Pascal 3.2 SRM/UX and MC68040 Supplement

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Printing History

New editions of this manual will incorporate all material updated since the previous edition. The manual printing date and part number indicate its current edition. The printing date changes when a new edition is printed. (Minor corrections which are incorporated at reprint do not cause the date to change.) The manual part number changes when extensive technical changes are incorporated.

February 1991 ... Edition 1. This edition includes information about MC68040 support and SRM/UX support provided by the 3.24 version of the Pascal Workstation.

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Introduction

Pascal 3.24 is a minor upgrade of the Pascal Language System software for the Series 200 and 300 systems. The primary objectives of this release are to add support for the 25 Mhz MC68040 based Series 300 Workstations, and add support for the HP-UX SRM/UX server.

This release of the Pascal 3.24 Workstation is supplied on either of the following media:

- Seventeen single-sided 5.25 inch discs (HP product number 98617A Opt 42)
- Seventeen single-sided 3.5 inch discs (HP product number 98617A Opt 44)
- Nine double-sided 3.5 inch discs (HP product number 98617A Opt 45)

Note that the manual set for the Pascal 3.2 Workstation has not changed. This supplement enhances the existing manual set by explaining changes and enhancements resulting from the 3.24 release of the Pascal Workstation.

Overview of Chapters

This section provides an overview of the chapters covered in this supplement.

Table 1-1.

Chapter	Description	Page
1	This chapter provides an overview of the chapters found in this supplement and conventions that are used.	1-1
2	This chapter covers SRM/UX support.	2-1
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4	This chapter provides a system history for the Pascal 3.2 Workstation.	4-1

Conventions

`CASE`

In a syntax statement, commands and keywords are shown in either uppercase or lowercase characters. The characters must be entered exactly as shown. For example:

```
writeln
```

cannot be entered as any of the following:

```
Writeln    WriteLn    write_ln
```

italics

In a syntax statement or an example, a word in italics represents a parameter or argument that you must replace with an actual value. In the following example, you must replace *filename* with the name of the file and *variable* with the name of a variable:

```
read (filename, variable);
```

Italics font is also used to emphasize a *word* or *words*.

punctuation

In a syntax statement, punctuation characters must be entered exactly as shown. In the following example, the colon must be entered:

```
BOOT:SYSTEM_P
```

2

SRM/UX Support

This chapter is not meant to be a replacement for the SRM/UX server documentation. For a full explanation of SRM/UX capabilities and limitations, read the *SRM/UX: System Administrator's and User's Guide* (HP Part No. E2085-90000). This chapter is meant to get you started using the Pascal Language System with an SRM/UX server, and to provide troubleshooting tips for using the Pascal System with the SRM/UX server. The primary focus will be one *client* with one *server*. A *client* is a node that does not have a local file system as its file system resides on the *server*. The *server* is a node with a local file system, and it is capable of supporting other workstations as clients.

Who Should Read This Chapter?

Table 2-1.

If you ...	Action to be taken ...
Are not interested in SRM/UX	Skip this chapter
Do not have SRM or SRM/UX	If you desire information about SRM/UX, read the section "The SRM/UX Server."
Do have SRM	If you desire information about SRM/UX, read the section "The SRM/UX Server."
Do have SRM but you do not use it	If you desire information about SRM/UX, read the section "The SRM/UX Server."
Do have SRM/UX	Read this chapter

The SRM/UX Server

SRM/UX is a server process running on HP-UX together with a collection of control files that emulate the Shared Resource Manager (SRM). The SRM/UX system physically consists of a Series 300 or Series 800 workstation running HP-UX that is connected to one or more Pascal clients by way of a LAN cable or an SRM cable.

SRM/UX allows the sharing of files between an HP-UX system and a Pascal Language System. A portion of the HP-UX file system is brought on line by running an appropriately modified **TABLE** program. This portion of the HP-UX file system appears like an SRM volume to the the Pascal client.

An SRM system can be replaced with an SRM/UX system by replacing the existing SRM server with an HP-UX SRM/UX server. Note that an existing SRM server is not upgradable to an SRM/UX server.

Why Run Pascal from an SRM/UX Server

The following are advantages of using SRM/UX:

- Easy transfer of and sharing of files between HP-UX and Pascal Language systems.
- Peripheral sharing through a central server computer.
- Software compatibility with most existing SRM applications.

What SRM/UX Is and Is Not

The following list describes those features that SRM/UX provides and those features that it does not provide.

- SRM/UX provides:
  - A mapping of SRM services onto an HP-UX system.
  - A way of networking Pascal Language Systems to a standard centralized server.
- SRM/UX does not provide:
  - A 100% emulation of SRM under HP-UX.
  - A way of running the Pascal Language System under HP-UX, or the reverse.
  - A service that can be hosted on any arbitrary UNIX™ implementation.

Prerequisites

System Administrator

Since SRM/UX runs on an HP-UX server, a part of SRM/UX administration will involve maintaining the underlying HP-UX system. This often requires a full time system administrator. This person may be responsible for maintaining the SRM/UX system as well, but this is not a requirement.

Proper use of the SRM/UX system requires a dedicated SRM/UX system administrator with good knowledge of HP-UX and who has the authority to do system administration tasks, such as changing or updating system files, re-building the system kernel, etc.

Hardware Requirements and Limitations

As previously stated, SRM/UX may operate over a LAN cable or an SRM cable. The actual capabilities of SRM/UX depend on the boot ROM present in the computer to be used as the client. On Series 200 computers, the boot ROM revisions are numbered 1 thru 4, and on Series 300 computers, the boot ROM revisions are designated A, A1, B, C, C1, D, and 2.0.

Using an SRM Cable

All Series 300 workstations can boot Pascal from the SRM/UX server over the SRM cable, and all Series 200 workstations with boot ROM versions 3 and 4 can boot Pascal from the SRM/UX server. Early Series 200 machines with boot ROM versions 1 or 2 cannot boot Pascal over the SRM cable, but they can connect to the server over the SRM cable after booting locally.

Using a LAN Cable

All Series 300 workstations with boot ROM version B or later can boot over the LAN cable. Series 200 models 226 and 236 can connect to the SRM/UX server over

the LAN cable after local boot, but they cannot boot from the server over the LAN cable. No other Series 200 models may connect with the server over the LAN cable in any way.

The HP-UX File System, the Control File srmdconf, and Available SRM/UX Volumes

On the server, there is a control file **srmdconf** (**/etc/srmdconf**) that describes to the server process **srmd** (**/etc/srmd**) information about all the Pascal clients and the volumes they may access. Volumes are brought online on the Pascal client by executing a **TABLE** program which contains appropriate calls to the routine **tea_srm**. This is the same way that volumes are brought online on an SRM system.

The control file **srmdconf** contains the following tables:

- VOLUME-TABLE
- LAN-CLIENTS
- SRM-CLIENTS
- SPOOL-ENVIRONMENT
- SPOOL-TABLE

Once your SRM/UX administrator has configured the system, ask him or her to print a copy of **srmdconf**. This file describes all the volumes you can bring online as a Pascal client and provides you with enough information to do it.

The following three sections provide you with samples of the first three tables given in the previous list. Note that you will refer to these tables throughout the remainder of this chapter.

VOLUME-TABLE

```
# Volume Descriptions
#
# Name      Address  Uid   Gid   Temp Directory   Root Directory
#-------------------------------------------------------------------------
 SRMUX_ROOT  :   8   : 17  :   9 :                : /srmserve
 HPUX_ROOT   :   9   :      :     : /tmp          : /
 JOHN        :  10   :      :     : /tmp          : /users/john
 SUSAN       :  10   :      :     : /tmp          : /users/susan
```

LAN-CLIENTS

```
# Clients
#
# Link Address   Internet      Node Snode Name     Uid   Gid  Umask Volume List
#-------------------------------------------------------------------------
 0x80009123456 : 15.2.48.62  :  2 : 0 : Susan   : 213 :  20 : 022 : SRMUX_ROOT,
 HPUX_ROOT,SUSAN # Susan's Workstation
```

Note that each LAN-CLIENTS entry should be all on one line in the srmdconf file.

SRM-CLIENTS

```
# SRM Clients
#
# SRM Device SRMnode   Name       Uid  Gid  Umask  Volume List
#-------------------------------------------------------------------------
 /dev/srm  :   41   :  John     : 212 : 20 : 022 : SRMUX_ROOT,JOHN # John's
 Workstation
```

Note that each SRM-CLIENTS entry should be all on one line in the srmdconf file.

The HP-UX File System

The following diagram should help you see how the VOLUME-TABLE entries from the previous section are positioned in the HP-UX file system.

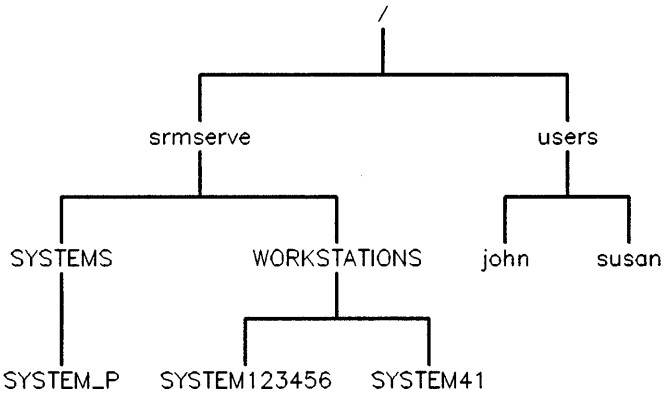

Figure 2-1. HP-UX Directories and SRM/UX Volumes

The previous diagram shows all of the volumes that the user can bring online. Within the **Volume List** column for Susan's workstation, you can see that her workstation can access the volumes **SRMUX_ROOT**, **HPUX_ROOT** and **SUSAN**. John's workstation can access the volumes **SRMUX_ROOT** and **JOHN**. Looking at the the **srmdconf** file for your own system will show you which volumes your workstation may access. This example **srmdconf** file will be referred to later.

Establishing a Boot Environment for Pascal Clients

This section describes the steps required on the client side to get SRM/UX up and running between an HP-UX SRM/UX server and a Pascal Workstation client. This section assumes that all the server side tasks have been completed.

Step 1: Setting Up the Software on the Pascal Workstation Client Side

The key modules on the Pascal client side are described in the following table. This table gives the module name, the file it is located in, and the disc that contains the file.

Table 2-2. Key Modules on the Pascal Client Side

Module Name	File Name	Disc that contains the file
DATA_COMM	DATA_COMM	CONFIG: (for single-sided media) ACCESS: (for double-sided media)
IOMPX	LAN	LIB: (for single-sided media) ACCESS: (for double-sided media)
LANDVR	LAN	LIB: (for single-sided media) ACCESS: (for double-sided media)
SRM	SRM	CONFIG: (for single-sided media) ACCESS: (for double-sided media)

For SRM/UX connectivity over the SRM cable, the modules DATA_COMM and SRM are required. For proper booting over the SRM cable, these modules should be placed in the user's INITLIB file, in the order DATA_COMM followed by SRM.

For SRM/UX connectivity over the LAN cable, the modules IOMPX, LANDVR and SRM are required. For proper booting over the LAN cable these modules need to be placed in the user's INITLIB file in the order IOMPX, LANDVR, and SRM.

Placing the modules DATA_COMM, IOMPX, LANDVR, and SRM in your INITLIB file allows booting over LAN or SRM cable.

The modules normally are inserted into INITLIB using the techniques described in the chapter "Special Configurations" in the manual *Pascal 3.2 Workstations System, Vol. 2*. The file system driver SRM uses either of the device drivers LAN or DATA_COMM, depending on whether the application is communicating via a LAN card (HP 98643A) or SRM card (HP 98629A).

Step 2: Establishing Contact

Contact is established by the Pascal client with the SRM/UX server by using the `tea_srm` call in the `TABLE` program. This same call is used to contact an SRM system. To establish a bootable system on the SRM/UX server, the SRM/UX system must be copied from the Pascal client to the server's file system after local boot of the client.

To establish initial contact between the server and the client, set the select code of your client's workstation SRM or LAN card to 21, and carry out the steps given in the subsequent sections.

Using an SRM Cable

The steps for establishing a connection between an SRM/UX server and its Pascal client are covered below. If you are making this connection with a LAN cable then skip this section and go to the section "Using a LAN Cable."

1. Execute `DATA_COMM` (which loads the `DATA_COMM` module).
2. Execute `SRM` (which loads the `SRM` module).
3. Re-run the `TABLE` program that executed when you first booted.

If the node address of the server's SRM card is set at 0, then the volume corresponding to volume address 8 as described in the `VOLUME-TABLE` should appear at unit `#5` after requesting a volumes listing with the `FILER`. Also, if your `SYSTEM` directory has been set up, it will appear at unit `#45`.

If you carry out the above steps and cannot bring volume 8 on line at unit `#5`, read the subsequent section "Troubleshooting the Connection Between the Server and the Client" before contacting your SRM/UX system administrator.

Once you have successfully completed the steps in this section, you can skip the sections "Using a LAN Cable" and "Troubleshooting the Connection Between the Server and the Client."

Using a LAN Cable

The steps for establishing a connection between an SRM/UX server and its Pascal client are covered below.

1. Execute **LAN** (which loads the **IOMPX** and **LANDVR** modules).
2. Execute **SRM** (which loads the **SRM** module).
3. Re-run the **TABLE** program that executed when you first booted.

If the emulated node address of the the server is set at 0 (you can read this value from the file **srmdconf**) then the volume corresponding to volume address 8 as described in the **VOLUME-TABLE** should appear at unit **#5** after requesting a volumes listing with the **FILER**. Also, if your **SYSTEM** directory has been set up, it will appear at unit **#45**.

If you carry out the above steps and cannot bring volume 8 on line at unit **#5**, read the subsequent section "Troubleshooting the Connection Between the Server and the Client" before contacting your SRM/UX system administrator.

Troubleshooting the Connection Between the Server and the Client

If you did not have any problems with the steps in the sections "Using an SRM Cable" or "Using a LAN Cable" then skip to the next section ("Step 3: Setting Up a Bootable System"). Otherwise, if you had problems carrying out the steps in either of these sections and could not bring volume 8 online at unit #5, you need to make sure the server node address is set at 0. If it is not set at 0, you will need to:

Modify your TABLE program's source file (CTABLE.TEXT) to override the default SRM Device Address Vector values. To do this, edit the file CTABLE.TEXT. Near the end of CTABLE.TEXT you can find the following code :

```
with SRM_dav do
   begin
   { tea_srm(46, sc, ba, du);  {free unless booting from HFS
     hard disc}
     tea_srm(45, sc, ba, du);  {for possible use as the system unit}
   end; {with}
```

Modify the above source code to read as follows:

```
 with SRM_dav do
    begin
      tea_srm(5, SC, M, 8);
    { tea_srm(46, sc, ba, du);  {free unless booting from HFS
      hard disc}
      tea_srm(45, SC, M, du);  {for possible use as the system unit}
    end; {with}
```

Where M is the node setting on the SRM card in the server or the emulated node number of the server if running over the LAN cable, and SC is the select code setting of your client SRM or LAN card. You can now compile CTABLE.TEXT, execute it, and request a volume listing with the FILER. If volume 8 does not come online at unit #5, ask your SRM/UX system administrator for help.

Step 3: Setting Up a Bootable System

Once contact with the server has been established, you may begin copying all the Pascal system files from the floppy discs to your system directory on the server.

Your system directory should be at unit **#45** but you can also reach it by prefixing down from the root (**/**) at unit **#5** to **WORKSTATIONS/SYSTEM***nn* (where *nn* is the node number switch setting for the client SRM cable connection) or **WORKSTATIONS/SYSTEM***nnnnnn* (where *nnnnnn* is the last six digits of the LAN ID number for the client LAN cable connection).

When you have finished copying the Pascal system files to your server and have placed the system boot file and extension boot files in the correct locations, you will have a bootable system on the server.

Step 4: Proper Location of System Files

The file SYSTEM_P needs to be placed in the directory SYSTEMS relative to the root of volume 8 (the root of volume 8 is what appears at unit #5 when you first connected with the server). Also, relative to the root of volume 8, the extension boot files INITLIB, STARTUP, and TABLE need to be placed in either the directory WORKSTATIONS/SYSTEM or a unique directory corresponding to each client name. The unique directory can be WORKSTATIONS/SYSTEM*nn* for an SRM cable connection and WORKSTATIONS/SYSTEM*nnnnnn* for a LAN cable connection. Note that any alphabetic characters in the hexadecimal address must be capitalized in the name of the directory (that is, /WORKSTATIONS/SYSTEM0134E7 works but /WORKSTATIONS/SYSTEM0134e7 does not work).

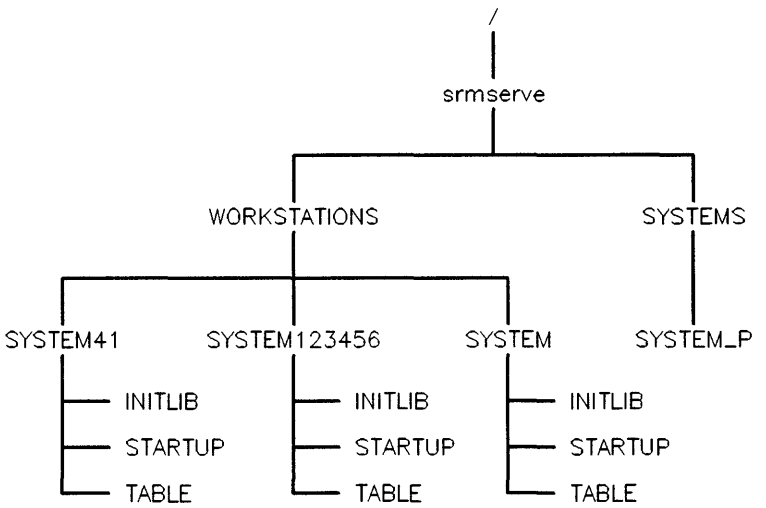

Figure 2-2.
Proper Location of System Files Relative to the Root of Volume 8

If the system is being set up for a large number of Pascal client users, it is better to establish one system directory similar to this:

```
WORKSTATIONS/SYSTEM3.24.
```

Next, the system files can be duplicate linked to each individual client's system directory to save space in the server's host file system. Some files will be unique to each client's system (for example, `TABLE` and `AUTOSTART`) so not all but most of the system files can be shared.

Now if power is cycled on the client workstation and everything is set up correctly on the server, the client boot ROM will display `SYSTEM_P` on the client workstation display as a bootable system. The system may be selected in the usual way and booting will commence. The root of the SRM/UX system should come online at unit `#5`, and unit `#45` should come online prefixed to the client's system directory.

The usual rules for renaming the system boot file (`SYSTEM_P`) and boot extension files (`INITLIB`, `STARTUP` and `TABLE`) apply. For instance, you may rename `SYSTEM_P` to `SYSP324` and rename `INITLIB`, `STARTUP` and `TABLE` to `INITP324`, `STARTP324` and `TABLEP324`, respectively. This can be of value if you add more systems to the server in the future.

Step 5: Using the Default Configurations

TABLE is the configuration program for the Pascal Workstation. It sets up the entries in the Pascal Workstation unit table, usually at boot time. The code file TABLE is on the boot discs that HP ships with the Pascal Workstation, and should be copied to a boot directory on the SRM/UX server. The source for TABLE, called CTABLE.TEXT, is supplied with the Pascal Workstation on the ACCESS: or CONFIG: discs, so that the user can modify the unit table configuration. You may modify your own TABLE program to access any SRM/UX volume that appears in the volume list for your workstation in /etc/srmdconf.

The TABLE program configures the various drivers and devices into the unit table. By default, the TABLE program tries to contact an SRM or SRM/UX server at host node 0 (or emulated host node 0) over a LAN or SRM card set at select code 21 on the client workstation and associate volume 8 of this server with unit #5 in the unit table. Also, the TABLE program will try to assign unit #45 to the directory WORKSTATIONS/SYSTEM*nn*, WORKSTATIONS/SYSTEM*nnnnnn* or WORKSTATIONS/SYSTEM.

For the case where the Pascal client actually boots from the server, unit #5 will be assigned volume 8 on the server even if the server node number and client select code do not match the default values. Also unit #45 will be assigned as above, but only if its associated directory is present. If the correct modules (DATA_COMM and SRM for SRM cable; IOMPX, LANDVR and SRM for LAN cable) are not present in INITLIB when booting, unit #5 and unit #45 will not be connected at all.

Using SRM/UX on a HP 98643A card in the Pascal Workstation does not prevent you from using the card simultaneously for other applications. The HP 98629A card (SRM card) can only be used for SRM or SRM/UX. It is not a general purpose I/O card.

Step 6: Customizing Your Configuration

One can imagine wanting to make several modifications to the above scheme: adding more unit entries with which to talk to one server, being connected to several servers at once, etc. Many of these possibilities are allowed for with SRM/UX.

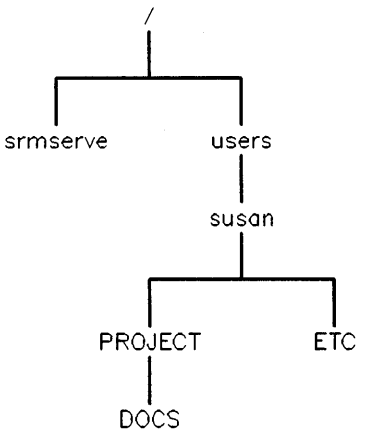

Figure 2-3. SRM/UX Volumes in the HP-UX File System

In the above example, Susan may have a particular directory, say `PROJECT/DOCS` (relative to the volume `SUSAN`) in which she is currently working. She can modify her `TABLE` program to bring the volume `SUSAN:` online at unit `#46`, and then prefix down to the directory `PROJECT/DOCS` with a call to `unit_prefix_successful` in the source for `CTABLE.TEXT`. The following procedure illustrates this.

Near the end of the file CTABLE.TEXT, there is a call to **tea_srm** which passes the number 46. Find this source line and duplicate it as many times as you need extra unit entries. Then modify each entry to assign it an unused unit number. Here is an example:

```
with SRM_dav do
   begin
   { tea_srm(46, sc, ba, du);  {free unless booting from HFS
     hard disc}
     tea_srm(45, sc, ba, du);  {for possible use as the system unit}
   end; {with}
```

You should modify the commented-out line to look like this:

```
tea_srm(46, sc, ba, 10);  {free unless booting from HFS hard disc}
```

This hooks up unit #46 to the volume SUSAN. This mapping (disc unit #10 with the volume SUSAN) is implied by the entry for Susan's workstation in the LAN-CLIENTS portion of the file srmdconf on the server.

You will also need to modify some lines a little farther down in CTABLE.TEXT. The purpose is to prefix the unit down a desired path as the boot-up default. Find the line:

```
{ if not unit_prefix_successful('#46:?') then zap_assigned_unit(46);}
```

and remove the { and the } from the line and replace the ? with the desired default path. For example:

```
if not unit_prefix_successful('#46:/PROJECT/DOCS') then
     zap_assigned_unit(46);
```

This sets up unit #46 pointing to the directory PROJECT/DOCS, relative to the volume SUSAN (/users/susan in the underlying HP-UX file system) unless that path cannot be found, in which case unit #46 will be erased.

The call to unit_prefix_successful is not required, but it allows for more flexibility in setting up

your boot time environment. Without the call to `unit_prefix_successful` in the above example, volume `SUSAN:` would come online at unit `#46`.

When the source is changed satisfactorily, compile CTABLE.TEXT and execute the resulting code file. Use the FILER's Volumes command to check if things went well. Once the unit table set up has been done correctly, you can copy CTABLE.CODE onto your boot disk or into your system directory naming it as needed for your specific boot setup (for example, TABLE, TABLEP324, etc.).

The above scheme may be repeated as many times as you like, to the extent that you do not run out of available unit table entries.

The above example brings online a volume and directory on the same server the client was booting from. The TABLE program may be also used to bring volumes and directories online from other servers provided the client is set up on that server with all the proper entries in **srmdconf** on that server.

Step 7: Accessing Other SRM or SRM/UX Servers

To access other SRM or SRM/UX servers, add or modify lines that call **tea_srm**, setting the **ba** value to the desired server node number or emulated node number (the SRM card node number setting on that server, or if connecting over LAN cable, the emulated node number as seen in **/etc/srmdconf** on the other HP-UX SRM/UX server machine). If the other server (SRM or SRM/UX) has node number 1 or emulated node number 1 for this client, the call:

```
tea_srm(48, sc, 1, 8);  { free unless booting from HFS hard disc }
```

sets up unit 48 to talk to volume 8 on an HP-UX machine whose **srmd** server is acting as SRM host node 1 for this Pascal Workstation client. If connecting over the LAN cable, the relevant part of the **/etc/srmdconf** file on this server might look like this:

```
# ABC's Workstation
0x80009001234 : 33 : 1 : 160 : 27 : 022 : SRM, ABC
```

where the HP 98643A in the Pascal Workstation client has LAN address `0x80009001234`. Note the value 1 in the "server node" field.

If you wish, add a line to call `unit_prefix_successful` (as in the above example). In any case, compile `CTABLE.TEXT` and execute.

Again, once the execution of `CTABLE.CODE` brings all your volumes online, replace your `TABLE` program with `CTABLE.CODE`.

For further information, especially server setup and administration, see the document *SRM/UX: System Administration and User's Guide*.

Using the FILER with SRM/UX

The FILER commands available to the Pascal Workstation user will be a mixture of SRM and HFS commands. For SRM/UX volumes the FILER will display both file locking and HFS permissions information when the extended listing request is made.

For a normal listing, the only difference visible to the user will be where the FILER displays:

```
Directory type =
```

For SRM volumes, something similar to the following is displayed:

```
Directory type = SRM 21,0,8
```

Where the:

select code = 21
bus address = 0
disc unit = 8

For HFS volumes, something similar to the following is displayed:

```
Directory type = 777      17      9
```

Where the:

file protections = 777
user id = 17
group id = 9

For SRM/UX volumes, something similar to the following is displayed:

```
Directory type = SRM/UX 21,0,8
```

Where the following fields are as described in the file /etc/srmdconf:

select code = 21
bus address = 0
disc unit = 8

For an extended listing with an SRM/UX volume, the field:

```
'..directory info...'
```

is enhanced to show both the file locking status for the file, and also the HFS permissions associated with the file. For example, currently SRM volumes display:

```
 ..directory info...
MRWSPC CLOSED
```

where MWRSPC describes access rights to the file. Note that the words SHARED, EXCLUSIVE and CORRUPT may replace CLOSED in the directory info description. The words CLOSED, SHARED and EXCLUSIVE represent the file locking attributes held by the file.

HFS volumes will display:

```
 ..directory info...
d777m     17u      9g
```

If the file is not a directory, d will be blank. The 777 entry describes the file protections, 17 is the user id, and 9 is the group id.

For SRM/UX volumes, the directory info field contains a mixture of the above two formats. The HFS information remains in place, and also two letters will indicate the current file locking status (for example, 'CL' for closed).

```
 ...directory info.....
d777m     17u      9g CL
```

Here CL (for CLOSED) could also be EX (for EXCLUSIVE), SH (for SHARED) or CO (for CORRUPT).

New Commands

There are some new commands available to the user for SRM/UX volumes, in particular controlling HFS permissions for SRM/UX files. The `FILER`'s `HFS` command has been enhanced to work with SRM/UX units as well as HFS units (note that for the workstation, HFS usually means a local hard disk and not the file system being shared with the SRM/UX server). For files to which the workstation has access, the `UID` and `GID` fields may be modified, as well as the file mode which describes access rights for owner, group and other.

HP-UX Special Files

As with an HFS disk, the Pascal Workstation System may see files on the server intended for use only by the HP-UX operating system that the server process is running on. When doing an extended listing with the `FILER` these files will be shown as having file `type = 0` (which prevents the Workstation from opening or manipulating the file) and a letter will be printed before the mode for the file indicating the file type, as follows:

Letter	Actual File Type
c	Character device file
b	Block device file
n	Network special file
p	Named pipe special file
o	Other special file
s	Socket special file

The Pascal Workstation user should not try to use or manipulate files of these types.

Troubleshooting Tips

This section provides some tips for troubleshooting your system For more troubleshooting information, read the appendix "Troubleshooting Your SRM/UX System" in the manual *SRM/UX: System Administrator's and User's Guide.*

Troubleshooting the Server Side

If you cannot establish contact with the server, check with the SRM/UX system administrator to make sure that the following steps have been carried out :

- The SRM/UX server software (HP Part No. E2085A) must be present on the server.
- The hardware (LAN or SRM cable, IO cards) must be properly installed.
- A properly configured srmdconf file must be in place.
- All the drivers for the peripherals to be employed must be present in the server's HP-UX kernel.
- If using the SRM interface, the latest SRM driver needs to be included in the server's HP-UX kernel. This requires the kernel be rebuilt and the server system rebooted.
- The SRM/UX server process **/etc/srmd** must be running.
- The file **/etc/services** must contain an entry for lansrm.
- If booting over the LAN wire is desired, a proper version (66.35 or later) of the remote boot daemon **/etc/rbootd**, must be in place and running.
- A properly configured **/etc/boottab** file must be in place.
- The directory structure for each clients system directory and the generic SYSTEMS directory must be in place.

Proper installation of the system hardware and software is described in Chapters 3 and 4 of the *SRM/UX: System Administrator's and User's Guide*.

Troubleshooting the Client Side

Following are some symptoms of incorrect behavior and some hints about where to look for the source of the trouble.

Symptom 1

The boot ROM doesn't display any bootable systems on the SRM/UX server.

Possible Problems :

- Is the server process (**srmd**) running on the server?

  From the server itself the HP-UX command **ps -ef** will show all the running processes. The **/etc/srmd** command should be one of the processes displayed.

- If using the LAN interface, does the client have the correct Boot ROM for booting over the LAN cable?

  Only series 300 machines with Boot ROM versions B and later may boot over the LAN cable

- If using the LAN interface, is **/etc/rbootd**, the remote boot daemon, running?

  From the server itself the HP-UX command **ps -ef** will show all the running processes. The **/etc/rbootd** command should be one of the processes displayed.

- If using the LAN interface, is **/etc/boottab** properly configured?

  There should be an entry in the Pascal Workstation SRM line for the particular Pascal system you wish to boot. See the server manual for a description of a correctly formatted **/etc/boottab** file.

- Is this client configured correctly on the server (i.e. is there an entry in **/etc/srmdconf** for this client with correct information)?

  Print out (or have your SRM/UX administrator print out) a copy of the file **/etc/srmdconf** and check the

information in the client line corresponding to your workstation for correctness.

- Are there any `SYSTEM` files in the directory `/SYSTEMS` (relative to the root of volume 8)?

  Just list the files in this directory from the server or from another client and make sure the Pascal `SYSTEM` file (for example, `SYSTEM_P`) is present in this directory.

- Are there any hardware problems?

  Chapter 3 of the SRM/UX System Administrator describes how to properly set the switches on LAN and SRM cards for use with the SRM/UX server and how to properly terminate LAN and SRM cables.

Symptom 2

The boot ROM displays what appears to be a bootable system, but when trying to boot this system the workstation does not complete its initialization.

Possible Problems :

- Is the server process (srmd) running on the server?

  On the server the HP-UX command **ps -ef** will show all the running processes. The **/etc/srmd** command should be one of the processes displayed.

- Is this client configured correctly on the server (i.e. is there an entry in **/etc/srmdconf** for this client with correct information)?

  Print out (or have your SRM/UX administrator print out) a copy of the file /etc/srmdconf and check the information in the client line corresponding to your workstation for correctness.

- Is some other computer using your workstation's IP address?

  Check the file **/etc/hosts** on the server workstation to make sure that your IP address is not being used by another workstation. Also check that your IP address is not being used by a different workstation on a different SRM/UX server on the same local subnet as your own workstation and server.

- Are the boot extension files present in the proper directory?

  Check to make sure that the files **INITLIB**, **STARTUP**, and **TABLE** are present in the clients system directory (**/WORKSTATIONS/SYSTEM***nn* or **/WORKSTATIONS/SYSTEM***nnnnnn* relative to the root of volume 8) or in the generic directory **/WORKSTATIONS/SYSTEM** (relative to the root of volume 8).

- Is the last thing displayed on the client CRT the copyright message?

  You probably have the incorrect CRT drivers in your INITLIB file for the display you are using. For a description of each CRT driver and which CRT drivers are needed for each display, see the section "Individual Module Descriptions" in the chapter "Special Configurations" in the *Pascal 3.2 Workstation System Manual*.

- Are volumes **#5** and **#45** undefined after booting completes ?

  Make sure that additional modifications to the **TABLE** program do not disable SRM/UX access to units **#5** and **#45**.

  Also make sure that the necessary drivers for SRM/UX are present in **INITLIB**. Use the Librarian to verify that the **DATA_COMM** and **SRM** modules (if running over the SRM cable) or the **IOMPX**, **LANDVR** and **SRM** modules (if running over the LAN cable) are present in your **INITLIB** file.

Error: IORESULT was 57.

This section provides information on how to handle the following error message:

```
Error: IORESULT was 57.
```

This message indicates that the Pascal Workstation asked the server to perform a link across physical mount points in the native HP-UX file system of the server.

If you get this error message when using the **DUP-LINK** command of the **FILER**, it means you are attempting to perform an illegal link.

If you get this error message when you using a Pascal Workstation subsystem (for example, **COMPILER**, **FILER**, **ASSEMBLER**, etc.) it means that your SRM/UX file system has not been set up properly by the SRM/UX system administrator. The current working directory is not located on the same physical device as the **TEMP** directory for the volume which contains the current working directory as specified in the file **/etc/srmdconf**.

This problem will not occur if volumes specified in **/etc/srmdconf** do not span more than one physical device (that is, disc) and if the **TEMP** directory for that volume is located on that same physical disc.

3

MC68040 Support

The 3.24 version of the Pascal Workstation provides support for MC68040 based Series 300 computers. Pascal 3.24 is the first version that supports the MC68040 processor. MC68040 support increases the performance of the Pascal Workstation as explained in these sections:

- Improved Cache Performance
- Floating-Point Processing

Who Should Read This Chapter?

Table 3-1.

If you ...	Action to be taken ...
Do not have an HP 9000 Model 380	Skip this chapter
Do have an HP 9000 Model 380	Read this chapter

Improved Cache Performance

The following features are a part of the MC68040 processor.

- The instruction and data caches (4096 vs 256 bytes) have increased in size.
- A copyback cache mode is provided for the first time.

  Copyback cache mode allows the data cache to be written into without automatically updating the main memory. With the MC68030 and earlier processors the data cache could only operate in writethrough mode. In writethrough mode main memory is updated whenever the data cache is written into. Copyback mode allows for a substantial performance improvement over writethrough mode.

  The copyback cache mode is the default caching mode for the Pascal Workstation (except for supervisor mode or I/O space memory accesses). This could cause problems for programs with self-modifying code or for programs that directly make DMA transfers.

  The routine `ASM_FLUSH_ICACHE` is provided to synchronize the caches and memory. In the case of an MC68040 processor this routine marks all the I-cache and D-cache entries invalid and writes any dirty D-cache entries back to main memory. Programs which modify instructions in main memory should call this routine before executing any such instructions. This ensures that the I-cache does not contain stale instructions.

  Copyback mode presents a new problem for user written I/O drivers that do DMA transfers. Users of such routines have always been advised to call `ASM_FLUSH_ICACHE` after any DMA transfer inbound to main memory to synchronize the caches and memory. This is still the correct way to proceed. However, now it is also important to call `ASM_FLUSH_ICACHE`

before any DMA transfer (inbound OR outbound) to ensure that both the correct data is written out and that dirty data in the data cache is not written over the results of any inbound DMA sometime later. The safest approach is to just call the routine `ASM_FLUSH_ICACHE` both before and after initiating or terminating a DMA transfer.

Correct handling of copyback mode could require that some existing code (only special applications that make DMA calls directly or applications with self-modifying code) be modified as described above and then re-compiled or re-assembled. This is not required if only the HP supplied I/O library transfer procedures are used. Also there is a provided routine (`ASM_COPY_OFF`) that can be used to change the default caching mode from copyback to writethrough. This is an alternative when existing code cannot be updated.

A sample program on the `DOC:` disc called `COPY_OFF.TEXT` shows how to call `ASM_COPY_OFF`. Executing this sample program will change the default mode of operation for the Pascal Workstation (for non-I/O space) to writethrough mode. Also on the `DOC:` disc is a sample program called `COPY_ON.TEXT`. This shows how to call the routine `ASM_COPY_ON`. Executing this program will cause the default mode of operation for the workstation (for non-I/O space and user mode) to be copyback mode, as will rebooting the system.

Floating-Point Processing

A floating-point coprocessor is not supported with the MC68040. Instead, some of the instructions and data types previously supported by the MC68881/MC68882 coprocessor are handled by a floating-point unit built into the MC68040 processor itself. The instructions and data types not supported by the floating-point unit will generate exceptions where they will be emulated in software. The built-in floating-point unit together with the emulation package allows code running on pre-MC68040 workstations to run on an MC68040 workstation without change.

Because some of the floating point instructions and data types are supported directly on the processor, many programs that contain floating point instructions will run correctly without the emulation package `FP40` installed in your system. If you should encounter the message

```
error -13: illegal cpu instruction
```

or

```
error -31: undocumented error
```

while running a program containing floating-point instructions on your MC68040 workstation you may have encountered an emulated instruction or data type. To eliminate this error, you should install the `FP40` package in your system as described above and try the program again. When in doubt, the `FP40` package should always be installed when using any floating-point instructions.

The Motorola supplied emulation software is provided in the module `FP40` located on the `LIB:` disc for single-sided media or the `SYSVOL:` disc for double-sided media. This module may be included in one's `INITLIB` file or can be executed directly after booting (it P-loads itself). Note that this package is for MC68040 based Series 300 workstations only.

The FP40 floating-point emulation module satisfies the requirements of the "ANSI IEEE Standard for Binary Floating-Point Arithmetic 754" and allows code compiled for the MC68881/MC68882 to run without change. For more details on the floating-point emulation module, you should purchase the Motorola manuals *MC68040 User's Manual* and the *Programmer's Reference Manual*. To purchase these manuals, write to Motorola Literature Distribution; P.O. Box 20912; Phoenix, Arizona 85036.

4

System History

Pascal 3.24

This version of the Pascal Workstation adds support for the HP 9000 Model 380 computer. Its main features are MC68040 support and support for the HP-UX SRM/UX server.

New Hardware

- SPU Model 380 including the 25 Mhz MC68040 processor

New Peripherals

- Plotter Model 7550B in HPGL compatibility mode only

Object Code Compatibility

Pascal 3.24 is generally upward code compatible with 3.2 systems. Programs compiled with 3.2, 3.21, 3.22, and 3.23 systems should run on the Pascal 3.24 release without being recompiled. Note that this may not apply if the application contains linked in system modules.

Applications which employ self-modifying code on an MC68040 based workstation are also potential trouble spots as the MC68040 allows copy-back cache mode. For more information on MC68040 support and the copy-back cache mode, read the chapter "MC68040 Support."

Software Changes

- An FP40 module is provided to emulate the MC68881/68882 instructions and data types not supported by the MC68040 processor. For more information on MC68040 support, read the chapter "MC68040 Support."
- The SRM module has been enhanced to allow support of the HP-UX SRM/UX server.
- The Assembler has been enhanced to support new MC68040 instructions.
- The reverse-assembly capabilities of the Librarian and Debugger have been enhanced to support new MC68040 instructions.

System Discs

The following changes were made:

Single-sided discs:	FP40 was added to the LIB: disc. COPY_ON.TEXT was added to the DOC: disc. COPY_OFF.TEXT was added to the DOC: disc.
Double-sided discs:	FP40 was added to the SYSVOL: disc. COPY_ON.TEXT was added to the DOC: disc. COPY_OFF.TEXT was added to the DOC: disc.

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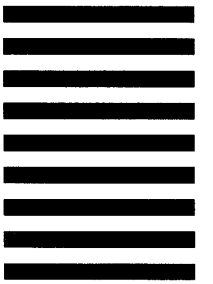

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