      Alias:             gns_gateway
Name:  chamrousse  Alias:             credit_france
Name:  rambo        Alias:             sales_us
```

Using `x25tool`, you can view the same list. See the chapter on PAD configuration in the *SunLink X.25 8.0.2 Configuration Guide* for instructions on how to do this. When you use `pad` to make a connection, you can specify either the name or alias for a remote host, exactly as displayed by the `hosts` command or in `x25tool`'s PAD Hosts Database window.

## 3.6 Using `pad` to Connect to a Remote Host

You can invoke `pad` in the following ways:

- with no arguments
- specifying a hostname or alias for a remote host
- specifying a numeric address of a remote host.

If you invoke `pad` with no arguments, you go into command mode, in which you can enter a `call` command, specifying either a hostname or alias, or a numeric address of a remote host. The numeric address can be an X.121 address or seven-byte MAC-plus-LSAP address (for example, a six-byte Ethernet address, plus the standard LSAP address, 7e). Section 3.7, "Specifying Numeric Addresses," presents the correct form of a numeric address.

The following is an example of invoking `pad` with no arguments, then specifying a hostname in a `call` command:

```
localhost% cd /opt/SUNWconn/bin
localhost% pad
PAD: call chamrousse
Connecting...Connected
login:
```

The following command is equivalent to the previous. Both commands presume your system administrator has entered a host (or an alias) named `chamrousse` in the PAD hosts database.

```
localhost% pad chamrousse
Connecting...Connected
login:
```

You can specify numeric addresses instead of hostnames or aliases. See the following subsection for the correct way to specify numeric addresses.

If you are connecting to a machine running the Solaris environment, enter your login and password, followed by your terminal type. Section 3.1, “A First Step: Obtaining and Setting Terminal Type” explains how to do this.

If you do not receive the `Connected` message, it indicates that something is incorrect with your PAD or X.25 configuration, or that the X.25 link to the remote host is not up.

### 3.7 Specifying Numeric Addresses

We recommend you use names rather than numeric addresses when you identify a remote host in a `pad` command line. Names are easier to remember than strings of digits and you are less likely to make an error when entering a name than when you are entering a number. That said, a numeric address is valid in a `pad` command line and as an argument to a `call` command that you enter at the `PAD:` prompt.

An address can be an X.121 address, if you are connecting to a PSDN, or a seven-byte MAC-plus-LSAP address, if you are using `pad` over a LAN.

The following example shows a call to a remote host over a PSDN:

```
localhost% cd /opt/SUNWconn/bin
localhost% pad
PAD: call 21521122334455
Connecting...Connected
login:
```

In technical terms, the Service Access Point (SAP) address, in combination with the six-byte MAC address, is the point at which the Link Service makes itself available to Link Service users (such as X.25). The SAP address of 7e is the standard value for use with X.25.

Note that, for the commands above, you can enter the numeric address on the pad command line, as in:

```
localhost% pad 21521122334455
Connecting...Connected
login:
```

The following example shows a call to a remote host over a LAN:

```
localhost% pad
PAD: call 0800200921867e
Connecting...Connected
login:
```

Note the standard LSAP address of 7e in the final byte in the preceding address.

### 3.7.1 Specifying Address Extensions

The pad command allows you to specify additional components of a numeric address, including an OSI NSAP address or a non-OSI address extension, and Call User Data.

To specify an address extension that is an OSI NSAP address, you enter a period following the host (X.121 or LAN) address and enter the NSAP address. For example:

```
localhost% cd /opt/SUNWconn/bin
localhost% pad
PAD: call 21521122334455.4910002233
Connecting...Connected
login:
```

You have the option of entering an N (uppercase only) and a period before the NSAP address, as in:

```
PAD: call 21521122334455.N.4910002233
```

The SunLink X.25 configuration tool, `x25tool`, allows you to specify an address extension for a specific host, so that that extension will be used each time you call that host. See the chapter on PAD configuration in the *SunLink X.25 8.0.2 Configuration Guide* for instructions on how to do this.

You can specify a non-OSI address extension by preceding the extension with a period, an X (again, uppercase only), and another period: `.X.` For example:

```
PAD: call 21521122334455.X.7777
```

Specify Call User Data by preceding the data with a tilde (`~`). For example:

```
PAD: call 21521122334455~carnation
```

When you specify Call User Data, the `pad` program automatically prepends the X.29 protocol identifier (01000000) to the data you specify.

You can also specify Call User Data in conjunction with an OSI or non-OSI address extension. For example:

```
PAD: call 21521122334455.N.4910002233~carnation
```

### 3.7.2 Specifying a Link Number

The SunLink X.25 configuration tool, `x25tool`, allows you to associate a link number with a specific host, so that that link will be used each time you call that host. See the chapter on PAD configuration in the *SunLink X.25 8.0.2 Configuration Guide* for instructions on how to do this.

A link is an association of a physical line, such as a serial cable or a phone line, and a hardware port on your machine. If you have multiple links and...

- you are using a numeric address rather than a name or alias
- and
- your system administrator has not set up the SunLink X.25 routing feature
- and
- you are calling over a link other than link 0...

...you must specify the link number when you specify the address. Link numbers start with 0 for the first link on a machine and increment for each additional link supported.

The following example shows a call to a remote DTE, over link 1:

```
localhost% pad
PAD: call 1.21521122334455
Connecting...Connected
login:
```

### 3.8 *Closing a Connection*

To close the connection to the remote host and quit the pad program, do the following:

**1. Log off the remote host.**

```
remotehost% logout
User eve logged out at 1630 4 May 1994
PAD:
```

The `logout` command above is an example of a command used in a Solaris environment. Obtain from your system administrator the command you use for your particular remote host.

With some hosts this is sufficient to close the connection, while with others it is not. If your logging out closes the connection, skip the following step.

**2. Enter the `clear` command. (This step is optional.)**

```
PAD:clear
Call Cleared
PAD:
```

**3. Enter the `quit` command.**

```
PAD:quit
localhost%
```

If you want to connect to a host rather than quitting the `pad` program, you can enter a `call` command as described in the previous subsection.

### 3.9 Example Session

The following is an example session of `pad` program use.

First, because our example remote host is running a Solaris environment, you determine the terminal type of your window or terminal:

```
localhost% set | grep term
sun-cmd
```

The string `sun-cmd` is the default terminal type for an OpenWindows shell or command tool. You will use this string later.

You invoke `pad` and specify a video, rather than a hardcopy, terminal:

```
localhost% cd /opt/SUNWconn/bin
localhost% pad
PAD: vdu                               you're now in command mode
PAD:
```

Note that this step is not necessary for many remote hosts.

You then view the list of hosts in the PAD hosts database:

```
PAD: hosts                               you're still in command mode
HOSTS AVAILABLE
Name:  ecosais      Alias:      gns_gateway
Name:  chamrousse  Alias:      credit_france
Name:  rambo        Alias:      sales_us
PAD:
```

From among the list of hosts, you choose to call the host `ecosais`:

```
PAD: call ecosais                         you're still in command mode
Connecting...Connected
login: eve                                 you're now in call mode
Password: password not displayed
remotehost%
```

Note that you could have specified `gns_gateway`, the alias for `ecossais`, instead of `ecossais`.

After logging in, you set the terminal type, using the string you obtained earlier:

```
remotehost% set term=sun-cmd
remotehost% tset
```

---

**Note** – The terminal type set with the `set term` command is unrelated to specifying whether the terminal is hardcopy or video with the `printer` and `vdu` commands.

---

At this point, you execute a number of commands at the system prompt. You are in the default echoing mode—`message`—which is the appropriate echoing mode for interacting with the operating system.

```
remotehost% cd /opt/applications
remotehost% enter operating system commands
```

You are now ready to invoke a full-screen-oriented application that needs full control over your terminal. You change echoing mode from `message` to `native`:

```
remotehost% <Ctrl-p><a> enter PAD command mode
PAD: native
PAD: <Return> resume call mode
remotehost% myapp
```

Many remote hosts and applications automatically change the echoing mode for you, so that the preceding step might not be necessary.

Upon completion of your work in the application, you are ready to return to the operating system level, so you resume message echoing mode:

```
<Ctrl-p><a>  
PAD: message  
PAD: <Return>           resume call mode  
remotehost%
```

You are now ready to close the connection with `ecossais`:

```
remotehost% logout  
User eve logged out at 1630 4 May 1994  
PAD:           you're now in command mode
```

Observe that logging out returns you to the PAD command mode. The `clear` command, shown below, is optional:

```
PAD: clear  
Call Cleared  
PAD:
```

With many hosts, logging out while in call mode is sufficient to close the connection.

At this point, you might exit the `pad` program (`quit` command), view hosts available in the hosts database (`hosts` command), or call another host (`call` command). For example:

```
PAD: call rambo  
Connecting...Connected  
login: eve  
Password: password not displayed  
remotehost%
```

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---

After you log off from the last host that you will use in the current `pad` session, you exit the `pad` program, as follows:

```
PAD:clear
Connection closed
PAD: quit
localhost%
```

## Command Reference

## 4

<i>PAD Commands</i>	<i>page 4-2</i>
<i>The call Command</i>	<i>page 4-9</i>
<i>Commands to Control Echoing Mode</i>	<i>page 4-12</i>
<i>Escape Sequences</i>	<i>page 4-14</i>

This chapter lists and describes all of the commands you can enter at the `PAD:` prompt. The `PAD:` prompt indicates you are in the `pad` program's command mode. You go into command mode by invoking `pad` from the system prompt with no arguments or by entering the key sequence `<Ctrl-P> <a>` from call mode. Section 3.2, "The `pad` Command and Call Modes" presents a complete explanation of the `pad` operational modes.

If you have access to OpenWindows, use `x25tool`, rather than the command-line interface described here. See the chapter on PAD configuration in the *SunLink X.25 8.0.2 Configuration Guide* for a description of the PAD configuration windows.

See Appendix A, "The PAD (X.3) Parameter Set" for a complete list of PAD parameters. There are 18 in the 1980 version of X.25 and 22 in the 1984/88 parameter set.

---

**Note** – With a properly configured PAD hosts database and a "well-behaved" remote host, you do not have to use any of the commands listed here, except perhaps `call`, the command you use to make a call, and `hosts`, which lists the contents of your hosts database. Your system administrator should read the *SunLink X.25 8.0.2 Configuration Guide* for instructions on setting up the PAD hosts database.

---

## 4.1 PAD Commands

The following is an alphabetical list, with syntax and descriptions, of PAD commands. The commands are listed here in lowercase. You can, however, enter the commands in lowercase or uppercase. Most commands can be abbreviated. Abbreviations are listed in parentheses immediately following the command name.

### **break (b)**

Sends a break signal to the currently connected remote host. The effect of the `break` command depends on the setting you make with the `breakaction` command.

### **breakaction (bra) <number>**

Determines the action taken if you invoke `break`. You normally do not have to invoke `breakaction` because the host usually sets the value it requires.

The argument `<number>` can be one of:

- 0 no action
- 1 send an interrupt packet
- 2 send a reset packet
- 5 (default) send an interrupt signal and an indication of break
- 8 exit call mode to command mode
- 21 send an interrupt signal and an indication of break, then discard output from the host

If you enter `breakaction` without an argument, it displays the current setting.

### **breakin <key sequence>**

Allows you to change the PAD break-in key sequence. The default is `<Ctrl-P>`. Normally, you do not need to change the break-in sequence.

### **call (c) <hostname> or <alias>**

**call (c)** { [`hostname` | `alias`] | `numeric address` } [`facilities`] [ [`G` | `B`] `<CUG>` ] [ `N` `<NUI>` ] [ `T` `<RPOA>` ]

Section 4.2, “The call Command,” covers this command in detail.

### **clear (clr)**

Closes the current connection. Not needed with remote hosts that close the connection when you log off.

**echo (e)** [ **on** | **off** ]

Toggles the PAD echo. The default is **on**, meaning the PAD echoes characters you type. If **echo** is **off**, the remote host must perform all echoing. If you enter **echo** with no arguments, it displays the current echo setting. Toggles the PAD echo. The default is **on**, meaning the PAD echoes characters you type. If **echo** is **off**, the remote host must perform all echoing. If you enter **echo** with no arguments, it displays the current echo setting.

**emask (em)** [ <*number*> ]

Allows you to select which characters are not echoed to the screen. The <*number*> is an echo mask value that corresponds to the following set of control characters:

*Table 4-1* Mask Values for `emask` Command

Mask value	Control characters affected
1	CR
2	LF
4	VT, HT, FF
8	BEL, BS
16	ESC, ENQ
32	ACK, NAK, STX, SOX, EOT, ETB, ETX
64	DEL, CAN, DC2
128	all other control characters

If you invoke `emask` with no arguments, it returns the current value of the echo mask. The default is 192 (128 + 64), which means that “all other control characters” and DEL, CAN, and DC2 are not echoed. Note that the editing characters DEL, CAN, and DC2 are not echoed, regardless of the echo mask setting.

As an example, specify that the PAD should not echo the BEL and BS characters, enter:

```
PAD: emask 8
```

To specify that the PAD should not echo the VT, HT, FF, and BEL characters, in addition to the BEL and BS characters, you add the mask values for the two sets of characters:

```
PAD: emask 12
```

**flow (f)** [ on | off ]

Enables or disables local flow control processing of XON and XOFF characters by the PAD. If you specify `flow on`, you can use the XOFF character, for example, `Ctrl-s` to halt output to the terminal and use the XON character, `Ctrl-q`, to restart it. If you specify `flow off`, you can use `Ctrl-S` and `Ctrl-Q` for other purposes. This might be required by certain applications, such as EMACS-type editors.

If you enter `flow` with no arguments, it returns the current state of the flow parameter. The default is `on`.

**forward (for)** [ <number> ]

Allows you to select a set of data-forwarding characters. Data-forwarding characters are characters that cause buffered characters to be sent to the remote host. The *number* is a value that corresponds to the following set of data-forwarding characters:

Table 4-2 Arguments for `forward` Command

Argument	Data-forwarding characters
1	alphanumeric characters
2	CR
4	ESC, BEL, ENQ, ACK
8	DEL, CAN, DC2
16	ETX, EOT
32	HT, LF, VT, FF
64	all other control characters not mentioned above except BS, XON, XOFF, DEL, CAN, DC2

If you do not specify an argument, `forward` displays the current setting. The default is 48 (16 + 32) so that ETX and EOT (16) and HT, LF, VT, and FF (32) are forwarding characters.

Add two or more numbers to enable a combination of sets of characters. For example, to forward on alphanumeric characters (1) and ESC, BEL, ENQ, and ACK (4), enter:

```
PAD: forward 5
```

**help (?)** [*<command>*]

Displays a list of PAD commands with a one-line summary of each. If specified with a command name as an argument, displays a one-line summary of that command.

**hosts (h)**

Displays a list of the hosts available in the PAD hosts database, as configured by your system administrator. For example:

```
PAD: hosts
HOSTS AVAILABLE
Name:  ecosais      Alias: gns_gateway
Name:  chamrousse  Alias: credit_france
Name:  rambo       Alias: sales_us
```

**int**

Transmits an interrupt packet to the remote host.

**lfinsert (lf)** [*<number>*]

Determines whether a linefeed (LF) is inserted after a carriage return (CR). The *<number>* is one or a combination of:

- 0 no LF insertion
- 1 add LF after CR in the data from the host
- 2 add LF after CR in the data to the host
- 4 add LF after CR echoed

The default value is 6. If you do not specify an argument, `lfinsert` displays the current setting.

Add two or more numbers to combine the conditions for LF insertion. For example, to set LF insertion after a CR in the data both to (2) and from (1) the host, you enter:

```
PAD: lfinsert 3
```

In native mode, the `lfinsert` setting has no effect unless echoing is on, in which case a setting of 4 is valid. (This is required because certain hosts operate in native mode, but leave local echo enabled.)

In transparent mode, a setting of 1 has no effect.

## **loghost (log)** [ on | off ]

Allows you to display all incoming and outgoing X.29 messages between the PAD and the remote host. A trained technical person might use this command for fault diagnosis. The messages displayed by the remote host have the syntax:

```
X29 TX|RX <code>: <param_num><param_value>...
```

TX indicates that the following data is for transmitted messages; RX indicates data for a received message. The `<code>` is an internal code useful to Sun support personnel. The pairing of `<param_num><param_value>` are PAD parameters and their currently assigned values. The parameter number and the setting are each expressed as two-digit values with a space between. For example:

```
X29 RX 4: 02 00 04 00 0F 00 reads parameters 2, 4, and 15
X29 RX 4: 02 01 04 01 0F 01 sets parameters 2, 4, and 15 to 1
```

There are also messages that begin: `X29 TX 0`. These are Parameter Indication messages, showing the current value of specified parameters.

## **message (mes)**

Section 4.3, “Commands to Control Echoing Mode” covers the `message` command in detail.

## **native (nat)**

Section 4.3, “Commands to Control Echoing Mode” covers the `native` command in detail.

## **pagewait (pw)** [ <number> ]

Allows you to make the display pause after `<number>` lines. To continue after a pause, press the space bar. All other characters, except the break-in key sequence (default: `<Ctrl-P><a>`), are ignored. The default `pagewait` value is 0, which means there is no pause: data that fills more rows than your window or terminal can hold, scrolls off the screen. If you invoke `pagewait` without an argument it returns the current `pagewait` setting.

**param (par)**

Displays the current values of all of the PAD (X.3) parameters in `<param_num>:<value>` pairs. Appendix A, “The PAD (X.3) Parameter Set” presents the list of PAD parameters and their possible values.

**par?** [ `<param_num>...` ]

Displays in `<param_num>:<value>` form the current values of the PAD (X.3) parameters you specify. If you specify multiple parameter numbers in a `par?` command line, separate the numbers with spaces or commas. If you do not specify any parameter numbers, `par?` responds as `param` does, that is, it displays all PAD parameters with their values. See Appendix A, “The PAD (X.3) Parameter Set,” for a list of PAD parameters supported by SunLink X.25.

---

**Note** – If you try to check or set a PAD parameter on a host that does not support the parameter, `param (par)` returns `INV`, indicating the parameter is invalid on that host. This can occur on hosts running versions of X.25 earlier than 1984, for example, 7.0 SunNet X.25. These implementations do not support PAD parameters 19-22.

---

**printer (prt)**

Notifies the PAD that you are using a hardcopy, rather than a video, terminal. The `printer` and `vdu` command set PAD parameter 19. Use the command: `par? 19` to view the current value. Where parameter 19 is supported, a return of `19:1` indicates a hardcopy terminal; `19:2` indicates a video terminal.

**profile (prof)** [ `<profile_name>` ]

Selects a set of options that are pre-defined as a profile. A profile contains default values for some or all of the PAD (X.3) parameters. The `<profile_name>` specifies the profile that the `profile` command puts into effect. Your system administrator can define a set of profiles appropriate for your needs.

The `pad` program is shipped with a number of profiles, including the CCITT simple and transparent profiles and the V1 through V5 profiles used with the GNS network in the United Kingdom. If you invoke `profile` with no arguments, it displays the current profile, which might be one created by your system administrator and identified by a hostname or might be one of the profiles supplied with the product.

**quit (q)**

Closes the connection to the remote host, exits the `pad` program, and returns you to the system prompt.

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### **reset (rst)**

Causes the PAD to send a Reset Request to the currently connected host.

**set** <param\_num>:<value>[,<param\_num>:<value>...]

Sets one or more PAD (X.3) parameter values. Specify the parameter number followed by a colon and a parameter setting. Separate multiple parameters by commas or spaces. For example:

```
PAD: set 2:1, 10:72, 13:4
```

If you specify a parameter number without a value or specify an invalid value, set returns a message telling you that the value is invalid and the parameter remains unchanged.

### **status (stat) [ all ]**

Displays the status of the connection (Call or Command) and the name of the host to which you are connected. For example:

```
PAD: status
Call Status: Call Connected Host: ecossais
PAD:
```

If you enter the all option, status returns further information:

```
PAD: status all
Echo = ON, Echomask = 192, Flow = ON, Lfinsert = 6, Breakaction = 5
Pagewait - 0, Width = 80, Forward = 48, Timeout = 0
Message Mode Profile = V3, Vdu, Loghost = OFF

Call Status: Call Connected Host: ecossais
PAD:
```

### **transparent**

Section 4.3, “Commands to Control Echoing Mode” covers the transparent command in detail.

**vdu**

Notifies the PAD that you are using a video, rather than a hardcopy, terminal. The `vdu` and `printer` command set PAD parameter 19. Use the command: `par? 19` to view the current value. A return of `19:1` indicates a hardcopy terminal; `19:2` indicates a video terminal.

**width (wid)** [*<number>*]

Defines the width, in columns, of the terminal or window used by the `pad` program. On output, `pad` inserts a newline when the specified width is reached. The valid range for width is 20-255. The default width is 80. If you do not specify an argument, `width` returns the current setting.

## 4.2 The `call` Command

The `call` command has the largest number of parameters and is the most complex of the PAD commands.

**call (c)** *<hostname>* or *<alias>*

**call (c)** { [*hostname* | *alias*] | *numeric address* } [*facilities*] [[*G* | *B*] *<CUG>*] [*N* *<NUI>*] [*T* *<RPOA>*]

The SunLink X.25 configuration tool, `x25tool`, allows you to specify the various arguments to the `call` command for a specific host so that those arguments will be in effect each time you connect to that host. See the chapter on PAD configuration in the *SunLink X.25 8.0.2 Configuration Guide* for instructions on how to do this.

The first form shown above presumes that your system administrator has entered any special parameter settings required by the remote host in the PAD hosts database.

Arguments for the second form of the `call` command are:

*hostname / alias*

A name as entered in PAD hosts database by your system administrator. Normally, you specify only a hostname or alias and no other parameters, as the `pad` program uses the settings associated with the named host in the PAD hosts database. If you enter parameter settings beyond the hostname or alias, the `pad` program uses those settings to override the settings in the PAD hosts database.

*numeric address*

An X.121 address of 15 or fewer decimal digits, if you are connecting to a PSDN, or a seven-byte LAN address (14 hexadecimal digits), if you are using `pad` over a LAN. A LAN address consists of a six-byte MAC address plus a one-byte Link Service Access Point (LSAP) address.

The `call` command allows you to specify additional components of a numeric address, including an OSI NSAP address or a non-OSI address extension, and Call User Data.

To specify an address extension that is an OSI NSAP address, you enter a period following the host (X.121 or LAN) address and enter the NSAP address. The NSAP address is 40 or fewer hexadecimal digits. You have the option of entering an *N* and a period before the NSAP address.

You can specify a non-OSI address extension by preceding the extension with a period, an *X*, and another period: *.X.*

Specify Call User Data by preceding the data with a tilde (~). You can enter up to 124 ASCII characters. When you specify Call User Data, the *pad* program automatically prepends the X.29 protocol identifier (01000000) to the data you specify. You can specify Call User Data in conjunction with an OSI or non-OSI address extension.

If you have multiple links, precede the numeric address you enter with a link number and a period. If you do not specify the link you want, the routing algorithm tries to work it out for you. If it cannot, the lowest numbered link is used, unless this is a LAN link. In this case, the call fails.

The following are examples of valid numeric addresses:

PAD: <b>call 0800200921867e</b>	<i>a LAN (LSAP) address</i>
PAD: <b>call 21521122334455.4910002233</b>	<i>an X.121 address with an NSAP address</i>
PAD: <b>call 21521122334455.N.4910002233</b>	<i>same as preceding with use of <i>N</i> identifier</i>
PAD: <b>call 0800200921867e.4910002233</b>	<i>a LAN address with an NSAP address</i>
PAD: <b>call 21521122334455.X.7777</b>	<i>an X.121 address with a non-OSI address extension</i>
PAD: <b>call 21521122334455~carnation</b>	<i>an X.121 address with Call User Data</i>
PAD: <b>call 21521122334455.N.4910002233~carnation</b>	<i>an X.121 address with an NSAP address and Call User Data</i>
PAD: <b>call 0800200921867e.N.4910002233~carnation</b>	<i>a LAN address with an NSAP address and Call User Data</i>
PAD: <b>call 1.21521122334455.N.4910002233</b>	<i>call over link 1 (presumes you have multiple links)</i>

*facilities*

A string indicating:

- incoming and outgoing packet sizes (syntax: *p* <num>/<num>)
- incoming and outgoing window sizes (syntax: *w* <num>/<num>)
- Fast Select (syntax: *f*)
- reverse charge (syntax: *r*)

The numbers you specify with *p* (packet size) are powers of two; for example, *p7/7* means 2<sup>7</sup>, or 128, for incoming and outgoing packets.

The following is an example in which you specify packet sizes of 256, window sizes of 2, with Fast Select and reverse charging in effect:

```
PAD: call 21521122334455 p8/8w2/2fr
Connecting...Connected
login:
```

#### [G|B]<CUG>

A number of four decimal digits or fewer, designating a Closed User Group (CUG). This number is preceded by a G, to specify a multi-user CUG, or a B, to specify a bilateral CUG. A bilateral CUG has only two members. In the following example, you specify a multi-user CUG of 1234:

```
PAD: call 21521122334455 G1234
Connecting...Connected
login:
```

#### N<NUI>

A string of up to 64 alphanumeric characters, preceded by an N, used to designate a Network User Identifier (NUI). A PSDN uses the NUI to identify your call for security or billing purposes. In the following example, you specify an NUI of abcd789:

```
PAD: call 21521122334455 Nabcd789
Connecting...Connected
login:
```

#### T<RPOA>

Up to four, four-digit numbers designating one or more Recognized Private Operating Agencies (RPOAs). These numbers are preceded by a T. There are no spaces between multiple RPOA numbers. The network uses RPOA numbers to assist in routing your call. In the following example, you specify two RPOA numbers, 2222 and 5555:

```
PAD: call 21521122334455 T22225555
Connecting...Connected
login:
```

In the following example, you specify:

- an RPOA number of 2222 (T2222, below)
- a bilateral CUG (B1234, below)
- packet sizes of 260 ( $2^8 + 4$ ) and window sizes of 2 (p8/8w2/2, below)

```
PAD: call 21521122334455 B1234 p8/8w2/2 T2222
Connecting...Connected
login:
```

## 4.3 Commands to Control Echoing Mode

The pad program has the *message*, *transparent*, and *native* commands, corresponding to the echoing modes supported by the program:

### *message* (the default)

The PAD echoes characters you type and has complete control of your terminal. In message mode, the PAD collects everything you type on one line up until you press Return or enter an 81st character on a line. The PAD then sends the line to the remote host. This is the appropriate mode when you are interacting with a remote host at the operating system level. Because the PAD performs the echo and line-editing functions, message mode places the least burden on the remote host and on the network of the three echoing modes.

### *transparent*

The PAD echoes and allows editing of characters you type, but does not format output characters. Of the three echoing modes, this is the least commonly used.

### *native*

The remote host, rather than the PAD, echoes the characters you type. The host has total control of your terminal, including input editing and output format. This is the appropriate mode for use with many screen-oriented applications. Because the host, rather than the PAD, performs echoing and line-editing functions, native mode places the greatest burden on the remote host and on the network of the three echoing modes.

At the PAD: prompt, you set the echoing modes with `message`, `transparent`, and `native` commands. For example, the following `native` command:

```
remotehost% <Ctrl-P><a>
PAD: native
PAD: <Return>
remotehost%
```

puts your PAD software in native mode. To return to message mode, you enter the break-in sequence, `<Ctrl-P><a>`, then, at the PAD: prompt enter `message`. For example:

```
remotehost% <Ctrl-P><a>
PAD: message
PAD: <Return>
remotehost%
```

Setting the echoing mode affects the values of the PAD parameters shown in Table 4-3.

*Table 4-3* PAD Parameters Affected by Mode Type Setting

Parameter Name	Parameter Number	Echoing Mode		
		Message	Native	Transparent
Echo	2	1	0	1
Data Forwarding Timeout	4	0	1	0
Line Folding Width	10	80	0	0
Local Editing	15	1	0	1

## 4.4 *Escape Sequences*

An escape sequence consists of pressing the current break-in character (the default is `Ctrl-P`), followed by one of the following characters:

*Table 4-4* Escape Sequences

<b>Ctrl-P &lt;letter&gt;, where &lt;letter&gt; is:</b>	<b>Effect of Escape Sequence</b>
a	Enter PAD command mode
b	Send break signal to currently connected host
e	Reverse the current echo state, until you type Return
r	Reset the current call
t	Forward the currently buffered line
<character>	Insert <character> into the buffer (used mainly for control characters DLE, DC2, and CAN)

## The PAD (X.3) Parameter Set



The material in this appendix is for reference purposes only.

Recommendation X.3 defines the PAD operating characteristics for asynchronous DTEs, such as operating speed, character echoing, editing, and flow control. The parameters defined in X.3 are commonly referred to as the PAD parameters. SunLink X.25 supports all of the 22 PAD parameters listed in the 1984 and 1988 X.3 Recommendations.

**Note** – The PAD function implemented in SunLink X.25 does not support the full range of possible values for all PAD parameters, as many values are not relevant for host-based PAD programs. These parameters, and the actual values supported by the product are listed below. These restrictions apply to *incoming* calls only. You can set the PAD to use other parameters in *outgoing* calls.

Table A-1 SunLink X.25 Exceptions to PAD Parameters

Parameter No.	Range Supported
1	1
6	1
8	0
9	0
10	20-255

*Table A-1 SunLink X.25 Exceptions to PAD Parameters*

Parameter No.	Range Supported
11	Read-only
14	0
15	1
19	1-2
21	0

Table A-2 presents the X.3 parameter set. An asterisk indicates the default value where applicable.

The full set of possible values is given for all parameters, including those listed in Table A-1, above, as you can request other values in outgoing calls.

*Table A-2 PAD Parameters*

Parameter	Name	Description
1	Escape from data transfer state	Specifies whether you can escape the data transfer state to go into PAD command mode and, if so, which character is used as an escape character. Selectable values: 0 no escape 1 escape permitted with DLE 32-126 escape permitted with user-specified character (decimal value corresponding to character from character set in Recommendation T.50)
2	Echo	Controls whether typed characters are echoed to standard output. The selection of characters to be echoed depends on the value of parameter 20. 0 no echo 1 echo is on
3	Data forwarding character	Specifies the character(s) on receipt of which the PAD forwards typed characters to the remote host. The value of parameter 3 is one of or a sum of some set of the following numbers: 0 no forwarding character (forward only on full packet) 1 alphanumeric characters (a-z, A-Z, 0-9) 2 CR 4 ESC, BEL, ENQ, ACK 8 DEL, CAN, DC2 16 ETX, EOT

Table A-2 PAD Parameters

Parameter	Name	Description
3	Data forwarding character (ctd.)	<p>32 HT, LF, VT, FF</p> <p>64 all characters in the range 0x0 to 0x31 not included above</p> <p>To allow combinations of characters, add the values for characters. For example, to forward data on linefeeds (LF), Ctrl-C (ETX), or carriage returns (CR), set parameter 3 to 32 + 16 + 2; that is, 50.</p>
4	Idle timer delay	<p>Controls the delay before the PAD forwards typed characters to the remote host. Note that the effect of the idle timer might be subject to flow control constraints. In the following list, non-zero values represent twentieths (.05) of a second. In other words, a value of 10 represents 10 * .05, or .5 seconds.</p> <p>0 No data forwarding timeout. The PAD forwards characters only under the conditions specified by parameter 3.</p> <p>1-255 number of .05 seconds units to wait before forwarding data</p>
5	PAD's flow control of user's terminal	<p>Determines whether PAD is allowed to control the flow of incoming (PAD-to-terminal) data. If allowed PAD controls flow with XON (DC1) and XOFF (DC3).</p> <p>0 no flow control</p> <p>1 flow control allowed for data transfer</p> <p>2 flow control allowed for data transfer and command</p>
6	Control of PAD service and command signals	<p>Controls the format, written language, and other aspects of PAD service signals. You can combine values from the following list to represent a combination of functions.</p> <p>0 no service signals transmitted to terminal</p> <p>1 service signals other than the "prompt PAD service signal" are transmitted in the standard format</p> <p>4 "prompt PAD service signal" is transmitted in the standard format</p> <p>8-15 service signals are transmitted in a network-dependent format</p> <p>16 extended dialogue mode handling with service signals in English</p> <p>32 extended dialogue mode handling with service signals in French</p> <p>48 extended dialogue mode handling with service signals in Spanish</p>
7	PAD's action on receipt of break signal	<p>Specifies action PAD takes then you type the break character (default: Ctrl-C). You can combine values from the following list to represent a combination of functions.</p> <p>0 do nothing</p> <p>1 send interrupt packet to remote host</p> <p>2 send reset packet to remote host</p> <p>5 send an indication-of-break PAD message to remote host</p> <p>8 escape from data transfer state to PAD command mode</p> <p>16 discard output to your terminal</p>

*Table A-2 PAD Parameters*

Parameter	Name	Description
8	Suppression of data output to your terminal	Determines whether data received from the remote host should be delivered to your terminal. The default is 0 (suppression off). Sending or receiving a reset packet has the effect of setting parameter 8 to 0. 0 normal delivery of data from PAD to terminal 1 discard output to terminal
9	Padding characters after CR	Specifies the number of padding characters the PAD generates after it transmits a carriage return to your terminal. 0 no padding after CR (however PAD service signals will contain a number of padding characters proportionate to data rate of your terminal) 1-255 number of padding characters
10	Line folding	Specifies the number of characters the PAD accepts before it prints a CR or LF on your terminal. 0 no line folding 1-255 number of characters PAD displays before inserting CR or LF
11	Line speed	Specifies the bit transmission rate of your terminal. Neither the remote host nor your terminal can change the setting of this parameter. The read-only characteristic of this parameter allows the remote host to obtain a setting of your terminal from the PAD. 0 110 bps 1 134.5 bps 2 300 bps 3 1200 bps 4 400 bps 5 75 bps 6 150 bps 7 1800 bps 8 200 bps 9 900 bps 10 50 bps 11 75/1200 bps 12 2400 bps 13 4800 bps 14 9600 bps 15 19200 bps 16 48000 bps 17 56000 bps 18 64000 bps

Table A-2 PAD Parameters

Parameter	Name	Description
12	Flow control of PAD by your terminal	Determines whether you can transmit XON (DC1) and XOFF (DC2) to the PAD to start and stop the flow of characters from the PAD to your terminal. 0           disable flow control 1           enable flow control
13	LF insertion following carriage return	Controls LF insertion under the conditions listed below. Note that this setting applies only to the data transfer state. You can combine the values in the following list to cover combinations of conditions: 0           no LF insertion 1           insert LF after each CR in the PAD-to-terminal direction 2           insert LF after each CR in the terminal-to-PAD direction 3           insert LF after each CR in the echoed data in the PAD-to-terminal direction
14	Padding after LF	Determines number of padding characters the PAD generates after the PAD transmits an LF to your terminal during the data transfer state. 0           no padding after LF 1-255      number of padding characters PAD transmits to your terminal
15	Editing	Determines whether you can edit characters you enter at your terminal when you are in the data transfer state. When this parameter is set to 1, the PAD does not forward data upon the expiration of the idle timer (parameter 4) or when it has a full packet. In the latter case, the PAD waits until the editing buffer is full. While parameter 15 being on suspends the effect of parameter 4, the parameter 4 setting remains unchanged. 0           no editing 1           editing enabled
16	Character delete	Specifies the character used as the character-delete character. The value for this parameter is a decimal number in the range 0-127. The delete character is the character corresponding to this value in the character set defined in Recommendation T.50. 0           no delete-character character 1-127      number corresponding to character in Recommendation T.50
17	Line (buffer) delete	Specifies the character used as the delete-line character. The value for this parameter is a decimal number in the range 0-127. The delete-line character is the character corresponding to this value in the character set defined in Recommendation T.50. 0           no delete-line character 1-127      number corresponding to character in Recommendation T.50

Table A-2 PAD Parameters

Parameter	Name	Description
18	Line (buffer) display character	<p>Specifies the character used as the line-display character. The value for this parameter is a decimal number in the range 0-127. The line-display character is the character corresponding to this value in the character set defined in Recommendation T.50.</p> <p>0           no line-display character 1-127       number corresponding to character in Recommendation T.50</p>
19	Editing PAD service signals	<p>Determines whether editing of PAD service signals is enabled. This parameter does not apply if parameter 6 (control of PAD service and command signals) is set to 0 (which means that the PAD does not transmit service signals to the terminal).</p> <p>0           no editing of service signals 1           editing enabled for hardcopy terminals 2           editing enabled for display terminals 8 &amp; 32-126 editing service signals using one character from the range of IA5</p>
20	Echo mask	<p>Specifies which characters are not echoed by the PAD. Parameter 20 applies only if parameter 2 (echo) is turned on. If parameters 5 (PAD flow control of user's terminal), 12 (user's terminal flow control of PAD), or 22 (page wait after <i>n</i> LFs from PAD to terminal) are non-zero, then XON and XOFF are not echoed. The character specified in parameter 1 (escape from data transfer) is not echoed, regardless of the setting of parameter 20. You can combine values from the following list to represent a combination of characters not to be echoed.</p> <p>0           no echo mask (all characters echoed) 1           no echo of CR 2           no echo of LF 4           no echo of VT, HT, FF 8           no echo of BEL, BS 16          no echo of ESC, ENQ 32          no echo of ACK, NAK, STX, SOH, EOT, ETB, ETX 64          no echo of editing characters as designated by parameters 16, 17, and 18 (does not apply if parameters 16, 17, and 18 are set to 0) 128        no echo of all characters in columns 0 and 1 of IA5 (including those listed above) and the character DEL</p>
21	Parity treatment	<p>You can combine 1 and 2 from the following list to specify parity checking <i>and</i> generation.</p> <p>0           no parity checking or generation 1           enable parity checking 2           enable parity generation</p>

---

*Table A-2* PAD Parameters

<b>Parameter</b>	<b>Name</b>	<b>Description</b>
22	Page wait	Specifies the number of LFs the PAD sends to your terminal before PAD puts page wait condition in effect. 0           page wait disabled 1-255       number of linefeed characters sent by PAD



# Glossary

---



## **CCITT**

See **Comité Consultatif International Télégraphique et Téléphonique**.

## **connectionless**

A model of interconnection in which end-to-end communication takes place without first establishing a connection. This model is used in TCP/IP-based Ethernet and FDDI LANs.

## **connection-oriented**

A model of interconnection in which end-to-end communication proceeds through three well-defined phases: connection establishment, data transfer, and connection release. Communication based on the X.25 recommendation is connection-oriented (as distinguished from connectionless), as is ordinary voice telephone service.

## **Comité Consultatif International Télégraphique et Téléphonique (CCITT)**

An international organization of communication carriers, most of which are government telephone and telegraph agencies. The CCITT develops telecommunication standards through the use of their recommendations. The X.25, X.3, and X.29 standards originated as CCITT recommendations.

## **Closed User Group (CUG)**

A PSDN-provided service that permits the DTEs belonging to the group to communicate with each other, but precludes communication with other DTEs. A single DTE can belong to multiple CUGs. The PSDN, not the caller or called parties, enforces the limitation inherent in a CUG.



---

**CUG**

See **Closed User Group**.

**Data Circuit-terminating Equipment (DCE)**

The network side of the user-to-network interface. Commonly corresponds to a modem or other device used to connect to a PSDN.

**Data Network Identification Code (DNIC)**

A four-digit number that identifies a specific PSDN . The DNIC is the first component of a complete X.121 address and is comparable to the exchange portion of a telephone number used for switched telephone service. In a DNIC, the first three digits make up a data country code, which identify a country, while the remaining digit can be used to distinguish up to 10 different networks within the specified country.

**DCE**

See **Data Circuit-terminating Equipment**.

**DNIC**

See **Data Network Identification Code**.

**DTE**

See **Data Terminal Equipment**.

**Data Terminal Equipment (DTE)**

The device at the user's side of a user-to-network interface. This might be a computer system (packet-mode DTE) or a character-mode terminal (DTE-C), and is both a source and destination for data.

**DTE-C**

See **Data Terminal Equipment-Character Mode**.

**Data Terminal Equipment-Character Mode (DTE-C)**

A character-mode (asynchronous) terminal that uses a PAD to connect to a remote host across a PSDN. Part of the SunLink X.25 software plays the role of a DTE-C when you use the PAD application that is shipped with the product.

**LAN**

See **Local Area Network**.

**LAPB**

See **Link Access Protocol Balanced**.



---

**Link Access Protocol Balanced**

A Data Link layer protocol implemented for X.25, for serial point-to-point connections. ISO 7776 specifies the LAPB protocol as used by X.25.

**LLC2**

See **Logical Link Control**.

**Local Area Network (LAN)**

A data communications network the extent of which is limited (approximately) to a building or a campus. Examples of LAN technologies are Ethernet and FDDI.

**Logical Link Control (LLC)**

The upper, medium-independent half of the Data Link layer, as that layer is specified for a LAN. (The lower half is the MAC layer.) There are two types of LLC protocols in common usage, LLC Type 1 (or LLC1), which provides a connectionless service, and LLC Type 2 (or LLC2), which provides a connection-oriented service. LLC2 is used for X.25 on a LAN.

**LSAP address**

Identifies the point at which the Link Service makes itself available to clients. Consists of a MAC address and a SAP address. As an LLC2 client, X.25 uses the LSAP address to access LLC2.

**MAC address**

Uniquely identifies a station at the Physical layer, such as a host on an Ethernet network or a station on an FDDI ring. In these two examples, a MAC address is a six-byte address.

**NTN**

See **Network Terminal Number**.

**Network Terminal Number (NTN)**

The component of a complete X.121 address that identifies a specific DTE .

**packet**

A sequence of bits representing data and associated control information. Is self-contained in that it has routing and packet-sequence information. Commonly used to refer to the structure and format defined by the X.25 recommendation.



---

**packet switching**

A data transmission technique in which user information is broken up into discrete, self-contained units called packets. Packet switching has two distinctive characteristics: 1) it allows a communication channel to be shared by many users, each using the circuit only for the time required to transmit a single packet and 2) it allows for the individuals packets that make up a message to be routed over the optimal path of a given moment. See **packet**.

**Packet Assembler/Disassembler (PAD)**

A device that resides between one or more character-mode devices, such as asynchronous terminals (or terminal emulation software), and a PSDN. On the terminal side, the PAD accepts asynchronous characters, assembles packets from these characters, and forwards the packets to the PSDN. On the PSDN side, the PAD accepts packets, disassembles the packets into asynchronous characters, and forwards the characters to the terminal(s).

**Packet-Switched Data Network (PSDN)**

A more general term than **Public Data Network**, refers to any public or private packet-switching network that provides X.25-compliant interfaces to its users.

**PAD**

See **Packet Assembler/Disassembler**.

**PDN**

See **Public Data Network**.

**permanent virtual circuit**

A permanent, logical association between two physically separate DTEs that does not require call set-up or clearing procedures. Analogous to a leased line in a circuit-switched telephone network.

**PSDN**

See **Packet-Switched Data Network**.

**Public Data Network (PDN)**

A data communications network whose services are available to any user willing to pay for them. Tymnet and Telnet are examples of PDNs in the United States; the public telephone and telegraph agencies of European and Asian nations are also examples of PDNs. SunLink X.25 product documentation usually uses the term "Packet-Switched Data Networks" in preference to "Public Data Network", as the former is more general than the latter.



---

**PVC**

See **permanent virtual circuit**.

**Recognized Private Operating Agency**

An X.25 user facility that provides for user specification of a particular RPOA transit network through which a call is to be routed internationally when more than one RPOA transit network exists at an international gateway.

**RPOA**

See **Recognized Private Operating Agency**.

**subaddress**

An optional component of an X.121 address that identifies a specific application on a DTE.

**SVC**

See **switched virtual circuit**.

**switched virtual circuit**

A temporary logical association between two physically separate DTEs that exists only for the duration of the data transfer. Call setup and call clearing procedures are required with a switched virtual circuit. Analogous to an everyday phone call on a circuit-switched telephone network.

**virtual circuit**

In technical terms, the association by the network of the logical identifiers of the source and destination of a call. In more general terms, the path of a connection over a packet-switched network between the calling and the called hosts.

**WAN**

See **Wide Area Network**.

**Wide Area Network**

A data communications network which covers a geographic scale on the order of a region or country. Except for satellite networks, WANs usually are built from numerous point-to-point links, rather than from multi-access channels (which are used by LANs). With a WAN, one or two communications carriers own the network and numerous clients own the connected hosts.

**X.121 address**

An address of 15 or fewer decimal digits used to identify the source or end point of communication over a PSDN.

**X.21bis**

A set of CCITT recommendations that define the physical interface between a DTE and a DCE of a public data network. Access to the DCE is through synchronous modems and voice-band lines. Equivalent to EIA-232 and V.24/V.28.

**X.25**

A CCITT recommendation that specifies the interface between a user's DTE and packet-switched DCE. The recommendation encompasses three layers for WAN communication: the packet layer (X.25 Packet Layer Protocol, similar to the OSI Network Layer), the Data Link layer (LAPB), and the Physical layer (X.21bis or RS-232-C). For LAN communication, X.25 specifies LLC2 for the Data Link layer.

**X.25 client**

An application layered above X.25. The `pad` program is an example of an X.25 client.

**X.28**

Defines the format of the terminal user's instructions to the PAD—referred to as PAD command signals—and the format of the PAD's responses to the terminal—referred to as PAD service signals.

**X.29**

Defines the interface between PADs and packet-mode DTEs or other PADs.

**X.3**

Describes the functions of the PAD and the various parameters used to specify its mode of operation.

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