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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

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>106550</td>
<td>1/4-inch QIC-150 OS/MP 4.1C tape, or</td>
</tr>
<tr>
<td>106552</td>
<td>8mm Exabyte OS/MP 4.1C tape, or</td>
</tr>
<tr>
<td>106507</td>
<td>CD-ROM OS/MP 4.1C disk</td>
</tr>
<tr>
<td>106562</td>
<td>Release and Installation Notes for OS/MP 4.1C</td>
</tr>
</tbody>
</table>
Table 2. Contents of OS/MP 4.1C Tape

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

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

equivalent:

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

To request all patches from a specified archive:

equivalent:

```plaintext
email 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), uuencoded, 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
pwd: your.email.address (i.e. user@domain.org)
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
```

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.org
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 log file 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.

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 10msec 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 cannot 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
dosyntodr/W0
_dosyntodr: 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_cam_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 KESS1.

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.

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>
<thead>
<tr>
<th>Layered Product</th>
<th>Revision Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>SVM</td>
<td>1.3</td>
</tr>
<tr>
<td>hsNFS</td>
<td>2.2</td>
</tr>
<tr>
<td>DES</td>
<td>4.1C</td>
</tr>
<tr>
<td>X.25</td>
<td>No change from OS/MP 4.1B</td>
</tr>
</tbody>
</table>
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 srl 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 (srl). 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 srl 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:

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

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**

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

The usage format for SCSI disks is as follows:

\[ \text{sd.si(unit,devid)} \]

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

\[ \text{ROM> setenv defaultroot sd.si(,1,0)} \]

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

\[ \text{ROM> setenv defaultroot xd(ctlr,unit,devid)} \]

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 SL_NS_PERBYTE to 300 will slow down the transfer rate to a maximum transfer rate of 3.33Mb/sec. To slow the internal SCSI bus type:

\[ \text{ROM> setenv si_nsperbyte 300} \]
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

<table>
<thead>
<tr>
<th>Memory</th>
<th>Discontinued</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 Mbyte Memory Board</td>
<td>Yes</td>
</tr>
<tr>
<td>32 Mbyte Memory Board</td>
<td>Yes</td>
</tr>
<tr>
<td>128 Mbyte Memory Board</td>
<td>No</td>
</tr>
<tr>
<td>256 Mbyte Memory Board</td>
<td>No</td>
</tr>
<tr>
<td>512 Mbyte Memory Board</td>
<td>No</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Device</th>
<th>Bus</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>830 Mbyte SMD Hard Disk Drive</td>
<td>VMEbus</td>
<td>xd</td>
</tr>
<tr>
<td>1040 Mbyte SMD Hard Disk Drive</td>
<td>VMEbus</td>
<td>xd</td>
</tr>
<tr>
<td>1.2 Gbyte IPI Hard Disk Drive</td>
<td>VMEbus</td>
<td>xd</td>
</tr>
<tr>
<td>2.7 Gbyte IPI Hard Disk Drive</td>
<td>VMEbus</td>
<td>xd</td>
</tr>
<tr>
<td>327 Mbyte Hard Disk Drive (5-1/4-inch)</td>
<td>SCSI</td>
<td>sd</td>
</tr>
<tr>
<td>661 Mbyte Hard Disk Drive (5-1/4-inch)</td>
<td>SCSI</td>
<td>sd</td>
</tr>
<tr>
<td>2 Gbyte Hard Disk Drive (5-1/4-inch)</td>
<td>SCSI</td>
<td>sd</td>
</tr>
<tr>
<td>1.3 Gbyte Hard Disk Drive (5-1/4-inch)</td>
<td>SCSI</td>
<td>sd</td>
</tr>
<tr>
<td>1 Gbyte Hard Disk Drive (3-1/2-inch)</td>
<td>SCSI</td>
<td>sd</td>
</tr>
<tr>
<td>2 Gbyte Hard Disk Drive (3-1/2-inch)</td>
<td>SCSI</td>
<td>sd</td>
</tr>
<tr>
<td>500 Mbyte Hard Disk Drive (3-1/2-inch)</td>
<td>SCSI</td>
<td>sd</td>
</tr>
<tr>
<td>200 Mbyte Hard Disk Drive (3-1/2-inch)</td>
<td>SCSI</td>
<td>sd</td>
</tr>
<tr>
<td>1.44 Mbyte Floppy Disk Drive (3-1/2-inch)</td>
<td>SCSI</td>
<td>fd0</td>
</tr>
<tr>
<td>CD ROM Drive</td>
<td>SCSI</td>
<td>sr</td>
</tr>
</tbody>
</table>
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>
<thead>
<tr>
<th>Device</th>
<th>Type</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Board</td>
<td>SCSI</td>
<td>si</td>
</tr>
<tr>
<td>Cougar SCSI-II controller</td>
<td>SCSI-II</td>
<td>sv</td>
</tr>
<tr>
<td>Multi-Channel Accelerator Board (MCAB)</td>
<td>SCSI (or with controller: SCSI-II, or IPI)</td>
<td>si l</td>
</tr>
<tr>
<td>IPI Controller</td>
<td>IPI</td>
<td>xdc</td>
</tr>
<tr>
<td>SMD Controller</td>
<td>SMD</td>
<td>xdc</td>
</tr>
</tbody>
</table>

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**

<table>
<thead>
<tr>
<th>Tape Drive</th>
<th>Bus</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>QIC-150</td>
<td>SCSI</td>
<td>st</td>
</tr>
<tr>
<td>8mm Cartridge (8200/8500)</td>
<td>SCSI</td>
<td>st</td>
</tr>
</tbody>
</table>

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.

```
(n) r s t
```

no rewind _______ tape

```
raw _______ SCSI
```

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**

<table>
<thead>
<tr>
<th>Media</th>
<th>Format</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q150_600</td>
<td>QIC-150</td>
<td>1/4-inch 600-foot XTD tape</td>
</tr>
<tr>
<td>P6-120</td>
<td>466033</td>
<td>8mm cartridge tape</td>
</tr>
</tbody>
</table>
**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**

<table>
<thead>
<tr>
<th>Device</th>
<th>Partition</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/rfd0a</td>
<td>partition A on the raw disk</td>
</tr>
<tr>
<td>/dev/rfd0b</td>
<td>partition B</td>
</tr>
<tr>
<td>/dev/rfd0c</td>
<td>partition C</td>
</tr>
<tr>
<td>/dev/rfd0</td>
<td>same as partition C</td>
</tr>
<tr>
<td>/dev/fd0a</td>
<td>partition A on the diskette using block mode</td>
</tr>
<tr>
<td>/dev/fd0b</td>
<td>partition B</td>
</tr>
<tr>
<td>/dev/fd0c</td>
<td>partition C</td>
</tr>
<tr>
<td>/dev/fd0</td>
<td>same as partition C using block mode</td>
</tr>
</tbody>
</table>

**Network Controllers**

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

**Table 12. Supported Network Controllers**

<table>
<thead>
<tr>
<th>Device</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Board Ethernet controller</td>
<td>ei0</td>
</tr>
<tr>
<td>Sbus Ethernet controller (Series S4000)</td>
<td>ei1</td>
</tr>
<tr>
<td>Multi-Channel Accelerator Board (MCAB) Ethernet Controller</td>
<td>ei1</td>
</tr>
<tr>
<td>VMEbus Ethernet controller</td>
<td>eg0</td>
</tr>
<tr>
<td>VMEbus FDDI controller</td>
<td>pg0</td>
</tr>
<tr>
<td>VMEbus X.25 Controller (see X.25 Release Notes)</td>
<td>vc0</td>
</tr>
</tbody>
</table>

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 gatewayname (create new file)
or hostname.pg0
```
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**  
  - `/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>
<thead>
<tr>
<th>Country</th>
<th>Hex Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>00</td>
</tr>
<tr>
<td>FRANCE_BELGIUM</td>
<td>02</td>
</tr>
<tr>
<td>CANADA_FRENCH</td>
<td>03</td>
</tr>
<tr>
<td>DENMARK</td>
<td>04</td>
</tr>
<tr>
<td>GERMANY</td>
<td>05</td>
</tr>
<tr>
<td>ITALY</td>
<td>06</td>
</tr>
<tr>
<td>NETHERLANDS</td>
<td>07</td>
</tr>
<tr>
<td>NORWAY</td>
<td>08</td>
</tr>
<tr>
<td>PORTUGAL</td>
<td>09</td>
</tr>
<tr>
<td>SPAIN_LATINAMERICA</td>
<td>0a</td>
</tr>
<tr>
<td>SWEDEN_FINLAND</td>
<td>0b</td>
</tr>
<tr>
<td>SWITZERLAND_FRENCH</td>
<td>0c</td>
</tr>
<tr>
<td>SWITZERLAND_GERMAN</td>
<td>0d</td>
</tr>
<tr>
<td>UK</td>
<td>0e</td>
</tr>
<tr>
<td>JAPAN</td>
<td>20</td>
</tr>
</tbody>
</table>

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 Problems in 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.

<table>
<thead>
<tr>
<th>Bug#</th>
<th>Component</th>
<th>Sub-component</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>B910508466</td>
<td>Diagnostics</td>
<td>ROM</td>
<td>S4000 stand-alone clock driver doesn’t return correct date/time.</td>
</tr>
<tr>
<td>B910510198</td>
<td>Diagnostics</td>
<td>ROM</td>
<td>3.4 Series5 BootROMs don’t deassert sysfail on warm starts.</td>
</tr>
<tr>
<td>B911218009</td>
<td>Diagnostics</td>
<td>POST</td>
<td>3.5 Series5 ECC RAM test in the POST does not enable ECC checking.</td>
</tr>
<tr>
<td>B920814008</td>
<td>Diagnostics</td>
<td>DG</td>
<td>Disk write/read test fails when prompted.</td>
</tr>
<tr>
<td>B921113002</td>
<td>Diagnostics</td>
<td>MDG</td>
<td>Shared Memory Test fails.</td>
</tr>
<tr>
<td>B930629002</td>
<td>Diagnostics</td>
<td>Sysdiag</td>
<td>sysdiag fpu error report format</td>
</tr>
<tr>
<td>B930914001</td>
<td>Diagnostics</td>
<td>Sysdiag</td>
<td>vmem only tests 40 kilobytes.</td>
</tr>
<tr>
<td>B931110001</td>
<td>Diagnostics</td>
<td>MDG</td>
<td>MDG will fail test 8 if master CPU is in slot 1.</td>
</tr>
<tr>
<td>B910508428</td>
<td>Documentation</td>
<td>Kernel</td>
<td>mt ret of Exabytes do not work.</td>
</tr>
<tr>
<td>B910508455</td>
<td>Documentation</td>
<td>Man pages</td>
<td>sd man page should describe SCSI disk cmd optimization.</td>
</tr>
<tr>
<td>B910508457</td>
<td>Documentation</td>
<td>Man pages</td>
<td>The eeprom man page shouldn’t mention CONSOLE variable.</td>
</tr>
<tr>
<td>B910508458</td>
<td>Documentation</td>
<td>Man pages</td>
<td>The eeprom man page should describe defaultdump.</td>
</tr>
<tr>
<td>B910510046</td>
<td>Documentation</td>
<td>Manual</td>
<td>page 4-7 of the adb tutorial has a 68020 assy. example.</td>
</tr>
<tr>
<td>B910510068</td>
<td>Documentation</td>
<td>Man pages</td>
<td>/usr/man/man3/List.* files missing</td>
</tr>
<tr>
<td>B910510188</td>
<td>Documentation</td>
<td>Manual</td>
<td>QIC-150 tape drive.</td>
</tr>
<tr>
<td>B910510189</td>
<td>Documentation</td>
<td>Man pages</td>
<td>tunefs man page needs more info on -a option.</td>
</tr>
<tr>
<td>B910619003</td>
<td>Documentation</td>
<td>Release Notes</td>
<td>boot of remote ramdisk may result in rarp timeout.</td>
</tr>
<tr>
<td>B920618002</td>
<td>Documentation</td>
<td>Manual</td>
<td>device drivers man. incorrect about vme32 master to kbus transactions</td>
</tr>
<tr>
<td>B920710001</td>
<td>Documentation</td>
<td>Manual</td>
<td>The burst data transfer rates are incorrect in the 500 Installation manual.</td>
</tr>
<tr>
<td>B920817005</td>
<td>Documentation</td>
<td>Manual</td>
<td>Installation guide for Interphase ethernet board has switch setting discrepancy.</td>
</tr>
<tr>
<td>B921210002</td>
<td>Documentation</td>
<td>Man pages</td>
<td>man page for config command needs to be updated to include Series6.</td>
</tr>
<tr>
<td>B921210004</td>
<td>Documentation</td>
<td>Man pages</td>
<td>config_server man page should include reference to Series6.</td>
</tr>
<tr>
<td>B921210005</td>
<td>Documentation</td>
<td>Man pages</td>
<td>install_client man page should be updated in reference to OS examples.</td>
</tr>
<tr>
<td>B921210006</td>
<td>Documentation</td>
<td>Man pages</td>
<td>boot man page missing</td>
</tr>
<tr>
<td>B921210007</td>
<td>Documentation</td>
<td>Man pages</td>
<td>kadb man page missing</td>
</tr>
<tr>
<td>B930205001</td>
<td>Documentation</td>
<td>Release Notes</td>
<td>The BootROM level is missing from the Installation/Release notes.</td>
</tr>
<tr>
<td>Bug#</td>
<td>Component</td>
<td>Sub-component</td>
<td>Summary</td>
</tr>
<tr>
<td>---------</td>
<td>---------------</td>
<td>---------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>B930205002</td>
<td>Documentation</td>
<td>Release Notes</td>
<td>Installation and release notes are missing remote install for Sbus machines.</td>
</tr>
<tr>
<td>B930312002</td>
<td>Documentation</td>
<td>Release Notes</td>
<td>need remote installation instructions in the stand-alone section</td>
</tr>
<tr>
<td>B930322001</td>
<td>Documentation</td>
<td>Manual</td>
<td>No software config info for FDDI in docs fpr 900/700/FDDI</td>
</tr>
<tr>
<td>B930406005</td>
<td>Documentation</td>
<td>Man pages</td>
<td>No cust. info, concerning how to utilize Hi Den mode on EXA-8500</td>
</tr>
<tr>
<td>B930412002</td>
<td>Documentation</td>
<td>Other</td>
<td>Enhancement to System I/O board notes</td>
</tr>
<tr>
<td>B930412004</td>
<td>Documentation</td>
<td>Release Notes</td>
<td>istat man page has strange comment</td>
</tr>
<tr>
<td>B930422002</td>
<td>Documentation</td>
<td>Man pages</td>
<td>man page says telnetd limits pts to 64</td>
</tr>
<tr>
<td>B930513001</td>
<td>Documentation</td>
<td>Release Notes</td>
<td>SVM release notes incomplete</td>
</tr>
<tr>
<td>B930525001</td>
<td>Documentation</td>
<td>Man pages</td>
<td>loadkeys -e conflicts with Solbourne usage in /etc/rc.single</td>
</tr>
<tr>
<td>B930903001</td>
<td>Documentation</td>
<td>Release Notes</td>
<td>config_server man page does not list all options</td>
</tr>
<tr>
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In previous releases of this document, the bugs were listed by Category. The title Category is now referred to as Component.

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<td>usr.lib Makefile doesn’t install librcpsvc subdir.</td>
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<td>Random processes dump core under high user load.</td>
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<td>BAD TRAP: asyncio; Memory address alignment</td>
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<td>A Spurious interrupt can lower interrupt level.</td>
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<td>Bad printf is the memory address alignment trap.</td>
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<td>update holds the vm_context lock too long causing problems.</td>
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<td>Performing three read/write pairs on a socket take much longer than two read/write pairs.</td>
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<td>conf.o is being supplied in OBI directory and shouldn't</td>
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<td>Member of group can remove file in dir where group has rwx even if unowned.</td>
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<td>pstat is hardcoded to look at 10000 nfiles.</td>
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<td>unable to install Ingres on sbus systems. Core dumps.</td>
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<td>wait_command_done panic in aim3 benchmark</td>
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<td>cannot start nfs on OS/MP 4.1B</td>
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<td>race in krpc (kuwakeup). timeout may need to know more about locks.</td>
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<td>NFS mounts time out right away.</td>
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<td>References to Sun in admin files needs to be changed to Solbourne.</td>
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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

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<tr>
<td>1083123</td>
<td>sun4m kernel fails if the mxusers is &gt; 250</td>
</tr>
<tr>
<td>1083662</td>
<td>4.1.x kernel doesn’t support SPARC V8 recomputation</td>
</tr>
<tr>
<td>1083810</td>
<td>L1-A sometimes ignored during panic</td>
</tr>
<tr>
<td>1083811</td>
<td>Kernel panics while syncing file system</td>
</tr>
<tr>
<td>1083844</td>
<td>Force MMU Tablewalk after page fault</td>
</tr>
<tr>
<td>1083892</td>
<td>kernel emulation code detects underflow after rounding</td>
</tr>
<tr>
<td>1083917</td>
<td>4/690, 4/670 hangs, CPU lights freeze, when running with speci</td>
</tr>
<tr>
<td>1084235</td>
<td>max sun4m RLIMIT_DATA is too low</td>
</tr>
<tr>
<td>1084676</td>
<td>Select best processor for a process</td>
</tr>
<tr>
<td>1084680</td>
<td>Window Overflow missing a nop for psr delay</td>
</tr>
<tr>
<td>1085152</td>
<td>Security: 600MP kernel has undocumented “probeme” trap</td>
</tr>
<tr>
<td>1085165</td>
<td>Remove nonfunctional 4.x TLB locking code</td>
</tr>
<tr>
<td>1085235</td>
<td>Prevent Cy7c605 from pagefaulting on M-bit update</td>
</tr>
<tr>
<td>1085863</td>
<td>Panic: BAD TRAP in fp_disabled trap</td>
</tr>
<tr>
<td>1086143</td>
<td>600MP system crashes with a watchdog reset - INSTRUCTION ACCE</td>
</tr>
<tr>
<td>1086438</td>
<td>clock_exit blows away caller’s %16 register</td>
</tr>
<tr>
<td>1086458</td>
<td>console login prompt garbled when 8-bit chars are passed through</td>
</tr>
<tr>
<td>1086685</td>
<td>adb doesn’t disassemble sdiv instruction</td>
</tr>
<tr>
<td>1086687</td>
<td>4.1.2 doesn’t handle divide instructions</td>
</tr>
<tr>
<td>1087264</td>
<td>atomic swap command fails only on IPC running 4.1.2 FCS</td>
</tr>
<tr>
<td>1087507</td>
<td>system panics with “panic on 0: ialloc: dup alloc”</td>
</tr>
<tr>
<td>1088483</td>
<td>Security: 600MP shipped with halt_and_catch_fire</td>
</tr>
<tr>
<td>1089128</td>
<td>rfs_lookup needs to release the directory vnode before error r</td>
</tr>
<tr>
<td>1090435</td>
<td>nice’d processes hang in run state and aren’t killable.</td>
</tr>
<tr>
<td>1090849</td>
<td>datasize limited to 512MB</td>
</tr>
<tr>
<td>1092548</td>
<td>under heavy load, “panic: swtch”</td>
</tr>
</tbody>
</table>
### System Administration Bugs Fixed

<table>
<thead>
<tr>
<th>Bug#</th>
<th>Description</th>
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<tbody>
<tr>
<td>1033724</td>
<td>/usr/lib/adb belongs in /usr/kvm</td>
</tr>
<tr>
<td>1081944</td>
<td>In 4.1.2, add_client and add_services fail to recognize DiskSuite</td>
</tr>
<tr>
<td>1082294</td>
<td>sunupgrade ignores <code>#</code> in /etc/hosts when upgrading diskless c</td>
</tr>
</tbody>
</table>

### Network Bugs Fixed

<table>
<thead>
<tr>
<th>Bug#</th>
<th>Description</th>
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<tbody>
<tr>
<td>1063432</td>
<td>tip to RFS mounted serial port causes panic: data fault</td>
</tr>
<tr>
<td>1076985</td>
<td>4/490 NFS client crashes when accessing mounted file from a no</td>
</tr>
</tbody>
</table>

### Library Bugs Fixed

<table>
<thead>
<tr>
<th>Bug#</th>
<th>Description</th>
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<tbody>
<tr>
<td>1072740</td>
<td>strcollO ... strxfrmO dumps core for locale =&gt; C if stdin c</td>
</tr>
</tbody>
</table>

#### POXIX (library)

<table>
<thead>
<tr>
<th>Bug#</th>
<th>Description</th>
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<tbody>
<tr>
<td>1032120</td>
<td>POXIX: _pid in flock isn’t a pid_t.</td>
</tr>
<tr>
<td>1032755</td>
<td>errno should be set to EBADF on a number of library routines.</td>
</tr>
<tr>
<td>1032777</td>
<td>fopen should return ENOENT for empty string.</td>
</tr>
<tr>
<td>1037220</td>
<td>sigvvec can’t examine action of SIKILL or SIGSTOP.</td>
</tr>
<tr>
<td>1080635</td>
<td>execvp &amp; execlp do not return ENOENT for null path.</td>
</tr>
</tbody>
</table>

#### POSIX (Kernel)

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

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

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

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<thead>
<tr>
<th>Patch#</th>
<th>Bug#</th>
<th>Description</th>
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<tbody>
<tr>
<td>p93012501</td>
<td>B921211001</td>
<td>Fix for data fault and lock error panics</td>
</tr>
<tr>
<td>p93012601</td>
<td>B930126001</td>
<td>Fix for hang in choose_process and loss of wakeup</td>
</tr>
<tr>
<td>p93012602</td>
<td>B930126002</td>
<td>Fix for anon_decref panic</td>
</tr>
<tr>
<td>p93012603</td>
<td>B930113002</td>
<td>Fix possible deadlock when an asynchronous memory error occurs</td>
</tr>
<tr>
<td>p93020101</td>
<td>B921121001</td>
<td>Fix for ttycommon_qfull kernel read fault</td>
</tr>
<tr>
<td>p93020102</td>
<td>B921010001</td>
<td>Fix for panic with kmem_free: block already free</td>
</tr>
<tr>
<td>p93020103</td>
<td>B921119001</td>
<td>Fix for spurious interrupts causing panic</td>
</tr>
<tr>
<td>p93020104</td>
<td>B921130001</td>
<td>Exiting sunview can hang console.</td>
</tr>
<tr>
<td>p93020105</td>
<td>B921217005</td>
<td>mount system call has bad check for uap-&gt;type.</td>
</tr>
<tr>
<td>p93020201</td>
<td>B921218001</td>
<td>fix lock error panics when using unix domain sockets</td>
</tr>
<tr>
<td>p93020203</td>
<td>B930106002</td>
<td>fix for CDROMSUBCHNL ioctl call to sr driver</td>
</tr>
<tr>
<td>p93020204</td>
<td>B930202002</td>
<td>jumbo patch to integrate CTE fixes to libcurses (equivalent to Sun patch 100408-01)</td>
</tr>
<tr>
<td>p93020205</td>
<td>B930202003</td>
<td>csh memory leak tty gets EOF condition (equivalent to Sun patch 100399-02)</td>
</tr>
<tr>
<td>p93020206</td>
<td>B930202004</td>
<td>tar fills last block of tarfile with unrelated data (equivalent to Sun patch 100413-01)</td>
</tr>
<tr>
<td>p93020207</td>
<td>B930202005</td>
<td>add code to grab MMU information during panic or NMI</td>
</tr>
<tr>
<td>p93030501</td>
<td>B930305005</td>
<td>ipcs aborts with “shcmtl: Permission denied” (equivalent to Sun patch 100650-01)</td>
</tr>
<tr>
<td>p93030801</td>
<td>B930301001</td>
<td>fix for lock timeout or system hang with Series6 CPUs</td>
</tr>
<tr>
<td>p93030901</td>
<td>B930309001</td>
<td>fix for dump to tape</td>
</tr>
<tr>
<td>p93030902</td>
<td>B930309002</td>
<td>socketpair system call was not setting syscall return value</td>
</tr>
<tr>
<td>p93031001</td>
<td>B930310002</td>
<td>fix kernel printf for memory address alignment fault</td>
</tr>
<tr>
<td>p93031002</td>
<td>B930310001</td>
<td>fix for lock semaphores lock violation</td>
</tr>
<tr>
<td>p93031003</td>
<td>B930310005</td>
<td>change ufs sync to minimize response time</td>
</tr>
<tr>
<td>p93031201</td>
<td>B930202001</td>
<td>add support for RORA VME controllers</td>
</tr>
<tr>
<td>p93032201</td>
<td>B930318002</td>
<td>fix for choose_process panic</td>
</tr>
<tr>
<td>p93032202</td>
<td>B930318007</td>
<td>NFS Jumbo Patch (equivalent to Sun patch 100173-10)</td>
</tr>
<tr>
<td>p93032601</td>
<td>B930318004</td>
<td>kernel can possibly generate duplicate pids (equivalent to Sun patch 100636-01)</td>
</tr>
<tr>
<td>p93033001</td>
<td>B930330001</td>
<td>cron dumps core &amp; cron dies when daylight savings time (equivalent to Sun patch 100651-01)</td>
</tr>
<tr>
<td>p93033002</td>
<td>B930323002</td>
<td>RFS Server patch. (equivalent to Sun patch 100684-02)</td>
</tr>
<tr>
<td>p93033003</td>
<td>B930301004</td>
<td>software fix for detecting possible hung lance ethernet chip</td>
</tr>
<tr>
<td>p93040101</td>
<td>B930330003</td>
<td>fix for socket poll panic</td>
</tr>
<tr>
<td>p93041201</td>
<td>B930412003</td>
<td>increase hash table size (equivalent to Sun patch 100606-03)</td>
</tr>
<tr>
<td>p93041301</td>
<td>B930413001</td>
<td>rdist security and hard links enhancement (equivalent to Sun patch 100383-06)</td>
</tr>
<tr>
<td>p93041601</td>
<td>B930416001</td>
<td>fix for sd_unit panic</td>
</tr>
<tr>
<td>Patch#</td>
<td>Bug#</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
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<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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<tr>
<td>p93041901</td>
<td>B930331001</td>
<td>Jumbo tty patch (equivalent to Sun patch 100513-02)</td>
</tr>
<tr>
<td>p93042001</td>
<td>B920925003</td>
<td>TCP “reset”s can cause an mbuf leak, resulting in mbuf map full (equivalent to Sun patch 100804-01)</td>
</tr>
<tr>
<td>p93042002</td>
<td>B920925003</td>
<td>mbuf + mcl_static cluster mbuf should be protected from interrupts (equivalent to Sun patch 100456-04)</td>
</tr>
<tr>
<td>p93050601</td>
<td>B930118001</td>
<td>fix race in close</td>
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<tr>
<td>p93050602</td>
<td>B930505003</td>
<td>fix for select on socket hang</td>
</tr>
<tr>
<td>p93051401</td>
<td>B930505002</td>
<td>fix copy from kernel to user space</td>
</tr>
<tr>
<td>p93051701</td>
<td>B930505002</td>
<td>fix zeroing from kernel to user space</td>
</tr>
<tr>
<td>p93052601</td>
<td>B930511001</td>
<td>UFS Jumbo Patch (equivalent to Sun patch 100623-03)</td>
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<tr>
<td>p93052701</td>
<td>B930520001</td>
<td>fix for Solpatch inability to install more than 26 patches at one time</td>
</tr>
<tr>
<td>p93052801</td>
<td>B930519001</td>
<td>TMPFS Jumbo Patch, v2 (equivalent to Sun patch 100507-04)</td>
</tr>
<tr>
<td>p93060401</td>
<td>B930525002</td>
<td>fix named pipe panic and data corruption (equivalent to Sun patch 100347-03)</td>
</tr>
<tr>
<td>p93061001</td>
<td>B930318006</td>
<td>vm_context lock timeout in klustsort()</td>
</tr>
<tr>
<td>p93061002</td>
<td>B930607001</td>
<td>expressee can trash files and give root access</td>
</tr>
<tr>
<td>p93061101</td>
<td>B930608001</td>
<td>fix for FDDI hangs</td>
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<tr>
<td>p93061102</td>
<td>B930526001</td>
<td>fix for lock error panic when LOCK_STYLE is debug</td>
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<tr>
<td>p93061401</td>
<td>B930426001</td>
<td>fix for store buffer exception</td>
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<tr>
<td>p93062101</td>
<td>B921216001</td>
<td>ld.so write buffer flush</td>
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<tr>
<td>p93062102</td>
<td>B930607001</td>
<td>security problem with expressee (equivalent to Sun patch 101080-01, and obsoletes Solbourn)</td>
</tr>
<tr>
<td>p93070101</td>
<td>B930416002</td>
<td>fix for FDDI hangs</td>
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<tr>
<td>p93070201</td>
<td>B930630002</td>
<td>fix for Data Fault Panic in Accept</td>
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<tr>
<td>p93071301</td>
<td>B930607001</td>
<td>security problem with expressee, secure installation (equivalent to Sun patch 101080-01, and obsoletes Solbourn)</td>
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<tr>
<td>p93071601</td>
<td>B930224005</td>
<td>wrong MAKEDEV line for /dev/tcp</td>
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<tr>
<td>p93071901</td>
<td>B930712002</td>
<td>incorrect results or SIGSEGV in emulated instructions</td>
</tr>
<tr>
<td>p93073001</td>
<td>B930603000</td>
<td>fix for lock problem</td>
</tr>
<tr>
<td>p93081001</td>
<td>B930408002</td>
<td>fix for panics in ckwakeup(), panic ‘getting user pte from interrupt’ ...</td>
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<tr>
<td>p93081101</td>
<td>B930729001</td>
<td>C2 Jumbo Patch (equivalent to Sun patch 100564-05. Due to the editin)</td>
</tr>
<tr>
<td>p93081102</td>
<td>B930708001</td>
<td>pstat chokes on greater than 10,000 file descriptors</td>
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<tr>
<td>p93081201</td>
<td>B930629001</td>
<td>automount Jumbo Patch (equivalent to Sun patch 100249-07)</td>
</tr>
<tr>
<td>p93081301</td>
<td>NONE</td>
<td>kernel support for 40 MHz Series6 CPUs</td>
</tr>
<tr>
<td>p93081302</td>
<td>B920814014</td>
<td>avoid swapping a process allocating page tables</td>
</tr>
<tr>
<td>p93081901</td>
<td>B930817001</td>
<td>“at” jobs are not running; job files are being over-written. (equivalent to Sun patch 100972-01)</td>
</tr>
<tr>
<td>p93082301</td>
<td>B930528001</td>
<td>exit of sntools from SunView causes panic: bad rmfree (equivalent to Sun patch 100666-02)</td>
</tr>
<tr>
<td>p93082501</td>
<td>B930526002</td>
<td>fix ‘block_n_lock’ on single CPU system</td>
</tr>
<tr>
<td>p93090701</td>
<td>NONE</td>
<td>tfs does not work with auditing enabled (equivalent to Sun patch 100372-02)</td>
</tr>
<tr>
<td>p93090801</td>
<td>B930512002</td>
<td>kernel memory fragmentation causes processes to hang in D state</td>
</tr>
<tr>
<td>p93091301</td>
<td>B930522002</td>
<td>fix Data Fault Panic, Invalid PTE Panic, Lock Timeout in update()</td>
</tr>
<tr>
<td>p93091401</td>
<td>None</td>
<td>generalized clock speed support for Series6</td>
</tr>
<tr>
<td>p93091402</td>
<td>B930914002</td>
<td>prevent kernel memory pool corruption due to i/o error in ufs_getsummaryinfo</td>
</tr>
<tr>
<td>Patch#</td>
<td>Bug#</td>
<td>Description</td>
</tr>
<tr>
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<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>p93092901</td>
<td>B930928001</td>
<td>fix Data Fault panic that may occur after mbuf map full</td>
</tr>
<tr>
<td>p93100401</td>
<td>NONE</td>
<td>data fault using ROM output routines</td>
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<tr>
<td>p93102801</td>
<td>B920929003</td>
<td>emulating integer multiply/divide instructions gets SIGILL or SIGSEGV</td>
</tr>
<tr>
<td>p93110801</td>
<td>B931005001</td>
<td>lock timeout in pvn_vptrunc</td>
</tr>
<tr>
<td>p93120201</td>
<td>B931124002</td>
<td>accounting Jumbo Patch (equivalent to Sun patch 100407-07)</td>
</tr>
<tr>
<td>p93120601</td>
<td>B931108002</td>
<td>Killing and restarting nfsd causes memory address align panic.</td>
</tr>
<tr>
<td>p93120901</td>
<td>B931209001</td>
<td>FDDI Deaf Receiver problem, incorrect Driver Stats, and related problems</td>
</tr>
<tr>
<td></td>
<td>B931205001</td>
<td></td>
</tr>
<tr>
<td>p93121601</td>
<td>NONE</td>
<td>Prevent ARP entries from running off the end of the arp table.</td>
</tr>
<tr>
<td>p93122301</td>
<td>B931021001</td>
<td>sendmail jumbo patch with security fixes (equivalent to Sun patch 100377-08. It replace)</td>
</tr>
<tr>
<td>p94010701</td>
<td>B930813002</td>
<td>Fix FDDI related DVMA map corruption</td>
</tr>
<tr>
<td></td>
<td>B931116003</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B931217001</td>
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</tr>
</tbody>
</table>
SunOS 4.1.2 patches in Solbourne OS/MP 4.1C

<table>
<thead>
<tr>
<th>Patch#</th>
<th>Bug#</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>100075-08</td>
<td>1040406</td>
<td>KLM protocol changed but RPC versn # wasn’t</td>
</tr>
<tr>
<td>100075-08</td>
<td>1046373</td>
<td>shared or exclusive lock doesn’t work on 412</td>
</tr>
<tr>
<td>100075-08</td>
<td>1063692</td>
<td>deadlock is not detected in nfs locking</td>
</tr>
<tr>
<td>100075-08</td>
<td>1064183</td>
<td>downgrading a lock doesn’t grant other read</td>
</tr>
<tr>
<td>100075-08</td>
<td>1071435</td>
<td>panic: corrupt file lock list</td>
</tr>
<tr>
<td>100075-08</td>
<td>1074757</td>
<td>rpc.lockd in 4.1.2 grows to few MB (leak)</td>
</tr>
<tr>
<td>100075-08</td>
<td>1077402</td>
<td>file can get left locked by exited process</td>
</tr>
<tr>
<td>100075-08</td>
<td>1080359</td>
<td>Read lock gets stuck in the kernel lock</td>
</tr>
<tr>
<td>100188-C2</td>
<td>1070495</td>
<td>pgms using pty can get output from prev ap</td>
</tr>
<tr>
<td>100224-03</td>
<td>1051832</td>
<td>rmail dumps core on certain (unknown) errs</td>
</tr>
<tr>
<td>100274-02</td>
<td>1044478</td>
<td>dup biodone related panics w ... 4.1.1</td>
</tr>
<tr>
<td>100371-01</td>
<td>1044726</td>
<td>showfh timeouts before accessing nfs fh</td>
</tr>
<tr>
<td>100381-01</td>
<td>1068938</td>
<td>du does not work with VMS(NFS) filesystem</td>
</tr>
<tr>
<td>100384-01</td>
<td>1063432</td>
<td>tip to RFS mounted serial port causes pan</td>
</tr>
<tr>
<td>100399-01</td>
<td>1066556</td>
<td>csh malloc mem leak results in Mem Fault</td>
</tr>
<tr>
<td>100401-02</td>
<td>1069046</td>
<td>cron dumps core on what appears to be corre</td>
</tr>
<tr>
<td>100408-01</td>
<td>1047916</td>
<td>keypad() misinterprets function keys when</td>
</tr>
<tr>
<td>100408-01</td>
<td>1070312</td>
<td>terms ins/del line and scroll region cap</td>
</tr>
<tr>
<td>100425-01</td>
<td>1055736</td>
<td>whois is getting host unknown when it uses</td>
</tr>
<tr>
<td>100431-04</td>
<td>1063683</td>
<td>back facing hollow polygon inconsistent w</td>
</tr>
<tr>
<td>100431-04</td>
<td>1068120</td>
<td>Undrawing antialiased lines in QUM mode ha</td>
</tr>
<tr>
<td>100431-04</td>
<td>107137</td>
<td>Back-faced QUADS are slow on GT when FACE</td>
</tr>
<tr>
<td>100431-04</td>
<td>1073181</td>
<td>Performance degrades for polygons follow</td>
</tr>
<tr>
<td>100431-04</td>
<td>1074981</td>
<td>color sometimes incorrect for clipped, dep</td>
</tr>
<tr>
<td>100431-04</td>
<td>1080766</td>
<td>Non-dot markers are slow</td>
</tr>
<tr>
<td>100431-04</td>
<td>1086669</td>
<td>Performance problem - short triangle</td>
</tr>
<tr>
<td>100453-01</td>
<td>1073672</td>
<td>Increase 1.5MB DVMA window avail to GT</td>
</tr>
<tr>
<td>100456-03</td>
<td>1075220</td>
<td>mcldup doesn’t block interrupts causing mbuf</td>
</tr>
<tr>
<td>100469-01</td>
<td>1039388</td>
<td>cdrom mount error message</td>
</tr>
<tr>
<td>100474-01</td>
<td>1074337</td>
<td>format: ass failure on 1.3G elites on sun4</td>
</tr>
<tr>
<td>100475-01</td>
<td>1073234</td>
<td>mmap sys call fails on galaxy causing unex</td>
</tr>
<tr>
<td>100484-01</td>
<td>1078167</td>
<td>SCSI driver for micropolis drive produces</td>
</tr>
<tr>
<td>100490-01</td>
<td>1080928</td>
<td>nl_langinfof(YESSTR) of libxpg.a caused co</td>
</tr>
<tr>
<td>100494-01</td>
<td>1074704</td>
<td>WIDs are freed when cg12 contexts are dest</td>
</tr>
<tr>
<td>100494-01</td>
<td>1074822</td>
<td>munmap’ing ctl register page clobbers shme</td>
</tr>
<tr>
<td>100495-01</td>
<td>1074424</td>
<td>sybase datasrvr crashes 4m (ER) - xc_atten</td>
</tr>
<tr>
<td>100505-01</td>
<td>1078521</td>
<td>Zero length directories can be left when</td>
</tr>
<tr>
<td>100507-01</td>
<td>1038651</td>
<td>Using tmpfs ie ram /tmp can cause data ini</td>
</tr>
<tr>
<td>100511-01</td>
<td>1082046</td>
<td>SunDiag cg6test failed on seg violation</td>
</tr>
<tr>
<td>100516-01</td>
<td>1077539</td>
<td>increase HEAPBYTES</td>
</tr>
<tr>
<td>100520-01</td>
<td>1031907</td>
<td>cron dies when daylight time starts, stop</td>
</tr>
<tr>
<td>100521-01</td>
<td>1080702</td>
<td>4/75GT crash when executing screenload ...</td>
</tr>
<tr>
<td>100534-01</td>
<td>1083022</td>
<td>nettest dies w Seg Violation on 4.1.2FCS</td>
</tr>
<tr>
<td>100536-01</td>
<td>1066287</td>
<td>nfs hang when looking at lg file changed on</td>
</tr>
<tr>
<td>100537-01</td>
<td>1069770</td>
<td>swapper hangs waiting fr pg of u-area to co</td>
</tr>
<tr>
<td>100537-01</td>
<td>1073679</td>
<td>async i/o peaks can hang system (gen)</td>
</tr>
<tr>
<td>Patch#</td>
<td>Bug#</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-----------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>100539-01</td>
<td>1085014</td>
<td>umount of busy hsfs fs succeeds causing pa</td>
</tr>
<tr>
<td>100542-03</td>
<td>1063059</td>
<td>ipi driver doesn’t return err</td>
</tr>
<tr>
<td>100542-03</td>
<td>1077801</td>
<td>galaxy with cg6+presto crashes on ipi</td>
</tr>
<tr>
<td>100547-01</td>
<td>1079876</td>
<td>fputest kvm_open failed</td>
</tr>
<tr>
<td>100569-01</td>
<td>1072183</td>
<td>gtest takes too lng to rpt Firmware fail</td>
</tr>
<tr>
<td>100569-01</td>
<td>1083997</td>
<td>mouse freezes running OW3.0 apps on GT</td>
</tr>
<tr>
<td>100570-01</td>
<td>1085043</td>
<td>net jammed&quot; messages annoy the user</td>
</tr>
<tr>
<td>100575-02</td>
<td>1080798</td>
<td>IPI runs slower on a 4/670 then a 4/470</td>
</tr>
<tr>
<td>100591-01</td>
<td>1089381</td>
<td>nimp_ins trap trashes %g[123] on MP systems</td>
</tr>
<tr>
<td>100597-01</td>
<td>1075751</td>
<td>VME dropped INT_ACK cycle</td>
</tr>
<tr>
<td>100618-01</td>
<td>1074668</td>
<td>kernel panics when running sunvision 1.1</td>
</tr>
<tr>
<td>100636-01</td>
<td>1082229</td>
<td>fork creates duplicate PIDs</td>
</tr>
<tr>
<td>100642-01</td>
<td>1089250</td>
<td>TLI hangs running on Sun-MP 4/690 running 4.1.2</td>
</tr>
<tr>
<td>100654-01</td>
<td>1090369</td>
<td>It takes a long time to terminate a big process.</td>
</tr>
</tbody>
</table>
SunOS 4.1.3 patches in Solbourne OS/MP 4.1C

<table>
<thead>
<tr>
<th>Patch#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>100075-11</td>
<td>rpc.lockd jumbo patch</td>
</tr>
<tr>
<td>100170-10</td>
<td>jumbo patch to fix various ld problems</td>
</tr>
<tr>
<td>100173-10</td>
<td>NFS Jumbo Patch</td>
</tr>
<tr>
<td>100178-08</td>
<td>inetd &quot;broken server detection&quot; breaks on fast machines</td>
</tr>
<tr>
<td>100224-06</td>
<td>program &quot;mail&quot; &quot;rmail&quot; problem in delivering mail; mail signal handlers cause recursing buss errors</td>
</tr>
<tr>
<td>100249-08</td>
<td>automounter jumbo patch</td>
</tr>
<tr>
<td>100283-03</td>
<td>in.routed mishandles gateways, multiple</td>
</tr>
<tr>
<td>100296-04</td>
<td>netgroup exports to world</td>
</tr>
<tr>
<td>100305-13</td>
<td>lpr Jumbo Patch</td>
</tr>
<tr>
<td>100338-05</td>
<td>system crashes with assertion failed panic</td>
</tr>
<tr>
<td>100342-03</td>
<td>NFS client needs long recovery time if server reboots</td>
</tr>
<tr>
<td>100347-03</td>
<td>panic’s when using fifo’s (named pipes) under load</td>
</tr>
<tr>
<td>100359-06</td>
<td>streams jumbo patch</td>
</tr>
<tr>
<td>100372-02</td>
<td>tfs and c2 do not work together</td>
</tr>
<tr>
<td>100383-06</td>
<td>rdist security and hard links enhancement</td>
</tr>
<tr>
<td>100407-07</td>
<td>accounting jumbo patch</td>
</tr>
<tr>
<td>100412-02</td>
<td>applications bind to same port if IP address supplied</td>
</tr>
<tr>
<td>100458-03</td>
<td>Setitimer sometimes fails to deliver</td>
</tr>
<tr>
<td>100468-03</td>
<td>rcp/rsh should use setsockopt to detect failed connection rsh uses old-style selects instead of 4.0 selects.</td>
</tr>
<tr>
<td>100482-04</td>
<td>ypserv and ypxfrd fix, plus DNS fix</td>
</tr>
<tr>
<td>100496-02</td>
<td>ptrace panic with a memory fault</td>
</tr>
<tr>
<td>100507-04</td>
<td>tmpfs jumbo patch</td>
</tr>
<tr>
<td>100513-02</td>
<td>Jumbo tty patch</td>
</tr>
<tr>
<td>100557-03</td>
<td>ftp Jumbo patch</td>
</tr>
<tr>
<td>100564-05</td>
<td>C2 Jumbo patch</td>
</tr>
<tr>
<td>100567-04</td>
<td>mfree panic due to mbuf being freed twice, icmp redirects can be used to make a host drop connections</td>
</tr>
<tr>
<td>100584-03</td>
<td>system freezes using loopback interface, BSD4.2 keepalive</td>
</tr>
<tr>
<td>100623-03</td>
<td>UFS Jumbo Patch</td>
</tr>
<tr>
<td>100631-01</td>
<td>environment variables can be used to exploit login</td>
</tr>
<tr>
<td>100645-01</td>
<td>swapon with very large swap files hangs, systems temporarily hangs while a large process exits</td>
</tr>
<tr>
<td>100650-02</td>
<td>permission denied”</td>
</tr>
<tr>
<td>100666-02</td>
<td>bad rmfree</td>
</tr>
<tr>
<td>100671-02</td>
<td>TLI causes application program to hang, and TLI subsystem does not handle certain IOCTL calls.</td>
</tr>
<tr>
<td>100684-02</td>
<td>RFS server patch</td>
</tr>
<tr>
<td>100689-01</td>
<td>large processes hang in “disk wait” when they’re trying to grow their data size with brk(2)</td>
</tr>
<tr>
<td>100783-01</td>
<td>ptrace panic with a memory fault</td>
</tr>
<tr>
<td>100804-01</td>
<td>TCP “reset”’s can cause an mbuf leak, resulting in mbuf map full</td>
</tr>
<tr>
<td>100813-01</td>
<td>memory leak in parser generated by yacc</td>
</tr>
<tr>
<td>100815-01</td>
<td>point patch for uucp with callback option</td>
</tr>
<tr>
<td>100909-01</td>
<td>syslog messages get confusing because it does not specify which machine sent it.</td>
</tr>
<tr>
<td>100937-01</td>
<td>NULL CLIENT</td>
</tr>
<tr>
<td>100965-01</td>
<td>quota exceeded console messages misleading</td>
</tr>
<tr>
<td>100972-01</td>
<td>“at” jobs are not running; job files are being over-written.</td>
</tr>
<tr>
<td>100988-01</td>
<td>Synopsis: UFS File system Corruption and panic patch</td>
</tr>
<tr>
<td>101070-01</td>
<td>tbl may dump core on sun-4; ok on sun-3.</td>
</tr>
<tr>
<td>101073-01</td>
<td>vacation(1) does not recognize aliases of the type firstname.lastname.</td>
</tr>
<tr>
<td>101080-01</td>
<td>security problem with exprsave</td>
</tr>
</tbody>
</table>
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
```
Installing OS/MP 4.1C on a Standalone System

***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:

```bash
# 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 [-I] [-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/mntab`, 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 -I 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/sbin/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:

```plaintext
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:

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

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

```plaintext
ROM> boot st.si(),TapeID,3
```
Installing OS/MP 4.1C on a Standalone System

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'..'?')?

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

What type of terminal are you using ('1'..'?')? 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:

<table>
<thead>
<tr>
<th>Ramdisk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Change Disk Partitioning</td>
</tr>
<tr>
<td>2) Install Software</td>
</tr>
<tr>
<td>3) Invoke a Bourne Shell</td>
</tr>
<tr>
<td>4) Reboot System</td>
</tr>
<tr>
<td>5) Halt System</td>
</tr>
</tbody>
</table>

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**

<table>
<thead>
<tr>
<th>Character</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>backspace</td>
<td>delete last input character</td>
</tr>
<tr>
<td>delete (^?)</td>
<td>delete last input character</td>
</tr>
<tr>
<td>^U</td>
<td>erase input line</td>
</tr>
<tr>
<td>^R</td>
<td>redisplay input line</td>
</tr>
<tr>
<td>^W</td>
<td>delete input up to ‘/’ or whitespace</td>
</tr>
<tr>
<td>^C</td>
<td>cancel input, returning to nearest menu</td>
</tr>
<tr>
<td>ESC</td>
<td>cancel input, returning to nearest menu</td>
</tr>
<tr>
<td>^L</td>
<td>redisplay entire screen</td>
</tr>
<tr>
<td>return (^M)</td>
<td>end input</td>
</tr>
<tr>
<td>newline (^J)</td>
<td>end input</td>
</tr>
</tbody>
</table>

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 /dev/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.
Installing OS/MP 4.1C on a Standalone System

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.

The new arrangement is displayed as shown in Figure 2.

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

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

<table>
<thead>
<tr>
<th>(a)</th>
<th>(b)</th>
<th>(c)</th>
<th>(d)</th>
<th>(e)</th>
<th>(f)</th>
<th>(g)</th>
<th>(h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>sd0</td>
<td>8.4</td>
<td>32.4</td>
<td>191.1</td>
<td>9.3</td>
<td>---</td>
<td>---</td>
<td>141.1</td>
</tr>
<tr>
<td>sd1</td>
<td>8.4</td>
<td>32.7</td>
<td>190.9</td>
<td>9.6</td>
<td>---</td>
<td>---</td>
<td>140.8</td>
</tr>
</tbody>
</table>

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
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.

<table>
<thead>
<tr>
<th>Installation Media Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Installation media type = CD-ROM</td>
</tr>
<tr>
<td>2) CD drive = /dev/sr0</td>
</tr>
<tr>
<td>3) Local Internet address = 0.0.0.0 (required for remote tape)</td>
</tr>
<tr>
<td>4) Network broadcast mask = 0xffff0000 (required for remote tape)</td>
</tr>
<tr>
<td>5) CD host = localhost (127.0.0.1)</td>
</tr>
</tbody>
</table>

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

![Figure 4. Installation Media Identification Menu - Local CD-ROM](image)

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 Menu](image)

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 'r' for help: 1

Should the Solbourne OS/MP 4.1C Optional Software package be installed ('yes', 'no', '^C', or 'r' 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.

<table>
<thead>
<tr>
<th>Module</th>
<th>Size(KB)</th>
<th>Software Modules</th>
<th>Directory</th>
<th>Free(KB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) DEBUGGING</td>
<td>2888</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>2) GAMES</td>
<td>3136</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>3) MANUAL</td>
<td>6992</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>4) NETWORKING</td>
<td>1096</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>5) PLOT</td>
<td>1784</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>6) SECURITY</td>
<td>320</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>7) SV_PROG</td>
<td>1848</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>8) SV_USER</td>
<td>3144</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>9) SYSTEM_V</td>
<td>3992</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>10) TEXT</td>
<td>728</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>11) VERSATEC</td>
<td>5960</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>12) UUCP</td>
<td>608</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>13) RFS</td>
<td>912</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>14) SHLIB</td>
<td>3376</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>15) TLI</td>
<td>48</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
</tbody>
</table>

Enter number of module to modify ('1'..'15'), 'continue', 'abort', or 'r' 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 `svdiid(7v)`, `svdiidi(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
Figure 7. Package Selection Menu - Deletion of Versatec Module

The GAMES menu entry is highlighted, and

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

<table>
<thead>
<tr>
<th>Module</th>
<th>Size (KB)</th>
<th>Install</th>
<th>Directory</th>
<th>Free (KB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) DEBUGGING</td>
<td>2888</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>2) GAMES</td>
<td>3136</td>
<td>y</td>
<td>/fun</td>
<td>4579</td>
</tr>
<tr>
<td>3) MANUAL</td>
<td>6992</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>4) NETWORKING</td>
<td>1096</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>5) PLOT</td>
<td>1784</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>6) SECURITY</td>
<td>320</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>7) SV_PROG</td>
<td>1868</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>8) SV_USER</td>
<td>3144</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>9) SYSTEM_V</td>
<td>3992</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>10) TEXT</td>
<td>728</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>11) VERSATEC</td>
<td>5960</td>
<td>n</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12) UUCP</td>
<td>608</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>13) RFS</td>
<td>912</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>14) SHLIB</td>
<td>1376</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>15) TLI</td>
<td>48</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Package Name</th>
<th>Size (KB)</th>
<th>Install</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Solbourne OS/MP 4.1C Optional Software</td>
<td>34832</td>
<td>y</td>
</tr>
</tbody>
</table>

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
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...
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

<table>
<thead>
<tr>
<th>Time Zone</th>
<th>Offset</th>
<th>City</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia/GMT+11</td>
<td>GMT-3</td>
<td></td>
<td>Middle East/GMT5</td>
</tr>
<tr>
<td>Brazil/GMT+12</td>
<td>GMT-4</td>
<td></td>
<td>New Zealand/GMT6</td>
</tr>
<tr>
<td>CET</td>
<td>GMT+13</td>
<td></td>
<td>Navajo/GMT7</td>
</tr>
<tr>
<td>CST/EDT</td>
<td>GMT+2</td>
<td></td>
<td>PRC/GMT8</td>
</tr>
<tr>
<td>Canada/GMT+3</td>
<td>GMT-5</td>
<td></td>
<td>ROK/GMT9</td>
</tr>
<tr>
<td>Chile/GMT+4</td>
<td>GMT-6</td>
<td></td>
<td>Singapore/GMT10</td>
</tr>
<tr>
<td>Cuba/GMT+5</td>
<td>GMT-8</td>
<td></td>
<td>Rostock/GMT11</td>
</tr>
<tr>
<td>EST</td>
<td>GMT+6</td>
<td></td>
<td>Japan/GMT12</td>
</tr>
<tr>
<td>EST</td>
<td>GMT+7</td>
<td></td>
<td>Libya/GMT13</td>
</tr>
<tr>
<td>EST/EDT</td>
<td>GMT+8</td>
<td></td>
<td>Universal/GMT14</td>
</tr>
<tr>
<td>Egypt</td>
<td>GMT+9</td>
<td></td>
<td>UTC/GMT15</td>
</tr>
<tr>
<td>Factory</td>
<td>GMT-0</td>
<td></td>
<td>UTC/GMT16</td>
</tr>
<tr>
<td>GB-Eire</td>
<td>GMT-1</td>
<td></td>
<td>UTC/GMT17</td>
</tr>
<tr>
<td>GMT</td>
<td>GMT-10</td>
<td></td>
<td>Universal/GMT18</td>
</tr>
<tr>
<td>GMT+0</td>
<td>GMT-11</td>
<td></td>
<td>W-SU/GMT19</td>
</tr>
<tr>
<td>GMT+1</td>
<td>GMT-12</td>
<td></td>
<td>WET/GMT20</td>
</tr>
<tr>
<td>GMT+10</td>
<td>GMT-2</td>
<td></td>
<td>Zulu/GMT21</td>
</tr>
</tbody>
</table>

(‘/’ 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 = 0.0.0.0
- 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 el0 to 255.255.255.0
Tue 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 [...]

---

*Note: The text above is a transcript of the actual content on the page, including any visible formatting and data.*
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 straightforward, 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.
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

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

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.

```
Figure 12. Sample Standard Filesystem Definition Menu

To modify the /var filesystem, enter the number 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.

---

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.
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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-
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:

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

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

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
Installing OS/MP 4.1C on a Standalone System

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, libcurves, libm, libtermcap, libtermlib, libsuntool, and libsunwindow.

**GAMES - games and demonstration programs**
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:
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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'..'15'), '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.
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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.

<table>
<thead>
<tr>
<th>Module</th>
<th>Size(KB)</th>
<th>Software Modules</th>
<th>Directory</th>
<th>Free(KB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) DEBUGGING</td>
<td>2868</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>2) GAMES</td>
<td>3136</td>
<td>y</td>
<td>/fun</td>
<td>4579</td>
</tr>
<tr>
<td>3) MANUAL</td>
<td>6992</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>4) NETWORKING</td>
<td>1096</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>5) PLOT</td>
<td>1784</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>6) SECURITY</td>
<td>320</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>7) SV_PROG</td>
<td>1848</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>8) SV_USER</td>
<td>3144</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>9) SYSTEM_V</td>
<td>3992</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>10) TEXT</td>
<td>728</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>11) VERSATEC</td>
<td>5960</td>
<td>n</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12) UUCP</td>
<td>608</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>13) RFS</td>
<td>912</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>14) SHLIB</td>
<td>1376</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>15) TLI</td>
<td>48</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
</tbody>
</table>

Enter number of module to modify ('1'..'15'), 'continue', 'abort', or '?' for help.
Installing OS/MP 4.1C on a Standalone System 103

Package Selection
Mandatory Software Will Be Installed

<table>
<thead>
<tr>
<th>Package Name</th>
<th>Size (KB)</th>
<th>Install</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Solbourne OS/MP 4.1C Optional Software</td>
<td>34832</td>
<td>y</td>
</tr>
</tbody>
</table>

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

---

Figure 20. Package Selection Menu

Randisk

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 shown in Figure 22.

Figure 22. Reboot System Menu

Enter number of function to execute ('1'..'3' 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.s1(0,0,0)/vmunix

Entry: 0xff050000
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...
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:

<table>
<thead>
<tr>
<th>Country</th>
<th>Time Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>GMT+11</td>
</tr>
<tr>
<td>Brazil</td>
<td>GMT+12</td>
</tr>
<tr>
<td>CET</td>
<td>GMT+13</td>
</tr>
<tr>
<td>CST/CDT</td>
<td>GMT+2</td>
</tr>
<tr>
<td>Canada</td>
<td>GMT+3</td>
</tr>
<tr>
<td>Chile</td>
<td>GMT+4</td>
</tr>
<tr>
<td>Cuba</td>
<td>GMT+5</td>
</tr>
<tr>
<td>EET</td>
<td>GMT+6</td>
</tr>
<tr>
<td>EST</td>
<td>GMT+7</td>
</tr>
<tr>
<td>EST/EDT</td>
<td>GMT+8</td>
</tr>
<tr>
<td>Egypt</td>
<td>GMT+9</td>
</tr>
<tr>
<td>Factory</td>
<td>GMT+10</td>
</tr>
<tr>
<td>GB-Eire</td>
<td>GMT+11</td>
</tr>
<tr>
<td>GMT</td>
<td>GMT+12</td>
</tr>
<tr>
<td>GMT+0</td>
<td>GMT+13</td>
</tr>
<tr>
<td>GMT+1</td>
<td>GMT+14</td>
</tr>
<tr>
<td>GMT+10</td>
<td>GMT+15</td>
</tr>
</tbody>
</table>

('/' 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:

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host name</td>
<td>standalone</td>
</tr>
<tr>
<td>Internet address</td>
<td>0.0.0.0</td>
</tr>
<tr>
<td>Network mask</td>
<td>0x0000000000</td>
</tr>
<tr>
<td>NIS domain</td>
<td>Rodent.COM</td>
</tr>
<tr>
<td>Savecore directory</td>
<td>/var/crash/standalone</td>
</tr>
<tr>
<td>Time zone</td>
<td>US/Mountain</td>
</tr>
<tr>
<td>Date (m/d/y)</td>
<td>2/1/1994</td>
</tr>
<tr>
<td>Time</td>
<td>16:55</td>
</tr>
</tbody>
</table>

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

yes

Setting netmask of eth0 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
```
Installing OS/MP 4.1C on a Standalone using reinstall_sys

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 by name, one per line. By using the -l option, the output is in long form (as from the -Is 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**

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

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 sda0a, swap is on sda0b, and the /usr filesystem is on sda0g. 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 sdb2a, the /usr filesystem to sdb2g, and the /var filesystem to sdb2d (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.
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.

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:

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.
Installing OS/MP 4.1C on a Standalone using reinst.sys

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.
Installing OS/MPE 4.1C on a Standalone using reinsys

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

A single package, OS/MPE 4.1C Full-Install Optional Software, is included on the OS/MPE 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 file systems 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:

The Should the OS/MPE 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.
### Package Selection

<table>
<thead>
<tr>
<th>Package Name</th>
<th>Size (KB)</th>
<th>Install</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) OS/MP 4.1C Full-Install Optional Software</td>
<td>34832</td>
<td>n</td>
</tr>
</tbody>
</table>

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

---

*****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, libcurcuses, 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.
Installing OS/MP 4.1C on a Standalone using reinst_sys

Customization of Solbourne OS/MP 4.1C Optional Software

<table>
<thead>
<tr>
<th>Module</th>
<th>Size(KB)</th>
<th>Software Modules</th>
<th>Install</th>
<th>Directory</th>
<th>Free(KB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) DEBUGGING</td>
<td>2688</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
<td></td>
</tr>
<tr>
<td>2) GAMES</td>
<td>3136</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
<td></td>
</tr>
<tr>
<td>3) MANUAL</td>
<td>7440</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
<td></td>
</tr>
<tr>
<td>4) NETWORKING</td>
<td>1072</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
<td></td>
</tr>
<tr>
<td>5) PLOT</td>
<td>1784</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
<td></td>
</tr>
<tr>
<td>6) SECURITY</td>
<td>312</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
<td></td>
</tr>
<tr>
<td>7) SV_PROG</td>
<td>1848</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
<td></td>
</tr>
<tr>
<td>8) SV_USER</td>
<td>2320</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
<td></td>
</tr>
<tr>
<td>9) SYSTEM_V</td>
<td>4032</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
<td></td>
</tr>
<tr>
<td>10) TEXT</td>
<td>720</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
<td></td>
</tr>
<tr>
<td>11) VERSATEC</td>
<td>5960</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
<td></td>
</tr>
<tr>
<td>12) UUCP</td>
<td>608</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
<td></td>
</tr>
<tr>
<td>13) RFS</td>
<td>912</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
<td></td>
</tr>
<tr>
<td>14) SHLIB</td>
<td>1376</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
<td></td>
</tr>
<tr>
<td>15) TLI</td>
<td>48</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
<td></td>
</tr>
</tbody>
</table>

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.
Installing OS/MP 4.1C on a Standalone using reinst_sys

Customization of Solbourne OS/MP 4.1C Optional Software

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

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.
Installing OS/MP 4.1C on a Standalone using reinst_sys

Customization of Solbourne OS/MP 4.1C Optional Software

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

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
Installing OS/MP 4.1C on a Standalone using reinst_sys

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.
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 xPF -
```

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 xPF -
```

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/mntab`, 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 `-Is` 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/bin/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.

  ```
  0:0:8:e: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: 0x10e0000+0x56af8+0xad40
```

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
```

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.

<table>
<thead>
<tr>
<th>System</th>
<th>Value of X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series5 and 5E</td>
<td>2</td>
</tr>
<tr>
<td>Series6</td>
<td>3</td>
</tr>
</tbody>
</table>

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> boot 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.

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

**☆☆☆ 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
Installing OS/MP 4.1C on a Server 135

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:

```bash
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:

```bash
diskhost # ps ax | 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.

```bash
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>
<thead>
<tr>
<th>System</th>
<th>Value of X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series5 and 5E</td>
<td>5</td>
</tr>
<tr>
<td>Series 6</td>
<td>6</td>
</tr>
</tbody>
</table>

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+0x56af8+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:

<table>
<thead>
<tr>
<th>Ramdisk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Change Disk Partitioning</td>
</tr>
<tr>
<td>2) Install Software</td>
</tr>
<tr>
<td>3) Invoke a Bourne Shell</td>
</tr>
<tr>
<td>4) Reboot System</td>
</tr>
<tr>
<td>5) Halt System</td>
</tr>
<tr>
<td>Enter number of function to execute (‘1’...’5’, or ‘?’ for help):</td>
</tr>
</tbody>
</table>

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

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

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:

```
# ^J stty 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.
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

<table>
<thead>
<tr>
<th>Disk Partitions (sizes in MB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
</tr>
<tr>
<td>sd0:</td>
</tr>
<tr>
<td>sd1:</td>
</tr>
</tbody>
</table>

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 = 0xffffffff (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 local-host. 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
Figure 36. Installation Media Identification Menu - Remote Tapehost

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 = 0xffffffff (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 37. Installation Media Identification Menu - Local 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 = 0xffffffff (required for remote tape)
5) CD host = localhost (127.0.0.1)

Enter selection number ('1'..'5'), 'continue', 'previous', 'cancel', or '?' for help:
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 /etc/hosts 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 its Internet address.

For a remote CD-ROM install, the nethost must have /cdrom in its /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.

<table>
<thead>
<tr>
<th>Package Name</th>
<th>Size(KB)</th>
<th>Install</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Solbourne OS/MP 4.1C Optional Software</td>
<td>34832</td>
<td>n</td>
</tr>
</tbody>
</table>

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'..'15'), '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.

<table>
<thead>
<tr>
<th>Module</th>
<th>Size(KB)</th>
<th>Software Modules</th>
<th>Directory</th>
<th>Free(KB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEBUGGING</td>
<td>2888</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>GAMES</td>
<td>3136</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>MANUAL</td>
<td>6992</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>NETWORKING</td>
<td>1096</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>PLOT</td>
<td>1784</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>SECURITY</td>
<td>320</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>SV_PROG</td>
<td>1848</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>SV_USER</td>
<td>3144</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>SYSTEM_V</td>
<td>3992</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>TEXT</td>
<td>728</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>VERSATEC</td>
<td>5960</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>UUCP</td>
<td>606</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>RFS</td>
<td>912</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>SLLIB</td>
<td>1376</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>TLI</td>
<td>48</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
</tbody>
</table>

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
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

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

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**

<table>
<thead>
<tr>
<th>Package Name</th>
<th>Size(KB)</th>
<th>Install</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Solbourne OS/MP 4.1C Optional Software</td>
<td>34032</td>
<td>y</td>
</tr>
</tbody>
</table>

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 (\texttt{root(/), /usr, or /var or /tmp}, as well as any new filesystems requested via the partition tool)

3. install mandatory \texttt{root} files

4. install mandatory \texttt{kvm} files

5. install mandatory \texttt{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.

![Figure 44. Ramdisk Menu](image-url)
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 Menu](image)

Figure 45. Reboot System Menu

Enter number of function to execute ('1'..'3', 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...
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 = 0xffffffff)? <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:

<table>
<thead>
<tr>
<th>Country</th>
<th>Zone</th>
<th>Time Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>GMT+11</td>
<td>GMT-3</td>
</tr>
<tr>
<td>Brazil</td>
<td>GMT+12</td>
<td>GMT-4</td>
</tr>
<tr>
<td>CET</td>
<td>GMT+13</td>
<td>GMT-5</td>
</tr>
<tr>
<td>CST (CDT)</td>
<td>GMT+2</td>
<td>GMT-6</td>
</tr>
<tr>
<td>Canada</td>
<td>GMT-3</td>
<td>GMT-7</td>
</tr>
<tr>
<td>Chile</td>
<td>GMT+4</td>
<td>GMT-8</td>
</tr>
<tr>
<td>Cuba</td>
<td>GMT+5</td>
<td>GMT-9</td>
</tr>
<tr>
<td>EST</td>
<td>GMT+6</td>
<td>GMT0</td>
</tr>
<tr>
<td>EST (EST)</td>
<td>GMT+7</td>
<td>GMT1</td>
</tr>
<tr>
<td>EST (EDT)</td>
<td>GMT+8</td>
<td>GMT10</td>
</tr>
<tr>
<td>Egypt</td>
<td>GMT+9</td>
<td>GMT11</td>
</tr>
<tr>
<td>Factory</td>
<td>GMT+10</td>
<td>GMT12</td>
</tr>
<tr>
<td>GB-Eire</td>
<td>GMT-1</td>
<td>GMT13</td>
</tr>
<tr>
<td>GMT</td>
<td>GMT-10</td>
<td>GMT2</td>
</tr>
<tr>
<td>GMT+0</td>
<td>GMT-11</td>
<td>GMT3</td>
</tr>
<tr>
<td>GMT+1</td>
<td>GMT-12</td>
<td>GMT4</td>
</tr>
<tr>
<td>GMT+10</td>
<td>GMT-2</td>
<td>GMT5</td>
</tr>
</tbody>
</table>

('/' 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 = 0xffffffff00
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 e10 to 255.255.255.0
Tue 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 [...]

Installing OS/MP 4.1C on a Server 155
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 straightforward, 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:

\begin{verbatim}
tftp dgram udp wait root /usr/etc/in.tftpd in.tftpd -s /tftpboot
\end{verbatim}

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:

\begin{verbatim}
tapehost # ps ax | egrep inetd
249 ? I 0:01 inetd
541 p3 R 0:00 egrep inetd
\end{verbatim}

The pid of inetd is the first number on the line that doesn’t contain egrep. In the above output, pid is 249.

\begin{verbatim}
tapehost # kill -HUP pid
\end{verbatim}

\textbf{***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.

\begin{verbatim}
tapehost # cd /var/tmp

tapehost # mt -f /dev/nrst0 asf 4

tapehost # dd if=/dev/nrst0 of=install bs=512
\end{verbatim}
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: 0xe000+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 | grep inetd
249 ? I 0:01 inetd
541 pts R 0:00 grep inetd
```

The pid of inetd is the first number on the line that doesn't contain grep. 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:

<table>
<thead>
<tr>
<th>Ramdisk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Change Disk Partitioning</td>
</tr>
<tr>
<td>2) Install Software</td>
</tr>
<tr>
<td>3) Invoke a Bourne Shell</td>
</tr>
<tr>
<td>4) Reboot System</td>
</tr>
<tr>
<td>5) Halt System</td>
</tr>
<tr>
<td>Enter number of function to execute ('1', '5', or '?' for help):</td>
</tr>
</tbody>
</table>

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**

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

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.
Installing OS/MP 4.1C on a Server

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)

<table>
<thead>
<tr>
<th>(a)</th>
<th>(b)</th>
<th>(c)</th>
<th>(d)</th>
<th>(e)</th>
<th>(f)</th>
<th>(g)</th>
<th>(h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>sd0:</td>
<td>8.4</td>
<td>32.4</td>
<td>191.1</td>
<td>9.3</td>
<td>---</td>
<td>---</td>
<td>141.1</td>
</tr>
<tr>
<td>sd1:</td>
<td>8.4</td>
<td>32.7</td>
<td>190.9</td>
<td>9.6</td>
<td>---</td>
<td>---</td>
<td>140.8</td>
</tr>
</tbody>
</table>

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.
Installing OS/MP 4.1C on a Server

Figure 47. Modified Standard Filesystem Definition Menu

<table>
<thead>
<tr>
<th></th>
<th>root on sd0a</th>
<th>swap on sd0b</th>
<th>/usr on sd0g</th>
<th>/var on sd0d</th>
<th>/tmp on root partition</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>8.4</td>
<td>32.4</td>
<td>191.1</td>
<td>9.3</td>
<td>141.1</td>
</tr>
<tr>
<td>(b)</td>
<td>8.4</td>
<td>32.7</td>
<td>190.9</td>
<td>9.6</td>
<td>140.8</td>
</tr>
</tbody>
</table>

Disk Partitions (sizes in MB)

Enter number of filesystem to change (‘1’..‘5’), ‘continue’, ‘previous’, ‘cancel’, or ‘?’ for help.

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.
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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/nrstl
3) Local Internet address = 192.9.3.4 (required for remote tape)
4) Network broadcast mask = 0xffffffff (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 = 0xffffffff (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
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 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 /etc/hosts 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 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 Menu](image)

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’..‘15’), ‘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.

<table>
<thead>
<tr>
<th>Module</th>
<th>Size(KB)</th>
<th>Software Modules</th>
<th>Directory</th>
<th>Free(KB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) DEBUGGING</td>
<td>2888</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>2) GAMES</td>
<td>3136</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>3) MANUAL</td>
<td>6992</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>4) NETWORKING</td>
<td>1096</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>5) PLOT</td>
<td>1784</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>6) SECURITY</td>
<td>320</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>7) SV_PROG</td>
<td>1648</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>8) SV_USER</td>
<td>3144</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>9) SYSTEM_V</td>
<td>3992</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>10) TEXT</td>
<td>728</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>11) VERSATEC</td>
<td>5960</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>12) UUCP</td>
<td>608</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>13) RFS</td>
<td>912</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>14) SHLIB</td>
<td>1376</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
<tr>
<td>15) TLI</td>
<td>48</td>
<td>y</td>
<td>/usr</td>
<td>58695</td>
</tr>
</tbody>
</table>

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 `shellt(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 `svdidii(7v)`, `svdidiii(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
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

<table>
<thead>
<tr>
<th>Module</th>
<th>Size(KB)</th>
<th>Install</th>
<th>Directory</th>
<th>Free(KB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEBUGGING</td>
<td>2868</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>GAMES</td>
<td>3136</td>
<td>y</td>
<td>/fun</td>
<td>4579</td>
</tr>
<tr>
<td>MANUAL</td>
<td>6992</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>NETWORKING</td>
<td>1096</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>PLOT</td>
<td>1784</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>SECURITY</td>
<td>320</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>SV_PROG</td>
<td>1848</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>SV_USER</td>
<td>3144</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>SYSTEM_V</td>
<td>3992</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>TEXT</td>
<td>728</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>VERSATEC</td>
<td>5960</td>
<td>n</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UUCP</td>
<td>608</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>NFS</td>
<td>912</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>SHLIB</td>
<td>1376</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
<tr>
<td>TLI</td>
<td>48</td>
<td>y</td>
<td>/usr</td>
<td>67791</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Package Name</th>
<th>Size(KB)</th>
<th>Install</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Solbourne OS/MP 4.1C Optional Software</td>
<td>34832</td>
<td>y</td>
</tr>
</tbody>
</table>

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(1), /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.
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: 0x6000+0x3358+0x81548

OS/MP 4.1C_Export (GENERIC/root) #0: Tue Feb 1 15:52:44 1994
Copyright (c) 1989-1994 Sun Microsystems, Inc. and
Solabourne 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...
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 = 0xffffffff00)? <Return>

What is the NIS domain name (‘none’ for none, default = ‘none’)? Rodant.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 PST/PDT
Chile/ GMT+4 GMT-8 HST Poland
Cuba GMT+5 GMT-9 Hong Kong ROC
EST GMT+6 GMT0 Iceland ROK
EST GMT+7 GMT1 Iran Singapore
EST/EDT GMT+8 GMT10 Israel Turkey
Egypt GMT+9 GMT11 Jamaica UCT
Factory GMT+9 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 MST/MDT 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 = Ox00000000
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 e10 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 straightforward, 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:

```
habitral 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 its `/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.

```bash
remotehost# mkdir /cdrom
remotehost# mount /dev/sr0 /cdrom
```

```bash
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
```

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 cannot 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 xpf -
```

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'.
Installing OS/MP 4.1C on a server using reinst_sys 191

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 xBf -
```

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

**preinstall** is normally used just before installing 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/mntab`, the `/var/sadm` accounting files, the `/tmp_mnt` automounter directories, and patched kernel object files in
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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 -Is 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/sbin/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 xpf -
```
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:

```bash
# 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 xpf -
```

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>
<thead>
<tr>
<th>Character</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>backspace (\H)</td>
<td>delete last input character</td>
</tr>
<tr>
<td>delete (?)</td>
<td>delete last input character</td>
</tr>
<tr>
<td>^U</td>
<td>erase input line</td>
</tr>
<tr>
<td>^R</td>
<td>redisplay input line</td>
</tr>
<tr>
<td>^W</td>
<td>delete input up to ‘/’ or whitespace</td>
</tr>
<tr>
<td>^C</td>
<td>cancel input, returning to nearest menu</td>
</tr>
<tr>
<td>ESC</td>
<td>cancel input, returning to nearest menu</td>
</tr>
<tr>
<td>^L</td>
<td>redisplay entire screen</td>
</tr>
<tr>
<td>return (^M)</td>
<td>end input</td>
</tr>
<tr>
<td>newline (^J)</td>
<td>end input</td>
</tr>
</tbody>
</table>

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 re-defined 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.
Installing OS/MP 4.1C on a server using reins_sys

Figure 58. Sample Standard Filesystem Definition Menu

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

Disk Partitions (sizes in MB) (available highlighted)

<table>
<thead>
<tr>
<th>(a)</th>
<th>(b)</th>
<th>(c)</th>
<th>(d)</th>
<th>(e)</th>
<th>(f)</th>
<th>(g)</th>
<th>(h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>sd0</td>
<td>8.4</td>
<td>32.4</td>
<td>191.1</td>
<td>9.3</td>
<td>---</td>
<td>---</td>
<td>141.1</td>
</tr>
<tr>
<td>sd2</td>
<td>8.6</td>
<td>32.9</td>
<td>484.9</td>
<td>9.5</td>
<td>---</td>
<td>---</td>
<td>433.5</td>
</tr>
</tbody>
</table>

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

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](image)

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.
Installing OS/MP 4.1C on a server using reinst_sys

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.

---

**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 = 0xffffffff00 (required for remote tape)
5) Tape host = localhost (127.0.0.1)

Enter selection number (‘1’..‘5’), ‘continue’, ‘previous’, ‘cancel’, or ‘?’ for help:
Installing OS/MP 4.1C on a server using reinst_sys

Figure 61. Installation Media Identification Menu - Remote Tapehost

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 = 0xffffffff (required for remote tape)  
5) Tape host = rootbeer (192.9.3.1)

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

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.
Installing OS/MP 4.1C on a server using reinst_sys

Figure 62. Installation Media Identification Menu - Local CD-ROM

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

| 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 = 0xffffffff00 (required for remote install) |
| 5) CD host = localhost (127.0.0.1) |

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 its /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.
Installing OS/MP 4.1C on a server using reinsys

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:

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.
Installing OS/MP 4.1C on a server using reins_sys

Figure 64. Package Selection Menu

<table>
<thead>
<tr>
<th>Package Name</th>
<th>Size (KB)</th>
<th>Install</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) OS/MP 4.1C Full-Install Optional Software</td>
<td>34832</td>
<td>n</td>
</tr>
</tbody>
</table>

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

★★★★ 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`, `libcur`es, `libm`, `libtermcap`, `libtermlib`, `l`ibsun`tool`, and `libsun`window.

**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.
Installing OS/MP 4.1C on a server using reinst_sys

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.

**VERSEATEC - 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.
Installing OS/MP 4.1C on a server using reinst_sys

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

Enter number of module to modify ('1'..'15'), '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

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.
Installing OS/MP 4.1C on a server using reinst_sys

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.
Figure 68. Package Selection Menu

<table>
<thead>
<tr>
<th>Package Name</th>
<th>Size (KB)</th>
<th>Install</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) OS/MP 4.1C Full-Install Optional Software</td>
<td>34832</td>
<td>y</td>
</tr>
</tbody>
</table>

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

Figure 69. Update ROM Variable

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)?
Installing OS/MP 4.1C on a server using reinst_sys

★★★ 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 server using reinst_sys
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:

```bash
# 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` file. Install **preinstall** using the following commands:

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

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 'jsf 5' instead of 'rew'.*

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

```bash
# 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 **preinstall** using the following commands:

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

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 -Is 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/sbin/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 SE 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+0x56af8+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>
<thead>
<tr>
<th>System</th>
<th>Value of X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series5 and 5e</td>
<td>2</td>
</tr>
<tr>
<td>Series6</td>
<td>3</td>
</tr>
</tbody>
</table>
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: > boot tftp.eli(/,hostname)/var/tmp/install
```

In the example above, the variable `hostname` 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>
<thead>
<tr>
<th>System</th>
<th>Value of X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series5 and 5E</td>
<td>5</td>
</tr>
<tr>
<td>Series6</td>
<td>6</td>
</tr>
</tbody>
</table>

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.sif(/,6)/Install.SeriesX
```
The bootROM copies the ramdisk image into memory and boots it:

<table>
<thead>
<tr>
<th>Boot:</th>
<th>sd.si(/6)/Install.SeriesX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry:</td>
<td>0xff060000</td>
</tr>
<tr>
<td>Size:</td>
<td>0x160000+0x748e8+0x660c8</td>
</tr>
</tbody>
</table>

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.tftp 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.

<table>
<thead>
<tr>
<th>System</th>
<th>Value of X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series 5 and 5E</td>
<td>5</td>
</tr>
<tr>
<td>Series 6</td>
<td>6</td>
</tr>
</tbody>
</table>

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+0x56af8+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:

<table>
<thead>
<tr>
<th>Ramdisk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Change Disk Partitioning</td>
</tr>
<tr>
<td>2) Install Software</td>
</tr>
<tr>
<td>3) Invoke a Bourne Shell</td>
</tr>
<tr>
<td>4) Reboot System</td>
</tr>
<tr>
<td>5) Halt System</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Character</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>backspace (^H)</td>
<td>delete last input character</td>
</tr>
<tr>
<td>delete (^?)</td>
<td>delete last input character</td>
</tr>
<tr>
<td>^U</td>
<td>erase input line</td>
</tr>
<tr>
<td>^R</td>
<td>redisplay input line</td>
</tr>
<tr>
<td>^W</td>
<td>delete input up to ‘/’ or whitespace</td>
</tr>
<tr>
<td>^C</td>
<td>cancel input, returning to nearest menu</td>
</tr>
<tr>
<td>ESC</td>
<td>cancel input, returning to nearest menu</td>
</tr>
<tr>
<td>^L</td>
<td>redisplay entire screen</td>
</tr>
<tr>
<td>return (^M)</td>
<td>end input</td>
</tr>
<tr>
<td>newline (^J)</td>
<td>end input</td>
</tr>
</tbody>
</table>

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](image)

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.
Once all changes for the standard filesystems have been made, enter **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:

**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.ef0` 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.
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 **local-host**. 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**.
Installing OS/MP 4.1C on a Dataless Client

Installing OSIMP 4.1C on a Dataless Client

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 = 0xffffffff (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 = 0xffffffff (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 'Ox' is necessary if entering the mask as a hexadecimal number. A leading 'O' 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 its Internet address.

For a remote CD-ROM install, the nethost must have /cdrom in its /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:
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 77. Ramdisk Menu

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

Enter selection number (‘1’..‘3’) or ‘?’ for help: 1

Figure 78. Reboot System Menu
After selecting 1, there is a short pause, and then:

```
ROM> boot
Boot: sd.sl(0,0,0)/vmunix
Entry: 0xff060000
Size: 0x160000+0x748e8+0x660c8
```

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
```

Next, determine the process ID of `inetd(8)`:

```
tapehost# ps ax | grep inetd
249 ?  I 0:01 inetd
541 p3 R 0:00 grep inetd
```

The `pid` of `inetd` is the first number on the line that doesn’t contain `grep`. 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...
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 = 0xffffffff)? <Return>

What is the NIS domain name ('none' for none, default = 'none')? Rodent.COM<Return>

What directory should be used for automatic savescore 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 GMT5 Mideast/
Brazil/ GMT+12 GMT-4 GMT7 NZ
CET GMT+13 GMT-5 GMT9 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
EST 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 e10 to 255.255.255.0
Tue 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 ini-
tial 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 ap-
propriate file manually, or reconfigure. Manually correcting the settings should
only be done if you are an experienced system administrator. Reconfiguring auto-
matically 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 /tftboost
```

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 /tftboot 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: 0x0000+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:

<table>
<thead>
<tr>
<th>Ramdisk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Change Disk Partitioning</td>
</tr>
<tr>
<td>2) Install Software</td>
</tr>
<tr>
<td>3) Invoke a Bourne Shell</td>
</tr>
<tr>
<td>4) Reboot System</td>
</tr>
<tr>
<td>5) Halt System</td>
</tr>
</tbody>
</table>

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**

<table>
<thead>
<tr>
<th>Character</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>backspace</td>
<td>delete last input character</td>
</tr>
<tr>
<td>delete</td>
<td>delete last input character</td>
</tr>
<tr>
<td>^U</td>
<td>erase input line</td>
</tr>
<tr>
<td>^R</td>
<td>redisplay input line</td>
</tr>
<tr>
<td>^W</td>
<td>delete input up to ‘/’ or whitespace</td>
</tr>
<tr>
<td>^C</td>
<td>cancel input, returning to nearest menu</td>
</tr>
<tr>
<td>ESC</td>
<td>cancel input, returning to nearest menu</td>
</tr>
<tr>
<td>^L</td>
<td>redisplay entire screen</td>
</tr>
<tr>
<td>return</td>
<td>end input</td>
</tr>
<tr>
<td>newline</td>
<td>end input</td>
</tr>
</tbody>
</table>

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:

```bash
# ^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(1), swap and /usr filesystems. These filesystems must be defined; however, they may be placed on any partition of any disk.

![Figure 79. Sample Standard Filesystem Definition Menu for Dataless Clients](image)

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.
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 therefore, 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.
Installing OS/MP 4.1C on a Dataless Client

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 'local-host'. The Installation media type must also be set to 'Tape'.

Installing from a remote tape drive requires that all the fields be set:
Installing OS/MP 4.1C on a Dataless Client

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.
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
```
Figure 86. Ramdisk Menu

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 87. Reboot System Menu

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

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.
[...]
```

**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...
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 = 0xffffffff00)? <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
- Brazil/ GMT+12
- CET GMT+13
- CST6CDT GMT+2
- Canada/ GMT+3
- Chile/ GMT+4
- Cuba GMT+5
- EET GMT+6
- EST GMT+7
- EST5EDT GMT+8
- Egypt GMT+9
- Factory GMT-0
- GB-Eire GMT-1
- GMT GMT-10
- GMT+0
- GMT+1
- GMT+10

GMT-3 GMT7 GMT8 GMT9 GMT-6 GMT-7 Greenwich PRC
GMT6 Mideast/ NZ Navajo
GMT-4 GMT8 Navajo
GMT-5 GMT9 PRC
GMT7 NZ
GMT8 Navajo
GMT9 PRC
GMT10 ROK
GMT11 Iceland
GMT12 Hongkong
GMT13 Libya
GMT14 Singapore

('/' 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 = 0xffffffff
- 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 e10 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 zpc 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 straightforward, 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 Dataless Client
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 vari-
ables set, in order to boot from a server by default. The following tables list vari-
ables that must be set on a Solbourne client.

**Table 27. Variables that must be set on a Solbourne Series 5, 5E or 6 Client**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sample Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEFAULTROOT</td>
<td>`tftp.ei(„hostnumber)</td>
</tr>
<tr>
<td>DEFAULTBOOT</td>
<td>`/export/root/clientname/vmunix</td>
</tr>
<tr>
<td>DEFAULTSWAP</td>
<td>`/export/swap/clientname/swap.clientname</td>
</tr>
<tr>
<td>DIAGBOOT</td>
<td>`/export/exec/Series5/kvm/stand/dg for a Series5 client</td>
</tr>
<tr>
<td></td>
<td>`/export/exec/Series6/kvm/stand/dg for a Series6 client</td>
</tr>
<tr>
<td>DIAGSERVER</td>
<td>`tftp.ei(„hostnumber)</td>
</tr>
<tr>
<td>CONSOLE</td>
<td>`bw(), cg(), zs(), or fb()</td>
</tr>
</tbody>
</table>
Table 28. Variables that must be set on a Solbourne Series S4000 Client

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sample Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEFAULTROOT</td>
<td>tftp.ei('hostnumber)</td>
</tr>
<tr>
<td>DEFAULTBOOT</td>
<td>/clients/root/clientname/vmunix</td>
</tr>
<tr>
<td>DEFAULTSWAP</td>
<td>/clients/swap/clientname/swap.clientname</td>
</tr>
<tr>
<td>DIAGBOOT</td>
<td>/clients/exec/S4000/kvm/stand/dg</td>
</tr>
<tr>
<td>DIAGSERVER</td>
<td>tftp.ei('hostnumber)</td>
</tr>
<tr>
<td>INPUT-DEVICE</td>
<td>keyboard, ttya, or ttyb</td>
</tr>
<tr>
<td>OUTPUT-DEVICES</td>
<td>screen, ttya, or ttyb</td>
</tr>
</tbody>
</table>

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 `inetc(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...
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'):
```
```
```

What is its Internet address (0 for none, default = 192.9.3.4)? <Return>

What is the network broadcast mask (default = 0xffffffff)? <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.
Installing OS/MP 4.1C on a Diskless Client 261

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
CST/CDT GMT+2 GMT-6 GMT9 PRC
Canada/ GMT+3 GMT-7 Greenwich PST/PDT
Chile/ GMT+4 GMT-8 HST Poland
Cuba GMT+5 GMT-9 Hongkong ROC
CET GMT+6 GMT0 Iceland ROK
EST GMT+7 GMT1 Iran Singapore
EST5/EDT GMT+8 GMT10 Israel Turkey
Egypt GMT+9 GMT11 Jamaica UTC
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 MST/MDT 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 = 0xfffff00
NTS 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 e10 to 255.255.255.0
Tue 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 straightforward, 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:

```
hatrail 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**

<table>
<thead>
<tr>
<th>Partition</th>
<th>Filesystem</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>/</td>
</tr>
<tr>
<td>b</td>
<td>swap</td>
</tr>
<tr>
<td>d</td>
<td>/var</td>
</tr>
<tr>
<td>g</td>
<td>/usr</td>
</tr>
</tbody>
</table>

★★★ 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 Menu](image)

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. To 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.
For example, if you have two SCSI drives, you may choose either \texttt{sd0} or \texttt{sd1} as your \texttt{DEFAULTROOT} device. The \texttt{root(1)} file system may be on any partition on the boot disk. See section on page 25 for setting \texttt{DEFAULTROOT}. The installation tools and the supplied "\texttt{GENERIC}" kernels require that the \texttt{root} and \texttt{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**

<table>
<thead>
<tr>
<th>Partition Use</th>
<th>IPI Disks</th>
<th>1.2 Gbytes 512 byte sectors</th>
<th>3.0 Gbytes 512 byte sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sectors</td>
<td>Size (Mbytes)</td>
<td>Sectors</td>
</tr>
<tr>
<td>a</td>
<td>/</td>
<td>18522</td>
<td>9</td>
</tr>
<tr>
<td>b</td>
<td>swap</td>
<td>65856</td>
<td>32</td>
</tr>
<tr>
<td>c</td>
<td>all</td>
<td>1679328</td>
<td>820</td>
</tr>
<tr>
<td>d</td>
<td>/var</td>
<td>20580</td>
<td>10</td>
</tr>
<tr>
<td>g</td>
<td>/usr</td>
<td>1574370</td>
<td>768</td>
</tr>
<tr>
<td>h</td>
<td>unmounted</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Table 31. Example SCSI Disk Partitions**

<table>
<thead>
<tr>
<th>Partition Use</th>
<th>SCSI Disks (sd0)</th>
<th>327 Mbytes</th>
<th>661 Mbytes</th>
<th>200 Mbytes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sectors</td>
<td>Size (Mbytes)</td>
<td>Sectors</td>
<td>Size (Mbytes)</td>
</tr>
<tr>
<td>a</td>
<td>/</td>
<td>16800</td>
<td>8</td>
<td>16695</td>
</tr>
<tr>
<td>b</td>
<td>swap</td>
<td>66150</td>
<td>32</td>
<td>66780</td>
</tr>
<tr>
<td>c</td>
<td>all</td>
<td>639450</td>
<td>312</td>
<td>1292670</td>
</tr>
<tr>
<td>d</td>
<td>/var</td>
<td>19425</td>
<td>9</td>
<td>19080</td>
</tr>
<tr>
<td>g</td>
<td>/usr</td>
<td>537075</td>
<td>262</td>
<td>1190115</td>
</tr>
</tbody>
</table>
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 partic­
ular 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 percen­
tage 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] [-tx] [-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(2) ("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 vadvice(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.

- `tx` 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(3)`).
- `SIZE` The combined size of the data and stack segments (in kilobytes)
- `SZ` 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
- SLOCK 00000200 process being swapped out
- SSWAP 00000400 save area flag
- STRC 00000800 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

Solbourne Computer, Inc.  6 March 1991
/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), vadvice(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 also 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 an 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 user 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 disabbling 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/rxxnp

SEE ALSO
dkio(4S), sd(4S), xd(4S)
NAME
iostat - report I/O statistics

SYNOPSIS
iostat [-cdDltv] [-I 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 -I 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 -ppid
/usr/etc/oncpu -ppid cpu_set
/usr/etc/oncpu -apid
/usr/etc/oncpu -npid
/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 hexadecimal (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 run 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 -ppid
    Display the current cpu_set and affinity for process pid.

oncpu -ppid cpu_set
    Restrict process pid to run on the CPUs specified in cpu_set.

oncpu -apid
    Enable dynamic affinity for process pid.

oncpu -npid
    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 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 mdddhhmm[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 -Is option to find), showing the type, date, and size of each file.

OPTIONS
The following options are accepted by preinstall:

- I  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 path name 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 mdddhhmm[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 pgp 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:

<table>
<thead>
<tr>
<th>LOC</th>
<th>The memory address of this table entry.</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>Run state encoded thus:</td>
</tr>
<tr>
<td></td>
<td>0  no process</td>
</tr>
<tr>
<td></td>
<td>1  awaiting an event</td>
</tr>
<tr>
<td></td>
<td>2  (abandoned state)</td>
</tr>
<tr>
<td></td>
<td>3  runnable</td>
</tr>
<tr>
<td></td>
<td>4  being created</td>
</tr>
<tr>
<td></td>
<td>5  being terminated</td>
</tr>
<tr>
<td></td>
<td>6  stopped (by signal or under trace)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>F</th>
<th>Miscellaneous state variables, ORed together (hexadecimal):</th>
</tr>
</thead>
<tbody>
<tr>
<td>00000001</td>
<td>loaded</td>
</tr>
<tr>
<td>00000002</td>
<td>a system process (scheduler or page-out daemon)</td>
</tr>
<tr>
<td>00000004</td>
<td>locked for swap out</td>
</tr>
<tr>
<td>00000008</td>
<td>swapped out during process creation</td>
</tr>
<tr>
<td>00000100</td>
<td>process is being traced</td>
</tr>
<tr>
<td>00000200</td>
<td>tracing parent has been told that process is stopped</td>
</tr>
<tr>
<td>00000400</td>
<td>user settable lock in memory</td>
</tr>
<tr>
<td>00000800</td>
<td>in page-wait</td>
</tr>
<tr>
<td>00001000</td>
<td>prevented from swapping during <code>fork(2)</code></td>
</tr>
<tr>
<td>00002000</td>
<td>will restore old mask after taking signal</td>
</tr>
<tr>
<td>00004000</td>
<td>exiting</td>
</tr>
<tr>
<td>00008000</td>
<td>doing physical I/O</td>
</tr>
<tr>
<td>00010000</td>
<td>process resulted from a <code>vfork(2)</code> which is not yet complete</td>
</tr>
<tr>
<td>00020000</td>
<td>another flag for <code>vfork(2)</code></td>
</tr>
<tr>
<td>00040000</td>
<td>process has no virtual memory, as it is a parent in the context of <code>vfork(2)</code></td>
</tr>
<tr>
<td>00080000</td>
<td>process is demand paging pages from its executable image vnode</td>
</tr>
<tr>
<td>00100000</td>
<td>process has advised of sequential VM behavior with <code>vadvise(2)</code></td>
</tr>
<tr>
<td>00200000</td>
<td>process has advised of random VM behavior with <code>vadvise(2)</code></td>
</tr>
<tr>
<td>00800000</td>
<td>process is a session process group leader</td>
</tr>
<tr>
<td>01000000</td>
<td>process is tracing another process</td>
</tr>
<tr>
<td>02000000</td>
<td>process needs a profiling tick</td>
</tr>
<tr>
<td>04000000</td>
<td>process is scanning descriptors during select</td>
</tr>
<tr>
<td>40000000</td>
<td>process has done record locks</td>
</tr>
</tbody>
</table>
8000000 process is having its system calls traced.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRI</td>
<td>Scheduling priority, see getpriority(2).</td>
</tr>
<tr>
<td>SIG</td>
<td>Signals received (signals 1-32 coded in bits 0-31).</td>
</tr>
<tr>
<td>UID</td>
<td>Real user ID.</td>
</tr>
<tr>
<td>SLP</td>
<td>Amount of time process has been blocked.</td>
</tr>
<tr>
<td>TIM</td>
<td>Time resident in seconds; times over 127 coded as 127.</td>
</tr>
<tr>
<td>CPU</td>
<td>Weighted integral of CPU time, for scheduler.</td>
</tr>
<tr>
<td>NI</td>
<td>Nice level, see getpriority(2).</td>
</tr>
<tr>
<td>PGRP</td>
<td>Process number of root of process group.</td>
</tr>
<tr>
<td>PID</td>
<td>The process ID number.</td>
</tr>
<tr>
<td>PPID</td>
<td>The process ID of parent process.</td>
</tr>
<tr>
<td>RSS</td>
<td>Resident set size — the number of physical page frames allocated to this process.</td>
</tr>
<tr>
<td>SRSS</td>
<td>RSS at last swap (0 if never swapped).</td>
</tr>
<tr>
<td>SIZE</td>
<td>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.</td>
</tr>
<tr>
<td>WCHAN</td>
<td>Wait channel number of a waiting process.</td>
</tr>
<tr>
<td>LINK</td>
<td>Link pointer in list of runnable processes.</td>
</tr>
<tr>
<td>PAM</td>
<td>Current process affinity bitmask.</td>
</tr>
<tr>
<td>SPAM</td>
<td>Saved process affinity bitmask.</td>
</tr>
<tr>
<td>ROTOR</td>
<td>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.</td>
</tr>
</tbody>
</table>

-S Print the streams table with these headings:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOC</td>
<td>The memory address of this table entry.</td>
</tr>
<tr>
<td>WRQ</td>
<td>The address of this stream's write queue.</td>
</tr>
<tr>
<td>VNODE</td>
<td>The address of this stream's vnode.</td>
</tr>
<tr>
<td>DEVICE</td>
<td>Major and minor device number of device to which this stream refers.</td>
</tr>
<tr>
<td>PGRP</td>
<td>This stream's process group number.</td>
</tr>
<tr>
<td>SIGIO</td>
<td>The process id or process group that has this stream open().</td>
</tr>
<tr>
<td>FLG</td>
<td>Miscellaneous stream state variables encoded thus:</td>
</tr>
<tr>
<td></td>
<td>I waiting for ioctl() to finish</td>
</tr>
<tr>
<td></td>
<td>R read/recvmsg is blocked</td>
</tr>
<tr>
<td></td>
<td>W write/putmsg is blocked</td>
</tr>
<tr>
<td></td>
<td>P priority message is at stream head</td>
</tr>
<tr>
<td></td>
<td>H device has been “hung up” (M_HANGUP)</td>
</tr>
<tr>
<td></td>
<td>O waiting for open to finish</td>
</tr>
<tr>
<td></td>
<td>M stream is linked under multiplexor</td>
</tr>
<tr>
<td></td>
<td>D stream is in message-discard mode</td>
</tr>
<tr>
<td></td>
<td>N stream is in message-nondiscard mode</td>
</tr>
<tr>
<td></td>
<td>E fatal error has occurred (M_ERROR)</td>
</tr>
<tr>
<td></td>
<td>T waiting for queue to drain when closing</td>
</tr>
<tr>
<td></td>
<td>2 waiting for previous ioctl() to finish before starting new one</td>
</tr>
<tr>
<td></td>
<td>3 waiting for acknowledgment for ioctl()</td>
</tr>
<tr>
<td></td>
<td>B stream is in non-blocking mode</td>
</tr>
<tr>
<td></td>
<td>A stream is in asynchronous mode</td>
</tr>
<tr>
<td></td>
<td>o stream uses old-style no-delay mode</td>
</tr>
<tr>
<td></td>
<td>S stream has had TOSTOP set</td>
</tr>
</tbody>
</table>
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.

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 [-fisP] [ 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 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 reclaim — 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.
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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. Auto vectored 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 proces­
or rather than the normal CPU statistics.

FILES
/dev/kmem
/vmunix

BUGS
If more than one auto vectored 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 ‘?’.