

# Tech Source

An EIZO Group Company



## **Raptor 4000 Series Drivers Installation and Reference Linux Manual**

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## **PREFACE**

This publication documents the Tech Source Raptor Drivers for Linux Installation for use with the Tech Source, Inc. Raptor graphics cards. This manual is intended for users who incorporate the Tech Source Raptor graphics cards into x86 PC workstations/servers.

This is a guide to the installation of the Raptor Drivers for Linux software. All systems vary to a degree. Knowledge of the features of your system is helpful during the installation process.

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# TABLE OF CONTENTS

<b>1</b>	<b>Introduction .....</b>	<b>1</b>
1.1	Overview.....	1
<b>2</b>	<b>Hardware Installation.....</b>	<b>3</b>
2.1	Hardware Configurations Supported.....	3
2.2	Installation Instructions.....	3
<b>3</b>	<b>Software Installation.....</b>	<b>5</b>
3.1	Overview.....	5
3.2	Requirements.....	5
3.3	CD-ROM Installation.....	6
3.3.1	Step-by-Step Installation Instructions.....	6
3.3.2	Using the install_all Installation Script.....	8
3.4	MOX Extension Support.....	8
3.5	TSIMISC Extension Support.....	9
3.6	New Device.....	10
3.7	DDC Resolution.....	11
3.8	Configuration for PC Graphics Hardware.....	11
3.8.1	Monitor Section.....	14
3.8.2	Device Section.....	14
3.8.3	Screen Section.....	16
3.8.4	Server Layout Section.....	17
<b>4</b>	<b>Invoking the X Server .....</b>	<b>19</b>
4.1	Overview.....	19
4.2	startx.....	20
4.3	xinit.....	20
4.4	xdm.....	21
4.5	Configuring the X Server for Multi-Screen Mode ....	22
4.5.1	Configurations for Multiscreen Mode.....	22
4.5.2	Defining Order of Display.....	25
4.6	Selecting Bit-Depths on 4000 Series Cards.....	26
4.6.1	Setting Bit-Depth.....	26
4.6.2	MOX Modes.....	29
4.7	Setting Resolution on Raptor 4000 Series Cards ...	29
4.7.1	Setting Resolution.....	30
4.7.2	Overriding DDC.....	33
4.7.3	Setting Mode Line.....	34
4.8	Rotation Mode Configuration.....	36
<b>5</b>	<b>Uninstalling Software .....</b>	<b>39</b>
5.1	Uninstalling the Software.....	39

## TABLE OF CONTENTS (Cont'd)

<b>6</b>	<b>Frequently Asked Questions .....</b>	<b>41</b>
6.1	Frequently Asked Questions .....	41
<b>7</b>	<b>Technical Assistance .....</b>	<b>43</b>
7.1	Who to call for Help .....	43
7.2	Email Address .....	43
7.3	Website.....	44
	<b>Appendix A Card Specifications .....</b>	<b>45</b>
A.1	Raptor 4000 Specifications .....	45
A.2	Raptor 4000e Specifications .....	46
A.3	Raptor 4000-LR Specifications.....	47
A.4	Raptor 4000e-LR Specifications.....	48
A.5	Raptor 4000-R Specifications.....	49
A.6	Raptor 3500e Specifications .....	50
	<b>Appendix B DDC Resolutions .....</b>	<b>51</b>
	<b>Appendix C China RoHS Declaration Table.....</b>	<b>53</b>

# 1 Introduction

## 1.1 Overview

Thank you for purchasing a Tech Source, Inc. Raptor graphics card for use with your x86 PC workstation/server. This manual describes the installation and configuration of the Raptor graphics card and the Linux drivers for the Raptor 4000 Series product.

This software runs on x86 PC workstations/servers and supports kernel versions 2.4 and 2.6. For support of another kernel, please contact Tech Source at: [hotline@techsource.com](mailto:hotline@techsource.com).

The following products are supported:

- Raptor 4000 Supports 2048x2048 resolutions (digital and analog) on a PCI bus.
- Raptor 4000e Supports 2048x2048 resolutions (digital and analog) on a PCI Express bus.
- Raptor 4000-LR Supports 1920x1200 resolutions (DVI-Single Link digital and analog) on a PCI bus.
- Raptor 4000e-LR Supports 1920x1200 resolutions (DVI-Single Link digital and analog) on a PCI Express bus.
- Raptor 4000-R Supports 2048x2048 resolutions (digital and analog) with hardware rotation on a PCI bus.
- Raptor 3500e Supports 2048x2048 resolutions (digital only) on a PCI Express bus.

The Raptor 4000 Series drivers for Linux are provided on a CD-ROM which consists of:

- Tech Source Raptor device drivers for Linux
- Loadable DDX modules for Tech Source Raptor cards.
- MOX extension files
- TSIMISC extension files

**NOTE:** In order to use the Tech Source Raptor DDX module, you must have XFree86 (v4.0 or later) previously installed.

All systems vary somewhat, therefore some knowledge of the features of your system and a basic understanding of UNIX shell commands are helpful during the software installation process.

A hardware specification for each of these cards is listed in Appendix A. From this point forward, Tech Source, Inc. will be referred to as Tech Source or TSI.

This manual will follow certain conventions throughout. Whenever a variable name, command name, directory, or filename is used in a paragraph, it will appear in a `mono-spaced` font.

At times the reader will be instructed to enter commands at a prompt. In this case a transcript of a sample session will be provided where a prompt will be followed by the commands the reader is to enter. The entire transcript will be in a `mono-spaced` font with the prompt in a normal weight and the user's entries in **bold**.

The prompt used in a transcript varies depending on the circumstances. The following are some common prompts and when they are used:

<code>prompt#</code>	used when the user is required to have root privileges
<code>prompt%</code>	used when the user is not required to have root privileges



## 2 Hardware Installation

### 2.1 Hardware Configurations Supported

The Raptor card and software accompanying this manual have been tested on Intel and AMD x86 based computer systems running Linux. By default, video will display on the head nearest to the PCI bus. This is the high resolution head which also supports the MOX feature. The low resolution head is the one furthest from the PCI bus.

In addition to supporting a single screen environment, each Raptor 4000 Series card has dual head capability to support multi-screen configurations. Each head on the card can co-exist with the other and display distinct screens.

Raptor cards use loadable drivers and can co-exist in multi-screen configurations with other VGA/SVGA graphics cards, provided drivers are available for those cards under XFree86.

**NOTE:** Raptor 4000 Series cards currently cannot be used to display console video in a PC. You must install a VGA/SVGA PC video card from another manufacturer for this purpose.

### 2.2 Installation Instructions

The Raptor graphics card installation is simple and consists of a few easy steps. Prior to installation, be sure to terminate the X Server.

**NOTE:** Remember which cables go to which connectors. You may want to label the cables and connectors before disconnecting them.

Step 1: Shut down the system and turn the power OFF.  
Remove the system's cover, then find an

available PCI slot, and remove the bracket and screw. Ground yourself by touching the metal part on an unpainted section of the metal case.

**Step 2:** Install the Raptor graphics card firmly into the PCI slot. Take care to press it evenly and snugly into the slot. Once you are certain the card is installed properly in the slot, secure it with the bracket screw.

**Step 3:** Secure the system cover, attach any previously removed cables, and connect the video cable card to your monitor.

The Raptor graphics card is now installed and the system is ready for software installation. Please refer to Chapter 3 for installing and configuring the software.

## 3 Software Installation

### 3.1 Overview

This installation chapter describes how to install and configure the drivers for Raptor 4000 Series cards. The following card models are supported:

- Raptor 4000
- Raptor 4000e
- Raptor 4000-LR
- Raptor 4000e-LR
- Raptor 4000-R
- Raptor 3500e

Henceforth, Raptor 3500e will be referred to as Raptor 4000 Series product.

### 3.2 Requirements

The following are prerequisites for installing the Raptor Drivers for Linux Software:

- At least 3MB of disk space available in `"/"` and `"/usr"` for drivers.
- A Raptor card is presently installed in the workstation/server (See Chapter 2 for instructions on installing a Raptor graphics card).
- Linux Kernel v2.4.x or v2.6.x installed
- XFree86 (v4.0 or later) or X.org distribution installed and configured for the current console graphics card
- RPM (v3.0 or later) packaging tools

Updates or recompiles to the kernel, X.org or XFree86 distribution may cause the driver and DDX to fail to load. In this event, please contact our technical support team for a possible solution (See Chapter 7).

The software consists of the following modules:

<code>rapafp.o</code>	Kernel driver for the Raptor 4000 series
<code>rapafp_drv.o</code>	Loadable DDX module
<code>libMOX.a</code>	MOX extension module
<code>libTSIMISC.a</code>	TSIMISC extension module

### 3.3 CD-ROM Installation

**NOTE:** Rebooting the system after the Raptor card installation may cause the auto configuration manager to come up in some distributions. At this point, ignore the auto configuration. Refer to Section 3.8 to configure the Raptor card after the software is installed.

#### 3.3.1 Step-by-Step Installation Instructions

The following are step by step instructions for installing the Raptor Drivers for Linux from a CD-ROM.

1. Login as `root` on the target system, using `/bin/sh` as your shell.
2. Insert the CD-ROM labeled "Raptor Drivers for Linux" into the drive.
3. If the drive is already mounted, the following directories will contain the Raptor Drivers for Linux:

For kernel 2.4, type:

```
prompt# cd /mnt/cdrom/linux_2.4/
```

For kernel 2.6, type:

```
prompt# cd /mnt/cdrom/linux_2.6/
```

4. If the CD-ROM is not already mounted, type:

```
prompt# mount /dev/cdrom /mnt/cdrom
```

Type the appropriate command as outlined in step 3.

5. The packages are in Red Hat's RPM format. For information on downloading, installing, and using the RPM utility, please refer to Red Hat's website and the related FAQ and HOWTO.

To install the driver package on kernel 2.4, type:

```
prompt# rpm -Uvh rapafp-*.rpm
```

To install the driver package on kernel 2.6, type:

```
prompt# rpm -Uvh rapafp6-*.rpm
```

6. Reboot the system to make sure the drivers will be reloaded.
7. To verify that the device drivers were loaded correctly, type:

```
prompt# cat /proc/modules | grep rapafp
```

The output should show the entry for the Raptor device drivers similar to the following:

```
rapafp_mod 39152 0 - Live 0xf8bbf000
```

8. To install the MOX package, type:

```
prompt# cd /mnt/cdrom/mox/  
prompt# rpm -Uvh tsimox-*.rpm
```

9. To install the TSIMISC package, type:

```
prompt# cd /mnt/cdrom/tsimisc/  
prompt# rpm -Uvh tsimisc-*.rpm
```

**NOTE:** You must install the MOX package if you plan on running the card(s) in MOX mode. Also note, that the Raptor 3500e does not support MOX mode.

### 3.3.2 Using the *install\_all* Installation Script

For ease of use, a script has been provided to install all available packages including the Raptor 4000 series software drivers, and all software extensions such as TSIMISC and MOX.

1. Refer to steps 1 through 4 in the step-by-step instructions for mounting the CD ROM and selecting the appropriate kernel version.
2. After the kernel version directory has been selected, type:

```
prompt# ./install_all
```

This script installs all available packages for the Raptor 4000 series boards.

### 3.4 MOX Extension Support

Tech Source provides and supports an X server extension called MOX (Multiple Overlay eXtension). Software support for MOX is provided by a server extension and a client library, which are included with this product.

Installation and configuration of MOX software is discussed throughout this chapter. The MOX software must be installed only once. The software can be found in the MOX directory on the cdrom. In the example below, the MOX software automatically modifies the "Module" Section in the `xorg.conf` file.

```
Section "Module"
    Load "dbe"
    Load "extmod"
    Load "MOX" # TSI MOX Extension
    Load "fbdevhw"
    Load "glx"
    Load "record"
    Load "freetype"
    Load "type1"
    Load "dri"
EndSection
```

For more information about MOX, please contact Tech Source for a technical white paper.

### 3.5 TSIMISC Extension Support

This extension provides various additional functionalities that are not included within the regular Xserver. Current implementation of TSIMISC extension enables a user to constrain the cursor to a particular screen.

The software can be found in the `tsimisc` directory on the cdrom. Upon installation of extension package the `xorg.conf` file gets updated so that the TSIMISC extension is loaded when the X server starts. In the example below, the TSIMISC software automatically modifies the "Module" Section in the `xorg.conf` file.

```
Section "Module"
    Load "dbe"
    Load "extmod"
    Load "MOX"                # TSI MOX Extension
    Load "TSIMISC"           # TSIMISC Extension
    Load "fbdevhw"
    Load "glx"
    Load "record"
    Load "freetype"
    Load "type1"
    Load "dri"
EndSection
```

For more information about TSIMISC please contact Tech Source for a technical white paper.

### 3.6 New Device

Upon initial installation of a Raptor 4000 series card, new device names are created in the `/dev` directory for each head. It is denoted by `rapafp#` for each card where # represents an instance number assigned by the operating system.

For example, `/dev/rapafp0` is the first head seen by the system, `/dev/rapafp1` will be the second head seen by the system.

**NOTE:** Only the first "Device" and "Screen" sections are automatically added to the `"xorg.conf"` file by the Raptor 4000 series installation software. Subsequent relocation(s) of the first Raptor 4000 card and/or additional Raptor 4000 cards being added to the system will require the user to manually add and configure these sections to the `"xorg.conf"` file per device instance. See section 4.5 for more details.



### 3.7 DDC Resolution

**NOTE:** From this point the name `xorg.conf` will be used to refer to the configuration file used by both the `XFree86` and `X.org` server.

If you are using a monitor with DDC2B/EDID protocol the default resolution will be determined using the Auto-Detect feature. With this protocol, the Raptor 4000 Series card first checks the Detailed Timing and Established Timing Identifiers (taking the first one supported) and then tries to match the Standard Timings.

**NOTE:** The monitor must be turned ON prior to starting the Xserver in order for a Raptor card to pick up and use the default monitor resolution. Some adapters and cables may block this signal.

By default, the X server will start with the resolution that DDC has reported. If the Auto-Detect feature fails the card will use the resolution specified in the "Screen" Section for the associated "Device" in the `xorg.conf` file.

Other methods described in this section will override any information obtained via EDID.

If the monitor is not DDC capable, then the Xserver will start with the resolution that is specified in the `xorg.conf` file. Please refer to section 4.7 for details on how to modify resolutions in the `xorg.conf` file, and section 4.7.2 on how to disable DDC.

### 3.8 Configuration for PC Graphics Hardware

This section assumes that the `XF86Config` or `xorg.conf` file was configured to work properly with your existing VGA/SVGA cards. For documentation on how to install and configure your VGA/SVGA card, please refer to the `XFree86` documentation.

After installing the Raptor drivers, five sections will be automatically added to the `xorg.conf` file. The "Monitor" section will be added followed by separate "Device" and "Screen" sections for each head for a total of five sections.

If your system is using a different configuration file than the `xorg.conf` file, you may need to configure your file with the necessary sections for each head from:

`/etc/X11/XF86Config.rapafp`

**NOTE:** If more than one Raptor 4000 Series card is installed, only the first card will be configured automatically. Subsequent card(s) must be configured manually. Each `Device` section must have a unique `Identifier`, `BusID` and `Device` option field. For more information on multi-screen environment refer to Section 4.5.

An example configuration of a Raptor 4000 Series card is listed below. The `Identifier` for the Raptor 3500e will be different. The required modifications are explained in greater detail in the following pages.

```
# TSI Raptor 4000 Configuration Sections
Section "Monitor"
    Identifier "TSI-FP DVI"
    VendorName "Tech Source, Inc"
    HorizSync 31.5 - 150.0
    VertRefresh 50-90
    ModeLine "2048x2048" 260.00 2048 2112 2176 2304
        2048 2051 2057 2116
    ModeLine "2560x2048" 292.40 2560 2592 2608 2672
        2048 2049 2050 2055
    ModeLine "2048x2048_D" 255.92 2048 2080 2112
        2176 2048 2053 2056 2079
EndSection

Section "Device"
    Identifier "Rapafp0"
    Driver "rapafp"
    BusID "PCI:41:0:0"
    Card "TSI Raptor 4000"
    Option "Device" "/dev/rapafp0"
    Option "Mode" "24"
    Option "ScaleCursPos" "on"
    Screen 0
    Option "Head" "0"
```

```
# Option      "DDCCheck" "off"
# Option      "Rotation" "+r"
# Option      "Sync" "sx"
# Option      "BackingStore"
# Option      "SaveUnder"
# Option      "TranspColor" "0x0a3246"
EndSection
```

```
Section "Screen"
  Identifier "Raptor4000-0"
  Device     "Rapafp0"
  Monitor    "TSI-FP DVI"
  DefaultDepth 24
  SubSection "Display"
    Depth     8
    Modes     "2048x2048"
  EndSubSection
  SubSection "Display"
    Depth     16
    Modes     "2048x2048"
  EndSubSection
  SubSection "Display"
    Depth     24
    Modes     "2048x2048"
  EndSubSection
EndSection
```

# TSI Raptor 4000 Configuration Sections

```
Section "Device"
  Identifier "Rapafp1"
  Driver     "rapafp"
  BusID      "PCI:41:0:0"
  Card       "TSI Raptor 4000"
  Option     "Device" "/dev/rapafp1"
  Option     "Mode" "24"
  Option     "ScaleCursPos" "on"
  Screen     1
  Option     "Head" "1"
# Option    "Sync" "sx"
# Option    "BackingStore"
# Option    "SaveUnder"
# Option    "TranspColor" "0x0a3246"
EndSection
```

```
Section "Screen"
  Identifier "Raptor4000-1"
  Device     "Rapafp1"
  Monitor    "TSI-FP DVI"
  DefaultDepth 24
  SubSection "Display"
    Depth     8
    Modes     "2048x2048"
  EndSubSection
```

```
SubSection "Display"
    Depth      16
    Modes      "2048x2048"
EndSubSection
SubSection "Display"
    Depth      24
    Modes      "2048x2048"
EndSubSection
EndSection
# TSI Raptor 4000 Configuration Sections
```

### 3.8.1 Monitor Section

This section contains default configuration information for the monitor and should remain unchanged.

### 3.8.2 Device Section

**Identifier:** Each instance of a Raptor card should have a unique identifier. This identifier is used in the `Screen` section.

**NOTE:** The `BusID` value in the configuration file will be updated automatically during software installation. The `BusID` will need to be updated manually for additional Raptor Series cards or slot changes. Please see the description below for details.

**BusID:** Depending on the machine and the slot the card is in, it might receive a unique `BusID`. When the driver attaches, it will print out the device name and `BusID`. To check the `BusID`, type `dmesg|grep rapafp`. The output should look similar to the following:

```
TSI: rapafp0 (BusID 41:0:0) is
RAPTOR 4000 @ 1280x1024
TSI: rapafp1 (BusID 41:0:0) is
RAPTOR 4000 @ 2048x2048.
```

In the example above, the Raptor 4000 has a

`BusID` of `PCI:41:0:0`. If you are experiencing a problem starting the Xserver, please verify the `BusID` of the card in `xorg.conf` match the `BusID` reported by the system.

**Option "Device":** This field specifies the device name assigned to each head on the Raptor 4000 Series card. The first head seen by the system will be `/dev/rapafp0` and the second will be `/dev/rapafp1`.

**Option "Mode":** This field specifies pixel modes.

<code>8</code>	8-bit PsuedoColor
<code>24</code>	24-bit True Color
<code>8+8</code>	Two 8-bit PseudoColor visuals
<code>8+24</code>	8-bit PseudoColor & 24 bit True Color visuals
<code>mox24</code>	MOX, 8-bit Normal, 21-bit Group, 13-bit Absolute
<code>mox32</code>	MOX, 8-bit Normal, 24-bit Group, 21-bit Absolute

**ScaleCursPos** This Boolean field option is useful when monitors of different screen sizes are used together in a multi-screen configuration. When the cursor crosses screen boundaries, its position on the new screen will be adjusted to be proportional to where it was on the previous screen.

**Sync** This field option is used to override DDC info. The `xorg.conf` resolution line is used to drive only digital panels. For an analog signal, this field should be commented out.

**TranspColor** This field option is only used while in 8+8 mode. It allows the user to specify the RGB color values associated with the transparent color of the overlay. If an application is

mistakenly using the transparent color, the value of the color can be changed so that the application no longer uses it. The default value is 0x0A3246.

### 3.8.3 Screen Section

- Identifier:** Each screen must have a unique identifier which will be used in the `ServerLayout` section.
- Device:** This field specifies which device you want to use for this screen. It should match the Identifier specified in one of the `Device` sections.
- Monitor:** This field should remain unchanged for the Raptor 4000 Series cards. Refer to the `XFree86` or `X.org` documentation for instructions on how to create a custom `Monitor` section.
- DefaultDepth:** Should be set to 24 bit depth.
- Modes:** This field should specify the desired resolution. If DDC2B/EDID is present, this field is ignored.

The following sample screen section shows the 4000 Series card, which is configured for 2048x2048:

```
Section "Screen"
    Identifier "Raptor4000-0"
    Device     "Rapafp0"
    Monitor    "TSI-FP DVI"
    DefaultDepth 24
    SubSection "Display"
        Depth     8
        Modes     "2048x2048"
    EndSubSection
```

```

SubSection "Display"
    Depth 16
    Modes "2048x2048"
EndSubSection
SubSection "Display"
    Depth 24
    Modes "2048x2048"
EndSubSection
EndSection
# TSI Raptor 4000 Configuration Sections

Section "Screen"
    Identifier "Raptor4000-1"
    Device "Rapafpl"
    Monitor "TSI-FP DVI"
    DefaultDepth 24
    SubSection "Display"
        Depth 8
        Modes "2048x2048"
    EndSubSection
    SubSection "Display"
        Depth 16
        Modes "2048x2048"
    EndSubSection
    SubSection "Display"
        Depth 24
        Modes "2048x2048"
    EndSubSection
EndSection

```

### 3.8.4 Server Layout Section

This is the section which specifies the server layout for either single-screen or multi-screen configuration.

**NOTE:** The `ServerLayout` section should already exist in your `xorg.conf` file. This section must be modified manually to include the Raptor card.

The following example shows the `ServerLayout` Section for a single-screen configuration on the Raptor 4000 Series device.

```

Section "ServerLayout"
    Identifier "XFree86 Configured"
    Screen 0 "Raptor4000-0" 0 0

```

```
InputDevice "Mouse0" "CorePointer"  
InputDevice "Keyboard0" "CoreKeyboard"  
EndSection
```

The following example shows the `ServerLayout` Section for a single-screen configuration on the Raptor 3500e device.

```
Section "ServerLayout"  
Identifier "XFree86 Configured"  
Screen 0 "Raptor3500-0" 0 0  
InputDevice "Mouse0" "CorePointer"  
InputDevice "Keyboard0" "CoreKeyboard"  
EndSection
```

Assuming `Screen0` is the console card, the following example shows the `ServerLayout` section with the Raptor Series card as the second screen.

```
Section "ServerLayout"  
Identifier "XFree86 Configured"  
Screen 0 "Screen0" LeftOf "Raptor4000-0"  
Screen 1 "Raptor4000-0" RightOf "Screen0"  
InputDevice "Mouse0" "CorePointer"  
InputDevice "Keyboard0" "CoreKeyboard"  
EndSection
```

Assuming `Screen0` is the console card, the following example shows the `ServerLayout` section with the Raptor 3500e card as the second screen.

```
Section "ServerLayout"  
Identifier "XFree86 Configured"  
Screen 0 "Screen0" LeftOf "Raptor3500-0"  
Screen 1 "Raptor3500-0" RightOf "Screen0"  
InputDevice "Mouse0" "CorePointer"  
InputDevice "Keyboard0" "CoreKeyboard"  
EndSection
```



## 4 Invoking the X Server

### 4.1 Overview

There are several ways to invoke the X server on your system:

- startx script provided in `/usr/X11R6/bin`
- `xinit`
- `xdm`

This section assumes the use of the `csH` environment. If you prefer a different shell, make the appropriate changes to the examples.

**NOTE:** For all these methods, there are some environment variables that **must** be set. These variables can be set in your `.cshrc` file.

```
prompt% setenv X11R6HOME /usr/X11R6

prompt% setenv LD_LIBRARY_PATH \
      $X11R6HOME/lib

prompt% set path=($X11R6HOME/bin $path)
```

All of the options specific to the Tech Source Raptor graphics accelerators are set through the option field in the `Device` section of the `xorg.conf` file. No command-line options are necessary when using `startx`, `xinit` or `xdm` to start the X server. Refer to Chapter 3 for instructions on how to properly configure the `xorg.conf` files.

**NOTE:** For changes to take effect, the Xserver must be restarted after modifications are made to the X configuration file.

## 4.2 startx

The `startx` script is provided in `$X11R6HOME/bin` directory. To start up the X server in the default mode type:

```
prompt% startx
```

You may add any other standard command line arguments to the end of the line as necessary.

## 4.3 xinit

The `xinit` program can be used to start the X server directly. The `xinit` format is as follows:

```
xinit [[client] options][ -- [server]          [display] options ]
```

If no specific client program is given on the command line, `xinit` will look for a file in the user's home directory called `.xinitrc` to run as a shell script to start up client programs. If no such file exists, `xinit` will use the following as a default:

```
xterm -geometry +1+1 -n login \  
-display :0
```

If no specific server program is given on the command line, `xinit` will look for a file in the user's home directory called `.Xserverrc` to run as a shell script to start up the server. If no such file exists, `xinit` will use the following as a default:

```
X :0
```

This assumes that there is a program named `x` in the current search path. The X server in the XFree86 4.0 (or later) distribution is called `XFree86` and is in the directory `$X11R6HOME/bin`. A symbolic link has been made from `x` to `XFree86`. The X server in the X.org distribution is called `Xorg` and is in the directory `$X11R6HOME/bin`. A symbolic link has been made from `x` to `Xorg`.

**NOTE:** Make sure that the environment is set as described in Section 4.1.

To start up the server using `xinit`, type:

```
prompt% xinit -- $X11R6HOME/bin/X
```

You may also add any other standard command line arguments to the end of the line. For additional information on the use of `xinit`, refer to the `xinit` man page.

## 4.4 xdm

The X Display Manager (`xdm`) program is used for running multiple users on the same host machine. `xdm` provides services similar to those provided by `init`, `getty` and `login` on character terminals prompting for login name and password, authenticating the user, and running a session. It provides a login window for each user or selected users.

Several files that are required to start `xdm` are provided in the directory `/etc/X11/xdm` (depending on the distribution on your system, the path to these files might be different). The configuration file, `xdmconfig`, contains references to the other files and is used to specify other configuration parameters of `xdm`. The `Xservers` file specifies the users (displays) that must get a login window.

The `Xservers` file will have individual lines to represent the X server startup on each of the display devices on which an `xdm` login screen is desired. Once the configuration file is properly configured, a typical `Xservers` file should contain only one uncommented line, such as the following example:

```
:0 local /usr/X11R6/bin/X
```

Other command line arguments may be added to end of the line. For more information on `xdm`, refer to the `xdm` man pages.

## 4.5 Configuring the X Server for Multi-Screen Mode

### 4.5.1 Configurations for Multiscreen Mode

The `xorg.conf` (configuration) file determines whether the X server starts up in single-screen or multi-screen mode. Desired configurations must first be set. Once the configuration file is correctly set up, the procedure for starting the X server (whether in single-screen or multi-screen mode) will be the same.

To start the X server in multi-screen mode, changes need to be made to the `ServerLayout`, `Device` and `Screen` sections.

Each Raptor card has its own `Device` and `Screen` section. These sections in the `xorg.conf` file are added once during driver installation and will need to be added manually for each additional 4000 Series card installed.

For multiscreen mode, the `ServerLayout` section in `xorg.conf` needs to be modified.

In the `Screen` section of the `xorg.conf` file, the fields that need to be changed are: `Identifier` and `Device`. The `Identifier` option for `Screen1` (head1) is `Raptor4000-1`. The `Device` option is labeled, "Rapafp1". This will differentiate this head from another in the `ServerLayout` section.

```
Section "ServerLayout"
    Identifier "XFree86 Configured"
    Screen 0 "Raptor4000-0"
    Screen 1 "Raptor4000-1" LeftOf "Raptor4000-0"
    InputDevice "Mouse[1]" "CorePointer"
    InputDevice "Keyboard[0]" "CoreKeyboard"
EndSection
```

In the example above, the Xserver will start on both heads of the 4000 card, `Screen0` (head0) and `Screen1` (head1).

**NOTE:** If you are using a Raptor 3500e then the Identifier will be Raptor3500-0 in the ServerLayout Section.

In the example below, the sections related to Screen0 and Screen1 are provided. To change the resolution on Screen1 (head1), the new resolution will need to be specified to the Modes option in the Screen section.

```
Section "Device"
    Identifier "Rapafp0"
    Driver      "rapafp"
    BusID      "PCI:17:0:0"
    Card       "TSI Raptor 4000"
    Option     "Device" "/dev/rapafp0"
    Option     "Mode" "24"
    Option     "ScaleCursPos" "on"
Screen
0
    Option    "Head" "0"
#   Option   "DDCCheck" "off"
#   Option   "Rotation" "+r"
#   Option   "Sync" "sx"
#   Option   "BackingStore"
#   Option   "SaveUnder"
#   Option   "TranspColor" "0x0a3246"
EndSection
```

```
Section "Screen"
    Identifier "Raptor4000-0"
    Device    "Rapafp0"
    Monitor   "TSI-FP DVI"
    DefaultDepth 24
    SubSection "Display"
        Depth    8
        Modes    "2048x2048"
    EndSubSection
    SubSection "Display"
        Depth    16
        Modes    "2048x2048"
    EndSubSection
    SubSection "Display"
        Depth    24
        Modes    "2048x2048"
    EndSubSection
EndSection
```

```

Section "Device"
  Identifier "Rapafp1"
  Driver     "rapafp"
  BusID     "PCI:17:0:0"
  Card      "TSI Raptor 4000"
  Option    "Device" "/dev/rapafp1"
  Option    "Mode" "24"
  Option    "ScaleCursPos" "on"
  Screen   1
  Option   "Head" "1"
# Option    "DDCCheck" "off"
# Option    "Sync" "sx"
# Option    "BackingStore"
# Option    "SaveUnder"
# Option    "TranspColor" "0x0a3246"
EndSection

```

```

Section "Screen"
  Identifier "Raptor4000-1"
  Device     "Rapafp1"
  Monitor    "TSI-FP DVI"
  DefaultDepth 24
  SubSection "Display"
    Depth     8
    Modes     "2048x2048"
  EndSubSection
  SubSection "Display"
    Depth     16
    Modes     "2048x2048"
  EndSubSection
  SubSection "Display"
    Depth     24
    Modes    "2048x2048"
  EndSubSection
EndSection

```

**NOTE:** The BusId and Device for each card is determined by running `dmesg | grep rapafp`.

**NOTE:** In the Screen section of a given Raptor card, the Device field must match the Identifier field specified in the corresponding Device section.

```

Section "Screen"
  Identifier "Raptor4000-1"
  Device    "Rapafp1"
  Monitor    "TSI-FP DVI"

```

```
DefaultDepth 8
SubSection "Display"
    Depth 8
    Modes "2048x2048_D"
EndSubSection
SubSection "Display"
    Depth 16
    Modes "2048x2048_D"
EndSubSection
SubSection "Display"
    Depth 24
    Modes "2048x2048_D"
EndSubSection
EndSection
```

To change the resolution for each device, please refer to Section 4.7.

## 4.5.2 Defining Order of Display

The order of appearance for the display of two cards can be configured in the `xorg.conf` file. In the example given below, the display of the primary card is specified to be on the left of the secondary card.

Assuming `Screen0` is the console card, the following example shows the `ServerLayout` section with the Raptor 4000 Series card as the secondary screen.

```
Section "ServerLayout"
    Identifier "Default Layout"
    Screen 0 "Screen0" LeftOf "Raptor4000-0"
    Screen 1 "Raptor4000-0" RightOf "Screen0"
    InputDevice "Mouse0" "CorePointer"
    InputDevice "Keyboard0" "CoreKeyboard"
EndSection
```

## 4.6 Selecting Bit-Depths on 4000 Series Cards

### 4.6.1 Setting Bit-Depth

The 4000 Class cards support 8-bit, 24 bit, 8+8, 8+24, mox24 and mox32 modes. By default, windows will start in 24-bit mode on these cards. For an explanation of the various MOX modes, please see Section 4.6.2.

**NOTE:** The Raptor 3500e does not support 8+8, 8+24 modes or any of the MOX modes.

To set bit-depth to 8-bit, the "Mode" option in the Device section needs to be set to "8" and the other values should remain unchanged.

```
Section "Device"
    Identifier "Rapafp0"
    Driver "rapafp"
    BusID "PCI:41:0:0"
    Card "TSI Raptor 4000"
    Option "Device" "/dev/rapafp0"
    Option "Mode" "8"
    Option "ScaleCursPos" "on"
    Screen 0
    Option "Head" "0"
#   Option "DCCheck" "off"
#   Option "Rotation" "+r"
#   Option "Sync" "sx"
#   Option "BackingStore"
#   Option "SaveUnder"
#   Option "TranspColor" "0x0a3246"
EndSection
```

To set bit-depth to 24, the "Mode" option should be set to "24" :

```
Section "Device"
    Identifier "Rapafp0"
    Driver "rapafp"
    BusID "PCI:41:0:0"
    Card "TSI Raptor 4000"
    Option "Device" "/dev/rapafp0"
    Option "Mode" "24"
```



```

Option      "ScaleCursPos" "on"
Screen      0
Option      "Head" "0"
# Option    "DDCCheck" "off"
# Option    "Rotation" "+r"
# Option    "Sync" "sx"
# Option    "BackingStore"
# Option    "SaveUnder"
# Option    "TranspColor" "0x0a3246"
EndSection

```

To select 8+8-bit mode, the "Mode" option in the Device section should be set to "8+8" and the "TranspColor" option should be uncommented. In the Screen section, the default depth should be set to "8".

```

Section "Device"
Identifier "Rapafp0"
Driver     "rapafp"
BusID      "PCI:41:0:0"
Card       "TSI Raptor 4000"
Option     "Device" "/dev/rapafp0"
Option    "Mode" "8+8"
Option     "ScaleCursPos" "on"
Screen     0
Option     "Head" "0"
# Option   "DDCCheck" "off"
# Option   "Rotation" "+r"
# Option   "Sync" "sx"
# Option   "BackingStore"
# Option   "SaveUnder"
Option    "TranspColor" "0x0a3246"
EndSection

Section "Screen"
Identifier "Raptor4000-0"
Device    "Rapafp0"
Monitor   "TSI-FP DVI"
DefaultDepth 8
SubSection "Display"
    Depth    8
    Modes    "2048x2048"
EndSubSection
SubSection "Display"
    Depth    16
    Modes    "2048x2048"
EndSubSection
SubSection "Display"
    Depth    24
    Modes    "2048x2048"
EndSubSection
EndSection

```

The following example shows the 8+24 mode being selected for a Raptor 4000 card. The "Mode" option is set to "8+24".

```

Section "Device"
  Identifier "Rapafp0"
  Driver "rapafp"
  BusID "PCI:41:0:0"
  Card "TSI Raptor 4000"
  Option "Device" "/dev/rapafp0"
  Option "Mode" "8+24"
  Option "ScaleCursPos" "on"
  Screen 0
  Option "Head" "0"
# Option "DDCCheck" "off"
# Option "Rotation" "+r"
# Option "Sync" "sx"
# Option "BackingStore"
# Option "SaveUnder"
# Option "TranspColor" "0x0a3246"
EndSection

```

The following example shows the mox24 mode being selected for a Raptor 4000 card. The "Mode" option is set to "mox24".

```

Section "Device"
  Identifier "Rapafp0"
  Driver "rapafp"
  BusID "PCI:41:0:0"
  Card "TSI Raptor 4000"
  Option "Device" "/dev/rapafp0"
  Option "Mode" "mox24"
  Option "ScaleCursPos" "on"
  Screen 0
  Option "Head" "0"
# Option "DDCCheck" "off"
# Option "Rotation" "+r"
# Option "Sync" "sx"
# Option "BackingStore"
# Option "SaveUnder"
# Option "TranspColor" "0x0a3246"
EndSection

```

The following example shows the mox32 mode being selected for a Raptor 4000 card. The "Mode" option is set to "mox32".

```

Section "Device"
  Identifier "Rapafp0"
  Driver "rapafp"
  BusID "PCI:41:0:0"
  Card "TSI Raptor 4000"
  Option "Device" "/dev/rapafp0"

```

```

Option      "Mode" "mox32"
Option      "ScaleCursPos" "on"
Screen      0
Option      "Head" "0"
# Option    "DDCCheck" "off"
# Option    "Rotation" "+r"
# Option    "Sync" "sx"
# Option    "BackingStore"
# Option    "SaveUnder"
# Option    "TranspColor" "0x0a3246"
EndSection

```

## 4.6.2 MOX Modes

MOX (Multiple Overlay Extension) provides support for multiple drawing layers on graphics cards. MOX is available on all Raptor cards with the exception of the Raptor 3500e card. Details about MOX can be obtained in a technical white paper available separately from Tech Source.

The following MOX modes are supported on the Raptor 4000 Series cards.

mox24            MOX, 8-bit Normal, 21-bit Group, 13-bit Absolute

mox32            MOX, 8-bit Normal, 32-bit Group, 24-bit Absolute

**NOTE:** MOX support is only available on the head closest to the pci slot (Head0).

## 4.7 Setting Resolution on Raptor 4000 Series Cards

By default, the Xserver will pick up the resolution specified by DDC. If the attached monitor is not DDC capable, it will pick up the resolution specified in the `xorg.conf` file.

The resolution and refresh rate can be changed by modifying the configuration file, such as the `xorg.conf` file.

The maximum supported resolution for each head on a Raptor 4000 Series can be found in Appendix B.

### 4.7.1 Setting Resolution

To override the provided DDC resolution in order to specify the resolution you wish to display, refer to section 4.7.2.

To specify the resolution you wish to display, modify the "Modes" option in the `Screen` section of the `xorg.conf` file. In the `SubSection "Display"` listed beneath the `DefaultDepth`, specify the new resolution in double quotes next to the `Modes` option.

The example below represents the resolution set to 2048x2048. In this case, the X server will automatically select the highest possible refresh rate for the monitor.

```
Section "Screen"
    Identifier "Raptor4000-0"
    Device      "Rapafp0"
    Monitor     "TSI-FP DVI"
    DefaultDepth 24
    SubSection "Display"
        Depth      8
        Modes      "2048x2048"
    EndSubSection
    SubSection "Display"
        Depth      16
        Modes      "2048x2048"
    EndSubSection
    SubSection "Display"
        Depth      24
        Modes      "2048x2048"
    EndSubSection
EndSection
```

The example below represents the resolution set to 1280x1024. In this case, the X server will automatically select the highest possible refresh rate for the monitor.

```
Section "Screen"
    Identifier "Raptor4000-0"
    Device "Rapafp0"
    Monitor "TSI-FP DVI"
    DefaultDepth 24
    SubSection "Display"
        Depth 8
        Modes "2048x2048"
    EndSubSection
    SubSection "Display"
        Depth 16
        Modes "2048x2048"
    EndSubSection
    SubSection "Display"
        Depth 24
        Modes "1280x1024"
    EndSubSection
EndSection
```

If the monitor is not DDC capable, the option `Sync` in the `Device` section should be uncommented so that the digital signal can be used.

**NOTE:** If the monitor is using an analog signal, the `Sync` option should remain commented out.

```
Section "Device"
    Identifier "Rapafp0"
    Driver "rapafp"
    BusID "PCI:41:0:0"
    Card "TSI Raptor 4000"
    Option "Device" "/dev/rapafp0"
    Option "Mode" "mox24"
    Option "ScaleCursPos" "on"
    Screen 0
    Option "Head" "0"
    # Option "DDCCheck" "off"
    # Option "Rotation" "+r"
    # Option "Sync" "sx"
    # Option "BackingStore"
    # Option "SaveUnder"
    # Option "TranspColor" "0x0a3246"
EndSection
```

The following "Screen" section shows the 4000 card configured for use with the 2048x2048\_D resolution:

```
Section "Screen"
    Identifier "Raptor4000-0"
    Device     "Rapafp0"
    Monitor    "TSI-FP DVI"
    DefaultDepth 24
    SubSection "Display"
        Depth 8
        Modes  "2048x2048_D"
    EndSubSection
    SubSection "Display"
        Depth 16
        Modes  "2048x2048_D"
    EndSubSection
    SubSection "Display"
        Depth 24
        Modes  "2048x2048_D"
    EndSubSection
EndSection

# TSI Raptor 4000 Configuration Sections
Section "Screen"
    Identifier "Raptor4000-1"
    Device     "Rapafp1"
    Monitor    "TSI-FP DVI"
    DefaultDepth 24
    SubSection "Display"
        Depth 8
        Modes  "2048x2048_D"
    EndSubSection
    SubSection "Display"
        Depth 16
        Modes  "2048x2048_D"
    EndSubSection
    SubSection "Display"
        Depth 24
        Modes  "2048x2048_D"
    EndSubSection
EndSection

# TSI Raptor 4000 Configuration Sections
```

If the desired resolution does not match a resolution in X server's internal list, it will be necessary to set both resolution and refresh rate as explained in Section 4.7.3.

## 4.7.2 Overriding DDC

If the monitor being used supports the DDC2B/EDID protocol, the default resolutions will be determined using the Auto-Detect feature. By default, the X server will start with the resolution that DDC has reported. If the monitor is not DDC enabled, the resolution defined in the `xorg.conf` file will be used.

To override or disable DDC mode, the `"DDCCheck" "off"` option must be uncommented in the `"Device"` Section in the `xorg.conf` file. It must be uncommented prior to starting the Xserver for changes to take effect. By default, the `"DDCCheck" "off"` option is commented out, so DDC is used.

When overriding DDC, the desired resolution should be defined in the `xorg.conf` file. In addition, if you want to use a digital signal, the option `Sync` in the `Device` section should also be uncommented. To specify a particular resolution for your display, refer to section 4.7.1.

In the example given below, the `"DDCCheck" "off"` option is uncommented.

```
Section "Device"
    Identifier "Rapafp0"
    Driver      "rapafp"
    BusID      "PCI:2:9:0"
    Card       "TSI Raptor 4000"
    Option     "Device" "/dev/rapafp0"
    Option     "Mode" "24"
    Option     "ScaleCursPos" "on"
    Screen     0
    Option     "Head" "0"
    Option     "DDCCheck" "off"
# Option     "Rotation" "+r"
# Option     "Sync" "sx"
# Option     "BackingStore"
# Option     "SaveUnder"
# Option     "TranspColor" "0x0a3246"
EndSection
```

To enable DDC mode, the "DDCcheck" "off" option must be commented out in the "Device" Section of your Raptor card. This line option can be found in the `xorg.conf` file and must be commented out prior to starting the Xserver.

In the example provided, Option "DDCcheck" "off" is commented out, so DDC will be enabled.

```
Section "Device"
    Identifier "Rapafp0"
    Driver      "rapafp"
    BusID       "PCI:2:9:0"
    Card        "TSI Raptor 4000"
    Option      "Device" "/dev/rapafp0"
    Option      "Mode" "24"
    Option      "ScaleCursPos" "on"
    Screen      0
    Option      "Head" "0"
    # Option    "DDCcheck" "off"
    # Option    "Rotation" "+r"
    # Option    "Sync" "sx"
    # Option    "BackingStore"
    # Option    "SaveUnder"
    # Option    "TranspColor" "0x0a3246"
EndSection
```

### 4.7.3 Setting Mode Line

To select a specific mode line and refresh rate, both the `Monitor` and the `Screen` sections of the configuration file need to be modified. The configuration file used in the following example is `/etc/X11/xorg.conf`. If the mode line you wish to use for your display is not listed, then a list of supported resolutions along with their corresponding timing numbers is available in the file `/etc/X11/rapafp_modeline`.



The example below shows how a user can configure their system to use with most digital monitors.

To configure your desired resolution, you may need to extract the necessary entry from `/etc/X11/rapafp_modeline` and insert it into the `Monitor` section as shown in bold-face below.

```
Section "Monitor"
    Identifier "TSI-FP DVI"
    VendorName "Tech Source, Inc"
    HorizSync 31.5 - 150.0
    VertRefresh 40-90
    ModeLine "2048x2048" 357.18 2048 2088 2408 2816
    2048 2051 2054 2114
    ModeLine "2048x2048_D" 255.92 2048 2080 2112 2176
    2048 2053 2056 2079
    ModeLine "2048x2048_T" 271.67 2048 2096 2104 2208
    2048 2058 2061 2071
    ModeLine "2560x2048" 292.40 2560 2592 2608 2672
    2048 2049 2050 2055
EndSection
```

Next, the "Modes" option in the `Screen` section should be changed to match the name listed in double quotations in the `ModeLine` field of the `Monitor` section.

In the example below, the resolution is set to `2048x2048_D` which is the timing mode for use with most digital monitors.

```
Section "Screen"
    Identifier "Raptor4000-0"
    Device "Rapafp0"
    Monitor "TSI-FP DVI"
    DefaultDepth 24
    SubSection "Display"
        Depth 8
        Modes "2048x2048_D"
    EndSubSection
    SubSection "Display"
        Depth 16
        Modes "2048x2048_D"
    EndSubSection
    SubSection "Display"
        Depth 24
        Modes "2048x2048_D"
    EndSubSection
EndSection
```

## 4.8 Rotation Mode Configuration

An option for screen rotation is available for the Raptor 4000R board. Only the first head, the one closest to the PCI bus, will support video for the rotator board.

To set the card in rotation mode, the "Rotation" option must be uncommented in the "Device" Section in the `xorg.conf` file. This option must be set prior to starting the Xserver. If this option is commented out, then X Windows will be displayed in regular, non rotated mode.

There are two rotation modes, clockwise and counterclockwise.

To start X Windows in clockwise rotated mode, set the "Rotation" option to "+r" prior to starting the X server.

Observe the example below:

```
Section "Device"
    Identifier "Rapafp0"
    Driver     "rapafp"
    BusID     "PCI:5:9:0"
    Card      "TSI Raptor 4000"
    Option    "Device" "/dev/rapafp0"
    Option    "Mode" "mox24"
    Option    "ScaleCursPos" "on"
    Screen    0
    Option    "Head" "0"
#   Option   "DDCCheck" "off"
Option    "Rotation" "+r"
#   Option   "Sync" "sx"
#   Option   "BackingStore"
#   Option   "SaveUnder"
#   Option   "TranspColor" "0x0a3246"
EndSection
```

To start X Windows in counterclockwise rotated mode, set the **"Rotation"** option to **"-r"** prior to starting the X server.

To display video in non-rotated mode, the "Rotation" option must be commented in the "Device" Section of your rotation card, as given in the example below.

```
Section "Device"
    Identifier "Rapafp0"
    Driver     "rapafp"
    BusID      "PCI:5:9:0"
    Card       "TSI Raptor 4000"
    Option     "Device" "/dev/rapafp0"
    Option     "Mode" "mox24"
    Option     "ScaleCursPos" "on"
    Screen     0
    Option     "Head" "0"
#   Option     "DDCCheck" "off"
#   Option     "Rotation" "+r"
#   Option     "Sync" "sx"
#   Option     "BackingStore"
#   Option     "SaveUnder"
#   Option     "TranspColor" "0x0a3246"
EndSection
```

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## 5 Uninstalling Software

### 5.1 Uninstalling the Software

To uninstall the software driver package:

For Kernel 2.4 type:

```
prompt# rpm -e rapafp
```

For Kernel 2.6 type:

```
prompt# rpm -e rapafp6
```

To uninstall the software extensions type:

```
prompt# rpm -e tsimox  
prompt# rpm -e tsimisc
```

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## 6 Frequently Asked Questions

### 6.1 Frequently Asked Questions

When installing or configuring the Raptor 4000 Series software, some questions, problems or concerns may arise. Some questions frequently asked are listed below. If you need further assistance with any questions or concerns not found in this section, please contact our technical support group via: [hotline@techsource.com](mailto:hotline@techsource.com).

- Q.** Can the Raptor 4000 Series card be used to display console video?

**A.** At this time, the Raptor 4000 Series card cannot be used to display console video. A proper VGA card and driver will need to be installed to display console video.
- Q.** When must I make modifications in order for a Raptor 4000 Series card to start on the X server?

**A.** Changing slots and adding new cards may require manual modifications to the X configuration file. Any change in default settings desired after the driver installation will need to be manually done. Initial configuration of a Raptor 4000 Series card is done during the installation of the driver and software. Please refer to Section 3.7 for details on changing configuration settings.
- Q.** I am experiencing problems with display of my video. What should I do?

**A.** Verify that you are using a monitor with a supported resolution. The resolutions supported are mentioned in

Appendix B. If your monitor and resolution are supported, then look for any error messages pertaining to your Raptor 4000 Series device in `/var/log/Xorg.0.log`. In the log file, verify that the correct configuration file is being used, in regards to any changes made. The line in the log file will read something like, "(==) Using config file: `/etc/X11/xorg.conf`" If this is the correct configuration file then next verify that the option in each of the sections are correctly configured. The sections to be verified are: "Server Layout" "Screen" "Display" and "Monitor" Verify the `BusID` option matches the `BusID` for the card. For further details, please refer to the examples given in Chapter 3.



## 7 Technical Assistance

### 7.1 Who to call for Help

If you need help, please call our Technical Support Team at (800) 330-8301, or directly at (407) 262-7100 between the hours of **9:30am - 5:30pm EST** Monday through Friday.

Please have the software part number, version, and serial number for your Raptor card(s) available when contacting Tech Source in order to expedite support. Please make a note of this information in the area below:

#### **DETAILS OF YOUR CARD(S):**

**P/N:** \_\_\_\_\_

**Model Name:** \_\_\_\_\_

**Serial Number(s):** \_\_\_\_\_

**NOTE:** Technical Assistance will be available only for products under standard or extended warranty.

### 7.2 Email Address

Our email address is: [hotline@techsource.com](mailto:hotline@techsource.com).

International customers may use email or our fax line at (407)339-2554.

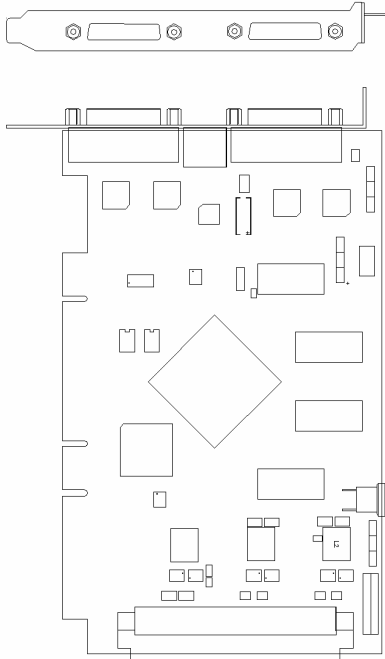
### **7.3 Website**

Detailed product information and Frequently Asked Questions (FAQs), are available on our website located at:

**<http://www.techsource.com>**

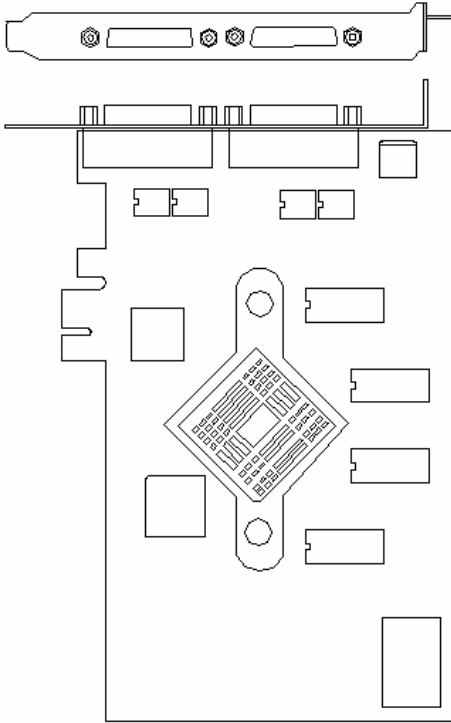
## Appendix A Card Specifications

### A.1 Raptor 4000 Specifications



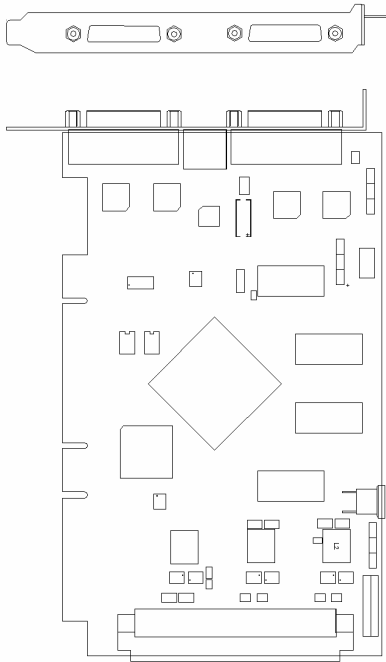
<b>Frame Buffer:</b>	256 MB
<b>MOX Hardware:</b>	Tech Source MOX 32 ASIC; 24 Layer Management
<b>Color Lookup Table:</b>	2048 entries from a palette of 16 million colors + 2 AUX 256 entry maps
<b>Bits per Pixel:</b>	8, 16, 24 or 32 (software configurable)
<b>Dynamic Color Plane Groups:</b>	32
<b>I/O Interface:</b>	66 MHz, 64-bit (Universal)
<b>Video Connector:</b>	DVI-Dual Link Digital, up to 2048x2048 High Resolution Head (Analog up to 360 MHz, 50Ω RGB)  DVI-Dual Link Digital, up to 2048x2048 Low Resolution Head (Analog up to 240 MHz, 75 Ω RGB)
<b>Temperature Rating:</b>	10 <sup>o</sup> to 50 <sup>o</sup> C (operating) -10 <sup>o</sup> to 70 <sup>o</sup> C (non-operating)
<b>Humidity Rating:</b>	10 to 90% (non-condensing)
<b>Power Rating:</b>	Less than 25 watts
<b>Dimensions:</b>	6.6 in. (168mm) x 4.37 in. (111mm)

## A.2 Raptor 4000e Specifications



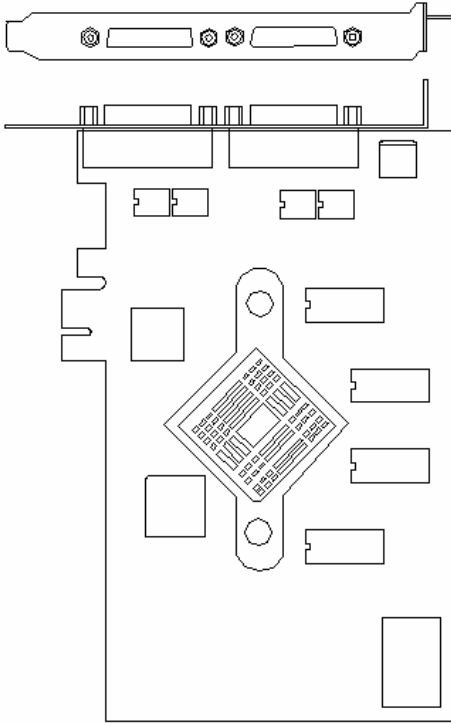
<b>Frame Buffer:</b>	256 MB
<b>MOX Hardware:</b>	Tech Source MOX 32 ASIC; 24 Layer Management
<b>Color Lookup Table:</b>	2048 entries from a palette of 16 million colors + 2 AUX 256 entries
<b>Bits per Pixel:</b>	8, 16, 24 or 32 (software configurable)
<b>Dynamic Color Plane Groups:</b>	32
<b>I/O Interface:</b>	PCI Express 1x, Compliant with PCI Express Base Spec 1.0a
<b>Video Connector:</b>	DVI-Dual Link Digital, up to 2048x2048 High Resolution Head (Analog is 50 ohm, up to 360 Mpixel/s, support optional)
	DVI-Dual Link Digital, up to 2048x2048 Low Resolution Head (Analog up to 240 MHz, 75 Ω RGB)
<b>Temperature Rating:</b>	10 <sup>0</sup> to 50 <sup>0</sup> C (operating) -10 <sup>0</sup> to 70 <sup>0</sup> C (non-operating)
<b>Humidity Rating:</b>	10 to 90% (non-condensing)
<b>Power Rating:</b>	Less than 25 watts
<b>Dimensions:</b>	6.6 in. (168mm) x 4.37 in. (111mm )

### A.3 Raptor 4000-LR Specifications



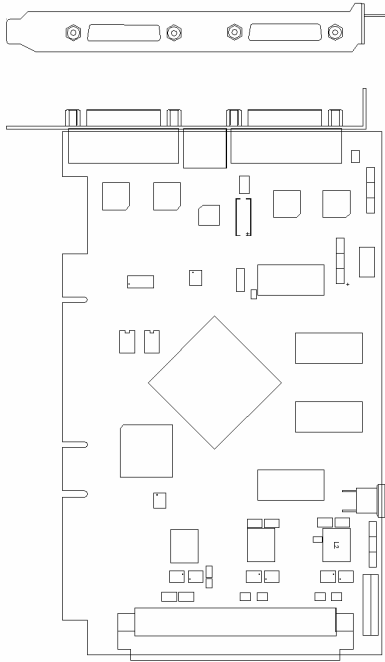
<b>Frame Buffer:</b>	128 MB
<b>MOX Hardware:</b>	Tech Source MOX 32 ASIC; 24 Layer Management
<b>Color Lookup Table:</b>	2048 entries from a palette of 16 million colors + 2 AUX 256 entry maps
<b>Bits per Pixel:</b>	8, 16, 24 or 32 (software configurable)
<b>Dynamic Color Plane Groups:</b>	32
<b>I/O Interface:</b>	PCI 66 MHz, 64-bit
<b>Video Connector:</b>	DVI-Dual Link Digital, up to 1920x1200  DVI-Dual Link Digital, up to 1920x1200 Low Resolution Head (Analog up to 240 MHz, 75 Ω RGB)
<b>Temperature Rating:</b>	10 <sup>0</sup> to 50 <sup>0</sup> C (operating) -10 <sup>0</sup> to 70 <sup>0</sup> C (non-operating)
<b>Humidity Rating:</b>	10 to 90% (non-condensing)
<b>Power Rating:</b>	Less than 25 watts
<b>Dimensions:</b>	6.6 in. (168mm) x 4.37 in. (111mm)

## A.4 Raptor 4000e-LR Specifications



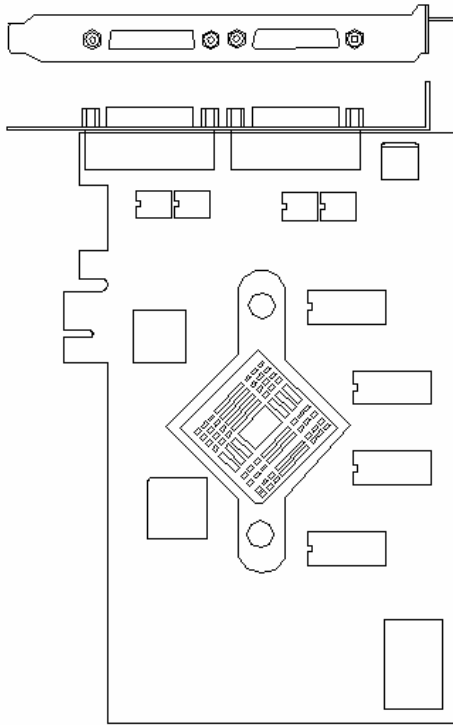
<b>Frame Buffer:</b>	128 MB
<b>MOX Hardware:</b>	Tech Source MOX 32 ASIC; 24 Layer Management
<b>Color Lookup Table:</b>	2048 entries from a palette of 16 million colors + 2 AUX 256 entries
<b>Bits per Pixel:</b>	8, 16, 24 or 32 (software configurable)
<b>Dynamic Color Plane Groups:</b>	32
<b>I/O Interface:</b>	PCI Express 1x, Compliant with PCI Express Base Spec 1.0a
<b>Video Connector:</b>	DVI-Single Link Digital, up to 1920x1200  DVI-Single Link Digital, up to 1920x1200 Low Resolution Head (Analog up to 240 MHz, 75 Ω RGB)
<b>Temperature Rating:</b>	10 <sup>0</sup> to 50 <sup>0</sup> C (operating) -10 <sup>0</sup> to 70 <sup>0</sup> C (non-operating)
<b>Humidity Rating:</b>	10 to 90% (non-condensing)
<b>Power Rating:</b>	Less than 25 watts
<b>Dimensions:</b>	6.6 in. (168mm) x 4.37 in. (111mm )

## A.5 Raptor 4000-R Specifications



<b>Frame Buffer:</b>	256 MB
<b>MOX Hardware:</b>	Tech Source MOX 32 ASIC; 24 Layer Management
<b>Color Lookup Table:</b>	2048 entries from a palette of 16 million colors + 2 AUX 256 entry maps
<b>Bits per Pixel:</b>	8, 16, 24 or 32 (software configurable)
<b>Dynamic Color Plane Groups:</b>	32
<b>I/O Interface:</b>	PCI, 66 MHz, 64-bit
<b>Video Connector:</b>	DVI-Dual Link Digital, up to 2048x2048 High Resolution Head (Analog up to 360 MHz, 50Ω RGB)
	2 <sup>nd</sup> Head is not active
<b>Temperature Rating:</b>	10 <sup>o</sup> to 50 <sup>o</sup> C (operating) -10 <sup>o</sup> to 70 <sup>o</sup> C (non-operating)
<b>Humidity Rating:</b>	10 to 90% (non-condensing)
<b>Power Rating:</b>	Less than 25 watts
<b>Dimensions:</b>	6.6 in. (168mm) x 4.37 in. (111mm)

## A.6 Raptor 3500e Specifications



<b>Frame Buffer:</b>	256 MB
<b>Color Lookup Table:</b>	256 entries
<b>Bits per Pixel:</b>	8 or 24 (software configurable)
<b>I/O Interface:</b>	PCI Express 1x, Compliant with PCI Express Base Spec 1.0a
<b>Video Connector:</b>	DVI-Dual Link Digital, up to 2048x2048 High Resolution Head  DVI-Dual Link Digital, up to 2048x2048 Low Resolution Head (Analog up to 240 MHz, 75 Ω RGB)
<b>Temperature Rating:</b>	10 <sup>0</sup> to 50 <sup>0</sup> C (operating) -10 <sup>0</sup> to 70 <sup>0</sup> C (non-operating)
<b>Humidity Rating:</b>	10 to 90% (non-condensing)
<b>Power Rating:</b>	Less than 25 watts
<b>Dimensions:</b>	6.6 in. (168mm) x 4.37 in. (111mm )



## Appendix B DDC Resolutions

For DDC to work properly, a cable must be connected to the Raptor 4000 Series cards and to the DDC capable display panel prior to starting the X server.

The head closest to the PCI slot (first head) will support resolutions up to 2048x2048 (Digital) and 2048x2048 (Analog).

The Raptor 4000-LR and Raptor 4000e-LR support resolutions up to 1920x1200 (Digital – no Analog) on the first head; and support up to 1920x1200 (Analog) on the second head.

**NOTE:** The Raptor 3500e does not support 2048x2048 (Analog).

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## Appendix C China RoHS Declaration Table.

2008.06.16

零件项目(名称) (Component Name)	有毒有害物质或元素 (Hazardous Substances or Elements)					
	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Chromium VI Compounds (Cr6+)	多溴联苯 Poly- brominated Biphenyls (PBB)	多溴二苯醚 Poly- brominated Diphenyl Ethers (PBDE)
猛禽4000系列印刷电路集会 (Raptor 4000 Series Printed Circuit Assemblies)	X	○	○	○	○	○
外接电(线)缆 (External Cables)	X	○	○	○	○	○
文件说明书 (Paper Manuals)	○	○	○	○	○	○
光盘说明书 (CD Manual)	○	○	○	○	○	○

O: 表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T 11363-2006 标准规定的限量要求以下。

O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.

X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T 11363-2006标准规定的限量要求。

X: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006.

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