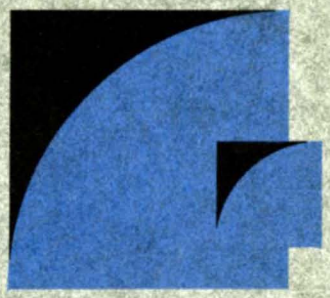
Solbourne Computer

OS/MP 4.1C
Release and Installation Notes



Part Number: **106562-AA**
Revision: **01**

Table of Contents

Introduction

This document describes the release and installation of OS/MP 4.1C.

OS/MP 4.1C is a "full" installation that you can use to:

- install OS/MP 4.1C on a Solbourne system
- add support to a server for an OS/MP 4.1C client
- repartition a hard disk drive

This release applies to the following Solbourne architectures: Series5, Series5E, Series6, and Series S4000 systems. In these release notes, the term "Series S4000," or simply "S4000," refers to all Solbourne S4000, S4000DX, and S3000 systems; "Series5" refers to both Series5 and Series5E architectures; also "Series6" refers to both the 33 and 50 mhz Series6 speeds.

OS/MP 4.1C offers basic binary application compatibility with SunOS 4.1.2 and 4.1.3. and prior OS/MP releases.

★ ★ ★ NOTE ★ ★ ★

Some layered products running on OS/MP 4.1C require revision upgrades. Refer to "OS/MP 4.1C Enhancements and Miscellaneous Software Information" for details.

Documentation Conventions

In the body of this document, commands and file names are presented in **boldface** and command parameters for which you substitute a value are *italicized.* User input instructions and examples are presented in a constant width font. In these notes, the following convention is followed:

- Information displayed by the system is given in `normal constant width`.
- Information you enter is displayed in **`bold constant width`**.
- Variables for which you substitute a value are shown in *`oblique constant width`*.

Definitions

local A device that is physically connected to the system being installed. For example, a *local disk drive.*

remote A device that is physically connected to a system other than the system being installed. For example, a *remote tape drive.*

package The components of a distribution are referred to as packages. Examples of packages are FORTRAN 1.4, X Windows, and Solbourne OS/MP Optional Software for S4000.

ramdisk image The ramdisk image is a special UNIX kernel with a built-in RAM disk that contains the installation software.

server A system that is on a network and may provide NFS disk services.

client A system that uses NFS services provided by another system. A diskful system with **root(/)**, **swap**, and **/usr** on a local disk.

diskless A system whose **root(/)**, **swap**, and **/usr** filesystems are provided by a server, instead of a local disk.

dataless A system whose **/usr** filesystem is on a remote disk and whose **root** (/) filesystem and **swap** disk partition are on a local disk.

standalone A system that has no networking. It also does not depend on a server for its **root**, **swap**, or **/usr** filesystems.

filesystem A set of files and directories that reside on one disk partition. The term is also used to refer to the swap area, even though the swap area does not actually contain files and directories.

hostnumber The host portion (the last number of a class C address) of the Internet Protocol address. For example, if the Internet address is 192.1.3.42, the hostnumber is 42.

Physical Elements of this Release

This release contains the following items:

Table 1. Physical Elements of the OS/MP 4.1C Release

Part Number	Description
106550 106552 106507	1/4-inch QIC-150 OS/MP 4.1C tape, or 8mm Exabyte OS/MP 4.1C tape, or CD-ROM OS/MP 4.1C disk
106562	Release and Installation Notes for OS/MP 4.1C

Contents of the OS/MP 4.1C Release Media

Table 2. Contents of OS/MP 4.1C Tape

File #	File	Format	Size (KB)
0	Table of Contents	dd	2
1	Package Description File for Full 4.1C installation	dd	2
2	Series5 Installation Kernel	dd	6826
3	Series6 Installation Kernel	dd	6882
4	S4000 Installation Kernel	dd	6479
5	Tools files	tar	288
6	Miniusr	dd	18432
7	Root files	tar	6856
8	Series5 kvm files	tar	11632
9	Series6 kvm files	tar	11760
10	S4000 kvm files	tar	10224
11	Usr files	tar	33384
12	debugging files	tar	2888
13	games files	tar	3136
14	man files	tar	7504
15	networking files	tar	1096
16	graphics files	tar	1784
17	security files	tar	320
18	sunview_programmers files	tar	1848
19	sunview_users files	tar	3144
20	system_v files	tar	3992
21	text files	tar	728
22	versatec files	tar	5960
23	uucp files	tar	608
24	rfs files	tar	912
25	shlib_custom files	tar	1376
26	tli files	tar	48

Customer Support Information

Customer Support Information

If you have problems installing or using the features included in the Solbourne OS/MP 4.1C release, call the Solbourne toll free support number, **1-800-447-2861**, if you are within the United States. Customers outside the U.S. should call their local Solbourne representative. If you have purchased a support contract that includes support for OS/MP 4.1C from Solbourne, this service is provided. When you call, please be prepared to give the following information about your system:

- Model number (such as Series6/902 or S4000)
- Serial number
- Solbourne OS/MP release number (4.1C)

The system's model number and serial number can usually be determined using the **eeprom**(8) command, as in the following:

```
# /usr/etc/eeprom MODEL SERIAL
```

To check the Solbourne OS/MP release number, enter the **cat** command as shown below:

```
# cat /etc/motd
OS/MP 4.1C Export(GENERIC/root)#0: Mon Oct 25 21:09:241993
#
```

SOLIS - Solbourne On-Line Information System

Following is a description of the various ways customers obtain the latest patches for the Solbourne operating system and unbundled software products.

SOLIS, Solbourne's On-Line Information Service, allows users access to available Solbourne patches via email.

The Information Service is based on the public domain "discussion listserv" program written by Anastasios Kotsikonas.

To access the service, simply email **solis@solbourne.com**. Command keywords are used in the body of the mail message (leave the subject line blank).to invoke the desired operations of the Information Service program. Requests are not case sensitive.

- To get a listing of recognized requests:

  help

  example:

```
mail solis@solbourne.com
Subject:
help
```

- To obtain an index of the files in a specified archive:

  index [*archive* | *path-to-archive*]

  example:

```
mail solis@solbourne.com
Subject:
index patches/4.1C
```

- To obtain a copy of the actual index file which gives a brief description of each patch:

  example:

```
mail solis@solbourne.com
Subject:
get patches/4.1C index
```

To request a file from a specified archive:

get <*archive* | *path-to-archive*> <*file*> [*parts*]

example:

```
mail solis@solbourne.com
Subject:
get patches/4.1C p93050601
```

To request all patches from a specified archive:

example:

```
mail solis@solbourne.com
Subject:
get patches/4.1C all
```

An archive file will be in one of two formats: an ascii file or multiple parts which should be concatenated (removing mail headers first), uudecoded, and tar extracted.

Currently available archives are: OS/MP 4.1B, 4.1C, c++, openwindows, pdb2.2, x2.1, x3.0.

If you have comments or other categories of archives you would like to see available on the Information Service, please email **solis-admin@solbourne.com**.

Patches via FTP

Patches are also available via anonymous ftp from the Solbourne archive machine, **ftp.solbourne.com** (internet address **141.138.2.2**). Each patch directory contains an index file and the individual patches which are in a compressed tar file format. Some patch directories also contain **README** files which provide specific instructions for that patch directory. The Solpatch utility MUST be used to install all OS/MP 4.1C patches.

Directions:

```
ftp ftp.solbourne.com
login: anonymous
passwd: your.email.address (i.e. user@domain.orig)
ftp> cd pub/support
ftp> ls (for listing of available patch directories)
ftp> cd [desired patch directory]
ftp> bin (to put in binary transfer mode)
ftp> get [desired patch]
uncompress patch.tar.Z
tar xvf patch
ftp> bye
```

Example:

```
ftp ftp.solbourne.com
Connected to Solbourne.
220 solbourne FTP server (OS/MP 4.1A.2) ready.
Name (solbourne: user): anonymous
331 Guest login ok, send ident (user@host) as password.
Password: user@domain.orig
230 Guest login ok, access restrictions apply.
ftp> cd pub/support/OS4.1C
250 CWD command successful.
ftp> bin
200 Type set to I.
ftp> get p93050601.tar.Z
200 PORT command successful.
150 Binary data connection for p93050601.tar.Z
(141.138.5.77,1877) (26097 bytes).
226 Binary transfer complete.
local: p93050601.tar.Z
remote: p93050601.tar.Z
26097 bytes received in 0.2 seconds (1.3e+02 Kbytes/s)
uncompress p93050601.tar.Z
tar xvf p93050601
ftp> bye
```

Patch Information via Solbourne News Group

The solbourne.info USENET mailing list is also updated regularly when patches are released. Patches cannot be obtained from the news group but it is a good source for finding out when patches are released.

To subscribe to this news group:

email: **solbourne-info-request@acsu.buffalo.edu**, and ask to be placed on the subscribers list.

If none of the above options is available to you, please contact National Technical Support at 800-447-2861.

Solpatch

Solpatch is a software utility that provides easy installation, tracking, and removal of official Solbourne released patches for the OS/MP and other unbundled software products.

Solpatch was available as a patch in OS/MP 4.1B and is bundled into OS/MP 4.1C. To use **Solpatch**:

1. Become root

```
% su root
```

2. Make sure that the **PATH** variable for the root login account contains the following directories:
   - **/usr/bin**
   - **/usr/sbin**
   - **/usr/sadm/install/bin**
3. To invoke solpatch:

```
# solpatch -d patch_spooldir -l patch_logfile
```

patch_spooldir is where the patches reside and **patch_logfile** is where solpatch logfile resides (default is **/var/adm/patch_logfile**). These arguments can also be specified by setting the environment variables **PATCH_SPOOLDIR** and **PATCH_LOGFILE**.

Refer to the solpatch man page for additional information. In addition, on-line help is available when running **Solpatch**.

OS/MP 4.1C Enhancements and Miscellaneous Software Information

This section explains the enhancements provided by OS/MP 4.1C and other useful software information such as kernel reconfiguration and setting BootROM environment variables.

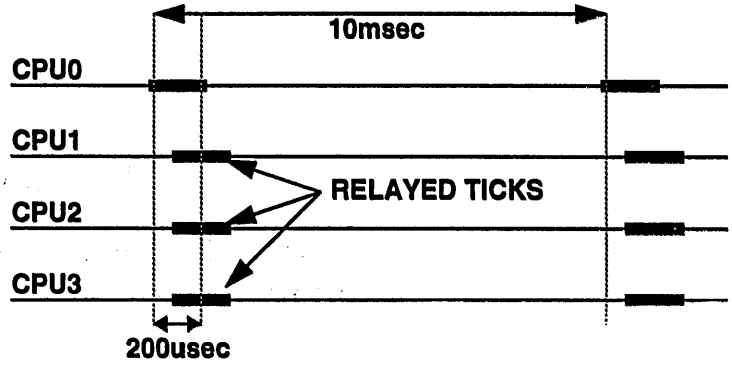
OS/MP 4.1C Enhancements

OS/MP 4.1C incorporates many improvements. These improvements were obtained by multithreading kernel subsystems that were previously single-threaded, improving already multithreaded subsystems, and optimizing critical code paths.

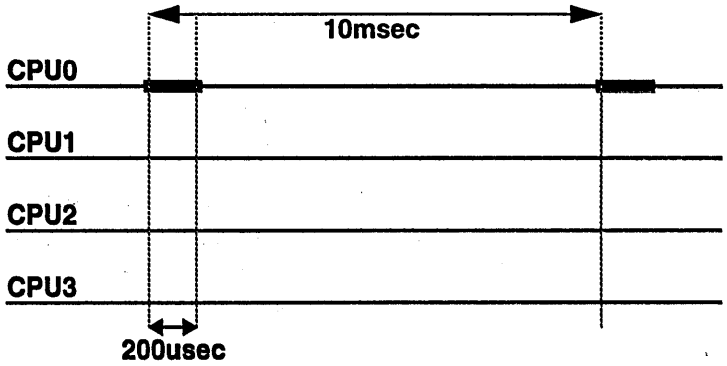
Clock Changes

In looking at customer performance problems a large degree of variability in per-process user and system time was noted. This discrepancy was caused by the way clock ticks were processed. For each clock tick from the hardware, the software "relayed" the tick to all other CPUs. When a tick was received it charged the process running for all the time that had elapsed since the last tick was received on that processor (based on whether it was in system or user mode when the tick was delivered). Because of some of the SPL problems detailed below a processor could miss many relayed ticks in a row and then charge all the missed time as a lump sum to either system or user. Also, there was no synchronization of missed ticks across a context switch in prior OS/MP releases, which could cause the wrong process to be charged.

All of these problems have been fixed in OS/MP 4.1C. A new method of dealing with clock ticks which does not require relaying clock ticks to slaves is used. The processor which receives the hardware clock tick does all the billing for all CPUs.



4.1B clock processing



4.1C clock processing

Also, the micro-second timer on Series6 boards is now used to provide high resolution time (to 1usec) to user level applications; For example, 4.1B allows time resolution to the 10msec level. For other CPU types, the 10 msec resolution still applies.

LEDs

One side effect of all the "clock tick" changes is that the CPU board LEDs no longer "bounce" (or toggle) the same. "Bouncing" is an interesting side effect of system behavior that was commonly used to verify normal operations; this pattern has changed. Now, bouncing LED displays only happen when clock ticks are received by a CPU. Since clock ticks are not received by all CPU's, not all CPUs will have bouncing LEDs.

The "F4" code displayed on a CPU running OS/MP 4.1B indicated that the CPU was idle on a process. OS/MP 4.1C no longer uses "F4" for idle states, and now displays a decimal point instead.

fsck Enhancement

The utility **fsck**(1)'s preen mode has been modified to avoid aborting due to insufficient swap space availability. Preen mode minimizes file system checking time by looking at file systems in parallel. This results in several instances of **fsck**(1) running at once, one per file system being checked. The memory requirements for each **fsck**(1) depend on the size of the file system involved. The previous behavior was that a memory allocation failure would cause **fsck**(1) to believe the file system was corrupted in a way that can not be corrected manually, causing the system to sit in single-user mode until a manual check of the file systems has been done. The new version of **fsck**(1) notices when a memory allocation failure occurs when checking a particular file system. The number of checks to be done in parallel is reduced, and the checks are repeated for the file systems that weren't able to be checked due to memory shortages. This procedure is repeated until all file systems have been checked, or the number of checks to run at once reaches zero. In the latter case, there is not sufficient swap space to check a particular file system at all when in preen mode.

When the number of parallel checks to run is reduced, **fsck**(1) prints the message:

```
fsck: concurrency reduced to N due to memory
restrictions
```

If the concurrency value is reduced many times, this is a good indication that the primary swap partition of the system is too small. It should either be enlarged, or a different, larger partition should be named in the BootROM environment variable DEFAULTDUMP.

Hardware Clock Synchronization

Using a network time synchronization utility can cause erratic time behavior under OS/MP 4.1C. This happens because the kernel, by default, attempts to synchronize with the hardware time-of-day clock, rather than forcing the hardware clock to agree with the kernel's idea of what time it is. One example of a utility to provide synchronized time across a network is **xntpd**, which is part of a program suite that implements the Network Time Protocol (it is available via the Internet).

You can disable the kernel synchronization with the hardware clock by using one of the following three methods.

```
# adb -w /vmunix /dev/kmem
not core file = /dev/kmem
dosynctodr/W0
_dosynctodr:    0x1             =       0x0
^D
```

It may also be set in the kernel config area, so that all new kernels will be built with the desired value:

```
# cd /sys/kbus/OBJ
# adb -w clock.o
dosynctodr?w0
_dosynctodr:      0x1           =         0x0
^D
# cd ../KERNEL
# make
# mv /vmunix /vmunix.old
# cp vmunix /vmunix
# shutdown -r +5 To install a new kernel
```

Finally, it can be set at boot time, avoiding any problems with installing any possible future patches to **/sys/kbus/OBJ/clock.o** by losing the modification to **dosynctodr**. This can be accomplished by adding the following line near the end of **/etc/rc.local**:

```
echo "dosynctodr/W0" | adb -w /vmunix /dev/kmem
```

It will result in these two lines being printed to the console during boot:

```
not core file = /dev/kmem
_dosynctodr: 0x1 = 0x0
```

This can be considered a reminder that hardware clock synchronization has been disabled. It can be suppressed by putting a slightly different command into **/etc/rc.local**:

```
echo "dosynctodr/W0" | adb -w /vmunix /dev/kmem >
/dev/null 2>&1
```

Support for up to 768 Pseudo-Terminals (ptys)

The system can now support up to 768 pseudo-terminals (ptys). This support includes the following modifications:

- The system utilities that use ptys (**in.rlogind**(8), **script**(1), **in.telnetd**(8), and **rexd**(8)) now take advantage of the greater available number of ptys.
- The file **/dev/MAKEDEV** can create all of the relevant **/dev/pty*** and **/dev/tty*** entries, using **MAKEDEV pty***N*, where *N* is between 0 and 47 inclusive. Each *N* number represents 16 devices.
- The macro **nonuser**() in the C header file **/usr/include/utmp.h** will scan all of the possible **tty** names.
- Entries have been added to **/etc/ttytab** for all of the new **tty** names.

The GENERIC kernel only supports 48 ptys. To enable kernel support for more, the appropriate config file in **/sys/kbus/conf** or **/sys/idt/conf** must be modified. Modify the line:

```
pseudo-device pty # pseudo-tty's, also needed for SunView
```

to list the number of ptys wanted. For instance, to support 128 ptys:

```
pseudo-device pty128 # pseudo-tty's, also needed for
SunView
```

Then reconfig and rebuild the kernel, and reboot the system:

```
# cd /sys/kbus/conf
# cp GENERIC MANYPTYS
# vi MANYPTYS (change the pty line as described above)
# config MANYPTYS
# cd ../MANYPTYS
# make
# mv /vmunix /vmunix.old
# cp vmunix /vmunix
# shutdown -r +5 To install a new kernel
```

SPL Changes

SPLs (Set Priority Level) in the kernel which were trying to block all device interrupts were also blocking clock ticks. This was a result of the way the System Board and MCAB delivered VME level 7 interrupts. To resolve this problem, support for VME level 7 interrupts was dropped, allowing the kernel to block all device interrupts without preventing clock ticks from being delivered.

Another optimization made in 4.1C was to keep a shadow copy of the processor priority in the per-cpu structure, avoiding the overhead of reading this value from the hardware. Also, unnecessary reads of the priority level were eliminated altogether.

Processor Affinity Changes

Processor affinity refers to the tendency of a process to keep running on the same CPU rather than wandering from one to another at each context switch. With a 16Mb cache there is potentially a lot of data cached on the Series6 L3 cache. If a process is allowed to wander at will it can generate significant Kbus traffic as its working set tries to follow it. OS/MP 4.1B had algorithms which prevented process migration if the number of runnable processes was less than or equal to the number of CPUs, or if the number of runnable processes was much bigger than the number of cpus. OS/MP 4.1C incorporates algorithms to maintain good process to processor affinity when the load is in the middle; the number of runnable processes is greater than the number of CPUs, and less than 4 times the number of CPUs.

The effectiveness of processor affinity can be monitored with **vmstat -p**. This displays the ratio of context switches to a process which last ran on this cpu, to the total number of context switches.

Processor affinity can be disabled by patching the kernel variable **enable_pam_affinity** to a value of zero and rebooting:

```
# adb -w /vmunix
  enable_pam_affinity?W0
        _enable_oam_affinity:       0x1     =       0x0
^D
# reboot
```

oncpu Command

The **oncpu** command is new in OS/MP 4.1C. This command lets you control which processors a process can run on in a multi-CPU system. By using **oncpu** to force certain critical processes to run on particular CPUs, you can improve caching characteristics and overall system performance.

Refer to Appendix A for the oncpu man page.

Page Allocation Changes

The selection of pages to allocate to a process when a large direct indexed cache is present can result in unnecessary physical aliases in the cache if all free pages are kept on a single free list. Maintaining a free list of pages for each page aliases in the cache and managing alias allocations on a per process basis can significantly reduce misses in the cache, thus improving performance and reducing traffic on the system bus. This technique, called "bin hopping" is described in KESS[1].

Reduction of False Sharing

False sharing occurs when private per-cpu data structures are allocated in the same cache block. False sharing results in unnecessary bus traffic. The following areas of code were modified to minimize false sharing: Global File Table allocation, statistics, and scheduling.

SCSI Command Queueing Changes

To achieve maximum performance with the latest generation SCSI-2 disks, host-adaptor drivers now support SCSI-2 tagged command queueing. SCSI-2 command queueing allows multiple commands to be issued to a drive at the same time. Each of these commands has an associated "tag" which allows the drive and the host driver to synchronize their operations. Tagged commands address many of the same problems on the per-drive basis that SCSI-1's disconnect-reconnect feature addressed on a per-SCSI bus basis. The benefits of tagged commands are:

- The latency from the end of one operation to the beginning of the next is minimized.
- Tagged commands allow the drive to implement 2-dimensional seek optimizations (cylinder distance, rotational distance), completing commands out of order while preserving the semantics.

[1] KESSLER, HILL: Page Placement Algorithms for Large Real-Indexed Caches. ACM Transactions on Computer Systems, Vol 10, No. 4, November 1992, Pages 338-359

Testability and Reliability Changes

New testability features have been added to 4.1C:

- Software was added to generate SECC and MECC errors. This improves the reliability and testability of handling memory errors.
- Special kernels were configured (from source) to simulate resource depletion. This helped uncover software errors which would not occur if resources were available.

Parallel Networking

The processing of network protocols has now been placed under its own lock called the domain lock. This allows file system service to occur in parallel with protocol processing.

Parallel Softcalls

The kernel can now perform softcalls in parallel. This is used for the processing of soft-clock ticks and for the initiation of protocol processing of incoming packets (netisr's).

Parallel NFS and OVERLAPPED Writes

The service of NFS requests has been made parallel up to the point of calling into the file-system layer. These changes provide faster NFS support by several mechanisms:

- *overlapped buffer writes:* NFS has a bottleneck when writing multiple blocks of the same file across the network. Although the write requests could be transmitted in parallel by the client-side biods, the server-side nfsds serialized the writes because of the requirement for each write to write to the buffer holding the file's inode as well as writing the actual data. In 4.1C this bottleneck is removed - a different locking mechanism is used for the inode buffer writes, permitting the data writes to occur in parallel.
- *process synchronous writes:* similarly, the prior implementations of NFS caused parallel write requests to the same file to become serialized because the inode itself was locked sequentially (as opposed to the memory buffer holding that inode). By changing the nfs daemons to use process synchronous writes, they are able to parallelize multiple writes to the same file (inode) arbitrarily, as long as all those writes are complete at the point the nfsd sends acknowledgment back to the client side.
- *event counters:* new kernel primitives were added to 4.1C to support waiting for certain values in a counter (permitting a greater degree of parallelism).
- *modifications to the buffer system:* many changes were made to the buffer system implementation to support overlapped writes.

Support for Large (> 2 Gbytes) Physical Memory

OS/MP 4.1B supported a maximum of 2 Gbytes of physical memory in one system. This limit is extended to 4Gb in OS/MP 4.1C.

Parallel FDDI Driver

The **pg** fddi driver has been parallelized. This allows the driver to receive and transmit packets while the system is doing file system operations.

Boot and Install From Tape or CDROM Drive on First BoSS™ Controller

GENERIC and INSTALL kernels have been modified in OS/MP 4.1C so that the first SCSI bus on the first BoSS controller channel (**sv2**) supports two tape drives (**st2** and **st3**) and a cdrom (**sr1**). In order to boot and install from BoSS, you need only address your device(s) as specified here (4, 5, and 6 respectively), so that the kernel will recognize the devices.

Miscellaneous Software Information

This section contains the following information:

- Layered Products
- Perfmon
- Kernel Configuration
- ROM features
- Setting the bootROM environment
- Unsupported software features
- System architectures
- SunView™

Layered Products

Layered products running on OS/MP 4.1C may require revision upgrades. The following table lists the layered product and the required revision level for operation with OS/MP 4.1C. Attempts to run previous revisions of these software products may produce unexpected results and is not supported. Please contact Solbourne if you do not have the current versions of these products.

Table 3. Layered Product Revision Requirements with OS.MP 4.1C

Layered Product	Revision Level
SVM	1.3
hsNFS	2.2
DES	4.1C
X.25	No change from OS/MP 4.1B

Perfmon

Perfmon (Rev. 1.0.1) is required for OS/MP 4.1C This revision is based on patch number **p93102501**which is available from Technical Support. Please contact Solbourne Technical Support to obtain this patch.

There is a workaround for users that wish to run Perfmon 1.0 on OS/MP 4.1C in the interim. The workaround is to execute the following commands as root:

```
# cd $PERFMONHOME/bin
# ln -s collect_stats-41B collect_stats-`uname -r`
```

This creates a symbolic link that allows Perfmon to recognize the **collect_stats** process on OS/MP 4.1C.

Kernel Configuration

The type of kernel you can configure depends on the kernel architecture of the machine, which may be determined using the **arch -k** command.

To configure a Series S4000 kernel, change directory to **/sys/idt/conf** and use **config**(8). The generic kernel configuration file is named **GENERIC**. Refer to the file **/sys/idt/conf/README** for more information on customizing a kernel.

To configure a Series5, Series5E, or Series6 kernel, change directory to **/sys/kbus/conf** and use **config**(8). The generic kernel configuration file is named **GENERIC**. Refer to the file **/sys/kbus/conf/README** for more information on customizing a kernel.

The kernel configuration files from previous OS/MP releases are not compatible with the kernel configuration files for OS/MP 4.1C. Compare your previous kernel configuration file with the generic OS/MP 4.1C kernel configuration file and make the corresponding changes to the OS/MP kernel configuration file.

The generic kernel does not provide configuration information for the Multi-Channel Accelerator Board. Refer to the *System and Network Administration* manual and the *Release Notes for the Multi-Channel Accelerator Board.*

The GENERIC config file does provide configuration information to support two VMEbus Cougar controllers (**sv2** through **sv5**) and two BoSS enclosures. Refer to the *BoSS Release Notes and Update Pages* (part number 106181).

One major change between the OS/MP 4.1B GENERIC config file and the OS/MP 4.1C GENERIC config file is new 4.1C support for installing from BoSS. The OS/MP 4.1B GENERIC kernel has these lines:

```
disk    sd24 at sv2 drive 0x04 flags 0x4a
disk    sd25 at sv2 drive 0x05 flags 0x4a
disk    sd26 at sv2 drive 0x06 flags 0x4a
```

OS/MP 4.1C GENERIC config file comments out the previous lines and added these:

```
tape    st2 at sv2 drive 0x04 flags 0x100
tape    st3 at sv2 drive 0x05 flags 0x100
disk    sr1 at sv2 drive 0x06 flags 0x100
```

Notice that the OS/MP 4.1C GENERIC config file has added two tape devices (`st2` and `st3`) and a CDROM device (`sr1`). These additions make it possible to boot from Cougar controller channel `sv2`. Also note that these devices are using the addresses previously used by disks `sd24`, `sd25`, and `sd26`.

Example Kernel Configuration

The following is an example of how to change the kernel back to supporting `sd24`, `sd25`, and `sd26` on Cougar controller channel `sv2`.

1. Create a kernel configuration file to edit:

```
# cd /sys/idt/conf
# cp GENERIC BACKTODISKS
# chmod u+w BACKTODISKS
```

2. Edit the **BACKTODISKS** file.

   a. Go to the lines that contain:

```
tape    st2 at sv2 drive 0x04 flags 0x100
tape    st3 at sv2 drive 0x05 flags 0x100
disk    sr1 at sv2 drive 0x06 flags 0x100
```

   b. Comment out these three lines by inserting a # symbol at the beginning of each line.

   c. Go to the lines that contain:

```
#disk   sd24 at sv2 drive 0x04 flags 0x4a
#disk   sd25 at sv2 drive 0x05 flags 0x4a
#disk   sd26 at sv2 drive 0x06 flags 0x4a
```

   d. Remove the **#** symbol at the beginning of each line.

3. Run config:

```
# usr/etc/config BACKTODISKS
[...]
```

4. Build the kernel:

```
# cd ../BACKTODISKS
# make
[...]
# mv /vmunix /vmunix.orig
# cp vmunix /
# reboot
```

ROM Features

VME_RORA ROM Variable:

A ROM variable called **VME_RORA** is available to inform the kernel that there is a VME Release on Register Access (RORA) interrupter on the VME bus. By setting this variable to **1**, the OS will call the interrupt handlers routines immediately. By default, the OS will queue VME interrupt requests and process them later. This algorithm works fine with Release on AcKnowledge (ROAK) VME boards, which is type the Solbourne sells. If one sees a console message, `WARNING: switching to RORA interrupt mode`, then the OS has seen many unanswered interrupt requests and has automatically turned on the **VME_RORA** interrupt handling. Turning on **VME_RORA** will slow cumulative response times for busy VME systems.

UNAME ROM Variable

UNAME is a new ROM variable that allows a system administrator to toggle the command **uname**'s output. By setting the UNAME to **sun, uname** will return a sun compatible output like `SunOS test3 4.1.3 3 sun4`. Some SPARC software packages use **uname** during installation to figure out the system architecture. The following are examples of setting the **UNAME** ROM variable from the Unix prompt and the ROM prompt respectively:

```
# eeprom UNAME=sun
```

```
ROM> setenv UNAME sun
```

Setting the BootROM Environment

BootROM environment variables that describe devices have the syntax:

```
[protocol.]device([ctlr], [unit], [devid])
```

Empty parentheses () or empty fields (,,) default to 0. `protocol` is required for SCSI devices and Ethernet devices. For SCSI, the legal protocols are **sd** and **st**. For Ethernet, the legal protocol is **tftp**.

- The disk *unit* number corresponds to the disk's SCSI address. *devid* describes partitions for disks (0 to 7 corresponding to partition a to h)
- Tape *unit* numbers are determined by adding 4 to the number in the **/dev** entry. In other words, the unit number for **st0** is **4**, and **st1** is **5**. The tape *devid* is the file on tape (the first file being number 0).
- Ethernet *unit* should always be 0. The *devid* is the IP host number of the system being contacted. On Series S4000 machines with an SBus™ Ethernet controller, the *ctlr* field should contain the slot number of the controller. The controller on the motherboard is represented by a value of **0**.

The bootROM environment variables listed in Table 4 must be set. The values shown in the table are correct for using **sd0** (with the I/O ASIC controller) as the boot disk and using a frame buffer.

Table 4. BootROM Environment Variables

Variables	Value	Meaning
DEFAULTROOT	sd.si() sd.sv(2,1)	root filesystem disk and partition BoSS example
DEFAULTSWAP	sd.si(,,1) sd.sv(2,3,6)	swap disk and partition BoSS example
DEFAULTDUMP	sd.si(,,1)	kernel dump device
DEFAULTBOOT	vmunix	kernel to boot
DIAGBOOT	sd.si(,,6)kvm/stand/dg	diagnostic to boot when in diag mode
BOOTMODE	manual/auto	automatic reboot off
INSTALLED	0 or 1	1 = mandatory files already installed
NOSPINNER	0 or 1	1 = suppress "N pages left" in dumps, savecore
INPUT-DEVICE	keyboard, ttya, ttyb	console input (Series S4000 only)
OUTPUT-DEVICE	screen, ttya, ttyb	console output (Series S4000 only)
CONSOLE	bw(), cg(), zs(), or fb()	monitor type (Series 5, 5E, or 6 only)

For Series S4000, set INPUT-DEVICE and OUTPUT-DEVICE; for Series5, Series5E, and Series6 set CONSOLE instead.

To print the bootROM environment, use the command:

```
ROM> printenv
```

The command to set a bootROM environment variable is:

```
ROM> setenv variable value
```

There is a space (not an equal sign) between *variable* and *value*.

For Series S4000, begin by setting the INPUT-DEVICE variable. For example:

```
ROM> setenv input-device keyboard
```

This sets the console input to the keyboard on a Series S4000.

If **OUTPUT-DEVICE** is set to **screen**, the last frame buffer found in the system will be used as the output device. If frame buffers are installed in Sbus slot 1 and Sbus slot 3, the console output would be displayed on the frame buffer in Sbus slot 3. Normally the Sbus slots are probed in numerical order (where slot 1 is the nearest to the power supply). This default probe order can be changed by setting the bootROM environment variable **SBUS-PROBE-LIST**. By setting **SBUS-PROBE-LIST** to **231**, the console output would be displayed on the frame buffer in Sbus slot 1.

While the **DEFAULTDUMP** variable is normally set to a disk device, it can be set instead to a tape device, for example **st.si(,4,)**. This is primarily intended for creating a tape to send to Solbourne for investigating a crash. Customers wishing to examine this tape themselves can read the contents of the tape with the **dd** command. An input block size of 8k must be specified, for example:

```
# dd if=/dev/rst0 of=core ibs=8k
```

After changing the bootROM environment, the bootROM must be reset to make the changes take effect:

```
ROM> reset warm
```

Using **reset warm** forces reinitialization of the system. If **reset cold** is used, the Solbourne system comes up just as it does from a power-up start.

Table 5 describes some examples of boot devices.

Table 5. Examples of Boot Devices

value	partition/file	description
sd.si()	a	SCSI disk 0 (sd0)
sd.si(,,6)	g	SCSI disk 0 (sd0)
sd.si(,1,)	a	SCSI disk 1 (sd1)
xd(,3,)	a	IPI/SMD disk3 (xd3)
st.si(,4,)	0	SCSI tape 0 (st0)
st.si(,5,1)	1	SCSI tape 1 (st1)
sd.sv(2,3,6)	g	SCSI disk 3 on BoSS (sv2)
tftp.ei (,,34) /path/name	/path/name	from system with host number 34 on local subnet

The usage format for SCSI disks is as follows:

```
sd.si(,unit,devid)
```

For example, the command to set the DEFAULTROOT unit to SCSI disk 1 and the partition to **a** (''sd1a'', in Unix terms) follows:

```
ROM> setenv defaultroot sd.si(,1,0)
```

For IPI and SMD disks, use the following command syntax:

```
ROM> setenv defaultroot xd(ctlr,unit,devid)
```

The controller value should be 0 if there is only a single controller. The default root and default swap must use controller 0 and unit 0-3 to boot properly with generic kernels.

A ROM environment variable has been added that allows the "slowing down" of the SCSI bus by limiting the maximum synchronous transfer rate that will be negotiated. This may be useful with long SCSI bus cables or bus timeouts. The 5Mb/-sec transfer rate results in 200ns/byte. Setting the ROM environmental **SI_NSPERBYTE** to **300** will slow down the transfer rate to a maximum transfer rate of 3.33Mb/sec. To slow the internal SCSI bus type:.

```
ROM> setenv si_nsperbyte 300
```

Similar problems on the Cougar controller can be addressed by setting the ROM environment variable:

```
ROM> setenv SVn_MODE nsperxfer=X
```

See the sv(4) man page for more details.

Unsupported Software Features

The following software and hardware features are not supported in OS/MP 4.1C.

- ❒ Cgfour color frame buffers
- ❒ VME controllers which interrupt at VME priority level 7.
- ❒ DES encryption facilities are supported through a separately available release tape.
  - **/usr/bin/crypt**
  - **/usr/bin/des**
- ❒ Loadable modules are not supported.
- ❒ Device drivers are not binary compatible with SunOS 4.1.2 or 4.1.3.
- ❒ There is no support for new hardware with extended VME addressing.
- ❒ "Special" drivers, including any and all device drivers from third-party vendors, may or may not work with OS/MP 4.1C. If "special" drivers are installed on your machine, contact the vendor(s) that supplied them.
- ❒ The following files are not included in OS/MP 4.1C:
  - **/usr/etc/gpconfig**
  - **/usr/lib/*.ucode**

System Architectures

Solbourne systems have an application architecture of "sun4". This is the output printed by **arch**(1). The kernel architecture is either "Series5", "Series6", or "S4000." These are the outputs printed by **arch -k**. The exit code for **arch sun4** is **0**; for other argument values, the exit code is **1**.

SunView™

Version 1.8 of SunView is included with OS/MP 4.1C. This is the same version currently available from Sun. The SunView application **dbxtool** is not included.

Supported Hardware

The OS/MP 4.1C release supports the hardware listed in this section. Solbourne provides installation instructions with each supported peripheral.

New hardware supported by OS/MP 4.1C include the Series6 50Mhz CPU and the 2 Gbyte 3-1/2-inch SCSI Disk Drive.

CPU Boards

Software support for Solbourne's new Series6 50Mhz CPU board is introduced in OS/MP 4.1C. In addition to the Series6 50Mhz CPU, the software also supports Sbus products (S3000 and S4000) and the Kbus products (Series5, Series5E, and Series6 33Mhz CPUs).

The Series6 33Mhz and 50Mhz CPU board may only be installed in Model 700 and Model 900 systems.

★ ★ ★ CAUTION ★ ★ ★

When using the romcopy command to upgrade bootROMs in Series6 CPUs, make sure the master CPU has the latest BootROM revision level of all CPUs in the system. If by accident a lower BootROM revision level is copied from an older CPU master, the system may not boot.

Please refer to the *Series6 50Mhz CPU Board Release Notes (106532), the Series6 Release Notes and Update Pages* **(part number 106145), and the man pages** *cpustatus*(8), **and** *romcopy*(8) **for more information.**

Memory Boards

The following memory boards are supported with OS/MP 4.1C. Notice that the 16 Mbyte and 32 Mbyte memory boards are no longer sold by Solbourne.

Table 6. Memory Boards

Memory	Discontinued
16 Mbyte Memory Board	Yes
32 Mbyte Memory Board	Yes
128 Mbyte Memory Board	No
256 Mbyte Memory Board	No
512 Mbyte Memory Board	No

OS/MP 4.1C supports more that 2Gbytes physical memory. Refer to the "OS/MP 4.1C Enhancements and Miscellaneous Software Information" section for details.

Supported Disk Drives

Software support for the 2 Gbyte 3-1/2-inch SCSI Disk Drive is introduced with OS/MP 4.1C. Table 7 lists all the disk drives supported in the OS/MP 4.1C release.

Table 7. Supported Disk Drives

Device	Bus	Name
830 Mbyte SMD Hard Disk Drive	VMEbus	xd
1040 Mbyte SMD Hard Disk Drive	VMEbus	xd
1.2 Gbyte IPI Hard Disk Drive	VMEbus	xd
2.7 Gbyte IPI Hard Disk Drive	VMEbus	xd
327 Mbyte Hard Disk Drive (5-1/4-inch)	SCSI	sd
661 Mbyte Hard Disk Drive (5-1/4-inch)	SCSI	sd
2 Gbyte Hard Disk Drive (5-1/4-inch)	SCSI	sd
1.3 Gbyte Hard Disk Drive (5-1/4-inch)	SCSI	sd
1 Gbyte Hard Disk Drive (3-1/2-inch)	SCSI	sd
2 Gbyte Hard Disk Drive (3-1/2-inch)	SCSI	sd
500 Mbyte Hard Disk Drive (3-1/2-inch)	SCSI	sd
200 Mbyte Hard Disk Drive (3-1/2-inch)	SCSI	sd
1.44 Mbyte Floppy Disk Drive (3-1/2-inch)	SCSI	fd0
CD ROM Drive	SCSI	sr

The **LXT213** entry in **/etc/format.dat** is not supported by Solbourne. The **LXT200** entry should be used instead. Solbourne treats the **LXT200** and **LXT213** drives identically and formats both types to 200 Mbytes before shipping. Solbourne may ship one type as a replacement for the other.

The floppy disk drive is available only on Series S4000 machines. Other non-SCSI devices are not available on Series S4000 machines.

All hard disk drives are shipped with a default partition.

Banks of SCSI Storage (BoSS™)

Not only is BoSS supported in OS/MP 4.1C, but the enhancement to boot from BoSS has been added as well. GENERIC and INSTALL kernels have been modified in OS/MP 4.1C so that the first SCSI bus on the first BoSS controller supports two tape drives (**st2** and **st3**) and a cdrom (**sr1**). See the *OS/MP Enhancements* section for more information.

Drive Controllers

Table 8 lists the SCSI Controllers supported in the OS/MP 4.1C release.

Table 8. Supported SCSI Controllers

Device	Type	Name
System Board	SCSI	si
Cougar SCSI-II controller	SCSI-II	sv
Multi-Channel Accelerator Board (MCAB)	SCSI (or with controller: SCSI-II, or IPI)	si1
IPI Controller	IPI	xdc
SMD Controller	SMD	xdc

The System Board only supports SCSI-I type interface. The Multi-Channel Accelerator Board (MCAB) supports both SCSI-I and SCSI-II (SCSI-II is supported only if Cougar Board is installed in MCAB) type interfaces. The Cougar controller only supports the SCSI-II type interface.

OS/MP 4.1C has been enhanced to support booting from **sv2**. **sv2** is the first of eight SCSI-II channels in the kernel configuration file. See the *OS/MP Enhancements* section for details.

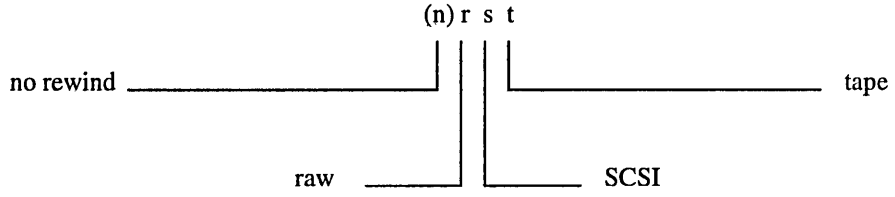
Tape Drives

Table 9 lists the tape drives supported in the OS/MP 4.1C release.

Table 9. Supported Tape Drives

Tape Drive	Bus	Name
QIC-150	SCSI	st
8mm Cartridge (8200/8500)	SCSI	st

Tape drives are accessed via entries in **/dev**, all tape drives are on the SCSI bus. **MAKEDEV** creates **mt** devices by making hard links to the corresponding **st** device; **/dev/rst0** is identical to **/dev/rmt0** and either name can be used to access the tape. For devices that support multiple densities, consult the **st**(4) manual page for information on how to manipulate the unit number to access the various densities. Tape operations are on the character (raw) device, such as **/dev/rst0; /dev/st0** is the block device.



The **dump** and **restore** commands were modified prior to 4.1C to use a media database, **/etc/media**. The **M** option causes **dump** and **restore** to consult the database to determine the blocking factor, length and density to maximize the tape use. Use the following command to dump file systems:

```
# dump 0Mf media /dev/nrst8 filesystem
```

where *media* is the media type described below and *filesystem* is the file system to dump. Use **/dev/nrst9** if the tape drive is set to SCSI id 0x5 (**st1**).

Table 10 gives a sampling of the different media types described in the **/etc/media** file. Additional media types may be added by editing **/etc/media**. Refer to the **media**(5) man page for details of this database.

Table 10. Examples of Media Types

Media	Format	Description
Q150_600	QIC-150	1/4-inch 600-foot XTD tape
P6-120	466033	8mm cartridge tape

★ ★ ★ NOTE ★ ★ ★

***dump** indicates it is rewinding the tape even when using a no-rewind name. Ignore the message.*

For example, the following command gives the maximum tape use for a QIC-150 with a 600 XTD tape:

```
# dump 0Mf Q150_600 /dev/nrst1 /usr
```

The generic kernel supports two SCSI tape drives. To add a first or second tape drive, power down the system, plug in the drive and reboot. One drive must be set to **`SCSI id 0x4`**, while the other drive must be set to **`SCSI id 0x5`** to be recognized. See the hardware installation manual for the device to determine how to set the drive to the appropriate SCSI ID.

To add more tape drives, the kernel must be reconfigured. A maximum of eight tape drives may be configured. See the *OS/MP 4.1C Enhancements and Miscellaneous Software Information* section for details.

The following list gives specific information about the supported tape drives:

QIC-150 The QIC-150 drive has the capacity to store 150 Megabytes when using 3M™ 600 XTD tapes. When reading tapes using the QIC-150 drive, the tape format (QIC-150, 120, 24, or 11) is automatically detected by the tape unit; therefore, tapes created with a QIC-24 drive can be read with the QIC-150 drive. The drive always writes QIC-150 format.

8mm Cartridge This drive has the capacity to store 2 Gbytes on the 8200, and 5 Gbytes on the 8500, when used with P6-120 8mm cartridge tapes.

Floppy Disk Drives

Series S4000 machines contain an optional 3.5-inch floppy drive. This drive supports two different densities. The low density is 720K (formatted) and the high density is 1.44Mb (formatted). Diskettes may be interchanged with Sun SPARCstation systems. Solbourne provides a utility, **pcnfs**, to read and write MS-DOS-compatible diskettes.

Several OS/MP 4.1C commands work with the floppy drive. Please refer to the appropriate manual pages for details.

- **fdformat**(1) is used for formatting a diskette. By default **fdformat** assumes that a high density diskette is in the drive. If a low density diskette is being formatted, the **`-l`** (for "low") option should be used.
- **eject**(1) is used to remove the diskette from the drive.
- **bar**(1) can be used to dump a file or files to the diskette that normally would not fit. When **bar** completes writing to one diskette, the diskette will be ejected and a request for a second diskette will be made

The **/dev** entries for the floppy are shown in Table 11:

Table 11. Floppy **/dev** Entries

Device	Partition
/dev/rfd0a	partition A on the raw disk
/dev/rfd0b	partition B
/dev/rfd0c	partition C
/dev/rfd0	same as partition C
/dev/fd0a	partition A on the diskette using block mode
/dev/fd0b	partition B
/dev/fd0c	partition C
/dev/fd0	same as partition C using block mode

Network Controllers

Table 12 lists the Network controllers supported in the OS/MP 4.1C release.

Table 12. Supported Network Controllers

Device	Name
System Board Ethernet controller	`ei0`
Sbus Ethernet controller (Series S4000)	`ei1`
Multi-Channel Accelerator Board (MCAB) Ethernet Controller	`ei1`
VMEbus Ethernet controller	`eg0`
VMEbus FDDI controller	`pg0`
VMEbus X.25 Controller (see X.25 Release Notes)	`vc0`

The System Board Ethernet controller is a standard component. The Sbus Ethernet controller (usable on the Series S4000) is available from third-party vendors. To add the Sbus Ethernet gateway, install the card in the system and make the indicated changes to these files:

file	add	following
/etc/hosts	**internet_address gatewayname**	line containing 'localhost'
/etc/hostname.ei1 or hostname.pg0	**gatewayname**	(create new file)

The I/O ASIC Ethernet controller is standard on Series 5, 5E, and 6 systems. To add the VMEbus Ethernet or FDDI gateway on one of these systems, install the controller in the system and make the indicated changes to these files:

file	add	following
/etc/hosts	**internet_address gatewayname**	line containing 'localhost'
/etc/hostname.eg0	**gatewayname**	(create new file)

★ ★ ★ NOTE ★ ★ ★

*If your network uses Network Information Service (NIS™), the **internal_address** and gateway must be added to the maps on the **NIS/YP** master as well as the local **/etc/hosts** file.*

gatewayname is the name for the Ethernet interface, often **hostname_gw**, it must be distinct from the name used for the onboard interface. The Sbus Ethernet controller is configured into the generic kernel. After you have made these changes, reboot the system.

Serial Multiplexers

The generic kernels for Kbus systems (Series5, Series5E, and Series6) support four serial mux controllers. Each serial mux controller supports 16 lines. Modify the **MAXUSERS** setting on the kernel depending on the number of serial mux controllers in the system. To modify **MAXUSERS**, edit the appropriate kernel configuration file in **/sys/kbus/conf** and set **MAXUSERS** equal to the quantity ((*number_of_serial_mux_boards* * **16) + 8**). After you have modified the configuration file, configure and build a kernel.

Keyboards and Consoles

Keyboards

OS/MP 4.1C supports the international keyboard layouts provided in SunOS 4.1.2, and supports two keyboard styles: a PC-style keyboard and an engineering-style keyboard.

The international keyboards provided are installed by setting the ROM environment variable **KBD_LAYOUT** to the appropriate hex value, *x* (shown in Table 13). For example:

```
ROM> setenv KBD_LAYOUT 0x
```

Table 13. Country hex values

Country	Hex Value
US	00
FRANCE_BELGIUM	02
CANADA_FRENCH	03
DENMARK	04
GERMANY	05
ITALY	06
NETHERLANDS	07
NORWAY	08
PORTUGAL	09
SPAIN_LATINAMERICA	0a
SWEDEN_FINLAND	0b
SWITZERLAND_FRENCH	0c
SWITZERLAND_GERMAN	0d
UK	0e
JAPAN	20

The PC-style keyboard is compatible with Sun's Type-4 keyboard. OS/MP 4.1C maps the PC-style keyboard so it is identical to Sun's Type-4 keyboard. Applications that expect the Type-4 keyboard, such as editors, will recognize the PC-style keyboard as a Type-4.

The Engineering-style keyboard is compatible with Sun's Type-3 keyboard. OS/MP 4.1C maps the Engineering-style keyboard so it is identical to Sun's Type-3 keyboard. Applications that expect the Type-3 keyboard, such as editors, will recognize the Engineering-style keyboard as a Type-3.

board/mouse is assigned to the device **/dev/ttyc1**. The devices **/dev/fb1**, **/dev/kbd1**, and **/dev/mouse1** refer to this board. Additional color frame buffer boards would be assigned to **/dev/ttyc2** or **/dev/ttyc3**.

On Series5, Series5E, and Series6 systems, the I/O board contains a bwtwo monochrome frame buffer and keyboard interface. It is assigned to the next console device, either **/dev/ttyc1**, **/dev/ttyc2**, or **/dev/ttyc3**, depending upon how many color frame buffer devices exist.

The **screenblank**(1) command now accepts a **-u** option for use when a serial port is used as the console, or when two graphics displays are in use. The argument to **-u** indicates the unit number (1-3) of the display to be blanked.

With this configuration, Solbourne supports running a windowing system, either SunView™ or X. If started from a normal login running on **/dev/ttyc1**, then the command **suntools** is all that is required, since the alternate kbd and mouse devices allow the kernel to reopen the correct kbd1 and mouse1 devices. A console window can be invoked, and any output to **/dev/ttyc1** will appear in this window. The **/dev/console** always refers to the serial port.

Multiple-Display Consoles

If more than one frame buffer exists, the OS/MP **adjacentscreens**(1) utility is supported. For instance, the following commands would start SunTools™ and extend the windowing system to the second frame buffer:

```
# suntools

# suntools -d /dev/fb2
```

To connect the displays, use the following command:

```
# adjacentscreens /dev/fb -l /dev/fb2
```

When using the X Window System, multiple displays are automatically connected by the X server.

Known Bugs with OS/MP 4.1C

In previous releases of this document, the bugs were listed by Category.
The term Category is now referred to as Component.

Bug#	Component	Sub-component	Summary
B910508466	Diagnostics	ROM	S4000 stand-alone clock driver doesn't return correct date/time.
B910510198	Diagnostics	ROM	3.4 Series5 BootROMs don't deassert sysfail on warm starts.
B911218009	Diagnostics	POST	3.5 Series5 ECC RAM test in the POST does not enable ECC checking.
B920814008	Diagnostics	DG	Disk write/read test fails when prompted.
B921113002	Diagnostics	MDG	Shared Memory Test fails.
B930629002	Diagnostics	Sysdiag	sysdiag fpu error report format
B930914001	Diagnostics	Sysdiag	vmem only tests 40 kilobytes.
B931110001	Diagnostics	MDG	MDG will fail test 8 if master CPU is in slot 1.
B910508309	Documentation	Manual	problem in SysAdmin Manual "Adding a modem"
B910508428	Documentation	Kernel	mt ret of Exabytes do not work.
B910508455	Documentation	Man pages	sd man page should describe SCSI disk cmd optimization.
B910508457	Documentation	Man pages	The eeprom man page shouldn't mention CONSOLE variable.
B910508458	Documentation	Man pages	The eeprom man page should describe defaultdump.
B910510046	Documentation	Manual	page 4-7 of the adb tutorial has a 68020 assy. example.
B910510068	Documentation	Man pages	/usr/man/man3/List.* files missing
B910510188	Documentation	Manual	QIC-150 tape drive.
B910510189	Documentation	Man pages	tunefs man page needs more info on -a option.
B910619003	Documentation	Release Notes	boot of remote ramdisk may result in rarp timeout.
B920618002	Documentation	Manual	device drivers man. incorrect about vme32 master to kbus transactions
B920710001	Documentation	Manual	The burst data transfer rates are incorrect in the 500 Installation manual.
B920811001	Documentation	Manual	documentation omission in System Admin Manual
B920817005	Documentation	Manual	Installation guide for Interphase ethernet board has switch setting discrepancy.
B921210002	Documentation	Man pages	man page for config command needs to be updated to include Series6.
B921210004	Documentation	Man pages	config_server man page should include reference to Series6.
B921210005	Documentation	Man pages	install_client man page should be updated in reference to OS examples.
B921210006	Documentation	Man pages	boot man page missing
B921210007	Documentation	Man pages	kadb man page missing
B930205001	Documentation	Release Notes	The BootROM level is missing from the Installation/Release notes.

Bug#	Component	Sub-component	Summary
B930205002	Documentation	Release Notes	Installation and release notes are missing remote install for Sbus machines.
B930312002	Documentation	Release Notes	need remote installation instructions in the stand-alone section
B930322001	Documentation	Manual	No software config info for FDDi in docs fpr 900/700/FDDI
B930406005	Documentation	Man pages	No cust. info, concerning how to utilize Hi Den mode on EXA-8500
B930412002	Documentation	Other	Enhancement to System I/O board notes
B930412004	Documentation	Man pages	eistat man page has strange comment
B930422002	Documentation	Man pages	man page says telnetd limits ptys to 64
B930513001	Documentation	Release Notes	SVM release notes incomplete
B930525001	Documentation	Man pages	loadkeys -e conflicts with Solbourne usage in /etc/rc.single
B930903001	Documentation	Man pages	config_server man page does not list all options
B930920002	Documentation	Release Notes	Instructions for dataless install incomplete
B930921002	Documentation	Release Notes	remote CDROM installation instructions are not in OS/MP 4.1B Release Notes
B930928003	Documentation	Manual	Power Components PSU should be added to the 900 Service Manual.
B931020001	Documentation	Man pages	spray(8) usage incorrect
B931029001	Documentation	Man pages	Man page on vi isn't clear on encryption requirements for the -x and -C options.
B921207001	OS	File system	df of device shows out-of-date information
B931029004	OS	File system	format.dat entry for Seagate ST11200N 1.2Gb 3 1/2" drive wrong
B931214001	OS	File system	unable to mount NFS disks
B910508404	OS	Kernel	The label of an IPI disk may be overwritten by a swap om C partition
B910510235	OS	Kernel	Problem with incoming and outgoing modem on same port.
B911106002	OS	Kernel	s4000 maxusers greater than 24 will cause system to reset due to double trap
B920925003	OS	Kernel	ei0 eiread mbuf allocation failure on low end Series5
B921022003	OS	Kernel	low-memory system starves processes
B921119002	OS	Kernel	Data fault panic running mmt test on Series5
B921130001	OS	Kernel	keyboard state not being set properly for keyboard resend
B921211002	OS	Kernel	io_tests hangs up on multi-cpu system
B921214002	OS	Kernel	Mux failures may occur on a BoSS system
B930616001	OS	Kernel	many lofs/tfs mount/unmounts can cause panic fbread
B930722001	OS	Kernel	cannot make a 4.1B kernel with LWP's commented out.
B930728001	OS	Kernel	cannot comment out Sunview support.
B931013001	OS	Kernel	Seeing bad signal stack messages on console
B931014001	OS	Kernel	lock time-out panic in swapout
B931014002	OS	Kernel	panic assertion failed m->m_type == MT_FREE
B931027001	OS	Kernel	data fault panic exiting Wingz in sunview
B931029003	OS	Kernel	Cougar driver complaining of double interrupt
B931111002	OS	Kernel	ps only prints u.u_comm with cores from >2GB machines
B931111004	OS	Kernel	SECC memory error early in boot causes panic...
B931116001	OS	Kernel	RUNLOCK panic
B931117002	OS	Kernel	Data fault panic
B931129002	OS	Kernel	unable to consistently sync file systems after kernel panic
B931202001	OS	Kernel	memory address alignment panic in login when STRMSGSZ==8k
B931202002	OS	Kernel	problems interrupting write to char special file in posix
B931208001	OS	Kernel	BAD TRAP, kernel read fault, data fault
B931208003	OS	Kernel	panic assertion failed cr != NULL, file ../../os/kern_prot.c, line 708

Bug#	Component	Sub-component	Summary
B931216004	OS	Kernel	panic caused by NFS mounted disk access
B931217002	OS	Kernel	system hang with prg_rc_drain_resp in trace back
B931227001	OS	Kernel	vm_context lock time-out panic syncing disks
B931227002	OS	Kernel	prg_rc_drain_resp unknown response panic
B931227005	OS	Kernel	system hangs when trying to spawn large (1136)of procs
B940105001	OS	Kernel	"memory board slot unknown" on SECC/MECC memory errors
B910813002	OS	Network	NFS default time-out is not 7/10th sec. according to man page
B911204018	OS	Network	Pipe writes block differently than under SunOS 4.1.[12]
B920403007	OS	Network	spray statistics go negative for extreme traffic
B930329003	OS	Network	ifconfig's 'metric' option does not work
B930614001	OS	Network	eg0 interface dies with VMEbus error(20) on Oracle Benchmark
B910912008	OS	Other	partition does not see changes to label until reboot
B930630001	OS	Other	System header files not ANSI C, C++ compliant
B931013002	OS	Other	update running @ 30 sec. interval too heavy for tpca
B910508493	OS	System call	Commands can dump core when out of swap space
B920513004	OS	User	eeprom -p option not always recognized
B920630005	OS	User	no man page for the /usr/etc/scsistat man page
B921028001	OS	User	mounting some CDROM is incompatible with Sun
B921217004	OS	User	verilog jobs cause panic on large mem. config. (maxuser related?)
B931119002	OS	User	/usr/etc/config dumps core on bad config file
B940110001	OS	User	App. which works under 4.1A.2 drops core under 4.1B
B910510040	Sunbug	C	Cpp mis-identifies itself
B911111004	Sunbug	C	acc fails if fflush(3) is used and program is statically linked
B911001002	Sunbug	File system	You can write to a CDROM, creating a bad inode
B920710002	Sunbug	File system	Ejecting CD while HSFS disc mounted may cause "segmap_release addr" panic
B910508295	Sunbug	Kernel	aioread doesn't return EINVAL when it should
B920131004	Sunbug	Kernel	cannot build valid kernel for diskless client
B930106001	Sunbug	Kernel	rebooting causes /dev/console to change mode, group
B930301003	Sunbug	Kernel	window displaylmutex lock broken messages
B930928004	Sunbug	Kernel	too many open files in perennial test suite
B930929005	Sunbug	Kernel	memory leak in rpc.lockd
B910910001	Sunbug	Network	NFS timeoouts at double the timeo value for nfs read operations
B920414002	Sunbug	Network	named complains about bad xfer when set up as a secondary nameserver
B910508283	Sunbug	Other	12/1 tape no man page for Uutry
B911204007	Sunbug	Other	4.1 man pages from Sun came with older dates than 4.0 man pages
B921013005	Other	Sunbug	4.1A.3man pages for pstat do not explain the fields displayed with -u option.
B930818001	Sunbug	Other	Need to know differences and enhancements from libc.so.1.7 to libc.so.1.8
B930930002	Sunbug	Other	load with undefined symbol makes file with exec permissions
B920318002	Sunbug	User	bug in make
B930624003	Sunbug	User	Need the equivalent patch for sun bug 100972-01
B930716001	Sunbug	User	Script that works under bourne shell fails when run from "at" or "cron"
B910508311	Utility	Editor	need statically-linked editor on root partition
B931029002	Utility	Editor	vi options inconsistant with man pages, ex. -C

Bug#	Component	Sub-component	Summary
B910508429	Utility	Installation	dopackage does not update it list of variables after abort
B910510208	Utility	Installation	install enhancement for handling patches
B920714010	Utility	Installation	partition tool doesn't do anything with new mount points
B920825009	Utility	Installation	More templates are listed than can fit in the given space
B931123002	Utility	Installation	reinst_sys dies on SVM /etc/fstab
B910927006	Utility	Integration	stcmp doesn't understand binary RCS files
B910510158	Utility	Library	getnetbyaddr(3N) doesn't take netmasks into account
B910702012	Utility	Make	pmake leaves scratch files in current directory when .KEEP_STATE used
B931103002	Utility	Make	pmake -c doesn't honor @ in Makefiles
B910510016	Utility	Other	Dis(1)'s usage message refers to itself as "kdis
B910510224	Utility	Other	tip doesn't like being hung op on
B930604001	Utility	Other	request 100344-01
B930805002	Utility	Other	solpatch has hard coded paths under /var, cannot install patches on some machines
B930830002	Utility	Other	solpatch list screen options mis-indented
B930920003	Utility	Other	solpatch and it's supporting binaries are dynamically linked
B931025001	Utility	Other	Australia Daylight savings time is off by a week.
B931026001	Utility	Other	solpatch doesn't echo user input
B931028002	Utility	Other	The audit flags under C2security work incorrectly.
B931115001	Utility	Other	solpatch when opened in a wind larger than 132x100 then shrunk to 132x75 give segmentation fault when -i opt used
B931215001	Utility	Other	processes started on remote system with rsh never exit
B910510184	Utility	Sendmail	sendmail -bi incorrectly sets YP_MASTER_NAME
B911105001	Utility	Source control	Checking out file that's not under RCS renames original

OS/MP Bugs Fixed in OS/MP 4.1C

In previous releases of this document, the bugs were listed by Category. The title Categroy is now referred to as Component.

Solbourne OS/MP 4.1B bugs fixed in OS/MP 4.1C

Bug#	Component	Subcomponent	Problem Summary
B930412003	Compilers	Other	request for sun patch 100606-03
B930212001	Diagnostics	DG	dg doesn't understand multiple channel boards
B920526004	Diagnostics	Other	Adding more than 256M on Series5 boards causes misalignment panics.
B910504221	Documentation	Man_pages	Xwd manual page needs info about swm windows
B921210008	Documentation	Man_pages	monitor man page is really the bootrom man page
B910510220	Documentation	Release_Notes	Keyboard explanation in release notes is misleading.
B911017014	Documentation	Release_Notes	incorrect documentation on TCP/IP configuration
B910508396	OS	File_system	You can truncate a newly-created read-only file on a NFS file system.
B910510153	OS	File_system	NFS doesn't always check for "x" permission on directories.
B910510160	OS	File_system	Sun NFS bug cause failure of SI test.
B910510172	OS	File_system	4.0D upgrade changes /etc/passwd file permissions to -rw-rw-rw (666).
B920921003	OS	File_system	fsck doesn't find all dirty filesystems on first pass.
B931209002	OS	File_system	X.25 modifications necessary
B910508320	OS	Kernel	"-target sun4" should be set in GENERIC conf's makeoptions
B910508334	OS	Kernel	Disk driver recovery doesn't release locks when system panics.
B910508365	OS	Kernel	xd locking can break on busy systems.
B910508394	OS	Kernel	pmake problem
B910508442	OS	Kernel	Sparc Int'l test fails when cgfast installed.
B910510135	OS	Kernel	st messages ignore shelltool console window.
B910520001	OS	Kernel	Memory address alignment panics
B910716004	OS	Kernel	swap_xlate panic occurred
B911017031	OS	Kernel	would like to add IPI drives dynamically
B911101004	OS	Kernel	many useless vmunix keyboard errors at 4.1.A.1
B920130012	OS	Kernel	divide by zero test program yields unpredictable results;
B920814001	OS	Kernel	some processes starve in 4.1B
B920814014	OS	Kernel	panic: should we really just allocate 12 pt here?
B920825006	OS	Kernel	fsck hangs system with > 5 CPUs installed
B920910005	OS	Kernel	ps prints negative numbers for %MEM and RSS with 1GByte memory.
B920911001	OS	Kernel	usr.lib Makefile doesn't install librpcsvc subdir.
B920914006	OS	Kernel	CDROM on BoSS hangs SCSI bus
B920914009	OS	Kernel	message requested when kmap_alloc falls below kmap_lowat

Bug#	Component	Subcomponent	Problem Summary
B920915002	OS	Kernel	swap space leak
B920925002	OS	Kernel	Random processes dump core under high user load.
B920928003	OS	Kernel	BAD TRAP: asyncio; Memory address alignment
B921008001	OS	Kernel	Using a volume as a block device in svm causes panic;
B921102001	OS	Kernel	Cannot configure ei1 in system with 6 CPUs & 1 MCAB
B921112001	OS	Kernel	ttycommon_qfull called wrong in ldterm flow control cases
B921119001	OS	Kernel	A Spurious interrupt can lower interrupt level.
B921119003	OS	Kernel	att panics on Series6 with lock_style set to debug
B921204001	OS	Kernel	remove support for cg40
B921211001	OS	Kernel	sysdiag panics system
B921217005	OS	Kernel	mount system call has bad check for uap->type
B921218001	OS	Kernel	multiple lock error panics
B921218002	OS	Kernel	lock timeout panics anon_decref
B921223001	OS	Kernel	cannot access 128Megs of the MCABs VME32 user space
B930106002	OS	Kernel	sr driver returns incorrect information from CDROMSUBCHNL ioctl
B930107002	OS	Kernel	Indirect system call with fork causes lock error panic
B930113002	OS	Kernel	async_memory_err can cause a deadlock situation
B930126001	OS	Kernel	choose_process could fail to find runnable processes
B930126002	OS	Kernel	swap_order causes anon_decref panic
B930202001	OS	Kernel	vme_rora doesn't work in 4.1B
B930202005	OS	Kernel	Gather TLB info in nmi routine
B930204002	OS	Kernel	pageval returned by vmepfnum is incorrect
B930204003	OS	Kernel	mapin kernel call does not support old PG_ flags
B930223001	OS	Kernel	system with 2.304GB of physical memory panics
B930224005	OS	Kernel	/dev/tcp has wrong minor number
B930301001	OS	Kernel	pagefault/system hang on kernel address
B930301005	OS	Kernel	lock violation: zs lock can't be taken after lock process
B930301006	OS	Kernel	ei0 interface will hang with Series6 and OS/MP 4.1B
B930303003	OS	Kernel	Duplicate PIDs
B930309001	OS	Kernel	defaultdump not working at OS/MP 4.1B
B930310001	OS	Kernel	lock violation: lock semaphores after lock vm_context
B930310002	OS	Kernel	Bad printf is the memory address alignment trap.
B930310005	OS	Kernel	update holds the vm_context lock too long causing problems.
B930310006	OS	Kernel	Performing three read/write pairs on a socket take much longer than two read/write pairs.
B930318002	OS	Kernel	choose process panics
B930318004	OS	Kernel	equivalent to Sun patch 100636-01
B930318006	OS	Kernel	lock timeout
B930318007	OS	Kernel	equivalent to Sun patch 100173-10
B930330003	OS	Kernel	poll on socket causes system to panic
B930331001	OS	Kernel	request for Sun Patch 100513-01 Jumbo tty patch
B930402002	OS	Kernel	lock timeout panics
B930407002	OS	Kernel	need support for >64 file descriptors
B930408002	OS	Kernel	Memory address alignment panic
B930408003	OS	Kernel	system hangs (choose_process)
B930412001	OS	Kernel	Oracle 7.0 cannot be installed from CDROM Solbourne/SUN HSFS driver doesn't support RockRidge Extensions
B930413002	OS	Kernel	add support for 8500C and 8505 Exabyte drives

Bug#	Component	Subcomponent	Problem Summary
B930414001	OS	Kernel	eiclfree2 panic
B930416001	OS	Kernel	sd_unit panic for major device 24
B930416003	OS	Kernel	conf.o is being supplied in OBJ directory and shouldn't
B930423001	OS	Kernel	Member of group can remove file in dir where group has rwx even if unowned.
B930426001	OS	Kernel	Series6 system panics with a Fatal Asynchronous Fault
B930505003	OS	Kernel	The select system call may hang.
B930511001	OS	Kernel	ialloc: dup alloc panic
B930512001	OS	Kernel	lock timeout
B930512002	OS	Kernel	processes go into "D" state waiting for memory
B930512003	OS	Kernel	panic getting user pte from interrupt
B930521001	OS	Kernel	The utsname structure returns incompatible results.
B930525002	OS	Kernel	100347-03
B930526001	OS	Kernel	Bug in fcntl can cause lock error panic
B930526002	OS	Kernel	block_n_lock broken in the 1 cpu case
B930528001	OS	Kernel	request for sun patch 100666-02
B930608001	OS	Kernel	fddi hangs
B930622001	OS	Kernel	Interrupting aim 3 benchmark causes system to drop to single user
B930630002	OS	Kernel	Data fault panic
B930706001	OS	Kernel	hat_add_mapping returns garbage
B930708001	OS	Kernel	pstat is hardcoded to look at 10000 nfiles.
B930708002	OS	Kernel	Assertion failure. DEBUG kernels only. from soreceive() or sosend()
B930712002	OS	Kernel	unable to install Ingres on sbus systems. Core dumps.
B930713001	OS	Kernel	wait_command_done panic in aim3 benchmark
B930713002	OS	Kernel	page_get map panic in aim3 benchmark
B930713003	OS	Kernel	page_hashout panic in aim3 benchmark
B930713004	OS	Kernel	out of memory panic in perennial test
B930713005	OS	Kernel	cannot start rfs on OS/MP 4.1B
B930713006	OS	Kernel	vm_context lock timeout panic in uucp_test
B930713007	OS	Kernel	bad trap/data fault in system_test
B930714001	OS	Kernel	vm_context lock timeout panic with aim3 and 256M memory
B930806001	OS	Kernel	tmpfs needs vm_context lock
B930813003	OS	Kernel	lock timeout panic
B930817002	OS	Kernel	race in krpc (ckuwakeup). timeout may need to know more about locks.
B930824001	OS	Kernel	kernel memory allocation causes crossed locks
B930825001	OS	Kernel	request for sun patch 100075-11
B930831001	OS	Kernel	dmesg reports negative memory for large-mem systems
B930831002	OS	Kernel	vmstat reports negative memory for large-mem systems
B930901002	OS	Kernel	panic in exit
B930914002	OS	Kernel	memory leak/corruption in ufs_getsummaryinfo
B930924001	OS	Kernel	adjtime() loses at 4.1C
B930928001	OS	Kernel	Data fault panics
B930928002	OS	Kernel	uiomove optimization does not occur unless LOCK_STYLE is debug
B930929001	OS	Kernel	mb_mapfree messages while probing SCSI devices
B930929002	OS	Kernel	perennial setrlimit test hangs on IDT
B930929003	OS	Kernel	IDT-specific problems in perennial test suite
B930929004	OS	Kernel	IDT time kernel stats zero in 4.1C
B930930001	OS	Kernel	illegal instruction panics from crashme test
B931005001	OS	Kernel	lock timeout panic

Bug#	Component	Subcomponent	Problem Summary
B931007002	OS	Kernel	can't have DEFAULTDUMP on high-numbered BoSS disks
B931013007	OS	Kernel	Optimization in scsi.c can cause SCSI bus resets (OS/MP 4.1C only)
B931013009	OS	Kernel	code to support tags can prevent dumps on panic
B931013011	OS	Kernel	lock order violations when draining mbufs
B931013013	OS	Kernel	SunOS failed MCLGET and mclget leave different m_len values.
B931020002	OS	Kernel	Diskless clients can't panic correctly.
B931028001	OS	Kernel	NFS clients hang under heavy load.
B931028003	OS	Kernel	data fault panic in tcp_fasttimo routine
B931101001	OS	Kernel	processes get stuck using "oncpu"
B931101003	OS	Kernel	oncpu command showing bad values for previous PAM?
B931103003	OS	Kernel	several problems with >2G memory
B931103004	OS	Kernel	"cpu n not responding" during reboot of >2G system
B931104001	OS	Kernel	CPUs go idle on >2G memory system
B931104002	OS	Kernel	vmstat "fre" value suspiciously large on >2G system
B931104003	OS	Kernel	performance penalty on >2G memory system
B931109001	OS	Kernel	data fault panics running SVM in 4.1C
B931110004	OS	Kernel	panic assertion failed: (bp->b_flags & B_WBUSY) || !(bp->b_flags & B_D
B931111003	OS	Kernel	Inv. Supervisor data load panic
B931112003	OS	Kernel	svm needs new kernel .o files for 4.1C.
B931112004	OS	Kernel	WARNING: CPU in slot # not responding on reboot
B931116003	OS	Kernel	svfatal(DMA VMEbusTimeout(21)) failure...
B931119001	OS	Kernel	Ingres shutdown causes Memory address alignment panic.
B931123003	OS	Kernel	Double Traps...
B931201001	OS	Kernel	mouse can't reach second screen in dual-headed sunview
B931202003	OS	Kernel	Store buffer faults caused by ECCM do not show any HW information.
B931207001	OS	Kernel	pg error panic
B931209001	OS	Kernel	FDDI hangs (deaf receiver)
B931216002	OS	Kernel	double drop of arp lock when no mbufs
B931216003	OS	Kernel	sa device driver with ASSERT kernels can panic.
B931221001	OS	Kernel	Drvconfig causes system to hang.
B931222004	OS	Kernel	space_reserve broken for VME space on Series6
B931223001	OS	Kernel	DES server panics on client mount requests
B940107001	OS	Kernel	System hang (running pmake on si drive + kbus_mon)
B910510164	OS	Network	running etherd or nfswatch causes data corruption.
B910510215	OS	Network	request for uuqueue and uusnap command
B931013005	OS	Network	OSMP 4.1C FDDI driver can leak mbufs.
B931013006	OS	Network	Calls to m_free with interface lock can lead order violations.
B931111001	OS	Network	nfsd daemons get stuck
B931112005	OS	Network	NFS mounts time out right away.
B931129003	OS	Network	possible panic when setting promisc with FDDI (41Conly)
B931205001	OS	Network	pgstat -s corrupts driver pgstat statistics
B931216001	OS	Network	MGET_NOLOCK: possible expand with lock ff343860:'pg_0'
B910508287	OS	Other	References to Sun in admin files needs to be changed to Solbourne.
B910508306	OS	Other	Error recovery in drivers can induce lock timeouts.
B910508342	OS	Other	Network performance on kbus machines is bad.
B910508427	OS	Other	Adding an MCAB to the kernel config file is difficult.
B910510111	OS	Other	Plot files are missing from /usr/bin in 4.0C.
B910510132	OS	Other	The suntool disk performance tool doesn't work properly.

Bug#	Component	Subcomponent	Problem Summary
B910510227	OS	Other	NCD xterminal performance through mux card is slow.
B910510239	OS	Other	timed loses approximately 9 minutes a week.
B911017013	OS	Other	cannot close net. interface with ifconfig
B920910006	OS	Other	/etc/rc incorrectly tries to delete /dev/printer
B921106001	OS	Other	mpstat seems to report cpu0 data in the average column
B921217002	OS	Other	autocad on sga20 occasionally draws bad vectors.
B930113001	OS	Other	Only 256 PTY's are in the /etc/ttytab file in OS/MP 4.1B; needs to be 736 as supported
B930204001	OS	Other	X1.1 doesn't work with OS/MP 4.1B.
B930225001	OS	Other	cpustatus cannot disable cpu 0.
B930519001	OS	Other	request for sun patch 100174-06
B930608003	OS	Other	kvm_read sometimes lies
B930920001	OS	Other	Unable to load OS from remote CD-ROM using reinst_sys.
B931013003	OS	Other	device xv0 in some Series6 config files
B910510073	OS	Shell	/bin/sh dumps core - intermittently
B910508494	OS	System_call	Series4 vfork(2) is really fork(2)
B910510077	OS	System_call	EINTR erro
B920812002	OS	System_call	bsf option of mt command returns i/o error.
B930309002	OS	System_call	socketpair returns wrong errno
B910508439	OS	User	bootparams entry is not deleted when installing client fails.
B910510078	OS	User	ld error with very large libraries
B921210003	OS	User	machid(1) command does not exist but man page does
B921216001	OS	User	'sendmail' gets segv/buserr during AIM Utilities test
B921217003	OS	User	panic if maxuser too large on large memory configuration
B930202002	OS	User	Need patch for Sun patch 100408-01.
B930202003	OS	User	Need patch for Sun patch 100399-02.
B930202004	OS	User	Need patch for Sun patch 100413-01.
B910510137	Sunbug	C	ld and ld.so bugs in Sun's 4.0.3
B910510030	Sunbug	Fortran	Fortran compiler goes into an infinite loop.
B910510031	Sunbug	Fortran	exp involving fields of structures hangs the converter.
B910510063	Sunbug	Fortran	Converter goes into an infinite loop.
B910510085	Sunbug	Fortran	B O X and Z constants used only in DATA statements
B910723016	Sunbug	Fortran	assembler grows to enormous size and pushes the load avg. high.
B910510079	Sunbug	Kernel	data fault panics
B920929003	Sunbug	Kernel	Simulated [su]div instructions are broken.
B930402003	Sunbug	Kernel	system hangs
B910508450	Sunbug	Network	Sun NFS bug causes failure of SI test.
B910510053	Sunbug	Network	Directory scan permissions don't work on nfs mounts.
B910510080	Sunbug	Network	pty fix
B910510098	Sunbug	Network	NFS clients may hang under certain conditions.
B910510099	Sunbug	Network	File corruption inode or vnode pointing to wrong file.
B910510144	Sunbug	Network	NFS Jumbo Patch
B910513004	Sunbug	Network	security bug: processes do not disassociate from ptys when user logs out
B930323002	Sunbug	Network	We need sun patch # 100684-02 (RFS patch)
B910508308	Sunbug	Other	12/18: Should /etc/motd be world writable?
B910510097	Sunbug	Other	selection_svc and rpc can be used to gain access to system files
B910516001	Sunbug	Other	various symbolic links in /usr/bin to sunview/...
B910516004	Sunbug	Other	suntools files in /usr/lib

Bug#	Component	Subcomponent	Problem Summary
B920601002	Sunbug	Other	3rd Party software which uses 'delay' function will not work.
B930107001	Sunbug	Other	The /usr/include/utmp.h file is wrong when there are more than 64 pty's
B930817001	Sunbug	Other	Need equivalent to Sun patch 100972-01 " at jobs not running: files being overwritten"
B931124002	Sunbug	Other	request for sun patch 100407-07
B910510230	Sunbug	System_call	4.0D poll returns POLLHUP when console is used.
B910510041	Sunbug	User	cron queudefs file is ignored
B910510042	Sunbug	User	Jobs must ALL complete before newly added jobs will run.
B910510062	Sunbug	User	make does not expand all dynamic macros properly when additonal suffixes are declared without rules.
B910510181	Sunbug	User	mount command prints bogus WARNING unknown options quota message
B920708004	Sunbug	User	request that tip does ioctl call to save window settings
B930119002	Sunbug	User	need OS/MP 4.1B patch for Sun patch 100399-02
B930120001	Sunbug	User	need to generate Sun patch 100413-01
B930305005	Sunbug	User	ipcs aborts with "shcmtl: permission denied"
B930413001	Sunbug	User	equivalent to Sun patch 100383-06
B910508399	Sunbug	system	Attempting to mount swap space hangs machine.
B930204004	Sunbug	system	Should run CERT file permission script to check and possibly fix file permissions
B920716001	Utility	Client_server	Cannot install a Solbourne client from CDROM.
B920910002	Utility	Client_server	config_server - it is desirable not to have /etc/exports modified;
B930329004	Utility	Client_server	config_server uses rst0 instead of nrst0
B910508293	Utility	Installation	12/18: error installing X when man pages don't exist
B910508345	Utility	Installation	config_server ungraceful about perm denied
B910508346	Utility	Installation	config_server tape usage inefficient
B910508452	Utility	Installation	soft links are not created during installation
B910508453	Utility	Installation	/etc/hosts is not updated on dataless client
B910517002	Utility	Installation	Upgrade of kbus clients fails if config_servers used -n.
B910614003	Utility	Installation	Rebooting on ramdisk doesn't work properly.
B920716004	Utility	Installation	Install tries to newfs 0 length partitions.
B921103005	Utility	Installation	/etc/rc.local assumes networksunview installed
B921105001	Utility	Installation	/etc/hostname.ei0 is not updated on dataless clients.
B921106002	Utility	Installation	config_system doesn't get default netmask from inst_sys.
B930830004	Utility	Installation	Solpatch remove patch falsely succeeds when save dir missing.
B931001001	Utility	Installation	Incorrect Warning Message
B931022001	Utility	Installation	/usr/share/man/whatis is out of date
B931116002	Utility	Installation	non-NIS diskless clients get broken /etc/rc.local
B910510157	Utility	Library	RPC interface to rstat functions improperly
B921019002	Utility	Library	/usr/lib/libbsdmalloc.a missing from 4.1B
B931021001	Utility	Mail	cert advisory on sendmail CA:93-15
B910508322	Utility	Other	1/23 tape: /etc/mtab is world-writable
B910508362	Utility	Other	tools for monitoring per-cpu stats
B910508373	Utility	Other	include fix for SunOS in.telnetd vulnerability
B910508420	Utility	Other	portmap occasionally dumps core due to seg fault
B910510109	Utility	Other	dump gives no errors but restore gives readhdr errors
B910510205	Utility	Other	lookbib core dumps
B910703001	Utility	Other	rcpgen as documented in man pages fails
B911101001	Utility	Other	quota is not updated dynamicallyrc.local entry doesn't work

Bug#	Component	Subcomponent	Problem Summary
B920910004	Utility	Other	dis -F does not work
B930303007	Utility	Other	ftp reports bogus transfer rate
B930330001	Utility	Other	sun patch 10061-01
B930416002	Utility	Other	pgstat reports negative number
B930505002	Utility	Other	dump can hang at 4.1b
B930520001	Utility	Other	solpatch exits when installing all patches at once
B930607001	Utility	Other	/usr/lib/expreserve may be used to trash any file
B930610003	Utility	Other	uncomment savecore by default in /etc/rc.local
B930629001	Utility	Other	request for sun patch 100249-07
B930629003	Utility	Other	/etc/utmp is world-writable
B930729001	Utility	Other	request for sun patch 100564-05 C2 Jumbo Patch in 4.1.2
B930830001	Utility	Other	Solpatch misreports what spool directory it is using.
B930830003	Utility	Other	Solpatch should report PATH being incorrectly set

SunOS 4.1.2 bugs fixed in Solbourne OS/MP 4.1C

Sun Bugs Fixed in Solaris 1.1

A number of Sun bugs were fixed by Solaris 1.1. This chapter lists the more significant fixes.

Kernel/Driver Bugs Fixed

Bug#	Description
1045104	Fix for 1044867 (infinite BOGUS page loop) has a bug
1062972	shared and exclusive lock lists get munged; rpc.lockd cores
1069493	Console driver can't display 8-bit characters
1070964	ie0: output queue full; increased due to 600MP
1071674	Sundiag 2.3 fails startup probing because of false devinfo inf
1075019	/usr/kvm/machine points to the wrong place
1075332	dtop_drawcursor determines if colormap is a power of 2 incorr
1076463	Insufficient kernel virtual space for large machines
1077035	itrunc: /mnt/123598 new size = 0, blocks = -29376 messages pri
1080630	Large 600MPs get "panic: out of virtual memory"
1080842	environmental errors are ignored by the IPI driver
1081482	kernel integer division emulation code does not deal with over
1081618	$<traceall does not work on a sun4m
1082227	sdiv incorrectly emulated on 600MP/4.1.2
1082539	sd: make_sd_cmd improperly clearing klustersort sort keys
1082751	segment violation caused by sdiv, udiv
1082782	sdiv emulation routine causes segfault under 4.1.2
1083014	4.1.2 kernel does not emulate integer mul/div correctly
1083123	sun4m kernel fails if the mxusers is > 250
1083662	4.1.x kernel doesn't support SPARC V8 recomputation
1083810	L1-A sometimes ignored during panic
1083811	Kernel panics while syncing file system
1083844	Force MMU Tablewalk after page fault
1083892	kernel emulation code detects underflow after rounding
1083917	4/690, 4/670 hangs, CPU lights freeze, when running with speci
1084235	max sun4m RLIMIT_DATA is too low
1084676	Select best processor for a process
1084680	Window Overflow missing a nop for psr delay
1085152	Security: 600MP kernel has undocumented "probeme" trap
1085165	Remove nonfunctional 4.x TLB locking code
1085235	Prevent Cy7c605 from pagefaulting on M-bit update
1085863	Panic: BAD TRAP in fp_disabled trap
1086143	600MP system crashes with a watchdog reset - INSTRUCTION ACCE
1086438	klock_exit blows away caller's %l6 register
1086458	console login prompt garbled when 8-bit chars are passed through
1086685	adb doesn't disassemble sdiv instruction
1086687	4.1.2 doesn't handle divide instructions
1087264	atomic swap command fails only on IPC running 4.1.2 FCS
1087507	system panics with "panic on 0: ialloc: dup alloc"
1088483	Security: 600MP shipped with halt_and_catch_fire
1089128	rfs_lookup needs to release the directory vnode before error r
1090435	nice'd processes hang in run state and aren't killable.
1090849	datasize limited to 512MB
1092548	under heavy load, "panic: swtch"

System Administration Bugs Fixed

Bug#	Description
1033724	/usr/lib/adb belongs in /usr/kvm
1081944	In 4.1.2, add_client and add_services fail to recognize DiskSuite
1082294	sunupgrade ignores '#' in /etc/hosts when upgrading diskless c

Network Bugs Fixed

Bug#	Description
1063432	tip to RFS mounted serial port causes panic: data fault
1076985	4/490 NFS client crashes when accessing mounted file from a no

Library Bugs Fixed

Bug#	Description
1072740	strcoll() .... strxfrm() dumps core for locale >< C if stdin c

POXIX (library)

Bug#	Description
1032120	POSIX:l_pid in flock isn't a pid_t.
1032755	errno should be set to EBADF on a number of library routines.
1032777	fopen should return ENOENT for empty string.
1037220	sigvvec can't examine action of SIKILL or SIGSTOP.
1080635	execvp & execlp do not return ENOENT for null path.

POSIX (Kernel)

Bug#	Description
1029856	Open 0-length file with O_TRUNC; doesn't update st_ctime and st_mtime.
1032784	fpathconf on unopened tty needs to return a value to pass PCTS.
1039505	Trailing / in pathname should be ignored.
1077642	Kernel rprts wrong SIMM loctn when ECC bit
1087606	heap fragmentation hangs brk()
1081728	write system call fails even if there are some bytes available.
1081740	Pending sigchld is not ignored if handler set to default.
2000582	POSIX settable test gets wrong value when PARENB and PARMARK set.
2000794	Check for maxuproc is off by one.
2001524	zs driver shouldn't have high bit set in CS5 mode.

Link-editor Bug Fixes

Bug#	Description
1019004	assert definitions can fail to report undefined symbols
1032739	ld core dumps with many libs in multiple directories
1034788	-r and -pic do not mix bad secondary magic number error
1034833	ld: can't mixed -r with -Bstatic or -A flag
1037879	Cannot create executable with shared object which points to another shared object.
1041946	(duplicated by 1065275, below).
1042261	ld only recognized first directory in LD_LIBRARY_PATH
1044524	multiply defined symbols and seg. fault caused by 4.1's ld
1045272	ld -u & -r do not seem to work properly
1046462	ld fails with segmentation fault when processing nested #include files
1050594	fix uninitialized structure entries.
1064820	ld can produce bogus diagnostics when processing cascaded dependencies
1065275	program dumps core with shared objects having only statics.
1033086	Calling dlopen() on a file with BSS kills your application.
1043300	dlclose prevents access to functions even after further dlopen
1045194	dlsym returns bad address for uninitialized global variable
1046379	cannot call a function in a [.so] from a function in another
1052428	ld.so usage of -L options confusing, leads to security probs

Patches Included in OS/MP 4.1C

Solbourne OS/MP 4.1B patches in OS/MP 4.1C

Patch#	Bug#	Description
p93012501	B921211001	Fix for data fault and lock error panics
p93012601	B930126001	Fix for hang in choose_process and loss of wakeup
p93012602	B930126002	Fix for anon_decref panic
p93012603	B930113002	Fix possible deadlock when an asynchronous memory error occurs
p93020101	B921112001	Fix for ttycommon_qfull kernel read fault
p93020102	B921010001	Fix for panic with kmem_free: block already free
p93020103	B921119001	Fix for spurious interrupts causing panic
p93020104	B921130001	Exiting sunview can hang console.
p93020105	B921217005	mount system call has bad check for uap->type.
p93020201	B921218001	fix lock error panics when using unix domain sockets
p93020203	B930106002	fix for CDROMSUBCHNL ioctl call to sr driver
p93020204	B930202002	jumbo patch to integrate CTE fixes to libcurses (equivalent to Sun patch 100408-01)
p93020205	B930202003	csh memory leak tty gets EOF condition (equivalent to Sun patch 100399-02)
p93020206	B930202004	tar fills last block of tarfile with unrelated data (equivalent to Sun patch 100413-01)
p93020207	B930202005	add code to grab MMU information during panic or NMI
p93030501	B930305005	ipcs aborts with "shcmtl: Permission denied" (equivalent to Sun patch 100650-01)
p93030801	B930301001	fix for lock timeout or system hang with Series6 CPUs
p93030901	B930309001	fix for dump to tape
p93030902	B930309002	socketpair system call was not setting syscall return value
p93031001	B930310002	fix kernel printf for memory address alignment fault
p93031002	B930310001	fix for lock semaphores lock violation
p93031003	B930310005	change ufs sync to minimize response time
p93031201	B930202001	add support for RORA VME controllers
p93032201	B930318002	fix for choose_process panic
p93032202	B930318007	NFS Jumbo Patch (equivalent to Sun patch 100173-10)
p93032601	B930318004	kernel can possibly generate duplicate pids (equivalent to Sun patch 100636-01)
p93033001	B930330001	cron dumps core & cron dies when daylight savings time (equivalent to Sun patch 100651-01)
p93033002	B930323002	RFS Server patch. (equivalent to Sun patch 100684-02)
p93033003	B930301004	software fix for detecting possible hung lance ethernet chip
p93040101	B930330003	fix for socket poll panic
p93041201	B930412003	increase hash table size (equivalent to Sun patch 100606-03)
p93041301	B930413001	rdist security and hard links enhancement (equivalent to Sun patch 100383-06)
p93041601	B930416001	fix for sd_unit panic

Patch#	Bug#	Description
p93041901	B930331001	Jumbo tty patch (equivalent to Sun patch 100513-02)
p93042001	B920925003	TCP "reset"s can cause an mbuf leak, resulting in mbuf map full (equivalent to Sun patch 100804-01)
p93042002	B920925003	mbuf + mcl_static cluster mbuf should be protected from interrupts (equivalent to Sun patch 100456-04)
p93050601	B930118001	fix race in close
p93050602	B930505003	fix for select on socket hang
p93051401	B930505002	fix copy from kernel to user space
p93051701	B930505002	fix zeroing from kernel to user space
p93052601	B930511001	UFS Jumbo Patch (equivalent to Sun patch 100623-03)
p93052701	B930520001	fix for Solpatch inability to install more than 26 patches at one time
p93052801	B930519001	TMPFS Jumbo Patch, v2 (equivalent to Sun patch 100507-04)
p93060401	B930525002	fix named pipe panic and data corruption (equivalent to Sun patch 100347-03)
p93061001	B930318006	vm_context lock timeout in klustsort()
p93061002	B930607001	expreserve can trash files and give root access
p93061101	B930608001	fix for FDDI hangs
p93061102	B930526001	fix for lock error panic when LOCK_STYLE is debug
p93061401	B930426001	fix for store buffer exception
p93062101	B921216001	ld.so write buffer flush
p93062102	B930607001	security problem with expreserve (equivalent to Sun patch 101080-01, and obsoletes Solbourn)
p93070101	B930416002 B930608001	fix for FDDI hangs
p93070201	B930630002	fix for Data Fault Panic in Accept
p93071301	B930607001	security problem with expreserve, secure installation (equivalent to Sun patch 101080-01, and obsoletes Solbourn)
p93071601	B930224005 B930713005	wrong MAKEDEV line for /dev/tcp
p93071901	B930712002	incorrect results or SIGSEGV in emulated instructions
p93073001	B930630002	fix for lock problem
p93081001	B930408002 B930512003	fix for panics in ckuwakeup(), panic 'getting user pte from interrupt' ...
p93081101	B930729001	C2 Jumbo Patch (equivalent to Sun patch 100564-05. Due to the editin)
p93081102	B930708001	pstat chokes on greater than 10,000 file descriptors
p93081201	B930629001	automount Jumbo Patch (equivalent to Sun patch 100249-07)
p93081301	NONE	kernel support for 40 MHz Series6 CPUs
p93081302	B920814014	avoid swapping a process allocating page tables
p93081901	B930817001	"at" jobs are not running; job files are being over-written. (equivalent to Sun patch 100972-01)
p93082301	B930528001	exit of suntools from SunView causes panic: bad rmfree (equivalent to Sun patch 100666-02)
p93082501	B930526002	fix 'block_n_lock' on single CPU system
p93090701	NONE	tfs does not work with auditing enabled (equivalent to Sun patch 100372-02)
p93090801	B930512002	kernel memory fragmentation causes processes to hang in D state
p93091301	B930522002 B930522001 B930820001	fix Data Fault Panic, Invalid PTE Panic, Lock Timeout in update()
p93091302	B930901002	fix for panic in exit
p93091401	B930706001	keep consistent RSS statistics
p93092101	NONE	feneralized clock speed support for Series6
p93092201	B930914002	prevent kernel memory pool corruption due to i/o error in ufs_getsummaryinfo

Patch#	Bug#	Description
p93092901	B930928001	fix Data Fault panic that may occur after mbuf map full
p93100401	NONE	data fault using ROM output routines
p93102801	B920929003	emulating integer multiply/divide instructions gets SIGILL or SIGSEGV
p93110801	B931005001	lock timeout in pvn_vptrunc
p93120201	B931124002	accounting Jumbo Patch (equivalent to Sun patch 100407-07)
p93120601	B931108002	Killing and restarting nfsd causes memory address align panic.
p93120901	B931209001	FDDI Deaf Receiver problem, incorrect Driver Stats, and related problems
	B931205001	
p93121601	NONE	Prevent ARP entries from running off the end of the arp table.
p93122301	B931021001	sendmail jumbo patch with security fixes (equivalent to Sun patch 100377-08. It replace)
p94010701	B930813002	Fix FDDI related DVMA map corruption
	B931116003	
	B931217001	

SunOS 4.1.2 patches in Solbourne OS/MP 4.1C

Patch#	Bug#	Description
100075-08	1040406	KLM protocol changed but RPC versn # wasn't
100075-08	1046373	shared or exclusive lock doesnt work on 412
100075-08	1063692	deadlock is not detected in nfs locking
100075-08	1064183	downgrading a lock doesnt grant other read
100075-08	1071435	panics: corrupt file lock list
100075-08	1074757	rpc.lockd in 4.1.2 grows to few MB (leak)
100075-08	1077402	file can get left locked by exited process
100075-08	1080359	Read lock gets stuck in the kernel lock
100188-02	1070495	pgms using pty can get output from prev ap
100224-03	1051832	rmail dumps core on certain (unknown) errs
100274-02	1044478	dup biodone related panics w ... 4.1.1
100371-01	1044726	showfh timeouts before accessing nfs fh
100381-01	1068938	du does not work with VMS(NFS) filesystem
100384-01	1063432	tip to RFS mounted serial port causes pan
100399-01	1066556	csh malloc mem leak results in Mem Fault
100402-01	1069046	cron dumps core on what appears to be corre
100408-01	1047916	keypad() misinterprets function keys when
100408-01	1070312	terms ins/del line and scroll region cap
100425-01	1055736	whois is getting host unknown when it uses
100431-04	1063683	back facing hollow polygon inconsistent w
100431-04	1068120	Undrawing antialiased lines in QUM mode ha
100431-04	1073137	Back-faceed QUADS are slow on GT when FACE
100431-04	1073181	Performance degrades for polygons follow
100431-04	1074981	color sometimes incorrect for clipped, dep
100431-04	1080766	Non-dot markers are slow
100431-04	1086669	Performance problem - short triangle
100453-01	1073672	Increase 1.5MB DVMA window avail to GT
100456-03	1075220	mcldup doesnt block interrpts causing mbuf
100469-01	1039388	cdrom mount error message
100474-01	1074337	format: ass failure on 1.3G elites on sun4
100475-01	1073234	mmap sys call fails on galaxy causing unex
100484-01	1078167	SCSI driver for micropolis drive produces
100490-01	1080928	nl_langinfor(YESSTR) of libxpg.a caused co
100494-01	1074704	WIDs are freed when cg12 contexts are dest
100494-01	1074822	munmap'ing ctl register page clobbers shme
100495-01	1074424	sybase datasrvr crashes 4m (ER) - xc_atten
100505-01	1078521	Zero length directories can be left when
100507-01	1038651	Using tmpfs ie ram /tmp can cause data ini
100511-01	1082046	SunDiag cg6test failed on seg violation
100516-01	1077539	increase HEAPBYTES
100520-01	1031907	cron dies when daylight time starts, stop
100521-01	1080702	4/75GT crash when executing screenload ...
100534-01	1083022	nettest dies w Seg Violation on 4.1.2FCS
100536-01	1066287	nfs hang when looking at lg file changed on
100537-01	1069770	swapper hangs waitng fr pg of u-area to co
100537-01	1073679	async i/o peaks can hang system (gen)

Patch#	Bug#	Description
100539-01	1085014	umount of busy hsfs fs succeeds causing pa
100542-03	1063059	ipi driver doesn't return err
100542-03	1077801	galaxy with cg6+presto crashes on ipi
100547-01	1079876	fputest kvm_open failed
100569-01	1072183	gttest takes too lng to rpt Firmware fail
100569-01	1083997	mouse freezes running OW3.0 apps on GT
100570-01	1085043	net jammed" messages annoy the user
100575-02	1080798	IPI runs slower on a 4/670 then a 4/470
100591-01	1089381	nimp_ins trap trashes %g[123] on MP systems
100597-01	1075751	VME dropped INT_ACK cycle
100618-01	1074668	kernel panics when running sunvision 1.1
100636-01	1082229	fork creates duplicate PIDs
100642-01	1089250	TLI hangs running on Sun-MP 4/690 running 4.1.2
100654-01	1090369	It takes a long time to terminate a big process.

SunOS 4.1.3 patches in Solbourne OS/MP 4.1C

Patch#	Description
100075-11	rpc.lockd jumbo patch
100170-10	jumbo patch to fix various ld problems
100173-10	NFS Jumbo Patch
100178-08	inetd "broken server detection" breaks on fast machines
100224-06	program "mail" "rmail" problem in delivering mail; mail signal handlers cause recursing buss errors
100249-08	automounter jumbo patch
100283-03	in.routed mishandles gateways, multiple
100296-04	netgroup exports to world
100305-13	lpr Jumbo Patch
100338-05	system crashes with assertion failed panic
100342-03	NIS client needs long recovery time if server reboots
100347-03	panic's when using fifo's (named pipes) under load
100359-06	streams jumbo patch
100372-02	tfs and c2 do not work together
100383-06	rdist security and hard links enhancement
100407-07	accounting jumbo patch
100412-02	applications bind to same port if IP address supplied
100458-03	Setitimer sometimes fails to deliver
100468-03	rcp/rsh should use setsockopt to detect failed connection rsh uses old-style selects instead of 4.0 selects.
100482-04	ypserv and ypxfrd fix, plus DNS fix
100496-02	ptrace panic with a memory fault
100507-04	tmpfs jumbo patch
100513-02	Jumbo tty patch
100557-03	ftp Jumbo patch
100564-05	C2 Jumbo patch
100567-04	mfree panic due to mbuf being freed twice, icmp redirects can be used to make a host drop connections
100584-03	system freezes using loopback interface, BSD4.2 keepalive
100623-03	UFS Jumbo Patch
100631-01	environment variables can be used to exploit login
100645-01	swapon with very large swap files hangs, systems temporarily hangs while a large process exits
100650-02	permission denied"
100666-02	bad rmfree
100671-02	TLI causes application program to hang, and TLI subsystem does not handle certain IOCTL calls.
100684-02	RFS server patch
100689-01	large processes hang in "disk wait" when they're trying to grow their data size with brk(2)
100783-01	ptrace panic with a memory fault
100804-01	TCP "reset"s can cause an mbuf leak, resulting in mbuf map full
100813-01	memory leak in parser generated by yacc
100815-01	point patch for uucp with callback option
100909-01	syslog messages get confusing because it does not specify which machine sent it.
100937-01	NULL CLIENT
100965-01	quota exceeded console messages misleading
100972-01	"at" jobs are not running; job files are being over-written.
100988-01	Synopsis: UFS File system Corruption and panic patch
101070-01	tbl may dump core on sun-4; ok on sun-3.
101073-01	vacation(1) does not recognize aliases of the type firstname.lastname.
101080-01	security problem with expreserve

Installing OS/MP 4.1C on a Standalone System

The OS/MP 4.1C software tape is a full installation media that allows you to update from a previous release, change the size of partitions on the root disk, add a disk to a previously diskless system, or configure a standalone system.

A standalone system is defined as not being connected to a network in any way. In addition, a standalone system does not provide NFS disk services to clients. It also does not depend on a server for its **root, swap**, or **/usr** filesystems.

Before Installing....

★ ★ ★ CAUTION ★ ★ ★

Perform a full backup before installing OS/MP 4.1C. A complete installation overwrites all information on the disk partitions specified for the root (/), swap, /usr, /var, and /tmp filesystems.

Before installing the release tape you must clean the tape drive on the host machine. Failure to do so may result in damage to the release tape.

With OS/MP 4.1C, the **preinstall** utility is available to help determine which system files should be restored or merged from backup. **preinstall** shows which files in system directories were modified after you last installed the OS version you're currently running.

If you do not want to use **preinstall**, skip to the section *Installing* below.

Installing preinstall

Because **preinstall** was not included in versions of OS/MP prior to 4.1C, it is necessary to install it before proceeding to install OS/MP 4.1C.

When using a local tape drive, install **preinstall** using the following commands:

```
# mt -f /dev/nrst0 asf 5
# cd /usr/etc
# tar xpf /dev/nrst0
```

★ ★ ★ NOTE ★ ★ ★

Some older versions of SunOS do not support the 'asf' request for **mt**. *If this is the case for your tape host, first substitute 'rew' for 'asf 5' in the above example, and then re-execute* **mt** *with 'fsf 5' instead of 'rew'.*

When using a local CD-ROM drive, install **preinstall** using the following commands:

```
# mkdir /cdrom
# mount /dev/sr0 /cdrom
# cd /usr/etc
# tar xpf /cdrom/Tools.tar
```

Using preinstall

After **preinstall** has been installed, it is located in **/usr/etc**. The usage of **preinstall** is as follows:

/usr/etc/preinstall [**-l**] [**-c** mmddhhmm[yy]]

The **preinstall** command is used to look for files that should be saved prior to doing a full install of a new version of OS/MP. It looks on the system partitions (root(/), **/usr**, and **/var**) for files which have been modified after the date of the last full install of OS/MP (or, if given a cutoff date, files modified after that date).

preinstall is normally used just before installing a new version of OS/MP to determine what system-related files should be backed up. Then, after installing the new version of OS/MP, you can merge or restore these files into the newly-installed system.

Some files, such as **/etc/fstab**, can typically be re-used without modification. Others, such as kernel configuration files in **/usr/kvm/sys/*/conf**, must be hand-merged into the new version of the OS with careful consideration of how the new OS version differs from the old.

Certain files are excluded from the output which are newer than the cutoff date. These files are normally updated by system operation and do not need to be backed up. Examples of excluded files are: **/etc/mtab**, the **/var/sadm** accounting files, the **/tmp_mnt** automounter directories, and patched kernel object files in **/usr/kvm/sys/*/OBJ**. By default, the cutoff date used is the modification date of the file **/etc/sys_conf/system-configured**, which is touched the first time you boot a new version of the OS after a full install. You may want to use some other cutoff date with the **-c** option if the current OS was installed in some non-standard way.

By default, the files and directories newer than the cutoff date are listed to standard output by name, one per line. By using the **-l** option, the output is in long form (as from the **-ls** option to **find**), showing the type, date, and size of each file.

The following options are accepted by **preinstall**:

- The **-l** option presents the output in long form, showing inode number, size in kilobytes (1024 bytes), protection mode, number of hard links, user, group, size in bytes, and modification time. If the file is a special file the size field will instead contain the major and minor device numbers. If the file is a symbolic link the pathname of the linked-to file is printed preceded by '->'. The format is identical to that of **find -ls**.
- The **-c** option specifies to use the given cutoff date to decide which files to print, rather than the date of the file **/etc/sys_conf/system-configured**. The cutoff date format is **-c** mmddhhmm[yy], with month, day, hour, minute, and optional year in numeric form. This is the same format as for **/usr/5bin/touch**.

Installing

Loading the ramdisk image is your first step. The ramdisk image is a special UNIX operating system kernel with a built-in RAM disk that contains the installation software. The command to load the ramdisk depends on the type of system. Follow the instructions for your system type.

Installing on a Series5, Series5E or Series6:

Loading the Ramdisk

Turn the system on. After the system passes the self-tests, the system displays the bootROM prompt.

Loading the Ramdisk via a Local Tape Drive

Ramdisk installation software uses the value of the bootROM variable **INSTALLED** to determine if a system needs to have the basic operating system installed. Set the value of this variable to 0 before loading the ramdisk:

```
ROM> setenv installed 0
```

The system asks if you want to re-install if **INSTALLED** is not 0.

The variable *TapeID* shown in the commands below should be replaced with the SCSI ID of the tape drive to be used. For st0, use 4; for st1, use 5.

To load the ramdisk on Series5 or 5E systems, enter a boot command of the following form:

```
ROM> boot st.si(,TapeID,2)
```

To load the ramdisk on Series6 systems, enter a boot command of the following form:

```
ROM> boot st.si(,TapeID,3)
```

The Series6 bootROM copies the ramdisk image into memory and boots it:

```
Boot: st.si(,4,3)
Entry: 0xfd080000
Size: 00xea000+0x43b878+0x3a9f0
```

The system displays spinner while it is copying the ramdisk into memory. When the copy completes, there is a pause of up to three minutes.

Loading the Ramdisk via a Local CD-ROM Drive

Power on the system. After the system passes the self-tests, the bootROM prompt is displayed.

Ramdisk installation software uses the value of the bootROM variable **INSTALLED** to determine if a system needs to have the basic operating system installed. Set the value of this variable to 0 before loading the ramdisk:

```
ROM> setenv installed 0
```

The system will ask if you want to re-install if **INSTALLED** is not 0.

Install the OS/MP 4.1C CD-ROM disk into the CD-ROM drive.

★ ★ ★ NOTE ★ ★ ★

In order to boot from the local CD-ROM disk, the bootROMs must be at version 3.5 or higher.

To load the ramdisk on Series5, and Series5E systems, using a local CD-ROM drive, enter a boot command of the following form:

```
ROM> boot sd.si(,6,)/Install.Series5
```

To load the ramdisk on Series6 systems, using a local CD-ROM drive, enter a boot command of the following form:

```
ROM> boot sd.si(,6,)/Install.Series6
```

The bootROM copies the ramdisk image into memory and boots it:

```
Boot: sd.si(,6,)/Install.Series6
Entry: 0xfd080000
Size: 00xea000+0x43b8b8+0x309a8
```

A spinner (oscillating long-dash line) is displayed while copying the ramdisk into memory. When the copy completes, there is a pause of up to three minutes.

Diskful Installation

When the ramdisk is booted, it first determines what sort of terminal is being used. If it is a serial terminal, that is, a terminal attached to the **ttya/ttyb** port, or if the bootROM variable **CONSOLE** is not set, the system displays a list of supported terminals:

```
1) 610
2) ansi
3) hp
4) sun
5) tvi912
6) vt100
7) wyse50
What type of terminal are you using ('1'..'7')?
```

If you are using a frame-buffer, select the 4, the sun terminal type.

```
What type of terminal are you using ('1'..'7')? 4
```

If the value of the bootROM variable **INSTALLED** is non-zero, the mandatory system software has already been installed. In that case, the system displays the following:

```
THIS SYSTEM IS ALREADY INSTALLED


Do you want to re-install the system ('yes', 'no', or '?'
for help)?
```

The above message is for the benefit of users intending to re-install the system software, but have not reset the **INSTALLED** environment variable, as described previously.

If the message appears, enter **yes** to re-install the mandatory system software, or **no** to continue installing software without re-installing mandatory OS/MP.

The disk drives attached to the system are then scanned, and a menu of procedures is displayed:

```
Ramdisk


 1) Change Disk Partitioning
 2) Install Software
 3) Invoke a Bourne Shell
 4) Reboot System
 5) Halt System
Enter number of function to execute ('1'..'5', or '?' for
help):
```

The provided functions are described below:

Change Disk Partitioning - Allows changing the sizes of disk partitions, and where those partitions are to be used for, filesystem space, swap space, or unused space. Refer to the section titled "Changing Disk Partitioning".

★ ★ ★ NOTE ★ ★ ★

If changes are going to be made to the disk partitions on which OS/MP 4.1C will reside, the changes must be made before installing software. Disk partitions not containing OS/MP 4.1C can be modified before or after the installation.

Install Software - Intended primarily for installing new systems. If system software has already been installed, then this option may be used to install any Solbourne software distribution, such as X Windows.

Invoke a Bourne Shell - Starts an interactive Bourne shell. This option is provided mainly for formatting disks and restoring filesystems. The sizes of disk partitions should not be changed here with the format(8) command. If they are, you must then select `Change Disk Partitioning` before attempting to `Install Software`.

Reboot System - Starts the UNIX operating system after software installation. Alternatively, you may reload the ramdisk from scratch.

Halt System - Returns control of the system to the bootROM.

You can request help at any ramdisk prompt by entering a question mark. Table 14 shows the edit commands available when you are entering text in response to prompts:

Table 14. Input Editing Commands

Character	Interpretation
backspace (^H)	delete last input character
delete (^?)	delete last input character
^U	erase input line
^R	redisplay input line
^W	delete input up to '/' or whitespace
^C	cancel input, returning to nearest menu
ESC	cancel input, returning to nearest menu
^L	redisplay entire screen
return (^M)	end input
newline (^J)	end input

If a string is too long to be displayed in the available space, the beginning of the string is displayed as ''. . .''. This allows display of the end of the string, which is usually of more interest.

Keywords can be shortened to any unique prefix (such as 'co' for 'continue'), except for 'yes' and 'no', which must always be spelled out.

Fatal errors during software installation are usually reported by messages beginning with `System error` or `Internal error` and ending with a ''#'' prompt. If a fatal error occurs, software installation may be restarted by entering:

```
# ^Jstty sane^J
# cd /
# rm -f /core
# inst_sys
```

where ^J is the linefeed character. The command **stty sane** may not be echoed (and is intended to fix exactly that problem). In the event of a fatal error during software installation, please report the problem to Solbourne customer support.

Install Software

Installing software has two distinct stages: gathering information and modifying the system. No permanent changes are made to the system until all information has been gathered.

The system uses three informational menus to gather the necessary information:

- Standard Filesystem Definition - specifies where the standard filesystems (**root** (/), **swap**, and **/usr**, optionally **/var** and **/tmp**) are located.
- Installation Media Identification - Determines the installation media from which to install (tape, CD-ROM, or network directory), and determines where that media is located.
- Package Selection - allows selecting of which optional software packages are to be installed.

All three menus provide the command **cancel**. The first two also provide the command **previous**. These commands allow you to return to prior menus, optionally discarding any changes that have been made.

cancel always returns to the ramdisk menu. If changes are to be discarded, then all changes made since `Install Software` was selected are forgotten.

previous always returns to the previous menu (which is the ramdisk menu, in the case of the Filesystem Definition menu). The changes discarded in this case are those made in the menu you are leaving.

cancel has higher priority than **previous**. In other words, if you use **previous** to leave a menu without discarding changes, then **cancel** from that menu and discard changes, the changes made in the earlier menu are also discarded.

Standard Filesystem Definition

The Standard Filesystem Definition Menu defines where the mandatory filesystems are located.

Any changes made to the standard filesystems with the partition tool appear in this menu.

Normally, no changes need to be made at this menu. To proceed to the Media Identification Menu, enter '**`continue`**'.

The following steps assign the **/var** filesystem to **sd0d**, rather than using the default of **/var** being a subdirectory of the root filesystem.

These steps are optional. If followed, the result is a filesystem definition that is the same as that supplied on the factory installation of a diskful system. In addition, it makes use of partition **d**, thus using 9.3 MB of disk space that is not used when the default disk partition is used with the standard filesystem definition.

In Figure 1, the notation "(required)" appears next to the **root(/)**, **swap** and **/usr** filesystems. These filesystems must be defined; however, they may be placed on any partition of any disk.

To modify the **/var** filesystem, enter the number: **4**.

```
Enter number of filesystem to change ('1'..'5'), 'continue',
'previous', 'cancel' or '?' for help: 4
```

```
                    Standard Filesystem Definition

  1) root on sd0a      (required)
  2) swap on sd0b      (required)
  3) /usr on sd0g      (required)
  4) /var on root partition
  5) /tmp on root partition

                      Disk Partitions (sizes in MB)
       (a)    (b)      (c)     (d)     (e)     (f)     (g)     (h)
sd0:   8.4    32.4     191.1   9.3     ---     ---     141.1   ---
sd1:   8.4    32.7     190.9   9.6     ---     ---     140.8   ---



Enter number of filesystem to change ('1'..'5'), 'continue', 'previous',
'cancel', or '?' for help:
```

Figure 1. Sample Standard Filesystem Definition Menu

The var menu will be highlighted, and the system will request a disk partition. Assign it to sd0d.

```
Enter name of disk partition or host:path for /var
filesystem, 'none', ^C, or'?' for help: sd0d
```

The new arrangement is displayed as shown in Figure 2.

Once all changes for the standard filesystems have been made, enter **continue** to proceed to the Installation Media Identification Menu.

```
Enter number of filesystem to change ('1'..'5'), 'continue',
'previous', 'cancel', or '?' for help: continue
```

Installation Media Identification Menu

The Installation Media Identification menu specifies the location of the media which will be used during the installation.

Figure 3 shows the Installation Media Identification menu of a machine that was booted from a local tape device st0 (SCSI address 4).

Installation may take place from Tape or CD-ROM. Each of these installations are discussed below.

```
                    Standard Filesystem Definition

  1) root on sd0a      (required)
  2) swap on sd0b      (required)
  3) /usr on sd0g      (required)
  4) /var on sd0d
  5) /tmp on root partition

                    Disk Partitions (sizes in MB)
       (a)    (b)      (c)     (d)     (e)     (f)     (g)     (h)
sd0:   8.4   32.4     191.1    9.3     ---     ---     141.1   ---
sd1:   8.4   32.7     190.9    9.6     ---     ---     140.8   ---



Enter number of filesystem to change ('1'..'5'), 'continue', 'previous',
'cancel', or '?' for help:
```

Figure 2. Modified Standard Filesystem Definition Menu

```
                    Installation Media Identification

1) Installation media type = Tape
2) Tape drive = /dev/nrst0
3) Local Internet address = 0.0.0.0 (required for remote tape)
4) Network broadcast mask = 0xffff0000 (required for remote tape)
5) Tape host = localhost (127.0.0.1)









Enter selection number ('1'..'5'), 'continue', 'previous', 'cancel', or '?'for
help:
```

Figure 3. Installation Media Identification Menu - Local Tapehost

Tape Installation

Installing from a local tape drive requires that the *Tape drive* field be set to either **st0** or **st1** (the only supported tape drives) and that *Tape host* be set to '**localhost**'. The Installation media type must also be set to '**Tape**'.

Local CD-ROM Installation

- Installing from a local CD-ROM disk drive requires that the Installation media type be set to **CD-ROM**, the CD-ROM drive field be set to **/dev/sr0** (**/dev/sr1** if installing from **sv2** on a Cougar controller) and the *CD host* field be set to '**localhost**'. Figure 4 shows the Installation media type menu with the CD-ROM parameters set to install from CD-ROM.

```
                    Installation Media Identification

1) Installation media type = CD-ROM
2) CD drive = /dev/sr0
3) Local Internet address = 0.0.0.0 (required for remote tape)
4) Network broadcast mask = 0xffff0000 (required for remote tape)
5) CD host = localhost (127.0.0.1)









Enter selection number ('1'..'5'), 'continue', 'previous', 'cancel', or '?'for
help:
```

Figure 4. Installation Media Identification Menu - Local CD-ROM

When the details of the media have been entered correctly, enter **continue**. You will be presented with the Package Selection Menu. If the operating system has already been installed, you will be prompted to insert the optional software distribution media.

Package Selection Menu

Use the Package Selection Menu to install optional Solbourne software distributions. It provides a menu-driven method of examining the components of the distribution tape, selecting the parts to be installed, and specifying the directories where the components will be located.

The components of a distribution are referred to as **packages**. Some examples of packages are **FORTRAN 1.4, X Windows**, and **Solbourne OS/MP Optional Software**. Packages contain one or more *modules*, which are groups of logically-related files, such as executables or libraries. Most packages also have *variables*, which have two uses: controlling the actions of installation commands associated with the package, and prefixing where modules are to be installed.

A single package, Solbourne OS/MP Optional Software, is included on the OS/MP 4.1C distribution tape. The following display shown in Figure 5 appears; the values shown for `Size` in this and subsequent displays may vary.

```
                        Package Selection

                  Mandatory Software Will Be Installed

Package Name                                  Size(KB)       Install

1) Solbourne OS/MP 4.1C Optional Software      34832             n




Enter number of package to examine ('1'..'1'), 'cancel', 'install', or '?'
for help:
```

Figure 5. Package Selection Menu

The message `Mandatory Software Will Be Installed` indicates that the standard filesystems will be built from scratch (overwriting any old contents) when the **`install`** command is issued. If this message does not appear, only the packages selected in this menu will be installed.

The Optional Software package contains a set of software modules that have historically been installed as part of **/usr**. These modules are not necessary for the basic operation of the system, and have been provided separately so that **/usr** may be kept as small as possible. To examine the modules available, select the Optional Software package:

```
Enter number of package to examine ('1'..'1'), 'cancel',
'install', or '?' for help: 1

Should the Solbourne OS/MP 4.1C Optional Software package
be installed ('yes', 'no', ^C, or '?' for help)? yes
```

The "`Should the Solbourne OS/MP 4.1C Optional Software package be installed`" question refers to the entire package in general. The modules are individually selected for installation on the customization screen, and by default all are selected for installation.

After replying **`yes`**, the customization menu appears as shown in Figure 6.

★ ★ ★ NOTE ★ ★ ★

Figure 6 is only an example. The Free KB reported varies depending on the type and size of disk drive installed.

```
          Customization of Solbourne OS/MP 4.1C Optional Software

                                Software Modules
 Module          Size(KB)       Install     Directory      Free(KB)
 1) DEBUGGING        2888           y           /usr           58695
 2) GAMES            3136           y           /usr           58695
 3) MANUAL           6992           y           /usr           58695
 4) NETWORKING       1096           y           /usr           58695
 5) PLOT             1784           y           /usr           58695
 6) SECURITY          320           y           /usr           58695
 7) SV_PROG          1848           y           /usr           58695
 8) SV_USER          3144           y           /usr           58695
 9) SYSTEM_V         3992           y           /usr           58695
10) TEXT              728           y           /usr           58695
11) VERSATEC         5960           y           /usr           58695
12) UUCP              608           y           /usr           58695
13) RFS               912           y           /usr           58695
14) SHLIB            1376           y           /usr           58695
15) TLI                48           y           /usr           58695

Enter number of module to modify ('1'..'15'), 'continue', 'abort', or '?' for
help:
```

Figure 6. Package Selection Customization Menu

The size of each module in kilobytes is listed immediately to the right of the module's name. The column after the size indicates whether or not the module is currently marked for installation. If the module is to be installed, the directory that the module's files are to be installed in is listed, followed by the free space on the partition that the directory refers to.

Below are short descriptions of the individual modules:

DEBUGGING - program debugging aids
This module contains the debugging tool **dbx**(1) and the profiled versions of the standard libraries libc, libcurses, libm, libtermcap, libtermlib, libsuntool, and libsunwindow.

GAMES - games and demonstration programs
The recreational programs listed in Section 6 of the *UNIX User's Reference Manual.*

MANUAL - on-line manual pages
Sections 1 through 8 of the *UNIX User's and Programmer's Manuals* in machine-readable form. See **man**(1), **lookup**(1), and **qref**(1) for more details. This option requires that the TEXT option also be installed.

NETWORKING - network utilities
Utilities and commands that access a network, such as **rcp**(1) or **ftp**(1). This module is required on systems that are connected to a network, or that will use the NIS/YP database services.

PLOT - basic plot-generating applications
The standard UNIX plotting utilities, which allow the creation of plots and graphs from simple data to be displayed on a variety of plotters and graphics terminals. See **plot**(1G) and **graph**(1G).

SECURITY - C2 security
The SECURITY module provides features such as audit trails and shadow password files in the spirit of the Department of Defense's C2 Security Specification (the "Orange Book"). The compliance of these features has not been certified.

SV_PROG - SunView program development support
Include files and libraries needed for compiling SunView applications. This module requires that SV_USER also be installed.

SV_USER - basic SunView support
The SunView windowing system and associated applications (such as **suntools**(1) and **shelltool**(1)). This module is not required if only X Windows will be used on the system.

SYSTEM_V
System V-compatible libraries and executables. System VR3, POSIX, and X/OPEN are supported. See **svidii**(7v), **svidiii**(7v), **xopen**(7v), and **posix**(7v) for details.

TEXT - nroff/troff text processing
This module provides the text formatter **troff**(1) and its associated support programs and files. This option is required if the MANUAL option is installed.

VERSATEC - Versatec printer support
Various utilities specific to Versatec printers, i.e. **vtroff**(1) and **vplot**(1G).

UUCP - uucp applications suite
uucp(1C) and its support programs. These are normally used for communicating to other UNIX systems via phone line.

RFS
Utilities and libraries to support the System V Remote File System.

SHLIB
Position-independent versions of the BSD and System-V versions of the C library. These are provided to allow substituting or adding a module to the shared C library.

TLI
Libraries and headers to support developing programs that take advantage of the System V Transport Layer Interface.

Modifying a module allows selecting whether or not it is to be installed and, if so, the directory its files are to be extracted into.

★ ★ ★ NOTE ★ ★ ★

All modules are intended to be extracted into their default directory. If a module is extracted somewhere else, there is no guarantee that the programs provided in the module will work.

For example, if you didn't want to install the VERSATEC module:

```
Enter number of module to modify ('1'..'15'), 'continue',
'abort', or '?' for help: 11
```

The VERSATEC menu entry is highlighted, and:

```
Modifying the Versatec printer support module
Should the VERSATEC module be installed ('yes', 'no', ^C,
or '?' for help)? no
```

Figure 7 shows the updated display:

★ ★ ★ NOTE ★ ★ ★

The free space for **/usr** *has been increased by the size of the VERSATEC module as shown in Figure 7.*

To install the GAMES module in **/fun** (on the root partition):

```
Enter number of module to modify ('1'..'13'), 'continue',
'abort', or '?' for help: 2
```

```
        Customization of Solbourne OS/MP 4.1C Optional Software

                                Software Modules
 Module          Size(KB)       Install     Directory      Free(KB)
 1) DEBUGGING        2888           y           /usr           64655
 2) GAMES            3136           y           /usr           64655
 3) MANUAL           6992           y           /usr           64655
 4) NETWORKING       1096           y           /usr           64655
 5) PLOT             1784           y           /usr           64655
 6) SECURITY          320           y           /usr           64655
 7) SV_PROG          1848           y           /usr           64655
 8) SV_USER          3144           y           /usr           64655
 9) SYSTEM_V         3992           y           /usr           64655
10) TEXT              728           y           /usr           64655
11) VERSATEC         5960           n
12) UUCP              608           y           /usr           64655
13) RFS               912           y           /usr           64655
14) SHLIB            1376           y           /usr           64655
15) TLI                48           y           /usr           64655

Enter number of module to modify ('1'..'15'), 'continue', 'abort', or '?' for
help:
```

Figure 7. Package Selection Menu - Deletion of Versatec Module

The GAMES menu entry is highlighted, and

```
Modifying the games and demonstration programs module

Should the GAMES module be installed ('yes', 'no', ^C, or
'?' for help)? yes

Install GAMES in what directory? /fun

/fun does not exist. Create it during installation ('yes',
'no', ^C, or '?' for help)? yes
```

The menu is updated to reflect the change, as shown in Figure 8.

★ ★ ★ NOTE ★ ★ ★

The free space for **/usr** *changes, and a completely new size (for* **/fun***) is also displayed as shown in Figure 8.*

If you decide to discard all changes made to the modules, use the command '**abort**'. This returns to the Package Selection Menu.

If you are satisfied with the changes (if any) made to the modules, enter the command '**continue**'. This will record the changes and return to the Package Selection Menu.

When you have completed package customization, (which may mean you didn't select any packages for installation), enter '**install**' as shown in Figure 9.

```
        Customization of Solbourne OS/MP 4.1C Optional Software

                                  Software Modules
 Module          Size (KB)      Install     Directory     Free (KB)
 1) DEBUGGING         2888          y           /usr          67791
 2) GAMES             3136          y           /fun           4579
 3) MANUAL            6992          y           /usr          67791
 4) NETWORKING        1096          y           /usr          67791
 5) PLOT              1784          y           /usr          67791
 6) SECURITY           320          y           /usr          67791
 7) SV_PROG           1848          y           /usr          67791
 8) SV_USER           3144          y           /usr          67791
 9) SYSTEM_V          3992          y           /usr          67791
10) TEXT               728          y           /usr          67791
11) VERSATEC          5960          n
12) UUCP               608          y           /usr          67791
13) RFS                912          y           /usr          67791
14) SHLIB             1376          y           /usr          67791
15) TLI                 48          y           /usr          67791

Enter number of module to modify ('1'..'15'), 'continue', 'abort', or '?' for
help:
```

Figure 8. Package Selection Menu - Install Games Module to /fun

```
                        Package Selection

                  Mandatory Software Will Be Installed

Package Name                                Size (KB)      Install

1) Solbourne OS/MP 4.1C Optional Software     34832            y




Enter number of package to examine ('1'..'1'), 'cancel', 'install', or '?'
for help: install
```

Figure 9. Package Selection Menu

The actual installation begins at this point, and may require 10 minutes to one hour depending on how much software is being installed.

The steps taken during the installation are:

1. extract miniusr. (This contains the installation software, as well as enabling swapping)
2. create filesystems (**root(/)**, **/usr**, or **/var** or **/tmp**, as well as any new filesystems requested via the partition tool)
3. install mandatory **root** files
4. install mandatory **kvm** files
5. install mandatory **usr** files
6. install optional software

When installation has finished, the ramdisk menu is displayed (see Figure 10). If the installation failed, call Customer Support.

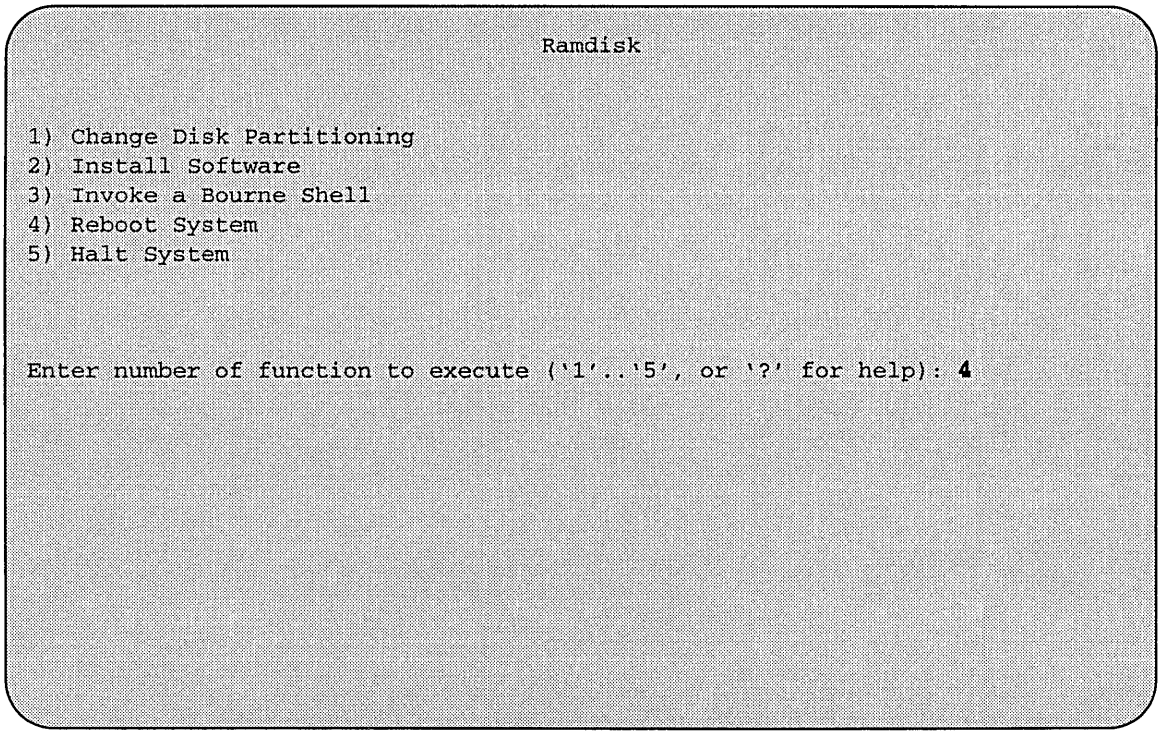


Figure 10. Ramdisk Menu

Rebooting from the Ramdisk

After a successful installation, start UNIX by first rebooting as shown in Figure 10.

Enter number of function to execute ('1'..'5', or '?' for help): **4**

```
                        Reboot System

1) Boot Unix
2) Boot on ramdisk
3) Return to Main Menu


Enter selection number ('1'..'3') or '?' for help: 1
```

Figure 11. Reboot System Menu

At the Reboot System menu select Boot Unix:

```
Enter selection number ('1'..'3') or '?' for help: 1
```

After selecting **1**, there is a short pause, and then:

```
Automatic boot enabled. Type Control-C to abort

ROM> boot

Boot: sd.si(0,0,0)/vmunix

Entry: 0xff060000

Size: 0xd6000+0x33358+0x81548


OS/MP 4.1C_Export (GENERIC/root) #0: Tue Feb 1 15:52:44
1994
Copyright (c) 1989-1994 Sun Microsystems, Inc. and
Solbourne Computer, Inc.
[...]
```

At this point, the system configuration information must be specified.

After Installing...

Initial Boot System Configuration

When a newly installed system is booted multi-user for the first time, the system asks a series of configuration questions:

```
OS/MP 4.1C_Export (GENERIC/root) #0: Tue Feb 1 15:52:44
1994

Copyright (c) 1989-1994 Sun Microsystems, Inc. and
Solbourne Computer, Inc.
[...]

Automatic reboot in progress...
Wed Feb 2 09:22:25 MDT 1994
checking quotas: done.

This system has not yet been configured. Several values
need to be set before the system can come up to multi-user
Unix.

What is this system's name (default = 'Standalone'):
<Return>

What is its Internet address (0 for none, default =
255.255.255.255)? 0 <Return>

What directory should be used for automatic savecore files
('none' for none, default = '/var/crash/standalone')?
<Return>
```

★ ★ ★ NOTE ★ ★ ★

Using the value '0' for the Internet address disables the NIS/YP services.

```
Time zone choices are:
Australia/  GMT+11      GMT-3       GMT6        Mideast/
Brazil/     GMT+12      GMT-4       GMT7        NZ
CET         GMT+13      GMT-5       GMT8        Navajo
CST6CDT     GMT+2       GMT-6       GMT9        PRC
Canada/     GMT+3       GMT-7       Greenwich   PST8PDT
Chile/      GMT+4       GMT-8       HST         Poland
Cuba        GMT+5       GMT-9       Hongkong    ROC
EET         GMT+6       GMT0        Iceland     ROK
EST         GMT+7       GMT1        Iran        Singapore
EST5EDT     GMT+8       GMT10       Israel      Turkey
Egypt       GMT+9       GMT11       Jamaica     UCT
Factory     GMT-0       GMT12       Japan       US/
GB-Eire     GMT-1       GMT13       Libya       UTC
GMT         GMT-10      GMT2        MET         Universal
GMT+0       GMT-11      GMT3        MST         W-SU
GMT+1       GMT-12      GMT4        MST7MDT     WET
GMT+10      GMT-2       GMT5        Mexico/     Zulu

('/' indicates time zone prefixes)

Enter time zone (default = 'US/Mountain'): <Return>

What is today's date (mm/dd/yyyy, default = 2/1/1994)? <Return>
What time is it (24-hour hh:mm, default = 16:55)? <Return>

Current settings are:
 Host name                = standalone
 Internet address         = 0.0.0.0
 Network mask             = 0x00000000
 NIS domain               = none
 Savecore directory       = /var/crash/standalone
 Time zone                = US/Mountain
 Date (m/d/y)             = 2/1/1994
 Time                     = 16:55

Are these correct ('yes' or 'no')?
yes

Setting netmask of ei0 to 255.255.255.0
Tues Feb 1 09:22:25 MDT 1994
Setting password for root
Changing password for root on standalone.
New password:
Retype new password:
Continuing boot
starting rpc and net services: portmap [...]
```

Reconfiguring the System

You may need to reconfigure the system if: (1) wrong value was set during the initial configuration, or (2) the system did not successfully come up to multi-user mode.

If you find that a wrong value was set during configuration, you can modify the appropriate file manually, or reconfigure. Manually correcting the settings should only be done if you are an experienced system administrator. Reconfiguring automatically is fairly straight-forward, as explained in the following procedure.

If the system has hung up during the boot process, press the Reset button.

★ ★ ★ NOTE ★ ★ ★

If automatic boot is enabled it is necessary to interrupt the reboot by typing ^C in the early stages of the reboot; otherwise the system will hang up as before.

Then bring up the system in single-user mode:

```
ROM> boot -s
[...]
```

If the system booted successfully originally, you may instead log in as root:

```
standalone login: root
Password:
```

In either case, if a file exists that tells the system it has been configured, remove it:

```
# rm /etc/sys_conf/system-configured
```

The above file may not exist; this is not a problem. Go ahead to the next step.

Now reboot. If you are in single-user mode, exit:

```
# exit
```

Otherwise, use fastboot:

```
# /etc/fastboot
```

The system asks configuration questions just as it did the first time it booted after being installed.

Installing on a Series S4000

Loading the Ramdisk

Turn the system on. After the system passes the self-tests, the system displays the bootROM prompt.

Loading the Local Ramdisk via a Local Tape Drive

The ramdisk installation software uses the value of the bootROM variable **INSTALLED** to determine if the basic operating system needs to be installed. Set the value of this variable to 0 before loading the ramdisk as follows:

```
ROM> setenv installed 0
```

The system will ask if you want to re-install if **INSTALLED** is not 0.

Install the OS/MP 4.1C distribution tape into the tape drive and enter the **install** command. If there is more than one tape drive, the bootROM asks which tape drive to use. For example:

```
ROM> install
Which type of device do you wish to install from:
1) Tape
2) Network
Enter device type: 1
You have the following tape drives. Please choose one:
1) At Target4, drive name: ARCHIVE VIPER 150 21247-005
2) At Target5, drive name: EXABYTE EXB-8200 251K
Enter device number: 1
```

The bootROM copies the ramdisk image into memory and boots it:

```
Boot: st.si(,4,4)
Entry: 0xfd080000
Size: 0xec000+0x53ab28+0x42ab8
```

The system displays a spinner while copying the ramdisk into memory. When the copy completes, the spinner pauses for up to three minutes.

Loading the Ramdisk via a Local CD-ROM Drive

Turn the system on. After the system passes the self-tests, the bootROM prompt is displayed.

The ramdisk installation software uses the value of the bootROM variable **INSTALLED** to determine if the basic operating system needs to be installed. Set the value of this variable to 0 before loading the ramdisk as follows:

```
ROM> setenv installed 0
```

The system will ask if you want to re-install if **INSTALLED** is not 0.

Install the OS/MP 4.1C CD-ROM disk into the CD-ROM drive.

To load the ramdisk on S4000 systems, using a local CD-ROM drive, enter a boot command of the following form:

```
ROM> boot sd.si(,6,)/Install.S4000
```

The bootROM copies the ramdisk image into memory and boots it:

```
Boot: sd.si(,6,)/Install.S4000
Entry: 0xfd080000
Size: 00xea000+0x43b8b8+0x309a8
```

A spinner is displayed while copying the ramdisk into memory. When the copy completes, there is a pause of up to three minutes.

Diskful Installation

When the ramdisk is booted, it first determines what sort of terminal is being used. If it is a serial terminal, that is, a terminal attached to the **ttya/ttyb** port, or if the bootROM variable **CONSOLE** is not set, a list of supported terminals is displayed as follows:

```
1) 610
2) ansi
3) hp
4) sun
5) tvi912
6) vt100
7) wyse50
What type of terminal are you using ('1'..'7')?
```

If you are using a frame-buffer as the console, select the 4, the sun terminal type.

```
What type of terminal are you using ('1'..'7')? 4
```

If the value of the bootROM variable **INSTALLED** is non-zero, the mandatory system software has already been installed. In that case, the system displays the following:

```
THIS SYSTEM IS ALREADY INSTALLED


Do you want to re-install the system ('yes', 'no', or '?'
for help)?
```

The above message is for the benefit of users intending to re-install the system software, but have not reset the **INSTALLED** environment variable.

If the message appears, enter **yes** to re-install the mandatory system software, or **no** to continue the installation without re-installing it.

The disk drives attached to the system are then scanned, and a menu of procedures is displayed:

```
                              Ramdisk

 1) Change Disk Partitioning

 2) Install Software

 3) Invoke a Bourne Shell

 4) Reboot System

 5) Halt System

Enter number of function to execute ('1'..'5', or '?' for
help):
```

The provided functions are described below:

Change Disk Partitioning - Allows changing sizes of disk partitions, and whether those partitions are for filesystem space, swap space, or unused space.

★ ★ ★ NOTE ★ ★ ★

If changes are going to be made to the disk partitions on which OS/MP 4.1C will reside, the changes must be made before installing software. Disk partitions not containing OS/MP 4.1C can be modified before or after the installation.

Install Software - Intended primarily for installing new systems. If system software has already been installed, then this option may be used to install any Solbourne software distribution, such as X Windows. Refer to the section, "Software Installation from the Ramdisk," for more information.

Invoke a Bourne Shell - Starts an interactive Bourne shell. This option is provided mainly for formatting disks and restoring filesystems. The sizes of disk partitions should not be changed here with the format(8) command. If they are, you must then select `'Change Disk Partitioning'` before attempting to `'Install Software'`.

Reboot System - Starts UNIX after software installation. Alternatively, you may reload the ramdisk from scratch.

Halt System - Returns control of the system to the bootROM.

Help may be requested at any ramdisk prompt by entering a question mark by itself. Table 15 shows edit commands available when entering text in response to prompts:

Table 15. Input Editing Commands

Character	Interpretation
backspace (^H)	delete last input character
delete (^?)	delete last input character
^U	erase input line
^R	redisplay input line
^W	delete input up to '/' or whitespace
^C	cancel input, returning to nearest menu
ESC	cancel input, returning to nearest menu
^L	redisplay entire screen
return (^M)	end input
newline (^J)	end input

If a string is too long to be displayed in the available space, the beginning of the string is displayed as "...". This allows display of the end of the string, which is usually of more interest.

Keywords can be shortened to any unique prefix (such as 'co' for 'continue'), except for 'yes' and 'no', which must always be spelled out.

Fatal errors during software installation are usually reported by messages beginning with `System error` or `Internal error` and ending with a "#" prompt. If a fatal error occurs, software installation may be restarted by entering:

```
# ^Jstty sane^J
# cd /
# rm -f /core
# inst_sys
```

where ^J is the linefeed character. The command **stty sane** may not be echoed (and is intended to fix exactly that problem). In the event of a fatal error during software installation, please report the problem to Solbourne customer support.

Software Installation from the Ramdisk

Installing software has two distinct stages: gathering information and modifying the system. No permanent changes are made to the system until all information has been gathered.

The system uses three informational menus to gather the necessary information:

- Standard Filesystem Definition - specifies where the standard filesystems (**root** (/), **swap**, and **/usr**, optionally **/var** and **/tmp**) are located.
- Installation Media Identification - Determines the installation media from which to install (tape, CD-ROM, or network directory), and determines where that media is located.
- Package Selection - allows selecting of which optional software packages are to be installed.

All three menus provide the command **cancel**. The first two also provide the command **previous**. These commands allow you to return to prior menus, optionally discarding any changes that have been made.

cancel always returns to the ramdisk menu. If changes are to be discarded, then all changes made since `Install Software` was selected are forgotten.

previous always returns to the previous menu (which is the ramdisk menu, in the case of the Filesystem Definition menu). The changes discarded in this case are those made in the menu you are leaving.

cancel has higher priority than **previous**. In other words, if you use **previous** to leave a menu without discarding changes, then **cancel** from that menu and discard changes, the changes made in the earlier menu are also discarded.

Standard Filesystem Definition

The Standard Filesystem Definition menu defines where the mandatory filesystems are located.

Any changes made to the standard filesystems with the partition tool will appear in this menu.

Normally, no changes need to be made at this menu. To proceed to the Media Identification Menu, enter '**continue**'.

Changing an entry at the Standard Filesystem Definition

The following steps assign the **/var** filesystem to **sd0d**, rather than using the default of **/var** being a subdirectory of the root filesystem.

These steps are optional. If followed, the result is a filesystem definition that is the same as that supplied on the factory installation of a diskful system. In addition, it makes use of partition **d**, thus using 9.3 MB of disk space that is not used when the default disk partition is used with the standard filesystem definition.

In Figure 12 shown below, the notation ''(required)'' appears next to the **root(/)**, **swap** and **/usr** filesystems. These filesystems must be defined; however, they may be placed on any partition of any disk.

```
                    Standard Filesystem Definition

  1) root on sd0a      (required)
  2) swap on sd0b      (required)
  3) /usr on sd0g      (required)
  4) /var on root partition
  5) /tmp on root partition

                      Disk Partitions (sizes in MB)
       (a)    (b)      (c)     (d)     (e)     (f)     (g)     (h)
sd0:   8.4   32.4      191.1   9.3     ---     ---     141.1   ---
sd1:   8.4   32.7      190.9   9.6     ---     ---     140.8   ---




Enter number of filesystem to change ('1'..'5'), 'continue', 'previous',
'cancel', or '?' for help:
```

Figure 12. Sample Standard Filesystem Definition Menu

To modify the **/var** filesystem, enter the number **4**.

```
Enter number of filesystem to change ('1'..'5'), 'continue',
'previous', 'cancel' or '?' for help: 4
```

The var menu will be highlighted, and the system will request a disk partition. Assign it to sd0d.

```
Enter name of disk partition or host:path for /var
filesystem, 'none', ^C, or'?' for help: sd0d
```

The new arrangement is displayed as shown in Figure 13.

```
                    Standard Filesystem Definition

  1) root on sd0a      (required)
  2) swap on sd0b      (required)
  3) /usr on sd0g      (required)
  4) /var on sd0d
  5) /tmp on root partition

                      Disk Partitions (sizes in MB)
       (a)    (b)      (c)     (d)     (e)     (f)     (g)     (h)
sd0:   8.4    32.4     191.1   9.3     ---     ---     141.1   ---
sd1:   8.4    32.7     190.9   9.6     ---     ---     140.8   ---




Enter number of filesystem to change ('1'..'5'), 'continue', 'previous',
'cancel', or '?' for help:
```

Figure 13. Modified Standard Filesystem Definition Menu

Once all changes for the standard filesystems have been made, enter **continue** to proceed to the Media Identification Menu:

```
Enter number of filesystem to change ('1'..'5'), 'continue',
'previous', 'cancel', or '?' for help: continue
```

Installation Media Identification Menu

The Installation Media Identification Menu specifies the location of the media which will be used during the installation.

On Series S4000 systems, the default values are determined by how the ramdisk was booted.

Figure 14 shows the Installation Media Identification menu of a S4000 machine that was booted from a local tape device st1 (SCSI address 5).

Installation may take place from Tape or CD-ROM. Each of these installations are discussed below.

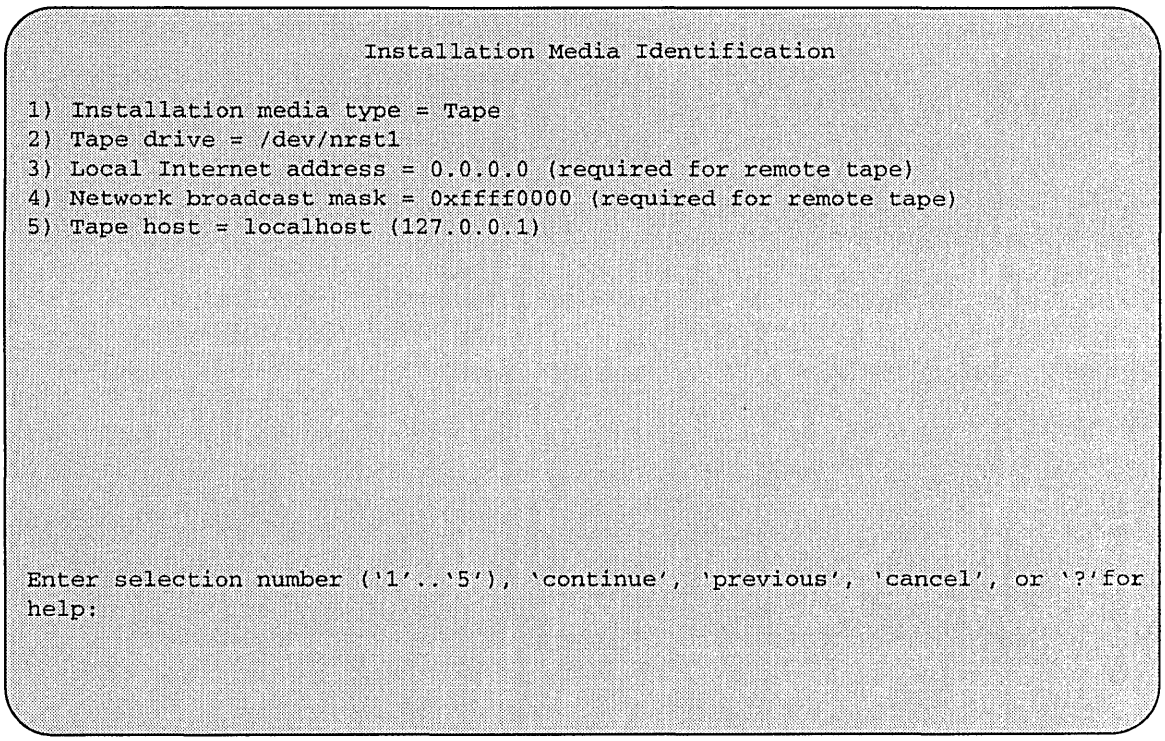


Figure 14. Installation Media Identification Menu - Local Tapehost

Tape Installation

Installing from a local tape drive requires that the *Tape drive* field be set to either **st0** or **st1** (the only supported tape drives) and that *Tape host* be set to '**localhost**'. The Installation media type must also be set to '**Tape**'.

Local CD-ROM Installation

Installing from a local CD-ROM disk drive requires that the Installation media type be set to **CD-ROM**, the CD-ROM drive field be set to **/dev/sr0** and the *CD host* field be set to '**localhost**'. Figure 15 shows the Installation media type menu with the CD-ROM parameters set to install from CD-ROM.

When the details of the media have been entered correctly, enter **continue**. You will be presented with the Package Selection Menu. If the operating system has already been installed, you will be prompted to insert the optional software distribution media.

Package Selection Menu

The Package Selection menu is used to install optional Solbourne software distributions. It provides a menu-driven method of examining the components of the distribution tape, selecting the parts to be installed, and specifying the directories where the components will be located.

The components of a distribution are referred to as **packages**. Some examples of packages are **FORTRAN 1.4, X Windows**, and **Solbourne OS/MP Optional Software**. Packages contain one or more *modules*, which are groups of logically-

```
                    Installation Media Identification

1) Installation media type = CD-ROM
2) CD drive = /dev/sr0
3) Local Internet address = 0.0.0.0 (required for remote tape)
4) Network broadcast mask = 0xffff0000 (required for remote tape)
5) CD host = localhost (127.0.0.1)









Enter selection number ('1'..'5'), 'continue', 'previous', 'cancel', or '?'for
help:
```

Figure 15. Installation Media Identification Menu - Local CD-ROM

related files, such as executables or libraries. Most packages also have *variables*, which have two uses: controlling the actions of installation commands associated with the package, and prefixing where modules are to be installed.

A single package, Solbourne OS/MP Optional Software, is included on the OS/MP 4.1C distribution tape. The following display shown in Figure 16 appears; the values shown for `Size` in this and subsequent displays may vary.

The message `Mandatory Software Will Be Installed` indicates that the standard filesystems will be built from scratch (overwriting any old contents) when the **`install`** command is issued. If this message does not appear, only the packages selected in this menu will be installed.

The Optional Software package contains a set of software modules that have historically been installed as part of **/usr**. These modules are not necessary for the basic operation of the system, and have been provided separately so that **/usr** may be kept as small as possible. To examine the modules available, select the Optional Software package:

```
Enter number of package to examine ('1'..'1'), 'cancel',
'install', or '?' for help: 1

Should the Solbourne OS/MP 4.1C Optional Software package
be installed ('yes', 'no', ^C, or '?' for help)? yes
```

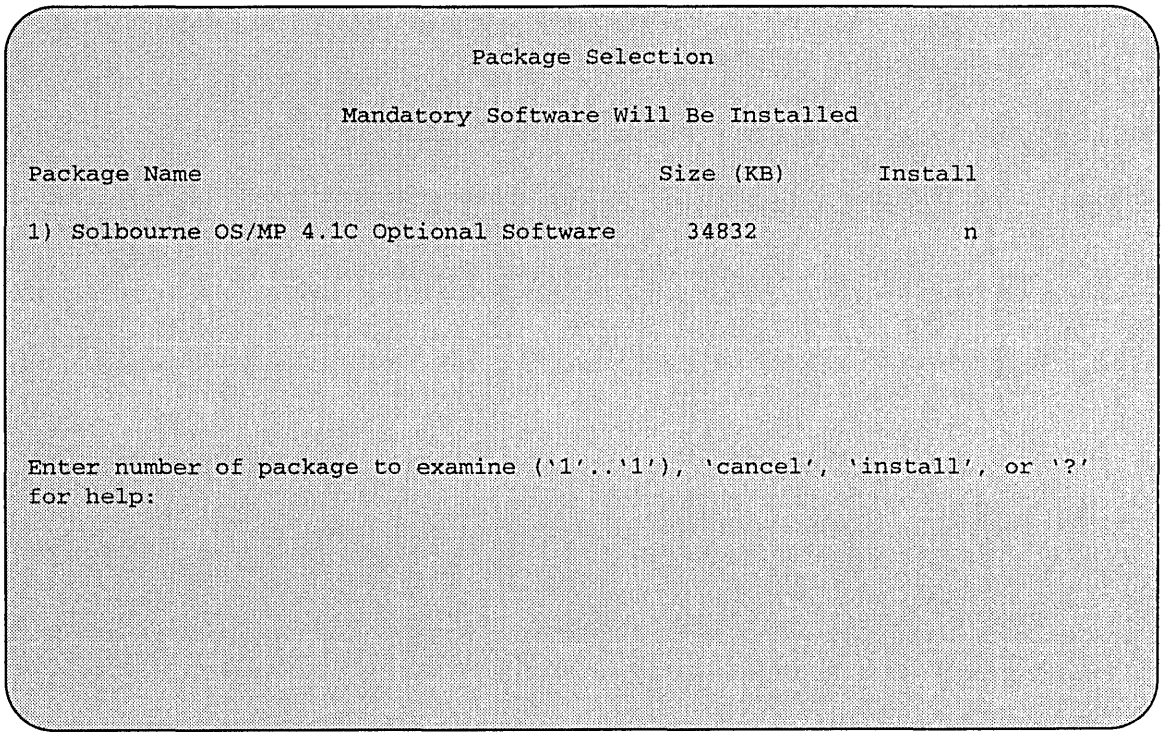


Figure 16. Package Selection Menu

The `Should the Solbourne Optional Software package be installed` question refers to the package in general. The modules are individually selected for installation on the customization screen, and by default all are selected for installation.

After replying **`yes`**, the customization menu will appear as shown in Figure 17.

★ ★ ★ NOTE ★ ★ ★

Figure 17 is only an example. The Free KB reported will vary depending on the type and size of disk drive installed.

The size of each module in kilobytes is listed immediately to the right of the module's name. The column after the size indicates whether or not the module is currently marked for installation. If the module is to be installed, the directory that the module's files are to be installed in is listed, followed by the free space on the partition that the directory refers to.

Below are short descriptions of the individual modules:

DEBUGGING - program debugging aids
This module contains the debugging tool **dbx**(1) and the profiled versions of the standard libraries libc, libcurses, libm, libtermcap, libtermlib, libsuntool, and libsunwindow.

GAMES - games and demonstration programs
The recreational programs listed in Section 6 of the *UNIX User's Reference Manual.*

```
        Customization of Solbourne OS/MP 4.1C Optional Software

                                Software Modules
 Module          Size(KB)      Install     Directory     Free(KB)
 1) DEBUGGING        2888          y          /usr          58695
 2) GAMES            3136          y          /usr          58695
 3) MANUAL           6992          y          /usr          58695
 4) NETWORKING       1096          y          /usr          58695
 5) PLOT             1784          y          /usr          58695
 6) SECURITY          320          y          /usr          58695
 7) SV_PROG          1848          y          /usr          58695
 8) SV_USER          3144          y          /usr          58695
 9) SYSTEM_V         3992          y          /usr          58695
10) TEXT              728          y          /usr          58695
11) VERSATEC         5960          y          /usr          58695
12) UUCP              608          y          /usr          58695
13) RFS               912          y          /usr          58695
14) SHLIB            1376          y          /usr          58695
15) TLI                48          y          /usr          58695

Enter number of module to modify ('1'..'15'), 'continue', 'abort', or '?' for help:
```

Figure 17. Package Selection Customization Menu

MANUAL - on-line manual pages
Sections 1 through 8 of the UNIX User's and Programmer's Manuals in machine-readable form. See **man**(1), **lookup**(1), and **qref**(1) for more details. This option requires that the TEXT option also be installed.

NETWORKING - network utilities
Utilities and commands that access a network, such as **rcp**(1) or **ftp**(1). This module is required on systems that are connected to a network, or that will use the NIS/YP database services.

PLOT - basic plot-generating applications
The standard UNIX plotting utilities, which allow the creation of plots and graphs from simple data to be displayed on a variety of plotters and graphics terminals. See **plot**(1G) and **graph**(1G).

SECURITY - C2 security
The SECURITY module provides features such as audit trails and shadow password files in the spirit of the Department of Defense's C2 Security Specification (the "Orange Book"). The compliance of these features has not been certified.

SV_PROG - SunView program development support
Include files and libraries needed for compiling SunView applications. This module requires that SV_USER also be installed.

SV_USER - basic SunView support
The SunView windowing system and associated applications (such as **suntools**(1) and **shelltool**(1)). This module is not required if only X Windows will be used on the system.

SYSTEM_V
System V-compatible libraries and executables. System VR3, POSIX, and X/OPEN are supported. See **svidii**(7v), **svidiii**(7v), **xopen**(7v), and **posix**(7v) for details.

TEXT - nroff/troff text processing
This module provides the text formatter **troff**(1) and its associated support programs and files. This option is required if the MANUAL option is installed.

VERSATEC - Versatec printer support
Various utilities specific to Versatec printers, i.e. **vtroff**(1) and **vplot**(1G).

UUCP - uucp applications suite
uucp(1C) and its support programs. These are normally used for communicating to other UNIX systems via phone line.

RFS
Utilities and libraries to support the System V Remote File System.

SHLIB
Position-independent versions of the BSD and System-V versions of the C library. These are provided to allow substituting or adding a module to the shared C library.

TLI
Libraries and headers to support developing programs that take advantage of the System V Transport Layer Interface.

Modifying a module allows selecting whether or not it is to be installed and, if so, the directory its files are to be extracted into.

★ ★ ★ NOTE ★ ★ ★

All modules are intended to be extracted in their default directory. If a module is extracted somewhere else, there is no guarantee that the programs provided in the module will work.

For example, to not install the VERSATEC module:

```
Enter number of module to modify ('1'..'15'), 'continue',
'abort', or '?' for help: 11
```

The VERSATEC menu entry is highlighted, and:

```
Modifying the Versatec printer support module
Should the VERSATEC module be installed ('yes', 'no', ^C,
or '?' for help)? no
```

Figure 18 shows the updated display:

```
        Customization of Solbourne OS/MP 4.1C Optional Software

                                Software Modules
 Module          Size(KB)       Install     Directory      Free(KB)
 1) DEBUGGING        2888           y           /usr           64655
 2) GAMES            3136           y           /usr           64655
 3) MANUAL           6992           y           /usr           64655
 4) NETWORKING       1096           y           /usr           64655
 5) PLOT             1784           y           /usr           64655
 6) SECURITY          320           y           /usr           64655
 7) SV_PROG          1848           y           /usr           64655
 8) SV_USER          3144           y           /usr           64655
 9) SYSTEM_V         3992           y           /usr           64655
10) TEXT              728           y           /usr           64655
11) VERSATEC         5960           n
12) UUCP              608           y           /usr           64655
13) RFS               912           y           /usr           64655
14) SHLIB            1376           y           /usr           64655
15) TLI                48           y           /usr           64655

Enter number of module to modify ('1'..'15'), 'continue', 'abort', or '?' for
help:
```

Figure 18. Package Selection Menu - Deletion of Versatec Module

★ ★ ★ NOTE ★ ★ ★

The free space for **/usr** *has been increased by the size of the VERSATEC module as shown in Figure 18.*

To install the GAMES module in **/fun** (on the root partition):

```
Enter number of module to modify ('1'..'13'), 'continue',
'abort', or '?' for help: 2
```

The GAMES menu entry is highlighted, and:

```
Modifying the games and demonstration programs module

Should the GAMES module be installed ('yes', 'no', ^C, or
'?' for help)? yes

Install GAMES in what directory? /fun

/fun does not exist. Create it during installation ('yes',
'no', ^C, or '?' for help)? yes
```

The menu is updated to reflect the change, as shown in Figure 19.

★ ★ ★ NOTE ★ ★ ★

The free space for **/usr** *changes, and a completely new size (for* **/fun***) is also displayed as shown in Figure 19.*

```
          Customization of Solbourne OS/MP 4.1C Optional Software

                                Software Modules
 Module            Size(KB)     Install     Directory      Free(KB)
 1) DEBUGGING          2888         y           /usr           67791
 2) GAMES              3136         y           /fun            4579
 3) MANUAL             6992         y           /usr           67791
 4) NETWORKING         1096         y           /usr           67791
 5) PLOT               1784         y           /usr           67791
 6) SECURITY            320         y           /usr           67791
 7) SV_PROG            1848         y           /usr           67791
 8) SV_USER            3144         y           /usr           67791
 9) SYSTEM_V           3992         y           /usr           67791
10) TEXT                728         y           /usr           67791
11) VERSATEC           5960         n
12) UUCP                608         y           /usr           67791
13) RFS                 912         y           /usr           67791
14) SHLIB              1376         y           /usr           67791
15) TLI                  48         y           /usr           67791

Enter number of module to modify ('1'..'15'), 'continue', 'abort', or '?' for
help:
```

Figure 19. Package Selection Menu - Install Games module to /fun

If you decide to discard all changes made to the modules, use the command '**abort**'. This returns to the Package Selection menu.

If you are satisfied with the changes (if any) made to the modules, enter the command '**continue**'. This will record the changes and return to the Package Selection menu.

When package customization has been completed (which may mean no packages were selected for installation), enter '**install**' as shown in Figure 20.

The actual installation begins at this point, and may require 10 minutes to one hour.

The steps taken during the installation are:

1. extract miniusr. (This contains the installation software, as well as enabling swapping.)
2. create filesystems (**root(/)**, **/usr**, or **/var** or **/tmp**, as well as any new filesystems requested via the partition tool)
3. install mandatory **root** files
4. install mandatory **kvm** files
5. install mandatory **usr** files
6. install optional software

When installation has finished, the ramdisk menu is displayed (see Figure 21). If the installation failed, call Customer Support.

```
                        Package Selection

                Mandatory Software Will Be Installed

Package Name                                Size (KB)       Install

1) Solbourne OS/MP 4.1C Optional Software     34832             y



Enter number of package to examine ('1'..'1'), 'cancel', 'install', or '?'
for help: install
```

Figure 20. Package Selection Menu

```
                              Ramdisk


1) Change Disk Partitioning
2) Install Software
3) Invoke a Bourne Shell
4) Reboot System
5) Halt System


Enter number of function to execute ('1'..'5', or '?' for help): 4
```

Figure 21. Ramdisk Menu

Rebooting from the Ramdisk

After a successful installation, start UNIX by rebooting as show in Figure 22.

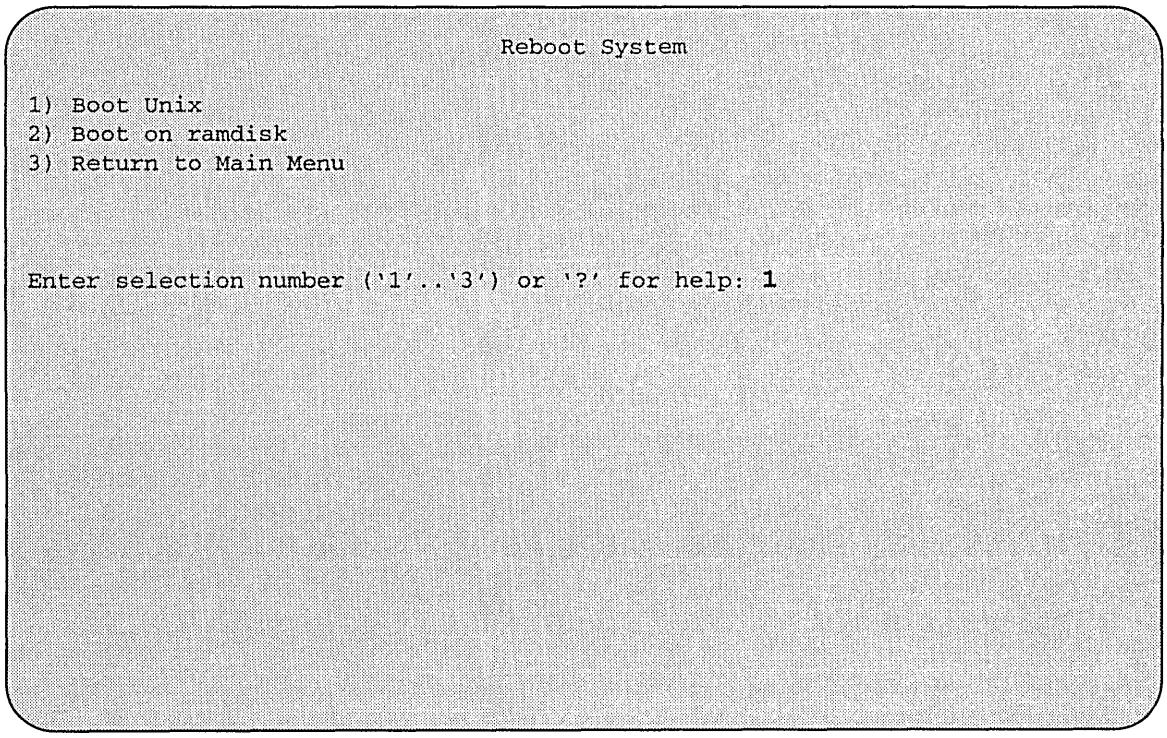


Figure 22. Reboot System Menu

Enter number of function to execute ('1'..'5', or '?' for help): **4**

At the Reboot System menu select Boot Unix:

```
Enter selection number ('1'..'3') or '?' for help: 1
```

After selecting **1**, there is a short pause, and then:

```
Automatic boot enabled. Type Control-C to abort

ROM> boot

Boot: sd.si(0,0,0)/vmunix


Entry: 0xff060000

Size: 0xd6000+0x33358+0x81548


OS/MP 4.1C_Export (GENERIC/root) #0: Tue Feb 1 15:52:44
1994
Copyright (c) 1989-1994 Sun Microsystems, Inc. and
Solbourne Computer, Inc.
[...]
```

At this point, the system configuration information must be specified.

After Installing...

Initial Boot System Configuration

When a newly installed system is booted multi-user for the first time, the system asks a series of configuration questions:

```
OS/MP 4.1C_Export (GENERIC/root) #0: Tue Feb 1 15:52:44
1994

Copyright (c) 1989-1994 Sun Microsystems, Inc. and
Solbourne Computer, Inc.
[...]

Automatic reboot in progress...
Wed Feb 2 09:22:25 MDT 1994
checking quotas: done.

This system has not yet been configured. Several values
need to be set before the system can come up to multi-user
Unix.

What is this system's name (default = 'standalone'):
<Return>

What is its Internet address (0 for none, default =
255.255.255.255)? 0 <Return>

What directory should be used for automatic savecore files
('none' for none, default = '/var/crash/standalone')?
<Return>
```

★ ★ ★ NOTE ★ ★ ★

Using the value '0' for the IP address disables the NIS/YP services.

```
Time zone choices are:
Australia/  GMT+11      GMT-3       GMT6        Mideast/
Brazil/     GMT+12      GMT-4       GMT7        NZ
CET         GMT+13      GMT-5       GMT8        Navajo
CST6CDT     GMT+2       GMT-6       GMT9        PRC
Canada/     GMT+3       GMT-7       Greenwich   PST8PDT
Chile/      GMT+4       GMT-8       HST         Poland
Cuba        GMT+5       GMT-9       Hongkong    ROC
EET         GMT+6       GMT0        Iceland     ROK
EST         GMT+7       GMT1        Iran        Singapore
EST5EDT     GMT+8       GMT10       Israel      Turkey
Egypt       GMT+9       GMT11       Jamaica     UCT
Factory     GMT-0       GMT12       Japan       US/
GB-Eire     GMT-1       GMT13       Libya       UTC
GMT         GMT-10      GMT2        MET         Universal
GMT+0       GMT-11      GMT3        MST         W-SU
GMT+1       GMT-12      GMT4        MST7MDT     WET
GMT+10      GMT-2       GMT5        Mexico/     Zulu

('/' indicates time zone prefixes)

Enter time zone (default = 'US/Mountain'): <Return>

What is today's date (mm/dd/yyyy, default = 2/1/1994)? <Return>
What time is it (24-hour hh:mm, default = 16:55)? <Return>

Current settings are:
 Host name                = standalone
 Internet address         = 0.0.0.0
 Network mask             = 0x00000000
 NIS domain               = Rodent.COM
 Savecore directory       = /var/crash/standalone
 Time zone                = US/Mountain
 Date (m/d/y)             = 2/1/1994
 Time                     = 16:55

Are these correct ('yes' or 'no')?
yes

Setting netmask of ei0 to 255.255.255.0
Teus Feb 1 09:22:25 MDT 1994
Setting password for root
Changing password for root on habitrail.
New password:
Retype new password:
Continuing boot
starting rpc and net services: portmap [...]
```

Reconfiguring the System

You may need to reconfigure the system if: (1) wrong value was set during the initial configuration, or (2) the system did not successfully come up to multi-user mode.

If you find that a wrong value was set during configuration, you can modify the appropriate file manually, or reconfigure. Manually correcting the settings should only be done if you are an experienced system administrator. Reconfiguring automatically is fairly straight-forward, as explained in the following procedure.

If the system has hung up during the boot process, cycle the power off and on.

★ ★ ★ NOTE ★ ★ ★

If automatic boot is enabled it is necessary to interrupt the reboot by typing Control-C in the early stages of the reboot; otherwise the system will hang up as before.

Then bring up the system in single-user mode:

```
ROM> boot -s
[...]
```

If the system booted successfully originally, you may instead log in as root:

```
habitrail login: root
Password:
```

In either case, if a file exists that tells the system it has been configured, remove it:

```
# rm /etc/sys_conf/system-configured
```

The above file may not exist; this is not a problem. Go ahead to the next step.

Now reboot. If you are in single-user mode, exit:

```
# exit
```

Otherwise, use fastboot:

```
# /etc/fastboot
```

The system asks configuration questions just as it did the first time it booted after being installed.

Installing OS/MP 4.1C on a Standalone using reinst_sys

This chapter describes how to install OS/MP 4.1C on a server using the utility, **reinst_sys**, which allows you to upgrade your system with a full installation of the operating system on unused partitions of one or more disks, while remaining in multi-user mode.

A standalone system does not provide NFS disk services to clients. It also does not depend on a server for its **root**, **swap**, or **/usr** filesystems.

The purpose of **reinst_sys** is to minimize downtime by performing a full install of OS/MP onto a new system disk while the system continues to run an earlier version on an old system disk. Once **reinst_sys** is complete, you are free to do whatever local modifications are desirable before booting from the new disk.

For example, you might reconfigure the OS/MP 4.1C kernel or modify files of local interest such as **/etc/printcap**. Only when the new system disk is ready to run do you need to halt the old system and reboot from the new disk.

Finally, unlike earlier full install releases, **reinst_sys** makes it possible to fall back to the earlier version of OS/MP if there turns out to be some problem with the way you set up the new system. To fall back to the old system, halt the new system, change ROM variables DEFAULTROOT and perhaps DEFAULTSWAP, and then boot.

★ ★ ★ NOTE ★ ★ ★

In order to use this utility, you must have an unused disk, or at least enough unused partitions, on which to install the OS/MP 4.1C release. You can not use ***reinst_sys*** *to install over the currently running disk partitions. If you do not have an unused disk for* ***reinst_sys*** *to use, you will have to install OS/MP 4.1C from scratch, while the system is unavailable to your users, as was done in previous OS/MP full installation releases.*

You should not install on a disk connected to a channel board as it will be impossible to boot from that device.

Before Installing...

★ ★ ★ NOTE ★ ★ ★

*Before using **reinst_sys**, you must know what disk(s) and partitions you want to install on. If changes need to be made to any of the disks partitions, you must do this prior to running **reinst_sys**. Use **partition**(8) to modify the disks.*

It is best to select a disk that will be recognized by an OS/MP 4.1C generic kernel. Otherwise it will be necessary to reconfigure the kernel (which may be desirable anyway) before rebooting. This is discussed in more detail at the end of this section.

★ ★ ★ CAUTION ★ ★ ★

If installing by tape, clean the tape drive on the machine you will be using before installing the release tape. Failure to do so may damage the release tape.

Starting in OS/MP 4.1C, the **preinstall** utility is available to help determine which system files should be restored or merged from backup. **preinstall** shows which files in system directories were modified after you last installed the OS version you're currently running.

If you do not want to use **preinstall**, skip to the *Extracting reinst_sys* section below.

Installing preinstall...

Because **preinstall** was not included in versions of OS/MP prior to 4.1C, it is necessary to install it before proceeding to install OS/MP 4.1C.

When using a local tape drive, install **preinstall** using the following commands:

```
# mt -f /dev/nrst0 asf 5
# cd /usr/etc
# tar xpf /dev/nrst0
```

When using a local CD-ROM drive, install **preinstall** using the following commands:

```
# mkdir /cdrom
# mount /dev/sr0 /cdrom
# cd /usr/etc
# tar xpf /cdrom/Tools.tar
```

Using preinstall

After **preinstall** has been installed, it is located in **/usr/etc**. The usage of **preinstall** is as follows:

/usr/etc/preinstall [**-l**] [**-c** mmddhhmm[yy]]

The **preinstall** command is used to look for files that should be saved prior to doing a full install of a new version of OS/MP. It looks on the system partitions (root(**/**), **/usr**, and **/var**) for files which have been touched after the date of the last full install of OS/MP (or, if given a cutoff date, files touched after that date).

preinstall is normally used just before installing a new version of OS/MP to determine what system-related files should be backed up. Then, after installing the new version of OS/MP, you can merge or restore these files into the newly-installed system.

Some files, such as **/etc/fstab**, can typically be re-used without modification. Others, such as kernel configuration files in **/usr/kvm/sys/*/conf**, must be hand-merged into the new version of the OS with careful consideration of how the new OS version differs from the old.

Certain files are excluded from the output which are newer than the cutoff date. These files are normally updated by system operation and do not need to be backed up. Examples of excluded files are: **/etc/mtab**, the **/var/sadm** accounting files, the **/tmp_mnt** automounter directories, and patched kernel object files in **/usr/kvm/sys/*/OBJ**. By default, the cutoff date used is the modification date of the file **/etc/sys_conf/system-configured**, which is touched the first time you boot a new version of the OS after a full install. You may want to use some other cutoff date with the **-c** option if the current OS was installed in some non-standard way.

By default, the files and directories newer than the cutoff are listed to standard output by name, one per line. By using the **-l** option, the output is in long form (as from the **-ls** option to **find**), showing the type, date, and size of each file.

The following options are accepted by **preinstall**:

- The **-l** option presents the output in long form, showing inode number, size in kilobytes (1024 bytes), protection mode, number of hard links, user, group, size in bytes, and modification time. If the file is a special file the size field will instead contain the major and minor device numbers. If the file is a symbolic link the pathname of the linked-to file is printed preceded by '->'. The format is identical to that of **find -ls**.
- The **-c** option specifies to use the given cutoff date to decide which files to print, rather than the date of the file **/etc/sys_conf/system-configured**. The cutoff date format is **-c** mmddhhmm[yy], with month, day, hour, minute, and optional year in numeric form. This is the same format as for **/usr/5bin/touch**.

Extracting reinst_sys

reinst_sys has been modified since OS/MP 4.1B, so be sure to extract the new version from the OS/MP 4.1C media. If you installed preinstall as shown above, then the server already contains the version of **reinst_sys** that it needs and you may skip to the *Installing* section below.

The following explains two different methods of extracting **reinst_sys** into the **/usr/etc** directory. You must be logged in as root.

Extracting reinst_sys via a Local Tape Drive

```
# mt -f /dev/nrst0 asf 5
# cd /usr/etc
# tar xpf /dev/nrst0
```

Extracting reinst_sys via a Local CD-ROM Drive

Create a mount point directory (if one doesn't exist), mount the CD-ROM drive, and extract **reinst_sys** as follows:

```
# mkdir /cdrom
# mount /dev/sr0 /cdrom
# cd /usr/etc
# tar xpf /cdrom/Tools.tar
```

Installing...

This section covers the OS/MP 4.1C installation on Series5, Series5E, Series6 and S4000 systems.

During installation, you can request help at any prompt by entering a question mark. Table 16 shows edit commands available when entering text in response to prompts:

Table 16. Input Editing Commands

Character	Interpretation
backspace (^H)	delete last input character
delete (^?)	delete last input character
^U	erase input line
^R	redisplay input line
^W	delete input up to '/' or whitespace
^C	cancel input, returning to nearest menu
ESC	cancel input, returning to nearest menu
^L	redisplay entire screen
return (^M)	end input
newline (^J)	end input

If a string is too long to be displayed in the available space, the beginning of the string is displayed as "...". This allows display of the end of the string, which is usually of more interest.

Keywords can be shortened to any unique prefix (such as 'co' for 'continue'), except for 'yes' and 'no', which must always be spelled out.

Fatal errors during software installation are usually reported by messages beginning with `System error` or `Internal error` and ending with a "`#`" prompt. If a fatal error occurs, software installation may be restarted by entering:

```
# ^Jstty sane^J
# rm -f core
# /usr/etc/reinst_sys
```

where ^J is the linefeed character. The command **stty sane** may not be echoed (and is intended to fix exactly that problem). In the event of a fatal error during software installation, please report the problem to Solbourne customer support.

Installing Software

Installing software has two distinct stages: gathering information and modifying the system. No permanent changes are made to the system until all information has been provided.

There are three information gathering menus:

- Standard Filesystem Definition - specifies where the standard filesystems (**root** (/), **swap**, and **/usr**, optionally **/var** and **/tmp**) are located.
- Installation Media Identification - Determines the installation media from which to install (tape, CD-ROM, or network directory), and determines where that media is located.
- Package Selection - allows selecting of which optional software packages are to be installed.

All three menus provide the command **cancel**. The first two also provide the command **previous**. These commands allow you to return to prior menus, optionally discarding any changes that have been made.

cancel always returns to the shell terminating **reinst_sys**.

previous always returns to the previous menu (which is the shell, in the case of the Filesystem Definition menu). The changes discarded in this case are those made in the menu you are leaving.

cancel has higher priority than **previous**. In other words, if you use **previous** to leave a menu without discarding changes, then **cancel** from that menu and discard changes, the changes made in the earlier menu are also discarded.

The Standard Filesystem Definition menu defines where the mandatory filesystems are located. These filesystems (except for root) may be either on a local disk partition or provided by a disk server. If root is to be on a remote system, install the system as a client of that system, even if the system actually contains a disk. You can add entries for any local disks to **/etc/fstab** after installing the system as a diskless client.

Any changes made to the standard filesystems with **partition**(8) will appear in this menu.

reinst_sys has the following options:

`reinst_sys` [-m] [-n] [-r /root/path] [-f host:/device/path] [-a arch]

-m	Don't mount or newfs filesystems
-n	Don't newfs filesystems
-r /root/path	Pretend /root/path is really /
-f host:/device/path	What tape device to use
-a arch	What cpu architecture to use - overrides cpustatus

In general, you will not need to use any of these options except perhaps the -a option. The -f option will be set while running **reinst_sys.**

The -a option is to be used when you are upgrading or changing the architecture of your machine. Suppose you have a machine with Series5 CPUs, and you want to upgrade to Series6 CPUs. To install the OS/MP 4.1C for Series6, log in as root and issue the following command:

```
# /usr/etc/reinst_sys -a Series6
```

To install OS/MP 4.1C with no change in architecture, log in as root and issue the command:

```
# /usr/etc/reinst_sys
```

reinst_sys begins by reading the current **/etc/fstab** file to determine the disks attached to your system (mounted disks are also probed).

After examining all attached disks, **reinst_sys** presents the first menu, the Standard Filesystem Definition menu.

The root, swap, and usr partitions are required and must be defined before going to the next menu. The swap will be defined as the current swap area, and may be redefined if you wish. The root and usr areas need to be defined from the currently available disk partitions that are highlighted in the Standard Filesystem Definition menu. For a disk partition to be available for use in **reinst_sys**, it must not be currently mounted, and it must not have an entry in the **/etc/fstab** file.

Example:

Currently, the **root(/)** filesystem is on **sd0a, swap** is on **sd0b,** and the **/usr** filesystem is on **sd0g.** Available partitions are highlighted. If the necessary partitions are not available, exit **reinst_sys.** A partition may not be available because it is mounted or an entry exists for it in the **/etc/fstab** file. Also, it may not be available because it does not exist, or it is not large enough, in which case you will need to run **partition**(8) to repartition the disk as needed.

Use the following steps to assign the **root** (/) filesystem to **sd2a,** the **/usr** filesystem to **sd2g,** and the **/var** filesystem to **sd2d** (rather than using the default of **/var** being a subdirectory of the root filesystem). Leaving **swap** on the disk may be desirable.

The steps for changing **/var** are optional. This makes use of partition **d,** thus using 9.5 MB of disk space that is not used when the default disk partition is used with the standard filesystem definition.

In Figure 23, the notation "(required)" appears next to the **root(/), swap** and **/usr** filesystems. These filesystems must be defined; however, they may be placed on any sufficiently large available partition of any disk.

```
                    Standard Filesystem Definition

   1) root              (required)     <not defined>
   2) swap on sd0b      (required)
   3) /usr              (required)     <not defined>
   4) /var on root partition
   5) /tmp on root partition

            Disk Partitions (sizes in MB) (available highlighted)
        (a)    (b)      (c)     (d)     (e)     (f)     (g)     (h)
sd0:    8.4    32.4     191.1   9.3     ---     ---     141.1   ---
sd2:    8.6    32.9     484.9   9.5     ---     ---     433.5   ---



Enter number of filesystem to change ('1'..'5'), 'continue', 'previous',
'cancel', or '?' for help:
```

Figure 23. Sample Standard Filesystem Definition Menu

To modify the **root (/)** filesystem, enter the number 1.

```
Enter number of filesystem to change ('1'..'5'),
'continue', 'previous', 'cancel' or '?' for help: 1
```

The **root** menu will be highlighted, and the system will request a disk partition. Assign it to sd2a.

```
Enter name of disk partition or host:path for /root
filesystem, 'none', ^C, or'?' for help: sd2a
```

To modify the **/usr** filesystem, enter the number **3**.

```
Enter number of filesystem to change ('1'..'5'),
'continue', 'previous', 'cancel' or '?' for help: 3
```

The usr menu will be highlighted, and the system will request a disk partition. Assign it to sd2g.

```
Enter name of disk partition or host:path for /usr
filesystem, 'none', ^C, or'?' for help: sd2g
```

To modify the **/var** filesystem, enter the number **4**.

```
Enter number of filesystem to change ('1'..'5'),
'continue', 'previous', 'cancel' or '?' for help: 4
```

The var menu will be highlighted, and the system will request a disk partition. Assign it to sd2d.

```
Enter name of disk partition or host:path for /var
filesystem, 'none', ^C, or '?' for help: sd2d
```

The new arrangement is displayed as shown in Figure 24.

```
                    Standard Filesystem Definition

  1) root on sd2a      (required)
  2) swap on sd0b      (required)
  3) /usr on sd2g      (required)
  4) /var on sd2d
  5) /tmp on root partition

            Disk Partitions (sizes in MB) (available highlighted)
       (a)    (b)      (c)     (d)     (e)     (f)     (g)     (h)
sd0:   8.4    32.4     191.1   9.3     ---     ---     141.1   ---
sd2:   8.6    32.9     484.9   9.9     ---     ---     433.5   ---



Enter number of filesystem to change ('1'..'5'), 'continue', 'previous',
'cancel', or '?' for help:
```

Figure 24. Modified Standard Filesystem Definition Menu

Once all changes for the standard filesystems have been made, enter **continue** to proceed to the Installation Media Identification menu.

```
Enter number of filesystem to change ('1'..'5'),
'continue', 'previous', 'cancel', or '?' for help: continue
```

Installation Media Identification Menu

The Installation Media Identification menu describes which media type (tape, CD-ROM, or network directory) will be used during the installation. Figure 25 shows the Installation Media Identification menu.

Installing from a Local Tape Drive

Installing from a local tape drive requires that the *Installation media type* be set to **Tape**, the *tape drive* field be set to either **st0** or **st1** (the only supported tape drives) and that *Tape host* be set to **localhost**.

```
                    Installation Media Identification

1) Installation media type = Tape
2) Tape drive = /dev/nrst0
3) Local Internet address = 192.9.3.4 (required for remote tape)
4) Network broadcast mask = 0xffffff00 (required for remote tape)
5) Tape host = localhost (127.0.0.1)









Enter selection number ('1'..'5'), 'continue', 'previous', 'cancel', or '?'for
help:
```

Figure 25. Installation Media Identification Menu - Local Tapehost

Local CD-ROM Installation

Installing from a local CD-ROM drive requires that the *Installation media type* be set to **CD-ROM**, the *CD drive* field be set to **/dev/sr0**, and the *CD host* field be set to **localhost**.

Figure 26 shows the Installation Media Menu with the CD-ROM parameters set to install from CD-ROM.

Once the details of the media have been entered correctly, enter **continue** to proceed to the Package Selection Menu.

Package Selection Menu

Use this menu to install optional Solbourne software distributions. It provides a menu-driven method of examining the components of the distribution tape, selecting the parts to be installed, and specifying the directories where the components will be located.

The components of a distribution are referred to as **packages**. Some examples of packages are **FORTRAN 1.4, X Windows**, and **Solbourne OS/MP Optional Software**. Packages contain one or more *modules*, which are groups of logically-related files, such as executables or libraries. Most packages also have *variables*, which have two uses: controlling the actions of installation commands associated with the package, and prefixing where modules are to be installed.

```
                    Installation Media Identification

1) Installation media type = CD-ROM
2) CD drive = /dev/sr0
3) Local Internet address = 0.0.0.0 (required for remote install)
4) Network broadcast mask = 0x00000000 (required for remote install)
5) CD host = localhost (127.0.0.1)









Enter selection number ('1'..'5'), 'continue', 'previous', 'cancel', or '?'for
help:
```

Figure 26. Installation Media Identification Menu - Local CD-ROM

A single package, OS/MP 4.1C Full-Install Optional Software, is included on the OS/MP 4.1C distribution tape. The following display shown in Figure 27 appears; the values shown for `Size` in this and subsequent displays may vary.

The message `Mandatory Software Will Be Installed` indicates that the standard filesystems will be built from scratch (overwriting any old contents) when the **`install`** command is issued. If this message does not appear, only the packages selected in this menu will be installed.

The Optional Software package contains a set of software modules that have historically been installed as part of **/usr**. These modules are not necessary for the basic operation of the system, and have been provided separately so that **/usr** may be kept as small as possible. To examine the modules available, select the Optional Software package:

```
Enter number of package to examine ('1'..'1'), 'cancel',
'install', or '?' for help: 1

Should the OS/MP 4.1C Full-Install Optional Software
package be installed ('yes', 'no', ^C, or '?' for help)?
```

The `Should the OS/MP 4.1C Full-Install Optional Software package be installed` question refers to the package in general. The modules are individually selected for installation on the customization screen, and by default all are selected for installation.

After replying **`yes`**, the customization menu will appear as shown in Figure 28.

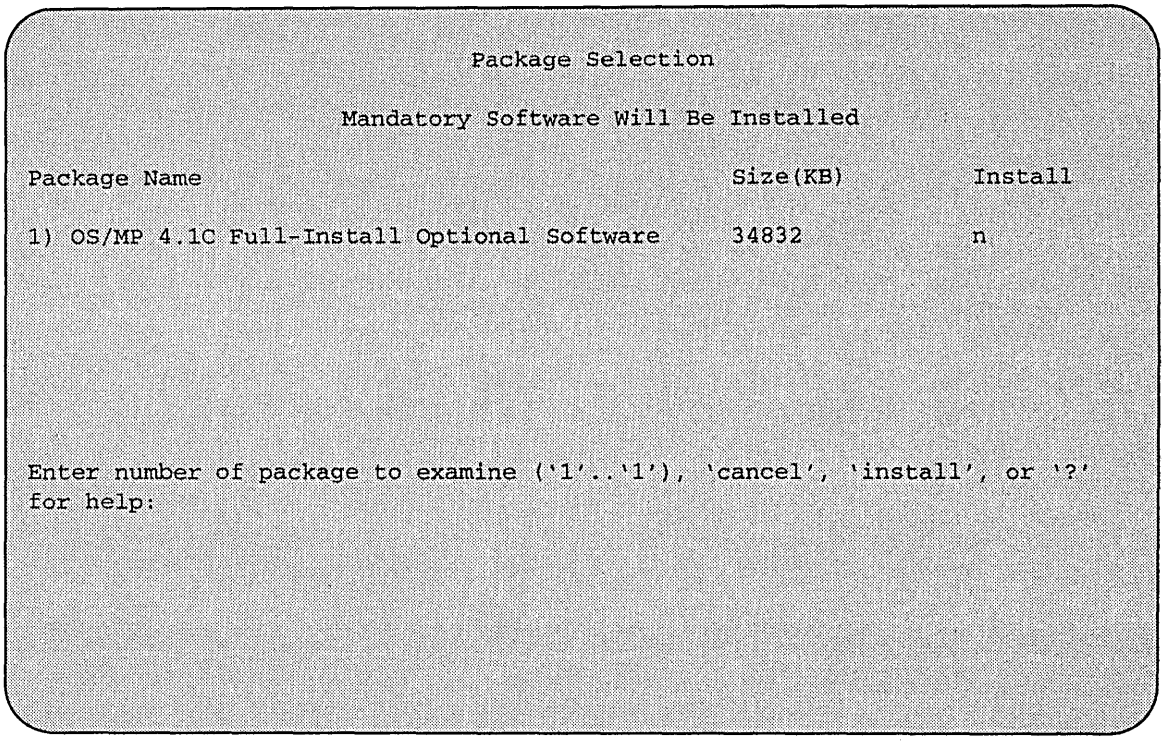


Figure 27. Package Selection Menu

★ ★ ★ NOTE ★ ★ ★

Figure 28 is only an example. The free KB reported varies depending on the type and size of disk drive installed.

The size of each module in kilobytes is listed immediately to the right of the module's name. The column after the size indicates whether or not the module is currently marked for installation. If the module is to be installed, the directory that the module's files are to be installed in is listed, followed by the free space on the partition that the directory refers to.

Below are short descriptions of the individual modules:

DEBUGGING - program debugging aids
This module contains the debugging tool **dbx**(1) and the profiled versions of the standard libraries libc, libcurses, libm, libtermcap, libtermlib, libsuntool, and libsunwindow.

GAMES - games and demonstration programs
The recreational programs listed in Section 6 of the *UNIX User's Reference Manual.*

MANUAL - on-line manual pages
Sections 1 through 8 of the UNIX User's and Programmer's Manuals in machine-readable form. See **man**(1), **lookup**(1), and **qref**(1) for more details. This option requires that the TEXT option also be installed.

```
        Customization of Solbourne OS/MP 4.1C Optional Software

                                Software Modules
 Module          Size(KB)       Install     Directory      Free(KB)
 1) DEBUGGING        2888           y           /usr           58695
 2) GAMES            3136           y           /usr           58695
 3) MANUAL           7440           y           /usr           58695
 4) NETWORKING       1072           y           /usr           58695
 5) PLOT             1784           y           /usr           58695
 6) SECURITY          312           y           /usr           58695
 7) SV_PROG          1848           y           /usr           58695
 8) SV_USER          2320           y           /usr           58695
 9) SYSTEM_V         4032           y           /usr           58695
10) TEXT              720           y           /usr           58695
11) VERSATEC         5960           y           /usr           58695
12) UUCP              608           y           /usr           58695
13) RFS               912           y           /usr           58695
14) SHLIB            1376           y           /usr           58695
15) TLI                48           y           /usr           58695

Enter number of module to modify ('1'..'15'), 'continue', 'abort', or '?' for
help:
```

Figure 28. Package Selection Customization Menu

NETWORKING - network utilities
Utilities and commands that access a network, such as **rcp**(1) or **ftp**(1). This module is required on systems that are connected to a network, or that will use the NIS/YP database services.

PLOT - basic plot-generating applications
The standard UNIX plotting utilities, which allow the creation of plots and graphs from simple data to be displayed on a variety of plotters and graphics terminals. See **plot**(1G) and **graph**(1G).

SECURITY - C2 security
The SECURITY module provides features such as audit trails and shadow password files in the spirit of the Department of Defense's C2 Security Specification (the "Orange Book"). The compliance of these features has not been certified.

SV_PROG - SunView program development support
Include files and libraries needed for compiling SunView applications. This module requires that SV_USER also be installed.

SV_USER - basic SunView support
The SunView windowing system and associated applications (such as **suntools**(1) and **shelltool**(1)). This module is not required if only X Windows will be used on the system.

SYSTEM_V
System V-compatible libraries and executables. System VR3, POSIX, and X/OPEN are supported. See **svidii**(7v), **svidiii**(7v), **xopen**(7v), and **posix**(7v) for details.

TEXT - nroff/troff text processing
This module provides the text formatter **troff**(1) and its associated support programs and files. This option is required if the MANUAL option is installed.

VERSATEC - Versatec printer support
Various utilities specific to Versatec printers, such as **vtroff**(1) and **vplot**(1G).

UUCP - uucp applications suite
uucp(1C) and its support programs. These are normally used for communicating with other UNIX operating systems via phone line.

RFS
Utilities and libraries to support the System V Remote File System.

SHLIB
Position-independent versions of the BSD and System-V versions of the C library. These are provided to allow substituting or adding a module to the shared C library.

TLI
Libraries and headers to support developing programs that take advantage of the System V Transport Layer Interface.

Modifying a module allows selecting whether or not it is to be installed and, if so, the directory its files are to be extracted into.

★ ★ ★ NOTE ★ ★ ★

All modules are intended to be extracted in their default directory. If a module is extracted somewhere else, there is no guarantee that the programs provided in the module will work.

For example, to not install the VERSATEC module:

```
Enter number of module to modify ('1'..'15'), 'continue',
'abort', or '?' for help: 11
```

The VERSATEC menu entry is highlighted, and:

```
Modifying the Versatec printer support module
Should the VERSATEC module be installed ('yes', 'no', ^C,
or '?' for help)? no
```

Figure 29 shows the updated display:

★ ★ ★ NOTE ★ ★ ★

The free space for **/usr** *has been increased by the size of the VERSATEC module as shown in Figure 29.*

```
        Customization of Solbourne OS/MP 4.1C Optional Software

                                Software Modules
 Module          Size(KB)       Install     Directory      Free(KB)
 1) DEBUGGING        2888           y           /usr           64655
 2) GAMES            3136           y           /usr           64655
 3) MANUAL           7440           y           /usr           64655
 4) NETWORKING       1072           y           /usr           64655
 5) PLOT             1784           y           /usr           64655
 6) SECURITY          312           y           /usr           64655
 7) SV_PROG          1848           y           /usr           64655
 8) SV_USER          2320           y           /usr           64655
 9) SYSTEM_V         4032           y           /usr           64655
10) TEXT              720           y           /usr           64655
11) VERSATEC         5960           n
12) UUCP              608           y           /usr           64655
13) RFS               912           y           /usr           64655
14) SHLIB            1376           y           /usr           64655
15) TLI                48           y           /usr           64655

Enter number of module to modify ('1'..'15'), 'continue', 'abort', or '?' for
help:
```

Figure 29. Package Selection Menu - Deletion of Versatec Module

To install the GAMES module in **/fun** (on the root partition):

```
Enter number of module to modify ('1'..'13'), 'continue',
'abort', or '?' for help: 2
```

The GAMES menu entry is highlighted, and:

```
Modifying the games and demonstration programs module

Should the GAMES module be installed ('yes', 'no', ^C, or
'?' for help)? yes

Install GAMES in what directory? /fun

/fun does not exist. Create it during installation ('yes',
'no', ^C, or '?' for help)? yes
```

The menu is updated to reflect the change, as shown in Figure 30.

★ ★ ★ NOTE ★ ★ ★

The free space for **/usr** *changes, and a completely new size (for* **/fun***) is also displayed as shown in Figure 30.*

If you decide to discard all changes made to the modules, use the command **abort**. This returns to the Package Selection Menu.

```
          Customization of Solbourne OS/MP 4.1C Optional Software

                                  Software Modules
 Module          Size(KB)        Install     Directory      Free(KB)
 1) DEBUGGING        2888            y           /usr          67791
 2) GAMES            3136            y           /fun           4579
 3) MANUAL           7440            y           /usr          67791
 4) NETWORKING       1072            y           /usr          67791
 5) PLOT             1784            y           /usr          67791
 6) SECURITY          312            y           /usr          67791
 7) SV_PROG          1848            y           /usr          67791
 8) SV_USER          2320            y           /usr          67791
 9) SYSTEM_V         4032            y           /usr          67791
10) TEXT              720            y           /usr          67791
11) VERSATEC         5960            n
12) UUCP              608            y           /usr          67791
13) RFS               912            y           /usr          67791
14) SHLIB            1376            y           /usr          67791
15) TLI                48            y           /usr          67791

Enter number of module to modify ('1'..'15'), 'continue', 'abort', or '?' for
help:
```

Figure 30. Package Selection Menu - Install Games module to /fun

If you are satisfied with the changes (if any) made to the modules, enter the command **`continue`**. This will record the changes and return to the Package Selection menu.

When package customization has been completed (which may mean no packages were selected for installation), enter **`install`** as shown in Figure 31.

The actual installation begins at this point. The steps taken during the installation are:

1. create filesystems (**root(/)**, **/usr**, possibly **/var** or **/tmp**
2. install mandatory **root** files
3. install mandatory **kvm** files
4. install mandatory **usr** files
5. install optional software

When installation has finished, it gives the following message:

```
Optional Software Installation Succeeded

Press any character to continue
```

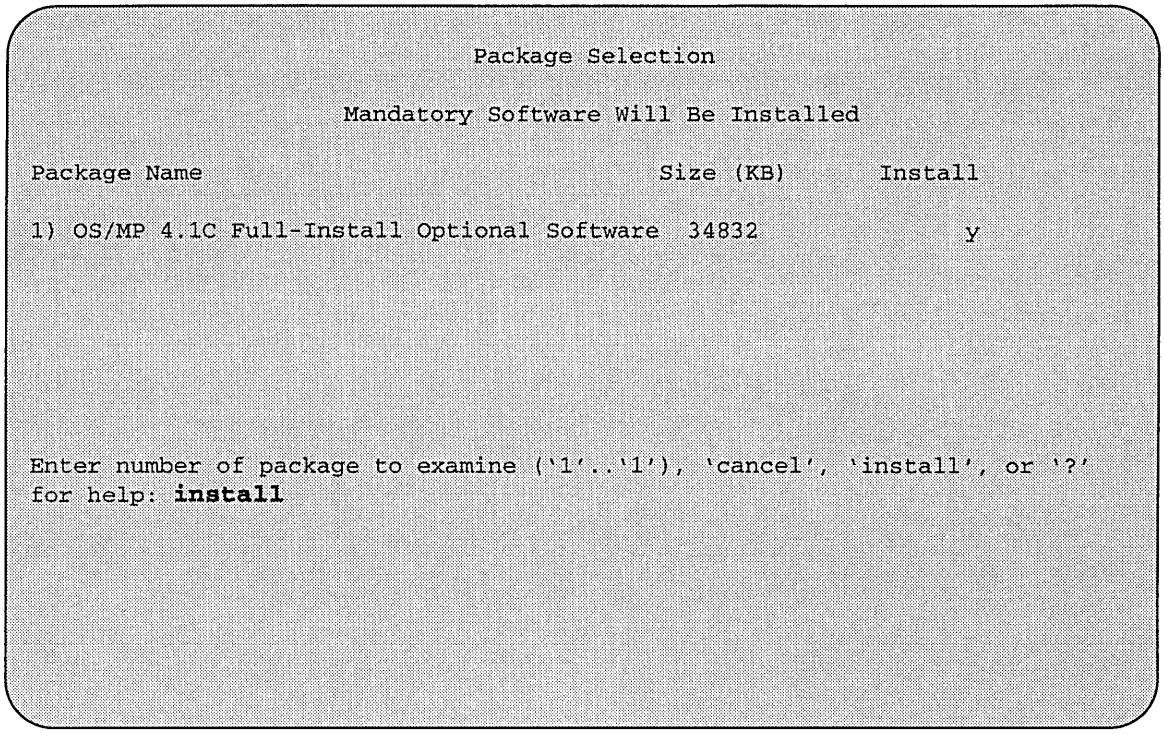


Figure 31. Package Selection Menu

The next display gives the values of the previous and new ROM variables DEFAULTROOT, DEFAULTSWAP (if they have changed), and asks if you want to update the variables, as shown in Figure 32.

★ ★ ★ NOTE ★ ★ ★

Before you say 'yes', make sure that all the previous settings of these variables are recorded so that you can later reboot from the old version of the system if necessary. If you choose not to update the ROM variables, make sure that you record the new values and use them to reboot the newly installed system at a later time.

reinst_sys then performs the final system setup, and completes. The new system's filesystems are currently mounted under the **/etc/sys_conf/reinst_sys/root** directory. For example, the new version of the /var directory is mounted at **/etc/sys_conf/reinst_sys/root/var**.

At this point, the newly installed system is ready to boot. However, you may want to finish the installation by creating or editing such files as **/etc/rc.local** and **/etc/printcap**, or any other files local to your system. If you have comments in your **/etc/fstab** file, they will not exist in the new **/etc/fstab** file, so you may want to edit this file.

★ ★ ★ NOTE ★ ★ ★

If you installed the new system on a disk that is not recognized by a OS/MP 4.1C generic kernel, then you must reconfigure the kernel before rebooting.

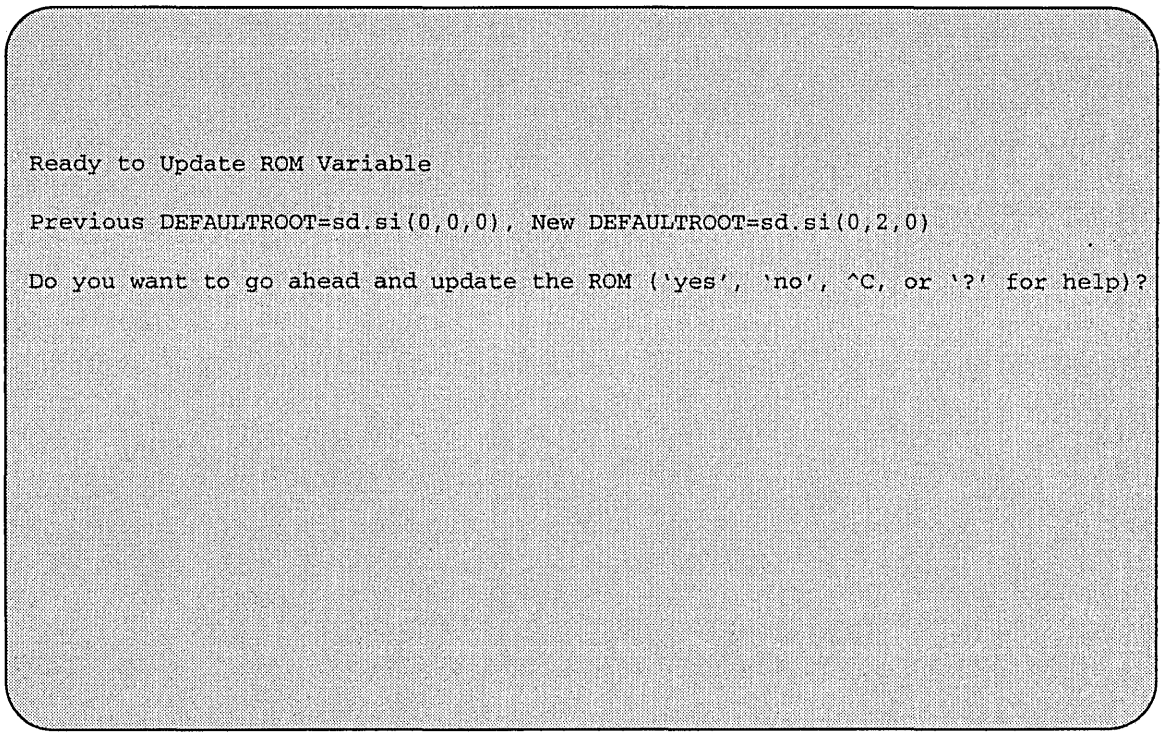


Figure 32. Update ROM Variable

You may also wish to create a customized kernel on the new system, so that hardware such as the channel board and VSCSI devices will be recognized. If you would rather wait until after rebooting the new system to configure your kernel, you should edit the new **/etc/fstab** file and comment out any partitions which are on disks not visible to the generic OS/MP 4.1C kernel.

After you have completed customizing the new installation, reboot your machine, using the new ROM variables.

If you used the -a option to upgrade to a different architecture, then after customizing the new installation, halt the machine and turn off the power. Replace the old CPUs with the new CPUs, power up and boot your machine using the new ROM variables.

Installing OS/MP 4.1C on a Server

This chapter describes how to install OS/MP 4.1C on a server. A server is a system that is on a network and may provide NFS disk services.

Before Installing...

★ ★ ★ CAUTION ★ ★ ★

Perform a full system backup before installing OS/MP 4.1C. A complete installation overwrites all information on the disk partitions specified for the root (/), swap, /usr, /var, and /tmp filesystems.

Before installing the release tape, clean the tape drive on the host machine. Failure to do so may result in damage to the release tape.

Starting in OS/MP 4.1C, the **preinstall** utility is available to help determine which system files should be restored or merged from backup. **preinstall** shows which files in system directories were modified after you last installed the OS version you're currently running.

If you do not want to use **preinstall**, skip to the section *Modifying the Hosts Database* below.

If you are going to be installing from a remote device, make sure you obtain the following information:

- ❒ Host name of system being installed
- ❒ IP address of system being installed
- ❒ Ethernet address of system being installed
- ❒ Tape host name and IP address

Installing preinstall...

Because **preinstall** was not included in versions of OS/MP prior to 4.1C, it is necessary to install it before proceeding to install OS/MP 4.1C.

When using a local tape drive, install **preinstall** using the following commands:

```
# mt -f /dev/nrst0 asf 5
# cd /usr/etc
# tar xpf /dev/nrst0
```

When using a remote tape drive, the system name needs to be in the `tapehosts` **/.rhosts** file. Install **preinstall** using the following commands:

```
# rsh -n tapehost mt -f /dev/nrst0 asf 5
# cd /usr/etc
# rsh -n tapehost dd if=/dev/nrst0 bs=8k | tar xpBf -
```

In this example, you should replace *tapehost* with the actual name of your tape host machine.

★ ★ ★ NOTE ★ ★ ★

Some older versions of SunOS do not support the 'asf' request for **mt**. *If this is the case for your tape host, first substitute 'rew' for 'asf 5' in the above example, and then re-execute* **mt** *with 'fsf 5' instead of 'rew'.*

When using a local CD-ROM drive, install **preinstall** using the following commands:

```
# mkdir /cdrom
# mount /dev/sr0 /cdrom
# cd /usr/etc
# tar xpf /cdrom/Tools.tar
```

When installing over the network, or when using a remote CD-ROM drive, create a mount point directory (if one doesn't exist), and mount the CD-ROM drive on the remote machine, referred to here as `nethosts`, as follows:

```
nethost# mkdir /cdrom
nethost# mount /dev/sr0 /cdrom
```

Install **preinstall** using the following commands:

```
# cd /usr/etc
# rsh -n nethost dd if=/cdrom/Tools.tar bs=8k | tar xpBf -
```

In this example, replace *nethost* with the actual name of the remote host machine, and replace *cdrom* with the actual path name or mount point.

Using preinstall

After **preinstall** has been installed, it is located in **/usr/etc/setup**. The usage of **preinstall** is as follows:

/usr/etc/setup/preinstall [**-l**] [**-c** mmddhhmm[yy]]

The **preinstall** command is used to look for files that should be saved prior to doing a full install of a new version of OS/MP. It looks on the system partitions (root(/), **/usr**, and **/var**) for files which have been touched after the date of the last full install of OS/MP (or, if given a cutoff date, files touched after that date).

preinstall is normally used just before installing a new version of OS/MP to determine what system-related files should be backed up. Then, after installing the new version of OS/MP, you can merge or restore these files into the newly-installed system.

Some files, such as **/etc/fstab**, can typically be re-used without modification. Others, such as kernel configuration files in **/usr/kvm/sys/*/conf**, must be hand-merged into the new version of the OS with careful consideration of how the new OS version differs from the old.

Certain files are excluded from the output which are newer than the cutoff date. These files are normally updated by system operation and do not need to be backed up. Examples of excluded files are: **/etc/mtab**, the **/var/sadm** accounting files, the **/tmp_mnt** automounter directories, and patched kernel object files in **/usr/kvm/sys/*/OBJ**. By default, the cutoff date used is the modification date of the file **/etc/sys_conf/system-configured**, which is touched the first time you boot a new version of the OS after a full install. You may want to use some other cutoff date with the **-c** option if the current OS was installed in some non-standard way.

By default, the files and directories newer than the cutoff are listed to standard output by name, one per line. By using the **-l** option, the output is in long form (as from the **-ls** option to **find**), showing the type, date, and size of each file.

The following options are accepted by **preinstall**:

- The **-l** option presents the output in long form, showing inode number, size in kilobytes (1024 bytes), protection mode, number of hard links, user, group, size in bytes, and modification time. If the file is a special file the size field will instead contain the major and minor device numbers. If the file is a symbolic link the pathname of the linked-to file is printed preceded by '->'. The format is identical to that of **find -ls**.
- The **-c** option specifies to use the given cutoff date to decide which files to print, rather than the date of the file **/etc/sys_conf/system-configured**. The cutoff date format is **-c** mmddhhmm[yy], with month, day, hour, minute, and optional year in numeric form. This is the same format as for **/usr/5bin/touch**.

Modifying the Hosts Database...

Any host on a network must be added to the hosts database. Before you can add a host to either database, choose a name and an address for that host. Be sure both are unique for your network. Determine which one of the three network information databases you are using.

- *Static files* - this is the simplest form of the databases: two files, **/etc/hosts** and **/etc/ethers**.
- *Network Information Service* - NIS, formerly called Yellow Pages (YP), is a centralized version of the static files approach. Fundamentally, one system, the NIS/YP master, uses the static files. Other systems ask the master to look up entries in its files.
- *Domain Name Service* - DNS is part of the software used to administrate the Internet, and is beyond the scope of this document. If you are using it, contact your system administrator for information on updating entries in it.

If you are using NIS/YP, take the following actions on the NIS/YP master. If you are using static files, take the following actions on the system that is to act as a server (by providing either its tape or disk drive). Only the superuser (account name **root**) is allowed to update these files.

- Update the *hosts* database with the name and IP address chosen for any new client by adding a line of the following form to **/etc/hosts**:

```
192.1.3.42 hamster
```

- If you are installing a diskless client on your server, update the *ethers* database by adding a line of the form below to /etc/ethers. The six colon-separated numbers are the ones displayed by the system when the power is turned on. The name must be the same as was added to the *hosts* database.

```
0:0:8e:10:0:16 hamster
```

- If you are using NIS/YP, the working copy of the database must be updated:

```
# cd /var/yp
# make
```

★ ★ ★ NOTE ★ ★ ★

Execute **make** *on the NIS/YP master server only.*

Installing...

This section covers the OS/MP 4.1C installation on Series5, Series5E, Series6 and S4000 systems.

Installing on a Series5, Series5E or Series6:

Loading the Ramdisk

The following explains four different methods of loading the ramdisk. After you have loaded the ramdisk continue on to the *Diskful Installation* section.

Loading the Ramdisk via a Local Tape Drive

Turn the system on. After the system passes the self-tests, the system displays the bootROM prompt.

The ramdisk installation software uses the value of the bootROM variable **INSTALLED** to determine if a system needs to have the basic operating system installed. Set the value of this variable to 0 before loading the ramdisk:

```
ROM> setenv installed 0
```

The system asks if you want to re-install if **INSTALLED** is not 0.

To load the ramdisk on Series5 or 5E systems using a local tape drive, enter a boot command in the following form:

```
ROM> boot st.si(,TapeID,2)
```

To load the ramdisk on Series6 systems using a local tape drive, enter a boot command in the following form:

```
ROM> boot st.si(,TapeID,3)
```

The variable *TapeID* shown in the command should be replaced with the SCSI ID of the tape drive to be used. For st0, use 4; for st1, use 5.

The bootROM copies the ramdisk image into memory and boots it:

```
Boot: st.si(,4,3)
Entry: 0xff060000
Size: 0x10e000+0x56afb8+0xadc40
```

The system displays a spinner while copying the ramdisk into memory. When the copy completes, the spinner pauses for up to three minutes. Proceed to the *Diskful Installation* section

Loading the Ramdisk via a Remote Tape Drive

The system with the tape drive, referred to as `tapehost` in the following example, must be on the same network as the system being installed, referred to as *hamster* in the following example. For example, with a class C network, the first three numbers in the Internet addresses of the two machines must be the same, such as 192.1.3.42 and 192.1.3.17. Also, *hamster* must be listed in **/etc/hosts**, or in the NIS/YP hosts database, and **/.rhosts** on `tapehost`. In addition, the ethernet address must be in the **ethers** database. The `tapehost` must also be running the **rarpd**(8) daemon.The ramdisk must be extracted from the OS/MP 4.1C distribution tape onto a disk on `tapehost`.

Since the system uses **tftp**(1) to load the ramdisk image, it must be enabled on the tapehost. Examine the file **/etc/inetd.conf**. A line similar to the one below should be in the file:

```
tftp dgram udp wait root /usr/etc/in.tftpd in.tftpd -s
/tftpboot
```

If the line starts with a #, remove the #.

If a `-s` appears after the last `in.tftpd` in **/etc/inetd.conf**, either remove it or use the directory **/tftpboot** instead of **/var/tmp** as shown above. Approximately 6 Mbytes will be needed in the directory used.

If **/etc/inetd.conf** has been changed, **inetd**(8) must be told to re-read the configuration file:

```
tapehost # ps ax | egrep inetd rarpd
  249 ? I 0:01 inetd
  541 p3 R 0:00 egrep inetd
```

The *pid* of inetd is the first number on the line that doesn't contain **egrep**. In the above output, *pid* is 249. If a *pid* shows up for **rarpd**, it is not necessary to re-execute it as shown below..

```
tapehost # kill -HUP pid
```

Put the distribution tape into the drive and execute the following commands.

```
tapehost # /usr/etc/rarpd -a
```

★ ★ ★ NOTE ★ ★ ★

In the following example the install kernel will be named /var/tmp/install. The actual name of the file is not important, so long as it is used consistently here and in the example on the next page. Also note that the filesystem must have enough space to hold the install kernel.

In the **mt** command below, replace the variable *X* with one of the following values, depending on the type of system.

Table 17.

System	Value of X
Series5 and 5E	2
Series6	3

For Exabyte tape drives, use bs=1024 instead of bs=512 in the **dd** command shown below.

```
tapehost # cd /var/tmp
tapehost # mt -f /dev/nrst0 asf X
tapehost # dd if=/dev/nrst0 of=install bs=512
```

Enter the following boot command on the system being installed:

```
ROM> b tftp.ei(,,hostnumber)/var/tmp/install
```

In the example above, the variable *hostnumber* should be replaced with the last of the four numbers in the tapehost's Internet address.

Loading the Ramdisk via a Local CD-ROM Drive

Power on the system. After the system passes the self-tests, the bootROM prompt is displayed.

The ramdisk installation software uses the value of the bootROM variable **INSTALLED** to determine if the basic operating system needs to be installed. Set the value of this variable to 0 before loading the ramdisk as follows:

```
ROM> setenv installed 0
```

The system will ask if you want to re-install if **INSTALLED** is not 0.

Install the OS/MP 4.1C CD-ROM disk into the CD-ROM drive.

★ ★ ★ NOTE ★ ★ ★

In order to boot from the local CD-ROM disk, the bootROMs must be at version 3.5 or higher.

To load the ramdisk on Series5 or Series5E, using a local CD-ROM drive, enter a boot command of the following form:

```
ROM> boot sd.si(,6,)/Install.Series5
```

To load the ramdisk on Series6 systems, using a local CD-ROM drive, enter a boot command of the following form:

```
ROM> boot sd.si(,6,)/Install.Series6
```

To load the ramdisk on Series6 systems, using a local CD-ROM drive, off a Cougar controller, enter a boot command of the following form:

```
ROM> boot sd.sv(2,6,0)/Install.Series6
```

The bootROM copies the ramdisk image into memory and boots it:

```
Boot: sd.si(,6,)/Install.Series5
Entry: 0xff060000
Size: 0x160000+0x748e8+0x660c8
```

A spinner is displayed while copying the ramdisk into memory. When the copy completes, there is a pause of up to three minutes.

Loading the Ramdisk via a Remote CD-ROM Drive or the Network

Loading the ramdisk from a remote CD-ROM drive is essentially the same as loading the ramdisk from an image area of the OS/MP 4.1C contained on a remote disk accessed over the network.

Power on the system. After the system passes the self-tests, the bootROM prompt is displayed.

The ramdisk installation software uses the value of the bootROM variable **INSTALLED** to determine if the basic operating system needs to be installed. Set the value of this variable to 0 before loading the ramdisk as follows:

```
ROM> setenv installed 0
```

The system will ask if you want to re-install if **INSTALLED** is not 0.

If you are installing by a remote CD-ROM drive (via the network), install the OS/MP 4.1C CD-ROM disk into the remote CD-ROM drive. Create a mount point directory (if one doesn't exist), and mount the CD-ROM drive on the remote machine, referred to here as `diskhost`, as follows:

```
diskhost# mkdir /cdrom
diskhost# mount /dev/sr0 /cdrom
```

The remote system `diskhost`, must be on the same network as the system being installed. For example, with a class C network, the first three numbers in the Internet addresses of the two machines must be the same, such as 192.1.3.42 and

192.1.3.17. Also, the local machine must be listed in **/etc/hosts**, or in the NIS/YP **hosts** database, and ethernet address must be in **/etc/ethers**, or in the NIS/YP **ethers** database. In addition, `diskhost` must have the **rarpd**(8) daemon running.

Since **tftp**(1) will be used by the system to load the ramdisk image, it must be enabled on the diskhost. Examine the file **/etc/inetd.conf**. A line similar to the one below should be in the file:

```
tftp dgram udp wait root /usr/etc/in.tftpd in.tftpd -s
/tftpboot
```

If the line starts with a #, remove the #.

If a `-s` appears after the last `in.tftpd` in **/etc/inetd.conf**, either remove it or use the directory /tftpboot instead of /var/tmp as shown above. Approximately 6 Mbytes will be needed in the directory used.

If **/etc/inetd.conf** has been changed, **inetd**(8) must be told to re-read the configuration file:

```
diskhost # ps ax | egrep inetd
  249 ? I 0:01 inetd
  541 p3 R 0:00 egrep inetd
```

The *pid* of inetd is the first number on the line that doesn't contain **egrep**. In the above output, *pid* is 249.

```
diskhost# kill -HUP pid
```

In the **boot** command below, replace the variable *X* with one of the following values, depending on the type of system

Table 18.

System	Value of X
Series5 and 5E	5
Series 6	6

Enter the following boot command:

```
ROM> b tftp.ei(,,hostnumber)/cdrom/Install.SeriesX
```

The bootROM copies the ramdisk image into memory and boots it:

```
Boot: tftp.ei(,,hostnumber)/cdrom/Install.SeriesX
Entry: 0xff060000
Size: 0x10e000+0x56afb8+0xadc40
```

A spinner is displayed while copying the ramdisk into memory. When the copy completes, there is a pause of up to three minutes.

Diskful Installation

Once the ramdisk is booted, it first determines what sort of terminal you are using. If you are using a serial terminal, that is, a terminal attached to the **ttya/ttyb** port, or if the bootROM variable **CONSOLE** is not set, the system displays a list of supported terminals:

```
1) 610
2) ansi
3) hp
4) sun
5) tvi912
6) vt100
7) wyse50
What type of terminal are you using ('1'..'7')?
```

If a frame-buffer is being used as the console, select the 4, the sun terminal type.

```
What type of terminal are you using ('1'..'7')? 4
```

If the value of the bootROM variable **INSTALLED** is non-zero, the mandatory system software has already been installed. In that case, the system displays the following:

```
THIS SYSTEM IS ALREADY INSTALLED


Do you want to re-install the system ('yes', 'no', or '?'
for help)?
```

The above message is for the benefit of users intending to re-install the system software, but have not reset the **INSTALLED** environment variable.

If the message appears, enter **yes** to re-install the mandatory system software.

The disk drives attached to the system are then scanned, and the system displays a menu of procedures:

```
                    Ramdisk

 1) Change Disk Partitioning

 2) Install Software

 3) Invoke a Bourne Shell

 4) Reboot System

 5) Halt System

Enter number of function to execute ('1'..'5', or '?' for
help):
```

The provided functions are described as follows:

Change Disk Partitioning - Allows the changing of the sizes of disk partitions, and what those partitions are to be used for filesystem space, swap space, or unused space. Refer to the *Changing Disk Partitions* Section for details on changing disk partitions.

★ ★ ★ NOTE ★ ★ ★

If you are going to make changes to the disk partitions on which OS/MP 4.1C will reside, make those changes before installing software. Disk partitions not containing OS/MP 4.1C can be modified before or after the installation.

Install Software - Intended primarily for installing new systems. If system software has already been installed, then this option may be used to install any Solbourne software distribution, such as X Windows. See the section *Software Installation from the Ramdisk* for more information.

Invoke a Bourne Shell - Starts an interactive Bourne shell. This option is provided mainly for formatting disks and restoring filesystems. The sizes of disk partitions should not be changed here with the format(8) command. If they are, you must then select `Change Disk Partitioning` before attempting to `Install Software`.

Reboot System - Starts the UNIX operating system after software installation. Alternatively, you may reload the ramdisk from scratch.

Halt System - Returns control of the system to the bootROM.

You can request help at any ramdisk prompt by entering a question mark. Table 19 shows edit commands available when entering text in response to prompts:

Table 19. Input Editing Commands

Character	Interpretation
backspace (^H)	delete last input character
delete (^?)	delete last input character
^U	erase input line
^R	redisplay input line
^W	delete input up to '/' or whitespace
^C	cancel input, returning to nearest menu
ESC	cancel input, returning to nearest menu
^L	redisplay entire screen
return (^M)	end input
newline (^J)	end input

If a string is too long to be displayed in the available space, the beginning of the string is displayed as "...". This allows display of the end of the string, which is usually of more interest.

Keywords can be shortened to any unique prefix (such as 'co' for 'continue'), except for 'yes' and 'no', which must always be spelled out.

Fatal errors during software installation are usually reported by messages beginning with `System error` or `Internal error` and ending with a "#" prompt. If a fatal error occurs, software installation may be restarted by entering:

```
# ^Jstty sane^J
# cd /
# rm -f /core
# inst_sys
```

where ^J is the linefeed character. The command **stty sane** may not be echoed (and is intended to fix exactly that problem). In the event of a fatal error during software installation, please report the problem to Solbourne customer support.

Install Software

Installing software has two distinct stages: gathering information and modifying the system. No permanent changes are made to the system until all information has been provided.

There are three information gathering menus:

- Standard Filesystem Definition - specifies where the standard filesystems (**root** (/), **swap**, and **/usr**, optionally **/var** and **/tmp**) are located.
- Media Identification - Determines the installation media from which to install (tape, CD-ROM, or network directory), and determines where that media is located.
- Package Selection - allows selecting of which optional software packages are to be installed.

All three menus provide the command **cancel**. The first two also provide the command **previous**. These commands allow you to return to prior menus, optionally discarding any changes that have been made.

cancel always returns to the ramdisk menu. If changes are to be discarded, then all changes made since `Install Software` was selected are forgotten.

previous always returns to the previous menu (which is the ramdisk menu, in the case of the Filesystem Definition menu). The changes discarded in this case are those made in the menu you are leaving.

cancel has higher priority than **previous**. In other words, if you use **previous** to leave a menu without discarding changes, then **cancel** from that menu and discard changes, the changes made in the earlier menu are also discarded.

The Standard Filesystem Definition menu defines where the mandatory filesystems are located. These filesystems (except for root) may be either on a local disk partition or provided by a disk server. If root is to be on a remote system, install the system as a client of that system, even if the system actually contains a disk. You can add entries for any local disks to /etc/fstab after installing the system as a diskless client.

Any changes made to the standard filesystems with the partition tool will appear in this menu.

Normally, no changes need to be made at this menu. To proceed to the Media Identification menu, enter **continue**.

Example:

Use the following steps to assign the **/var** filesystem to **sd0d**, rather than using the default of **/var** being a subdirectory of the root filesystem.

These steps are optional. If followed, the result is a filesystem definition that is the same as that supplied on the factory installation of a diskful system. In addition, it makes use of partition **d**, thus using 9.3 MB of disk space that is not used when the default disk partition is used with the standard filesystem definition.

In Figure 33, the notation "(required)" appears next to the **root(/)**, **swap** and **/usr** filesystems. These filesystems must be defined; however, they may be placed on any partition of any disk.

```
                    Standard Filesystem Definition

  1) root on sd0a      (required)
  2) swap on sd0b      (required)
  3) /usr on sd0g      (required)
  4) /var on root partition
  5) /tmp on root partition

                    Disk Partitions (sizes in MB)
       (a)    (b)      (c)     (d)     (e)     (f)     (g)     (h)
sd0:   8.4    32.4     191.1   9.3     ---     ---     141.1   ---
sd1:   8.4    32.7     190.9   9.6     ---     ---     140.8   ---



Enter number of filesystem to change ('1'..'5'), 'continue', 'previous',
'cancel', or '?' for help:
```

Figure 33. Sample Standard Filesystem Definition Menu

To modify the **/var** filesystem, enter the number: **4**.

```
Enter number of filesystem to change ('1'..'5'),
'continue', 'previous', 'cancel' or '?' for help: 4
```

The var menu will be highlighted, and the system will request a disk partition. Assign it to sd0d.

```
Enter name of disk partition or host:path for /var
filesystem, 'none', ^C, or'?' for help: sd0d
```

The new arrangement is displayed as shown in Figure 34.

Once all changes for the standard filesystems have been made, enter **continue** to proceed to the Installation Media Identification menu.

```
Enter number of filesystem to change ('1'..'5'),
'continue', 'previous', 'cancel', or '?' for help: continue
```

Installation Media Identification Menu

The Installation Media Identification Menu describes which media type (tape, CD ROM, or network directory) will be used during the installation. Figure 35 shows the Media Identification menu.

```
                    Standard Filesystem Definition

   1) root on sd0a      (required)
   2) swap on sd0b      (required)
   3) /usr on sd0g      (required)
   4) /var on sd0d
   5) /tmp on root partition

                        Disk Partitions (sizes in MB)
        (a)     (b)      (c)     (d)     (e)     (f)     (g)     (h)
sd0:    8.4    32.4     191.1   9.3     ---     ---     141.1   ---
sd1:    8.4    32.7     190.9   9.6     ---     ---     140.8   ---



Enter number of filesystem to change ('1'..'5'), 'continue', 'previous',
'cancel', or '?' for help:
```

Figure 34. Modified Standard Filesystem Definition Menu

```
                    Installation Media Identification

1) Installation media type = Tape
2) Tape drive = /dev/nrst0
3) Local Internet address = 0.0.0.0 (required for remote tape)
4) Network broadcast mask = 0xffff0000 (required for remote tape)
5) Tape host = localhost (127.0.0.1)









Enter selection number ('1'..'5'), 'continue', 'previous', 'cancel', or '?'for
help:
```

Figure 35. Installation Media Identification Menu - Local Tapehost

Local Tape Drive Installation

Installing from a local tape drive requires that the *Tape drive* field be set to either **st0** or **st1** (the only supported tape drives) and that *Tape host* be set to **localhost**. The Installation media type must also be set to **Tape**.

Remote Tape Drive Installation

Installation media type must be set to Tape.

Tape drive should be the basic name of the tape drive on the tapehost.

The **Local Internet address** is the address of the system being installed. If the default value is not correct, make sure that the client name corresponding to the correct address appears in the tape host's **/.rhosts** file. Check **/etc/hosts** or the NIS/YP hosts map as appropriate.

The **broadcast mask** should not be changed unless your network uses a non-standard mask. Such a mask is used when a network is sub-netted (i.e., a Class B network is treated as several Class C networks). A leading '0x' is necessary if entering the mask as a hexadecimal number. A leading '0' is needed for octal numbers. If neither prefix is given, the value is assumed to be in decimal.

Tape host must be set to the name of the system with the tape, which is used to determine the tape host's Internet address. The name itself, however, is not especially important (it is discarded after the installation is complete). As such, the default name, *tape-n-boot-serv*, generally need not be changed.

Figure 36 shows the Media Identification Menu of a system that is set up to install from a remote tape using tape device st0 (SCSI address 4).

When the details of the tape drive have been entered correctly, enter **continue**. You will be presented with the Package Selection Menu. If the operating system has already been installed, you will be prompted to insert the optional software distribution media.

Local CD-ROM Installation

Installing from a local CD-ROM disk drive requires that the Installation media type be set to **CD-ROM**, the CD-ROM drive field be set to **/dev/sr0** (`/dev/sr1` for `sv2` on a Cougar controller) and the *CD host* field be set to '**localhost**'. Figure 37 shows the Installation Media Menu with the CD-ROM parameters set to install from CD-ROM.

Network and remote CD-ROM Installations

Figure 38 shows the Installation media type menu with the Network parameters set to install from the network or a remote CD-ROM Installations of this type require that all the fields be set as follows:.

Installation media type must be set to **Network**

```
                    Installation Media Identification
1) Installation media type = Tape
2) Tape drive = /dev/nrst0
3) Local Internet address = 192.9.3.4 (required for remote tape)
4) Network broadcast mask = 0xffffff00 (required for remote tape)
5) Tape host = tape-n-boot-serv (192.9.3.1)




Enter selection number ('1'..'5'), 'continue', 'previous', 'cancel', or '?'for
help:
```

Figure 36. Installation Media Identification Menu - Remote Tapehost

```
                    Installation Media Identification

1) Installation media type = CD-ROM
2) CD drive = /dev/sr0
3) Local Internet address = 0.0.0.0 (required for remote tape)
4) Network broadcast mask = 0xffff0000 (required for remote tape)
5) CD host = localhost (127.0.0.1)




Enter selection number ('1'..'5'), 'continue', 'previous', 'cancel', or '?'for
help:
```

Figure 37. Installation Media Identification Menu - Local CD-ROM

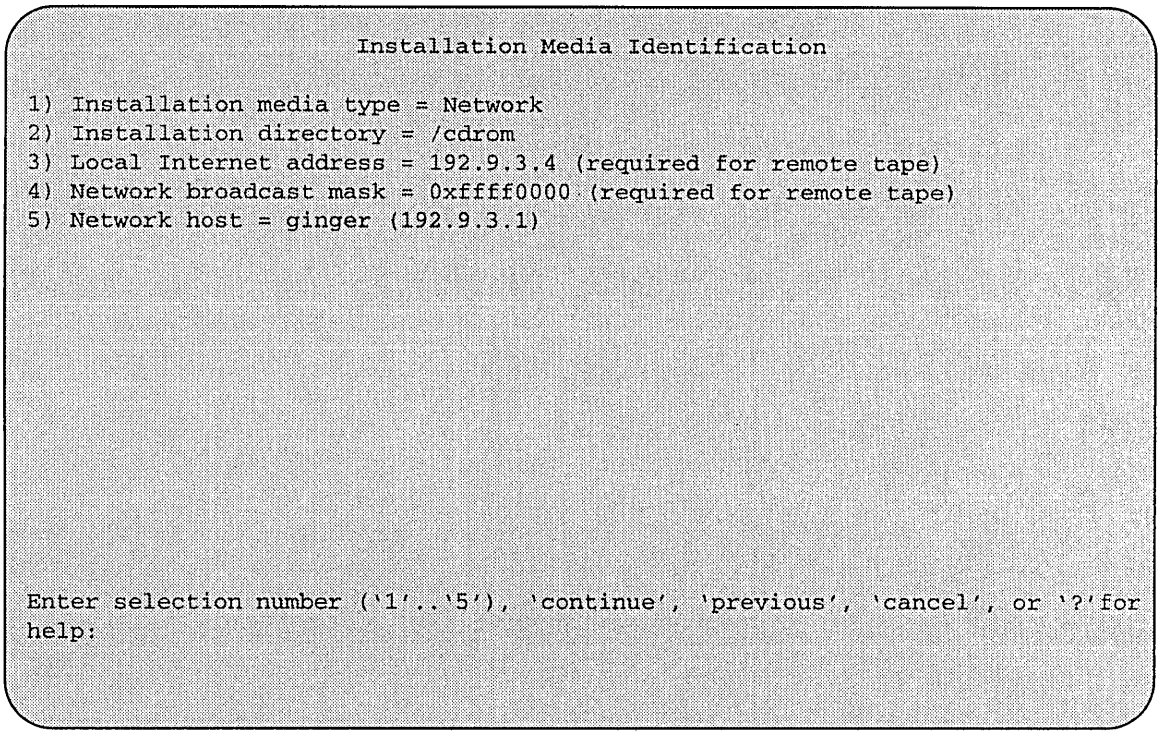


Figure 38. Installation Media Identification Menu -Remote CD-ROM

Installation directory should be the full path name of the location of the installation area, or the full path of the CD-ROM mount point, on the network host. For example, if the remote CD-ROM is mounted on **/cdrom**, then the installation path is simply **/cdrom**.

The **Local Internet address** is the address of the system being installed. If the default value is not correct, make sure that the client name corresponding to the correct address appears in the tape host's **/.rhosts** file. Check **/etc/hosts** or the NIS/YP hosts map as appropriate.

The **broadcast mask** should not be changed unless your network uses a non-standard mask. Such a mask is used when a network is sub-netted (i.e., a Class B network is treated as several Class C networks). A leading '0x' is necessary if entering the mask as a hexadecimal number. A leading '0' is needed for octal numbers. If neither prefix is given, the value is assumed to be in decimal.

Network host must be set to the name of the system with the installation directory, which is used to determine it's Internet address.

For a remote CD-ROM install, the `nethost` must have **/cdrom** in it's **/etc/exports** file, and must export it. Also, the **rpc.mountd**(8), **nfsd**(8), and **rarpd**(8) daemons must be running on `nethost`.

When the details of the media have been entered correctly, enter **continue**. If You will be presented with the Package Selection Menu If the operating system has already been installed, you will be prompted to insert the optional software distribution media.

Package Selection Menu

Use the Package Selection Menu to install optional Solbourne software distributions. It provides a menu-driven method of examining the components of the distribution tape, selecting the parts to be installed, and specifying the directories where the components will be located.

The components of a distribution are referred to as **packages**. Some examples of packages are **FORTRAN 1.4, X Windows**, and **Solbourne OS/MP Optional Software**. Packages contain one or more *modules*, which are groups of logically-related files, such as executables or libraries. Most packages also have *variables*, which have two uses: controlling the actions of installation commands associated with the package, and prefixing where modules are to be installed.

A single package, Solbourne OS/MP Optional Software, is included on the OS/MP 4.1C distribution tape. The following display shown in Figure 39 appears; the values shown for `Size` in this and subsequent displays may vary.

```
                        Package Selection

                  Mandatory Software Will Be Installed

Package Name                                Size(KB)      Install

1) Solbourne OS/MP 4.1C Optional Software     34832           n




Enter number of package to examine ('1'..'1'), 'cancel', 'install', or '?'
for help:
```

Figure 39. Package Selection Menu

The message `Mandatory Software Will Be Installed` indicates that the standard filesystems will be built from scratch (overwriting any old contents) when the **`install`** command is issued. If this message does not appear, only the packages selected in this menu will be installed.

The Optional Software package contains a set of software modules that have historically been installed as part of **/usr**. These modules are not necessary for the basic operation of the system, and have been provided separately so that **/usr** may be kept as small as possible. You must examine the package if you want it installed.

To examine the modules available, select the Optional Software package:

```
Enter number of package to examine ('1'..'1'), 'cancel',
'install', or '?' for help: 1

Should the Solbourne OS/MP 4.1C Optional Software package
be installed ('yes', 'no', ^C, or '?' for help)? yes
```

The `Should the Solbourne OS/MP 4.1C Optional Software package be installed` question refers to the package in general. The modules are individually selected for installation on the customization screen, and by default all are selected for installation.

After replying **yes**, the customization menu will appear as shown in Figure 40.

★ ★ ★ NOTE ★ ★ ★

Figure 40 is only an example. The free KB reported varies depending on the type and size of disk drive installed.

```
        Customization of Solbourne OS/MP 4.1C Optional Software

                                Software Modules
 Module          Size(KB)       Install     Directory      Free(KB)
 1) DEBUGGING        2888           y          /usr           58695
 2) GAMES            3136           y          /usr           58695
 3) MANUAL           6992           y          /usr           58695
 4) NETWORKING       1096           y          /usr           58695
 5) PLOT             1784           y          /usr           58695
 6) SECURITY          320           y          /usr           58695
 7) SV_PROG          1848           y          /usr           58695
 8) SV_USER          3144           y          /usr           58695
 9) SYSTEM_V         3992           y          /usr           58695
10) TEXT              728           y          /usr           58695
11) VERSATEC         5960           y          /usr           58695
12) UUCP              608           y          /usr           58695
13) RFS               912           y          /usr           58695
14) SHLIB            1376           y          /usr           58695
15) TLI                48           y          /usr           58695

Enter number of module to modify ('1'..'15'), 'continue', 'abort', or '?' for
help:
```

Figure 40. Package Selection Customization Menu

The size of each module in kilobytes is listed immediately to the right of the module's name. The column after the size indicates whether or not the module is currently marked for installation. If the module is to be installed, the directory that the module's files are to be installed in is listed, followed by the free space on the partition that the directory refers to.

Below are short descriptions of the individual modules:

DEBUGGING - program debugging aids
This module contains the debugging tool **dbx**(1) and the profiled versions of the standard libraries libc, libcurses, libm, libtermcap, libtermlib, libsuntool, and libsunwindow.

GAMES - games and demonstration programs
The recreational programs listed in Section 6 of the *UNIX User's Reference Manual.*

MANUAL - on-line manual pages
Sections 1 through 8 of the UNIX User's and Programmer's Manuals in machine-readable form. See **man**(1), **lookup**(1), and **qref**(1) for more details. This option requires that the TEXT option also be installed.

NETWORKING - network utilities
Utilities and commands that access a network, such as **rcp**(1) or **ftp**(1). This module is required on systems that are connected to a network, or that will use the NIS/YP database services.

PLOT - basic plot-generating applications
The standard UNIX plotting utilities, which allow the creation of plots and graphs from simple data to be displayed on a variety of plotters and graphics terminals. See **plot**(1G) and **graph**(1G).

SECURITY - C2 security
The SECURITY module provides features such as audit trails and shadow password files in the spirit of the Department of Defense's C2 Security Specification (the "Orange Book"). The compliance of these features has not been certified.

SV_PROG - SunView program development support
Include files and libraries needed for compiling SunView applications. This module requires that SV_USER also be installed.

SV_USER - basic SunView support
The SunView windowing system and associated applications (such as **suntools**(1) and **shelltool**(1)). This module is not required if only X Windows will be used on the system.

SYSTEM_V
System V-compatible libraries and executables. System VR3, POSIX, and X/OPEN are supported. See **svidii**(7v), **svidiii**(7v), **xopen**(7v), and **posix**(7v) for details.

TEXT - nroff/troff text processing
This module provides the text formatter **troff**(1) and its associated support programs and files. This option is required if the MANUAL option is installed.

VERSATEC - Versatec printer support
Various utilities specific to Versatec printers, such as **vtroff**(1) and **vplot**(1G).

UUCP - uucp applications suite
uucp(1C) and its support programs. These are normally used for communicating with other UNIX operating systems via phone line.

RFS
Utilities and libraries to support the System V Remote File System.

SHLIB
Position-independent versions of the BSD and System-V versions of the C library. These are provided to allow substituting or adding a module to the shared C library.

TLI
Libraries and headers to support developing programs that take advantage of the System V Transport Layer Interface.

Modifying a module allows selecting whether or not it is to be installed and, if so, the directory its files are to be extracted into.

★ ★ ★ NOTE ★ ★ ★

All modules are intended to be extracted in their default directory. If a module is extracted somewhere else, there is no guarantee that the programs provided in the module will work.

For example, to not install the VERSATEC module:

```
Enter number of module to modify ('1'..'15'), 'continue',
'abort', or '?' for help: 11
```

The VERSATEC menu entry is highlighted, and:

```
Modifying the Versatec printer support module
Should the VERSATEC module be installed ('yes', 'no', ^C,
or '?' for help)? no
```

Figure 41 shows the updated display.

★ ★ ★ NOTE ★ ★ ★

The free space for **/usr** *has been increased by the size of the VERSATEC module as shown in Figure 41.*

To install the GAMES module in **/fun** (on the root partition):

```
Enter number of module to modify ('1'..'13'), 'continue',
'abort', or '?' for help: 2
```

```
        Customization of Solbourne OS/MP 4.1C Optional Software

                                Software Modules
 Module          Size(KB)       Install     Directory      Free(KB)
 1) DEBUGGING        2888           y           /usr          64655
 2) GAMES            3136           y           /usr          64655
 3) MANUAL           6992           y           /usr          64655
 4) NETWORKING       1096           y           /usr          64655
 5) PLOT             1784           y           /usr          64655
 6) SECURITY          320           y           /usr          64655
 7) SV_PROG          1848           y           /usr          64655
 8) SV_USER          3144           y           /usr          64655
 9) SYSTEM_V         3992           y           /usr          64655
10) TEXT              728           y           /usr          64655
11) VERSATEC         5960           n
12) UUCP              608           y           /usr          64655
13) RFS               912           y           /usr          64655
14) SHLIB            1376           y           /usr          64655
15) TLI                48           y           /usr          64655

Enter number of module to modify ('1'..'15'), 'continue', 'abort', or '?' for
help:
```

Figure 41. Package Selection Menu - Deletion of Versatec Module

The GAMES menu entry is highlighted, and:

```
Modifying the games and demonstration programs module

Should the GAMES module be installed ('yes', 'no', ^C, or
'?' for help)? yes

Install GAMES in what directory? /fun

/fun does not exist. Create it during installation ('yes',
'no', ^C, or '?' for help)? yes
```

The menu is updated to reflect the change, as shown in Figure 42.

★ ★ ★ NOTE ★ ★ ★

The free space for **/usr** *changes, and a completely new size (for* **/fun***) is also displayed as shown in Figure 42.*

If you decide to discard all changes made to the modules, use the command **abort**. This returns to the Package Selection Menu.

If you are satisfied with the changes (if any) made to the modules, enter the command **continue**. This will record the changes and return to the Package Selection menu.

When package customization has been completed (which may mean no packages were selected for installation), enter **install** as shown in Figure 43.

```
        Customization of Solbourne OS/MP 4.1C Optional Software

                                Software Modules
 Module          Size(KB)       Install     Directory     Free(KB)
 1) DEBUGGING        2888           y           /usr          67791
 2) GAMES            3136           y           /fun           4579
 3) MANUAL           6992           y           /usr          67791
 4) NETWORKING       1096           y           /usr          67791
 5) PLOT             1784           y           /usr          67791
 6) SECURITY          320           y           /usr          67791
 7) SV_PROG          1848           y           /usr          67791
 8) SV_USER          3144           y           /usr          67791
 9) SYSTEM_V         3992           y           /usr          67791
10) TEXT              728           y           /usr          67791
11) VERSATEC         5960           n
12) UUCP              608           y           /usr          67791
13) RFS               912           y           /usr          67791
14) SHLIB            1376           y           /usr          67791
15) TLI                48           y           /usr          67791

Enter number of module to modify ('1'..'15'), 'continue', 'abort', or '?' for
help:
```

Figure 42. Package Selection Menu - Install Games module to /fun

```
                        Package Selection

                  Mandatory Software Will Be Installed

Package Name                                Size(KB)       Install

1) Solbourne OS/MP 4.1C Optional Software     34832            y




Enter number of package to examine ('1'..'1'), 'cancel', 'install', or '?'
for help: install
```

Figure 43. Package Selection Menu

Actual installation begins at this point, and may require from 10 minutes (if only mandatory root files are being installed and a local tape drive is used) to about two hours (if everything is being installed from a remote QIC-150 tape drive).

The steps taken during the installation are:

1. extract miniusr. (This contains the installation software, as well as enabling swapping. The root disk might not be repartitioned after this step without requiring reinstallation.)
2. create filesystems (**root(/)**, **/usr**, or **/var** or **/tmp**, as well as any new filesystems requested via the partition tool)
3. install mandatory **root** files
4. install mandatory **kvm** files
5. install mandatory **usr** files
6. install optional software

When installation has finished, the ramdisk menu is displayed (see Figure 44). If the installation failed, call Customer Support.

```
                                Ramdisk

1) Change Disk Partitioning
2) Install Software
3) Invoke a Bourne Shell
4) Reboot System
5) Halt System


Enter number of function to execute ('1'..'5', or '?' for help): 4
```

Figure 44. Ramdisk Menu

Rebooting from the Ramdisk

When the `Tape Change` selection is displayed, type **`continue.`**

After a successful installation, start the UNIX operating system by rebooting as shown in Figure 45.

```
                              Reboot System

1) Boot Unix
2) Boot on ramdisk
3) Return to Main Menu


Enter selection number ('1'..'3') or '?' for help: 1
```

Figure 45. Reboot System Menu

Enter number of function to execute ('1'..'5', or '?' for help): **4**

At the Reboot System menu select Boot Unix:

```
Enter selection number ('1'..'3') or '?' for help: 1
```

If BOOTMODE is set to "manual", the system takes you to the ROM prompt (ROM>).

After selecting **1** there is a short pause, and then

```
Automatic boot enabled. Type Control-C to abort

ROM> boot

Boot: sd.si(0,0,0)/vmunix

Entry: 0xff060000

Size: 0xd6000+0x33358+0x81548


OS/MP 4.1C_Export (GENERIC/root) #0: Tue Feb 1 15:52:44
1994
Copyright (c) 1989-1994 Sun Microsystems, Inc. and
Solbourne Computer, Inc.
[...]
```

Now you must specify system configuration information.

Disabling tftp

If the ramdisk was loaded from a remote tape drive, **tftp**(1) was enabled at that time.

For security reasons, it should now be disabled on the system from which the tape was read.

First, comment out the line, as shown below, in **/etc/inetd.conf**:

```
#tftp dgram udp wait root /usr/etc/in.tftpd in.tftpd
/tftpboot
```

Next, determine the process ID of **inetd**(8):

```
tapehost# ps ax | egrep inetd
  249 ?  I 0:01 inetd
  541 p3 R 0:00 egrep inetd
```

The *pid* of inetd is the first number on the line that doesn't contain egrep. In the above output, pid is 249.

Last, signal **inetd** to re-read the configuration file:

```
tapehost# kill -HUP pid
```

After Installing...

Initial Boot System Configuration

When a newly installed system is booted multi-user for the first time, the system asks a series of configuration questions:

```
OS/MP 4.1C_Export (GENERIC/root) #0: Tue Feb 1 15:52:44
1994

Copyright (c) 1989-1994 Sun Microsystems, Inc. and
Solbourne Computer, Inc.

[...]

Automatic reboot in progress...
Wed Feb 2 09:22:25 MDT 1994
checking quotas: done.

This system has not yet been configured. Several values
need to be set before the system can come up to multi-user
Unix.

What is this system's name (default = 'standalone'):
habitrail<Return>

What is its Internet address (0 for none, default =
192.9.3.4)? <Return>

What is the network broadcast mask (default = 0xffffff00)?
<Return>

What is the NIS domain name ('none' for none, default =
'none')? Rodent.COM<Return>

What directory should be used for automatic savecore files
('none' for none, default = '/var/crash/habitrail')?
<Return>
```

★ ★ ★ NOTE ★ ★ ★

Using the default 'none' for the NIS domain name disables the NIS/YP services.

```
Time zone choices are:
Australia/  GMT+11      GMT-3       GMT6        Mideast/
Brazil/     GMT+12      GMT-4       GMT7        NZ
CET         GMT+13      GMT-5       GMT8        Navajo
CST6CDT     GMT+2       GMT-6       GMT9        PRC
Canada/     GMT+3       GMT-7       Greenwich   PST8PDT
Chile/      GMT+4       GMT-8       HST         Poland
Cuba        GMT+5       GMT-9       Hongkong    ROC
EET         GMT+6       GMT0        Iceland     ROK
EST         GMT+7       GMT1        Iran        Singapore
EST5EDT     GMT+8       GMT10       Israel      Turkey
Egypt       GMT+9       GMT11       Jamaica     UCT
Factory     GMT-0       GMT12       Japan       US/
GB-Eire     GMT-1       GMT13       Libya       UTC
GMT         GMT-10      GMT2        MET         Universal
GMT+0       GMT-11      GMT3        MST         W-SU
GMT+1       GMT-12      GMT4        MST7MDT     WET
GMT+10      GMT-2       GMT5        Mexico/     Zulu

('/' indicates time zone prefixes)

Enter time zone (default = 'US/Mountain'): <Return>

What is today's date (mm/dd/yyyy, default = 2/1/1994)? <Return>
What time is it (24-hour hh:mm, default = 16:55)? <Return>

Current settings are:
 Host name                = habitrail
 Internet address         = 192.9.3.4
 Network mask             = 0xffffff00
 NIS domain               = Rodent.COM
 Savecore directory       = /var/crash/habitrail
 Time zone                = US/Mountain
 Date (m/d/y)             = 2/1/1994
 Time                     = 16:55

Are these correct ('yes' or 'no')?
yes

Setting netmask of ei0 to 255.255.255.0
Tues Feb 1 09:22:25 MDT 1994
Setting password for root
Changing password for root on habitrail.
New password:
Retype new password:
Continuing boot
starting rpc and net services: portmap [...]
```

Reconfiguring the System

You may need to reconfigure the system if: (1) wrong value was set during the initial configuration, or (2) the system did not successfully come up to multi-user mode.

If you find that a wrong value was set during configuration, you can modify the appropriate file manually, or reconfigure. Manually correcting the settings should only be done if you are an experienced system administrator. Reconfiguring automatically is straight forward, as explained in the following procedure.

If the system has hung up during the boot process, press the Reset button.

★ ★ ★ NOTE ★ ★ ★

If automatic boot is enabled, interrupt the reboot by typing Control-C in the early stages of the reboot; otherwise the system will hang up as before

Then bring up the system in single-user mode:

```
ROM> boot -s
[...]
```

If the system booted successfully originally, you may instead log in as root:

```
habitrail login: root
Password:
```

In either case, if the file **/etc/sys_conf/system-configured** exists, that tells the system it has been configured, remove it:

```
# rm /etc/sys_conf/system-configured
```

The above file may not exist; this is not a problem. Go to the next step.

Now reboot. If you are in single-user mode, exit:

```
# exit
```

Otherwise, use fastboot:

```
# /etc/fastboot
```

The system asks configuration questions just as it did the first time it booted after being installed.

Installing on Series S4000

Loading the Ramdisk

Turn the system on. After the system passes the self-tests, the system displays the bootROM prompt.

Loading the Local Ramdisk via a Local Tape Drive

The ramdisk installation software uses the value of the bootROM variable **INSTALLED** to determine if the basic operating system needs to be installed. Set the value of this variable to 0 before loading the ramdisk as follows:

```
ROM> setenv installed 0
```

The system asks if you want to re-install if **INSTALLED** is not 0.

Install the OS/MP 4.1C distribution tape into the tape drive and enter the **install** command. If there is more than one tape drive, the bootROM asks which tape drive to use. For example:

```
ROM> install
Which type of device do you wish to install from:
   1) Tape
   2) Network
Enter device type: 1
You have the following tape drives. Please choose one:
   1) At Target4, drive name: ARCHIVE VIPER 150 21247-005
   2) At Target5, drive name: EXABYTE EXB-8200 251K
Enter device number: 1
```

The bootROM copies the ramdisk image into memory and boots it:

```
Boot: st.si(,4,4)
Entry: 0xfd080000
Size: 0xec000+0x53ab28+0x42ab8
```

The system displays a spinner while copying the ramdisk into memory. When the copy completes, the spinner pauses for up to three minutes.

Loading the Ramdisk via a Remote Tape Drive

The system with the tape drive, referred to as `tapehost` in the following example, must be on the same network as the system being installed, referred to as *hamster* in the following example. For example, with a class C network, the first three numbers in the Internet addresses of the two machines must be the same, such as

192.1.3.42 and 192.1.3.17. Also, *hamster* must be listed in **/etc/hosts**, or in the NIS/YP hosts database, and **/.rhosts** on `tapehost`. In addition, the ethernet address must be in the **ethers** database. The `tapehost` must also be running the **rarpd**(8) daemon.The ramdisk must be extracted from the OS/MP 4.1C distribution tape onto a disk on `tapehost`.

Since **tftp**(1) will be used by the system to load the ramdisk image, it must be enabled on the tapehost. Examine the file **/etc/inetd.conf**. A line similar to the one below should be in the file:

```
tftp dgram udp wait root /usr/etc/in.tftpd in.tftpd -s
/tftpboot
```

If the line starts with a #, remove the #.

If a `-s` appears after the last `in.tftpd` in **/etc/inetd.conf**, either remove it or use the directory **/tftpboot** instead of **/var/tmp** as shown above. Approximately 6 MBytes will be needed in the directory used.

If **/etc/inetd.conf** has been changed, **inetd**(8) must be told to re-read the configuration file:

```
tapehost # ps ax | egrep inetd
249 ? I 0:01 inetd
541 p3 R 0:00 egrep inetd
```

The *pid* of inetd is the first number on the line that doesn't contain **egrep**. In the above output, *pid* is 249.

```
tapehost # kill -HUP pid
```

★ ★ ★ NOTE ★ ★ ★

In the following example the install kernel will be named /var/tmp/install. The actual name of the file is not important, as long as it is used consistently here and in the example on the next page. Also note that the filesystem must have enough space to hold the install kernel.

Put the distribution tape into the drive and execute the following commands. For Exabyte tape drives, use bs=1024 instead of bs=512 in the **dd** command shown below.

```
tapehost # cd /var/tmp
tapehost # mt -f /dev/nrst0 asf 4
tapehost # dd if=/dev/nrst0 of=install bs=512
```

The ramdisk installation software uses the value of the bootROM variable **INSTALLED** to determine if a system needs to have the basic operating system installed. Set the value of this variable to 0 before loading the ramdisk:

```
ROM> setenv installed 0
```

The system will ask if you want to re-install if **INSTALLED** is not 0. Enter the **install** command, selecting network installation. In the following sample interaction, sample Internet addresses are shown. Where the system prompts for an Internet address, you should enter the value assigned to your system.

```
ROM> install
Which type of device do you wish to install from:
   1) Tape
   2) Network
Enter device type: 2
Enter internet address of this system (default=a.b.c.d):
192.9.3.4


Enter internet address of remote tape system
(default=a.b.c.d):
   192.9.3.1
Enter name of file to boot (default=/usr/boot/munix.S4000):
   /var/tmp/install
Using IP address 192.9.3.4 = C0090304
Server at IP address 192.9.3.1 = C0090301
Boot: tftp.ei(,1,1)/var/tmp/install
Entry: 0xfd080000
Size: 0xec000+0x53ab28+0x42ab8
```

A spinner is displayed while copying the ramdisk into memory. When the copy completes, there is a pause of up to three minutes.

Loading the Ramdisk via a Local CD-ROM Drive

Power on the system. After the system passes the self-tests, the bootROM prompt is displayed.

The ramdisk installation software uses the value of the bootROM variable **INSTALLED** to determine if the basic operating system needs to be installed. Set the value of this variable to 0 before loading the ramdisk as follows:

```
ROM> setenv installed 0
```

The system will ask if you want to re-install if **INSTALLED** is not 0.

Install the OS/MP 4.1C CD-ROM disk into the CD-ROM drive.

To load the ramdisk on S4000 systems, using a local CD-ROM drive, enter a boot command of the following form:

```
ROM> boot sd.si(,6,)/Install.S4000
```

The bootROM copies the ramdisk image into memory and boots it:

```
Boot: sd.si(,6,)/Install.S4000
Entry: 0xfd080000
Size: 00xea000+0x43b8b8+0x309a8
```

A spinner is displayed while copying the ramdisk into memory. When the copy completes, there is a pause of up to three minutes.

Loading the Ramdisk via a Remote CD-ROM Drive or the Network

Loading the ramdisk from a remote CD-ROM drive is essentially the same as loading the ramdisk from an image area of the OS/MP 4.1C contained on a remote disk accessed over the network. The command to load the ramdisk depends on the type of system.

Power on the system. After the system passes the self-tests, the bootROM prompt is displayed.

The ramdisk installation software uses the value of the bootROM variable **INSTALLED** to determine if the basic operating system needs to be installed. Set the value of this variable to 0 before loading the ramdisk as follows:

```
ROM> setenv installed 0
```

The system will ask if you want to re-install if **INSTALLED** is not 0.

If you are installing using a remote CD-ROM drive (via the network), install the OS/MP 4.1C CD-ROM disk into the remote CD-ROM drive. Create a mount point directory (if one doesn't exist), and mount the CD-ROM drive on the remote machine, referred to here as `diskhost`, as follows:

```
diskhost# mkdir /cdrom
diskhost# mount /dev/sr0 /cdrom
```

The remote system `diskhost`, must be on the same network as the system being installed. For example, with a class C network, the first three numbers in the Internet addresses of the two machines must be the same, such as 192.1.3.42 and 192.1.3.17. Also, the local machine must be listed in **/etc/hosts**, or in the NIS/YP *hosts* database, and in **/.rhosts** on `diskhost`. In addition, the ethernet address must be in **/etc/ethers**, or in the NIS/YP *ethers* database.

`diskhost` must have **`/cdrom`** in it's **`/etc/exports`** file, and must also be running the **`rpc.mountd`**(8) **`nfsd`**(8) and **`rarpd`**() daemons.

Since **tftp**(1) will be used by the system to load the ramdisk image, it must be enabled on the diskhost. Examine the file **/etc/inetd.conf**. A line similar to the one below should be in the file:

```
tftp dgram udp wait root /usr/etc/in.tftpd in.tftpd -s
/tftpboot
```

If the line starts with a #, remove the #.

If a `-s` appears after the last `in.tftpd` in **/etc/inetd.conf**, either remove it or use the directory **/tftpboot** instead of **/var/tmp** in the example below. Approximately 6 MBytes will be needed in the directory used.

If **/etc/inetd.conf** has been changed, **inetd**(8) must be told to re-read the configuration file:

```
diskhost # ps ax | egrep inetd
  249 ? I 0:01 inetd
  541 p3 R 0:00 egrep inetd
```

The *pid* of inetd is the first number on the line that doesn't contain **egrep**. In the above output, *pid* is 249.

```
diskhost# kill -HUP pid
```

Enter the following boot command:

```
ROM> b tftp.ei(,,hostnumber)/cdrom/Install.S4000
```

Diskful Installation

This section describes the procedure for installing diskful systems.

When the ramdisk is booted, it first determines what sort of terminal is being used. If it is a serial terminal, that is, a terminal attached to the **ttya/ttyb** port, or if the bootROM variable **CONSOLE** is not set, a list of supported terminals is displayed as follows:

```
1) 610
2) ansi
3) hp
4) sun
5) tvi912
6) vt100
7) wyse50
What type of terminal are you using ('1'..'7')?
```

If a frame-buffer is being used as the console, select the 4, the sun terminal type.

```
What type of terminal are you using ('1'..'7')? 4
```

If the value of the bootROM variable **INSTALLED** is non-zero, the mandatory system software has already been installed. In that case, the system displays the following:

```
THIS SYSTEM IS ALREADY INSTALLED


Do you want to re-install the system ('yes', 'no', or '?'
for help)?
```

The above message is for the benefit of users intending to re-install the system software, but have not reset the **INSTALLED** environment variable. If the message appears, enter **yes** to re-install the mandatory system software.

The disk drives attached to the system are then scanned, and a menu of procedures is displayed:

```
                              Ramdisk

 1) Change Disk Partitioning

 2) Install Software

 3) Invoke a Bourne Shell

 4) Reboot System

 5) Halt System

Enter number of function to execute ('1'..'5', or '?' for
help):
```

The provided functions are described below:

Change Disk Partitioning - Allows changing the sizes of disk partitions, and what those partitions are to be used for, such as filesystem, swap, or unused.

★ ★ ★ NOTE ★ ★ ★

If changes are going to be made to the disk partitions on which OS/MP 4.1C will reside, make the changes before installing software. Disk partitions not containing OS/MP 4.1C can be modified before or after the installation.

Install Software - Intended primarily for installing new systems. If system software has already been installed, then this option may be used to install any Solbourne software distribution, such as X Windows.

Invoke a Bourne Shell - Starts an interactive Bourne shell. This option is provided mainly for formatting disks and restoring filesystems. The sizes of disk partitions should not be changed here with the format(8) command. If they are, you must then select `Change Disk Partitioning` before attempting to `Install Software`.

Reboot System - Starts the UNIX operating system after software installation. Alternatively, you may reload the ramdisk from scratch.

Halt System - Returns control of the system to the bootROM.

You can request help at any ramdisk prompt by entering a question mark by itself. Table 20 shows edit commands available when entering text in response to prompts:

Table 20. Input Editing Commands

Character	Interpretation
backspace (^H)	delete last input character
delete (^?)	delete last input character
^U	erase input line
^R	redisplay input line
^W	delete input up to '/' or whitespace
^C	cancel input, returning to nearest menu
ESC	cancel input, returning to nearest menu
^L	redisplay entire screen
return (^M)	end input
newline (^J)	end input

If a string is too long to be displayed in the available space, the beginning of the string is displayed as "...". This allows display of the end of the string, which is usually of more interest.

Keywords can be shortened to any unique prefix (such as 'co' for 'continue'), except for 'yes' and 'no', which must always be spelled out.

Fatal errors during software installation are usually reported by messages beginning with "`System error`" or "`Internal error`" and ending with a "`#`" prompt. If a fatal error occurs, software installation may be restarted by entering:

```
# ^Jstty sane^J
# cd /
# rm -f /core
# inst_sys
```

where ^J is the linefeed character. The command **stty sane** may not be echoed (and is intended to fix exactly that problem). In the event of a fatal error during software installation, please report the problem to Solbourne customer support.

Install Software

Installing software has two distinct stages: gathering information and modifying the system. No permanent changes are made to the system until all information has been provided.

There are three information gathering menus:

- Standard Filesystem Definition - specifies where the standard filesystems (**root (/)**, **swap**, and **/usr**, optionally **/var** and **/tmp**) are located.
- Media Identification - Determines the installation media from which to install (tape, CD-ROM, or network directory), and determines where that media is located.
- Package Selection - allows selecting of which optional software packages are to be installed.

All three menus provide the command **cancel**. The first two also provide the command **previous**. These commands allow you to return to prior menus, optionally discarding any changes that have been made.

cancel always returns to the ramdisk menu. If changes are to be discarded, then all changes made since `Install Software` was selected are forgotten.

previous always returns to the previous menu (which is the ramdisk menu, in the case of the Filesystem Definition menu). The changes discarded in this case are those made in the menu you are leaving.

cancel has higher priority than **previous**. In other words, if you use **previous** to leave a menu without discarding changes, then **cancel** from that menu and discard changes, the changes made in the earlier menu are also discarded.

Standard Filesystem Definition

The Standard Filesystem Definition menu defines where the mandatory filesystems are located. These filesystems (except for root) may be either on a local disk partition or provided by a disk server. If root is to be on a remote system, install the system as a client of that system, even if the system actually contains a disk.

Any changes made to the standard filesystems with the partition tool will appear in this menu.

Normally, no changes need to be made at this menu. To proceed to the Tape Identification Menu, enter **`continue`**.

Use the following steps to assign the **/var** filesystem to **sd0d**, rather than using the default of **/var** being a subdirectory of the root filesystem.

These steps are optional. If followed, the result is a filesystem definition that is the same as that supplied on the factory installation of a diskful system. In addition, it makes use of partition d, thus using 9.3 MB of disk space that is not used when the default disk partition is used with the standard filesystem definition.

In Figure 46, the notation "(required)" appears next to the **root(/)**, **swap** and **/usr** filesystems. These filesystems must be defined; however, they may be placed on any partition of any disk.

```
                    Standard Filesystem Definition

  1) root on sd0a      (required)
  2) swap on sd0b      (required)
  3) /usr on sd0g      (required)
  4) /var on root partition
  5) /tmp on root partition

                    Disk Partitions (sizes in MB)
       (a)    (b)      (c)     (d)     (e)     (f)     (g)     (h)
sd0:   8.4   32.4     191.1    9.3     ---     ---     141.1   ---
sd1:   8.4   32.7     190.9    9.6     ---     ---     140.8   ---



Enter number of filesystem to change ('1'..'5'), 'continue', 'previous',
'cancel', or '?' for help:
```

Figure 46. Sample Standard Filesystem Definition Menu

To modify the **/var** filesystem, enter the number: **4**.

```
Enter number of filesystem to change ('1'..'5'),
'continue', 'previous', 'cancel' or '?' for help: 4
```

The var menu will be highlighted, and the system will request a disk partition. Assign it to sd0d.

```
Enter name of disk partition or host:path for /var
filesystem, 'none', ^C, or'?' for help: sd0d
```

The new arrangement is displayed as shown in Figure 47.

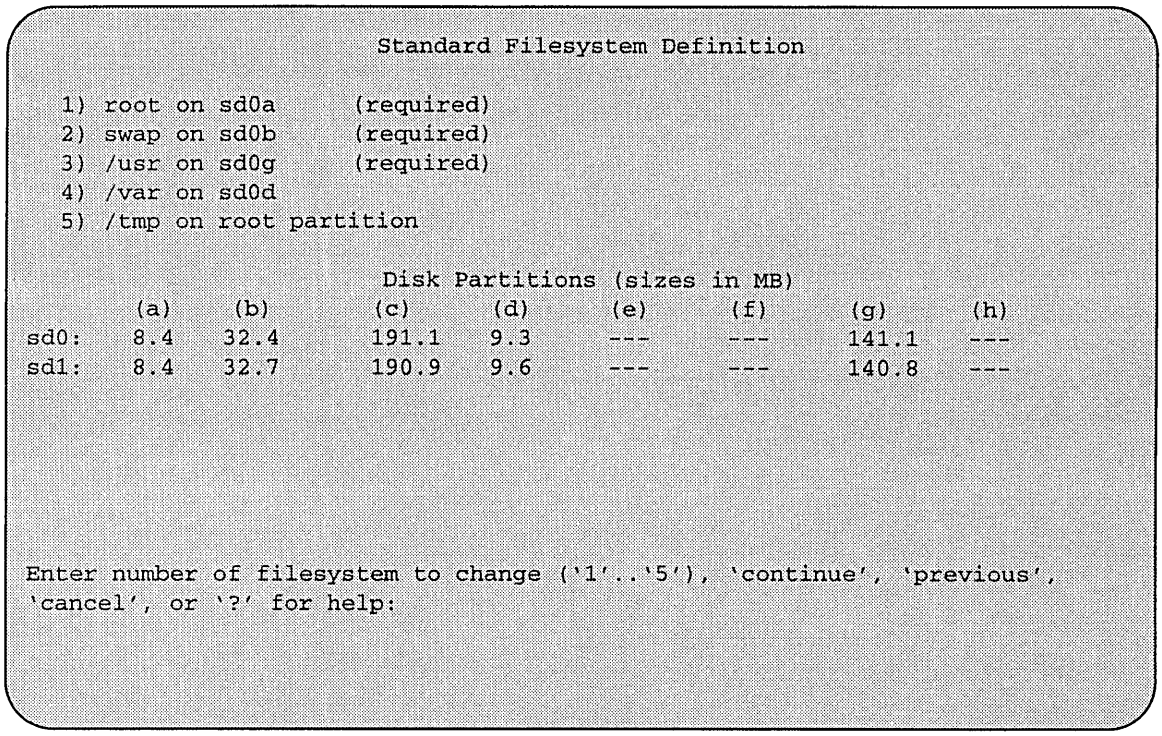
Once all changes for the standard filesystems have been made, enter **continue** to proceed to the Installation Media Identification Menu:

```
Enter number of filesystem to change ('1'..'5'),
'continue', 'previous', 'cancel', or '?' for help: continue
```

Installation Media Identification Menu

The Media Identification Menu describes which media type (tape, CD ROM, or network directory) will be used during the installation.

On Series S4000 systems, the default values are determined by how the ramdisk was booted.



```
                    Standard Filesystem Definition

  1) root on sd0a      (required)
  2) swap on sd0b      (required)
  3) /usr on sd0g      (required)
  4) /var on sd0d
  5) /tmp on root partition

                        Disk Partitions (sizes in MB)
       (a)     (b)      (c)      (d)      (e)      (f)      (g)      (h)
sd0:   8.4    32.4     191.1    9.3      ---      ---      141.1    ---
sd1:   8.4    32.7     190.9    9.6      ---      ---      140.8    ---



Enter number of filesystem to change ('1'..'5'), 'continue', 'previous',
'cancel', or '?' for help:
```

Figure 47. Modified Standard Filesystem Definition Menu

Figure 48 shows the Installation Media Identification Menu of a S4000 machine that was booted from a local tape device st0 (SCSI address 4).

Local Tape Drive Installation

Installing from a local tape drive requires that the *Tape drive* field be set to either **st0** or **st1** (the only supported tape drives) and that *Tape host* be set to '**localhost**'. The Installation media type must also be set to '**Tape**'.

Remote Tape Drive Installation

Installation media type must be set to Tape.

Tape drive should be the basic name of the tape drive on the tapehost.

The **Local Internet address** is the address of the system being installed. If the default value is not correct, make sure that the client name corresponding to the correct address appears in the tape host's **/.rhosts** file. Check **/etc/hosts** or the NIS/YP hosts map as appropriate.

The **broadcast mask** should not be changed unless your network uses a non-standard mask. Such a mask is used when a network is sub-netted (i.e., a Class B network is treated as several Class C networks). A leading '0x' is necessary if entering the mask as a hexadecimal number. A leading '0' is needed for octal numbers. If neither prefix is given, the value is assumed to be in decimal.

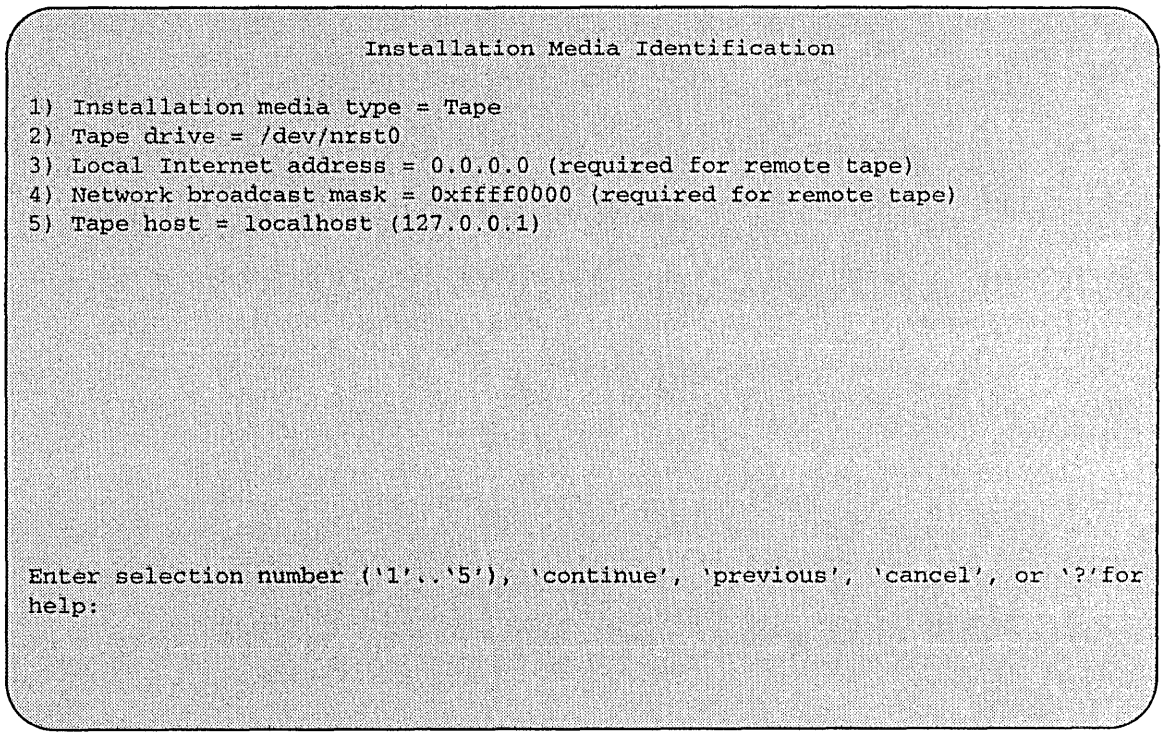


Figure 48. Installation Media Identification Menu - Local Tapehost

Tape host must be set to the name of the system with the tape, which is used to determine the tape host's Internet address. The name itself, however, is not especially important (it is discarded after the installation is complete). As such, the default name, *tape-n-boot-serv*, generally need not be changed.

Figure 49 shows the Media Identification menu of a system loading software from a remote tape using tape device st1 (SCSI address 5).

When the details of the tape drive have been entered correctly, enter **`continue`**. You will be presented with the Package Selection Menu. If the operating system has already been installed, you will be prompted to insert the optional software distribution media.

Local CD-ROM installation

Installing from a local CD-ROM disk drive requires that the Installation media type be set to **`CD-ROM`**, the CD-ROM drive field be set to **`/dev/sr0`** and the *CD host* field be set to '**`localhost`**'. Figure 50 shows the Installation Media Identification menu with the CD-ROM parameters set to install from CD-ROM.

Network and remote CD-ROM Installations

Figure 51 shows the Installation media type menu with the Network parameters set to install from the network or a remote CD-ROM. Installations of this type require that all the fields be set as follows:

Installation media type must be set to **`Network`**

```
                    Installation Media Identification
1) Installation media type = Tape
2) Tape drive = /dev/nrst1
3) Local Internet address = 192.9.3.4 (required for remote tape)
4) Network broadcast mask = 0xffffff00 (required for remote tape)
5) Tape host = tape-n-boot-serv (192.9.3.1)









Enter selection number ('1'..'5'), 'continue', 'previous', 'cancel', or '?' for
help:
```

Figure 49. Installation Media Identification Menu - Remote Tapehost

```
                    Installation Media Identification

1) Installation media type = CD-ROM
2) CD drive = /dev/sr0
3) Local Internet address = 0.0.0.0 (required for remote tape)
4) Network broadcast mask = 0xffff0000 (required for remote tape)
5) CD host = localhost (127.0.0.1)









Enter selection number ('1'..'5'), 'continue', 'previous', 'cancel', or '?' for
help:
```

Figure 50. Installation Media Identification Menu - Local CD-ROM

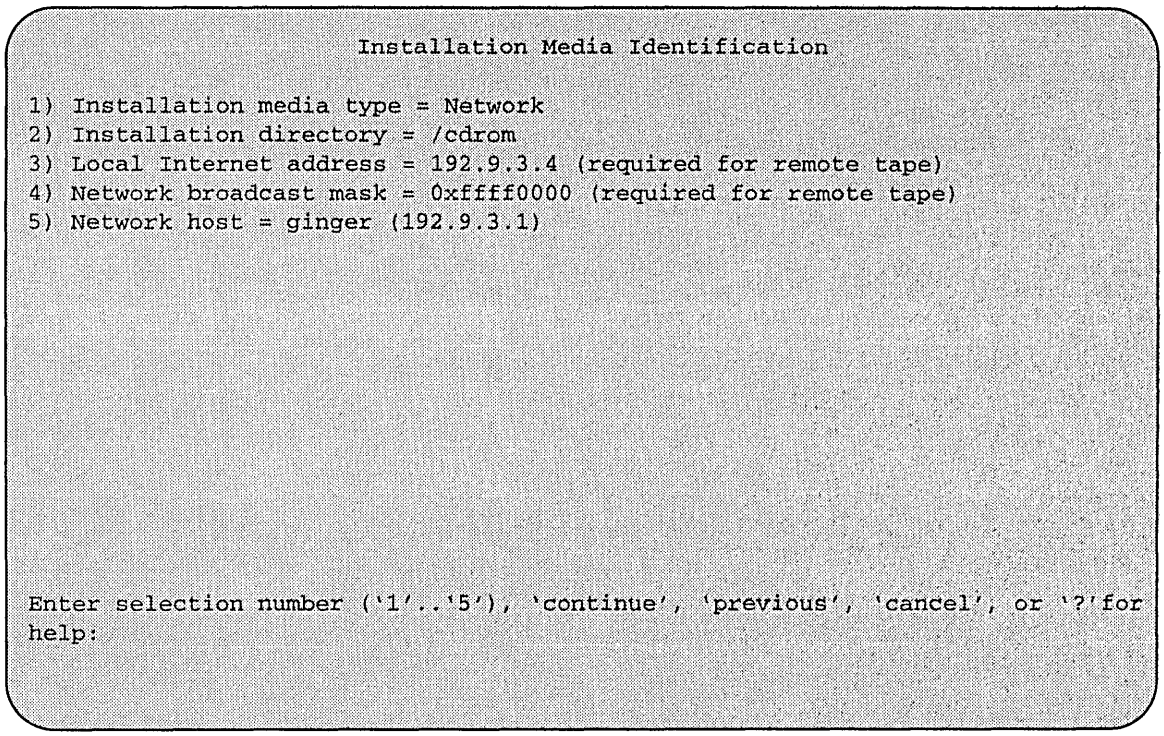


Figure 51. Installation Media Identification Menu -Remote CD-ROM

Installation directory should be the full path name of the location of the installation area, or the full path of the CD-ROM mount point, on the network host. For example, if the remote CD-ROM is mounted on **/usr/cdrom**, then the installation path is simply **/usr/cdrom**.

The **Local Internet address** is the address of the system being installed. If the default value is not correct, make sure that the client name corresponding to the correct address appears in the tape host's **/.rhosts** file. Check **/etc/hosts** or the NIS/YP hosts map as appropriate.

The **broadcast mask** should not be changed unless your network uses a non-standard mask. Such a mask is used when a network is sub-netted (i.e., a Class B network is treated as several Class C networks). A leading '0x' is necessary if entering the mask as a hexadecimal number. A leading '0' is needed for octal numbers. If neither prefix is given, the value is assumed to be in decimal.

Network host must be set to the name of the system with the remote CD-ROM, and it's Internet address.

For a remote CD-ROM install, the `nethost` must have **/cdrom** in it's **/etc/exports** file, and must export it. Also, the **rpc.mountd**(8), **nfsd**(8), and **rarpd**(8) daemons must be running on `nethost`.

When the details of the media have been entered correctly, enter **continue**. If You will be presented with the Package Selection Menu. If the operating system has already been installed, you will be prompted to insert the optional software distribution media.

Package Selection Menu

Use the he Package Selection Menu to install optional Solbourne software distributions. It provides a menu-driven method of examining the components of the distribution tape, selecting the parts to be installed, and specifying the directories where the components will be located.

The components of a distribution are referred to as **packages**. Some examples of packages are **FORTRAN 1.4, X Windows**, and **Solbourne OS/MP Optional Software**. Packages contain one or more *modules*, which are groups of logically-related files, such as executables or libraries. Most packages also have *variables*, which have two uses: controlling the actions of installation commands associated with the package, and prefixing where modules are to be installed.

A single package, Solbourne OS/MP Optional Software, is included on the OS/MP 4.1C distribution tape. The following display shown in Figure 52 appears; the values shown for `Size` in this and subsequent displays may vary.

```
                        Package Selection

                Mandatory Software Will Be Installed

Package Name                                Size (KB)      Install

1) Solbourne OS/MP 4.1C Optional Software     34832



Enter number of package to examine ('1'..'1'), 'cancel', 'install', or '?'
for help:
```

Figure 52. Package Selection Menu

The message `Mandatory Software Will Be Installed` indicates that the standard filesystems will be built from scratch (overwriting any old contents) when the **`install`** command is issued. If this message does not appear, only the packages selected in this menu will be installed.

The Optional Software package contains a set of software modules that have historically been installed as part of **/usr**. These modules are not necessary for the basic operation of the system, and have been provided separately so that **/usr** may be kept as small as possible. To examine the modules available, select the Optional Software package:

```
Enter number of package to examine ('1'..'1'), 'cancel',
'install', or '?' for help: 1

Should the Solbourne OS/MP 4.1C Optional Software package
be installed ('yes', 'no', ^C, or '?' for help)? yes
```

The `Should the Solbourne OS/MP 4.1C. Optional Software package be installed` question refers to the package in general. The modules are individually selected for installation on the customization screen, and by default all are selected for installation.

After replying **yes**, the customization menu will appear as shown in Figure 53.

★★★NOTE★★★

In Figure 53, the free KB reported varies depending on the type and size of disk drive installed.

```
          Customization of Solbourne OS/MP 4.1C Optional Software

                                  Software Modules
 Module          Size(KB)         Install     Directory      Free(KB)
 1) DEBUGGING        2888           y           /usr           58695
 2) GAMES            3136           y           /usr           58695
 3) MANUAL           6992           y           /usr           58695
 4) NETWORKING       1096           y           /usr           58695
 5) PLOT             1784           y           /usr           58695
 6) SECURITY          320           y           /usr           58695
 7) SV_PROG          1848           y           /usr           58695
 8) SV_USER          3144           y           /usr           58695
 9) SYSTEM_V         3992           y           /usr           58695
10) TEXT              728           y           /usr           58695
11) VERSATEC         5960           y           /usr           58695
12) UUCP              608           y           /usr           58695
13) RFS               912           y           /usr           58695
14) SHLIB            1376           y           /usr           58695
15) TLI                48           y           /usr           58695

Enter number of module to modify ('1'..'15'), 'continue', 'abort', or '?' for
help:
```

Figure 53. Package Selection Customization Menu

The size of each module in kilobytes is listed immediately to the right of the module's name. The column after the size indicates whether or not the module is currently marked for installation. If the module is to be installed, the directory that the module's files are to be installed in is listed, followed by the free space on the partition that the directory refers to.

Below are short descriptions of the individual modules:

DEBUGGING - program debugging aids
This module contains the debugging tool **dbx**(1) and the profiled versions of the standard libraries libc, libcurses, libm, libtermcap, libtermlib, libsuntool, and libsunwindow.

GAMES - games and demonstration programs
The recreational programs listed in section 6 of the *UNIX User's Reference Manual.*

MANUAL - on-line manual pages
Sections 1 through 8 of the UNIX User's and Programmer's Manuals in machine-readable form. See **man**(1), **lookup**(1), and **qref**(1) for more details. This option requires that the TEXT option also be installed.

NETWORKING - network utilities
Utilities and commands that access a network, such as **rcp**(1) or **ftp**(1). This module is required on systems that are connected to a network, or that will use the NIS/YP database services.

PLOT - basic plot-generating applications
The standard UNIX plotting utilities, which allow the creation of plots and graphs from simple data to be displayed on a variety of plotters and graphics terminals. See **plot**(1G) and **graph**(1G).

SECURITY - C2 security
The SECURITY module provides features such as audit trails and shadow password files in the spirit of the Department of Defense's C2 Security Specification (the "Orange Book"). The compliance of these features has not been certified.

SV_PROG - SunView program development support
Include files and libraries needed for compiling SunView applications. This module requires that SV_USER also be installed.

SV_USER - basic SunView support
The SunView windowing system and associated applications (such as **suntools**(1) and **shelltool**(1)). This module is not required if only X Windows will be used on the system.

SYSTEM_V
System V-compatible libraries and executables. System VR3, POSIX, and X/OPEN are supported. See **svidii**(7v), **svidiii**(7v), **xopen**(7v), and **posix**(7v) for details.

TEXT - nroff/troff text processing
This module provides the text formatter **troff**(1) and its associated support programs and files. This option is required if the MANUAL option is installed.

VERSATEC - Versatec printer support
Various utilities specific to Versatec printers, such as **vtroff**(1) and **vplot**(1G).

UUCP - uucp applications suite
uucp(1C) and its support programs. These are normally used for communicating with other UNIX operating systems via phone line.

RFS
Utilities and libraries to support the System V Remote File System.

SHLIB
Position-independent versions of the BSD and System-V versions of the C library. These are provided to allow substituting or adding a module to the shared C library.

TLI
Libraries and headers to support developing programs that take advantage of the System V Transport Layer Interface.

Modifying a module allows selecting whether or not it is to be installed and, if so, the directory its files are to be extracted into.

★ ★ ★ NOTE ★ ★ ★

All modules are intended to be extracted in their default directory. If a module is extracted somewhere else, there is no guarantee that the programs provided in the module will work.

For example, to not install the VERSATEC module:

```
Enter number of module to modify ('1'..'15'), 'continue',
'abort', or '?' for help: 11
```

The VERSATEC menu entry is highlighted, and:

```
Modifying the Versatec printer support module
Should the VERSATEC module be installed ('yes', 'no', ^C,
or '?' for help)? no
```

Figure 54 shows the updated display.

★ ★ ★ NOTE ★ ★ ★

The free space for **/usr** *has been increased by the size of the VERSATEC module as shown in Figure 54.*

To install the GAMES module in **/fun** (on the root partition):

```
Enter number of module to modify ('1'..'13'), 'continue',
'abort', or '?' for help: 2
```

```
        Customization of Solbourne OS/MP 4.1C Optional Software

                                Software Modules
 Module          Size(KB)      Install     Directory     Free(KB)
 1) DEBUGGING        2888          y          /usr          64655
 2) GAMES            3136          y          /usr          64655
 3) MANUAL           6992          y          /usr          64655
 4) NETWORKING       1096          y          /usr          64655
 5) PLOT             1784          y          /usr          64655
 6) SECURITY          320          y          /usr          64655
 7) SV_PROG          1848          y          /usr          64655
 8) SV_USER          3144          y          /usr          64655
 9) SYSTEM_V         3992          y          /usr          64655
10) TEXT              728          y          /usr          64655
11) VERSATEC         5960          n
12) UUCP              608          y          /usr          64655
13) RFS               912          y          /usr          64655
14) SHLIB            1376          y          /usr          64655
15) TLI                48          y          /usr          64655

Enter number of module to modify ('1'..'15'), 'continue', 'abort', or '?' for
help:
```

Figure 54. Package Selection Menu - Deletion of Versatec Module

The GAMES menu entry is highlighted, and:

```
Modifying the games and demonstration programs module

Should the GAMES module be installed ('yes', 'no', ^C, or
'?' for help)? yes

Install GAMES in what directory? /fun

/fun does not exist. Create it during installation ('yes',
'no', ^C, or '?' for help)? yes
```

The menu is updated to reflect the change, as shown in Figure 55.

★ ★ ★ NOTE ★ ★ ★

The free space for **/usr** *changes, and a completely new size (for* **/fun***) is also displayed as shown in Figure 55.*

If you decide to discard all changes made to the modules, use the command **abort**. This returns to the Package Selection Menu.

If you are satisfied with the changes (if any) made to the modules, enter the command **continue**. This will record the changes and return to the Package Selection menu.

When package customization has been completed (which may mean no packages were selected for installation), enter **install** as shown in Figure 56.

```
          Customization of Solbourne OS/MP 4.1C Optional Software

                                  Software Modules
 Module           Size(KB)        Install     Directory      Free(KB)
 1) DEBUGGING         2888          y           /usr           67791
 2) GAMES             3136          y           /fun            4579
 3) MANUAL            6992          y           /usr           67791
 4) NETWORKING        1096          y           /usr           67791
 5) PLOT              1784          y           /usr           67791
 6) SECURITY           320          y           /usr           67791
 7) SV_PROG           1848          y           /usr           67791
 8) SV_USER           3144          y           /usr           67791
 9) SYSTEM_V          3992          y           /usr           67791
10) TEXT               728          y           /usr           67791
11) VERSATEC          5960          n
12) UUCP               608          y           /usr           67791
13) RFS                912          y           /usr           67791
14) SHLIB             1376          y           /usr           67791
15) TLI                 48          y           /usr           67791

Enter number of module to modify ('1'..'15'), 'continue', 'abort', or '?' for
help:
```

Figure 55. Package Selection Menu - Install Games module to /fun

```
                          Package Selection

                   Mandatory Software Will Be Installed

Package Name                                  Size(KB)       Install

1) Solbourne OS/MP 4.1C Optional Software      34832             y




Enter number of package to examine ('1'..'1'), 'cancel', 'install', or '?'
for help: install
```

Figure 56. Package Selection Menu

Actual Installation

Actual installation begins at this point, and may require from 10 minutes (if only mandatory root files are being installed and a local tape drive is used) to about two hours (if everything is being installed from a remote QIC-150 tape drive).

The steps taken during the installation are:

1. extract miniusr. (This contains the installation software, as well as enabling swapping. The root disk might not be repartitioned after this step without requiring reinstallation.)
2. create filesystems (**root(/)**, **/usr**, possibly **/var** or **/tmp**, as well as any new filesystems requested via the partition tool)
3. install mandatory **root** files
4. install mandatory **kvm** files
5. install mandatory **usr** files
6. install optional software

When installation has finished, the ramdisk menu is displayed (see Figure 57). If the installation failed, call Customer Support.

Rebooting from the Ramdisk

After a successful installation, start UNIX by rebooting as shown in Figure 57.

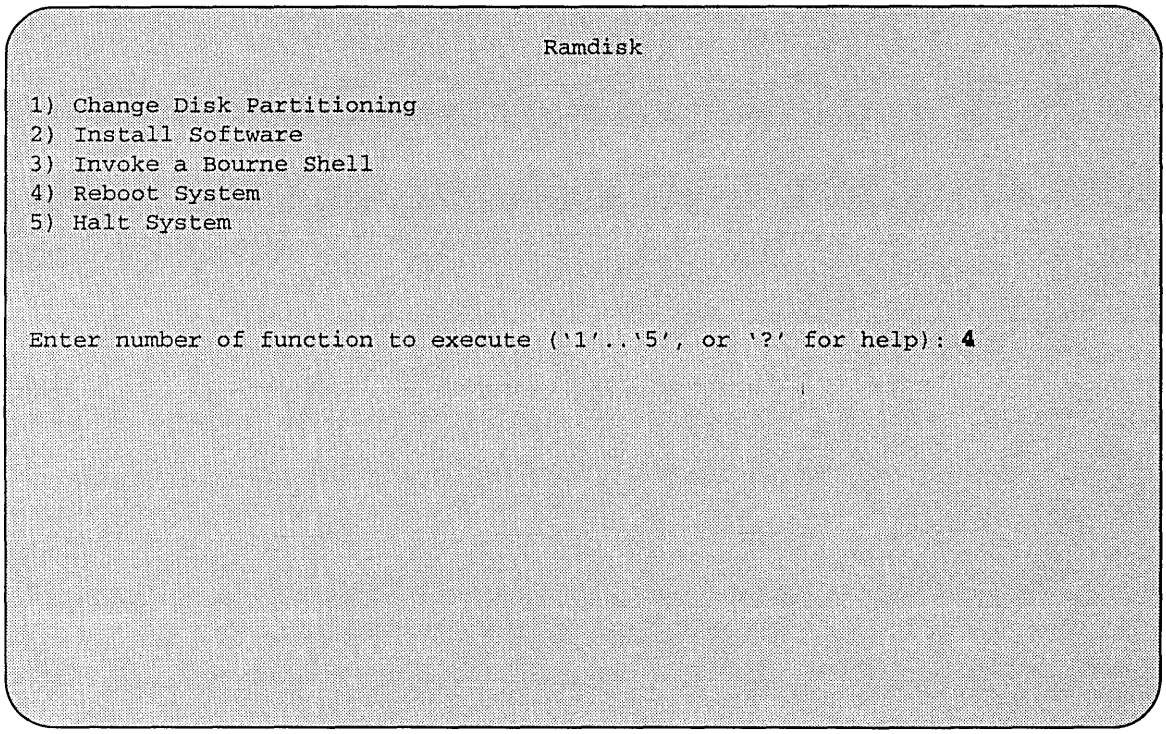


Figure 57. Ramdisk Menu

Enter number of function to execute ('1'..'5', or '?' for help): **4**

At the Reboot System menu select Boot Unix:

```
Enter selection number ('1'..'3') or '?' for help: 1
```

After selecting **1**, there is a short pause, and then:

```
Automatic boot enabled. Type Control-C to abort

ROM> boot

Boot: sd.si(0,0,0)/vmunix

Entry: 0xfd080000

Size: 0xd6000+0x33358+0x81548


OS/MP 4.1C_Export (GENERIC/root) #0: Tue Feb 1 15:52:44
1994
Copyright (c) 1989-1994 Sun Microsystems, Inc. and
Solbourne Computer, Inc.
[...]
```

Now you must specify the system configuration information must be specified.

Disabling tftp

If the ramdisk was loaded from a remote tape drive, **tftp**(1) was enabled at that time.

For security reasons, it should now be disabled on the system from which the tape was read.

First, comment out the line, as shown below, in **/etc/inetd.conf**:

```
#tftp dgram udp wait root /usr/etc/in.tftpd in.tftpd
/tftpboot
```

Next, determine the process ID of **inetd**(8):

```
tapehost# ps ax | egrep inetd
  249 ?  I 0:01 inetd
  541 p3 R 0:00 egrep inetd
```

The *pid* of inetd is the first number on the line that doesn't contain egrep. In the above output, pid is 249.

Last, signal **inetd** to re-read the configuration file:

```
tapehost# kill -HUP pid
```

After Installing...

Initial Boot System Configuration

When a newly installed system is booted multi-user for the first time, the system asks a series of configuration questions:

```
OS/MP 4.1C_Export (GENERIC/root) #0: Tue Feb 1 15:52:44
1994

Copyright (c) 1989-1994 Sun Microsystems, Inc. and
Solbourne Computer, Inc.
[...]

Automatic reboot in progress...
Wed Feb 2 09:22:25 MDT 1994
checking quotas: done.

This system has not yet been configured. Several values
need to be set before the system can come up to multi-user
Unix.

What is this system's name (default = 'standalone'):
habitrail <Return>

What is its Internet address (0 for none, default =
192.9.3.4)? <Return>

What is the network broadcast mask (default = 0xffffff00)?
<Return>

What is the NIS domain name ('none' for none, default =
'none')? Rodent.COM <Return>

What directory should be used for automatic savecore files
('none' for none, default = '/var/crash/habitrail')?
<Return>
```

★ ★ ★ NOTE ★ ★ ★

Using the default 'none' for the NIS domain name disables the NIS/YP services.

Because you are installing a server, it is important that you obtain the system's name, internet address, and network mask from the site's resident system administrator.

The next window will ask for you to specify your time zone. If you enter one of the options as it appears on the screen, that has a prefix, a list of options for that prefix will appear.

```
Time zone choices are:
Australia/  GMT+11      GMT-3       GMT6        Mideast/
Brazil/     GMT+12      GMT-4       GMT7        NZ
CET         GMT+13      GMT-5       GMT8        Navajo
CST6CDT     GMT+2       GMT-6       GMT9        PRC
Canada/     GMT+3       GMT-7       Greenwich   PST8PDT
Chile/      GMT+4       GMT-8       HST         Poland
Cuba        GMT+5       GMT-9       Hongkong    ROC
EET         GMT+6       GMT0        Iceland     ROK
EST         GMT+7       GMT1        Iran        Singapore
EST5EDT     GMT+8       GMT10       Israel      Turkey
Egypt       GMT+9       GMT11       Jamaica     UCT
Factory     GMT-0       GMT12       Japan       US/
GB-Eire     GMT-1       GMT13       Libya       UTC
GMT         GMT-10      GMT2        MET         Universal
GMT+0       GMT-11      GMT3        MST         W-SU
GMT+1       GMT-12      GMT4        MST7MDT     WET
GMT+10      GMT-2       GMT5        Mexico/     Zulu

('/' indicates time zone prefixes)

Enter time zone (default = 'US/Mountain'): US <Return>

What is today's date (mm/dd/yyyy, default = 2/1/1994)? <Return>
What time is it (24-hour hh:mm, default = 16:55)? <Return>

Current settings are:
 Host name                = habitrail
 Internet address         = 192.9.3.4
 Network mask             = 0xffffff00
 NIS domain               = Rodent.COM
 Savecore directory       = /var/crash/habitrail
 Time zone                = US/Mountain
 Date (m/d/y)             = 2/1/1994
 Time                     = 16:55

Are these correct ('yes' or 'no')?
yes

Setting netmask of ei0 to 255.255.255.0
Tues Feb 1 09:22:25 MDT 1994
Setting password for root
Changing password for root on habitrail.
New password:
Retype new password:
Continuing boot
starting rpc and net services: portmap [...]
```

Reconfiguring the System

You may need to reconfigure the system if: (1) wrong value was set during the initial configuration, or (2) the system did not successfully come up to multi-user mode.

If you find that a wrong value was set during configuration, you can modify the appropriate file manually, or reconfigure. Manually correcting the settings should only be done if you are an experienced system administrator. Reconfiguring automatically is fairly straight-forward, as explained in the following procedure.

If the system has hung up during the boot process, cycle the power off and on.

★ ★ ★ NOTE ★ ★ ★

If automatic boot is enabled it is necessary to interrupt the reboot by typing Control-C in the early stages of the reboot; otherwise the system will hang up as before.

Then bring up the system in single-user mode:

```
ROM> boot -s
[...]
```

If the system booted successfully originally, you may instead log in as root:

```
habitrail login: root
Password:
```

In either case, if a file exists that tells the system it has been configured, remove it:

```
# rm /etc/sys_conf/system-configured
```

The above file may not exist; this is not a problem. Go ahead to the next step.

Now reboot. If you are in single-user mode, exit:

```
# exit
```

Otherwise, use fastboot:

```
# /etc/fastboot
```

The system asks configuration questions just as it did the first time it booted after being installed.

Installing Diskless Clients on Sun and Solbourne Servers

The commands **config_server** and **install_client** automate the installation of diskless clients.

config_server sets up a prototype area for clients of a particular architecture (i.e. S4000 at OS/MP 4.1B).

install_client sets up a unique area for each individual client.

You may set up a network in which either a Solbourne or a Sun acts as the server. The clients may be either Solbourne or Sun systems. The clients need not be at the same OS release level as the server or each other.

The necessary steps depend on your arrangement, and are discussed in the following subsections.

1. Installing the correct **config_server**

If the server is a Sun, or a Solbourne not running OS/MP 4.1C or later, you must install and configure a new version of **config_server**.

If the server is a Solbourne system running OS/MP 4.1C or later, or if the **preinstall** utility was installed, it already has the necessary version of **config_server**. Skip the *Installing config_server* subsection and go to *Configuring the Server.*

2. Running **config_server**
3. Running **install_client**
4. Booting the client

★ ★ ★ NOTE ★ ★ ★

An OS/MP 4.1C server can support any Solbourne S4000, Series5, or Series6 clients at OS/MP 4.1C or Series4 at OS/MP 4.1A.3. It can also support Sun clients running SunOS.

Installing config_server

This procedure is necessary only for systems not running OS/MP level 4.1C, or systems not using the **preinstall** utility. It can be used for any type of Sun or Solbourne system.

When using a local tape drive, install **config_server** using the following commands:

```
# mt -f /dev/nrst0 asf 5
# cd /usr/etc
# tar xpf /dev/nrst0
```

When using a remote tape drive, the system name needs to be in the `tapehost` **/.rhosts** file. Install **config_server** using the following commands:

```
# rsh -n tapehost mt -f /dev/nrst0 asf 5
# cd /usr/etc
# rsh -n tapehost dd if=/dev/nrst0 bs=8k | tar xpBf -
```

In this example, you should replace *tapehost* with the actual name of your tape host machine.

★ ★ ★ NOTE ★ ★ ★

Some older versions of SunOS do not support the 'asf' request for **mt**. *If this is the case for your tape host, first substitute 'rew' for 'asf 5' in the above example, and then re-execute* **mt** *with 'fsf 5' instead of 'rew'.*

When using a local CD-ROM drive, install **config_server** using the following commands:

```
# mkdir /cdrom
# mount /dev/sr0 /cdrom
# cd /usr/etc
# tar xpf /cdrom/Tools.tar
```

When installing over the network, or when using a remote CD-ROM drive, create a mount point directory (if one doesn't exist), and mount the CD-ROM drive on the remote machine, referred to here as `nethost`, as follows:

```
nethost# mkdir /cdrom
nethost# mount /dev/sr0 /cdrom
```

Install **config_server** using the following commands:

```
# cd /usr/etc
# rsh -n nethost dd if=/cdrom/Tools.tar bs=8k | tar xpBf -
```

In this example, replace *nethost* with the actual name of the remote host machine, and replace *cdrom* with the actual path name or mount point.

Configuring the Server

The command **config_server** installs executables on the server for use by one or more client systems. The executables are placed in **/export** directories, as described below. Since the **/export** directories may grow to be quite large, you may wish to have **/export** be a link to a file system with more space, for example:

```
# mkdir /usr/export
# ln -s /usr/export /export
```

If you wish to use a directory other than **/export**, set the environment variable EXPORT_DIR to the directory that you desire:

```
# setenv EXPORT_DIR /usr/clients
```

When installing from tape, **config_server** prompts for a carriage return, which you enter after loading the tape containing the required files for the specified architecture.

config_server accepts several options and arguments. The following are the most commonly used:

- The **-f** option specifies the tape drive from which the software will be loaded onto the server. In the examples, **/dev/nrst0** is the value used. When accessing a remote tape drive, use a value of the form *tapehost:tapedrive*.

  If the software that will be loaded onto the server is from a **CD-ROM** disk, or the mount point of the CD-ROM, the **-f** option specifies the pathname from which to read architecture-dependent directories.

- The **-c** option is used to specify a selected tape/on-disk configuration file.

  If you are using a **CD-ROM** disk or a remote system over the network, you will need to specify this option and one of the following three configuration files: **s4000-cd, s5-cd** and **s6-cd**. These configuration files contain the required root, usr and kvm tar files. They also contain the optional tar files for 4.1C, and may be added by editing the corresponding configuration file and taking out the "#" at the beginning of each line.

  If the server is a Solbourne, and the client is a Sun, use one of the configuration files in **/usr/etc/setup** corresponding to the architecture, operating system, and media of the client. You may also create a configuration file for any Sun tape or CD-ROM. Refer to the **config_server**(8) man page.

- The **-n** option specifies the operating system and release level of the client systems, where these differ from the server. It is also used when clients with the same architecture are not all running the same release level.

  The values used may be any you wish, provided you are consistent when running the **config_server** and **install_client** commands. For example, you could use the values osmp.4.1B, osmp.4.1C, or sunos.4.1.1.

The result is to create subdirectories of **/export** named such that the machine type is the basename and the OS release is the extension.

- **client_arch**, the final argument to **config_server**, specifies the machine architecture of the client, such as Series5, Series6, S4000, sun4, sun4c.

Run **config_server** as many times as necessary to support the variety of machine architectures, operating systems, and release levels in use by clients on your network.

A number of examples are presented here. For additional details, refer to the **config_server**(8) man page.

The first example configures a Solbourne OS/MP 4.1C server for a Series5 client also running OS/MP 4.1C. On the Solbourne server enter the following:

```
# /usr/etc/setup/config_server -f /dev/nrst0 Series5
```

The next example configures a Solbourne server running OS/MP 4.1C for a pair of Solbourne S4000 clients, one at 4.1C and the other running 4.1B.

```
# /usr/etc/setup/config_server -f /dev/nrst0 S4000

# /usr/etc/setup/config_server -f /dev/nrst0 -n osmp.4.1B
S4000
```

Notice that the first invocation of **config_server** shown above did not use the **-n** option, by default supporting the client at the same release level as the server. The second example used the **-n** option, since the server and client are at different release levels.

The next example is for a Series6 server which supports a Sun 4 client running SunOS 4.1:

```
# /usr/etc/setup/config_server -f /dev/nrst0 -n sunos.4.1
-c sun4-4.1-t1.4 sun4
```

The last example is running **config_server** from 4.1C software on a CD-ROM disk for a Solbourne OS/MP 4.1C server which supports Solbourne S4000 clients, Series5 clients, and Series6 clients respectively:

```
# /usr/etc/setup/config_server -f /cdrom -c \
/usr/etc/setup/s4000-cd S4000

# /usr/etc/setup/config_server -f /cdrom -c \
/usr/etc/setup/s5-cd Series5

# /usr/etc/setup/config_server -f /cdrom -c \
/usr/etc/setup/s6-cd Series6
```

Replace *cdrom* with the actual path name or mount point on the local host.

For a remote CD-ROM, the remote host must have */cdrom* in it's **/etc/exports** file, and must export it. Also, the **rpc.mountd**(8) and **nfsd**(8), daemons must be running on the remote host. First mount the cdrom on the remote host, then mount the remote host on the local host.

```
remotehost# mkdir /cdrom
remotehost# mount /dev/sr0 /cdrom
```

```
localhost# mkdir /cdrom
localhost# mount remotehost:/cdrom /cdrom
```

This concludes the examples of **config_server.**

After running **config_server**, add the client to the **/etc/hosts** and **/etc/ethers** files, or the corresponding network information services databases (NIS/YP).

If the server is using NIS/YP, **/etc/ethers** and **/etc/hosts** must be modified on the master server. **config_server** does not update NIS/YP; this must be done manually.

If the server is not using NIS/YP, the domain name must be set to "none" for **install_client** to work correctly.

★ ★ ★ NOTE ★ ★ ★

/etc/ethers *must not start with a blank line.*

Installing Clients

The **install_client** command installs the diskless client on the server. It creates the client's root filesystem under the server's **/export/root** directory, links the client's **/usr** to the appropriate **/export/exec** directory, and sets up the client's kernel-specific files, such as **/vmunix.** After running **install_client** on the server, the client can boot as soon as the client's bootROM variables are set correctly.

The **install_client** command accepts a number of options and arguments. The following are the most commonly used:

- The **-n** option. If you used the **-n** option to **config_server** when setting up the server for this client, be sure to use it in the same way when invoking **install_client**. If necessary, examine the subdirectory names in **/export/exec** on the server; when you find the relevant subdirectory, the portion of the name after the first dot is the value to use for the **-n** argument.
- The **client** argument identifies the name of the client being installed.
- The **machine_arch** argument specifies the type of machine in the client, such as Series5, Series6, S4000, sun4, sun4c.

Other options and further details are discussed in the **install_client**(8) man page.

The examples which follow parallel the server configuration examples.

Example install_client Command Lines

The first example installs a Solbourne OS/MP 4.1C client (named "rootbeer") on a Series5 server which also run OS/MP 4.1C. On the Solbourne server enter the following:

```
# /usr/etc/setup/install_client rootbeer Series5
```

The next example installs a pair of Solbourne S4000 clients, one running OS/MP 4.1C ("rootbeer") and the other running 4.1B ("lemonade"), on a Solbourne server running OS/MP 4.1C.

```
# /usr/etc/setup/install_client rootbeer S4000

# /usr/etc/setup/install_client -n osmp.4.1B lemonade
S4000
```

Note that the first invocation of **install_client** shown above did not use the **-n** option, by default placing the client at the same release level as the server. The second example used **-n** since the server and client are at different release levels.

The next example is for a Sun 4 client, running SunOS 4.1, on a Solbourne server running OS/MP 4.1C:

```
# /usr/etc/setup/install_client -n sunos.4.1 candybar sun4
```

★ ★ ★ NOTE ★ ★ ★

install_client *modifies only the local* **/etc/bootparams**. *If the server is using NIS/YP,* **/etc/bootparams** *must be modified on the NIS/YP master server.*

This concludes the examples of **install_client**.

Installing OS/MP 4.1C on a Server using reinst_sys

This chapter describes how to install OS/MP 4.1C on a server using the utility, **reinst_sys**, which allows you to upgrade your system with a full installation of the operating system on unused partitions of one or more disks, while staying up in multi-user mode.

A server is a system that provides NFS disk services.

The purpose of **reinst_sys** is to minimize downtime by performing a full install of OS/MP onto a new system disk while the system continues to run an earlier version on an old system disk. Once **reinst_sys** is complete, you are free to do whatever local modifications are desirable before booting from the new disk.

For example, you might reconfigure the OS/MP 4.1C kernel or modify files of local interest such as **/etc/printcap**. Only when the new system disk is ready to run do you need to halt the old system and reboot from the new disk.

Finally, unlike earlier full install releases, **reinst_sys** makes it possible to fall back to the earlier version of OS/MP if there turns out to be some problem with the way you set up the new system. To fall back to the old system, halt the new system, change ROM variables **DEFAULTROOT** and perhaps **DEFAULTSWAP**, and then boot.

★ ★ ★ NOTE ★ ★ ★

In order to use this utility, you must have an unused disk, or at least enough unused partitions, on which to install the OS/MP 4.1C release. You can not use ***reinst_sys*** *to install over the currently running disk partitions. If you do not have an unused disk for* ***reinst_sys*** *to use, you will have to install OS/MP 4.1C from scratch, while the system is unavailable to your users, as was done in previous OS/MP full installation releases.*

You should not install on a disk connected to a channel board as it will be impossible to boot from that device.

Before Installing...

★ ★ ★ NOTE ★ ★ ★

*Before using **reinst_sys**, you must know what disk(s) and partitions you want to install on. If changes need to be made to any of the disks partitions, you must do this prior to running **reinst_sys**. Use **partition**(8) to modify the disks.*

It is best to select a disk that will be recognized by an OS/MP 4.1C generic kernel. Otherwise it will be necessary to reconfigure the kernel (which may be desirable anyway) before rebooting. This is discussed in more detail at the end of this section.

★ ★ ★ CAUTION ★ ★ ★

If installing by tape, clean the tape drive on the machine you will be using before installing the release tape. Failure to do so may damage the release tape.

Starting in OS/MP 4.1C, the **preinstall** utility is available to help determine which system files should be restored or merged from backup. **preinstall** shows which files in system directories were modified after you last installed the OS version you're currently running.

If you do not want to use **preinstall**, skip to the *Extracting reinst_sys* section below.

Installing preinstall...

Because **preinstall** was not included in versions of OS/MP prior to 4.1C, it is necessary to install it before proceeding to install OS/MP 4.1C.

When using a local tape drive, install **preinstall** using the following commands:

```
# mt -f /dev/nrst0 asf 5
# cd /usr/etc
# tar xpf /dev/nrst0
```

When using a remote tape drive, the system name needs to be in the `tapehosts` **/.rhosts** file. Install **preinstall** using the following commands:

```
# rsh -n tapehost mt -f /dev/nrst0 asf 5
# cd /usr/etc
# rsh -n tapehost dd if=/dev/nrst0 bs=8k | tar xpBf -
```

In this example, you should replace `tapehost` with the actual name of your tape host machine.

★ ★ ★ NOTE ★ ★ ★

*Some older versions of SunOS do not support the 'asf' request for **mt**. If this is the case for your tape host, first substitute 'rew' for 'asf 5' in the above example, and then re-execute **mt** with 'fsf 5' instead of 'rew'.*

When using a local CD-ROM drive, install **preinstall** using the following commands:

```
# mkdir /cdrom
# mount /dev/sr0 /cdrom
# cd /usr/etc
# tar xpf /cdrom/Tools.tar
```

When installing over the network, or when using a remote CD-ROM drive, create a mount point directory (if one doesn't exist), and mount the CD-ROM drive on the remote machine, referred to here as `nethosts`, as follows:

```
nethost# mkdir /cdrom
nethost# mount /dev/sr0 /cdrom
```

Install **preinstall** using the following commands:

```
# cd /usr/etc
# rsh -n nethost dd if=/cdrom/Tools.tar bs=8k | tar xpBf -
```

In this example, replace *nethost* with the actual name of the remote host machine, and replace *cdrom* with the actual path name or mount point.

Using preinstall

After **preinstall** has been installed, it is located in **/usr/etc**. The usage of **preinstall** is as follows:

/usr/etc/preinstall [**-l**] [**-c** mmddhhmm[yy]]

The **preinstall** command is used to look for files that should be saved prior to doing a full install of a new version of OS/MP. It looks on the system partitions (root(/), **/usr**, and **/var**) for files which have been touched after the date of the last full install of OS/MP (or, if given a cutoff date, files touched after that date).

preinstall is normally used just before installing a new version of OS/MP to determine what system-related files should be backed up. Then, after installing the new version of OS/MP, you can merge or restore these files into the newly-installed system.

Some files, such as **/etc/fstab**, can typically be re-used without modification. Others, such as kernel configuration files in **/usr/kvm/sys/*/conf**, must be hand-merged into the new version of the OS with careful consideration of how the new OS version differs from the old.

Certain files are excluded from the output which are newer than the cutoff date. These files are normally updated by system operation and do not need to be backed up. Examples of excluded files are: **/etc/mtab**, the **/var/sadm** accounting files, the **/tmp_mnt** automounter directories, and patched kernel object files in

/usr/kvm/sys/*/OBJ. By default, the cutoff date used is the modification date of the file **/etc/sys_conf/system-configured**, which is touched the first time you boot a new version of the OS after a full install. You may want to use some other cutoff date with the **-c** option if the current OS was installed in some non-standard way.

By default, the files and directories newer than the cutoff are listed to standard output by name, one per line. By using the **-l** option, the output is in long form (as from the **-ls** option to **find**), showing the type, date, and size of each file.

The following options are accepted by **preinstall**:

- The **-l** option presents the output in long form, showing inode number, size in kilobytes (1024 bytes), protection mode, number of hard links, user, group, size in bytes, and modification time. If the file is a special file the size field will instead contain the major and minor device numbers. If the file is a symbolic link the pathname of the linked-to file is printed preceded by '->'. The format is identical to that of **find -ls**.
- The **-c** option specifies to use the given cutoff date to decide which files to print, rather than the date of the file **/etc/sys_conf/system-configured**. The cutoff date format is **-c** mmddhhmm[yy], with month, day, hour, minute, and optional year in numeric form. This is the same format as for **/usr/5bin/touch**.

reinst_sys has been modified since OS/MP 4.1B, so be sure to extract the new version from the OS/MP 4.1C media. If you installed preinstall as shown above, then the server already contains the version of **reinst_sys** that it needs and you may skip to the *Installing* section below.

Extracting reinst_sys

The following explains four different methods of extracting **reinst_sys** into the **/usr/etc** directory. You must be logged in as root.

Extracting reinst_sys via a Local Tape Drive

```
# mt -f /dev/nrst0 asf 5
# cd /usr/etc
# tar xpf /dev/nrst0
```

Extracting reinst_sys via a Remote Tape Drive

Routing from the system being installed to the tapehost must exist. Refer to the *System Network and Administration Guide* (101481). The local machine must be listed in **/etc/hosts**, or in the NIS/YP **hosts** database, and **/.rhosts** on `tapehost`.

```
# rsh -n tapehost mt -f /dev/nrst0 asf 5
# cd /usr/etc
# rsh -n tapehost dd if=/dev/nrst0 bs=8k | tar xpBf -
```

Extracting reinst_sys via a Local CD-ROM Drive

Create a mount point directory (if one doesn't exist), mount the CD-ROM drive, and extract **reinst_sys** as follows:

```
# mkdir /cdrom
# mount /dev/sr0 /cdrom
# cd /usr/etc
# tar xpf /cdrom/Tools.tar
```

Extracting reinst_sys via a Remote CD-ROM Drive or the Network

When installing over the network, or when using a remote CD-ROM drive, create a mount point directory (if one doesn't exist), and mount the CD-ROM drive on the remote machine, referred to here as `nethosts`, as follows:

```
nethost# mkdir /cdrom
nethost# mount /dev/sr0 /cdrom
```

Install **reinst_sys** using the following commands:

```
# cd /usr/etc
# rsh -n nethost dd if=/cdrom/Tools.tar bs=8k | tar xpBf -
```

In this example, replace *nethost* with the actual name of the remote host machine, and replace *cdrom* with the actual path name or mount point.

Installing...

This section covers the OS/MP 4.1C installation on Series5, Series5E, Series6 and S4000 systems.

During installation, you can request help at any prompt by entering a question mark. Table 21 shows edit commands available when entering text in response to prompts:

Table 21. Input Editing Commands

Character	Interpretation
backspace (^H)	delete last input character
delete (^?)	delete last input character
^U	erase input line
^R	redisplay input line
^W	delete input up to '/' or whitespace
^C	cancel input, returning to nearest menu
ESC	cancel input, returning to nearest menu
^L	redisplay entire screen
return (^M)	end input
newline (^J)	end input

If a string is too long to be displayed in the available space, the beginning of the string is displayed as "...". This allows display of the end of the string, which is usually of more interest.

Keywords can be shortened to any unique prefix (such as 'co' for 'continue'), except for 'yes' and 'no', which must always be spelled out.

Fatal errors during software installation are usually reported by messages beginning with `System error` or `Internal error` and ending with a "#" prompt. If a fatal error occurs, software installation may be restarted by entering:

```
# ^Jstty sane^J
# rm -f core
# /usr/etc/reinst_sys
```

where ^J is the linefeed character. The command **stty sane** may not be echoed (and is intended to fix exactly that problem). In the event of a fatal error during software installation, please report the problem to Solbourne customer support.

Installing Software

Installing software has two distinct stages: gathering information and modifying the system. No permanent changes are made to the system until all information has been provided.

There are three information gathering menus:

- Standard Filesystem Definition - specifies where the standard filesystems (**root** (/), **swap**, and **/usr**, optionally **/var** and **/tmp**) are located.
- Installation Media Identification - Determines the installation media from which to install (tape, CD-ROM, or network directory), and determines where that media is located.
- Package Selection - allows selecting of which optional software packages are to be installed.

All three menus provide the command **cancel**. The first two also provide the command **previous**. These commands allow you to return to prior menus, optionally discarding any changes that have been made.

cancel always returns to the shell terminating **reinst_sys**.

previous always returns to the previous menu (which is the shell, in the case of the Filesystem Definition menu). The changes discarded in this case are those made in the menu you are leaving.

cancel has higher priority than **previous**. In other words, if you use **previous** to leave a menu without discarding changes, then **cancel** from that menu and discard changes, the changes made in the earlier menu are also discarded.

The Standard Filesystem Definition menu defines where the mandatory filesystems are located. These filesystems (except for root) may be either on a local disk partition or provided by a disk server. If root is to be on a remote system, install the system as a client of that system, even if the system actually contains a disk. You can add entries for any local disks to **/etc/fstab** after installing the system as a diskless client.

Any changes made to the standard filesystems with **partition**(8) will appear in this menu.

reinst_sys has the following options:

`reinst_sys` [-m] [-n] [-r /root/path] [-f host:/device/path] [-a arch]

-m	Don't mount or newfs filesystems
-n	Don't newfs filesystems
-r /root/path	Pretend /root/path is really /
-f host:/device/path	What tape device to use
-a arch	What cpu architecture to use - overrides cpustatus

In general, you will not need to use any of these options except perhaps the -a option. The -f option will be set while running **reinst_sys**.

The -a option is to be used when you are upgrading or changing the architecture of your machine. Suppose you have a machine with Series5 CPUs, and you want to upgrade to Series6 CPUs. To install the OS/MP 4.1C for Series6, log in as root and issue the following command:

```
# /usr/etc/reinst_sys -a Series6
```

To install OS/MP 4.1C with no change in architecture, log in as root and issue the command:

```
# /usr/etc/reinst_sys
```

reinst_sys begins by reading the current **/etc/fstab** file to determine the disks attached to your system (mounted disks are also probed).

After examining all attached disks, **reinst_sys** presents the first menu, the Standard Filesystem Definition menu.

The root, swap, and usr partitions are required and must be defined before going to the next menu. The swap will be defined as the current swap area, and may be redefined if you wish. The root and usr areas need to be defined from the currently available disk partitions that are highlighted in the Standard Filesystem Definition menu. For a disk partition to be available for use in **reinst_sys**, it must not be currently mounted, and it must not have an entry in the **/etc/fstab** file.

Example:

Currently, the **root(/)** filesystem is on **sd0a**, **swap** is on **sd0b**, and the **/usr** filesystem is on **sd0g**. Available partitions are highlighted. If the necessary partitions are not available, exit **reinst_sys**. A partition may not be available because it is mounted or an entry exists for it in the **/etc/fstab** file. Also, it may not be available because it does not exist, or it is not large enough, in which case you will need to run **partition**(8) to repartition the disk as needed.

Use the following steps to assign the **root (/)** filesystem to **sd2a**, the **/usr** filesystem to **sd2g**, and the **/var** filesystem to **sd2d** (rather than using the default of **/var** being a subdirectory of the root filesystem). Leaving **swap** on the disk may be desirable.

The steps for changing **/var** are optional. This makes use of partition **d**, thus using 9.5 MB of disk space that is not used when the default disk partition is used with the standard filesystem definition.

In Figure 58, the notation "(required)" appears next to the **root(/)**, **swap** and **/usr** filesystems. These filesystems must be defined; however, they may be placed on any sufficiently large available partition of any disk.

```
                    Standard Filesystem Definition

   1) root              (required)      <not defined>
   2) swap on sd0b      (required)
   3) /usr              (required)      <not defined>
   4) /var on root partition
   5) /tmp on root partition

            Disk Partitions (sizes in MB) (available highlighted)
        (a)    (b)      (c)     (d)     (e)     (f)     (g)     (h)
sd0:    8.4    32.4     191.1   9.3     ---     ---     141.1   ---
sd2:    8.6    32.9     484.9   9.5     ---     ---     433.5   ---



Enter number of filesystem to change ('1'..'5'), 'continue', 'previous',
'cancel', or '?' for help:
```

Figure 58. Sample Standard Filesystem Definition Menu

To modify the **root** (/) filesystem, enter the number 1.

```
Enter number of filesystem to change ('1'..'5'),
'continue', 'previous', 'cancel' or '?' for help: 1
```

The **root** menu will be highlighted, and the system will request a disk partition. Assign it to sd2a.

```
Enter name of disk partition or host:path for /root
filesystem, 'none', ^C, or'?' for help: sd2a
```

To modify the **/usr** filesystem, enter the number **3**.

```
Enter number of filesystem to change ('1'..'5'),
'continue', 'previous', 'cancel' or '?' for help: 3
```

The usr menu will be highlighted, and the system will request a disk partition. Assign it to sd2g.

```
Enter name of disk partition or host:path for /usr
filesystem, 'none', ^C, or'?' for help: sd2g
```

To modify the **/var** filesystem, enter the number **4**.

```
Enter number of filesystem to change ('1'..'5'),
'continue', 'previous', 'cancel' or '?' for help: 4
```

The var menu will be highlighted, and the system will request a disk partition. Assign it to sd2d.

```
Enter name of disk partition or host:path for /var
filesystem, 'none', ^C, or'?' for help: sd2d
```

The new arrangement is displayed as shown in Figure 59.

```
                    Standard Filesystem Definition

  1) root on sd2a     (required)
  2) swap on sd0b     (required)
  3) /usr on sd2g     (required)
  4) /var on sd2d
  5) /tmp on root partition

            Disk Partitions (sizes in MB) (available highlighted)
       (a)    (b)      (c)     (d)     (e)     (f)     (g)     (h)
sd0:   8.4   32.4     191.1    9.3     ---     ---     141.1   ---
sd2:   8.6   32.9     484.9    9.9     ---     ---     433.5   ---




Enter number of filesystem to change ('1'..'5'), 'continue', 'previous',
'cancel', or '?' for help:
```

Figure 59. Modified Standard Filesystem Definition Menu

Once all changes for the standard filesystems have been made, enter **continue** to proceed to the Installation Media Identification menu.

```
Enter number of filesystem to change ('1'..'5'),
'continue', 'previous', 'cancel', or '?' for help: continue
```

Installation Media Identification Menu

The Installation Media Identification menu describes which media type (tape, CD-ROM, or network directory) will be used during the installation. Figure 60 shows the Installation Media Identification menu.

Installing from a Tape Drive

Installing from a local tape drive requires that the *Installation media type* be set to **Tape**, the *tape drive* field be set to either **st0** or **st1** (the only supported tape drives) and that *Tape host* be set to **localhost**.

```
                    Installation Media Identification

1) Installation media type = Tape
2) Tape drive = /dev/nrst0
3) Local Internet address = 192.9.3.4 (required for remote tape)
4) Network broadcast mask = 0xffffff00 (required for remote tape)
5) Tape host = localhost (127.0.0.1)









Enter selection number ('1'..'5'), 'continue', 'previous', 'cancel', or '?' for
help:
```

Figure 60. Installation Media Identification Menu - Local Tapehost

Installing From a Remote Tape

Installation media type must be set to **`Tape`**.

Tape drive should be the base name of the tape drive on the tapehost, either **`st0`** or **`st1`**.

The **Local Internet address** is the address of the system being installed. If the default value is not correct, make sure that the client name corresponding to the correct address appears in the tape host's **/.rhosts** file. Check **/etc/hosts** or the NIS/YP hosts map as appropriate.

The **broadcast mask** should not be changed unless your network uses a non-standard mask. Such a mask is used when a network is sub-netted (i.e., a Class B network is treated as several Class C networks). A leading '0x' is necessary if entering the mask as a hexadecimal number. A leading '0' is needed for octal numbers. If neither prefix is given, the value is assumed to be in decimal.

Tape host must be set to the name of the system with the tape (**`rootbeer`** in this example), which is used to determine the tape host's Internet address.

Figure 61 shows the Installation Media Identification Menu of a system that is set up to install from a remote tape using tape device st0 (SCSI address 4).

When the details of the tape drive have been entered correctly, enter **`continue`**. You will be presented with the Package Selection Menu.

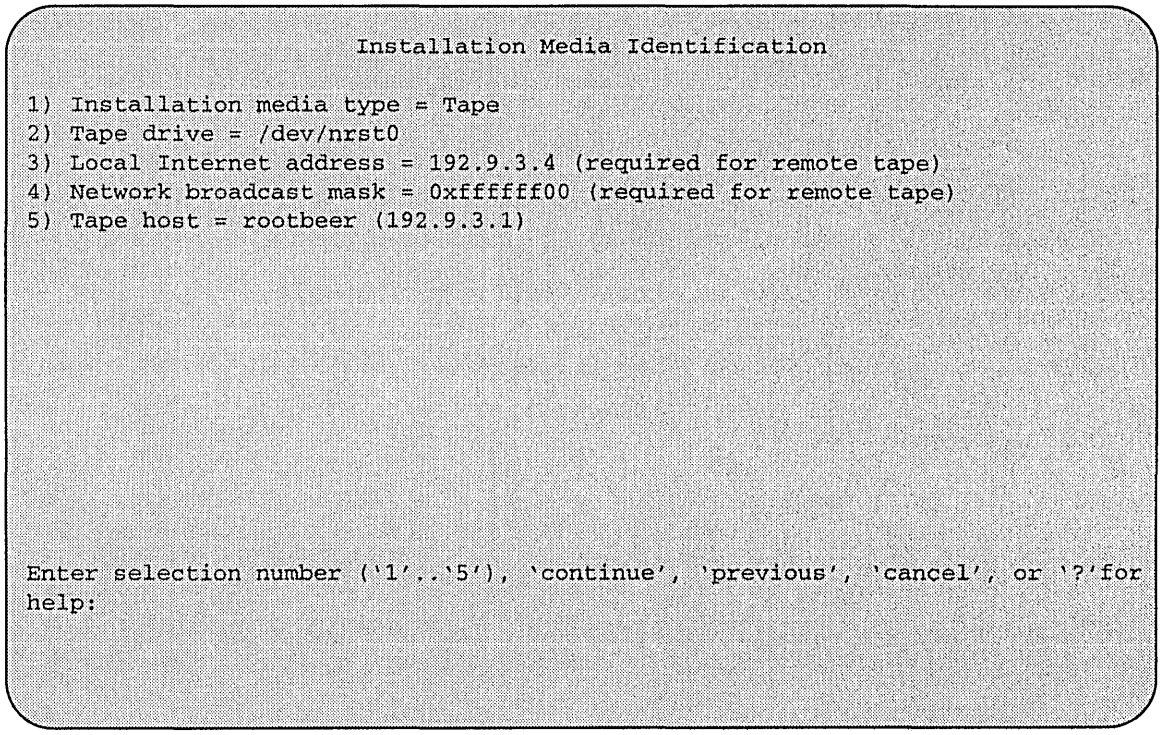


Figure 61. Installation Media Identification Menu - Remote Tapehost

Local CD-ROM Installation

Installing from a local CD-ROM drive requires that the *Installation media type* be set to **CD-ROM**, the *CD drive* field be set to **/dev/sr0**, and the *CD host* field be set to **localhost**.

Figure 62 shows the Installation Media Menu with the CD-ROM parameters set to install from CD-ROM.

Network and remote CD-ROM Installations

Installation media type must be set to **Network.**

Installation directory should be the full path name of the location of the installation area, OR the full path of the CD-ROM mount point, on the network host. For example, if the remote CD-ROM is mounted on **/cdrom**, then the installation path is simply **/cdrom.**

The **Local Internet address** is the address of the system being installed. If the default value is not correct, make sure that the client name corresponding to the correct address appears in the tape host's **/.rhosts** file. Check **/etc/hosts** or the NIS/YP hosts map as appropriate.

The **broadcast mask** should not be changed unless your network uses a non-standard mask. Such a mask is used when a network is sub-netted (i.e., a Class B network is treated as several Class C networks). A leading '0x' is necessary if entering the mask as a hexadecimal number. A leading '0' is needed for octal numbers. If neither prefix is given, the value is assumed to be in decimal.

```
                    Installation Media Identification

1) Installation media type = CD-ROM
2) CD drive = /dev/sr0
3) Local Internet address = 192.9.3.4 (required for remote install)
4) Network broadcast mask = 0xffffff00 (required for remote install)
5) CD host = localhost (127.0.0.1)









Enter selection number ('1'..'5'), 'continue', 'previous', 'cancel', or '?'for
help:
```

Figure 62. Installation Media Identification Menu - Local CD-ROM

Network host must be set to the name of the system with the installation directory (**`rootbeer`** in this example), which is used to determine its Internet address.

For a remote CD-ROM install, the `nethost` must have **/cdrom** in it's **/etc/exports** file, and must export it. Also, the **rpc.mountd**(8), **nfsd**(8), and **rarpd**(8) daemons must be running on `nethost`.

Figure 63 shows the Installation Media Menu with the values set for a network installation.

Once the details of the media have been entered correctly, enter **`continue`** to proceed to the Package Selection Menu.

Package Selection Menu

Use this menu to install optional Solbourne software distributions. It provides a menu-driven method of examining the components of the distribution tape, selecting the parts to be installed, and specifying the directories where the components will be located.

The components of a distribution are referred to as **packages**. Some examples of packages are **FORTRAN 1.4, X Windows**, and **Solbourne OS/MP Optional Software**. Packages contain one or more *modules*, which are groups of logically-related files, such as executables or libraries. Most packages also have *variables*, which have two uses: controlling the actions of installation commands associated with the package, and prefixing where modules are to be installed.

```
                    Installation Media Identification

1) Installation media type = Network
2) Installation directory = /cdrom
3) Local Internet address = 192.9.3.4 (required for remote install)
4) Network broadcast mask = 0xffffff00 (required for remote install)
5) Network host = rootbeer (192.9.3.1)









Enter selection number ('1'..'5'), 'continue', 'previous', 'cancel', or '?'for
help:
```

Figure 63. Installation Media Identification Menu - Network

A single package, OS/MP 4.1C Full-Install Optional Software, is included on the OS/MP 4.1C distribution tape. The following display shown in Figure 64 appears; the values shown for `Size` in this and subsequent displays may vary.

The message `Mandatory Software Will Be Installed` indicates that the standard filesystems will be built from scratch (overwriting any old contents) when the **`install`** command is issued. If this message does not appear, only the packages selected in this menu will be installed.

The Optional Software package contains a set of software modules that have historically been installed as part of **/usr**. These modules are not necessary for the basic operation of the system, and have been provided separately so that **/usr** may be kept as small as possible. To examine the modules available, select the Optional Software package:

```
Enter number of package to examine ('1'..'1'), 'cancel',
'install', or '?' for help: 1

Should the OS/MP 4.1C Full-Install Optional Software
package be installed ('yes', 'no', ^C, or '?' for help)?
```

The `Should the OS/MP 4.1C Full-Install Optional Software package be installed` question refers to the package in general. The modules are individually selected for installation on the customization screen, and by default all are selected for installation.

After replying **`yes`**, the customization menu will appear as shown in Figure 65.

```
                        Package Selection

                Mandatory Software Will Be Installed

Package Name                                    Size(KB)        Install

1) OS/MP 4.1C Full-Install Optional Software    34832           n




Enter number of package to examine ('1'..'1'), 'cancel', 'install', or '?'
for help:
```

Figure 64. Package Selection Menu

★ ★ ★ NOTE ★ ★ ★

Figure 65 is only an example. The free KB reported varies depending on the type and size of disk drive installed.

The size of each module in kilobytes is listed immediately to the right of the module's name. The column after the size indicates whether or not the module is currently marked for installation. If the module is to be installed, the directory that the module's files are to be installed in is listed, followed by the free space on the partition that the directory refers to.

Below are short descriptions of the individual modules:

DEBUGGING - program debugging aids
This module contains the debugging tool **dbx**(1) and the profiled versions of the standard libraries libc, libcurses, libm, libtermcap, libtermlib, libsuntool, and libsunwindow.

GAMES - games and demonstration programs
The recreational programs listed in Section 6 of the *UNIX User's Reference Manual.*

MANUAL - on-line manual pages
Sections 1 through 8 of the UNIX User's and Programmer's Manuals in machine-readable form. See **man**(1), **lookup**(1), and **qref**(1) for more details. This option requires that the TEXT option also be installed.

```
          Customization of Solbourne OS/MP 4.1C Optional Software

                                  Software Modules
 Module          Size(KB)       Install     Directory      Free(KB)
  1) DEBUGGING       2888           y           /usr           58695
  2) GAMES           3136           y           /usr           58695
  3) MANUAL          7440           y           /usr           58695
  4) NETWORKING      1072           y           /usr           58695
  5) PLOT            1784           y           /usr           58695
  6) SECURITY         312           y           /usr           58695
  7) SV_PROG         1848           y           /usr           58695
  8) SV_USER         2320           y           /usr           58695
  9) SYSTEM_V        4032           y           /usr           58695
 10) TEXT             720           y           /usr           58695
 11) VERSATEC        5960           y           /usr           58695
 12) UUCP             608           y           /usr           58695
 13) RFS              912           y           /usr           58695
 14) SHLIB           1376           y           /usr           58695
 15) TLI               48           y           /usr           58695

Enter number of module to modify ('1'..'15'), 'continue', 'abort', or '?' for
help:
```

Figure 65. Package Selection Customization Menu

NETWORKING - network utilities

Utilities and commands that access a network, such as **rcp**(1) or **ftp**(1). This module is required on systems that are connected to a network, or that will use the NIS/YP database services.

PLOT - basic plot-generating applications

The standard UNIX plotting utilities, which allow the creation of plots and graphs from simple data to be displayed on a variety of plotters and graphics terminals. See **plot**(1G) and **graph**(1G).

SECURITY - C2 security

The SECURITY module provides features such as audit trails and shadow password files in the spirit of the Department of Defense's C2 Security Specification (the "Orange Book"). The compliance of these features has not been certified.

SV_PROG - SunView program development support

Include files and libraries needed for compiling SunView applications. This module requires that SV_USER also be installed.

SV_USER - basic SunView support

The SunView windowing system and associated applications (such as **suntools**(1) and **shelltool**(1)). This module is not required if only X Windows will be used on the system.

SYSTEM_V
System V-compatible libraries and executables. System VR3, POSIX, and X/OPEN are supported. See **svidii**(7v), **svidiii**(7v), **xopen**(7v), and **posix**(7v) for details.

TEXT - nroff/troff text processing
This module provides the text formatter **troff**(1) and its associated support programs and files. This option is required if the MANUAL option is installed.

VERSATEC - Versatec printer support
Various utilities specific to Versatec printers, such as **vtroff**(1) and **vplot**(1G).

UUCP - uucp applications suite
uucp(1C) and its support programs. These are normally used for communicating with other UNIX operating systems via phone line.

RFS
Utilities and libraries to support the System V Remote File System.

SHLIB
Position-independent versions of the BSD and System-V versions of the C library. These are provided to allow substituting or adding a module to the shared C library.

TLI
Libraries and headers to support developing programs that take advantage of the System V Transport Layer Interface.

Modifying a module allows selecting whether or not it is to be installed and, if so, the directory its files are to be extracted into.

★ ★ ★ NOTE ★ ★ ★

All modules are intended to be extracted in their default directory. If a module is extracted somewhere else, there is no guarantee that the programs provided in the module will work.

For example, to not install the VERSATEC module:

```
Enter number of module to modify ('1'..'15'), 'continue',
'abort', or '?' for help: 11
```

The VERSATEC menu entry is highlighted, and:

```
Modifying the Versatec printer support module
Should the VERSATEC module be installed ('yes', 'no', ^C,
or '?' for help)? no
```

Figure 66 shows the updated display:

★ ★ ★ NOTE ★ ★ ★

The free space for **/usr** *has been increased by the size of the VERSATEC module as shown in Figure 66.*

```
          Customization of Solbourne OS/MP 4.1C Optional Software

                                  Software Modules
 Module          Size(KB)         Install     Directory      Free(KB)
 1) DEBUGGING        2888           y           /usr           64655
 2) GAMES            3136           y           /usr           64655
 3) MANUAL           7440           y           /usr           64655
 4) NETWORKING       1072           y           /usr           64655
 5) PLOT             1784           y           /usr           64655
 6) SECURITY          312           y           /usr           64655
 7) SV_PROG          1848           y           /usr           64655
 8) SV_USER          2320           y           /usr           64655
 9) SYSTEM_V         4032           y           /usr           64655
10) TEXT              720           y           /usr           64655
11) VERSATEC         5960           n
12) UUCP              608           y           /usr           64655
13) RFS               912           y           /usr           64655
14) SHLIB            1376           y           /usr           64655
15) TLI                48           y           /usr           64655

Enter number of module to modify ('1'..'15'), 'continue', 'abort', or '?' for
help:
```

Figure 66. Package Selection Menu - Deletion of Versatec Module

To install the GAMES module in **/fun** (on the root partition):

```
Enter number of module to modify ('1'..'13'), 'continue',
'abort', or '?' for help: 2
```

The GAMES menu entry is highlighted, and:

```
Modifying the games and demonstration programs module

Should the GAMES module be installed ('yes', 'no', ^C, or
'?' for help)? yes

Install GAMES in what directory? /fun

/fun does not exist. Create it during installation ('yes',
'no', ^C, or '?' for help)? yes
```

The menu is updated to reflect the change, as shown in Figure 67.

★ ★ ★ NOTE ★ ★ ★

The free space for **/usr** *changes, and a completely new size (for* **/fun***) is also displayed as shown in Figure 67.*

If you decide to discard all changes made to the modules, use the command **abort**. This returns to the Package Selection Menu.

```
        Customization of Solbourne OS/MP 4.1C Optional Software

                                Software Modules
 Module          Size(KB)       Install     Directory      Free(KB)
 1) DEBUGGING        2888           y           /usr           67791
 2) GAMES            3136           y           /fun            4579
 3) MANUAL           7440           y           /usr           67791
 4) NETWORKING       1072           y           /usr           67791
 5) PLOT             1784           y           /usr           67791
 6) SECURITY          312           y           /usr           67791
 7) SV_PROG          1848           y           /usr           67791
 8) SV_USER          2320           y           /usr           67791
 9) SYSTEM_V         4032           y           /usr           67791
10) TEXT              720           y           /usr           67791
11) VERSATEC         5960           n
12) UUCP              608           y           /usr           67791
13) RFS               912           y           /usr           67791
14) SHLIB            1376           y           /usr           67791
15) TLI                48           y           /usr           67791

Enter number of module to modify ('1'..'15'), 'continue', 'abort', or '?' for
help:
```

Figure 67. Package Selection Menu - Install Games module to /fun

If you are satisfied with the changes (if any) made to the modules, enter the command **`continue`**. This will record the changes and return to the Package Selection menu.

When package customization has been completed (which may mean no packages were selected for installation), enter **`install`** as shown in Figure 68.

The actual installation begins at this point. The steps taken during the installation are:

1. create filesystems (**root(/)**, **/usr**, possibly **/var** or **/tmp**
2. install mandatory **root** files
3. install mandatory **kvm** files
4. install mandatory **usr** files
5. install optional software

When installation has finished, it gives the following message:

```
Optional Software Installation Succeeded

Press any character to continue
```

The next display gives the values of the previous and new ROM variables **DEFAULTROOT**, **DEFAULTSWAP** (if they have changed), and asks if you want to update the variables, as shown in Figure 69.

```
                              Package Selection

                        Mandatory Software Will Be Installed

Package Name                                    Size (KB)       Install

1) OS/MP 4.1C Full-Install Optional Software  34832                 y




Enter number of package to examine ('1'..'1'), 'cancel', 'install', or '?'
for help: install
```

Figure 68. Package Selection Menu

```
Ready to Update ROM Variable

Previous DEFAULTROOT=sd.si(0,0,0), New DEFAULTROOT=sd.si(0,2,0)

Do you want to go ahead and update the ROM ('yes', 'no', ^C, or '?' for help)?
```

Figure 69. Update ROM Variable

★ ★ ★ NOTE ★ ★ ★

Before you say 'yes', make sure that all the previous settings of these variables are recorded so that you can later reboot from the old version of the system if necessary. If you choose not to update the ROM variables, make sure that you record the new values and use them to reboot the newly installed system at a later time.

reinst_sys then performs the final system setup, and completes. The new system's filesystems are currently mounted under the **/etc/sys_conf/reinst_sys/root** directory. For example, the new version of the **/var** directory is mounted at **/etc/sys_conf/reinst_sys/root/var**.

At this point, the newly installed system is ready to boot. However, you may want to finish the installation by creating or editing such files as **/etc/rc.local**, automounter maps, **/etc/printcap**, the **/var/spool** directories, NIS/YP maps, or any other files local to your system. If you have comments in your **/etc/fstab** file, they will not exist in the new **/etc/fstab** file, so you may want to edit this file.

★ ★ ★ NOTE ★ ★ ★

If you installed the new system on a disk that is not recognized by a OS/MP 4.1C generic kernel, then you must reconfigure the kernel before rebooting.

You may also wish to create a customized kernel on the new system, so that hardware such as the channel board and VSCSI devices will be recognized. If you would rather wait until after rebooting the new system to configure your kernel, you should edit the new **/etc/fstab** file and comment out any partitions which are on disks not visible to the generic OS/MP 4.1C kernel.

After you have completed customizing the new installation, reboot your machine, using the new ROM variables.

If you used the -a option to upgrade to a different architecture, then after customizing the new installation, halt the machine and turn off the power. Replace the old CPUs with the new CPUs, power up and boot your machine using the new ROM variables.

Installing OS/MP 4.1C on a Dataless Client

Before Installing...

This chapter describes how to install OS/MP 4.1C on a Dataless Client.

A dataless client is a machine whose /usr files are NFS-mounted from another machine (the "server") but whose root partition is on a local disk.

★ ★ ★ NOTE ★ ★ ★

Before installing a dataless client, you must have already installed the server. On the server, you must also have run **config_server** for this client's architecture. Refer to Installing OS/MP 4.1C on a Server for details.

★ ★ ★ CAUTION ★ ★ ★

Perform a full backup before installing OS/MP 4.1C. A complete installation will overwrite all information on the disk partitions specified for the root (/), swap, /var, and /tmp filesystems.

Before installing the release tape, you must clean the tape drive on the host machine. Failure to do so may damage the release tape.

Installing...

Starting in OS/MP 4.1C, the **preinstall** utility is available to help determine which system files should be restored or merged from backup. **preinstall** shows which files in system directories were modified after you last installed the OS version you're currently running.

If you do not want to use **preinstall**, skip to the section *Loading the Ramdisk* below.

Installing preinstall...

Because **preinstall** was not included in versions of OS/MP prior to 4.1C, it is necessary to install it before proceeding to install OS/MP 4.1C.

When using a local tape drive, install **preinstall** using the following commands:

```
# mt -f /dev/nrst0 asf 5
# cd /usr/etc
# tar xpf /dev/nrst0
```

When using a remote tape drive, the system name needs to be in the `tapehosts` **/.rhosts** file. Install **preinstall** using the following commands:

```
# rsh -n tapehost mt -f /dev/nrst0 asf 5
# cd /usr/etc
# rsh -n tapehost dd if=/dev/nrst0 bs=8k | tar xpBf -
```

In this example, you should replace *tapehost* with the actual name of your tape host machine.

★ ★ ★ NOTE ★ ★ ★

Some older versions of SunOS do not support the 'asf' request for **mt**. *If this is the case for your tape host, first substitute 'rew' for 'asf 5' in the above example, and then re-execute* **mt** *with 'fsf 5' instead of 'rew'.*

When using a local CD-ROM drive, install **preinstall** using the following commands:

```
# mkdir /cdrom
# mount /dev/sr0 /cdrom
# cd /usr/etc
# tar xpf /cdrom/Tools.tar
```

When installing over the network, or when using a remote CD-ROM drive, create a mount point directory (if one doesn't exist), and mount the CD-ROM drive on the remote machine, referred to here as `nethosts`, as follows:

```
nethost# mkdir /cdrom
nethost# mount /dev/sr0 /cdrom
```

Install **preinstall** using the following commands:

```
# cd /usr/etc
# rsh -n nethost dd if=/cdrom/Tools.tar bs=8k | tar xpBf -
```

In this example, replace *nethost* with the actual name of the remote host machine, and replace *cdrom* with the actual path name or mount point.

Using preinstall

After **preinstall** has been installed, it is located in **/usr/etc**. The usage of **preinstall** is as follows:

/usr/etc/preinstall [**-l**] [**-c** mmddhhmm[yy]]

The **preinstall** command is used to look for files that should be saved prior to doing a full install of a new version of OS/MP. It looks on the system partitions (root(/), **/usr**, and **/var**) for files which have been touched after the date of the last full install of OS/MP (or, if given a cutoff date, files touched after that date).

preinstall is normally used just before installing a new version of OS/MP to determine what system-related files should be backed up. Then, after installing the new version of OS/MP, you can merge or restore these files into the newly-installed system.

Some files, such as **/etc/fstab**, can typically be re-used without modification. Others, such as kernel configuration files in **/usr/kvm/sys/*/conf**, must be hand-merged into the new version of the OS with careful consideration of how the new OS version differs from the old.

Certain files are excluded from the output which are newer than the cutoff date. These files are normally updated by system operation and do not need to be backed up. Examples of excluded files are: **/etc/mtab**, the **/var/sadm** accounting files, the **/tmp_mnt** automounter directories, and patched kernel object files in **/usr/kvm/sys/*/OBJ**. By default, the cutoff date used is the modification date of the file **/etc/sys_conf/system-configured**, which is touched the first time you boot a new version of the OS after a full install. You may want to use some other cutoff date with the **-c** option if the current OS was installed in some non-standard way.

By default, the files and directories newer than the cutoff are listed to standard output by name, one per line. By using the **-l** option, the output is in long form (as from the **-ls** option to **find**), showing the type, date, and size of each file.

The following options are accepted by **preinstall**:

- The **-l** option presents the output in long form, showing inode number, size in kilobytes (1024 bytes), protection mode, number of hard links, user, group, size in bytes, and modification time. If the file is a special file the size field will instead contain the major and minor device numbers. If the file is a symbolic link the pathname of the linked-to file is printed preceded by '->'. The format is identical to that of **find -ls**.
- The **-c** option specifies to use the given cutoff date to decide which files to print, rather than the date of the file **/etc/sys_conf/system-configured**. The cutoff date format is **-c** mmddhhmm[yy], with month, day, hour, minute, and optional year in numeric form. This is the same format as for **/usr/5bin/touch**.

After configuring the server for a dataless client, loading the ramdisk image is your next step in a diskful installation. The ramdisk image is a special UNIX operating system kernel with a built-in ramdisk that contains the installation software. The command to load the ramdisk depends on the type of system. Follow the instructions for your system type.

Installing on a Series5, Series5E, or Series6:

Loading the Ramdisk

The following explains four different methods of loading the ramdisk. After you have loaded the ramdisk continue on to the *Dataless Installation* section.

Turn the system on. After the system passes the self-tests, the system displays the bootROM prompt.

Loading the Ramdisk via a Local Tape Drive

The ramdisk installation software uses the value of the bootROM variable **INSTALLED** to determine if a system needs to have the basic operating system installed. Set the value of this variable to 0 before loading the ramdisk:

```
ROM> setenv installed 0
```

The system asks if you want to re-install if **INSTALLED** is not 0.

To load the ramdisk on Series5 or 5E systems using a local tape drive, enter the following boot command:

```
ROM> boot st.si(,TapeID,2)
```

To load the ramdisk on Series6 systems using a local tape drive, enter the following boot command:

```
ROM> boot st.si(,TapeID,3)
```

The variable *TapeID* shown in the command should be replaced with the SCSI ID of the tape drive to be used. For st0, use 4; for st1, use 5.

The bootROM copies the ramdisk image into memory and boots it:

```
Boot: st.si(,4,3)
Entry: 0xff060000
Size: 0x10e000+0x56afb8+0xadc40
```

The system displays a spinner while copying the ramdisk into memory. When the copy completes, the spinner pauses for up to three minutes.

Loading the Ramdisk via a Remote Tape Drive

The system with the tape drive, referred to as `tapehost` in the following example, must be on the same network as the system being installed, referred to as *hamster* in the following example. For example, with a class C network, the first three numbers in the Internet addresses of the two machines must be the same, such as 192.1.3.42 and 192.1.3.17. Also, *hamster* must be listed in **/etc/hosts**, or in the NIS/YP hosts database, and **/.rhosts** on `tapehost`. In addition, the ethernet address

must be in the **ethers** database. The `tapehost` must also be running the **rarpd**(8) daemon.The ramdisk must be extracted from the OS/MP 4.1C distribution tape onto a disk on `tapehost`.

Since the system uses **tftp**(1) to load the ramdisk image, it must be enabled on the tapehost. Examine the file **/etc/inetd.conf**. A line similar to the one below should be in the file:

```
tftp dgram udp wait root /usr/etc/in.tftpd in.tftpd -s
/tftpboot
```

If the line starts with a #, remove the #.

If a `-s` appears after the last `in.tftpd` in **/etc/inetd.conf**, either remove it or use the directory **/tftpboot** instead of **/var/tmp** as shown above. Approximately 6 Mbytes will be needed in the directory used.

If **/etc/inetd.conf** has been changed, **inetd(8)** must be told to re-read the configuration file:

```
tapehost # ps ax | egrep inetd
  249 ? I 0:01 inetd
  541 p3 R 0:00 egrep inetd
```

The *pid* of inetd is the first number on the line that doesn't contain **egrep**. In the above output, *pid* is 249.

```
tapehost # kill -HUP pid
```

★ ★ ★ NOTE ★ ★ ★

In the following example the install kernel will be named ***/var/tmp/install****. The actual name of the file is not important, as long as it is used consistently here and in the example on the next page. Also note that the filesystem must have enough space to hold the install kernel.*

In the **mt** command below, replace the variable *X* with one of the following values, depending on the type of system:

Table 22.

System	Value of X
Series5 and 5e	2
Series6	3

Put the distribution tape into the tapehost drive and execute the following commands. For Exabyte tape drives, use bs=1024 instead of bs=512 in the **dd** command shown below.

```
tapehost # cd /var/tmp
tapehost # mt -f /dev/nrst0 asf X
tapehost # dd if=/dev/nrst0 of=install bs=512
```

Enter the following boot command:

```
ROM> b tftp.ei(,,hostnumber)/var/tmp/install
```

In the example above, the variable *hostnumber* should be replaced with the last of the four numbers in the system's Internet address.

Loading the Ramdisk via a Local CD-ROM Drive

Power on the system. After the system passes the self-tests, the bootROM prompt is displayed.

The ramdisk installation software uses the value of the bootROM variable **INSTALLED** to determine if the basic operating system needs to be installed. Set the value of this variable to 0 before loading the ramdisk as follows:

```
ROM> setenv installed 0
```

The system will ask if you want to re-install if **INSTALLED** is not 0.

Install the OS/MP 4.1C CD-ROM disk into the CD-ROM drive.

★ ★ ★ NOTE ★ ★ ★

In order to boot from the local CD-ROM disk, the bootROMs must be at version 3.5 or higher.

In the two boot commands below, replace the variable *X* with one of the following values, depending on the type of system.

Table 23.

System	Value of X
Series5 and 5E	5
Series6	6

To load the ramdisk on Series5, 5E, or 6 systems, using a local CD-ROM drive, enter a boot command of the following form:

```
ROM> boot sd.si(,6,)/Install.SeriesX
```

The bootROM copies the ramdisk image into memory and boots it:

```
Boot: sd.si(,6,)/Install.SeriesX
Entry: 0xff060000
Size: 0x160000+0x748e8+0x660c8
```

A spinner is displayed while copying the ramdisk into memory. When the copy completes, there is a pause of up to three minutes.

Loading the Ramdisk via a Remote CD-ROM Drive or the Network

Loading the ramdisk from a remote CD-ROM drive is essentially the same as loading the ramdisk from an image area of the OS/MP 4.1C contained on a remote disk accessed over the network. The command to load the ramdisk depends on the type of system.

Power on the system. After the system passes the self-tests, the bootROM prompt is displayed.

The ramdisk installation software uses the value of the bootROM variable **INSTALLED** to determine if the basic operating system needs to be installed. Set the value of this variable to 0 before loading the ramdisk as follows:

```
ROM> setenv installed 0
```

The system will ask if you want to re-install if **INSTALLED** is not 0.

If you are installing by a remote CD-ROM drive (via the network), install the OS/MP 4.1C CD-ROM disk into the remote CD-ROM drive. Create a mount point directory (if one doesn't exist), and mount the CD-ROM drive on the remote machine, referred to here as `diskhost`, as follows:

```
diskhost# mkdir /cdrom
diskhost# mount /dev/sr0 /cdrom
```

The remote system `diskhost`, must be on the same network as the system being installed. For example, with a class C network, the first three numbers in the Internet addresses of the two machines must be the same, such as 192.1.3.42 and 192.1.3.17. Also, the local machine must be listed in **/etc/hosts**, or in the NIS/YP **hosts** database and the ethernet address must be in **/etc/ethers**, or in the NIS/YP **ethers** database. In addition, `diskhost` must have the **rarpd**(8) daemon running.

Since **tftp**(1) will be used by the system to load the ramdisk image, it must be enabled on the `diskhost`. Examine the file **/etc/inetd.conf**. A line similar to the one below should be in the file:

```
tftp dgram udp wait root /usr/etc/in.tftpd in.tftpd -s
/tftpboot
```

If the line starts with a #, remove the #.

If a `-s` appears after the last `in.tftpd` in **/etc/inetd.conf**, either remove it or use the directory **/tftpboot** instead of **/var/tmp** as shown above. Approximately 6 MBytes will be needed in the directory used.

If **/etc/inetd.conf** has been changed, **inetd**(8) must be told to re-read the configuration file:

```
diskhost # ps ax | egrep inetd
  249 ? I 0:01 inetd
  541 p3 R 0:00 egrep inetd
```

The *pid* of inetd is the first number on the line that doesn't contain **egrep**. In the above output, *pid* is 249.

```
diskhost# kill -HUP pid
```

In the **boot** command below, replace the variable *X* with one of the following values, depending on the type of system

Table 24.

System	Value of X
Series5 and 5E	5
Series 6	6

Enter the following boot command:

```
ROM> b tftp.ei(,,hostnumber)/cdrom/Install.SeriesX
```

The bootROM copies the ramdisk image into memory and boots it:

```
Boot: tftp.ei(,,hostnumber)/cdrom/Install.SeriesX
Entry: 0xff060000
Size: 0x10e000+0x56afb8+0xadc40
```

A spinner is displayed while copying the ramdisk into memory. When the copy completes, there is a pause of up to three minutes.

Dataless Installation

After Booting Ramdisk

When the ramdisk is booted, it first determines what sort of terminal is being used. If it is a serial terminal, that is, a terminal attached to the **ttya/ttyb** port, or if the bootROM variable **CONSOLE** is not set, a list of supported terminals is displayed as follows:

```
1) 610
2) ansi
3) hp
4) sun
5) tvi912
6) vt100
7) wyse50
What type of terminal are you using ('1'..'7')?
```

If a frame-buffer is being used as the console, select the 4, the sun terminal type.

```
What type of terminal are you using ('1'..'7')? 4
```

If the value of the bootROM variable **INSTALLED** is non-zero, the mandatory system software has already been installed. In that case, the system displays the following:

```
THIS SYSTEM IS ALREADY INSTALLED


Do you want to re-install the system ('yes', 'no', or '?'
for help)?
```

The above message is for the benefit of users intending to re-install the system software, but have not reset the **INSTALLED** environment variable.

If the message appears, enter `yes` to re-install the mandatory system software, or `no` to continue the installation without re-installing it.

The disk drives attached to the system are then scanned, and a menu of procedures is displayed:

```
                              Ramdisk

  1) Change Disk Partitioning

  2) Install Software

  3) Invoke a Bourne Shell

  4) Reboot System

  5) Halt System

Enter number of function to execute ('1'..'5', or '?' for
help):
```

The provided functions are described below:

Change Disk Partitioning - Allows the changing of the sizes of disk partitions, and what those partitions are to be used for (filesystem, swap, or unused). Refer to the *Changing Disk Partitions* Section for details on changing disk partitions.

★ ★ ★ NOTE ★ ★ ★

If changes are going to be made to the disk partitions on which OS/MP 4.1C will reside, the changes must be made before installing software. Disk partitions not containing OS/MP 4.1C can be modified before or after the installation.

Install Software - Intended primarily for installing new systems. If system software has already been installed, then this option may be used to install any Solbourne software distribution, such as X Windows. See "Software Installation from the Ramdisk," for more information.

Invoke a Bourne Shell - Starts an interactive Bourne shell. This option is provided mainly for formatting disks and restoring filesystems. The sizes of disk partitions should not be changed here with the **format**(8) command. If they are, you must then select `Change Disk Partitioning` before attempting to `Install Software`.

Reboot System - Starts UNIX after software installation. Alternatively, you may reload the ramdisk from scratch.

Halt System - Returns control of the system to the bootROM.

Help may be requested at any ramdisk prompt by entering a question mark by itself. Table 25 shows edit commands available when entering text in response to prompts:

Table 25. Input Editing Commands

Character	Interpretation
backspace (^H)	delete last input character
delete (^?)	delete last input character
^U	erase input line
^R	redisplay input line
^W	delete input up to '/' or whitespace
^C	cancel input, returning to nearest menu
ESC	cancel input, returning to nearest menu
^L	redisplay entire screen
return (^M)	end input
newline (^J)	end input

If a string is too long to be displayed in the available space, the beginning of the string is displayed as "...". This allows display of the end of the string, which is usually of more interest.

Keywords can be shortened to any unique prefix (such as 'co' for 'continue'), except for 'yes' and 'no', which must always be spelled out.

Fatal errors during software installation are usually reported by messages beginning with "`System error`" or "`Internal error`" and ending with a "`#`" prompt. If a fatal error occurs, software installation may be restarted by entering:

```
# ^Jstty sane^J
# cd /
# rm -f /core
# inst_sys
```

where ^J is the linefeed character. The command **stty sane** may not be echoed (and is intended to fix that problem). In the event of a fatal error during software installation, please report the problem to Solbourne customer support.

Software Installation from the Ramdisk

Installing software has two distinct stages: gathering information and modifying the system. No permanent changes are made to the system until all information has been provided.

For a dataless client installation, there are three informational menus:

- Standard Filesystem Definition - specifies where the standard filesystems (**root** (/), **swap**, and **/usr**, optionally **/var** and **/tmp**) are located.
- Dataless Install Identification - specifies the dataless client's name and the servers Internet address.
- Media Identification - Determines the installation media from which to install (tape, CD-ROM, or network directory), and determines where that media is located.

All three menus provide the command **cancel**. The first two also provide the command **previous**. These commands allow you to return to prior menus, optionally discarding any changes that have been made.

cancel always returns to the ramdisk menu. If changes are to be discarded, then all changes made since `Install Software` was selected are forgotten.

previous always returns to the previous menu (which is the ramdisk menu, in the case of the Filesystem Definition menu). The changes discarded in this case are those made in the menu you are leaving.

cancel has higher priority than **previous**. In other words, if you use **previous** to leave a menu without discarding changes, then **cancel** from that menu and discard changes, the changes made in the earlier menu are also discarded.

Standard Filesystem Definition

The Standard Filesystem Definition menu defines where the mandatory filesystems are located. The **/usr** files should have already been installed on the server.

Any changes made to the standard filesystems with the partition tool will appear in this menu.

Changing an entry at the Standard Filesystem Definition

The following steps assign the **/usr** filesystem to **rootbeer:/export/exec/Series5.**, rather than using the default of **/usr** being a subdirectory of the root filesystem.

To modify the **/usr** filesystem, enter the number **3**.

```
Enter number of filesystem to change ('1'..'5'),
 'continue', 'previous', 'cancel' or '?' for help: 3
```

The **usr** menu will be highlighted, and the system will request a disk partition. The format is *host:path*, where *host* is the name of the server from which the /usr files will be used. *path* is */export*/exec/*architecture* (which was created by running config_server) where *export* is your export directory, and *architecture* is the architecture of your dataless client. Assign it to **rootbeer:/export/exec/Series5.**

If you wish to use a directory other than **/export**, set the environment variable EXPORT_DIR to the directory that you desire

The new arrangement is displayed as shown in Figure 70.

The following steps assign the **/var** filesystem to **sd0d**, rather than using the default of **/var** being a subdirectory of the root filesystem.

These steps are optional. If followed, the result is a filesystem definition that is the same as that supplied on the factory installation of a diskful system. In addition, it makes use of partition d, thus using 9.3 MB of disk space that is not used when the default disk partition is used with the standard filesystem definition.

In Figure 70 shown below, the notation "(required)" appears next to the **root(/)**, **swap** and **/usr** filesystems. These filesystems must be defined; however, they may be placed on any partition of any disk.

```
                    Standard Filesystem Definition

  1) root on sd0a      (required)
  2) swap on sd0b      (required)
  3) /usr on rootbeer:/export/exec/Series5(required)
  4) /var on root partition
  5) /tmp on root partition

                      Disk Partitions (sizes in MB)
       (a)    (b)      (c)     (d)     (e)     (f)     (g)     (h)
sd0:   8.4    32.4     191.1   9.3     ---     ---     141.1   ---
sd1:   8.4    32.7     190.9   9.6     ---     ---     140.8   ---




Enter number of filesystem to change ('1'..'5'), 'continue', 'previous',
'cancel', or '?' for help:
```

Figure 70. Sample Standard Filesystem Definition Menu for Dataless Clients

To modify the **/var** filesystem, enter the number **4**.

```
Enter number of filesystem to change ('1'..'5'),
'continue', 'previous', 'cancel' or '?' for help: 4
```

The var menu will be highlighted, and the system will request a disk partition. Assign it to **sd0d.**

```
Enter name of disk partition or host:path for /var
filesystem, 'none', ^C, or'?' for help: sd0d
```

The new arrangement is displayed as shown in Figure 71.

```
                    Standard Filesystem Definition

  1) root on sd0a      (required)
  2) swap on sd0b      (required)
  3) /usr on rootbeer:/export/exec/Series5(required)
  4) /var on sd0d
  5) /tmp on root partition

                    Disk Partitions (sizes in MB)
       (a)    (b)      (c)     (d)     (e)     (f)     (g)     (h)
sd0:   8.4    32.4     191.1   9.3     ---     ---     141.1   ---
sd1:   8.4    32.7     190.9   9.6     ---     ---     140.8   ---



Enter number of filesystem to change ('1'..'5'), 'continue', 'previous',
'cancel', or '?' for help:
```

Figure 71. Modified Standard Filesystem Definition Menu for Dataless Clients

Once all changes for the standard filesystems have been made, enter **continue**:

```
Enter number of filesystem to change ('1'..'5'),
'continue', 'previous', 'cancel', or '?' for help: continue
```

Next you are asked to verify the **/usr** partition. If the value is correct, enter **yes** to proceed to the Dataless Install Identification Menu:

```
Is rootbeer:/export/exec/Series5 the correct host:path for
the /usr partition?

('yes', 'no', ^C, or '?' for help): yes
```

The Dataless Install Identification Menu

The Dataless Install Identification Menu is a new menu that only appears when the **/usr** partition in the Standard Filesystem Definition Menu specifies that the install will be dataless.

This menu was added so that it is no longer necessary to hand modify the **/etc/hosts** and **/etc/hostname.ei0** files. In releases prior to OS/MP 4.1C, at the completion of the dataless installation, the user had to exit to a Bourne Shell, and modify these files by hand.

Figure 72 shows the Dataless Install Identification Menu.

```
                    Dataless Install Identification Menu

  1) Client Machine Name = <undefined>
  2) Internet address for rootbeer = <undefined>




Enter selection number ('1'..'2'), 'continue', 'previous',
'cancel', or '?' for help:
```

Figure 72. Dataless Install Identification Menu for Dataless Clients

The **Client Machine Name** is simply the name of the Dataless Client that you are currently installing.

The **Internet address** is the address of the server from which the /usr files will be used. In this case the server is rootbeer.

Both of these variables must be set before continuing. After these values have been entered correctly, enter **`continue`**. Next you are asked to verify the values entered. If the values are correct, enter **`yes`** to proceed to the Media Identification Menu.

Installation Media Identification Menu

The Media Identification Menu describes which type of installation media will be used during the installation and where it is located. On Series5, Series5E, and Series6 systems, the default is to install from a local tape drive, even if no such drive exists. Therefore, changing the settings on a non-Series S4000 machines probably will be necessary.

Figure 73 shows the Media Identification Menu.

Installing from a Tape Drive

Installing from a local tape drive requires that the *Tape drive* field be set to either **st0** or **st1** (the only supported tape drives) and that *Tape host* be set to **`localhost`**. The Installation media type must also be set to **`Tape`**.

Installing from a remote tape drive requires that all the fields be set:

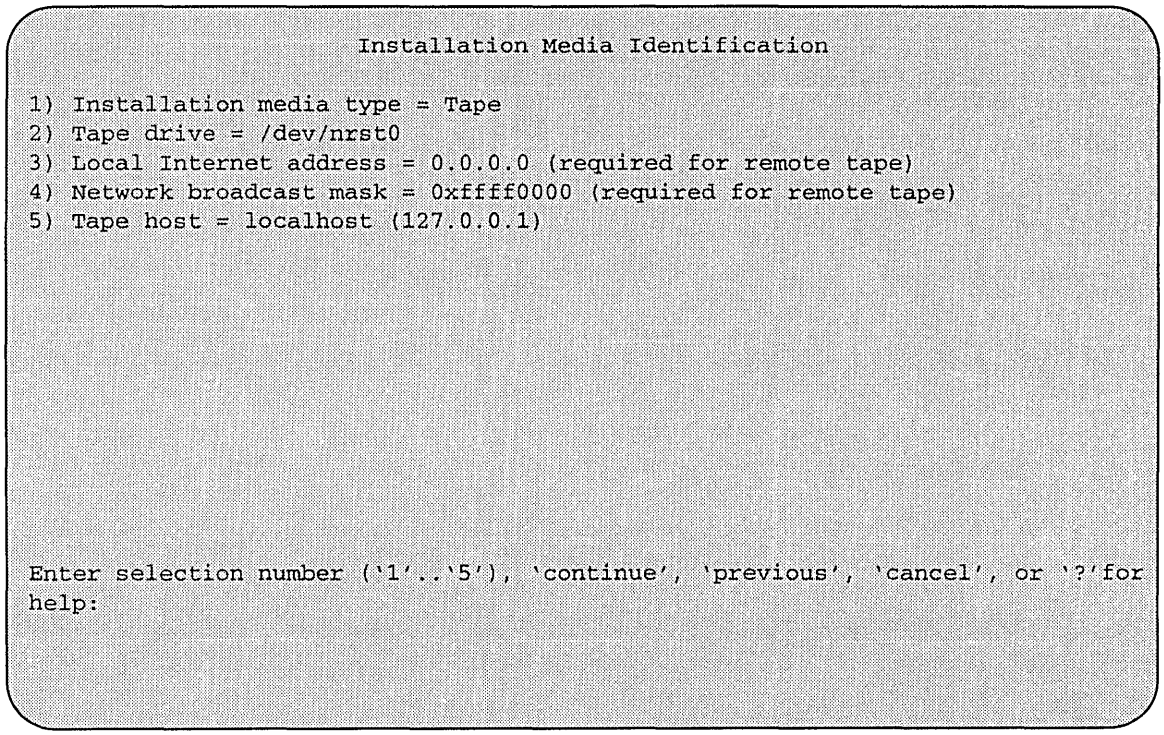


Figure 73. Installation Media Identification Menu - Local Tapehost

Installation media type must be set to **`Tape`**.

Tape drive should be the basic name of the tape drive on the tapehost.

The **Local Internet address** is the address of the system being installed. If the default value is not correct, make sure that the client name corresponding to the correct address appears in the tape host's **/.rhosts** file. Check **/etc/hosts** or the NIS/YP hosts map as appropriate.

The **broadcast mask** should not be changed unless your network uses a non-standard mask. Such a mask is used when a network is sub-netted (i.e., a Class B network is treated as several Class C networks). A leading '0x' is necessary if entering the mask as a hexadecimal number. A leading '0' is needed for octal numbers. If neither prefix is given, the value is assumed to be in decimal.

Tape host must be set to the name of the system with the tape, which is used to determine the tape host's Internet address. The name itself, however, is not especially important (it is discarded after the installation is complete). As such, the default name, *tape-n-boot-serv*, generally need not be changed.

Figure 74 shows the Media Identification menu of a system that was booted from a remote tape using tape device st0 (SCSI address 4).

When the details of the tape drive have been entered correctly, enter **`continue`**.

```
                    Installation Media Identification
1) Installation media type = Tape
2) Tape drive = /de/nrst0
3) Local Internet address = 192.9.3.4 (required for remote tape)
4) Network broadcast mask = 0xffffff00 (required for remote tape)
5) Tape host = tape-n-boot-serv (192.9.3.1)









Enter selection number ('1'..'5'), 'continue', 'previous', 'cancel', or '?'for
help:
```

Figure 74. Installation Media Identification Menu - Remote tapehost

Local CD-ROM Installation

Installing from a local CD-ROM disk drive requires that the Installation media type be set to **CD-ROM**, the CD-ROM drive field be set to **/dev/sr0** and the *CD host* field be set to '**localhost**'. Figure 75 shows the Installation media type menu with the CD-ROM parameters set to install from CD-ROM.

Network and remote CD-ROM Installations

Figure 76 shows the Installation media type menu with the Network parameters set to install from the network or a remote CD-ROM. Installations of this type require that all the fields be set as follows:

Installation media type must be set to **Network**

Installation directory should be the full path name of the location of the installation area, or the full path of the CD-ROM mount point, on the network host. For example, if the remote CD-ROM is mounted on **/cdrom**, then the installation path is simply **/cdrom**.

The **Local Internet address** is the address of the system being installed. If the default value is not correct, make sure that the client name corresponding to the correct address appears in the tape host's **/.rhosts** file. Check **/etc/hosts** or the NIS/YP hosts map as appropriate.

```
                    Installation Media Identification

1) Installation media type = CD-ROM
2) CD drive = /dev/sr0
3) Local Internet address = 0.0.0.0 (required for remote tape)
4) Network broadcast mask = 0xffff0000 (required for remote tape)
5) CD host = localhost (127.0.0.1)









Enter selection number ('1'..'5'), 'continue', 'previous', 'cancel', or '?'for
help:
```

Figure 75. Installation Media Identification Menu - Local CD-ROM

```
                    Installation Media Identification

1) Installation media type = Network
2) Installation directory = /cdrom
3) Local Internet address = 192.9.3.4 (required for remote tape)
4) Network broadcast mask = 0xffff0000 (required for remote tape)
5) Network host = ginger (192.9.3.1)









Enter selection number ('1'..'5'), 'continue', 'previous', 'cancel', or '?'for
help:
```

Figure 76. Installation Media Identification Menu -Remote CD-ROM

The **broadcast mask** should not be changed unless your network uses a non-standard mask. Such a mask is used when a network is sub-netted (i.e., a Class B network is treated as several Class C networks). A leading '0x' is necessary if entering the mask as a hexadecimal number. A leading '0' is needed for octal numbers. If neither prefix is given, the value is assumed to be in decimal.

Network host must be set to the name of the system with the remote CD-ROM, and it's Internet address.

For a remote CD-ROM install, the `nethost` must have **/cdrom** in it's **/etc/exports** file, and must export it. Also, the **rpc.mountd**(8), **nfsd**(8), and **rarpd**(8) daemons must be running on `nethost`.

When the details of the media have been entered correctly, enter **`continue`**.

Root Files Installation

Next, you are asked if you want to install just the mandatory root files. This is asked as a confirmation before starting the installation:

```
Install only mandatory root files ('yes', 'no', ^C, or '?'
for help)?
```

After entering **`yes`**, the installation is performed. When it completes, you will be returned to the ramdisk menu. Reboot the system.

The steps taken during the installation are:

1. extract miniusr. This contains the installation software, as well as enabling swapping.
2. create filesystems (**root(/)**, possibly **/var** or **/tmp**, as well as any new filesystems requested via the partition tool)
3. install mandatory root files

When installation has finished, the ramdisk menu is displayed (see Figure 77). If the installation failed, call Customer Support.

Rebooting from the Ramdisk

When the `Tape Change` selection is displayed, type **`continue.`**

After a successful installation, start the UNIX operating system by rebooting as shown in Figure 78.

Enter number of function to execute ('1'..'5', or '?' for help): **4**

At the Reboot System menu select Boot Unix:

```
Enter selection number ('1'..'3') or '?' for help: 1
```

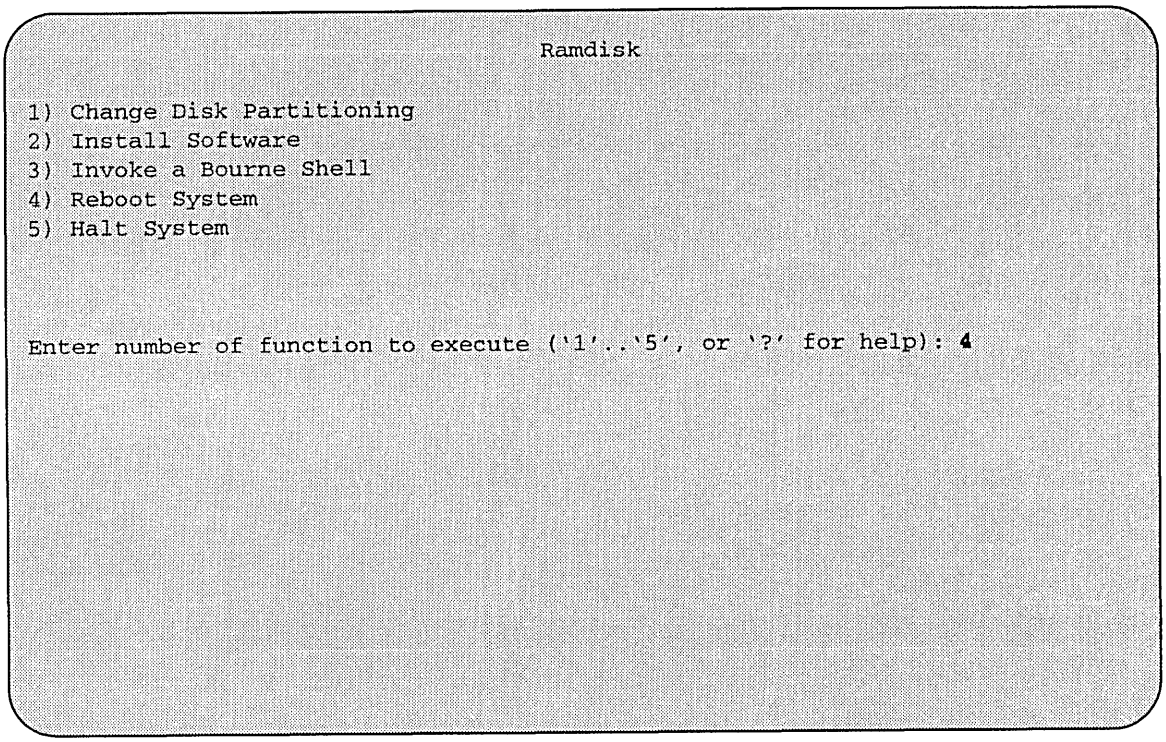


Figure 77. Ramdisk Menu

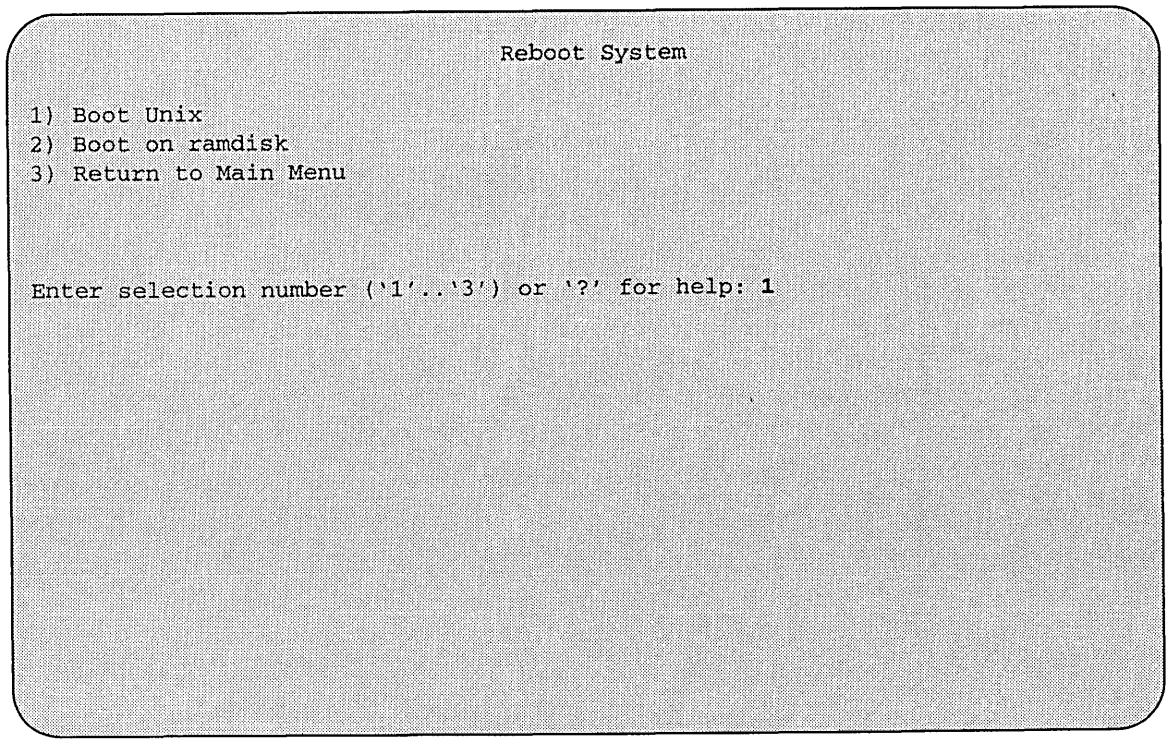


Figure 78. Reboot System Menu

After selecting **1**, there is a short pause, and then:

```
Automatic boot enabled. Type Control-C to abort
ROM> boot
Boot: sd.si(0,0,0)/vmunix
Entry: 0xff060000
Size: 0x160000+0x748e8+0x660c8


OS/MP 4.1C_Export (GENERIC/root) #0: Tue Feb 1 15:52:44
1994
Copyright (c) 1989-1994 Sun Microsystems, Inc. and
Solbourne Computer, Inc.
[...]
```

Now you must specify the system configuration information must be specified.

Disabling tftp

If the ramdisk was loaded from a remote tape drive, **tftp**(1) was enabled at that time.

For security reasons, it should now be disabled on the system from which the tape was read.

First, comment out the line, as shown below, in **/etc/inetd.conf**:

```
#tftp dgram udp wait root /usr/etc/in.tftpd in.tftpd
/tftpboot
```

Next, determine the process ID of **inetd**(8):

```
tapehost# ps ax | egrep inetd
  249 ?  I 0:01 inetd
  541 p3 R 0:00 egrep inetd
```

The *pid* of inetd is the first number on the line that doesn't contain egrep. In the above output, pid is 249.

Last, signal **inetd** to re-read the configuration file:

```
tapehost# kill -HUP pid
```

After Installing...

Initial Boot System Configuration

When a newly installed system is booted multi-user for the first time, the system asks a series of configuration questions:

```
OS/MP 4.1C_Export (GENERIC/root) #0: Tue Feb 1 15:52:44
1994

Copyright (c) 1989-1994 Sun Microsystems, Inc. and
Solbourne Computer, Inc.

[...]

Automatic reboot in progress...
Wed Feb 2 09:22:25 MDT 1994
checking quotas: done.

This system has not yet been configured. Several values
need to be set before the system can come up to multi-user
Unix.

What is this system's name (default = 'standalone'):
habitrail<Return>

What is its Internet address (0 for none, default =
192.9.3.4)? <Return>

What is the network broadcast mask (default = 0xffffff00)?
<Return>

What is the NIS domain name ('none' for none, default =
'none')? Rodent.COM<Return>

What directory should be used for automatic savecore files
('none' for none, default = '/var/crash/habitrail')?
<Return>
```

★ ★ ★ NOTE ★ ★ ★

Using the default 'none' for the NIS domain name disables the NIS/YP services.

```
Time zone choices are:
Australia/  GMT+11      GMT-3       GMT6        Mideast/
Brazil/     GMT+12      GMT-4       GMT7        NZ
CET         GMT+13      GMT-5       GMT8        Navajo
CST6CDT     GMT+2       GMT-6       GMT9        PRC
Canada/     GMT+3       GMT-7       Greenwich   PST8PDT
Chile/      GMT+4       GMT-8       HST         Poland
Cuba        GMT+5       GMT-9       Hongkong    ROC
EET         GMT+6       GMT0        Iceland     ROK
EST         GMT+7       GMT1        Iran        Singapore
EST5EDT     GMT+8       GMT10       Israel      Turkey
Egypt       GMT+9       GMT11       Jamaica     UCT
Factory     GMT-0       GMT12       Japan       US/
GB-Eire     GMT-1       GMT13       Libya       UTC
GMT         GMT-10      GMT2        MET         Universal
GMT+0       GMT-11      GMT3        MST         W-SU
GMT+1       GMT-12      GMT4        MST7MDT     WET
GMT+10      GMT-2       GMT5        Mexico/     Zulu

('/' indicates time zone prefixes)

Enter time zone (default = 'US/Mountain'): <Return>

What is today's date (mm/dd/yyyy, default = 2/1/1994)? <Return>
What time is it (24-hour hh:mm, default = 16:55)? <Return>

Current settings are:
 Host name                = habitrail
 Internet address         = 192.9.3.4
 Network mask             = 0xffffff00
 NIS domain               = Rodent.COM
 Savecore directory       = /var/crash/habitrail
 Time zone                = US/Mountain
 Date (m/d/y)             = 2/1/1994
 Time                     = 16:55

Are these correct ('yes' or 'no')?
yes

Setting netmask of ei0 to 255.255.255.0
Tues Feb 1 09:22:25 MDT 1994
Setting password for root
Changing password for root on habitrail.
New password:
Retype new password:
Continuing boot
starting rpc and net services: portmap [...]
```

Reconfiguring the System

You may need to reconfigure the system if: (1) wrong value was set during the initial configuration, or (2) the system did not successfully come up to multi-user mode.

If you find that a wrong value was set during configuration, you can modify the appropriate file manually, or reconfigure. Manually correcting the settings should only be done if you are an experienced system administrator. Reconfiguring automatically is fairly straight-forward, as explained in the following procedure.

If the system has hung up during the boot process, press the Reset button..

★ ★ ★ NOTE ★ ★ ★

If automatic boot is enabled it is necessary to interrupt the reboot by typing Control-C in the early stages of the reboot; otherwise the system will hang up as before.

Then bring up the system in single-user mode:

```
ROM> boot -s
[...]
```

If the system booted successfully originally, you may instead log in as root:

```
habitrail login: root
Password:
```

In either case, if a file exists that tells the system it has been configured, remove it:

```
# rm /etc/sys_conf/system-configured
```

The above file may not exist; this is not a problem. Go ahead to the next step.

Now reboot. If you are in single-user mode, exit:

```
# exit
```

Otherwise, use fastboot:

```
# /etc/fastboot
```

The system asks configuration questions just as it did the first time it booted after being installed.

Installing on a Series S4000

Loading the Ramdisk

The following explains four different methods of loading the ramdisk. After you have loaded the ramdisk continue on to the *Dataless Installation* section.

Loading the Ramdisk via a Local Tape Drive

Turn the system on. After the system passes the self-tests, the system displays the bootROM prompt.

The ramdisk installation software uses the value of the bootROM variable **INSTALLED** to determine if a system needs to have the basic operating system installed. Set the value of this variable to 0 before loading the ramdisk:

```
ROM> setenv installed 0
```

The system asks if you want to re-install if **INSTALLED** is not 0.

To load the ramdisk on Series S4000 systems using a local tape drive, enter a boot command in the following form:

```
ROM> install
Which type of device do you wish to install from:
   1) Tape
   2) Network
Enter device type: 1
You have the following tape drives. Please choose one:
   1) At Target4, drive name: ARCHIVE VIPER 150 21247-005
   2) At Target5, drive name: EXABYTE EXB-8200 251K
Enter device number: 1
```

The bootROM copies the ramdisk image into memory and boots it:

```
Boot: st.si(,4,4)
Entry: 0xfd080000
Size: 0xec000+0x53ab28+0x42ab8
```

The system displays a spinner while copying the ramdisk into memory. When the copy completes, the spinner pauses for up to three minutes. Proceed to the *Dataless Installation* section

Loading the Ramdisk via a Remote Tape Drive

The system with the tape drive, referred to as `tapehost` in the following example, must be on the same network as the system being installed, referred to as *hamster* in the following example. For example, with a class C network, the first three numbers in the Internet addresses of the two machines must be the same, such as 192.1.3.4 and 192.1.3.1. Also, *hamster* must be listed in **/etc/hosts**, or in the NIS/YP hosts database, and **/.rhosts** on `tapehost`. In addition, the ethernet address must be in the **ethers** database. The `tapehost` must also be running the **rarpd**(8) daemon.The ramdisk must be extracted from the OS/MP 4.1C distribution tape onto a disk on `tapehost`.

Since the system uses **tftp**(1) to load the ramdisk image, it must be enabled on the tapehost. Examine the file **/etc/inetd.conf**. A line similar to the one below should be in the file:

```
tftp dgram udp wait root /usr/etc/in.tftpd in.tftpd -s
/tftpboot
```

If the line starts with a #, remove the #.

If a `-s` appears after the last `in.tftpd` in **/etc/inetd.conf**, either remove it or use the directory **/tftpboot** instead of **/var/tmp** as shown above. Approximately 6 MBytes will be needed in the directory used.

If **/etc/inetd.conf** has been changed, **inetd**(8) must be told to re-read the configuration file:

```
tapehost # ps ax | egrep inetd
  249 ? I 0:01 inetd
  541 p3 R 0:00 egrep inetd
```

The *pid* of inetd is the first number on the line that doesn't contain **egrep**. In the above output, *pid* is 249.

```
tapehost # kill -HUP pid
```

★ ★ ★ NOTE ★ ★ ★

*In the following example the install kernel will be named **/var/tmp/install**. The actual name of the file is not important, so long as it is used consistently here and in the example on the next page.Also note that the filesystem must have enough space to hold the install kernel.*

Put the distribution tape into the drive and execute the following commands. For Exabyte tape drives, use bs=1024 instead of bs=512 in the **dd** command shown below.

```
tapehost # cd /var/tmp
tapehost # mt -f /dev/nrst0 asf 4
tapehost # dd if=/dev/nrst0 of=install bs=512
```

Enter the following boot command:.

```
ROM> install
Which type of device do you wish to install from:
   1) Tape
   2) Network
Enter device type: 2
Enter internet address of this system (default=a.b.c.d):
192.9.3.4


Enter internet address of remote tape system
(default=a.b.c.d):
   192.9.3.1
Enter name of file to boot (default=/usr/boot/munix.S4000):
   /var/tmp/install
Using IP address 192.9.3.4 = C0090304
Server at IP address 192.9.3.1 = C0090301
Boot: tftp.ei(,1,1)/var/tmp/install
Entry: 0xfd080000
Size: 0xec000+0x53ab28+0x42ab8
```

In the example above, the variable *hostnumber* should be replaced with the last of the four numbers in the system's Internet address.

Loading the Ramdisk via a Local CD-ROM Drive

Power on the system. After the system passes the self-tests, the bootROM prompt is displayed.

The ramdisk installation software uses the value of the bootROM variable **INSTALLED** to determine if the basic operating system needs to be installed. Set the value of this variable to 0 before loading the ramdisk as follows:

```
ROM> setenv installed 0
```

The system will ask if you want to re-install if **INSTALLED** is not 0.

Install the OS/MP 4.1C CD-ROM disk into the CD-ROM drive.

To load the ramdisk on S4000 systems, using a local CD-ROM drive, enter a boot command of the following form:

```
ROM> boot sd.si(,6,)/Install.S4000
```

The bootROM copies the ramdisk image into memory and boots it:

```
Boot: sd.si(,6,)/Install.S4000
Entry: 0xfd080000
Size: 0xec000+0x53ab28+0x42ab8
```

The system displays a spinner while copying the ramdisk into memory. When the copy completes, the spinner pauses up to three minutes.

Loading the Ramdisk via a Remote CD-ROM Drive or the Network

Loading the ramdisk from a remote CD-ROM drive is essentially the same as loading the ramdisk from an image area of the OS/MP 4.1C contained on a remote disk accessed over the network. The command to load the ramdisk depends on the type of system.

Power on the system. After the system passes the self-tests, the bootROM prompt is displayed.

The ramdisk installation software uses the value of the bootROM variable **INSTALLED** to determine if the basic operating system needs to be installed. Set the value of this variable to 0 before loading the ramdisk as follows:

```
ROM> setenv installed 0
```

The system will ask if you want to re-install if **INSTALLED** is not 0.

If you are installing by a remote CD-ROM drive (via the network), install the OS/MP 4.1C CD-ROM disk into the remote CD-ROM drive. Create a mount point directory (if one doesn't exist), and mount the CD-ROM drive on the remote machine, referred to here as `diskhost`, as follows:

```
diskhost# mkdir /cdrom
diskhost# mount /dev/sr0 /cdrom
```

The remote system `diskhost`, must be on the same network as the system being installed. For example, with a class C network, the first three numbers in the Internet addresses of the two machines must be the same, such as 192.1.3.42 and 192.1.3.17. Also, the local machine must be listed in **/etc/hosts**, or in the NIS/YP **hosts** database the ethernet address must be in **/etc/ethers**, or in the NIS/YP **ethers** database. In addition, `diskhost` must have the **rarpd**(8) daemon running.

Since **tftp**(1) will be used by the system to load the ramdisk image, it must be enabled on the `diskhost`. Examine the file **/etc/inetd.conf**. A line similar to the one below should be in the file:

```
tftp dgram udp wait root /usr/etc/in.tftpd in.tftpd -s
/tftpboot
```

If the line starts with a #, remove the #.

If a `-s` appears after the last `in.tftpd` in **/etc/inetd.conf**, either remove it or use the directory **/tftpboot** instead of **/var/tmp** in the example below. Approximately 6 MBytes will be needed in the directory used.

If **/etc/inetd.conf** has been changed, **inetd**(8) must be told to re-read the configuration file:

```
diskhost # ps ax | egrep inetd
   249 ? I 0:01 inetd
   541 p3 R 0:00 egrep inetd
```

The *pid* of inetd is the first number on the line that doesn't contain **egrep**. In the above output, *pid* is 249.

```
diskhost# kill -HUP pid
```

Enter the following boot command:

```
ROM> b tftp.ei(,,hostnumber)/cdrom/Install.S4000
```

The bootROM copies the ramdisk image into memory and boots it:

```
Boot: tftp.ei(,,hostnumber)/cdrom/Install.S4000
Entry: 0xfd080000
Size: 0xec000+0x53ab28+0x42ab8
```

A spinner is displayed while copying the ramdisk into memory. When the copy completes, there is a pause of up to three minutes.

Dataless Installation

After Booting Ramdisk

When the ramdisk is booted, it first determines what sort of terminal is being used. If it is a serial terminal, that is, a terminal attached to the **ttya/ttyb** port, or if the bootROM variable **CONSOLE** is not set, a list of supported terminals is displayed as follows:

```
1) 610
2) ansi
3) hp
4) sun
5) tvi912
6) vt100
7) wyse50
What type of terminal are you using ('1'..'7')?
```

If you are using a frame-buffer as the console, select the 4, the sun terminal type.

```
What type of terminal are you using ('1'..'7')? 4
```

If the value of the bootROM variable **INSTALLED** is non-zero, the mandatory system software has already been installed. In that case, the system displays the following:

```
THIS SYSTEM IS ALREADY INSTALLED


Do you want to re-install the system ('yes', 'no', or '?'
for help)?
```

The above message is for the benefit of users intending to re-install the system software, but have not reset the **INSTALLED** environment variable.

If the message appears, enter `yes` to re-install the mandatory system software, or `no` to continue the installation without re-installing it.

The disk drives attached to the system are then scanned, and a menu of procedures is displayed:

```
Ramdisk


 1) Change Disk Partitioning

 2) Install Software

 3) Invoke a Bourne Shell

 4) Reboot System

 5) Halt System

Enter number of function to execute ('1'..'5', or '?' for
help):
```

The provided functions are described below:

Change Disk Partitioning - Allows the changing of the sizes of disk partitions, and what those partitions are to be used for (filesystem, swap, or unused). Refer to the *Changing Disk Partitions* Section for details on changing disk partitions.

★ ★ ★ NOTE ★ ★ ★

If changes are going to be made to the disk partitions on which OS/MP 4.1C will reside, the changes must be made before installing software. Disk partitions not containing OS/MP 4.1C can be modified before or after the installation.

Install Software - Intended primarily for installing new systems. If system software has already been installed, then this option may be used to install any Solbourne software distribution, such as X Windows.

Invoke a Bourne Shell - Starts an interactive Bourne shell. This option is provided mainly for formatting disks and restoring filesystems. The sizes of disk partitions should not be changed here with the format(8) command. If they are, you must then select `Change Disk Partitioning` before attempting to `Install Software`.

Reboot System - Starts UNIX after software installation. Alternatively, you may reload the ramdisk from scratch.

Halt System - Returns control of the system to the bootROM.

Help may be requested at any ramdisk prompt by entering a question mark by itself.Table 26 shows edit commands available when entering text in response to prompts:

Table 26. Input Editing Commands

Character	Interpretation
backspace (^H)	delete last input character
delete (^?)	delete last input character
^U	erase input line
^R	redisplay input line
^W	delete input up to '/' or whitespace
^C	cancel input, returning to nearest menu
ESC	cancel input, returning to nearest menu
^L	redisplay entire screen
return (^M)	end input
newline (^J)	end input

If a string is too long to be displayed in the available space, the beginning of the string is displayed as "...". This allows display of the end of the string, which is usually of more interest.

Keywords can be shortened to any unique prefix (such as 'co' for 'continue'), except for 'yes' and 'no', which must always be spelled out.

Fatal errors during software installation are usually reported by messages beginning with `System error` or `Internal error` and ending with a "`#`" prompt. If a fatal error occurs, software installation may be restarted by entering:

```
# ^Jstty sane^J
# cd /
# rm -f /core
# inst_sys
```

where ^J is the linefeed character. The command **stty sane** may not be echoed (and is intended to fix that problem). In the event of a fatal error during software installation, please report the problem to Solbourne customer support.

Software Installation from the Ramdisk

Installing software has two distinct stages: gathering information and modifying the system. No permanent changes are made to the system until all information has been provided.

For a dataless client installation, there are three informational menus:

- Standard Filesystem Definition - specifies where the standard filesystems (**root** (/), **swap**, and **/usr**, optionally **/var** and **/tmp**) are located.
- Dataless Install Identification - specifies the dataless client's name and the servers Internet address.
- Media Identification - Determines the installation media from which to install (tape, CD-ROM, or network directory), and determines where that media is located.

All three menus provide the command **cancel**. The first two also provide the command **previous**. These commands allow you to return to prior menus, optionally discarding any changes that have been made.

cancel always returns to the ramdisk menu. If changes are to be discarded, then all changes made since `Install Software` was selected are forgotten.

previous always returns to the previous menu (which is the ramdisk menu, in the case of the Filesystem Definition menu). The changes discarded in this case are those made in the menu you are leaving.

cancel has higher priority than **previous**. In other words, if you use **previous** to leave a menu without discarding changes, then **cancel** from that menu and discard changes, the changes made in the earlier menu are also discarded.

Standard Filesystem Definition

The Standard Filesystem Definition menu defines where the mandatory filesystems are located. These filesystems (except for root) may be either on a local disk partition or provided by a disk server. If root is to be on a remote system, install the system as a client of that system. For a dataless system, the **/usr** files should have already been installed on the server.

Any changes made to the standard filesystems with the partition tool will appear in this menu.

Changing an entry at the Standard Filesystem Definition

The following steps assign the **/usr** filesystem to **rootbeer:/export/exec/Series5.**, rather than using the default of **/usr** being a subdirectory of the root filesystem.

To modify the **/usr** filesystem, enter the number **3**.

```
Enter number of filesystem to change ('1'..'5'),
'continue', 'previous', 'cancel' or '?' for help: 3
```

The **usr** menu will be highlighted, and the system will request a disk partition. The format is *host:path*, where *host* is the name of the server from which the /usr files will be used. *path* is */export*/exec/*architecture* (which was created by running config_server) where *export* is your export directory, and *architecture* is the architecture of your dataless client. Assign it to **rootbeer:/export/exec/S4000.**

The new arrangement is displayed as shown in Figure 79.

The following steps assign the **/var** filesystem to **sd0d**, rather than using the default of **/var** being a partition of a local disk.

These steps are optional. If followed, the result is a filesystem definition that is the same as that supplied on the factory installation of a diskful system. In addition, it makes use of partition d, thus using 9.3 MB of disk space that is not used when the default disk partition is used with the standard filesystem definition.

In Figure 79 shown below, the notation "(required)" appears next to the **root(/)**, **swap** and **/usr** filesystems. These filesystems must be defined; however, they may be placed on any partition of any disk.

```
                    Standard Filesystem Definition

  1) root on sd0a      (required)
  2) swap on sd0b      (required)
  3) /usr rootbeer:/export/exec/S4000(required)
  4) /var on root partition
  5) /tmp on root partition

                      Disk Partitions (sizes in MB)
       (a)    (b)      (c)     (d)     (e)     (f)     (g)     (h)
sd0:   8.4    32.4     191.1   9.3     ---     ---     141.1   ---
sd1:   8.4    32.7     190.9   9.6     ---     ---     140.8   ---




Enter number of filesystem to change ('1'..'5'), 'continue', 'previous',
'cancel', or '?' for help:
```

Figure 79. Sample Standard Filesystem Definition Menu for Dataless Clients

To modify the **/var** filesystem, enter the number **4**.

```
Enter number of filesystem to change ('1'..'5'),
'continue', 'previous', 'cancel' or '?' for help: 4
```

The var menu will be highlighted, and the system will request a disk partition. Assign it to sd0d.

```
Enter name of disk partition or host:path for /var
filesystem, 'none', ^C, or'?' for help: sd0d
```

The new arrangement is displayed as shown in Figure 80.

```
                    Standard Filesystem Definition

   1) root on sd0a      (required)
   2) swap on sd0b     required)
   3) /usr on rootbeer:/export/exec/s4000(required)
   4) /var on sd0d
   5) /tmp on root partition

                        Disk Partitions (sizes in MB)
        (a)     (b)       (c)      (d)      (e)      (f)      (g)      (h)
sd0:    8.4    32.4      191.1    9.3      ---      ---      141.1    ---
sd1:    8.4    32.7      190.9    9.6      ---      ---      140.8    ---



Enter number of filesystem to change ('1'..'5'), 'continue', 'previous',
'cancel', or '?' for help:
```

Figure 80. Modified Standard Filesystem Definition Menu for Dataless Clients

Once all changes for the standard filesystems have been made, enter **continue**:

```
Enter number of filesystem to change ('1'..'5'),
'continue', 'previous', 'cancel', or '?' for help: continue
```

Next you are asked to verify the **/usr** partition. If the value is correct, enter **yes** to proceed to the Dataless Install Identification Menu:

```
Is rootbeer:/export/exec/S4000 the correct host:path for
the /usr partition?

('yes', 'no', ^C, or '?' for help): yes
```

The Dataless Install Identification Menu

The Dataless Install Identification Menu is a new menu that only appears when the **/usr** partition in the Standard Filesystem Definition Menu specifies that the /usr files will be NFS-mounted from another machine, and therefor, a dataless installation.

This menu was added so that it is no longer necessary to hand modify the **/etc/hosts** and **/etc/hostname.ei0** files. In releases prior to OS/MP 4.1C, at the completion of the dataless installation, the user had to exit to a Bourne Shell, and modify these files by hand.

Figure 81 shows the Dataless Install Identification Menu.

```
                    Dataless Install Identification Menu

  1) Client Machine Name = <undefined>
  2) Internet address for rootbeer = <undefined>




Enter selection number ('1'..'2'), 'continue', 'previous',
'cancel', or '?' for help:
```

Figure 81. Dataless Install Identification Menu for Dataless Clients

The **Client Machine Name** is simply the name of the Dataless Client that you are currently installing.

The **Internet address** is the address of the server from which the /usr files will be used. In this case the server is rootbeer.

Both of these variables must be set before continuing. After these values have been entered correctly, enter **`continue`**. Next you are asked to verify the values entered. If the values are correct, enter **`yes`** to proceed to the Media Identification Menu.

Installation Media Identification Menu

The Installation Media Identification Menu describes which media will be used during the installation.

On Series S4000 systems, the default values are determined by how the ramdisk was booted.

Figure 82 shows the Installation Media Identification Menu of a S4000 machine that was booted from a local tape device st1 (SCSI address 5).

Installing from a Tape

Installing from a local tape drive requires that the *Tape drive* field be set to either **st0** or **st1** (the only supported tape drives) and that *Tape host* be set to **'`localhost`'**. The Installation media type must also be set to **'`Tape`'**.

Installing from a remote tape drive requires that all the fields be set:

```
                    Installation Media Identification

1) Installation media type = Tape
2) Tape drive = /dev/nrst1
3) Local Internet address = 0.0.0.0 (required for remote tape)
4) Network broadcast mask = 0xffff0000 (required for remote tape)
5) Tape host = localhost (127.0.0.1)









Enter selection number ('1'..'5'), 'continue', 'previous', 'cancel', or '?'for
help:
```

Figure 82. Installation Media Identification Menu - Local Tapehost

Installation media type must be set to **`Tape`**.

Tape drive should be the basic name of the tape drive on the tapehost.

The **Local Internet address** is the address of the system being installed. If the default value is not correct, make sure that the client name corresponding to the correct address appears in **/etc/hosts** or the NIS/YP hosts map as appropriate.

The **broadcast mask** should not be changed unless your network uses a non-standard mask. Such a mask is used when a network is sub-netted (i.e., a Class B network is treated as several Class C networks). A leading '0x' is necessary if entering the mask as a hexadecimal number. A leading '0' is needed for octal numbers. If neither prefix is given, the value is assumed to be in decimal.

Tape host must be set to the name of the system with the tape, which is used to determine the tape host's Internet address. The name itself, however, is not especially important (it is discarded after the installation is complete). As such, the default name, *tape-n-boot-serv*, generally need not be changed.

Figure 83 shows the Tape Drive Identification menu of a system that was booted from a remote tape using tape device st0 (SCSI address 4).

When the details of the tape drive have been entered correctly, enter **`continue`**.

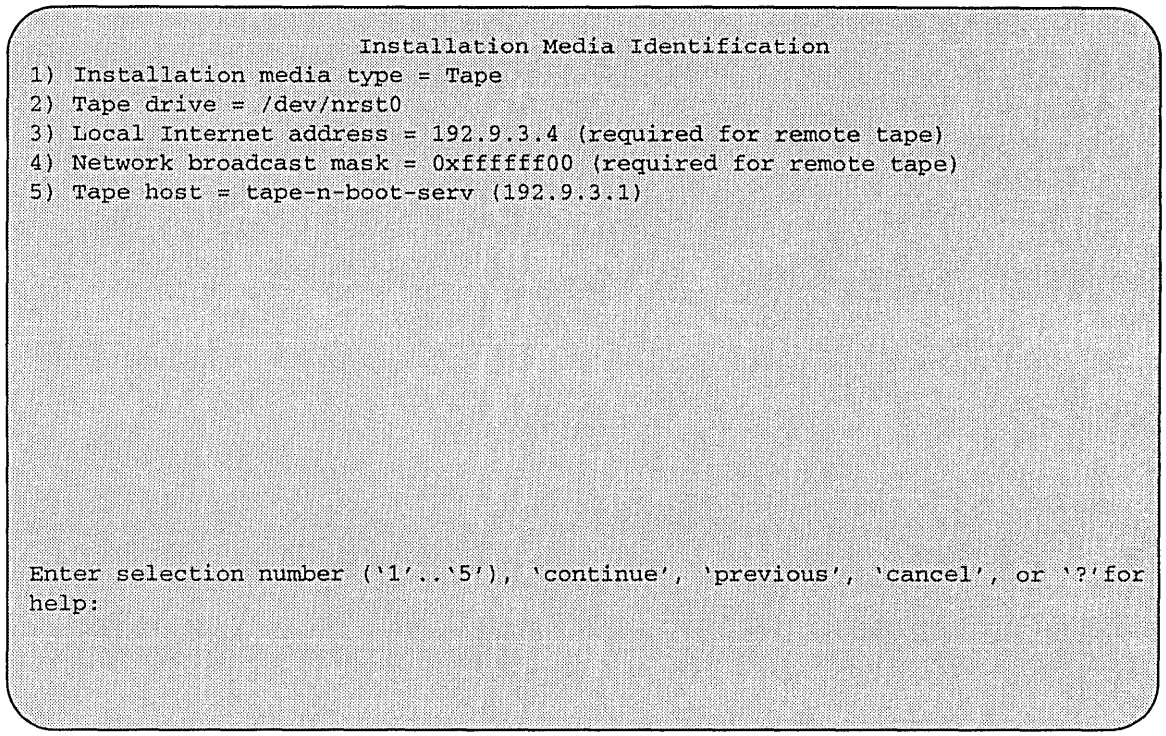


Figure 83. Installation Media Identification Menu - Remote Tapehost

Local CD-ROM Installation

Installing from a local CD-ROM disk drive requires that the Installation media type be set to **CD-ROM**, the CD-ROM drive field be set to **/dev/sr0** (**/dev/sr1** if installing from **sv2** on a Cougar controller) and the *CD host* field be set to '**localhost**'. Figure 84 shows the Installation media type menu with the CD-ROM parameters set to install from CD-ROM.

Network and remote CD-ROM Installations

Figure 85 shows the Installation media type menu with the Network parameters set to install from the network or a remote CD-ROM. Installations of this type require that all the fields be set as follows:

Installation media type must be set to **Network**

Installation directory should be the full path name of the location of the installation area, or the full path of the CD-ROM mount point, on the network host. For example, if the remote CD-ROM is mounted on **/cdrom**, then the installation path is simply **/cdrom**.

The **Local Internet address** is the address of the system being installed. If the default value is not correct, make sure that the client name corresponding to the correct address appears in the tape host's **/.rhosts** file. Check **/etc/hosts** or the NIS/YP hosts map as appropriate.

```
                    Installation Media Identification

1) Installation media type = CD-ROM
2) CD drive = /dev/sr0
3) Local Internet address = 0.0.0.0 (required for remote tape)
4) Network broadcast mask = 0xffff0000 (required for remote tape)
5) CD host = localhost (127.0.0.1)









Enter selection number ('1'..'5'), 'continue', 'previous', 'cancel', or '?'for
help:
```

Figure 84. Installation Media Identification Menu - Local CD-ROM

```
                    Installation Media Identification
1) Installation media type = Network
2) Installation directory = /cdrom
3) Local Internet address = 192.9.3.4 (required for remote tape)
4) Network broadcast mask = 0xffff0000 (required for remote tape)
5) Network host = ginger (192.9.3.1)









Enter selection number ('1'..'5'), 'continue', 'previous', 'cancel', or '?'for
help:
```

Figure 85. Installation Media Identification Menu -Remote CD-ROM

The **broadcast mask** should not be changed unless your network uses a non-standard mask. Such a mask is used when a network is sub-netted (i.e., a Class B network is treated as several Class C networks). A leading '0x' is necessary if entering the mask as a hexadecimal number. A leading '0' is needed for octal numbers. If neither prefix is given, the value is assumed to be in decimal.

Network host must be set to the name of the system with the installation directory, which is used to determine it's Internet address.

For a remote CD-ROM install, the `nethost` must have **/cdrom** in it's **/etc/exports** file, and must export it. Also, the **rpc.mountd**(8), **nfsd**(8), and **rarpd**(8) daemons must be running on `nethost`.

When the details of the media have been entered correctly, enter **`continue`**.

Root Files Installation

You are then asked if you want to install just the mandatory root files. This is asked as a confirmation before starting the installation:

```
Install only mandatory root files ('yes', 'no', ^C, or '?'
for help)?
```

After entering **`yes`**, the installation is performed.

The steps taken during the installation are:

1. extract miniusr. (This contains the installation software, as well as enabling swapping. The root disk might not be repartitioned after this step without requiring reinstallation.)
2. create filesystems (**root**(*/*), **/usr**, possibly **/var** or **/tmp**, as well as any new filesystems requested via the partition tool)
3. install mandatory root files

   When installation has finished, the ramdisk menu is displayed (see Figure 86). If the installation failed, call Customer Support.

Rebooting from the Ramdisk

After a successful installation, and after running config_server on your server, start UNIX by rebooting as shown in Figure 87.

```
Enter selection number ('1'..'5') or '?' for help: 4
```

At the Reboot System menu select Boot Unix as shown in Figure 87:

```
Enter selection number ('1'..'3') or '?' for help: 1
```

```
                                Ramdisk

1) Change Disk Partitioning
2) Install Software
3) Invoke a Bourne Shell
4) Reboot System
5) Halt System


Enter number of function to execute ('1'..'5', or '?' for help): 4
```

Figure 86. Ramdisk Menu

```
                            Reboot System

1) Boot Unix
2) Boot on ramdisk
3) Return to Main Menu


Enter selection number ('1'..'3') or '?' for help: 1
```

Figure 87. Reboot System Menu

After selecting **1**, there is a short pause, and then:

```
Automatic boot enabled. Type Control-C to abort
ROM> boot
Boot: sd.si(0,0,0)/vmunix
Entry: 0xfd080000
Size: 0xd6000+0x33358+0x81548

OS/MP 4.1C_Export (GENERIC/root) #0: Tue Feb 1 15:52:44
1994
Copyright (c) 1989-1994 Sun Microsystems, Inc. and
Solbourne Computer, Inc.
[...]
```

Disabling tftp

If the ramdisk was loaded from a remote tape drive, **tftp**(1) was enabled at that time.

For security reasons, it should now be disabled on the system from which the tape was read.

First, comment out the line, as shown below, in **/etc/inetd.conf**:

```
#tftp dgram udp wait root /usr/etc/in.tftpd in.tftpd
/tftpboot
```

Next, determine the process ID of **inetd**(8):

```
tapehost# ps ax | egrep inetd
  249 ?  I 0:01 inetd
  541 p3 R 0:00 egrep inetd
```

The *pid* of inetd is the first number on the line that doesn't contain egrep. In the above output, pid is 249.

Last, signal **inetd** to re-read the configuration file:

```
tapehost# kill -HUP pid
```

At this point, the system configuration information must be specified as described in the section *After Installing...*

After Installing...

Initial Boot System Configuration

When a newly installed system is booted multi-user for the first time, the system asks a series of configuration questions:

```
OS/MP 4.1C_Export (GENERIC/root) #0: Tue Feb 1 15:52:44
1994

Copyright (c) 1989-1994 Sun Microsystems, Inc. and
Solbourne Computer, Inc.

[...]

Automatic reboot in progress...
Wed Feb 2 09:22:25 MDT 1994
checking quotas: done.

This system has not yet been configured. Several values
need to be set before the system can come up to multi-user
Unix.

What is this system's name (default = 'standalone'):
habitrail<Return>

What is its Internet address (0 for none, default =
192.9.3.4)? <Return>

What is the network broadcast mask (default = 0xffffff00)?
<Return>

What is the NIS domain name ('none' for none, default =
'none')? Rodent.COM<Return>

What directory should be used for automatic savecore files
('none for none, default = '/var/crash/habitrail')?
<Return>
```

★ ★ ★ NOTE ★ ★ ★

Using the default 'none' for the NIS domain name disables the NIS/YP services.

```
Time zone choices are:
Australia/  GMT+11      GMT-3       GMT6        Mideast/
Brazil/     GMT+12      GMT-4       GMT7        NZ
CET         GMT+13      GMT-5       GMT8        Navajo
CST6CDT     GMT+2       GMT-6       GMT9        PRC
Canada/     GMT+3       GMT-7       Greenwich   PST8PDT
Chile/      GMT+4       GMT-8       HST         Poland
Cuba        GMT+5       GMT-9       Hongkong    ROC
EET         GMT+6       GMT0        Iceland     ROK
EST         GMT+7       GMT1        Iran        Singapore
EST5EDT     GMT+8       GMT10       Israel      Turkey
Egypt       GMT+9       GMT11       Jamaica     UCT
Factory     GMT-0       GMT12       Japan       US/
GB-Eire     GMT-1       GMT13       Libya       UTC
GMT         GMT-10      GMT2        MET         Universal
GMT+0       GMT-11      GMT3        MST         W-SU
GMT+1       GMT-12      GMT4        MST7MDT     WET
GMT+10      GMT-2       GMT5        Mexico/     Zulu

('/' indicates time zone prefixes)

Enter time zone (default = 'US/Mountain'): <Return>

What is today's date (mm/dd/yyyy, default = 2/1/1994)? <Return>
What time is it (24-hour hh:mm, default = 16:55)? <Return>

Current settings are:
 Host name                = habitrail
 Internet address         = 192.9.3.4
 Network mask             = 0xffffff00
 NIS domain               = Rodent.COM
 Savecore directory       = /var/crash/habitrail
 Time zone                = US/Mountain
 Date (m/d/y)             = 2/1/1994
 Time                     = 16:55

Are these correct ('yes' or 'no')?
yes

Setting netmask of ei0 to 255.255.255.0
Tues Feb 1 09:22:25 MDT 1994
Setting password for root
Changing password for root on habitrail.
New password:
Retype new password:
Continuing boot
starting rpc and net services: portmap [...]
```

Reconfiguring the System

You may need to reconfigure the system if: (1) wrong value was set during the initial configuration, or (2) the system did not successfully come up to multi-user mode.

If you find that a wrong value was set during configuration, you can modify the appropriate file manually, or reconfigure. Manually correcting the settings should only be done if you are an experienced system administrator. Reconfiguring automatically is fairly straight-forward, as explained in the following procedure.

If the system has hung up during the boot process, cycle the power off and on).

★ ★ ★ NOTE ★ ★ ★

If automatic boot is enabled it is necessary to interrupt the reboot by typing Control-C in the early stages of the reboot; otherwise the system will hang up as before.

Then bring up the system in single-user mode:

```
ROM> boot -s
[...]
```

If the system booted successfully originally, you may instead log in as root:

```
habitrail login: root
Password:
```

In either case, if a file exists that tells the system it has been configured, remove it:

```
# rm /etc/sys_conf/system-configured
```

The above file may not exist; this is not a problem. Go ahead to the next step.

Now reboot. If you are in single-user mode, exit:

```
# exit
```

Otherwise, use fastboot:

```
# /etc/fastboot
```

The system asks configuration questions just as it did the first time it booted after being installed.

Installing OS/MP 4.1C on a Diskless Client

Before Installing...

Any host on a network must be added to the hosts database. Before you can add a host to either database, a name and an address must be chosen for that host. Be sure both are unique for your network.There are three forms of network information databases to be considered.

- *Static files* - this is the simplest form of the databases: two files, **/etc/hosts** and **/etc/ethers**.
- *Network Information Service* - NIS, formerly called Yellow Pages (YP), is a centralized version of the static files approach. Fundamentally, one system, the NIS/YP master, uses the static files. Other systems ask the master to look up entries in its files.
- *Domain Name Service* - DNS is part of the software used to administrate the Internet, and is beyond the scope of this document. If you are using it, contact your system administrator for information on updating entries in it.

If you are using NIS/YP, the following actions must be taken on the NIS/YP master. If you are using static files, these actions must be taken on the system that is to act as a server (by providing either its tape or disk drive). Only the superuser (account name **root**) is allowed to update these files.

First: Update the *hosts* database with the name and IP address chosen for the new client by adding a line of the following form to **/etc/hosts**:

192.1.3.42 hamster

Next: If you are installing a diskless client, update the *ethers* database by adding a line of the form below to **/etc/ethers**. The six colon-separated numbers are the ones displayed by the system when the power is turned on. The name must be the same as was added to the *hosts* database.

0:0:8e:10:0:16 hamster

Finally: If you are using NIS/YP, the working copy of the database must be updated:

```
# cd /var/yp
# make
```

★ ★ ★ NOTE ★ ★ ★

The **make** *command should be executed on the NIS/YP master server only.*

Before installing a diskless client, you must have already installed the server. On the server, you must also have run **config_server** for this client's architecture, and you must have run **install_client** for this machine. Refer to Installing OS/MP 4.1C on a Server for details.

Installing...

Setting BootROM Variables

The Solbourne diskless client must have the proper bootROM environment variables set, in order to boot from a server by default. The following tables list variables that must be set on a Solbourne client.

Table 27. Variables that must be set on a Solbourne Series 5, 5E or 6 Client

Variable	Sample Value
DEFAULTROOT	**tftp.ei**(,,*hostnumber*)
DEFAULTBOOT	**/export/root/***clientname***/vmunix**
DEFAULTSWAP	**/export/swap/***clientname***/swap.***clientname*
DIAGBOOT	**/export/exec/Series5/kvm/stand/dg** *for a Series5 client*
	/export/exec/Series6/kvm/stand/dg *for a Series6 client*
DIAGSERVER	**tftp.ei**(,,*hostnumber*)
CONSOLE	**bw**(), **cg**(), **zs**(), or **fb**()

Table 28. Variables that must be set on a Solbourne Series S4000 Client

Variable	Sample Value
DEFAULTROOT	**tftp.ei**(,,*hostnumber*)
DEFAULTBOOT	**/clients/root/***clientname***/vmunix**
DEFAULTSWAP	**/clients/swap/***clientname***/swap.***clientname*
DIAGBOOT	/clients/exec/S4000/kvm/stand/dg
DIAGSERVER	**tftp.ei**(,,*hostnumber*)
INPUT-DEVICE	keyboard, ttya, or ttyb
OUTPUT-DEVICES	screen, ttya, or ttyb

In the tables above, *clientname* represents the name of the diskless client and *hostnumber* represents the last portion of the internet address of the server. For example, if the server's Internet address is 192.9.201.134, the *hostnumber* is 134.

The acceptable settings for **CONSOLE** depend on the version of the bootROM in the system.

The diskless client must have the proper bootROM environment variables set to boot from a server by default. To set the variables:

Turn on the client.

Set the following bootmode variables:

```
ROM> setenv defaultroot tftp.ei(,,hostnumber)

ROM> setenv defaultboot /export/root/clientname/vmunix

ROM> setenv defaultswap
/export/swap/clientname/swap.clientname

ROM> setenv diagboot

tftp.ei(,,hostnumber)/export/exec/kvm/type/stand/dg
```

In the commands above, `clientname` represents the name of the diskless client, and `hostnumber` is the last portion of the internet address of the server. For example, if the server's internet address is 192.9.201.134 the `hostnumber` is 134.

The `type` can be Series5, Series6 or S4000, or a directory name comprised of a basename standing for the machine architecture and an extension standing for the operating system and release level, as created by the **-n** option of **config_server**; for example, S4000.osmp.4.1A.

Set the BOOTMODE to auto and reboot:

```
ROM> setenv bootmode auto

ROM> b
```

★ ★ ★ NOTE ★ ★ ★

If the system reports a protocol error while attempting to boot, kill and restart **inetd***(8) on the server.*

After Installing...

When a newly installed system is booted multi-user for the first time, the system asks a series of configuration questions:

```
OS/MP 4.1C_Export (GENERIC/root) #0: Tue Feb 1 15:52:44
1994

Copyright (c) 1989-1994 Sun Microsystems, Inc. and
Solbourne Computer, Inc.
[...]

Automatic reboot in progress...
Wed Feb 2 09:22:25 MDT 1994
checking quotas: done.


This system has not yet been configured. Several values
need to be set before the system can come up to multi-user
Unix.

What is this system's name (default = 'standalone'):
habitrail

What is its Internet address (0 for none, default =
192.9.3.4)? <Return>

What is the network broadcast mask (default = 0xffffff00)?
<Return>

What is the NIS domain name ('none' for none, default =
'none')? Rodent.COM

What directory should be used for automatic savecore files
('none' for none, default = '/var/crash/habitrail')?
<Return>
```

★ ★ ★ NOTE ★ ★ ★

Using the default 'none' for the NIS domain name disables the NIS/YP services.

```
Time zone choices are:
Australia/  GMT+11      GMT-3       GMT6        Mideast/
Brazil/     GMT+12      GMT-4       GMT7        NZ
CET         GMT+13      GMT-5       GMT8        Navajo
CST6CDT     GMT+2       GMT-6       GMT9        PRC
Canada/     GMT+3       GMT-7       Greenwich   PST8PDT
Chile/      GMT+4       GMT-8       HST         Poland
Cuba        GMT+5       GMT-9       Hongkong    ROC
EET         GMT+6       GMT0        Iceland     ROK
EST         GMT+7       GMT1        Iran        Singapore
EST5EDT     GMT+8       GMT10       Israel      Turkey
Egypt       GMT+9       GMT11       Jamaica     UCT
Factory     GMT-0       GMT12       Japan       US/
GB-Eire     GMT-1       GMT13       Libya       UTC
GMT         GMT-10      GMT2        MET         Universal
GMT+0       GMT-11      GMT3        MST         W-SU
GMT+1       GMT-12      GMT4        MST7MDT     WET
GMT+10      GMT-2       GMT5        Mexico/     Zulu

('/' indicates time zone prefixes)

Enter time zone (default = 'US/Mountain'): <Return>

What is today's date (mm/dd/yyyy, default = 2/1/1994)? <Return>
What time is it (24-hour hh:mm, default = 16:55)? <Return>

Current settings are:
 Host name                = habitrail
 Internet address         = 192.9.3.4
 Network mask             = 0xffffff00
 NIS domain               = Rodent.COM
 Savecore directory       = /var/crash/habitrail
 Time zone                = US/Mountain
 Date (m/d/y)             = 2/1/1994
 Time                     = 16:55

Are these correct ('yes' or 'no')?
yes

Setting netmask of ei0 to 255.255.255.0
Tues Feb 1 09:22:25 MDT 1994
Setting password for root
Changing password for root on habitrail.
New password:
Retype new password:
Continuing boot
starting rpc and net services: portmap [...]
```

Reconfiguring the System

You may need to reconfigure the system if: (1) wrong value was set during the initial configuration, or (2) the system did not successfully come up to multi-user mode.

If you find that a wrong value was set during configuration, you can modify the appropriate file manually, or reconfigure. Manually correcting the settings should only be done if you are an experienced system administrator. Reconfiguring automatically is fairly straight-forward, as explained in the following procedure.

If the system has hung up during the boot process, press the Reset button (for Series S4000 machines, cycle the power off and on).

★ ★ ★ NOTE ★ ★ ★

If automatic boot is enabled, to interrupt the reboot by typing Control-C in the early stages of the reboot; otherwise the system will hang up as before.

Then bring up the system in single-user mode:

```
ROM> boot -s
[...]
```

If the system booted successfully originally, you may instead log in as root:

```
habitrail login: root
Password:
```

In either case, if a file exists that tells the system it has been configured, remove it:

```
# rm /etc/sys_conf/system-configured
```

The above file may not exist; this is not a problem. Go ahead to the next step.

Now reboot. If you are in single-user mode, exit:

```
# exit
```

Otherwise, use fastboot:

```
# /etc/fastboot
```

The system asks configuration questions just as it did the first time it booted after being installed.

Changing Disk Partitioning

All hard disks are shipped with a default partitioning. Disk partitioning is useful for:

- ❒ Changing the size of a partition
- ❒ Assigning secondary swap space before installation
- ❒ Assigning mount points

OS/MP 4.1C uses the default partitions in the following way:

Table 29. Default Disk Partitions and Filesystem Assignments

Partition	Filesystem
a	/
b	swap
d	/var
g	/usr

★ ★ ★ CAUTION ★ ★ ★

Changing the size of a partition destroys any information on that partition.

★ ★ ★ NOTE ★ ★ ★

If you change the partitioning on the drive containing the root partition, you must reinstall the operating system.

The following instructions assume the ramdisk has already been loaded, as described in the *Starting Diskful Installation* section.

After selecting `Change Disk Partitioning` from the ramdisk menu (as shown in Figure 88), a spinner is displayed while the partition tool starts up.

Once its initialization is complete, it displays a description screen and asks if you wish to continue. Answering '**no**' returns to the ramdisk menu. Answering '**yes**' produces a menu of disks installed in the system (see Figure 89). If a disk is missing from this menu, verify that the SCSI address is set correctly on the drive, and that the cables are firmly seated.

```
                                Ramdisk

 1) Change Disk Partitioning
 2) Install Software
 3) Invoke a Bourne Shell
 4) Reboot System
 5) Halt System




Enter number of function to execute ('1'..'5', or '?' for help): 1
```

Figure 88. Ramdisk Menu

```
                    Select Disk to Partition or Review

 1) sd0 (191.1 Mb)
 2) sd1 (193.8 Mb)




 Enter disk number, '?', or 'exit': 1
```

Figure 89. Disk Partitioning Menu

To return to the ramdisk menu, enter '**exit**' at the disk menu.

Select the disk you wish to examine and proceed to section, "Partition or Review Disk". This tool is also available on installed systems in **/usr/etc/partition**.

Partition or Review Disk

Upon selecting the disk you wish to examine, a screen describing the disk is displayed as shown in Figure 90.

```
                        Partition or Review Disk

Disk sd0:
Total Disk Size: 191.1 Mb

a: 8.4 Megabytes
b: 32.3 Megabytes
c: 191.1 Megabytes
d: 9.3 Megabytes
e: 0.0 Megabytes
f: 0.0 Megabytes
g: 141.1 Megabytes
h: 0.0 Megabytes


1. Resize partition                    5. Change display parameters
2. Change mount points                 6. Undo last action
3. Overlay with template               7. Undo ALL actions
4. Store as new template               8. Return to previous menu


Please enter menu number:
```

Figure 90. Partition or Review Disk Menu

To change the size of a partition, see ''Resizing Partitions,'' section. To modify mount points, see ''Changing Mount Points''. For discussion of templates, see ''Templates''. Other available actions are:

- **Change display parameters** - modifies how partition sizes are displayed, in megabytes, blocks (sectors), or cylinders/tracks/sectors.
- **Undo last action** - does just that. Only the most-recent change is remembered, and undo counts as a change. Therefore, two undos in a row have no net effect.
- **Undo ALL actions** - discards all changes made since selecting this disk from the disk menu. It is possible to undo an undo all.

No changes are made to the disk itself until returning to disk menu. If changes have been requested:

```
Please enter menu number: 8

Template has been modified. Do you wish to accept these
changes?

'yes' or 'no' to exit, any other input to continue editing:
yes
```

Resizing Partitions

This section demonstrates changing the size of partitions by increasing the size of partition d to 12 megabytes, taking the additional space from the g partition.

First, select the resize partition action from the `Partition or Review Disk` menu:

```
Please enter menu number: 1
```

This causes the Resize partition menu entry to highlight, and the following questions to be asked:

```
Please specify partition to be resized: d

Enter size of partition d in Megabytes: 12

Please specify partition to contribute this space: g
```

Figure 91 shows the updated screen with the new sizes. Observe that the d partition is not exactly 12 megabytes. This is because partition sizes may only be changed in fixed quantities determined by cylinder boundaries (the number of sectors per track and the number of heads in the drive).

Also, the tool is asking for another partition to resize. It will continue to do so until a blank line is entered by just typing **<Return>** at the prompt, `Please specify partition to be resized:`

The default partitions can be changed during the install procedure. We recommend using partition c for the entire disk.

OS/MP 4.1C supports booting from any configured disk, whether IPI, SMD, or SCSI, with the following exceptions:

- You cannot boot from a disk connected by an MCAB, and
- You cannot boot from a SCSI disk in a BoSS tray numbered higher than sd31.

```
                        Partition or Review Disk

Disk sd0: Maxtor LXT-200
Total Disk Size: 191.1 Mb

a: 8.4          Megabytes       /
b: 32.3         Megabytes       (swap)
c: 191.1        Megabytes
d: 12.1         Megabytes
e: 0.0          Megabytes
f: 0.0          Megabytes
g: 138.3        Megabytes       /usr
h: 0.0          Megabytes


1. Resize partition             5. Change display parameters
2. Change mount points          6. Undo last action
3. Overlay with template        7. Undo ALL actions
4. Store as new template        8. Return to previous menu

Please specify partition to be resized: Return
```

Figure 91. Partition or Review Disk Menu - Resizing Partition

For example, if you have two SCSI drives, you may choose either **sd0** or **sd1** as your DEFAULTROOT device. The **root(/)** file system may be on any partition on the boot disk. See section on page 25 for setting DEFAULTROOT. The installation tools and the supplied "GENERIC" kernels require that the **root** and **usr** file systems for IPI-based systems be assigned to partitions of the first four drives of the first controller.

The Series5, Series5E and Series6 generic kernels support four SCSI disks on the I/O ASIC SCSI controller as well as four VMEbus "xd" disk controllers. Each "xd" disk controller can support four disks in the generic kernels.

Example partitions for these drives are listed in the following tables:

Table 30. Example IPI Disk Partitions

IPI Disks					
Partition Use		1.2 Gbytes 512 byte sectors		3.0 Gbytes 512 byte sectors	
		Sectors	Size (Mbytes)	Sectors	Size (Mbytes)
a	/	18522	9		
b	swap	65856	32		
c	all	1679328	820		
d	/var	20580	10		
g	/usr	1574370	768		
h	unmounted	N/A	N/A		

Table 31. Example SCSI Disk Partitions

SCSI Disks (sd0)							
Partition Use		327 Mbytes		661 Mbytes		200 Mbytes	
		Sectors	Size (Mbytes)	Sectors	Size (Mbytes)	Sectors	Size (Mbytes)
a	/	16800	8	16695	8	16800	8
b	swap	66150	32	66780	32	66220	32
c	all	639450	312	1292670	631	391300	191
d	/var	19425	9	19080	9	18963	9
g	/usr	537075	262	1190115	581	288960	141

Changing Mount Points

Partitions that will contain filesystems must be given mount points. A mount point is where in the directory structure the filesystem will appear. Two filesystem mount points that must be defined on all systems are **/** (also called **root**) and **/usr**. The following example shows how to define a new filesystem.

To define a new filesystem named /bench on partition b, begin by entering **2** in response to the `Partition or Review Disk` menu:

```
Please enter menu number: 2
```

This causes the `Change mount points entry` to be highlighted, and you may specify the partition and desired mount point:

```
Change mount point for which partition (or '?'): b

Enter full unix pathname on which to mount this partition,
'none', or '?'

 -> /bench
```

The display is updated to reflect the new mount-point, as shown in Figure 92. As with changing partition with changing partition sizes, the tool is asking for another mount point to change. Entering a blank line by pressing **<Return>** will return to the menu prompt.

To define a swap partition, proceed as if defining a mount point, but enter either "**swap**" or "**primary**" as the partition name. Only one partition should be labeled primary. This partition is verified to be sufficiently large, and is presented to the system as the primary swap space, however, you can add additional swap space by labeling the others "swap". The primary swap area must be at least 32MB.

Other swap areas should be listed in the **/etc/fstab** file and enabled by the **swapon**(8) command from within the **/etc/rc.local** file.

```
                        Partition or Review Disk

Disk sd0:
Total Disk Size: 191.1 Mb

a: 8.4      Megabytes   /
b: 32.3     Megabytes   /bench
c: 191.1    Megabytes
d: 9.3      Megabytes
e: 0.0      Megabytes
f: 0.0      Megabytes
g: 141.1    Megabytes   /usr
h: 0.0      Megabytes


1. Resize partition              5. Change display parameters
2. Change mount points           6. Undo last action
3. Overlay with template         7. Undo ALL actions
4. Store as new template         8. Return to previous menu


Change mount point for which partition: Return
```

Figure 92. Partition or Review Disk Menu - Changing Mount Points

Templates

Overlaying with a template is a fast way to change all the partition sizes on a disk simultaneously. Initially, only the Solbourne standard templates are available. However, if a customized template is saved, it can be used just as readily as the standard templates. This feature is mainly used when there are several identical disks in a system.

After a particular set of partition sizes has been settled upon, it can be saved as a new template (menu item 4). This new template is stored on the ramdisk, and so is lost when the system is next halted or rebooted.

★ ★ ★ CAUTION ★ ★ ★

Applying a template from one type or size of disk to a different type or size of disk is very likely to result in corrupted filesystems on the modified disk. Such a mistake usually causes a system panic at some point (possibly several days) in the future.

Appendix A - MAN pages

NAME

mpstat - show multi-processor usage or cache statistics

SYNOPSIS

/usr/kvm/mpstat [**-x** | **-c**] [*interval* [*count*]]

AVAILABILITY

This program is only available on Solbourne multiprocessing machines.

DESCRIPTION

mpstat enters the system and shows average and per-processor percentage usage data during a particular time interval. The first group of data represents the average of all the processors in the system while the second and subsequent data groups represent particular processors, with their particular name designations above each group.

Without an *interval* or *count* option, **mpstat** displays a one-line summary of MP system activity since the system has been booted. If *interval* is specified, **mpstat** summarizes activity over the last *interval* seconds. If a *count* is given, the statistics are repeated *count* times.

The particular fields of each data group give a breakdown of percentage usage of CPU time:

us user time for normal processes

ni time for processes with an altered scheduling priority (*nice(1)*)

sy system time

id CPU idle

OPTIONS

-x Displays, per cpu, the amount of time spinning (sp), the amount of time in diskwait (dw), and the amount of time waiting on cross-service calls (sv).

-c Displays, per cpu, the percentage of cache hits (hi) and cache bandwidth used (bw) for the level 2 (L2) and level 3 (L3) caches. It also displays the estimated percentage of the Kbus bandwidth (KB) which is being used (this is computed from the level 3 cache miss rate). This option is only available on Series6 CPUs.

FILES

/dev/kmem
/vmunix

SEE ALSO

mps(1), **nice**(1), **ps**(1), **vmstat**(8)

BUGS

The time spinning displayed by the **-x** option is only accurate for cpu 0.

NAME

mps - display the status of current processes on an MP system

SYNOPSIS

/usr/kvm/mps [[-]**acCegjklnrSuUvwx**][**-t***x*]|[*num*] [*kernel-name*] [*c-dump-file*] [*swap-file*]

AVAILABILITY

This program is only available on Solbourne multiprocessing machines.

DESCRIPTION

mps displays information about processes on an MP system. **mps** is identical to **ps(1)** except that the **CPU** field was added to show the cpu number on which the process is or was running. Normally, only those processes that are running with your effective user ID and are attached to a controlling terminal (see **termio**(4)) are shown. Additional categories of processes can be added to the display using various options. In particular, the **-a** option allows you to include processes that are not owned by you (i.e., that do not have your user ID), and the **-x** option allows you to include processes without control terminals. When you specify both **-a** and **-x**, you get processes owned by anyone, with or without a control terminal. The **-r** option restricts the list of processes printed to "running" processes: runnable processes, those in page wait, or those in short-term non-interruptible waits.

mps displays the process ID, under PID; the control terminal (if any), under TT; the cpu time used by the process so far, including both user and system time), under TIME; the state of the process, under STAT; and finally, an indication of the COMMAND that is running.

The state is given by a sequence of four letters, for example, '**RWNA**'.

First letter indicates the runnability of the process:

- **R** Runnable processes.
- **T** Stopped processes.
- **P** Processes in page wait.
- **D** Processes in non-interruptible waits; typically short-term waits for disk or NFS I/O.
- **S** Processes sleeping for less than approximately 20 seconds.
- **I** Processes that are idle (sleeping longer than approximately 20 seconds).
- **Z** Processes that have terminated and that are waiting for their parent process to do a **wait**(2V) ("zombie" processes).

Second letter indicates whether a process is swapped out:

- *blank* Represented as a SPACE character indicates that the process is loaded (in memory).
- **W** Process is swapped out.
- **>** Process has specified a soft limit on memory requirements and has exceeded that limit; such a process is (necessarily) not swapped.

Third letter indicates whether a process is running with altered CPU scheduling priority (**nice**(1)):

- *blank* Represented as a SPACE character indicates that the process is running without special treatment.
- **N** The process priority is reduced.
- **<** The process priority has been raised artificially.

Fourth letter indicates any special treatment of the process for virtual memory replacement. The letters correspond to options to the **vadvise**(2)

system call. Currently the possibilities are:

blank Represented as a SPACE character stands for **VA_NORM.**

A Stands for **VA_ANOM.** An **A** typically represents a program which is doing garbage collection.

S Stands for **VA_SEQL.** An **S** is typical of large image processing programs that are using virtual memory to sequentially address voluminous data.

kernel-name specifies the location of the system namelist. If the **-k** option is given, *c-dump-file* tells **mps** where to look for the core dump. Otherwise, the core dump is located in the file **/vmcore** and this argument is ignored. *swap-file* gives the location of a swap file other than the default, **/dev/drum.**

OPTIONS

Options must all be combined to form the first argument.

-a Include information about processes owned by others.

-c Display the command name, as stored internally in the system for accounting purposes, rather than the command arguments, which are kept in the process address space. This is more reliable, if less informative, as the process is free to destroy the latter information.

-C Display raw CPU time instead of the decaying average in the %CPU field.

-e Display the environment as well as the arguments to the command.

-g Display all processes. Without this option, **mps** prints only "interesting" processes. Processes are deemed to be uninteresting if they are process group leaders. This normally eliminates top-level command interpreters and processes waiting for users to login on free terminals.

-j Display a listing useful for job control information, with fields PPID, PID, PGID, SID, TT, TPGID, STAT, UID, TIME, and COMMAND as described below.

With this option, the STAT field has three additional letters:

C indicates the process does not want SIGCHLD when a child changes state done to job control.

E The process has completed an exec, and the parent can no longer change the process group of this process.

O The process is an orphan, with no parent process to handle job control signals.

-k Normally, *kernel-name* defaults to **/vmunix**, *c-dump-file* is ignored, and *swap-file* defaults to **/dev/drum.** With the **-k** option in effect, these arguments default to **/vmunix**, **/vmcore**, and **/dev/drum**, respectively.

-l Display a long listing, with fields **F, PPID, CP, PRI, NI, SZ, RSS,** and **WCHAN,** as described below.

-n Produce numeric output for some fields. In a long listing, the WCHAN field is printed numerically rather than symbolically, or, in a user listing, the USER field is replaced by a UID field.

-r Restrict output to "running" processes.

-S Display accumulated CPU time used by this process and all of its reaped children.

-u Display user-oriented output. This includes fields **USER, %CPU, %MEM, SZ,** RSS and START as described below.

-U Update a private database where **mps** keeps system information. Include **'mps -U'**

in the **/etc/rc** file.

-v Display a version of the output describing virtual memory information. This includes fields **RE**, **SL**, **PAGEIN**, **SIZE**, **RSS**, **LIM**, %CPU and **%MEM**, described below.

-w Use a wide output format (132 columns rather than 80); if repeated, that is, **-ww**, use arbitrarily wide output. This information is used to decide how much of long commands to print.

-x Include processes with no controlling terminal.

The following two options are mutually exclusive. When specified, these options must appear immediately following the last option.

-t*x* Restrict output to processes whose controlling terminal is *x* (which should be specified as printed by **mps**; for example, **t3** for **/dev/tty3**, **tco** for **/dev/console**, **td0** for **/dev/ttyd0**, **t?** for processes with no terminal, etc). This option must be the last one given.

num A process number may be given, in which case the output is restricted to that process. This option must also be last, and must appear with no white space between it and the previous option.

DISPLAY FORMATS

Fields that are not common to all output formats:

USER Name of the owner of the process.

%CPU CPU use of the process; this is a decaying average over up to a minute of previous (real) time. Because the time base over which this is computed varies (since processes may be very young) it is possible for the sum of all %CPU fields to exceed 100%.

NI Process scheduling increment (see **getpriority**(2) and **nice**(3V)).

SIZE

SZ The combined size of the data and stack segments (in kilobytes)

RSS Real memory (resident set) size of the process (in kilobytes).

LIM Soft limit on memory used, specified using a call to **getrlimit**(2); if no limit has been specified, this is shown as *xx*.

%MEM Percentage of real memory used by this process.

RE Residency time of the process (seconds in core).

SL Sleep time of the process (seconds blocked).

PAGEIN Number of disk I/Os resulting from references by the process to pages not loaded in core.

UID Numeric user-ID of process owner.

PPID Numeric ID of parent of process.

SID Numeric ID of the session to which the process belongs. SID = PGID = PID indicates a session leader.

PGID Numeric ID of the process group of the process.

TPGID Numeric ID of the process group associated with the terminal specified under TT (distinguished process group, see **termio**(4)).

CP Short-term CPU utilization factor (used in scheduling).

PRI Process priority (non-positive when in non-interruptible wait).

START Time the process was created if today, or the date it was created, if before today.

WCHAN Event on which process is waiting (an address in the system). A symbol is chosen that classifies the address, unless numeric output is requested (see the **n** flag). In this case, the address is printed in hexadecimal.

CPU Relationship between process and processor. Under the **CPU** field, the cpu number the process is or was running on is displayed.

F Flags (in hex) associated with process as in **<sys/proc.h>**:

SLOAD	00000001	in core
SSYS	00000002	swapper or pager process
SLOCK	00000004	process being swapped out
SSWAP	00000008	save area flag
STRC	00000010	process is being traced
SWTED	00000020	parent has been told that this process stopped
SULOCK	00000040	user can set lock in core
SPAGE	00000080	process in page wait state
SKEEP	00000100	another flag to prevent swap out
SOMASK	00000200	restore old mask after taking signal
SWEXIT	00000400	working on exiting
SPHYSIO	00000800	doing physical I/O
SVFORK	00001000	process resulted from vfork()
SVFDONE	00002000	another vfork flag
SNOVM	00004000	no vm, parent in a vfork()
SPAGI	00008000	init data space on demand, from vnode
SSEQL	00010000	user warned of sequential vm behavior
SUANOM	00020000	user warned of anomalous vm behavior
STIMO	00040000	timing out during sleep
SORPHAN	00080000	process is orphaned
STRACNG	00100000	process is tracing another process
SOWEUPC	00200000	process is being profiled and has a pending count increment
SSEL	00400000	selecting; wakeup/waiting danger
SFAVORD	02000000	favored treatment in swapout and pageout
SLKDONE	04000000	record-locking has been done
STRCSYS	08000000	tracing system calls
SNOCLDSTOP	10000000	SIGCHLD not sent when child stops
SEXECED	20000000	process has completed an exec
SRPC	40000000	sunview window locking

A process that has exited and has a parent, but has not yet been waited for by the parent, is marked **<defunct>**; a process that is blocked trying to exit is marked **<exiting>**; otherwise, **mps** makes an educated guess as to the file name and arguments given when the process was created by examining memory or the swap area.

ENVIRONMENT

The environment variables **LC_CTYPE**, **LANG**, and **LC_default** control the character classification throughout **mps**. On entry to **mps**, these environment variables are checked in the following order: **LC_CTYPE**, **LANG**, and **LC_default.** When a valid value is found, remaining environment variables for character classification are ignored. For example, a new setting for **LANG** does not override the current valid character classification rules of **LC_CTYPE**. When none of the values is valid, the shell character classification defaults to the POSIX.1 "C" locale.

FILES

/vmunix	system namelist
/dev/kmem	kernel memory

/dev/drum	swap device
/vmcore	core file
/dev	searched to find swap device and terminal names
/etc/psdatabase	system namelist, device, and wait channel information

SEE ALSO

kill(1), **w**(1), **getpriority**(2), **getrlimit**(2), **wait**(2V), **vadvise**(2), **nice**(3V), **termio**(4), **locale**(5), **pstat**(8), **mpstat**(1)

BUGS

Things can change while **mps** is running; the picture it gives is at best a close approximation to the current state.

NAME

solpatch - install, list, remove patch packages

SYNOPSIS

solpatch [**-d** *spool_dir*] [**-l** *patch_logfile*]

DESCRIPTION

solpatch allows for the installation, listing, and/or removal of patch packages.

The Solbourne Patch Management System utilizes the SunOS/SVR4 packaging application software utilities. The System V ABI specifies a new model for the distribution format of applications. This model is called software packages, and is supported by tools and utilities to create releasable distribution media. Software that is packaged using the ABI formats is guaranteed to install correctly, easily, and in a similar fashion on all ABI-compliant systems.

Solpatch interfaces with the package utilities pkgadd, pkgrm, pkginfo, and pkgparam.

Solpatch must be run as the super-user.

OPTIONS

-d patch_spooldir

This is the directory where the patch packages reside prior to installation. These patch packages may have been obtained via anonymous ftp from solbourne.com, via email from SOLIS (Solbourne On-Line Information System) at solis@solbourne.com, or via tape from the Solbourne Technical Services group. Each patch package consists of a directory containing the actual package information files and package objects. The default patch spool directory area is /var/spool/pkg. The patch spool directory area can a lso be defined by setting the PATCH_SPOOLDIR environment variable.

-l patch_logfile

This is the file specification of where the actions performed by solpatch are logged. The default solpatch logfile is /var/adm/patch_logfile. The solpatch logfile can also be defined by setting the PATCH_LOGFILE environment variable.

USAGE

The root account from which the solpatch utility is invoked should contain the following directories in the PATH environment variable to locate the solpatch utilities: /usr/bin, /usr/sbin, /usr/sadm/install/bin

The Main Menu

Solpatch presents a main menu entitled Solbourne Patch Management System after performing initialization and pre-processing steps. From the main menu you can select to install patch package(s), list currently installed patch package(s), or remove installed patch package(s).

Help is available from all menu option screens by pressing the 'h' key.

Common Command Keys/Cursor Movement

Common screen manipulation functions available at the install, list, and remove screens are display next page ('n' key), display previous page ('p' key), scroll screen display up a line ('u' key), and scroll screen display down a line ('d' key).

The screen display can be captured to a user specified file from the solpatch install, list, and remove menus by entering 'c' at the prompt line. All pages of a multi-screen display will be captured. Multiple invocations of the capture option will append to the specified file if it exists.

Help can be obtained by entering 'h' at the prompt lines of the install, list, and remove menus.

An invalid option that is entered will cause the screen to beep.

Install option

Upon selecting the install patch package(s) option from the main solpatch menu, a list of patch packages available for installation is presented. Information items displayed on this screen include the patch id number (listed with sequence numbers along the left side of the screen), install toggle field, type of patch package (M for mandatory, O for optional), and a description of the patch package. The full README file associated with a patch package can be displayed by entering the patch sequence number followed by the letter 'h'.

By default, all patch packages with a type of "M" (mandatory) are presented with a install toggle field set to 'y' and all patch packages with a type of "O" (optional) are presented with a toggle field set to 'n'. To toggle the install field for a patch package from 'y' to 'n' or from 'n' to 'y', simply enter the patch id sequence number at the prompt line.

During the pre-processing phase upon invocation of solpatch, a dependency check is performed on all patch packages currently installed and those available for installation in the patch spool directory. If an error is encountered during this phase the install toggle field will display a '-' for the patch package that encountered an error during the dependency check. Upon selection of this patch package, when attempting to toggle the install field from 'n' to 'y', an error window will be presented to the u ser informing of the patch packages on which this patch package depends, but were unable to be located as either installed or found in the patch spool directory. This patch package will not be allowed to be installed until the dependency errors are corrected. This will usually involve obtaining the missing patch package(s) via one of the methods mentioned above.

For patch packages that have special installation instructions associated with them, a special character such as '*' will be displayed immediately to the right of the Type field. Special instructions regarding this patch package will be displayed to the user upon selection of this patch package.

If a patch package is selected for installation, all patch packages which the selected patch package depend upon are automatically also selected for installation and the install toggle field set to 'y'. Conversely, if a patch package is selected to toggle the install field from 'y' to 'n', all patch packages which depend on the patch package will also have their install fields set to 'n'.

When the user selects the 'i' (install) option, all patch packages which have the install toggle field set to 'y' will be installed. As installation is occurring, status information will be displayed upon the screen and also logged to the patch logfile. Upon completion of installation, the user will be prompted to press a key and will then be returned to the solpatch main menu.

List option

Upon selecting the list patch package(s) option from the solpatch main menu, a list of patch package(s) currently installed on the system will be displayed. Information items displayed on this screen include the patch id number, type of patch package (M for mandatory, O for optional), and a description of the patch package. The full README file associated with a patch package can be displayed by entering the patch sequence number followed by the letter 'h'.

Remove option

Upon selecting the remove patch package(s) option from the main solpatch menu, a list of patch packages currently installed on the system are displayed. Information items displayed on this screen include the patch id number (listed with sequence numbers along the left side of the screen), remove toggle field, type of patch package (M for mandatory, O for optional), and a description of the patch package. The full README file associated with a patch package can be displayed by entering the patch sequence number followed by the letter 'h'.

By default, all patch packages are presented with a remove toggle field set to 'n'. To toggle the remove field for a patch package from 'n' to 'y' or from 'y' to 'n', simply enter the patch id sequence number at the prompt line.

For patch packages that have special removal instructions associated with them, a special character such as '*' will be displayed immediately to the right of the Type field. Special instructions regarding this patch package will be displayed to the user upon selection of this patch package.

If a patch package is selected for removal, all patch packages which the selected patch package depend upon are automatically also selected for removal and the remove toggle field set to 'y'. Conversely, if a patch package is selected to toggle the remove field from 'y' to 'n', all patch packages which depend on the patch package will also have their remove fields set to 'n'.

When the user selects the 'r' (remove) option, all patch packages which have the remove toggle field set to 'y' will be removed. As removal of patches is occurring, status information will be displayed upon the screen and also logged to the patch logfile. Upon completion of the removal process, the user will be prompted to press a key and will then be returned to the solpatch main menu.

FILES

pkginfo	package characteristics file
pkgmap	package contents description file
/var/adm/patch_logfile	default solpatch log file
/usr/bin/pkginfo	display software package information
/usr/bin/pkgparam	displays package parameter values
/usr/sbin/pkgadd	transfer software package to the system
/usr/sbin/pkgchk	check accuracy of installation
/usr/sbin/pkgrm	removes a package from the system

ENVIRONMENT VARIABLES

PAGER Solpatch checks the environment variable PAGER to determine what pager to use to display help and README files. If no PAGER is specified, 'more' will be used.

SEE ALSO

pkginfo(1), pkgparam(1), pkgadd(1m), pkgchk(1m), pkgrm(1m), pkginfo(4), pkgmap(4), admin(4), prototype(4)

NAME

dkctl - control special disk operations

SYNOPSIS

/usr/etc/dkctl *disk command*

DESCRIPTION

dkctl is used to enable or disable special disk operations. In particular, enabling or disabling of verified writes (write check functionality) is controlled by this program.

The *disk* specification here is a disk name of the form */dev/rxxnp*, where *xx* is the controller device abbreviation (xd, sd, etc.), *n* is the disk number, and *p* is the partition to which the operation applies. The *partition* specification is simply the letter used to identify that partition in the standard UNIX system nomenclature.

SUPPORTED COMMANDS

wchk This function enables write checking for disks that support it for the named disk partition. This means that disk partitions with this feature enabled, all writes are *verified* to have been correctly written on the disk. This operation emphasizes data reliability over performance, although for each implementation, the fastest reasonable method will be used (i.e., implemented in hardware, if possible).

-wchk This disables write check functionality for the named disk partition.

spin Same as **-spin**.

-spin This function allows the administrator to take the particular device containing the named partition offline. The drive is spun back up on the next access.

suspend This function allows the administrator to suspend all I/O operations to the I/O bus containing the named partition.

resume This function allows the administrator to resume I/O operations to the I/O bus containing the named partition.

high This function places a higher priority for all operations which are destined to the named disk partition. High priority implies that the I/Os to this disk will be started in front of any other operations destined for normal priority devices on the same I/O bus. Issuing two operations to a single high priority disk may cause the second command to be started before the first. This operation mode emphasizes the performance of particular drives over others and may be useful in performance tuning.

-high This disables the high priority functionality for the named disk partition.

BUGS

Use of the **dkctl** command requires super-user permissions.

There are many other features this program could control, and may in the future.

FILES

/dev/r*xxnp*

SEE ALSO

dkio(4S), **sd**(4S), **xd**(4S)

NAME

iostat - report I/O statistics

SYNOPSIS

iostat [**-cdDItv**] [**-l** *n*] [*disk* ...] [*interval* [*count*]]

DESCRIPTION

iostat can iteratively report terminal and disk I/O activity, as well as CPU utilization. The first report is for all time since a reboot and each subsequent report is for the prior interval only.

In order to compute this information, the kernel maintains a number of counters. For each disk, seeks, data transfer completions, number of words transferred are counted; for terminals collectively, the number of input and output characters are counted. Also, at each clock tick, the state of each disk is examined and a tally is made if the disk is active. The kernel also provides approximate transfer rates of the devices.

OPTIONS

iostat's activity class options default to **tdc** (terminal, disk, and CPU). If any activity class options are specified, the default is overridden. Therefore, if only **-d** is specified, neither terminal nor CPU statistics will be reported. The last disk option specified (either **-d** or **-D**) is the only one that is used.

-c Report the percentage of time the system has spent in user mode, in user mode running low priority processes, see **nice**(1), in system mode, and idling.

-d For each disk, report the number of kilobytes transferred per second, the number of transfers per second, and the milliseconds per average seek (see BUGS below).

-D For each disk, report the reads per second, writes per second, and percentage disk utilization.

-I Report the counts in each interval, rather than reporting rates.

-t Report the number of characters read and written to terminals.

-v Normally, the statistics for each drive are printed on a single line. On systems where there are more than four drives, statistics for some drives are not printed due to limited space on the output line. The **-v** option prints the output vertically, one drive per line, allowing the statistics for all drives on the system to be printed. A header is printed and the CPU and TTY statistics are not printed.

-l *n* Limit the number of disks included in the report to *n*; the disk limit defaults to 4. Note: disks explicitly requested (see *disk* below) are not subject to this disk limit.

disk Explicitly specify the disks to be reported; in addition to any enumerated disks, any active disks up to the disk limit (see **-l** above) will also be reported.

interval Report once each *interval* seconds.

count Only print *count* reports.

FILES

/dev/kmem
/vmunix

SEE ALSO

vmstat(8)

BUGS

Milliseconds per average seek is an approximation based on the disk (not the controller) transfer rate. Therefore, the seek time will be over-estimated in systems with slower controllers.

NAME

oncpu - manipulate processors on which a process runs.

SYNOPSIS

/usr/etc/oncpu -p*pid*
/usr/etc/oncpu -p*pid cpu_set*
/usr/etc/oncpu -a*pid*
/usr/etc/oncpu -n*pid*
/usr/etc/oncpu -A
/usr/etc/oncpu -N
/usr/etc/oncpu *cpu_set* [*command*]

DESCRIPTION

oncpu is used to manipulate the processors on which a process can run and to control whether processes have an *affinity* for the last processor on which they ran. Processor *affinity* specifies if a process is trying to run on the same CPU for an extended length of time. With *affinity* the CPU's local cache state is preserved, an advantage with large physical caches. The disadvantage of *affinity* is that the latency until a process runs may increase. OS/MP implements a dynamic affinity mechanism which will balance load across available processors, with each process having an affinity to the processor on which it last ran. When the load becomes too large, reducing the likelihood of meaningful cache states being intact, *affinity* is disabled. This dynamic affinity mechanism is enabled by default. **oncpu** can be used to enable or disable this dynamic affinity per process, or for the entire system. **oncpu** can also limit processes to run on a restricted set of processors.

The numeric *cpu_set* field is interpreted as the processor number if the value is decimal or is a hexidecimal (i.e., preceded by **0x**). bit mask with bits set for each CPU on which a process can run. In order to restrict a particular process to running on processor number 0, use the cpu_set value **0**. In order to restrict a particular process to run on processor 0, 1, 2, or 4, use the cpu_set value **0x17**.

When child is created its initial *cpu_set* and *affinity* are inherited from its parent.

oncpu assumes that the kernel running is called */vmunix*. If another kernel is running, a different *kernel_file* must be specified at the end of the command.

The **oncpu** command has a number of forms:

oncpu -p*pid*
Display the current *cpu_set* and *affinity* for process *pid*.

oncpu -p*pid cpu_set*
Restrict process *pid* to run on the CPUs specified in *cpu_set*.

oncpu -a*pid*
Enable dynamic *affinity* for process *pid*.

oncpu -n*pid*
Disable dynamic *affinity* for process *pid*.

oncpu -A
Enable dynamic *affinity* for all processes on the system which have not had *affinity* disabled via the *-n* option.

oncpu -N
Disable dynamic *affinity* for all processes on the system.

oncpu *cpu_set* **[***command***]**
Execute the specified command, restricting it to to run on the CPUs specified in *cpu_set*. If *command* is not specified then the parent of **oncpu** is restricted to

run on the CPUs specified in *cpu_set*.

NOTES

Attempting to restrict a process so that it can not run on any CPU causes a process to be restricted to run on the CPU where the **oncpu** command was executing.

Attempting to restrict a process to run on a nonexistent processor causes the whole operation to fail. That is, if the **-p** option is being used, the restriction operation fails. If no **-** options are being used, the *command* is not executed.

FILES

/vmunix the kernel

SEE ALSO

cpustatus(8), **pstat**(8)

NAME

preinstall - check for files to save before full install of OS/MP

SYNOPSIS

/usr/etc/preinstall [-l] [-c mmddhhmm[yy]]

DESCRIPTION

The **preinstall** command is used to look for files that should be saved prior to doing a full install of a new version of OS/MP. It looks on the system partitions (root, /usr, and /var) for files which have been touched after the date of the last full install of OS/MP (or, if given a cutoff date, files touched after that date.)

preinstall is normally used just before installing a new version of OS/MP to determine what system-related files should be backed up. Then, after installing the new version of OS/MP, you can merge or restore these files into the newly-installed system. Some files, such as **/etc/fstab**, can typically be re-used without modification. Others, such as kernel configuration files in **/usr/kvm/sys/*/conf**, must be hand-merged into the new version of the OS with careful consideration of how the new OS version differs from the old.

Certain files are excluded from the output which are newer than the cutoff date. These files are normally updated by system operation and do not need to be backed up. Examples of excluded files are: **/etc/mtab**, the **/var/sadm** accounting files, the **/tmp_mnt** automounter directories, and patched kernel object files in **/usr/kvm/sys/*/OBJ**.

By default, the cutoff date used is the modification date of the file **/etc/sys_conf/system-configured**, which is touched the first time you boot a new version of the OS after a full install. You may want to use some other cutoff date with the **-c** option if the current OS was installed in some nonstandard way.

By default, the files and directories newer than the cutoff are listed to standard output by name, one per line. By using the **-l** option, the output is in long form (as from the **-ls** option to **find**), showing the type, date, and size of each file.

OPTIONS

The following options are accepted by **preinstall**:

-l Present the output in long form, showing inode number, size in kilobytes (1024 bytes), protection mode, number of hard links, user, group, size in bytes, and modification time. If the file is a special file the size field will instead contain the major and minor device numbers. If the file is a symbolic link the pathname of the linked-to file is printed preceded by '->'. The format is identical to that of **find -ls**.

-c cutoff Use the given cutoff date to decide which files to print, rather than the date of the file **/etc/sys_conf/system-configured**. The cutoff date format is -c mmddhhmm[yy], with month, day, hour, minute, and optional year in numeric form. This is the same format as for **/usr/5bin/touch**.

SEE ALSO

find(1), **touch**(1v)

DIAGNOSTICS

please become superuser to run this script

The script needs to look inside system directories that are protected against normal users, so it must be run as super-user.

Could not find the file /usr/etc/sys_conf/system-configured

This file, which should have been touched during the first-time boot of the current version of OS/MP, is missing. You will have to use the **-c** option to

preinstall after choosing a date that reflects the last time OS/MP was installed.

NAME

pstat - print system facts

SYNOPSIS

/usr/etc/pstat [**-afipSsTb**] [**-u** *pid*] [*system* [*corefile*]]

DESCRIPTION

pstat interprets the contents of certain system tables. If *corefile* is given, the tables are sought there, otherwise in **/dev/kmem**. The required namelist is taken from **/vmunix** unless *system* is specified.

OPTIONS

-a Under **-p**, describe all process slots rather than just active ones.

-b Print a stack backtrace of all processes in the system.

-f Print the open file table with these headings:

- LOC — The memory address of this table entry.
- TYPE — The type of object the file table entry points to.
- FLG — Miscellaneous state variables encoded thus:
  - R open for reading
  - W open for writing
  - A open for appending
  - S shared lock present
  - X exclusive lock present
  - I signal pgrp when data ready
- CNT — Number of processes that know this open file.
- MSG — Number of references from message queue.
- DATA — The location of the vnode table entry or socket for this file.
- OFFSET — The file offset (see **lseek**(2V)).

-i Print the inode table including the associated vnode entries with these headings:

- ILOC — The memory address of this table entry.
- IFLAG — Miscellaneous inode state variables encoded thus:
  - A inode access time must be corrected
  - C inode change time must be corrected
  - L inode is locked
  - R inode is being referenced
  - U update time (**fs**(5)) must be corrected
  - W wanted by another process (L flag is on)
- IDEVICE — Major and minor device number of file system in which this inode resides.
- INO — I-number within the device.
- MODE — Mode bits in octal, see **chmod**(2V).
- NLK — Number of links to this inode.
- UID — User ID of owner.
- SIZE/DEV — Number of bytes in an ordinary file, or major and minor device of special file.
- VFLAG — Miscellaneous vnode state variables encoded thus:
  - R root of its file system
  - S shared lock applied
  - E exclusive lock applied
  - Z process is waiting for a shared or exclusive lock
- CNT — Number of open file table entries for this vnode.
- SHC — Reference count of shared locks on the vnode.

EXC Reference count of exclusive locks on the vnode (this may be '**> 1**' if, for example, a file descriptor is inherited across a fork).

TYPE Vnode file type, either VNON (no type), VREG (regular), VDIR (directory), VBLK (block device), VCHR (character device), VLNK (symbolic link), VSOCK (socket), VFIFO (named pipe), or VBAD (bad).

-p Print process table for active processes with these headings:

LOC The memory address of this table entry.

S Run state encoded thus:

0 no process
1 awaiting an event
2 (abandoned state)
3 runnable
4 being created
5 being terminated
6 stopped (by signal or under trace)

F Miscellaneous state variables, ORed together (hexadecimal):

0000001	loaded
0000002	a system process (scheduler or page-out daemon)
0000004	locked for swap out
0000008	swapped out during process creation
0000010	process is being traced
0000020	tracing parent has been told that process is stopped
0000040	user settable lock in memory
0000080	in page-wait
0000100	prevented from swapping during **fork**(2V)
0000200	will restore old mask after taking signal
0000400	exiting
0000800	doing physical I/O
0001000	process resulted from a **vfork**(2) which is not yet complete
0002000	another flag for **vfork**(2)
0004000	process has no virtual memory, as it is a parent in the context of **vfork**(2)
0008000	process is demand paging pages from its executable image vnode
0010000	process has advised of sequential VM behavior with **vadvise**(2)
0020000	process has advised of random VM behavior with **vadvise**(2)
0080000	process is a session process group leader
0100000	process is tracing another process
0200000	process needs a profiling tick
0400000	process is scanning descriptors during select
4000000	process has done record locks

8000000 process is having its system calls traced

PRI Scheduling priority, see **getpriority**(2).
SIG Signals received (signals 1-32 coded in bits 0-31).
UID Real user ID.
SLP Amount of time process has been blocked.
TIM Time resident in seconds; times over 127 coded as 127.
CPU Weighted integral of CPU time, for scheduler.
NI Nice level, see **getpriority**(2).
PGRP Process number of root of process group.
PID The process ID number.
PPID The process ID of parent process.
RSS Resident set size — the number of physical page frames allocated to this process.
SRSS RSS at last swap (0 if never swapped).
SIZE The size of the process image. That is, the sum of the data and stack segment sizes, not including the sizes of any shared libraries.
WCHAN Wait channel number of a waiting process.
LINK Link pointer in list of runnable processes.
PAM Current process affinity bitmask.
SPAM Saved process affinity bitmask.
ROTOR Index of the next free list where pages will be allocated from when a new page is required. This is used to avoid cache aliasing.

-S Print the streams table with these headings:

LOC The memory address of this table entry.
WRQ The address of this stream's write queue.
VNODE The address of this stream's vnode.
DEVICE Major and minor device number of device to which this stream refers.
PGRP This stream's process group number.
SIGIO The process id or process group that has this stream **open()**.
FLG Miscellaneous stream state variables encoded thus:

- I waiting for **ioctl**() to finish
- R read/recvmsg is blocked
- W write/putmsg is blocked
- P priority message is at stream head
- H device has been "hung up" (M_HANGUP)
- O waiting for open to finish
- M stream is linked under multiplexor
- D stream is in message-discard mode
- N stream is in message-nondiscard mode
- E fatal error has occurred (M_ERROR)
- T waiting for queue to drain when closing
- 2 waiting for previous **ioctl**() to finish before starting new one
- 3 waiting for acknowledgment for **ioctl**()
- B stream is in non-blocking mode
- A stream is in asynchronous mode
- o stream uses old-style no-delay mode
- S stream has had TOSTOP set

C VTIME clock running
V VTIME timer expired
r collision on **select**() for reading
w collision on **select**() for writing
e collision on **select**() for exceptional condition

The queues on the write and read sides of the stream are listed for each stream. Each queue is printed with these headings:

NAME The name of the module or driver for this queue.
COUNT The approximate number of bytes on this queue.
FLG Miscellaneous state variables encoded thus:
E queue is enabled to run
R someone wants to get from this queue when it becomes non-empty
W someone wants to put on this queue when it drains
F queue is full
N queue should not be enabled automatically by a putq
MINPS The minimum packet size for this queue.
MAXPS The maximum packet size for this queue, or INF if there is no maximum.
HIWAT The high-water mark for this queue.
LOWAT The low-water mark for this queue.

-s Print information about swap space usage:

allocated: The amount of swap space (in bytes) allocated to private pages.

reserved: The number of swap space bytes not currently allocated, but claimed by memory mappings that have not yet created private pages.

used: The total amount of swap space, in bytes, that is either allocated or reserved.

available: The total swap space, in bytes, that is currently available for future reservation and allocation.

-T Print the number of used and free slots in the several system tables. This is useful for checking to see how full system tables have become if the system is under heavy load. Shows both used and cached inodes.

-u *pid* Print information about the process with ID *pid*.

FILES

/vmunix	namelist
/dev/kmem	default source of tables

SEE ALSO

ps(1), **chmod**(2V), **fork**(2V), **getpriority**(2), **lseek**(2V), **stat**(2V), **vadvise**(2), **vfork**(2), **fs**(5) **iostat**(8), **oncpu**(8), **vmstat**(8),

BUGS

It would be very useful if the system recorded "maximum occupancy" on the tables reported by **-T**; even more useful if these tables were dynamically allocated.

NAME

swapon - specify additional device for paging and swapping

SYNOPSIS

/usr/etc/swapon -a

/usr/etc/swapon

/usr/etc/swapon -w *name...*

DESCRIPTION

swapon specifies additional devices or files on which paging and swapping are to take place. The system begins by swapping and paging on only a single device so that only one disk is required at bootstrap time. Calls to **swapon** normally occur in the system multi-user initialization file **/etc/rc** making all swap devices available, so that the paging and swapping activity is interleaved across several devices.

The second form gives individual block devices or files as given in the system swap configuration table. The call makes only this space available to the system for swap allocation.

Note: "swap files" made with **mkfile**(8) can be used as swap areas over NFS.

OPTIONS

-a Make available all devices of type **swap** in **/etc/fstab**. Using **swapon** with the **-a** option is the normal usage.

-w Reports the names of the device special files which are currently being used as swap devices. Partitions are reported one per line.

FILES

/dev/sd?b	
/dev/xy?b	
/dev/xd?b	normal paging devices
/etc/fstab	
/etc/rc	

SEE ALSO

swapon(2), **fstab**(5), **init**(8), **mkfile**(8)

BUGS

There is no way to stop paging and swapping on a device. It is therefore not possible to make use of devices which may be dismounted during system operation.

NAME

vmstat - report virtual memory statistics

SYNOPSIS

vmstat [**-fisSp**] [*interval* [*count*]]

DESCRIPTION

vmstat delves into the system and normally reports certain statistics kept about process, virtual memory, disk, trap and CPU activity.

Without options, **vmstat** displays a one-line summary of the virtual memory activity since the system has been booted. If *interval* is specified, **vmstat** summarizes activity over the last *interval* seconds. If a *count* is given, the statistics are repeated *count* times.

For example, the following command displays a summary of what the system is doing every five seconds. This is a good choice of printing interval since this is how often some of the statistics are sampled in the system.

```
example% vmstat 5
 procs   memory              page    faults
 r b w   avm  fre  re at pi po fr de sr x0 x1 x2 x3 in  sy  cs us sy id
 2 0 0   918  286  0  0  0  0  0  0  0  1  0  0  0  4 12   5  3  5 91
 1 0 0   846  254  0  0  0  0  0  0  0  6  0  1  0 42 153 31  7 40 54
 1 0 0   840  268  0  0  0  0  0  0  0  5  0  0  0 27 103 25  8 26 66
 1 0 0   620  312  0  0  0  0  0  0  0  6  0  0  0 26  76 25  6 27 67

CTRL-C
example%
```

The fields of **vmstat**'s display are:

procs Report the number of processes in each of the three following states:

- **r** in run queue
- **b** blocked for resources (i/o, paging, etc.)
- **w** runnable or short sleeper (< 20 secs) but swapped

memory

Report on usage of virtual and real memory. Virtual memory is considered active if it belongs to processes which are running or have run in the last 20 seconds.

- **avm** number of active virtual Kbytes
- **fre** size of the free list in Kbytes

page Report information about page faults and paging activity. The information on each of the following activities is averaged each five seconds, and given in units per second.

- **re** page reclaims — but see the **-S** option for how this field is modified.
- **at** number of attaches — but see the **-S** option for how this field is modified.
- **pi** kilobytes per second paged in
- **po** kilobytes per second paged out
- **fr** kilobytes freed per second
- **de** anticipated short term memory shortfall in Kbytes
- **sr** pages scanned by clock algorithm, per-second

disk Report number of disk operations per second (this field is system dependent). For Solbourne systems, four slots are available for up to four drives: "x0" (or "s0" for SCSI disks), "x1", "x2", and "x3".

faults Report trap/interrupt rate averages per second over last 5 seconds.

in (non clock) device interrupts per second
sy system calls per second
cs CPU context switch rate (switches/sec)

cpu Give a breakdown of percentage usage of CPU time.
us user time for normal and low priority processes
sy system time
id CPU idle
phit Percentage of the time the context switch of a process resumes on the same processor where it last executed (**-p**) option.

OPTIONS

-f Report on the number of **forks** and **vforks** since system startup and the number of pages of virtual memory involved in each kind of fork.

-i Report the number of interrupts per device. Autovectored interrupts (including the clock) are listed first.

-s Display the contents of the **sum** structure, giving the total number of several kinds of paging-related events which have occurred since boot.

-S Report on swapping rather than paging activity. This option will change two fields in **vmstat**'s "paging" display: rather than the "re" and "at" fields, **vmstat** will report "si" (swap-ins), and "so" (swap-outs).

-p Displays how often a context switch of a process resumes on the same processor rather than the normal CPU statistics.

FILES

/dev/kmem
/vmunix

BUGS

If more than one autovectored device has the same name, interrupts are counted for all like-named devices regardless of unit number. Such devices are listed with a unit number of '**?**'.