RAD4 Owner's Guide

Software revision 1.3

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Contents

Introduction

Thank you for purchasing the RAD4 product. The RAD4 provides low cost display heads for Silicon Graphics, Inc. Systems. This Owners Guide covers installation of the PCI board, removal of the PCI board, installing and removing the RAD4 software, and changing monitor types.

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        passwd: your e-mail address
        cd /users/p/psitech

Getting Started

Check to see that you have all of the parts.
The RAD4 box contains:
RAD4 PCI board
CD-ROM release 1.3
RAD4 Owner's Guide
Software Registration Card
Antistatic wrist strap

Please **return the Software Registration Card** to PsiTech to validate the warranty.

You will also need a video cable and monitor or other Analog Display device.

Refer to Section 1 for application in the O2 Workstation.
Refer to Section 2 for application in the Origin 200/2000 File Servers.

RAD4™ Graphics Head

A low cost graphics head alternative for SGI Systems

Description
The PsiTech RAD4 is a software based graphics head which comes complete with PsiTech Graphics Server and PsiTech PCI drivers for applications on the Silicon Graphics' O2™, Octane™, Origin 200™, and Origin 2000™ host systems.

The RAD4's 8MB frame buffer with the 200MHz RAMDAC provides a wide range of display options including VGA, SVGA, XGA, 17", 20", or 24" in either landscape or portrait formats and a full range of display visuals from gray scale to full 24 bit color with overlays.

The PsiTech Graphics Server is protocol compatible with both the X Consortiums' X Window System™ and the Silicon Graphics' OpenGL® technologies.

The PsiTech PCI Drivers are compatible with Silicon Graphics' IRIX™ 6.3 and 6.4 operating systems. These drivers minimize system impact by utilizing optimized DMA routines.

Benefits
For Desktop systems, the RAD4 provides low cost additional display space which not only increases the display surface but results in better visual separation between user control and graphic output. The additional head frees up the Silicon Graphics' native accelerated head for the graphics intensive operations and results in better utilization of system resources.

For File servers, the RAD4 provides a low cost integrated systems console and graphics head alternative to ASCII or network attached X terminals. System administration is more convenient with the graphical based system administration tools. In addition to the console advantages, the RAD4 opens up the file server to those new applications which benefit from having special low to high resolution ranges with single or multiple graphic head requirements.

Applications
The RAD4 supports a wide variety of applications in Command and Control, Training and Simulation, Weather, Architecture Engineering and Construction (AEC), Geographic Information Systems (GIS), Computer Aided Design Manufacturing and Engineering (CAD/CAM/CAE), medical, high resolution defense and medical imaging, and air traffic control markets.

Configurations
The RAD4 may be used as the primary, or secondary graphics head or combined together for use as multiple graphics heads. Each graphics head requires a RAD4, Monitor, keyboard/mouse, and a system PCI slot. The CD-ROM included with the RAD4 contains all of the software options for the supported hosts.

On the Silicon Graphics' O2 and Octane, an additional head is provided with a single RAD4 in either 1) a merged graphics server (X only head) which is combined with the native SGI X server or 2) a second graphic server with both X and OpenGL functionality .

On the Silicon Graphics' Origin 200 and Origin 2000 file servers, the RAD4 provides primary, secondary, or multiple graphics heads. The Origin 200 uses the RAD4 and the Origin 2000 uses the RAD4-KM for the primary display. Additional graphic heads can be provided with either the RAD4 for multiple screens or the RAD4-KM for multiple users.

Configuration Matrix

	O2	Octane	Origin 200	Origin 2000
Servers Supported	Second Server, Standalone Server, or Merged Server	Second Server, Standalone Server, or Merged Server	Standalone Server	Standalone Server
Dual Head w/Shared KB/M	Second Server S1-Native :0.0 S2-RAD4 :1.0	Second Server S1-Native :0.0 S2-RAD4 :1.0	N/A	N/A
Multi- Screen	Merged Server S1-Native :0.0 S2-RAD4 :0.1	Merged Server S1-Native :0.0 S2-RAD4 :0.1 .	Standalone Server S1-RAD4 :0.0 S2-RAD4 :0.1 . .	Standalone Server S1-RAD4-KM :0.0 S2-RAD4 :0.1 .
Multi-user	Standalone Server U1-Native :0.0 U2 RAD4-KM :1.0	Standalone Server U1-Native :0.0 U2-RAD4-KM :1.0 U2-RAD4-KM :2.0	Standalone Server U1-RAD4 :0.0 U2-RAD4-KM :1.0 U3-RAD4-KM :2.0 .	Standalone Server U1-RAD4-KM :0.0 U2-RAD4-KM :1.0 U3-RAD4-KM :2.0 .
Multi-user Multi-screen	N/A	Standalone Server U1-Native :0.0 U2-RAD4-KM :1.0 U2-RAD4 :1.1	Standalone Server U1-RAD4 :0.0 U1-RAD4 :0.1 U1-RAD4 :0.2 . U2-RAD4-KM :1.0 U2-RAD4 :1.1 U2-RAD4 :1.2	Standalone Server U1-RAD4-KM :0.0 U1-RAD4 :0.1 U1-RAD4 :0.2 . U2-RAD4-KM :1.0 U2-RAD4 :1.1 U2-RAD4 :1.2
PCI Slots	1	3	6	6
Host Keyboard Mouse Port	Yes	Yes	Yes	No
Native Head	Yes	Yes	No	No

Sx - Screen
Ux - User
:x.x - Display number

Section 1   O2 Workstation

Installation Steps

1. Wear a Antistatic wrist strap connected to the O2 chassis

2. Install the PCI board; refer to the section "Hardware Installation"

3. Remove wrist strap from the O2 chassis

4. Power up the O2

5. Install the Software; refer to the section "Software Installation"

6. Configure the RAD4; refer to the section "Configuring RAD4"

Hardware Installation/Removal

Warning: The RAD4's are extremely sensitive to static electricity. Handle the module carefully, and wear a grounded Antistatic wrist strap while installing or removing them.

Installation:
1. Remove the system module from the O2 chassis. See "Removing the System Module" in the SGI O2 Workstation Owners Guide.

2. Release the PCI tray by pushing up the **lever** on the side. The tray pops up. Return the **lever** to the original position.

3. Push down slightly on the rear of the PCI tray and remove it from the system module.

4. Hold the PCI tray with one hand and remove the screw and the blank panel from the tray. Keep the panel. If you later remove the PCI board and do not replace it, you must reinstall the blank panel and screw.

5. Slide the PCI board into the tray and push the PCI connector firmly into the slot. Make sure it is completely seated.

6. Replace the screw and tighten it.

7. Replace the PCI tray in the system module. **The lever should be in the up position.**
   - Engage the hinge on the PCI tray in the slot.
   - Lower the PCI tray and insert the connector into the slot, pushing toward the back of the module as you do this.

8. Push the PCI tray down firmly until it is completely seated. Check that the lever returns to its starting position.

9. Refer to "Reinstalling the System Module" in the O2 Workstation Owner's Guide.

10. Connect the video cable from the RAD4 to the display device.

11. Power up the O2

12. Type **hinv** in a window.
    The following should be displayed
Unknown Type PCI: Bus 0, Slot 3, Function 0, Vendor ID 0x12d1, Device IP 0x104 (for the RAD4)
0x105 (for RAD4-KM)

13. Proceed with software installation.

O2 Workstation

Warning: The RAD4's are extremely sensitive to static electricity. Handle the module carefully, and wear the wrist strap while installing or removing them.

Removal:

1. Remove the Video Cable from the RAD4 PCI board.

2. Remove the system module from the O2 chassis. See "Removing the System Module" in the SGI O2 Workstation Owners Guide.

3. Release the PCI tray by pushing up the lever on the side. The tray pops up.

4. Push down slightly on the rear of the PCI tray and remove it from the system module.

5. Remove the screw that secures the RAD4 PCI board.

6. Slide the RAD4 PCI board out of the tray. It may be a little difficult to remove.

7. If you are installing another RAD4 PCI board, see "Installing the RAD4 PCI board". Otherwise, replace the blank panel and screw. (You removed the panel and screw when you installed the board.

8. See "Reinstalling the System Module" in the O2 Workstation Owner's Manual".

Software Installation/Removal

Note: For the Merged server you need SGI patch 2009

Note: If the O2 has 64MB of memory you will need to edit the /var/sysgen/master.d/rad4pci file rad4pci_use_usebuffer=0; then autoconfig and reboot system. This should be done after the RAD4 software has been installed. Rad4pci_use_usebuffer=1 is the default which requires greater than 64MB of memory.

The following action installs or removes the RAD4 software.

Installation:

1. Login as Root.

2. Insert RAD4 CD ROM Disk into Drive.

3. Click on the CD Icon or start the SGI's Software Manager

4. Chose "Default Installation"; Click on the Start Button in the Software Manager's Window

5. Exit Software manager.

6. Select either the Merged Server, Second Server, or Standalone Server:

>   a)To select the Merged Server;
>>   type **chkconfig rad4X_merged_server on**
>>   type **chkconfig rad4X_second_server off**
>
>   b)To select the Second Server;
>>   type **chkconfig rad4X_merged_server off**
>>   type **chkconfig rad4X_second_server on**
>
>   c) To select Standalone server for RAD4-KM
>>   type **chkconfig rad4X_merged_server off**
>>   type **chkconfig rad4X_second_server off**

8. Proceed with Configuring RAD4

Removal:

1. Restore the /var/X11/xdm/Xservers and Xresources files.

2. Use the Software Manager
   Select "Manage Installed Software"; Remove the PsiTech RAD4 files

Configuring the RAD4

Refer to Appendix E. Special Files rad4XStart and Xservers for the following discussion.

Change Monitor Types

If the display shows the PsiTech logo with the background green fading to blue, then your default monitor type is OK. 1280 x 1024x 72

1.To list monitors supported:
> Type **rad4setres**
> Select the monitor number and
> Type **rad4setres [number]**

2. A successful new setting will display the PsiTech logo in the lower lefthand corner and the displayed color will be green fading diagonally to blue.

3. Edit the **/etc/init.d/rad4XStart** script file to include the **[number]** in the RESOLUTION=[number]

Proceed with the instructions for either the Second, Standalone, or Merged Server.

Second Server:

From the primary display:
1. Edit the .sgisession file in your home directory with the following:

```
#!/sbin/sh
xsetroot -display :1.0 -solid sgilightblue
#Starts up the Window manager, add any startup here
(DISPLAY=:1.0;export DISPLAY;4Dwm)&
#Sets up GL and OpenGL libraries and launches toolchest
(GLFORCEDIRECT=no;export GLFORCEDIRECT;\
DISPLAY=:1.0;export DISPLAY;/usr/bin/X11/toolchest -title Toolchest_RAD4)&
#copies the native head keycodes to the second head
xmodmap -display :0 -pke | xmodmap -display :1 -
```

2. Setting monitor orientation (not needed for RAD4-KM):
> default is **-right**, to change edit **/etc/init.d/rad4XStart** file on the line which has the **rad4_X-knp -right** entry and change to the desired orientation. ie. **-left, -right,-top,** or **-bottom.**

3. Reboot system

Standalone Server:

1. For the RAD4-KM edit the line in the /var/X11/xdm/Xservers file as follows:

```
#        second workstation on o2
:1 secure /var/rad4/X  -kybd /dev/rad4_kbd -pntr /dev/rad4_pntr
```

2. Reboot system

Merged Server:

1. Monitor orientation:
   default is right , to change edit the **/var/X11/xdm/Xservers** file
   and add -stacked for the monitor on top as follows:

```
# standard sgi xdm line with psitech rad4 merged server
#
0: secure /var/rad4/X_psi -bs -nobitscale -c -pseudomap 4sight -solidroot sgilightblue -
cursorFG red -cursorBG white -stacked
```

2. Reboot system

Section 2   Origin 200/2000 File Servers

Hardware Installation/Removal

Warning: The RAD4's are extremely sensitive to static electricity. Handle the module carefully, and wear the wrist strap grounded to the chassis while installing or removing the RAD4's.

Note: The following installation instructions are from the rear or back of the System

Installation:

For the **Origin 200**:

1. Power System off

2. Remove the three screws on the Left side; two on the top and one on the bottom.

3. Pull Left side cover towards the rear and remove

4. Open the Left side door and remove by lifting up

5. Remove screw and cover plate associated with the PCI slot in which the RAD4 will be installed

6. Insert the RAD4 PCI card and replace screw; PCI slots from top to bottom are Slot 5 , 6, and 7; RAD4 can be inserted in any of these PCI slots.

7. Replace Left side door and top most screw

8. Replace Left side cover and top and bottom screws

9. Connect Monitor cable to RAD4

10. Connect Keyboard to Right side round connector under the right side terminal connector

11. Connect Mouse to the Left side round connector

12. Connect Terminal to the Right side 9 pin D connector

13. Remove wrist strap

14. Power System on

For the **Origin 2000**:

1. Power System off

2. Remove the screw below the PCI chassis, pull out the tab, and remove PCI Chassis

3. Remove screw and cover plate associated with the PCI slot in which the RAD4 will be installed

4. Insert the RAD4 PCI card and replace screw

5. Reinstall PCI Chassis, push in tab and replace screw

6. Connect Monitor and Monitor cable to RAD4

7. Connect Keyboard and mouse (SGI Mouse is preferred) to RAD4-KM to either connector on the RAD4-KM

8. Remove wrist strap

9. Power System on

Software Installation/Removal

Note: Need "IRIX 6.4 02121744" or newer with patch "SG0001887 PCI Rollup patch"
Note: The following procedure is executed from the System terminal

Installation:
1. During the power on sequence the following message should be observed:
PCI slot x (x=5,6,or7) **pci 010412d1 UNKNOWN**

2. From the System Maintenance Menu type **1** Start System

3. Login as root

4. Type **inst -f** "directory of where distribution is located" ie. **/CDROM/dist**

5. Type **go** then type **quit**

6. Type **chkconfig xdm on** ; to enable login screen on the RAD4

7. Type **chkconfig visuallogin off** ;disables version of xdm requiring GL

8. Edit the /var/X11/xdm/Xservers file as follows:
For the RAD4 on **Origin 200**(has native Keyboard and Mouse) uncomment or add the following line:

```
:0 secure /var/rad4/X -kybd /dev/input/keyboard -pntr /dev/input/mouse
```

For the RAD4-KM on the **Origin 2000** add the following line:

```
:0 secure /var/rad4/X -kybd /dev/rad4_kbd -pntr /dev/rad4_pntr
```

For other example, see Appendix E.

Note: Only the line(s) containing active servers should uncommented

9. Edit file /var/X11/xdm/xdm-config
append _rad4 to the following line from:
```
DisplayManager._0.loginProgram: /var/X11/xdm/Xlogin
```
to:
```
DisplayManager._0.loginProgram: /var/X11/xdm/Xlogin_rad4
```

10. Make sure chkconfig rad4X_merged_server and rad4X_second_server are both off.

11. If the monitor does not display the PsiTech logo with the background green fading to blue, then you need to change monitor settings:
    A. To list monitors supported:
    Type **rad4setres**
    Select the monitor number and
    Type **rad4setres [number]**

    A successful new setting will display the PsiTech logo in the lower lefthand corner and
    the displayed color will be green fading diagonally to blue.

    B. Edit the **/etc/init.d/rad4XStart** script file to include the **[number]** in the

RESOLUTION=[number]

12. Reboot System

13. RAD4 screen should display PsiTech logo in lower left with green fading to blue background; followed with the PsiTech login screen

14. The xdm login screen should be on the RAD4 screen.

15. For the Origin 2000, set PCI pre-fetch off:
       edit the /var/sysgen/master.d/rad4pci file
       set the line as follows: int rad4pci_enable_prefetch = 0

For Visual Logins:
Install the GL libraries from the
SGI CDROM IRIX 6.4 for Origin, Onyx, and Octane PN 812-0616-002:
1. type **swmgr -m GFXBOARD=KONA -m CPUBOARD=IP27 -m SUBGR=IP27**

2. Then select both "Graphics Execution Environment" and "Graphics N64 Execution Environment" for installation which are sub groups of "IRIX Execution Environment, 6.4 for Origin, Onyx2, and Octane".

3. Install these even if the software manager says Same Version.

4. Add **setenv GLFORCEDIRECT no** to either the /etc/cshrc file or in $HOME/.cshrc
Add **GLFORCEDIRECT=no ; export GLFORCEDIRECT** to either the /etc/profile or $HOME/.profile

5. Type **chkconfig visuallogin on**

5. Reboot

Removal:
Note: Use the System terminal

1. Remove the PsiTech software using **swmgr or inst**.

2. Restore old Xservers and Xresources files, type the following:
       cd /var/X11/xdm
       rm Xservers
       rm Xresources
       mv Xservers.O Xservers
       mv Xresources.O Xresources

APPENDIX

A. Changes in Release 1.3

PCI DMA issues
Server Crash
OpenGL crashes
New PCI 3 level driver
Increased number of RAD4 in a system to 16
Added tools (rad4pci) to control DMA max size; pre-fetch; turn it on or off
Added ability to change default monitor settings (resolution, syncs, and sync polarity) and gamma
Mouse Acceleration
Added beta buffered server
Added monitor settings for New Sony w900 1920 x1080
Added support for Xmetax from X-software (move windows between screens)
Increased X performance

Known Bugs or Problems

rad4_X_knp cursor problem with window maximize, need to leave at least on pixel width on side
facing second monitor (only on O2 and Octane)
Merged server, no GL or OpenGL support
No support for: double buffering, Stereo, genlock, or syncing with native head
Clicking on background causes it to flash black; clicking on desktop objects cause a black rectangle
Changing default visuals on Xserver server startup has a bug

B. Useful Commands

```
versions | grep rad4x
versions | grep patch
uname -a
uname -R
hinv
```

C. Server Summary Notes

1. To change **monitor types** use rad4setres

2. To change **resolution** (dots per inch) add -dpi the Xradsgi command line.

3. To put a **toolchest** on the second server display, type:
   setenv DISPLAY :1
   setenv GLFORCEDIRECT no
   toolchest&

4. The **O2 and Octane** are started with the rad4XStart script; the **Origin 200 and Origin 2000** are managed by xdm.

5. To enable the **merged server** on the O2 or Octane use;
chkconfig rad4X_merged_server on
This variable overrides the rad4X_second_server.
Keyboard and mouse managed by the SGI server.

6. To enable the PsiTech **second server** on the O2 or Octane use;
chkconfig rad4X_second_server on
chkconfig rad4X_merged_server off.
Keyboard and Mouse shared between the SGI head and the RAD4 with the rad4_X_knp program.

7. To change the **keycodes** use xmodmap.
To duplicate the keycode used on the SGI native head to the RAD4:
xmodmap -display :0 -pke | xmodmap -display :1 -

8. On the Origin 200 and Origin 2000, loading the PsiTech software renames the **Xservers and Xresources** to Xservers.O and Xresources.O in the /var/X11/xdm directory and loads new Xservers and Xresources files.

9. **setenv GLFORCEDIRECT no** is required for OpenGL and GL

D. Important SGI Patches

For the O2 and Octane - #2009 Merged Server patch

For the O200 and Origin 2000 - #2082 Fixes six second launch delay

E. Special Files

```
/etc/init.d/rad4XStart
#!/sbin/sh
#
#   script for starting the psitech rad4 Xserver as the second head
#     change the -left to -right ,-top for other positions of the second head
#
#           if a resolution other then 1280 x 1024 is wanted
#                   change RESOLUTION
#           for a list of available resolutions type rad4setres with no argument
#
#           a partial list
#           0 = 1280 by 1024 at 60
#           1 = 1280 by 1024 at 72
#           2 = 1600 by 1200 at 60
#           3 = 1600 by 1200 at 72
#           4 = 2048 by 1000 at 60
#           5 = 1200 by 1600 at 76
#           6 = 1600 by 1200 at 79
#           7 =  640 by  480 at 72
#           8 =  800 by  600 at 56
#           9 = 1024 by  768 at 60
#           10 = 1024 by  768 at 70
#           11 = 1920 by 1080 at 75
#
RESOLUTION=1
if [ `uname -r` = "6.4" ] ; then
        rm -f /dev/rad4*
#find the devs in the hw graph
        find /hw -name rad4 -exec ln -sf {} /dev/rad4 \;
        find /hw -name rad4_b -exec ln -sf {} /dev/rad4_b \;
        find /hw -name rad4_b -exec ln -sf {} /dev/rad4.16 \;
        find /hw -name rad4.1 -exec ln -sf {} /dev/rad4.1 \;
        find /hw -name rad4.2 -exec ln -sf {} /dev/rad4.2 \;
        find /hw -name rad4_kbd -exec ln -sf {} /dev/rad4_kbd \;
        find /hw -name rad4_pntr -exec ln -sf {} /dev/rad4_pntr \;
        find /hw -name rad4_kbd.1 -exec ln -sf {} /dev/rad4_kbd.1 \;
        find /hw -name rad4_pntr.1 -exec ln -sf {} /dev/rad4_pntr.1 \;
        find /hw -name rad4_kbd.2 -exec ln -sf {} /dev/rad4_kbd.2 \;
        find /hw -name rad4_pntr.2 -exec ln -sf {} /dev/rad4_pntr.2 \;
fi
if [ -c /dev/rad4.2 ] ; then
        /usr/bin/rad4setres $RESOLUTION
        /usr/bin/rad4setres /dev/rad4.1 $RESOLUTION
        /usr/bin/rad4setres /dev/rad4.2 $RESOLUTION
elif [ -c /dev/rad4.1 ] ; then
        /usr/bin/rad4setres $RESOLUTION
        /usr/bin/rad4setres /dev/rad4.1 $RESOLUTION
elif [ -c /dev/rad4 ] ; then
        /usr/bin/rad4setres $RESOLUTION
fi
if chkconfig rad4X_merged_server ; then
   echo `date` "rad4 as second screen is enabled (see chkconfig)">> /var/rad4/rad4log
elif chkconfig rad4X_second_server ; then
   echo `date` "starting rad4 as second head" >> /var/rad4/rad4log
#
(sleep 2 ; DISPLAY=:0; export DISPLAY; gamma 1.0;/var/rad4/rad4_X_knp -right -server
/var/rad4/Xradsgi :1 -fp
"/usr/lib/X11/fonts/100dpi/,/usr/lib/X11/fonts/75dpi/,/usr/lib/X11/fonts/misc/,/usr/lib/X1
1/fonts/Type1/,/usr/lib/X11/fonts/Speedo/,/usr/lib/X11/fonts/CID/">> /var/rad4/rad4log) &
DISPLAY=:1;export DISPLAY
(sleep 5; xsetroot -display :1 -solid sgilightblue >> /var/rad4/rad4log)
#
#        add the following lines to the users .sgisession file
#
#(4Dwm -display :1>> /var/rad4/rad4log)&
#(DISPLAY=:1; export DISPLAY;/usr/bin/X11/toolchest -display :1 -name ToolChest)&
else
   echo `date` " rad4 as second head is disabled (see chkconfig)">> /var/rad4/rad4log
fi
#
# start the buffered server's deamon if needed
#
if chkconfig rad4X_buffered_server ; then
/var/rad4/rad4d &
fi



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```

```
/var/X11/xdm/Xservers
# standard sgi line
#
#:0 secure /usr/bin/X11/X -bs -nobitscale -c -pseudomap 4sight -solidroot sgilightblue
-cursorFG red -cursorBG white
#
# standard sgi xdm line with psitech rad4 merged server
#
:0 secure /var/rad4/X_psi -bs -nobitscale -c -pseudomap 4sight -solidroot sgilightblue
-cursorFG red -cursorBG white
#
# line to start standalone psitech rad4 server as main display
# with native keyboard and mouse
#
#:0 secure /var/rad4/X -kybd /dev/input/keyboard -pntr /dev/input/mouse
#
# line to start standalone psitech rad4 server as main display
#        with 2 rad4s and two screens ( can be up to four )
# with native keyboard and mouse
#
#:0 secure /var/rad4/X -nr 2 -kybd /dev/input/keyboard -pntr /dev/input/mouse
#
# line to start standalone psitech rad4 server as second display
#        with rad4-km keyboard and mouse (the first server is not a rad4 )
#
#:1 secure /var/rad4/X :1 -kybd /dev/rad4_kbd -pntr /dev/rad4_pntr
#
# lines to start 2 standalone psitech rad4 servers
#        with rad4-km keyboard and mouse
#
#:0 secure /var/rad4/X -kybd /dev/input/keyboard -pntr /dev/input/mouse
#:1 secure /var/rad4/X :1 -rad4 1 -kybd /dev/rad4_kbd.1 -pntr /dev/rad4_pntr.1
#
#       second workstation on o2
#:1 secure /var/rad4/Xradsgi :1 -kybd /dev/rad4_kbd -pntr /dev/rad4_pntr
#
#:0 foreign
```

Xservers file discussion and some examples:
The RAD4 can by used with a variety of configurations ranging from Merged servers, Standalone server with keyboard and mouse managed by PsiTech, and multiples of RAD4 and RAD4-KM's. For the most part the Xservers file is where the configurations are defined.

The various servers that make use of the RAD4 are:
PsiTech Standalone server   /var/rad4/X
SGI server   /usr/bin/X11/X
Merged server   /var/rad4/X_psi (this calls the SGI server).

The next thing to consider is the keyboard and pointer.
SGI native   -kybd /dev/input/keyboard -pntr /dev/input/mouse
PsiTech -KM   -kybd /dev/rad4_kbd -pntr /dev/rad4_pntr
       next -KM   -kybd /dev/rad4_kbd.1 -pntr /dev/rad4_pntr.1
       next -KM   -kybd /dev/rad4_kbd.2 -pntr /dev/rad4_pntr.2
       etc.

The next thing to consider is the number of screens on each server with keyboard and mouse(s), use the **-nr n** option. For example, three screens use -nr 3

The next thing to consider is the number of RAD4's and RAD4-KM's. The PsiTech software searches for the devices in PCI node, slot ascending order and assigns numbers starting with 0 to n. These numbers are then used to set up the servers with the **-rad4 n** option. If only one workstation or server is to be used the -rad4 option is not required. The server will find all of the screens via the -nr option and assigns rad4 numbers to them.

Xserver line examples:
Add a workstation (RAD4-KM) to an O2:

```
:1 secure /var/rad4/X  -kybd /dev/rad4_kbd -pntr /dev/rad4_pntr
```

Add two screens (two RAD4's) to Origin 200:

```
:0 secure /var/rad4/X -nr 2  -kybd /dev/input/keyboard -pntr -pntr /dev/input/mouse
```

Add a second workstation (RAD4-KM) the above Origin 200:

```
:0 secure /var/rad4/X -nr 2 -rad4 0  -kybd /dev/input/keyboard -pntr /dev/input/mouse
:1 secure /var/rad4/X  -rad4 2 -kybd /dev/rad4_kbd -pntr /dev/rad4_pntr
```

To construct an Xservers entry for an Origin 2000 with RAD4-KM and three RAD4's
(The origin 2000 does not have a native keyboard and mouse port; therefore the first RAD4 must be a -KM):

```
:0 secure /var/rad4/X -nr 4  -kybd /dev/rad4_kbd -pntr /dev/rad4_pntr
```

To add another workstation with a RAD4-KM and RAD4:

```
:1 secure /var/rad4/X -nr 2  -kybd /dev/rad4_kbd.1 -pntr /dev/rad4_pntr.1
```

/var/sysgen/master.d/rad4pci

```
*
* rad4pci: SGI PCI driver for PsiTech Rad4 card
*
* $Revision: 1.0 $
*
*
*FLAG      PREFIX     SOFT      #DEV        DEPENDENCIES
cs         rad4pci    63        3
$$$
int rad4pci_major = ##E;          /* so the user can change the device number */
int rad4pci_use_userbuffer = 0;              /* set to 0 if not enough memory */
int rad4pci_max_dma_area = (1024*200); /* 200k bytes dmaed at a time */
int rad4pci_no_dma = 0; /* 0=enable dma  1= disable dma*/
int rad4pci_default_resolution = 0x201; /* 0xSPRR S= sync type P = sync level RR =
resolution */
int rad4pci_dma_read_cmd = 0xc; /* cmd for dma read 0x6 0xc 0xe */
int rad4pci_enable_prefetch = 1; /* 0 - prefetch off, 1 - prefetch enabled*/
```

Notes: