IBM Advanced Interactive Executive
AIX PS/2
Installing and Customizing the
Operating System
Version 1.2.1

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About This Book

This book shows you how to install the IBM Advanced Interactive Executive
(AIX) Operating System for the Personal System/2, hereafter referred to as
AIX PS/2, and how to customize the system to suit your needs. The
step-by-step instructions enable you to install the operating system and
its accompanying programs.

 Subtopics
Who Should Read This Book
How to Use This Book
Related Publications

Who Should Read This Book

This book is written for anyone who would like to install the AIX PS/2
Operating System. It should also be read by anyone responsible for
planning the installation.

How to Use This Book

 This book contains eight chapters. We suggest that you read Chapter 1 in
 its entirety to familiarize yourself with the functions and capabilities
 of AIX PS/2. Next, read Chapter 2 which tells you how to plan an
 installation and Chapter 3 which shows you how to install the base
 operating system. Then, depending on how you plan to customize the system
 and whether you are installing for a single user or a cluster, read the
 remaining chapters in any order you want.

 This book also includes two appendixes. They contain supplementary
 information that you may find helpful as you install the system. A
 glossary of terms is also included.

 <u>Japanese Language Support</u>: If Japanese Language Support is provided with
 your system, all input required during install and update processes must
 still be entered in English. Instances of required English input as well
 as any other differences from the base system (supporting US-English and
 European locales) are pointed out in relevant sections of this book.

 Subtopics
Quick-Reference Boxes
Highlighting

Quick-Reference Boxes

Most of the chapters have the same basic structure. For each major task,
you find a brief discussion of the task and a quick-reference box
containing the steps for performing that task. For some tasks, additional
examples and explanations are given under the heading, "In Detail".

Typically, a quick-reference box contains no examples, sample screens, or
additional information. It serves only as a reference or a reminder of
the basic steps. It does not replace the information in the "In Detail"
section. Here is an example:

```
+--- To Request Devices --------------------------------------------------+
¦                                                                         ¦
¦ 1.  Log in to the system.                                               ¦
¦                                                                         ¦
¦ 2.  At the system prompt, type devices and press Enter.  The DEVICE     ¦
¦     CUSTOMIZING COMMANDS screen is displayed.                           ¦
¦                                                                         ¦
+-------------------------------------------------------------------------+
```

Highlighting

This book uses different type styles to distinguish among certain kinds of information. General information is printed in standard type style (the style used for this sentence). The following type styles indicate other types of information:

Type Style	Description
Italics	Variables appear in *italic* type.
Bold	Files, path names, commands, flags, and keywords appear in **bold** type.
Bold Italics	New terms introduced in the text appear in ***bold italic*** type and are defined in the glossary.
Monospace	Text that you type or that shows on your display screen appears in `monospace` type.

Related Publications

For additional information, you may want to refer to the following
publications:

AIX Commands Reference, SC23-2292 (Vol. 1) and SC23-2184 (Vol. 2),
lists and describes the AIX/370 and AIX PS/2 Operating System
commands.

AIX Guide to Multibyte Character Set (MBCS) Support, GC23-2333,
explains the basic concepts of AIX Multibyte character set support and
refers to other AIX books that contain more detailed information.

AIX Messages Reference, SC23-2294, lists messages displayed by the AIX
Operating System and explains how to respond to them.

AIX Programming Tools and Interfaces, SC23-2304, describes the
programming environment of the AIX Operating System and includes
information about operating system tools that are used to develop,
compile, and debug programs.

AIX TCP/IP User's Guide, SC23-2309, describes the features of TCP/IP
and shows how to install and customize the program. It includes
reference information on TCP/IP commands that are used to transfer
files, manage the network, and log into remote systems.

AIX Technical Reference, SC23-2300 (Vol. 1) and SC23-2301 (Vol. 2),
describes the system calls and subroutines a programmer uses to write
application programs. This book also provides information about the
AIX Operating System file system, special files, miscellaneous files,
and the writing of device drivers.

AIX PS/2 General Information, GC23-2055, describes the AIX PS/2
Operating System's functions and capabilities and the product's
position in the AIX family of products.

AIX PS/2 Keyboard Description and Character Reference, SC23-2037,
describes the characters and keyboards supported by the AIX PS/2
Operating System. This book also provides information on keyboard
position codes, keyboard states, control code points, code-sequence
processing, and non-spacing character sequences.

AIX PS/2 Text Formatting Guide, SC23-2044, describes the text
formatting utilities available on the PS/2 and shows how to format
text with NROFF and TROFF. This book also shows how to use the **vi**
editor to create, revise, and store files.

Managing the AIX Operating System, SC23-2293, describes such
system-management tasks as adding and deleting user IDs, creating and
mounting file systems, backing up the system, repairing file system
damage, and setting up an electronic mail system and other networking
facilities.

Using the AIX Operating System, SC23-2291, shows the beginning user
how to use AIX Operating System commands to do such basic tasks as log
in and out of the system, display and print files, and set and change
passwords. It includes information for intermediate to advanced users
about how to use communication and networking facilities and write
shell procedures.

AIX Japanese User's Guide, SC18-0812 (written in Japanese), provides programming information for use of the PS/55 system.

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1.5 Customizing Your System
1.6 Backing Up Your AIX PS/2 Operating System

1.1 CONTENTS

1.2 About This Chapter

This chapter describes the following items to help you prepare to install
the AIX PS/2 Operating System:

    The AIX PS/2 Operating System and its functions in your IBM PS/

    TCF considerations in AIX PS/2 cluster installation

1.3 Introducing the AIX PS/2 Software

The AIX PS/2 Operating System is a version of IBM's Advanced Interactive
Executive (AIX) for Intel 80386 and 80486 based IBM PS/2s. AIX PS/2
supports multiple user sessions with each user being allowed to execute
many programs simultaneously. In addition, with DOS Merge, AIX PS/2
enables the user to run DOS 3.3(TM) programs in a true DOS environment.

When you have set up your PS/2 according to the instructions included with
it, you can install the IBM AIX PS/2 Operating System. The operating
system manages system resources for you. It enables you to use several
complex functions without having to know how those functions work. For
instance, the AIX PS/2 Operating System gives you access to system
programs that handle processing, scheduling, storage, file systems, and
printing. In addition, it accommodates several users at one time, and
enables each user to run several processes at one time.

The most important program in the AIX PS/2 Operating System is the Base
System Program. You must install this program before your IBM PS/2 is
ready for you to do work.

The Base System Program contains the operating system code that performs
many of the processing tasks on your PS/2. The Base System Program
interprets a set of commands that perform a variety of tasks, including
management of the AIX PS/2 file system.

Additional operating system features provide a variety of options to
extend the function and capabilities of your PS/2. These optionally
installable features include an editor, support for additional device
types, communications capabilities, and so on. Each of these features is
described in Chapter 3, "Installing the AIX PS/2 Operating System."

The operating system installation program is menu-driven; that is, you
will be presented with a list of items from which to choose. The
installation program will also be discussed in Chapter 3.

Before you select an option, you should read enough about the various
installation options to understand exactly what each one does. Then, you
can decide which option best meets your system needs and requirements.

AIX PS/2 may be used on a standalone system or on the PS/2 sites in a
cluster.

Subtopics
1.3.1 AIX PS/2 System Programs

1.3.1 AIX PS/2 System Programs

AIX PS/2 contains two basic types of programs. They are:

    The Base Operating System for the AIX PS/

    The Licensed Program Products are optionally available programs whic
    perform a particular function. LPPs available to run with AIX PS/2
    include, but are not limited to the following:

        Application Development Toolkit (ADT)

        C

        DOS Merge

        DOS SERVER

        Graphic Support Library (GSL)

        INed and INmail/INnet/INftp

        Network File System (NFS)

        Operating System Extensions

        TCP/IP

        Text Formatting System (TFS)

        Transparent Computing Facility (TCF)

        Usability Services

        VS COBOL

        VS FORTRAN Version 2

        VS Pascal

        Workstation Host Interface Program (WHIP)

        X.25

        X-Windows

<u>Japanese Language Support</u> If Japanese Language Support is provided with
your AIX operating system, note that this support is integrated into AIX.
The Multibyte Character Set (MBCS) encoding system, which allows Japanese
users to interact with their AIX system primarily in Japanese, is not an
LPP.

1.4 Cluster Installation Overview

The installation of an AIX PS/2 cluster is the sequenced installation of a
set of AIX PS/2 cluster sites with Transparent Computing Facility (TCF).
There are a number of configuration decisions that must be made prior to
starting the process. The overall process involves the following main
steps:

1.   Select the machine for the primary site that will maintain the primary
     copy of the (replicated) root file system.

2.   Determine the names and cluster site numbers for all sites.

3.   Install the cluster site system on the machine selected to maintain
     the primary copy of the (replicated) root. Install the additional
     packages required to support TCF and/or the packages you desire to
     have available within the cluster.

4.   For the remaining machines (secondary sites), decide which of the
     machines will maintain backbone copies of the (replicated) root file
     system and which machines will maintain secondary copies of the
     (replicated) root file systems.

5.   Install AIX PS/2 on each of the remaining machines using the
     installation procedure for AIX PS/2 (see Chapter 3, "Installing the
     AIX PS/2 Operating System").

Subtopics
1.4.1 Transparent Computing Facility (TCF)
1.4.2 Standalone PS/2
1.4.3 Homogeneous Clusters

1.4.1 Transparent Computing Facility (TCF)

The Transparent Computing Facility (TCF) provides the environment for combining one or more AIX PS/2 computers into a cluster connected on a Local Area Network (LAN). The TCF cluster appears as a single machine to users accessing cluster resources and acts as a single computer system when communicating outside the cluster.

The cluster has a ***replicated root*** file system which contains key common files and directories for basic system operation. Almost all system binaries and program libraries are in the replicated root file system.

Each root file system has a designated ***primary copy*** that resides on the primary site in the cluster. This primary copy is the only root file system copy that can be updated.

The read-only ***backbone copy*** of the replicated root file system resides on a secondary cluster site. Changes are automatically made to the backbone copy of the root file system from the primary copy, to guarantee that root file updates are kept consistent on all sites within the cluster.

Secondary sites in the cluster may have secondary copies of the root file system. These secondary copies contain only a subset of the files and directories in the primary copy of the root file system.

1.4.2 Standalone PS/2

One PS/2 computer can run AIX PS/2 as a standalone site. Figure 1-1 shows
a standalone PS/2.

```
                            PS/2
                 ┌──────────────────────┐
                 │      AIX PS/2        │
                 │                      │
                 └──────────────────────┘
                   /                  \

    RS-232 to                           RS-232 to
  3162 Terminals                          modem
 (ASCII attached)

        │                                   │
        │                                   │
   ┌─────────┐                        ┌──────────────┐
   │  Users  │                        │ PC/XT, PC/AT │
   └─────────┘                        └──────────────┘
```
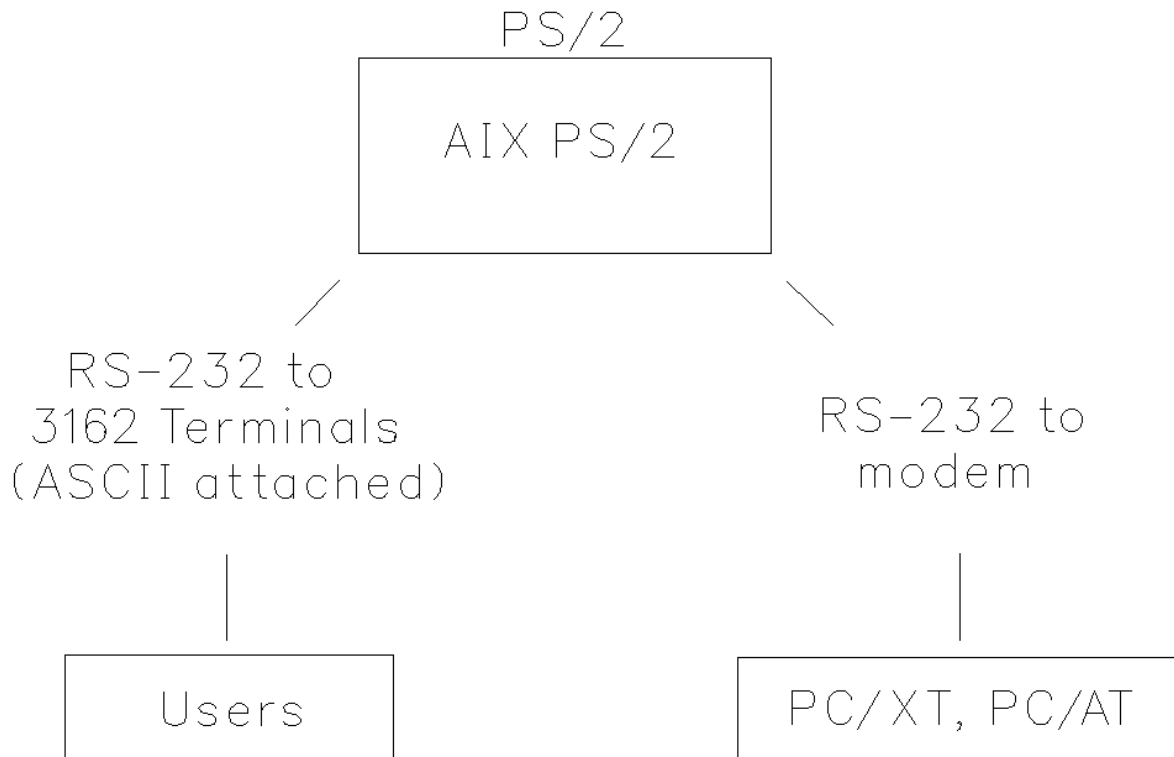
Figure 1-1. Example of a standalone PS/2

1.4.3 Homogeneous Clusters

The homogeneous cluster includes an AIX PS/2 computer serving as the
primary site and PS/2s serving as secondary sites. Figure 1-2 shows a
homogeneous cluster.

```
                              PS/2
                    ┌────────────────────┐
                    │                    │
                    │    AIX PS/2        │
                    │                    │
                    └────────────────────┘
                              │
                           ╭──────╮
      PS/2                 │  LAN  │              PS/2
┌──────────────┐          │Ethernet│       ┌──────────────┐
│              │          │or Token│       │              │
│ Secondary    │──────────│  Ring  │───────│ Secondary    │
│ Site         │          ╰──────╯          │ Site         │
│              │                            │              │
└──────────────┘                            └──────────────┘
       │                                           │
     PC/AT                                    RS-232 to
┌──────────────┐                             3162 Terminals
│ AIX Access   │                             (ASCII attached)
│ for DOS      │                                    │
│ users        │                                  users
│              │
└──────────────┘
```
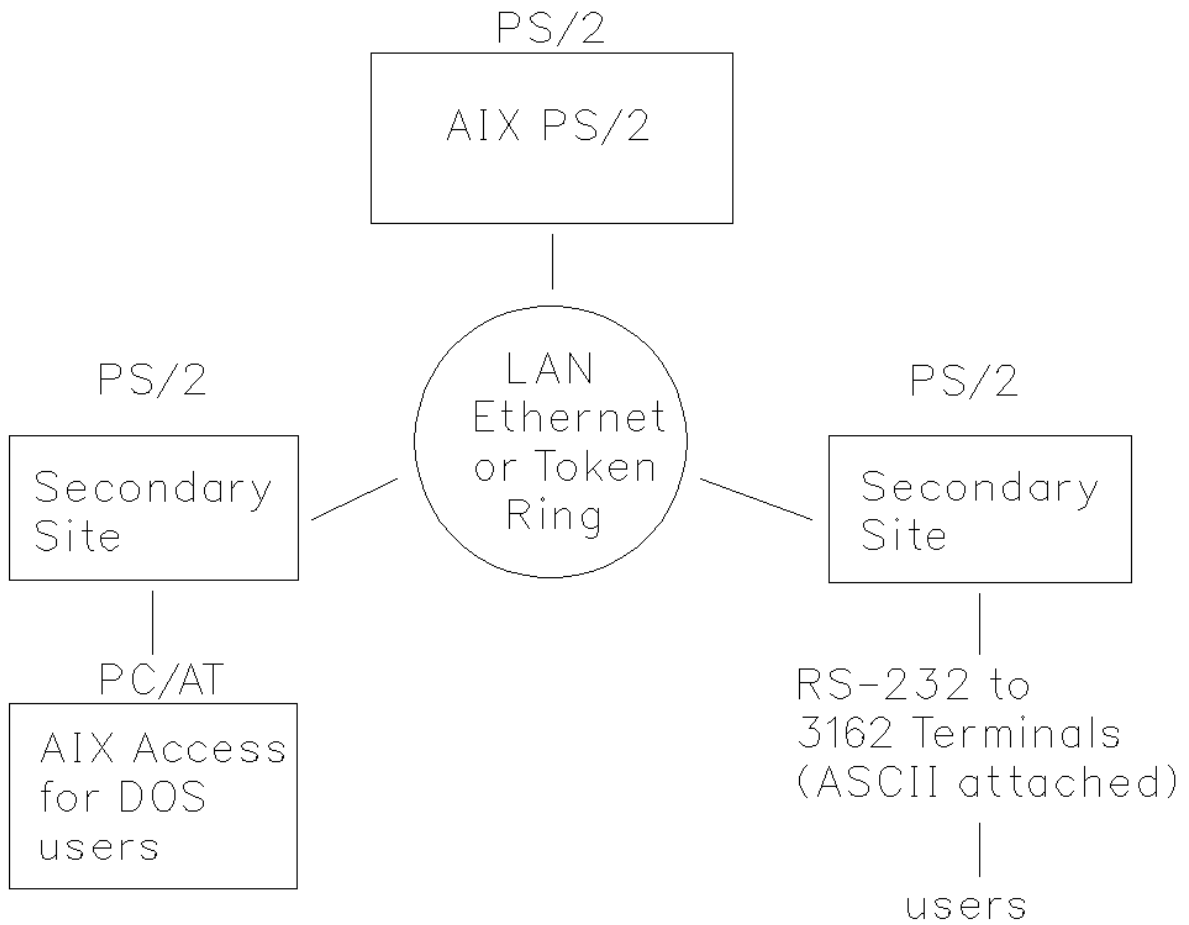
Figure 1-2. Example of a homogeneous cluster

1.5 Customizing Your System

As you install the AIX PS/2 Operating System, the system automatically
configures your system with the basic hardware components (system unit,
display, keyboard). But as you add other hardware components (a printer,
for example) and users to your system, and as you change the defaults, you
customize your system.

When you customize your system, you describe (to the system) the devices,
programs, and users for a particular machine. You have the choice of
using IBM-supplied defaults or of tailoring information about devices and
minidisks to suit your own needs. You can customize your system as you
install the AIX PS/2 Operating System or any time thereafter.

You can customize your system with two basic commands:

devices   Add predefined devices to your system, delete devices already
attached to your system, and display or change device
information describing your system. Chapter 7, "Using the
devices Command," explains how to use the **devices** command.

minidisks Organize the storage space on your fixed disk. You can add
minidisks to your fixed disk. You also can delete minidisks
from your fixed disk or change the minidisk characteristics.
Chapter 8, "Using the minidisks Command," explains how to use
the **minidisks** command.

1.6 Backing Up Your AIX PS/2 Operating System

After you have installed the Base System Program and any additional
operating system programs or licensed programs, you may make backup copies
of all your system information. Having backup diskettes (or tapes) helps
protect you against possible loss of programs and files. See *Managing the
AIX Operating System* for more information about backup procedures and
security concerns.

2.0 Chapter 2. Planning for Cluster Site Installation

Subtopics

2.1 CONTENTS

2.2 About This Chapter

This chapter describes the following items to help you plan to install the AIX PS/2 operating system.

2.3 Overview of AIX PS/2

When you install the AIX Operating System, you must perform two groups of
tasks that are necessary to operate the system.

To begin, you need to tell the AIX operating system the basic
configuration of your machine. You will configure the system for the
national language you are using, the type of display, your time zone, and
the keyboard language. At this point the AIX operating system understands
the input from your keyboard and knows how to display information to you.
You will also set the name of your machine to distinguish your particular
machine from others in a networked environment. Once you have set this
information, you will not have to reset it, unless the battery in your
PS/2 needs to be replaced.

The other group of tasks defines the fixed disk space you will use for the
AIX operating system. AIX does not disturb disk areas claimed by other
operating systems, such as DOS. When you install AIX, the system shows
you data about the current free space left on the fixed disk. If there is
not enough disk storage for AIX in the current disk configuration, you
will see a message informing you to remove some data from the fixed disk
and allocate that space as free space. (In DOS, you would use the **fdisk**
program to do this. See the *Disk Operating System (DOS) Reference* manual
for more information about **fdisk**.) If there is enough room on the fixed
disk to install AIX, you can go on.

Subtopics
2.3.1 Minidisks

2.3.1 Minidisks

You will divide the space on your fixed disk into several areas, called
minidisks. These minidisks are split into file systems. These are the
root, the **user**, the **temporary**, and a **local** file systems, and a **virtual
memory paging space** and a **dump** file. If there is more space than you need
for these system minidisks, you can create minidisks for extra space, once
you have installed the system. Any minidisks created in this fashion can
be saved if you want to reinstall a newer version of AIX at a later date.

You may also choose the sizes for system minidisks. Defaults which should
work for most applications are provided. However, if you choose to change
these default values, there are several important factors to keep in mind,
especially the purpose of each minidisk.

> The *root file system minidisk* is the storage area for all system
> commands, utilities, and application programs. If the user is
> planning to install other applications, such as X-Windows or DOS
> Merge, this file system should be made large enough to accommodate
> future growth and applications.

> The *user file system minidisk* is where most users' home directories,
> data, and applications are stored. This minidisk should be decreased
> for systems with only a few users and increased for systems with many
> users.

> The *temporary file system minidisk* is used for temporary storage by
> programs that are currently executing.

> The *local file system minidisk* is where system-specific configuration
> information is kept. The size of this minidisk should not be
> decreased, and in most cases, the system's choice of its size will be
> correct.

> The virtual memory *page space minidisk* defines the amount of virtual
> memory the system has. The number of programs that the user expects
> to run concurrently and the size of the machine's random-access memory
> should determine the size of this minidisk.

> The *dump file minidisk* stores a copy of the system memory if a fatal
> error occurs. This partition is not used during normal operation and
> should not be larger than the amount of real memory. If this
> partition size is set to 0, then the user will be prompted to save the
> system dump on diskette.

Now you can enter the first stage of the installation process. During
this stage, the fixed disk is prepared and the AIX file systems are
created. The minimal AIX system commands are then installed on the hard
drive, and system-specific information is created. When the first stage
is completed, the system halts itself and waits for the final stage of
installation.

Finally you will complete the last stage of the installation by copying
the AIX distribution diskettes onto the fixed disk. Then the system is
ready to start up as a normal system. If you have also purchased other
application programs for AIX, you can also install them at this time.

2.4 Planning Minidisk Sizes

Planning ahead for minidisk size requirements is much easier than making
corrections if you should run out of space. To plan your software
installation for your specific needs, complete the worksheets provided in
this chapter and begin the installation process with Chapter 3,
"Installing the AIX PS/2 Operating System."

If you have a stand-alone system, or would prefer to install the system
with the default storage space, skip this chapter.

In order to plan for installation of the operating system and licensed
programs, you may find the information on the following topics helpful:

    AIX PS/2 minidisk type

    PS/2 fixed disk drive capacity

Subtopics
2.4.1 Minidisk Types
2.4.2 Fixed Disk Drive Data Capacity

2.4.1 Minidisk Types

The AIX Operating System requires that different parts of the system,
various working files, and user data be placed on partitions of the fixed
disk called *minidisks*. A minidisk is a variable-size portion of
contiguous space on a fixed disk. Minidisks consist of 1024-byte segments
called *blocks*. All references to minidisk size are expressed as a number
of blocks.

Not all the space on a fixed disk has to be included in defined minidisks.
Free space on a fixed disk can always be used for future expansion and to
maintain flexibility. These topics are discussed in the following
sections.

2.4.2 Fixed Disk Drive Data Capacity

You can have up to 2 internal fixed disks on the PS/2. Internal disks
come in 40-, 60-, 70-, 114-, 120- and 315-megabyte models. The capacity
of the internal fixed disks, in 1024-byte blocks, is approximately:

```
    40-megabyte drive =  43,000 blocks

    60-megabyte drive =  59,000 blocks

    70-megabyte drive =  71,000 blocks

   114-megabyte drive = 112,000 blocks

   120-megabyte drive = 117,000 blocks

   315-megabyte drive = 307,000 blocks
```

Subtopics
2.4.2.1 Minidisks Defined by the System
2.4.2.2 Minidisks Defined by the User

2.4.2.1 Minidisks Defined by the System

During installation and configuration of a typical PS/2, the system
defines several minidisks for its basic software components and
requirements. These system minidisks reside only on internal disks and
include:

/ (root)

The **/** minidisk, called the root minidisk, is the highest level file
system of the AIX Operating System. This minidisk can also contain
some of the system files and licensed program files, but should not be
used for personal user files.

/aixps2

/aixps2 is the default for the *machine name* minidisk. This is the
local file system used to store the frequently updated system files.

/aixps2/tmp

The **/aixps2/tmp** minidisk is a file system used for temporary files.
If large files are archived, sorted, or edited, the size of the
/aixps2/tmp minidisk must be increased to accommodate these large
files. IBM recommends that you allocate at least 2000 blocks for
/aixps2/tmp. Some programming and development environments require
more than 2000 blocks.

/u

The **/u** minidisk is created for storage of user files. The amount of
fixed disk space to allow for **/u** depends on how many users your system
will be supporting and the licensed programs you plan to use.

dump

The dump minidisk contains operating system memory dumps. This
information is helpful in case you experience problems or require
diagnostic service at your site. If your system has one 40-megabyte
fixed disk, IBM recommends you allocate no blocks for dump. If this
partition size is set to 0, then the user will be prompted to save the
system dump on diskette.

Note: All other systems should add 24 blocks to the RAM size of the
PS/2 to configure the **dump** partition.

page space

Paging is the copying of virtual memory contents into or out of the
available real memory. The default page space minidisk sizes are
determined by the fixed disk configuration and the amount of
random-access memory. These defaults can be changed when the
operating system is installed.

The default page space minidisk size for systems with 40-megabyte
fixed disks is 3500 blocks; the page space size for systems with fixed
disks larger than 40-megabytes should be twice the size of the
physical RAM.

You can store user files on the **/**, **/aixps2/tmp**, or **/aixps2** minidisk.

However, if the operating system is ever reinstalled using the install
option rather than the replace option, these minidisks may be completely
replaced and user files lost. IBM recommends that you place user files
only on the **/u** minidisk or on minidisks you define.

About 5 percent of the space is used for indexes, so the actual space
available for data is about 95 percent of the total minidisk space.

Note: AIX and DOS can reside on the same system. DOS partitions are
maintained separately from AIX partitions, and cannot be changed
with AIX. When you install AIX, make sure there is enough free
storage on your fixed disk. Use the Minidisk Calculation Worksheet
to find the amount of storage needed for installation. If there is
not enough storage on the hard file system use the DOS **fdisk**
program to remove DOS partitions until the required storage is
available.

2.4.2.2 Minidisks Defined by the User

You can define your own minidisks in addition to the default minidisks
defined by the system. Some licensed programs require that you define a
separate minidisk for their files. For some large programs, IBM
recommends that you define separate minidisks.

"Learning about Minidisks" in topic 8.3 provides more information on
user-defined minidisks, as well as the default locations of minidisks for
systems with one or two fixed disks.

2.5 Calculating Minidisk Size Requirements

Table 2-1 in topic 2.5.1 and Table 2-2 in topic 2.5.1 show the minidisk
space requirements for operating system components and the values for
optionally available licensed programs.

The Operating System Extensions program consists of multiple diskettes
included with the AIX Operating System, contains components that can be
installed separately. Installing only those you need will leave space
available for other uses. See Chapter 4, "Installing Additional Licensed
Program Products," for descriptions of each module and of other additional
AIX Operating System programs. These descriptions may help you decide
whether to install some or all of the programs. You should install only
those that you think you will need.

Notes:

1. If you are installing a PS/2 TCF cluster site, the minimum requirement
    for LPPs includes the Base Operating System, and TCF.

2. Block-size requirements provided in this publication for software
    components are accurate as of the date of this publication.
    Variations may occur as a result of modifications to the software
    components made by the manufacturer. IBM is not responsible for
    variations made to these components after the date of this
    publication.

Subtopics
2.5.1 Using the Calculation Worksheets

2.5.1 Using the Calculation Worksheets

The worksheets on the next pages are provided so you can calculate the fixed disk requirements for a given set of software components and plan for the placement of minidisks on the fixed disks.

Photocopy and fill out the Minidisk Calculation Worksheet (Table 2-3) using the block-sizes from Table 2-1 in topic 2.5.1 and Table 2-2. Additional space is provided on the worksheet along the top for minidisks you have defined, and along the side for programs not listed in the tables.

The **Future Uses** row, in the Minidisk Calculation Worksheet (Table 2-3), allows you to include an expansion factor for minidisk size.

The Disk Configuration Worksheet (Table 2-4) helps to verify that the number and size of fixed disks you have chosen will support your software.

After you have decided which programs to install, follow these steps to calculate fixed disk requirements and plan for minidisk placement:

1. Make a photocopy of Table 2-1, Table 2-2, Table 2-3, and Table 2-4. Fill out the copies, not the originals.

2. Find the Operating System programs on the Base Operating Disk Space Table (Table 2-1) that you intend to use. Circle (or highlight in some way) the block-size requirement values that correspond to the programs you have selected. On the Minidisk Calculation Worksheet, write the program names in the blank spaces in the **Program** row and indicate the required block-sizes in the appropriate minidisk columns.

3. Find the licensed programs on the Licensed Program Disk Space Table (Table 2-2) that you intend to use. Circle (or highlight in some way) the block-size requirement values that correspond to the programs you have selected. On the Minidisk Calculation Worksheet, write the program names in the blank spaces in the **Program** row and indicate the required block-sizes in the appropriate minidisk columns.

4. If you plan to use a software program not listed in this publication, write the program name in one of the blank spaces in the **Program** row and indicate the required block-sizes in the appropriate minidisk columns.

    If you plan to define a minidisk not listed, write the minidisk name in one of the blank spaces in the **Minidisk Name** row and indicate the required block-sizes below.

5. To allow minidisk space for future expansion, write the block-size requirements in the **Future Uses** row for the appropriate minidisks.

6. Write the total block-size requirement for each minidisk (including **dump**, **page space**, and **user** minidisks) in the **Totals** row.

7. Now fill out the Disk Configuration Worksheet with the results from the Minidisk Calculation Worksheet. Write the minidisk name and total number of blocks required in the spaces provided for systems with one or two fixed disks. Be sure that you have enough disk space to support your planned software.

8. In TCF clusters, remember to add the inode overhead for the /

minidisk. This value is calculated by dividing the number of files
(inodes) allocated on the primary site for the **/** (root) filesystem by
2. For example:

    12,000 inodes / 2 = 6,000 1K Blocks

9. Add 24 blocks to the RAM size of the PS/2 to configure the **dump**
    partition.

```
+--- Note ----------------------------------------------------------+
¦                                                                   ¦
¦ If the total number of blocks exceeds the number of blocks available ¦
¦ with your fixed disk configuration, consider the following actions: ¦
¦                                                                   ¦
¦    Rearrange the minidisks in the following order to use the      ¦
¦     available disk space more efficiently:                        ¦
¦                                                                   ¦
¦    -   The dump minidisk can be moved without affecting performance. ¦
¦    -   The /u or user-defined minidisks can be moved.             ¦
¦    -   The /aixps2/tmp minidisk can be moved.                     ¦
¦    -   If necessary, move either / (root) or /aixps2.             ¦
¦                                                                   ¦
¦    Divide user data into several smaller minidisks to spread it   ¦
¦     across multiple disks.                                        ¦
¦                                                                   ¦
¦    Use a larger fixed disk instead of a 40-megabyte disk.  Either of ¦
¦     these actions will require that you change the page space if  ¦
¦     default values are used.                                      ¦
¦                                                                   ¦
+-------------------------------------------------------------------+
```

The base operating system requirements (in 1K blocks) are:

Table 2-1. Base Operating System Disk Space Requirements		
Program Name	**/root**	**/aixps2**
Base System Program*	15,000	2,200
Asynchronous Terminal Emulation	275	0
DOS Server	750	75
Graphic Subroutine Library*	3,300	0
CD ROM	250	0
Learn	2,400	
* Must be installed on each PS/2 cluster site.		

The Licensed Program disk space requirements are:

Table 2-2. Licensed Program Disk Space Requirements		
Program Name	**/root**	**/aixps2**

Extensions		
Administrative Support	375	0
Extended User Support	1,140	0
Games	375	0
Mail, Sendmail	325	70
Man Pages	8,500	0
Message Handler	3,275	0
Samples	325	0
Basic Networking Utilities	2,200	900
Application Development Toolkit		
SCCS	600	0
Application Development Support Tools	10,700	0
DOS Merge	1,130	100
TCP/IP*	1,500	100
Text Formatting System (TFS)	1,900	0
X.25	1,000	0
Network File System (NFS)	525	0
Transparent Computing Facility (TCF)	500	60
INed	2,450	0
INmail/INnet/INftp	800	0
Usability	2,700	0
X-Windows		
X-Windows	9,600	
X-Windows Samples	5,500	0
X-Windows Japanese Language Support	7,600	0
IAA	125	60
AIX Windows		
AIX Windows	2,400	0
AIX Windows Desktop	3,500	20
Workstation Host Interface Program	3,200	0
C compiler	750	0
Extended C compiler	1,225	0
VS FORTRAN	800	0
VS Pascal	700	0
VS Cobol		
* Must be installed on each PS/2 cluster site.		

Table 2-3. Minidisk Calculation Worksheet

Program Name	Minidisk Name						
	/ (root)	/aix	s/aix /tmp	s2 /u	dump	page spac	
Totals							
Future Uses							

```
+---------------------------------+-----+-----+-----+------+-----+----+-----+
¦ Totals                          ¦     ¦     ¦     ¦      ¦     ¦    ¦     ¦
+---------------------------------+-----+-----+-----+------+-----+----+-----+
```

* Add 24K to the RAM size of the PS/2 to configure the **dump** partition.

Table 2-4. Disk Configuration Worksheet			
Disk 1 (hd0)		**Disk 2 (hd1)**	
Minidisk Name	**Number of Blocks**	**Minidisk Name**	**Number of Blocks**

```
|                |                |                |                |                |
+----------------+----------------+----------------+----------------+----------------|
|                |                |                |                |                |
+----------------+----------------+----------------+----------------+----------------|
| Totals for Disk|                | Totals for Disk|                |                |
|              1 |                |              2 |                |                |
+---------------------------------+--------------------------------------------------+
```

3.0 Chapter 3. Installing the AIX PS/2 Operating System

Subtopics

3.1 CONTENTS

3.2 About This Chapter

This chapter explains how to install or reinstall the AIX PS/2 Operating
System file systems.

Note: The defaults for storage of the programs you are about to install
are fine for most applications. If you want to plan space to meet
additional requirements, see Chapter 2, "Planning for Cluster Site
Installation" for details.

3.3 What You Need

1. Personal System/2 with:

        An Intel 80386 or 80486 processor

        At least 2 megabytes of RAM

        At least 60 megabytes of available space on a fixed disk

        Up to ten blank 3.5 inch diskettes to perform backups.

2. The AIX PS/2 Installation Package consisting of:

        These instructions

        The Boot Diskettes

        The Installation Diskette

        The Maintenance Diskette

        Operating system diskettes or ITBU tape.

Note: If you are installing AIX PS/2 on a system that will be used to run
         DOS or DOS-Merge, you should read "Example: Providing Space for
         DOS Merge and Non-AIX Minidisks" in topic 8.5.6.8.

Subtopics
3.3.1 Using the Reference Diskette

3.3.1 Using the Reference Diskette

The IBM PS/2 Reference Diskette included with your IBM PS/2 is necessary
to install AIX PS/2. To configure the options and features of your IBM
PS/2, follow the instructions in the *IBM PS/2 Quick Reference*.

You can use the **set date** option on the Reference Diskette to set the time
so that during installation the times will be correctly logged.

3.4 What You Will Be Doing

Using the interactive installation program, you will install the AIX PS/2
Operating System on your machine. Installation consists of six steps
which will be covered in detail later:

1. **Booting the kernel from the Boot Diskettes.**

   The *kernel* is the name given to the program which performs all the
   maintenance, input/output, scheduling and general housekeeping of the
   AIX PS/2 Operating System. It is the fundamental part of the AIX PS/2
   Operating System. By "booting" the kernel, you will be loading it
   into the memory of your PS/2.

2. **Making backup copies of the Installation and Maintenance Diskettes.**

   The Installation and Maintenance Diskettes are mounted as file systems
   and must not be write-protected. For this reason, backup copies must
   be made of these diskettes, before they are used. During the
   installation process you will be given an opportunity to make copies
   of these diskettes from the Bootstrap menu.

   Warning: Since the copy of the Maintenance Diskette is not
   write-protected, do not attempt to use the command **installp** with this
   diskette in the drive. This will affect the files on the diskette.

3. **Running the Installation Program.**

   The Installation Diskettes contain all the required programs to
   perform the installation of AIX PS/2 onto your PS/2.

   After you have run through the boot procedure, the installation
   program will set up the fixed disk in preparation for the installation
   of the operating system software from the operating system diskettes
   or ITBU tape. It will then halt, allowing you to reboot the system.

   Note: AIX PS/2 1.2.1 supports installation from both 6157 tape and
           ITBU tape. The BOS, the separably installable portions of the
           BOS and the seperably installable portions of the Operating
           System Extensions LPP are distributed by IBM on ITBU tape.
           User generated 6157 or ITBU tapes can also be used in the
           install process.

4. **Rebooting the kernel from the Boot Diskettes.**

   Once again the kernel will be loaded into memory. You should select
   the option **Boot from Diskettes**. The kernel will then ensure that the
   fixed disk drive is properly set up and will then automatically invoke
   the installation program to complete the installation of AIX PS/2 onto
   your system.

5. **Completing the Installation of AIX PS/2.**

   The installation program will ask you to select the device drive you
   want to use to complete the installation of the operating system, and
   then to insert the appropriate media in the proper device. There will
   be 16 to 18 diskettes or a tape. If installing from diskettes, all of
   the diskettes must be inserted at the prompts in sequence to complete
   the operating system installation.

6. **After the Installation.**

    After the installation program completes, you will end the system
    installation and boot off of the fixed disk.

3.5 Booting the Kernel from the Boot Diskettes

Before you can begin to install AIX on your PS/2, you must first be sure
your machine is set up and operating properly. This includes using the
IBM PS/2 Reference Diskette. See the *IBM PS/2 Quick Reference* for
details.

You will also need the Boot Diskettes, the Installation Diskette, and the
diskettes or ITBU tape containing the AIX PS/2 Operating System files.

Japanese Language Support: If Japanese Language Support is provided with
your system, all input required during the installation process must be
entered in English. Note also that all the information which appears on
your screen (including menus, questions, and messages) to guide you
through the installation of the AIX PS/2 Operating System on your machine
is in English as well.

To begin the installation procedure:

    Insert Boot Diskette 1 (with the label up and metal-shutter en
    forward) into diskette drive 0. Make sure the diskette clicks in
    place.

    Turn on the power switches to the computer, display, and othe
    peripherals.

Note: If you see an error message on the display after the system starts,
        see *IBM AIX Operating System Messages Reference*. Locate the
        message by finding the six-digit number corresponding to the number
        shown on your display. The manual will describe what caused the
        message to appear and what you can do to resolve the problem.

After turning on your system, you will see the following copyright screen:


```
+--------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦                    IBM AIX PS/2 Operating System
¦
¦                         Version 1.2.1
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦    IBM AIX PS/2 Operating System - Version 1.2.1
¦    5713-AEQ COPYRIGHT IBM CORP. 1989
¦    LICENSED MATERIAL -- PROGRAM PROPERTY OF IBM
¦    All Rights Reserved
¦    PS/2 and AIX are trademarks of International Business Machines Corp.
¦
```

```
¦
¦
¦
¦
+----------------------------------------------------------------------
```

Then you will see one of two screens, depending on whether

    You are installing AIX for the first time on your syste

    You are reinstalling a newer version of the AIX Operating System o
    your system.

If you are *reinstalling* the operating system over an existing AIX PS/2
Operating System, the installation process will continue with "The
Bootstrap Menu" in topic 3.5.1.

If you are installing AIX PS/2 for the first time, the next screen you
will see will be the following.

```
+----------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦                    IBM AIX PS/2 Operating System
¦                            Version 1.2.1
¦                          NVRAM Configuration
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦   AIX PS/2 requires that a few system configuration parameters
¦   be recorded in non-volatile memory (NVRAM). Your NVRAM does not
¦   contain this information. It will be necessary for you to provide
¦   the required information before proceeding to boot the AIX kernel.
¦
¦
¦
¦
¦
¦         Press any key to continue...
¦
¦
¦
¦
¦
+----------------------------------------------------------------------
```

Press any key on the keyboard and the installation process will continue
with the screen on the next page.

Note: For these initial screens, the **F3** key will be treated as any other
      key and cause the next screen to appear.

      This will hold true for the next five screens when you are asked
      for information.

If you wish to make any changes in your selections in the next several
menus, there will be a second chance in "The Bootstrap Menu" in

topic 3.5.1.

The first screen will ask you to select a translation language.

```
+-------------------------------------------------------------------------
|
|
|
|                       SELECT NLS TRANSLATION LANGUAGE
|
|            Canadian
|            Danish
|            Dutch
|            Finnish
|            French
|            German
|            Icelandic
|            Italian
|            Japanese
|            Norwegian
|            Portuguese
|            Spanish
|            Swedish
|            UK English
|            US English
|
|     Use the cursor keys to select the desired item.
|     Press Enter to confirm your selection and continue.
|     Press F3 to cancel this selection.
|
|
|
|
+-------------------------------------------------------------------------
```

Select the language you want to use and press **Enter**.

The next screen asks for the model number of your display. Check the base
of the front of your display for this number.

```
+-------------------------------------------------------------------------
|
|
|
|
|                        SELECT MONITOR TYPE
|
|
|
|         VGA w/8503      (12 inch monochrome display)
|         VGA w/8507      (19 inch monochrome display)
|         VGA w/8512      (14 inch color display)
|         VGA w/8513      (12 inch color display)
|         VGA w/8514      (16 inch color display)
|         VGA w/8515      (14 inch color display)
|         IBM 5574-M06    (15 inch monochrome display)
|         IBM 5574-W06    (15 inch monochrome display)
|         IBM 5574-C06    (14 inch color display)
|         IBM 5574-C07    (16 inch color display)
|         IBM 5574-C09    (20 inch color display)
|
|     Use the cursor keys to select the desired item.
|     Press Enter to confirm your selection and continue.
```

```
¦    Press F3 to cancel this selection.
¦
¦
¦
¦
¦
¦
+--------------------------------------------------------------------
```

Choose your display and press **Enter**.
The next screen will prompt for the time zone.

```
+--------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦                      SELECT TIME ZONE
¦
¦    (GMT)       Greenwich England      (GMT + 12)   New Zealand
¦    (GMT - 1)   Azores, Cape Verde     (GMT + 11)   Solomon Islands
¦    (GMT - 2)   Falkland Islands       (GMT + 10)   Eastern Australia
¦    (GMT - 3)   Greenland, East Brazil (GMT + 9)    Japan, Korea
¦    (GMT - 4)   Central Brazil         (GMT + 8)    Western Australia
¦    (GMT - 5)   Eastern U.S., Columbia (GMT + 7)    Thailand
¦    (GMT - 6)   Central U.S., Honduras (GMT + 6)    Tashkent USSR
¦    (GMT - 7)   Mountain U.S.          (GMT + 5)    Pakistan
¦    (GMT - 8)   Pacific U.S.           (GMT + 4)    Gorki USSR, Oman
¦    (GMT - 9)   Yukon                  (GMT + 3)    Turkey, Saudi Arabia
¦    (GMT - 10)  Alaska, Hawaii         (GMT + 2)    Finland, South Africa
¦    (GMT - 11)  Bering Straits         (GMT + 1)    Norway, France
¦
¦
¦    Use the cursor keys to select the desired item.
¦    Press Enter to confirm your selection and continue.
¦    Press F3 to cancel this selection.
¦
¦
¦
¦
¦
+--------------------------------------------------------------------
```

Choose your time zone and press **Enter**.

You will then be asked the following questions:

  Do you observe daylight savings time?

  What is your standard timezone name?

  What is your daylight savings timezone name?

Press the **Space** bar to toggle to the correct answer and press **Enter**. The
third question will only appear if you answered **yes** to the first question.
The next screen will prompt you for a keyboard language.

```
+--------------------------------------------------------------------
¦
¦
¦             SELECT KEYBOARD LANGUAGE
¦
¦       Belgian                          Norwegian
```

```
¦           Canadian                              Portuguese
¦           Danish                                Spanish
¦           Dutch                                 Swedish
¦           French                                Swiss Fren
¦           German                                Swiss Germ
¦           Italian                               UK
¦           Japanese                              US
¦           LatinAmer
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦    Use the cursor keys to select the desired item.
¦    Press Enter to confirm your selection and continue.
¦    Press F3 to cancel this selection.
¦
¦
¦
¦
+---------------------------------------------------------------------------
```

Choose your keyboard and press **Enter**.

The next screen asks you for your machine name. For some licensed
programs such as TCP/IP, your computer must have a unique name.

```
+---------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦                         SELECT MACHINE NAME
¦
¦       Enter Machine Name:    aixps2
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦    Type the requested information into the highlighted field.
¦    Press Enter to confirm your selection and continue.
¦    Press F3 to cancel this selection.
¦
¦
¦
¦
¦
+---------------------------------------------------------------------------
```

Enter a unique name for this machine. The maximum length of the name is
12 characters.

This name is used internally to establish various file identifiers. When
certain product functions are used, for example in TCP/IP communications,
each system will require a unique name to function correctly.

If you do not enter a machine name, the system will use the default name
aixps2. All examples in this book use the **aixps2** machine name.

Subtopics
3.5.1 The Bootstrap Menu

3.5.1 The Bootstrap Menu

The next screen you see is:

```
+---------------------------------------------------------------------------
¦
¦
¦
¦
¦                 IBM AIX PS/2 Bootstrap
¦
¦                     Version 1.2.1
¦
¦           Boot from Diskettes
¦           Boot from Hard Disk
¦           Boot from Ethernet
¦           Boot from Token Ring
¦           Boot DOS
¦           Set Keyboard Language
¦           Set Monitor Type
¦           Set Time zone
¦           Set Machine Name
¦           Set NLS Translation Language
¦           Copy Diskette
¦           Stand-alone Backup
¦           Stand-alone Restore
¦
¦     Use the cursor keys to select the desired item.
¦     Press Enter to confirm your selection and continue.
¦     Press F3 to cancel this selection.
¦
¦
¦
¦
+---------------------------------------------------------------------------
```

If you change any selections made in the previous menus, you can change
your answers here. Just move the highlighted cursor, using the **Cursor Up**
and **Cursor Down** keys, to the option that you would like to change and
press **Enter.**

When you are sure that all of your choices are correct, choose the **Copy
Diskette** option and press **Enter**.

Note: The Boot, Installation and Maintenance Diskettes are all
       permanently write-protected. You must make backup copies of these
       diskettes.

Follow the instructions of the **Copy Diskette** option to backup your AIX
Boot, Installation and Maintenance Diskettes.

```
  Diskette format and Copy Utility - v.1.1
  (C)copy, (F)ormat or (Q)uit (cfq)?

  insert new diskette, enter c.
```

Insert the diskette you would like to backup into the drive and press
Enter. You will see the following messages:

```
  Reading Head 1 Track 79
  Insert target diskette
```

Insert a blank, formatted diskette. Then you will see:

  msgs: writing, verifying, formatting Head 1 Track 73

  Insert bootable diskette and hit any key to re-start.

When you have finished copying the diskettes, use the copy of the Boot and
Installation Diskettes for the rest of the installation procedure. Put
the originals in a safe place.

Next choose the **Boot from Diskettes** option, and press **Enter**. You will
see:

```
+-----------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦
¦                     LOAD A SYSTEM FROM THE DISKETTE
¦
¦           Module to be loaded:        unix.gen
¦           System mode:                Single User
¦           Run system from hard disk: No
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦     Press Space to toggle the field to the desired value.
¦     Press Enter to confirm your selection and continue.
¦     Press F3 to cancel this selection.
¦
¦
¦
¦
+-----------------------------------------------------------------------------
```

The questions appear on the screen one at a time. Use the default answers
given on the screen and press **Enter** after each request.
You will then see:

```
        Loading sec 0 (.bss) at 0xXXXXXX, length YYYYYY bytes
        YYYYYY bytes cleared
        Loading sec 1 (.data) at 0xXXXXX, length YYYYYY bytes
        YYYYYY bytes loaded
        Loading sec 2 (.text) at 0xXXXXXX, length YYYYYY bytes
        YYYYYY bytes loaded
```

And then:

  Please insert BOOT diskette number 2; press any key when ready.

Insert Boot Diskette number 2 and press any key. You will see the
following:

```
+----------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦                        AIX PS/2 INSTALLATION
¦
¦
¦
¦
¦
¦
¦
¦          To install AIX, insert installation diskette and press Enter.
¦
¦                              - OR -
¦
¦     To perform system maintenance, insert the Maintenance diskette and press Ent
¦
¦
¦
¦
¦
¦     Check to make sure the diskette is write-enabled before using.
¦
¦
¦
¦
¦
+----------------------------------------------------------------------
```

Note: The copy of the Installation Diskette you are using must be
        write-enabled. That is, slide the black tab in the lower corner of
        the diskette so that you cannot see through the hole.

At this point, insert the write-enabled Installation Diskette and press
Enter. The loading of the kernel will take a few seconds. You should now
see:

```
  IBM AIX PS/2 Version 1.2.1
  driver not initialized
  Available User Memory: 351 pages (xxxxxx bytes)
```

Exactly what you will see will depend on the configuration of your system.
And then a new menu will appear.

```
+----------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦                        SYSTEM INSTALLATION
¦
¦
¦
¦
¦
¦                      Install and Customize AIX
¦
¦                        End Installation
¦
¦
¦
```

```
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦    Hit <SPACE> to toggle items; <ENTER> to select.
¦
¦
¦
¦
¦
+------------------------------------------------------------------------
```

This menu lists two options: Select the first, **Install and Customize AIX**,
and press **Enter** to continue.

3.6 Running the Installation Program

After the message **Getting disk drive parameters...**, a new menu will appear
and look like this:

```
+------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦                    INSTALL A NEW VERSION OF AIX
¦
¦     Select a method of installation
¦
¦             Install a NEW AIX System. All AIX type minidisks
¦             will be deleted.
¦
¦             Replace your Current Version of AIX with the New
¦             Version.  AIX system minidisks will be deleted.
¦             All user created AIX minidisks as well as
¦             all non-AIX minidisks and DOS partitions will remain
¦             intact.
¦
¦
¦
¦
¦
¦
¦
¦             Hit <SPACE> to toggle items; <ENTER> to select.
¦             or F3 to return to the previous menu.
¦
¦
¦
¦
¦
¦
+------------------------------------------------------------------------
```

Choose **Install a NEW AIX System** and press **Enter**.

Then you will be asked if you want to continue.

The following warning appears:

```
+------------------------------------------------------------------------
¦
¦     The installation method you have selected will
¦     result in the deletion of all AIX minidisks.
¦     Do you wish to proceed (y/n)?
¦
+------------------------------------------------------------------------
```

Type a **y** and press **Enter**.
Then you may see the following if you have previously installed AIX on
this PS/2.

```
        Removing all AIX minidisks ...
        Deleting ...
        /dev/hd6
        /dev/hd5
        /dev/hd4
        /dev/hd3
        /dev/hd2
```

```
        /dev/hd1
```


Note: If you select the **Replace your Current Version of AIX** option
           instead of the **Install a NEW AIX System**, the menu screens will be
           similar to those screens shown for the first option. The only
           differences are:

               The warning screen will say, "The installation method you have
                selected will result in the deletion of AIX *system* minidisks".

               The list of minidisks being replaced will not include user
                created minidisks. The header will read, "Removing AIX *system*
                minidisks".

User-created minidisks are saved but they cannot be remounted or used
without a few extra steps. The */hd/hdx* stanza will be missing from
/etc/filesystems and the *hd name* will not appear on the **show** option of the
minidisks command.

To restore the minidisk(s) to usefulness you must reinstall with the **mdrc**
command, recreate the mountpoint, and remount the minidisk(s). Use the
following steps:

```
        mdrc -h hdnum
        mkdir mountpoint
        mount /dev/hdnum /mountpoint
```

By selecting the option **Installing a NEW AIX System** you will see the
following screen:

```
+--------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦                       CLUSTER ID MENU
¦
¦          Enter Cluster ID
¦
¦          Continue Installation
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦    Hit <SPACE> to toggle items; <ENTER> to select
¦
¦
¦
¦
¦
```

+---

If you do not want to install TCF, select **Continue Installation** and press
Enter.

When you select **Enter Cluster ID**, type Internet Protocol address of the
primary site for the cluster you are installing in the form
xxx.xxx.xxx.xxx.x.x.   Then press **Enter**.

You will need this number when installing dependent TCF sites. For
further information about IP addresses, see the *AIX TCP/IP User's Guide*.

You will return to the CLUSTER ID menu. Select **Continue Installation** and
press **Enter**.

Subtopics
3.6.1 Install and Customize AIX
3.6.2 Change Current Choices and Install

3.6.1 Install and Customize AIX

After responding to the CLUSTER ID menu, you will see the following
screen.

```
+-------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦                    INSTALL AND CUSTOMIZE AIX
¦
¦
¦
¦           Install AIX with Current Choices
¦
¦           Show Current Choices and Install
¦
¦           Change Current Choices and Install
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦   Hit <SPACE> to toggle items; <ENTER> to select.
¦    or F3 to return to the previous menu.
¦
¦
¦
¦
+-------------------------------------------------------------------------
```

3.6.1 Install and Customize AIX

After responding to the CLUSTER ID menu, you will see the following
screen.

3.6.2 Change Current Choices and Install

Select option 3, **Change Current Choices and Install**, and press **Enter**.

From the CHANGE CURRENT CHOICES AND INSTALL menu, choose the number of the
minidisk you want to change, and press **Enter**. This menu shows current and
recommended choices, and the range of possible choices. The current and
recommended choices are the same until you install the Operating System
with changes. At any point, you can press **F3** to cancel all changes and
return to the INSTALL AND CUSTOMIZE AIX menu.

```
+---------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦                   CHANGE CURRENT CHOICES AND INSTALL
¦
¦      Select a minidisk to change, or install AIX
¦
¦                             Disk           Blocks           Files
¦
¦           /u                 0             9788             978
¦           /aixps2            0             7995             799
¦           /                  0            42000            4200
¦           page               0             4000               0
¦           dump               0             4000               0
¦           /aixps2/tmp        0             5798             579
¦
¦           Install the Operating System and cause the current
¦           choices to take effect.
¦
¦
¦      Hit <SPACE> to toggle items; <ENTER> to select
¦      or F3 to return to the previous menu.
¦
¦
¦
¦
¦
+---------------------------------------------------------------------------
```

If you choose to change any of these choices, you will get the following
windows. (The first window appears only when there is more than one fixed
disk).

```
+---------------------------------------------------------------------------
¦
¦      Change the fixed disk where the "/(root)" minidisk
¦      will be stored; valid choices are (0,1): _
¦
+---------------------------------------------------------------------------
```

```
+---------------------------------------------------------------------------
¦
¦      Change the number of blocks for the "/root" minidisk.
¦      Enter 0 or a value in the range (16-NNNNNN): _
¦      (Default: 42000)
¦
+---------------------------------------------------------------------------
```

```
+------------------------------------------------------------------------
¦
¦      Change the number of files for the "/root" minidisk.
¦      Enter a value (0-NNNNNN): _
¦      (Default: NNNNNN)
¦
¦
+------------------------------------------------------------------------
```

In these windows, the value **NNNNNN** will vary depending on the size of your
disk drive(s) or on what value you select for your minidisk.

Note: The page size should be twice the size of the physical RAM.

After making all your changes and returning to the CHANGE CURRENT CHOICES
AND INSTALL menu, type **7**, and press **Enter** to make the changes take effect.

At first you will see:

  Installation of AIX will take several minutes.
  To cancel and return to the INSTALL AND CUSTOMIZE AIX menu, press F3.

After all the minidisks and file systems have been created, the screen
will be similar to the one below. The values for your system may differ,
depending on the system's fixed disks.

```
+------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦             CREATING MINIDISKS AND FILESYSTEMS
¦
¦    Installing AIX...
¦        - building minidisk /u (9788 blks) on ID#1
¦        - building minidisk /aixps2 (7995 blks) on ID#2
¦        - building minidisk / (root) (42000 blks) on ID#3
¦        - building minidisk page (4000 blks) on ID#4
¦        - building minidisk dump (4000 blks) on ID#5
¦        - building minidisk /aixps2/tmp (5798 blks) on ID#6
¦
¦
¦
¦        - making /u filesystem (9788 blks: 2500 files) on ID#1
¦        - making /aixps2 filesystem (7995 blks: 1500 files) on ID#2
¦        - making / (root) filesystem (42000 blks: 5000 files) on ID#3
¦        - making /aixps2/tmp filesystem (5798 blks: 1000 files) on ID#6
¦
¦
¦
¦
¦
¦
¦
+------------------------------------------------------------------------
```

After the last file system has been built, the screen will clear and
display:

```
+----------------------------------------------------------------------------
|
|
|
|
|
|                          FIRST STAGE INSTALLATION
|
|
|
|
|
|      Installation of the mini system will take several minutes.
|
|
|                    Installing mini-root, please wait ...
|
|                    Installing mini-local, please wait ...
|
|                    Updating /etc/system.
|                    Linking devices.
|                    Updating Configuration file
|                    updating global information file /etc/fsmap.
|
|                    Completing first stage installation.
|
|
|
|
|
|
+----------------------------------------------------------------------------
```

Then you will see:

```
+----------------------------------------------------------------------------
|
|
|
|
|
|              INSTALLATION OF THE MINI SYSTEM IS COMPLETE
|
|
|
|      The system is now ready to reboot.
|      After you receive the "System Halted" message
|      remove the Installation Diskette
|      and insert Boot Diskette 1.
|
|      After you have switched the diskettes
|      press Enter to reboot the system.
|
|
|
|
|      Refer to the "Installing and Customizing the AIX Operating System" Manual
|      for further instructions.
|      System halted, you may turn the power off now.
|      Type Enter to Reboot:
|
|
|
|
```

+---

Continue with the next section "Rebooting the Kernel from the Boot
Diskettes."

3.7 Rebooting the Kernel from the Boot Diskettes

Remove the Installation Diskette, insert Boot Diskette 1, and press **Enter**.
You should see:

```
+----------------------------------------------------------------------
|
|
|
|
|                  IBM AIX PS/2 Bootstrap
|                       vers 1.2.1
|
|           Boot from Diskettes
|           Boot from Hard Disk
|           Boot from Ethernet
|           Boot from Token Ring
|           Boot DOS
|           Set Keyboard Language
|           Set Monitor Type
|           Set Timezone
|           Set Machine Name
|           Set NLS Translation Language
|           Copy Diskette
|           Stand-alone Backup
|           Stand-alone Restore
|
|     Use the cursor keys to select the desired item.
|     Press Enter to confirm your selection and continue.
|     Press F3 to change this selection.
|
|
|
|
|
+----------------------------------------------------------------------
```

Choose the **Boot from Diskettes** option.
Next you will see a familiar screen, but you will have to make a change.

```
+----------------------------------------------------------------------
|
|
|
|
|
|
|
|                  LOAD A SYSTEM FROM THE DISKETTE
|
|       Module to be loaded: unix.gen
|
|
|
|
|
|
|
|
|
|
|
|
|       Press Space to toggle the field to the desired value.
|       Press Enter to confirm your selection.
```

```
¦        Press F3 to cancel this selection.
¦
¦
¦
¦
¦
¦
¦
+-----------------------------------------------------------------------
```

Press **Enter**. Next you will see:

   System mode: Single¦User

Press **Enter**, *but do not press* **Enter** *again.* Now you will see another
prompt.

Warning: The **NO** at this prompt must be changed to a **YES**. Press the **Space**
bar to change the answer to yes, and it will look like this:

   Run system from fixed disk: YES

Press **Enter**.

The system reads from diskette and requests a second diskette.

Some messages about loading **unix.gen** will scroll quickly across the
screen. After a moment, you will see:

   IBM AIX PS/2 Version 1.2.1 aunix1
   driver not initialized
   Available User Memory: 351 pages (xxxxxx bytes)

3.8 Completing the Installation of AIX PS/2

You should now see this menu on your screen:

```
+----------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦                    CONTINUE  INSTALLATION
¦
¦
¦           Diskette Drive 0
¦
¦
¦           Diskette Drive 1
¦
¦
¦           6157 Tape
¦
¦           ITBU Tape
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦           Hit <SPACE> to toggle items; <ENTER> to select.
¦
¦
¦
¦
¦
+----------------------------------------------------------------------
```

If you would prefer to use the second drive (Diskette Drive 1), or the
6157 or ITBU tape drives, select option 2, 3 or 4 and press **Enter**.

Otherwise, press **Enter** to indicate that you will be using Diskette Drive
0.

The screen will clear and display:

```
  Use the Operating System Diskettes.
  Please mount volume 1 on /dev/fd0
  ... and press Enter to continue
```

You will see a list of operating system files that are being loaded onto
your fixed disk.
If you are installing with diskettes, the following prompt will appear:

```
  Please mount volume xx on /dev/fd0
  ... and press Enter to continue
```

The number of the next diskette in the set to be inserted is **xx**, and **fd0**
represents the diskette drive number. When all the diskettes have been
read in, you will see the screen display:

```
  files restored: xxxx
```

Press Enter to refresh the screen (Be sure to check for errors).

Note: If you are installing from tape, and the first file has been read,
you will also see this message.

Remove your diskette and press **Enter**. You will see:

   The new version of AIX was installed successfully.
   Post installation procedures will take several minutes.

   To CONTINUE with post installation processing, press Enter.

Press **Enter** again. You will see:


```
+----------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦                      CONSOLE LOGIN MODE
¦
¦          Normal console login. At system
¦          startup /etc/getty will run on the
¦          system console allowing login by
¦          any valid username.
¦
¦          Automatic login of specific username.
¦          At system startup the specified
¦          username will be automatically logged
¦          into the console.
¦
¦
¦
¦
¦
¦
¦
¦
¦    Hit <SPACE> to toggle items; <ENTER> to select
¦    or F3 to return to the previous menu.
¦
¦
¦
¦
+----------------------------------------------------------------------
```


Choose the first option, **Normal Console Login**, and press **Enter**.
The menu titled CONSOLE LOGIN MODE lists two ways of logging in to AIX at
the system console during normal operation. If you select the first,
Normal console login, a login prompt appears on the system console when
the system is turned on. Then you must enter your login name. If you
select the second way, **Automatic login**, you will be prompted to enter a
name during installation. When the system is turned on, this name is used
by the system to automatically log in for you.

You will see:

   Running post installation. Please wait ...

And then the INSTALL PROGRAM PRODUCTS screen.

If you would like to choose the option **Install a Program Product**, see
"Installing Licensed Program Products" in topic 4.5. If not, select **End
Installation**.

If you are installing using the ITBU, you must select **End Installation** and
continue after the machine reboots.

3.9 After the Installation

You will see the following screen:

```
+----------------------------------------------------------------------
¦
¦
¦
¦
¦
¦                      POST  INSTALLATION
¦
¦
¦
¦
¦      Post installation processing is complete. To start
¦      your system return to the SYSTEM INSTALLATION menu
¦      and select the END INSTALLATION menu item.
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦     To RETURN to the SYSTEM INSTALLATION menu, press ENTER
¦
¦
¦
¦
¦
+----------------------------------------------------------------------
```

You will now see the following screen:

```
+----------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦                    SYSTEM  INSTALLATION
¦
¦
¦
¦
¦
¦          Install and Customize AIX
¦
¦          End Installation
¦
¦
¦
¦
¦
¦
¦
¦
¦       Total free space on root: <40660>
¦
¦    Hit <SPACE> to toggle items; <ENTER> to select
¦    or F3 to return to the previous menu.
```

Move the cursor to the **End Installation** option, and press **Enter**.

```
+----------------------------------------------------------------------
|
|
|
|
|
|
|                      END INSTALLATION
|
|
|     The system is now ready to reboot.
|     After you receive the "System Halted" message
|     remove any diskettes and
|     press Enter to reboot the system.
|
|
|
|
|     15:16:15 System halted, you may turn the power off now.
|     15:16:15 Press Enter to reboot:
|
|
|
|
|
|
|
|
|
|
|
+----------------------------------------------------------------------
```

Press **Enter**.
The system will reboot and shortly display the following login prompt:

```
  IBM AIX PS/2 Operating System - Version 1.2.1
  5713-AEQ (C) COPYRIGHT IBM CORP. 1988
  LICENSED MATERIAL - PROGRAM PROPERTY OF IBM
  aixps2 PS/2 Console login:
```

Type in **root** and press **Enter**. A message of the day banner will be
displayed and then you will receive a **#** prompt.

At this point, you should do the following:

   use the **updatep** command if necessary (See *Managing the AIX Operating
   System.*)

   add users (See *Managing the AIX Operating System.*)

   set passwords (See *Using the AIX Operating System.*)

   use the **devices** command to customize your system (See Chapter 6,
   "Customizing the TCF Cluster.")

See below for information on logging out and turning off the system.

Subtopics
3.9.1 Logging in to the AIX PS/2 Operating System
3.9.2 Logging out of the AIX PS/2 Operating System
3.9.3 File Size Limits

3.9.1 Logging in to the AIX PS/2 Operating System

You can log in to the system in the following way:

1. Turn on the power switches. As described in Chapter 2, "Planning for
    Cluster Site Installation," when you start your IBM PS/2 system, the
    system goes through a series of internal tests before it is ready to
    use. While these procedures are running, various messages about
    system activities display on the screen.

2. Enter your login name after the prompt **login:** and press **Enter**.
    Remember to use your exact login name. The system will require
    lowercase letters if that was the way the login name was originally
    entered. If your system does not require a user name, the message
    Autologin of (user name) is displayed, followed by the shell **$** or **#**
    prompt. You are now ready to begin using the system.

3. Enter your password. If you have just installed the AIX PS/2
    Operating System and have no password, you will not be prompted for
    one. Instead, you will see the **$** or **#** prompt. If you do have a
    password and enter it when requested, the **$** or **#** prompt appears.

    For security reasons, the system does not display your password as you
    type it. See *Managing the AIX Operating System* for information on
    passwords and security procedures.

    The system is now ready to accept a command.

    If your system again displays the login prompt, you are not logged in.
    Try to log in again. Be sure to type your password correctly.

3.9.2 Logging out of the AIX PS/2 Operating System

You can log out of the system in two ways:

Log out and leave the system running for others to us

Log out and turn off the system

Logging out and Letting the System Run: Follow these instructions to log out and leave the system running:

1. Be sure that all virtual terminals other than the console are closed.

2. Be sure that the **$** or **#** prompt is displayed on the screen.

3. Press **Ctrl-d**.

Logging out and Stopping the System: To log out of the system and turn off the power to the system, follow these steps:

1. Be sure that the **$** or **#** prompt is displayed on the screen.

2. Type **shutdown -F**. Then press **Enter**. See the warning below.

3. All users are now informed of the impending shutdown. To proceed with the shutdown, type **y** and press **Enter** when prompted.

4. When you receive the message **System Halted**, turn off the power to the system.

Warning: It is very important that you use the **shutdown** command before you turn off the power to your system. Failure to do so can result in the loss of data, damage to the AIX PS/2 Operating System, or both.

When you issue the **shutdown** command, the system notifies all users of the impending shutdown.

If you have a standalone or single-user system and want a fast shutdown, type the **shutdown** command. This command bypasses the message to other users and brings the system down as quickly as possible.

When the AIX PS/2 Operating System stops running, the screen displays

   ...shutdown completed...

Note: Only certain system users can use the **shutdown** command. These users are responsible for shutting down the system. If you are not the person responsible for shutting down your system, log out, and leave the system running.

For more information about **shutdown**, see *Managing the AIX Operating System*.

3.9.3 File Size Limits

The AIX family default file size limit for all processes is 4 Megabytes.
There are ways to increase this on a per system (cluster, if you are using
TCF) basis or on a per-user basis. The system-wide change can be done by
changing **/etc/system** and rebuilding the kernel(s). The per-user limit can
be changed by **adduser**. See the following example:

```
ulim_file = 2097152
ulim_data = 8388608
ulim_stack = 2097152
```

Warning: The proper way to change configurable kernel parameters is in
/etc/system. 386 machines do not compile **conf.c** as part of **newkernel**.
They do kernel configuration using patchdecks generated from using the **awk**
command on the configuration summary file. Patches are generated for
those things in the master file that have **patchaddr** attributes and whose
default values differ from the new desired values given in **/etc/system**.
See *AIX Programming Tools and Interfaces* for more information about the
awk command.

In general, the only way that the master file should change in a field is
if a user adds a new (OEM supplied) device driver.

4.0 Chapter 4. Installing Additional Licensed Program Products

Subtopics

4.1 CONTENTS

4.2 About This Chapter

This chapter explains how to install additional licensed program products
(LPPs).

4.3 Selecting Additional Programs

The AIX PS/2 Operating System contains the following programs:

Base Operating System

Boot

Installation

Maintenance

Asynchronous Terminal Emulation

DOS Server

Graphic Subroutine Library

man (Part of the Operating System Extensions)

learn

All other licensed programs are sold separately.

You can choose to install none, some, or all of these programs. IBM
recommends that you install the programs in order of the amount of use
they will receive. For instance, if you believe that you will use
Usability Services most, you should install it first.

If you have an update diskette for any of the AIX PS/2 Licensed Program
Products, see *Managing the AIX Operating System* for update instructions.

Note: For more detailed descriptions of the programs available for the
AIX PS/2 Operating System, see the *AIX PS/2 General Information
Manual*, GC23-2055.

Application Development Toolkit (ADT)

The Application Development Toolkit provides tools and services
required to support a programming development environment. There are
two components that can be installed separately:

-   Extended Programming Support

-   Source Code Control System

C

AIX PS/2 C Language is a high-level programming language that provides
2 high performance, optimizing C compilers.

Note: AIX PS/2 C Language requires the AIX PS/2 Application
Development Toolkit.

DOS Merge

DOS Merge provides a familiar interface to DOS users. It allows
multiple users to execute IBM DOS Version 3.30 and many DOS
applications. DOS merge also allows access to DOS files from AIX,
access to AIX files from DOS, and full file conversion utilities.

Note: DOS Merge requires a DOS 3.3 operating system diskette.

DOS Server

IBM DOS Server allows DOS users on connected PCs and PS/2s to take
advantage of the AIX PS/2 storage facilities and to access data and
programs that are maintained under AIX PS/2. IBM DOS Server is
installed on the PS/2 serving as a host, and requires AIX Access for
DOS Users to be installed on the PCs and PS/2s running DOS.

Graphic Support Library (GSL)

Advanced Display Graphics Support Library (GSL) provides a program
interface for graphics applications to displays.

GSL includes a set of graphics primitives designed to provide access
to the display hardware with a minimum of system overhead.

Notes:

1. If you install GSL or other PS/2 LPPs on a heterogeneous cluster
    using System/370 media, you must have at least one PS/2 running in
    the cluster at the time of installation.

2. Modify the kernel of both the primary site and the PS/2 site so
    that they have different subnet numbers. Next modify the rest of
    the cluster. Then reboot the cluster.

    When you have a cluster consisting of only your primary site and a
    PS/2, then you can proceed with the installation of GSL.

INed and INmail/INnet/INftp

The INned program is a full-screen text editor that enables you to
enter programs, memos, and other text documents into files. By using
the INed key commands, you can view, revise, and delete files.

The INmail/INnet/INftp program provides for the queued transfer of
files and electronic messages, and to interactively enter commands
that can be executed at other remote systems.

Network File System (NFS)

AIX PS/2 Network File System (NFS) allows a properly configured AIX
PS/2 to participate in an NFS local area network. With NFS, non-IBM
mainframes and workstations can be integrated with AIX systems or
clusters. This integration ability allows resource sharing while
still supporting the specific needs of each user.

Note: AIX PS/2 Network File System requires AIX PS/2 TCP/IP.

Operating System Extensions

Operating System Extensions provides additional AIX commands and
subroutines to complement the AIX commands that are already part of
the AIX Operating System.

Each component in Operating System Extensions can be installed
separately. If you do not need the entire program, you can save
minidisk space for other uses by selecting and installing only those
components you need.

These are the components:

-   Administrative Support (directory profiling, password checking,
    archiving, terminal information)

-   BNU (Basic Network Utilities) (for copying one or more files from
    one system to a single destination on another system)

-   Extended User Support

-   Mail, Sendmail (Network message routing functions)

-   MH (Message Handling) Package (alternative to **mail** command for
    sending, receiving, and handling messages)

-   on line documentation (man pages)

-   samples (sample programs)

See "Calculating Minidisk Size Requirements" in topic 2.5 for
information on the required block sizes of each component.

TCP/IP

The Transmission Control Protocol/Internet Protocol, or TCP/IP,
supports certain communications protocols, commands, and an
applications programming interface. These features allow two systems
to have equivalent protocols. The systems can then transfer files,
relay mail, and perform network management tasks. In addition,
Interface Program for use with TCP/IP allows remote connection to a
host system and remote login capability.

Text Formatting System (TFS)

The Text Formatting System provides text processing and typesetting
functions.

Transparent Computing Facility (TCF)

AIX PS/2 Transparent Computing Facility (TCF) allows AIX PS/2 in a
multiple-node, networked environment to appear to users as a single
host system. Up to 31 AIX systems can be connected (*clustered*) via
Ethernet or IBM Token-Ring into a single system image. TCF clusters
can be connected by way of TCP/IP or NFS to allow additional sharing
of data.

Usability Services

Usability Services provides a menu-driven program that allows you to
use commands and select options on your system. Usability Services
translates those commands and selections into ones that the AIX PS/2
Operating System can understand. Usability Services also has a window
function that lets you work on a number of files and tasks at the same
time if you have an appropriate display station.

Exploring Usability Services is an on-line tutorial designed to
introduce you to the functions available through the Usability
Services program. It should help you become familiar with the
capabilities of Usability Services. By responding to questions and
entering choices, you do exercises designed to help you experience the
windowing functions of the Usability Services program. Usability
Services must be installed prior to installing Exploring Usability
Services.

VS COBOL

AIX PS/2 VS COBOL is a high-level programming language that provides a
high performance, optimizing VS COBOL compiler.

Note: AIX PS/2 VS COBOL requires the AIX PS/2 Application Development
     Toolkit.

VS FORTRAN Version 2

AIX PS/2 VS FORTRAN Version 2 is a high-level programming language
that provides a high performance, optimizing VS FORTRAN compiler.

Note: AIX PS/2 VS FORTRAN Version 2 requires the AIX PS/2 Application
     Development Toolkit.

VS Pascal

AIX PS/2 VS Pascal is a high-level programming language that provides
a high performance, optimizing VS Pascal compiler.

Note: AIX PS/2 VS Pascal requires the AIX PS/2 Application
     Development Toolkit.

Workstation Host Interface Program (WHIP)

The AIX PS/2 Workstation Host Interface Program (WHIP), using the PS/2
3278/79 Emulation Adapter in DFT mode, allows you to communicate with
a System/370 host system and provides:

-   3278/79 emulation (**E789**)

-   High-speed file transfer (**fxfer**)

-   Application Program Interface (**API**)

X.25

AIX PS/2 X.25 allows a properly configured PS/2 to attach as Date
Terminal Equipment (DTE) to an x.25 packet-switched data network.
X.25 is supported on a single port or on two ports simultaneously.

X-Windows

AIX PS/2 X-Windows provides a popular windowing environment to users
on all-points-addressable displays. Based on the X-Windows Version 11
protocol, it provides a powerful end-user interface into whatever
environment the user is operating.

4.4 Preparing For Additional Program Installation in a TCF Cluster

Prior to the installation of any additional programs, the following
preparatory work needs to be done:

Decide Which LPPs to Store on Each Site

Because each secondary cluster site can have varying disk storage
capacities, you need to decide in advance which program products will
be stored in the root file system on each machine.

Table 2-2 in topic 2.5.1 shows the disk requirements for all
components and licensed program products. The AIX PS/2 Base System
Program and TCP/IP, if present, must be stored on each replicated root
file system on a PS/2. Refer to the internal service command
/etc/lpp/qproc of the **installp** command in the *AIX Operating System
Commands Reference, Vol.2* for a description of what to do if you want
an LPP to be installed on a site other than the one you first
selected.

Determine the Size of the Secondary Root File System

Based on the storage requirements of each of the components in
Table 2-1 in topic 2.5.1 and Table 2-2 in topic 2.5.1 you must decide
which LPPs will be stored in the replicated root on each of your
secondary sites. Adding together the requirements for all selected
components gives you the approximate storage requirements for your
local replicated roots. Be sure to include the storage requirements
for the Base System Program and TCP/IP in your calculations. An
additional 5% to 10% should be added to this figure to provide a
"buffer" of free space in your roots.

Determine LPP Storage

Your AIX PS/2 system comes with a default set of **fstore** values that
determine the files to be stored on each site in a system replicated
file system. Each file installed into the replicated root has an
fstore value associated with it. For more information on **fstore** see
the **chfstore** command in the *AIX PS/2 Commands Reference*.

The following list of **fstore** options is provided with a standard
AIX/370 installation:

020000000000:0:none (stored only on primary and backbone sites)
037777777777:0:all (stored on all sites)
000000007000:0:i386 (stored on all 386 sites)

Customize LPP Storage

If your cluster is relatively homogeneous with respect to disk
capacities of each machine of a particular type (for example, all of
your PS/2s have 314 MB drives), you may wish to use the default set of
fstore values provided. In this case, simply assign one of the above
default values to each LPP when installing.

Customizing the **fstore** values provide a very high degree of
flexibility in designating LPP storage locations, and is particularly
well-suited to clusters with varying disk capacities on machines of
the same type (some PS/2s with 70MB drives, some with 314MB drives,
and so on.)

Refer to Chapter 6, "Customizing the TCF Cluster" for a description of customizing **fstore** values for LPP storage.

4.5 Installing Licensed Program Products

If you would like to install any LPPs after the installation is complete,
see "Installing Additional Programs after the Original Installation" in
topic 4.6. During installation you will have the opportunity to install
any licensed program products. You will see the following screen:

```
+------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦                      INSTALL PROGRAM PRODUCTS
¦
¦
¦
¦              Continue Installation
¦
¦              Install a Program Product
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦    Total free space on root: 26876K
¦
¦
¦
¦    Hit <SPACE> to toggle items; <ENTER> to select.
¦
¦
¦
¦
+------------------------------------------------------------------------
```

The **Total free space on root** is the amount of space available to install
program products. Some LPPs, however, can be put on separate minidisks.
Refer to Table 2-2 in topic 2.5.1 for LPP block size requirements.

If you have no licensed program products to install here, select **Continue
Installation** and see "After the Installation."

If you wish to install licensed programs at this point, select **Install
Program Products**, and press **Enter**. The following menu will appear:

Note: The seperately installable portions of the Base Operating System
        and Operating System Extensions packaged on an ITBU tape, cannot be
        installed at this time. See "Installing Additional Programs after
        the Original Installation".

```
+------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦                      SET INSTALL DEVICE
¦
```

```
|        Diskette Drive 0
|
|
|        Diskette Drive 1
|
|
|        6151 Tape
|
|
|        ITBU Tape
|
|
|
|
|
|
|
|
|
|
|
|
|
|
|
|   Hit <SPACE> to toggle items; <ENTER> to select.
|
|
|
|
|
+-------------------------------------------------------------------------
```

Select the appropriate diskette drive and press **Enter**.

It is important to install the programs in the order in which you expect
to use them most. When prompted to do so, insert the appropriate diskette
into the specified drive and press **Enter**.

Follow the prompts to install the additional program. If the program has
multiple diskettes, the system tells you when (and in what sequence) to
load them. As various files are restored from the diskette, they are
listed on the screen. If a program has components that can be installed
separately, a menu will let you select the components you want to install.

When you have completed installing the program product, the INSTALL
PROGRAM PRODUCTS menu will again be displayed. Select the option **Install
a Program Product** until you have installed all of your programs.

If you receive a message indicating that the programs did not load
successfully, try the installation procedure again. If numbered messages
appear, go to the *IBM AIX Operating System Messages Reference* for
suggested actions.

4.6 Installing Additional Programs after the Original Installation

Remember, it is important to install the programs in the order in which
you expect to use them most. You may want to install them in the sequence
in which they are described in the previous section.

To install additional programs, use the **installp** command. The
installation process described below is essentially the same for each of
the programs. You may see some variation in the wording and messages on
the screen, but the steps are very similar.

Should an error message display on the screen, see *AIX Operating System
Messages Reference* for details. See *AIX Operating System Commands
Reference* for a detailed discussion of the **installp** command.

Japanese Language Support: If Japanese Language Support is provided with
your system and you selected a Japanese locale while installing the AIX
PS/2 Operating System on your machine, then all the information which
appears on your screen to guide you through installing or updating LPPs
(with **installp** or **updatep**) will be in Japanese. However, all input
required during these processes must still be entered in English. For
details on types of information which must always be expressed in English
regardless of locale selected (such as login IDs, passwords, site names,
system directory names, and so on), see the *Guide to Multibyte Character
Set (MBCS) Support*.

To install an additional program from diskettes, follow these basic steps:

```
+--- To Install an Additional Program ---------------------------------+
¦                                                                      ¦
¦ 1.  Log in as superuser or as a member of the system group.          ¦
¦                                                                      ¦
¦ 2.  Make sure that no one else is using the system, that no user     ¦
¦     programs are running, and that all the daemons are killed.       ¦
¦                                                                      ¦
¦ 3.  Type installp.  Then press Enter.                                ¦
¦                                                                      ¦
¦ 4.  When prompted to do so, insert the appropriate diskette into the ¦
¦     proper diskette drive.                                           ¦
¦                                                                      ¦
¦ 5.  Follow the prompts to install the additional program.  If the    ¦
¦     program has multiple diskettes, the system tells you when (and in ¦
¦     what sequence) to load them.  As various files are restored from ¦
¦     the diskette, they may be listed on the screen.  If a program has ¦
¦     components that can be installed separately, a menu will let you  ¦
¦     select the components you want to install.                       ¦
¦                                                                      ¦
¦ 6.  When installation is complete, remove the diskette and return it ¦
¦     to its protective diskette holder in the binder.  In some cases, ¦
¦     the system may restart at this point.  If so, a message will     ¦
¦     advise you.                                                      ¦
¦                                                                      ¦
¦ 7.  Log out.                                                         ¦
¦                                                                      ¦
+---------------------------------------------------------------------+
```

If you install Usability Services, you can perform many of the same tasks
that you can from the AIX shell, including the installation of programs
described above.

Warning: You must install Usability Services from the AIX shell. Do not
attempt to reinstall Usability Services from within Usability Services.
Doing so may damage certain files.

Subtopics
4.6.1 History Files
4.6.2 Updating LPPs

4.6.1 History Files

A separate history file is maintained for each program installed by the
installp command. For example, separate history files are maintained for
Sendmail and Message Handler.

For additional information about history files, see *Managing the AIX
Operating System.*

Subtopics
4.6.1.1 linstall

4.6.1.1 linstall

linstall is used by the installation process to install the base operating
system onto the target machine.

It is run in the shell scripts **.post.386.sh** and **.post.370.sh**, depending on
the machine. It is also used to create empty files in the local of the
machine. **linstall** is run in **newsite.bkend**.

4.6.2 Updating LPPs

You may receive updates that to your licensed programs. To apply these
updates, use the **updatep** command. Refer to the *AIX Operating System
Managing Guide* for details.

4.6.2 - 1

4.6.2 Updating LPPs

You may receive updates that to your licensed programs. To apply these
updates, use the **updatep** command. Refer to the *AIX Operating System
Managing Guide* for details.

5.0 Chapter 5. Installing a PS/2 TCF Cluster Site

Subtopics

5.1 CONTENTS

5.2 About This Chapter

This chapter describes the procedures for adding PS/2 sites to a cluster.
Before installing PS/2 cluster sites, the primary site must be installed
and operational. The primary site is the site from which the root file
system is to be propagated. The secondary site joins the primary and uses
propagation to get the current contents of the root file system from the
primary site. The primary site must have, at minimum, the root, the
primary site's **local**, a kernel for the secondary, and the scripts **clm** and
newsite.

The AIX PS/2 BOS must have been installed on the primary site before the
installation of any PS/2 secondary sites is possible.

5.3 What You Need

An AIX PS/2 primary site installed as described i Chapter 3,
"Installing the AIX PS/2 Operating System."

A list of site and file system names, minidisk sizes and addresses
and network information for the cluster site you are installing.

A list indicating the LPPs which will be installed on each site an
the corresponding **fstore** value (see Chapter 4, "Installing Additional
Licensed Program Products").

5.4 What You Will Be Doing

Using the AIX PS/2 Boot, Installation and Maintenance Diskettes, you will
install AIX software on your PS/2 site. This process consists of the
following steps:

    Setting up your PS/2 for installatio

    Running the **clm** (cluster maintenance) program on the primary site.

    Coming up as a Dependent Sit

    Running the **newsite** program on the dependent site.

You have to bring up your PS/2 as a dependent site in order to propagate
the root file system from the primary to the new site. When a site is
dependent, it means that the system is booted without accessing any data
on its disk. All system files (such as **/etc/init** and **/bin/sh**) are
provided through the network. The dependent site kernel is generic
because it has not been configured for any particular machine. You can
bring up and propagate several new sites concurrently.

5.5 Setting Up Your PS/2 for Installation

Before you can begin to install AIX on your PS/2, you must first be sure
your machine is set up and operating properly. This includes using the
IBM PS/2 Reference diskette. See the *IBM PS/2 Quick Reference Guide* for
details.

The Boot procedure for AIX PS/2 is contained on a set of Diskettes. The
Boot Diskettes are labeled in numeric order. To start, you will load Boot
Diskette 1 in drive 0. Throughout the booting process you will be
prompted when to load the appropriate diskette.

You will also need the Installation and the Maintenance Diskettes.

To begin the installation procedure:

>   Insert Boot Diskette 1 (with the label up and metal-shutter en
>   forward) into diskette drive 0. Make sure the diskette clicks in
>   place.

>   Turn on the power switches to the computer, display, and othe
>   peripherals.

Note: If you see an error message on the display after the system starts,
see *IBM AIX Operating System Messages Reference*. Locate the
message by finding the six-digit number corresponding to the number
shown on your display. The manual will describe what caused the
message to appear and what you can do to resolve the problem.

Japanese Language Support: Even if Japanese Language Support is provided
with your AIX/370 primary site, the information which appears on your
screen to guide you through installing a PS/2 TCF Cluster site will be in
English. For details on the types of information which must always be
expressed in 7-bit ASCII regardless of language selected (such as login
IDs, passwords, site names, and so on), see the *Guide to Multibyte
Character Set (MBCS) Support*.

After turning on your system, you will see the following copyright screen:

```
+--------------------------------------------------------------------
¦
¦
¦
¦
¦
¦                     IBM AIX PS/2 Operating System
¦                            Version 1.2.1
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦    IBM AIX PS/2 Operating System Version 1.2.1
¦    5713-AEQ (C) IBM Corp. 1989
¦    LICENSED MATERIAL -- PROGRAM PROPERTY OF IBM
```

```
¦    All Rights Reserved
¦    PS/2 and AIX are trademarks of International Business Machines Corp.
¦
¦
¦
¦
+------------------------------------------------------------------------
```

If this is the first time you are installing AIX on this site, you will
see:

```
+------------------------------------------------------------------------
¦
¦
¦
¦
¦                     IBM AIX PS/2 Operating System
¦                             Version 1.2.1
¦                           NVRAM CONFIGURATION
¦
¦
¦
¦   AIX PS/2 requires that a few system configuration parameters
¦   be recorded in non-volatile memory (NVRAM).
¦   Your NVRAM does not contain this information.
¦
¦
¦   It will be necessary for you to provide the required information before
¦   proceeding to boot the AIX kernel.
¦
¦
¦
¦   Press any key to continue...
¦
¦
¦
¦
+------------------------------------------------------------------------
```

If AIX has been previously installed, skip to "The Bootstrap Menu" in
topic 3.5.1.

Press any key on the keyboard and the installation process will continue
with the screen on the next page.

If you wish to make any changes in your selections in the next several
menus, there will be a second chance in "The Bootstrap Menu" in
topic 3.5.1.

```
+------------------------------------------------------------------------
¦
¦
¦
¦
¦                  SELECT KEYBOARD LANGUAGE
¦
¦
¦         Belgian                          LatinAmer
¦         Canadian                         Norwegian
¦         Danish                           Portugese
¦         Dutch                            Spanish
¦         French                           Swedish
¦         German                           Swiss Fren
```

```
¦         Icelandic                            Swiss Germ
¦         Italian                              UK (English)
¦         Japanese                             US (English)
¦
¦
¦
¦
¦
¦
¦   Use the cursor keys to select the desired item.
¦   Press Enter to confirm your selection and continue.
¦   Press F3 to cancel this selection.
¦
¦
¦
+------------------------------------------------------------------------
```

Choose your keyboard language and press **Enter**.

The next screen to appear asks for information about the model number of
the display you are using. Check the base of the front of your display
for this number.

```
+------------------------------------------------------------------------
¦
¦
¦
¦                     SELECT MONITOR TYPE
¦
¦
¦
¦         VGA w/7544     (13 inch color display)
¦         VGA w/7554     (19 inch color display)
¦         VGA w/8503     (12 inch monochrome display)
¦         VGA w/8507     (19 inch monochrome display)
¦         VGA w/8512     (14 inch color display)
¦         VGA w/8513     (12 inch color display)
¦         VGA w/8514     (16 inch color display)
¦         VGA w/8515     (14 inch color display)
¦         8514A w/8503   (12 inch monochrome display)
¦         8514A w/8507   (19 inch monochrome display)
¦         8514A w/8512   (14 inch color display)
¦         8514A w/8513   (12 inch color display)
¦         8514A w/8514   (16 inch color display)
¦         8514A w/8515   (14 inch color display)
¦
¦   Use the cursor keys to select the desired item.
¦   Press Enter to confirm your selection and continue.
¦   Press F3 to cancel this selection.
¦
¦
¦
+------------------------------------------------------------------------
```

Note: The hardware connected determines the monitor options on you site.

Choose your display and press **Enter**. The next screen will prompt for the
timezone.

```
+------------------------------------------------------------------------
¦
¦
¦
¦                     TIMEZONE
¦
```

```
¦    (GMT)        Greenwich England      (GMT + 12)   New Zealand
¦    (GMT - 1)    Azores, Cape Verde     (GMT + 11)   Solomon Islands
¦    (GMT - 2)    Falkland Islands       (GMT + 10)   Eastern Australia
¦    (GMT - 3)    Greenland, East Brazil (GMT + 9)    Japan, Korea
¦    (GMT - 4)    Central Brazil         (GMT + 8)    Western Australia
¦    (GMT - 5)    Eastern U.S., Columbia (GMT + 7)    Thailand
¦    (GMT - 6)    Central U.S., Honduras (GMT + 6)    Tashkent USSR
¦    (GMT - 7)    Mountain U.S.          (GMT + 5)    Pakistan
¦    (GMT - 8)    Pacific U.S.           (GMT + 4)    Gorki USSR, Oman
¦    (GMT - 9)    Yukon                  (GMT + 3)    Turkey, Saudi Arabia
¦    (GMT - 10)   Alaska, Hawaii         (GMT + 2)    Finland, South Africa
¦    (GMT - 11)   Bering Straits         (GMT + 1)    Norway, France
¦
¦
¦    Use the cursor keys to select the desired item.
¦    Press Enter to confirm your selection and continue.
¦    Press F3 to cancel this selection.
¦
¦
¦
¦
+----------------------------------------------------------------------
```

Choose your timezone and press **Enter**.

You will then be asked:

  Do you observe daylight savings time?

Press the **Space** bar to indicate yes or no and press **Enter**.

If you answer **yes**, the system asks for **Daylight Savings Timezone Name**

If you answer **no**, you are asked for the **Standard Timezone Name**. Select
your timezone name and press **Enter**.

The next screen will prompt you for a language.

```
+----------------------------------------------------------------------
¦
¦
¦
¦                   SELECT NLS TRANSLATION LANGUAGE
¦
¦          Canadian
¦          Danish
¦          Dutch
¦          Finnish
¦          French
¦          German
¦          Italian
¦          Japanese
¦          Icelandic
¦          Norwegian
¦          Portuguese
¦          Spanish
¦          Swedish
¦          UK English
¦          US English
¦
¦    Use the cursor keys to select the desired item.
¦    Press Enter to confirm your selection and continue.
```

```
¦   Press F3 to cancel this selection.
¦
¦
¦
+------------------------------------------------------------------------
```

Select the language you want to use and press **Enter**.

The next screen asks you for your machine name. For some licensed
programs such as TCP/IP or TCF, your computer must have a unique name.

```
+------------------------------------------------------------------------
¦
¦
¦
¦
¦                         SELECT MACHINE NAME
¦
¦      Enter Machine Name:    aixps2
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦    Type the requested information into the highlighted field.
¦    Press Enter to confirm your selection and continue.
¦    Press F3 to cancel this selection.
¦
¦
¦
+------------------------------------------------------------------------
```

Enter a unique name that is the same as the site name that will be used
for this machine. The maximum length of the name is 8 characters.

Note: Record this name for use later in the installation.

This name is used internally to establish various file identifiers. When
certain product functions are used, for example in TCP/IP communications,
each system will require a unique name to function correctly.

Use the **aixps2** machine name which is the default entered if you do not
enter a machine name. You can only use the default name for one machine
in the cluster.

Subtopics
5.5.1 Copying the Install and Maintenance Diskettes
5.5.2 Installing Minidisks
5.5.3 Running the clm Program
5.5.4 Configuring TCP/IP
5.5.5 Coming up as a Dependent Site
5.5.6 Running newsite
5.5.7 Coming Up as a Secondary Site

5.5.1 Copying the Install and Maintenance Diskettes

The next screen you see is:


```
+-----------------------------------------------------------------------
¦
¦
¦
¦
¦                  IBM AIX PS/2 Bootstrap
¦
¦                     Version 1.2.1
¦
¦            Boot from Diskettes
¦            Boot from Hard Disk
¦            Boot from Ethernet
¦            Boot from Token Ring
¦            Boot DOS
¦            Set Keyboard Language
¦            Set Monitor Type
¦            Set Timezone
¦            Set Machine Name
¦            Set NLS Translation Language
¦            Copy Diskette
¦            Stand-alone Backup
¦            Stand-alone Restore
¦
¦      Use the cursor keys to select the desired item.
¦      Press Enter to confirm your selection and continue.
¦      Press F3 to cancel this selection.
¦
¦
¦
¦
+-----------------------------------------------------------------------
```


If you set any of options in the previous menus, you can change your
answers here. Just move the highlighted cursor to the option that you
would like to change and press **Enter**. You may also change any parameters,
including site name (machine name), that were set during a previous
installation on this machine by using this procedure.

When you are sure that all of your choices are correct, choose the **Copy
Diskette** option and press **Enter**.

Note: The Boot, Installation and Maintenance Diskettes are all
         permanently write-protected. Make backup copies of the I/M
         diskettes each time you do an installation.

The following screens will allow you to backup your AIX Boot, Installation
and Maintenance Diskettes.

```
  Diskette format and Copy Utility - v.1.1
  (C)copy, (F)ormat or (Q)uit (cfq)?

  insert new diskette, enter c.
```

Insert the diskette you would like to backup into the drive and press
Enter. You will see the following messages:

```
  Reading Head 1 Track 79
  Insert target diskette
```

Insert a blank, formatted diskette. Then you will see:

  msgs: writing, verifying, formatting Head 1 Track 73

  Insert bootable diskette and hit any key to re-start.

When you have finished copying the diskettes, use the copy of the Boot and
Installation Diskettes for the rest of the installation procedure. Put
the originals in a safe place. Next choose the **Boot from Diskettes**
option, and press **Enter**. You will see:

```
+------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦
¦                    LOAD A SYSTEM FROM THE DISKETTE
¦
¦           Module to be loaded:         unix.gen
¦           System mode:                 Single User
¦           Run system from hard disk:   No
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦     Type the requested information in the highlighted field.
¦     Press Enter to confirm your selection and continue.
¦     Press F3 to cancel this selection.
¦
¦
¦
¦
¦
+------------------------------------------------------------------------
```

The prompts appear on the screen one at a time. Use the default answers
given on the screen and press **Enter** after each request.

You will then see:

```
        Loading sec 0 (.bss) at 0xXXXXXXX, length YYYYYY bytes
        YYYYYY bytes cleared
        Loading sec 1 (.data) at 0xXXXXXX, length YYYYYY bytes
        YYYYYY bytes loaded
        Loading sec 2 (.text) at 0xXXXXXXX, length YYYYYY bytes
        YYYYYY bytes loaded
        Please insert BOOT diskette number 2; press any key when ready.
```

Insert Boot Diskette number 2.
The screen will then change to the following:

```
+------------------------------------------------------------------------
¦
¦
```

```
                           AIX PS/2 INSTALLATION




         To install AIX, insert installation diskette and press Enter.

                                 - OR -

     To perform system maintenance, insert the Maintenance diskette and press Ent




     Check to make sure the diskette is write-enabled before using.



+---------------------------------------------------------------------
```

Note: The Installation and Maintenance diskettes must be write-enabled.
       Slide the black tab in the corner portion of the diskettes up so
       that you cannot see through the hole.

At this point, insert the write-enabled Installation diskette and press
Enter. The loading of the kernel will take a few seconds. You should now
see:

        IBM AIX PS/2 Version 1.2.1

        Using diskette as root device...

        Available user Memory: xxx pages (0xnnnn bytes)

        INIT: generic site -- NOT CHECKING ROOT

And then a new menu will appear.

```
+---------------------------------------------------------------------



                         SYSTEM INSTALLATION



                      Install and Customize AIX

                      End Installation
```

Copyright IBM Corp. 1989, 1991

```
¦
¦
¦
¦
¦
¦
¦
¦    Hit <SPACE> to toggle items; <ENTER> to select.
¦
¦
¦
¦
¦
¦
+---------------------------------------------------------------------
```

This menu lists two options: Select the first, **Install and Customize AIX**,
and press **Enter.**

5.5.2 Installing Minidisks

After the message **Getting disk drive parameters...**, a new menu will appear
and look like this:


```
+------------------------------------------------------------------------------
¦
¦
¦
¦
¦                      INSTALL A NEW VERSION OF AIX
¦
¦     Select a method of installation
¦
¦                    Install a NEW AIX System. All AIX type minidisks
¦                    will be deleted.
¦
¦                    Replace your Current Version of AIX with the New
¦                    Version.  AIX system minidisks will be deleted.
¦                    All user created AIX minidisks as well as
¦                    all non-AIX minidisks and DOS partitions will remain
¦                    intact.
¦
¦
¦
¦
¦             Hit <SPACE> to toggle items; <ENTER> to select
¦             or F3 to return to the previous menu.
¦
¦
¦
¦
+------------------------------------------------------------------------------
```


Choose **Install a NEW AIX System** and press **Enter**.

Note: You can use option 2 if you are installing over a previous AIX
         installation.

Then you will be asked if you want to continue.

The following window appears:


```
+------------------------------------------------------------------------------
¦
¦       The installation method you have selected will
¦       result in the deletion of all AIX minidisks.
¦       Do you wish to proceed (y/n)?
¦
+------------------------------------------------------------------------------
```


Type a **y** and press **Enter**.

Then you may see the following if you have previously installed AIX on
this PS/2.


```
         Removing all AIX minidisks ...
         Deleting ...
         /dev/hd6
         /dev/hd5
         /dev/hd4
         /dev/hd3
```

```
          /dev/hd2
          /dev/hd1
```

By selecting the option for installing a new AIX system, you will see the
following screen.

```
+------------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦                            CLUSTER ID MENU
¦
¦                    Enter Cluster ID
¦
¦                    Continue Installation
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦    Hit <SPACE> to toggle items; <ENTER> to select
¦
¦
¦
¦
¦
+------------------------------------------------------------------------------
```

When you select **Enter Cluster ID**, enter the Internet Protocol address of
the primary site for the cluster you are installing in the form
xxx.xxx.x.x. Press **Enter**.

You will return to the CLUSTER ID menu. Select **Continue Install** and press
Enter.

You will see the following:

```
+------------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦                     INSTALL AND CUSTOMIZE AIX
¦
¦
¦
¦                          Install AIX with Current Choices
¦
¦                          Show Current Choices and Install
¦
¦                          Change Current Choices and Install
¦
¦
¦
```

```
¦
¦
¦
¦
¦
¦
¦
¦   Hit <SPACE> to toggle items; <ENTER> to select
¦   or F3 to return to the previous menu.
¦
¦
¦
¦
¦
¦
+-----------------------------------------------------------------------
```

You may need to increase the number of blocks in the **/u** file system. To
do so, select option 3, **Change Current Choices and Install**, and press
Enter.

```
+-----------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦                  CHANGE CURRENT CHOICES AND INSTALL
¦
¦      Select a minidisk to change, or install AIX
¦
¦                           Disk            Blocks            Files
¦
¦           /u               0              9788               978
¦           /aixps           0              7995               799
¦           /                0             42000              4200
¦           page             0              4000                 0
¦           dump             0              4000                 0
¦           /aixps/tmp       0              5798               579
¦
¦           Install the Operating System and cause the
¦           current choices to take effect.
¦
¦
¦      Hit <SPACE> to toggle items; <ENTER> to select
¦      or F3 to return to the previous menu.
¦
¦
¦
¦
¦
+-----------------------------------------------------------------------
```

If you want to change any of these items, toggle to the minidisk and press
Enter. You will see the following windows, displaying the **/u** minidisk as
an example. (The first window appears only if you have more than one
fixed disk).

```
+-----------------------------------------------------------------------
¦
¦      Change the fixed disk where the "/u" minidisk
¦      will be stored; valid choices are (0,1): _
¦
+-----------------------------------------------------------------------
```

```
+------------------------------------------------------------------------
¦
¦
¦      Change the number of blocks for the "/u" minidisk.
¦      Enter 0 or a value in the range (16-NNNNNN): _
¦      (Default: 9284)
¦
¦
+------------------------------------------------------------------------
```

```
+------------------------------------------------------------------------
¦
¦
¦      Change the number of files for the "/u" minidisk.
¦      Enter a value (0-NNNNNN): _
¦      (Default: NNNNNN)
¦
¦
+------------------------------------------------------------------------
```

In these windows, the value **NNNNNN** will vary depending on the size of your
disk drive(s) or on what value you select for your minidisk.

Note: Disk blocks for the root file system should be set following the
         space requirements determined earlier for this site. See
         Chapter 3, "Installing the AIX PS/2 Operating System."

         The value for the maximum number of files in the root file system
         is irrelevant here, since it will be replaced, so that it equals
         that of the primary root file system, when you run **newsite**.

After making all your changes and move cursor to **Install the Operating
System and cause the current choices to take effect**.

Press **Enter**. You will see:

        Installation of AIX will take several minutes.

        To CANCEL and go back to the INSTALL AND CUSTOMIZE AIX menu, press F3.

        To INSTALL AIX, press Enter.

At first you will see:

  CREATING MINIDISKS AND FILESYSTEMS

The values for your system may differ, depending on the system's fixed
disks. After all the minidisks and file systems have been created, the
screen will look like this:

```
+------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦
¦
¦             CREATING MINIDISKS AND FILESYSTEMS
¦
¦
¦    Installing AIX...
¦       - building minidisk /u (10000 blks) on ID#1
¦       - building minidisk /aixps2 (8000 blks) on ID#2
```

```
¦       - building minidisk / (root) (39000 blks) on ID#3
¦       - building minidisk page (4000 blks) on ID#4
¦       - building minidisk dump (4000 blks) on ID#5
¦       - building minidisk /aixps2/tmp (6000 blks) on ID#6
¦
¦
¦
¦       - making /u filesystem (10000 blks: 2500 files) on ID#1
¦       - making /aixps2 filesystem (8000 blks: 1500 files) on ID#2
¦       - making / (root) filesystem (39000 blks: 5000 files) on ID#3
¦       - making /aixps2/tmp filesystem (6000 blks: 1000 files) on ID#6
¦
¦
¦
¦
¦
¦
¦
¦
¦
+------------------------------------------------------------------------
```

The **ID#s** in this screen are examples, and may not be what you see.

Note: From this screen record the following items:

        The minidisk id of the **/sitename**, **page** and **dump** minidisks.

        The size of the **page** minidisk.

After the last file system has been built, the screen will clear and
display:

```
+------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦                 FIRST STAGE INSTALLATION
¦
¦
¦
¦    Installation of the mini system will take several minutes.
¦
¦              Installing mini-root, please wait ...
¦
¦              Installing mini-local, please wait ...
¦
¦
¦
¦              updating /etc/system
¦              Linking devices.
¦              Updating global information file /etc/fsmap.
¦
¦              Completing first stage installation.
¦
¦
¦
¦
¦
¦
¦
+------------------------------------------------------------------------
```

Then you will see:
```

```
+------------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦              INSTALLATION OF THE MINI SYSTEM IS COMPLETE
¦
¦   The system is now ready to reboot.
¦   After you receive the "System Halted" message
¦   remove the Installation Diskette
¦   and insert Boot Diskette 1.
¦
¦   After you have switched the diskettes
¦   press Enter to reboot the system.
¦
¦
¦
¦
¦
¦   Refer to the "Installing and Customizing the AIX Operating System" manual
¦   for further instructions.
¦
¦
¦   System halted, you may turn the power off now.
¦   Type Enter to Reboot:
¦
¦
¦
¦
+------------------------------------------------------------------------------
```

Continue with the next section "Running the clm Program."

5.5.3 Running the clm Program

You must go to the primary site and execute the cluster maintenance (**clm**)
script before installing a secondary site as a member of the cluster.

On the primary site console type:

  /generic/clm

and press **Enter**.

The **clm** script will ask a series of questions which are described in the
table below. The files affected are listed in Appendix B.

+--+
¦ Table 5-1. Running the clm (cluster maintenance) program   ¦
+---------------------------------+--¦
¦ **Prompt**   ¦ **Explanation**   ¦
+---------------------------------+--¦
¦ Site number?   ¦ Enter the number of the site to be added.¦
¦   ¦ (For example, 7).   ¦
+---------------------------------+--¦
¦ Site CPU type (i386, i370,   ¦ Enter the CPU type of the new machine.   ¦
¦ xa370)?   ¦   ¦
+---------------------------------+--¦
¦ Site model (default: PS/2   ¦ Enter the model type of the new machine. ¦
¦ Model 80)?   ¦   ¦
+---------------------------------+--¦
¦ Site description (default: ¦ Enter a short site description. The site¦
¦ PS/2 Model 80)?   ¦ description may be an additional short   ¦
¦   ¦ description of the site such as its   ¦
¦   ¦ purpose or location (':' is not a valid   ¦
¦   ¦ character).   ¦
+---------------------------------+--¦
¦ Site name as specified   ¦ Enter the machine name given in Setting ¦
¦ during single site   ¦ Up Your PS/2 for Installation   ¦
¦ installation (default: ¦   ¦
¦ aixps2)?   ¦   ¦
+---------------------------------+--¦
¦ Full pathname of **local**   ¦ Enter the mount point to use for the   ¦
¦ file system mount point   ¦ **local** file system.   ¦
¦ (default: **/sitename**)?   ¦   ¦
+---------------------------------+--¦
¦ Internet Protocol address?   ¦ Enter the IP address for the new machine.¦
+---------------------------------+--¦
¦ Minor number of the **local**   ¦ Enter the ID # that you saw when creating¦
¦ file system? (default: 2)   ¦ minidisks and filesystems. If your **local**¦
¦   ¦ file system is on a second hard disk, the¦
¦   ¦ correct number will probably be 102.   ¦
+---------------------------------+--¦
¦ Please check carefully: is   ¦ If all your answers are correct, type **y**¦
¦ everything correct?   ¦ and press **Enter** Otherwise, type **n** and¦
¦ (default: yes)?   ¦ press **Enter**.   ¦
+--+

Note: If you select a site name or number which already exists in the
        /etc/site file or IP address which exists in the **/etc/hosts** file,
        you will be informed of this condition during the processing. You
        will be asked whether you wish to replace any previously created
        entries or files.

Normally you would select the defaults to these questions. The following
messages are similar to the ones which would be seen if you had selected a
site name which had previously existed. The responses to the questions
are the default responses.

```
  Modifying /etc/site file ...
  Site name/number exist:
  Site: /generic:generic:Generic:Generic Site:
```

The existing **/etc/site** entry is displayed here.

```
  Replace (default: yes)?
```

Press **Enter**.

Warning: If you select no, make sure the data in the file is accurate
before trying to continue to the next stage of installation.

```
  Modifying /etc/hosts file ...
  IP address exist: (xxx.xxx.xx.xx sitename)
  Replace (default: yes)?
```

Press **Enter**.

```
  Entry replaced
  Making special file /generic/dev/sitename ...

  Making LOCAL mount point ...
  Directory / local mountpoint exists, remove and recreate (default no)?
```

Press **Enter**.

```
  Making /u sitename mount point ...
  Directory exists, remove and recreate (default: no)?
```

Press **Enter**.

5.5.4 Configuring TCP/IP

You must configure the network device on the primary site so that the
primary site will initialize the device and create routes to other sites
in the cluster. Complete the following steps on the primary site console:

1. Edit the file **/etc/rc.tcpip.local.**

2. Search for the line containing the string **/etc/ifconfig.**

    This line should look similar to the following:

       /etc/ifconfig net0 $SITE # default to Pegasus board

    Note: The **$SITE** variable in this line is for the case where the IP
             host name is the same as the AIX site name. If these names are
             not the same, or if the site has more than one IP interface,
             replace the **$SITE** with the correct IP host name for the
             interface.

3. Change this line, if necessary, so that it is correct for the type of
    network you are using.

The string following **/etc/ifconfig** should read as follows:

1. If you are using Ethernet on a PS/2, this string should be net0. In
    this case, the line should read:

       /etc/ifconfig net0 $SITE

2. If you are using Token-Ring on a PS/2, this string should be tk0:

       /etc/ifconfig tk0 $SITE

3. If you are using a 9370 integrated Ethernet adapter on a 370, this
    string should be ce0:

       /etc/ifconfig ce0 $SITE

4. If you are using a 9370 integrated Token-Ring adapter on a 370, this
    string should be il0:

       /etc/ifconfig il0 $SITE

5. If you are using an 8232 LAN channel station Ethernet adapter on a
    370, this string should be lcsAe0:

       /etc/ifconfig lcsAae0 $SITE

6. If you are using an 8232 LAN channel station Token-Ring adapter on a
    370, this string should be lcsAt0:

       /etc/ifconfig lcsAt0 $SITE

7. If you are using an X.25 adapter on a PS/2, this string should be:

       /etc/ifconfig xip0 $SITE

You might want to change the comment at the end of the line to reflect
whether you are using ethernet or token-ring. Once you have made these

changes, you should run the **devices** to add the network device that you
want to use. TCF kernels are distributed with network devices
preconfigured and some pty devices are also included. To use TCP/IP, you
must set up at least one pty device.

To start devices, you must first be logged in as a member of the system
group or you must have superuser authority. The # prompt appears when you
are logged in as a superuser. The $ prompt appears when you are logged in
as a system or regular user.

5.5.5 Coming up as a Dependent Site

Note: Before bringing up the primary site in multi-user mode, you must
         edit the **/etc/rc.tcpip** file on the primary site to configure the
         network devices. The primary site will then initialize its network
         device and create routes to the other sites in the cluster (see the
         "Configuring TCP/IP" section in Chapter 2 of *AIX Operating System
         TCP/IP User's Guide)*.

On the site you are installing, remove the Installation diskette, insert
Boot Diskette 1, and press Enter. A copyright notice displays, then you
should see:

```
+-----------------------------------------------------------------------
|
|
|
|
|                    IBM AIX PS/2 Bootstrap
|                        Version 1.2.1
|
|          Boot from Diskettes
|          Boot from Hard Disk
|          Boot from Ethernet
|          Boot from Token Ring
|          Boot DOS
|          Set Keyboard Language
|          Set Monitor Type
|          Set Timezone
|          Set Machine Name
|          Set NLS Translation Language
|          Copy Diskette
|          Stand-alone Backup
|          Stand-alone Restore
|
|
|     Use the cursor keys to select the desired item.
|     Press Enter to confirm your selection and continue.
|     Press F3 to change this selection.
|
|
|
|
|
+-----------------------------------------------------------------------
```

Choose the **Boot from Diskettes** option. If you already have one or more
PS/2s installed on the network (ethernet or token ring) you can boot from
that interface instead of from diskettes.

Next you will see a familiar screen, and will need to make several
changes. Three prompts appear, one at a time. You will accept the
default value for the first, but select other values for the second and
third.

```
+-----------------------------------------------------------------------
|
|
|
|
|
|
|                    LOAD A SYSTEM FROM THE DISKETTE
|
|          Module to be loaded:          unix.gen
```

¦ Copyright IBM Corp. 1989, 1991

```
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦    Type the requested information in the highlighted field.
¦    Press Enter to confirm your selection and continue.
¦    Press F3 to cancel this selection.
¦
¦
¦
¦
¦
+------------------------------------------------------------------------
```

Press **Enter** to accept the default value, **unix.gen**, for the module to be
loaded.

Then you will see the second prompt. Press the **Space** bar to toggle the
Single value to **Dependent**. It will look like this:

      System mode: Dependent

Press **Enter**. You will see the third prompt.

Warning: The **NO** at this point must be changed to a **YES**. Press the **Space**
bar to change the answer to yes, and it will look like this:

      Run system from fixed disk: YES

Press **Enter**.

Then the system displays the following:

```
        Loading sec 0 (.bss) at 0xXXXXXX, length YYYYYY bytes
        YYYYYY bytes cleared
        Loading sec 1 (.data) at 0xXXXXXX, length YYYYYY bytes
        YYYYYY bytes loaded
        Loading sec 2 (.text) at 0xXXXXXX, length YYYYYY bytes
        YYYYYY bytes loaded
```

And then:

  Please insert Boot diskette number 2; press any key when ready.

Insert Boot Diskette 2 and press any key.

You will see the following:

```
        ------- Start of Questions -------

      Installation Options:
       1         Perform initial installation of a new site
       2         Add this previously installed site to an existing TCF cluster
```

```
    3          Perform maintenance on a previously installed system

      Select Installation Option
```

Select option 2, and follow the prompts.

Note: You may see the following error message after you restart the
installation:

> Error adding route. Route already exists.

> You have restarted the installation due to a routing error. Your
> site must be rebooted to correct this condition. Re-verify your
> routing information before continuing.

At this point, the system asks questions to establish communication with
the primary site. The questions asked are summarized in Table 5-2.

The table shows the questions asked when your PS/2 has one interface
(ethernet or token ring). When your PS/2 has both interfaces, the
Internet Protocol address question is asked for each interface. Enter the
IP address for the interface you are going to use for propagation, and
press **Enter** for the interface you are not using. The interface
corresponds to the primary site's configured interface.

Warning: Do not provide IP addresses for more than one interface.

+--+
| Table 5-2. Bringing up a PS2 as a dependent site in a TCF cluster |
+--+

Prompt	Explanation
What is the source internet address for net0 (a.b.c.d)? (default skip configuration for this device).	Enter the IP (Internet Protocol) address of this site. Net0 indicates an ethernet card. Tk0 indicates a token ring card. Select a unique IP address appropriate to the primary site. For example, if the primary site IP address is 130.200.4.1, an appropriate secondary site address would be 130.200.4.2 if that number is not already being used.
What is the internet subnetmask for net0? (default 255.255.0.0).	Enter the Internet Subnetmask for net0, which must match the primary site. If you did not change values on the primary site, the default value is appropriate.
Do any routes need to be added? (default no).	No (This depends on if there is a gateway between the PS/2 and the primary host).
Enter TCF Cluster Site Number	Enter the site number you gave to this site when you ran **clm** for this machine on the cluster's primary site.
Enter TCF Cluster ID (default 0.0.0.0).	Enter the cluster id in decimal.

```
+--------------------------+------------------------------------------+
| Use 1s filled or 0s filled | Specify the host portion of the broadcast |
| broadcasts for TCF       | address as either 0 or 1, based on the   |
| (default 1).             | primary's broadcast address.             |
+--------------------------+------------------------------------------+
| Enter pipe gfs           | Enter the gfs of the primary site local  |
|                          | file system.  Use the command rdf        |
|                          | /primary_site_name on the primary site to|
|                          | determine the gfs of the local.          |
+--------------------------+------------------------------------------+
| Enter paging device (hex)? | Enter the major and minor device numbers |
|     (default find from   | of the paging device in the form X00YY.  |
| minidisk).               | X is the major number in hexadecimal.  YY|
|                          | is the minor number whose 3 most         |
|                          | significant bits are the drive number,   |
|                          | and whose 5 least significant bits are   |
|                          | the minidisk ID number previously        |
|                          | displayed on the CREATING MINIDISKS AND  |
|                          | FILESYSTEMS screen (it's generally 4).   |
|                          | For example, for drive 0, minidisk 4,    |
|                          | YY=04, and for drive 1, minidisk 4,      |
|                          | YY=24.                                   |
+--------------------------+------------------------------------------+
| Enter core dump device   | Enter 70000.  (This means there is no    |
| (hex).                   | dump device.  If there is a dump device, |
|                          | enter 30005 or 30000 plus the ID number  |
|                          | for the dump minidisk.)                  |
+--------------------------+------------------------------------------+
| Enter dumplo (default 0  | For dumplo enter 0.                       |
| decimal).                |                                          |
+--------------------------+------------------------------------------+
```

After the questions are answered you see:

  ********** End of Questions **********

then the following messages display:

```
        pipe (2/135), root (2/135), swap (3/4), dump (7/0)
        TCF Protocol version 68
        TCF cluster ID 0.0.0.0
        LARP version 3
        procstartup: found independent site 1
        INIT:  dependent site - NOT CHECKING ROOT
        INIT:  Using /generic - NOT CHECKING LOCAL
        INIT:  SINGLE USER MODE

        GENERIC SITE
        Give root password for maintenance single user mode

        <sitename>>#
```

Note: The password requested is the password assigned to primary site.
        If there is no root password on the primary site, press **Enter**.

The **clm** program must complete running on the primary site before running
newsite on the PS/2 secondary site.

At this time, the site is dependent and the script **newsite** can be executed

to change the site to become a secondary site after rebooting.

5.5.6 Running newsite

To run **newsite**, type **/generic/newsite**, and press **Enter**. In the following
newsite output, the site being added is a PS/2 Model 80, site number 6
named **aixps2**. The primary site from which propagation is to occur is
named **fafnir**. The responses to all questions are the defaults. To select
the defaults, press **Enter**.

```
+----------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦                   AIX ADDITIONAL SITE INSTALLATION
¦
¦         Site number      :   6
¦         Site name        :   aixps2
¦         Local mount point:   /aixps2
¦         CPU type          :   i386
¦         CPU model         :   PS/2 Model 80
¦         Description       :   Oval Office
¦         Speed rating      :   300
¦         Local device      :   3 / 2
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦     Is this information all correct?
¦
¦
¦
¦
¦
+----------------------------------------------------------------------------
```

Note: The information on the screen must be correct or your system will
         not be installed correctly.

         If the information is incorrect you must type **n** and answer the
         questions asked by the **newsite** program. Then run the **clm** program
         again on the primary site, and reinstall your site from that point.
         Follow the instructions in the previous section on *Running the* **clm**
         program, and continue the installation.

         If the information is correct, type **y** and press **Enter**. You will
         then see:

  Skip cleaning out the root file system in order to restart an
  installation? (default: no)

Press **Enter**.

  Should the **local** copy of the root file system be a backbone or
  secondary copy (default: secondary)

Press **Enter**.

If the site is to be a backbone, the next two **fstore** questions are
skipped:

      Default fstore value is: i386

      Other available fstore values are below...

          none
          primary
          i370
          xa370
          cluster
          all

Type in the new **fstore** value or press **Enter** to keep the i386 value. These
values may differ if you customized the **/etc/fstore** file.

  Site from which to propagate root file system (default: fafnir)?

Press **Enter** to choose the default.

The following messages appear:

      Converting LOCAL file system ...
      old site 1. new site 6.
      71 inodes changed
      done.

      Changing gfs of LOCAL file system ...
      FSDB 5.7, file system on /generic/dev/aixps2
      FSIZE = 2250, ISIZE = 1000
      GFS = 14, GFSPACK = 1
      Global file system number = 14
      done.

  Checking LOCAL file system consistency ...
  /generic/dev//aixps2: gfs 14, pk 1: 178 files 27 blocks 1846 free
  done.

  mount: No entry in /etc/filesystems has global filesystems number 14 pack numbe
  done.

      Getting gfs for tmp
      Checkpointing ...1
      Getting gfs for /u
      FSDB 5.7, file system on /dev/hd1
      FSIZE = 1000, ISIZE = 800
      GFS = 33, GFSPACK = 1
      Global file system number = 33
      FSDB 5.7, file system on /dev/hd6
      FSIZE = 1250, ISIZE = 1000
      GFS = 26, GFSPACK = 1
      Global file system number = 26
      done.
      Checkpointing ...2
      Making root file system ...

Messages describing file system mounting appear followed by:

```
Checkpointing ...3
Propagating root file system ...
Updating gfs 1
target: aixps2  [6]     low water mark: 201
host:   fafnir  [1]     low water mark: 790800
/etc/comlist: host device name=/dev/chd00035

....1....2....3....4....5....6....7....8....9..... 1000  inodes
....1....2....3....4....5....6....7....8....9..... 2000  inodes
....1....2....3....4....5....6....7....8....9..... 3000  inodes
....1....2....3....4....5....6....7....8....9..... 4000  inodes
....1....2....3....4....5....6....7....8....9..... 5000  inodes
....1....2....3....4....5....6....7....8....9..... 6000  inodes
....1....2....3....4....5....6....7....8....9..... 7000  inodes
....1....2....3....4....5....6....7....8....9..... 8000  inodes
....1....2....3....4....5....6....7....8....9..... 9000  inodes
....1....2....3....4....5....6....7....8....9..... 9984  inodes
```

Note: The total number of inodes propagated is the same number as in the
/ (root) on the primary site.

As the propagation of the site concludes, the following messages appear:

```
Propagation successfully completed.
done.

Making misc directories ...
done.

Copying a new kernel ...
done.

Reconfiguring the kernel ...

Copying an inittab ...

The multi-site phase of the installation is now completed.
```

You can now remove the diskette in the drive at site **$sitename**. Type
/etc/reboot at the site's console to reboot it. **$sitename** is a newsite
variable containing the name of the PS/2 site being installed.

Note: Remember to remove any diskettes from the machine.

This completes the AIX PS/2 secondary site installation.

After completing installation of a dependent site, the **/etc/hosts** and
/etc/sites files contain information on the assigned internet address and
site name of the PS/2.

If you repeat running **newsite** on a site, messages display informing you
that these files already exist. When asked if you wish to delete or
replace these files, reply **y** (yes) in both cases so that the new values
you have entered at the **newsite** prompts are recorded for the site.

5.5.7 Coming Up as a Secondary Site

After the installation has been completed, the system may be rebooted, and
will join the cluster as an independent site.

5.6 Performing a Remote Boot on a PS/2

Subtopics
5.6.1 Introduction
5.6.2 Before Performing a Remote Boot
5.6.3 Remote Boot Procedures

5.6.1 Introduction

Performing a remote boot provides the capability of rebooting a site using a kernel loaded from another site on the network. The protocol used to perform the transfer of an AIX kernel is the Trivial File Transfer Program (TFTP). There are two possible network options: Ethernet and Token Ring.

The site is brought up on the network as dependent. The site being rebooted is called the *local site* and the site providing the kernel is called the *host machine*. The remote boot program is included on the boot diskettes.

5.6.2 Before Performing a Remote Boot

The procedures below describe what you should do before attempting a
remote boot in the dependent system mode.

1. Search the **/etc/hosts** file to determine the remote and local internet
    protocol (IP) addresses for the Ethernet or Token Ring network type
    you have.

    For example:

       Remote site internet protocol address: 130.200.11.6
       Local site internet protocol address: 130.200.100.7

2. Check that your host machine is running in multi-user mode. To check,
    enter **ps -e** and look for a running process called **inetd**. This program
    will start up the **/etc/tftpd** file to transfer the kernel.

5.6.3 Remote Boot Procedures

At the first screen after rebooting, press any key on the keyboard. You
will see the following:

```
+---------------------------------------------------------------------------
¦
¦
¦
¦                   IBM AIX PS/2 Bootstrap
¦
¦                      Version 1.2.1
¦
¦           Boot from Diskettes
¦           Boot from Hard Disk
¦           Boot from Ethernet
¦           Boot from Token Ring
¦           Boot DOS
¦           Set Keyboard Language
¦           Set Monitor Type
¦           Set Timezone
¦           Set Machine Name
¦           Set NLS Translation Language
¦           Copy Diskette
¦           Stand-alone Backup
¦           Stand-alone Restore
¦
¦     Use the cursor keys to select the desired item.
¦     Press Enter to confirm your selection and continue.
¦     Press F3 to cancel this selection.
¦
¦
+---------------------------------------------------------------------------
```

From the Bootstrap Menu select either **Boot from Ethernet** or **Boot from
Token Ring**, according to your network type. You will see the following:

```
+---------------------------------------------------------------------------
¦
¦
¦
¦
¦                LOAD A SYSTEM FROM A REMOTE MACHINE
¦
¦
¦        Module to be loaded:    /generic/unix.ps2
¦        System Mode:            dependent
¦        Remote Address:         130.200.11.6
¦        Local Address:          130.200.100.7
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦     Use the cursor keys to select the desired item.
¦     Press Enter to confirm your selection and continue.
¦     Press F3 to cancel this selection.
```

```
¦
¦
¦
¦
+------------------------------------------------------------------------
```

This screen is an example.

After you have selected all the correct information, press **Enter**.

At this point, the generic kernel **unix.ps2** will be loaded from the host to
the local system. Messages similar to the following will appear on the
screen:

```
  loading sec 0 at 0x100000, length 204784 bytes
  204784 bytes cleared
  Loading sec 1 at 0 ...
```

The messages will continue until the remote boot is completed.

5.7 Generating a New Kernel

Some system modifications require you to generate a new kernel. For
example, if you modify *system parameters* or add a new class of device
drivers to your system, you must generate a new kernel. This section
describes the procedure for generating a new kernel and provides general
information about system parameters. See the **master** file format in the
AIX Operating System Technical Reference for further information.

Note: Generating a new kernel is not a routine procedure. You may never
          need to perform it.

As distributed, the AIX Operating System kernel should support a
reasonable mix of applications on a basic system. Many of the more common
configuration changes (such as, adding new terminals or printers) can be
handled without building a new kernel. If, however, you need to change
resource allocations within the kernel or you need to support new
peripherals that require drivers that are not distributed with the basic
system, you must configure and generate a new kernel.

The basic steps in this process are:

1. If you are adding a new device, install the new hardware in your
    machine (For an AIX/370 system you must also attach and dedicate that
    device for the AIX virtual machine).

2. Run the devices command as described in *Using the Devices Command*
    chapter.

or:

1. If system resources allocations are to be changed, determine which
    system parameters you want to change and what values you would like
    them to have.

2. Make the necessary changes to the AIX Operating System **/etc/system**
    files.

3. Build a new kernel using **/usr/sys/newkernel**.

4. Install the new kernel as experimental.

5. Reboot the system, running the new experimental kernel, and test it
    thoroughly.

6. If the testing is successful, install the new kernel as your standard
    kernel.

Most of the system definition information is contained in the files
/etc/master and **/etc/system**. The master file contains stanzas that
describe the available device drivers and parameter values that are
configured into your particular system.

To modify system parameters, you must define new values for the parameters
in the **/etc/system** file. Only those system parameters defined in the
/etc/master file that contain the **patchaddr** or **softcfg** keywords may be
modified and a new kernel built, using the **newkernel** command. Modifying
any system parameters that do not contain the **patchaddr** or **softcfg**
keywords requires a C compiler and a customized kernel build procedure.
Since all system parameters that are intended for tuning by the user

contain these keywords, the **newkernel** command is normally used to build a
new kernel. The **newkernel** command is also used to build a kernel when
adding device drivers. See the *AIX Operating System Commands Reference*
for information on this command.

The format and contents of these files are described in the *AIX Operating
System Technical Reference*.

Subtopics
5.7.1 The newkernel Command
5.7.2 Loading and Testing an Experimental Kernel
5.7.3 Making a New Kernel the Standard Kernel
5.7.4 TCF Requirements
5.7.5 Deleting Old Kernels

5.7.1 The newkernel Command

The building of new kernels is done by the **newkernel** command. In order to
build a new kernel, type the following sequence of commands:

```
cd /usr/sys
/usr/sys/newkernel
```

and wait for the build to complete. If it is successful, the new kernel
is in one of the following directories, depending on the type of system on
which it is being installed: **/tmp/sysgen.B370**, **/tmp/sysgen.XA370** or
/tmp/sysgen.386. By default, the **newkernel** command does not copy the new
kernel into the base directory of the **<LOCAL>** file system (/**sitename**
directory). For more information about the **newkernel** command, see
newkernel in *AIX Operating System Commands Reference*.

5.7.2 Loading and Testing an Experimental Kernel

All new kernels should be thoroughly tested before they are installed as
the standard system even if the changes made were trivial. Significant
problems with reconfigured kernels are rare, but the consequences of such
problems can be catastrophic. Because of this, it is a good idea to make
sure that you have current backups of your major file systems before you
attempt to test a new kernel.

Because of the danger that a new kernel might not work, new kernels should
never be installed as **/sitename/unix.std**. Rather, they should be copied
into the local file system with an experimental name and booted as
non-standard kernels. If the new kernel does not work, you can still get
back to the previous (good) kernel by just rebooting the standard system.

5.7.3 Making a New Kernel the Standard Kernel

There are two aspects of the standard system:

>   **/unix**--the name of the load module that system utilities examine to
>   get a symbol table for the running kernel. Programs like **ps** need the
>   symbol table to locate the process table and other important data
>   structures within the kernel. Usually, **/unix** is a symbolic link to
>   **/sitename/unix**.

>   **/sitename/unix.std**--the name of the load module that is loaded by
>   default when the machine is rebooted.

It is a good idea to retain several old kernels in case of problems with
new functions. It is also a good practice to keep **sitename/unix** and
/sitename/unix.std as links to the standard kernel but to let each kernel
keep its original name (for example, **unix14**). This makes it easier to
determine which kernel is which when you are trying to decide what kernel
to go back to or what kernel to delete.

If you maintain **/sitename/unix** and **/sitename/unix.std** as links, the proper
procedure for installing a new kernel (**unix14**, for example) as standard
is:

```
  cd /sitename        # go to LOCAL file system

  rm unix.std.old            # delete previous old kernel
  mv unix.std unix.std.old   # make current kernel the old one
  ln unix14 unix.std         # make new kernel the current one

  rm unix                    # delete old symbol table link
  ln unix14 unix             # link in new kernel for symbol table
```

It is best to save a link to the previous kernel as **/sitename/unix
std.old**. This makes it easier to get back to that kernel in an emergency.
If you find that the new kernel has problems, you can explicitly load
unix.std.old and get back to the previous system. Of course, you can load
any kernel if you can remember (or find out) its name.

5.7.4 TCF Requirements

If your system has TCF installed, you will first need to ensure that your
site has joined the TCF cluster and that the primary cluster site is also
present before running the newkernel command. The primary site must be
present to read the system libraries and create the new kernel.

5.7.5 Deleting Old Kernels

Each AIX kernel is a fairly large load module, and you may find that you
cannot maintain a large number of kernels on your **<LOCAL>** file system. If
you find yourself running low on that file system, you should check to see
if there are any old kernels that should be deleted.

6.0 Chapter 6.   Customizing the TCF Cluster

6.1 CONTENTS

6.2 About This Chapter

This chapter explains how to customize your cluster site to allow for
differences in configurations. This will allow you to use your file
system space more efficiently.

6.3 Setting Up LPP Propagation

The following sections describe how to plan an **fstore** scheme to meet the
requirements of your particular cluster. Before choosing to customize
your LPP storage, bear in mind that with flexibility also comes some
degree of complexity. *Any customization of fstores should be carefully
thought out before being implemented.*

Subtopics
6.3.1 Defining fstore Values
6.3.2 Customizing fstore Values: Example
6.3.3 File System fstore Bitmasks

6.3.1 Defining fstore Values

You must define a unique **fstore** value (bitmask) (in **/etc/fstore**) for each
LPP or group of LPPs that you want to identify separately for storing on
different machines. This type of **fstore** value is a *file fstore*.

Additionally, you need to define an **fstore** value or *site fstore* to
represent each combination of LPPs that will be stored on a secondary
site.

fstore Value Convention: A file **fstore** value can represent either one LPP
or a group of LPPs. A file **fstore** value should consist of a single bit in
the **fstore** bitmask field. This bit should be unique, and should conform
some kind of cluster-wide convention. A recommended convention is as
follows:

Bits	Used For
0	reserved for "opsys370"
1-2	reserved
3-8	370 files and sites
9	reserved for "opsys386"
10-11	reserved
12-30	386 files and sites
31	reserved for "none"

The "opsys" bits are reserved for the mandatory BOS LPP files for each
respective machine type. In many cases, you'll want to cluster certain
LPPs together (X11 and X11Smpl, for example), using a single bit to
represent them. In these cases, it won't be necessary to have a unique
fstore for every LPP.

Remember, any time that you foresee a need to *uniquely* identify a
particular LPP in order to designate on which sites it will be stored, you
should define an **fstore** value (bit) for it.

For stand-alone users, the **fstore** options are provided in case the user
wishes to convert his site into a TCF primary site at a later date.

For TCF installers, *none* is the best option to use if disk space is highly
inconsistent across the cluster.

When installing LPPs on your cluster, you are asked whether or not you
wish to set **fstores** for that LPP. Any **fstores** on that LPP with the value
all, **asis** or **none** cannot be customized at the time of installation. To
allow you to build LPPs with these **fstore** values, and also allow you to
customize them, there are two other **fstore** values. These are **cluster** and
primary.

These **fstore** values function exactly like **all** and **none** respectively,

except that they are modifiable during installation.

6.3.2 Customizing fstore Values: Example

Assume you have a TCF cluster of 8 sites and you plan to install the
following LPPs on the cluster:

    Operating System Extensions (ext)
    Application Development Toolkit (adt)
    DOS Merge (merge)
    X-Windows (X11)
    X-Windows Samples (X11Smpl)
    C compiler (cc)

Also suppose that because of storage limitations and application
considerations, you want to store these LPPs in the following
configuration:

    Site 1: (primary) Everything will be stored here.
    Site 2: ext, adt, X11, X11Smpl, cc
    Site 3: merge
    Site 4: adt, cc
    Site 5: ext, X11
    Site 6: adt
    Site 7: adt, cc
    Site 8: ext, X11

Prior to installation of any of these LPPs, you must define a unique
fstore value for each, and add it to **/etc/fstore**. For example:

```
020000000000:0:none      (should never be changed)
037777777777:0:all       (should never be changed)
000000000777:0:i370
000000000001:0:opsys370
017777777000:0:i386
000000001000:0:opsys386
000000010000:0:ext386
000000020000:0:adt386
000000040000:0:X11386
000000100000:0:X11Smpl386
000000200000:0:merge386
000000400000:0:cc386
```

Note that **fstore** values are expressed as octal bit-masks, and that each
LPP uses exactly one bit in its **fstore** mask. In this way, you can use up
to 19 bits for unique AIX PS/2 LPPs, and 6 bits for unique AIX/370 LPPs.
Now, when each LPP is installed, enter the appropriate symbolic **fstore**
value.

Notice also, that the i370 and i386 **fstore** masks have been expanded to
encompass all LPP file **fstore** bits for each machine type, respectively.
This will not conflict with files installed using the default **fstore**
values.

6.3.3 File System fstore Bitmasks

As mentioned above, site **fstores** represent combinations of LPPs to be
stored on the various sites. The site **fstore** value is stored in the
superblock of each replicated root file system.

In the example cluster, there are 7 sites that have 5 different
configurations, excluding the primary. According to the desired
configurations and the file **fstore** values that have been defined, the
following site fstores should be added to the **/etc/fstore** file:

000000571000:0:SITEtype1 (For site 2: ext, adt, X11, X11Smpl, cc)
000000201000:0:SITEtype2 (For site 3: merge only)
000000421000:0:SITEtype3 (For sites 4,7: adt, cc)
000000051000:0:SITEtype4 (For sites 5,8: ext, X11)
000000021000:0:SITEtype5 (For site 6: adt only)

Note: Comments in parenthesis should not be included in the **fstore** file.

Each of these site **fstores** is merely a bit-wise *or* of the *opsys386* **fstore**
bit and each of its component LPP **fstore** bits. Remember that *every*
replicated root file system must have either the *opsys386* or *opsys370:*
fstore bit turned on (for AIX/PS2 and AIX/370 sites, respectively) in the
fstore field of its superblock.

When **/generic/newsite** is run for each site, the appropriate symbolic site
fstore value (SITEtypex) can be given in response to the **newsite** prompt.

Now you can proceed with the installation of all LPPs and additional
cluster sites.

Note: Because the PS/2 BOS LPP includes the file **/etc/fstore**, any
customization of the **/etc/fstore** file must be done *after*
installation of this LPP, or your changes will be overwritten. For
this reason, it is suggested that the PS/2 BOS LPP be the first LPP
to be installed. Also, note that files in the PS/2 BOS LPP are
installed with an **fstore** value of 7000. This is why bits 10 and 11
are reserved in our example **fstore** masks.

Also be aware that once a (site) **fstore** value has been associated with a
file system and files have been propagated to it, it is not possible to
change that **fstore** value in order to include either more or fewer LPPs in
that file system. The only way that this can be accomplished is for the
file system to be remade and completely repropagated. Therefore, give
careful consideration to file system sizes and **fstore** values prior to
actual installation.

6.4 Setting Up Complex Clusters

A complex TCF cluster is formed by joining one or more physical networks
having a maximum of thirty-one sites via one or more gateway machines
which has interfaces to connect physical networks together.

The simplest TCF cluster consists of sites on only one physical network,
while the most complex cluster could have thirty one sites from thirty one
physical networks. If you are planning to install a complex cluster, you
must know the following:

    The gateway site IP addres

    The network portion of the IP address for the network to be adde

    The number of metrics, or hops, from the source machine to th
    destination machine.

Subtopics
6.4.1 Customizing Your Startup Files for Complex Clusters
6.4.2 Configuring a Complex Cluster

6.4.1 Customizing Your Startup Files for Complex Clusters

Whenever an AIX PS/2 site is booted, it executes a series of startup
scripts as part of the installation procedure. However, the **/etc/rc.tcpip**
and **<LOCAL> /rc.tcpip.local** files may need to be modified for complex
clusters which contain two or more physical networks.

The **/etc/rc.tcpip** file configures the network devices for all sites in a
cluster. The network devices configured in **/etc/rc.tcpip** are considered
the default devices. In a complex cluster, you may be using other network
device types for some machines in the network. For these sites, you will
need to create a **<LOCAL>/rc.tcpip.local** startup script. As the pathname
reflects, this belongs in the *local* directory of each nonstandard site.
This file is a script to configure the network device(s) and add routes
that deviate from your standard site configuration.

6.4.2 Configuring a Complex Cluster

When configuring a complex cluster, you may use Internet Protocol class B
addressing in the form (A.B.C.D) where the first two numbers (A.B.) are
the network address, the next number (C.) is the subnet number for
Ethernet or Token-Ring, and the final number (D) is the site number. The
following examples illustrate how to configure a complex cluster of 6
sites with the following topology:

```
        Ethernet                          Token-ring

        Sitename     site addr            Sitename          site addr

        uno          130.200.1.1
        dos          130.200.1.2          cinco             130.201.2.2
        tres         130.200.1.3          seis              130.201.2.3
        quatro       130.200.1.4 (gateway) quatro           130.200.1.4
```

Since site quatro is on both networks, it serves as the gateway in this
cluster.

The following excerpt of **/etc/rc.tcpip** will show how standard sites with
one ethernet device are configured.

```
        #
        # This file initializes the site independent portions of the IP interface
        #
        # $SITE && $LOCAL are exported in Singl2multi.
        #
        if [ -x $LOCAL/rc.tcpip.local ] # Needs site specific initialization
        then
                /bin/sh $LOCAL/rc.tcpip.local > /dev/syscon 2>.*
        else
                if i386; then
                        /etc/ifconfig net0 $SITE  #
                elif u370; then
                        # Default to LCS and/or CETI, whichever can be found
                        /etc/ifconfig lc0 $SITE
                fi
        fi
```

The following example is a **<LOCAL>/rc.tcpip.local** for sites with only a
Token-Ring adaptor (sites cinco and seis).

Note: *sitename* will be replaced by the actual names of these sites.

```
        #
        # This file initializes sites with ONLY a token-ring adaptor
        #
        /etc/ifconfig tk0 sitename
```

The following example is the **<LOCAL>/rc.tcpip.local** for the gateway site
(quatro):

```
        #
        # This file initializes the gateway site.
        #
        /etc/ifconfig net0 quatro
        /etc/ifconfig tk0 quatro-tkr
```

6.5 Network Topology Requirements

To provide Internet Protocol forwarding between sites in different
physical networks via gateway machines, the following requirements must be
met:

Each site must have a unique address in the form A.B.C.D

All gateway machines must implement the IP protocol standard
particularly the IP route record and IP source route options.

The path between two sites in the cluster can include only two gatewa
machines.

The round-trip packet time between two cluster sites averages 200 m
and should not exceed 300 ms. Greater numbers may work, but the
stated amounts do work.

The number of gateways between the same two IP subnetworks should no
exceed 4 although this number of gateways may be artificially low.

False sitedowns may be declared, if multiple concurrent failure
occur. Sometimes this type of failure will resolve, but all instances
of false sitedowns may not be corrected. This type of failure
includes:

-    Hardware failure of cluster machines

-    Software failure of cluster machines

-    LAN failures such as cable problems, transceiver failures, and
     related media problems.

Subtopics
6.5.1 Non-Cooperating Gateways

6.5.1 Non-Cooperating Gateways

A gateway that is labeled ***cooperating*** is one which belongs to a cluster
(for example, is an AIX site in the cluster), while a ***non-cooperating***
gateway is a machine which is not part of the cluster (and may or may not
be running AIX). TCF places some restrictions on which commercial gateway
products to use for non-cooperating gateways.

TCF was designed to work in conjunction with Internet Protocol (IP). IP
has an option called **route-record** which, when activated, will record the
path that a packet has taken from source to destination. Other vendors
who sell commercial gateways may not have conformed to the U.S. government
specifications (refer to RFC 791, September 1981 and DoD MIL-STD-1777) for
processing packets with this option (which IBM has done). As a result,
some non-cooperating gateways may fail when presented with a packet which
has the **route-record** option turned on.

If the gateway is a system running some other implementation of UNIX, that
gateway may fail to forward the TCF packets or it may fail to operate
altogether, due to software errors in older systems. Furthermore, other
(non-AIX) UNIX systems operating on the same Local Area Network may
experience difficulties when it receives these packets, even though it
does not have to forward them.

7.0 Chapter 7.   Using the devices Command

7.1 CONTENTS

7.2 About This Chapter

This chapter explains how you can customize your IBM PS/2 System by using
the **devices** command to:

    Add devices to your syste

    Change system information about devices in your syste

    Delete devices from your system

This chapter also explains how you can display information about devices
in your system.

7.3 Using the devices Command to Customize the System

After installing the AIX PS/2 Operating System, you are ready to begin
using your system. You may, however, want to add some of the optional
devices supported by IBM. To do so, use the **devices** command. With the
devices command, you can remove devices from your system, as well as
display and change system information about devices.

Adding devices, removing them, and changing the system information that
describes them are ways that you customize your system. If you are using
IBM-supported devices, you can customize your system with standardized
procedures. If the devices are not IBM-supported, you may need to take
extra steps to customize your system. You should also recognize that
while the **devices** command does the processing required to configure
devices into your system, the device must be properly set up. See the
installation instructions shipped with the device for details.

Before you begin using the **devices** command, read the following sections to
learn how to supply the information **devices** will request from you. This
chapter contains several examples of using the **devices** command. You
should be able to find an example similar to the task that you want to
perform. Following the example closely should guide you in doing your own
task.

Japanese Language Support If Japanese Language Support is provided with
your system and you selected a Japanese locale while installing the AIX
PS/2 Operating System on your machine, all the information which appears
on your screen, related to using the **devices** command will be in Japanese.
However, all input required as you use **devices** must still be entered in
English. For details on types of information which must always be
expressed in English (such as login IDs, passwords, site names, system
directory names, and so on), see the *Guide to Multibyte Character Set
(MBCS) Support*.

7.4 IBM-Defined Devices

In addition to the IBM-defined standard devices that were configured
automatically as part of your operating system, you can add many other
IBM-defined devices to your system.

The following chart describes representative devices supported by IBM:

The **Device Class** is the name for the category (for example, terminal
or printer).

The **Device Type** is the name that identifies the device.

The **Device Description** provides you with information about the device
type. For instance, 5152 (type) is an IBM PC Graphics Printer
(description).

Table 7-1. IBM Defined Devices		
Device Class	**Device Type**	**Device Description**
adapters	3270c	IBM PS/2 3270 Connection Adapter
lan	ethernet	Ethernet Device Driver (Ungerman Bass)
lan	ethernet	Ethernet Device Driver (HYPERchannel)
lan	tokennet	Token Ring Device Driver
diskette	fd	3 1/2" Diskette Drive
diskette	fdx	5 1/4" External Diskette Drive
printer	3812	IBM Pageprinter (3812)
printer	3852	Color Jetprinter
printer	4202s	IBM Proprinter XL, serial port
printer	4202p	IBM Proprinter XL, parallel port
printer	5201s	IBM PC QUIETWRITER¦ Printer Model 2, serial port
printer	5201p	IBM PC QUIETWRITER¦ Printer Model 2, parallel port
printer	5202	IBM PC QUIETWRITER¦ Printer Model 3, parallel port
printer	5182	IBM PC Color Printer
printer	5152	IBM PC Graphics Printer

printer	4201s	IBM Proprinter, serial port
printer	4201p	IBM Proprinter, parallel port
printer	5575/F02	Japanese line printer
printer	6184	IBM 6184 Color Plotter
printer	6186	IBM 6186 Color Plotter (Model 1 or 2)
printer	7371	IBM 7371 Plotter
printer	7372	IBM 7372 Plotter
printer	7374	IBM 7374 Color Plotter
printer	7375	IBM 7375 Color Plotter (Model 1 or 2)
ptydev	ttyp	Asynchronous Pseudo-Terminal
ptydev	ttyn	Network Terminal
tape	tape	IBM PS/2 Streaming Tape Drive
ttydev	tty	Any device on an asynchronous port (except printers)
console	console	Display used as system console, connected to either the VGA port or the 8514A adapter.

While you do not have to use the **devices** command to add a second diskette drive, you do have to edit the **/etc/filesystem** to give it a default mount point. See *Managing the AIX Operating System*.

7.5 Customization Files

Your system uses two types of files for customization: configuration
files and device-dependent information files. These files contain
information about the IBM-supported devices and about the devices
installed in your system. The **devices** command updates these files as you
add a printer, for instance, or change some of the device information.

After you have installed the AIX PS/2 Operating System and the additional
programs described in Chapter 3, "Installing the AIX PS/2 Operating
System," and after you have customized your system by adding devices and
user information, you should back up your files to prevent the loss of
valuable information. See *Managing the AIX Operating System* for details.

Subtopics
7.5.1 Configuration Files
7.5.2 Device-Dependent Information Files

7.5.1 Configuration Files

The following files contain information about your system configuration:

/etc/master contains configuration information about IBM-supported devices
for the system, including AIX device drivers.

/etc/predefined contains configuration information about IBM-supported
devices for the system, but does not contain device driver
information.

/etc/system contains configuration information about IBM-supported devices
currently configured in your system. This file is similar in
format to the **/etc/predefined** file.

/etc/ddi is a directory that contains device-dependent information; the
number and types of files in this directory depend upon the
options and programs installed. See the next section for more
information on these files.

7.5.2 Device-Dependent Information Files

Device-dependent information files contain information describing a
particular device. For example, a printer's device-dependent information
includes such items as port address (where the device is attached), color
(whether the printer has color), left and right margin settings, and so
on. You can change some of these items, but not all of them. For
instance, while you cannot change the color characteristic of a printer,
you can change the margin settings. Some devices have no information that
can be changed.

As you use **devices**, you will notice that the **showdev** command shows you all
the device information. The **add** and **change** commands show only the device
information that you can change.

The device-dependent information files are contained in the **/etc/ddi**
directory. For example, the device-dependent information file for the
asynchronous device is **/etc/ddi/tty**. The files for a serial printer and a
parallel printer are

7.6 Getting Ready to Use the Devices Command

Now that you understand the general purposes of the **devices** command, the
IBM-defined devices, and the customization files, you can prepare to use
the choices on the DEVICE CUSTOMIZING COMMANDS menu.

Call up the DEVICE CUSTOMIZING COMMANDS screen by typing **devices** and
pressing **Enter**.   Then you can begin using any of the **devices** commands.

```
+---------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦
¦                  DEVICE CUSTOMIZING COMMANDS
¦
¦     Devices commands are:
¦
¦
¦     Command     Description
¦
¦     add         Add a new device
¦     change      Change information about an existing device
¦     delete      Delete an existing device
¦     showall     Show general information about all existing devices
¦     showdev     Show detailed information about an existing device
¦
¦
¦     To EXIT the devices command, press F3 (or Q).
¦     To USE a devices command, type the Command and press Enter.
¦
¦     >
¦
¦
¦
¦
¦
+---------------------------------------------------------------------------
```

The following sections describe how to use **devices**.

Subtopics
7.6.1 Starting and Exiting Devices
7.6.2 Using Abbreviated Commands
7.6.3 Handling Errors
7.6.4 Adding a Device May Require Restarting the AIX PS/2 Operating System

7.6.1 Starting and Exiting Devices

To start **devices**, you must first be logged in as a member of the system
group or you must have superuser authority.

Warning: You must not run more than one devices session on a site at one
time.

7.6.2 Using Abbreviated Commands

To reduce the number of keystrokes you must enter, you can abbreviate the **devices** commands, the device class, device type, and port fields, and the yes/no responses. Simply type the letters that uniquely identify the desired command, device, or response. For the **add**, **change**, and **delete** commands, you can type a single letter or multiple letters, as in: **a**, **ad**, or the full **add**. Or you can type **c**, **ch**, **cha**, and so on for **change**.

For the **showall** and **showdev** commands, however, you must type at least **showa** or **showd** to identify the desired command.

Whenever you are asked to type **yes** or **no**, you can type **y** or **n**.

If you already know the device class and device type for the device you want to add, change, delete, or show, you can enter valid abbreviations for the command, the device class, and the device type. For example, **a pr 5152** adds a 5152 printer. To add a tty or streaming tape device, type in **a tt** for tty or **a ta** for tape.

7.6.3 Handling Errors

If you should supply an incorrect response while responding to **devices**
prompts, you will be asked again to supply correct information. If you
are unable to supply correct information and want to go back to the DEVICE
CUSTOMIZING COMMANDS screen, press **F3**.

7.6.4 Adding a Device May Require Restarting the AIX PS/2 Operating System

Depending upon the information in the system configuration files, the
devices may rebuild the AIX kernel on exit. In such cases, the following
screen will appear saying that the system must be **rebooted** in order for
the changes to be activated.

```
+------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦   When you exit, a kernel rebuild will be performed.  This will take
¦   several minutes.  Perform a system reboot to come up on the new kernel.
¦
¦   Exit Devices?
¦
¦
¦
¦   yes
¦   no
¦
¦
¦
¦
¦
¦
¦
¦
¦   To CANCEL and return to the list of commands, press F3.
¦   To CHOOSE, type yes or no and press Enter.
¦
¦
¦
¦
¦
+------------------------------------------------------------------------
```

If restarting is not required as you exit **devices**, you will return to the
$ or **#** prompt.

7.7 *Understanding the Devices Commands*

The five **devices** commands are:

> **add**
>
> **change**
>
> **delete**
>
> **showall**
>
> **showdev**.

When you type **devices** after the system prompt and press **Enter**, the DEVICE
CUSTOMIZING COMMANDS screen appears. Each time you want to use a **devices**
command, you must begin with this screen.

```
+-----------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦
¦
¦                    DEVICE CUSTOMIZING COMMANDS
¦
¦     Devices commands are:
¦
¦
¦     Command  Description
¦
¦     add      Add a new device
¦     change   Change information about an existing device
¦     delete   Delete an existing device
¦     showall  Show general information about all existing devices
¦     showdev  Show detailed information about an existing device
¦
¦
¦
¦
¦     To EXIT the devices command, press F3.
¦     To USE a devices command, type the Command and press Enter.
¦
¦     >
¦
¦
¦
¦
¦
+-----------------------------------------------------------------------
```

The following sections provide information on each command. In this
chapter, you will also find examples of using each command.

Subtopics
7.7.1 Adding Devices
7.7.2 Changing Device Information
7.7.3 Deleting Devices
7.7.4 Showing Device Information

7.7.1 Adding Devices

With the **add** command, you can do these tasks:

Add IBM-defined devices to your syste

Add an unsupported printer to your system

Note: After you have added a device associated with an adapter, you
cannot change the slot number of that adapter without first
deleting the device.

7.7.2 Changing Device Information

The **/etc/ddi/** (device class) files contain information about your system
devices. Each time you add a device, you can see information about the
device in the **/etc/ddi** file for that device class. While you may find
most default settings or choices acceptable, you may also want to change
some settings.

With the **change** command, you can display any device settings that can be
changed.

Note: If you use the change option of the **devices** command to change any
        of the settings for your system devices and you notice that your
        requested changes are not implemented, then perform a reboot of the
        system by issuing the **shutdown** command.

7.7.3 Deleting Devices

You can use the **delete** command to delete almost any device in your system.
You can physically remove the device either before or after you delete it
from your system configuration. You should not, of course, delete a
device while it is actively in use.

Should you have to remove a device for adjustments or repairs, you do not
have to delete it from the system. You can re-attach the device and
continue to use it as before.

7.7.4 *Showing Device Information*

With the **showall** and **showdev** commands, you can display the following:

A list of all devices configured in your system. (Type **showall** and press **Enter**.)

A list of all devices of a particular class. (Type **showdev** and the device class, as in **showdev printer**.)

Device-dependent information for a device. (Type **showdev** and the device class and name, as in **showdev printer lp0**.)

7.8 Using the Devices Commands

The rest of this chapter shows examples of how you can use the **devices**
commands. In each case, the box contains steps that apply to any device.
If you are familiar with **devices**, you might use the boxed information as a
reminder of the steps involved.

The "In Detail" sections contain specific examples of using **add**, **change**,
delete, **showall**, and **showdev**. In addition, you will see the information
that displays on the screen, along with an explanation of what the prompts
mean and how to answer them.

The first step when using **devices** is to request the DEVICE CUSTOMIZING
COMMANDS screen. This shows you a list of the available commands.

```
+--- To Request Devices ---------------------------------------------+
¦                                                                    ¦
¦ 1.  Log in to the system.                                          ¦
¦                                                                    ¦
¦ 2.  After the system prompt, type devices and press Enter to see the ¦
¦     DEVICE CUSTOMIZING COMMANDS screen.                            ¦
¦                                                                    ¦
¦ Now you can select the command you want to enter.  See the examples ¦
¦ that follow for specific steps.                                    ¦
¦                                                                    ¦
+--------------------------------------------------------------------+
```

7.9 Displaying All Devices in the System

To see a list of all the devices that currently are part of your system,
use the **showall** command.

```
+--- To Display a List of All Devices ----------------------------------+
¦                                                                       ¦
¦                                                                       ¦
¦ 1.  On the DEVICE CUSTOMIZING COMMANDS screen, type showall.  Press    ¦
¦     Enter.                                                             ¦
¦                                                                       ¦
¦                                                                       ¦
¦       > showall                                                       ¦
¦                                                                       ¦
¦                                                                       ¦
¦                                                                       ¦
¦                                                                       ¦
¦                                                                       ¦
¦ 2.  To return to the DEVICE CUSTOMIZING COMMANDS screen after seeing   ¦
¦     the list of devices, press Enter.  To print a copy of the list (if ¦
¦     your printer is configured and working), press F4.                ¦
¦                                                                       ¦
+-----------------------------------------------------------------------+
```

You will see a list of devices similar to those on the following screen.
If your system has more devices than one screen can contain, you will see
a prompt to continue to the next screen. You go to the next screen by
scrolling. Use the **Page Up** key to move to a previous screen and the **Page
Down** key to move to a following screen.

```
+-----------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦    The following devices are configured in your system.
¦
¦    Name        Type        Class       Port                            Slot
¦
¦    fd0         fd0         diskette    IBM PS/2 3.5" Diskette Drive    -
¦    hdisk0      hdisk0      disk        IBM PS/2 Fixed Disk Drive       -
¦    lp0         5152        printer     PS/2 Graphics Printer           -
¦    tty0        tty         ttdev       Serial Port 1                   planer
¦    rmt0        tape        tape        IBM PS/2 Tape Drive             -
¦
¦
¦
¦
¦
¦
¦    To RETURN to the list of commands, press Enter.
¦    To PRINT this list of devices, press F4 (or P).
¦
¦    >
¦
¦
¦
¦
¦
+-----------------------------------------------------------------------------
```

If your printer is configured and working, you can print the list of
devices on the screen by pressing **F4**. A summary report is also written to

the file **/aixps2/tmp/CONFIGREPORT**, which contains the information on each screen, when you press **F4** during a devices session.

7.10 Displaying Information about Specific Devices

To see information about specific devices in your system, use the **showdev**
command.

```
+--- To Display Information About Specific Devices --------------------+
¦                                                                      ¦
¦ 1.  On the DEVICE CUSTOMIZING COMMANDS screen, type showdev and press ¦
¦     Enter, to display a list of device classes currently configured in ¦
¦     your system.                                                     ¦
¦                                                                      ¦
¦                                                                      ¦
¦        > showdev                                                     ¦
¦                                                                      ¦
¦                                                                      ¦
¦                                                                      ¦
¦ 2.  To see information about a specific device, type the name of the  ¦
¦     device class.  Press Enter.  For instance, if you want to see     ¦
¦     information about a printer, type printer.                        ¦
¦                                                                      ¦
¦                                                                      ¦
¦        > printer                                                     ¦
¦                                                                      ¦
¦                                                                      ¦
¦     You can combine both steps by typing showdev printer.            ¦
¦                                                                      ¦
¦ 3.  Type the name of a specific device from the list of devices       ¦
¦     configured in your system.  For instance, type the name of a      ¦
¦     specific printer, such as lp0.  Then press Enter to see the       ¦
¦     information.  If you have a printer that is configured and         ¦
¦     working, you can print a copy of the list of device information by ¦
¦     pressing F4.                                                     ¦
¦                                                                      ¦
¦ 4.  To return to the DEVICE CUSTOMIZING COMMANDS screen, press Enter. ¦
¦                                                                      ¦
+----------------------------------------------------------------------+
```

After you enter the **showdev** command, a list of device names similar to the
following appears:

```
+------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦    The following device classes are available.
¦
¦    Device Name      Description
¦
¦    lp0              IBM PC Graphics Printer (5152)
¦    lp1              IBM Proprinter (4201) on a Serial Port
¦
¦
¦
¦
¦
¦
¦
¦
¦    To RETURN to the list of commands, press F3 (or Q).
¦    To CHOOSE from the list, type the Device Name and press Enter.
¦
```

```
¦     >
¦
¦
¦
¦
¦
¦
¦
+-------------------------------------------------------------------------
```

Type the name of the device about which you want information and that
information appears.

```
+-------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦                              Current      Possible
¦    Name      Description      Choice      Choices
¦
¦     fl       Form (page) Length    50          1 - length (in . . .
¦     tm       Top Margin             0          0 - length (in . . .
¦     bm       Bottom Margin         50          1 - length (in . . .
¦     lm       Left Margin            0          0 -  width (in . . .
¦     fw       Form Width            80          1 -  width (in . . .
¦
¦
¦
¦
¦
¦
¦    To SEE additional items in the list, use the Page Down or Page Up keys.
¦
¦    To RETURN to the list of commands, press Enter.
¦    To PRINT this device information, press F4.
¦
¦     >
¦
¦
¦
¦
¦
+-------------------------------------------------------------------------
```

If your printer is configured and working, you can print the list of
devices on the screen by pressing **F4**. A summary report is also written to
the file **/aixps2/tmp/CONFIGREPORT**, which contains the information on each
screen, when you press **F4** during a devices session.

7.11 Adding Devices to the System

To add a device to your system, use the **add** command. Several examples are
included in this section to help you better understand the procedures.
These examples include:

    Adding an IBM-defined device with default

    Adding an IBM-defined device and changing device informatio

    Adding an unsupported printer

Remember, these are representative examples. The lists of device classes,
device types, and ports that you see on your screen may not be exactly the
same as those shown in the examples. But the basic procedures are very
similar. You need only follow the numbered steps for the example most
like the task that you want to perform.

Subtopics
7.11.1 Example: Adding an IBM-Defined Device with Defaults
7.11.2 In Detail
7.11.3 Example: Adding an Asynchronous Terminal
7.11.4 In Detail
7.11.5 Example: Adding an Unsupported Printer
7.11.6 In Detail

7.11.1 Example: Adding an IBM-Defined Device with Defaults

This first example shows how to add an IBM-defined device to a serial or
parallel port. Because it is an IBM-defined device, you may not need to
change any of the settings (device-dependent information).

```
+--- To Add an IBM-Defined Device -------------------------------------+
¦                                                                      ¦
¦ 1.  On the DEVICE CUSTOMIZING COMMANDS screen, type a to select the  ¦
¦     add command.  Then press Enter.                                  ¦
¦                                                                      ¦
¦ 2.  Type the name of the device class.  Then press Enter.           ¦
¦                                                                      ¦
¦ 3.  Type the name of the device type.  Then press Enter.            ¦
¦                                                                      ¦
¦ 4.  If more than one port is available, type the name of the port to ¦
¦     which you want to add the device.  Then press Enter.            ¦
¦                                                                      ¦
¦ 5.  Adjust the device parameters as needed, then press Enter.  for the ¦
¦     port.                                                            ¦
¦                                                                      ¦
¦ 6.  After you receive a message indicating that the device has been ¦
¦     added, press Enter to return to the DEVICE CUSTOMIZING COMMANDS  ¦
¦     screen.                                                          ¦
¦                                                                      ¦
+----------------------------------------------------------------------+
```

7.11.2 In Detail

The following example shows you how to add an IBM 3812 printer to your
system:

1. On the DEVICE CUSTOMIZING COMMANDS screen, type **a** to select the **add**
    command. Then press **Enter**.

        > a

2. From the list of device classes, type **printer** as the device class and
    press **Enter**.

```
    +-----------------------------------------------------------------------
    ¦
    ¦
    ¦
    ¦
    ¦
    ¦
    ¦    The following device classes are available.
    ¦
    ¦    Device Class  Description
    ¦
    ¦    printer       Printer or Plotter
    ¦    ttydev        Asynchronous Terminal (Any Non-Prntr Device on an Async Po
    ¦    tape          Streaming Tape Drive
    ¦    ptydev        Pseudo-Terminal
    ¦    adapters      IBM PS/2 Adapters
    ¦    lan           Local Area Network
    ¦
    ¦
    ¦
    ¦
    ¦
    ¦    To CANCEL and return to the list of commands, press F3 (or Q).
    ¦    To CHOOSE from the list, type the Device Class and press Enter.
    ¦
    ¦    > printer
    ¦
    ¦
    ¦
    ¦
    ¦
    +-----------------------------------------------------------------------
```

3. The list of printers that is displayed for your system may not exactly
    match the example shown below. From the list of printers, type **3812**
    as the name of the printer and press **Enter**. Remember, if you have all
    of the information you need, you can combine these steps by typing **a
    pr 3812**.

```
    +-----------------------------------------------------------------------
    ¦
    ¦
    ¦
    ¦    The following devices are available.
    ¦
    ¦    Device Type Description
    ¦
    ¦    5202         IBM Quietwriter Printer, Model III on a Parallel Port
    ¦    5182         IBM PC Color Printer (5182)
    ¦    5152         IBM PC Graphics Printer (5152)
    ¦    3852         IBM PC Color Jetprinter (3852)
```

```
¦   4201s        IBM Proprinter on a Serial Port
¦   4201p        IBM Proprinter on a Parallel Port
¦   5201s        IBM PC Quietwriter Printer, Model 2 on a Serial Port
¦   5201p        IBM PC Quietwriter Printer, Model 2 on a Parallel Port
¦   4202s        IBM Proprinter XL (4202) on a Serial Port
¦   4202p        IBM Proprinter XL (4202) on a Parallel Port
¦   opp          Other Parallel Port
¦   osp1         Other Serial Printer
¦   3812         IBM Pageprinter (3812)
¦
¦   To SEE more items in the list, use the Cursor Down or Up keys (or D or U
¦   To CANCEL and return to the list of commands, press F3 (or Q).
¦   To CHOOSE from the list, type the Device Type and press Enter.
¦
¦   > 3812
¦
¦
¦
+--------------------------------------------------------------------------
```

4. Type the name of the port to which you want to add the 3812 printer
    (for instance, **s1**). Then press **Enter**.

```
+--------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦   The following ports are available.
¦
¦   Port Name         Description
¦
¦   s1                Serial Port 1
¦   s2                Serial Port 2
¦
¦
¦
¦
¦
¦
¦
¦   To CANCEL and return to the list of commands, press F3 (or Q).
¦   To CHOOSE from the list, type the Port Name and press Enter.
¦
¦   > s1
¦
¦
¦
¦
+--------------------------------------------------------------------------
```

    Slot refers to the slot number in the microchannel bus. **Port** refers
    to the physical port number. The PS/2 supports up to 8 serial ports,
    assigned by the PS/2 Reference Diskette.

    If your machine has only one available port, then this menu will not
    appear.

5. Adjust the printer parameters as needed. Unless you want to change
    printer characteristics such as margin, page length, and so on, all of
    the device information needed by the system is already set for you.
    Press **Enter** to add the printer or press **F3** to cancel the request.

```
+-----------------------------------------------------------------------
¦
¦       Change any of the following information that does not
¦       match your system configuration.
¦
¦                                          Current Possible
¦    Name    Description                   Choice  Choices
¦
¦    psd     Paper Source Drawer              2     1=Top,2=Bottom
¦    fl      Form (page) Length              66     1-[length(in.xlines/in.]
¦    tm      Top Margin                       0     0-[length(in.xlines/in.]
¦    bm      Bottom Margin                   66     1-[length(in.)xlines/in.]
¦    lm      Left Margin                      0     0-[width(in.)xpitch]
¦    fw      Form Width (right margin)       80     1-[width(in.)xpitch]
¦    urpim   Usr to Recv Prtr Intrum Msgs   pjo     Any User ID,pjo=Prnt Job Owne:
¦    lpi     Lines Per Inch                   6     6,8
¦    dwp     Double Width Print              no     yes,no
¦    cdp     Condensed Print                 no     yes,no
¦    ed      Emphasized Print                no     yes,no
¦    dsp     Double Strike Print             no     yes,no
¦
¦    To SEE more items in the list, use the Cursor Down or Up keys (or D or U
¦    To CANCEL and return to the list of commands, press F3 (or Q).
¦    TO CHANGE a current choice, Type the Name followed by your new choice
¦            (example:  lpi 6) and press Enter.
¦    To COMMIT the changes you have made, Press Enter.
¦    >
¦
+-----------------------------------------------------------------------
```

You will then be asked to confirm your selection.

6. After you receive a message indicating that the printer has been
    added, press **Enter** to return to the DEVICE CUSTOMIZING COMMANDS
    screen.

        The device was added to the system.

        Device Name: lp0
        Device Type: 3812
        Device Class: printer

        To RETURN to the list of commands, press Enter.

    The system has assigned a new name to the device. This is the name to
    use when you issue the **print** command for this device.

Note: The first printer you add is the default printer. If you add
       additional printers, the order of the printers in the print queue
       is determined by the order of *stanzas* in **/etc/qconfig**.

7.11.3 Example: Adding an Asynchronous Terminal

Follow these steps to add an asynchronous terminal (an IBM-defined device)
to your system.

```
+--- To Add an IBM-Defined Device ------------------------------------+
¦                                                                     ¦
¦ 1.  On the DEVICE CUSTOMIZING COMMANDS screen, type a to select the ¦
¦     add command.  Then press Enter.                                 ¦
¦                                                                     ¦
¦ 2.  Type the name of the device class.  Then press Enter.          ¦
¦                                                                     ¦
¦ 3.  From the list of devices that you can add, type the name of the ¦
¦     device type.  Then press Enter.                                 ¦
¦                                                                     ¦
¦ 4.  Type the name of the port to which you want to add the device. ¦
¦     Then press Enter.                                               ¦
¦                                                                     ¦
¦ 5.  Adjust the tty device parameters as needed.  Then press Enter. ¦
¦                                                                     ¦
¦ 6.  After receiving a message indicating that the device has been  ¦
¦     added, press Enter to return to the DEVICE CUSTOMIZING COMMANDS ¦
¦     screen.                                                         ¦
¦                                                                     ¦
+---------------------------------------------------------------------+
```

7.11.4 In Detail

The following example shows you how to add an asynchronous terminal to
your system:

1. On the DEVICE CUSTOMIZING COMMANDS screen, type **a** to select the **add**
    command. Then press **Enter**. The system displays a list of devices
    that you can add to your system. The list you see may differ some
    from the one shown here.

2. From the list of device classes, type **ttydev** as the device class and
    press **Enter**.

```
+--------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦      The following device classes are available.
¦
¦      Device Class      Description
¦
¦      printer           Printer or Plotter
¦      ttydev            Asynchronous Terminal (Any Non-Prntr Device on an Async Po
¦      tape              Streaming Tape Drive
¦      ptydev            Pseudo-Terminal
¦      adapters          IBM PS/2 Adapters
¦      lan               Local Area Network
¦
¦
¦
¦
¦
¦      To CANCEL and return to the list of commands, press F3 (or Q).
¦      To CHOOSE from the list, type the Device Class and press Enter.
¦
¦      >ttydev
¦
¦
¦
¦
¦
+--------------------------------------------------------------------
```

3. From the list of device types, type **tty** as the name of the device and
    press **Enter**. Remember, if you have all of the information you need,
    you can combine these steps by typing **a ttydev tty**.

```
+--------------------------------------------------------------------
¦
¦
¦
¦
¦
¦      The following devices are available.
¦
¦      Device Type      Description
¦
¦      tty              Asynchronous Terminal (A Non-Printer Device on an Async Po
¦
¦
¦
```

```
|
|
|
|
|
|
|
|      To CANCEL and return to the list of commands, press F3 (or Q).
|      To CHOOSE from the list, type the Device Type and
|        press Enter.
|
|      >
|
|
|
|
|
+-----------------------------------------------------------------------
```

4. Type the name of the port to which you want to add the terminal. Then
    press **Enter**.

```
+-----------------------------------------------------------------------
|
|
|
|
|
|      The following ports are available.
|
|      Port Name           Description
|
|      s1                  Serial Port 1
|      s2                  Serial Port 2
|
|
|
|
|
|
|
|
|
|
|
|      To CANCEL and return to the list of commands, press F3 (or Q).
|      To COMMIT the changes you have made, press Enter.
|
|      >
|
|
|
|
|
+-----------------------------------------------------------------------
```

    You will then be asked to confirm your selection.

5. Adjust the tty parameters as needed. It is recommended that you
    change the terminal type, and that all other device settings match the
    way the terminal is set (parity, bits per character, receive/transmit
    speed, and so on). Press **Enter** to add the tty or press **F3** to cancel
    the request.

```
+-----------------------------------------------------------------------
|
```

```
¦
¦    Change any of the following information that does not
¦    match your system configuration.
¦
¦
¦                                    Current  Possible
¦    Name     Description           Choice   Choices
¦
¦    tt       Terminal Type         dumb     vt100,vt220,ibm3161,...
¦    ae       Automatic Enable      false    true, false, share, delay
¦    dvam     Device Attachment Method 0      0 = local,1=remote(modem)
¦    bpc      Bits per Character    7        5,6,7,8
¦    nosb     Number of Stop Bits   1        1,1.5,2
¦    pt       Parity Type           even     even,odd,mark,space,none
¦    elevel   Enable level for terminal 1,4   one or more of 0-6,a,b,c
¦    rts      Receive/Transmit Speed 9600     300,1200,4800,9600,etc.
¦    ixp      Include Xon/Xoff Protocol false true,false
¦
¦    To CANCEL and return to the list of commands, press F3.
¦    To CHANGE a current choice, type the Name followed by
¦         your new choice (example: pt even) and press Enter.
¦    To COMMIT the change you have made, Press Enter.
¦
¦    > dvam 1
¦
¦
¦
¦
+-----------------------------------------------------------------------
```

6. After receiving a message indicating that the terminal has been added,
    press **Enter** to return to the DEVICE CUSTOMIZING COMMANDS screen.

        The device was added to the system.

        Device Name: tty0
        Device Type: tty
        Device Class: ttydev

        To RETURN to the list of commands, press Enter.

Note: To use the tty, the corresponding stanza in **/etc/inittab** must
        contain the keywords **action = respawn** and a signal must be sent to
        inform the **INIT** process of the change. To do this, type **penable**
        tty0 after the system prompt. Then press **Enter**.

7.11.5 Example: Adding an Unsupported Printer

With the **devices** commands, you can add an unsupported printer to your
system. The procedures are similar to those for adding any other device,
but you must supply a little more information.

Follow these steps to add an unsupported printer to your system.


```
+--- To Add an Unsupported Printer ------------------------------------+
¦                                                                      ¦
¦ 1.   On the DEVICE CUSTOMIZING COMMANDS screen, type the following:  a  ¦
¦      printer osp.  Then press Enter.  osp stands for other serial    ¦
¦      printer.                                                        ¦
¦                                                                      ¦
¦ 2.   If more than one port is available, type the name of the port to  ¦
¦      which you want to add the printer.  Then press Enter.           ¦
¦                                                                      ¦
¦ 3.   Adjust the printer parameters as needed, then press Enter.      ¦
¦                                                                      ¦
¦ 4.   Supply the requested parameter information.                     ¦
¦                                                                      ¦
¦ 5.   When the printer has been added, press Enter to return to the   ¦
¦      DEVICE CUSTOMIZING COMMANDS screen.                             ¦
¦                                                                      ¦
+----------------------------------------------------------------------+
```

7.11.6 In Detail

1. From the DEVICE CUSTOMIZING COMMANDS screen, type the following: **a
    printer osp**

        > a printer osp

    Type **osp** for **other serial printer** and **opp** for **other parallel printer**.
    Then press **Enter**.

2. Type the name of the port to which you want to add the printer. Then
    press **Enter**.

    ```
    +---------------------------------------------------------------
    ¦
    ¦
    ¦
    ¦
    ¦    The following ports are available.
    ¦
    ¦    Port Name          Description
    ¦
    ¦    s1                 Serial Port 1
    ¦    s2                 Serial Port 2
    ¦
    ¦
    ¦
    ¦
    ¦
    ¦
    ¦
    ¦
    ¦    To CANCEL and return to the list of commands, press F3 (or Q).
    ¦    To CHOOSE from the list, type the Port Name and
    ¦      press Enter.
    ¦
    ¦    > s2
    ¦
    ¦
    ¦
    ¦
    ¦
    +---------------------------------------------------------------
    ```

3. As requested, supply the necessary information to complete the
    parameters for the printer.

    ```
    +---------------------------------------------------------------
    ¦
    ¦
    ¦
    ¦    Change any of the following information that does not
    ¦    match your system configuration.
    ¦
    ¦                                Current    Possible
    ¦    Name    Description         Choice     Choices
    ¦
    ¦    fl      Form (page) Length  50         1 - length (in . . .
    ¦    .
    ¦    .
    ¦    p1      Lines per inch 6
    ¦
    ```

```
¦
¦
¦     To CANCEL and return to the list of commands, press F3 (or Q).
¦     To CHANGE a current choice, type the Name followed by
¦           your new choice (example: sn 3) and press Enter.
¦     To ADD this device with the current choices, press Enter.
¦
¦     > fl 40
¦
¦
¦
¦
+--------------------------------------------------------------------
```

4. When the printer has been added, press **Enter** to return to the DEVICE
    CUSTOMIZING COMMANDS screen.

7.12 Changing Information about System Devices

You may want to change the settings (device information) for a device in
your system. For instance, you may want to change the margin settings for
printing documents. The **change** command lets you change settings for a
device already installed in your system.

The following example shows how you might change settings for a typical
device. (The lists of device types and device classes shown in the
example may not be exactly the same as those you see on your screen.)

```
+--- To Change Device Information ---------------------------------------+
¦                                                                        ¦
¦ 1.  On the DEVICE CUSTOMIZING COMMANDS screen, type c if you want to   ¦
¦     change device information.  Then press Enter.                      ¦
¦                                                                        ¦
¦ 2.  From the list of available devices, type the device class for     ¦
¦     which you want to change information.  Then press Enter.           ¦
¦                                                                        ¦
¦ 3.  From the list of device names, type the name of the device for    ¦
¦     which you want to change information.  Then press Enter.           ¦
¦                                                                        ¦
¦ 4.  Follow the prompts to change the settings displayed on the screen, ¦
¦     then commit the changes by pressing Enter.                         ¦
¦                                                                        ¦
¦ 5.  After receiving a message indicating that the device information   ¦
¦     has changed, press Enter to return to the DEVICE CUSTOMIZING       ¦
¦     COMMANDS screen.                                                   ¦
¦                                                                        ¦
+------------------------------------------------------------------------+
```

Subtopics
7.12.1 In Detail

7.12.1 In Detail

The following example shows to you how to change information about a
printer in the system:

1. On the DEVICE CUSTOMIZING COMMANDS screen, type **c** to choose the **change**
    command. Then press **Enter**.

2. From the list of available device classes, type **printer** as the device
    class for which you want to change information. Then press **Enter**.

```
+----------------------------------------------------------------------
¦
¦
¦
¦
¦     The following device classes are available.
¦
¦     Device Class       Description
¦
¦     printer         Printer or Plotter
¦     ttydev          Asynchronous Terminal (Any Non-Prntr Device on an Async Po
¦     tape            Streaming Tape Drive
¦     ptydev          Pseudo-Terminal
¦     adapters        IBM PS/2 Adapters
¦     lan             Local Area Network
¦
¦
¦     To CANCEL and return to the list of commands, press F3 (or Q).
¦     To CHOOSE from the list, type the Device Name and press Enter.
¦
¦     >
¦
¦
¦
¦
+----------------------------------------------------------------------
```

3. From the list of available devices, type in **lp0** as the name of the
    printer for which you want to change information. Then press **Enter**.

```
+----------------------------------------------------------------------
¦
¦
¦
¦
¦     The following devices are available.
¦
¦
¦     Device Name      Description
¦
¦     lp0              IBM PC Graphics Printer (5152)
¦     lp1              IBM Pageprinter (3812)
¦
¦
¦
¦
¦
¦
¦     To CANCEL and return to the list of commands, press F3 (or Q).
¦     To CHOOSE from the list, type the Device Name and press Enter.
¦
```

```
¦     > lp0
¦
¦
¦
¦
¦
¦
     +----------------------------------------------------------------
```

4. When the list of settings for printer lp0 displays, make the changes
    that you want. Type the name of the setting, followed by a space and
    the new choice (which must be one of the choices in the **Possible**
    Choices column). For example, to change the left margin setting from
    0 (current choice) to 5, type **lm 5**. Then press **Enter**. Make changes
    and press **Enter** until you have changed all settings that you want to
    change.

```
     +----------------------------------------------------------------
     ¦
     ¦
     ¦
     ¦                         Current  Possible
     ¦    Name    Description   Choice   Choices
     ¦
     ¦    fl      Form (page) Length  50     1 - length (in . .)
     ¦    tm      Top Margin    0        0 - length (in . .)
     ¦    bm      Bottom Margin  50      1 - length (in . .)
     ¦    lm      Left Margin    0        0 - width (in . .)
     ¦    fw      Form Width    80       1 - width (in . .)
     ¦    .
     ¦    .
     ¦    .
     ¦    pitch  Character Pitch  10      10, 12
     ¦    .
     ¦    .
     ¦
     ¦    To SEE more items in the list, use the Cursor Down or Up keys (or D or U
     ¦    To CANCEL and return to the list of commands, press F3.
     ¦    To CHANGE a current choice, type the Name followed by
     ¦          your new choice (example: sn 3) and press Enter.
     ¦    To COMMIT the changes you have made, press Enter.
     ¦
     ¦    >
     ¦
     ¦
     ¦
     ¦
     +----------------------------------------------------------------
```

5. You will see a message indicating that the device information has been
    changed. Press **Enter** to return to the DEVICE CUSTOMIZING COMMANDS
    screen.

```
        The device information was changed.

        Device Name:  lp0
        Device Type:  5152
        Device class:   printer

        To RETURN to the list of commands, press Enter.

        >
```

Note: If you use the **change** option of the **devices** command to change
any of the settings for your system devices and you notice that
your requested changes are not implemented, then perform a
reboot of the system by issuing the **shutdown** command.

7.13 Deleting Devices from the System

When you no longer need a particular device in the system, you may delete
that device from the system configuration. To delete a device, use the
delete command.

The following steps show you how to delete a typical device from your
system:

```
+--- To Delete a Device --------------------------------------------------+
¦                                                                         ¦
¦ 1.   From the DEVICE CUSTOMIZING COMMANDS screen, type delete.  Then    ¦
¦      press Enter.                                                       ¦
¦                                                                         ¦
¦ 2.   From the list of device classes, type in one of the choices.  Then ¦
¦      press Enter.                                                       ¦
¦                                                                         ¦
¦ 3.   From the list of devices, type the name of the device you want to  ¦
¦      delete.  Then press Enter.                                         ¦
¦                                                                         ¦
¦ 4.   To verify that you want to delete the device, press Enter.         ¦
¦                                                                         ¦
¦ 5.   After you receive a message telling you that the device has been   ¦
¦      deleted, press Enter to return to the DEVICE CUSTOMIZING COMMANDS   ¦
¦      screen.                                                            ¦
¦                                                                         ¦
¦      Note:  See the appropriate setup information for instructions on    ¦
¦             physically removing the device you have just deleted from    ¦
¦             your system.                                                ¦
¦                                                                         ¦
+-------------------------------------------------------------------------+
```

Subtopics
7.13.1 In Detail

7.13.1 In Detail

The following example shows how to delete a device from your system. In
this example, you are deleting the printer **lp0**.

1. On the DEVICE CUSTOMIZING COMMANDS screen, type **delete**. Then press
    Enter.

2. From the list of device classes, type **printer** as the name of the
    device class you want to delete. Then press **Enter**.

    ```
    +----------------------------------------------------------------------
    |
    |
    |
    |
    |     The following device classes are available.
    |
    |     Device Class      Description
    |
    |     printer           Printer or Plotter
    |     ttydev            Asynchronous Terminal (Any Non-Prntr Device on an Async Po
    |     tape              Streaming Tape Drive
    |     ptydev            Pseudo-Terminal
    |     adapters          IBM PS/2 Adapters
    |     lan               Local Area Network
    |
    |
    |     To CANCEL and return to the list of commands, press F3 (or Q).
    |     To CHOOSE from the list, type the Device Class and press Enter.
    |
    |     > printer
    |
    |
    |
    |
    +----------------------------------------------------------------------
    ```

3. From the list of printers available to be deleted, type **lp0** as the
    name of the printer you want to delete from the system. Then press
    Enter.

    ```
    +----------------------------------------------------------------------
    |
    |
    |
    |
    |     The following devices are available.
    |
    |
    |     Device Name       Description
    |
    |     lp0               IBM PC Graphics Printer (5152)
    |     lp1               IBM Pageprinter (3812)
    |     lp2               Other Serial Printer
    |
    |
    |
    |
    |     To CANCEL and return to the list of commands, press F3 (or Q).
    |     To CHOOSE from the list, type the Device Name and press Enter.
    |
    ```

```
¦    >  lp0
¦
¦
¦
¦
¦
+-------------------------------------------------------------------------
```

4. Verify that you want to delete the printer by pressing **Enter**.

    To CANCEL deleting the device, press F3 (or Q).
    To DELETE the device, press Enter.

    >

5. After you receive a message telling you that the printer has been
    deleted, press **Enter** to return to the DEVICE CUSTOMIZING COMMANDS
    screen.

        The device was deleted from the system.

        Device Name: lp0
        Device Type: 5152
        Device Class: printer

        To RETURN to the list of commands, press Enter.

7.14 Other Device-Specific Information

The following list contains information specific to certain devices that
you will need to know when adding or deleting devices from your system:

IBM 4201 Proprinter Change the **cp1** keyword to **MLP** to use the international
language fonts.

IBM 4202 Proprinter Change the **cp1** keyword to **MLP** to use the international
language fonts.

tty   Once the tty is added using **devices**, the **penable** command must be
run to enable the tty port before it can be used. The **ae**
keyword can be set to true to allow this to happen automatically
during the reboot of the system.

To add a remote tty, the **dvam** keyword must be set to 1.

8.0 Chapter 8.   Using the minidisks Command

Subtopics

8.1 CONTENTS

8.2 About This Chapter

This chapter explains how you can create minidisks (or partitions) on your
system fixed disks to store the required system information. If you have
installed the AIX PS/2 Operating System, you already have several
minidisks on your fixed disk. These minidisks may be adequate for your
system needs.

However, if you want to create other minidisks, then you must follow
instructions in this chapter to create and delete minidisks. This chapter
also contains instructions for changing the mount attributes of existing
AIX minidisks and for redefining AIX minidisks that you have created with
the **minidisks** command.

Note: The **minidisks** command works only for creating or changing
user-defined minidisks, not system-created minidisks such as
/(root)and **/aixps2**. For system minidisks, use the commands
available on the Maintenance Diskette. These commands are
described in *Managing the AIX Operating System*.

8.3 Learning about Minidisks

Your IBM PS/2 system has one or more internal fixed disks, which can be
divided into separate areas called minidisks. Each contains information
used by the system, and the various minidisks can be different sizes.

A maximum of 128 minidisks can be configured at one time across your
system, with a limit of 32 minidisks per disk. At this point, you already
have several minidisks on your system.

The operating system minidisks, which include /(root), **/aixps2,
/aixps2/tmp, /u,** and **dump**, were created when you installed the AIX PS/2
Operating System.

If you need no more than these minidisks, you can use your system without
ever using the **minidisks** command. If you need to change these minidisks
or create others, then you must use the **minidisks** command discussed in
this chapter.

If you have one fixed disk, it is probably partitioned as shown below.
While you were installing the AIX PS/2 Operating System, you may have
indicated that you wanted to reserve space on the fixed disk for other
programs. If so, there is an area of free space at the beginning of the
disk for a minidisk. Instructions in this chapter explain how to create
minidisks, with an example of how to create one for DOS Merge.

If you have two fixed disks and have installed the AIX PS/2 Operating
System with the recommended choices, then the fixed disks can be divided
as shown below. The configuration on your system may differ.

Available free space cannot be used until you create a minidisk from it.
You can use the **minidisks** command to create a different minidisk from each
area of free space.

If you have added a second fixed disk after installing the AIX Operating
System, this disk will be one large area of free space. You can create
one minidisk for the entire disk or divide it into several minidisks.

8.4 Using the minidisks Command

Now that you better understand the relationship of minidisks to the fixed disks in your system, you can use the **minidisks** commands (**show**, **add**, **delete**, **change**, **mark**, and **release**), as described in the following sections.

Japanese Language Support If Japanese Language Support is provided with your system and you selected a Japanese locale while installing the AIX PS/2 Operating System on your machine, then all the information which appears on your screen, related to using the **minidisks** command will be in Japanese. However, all input required as you use **minidisks** must still be entered in English. For details on types of information which must always be expressed in English regardless of locale selected (such as login IDs, passwords, site names, system directory names, etc.), see the *Guide to Multibyte Character Set (MBCS) Support*.

Subtopics
8.4.1 Starting and Exiting Minidisks
8.4.2 Using Abbreviated Commands

8.4.1 Starting and Exiting Minidisks

To start the **minidisks** command, you must first be logged in to the system.
In addition, you must have superuser authority or be a member of the
system group. After the system prompt, type **minidisks**, and press **Enter**.
You will see the MINIDISK CUSTOMIZING COMMANDS screen, and you can begin
using any of those commands.

```
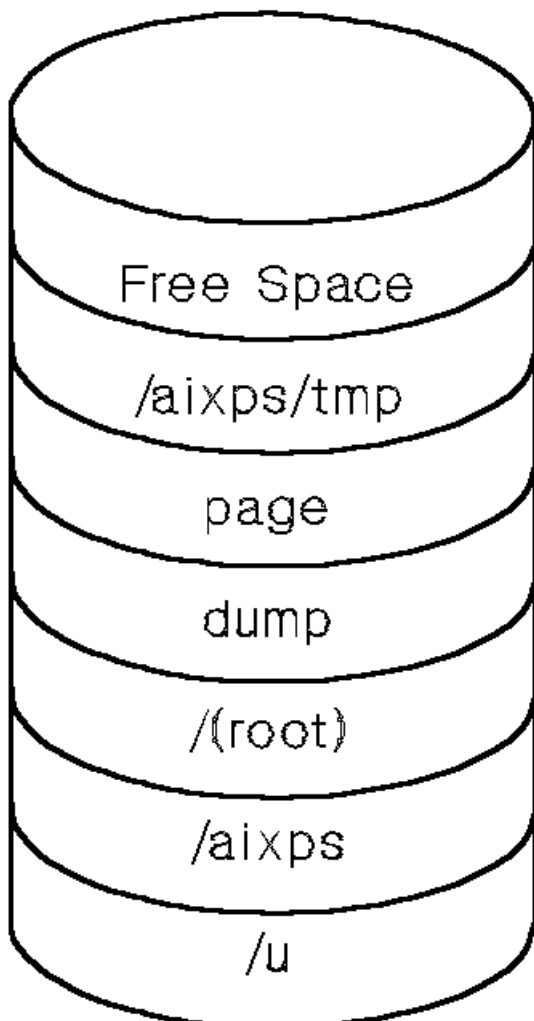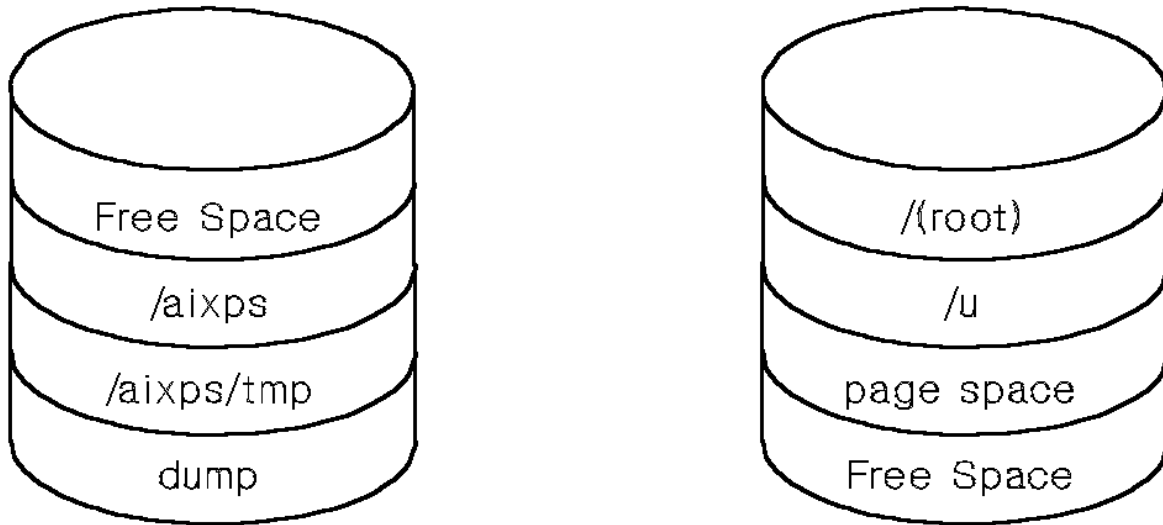+-------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦                   MINIDISK CUSTOMIZING COMMANDS
¦
¦
¦     Minidisks commands are:
¦
¦
¦     Command    Description
¦
¦
¦     add        Create a new minidisk
¦     change     Change mount characteristics of an existing minidisk
¦     delete     Delete an existing minidisk
¦     mark       Mark an operating system as active
¦     release    Release free space for use by another operating system
¦     show       Show minidisk information
¦
¦
¦
¦     To EXIT the minidisks command, press F3 (or Q).
¦
¦     To USE a minidisks command, type the command and press Enter.
¦
¦
¦     >
¦
¦
¦
¦
¦
+-------------------------------------------------------------------------
```

You can exit **minidisks** at any time by pressing **F3** on the keyboard. When
you press **F3**, you return to the list of commands. If you press **F3** from
the list of commands, you exit **minidisks**. You will see the **$** or **#** prompt
displayed.

8.4.2 Using Abbreviated Commands

To save time, you can abbreviate the **minidisks** commands by typing only the
first letter for each command. That is, type **s** for **show**, **a** for **add**, **d** for
delete, and so on. You can also type **y** for **yes** and **n** for **no**. You must
spell out in full all minidisk names, directory names, and fixed disk
names.

8.5 Using Minidisks Commands

The six **minidisks** commands are:

    add
    change
    delete
    mark
    release
    show

The following sections provide information on each command, and you will
find examples of how to use each command later in this chapter.

Subtopics
8.5.1 Adding Minidisks
8.5.2 Changing Mount Attributes
8.5.3 Deleting Minidisks
8.5.4 Marking a Minidisk as Active
8.5.5 Releasing Free Space
8.5.6 Showing Minidisk Information and Planning Ahead

8.5.1 Adding Minidisks

Once you decide to add a minidisk, you select **add** from the list of
minidisks commands. When a line on the screen indicates that you can do
so, you can press **F2** to see where the free space is and how large it is.
At other times, you can use the **show** command to see this information.

After you enter the **add** command, you must provide the needed information
for the system to add the minidisk. For example, you will be asked to
provide the block size, the location on the disk, and other information.
These are items that you should have recorded while using the **show**
command.

Note: The **add** command does not recognize external disks that are not
          powered-on and configured.

8.5.2 Changing Mount Attributes

With the **change** command, you can make the following changes to AIX
minidisks:

    Change the directory on which a minidisk is mounte
    Change the mount status from automatic to non-automati
    Change a minidisk from read-only to read-write, and vice versa

See *Managing the AIX Operating System* for more information on these
topics.

After you enter the **change** command, you will be asked to answer several
questions to guide you through steps to change the settings for the
minidisk.

8.5.3 Deleting Minidisks

Once you enter the **delete** command, you will be asked to enter the name of
the minidisk you want to delete. Then you will see information about the
minidisk and be asked to verify that you want to delete that minidisk.

Warning: When you delete a minidisk, any files on that minidisk are lost.
Be certain to copy any files you want to keep. Otherwise, you can lose
valuable information. See *Managing the AIX Operating System* for
information about guidelines for backing up your files.

8.5.4 Marking a Minidisk as Active

The **mark** option allows you to mark a minidisk as active. Once you enter
the **mark** command you will be prompted to select the number of the
partition you wish to mark as active. After selecting the partition, you
will be given the opportunity to cancel or to cause the change to take
effect.

8.5.5 Releasing Free Space

Select the **release** option to free minidisk space for use by another
operating system. This selection will result in a prompt for your **free
space** entry choice. For example **fs33**. After the space has been freed
press **Enter** to return to the main minidisk command menu.

8.5.6 Showing Minidisk Information and Planning Ahead

The **show** command lists all minidisks and areas of free space for all disks
configured in your system. Any external disks that are not powered on and
configured will not be displayed. Also, while you are using the **minidisks**
commands, you can see this information by pressing the **F2** key. A line on
the screen identifies those times when that information is available. In
the example below, **hd3** is the AIX PS/2 Operating System **/** (root) file
system minidisk, and **hd6** is a minidisk that has been created on free
space. **hd6** is mounted at boot time on the directory **/aixps2/tmp**, with
read-write access.

If you are planning to create a minidisk, record the following information
to use for that procedure:

> Location and number of blocks of the free space area to b
> partitioned.
>
> If the disk contains two or more areas of free space, you can request
> any one of those areas; your minidisk will then be created such that
> all of the space in the requested area is taken first before any space
> in the next free area (if needed) is used. You should specify the
> beginning or middle area for best results. The space can overlap the
> beginning and middle areas or the middle and end areas, but if you
> specify the end area, the system cannot create a minidisk that
> overlaps free space in the middle area.
>
> Name of the fixed disk

All free space is measured in units of 1024-byte blocks, and most
minidisks have a block size of 1024 bytes.

```
+-----------------------------------------------------------------------



    Fixed Disk hdisk0 has the following minidisks:

    MD    MD   GFS   Pack Minidisk      Number MD  Mount      Auto  Auto  Mount
    Name  ID   Num   Num  Type          Blocks Loc Directory  IPL Mount Status

    hd1   1    2     1    AIX           10000  B   /u          N   Y     R/W
    hd2   2    3     1    bootable AIX  6000   B   /aixps2     N   Y     R/W
    hd3   3    1     2    AIX           37000  BM  /           N   Y     R/W
    hd4   4               page space    4000   M               N   Y     R/W
    hd5   5               dump space    4000   M               N   Y     R/W
    hd6   6    4     1    AIX           4000   M   /aixps2/tmp N   Y     R/W
    fs1                   free space    47584  ME  ***********************



    To PRINT this list of minidisks, press F4 (or P).
    To CONTINUE, press Enter.


    >


```

+---

```
Subtopics
8.5.6.1 Example:  Using the minidisks Command
8.5.6.2 In Detail
8.5.6.3 Example:  Displaying Minidisk Information
8.5.6.4 In Detail
8.5.6.5 Example:  Adding an AIX Minidisk
8.5.6.6 In Detail
8.5.6.7 In Detail
8.5.6.8 Example:  Providing Space for DOS Merge and Non-AIX Minidisks
8.5.6.9 In Detail
8.5.6.10 Example:  Deleting a Minidisk
8.5.6.11 In Detail
8.5.6.12 Example:  Changing Minidisk Mount Attributes
8.5.6.13 In Detail
```

8.5.6.1 Example: Using the minidisks Command

The rest of this chapter presents several examples to show you how to use
the **minidisks** commands. In each case, the box contains steps for the use
of the command. If you are familiar with **minidisks**, you might use the
boxed information as a reminder of the steps involved.

The "In Detail" section contains information that displays on the screen,
along with an explanation of what the prompts mean and how to respond to
them.

The first step when using **minidisks** is to request the list of **minidisks**
commands. This list shows you the available options.

```
+--- To Request minidisks --------------------------------------------+
¦                                                                     ¦
¦ 1.  After the system prompt, type minidisks.                        ¦
¦                                                                     ¦
¦ 2.  Press Enter.                                                    ¦
¦                                                                     ¦
+---------------------------------------------------------------------+
```

8.5.6.2 In Detail

1. After the system prompt, type **minidisks**.

    # minidisks

2. Press **Enter** to see the MINIDISK CUSTOMIZING COMMANDS screen.

```
+------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦               MINIDISK CUSTOMIZING COMMANDS
¦
¦   Minidisks commands are:
¦
¦   Command   Description
¦
¦   add       Create a new minidisk
¦   change    Change mount characteristics of an existing minidisk
¦   delete    Delete an existing minidisk
¦   mark      Mark an operating system as active
¦   release   Release free space for use by another operating system
¦   show      Show minidisk information
¦
¦
¦   To EXIT the minidisks command, press F3.
¦
¦   To USE a minidisks command, type the command and press Enter.
¦
¦   >
¦
¦
¦
¦
+------------------------------------------------------------------------
```

8.5.6.3 Example: Displaying Minidisk Information

To display information about an existing minidisk, select **show** from the
minidisks commands screen.

```
+--- To Display Minidisk Information ---------------------------------+
¦                                                                     ¦
¦ 1.  On the MINIDISK CUSTOMIZING COMMANDS screen, type show (or s) to ¦
¦     see information about minidisks.  Press Enter.                   ¦
¦                                                                     ¦
¦                                                                     ¦
¦       >   show                                                      ¦
¦                                                                     ¦
¦                                                                     ¦
¦     Remember that as you use the minidisk customizing commands, you ¦
¦     can display information about disks by pressing F2.             ¦
¦                                                                     ¦
¦ 2.  To return to the MINIDISK CUSTOMIZING COMMANDS screen, press    ¦
¦     Enter.                                                          ¦
¦                                                                     ¦
+---------------------------------------------------------------------+
```

8.5.6.4 In Detail

After entering **show** (or **s**) to display information about existing
minidisks, you will see a screen similar to this one:

```
+-----------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦    You may show the minidisk information for every fixed disk
¦    or for one disk only.
¦    To CHOOSE from the list, type your choice and press Enter.
¦
¦    hdisk0
¦    hdisk1
¦    all
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦    > hdisk0
¦
¦
¦
¦
¦
+-----------------------------------------------------------------------
```

After entering the name of the fixed disk about which you want to see
information, a screen similar to the following will appear.

```
+-----------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦   Fixed Disk hdisk0 has the following minidisks:
¦
¦   MD    MD  GFS Pack  Minidisk      Number MD  Mount       Auto  Auto  Mount
¦   Name  ID  Num Num   Type          Blocks Loc Directory   IPL Mount Status
¦
¦   hd1   1   2   1     AIX           10000  B   /u            N   Y    R/W
¦   hd2   2   3   1     Bootable AIX  6000   B   /aixps2       N   Y    R/W
¦   hd3   3   1   2     AIX           37000  BM  /             N   Y    R/W
¦   hd4   4             Page Space    4000   M                 N   Y    R/W
¦   hd5   5             Dump Space    4000   M                 N   Y    R/W
¦   hd6   6   4   1     AIX           4000   M   /aixps2/tmp   N   Y    R/W
¦   fs1                 Free Space    47584  ME  *********************
¦
¦
¦
¦   To PRINT this list of minidisks, press F4.
```

```
¦    To CONTINUE, press Enter.
¦
¦
¦    >
¦
¦
¦
¦
¦
¦
+------------------------------------------------------------------------
```

To better understand this information, you may want to review the
information about minidisks at the beginning of this chapter.

If you have a printer configured and running, you can print the
information displayed on the screen by pressing **F4**. A summary report is
also written to the file **/aixps2/tmp/CONFIGREPORT**, which contains the
information on each show screen, where **F4** has been pressed during the
minidisks session.

After you have completed adding or deleting a minidisk, use the **mdrc**
command after rebooting in order to create the stanzas needed in the
configuration files.

8.5.6.5 Example: Adding an AIX Minidisk

To add an AIX minidisk to the system and specify characteristics for that
minidisk, select **add** from the **minidisks** list. Follow these instructions:

```
+--- To Add an AIX Minidisk--Part 1 -------------------------------------+
¦                                                                        ¦
¦ 1.   On the MINIDISK CUSTOMIZING COMMANDS screen, type add (or a).     ¦
¦      Then press Enter.                                                 ¦
¦                                                                        ¦
¦ 2.   Type the full path name of the directory on which the minidisk is ¦
¦      to be mounted.  Press Enter.                                      ¦
¦                                                                        ¦
¦ 3.   Indicate whether you want the minidisk mounted after it is        ¦
¦      configured,  and press Enter.                                     ¦
¦                                                                        ¦
¦ 4.   Indicate whether you want the minidisk to be read-only or         ¦
¦      read-write.  Press Enter.                                         ¦
¦                                                                        ¦
¦ 5.   If you want file systems to be replicated, type y and press Enter.¦
¦      If you do not want replicated file systems, type n, press Enter,  ¦
¦      and go to Part 2.                                                 ¦
¦                                                                        ¦
¦ 6.   The user replication prompt is then displayed.  If you want to    ¦
¦      make replication choices, type yes and press Enter.  If you want  ¦
¦      the program to replicate the file system, type no and press Enter,¦
¦      and go to Part 2.                                                 ¦
¦                                                                        ¦
¦ 7.   The primary site file system screen is then displayed.  If you do ¦
¦      not want your site to be a primary site file system, enter no and ¦
¦      then press Enter.  If you do want it to be a primary site file    ¦
¦      system, enter yes, press Enter, and go to Part 2.                 ¦
¦                                                                        ¦
¦ 8.   The backbone screen is then displayed.  If you do not want your   ¦
¦      site to be a backbone site, enter no and then press Enter.  If you ¦
¦      do want it to be a backbone site, enter yes, press Return, and go ¦
¦      to Part 2.                                                        ¦
¦                                                                        ¦
¦ 9.   The i386 fstore screen is then displayed.  If you want your file  ¦
¦      system to have the i386 fstore set, enter yes and press Enter.  If ¦
¦      you do not want your file system to have the i386 fstore set,     ¦
¦      enter no and press Enter.                                         ¦
¦                                                                        ¦
¦      Then go on to "To Add an AIX Minidisk--Part 2" in topic 8.5.6.6.  ¦
¦                                                                        ¦
+------------------------------------------------------------------------+
```

8.5.6.6 In Detail

1. On the MINIDISK CUSTOMIZING COMMANDS screen, type **add** to indicate that
    you want to add a minidisk. Press **Enter**.

        > add

2. Type the full path name of the directory on which to mount the new
    minidisk, and press **Enter**.

        Type the full path name of the directory on which you
          want to mount this minidisk (example: **/aixps2/mine**)
          and press Enter.

        > /u/anydir

    A full path name begins with the / (root) directory. For example, if
    your minidisk is to be mounted on **/u/anydir**, the files **file1** and **file2**
    will have the path names **/u/anydir/file1** and **/u/anydir/file2**.

3. Next, indicate whether you want the new minidisk mounted after it is
    configured, and press **Enter**.

        Do you want this minidisk to be automatically mounted after it is configure

    Type **yes** or **no** and press **Enter**.

    Internal disks and the minidisks on them are configured each time you
    start the system. If the minidisk is automatically mounted each time
    you start the system, you can access the files stored on the minidisk
    without using the **mount** command. But if the minidisk is not
    automatically mounted each time you start up the system, you must use
    the **mount** command to mount the minidisk before you can access the
    files on that minidisk.

4. Now indicate whether you want the minidisk to be read-only or
    read-write, and press **Enter**.

```
    +----------------------------------------------------------------------
    ¦
    ¦
    ¦
    ¦
    ¦
    ¦
    ¦      The following access permissions are available:
    ¦
    ¦        Name      Description
    ¦
    ¦        rw        read/write
    ¦        ro        read-only
    ¦
    ¦
    ¦
    ¦
    ¦
    ¦
    ¦
    ¦
    ¦
    ¦   To choose a permission, type the name and press Enter.
    ¦
```

```
¦    >
¦
¦
¦
¦
¦
¦
+------------------------------------------------------------------------
```

The minidisk can be mounted with either read-only or read-write
access. With read-only access, you can read files without changing
them. If you choose the read-write option, you can both read and
write to the files on your minidisk.

When a stanza in **/etc/fsmap** identifies the mount point you select as
replicated, you are not asked if your file system is to be replicated.
The question on user-replicated choices appears first.

5. If you want a replicated file system, type **yes** and then press **Enter**.
    If you do not, type **no**, and press **Enter**, and go to step 7.

       Do you want your file system to be replicated? (y/n)

    A file system that is replicated can have full or partial copies of
    itself on other sites in the cluster. This replication allows cluster
    sites to run independently while presenting a uniform view to all
    users. A replicated file system contains files and directories that
    are automatically copied to many or all sites in the cluster and are
    not specific to any one cluster site. The root file system is a good
    example of a system replicated file system. The root file system
    contains files critical to the normal operation of all sites in the
    cluster.

6. If you have decided on a replicated file system, the user replication
    prompt displays. Type **y** and press **Enter** if you want to make file
    replication choices. If you want the program to replicate the file
    system, type **n**, press **Enter**, and go to step 7.

       Do you want the file system to be user replicated (y/n)?

7. The primary site file system prompt is then displayed. If you do not
    want your site to be a primary site file system, enter no and press
    Enter.. If you do want it to be a primary site file system, enter
    yes, press **Enter** and go to step 7.

       Do you want your file system to be the primary site? (y/n)

    Replicated system and user file systems must have a primary copy, and
    may have other copies (backbone and secondary) of the file system.
    For each replicated file system there must be one copy that is
    designated as the primary copy. Updates to any file in a file system
    can only occur when the primary copy is available for modification.

8. The backbone prompt is then displayed. If you do not want your site
    to be a backbone site, enter no and then press **Enter**. If you do want
    it to be a backbone site, enter yes, press **Return**, and go to step 7.

       Do you want your file system to be a backbone copy? (y/n)

    The backbone copy is an exact copy of the primary copy. The user
    always has read-only access to the backbone copy. It is useful as a

backup version to the primary copy.

Any number of backbone copies can be created.

9. The i386 fstore screen is then displayed. If you want your file
    system to have the i386 fstore set, enter yes and press **Enter**. If you
    do not want your file system to have the i386 fstore set, enter no and
    press **Enter**.

    Do you want your file system to have the i386 fstore set? (y/n)

    The fstore values are used for determining if a secondary file system
    copy will get a modified file from the primary copy. Refer to the
    Administration Guide for details.

```
+--- To Add an AIX Minidisk--Part 2 ------------------------------------+
¦                                                                       ¦
¦                                                                       ¦
¦ 1.  After the > prompt, establish the size of the minidisk by typing  ¦
¦      the number of 1024-byte blocks.  Press Enter.                    ¦
¦                                                                       ¦
¦ 2.  When the > prompt returns, type the number of inodes in this file ¦
¦      system, and press Enter.  The prompt does not appear if the file ¦
¦      system is replicated and the number of inodes can be set from a  ¦
¦      copy of this file system stored on another site.                 ¦
¦                                                                       ¦
¦ 3.  Choose the disk where the new minidisk will be located.  Type in  ¦
¦      the disk name, and press Enter.                                  ¦
¦                                                                       ¦
¦ 4.  Review the settings for the new minidisk, and follow directions on¦
¦      the screen to cancel the creation of the minidisk or to create the¦
¦      new minidisk.                                                    ¦
¦                                                                       ¦
¦ 5.  If the mount directory does not exist, use the mkdir command to   ¦
¦      create it.                                                       ¦
¦                                                                       ¦
¦ 6.  For an existing minidisk, mount it before you use it.  Type:      ¦
¦      mount /u/minidisk.  Then press Enter.                            ¦
¦                                                                       ¦
+-----------------------------------------------------------------------+
```

8.5.6.7 In Detail

1. After the > prompt, establish the size of the minidisk by typing the
    number of 1024-byte blocks. Then press **Enter**.

    ```
    +----------------------------------------------------------------------
    |
    |
    |
    |
    |
    | The block size for AIX minidisks is 1024 bytes.
    | Type the number of blocks for this minidisk and press Enter.
    |
    |
    |
    |
    |
    |
    |
    |
    |
    |
    |
    |
    |
    |
    |
    | To SHOW minidisk information, press F2 (or S).
    |    press F2.
    |
    |
    | >
    |
    |
    |
    |
    |
    +----------------------------------------------------------------------
    ```

    The number of blocks determines how large your minidisk will be. AIX
    minidisks have a blocksize of 1024-bytes. You can press **F2** for the
    show command at this time. Doing so displays free space in 1024
    blocks. Note that some of this space (about 5%) is used for indexes,
    not data. See "Showing Minidisk Information and Planning Ahead" in
    topic 8.5.6.

2. When the mount point is not replicated, or the replicated file system
    is new to the cluster, type the number of inodes for this file system
    and press **Enter**, or press **Enter** to select the default.

       Enter the number of inodes (default is 600)

3. The next screen shows the disk names that are currently configured
    into the system. Choose the disk where the new minidisk will be
    located. Type in the disk name, and press **Enter**.

    ```
    +----------------------------------------------------------------------
    |
    |
    |
    |
    |
    | The following fixed disks are available:
    |
    ```

```
¦      hdisk0
¦      hdisk1
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦ Type the fixed disk on which to create this minidisk
¦   and press Enter.
¦
¦ To SHOW minidisk information, press F2 (or S).
¦
¦
¦
¦ > hdisk0
¦
¦
¦
¦
+------------------------------------------------------------------------
```

There may not be enough free space for a minidisk of the size you have
requested on each disk in the list. If you do select a fixed disk
without adequate space for your minidisk, you will see an error
message and then a summary screen from which you can select a
different fixed disk or number of blocks.

4. Now you will see a screen summarizing the current choices and any
    choices you may have indicated that you want to make. You have the
    option of canceling the creation of this minidisk or creating the new
    minidisk with the current choices. The following example assumes that
    the number of blocks will be changed to 50000:

```
+------------------------------------------------------------------------
¦
¦
¦
¦
¦
¦
¦      Minidisk name:  hd9
¦      Minidisk location:  end
¦      Directory:  /u/anydir
¦      Automatic Mount: yes
¦      Read Permission:  read/write
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦    To CHANGE a current choice, type the Name followed by
¦       your new choice and press Enter.
¦    To CANCEL creation of this minidisk, press F3 (or Q).
¦    To CREATE this minidisk with the current choices, press Enter.
¦    To SHOW minidisk information, press F2 (or S).
¦
```

```
¦     >
¦
¦
¦
¦
+-------------------------------------------------------------------
```

When you press **Enter** the minidisk is added to the system. For large
minidisks, this process may take a few minutes. During this time, the
minidisk is being defined and the **lost+found** directory is created.

5. If the mount directory does not exist, use the **mkdir** command to create
    it. For more details on **mkdir**, see *AIX Operating System Commands
    Reference*.

6. The system displays a message confirming the addition of the new
    minidisk, then returns to the list of **minidisks** commands.

    The minidisk has been successfully created. The minidisk
    name is hd9.

    To CONTINUE, press Enter.

Note: The directory **/u/anydir** must exist before you try to mount the
       minidisk for the first time.

If the directory **/u/anydir** does not exist, you must exit **minidisks** and
type:

mkdir /u/anydir (Press **Enter**)

These steps will create the directory **/u/anydir**. See *Managing the AIX
Operating System* for more information on creating new file systems.

Mount the minidisk before you use it the first time. To do this, type:
mount /u/anydir. Then press **Enter**.

8.5.6.8 Example: Providing Space for DOS Merge and Non-AIX Minidisks

DOS Merge can be run with a ***virtual partition***, which is a minidisk.

If the DOS partition needs to be bootable, it must be defined with DOS
FDISK on the first fixed disk, and formatted by the DOS format command
with the **/s** option.

To use DOS Merge (once it is installed in your system), create a minidisk
for DOS Merge. To do so, use the **release** command. Use the following
instructions to create a minidisk after installing DOS Merge:

```
+--- To Add a Non-AIX Minidisk -------------------------------------------+
¦                                                                         ¦
¦ 1.  On the MINIDISK CUSTOMIZING COMMANDS screen, type release (or a).  ¦
¦     Press Enter.                                                        ¦
¦                                                                         ¦
¦ 2.  After the > prompt, type the name of the free space minidisk to be ¦
¦     released for use by DOS and press Enter.                           ¦
¦                                                                         ¦
¦ 3.  After the > press Enter.                                           ¦
¦                                                                         ¦
+-------------------------------------------------------------------------+
```

8.5.6.9 In Detail

1. On the MINIDISK CUSTOMIZING COMMANDS screen, type **release** (or **a**) and
    press **Enter**.

         > release

2. After the > prompt, type the name of the free space minidisk to be
    released for use by DOS and press **Enter**.

             Type the name of the free space entry you want to
             release for use by other operating systems and
             press Enter.

             > fs33

3. After the > press **Enter**. You will see:

             The requested free space entry has been released
             and can now be used for other operating systems.

             To continue, press Enter.

             >

1. On the MINIDISK CUSTOMIZING COMMANDS screen, type **release** (or **a**) and
    press **Enter**.

8.5.6.10 Example: Deleting a Minidisk

To delete a minidisk, select the **delete** option from the list of **minidisks**
commands.

Note: Be certain to copy any files that you want to save before you
delete the minidisk. See *Managing the AIX Operating System* for
information on copying files.

```
+--- To Delete a Minidisk ----------------------------------------------+
¦                                                                       ¦
¦ 1.  On the MINIDISK CUSTOMIZING COMMANDS screen, type delete and press ¦
¦     Enter.                                                             ¦
¦                                                                       ¦
¦ 2.  After the > prompt, type the name of the minidisk you want to     ¦
¦     delete.  Press Enter.                                             ¦
¦                                                                       ¦
¦ 3.  On the summary screen, verify that you want to delete the minidisk ¦
¦     by pressing Enter.  To cancel the deletion process, press F3.     ¦
¦                                                                       ¦
+-----------------------------------------------------------------------+
```

8.5.6.11 In Detail

1. On the MINIDISK CUSTOMIZING COMMANDS screen, type **delete**. Press
    Enter.

        > delete

2. After the > prompt, type name of the minidisk you want to delete.
    Press **Enter**.

            Type the name of the minidisk you want to delete and
              press Enter.

            To SHOW minidisk information, press F2.

            > hd8

3. On the summary screen, verify that you want to delete the minidisk by
    pressing **Enter**. To cancel the deletion process, press **F3**.

```
    +----------------------------------------------------------------------
    ¦
    ¦
    ¦
    ¦
    ¦
    ¦
    ¦    Minidisk name: hd8
    ¦    Directory: /u/amy
    ¦
    ¦    Name      Description         Current    Possible
    ¦                                   Choice     Choices
    ¦
    ¦    fd        Fixed Disk          hdisk0    hdisk0,hdisk1,...
    ¦    nob       Number of Blocks   25000
    ¦
    ¦
    ¦
    ¦    WARNING:   ALL FILES ON THIS MINIDISK WILL BE DESTROYED
    ¦
    ¦
    ¦    To DELETE this minidisk, press Enter.
    ¦    To CANCEL deletion of this minidisk, press F3 (or Q).
    ¦
    ¦
    ¦    >
    ¦
    ¦
    ¦
    ¦
    ¦
    +----------------------------------------------------------------------
```

    After the minidisk has been deleted, this message appears:

        Minidisk hd8 has been deleted.

        To CONTINUE, press Enter.

Note: You cannot delete a minidisk that is in use.

8.5.6.12 Example: Changing Minidisk Mount Attributes

To change the mount attributes for an existing AIX minidisk, select **change**
from the list of **minidisks** commands.

The mount attributes (automount, permissions, and so on) usually are set
so that existing minidisks are automatically mounted each time you start
up the system. However, if you want to change the attributes of one or
more minidisks so that they are not automatically loaded at startup time,
you can do so with the **change** command.

To change mount attributes, follow these steps:

```
+--- To Change Mount Attributes ----------------------------------------+
¦                                                                       ¦
¦ 1.  On the MINIDISK CUSTOMIZING COMMANDS screen, type change.  Press   ¦
¦     Enter.                                                             ¦
¦                                                                       ¦
¦ 2.  After the > prompt, type the name of the minidisk you want to      ¦
¦     change.  Press Enter.                                             ¦
¦                                                                       ¦
¦ 3.  After the > prompt, type yes or no to indicate whether you want to ¦
¦     change the directory on which the minidisk is mounted.  Then press ¦
¦     Enter.                                                             ¦
¦                                                                       ¦
¦ 4.  Answer the GFS# prompt.                                            ¦
¦                                                                       ¦
¦ 5.  Answer the pack# prompt.                                           ¦
¦                                                                       ¦
¦ 6.  Type yes or no to indicate whether you want to change the          ¦
¦     automatic mount status of the minidisk.  Then press Enter.         ¦
¦                                                                       ¦
¦ 7.  Type yes or no to indicate whether you want to change the          ¦
¦     read/write status of the minidisk.  Then press Enter.              ¦
¦                                                                       ¦
¦ 8.  On the summary screen, press Enter to change the mount attributes  ¦
¦     or press F3 to cancel the mount process.                           ¦
¦                                                                       ¦
+-----------------------------------------------------------------------+
```

8.5.6.13 In Detail

1. On the MINIDISK CUSTOMIZING COMMANDS screen, type **change** (or **c** or **ch**).
    Then press **Enter**. This selects the **change mount attributes** option.

    > change

2. After the > prompt, type the name of the minidisk you want to change.
    Then press **Enter**.

         Type the name of the minidisk you want to change and
            press Enter.

         To SHOW minidisk information, press F2.

         > hd8

3. Type **yes** or **no** to indicate whether you want to change the directory on
    which the minidisk is mounted. Then press **Enter**.

       This minidisk is mounted on directory /u/amy.

       Do you want to change the directory?

    Type **yes** or **no** and press **Enter**.

4. Answer the GFS# prompt.

5. Answer the pack# prompt.

6. Type **yes** or **no** to indicate whether you want to change the automatic
    mount status of the minidisk--that is, whether you want the minidisk
    automatically mounted after it is configured. Then press **Enter**.

       This minidisk is automatically mounted.
       Do you want to change the automatic mount status?

    Type **yes** or **no** and press Enter.

7. Type **yes** or **no** to indicate whether you want to change the read/write
    status of the minidisk. Then press **Enter**.

       This minidisk is mounted with read/write permission.
       Do you want to change the mount permission?

    Type **yes** or **no** and press **Enter**.

8. On the summary screen, press **Enter** to change the mount attributes. Or
    press **F3** to cancel.

    +---
    ¦
    ¦
    ¦
    ¦
    ¦
    ¦
    ¦   Current mount characteristics for minidisk hd8.
    ¦
    ¦   Minidisk name: hd8
    ¦   Directory: /u/amy
    ¦   Automatic Mount: yes

```
¦   Read Permission: read only
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦   To CANCEL changing the mount characteristics, press F3 (or Q).
¦
¦   To CAUSE the mount characteristics to take effect, press Enter.
¦
¦   >
¦
¦
¦
¦
+-------------------------------------------------------------------------
```

A.0 Appendix A. Special Processing for Devices and Minidisks
While adding or deleting certain devices or adding minidisks, you may
receive a message that ***special processing*** has failed. Special processing
automatically makes appropriate changes in the files when a printer, a
tty, a **pty** device, a streaming tape drive, or other device is either added
to or deleted from the system configuration through the **devices** command or
when a minidisk is added.

When you inadvertently edit certain files, a message on the display screen
may indicate that processing has failed. Then you must edit the files to
make the necessary changes. The **devices** command has already added the
device to the system, but that device is not usable until you make changes
in the files. For directions on editing files, see the *AIX PS/2 Text
Formatting Guide* and the *IBM AIX INned* manual.

Subtopics
A.1 Devices
A.2 Minidisks

A.1 Devices

Should you receive a message that special processing for devices has
failed, read the following sections to determine what action to take.

Subtopics
A.1.1 Printers and Plotters
A.1.2 pty Devices
A.1.3 tty Devices
A.1.4 3270 Devices
A.1.5 LAN Devices
A.1.6 Tapes

A.1.1 Printers and Plotters

When a printer or plotter is added, a new print queue (with the same name
as the printer or plotter) is created. For example, the first printer
added to the system is assigned the name **lp0**, and the queue associated
with that printer is also assigned the name **lp0**. You can print jobs on
the printer by using the command **print lp0** *filename*. This printer/queue
association is established by updating the **/etc/qconfig** file. In
addition, the special processing routine issues the **print -rr** command to
activate the new print queue. (When the printer is deleted through the
devices command, the queue is also deleted.) For more information on the
format of the **/etc/qconfig** file, see the *AIX Operating System Technical
Reference*.

Should you receive a message that special processing for devices has
failed, read the following sections to determine what action to take.

Subtopics
A.1.1.1 Adding a Printer or Plotter
A.1.1.2 Deleting a Printer or Plotter

A.1.1.1 Adding a Printer or Plotter

Edit the **/etc/qconfig** file to add a new queue for the printer. You must
add two stanzas to the file, one for the queue and one for the printer.
For example, add the following stanzas to the **/etc/qconfig** file to add a
printer:

```
     lp0:
          argname = lp0
          device = dlp0
          node = <machine name>

     dlp0:
          file = /dev/lp0
          backend = /usr/lpd/piobe -pname=name -device=dname
          -profile=/etc/ddi/dfilename  -statusfile
```

where:

   name is the name of lp#.

   dname is the **ddi** stanza name. You can find this name by looking at
   the **lp0** stanza in the **/etc/system** file and getting the value of the
   keyword **use**.

   dfilename is the **ddi** file name. You can find this name by looking at
   the **lp0** stanza in the **/etc/system** file and getting the value of the
   ddi_file keyword.

Add the following stanzas to the **/etc/qconfig** file to add a plotter:

```
     lp1:
          argname = lp1
          device = dlp1

     dlp1:
          file = /dev/lp1
          backend = /usr/lpd/piobe -statusfile -pname=name -plot
```

A.1.1.2 Deleting a Printer or Plotter

Edit the **/etc/qconfig** file to delete the queue associated with the plotter
or printer that you deleted. You must delete two stanzas from
/etc/qconfig: the queue stanza and the device stanza. For example,
delete stanzas **lp0** and **dlp0** from the **/etc/qconfig** file.

A.1.2 pty Devices

When a new **ptyp** device is added, a new entry is made in the **/etc/systems**
file for the controller side (**ptyp**) of the **ptyp** device and the server side
(**ttyp**) of the device. Special processing involves only the controller
side (**ptyp**). When a **ptyp** device is deleted with the **devices** command, the
special processing routine removes the **ptyp** entry from **/etc/system**.

When a new **ptyp** device is added to the system and the **logger** keyword is
set to **true**, a new entry is made in the **/etc/ports** and **/etc/inittab** files
for the **ptyp** device. Information about the terminal type, parity type,
bits per character, number of stop bits, herald, location, and choice of
whether the **ptyp** is to be automatically enabled during system start is
copied from the device information file to the new entry in **/etc/ports**.
Information concerning the getty process associated with a ttyp is
contained in the pty's /etc/inittab stanza. The new entry sets the **ptyp**'s
characteristics when the **ptyp** device is enabled. When the **ptyp** is deleted
through the **devices** command, the entries in **/etc/inittab** and **/etc/ports**
are also deleted. For information about the format of the **/etc/ports** and
/etc/inittab files, see *AIX Operating System Technical Reference*.

Subtopics
A.1.2.1 Adding a pty Device
A.1.2.2 Deleting a pty Device

A.1.2.1 Adding a pty Device

Edit the **/etc/system** file to add a new entry for the controller side of
the **ptyp** device. You may also have to add an entry in the **/etc/inittab**
and **/etc/ports** for the device. You must add one stanza to the **/etc/system**
file. For example, if **ttyp0** is added to the system but special processing
fails, add the following stanza to the **/etc/system** file:

```
ptyp0:
     driver = ptc
     minor  = c0
     modes  = rw-rw-rw-
     owner  = root
```

Note that the **minor** keyword value is **c** followed by the **ptyp** number.

Each **ttyp** device has a stanza associated with that device in the
/etc/ddi/pty file. Each stanza contains a **logger** keyword. If the **logger**
keyword is not present in the **ttyp** device's stanza, the **ttyp** device uses
the **logger** keyword from the default stanza. If **logger = true** for the **ptyp**
device, you must edit the **/etc/ports** file, adding a new stanza for the
ptyp device. For example, if **ttyp0** is added to the system but special
processing fails and **logger = true**, add the following stanza to
/etc/ports:

```
/dev/ttyp0 :
  loc = "ttyp0"
  term = tt
  parity = pt
  enabled = true/false
  logmodes = (see below)
  herald = "IBM PS/2
            AIX PS/2 Operating System
            \r\nxxXxxxx(c)
            Copyright IBM Corp. 1985,1989\r\n
            (/dev/ttyp0)\r\nlogin:
```

where:

   term is the terminal type that was specified when the **ttyp** was added
   with **devices**. It is the value entered for the keyword **tt**.

   parity is the parity specified when you added the **ttyp** device with the
   devices command. Its corresponding value in the **ddi** file is **pt**, shown
   on the left below. The value on the right is in the **/etc/ports** file.
   The values map as follows:

```
        pt even  --> parity even
        pt odd   --> parity odd
        pt none  --> parity none
        pt space --> parity space
        pt mark  --> parity mark
```

   enabled refers to whether you want the terminal functional when you
   start the system. Choose either true or false. If you choose false,
   you must use the **penable** command to enable the terminal.

   logmodes consists of three parts: **echoe+CSNSTOP**. These parts are
   defined as follows:

- **echoe+** is part of all logmodes for a **ptyp** device.
- **CSN** is determined by the **bpc** value in the device's **ddi** stanza:

        bpc = 5 --> cs5
        bpc = 6 --> cs6
        bpc = 7 --> cs7
        bpc = 8 --> cs8

- **STOP** is determined by the **nosb** value in the device's **ddi** stanza:

        nosb = 1 --> -cstopb
        nosb = 1.5 --> -cstopb
        nosb = 2 --> +cstopb

  For example, a **ptyp** device with **bpc = 8** and **nosb = 2** has **logmodes = echoe+cs8+cstopb**.

Note that the **minor** keyword value is **c** followed by the **ptyp** number.

Each **ttyp** device also has the following stanza added to **/etc/inittab**.

```
ttyp0:
     id=tt0
     action=respawn
     command="/etc/getty /dev/ttyp0"
     level=14
```

A.1.2.2 Deleting a pty Device

Edit the **/etc/system** file to delete the **ptyp** stanza associated with the
ptyp device. You must delete one stanza from **/etc/system**. If there is a
corresponding entry in **/etc/ports** for the entry you deleted from
/etc/system, edit **/etc/ports** and **/etc/inittab** to delete the corresponding
entry. For example, if **ttyp3** is deleted from the system but special
processing fails, delete stanza **ptyp3** from the **/etc/system** file and delete
stanza **ttyp3** from **/etc/ports** and **/etc/inittab**.

A.1.3 tty Devices

When a new **tty** is added, a new entry is made in the **/etc/ports** file for
the **tty**. Information about the terminal type, receive/transmit speed,
parity type, bits per character, number of stop bits, and choice of
whether the **tty** is to be automatically enabled during system start is
copied from the device information file to the new entry in **/etc/ports**.
The new entry sets the **tty**'s characteristics when the **tty** is enabled. A
stanza is also created in **/etc/inittab** that contains status information
about the tty's getty process. When the **tty** is deleted through the
devices command, the entry in **/etc/ports** is also deleted. For information
about the format of the **/etc/ports** and **/etc/inittab** files, see the *AIX
Operating System Technical Reference*.

Subtopics
A.1.3.1 Adding a Terminal
A.1.3.2 Deleting a Terminal

A.1.3.1 Adding a Terminal

Edit the **/etc/ports** file to add a new entry for the **tty**. You must add one
stanza to the file. For example, if **tty0** is added to the system but
special processing fails, add the following stanza to the **/etc/ports** file:

```
     /dev/tty0:
         term = tt
         enabled = (see below)
         speed = rts
         logmodes = (see below)
         parity = pt
```

where,

   term is the terminal type that was specified when the **tty** was added
   with the program devices. It is the value entered for the keyword **tt**.

   enabled refers to whether you want the terminal functional when you
   start the system. Choose true, false, share, or delay. If you choose
   false, you must use the **penable** command to enable the terminal. For
   additional information about these values, see the *AIX Operating
   System Technical Reference*.

   speed is the receive/transmit speed specified when you added the
   terminal with the **devices** command. It is the value for the keyword
   rts.

   logmodes can contain multiple values, but at least two of those values
   are always the bits per character and number of stop bits. Special
   processing maps these two values from the **ddi** file, where the
   corresponding keywords are **bpc** and **nosb**.

   The logmode value is divided into two parts: **logmodes = bpc and nosb**,
   with no space between them. It maps as follows:

```
         logmode = ixon+echoe+cs8+cstopb+hupcl

             nosb 1      --> -cstopb
             nosb 1.5  --> -cstopb
             nosb 2      --> +cstopb

             bpc 5 --> cs5
             bpc 6 --> cs6
             bpc 7 --> cs7
             bpc 8 --> cs8
```

   parity is the parity specified when you added the terminal with the
   devices command. Its corresponding value in the **ddi** file is **pt**, shown
   on the left below. The value on the right is in the **/etc/ports** file.
   The values map as follows:

```
             pt even --> parity even
             pt odd  --> parity odd
             pt none --> parity none
             pt space --> parity none
             pt mark --> parity none
```

Add the following stanza in **/etc/inittab**:

```
tty0:
     id=tty0
     action=respawn
     command="/etc/getty /dev/tty0"
     level=14
```

```
tty0:

     id=tty0
     action=respawn
     command="/etc/getty /dev/tty0"
```

A.1.3.2 Deleting a Terminal

Edit the **/etc/ports** and **/etc/inittab** files to delete the entry associated
with the **tty** that you deleted. You must delete one stanza from
/etc/ports. For example, if **tty0** is deleted from the system but special
processing fails, delete stanza **tty0** from the **/etc/inittab** and **/etc/ports**
files.

A.1.4 3270 Devices

While adding the first 3270 device, the 3270 special processing routine
edits **/etc/init.dir/Singl2multi** and enables the 3270 offlevel interrupt
handler. Likewise, when the last 3270 device is deleted, the 3270 special
processing routine edits **/etc/init.dir/Singl2multi** and disables the 3270
offlevel interrupt handler.

Also, due to 3270 processing techniques, the system wide maximum number of
message queue identifiers are increased or decreased by a factor of 64
during an add or delete, respectively.

Subtopics
A.1.4.1 Adding a 3270 Device
A.1.4.2 Deleting a 3270 Device

A.1.4.1 Adding a 3270 Device

If special processing fails while adding the first 3270 device, then edit
/etc/init.dir/Singl2multi and remove the number sign from the beginning of
the following lines:

```
#if [ -x /etc/3270offlvl ]
#then
#      echo Enabling the 3270 device driver...
#      /etc/3270offlvl&
#fi
```

When the operating system is restarted the offlevel interrupt handler is
automatically enabled.

Edit the **/etc/system** file to change the value of the **msgmni** keyword in the
sysparms stanza. This number is calculated as follows:

  msgmni=(default from /etc/master)+((# of 3270 devices)*64)

A.1.4.2 Deleting a 3270 Device

If special processing fails while deleting the last 3270 device then, edit
/etc/init.dir/Singl2multi and add the number sign in the first column of
the following lines:

```
if [ -x /etc/3270offlvl ]
then
        echo Enabling the 3270 device driver...
        /etc/3270offlvl&
fi
```

Edit the **/etc/system** file to change the value of the **msgmni** keyword in the
sysparms stanza. This number is calculated as follows:

```
msgmni=(default from /etc/master)+((# of 3270 devices)*64)
```

A.1.5 LAN Devices

One token ring and one ethernet adapter are already configured into your
system. When adding or deleting the last LAN device (ethernet or token
ring) the LAN special processing routine updates the value of **ipc43** in
/etc/system.

Subtopics
A.1.5.1 Adding a LAN device

A.1.5.1 Adding a LAN device

If the special processing routines should fail while adding a LAN device,
then the rebuild of the AIX kernel that is performed by **devices** will fail.
Perform the following steps to correct the failure:

1. edit **/etc/system** and change the following line:

                        ipc43 = 0

    to:

                        ipc43 = 1

2. rebuild the PS/2 AIX kernel by typing:

                        cd /usr/sys
                  ./newkernel

3. restart the PS/2 AIX system by invoking the **reboot** command.

A.1.6 Tapes

When a streaming tape drive is added to the system through the **devices**
command, the default dump device becomes the tape instead of diskette.
This is accomplished by changing the **backupdev** and **backuplen** keywords in
the **/etc/filesystems** file to be the values for tape. The **backupdev**
keyword value is set to **/dev/rmt0**, and the **backuplen** keyword value is set
to **2700**. When the streaming tape drive is deleted from the system
configuration, the values are changed back to the diskette values;
backupdev is set to **/dev/fd0** and **backuplen** is set to **2400**.

Subtopics
A.1.6.1 Adding a Tape
A.1.6.2 Deleting a Tape

A.1.6.1 Adding a Tape

Edit the **/etc/filesystems** file to change two keywords in the default
stanza:

```
default:
     backupdev = /dev/rmt0
     backuplen = 2700
```

Ignore other keywords in the default stanzas.

A.1.6.2 Deleting a Tape

Edit the **/etc/filesystems** file to change two keywords in the default
stanza:

```
  default:
      backupdev = /dev/fd0
      backuplen = 2400
```

Ignore other keywords in the default stanzas.

A.2 Minidisks

While adding an AIX PS/2 minidisk, you may receive a message that the special processing has failed. Special processing automatically creates a **lost+found** directory for the added minidisk. This process may fail if the **minidisks** command was not able to mount the minidisk or create the **lost+found** directory. In such cases, the minidisk is added, but the **lost+found** directory must be created manually.

Follow these steps to create the **lost+found** directory:

1. Create the minidisk mount directory: **mkdir <dir name>**

2. Mount the minidisk: **mount <dir name>**

3. Change to the mounted directory: **cd <dir name>**

4. Make the **lost+found** directory: **mkdir lost+found**

5. Create the **lost+found** entries by running the shell procedure below
    from the mount directory. Type this shell procedure in a file and run
    it:

```
        cd lost+found

        for i in a b c d e f g h i j k l m n o
        do
           for j in 0 1 2 3 4 5 6 7 8 9
           do
              >$i$j
           done
        done
        for i in a b c d e f g h i j k l m n o
        do
           for j in 0 1 2 3 4 5 6 7 8 9
           do
              rm $i$j
           done
        done
```

    The cross product of **i** and **j** is the number of entries you want in your
    lost+found directory. The algorithm used by the **minidisks** command to
    produce this number is described in Chapter 7, "Using the devices
    Command."

B.0 Appendix B. User Configurable Files
The installation media contains files that are commonly modified after
installation to customize the system to your specific needs. When the
system is re-installed for any reason, these files will be overwritten,
eliminating the effect of the customizing changes that had been made.

Before re-installing the system, you should make copies of the files in
the following list. After the re-installation is completed, you will need
to reapply your customizations to these files. These files preceded by
asterisks are files which have been changed in some way between AIX 1.2
and AIX 1.2.1 or which are updated by the re-installation process. You
will need to reapply any changes to these files carefully. The remaining
files can be safely restored from the copies you save before the
re-installation.

```
/.profile
/etc/3270.keys
/etc/INsites
/etc/MOTD
* /etc/atdumps
* /etc/cc.cfg@/i386
* /etc/checkall
* /etc/dosenv.def
* /etc/ethmap
/etc/exports
* /etc/filesystems -> <LOCAL>/filesystems
/etc/filters
* /etc/fsmap
* /etc/fssel
* /etc/fstore
/etc/gateways
* /etc/group
/etc/hosts
* /etc/hosts.equiv
* /etc/inetd.conf
* /etc/inetd.security
* /etc/init.dir/Auxconsole
/etc/init.dir/B2s.i386
* /etc/init.dir/Boot2singl
/etc/init.dir/Multi2singl
* /etc/init.dir/Singl2multi
* /etc/inittab -> <LOCAL>/inittab
/etc/make.cfg
* /etc/map3270
* /etc/net.config
/etc/networks
* /etc/nfsfilesystems
/etc/ogroup
/etc/opasswd
* /etc/passwd
/etc/profile
/etc/protocols
* /etc/qconfig
/etc/rasconf
* /etc/rc.csh
* /etc/rc.nfs
* /etc/rc.sh
/etc/rc.sendmail
/etc/rc.pci
* /etc/rc.tcpip
```

```
* /etc/remote
/etc/rc.x25
/etc/resolv.conf
/etc/rpc
/etc/servers
/etc/shells
* /etc/site
/etc/sitegroup
* /etc/state
* /etc/subnetnums
/etc/syslog.conf
* /etc/system -> <LOCAL>/system
/etc/termcap
/etc/uucpsites
* /etc/yp/Makefile
* /etc/yp/ypinit
* /usr/adm/daily
/usr/adm/def.profile
/usr/adm/def.login
/usr/adm/monthly
/usr/adm/newuser.sys
* /usr/adm/newuser.usr
/usr/adm/sendmail/aliases
* /usr/adm/sendmail/sendmail.cf
/usr/adm/user.cfile
/usr/adm/uucp/Myname
/usr/adm/uucp/Devices
/usr/adm/uucp/Dialcodes
/usr/adm/uucp/Dialers
/usr/adm/uucp/Maxuuscheds
/usr/adm/uucp/Maxuuxqts
* /usr/adm/uucp/Permissions
/usr/adm/uucp/Poll
/usr/adm/uucp/Spools
/usr/adm/uucp/Systems
* /usr/adm/weekly
* /usr/lib/terminfo/*/*
<LOCAL>/adm/cron/*.{allow,deny}
<LOCAL>/spool/cron/crontabs/*
* <LOCAL>/MOTD
```

Note: Files marked <LOCAL> are unique to every site in a cluster, i.e.
there is a file with the referenced name on every machine in the
cluster. Each of the copies from every machine must be backed up
prior to re-installing the system.

BACK_1 Glossary

adapter. An electronic part used to connect two unlike parts or machines.

allocate. To assign a resource, such as a disk file or a tape file, to perform a specific task.

append. The action that causes data to be added to the end of existing data.

application. (1) A particular task, such as inventory control or accounts receivable. (2) A program or group of programs that apply to a particular business area, such as the Inventory Control or the Accounts Receivable application.

application program. A program used to perform an application or part of an application.

backup copy. A copy, usually of a file or group of files, that is kept in case the original file or files are unintentionally changed or destroyed.

backup diskette. A diskette containing information copied from a fixed disk or from another diskette. It is used in case the original information becomes unusable.

backup tape. A tape containing information copied from disks or another tape. It is used in case the original information is unintentionally destroyed.

Base System Program. That part of the AIX/370 Operating System that contains operating system files and data. The AIX/370 Operating System consists of the Base System Program, which contains the Operating System files.

block. (1) A group of records that is recorded or processed as a unit. (2) In data communication, a group of records that is recorded, processed, or sent as a unit. (3) A physical block in AIX is 4096 bytes long. (4) A logical block in AIX/370 and AIX PS/2 is 1024 bytes. (5) A logical block in AIX/RT is 512 bytes.

boot. To prepare a computer system for operation by loading an operating system. Sometimes referred to as IPL (Initial Program Load)

bootstrap. A small program that loads larger programs during system initialization.

byte. The amount of storage required to represent one character; a byte is 8 bits.

cancel. To end a task before it is completed.

character set. (1) A finite set of different characters that is complete for a given purpose, for example, the character set in ISO Standard 646, "7-bit Coded Character Set for Information Processing Interchange". (2) An ordered set of unique representations called characters; for example, the 26 letters of the English alphabet, Boolean 0 and 1, the set of symbols in the Morse code, and the 128 ASCII characters. (3) A defined collection of characters. (4) All the valid characters for a programming language or for a computer system. (5) A group of characters used for a specific reason, for example, the set of characters a printer can print.

client. A system that is dependent on a server to provide it with program and/or access to programs.

Cluster. A *cluster* is a group of AIX/370 and AIX PS/2 systems running the Transparent Computing Facility (TCF) and communicating over a local area network (LAN). A cluster can function as a single system that presents a consistent interface and set of resources to users anywhere in the group.

configuration. The group of machines, devices, and programs that make up a computer system.

command. A request to perform an operation or run a program. There can be options associated with a command, resulting in a character string that becomes a single command.

configuration. The group of machines, devices and programs that make up a computer system.

cursor. A movable symbol (such as an underline) on a display, usually used to indicate to the operator where to type the next character.

customize. To describe (to the system) the devices, programs, users, and user defaults for a particular data processing system.

default. A value that is used when no alternative is specified by the operator.

device. An electrical or electronic machine that is designed for a specific purpose and that attaches to your computer; for example, a printer, plotter, or disk drive.

device driver. A program that operates a specific device, such as a printer, disk drive, or display.

diagnostic. Pertaining to the detection and isolation of an error.

diskette. A thin, flexible magnetic plate that is permanently sealed in a protective cover. It can be used to store information copied from the fixed disk or another diskette.

display screen. The part of the display device that displays information visually.

DOS. Disk Operating System.

dump. (1) To copy the contents of all or part of storage, usually to an output device. (2) Data that has been dumped.

emulation. Imitation; for example, when one computer imitates the characteristics of another computer.

enable. To make functional.

Ethernet. A physical medium through which computers in the same or different clusters can communicate and share files.

file. A collection of related data that is stored and retrieved by an assigned name.

file index. Sixty-four bytes of information describing a file. Information such as the type and size of the file, and the location on the physical device on which the data in the file is stored, is kept in the file index. This index is the same as the AIX Operating System inode.

file name. The name used by a program to identify a file.

filename. In DOS, that portion of the file name that precedes the extension.

file system. A collection of files and directories stored on logical and physical devices (such as disks) and logically organized in a hierarchical fashion.

fixed disk. A storage device made of one or more flat, circular plates with magnetic surfaces on which information can be stored.

floating point. In AIX PS/2, a way of representing real numbers (that is, values with fractions or decimals) in 32 bits or 64 bits. Floating-point representation is useful to describe very small or very large numbers.

font. A family or assortment of characters of a given size and style.

format. (1) A defined arrangement of such things as characters, fields and lines, usually used for displays, printouts or files. (2) The pattern which determines how data is recorded.

hardware. The equipment, as opposed to the programming, of a system.

history file. A file containing a log of system actions and operator responses.

INed. A full screen editor that also features windows.

initial program load (IPL). The process of loading the system programs and preparing the system to run jobs.

initialize. To set counters, switches, addresses or contents of storage to zero or other starting values at the beginning of, or at prescribed points in, the operation of a computer routine.

inode. The internal structure for managing files in the system. Inodes contain all of the information pertaining to the node, type, owner, and location of a file. A table of inodes is stored near the beginning of a file system.

interface (n). A shared boundary between two or more entities. An interface might be a hardware component to link two devices together, or it might be a portion of storage or registers accessed by two or more computer programs.

IPL. Initial Program Load.

keyboard. An input device consisting of various keys allowing the user to input data, control cursor and pointer locations, and to control the user/work station dialogue.

keyword. One of the predefined words of a programming language; a reserved word.

kilobyte. 1024 bytes.

LAN. Local Area Network.

Licensed Program Product (LPP). Software programs that remain the property of the manufacturer, for which customers pay a license fee.

local area network (LAN). A physical medium that allows computers in the same or different clusters to communicate and share files. Ethernet and Token-Ring are two examples of a LAN.

<LOCAL> file system. The part of the root file system hierarchy comprising system directories and files (such as the /etc/motd "message of the day" file) defined uniquely on a particular computer in the cluster. These files are not replicated.

log in. To begin a session at a display station.

log out. To end a session at a display station.

Megabyte (MB). Megabyte (1,048,576 bytes).

memory. Storage on electronic memory such as random access memory, read only memory, or registers. See *storage*.

message. Information displayed about an error or system condition that may or may not require a user response.

minidisk. A logical division of a fixed disk.

modem. A device that converts data from the computer to a signal that can be transmitted to a communications line and converts the signal received to data for the computer.

network. A collection of products connected by communication lines for information exchange between locations.

Network File System (NFS). A licensed program that allows you to share files with other computers in one or more networks that have a variety of machine types and operating systems. You can mount file systems located on network servers and use remote files as if they were on your workstations by creating file trees that are independent of the file systems.

operating system. The programs and procedures designed to cause a computer to function, enabling the user to interact with the system.

page space. The area on a fixed disk that temporarily stores instructions or data currently being run.

paging. The action of transferring instructions, data, or both between real storage and external page storage.

parameter. Information that the user supplies to a panel, command, or function.

primary copy. Each replicated file system has a copy designated as the *primary copy*, which is the copy that may be modified. It resides on the *primary site* and its purpose is to guarantee that file updates are kept consistent.

primary site. The cluster site that maintains the primary copy of a replicated file system.

prompt. A displayed request for information or operator action.

protocol. In data communications, the rules for transferring data.

queue. A line or list formed by items waiting to be processed.

replicated root file system. The replicated root file system is a file system with key common files and directories for basic system operation. Almost all system binaries, programs and libraries are in the replicated root file system. Other user and system file systems (like the local file system) are mounted on top of directories in the replicated root file system.

root. (1) Another name sometimes used for superuser. (2) The main file system to which others are appended.

root directory. The top level of a tree-structured directory system.

screen. See *display screen*.

secondary copy. A read-only copy of the primary copy of a replicated file system. Files in the secondary copy are automatically modified or deleted when the corresponding file in the primary copy is modified or deleted. New files added to the primary copy will be automatically added to the secondary copy only if the appropriate **fstore** value has been set.

secondary site. The secondary site maintains the secondary copy of a replicated file system.

sector. (1) An area on a disk track or a tape track reserved for recording information. (2) The smallest amount of information that can be written to or read from a disk or tape during a single read or write operation.

server. A system that contains most of the data files or programs that the client reads.

site name. A method of referring to a machine by a specific name.

software. Programs.

stanza. A group of lines in a file that together have a common function. Stanzas are usually separated by blank lines, and each stanza has a name.

storage. In contrast to memory, the saving of information on physical devices such as a minidisk or tape. See *memory*.

store. To place information in memory or onto a tape, minidisk, or tape so that it is available for retrieval and updating.

subroutine. (1) A sequenced set of statements that may be used in one or more computer programs and at one or more points in a computer program. (2) A routine that can be part of another routine.

system. The computer and its associated devices and programs.

system administrator. The person at a computer installation who designs, controls, and manages the use of the computer system.

system unit. The part of the system that contains the processing unit and the disk drives.

tape. A thin, flexible magnetic strip used to store information.

tape drive. The mechanism used to read and write information on tapes.

Transparent Computing Facility (TCF). A facility that automatically allows for data, process, name, location and semantic transparency. Process transparency is the ability to execute and control tasks on any cluster site, no matter where the user program is currently executing. A TCF LPP is required to obtain support.

TCF cluster. A group of computers operating under the AIX Operating System and using the Transparent Computing Facility (TCF).

TCF/IP. Transmission Control Protocol/Internet Protocol.

Token-Ring network. A network that uses a ring topology, in which tokens are passed in the circuit from node to node. A node ready to send can

capture the token and insert data for transmission.

virtual machine. (1) A functional simulation of a computer and its associated devices. Each virtual machine is controlled by a suitable operating system (for example, conversational monitor system). VM/370 controls concurrent execution of multiple virtual machines on a single System/370. (2) In VM, a functional equivalent of either a System/370 computing system or a System/370-Extended Architecture computing system. Each virtual machine is controlled by an operating system. VM controls concurrent execution of multiple virtual machines on a single system.

workstation. A device that includes a keyboard from which an operator can send information to the system and a display screen on which an operator can see the information sent to or received from the computer.

```
standalone site 1.4.2
startup files 6.4.1
system start 7.6.4
```
T
```
TCF 4.3
TCF clusters, inode requirements 2.5.1
TCF requirements 5.7.4
TCP/IP 4.3
temporary file system minidisk 2.3.1
Text Formatting System 4.3
TFTP 5.6.1
Transparent Computing Facility 4.3
   TCF 1.4.1
Trivial File Transfer Program (TFTP) 5.6.1
tty device, add A.1.3
```
U
```
Usability Services 4.3
user file system minidisk 2.3.1
user-defined minidisks 2.4.2.2
```
V
```
VS COBOL 4.3
VS FORTRAN Version 2 4.3
VS Pascal 4.3
```
W
```
WHIP 4.3
Workstation Host Interface Program 4.3
```
X
```
X-Windows 4.3
X.25 4.3
```