

Tech Source

GFX 550e Installation and Reference Manual

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PREFACE

This publication documents the Tech Source, Inc. GFX installation and reference. This manual is intended for users who incorporate the Tech Source GFX graphics cards into their PCI or PCIe workstations. All systems vary to a degree. Knowledge of the features of your system and an understanding of UNIX shell scripts are helpful during the installation process.

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Chapter 1

INTRODUCTION

1.1 Overview

Thank you for purchasing a Tech Source GFX 550e card.

The GFX 550e card is a low profile single slot PCI Express graphics card. The target for this card is the new Sun Microsystems servers with PCI Express slots such as the Sun Fire T2000. The card can support up to two DVI or two analog outputs. The card can also simultaneously support 8 and 24-bit visuals.

Some of the salient features are:

- 32MB framebuffer
- Low Profile PCI Express card with x1 interface
- Dual head display
- Support for multiple resolutions

For more specifications, refer to Appendix B.

This product is currently supported on Solaris 10. Support for other versions of the OS may be available. Please email Tech Source at hotline@techsource.com for inquiries about support for other versions of Solaris.

From this point forward, Tech Source, Inc. will be referred to as Tech Source or TSI.

1.2 Conventions

This manual will follow certain conventions throughout.

Whenever a variable name, command name, directory, or filename is used in a paragraph, they 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
<code>ok</code>	prompt displayed when the user is in Boot PROM mode

Chapter 2

HARDWARE INSTALLATION

2.1 Installation Instructions

The GFX 550e graphics card installation is simple and consists of a few easy steps. These installation instructions presume that you are familiar with the Solaris operating system.

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

- Step 1: Turn your computer OFF, remove the computer's cover, find an available PCIe slot, and remove the bracket and screw. Ground yourself by touching the metal part on the case.
- Step 2: Install the GFX 550e card firmly into the PCIe slot. Take care to press it evenly and snugly into the slot. Once you are certain that the card is installed properly into the slot, secure it with the bracket screw.
- Step 3: Secure the computer's cover, attach any previously removed cables, and connect the video cable to your monitor.

The port on the GFX 550e supports two displays with a custom splitter cable attached to the port. The splitter cable that is packaged with the card has two DVI-I connectors. (Please refer to Appendix B for more information on the cables or for information about the required adapters for supporting analog monitors.)

Please note that some Sun monitors may require a DB-15 to 13W3 adapter (Refer to Appendix B, Section B.3).

Step 4: Turn ON the monitor before turning ON the computer so that the GFX 550e card can auto-detect the proper resolution for your monitor.

NOTE: If the system is currently using a secondary graphics device, read section 3.6 on configuring the console device. The console device is the screen on which the boot up messages appear. A monitor must be connected to the console device before you proceed to Chapter 3 Software Installation.

The GFX 550e card is now installed and ready for software installation. Refer to Chapter 3 for installing the Driver Software.

2.2 Resolution Settings

For monitors that support the DDC2B/EDID (Display Data Channel) protocol, the GFX 550e card will automatically select a compatible resolution. To override this selection, or to change the default resolution for monitors that do not provide DDC information, refer to Section 3.4 and Appendix A.

The default resolution for the GFX 550e card is listed in the table below.

Board	Resolution	Refresh	Bits/Pixels	Sync
GFX 550e	Auto Detect	-	8	separate/composite

If the monitor does not support the DDC2B/EDID protocol (auto-detect), and the console resolution is not set using methods described in Appendix A, the resolution will default to 1024x768@75Hz.

Chapter 3

SOFTWARE INSTALLATION

3.1 Overview

This chapter describes the software installation method for the “GFX 550e Driver Software”.

NOTE: Please note that this software must be installed on your system prior to running X Windows on these cards.

The software is provided on CD-ROM or by FTP and is composed of the following packages:

- TSImkox 64-bit System Software/Device Driver
- TSImkow OpenWindows System Support Software
- TSImkonn Manual pages

3.2 Requirements

The software currently supports the following Sun PCIe based systems:

Sun Fire T2000

NOTE: If your Sun PCI system is not listed here, please contact Tech Source, Inc.

The following are prerequisites for installing the “GFX 550e Driver Software”:

- The system is running Solaris 10 or higher..
- At least 2MB of disk space is available in `"/usr"` and `"/."`
- One or more GFX 550e cards are presently installed in the desktop/server.

NOTE: All device drivers are loadable. No kernel changes are required.

3.3 Installing GFX 550e Driver Software

This section describes software installation from a CD-ROM.

3.3.1 CD-ROM Installation

The following are step-by-step instructions for installing the “GFX 550e Driver Software” from a CD-ROM.

1. Install a GFX 550e card in the computer as described in Chapter 2.
2. Boot the computer with the `"-r"` (reconfiguration) option. To do this on a typical SPARC desktop/server, perform the following steps:
 - Power ON the computer.
 - Wait until you see boot messages displaying on the screen, then press and hold the `STOP` (L1) key, and then press the `"A"` key.
 - At the `"ok"` prompt, type `"boot -r"` followed by the `<Enter>` key .
3. After the system has booted, log in as `root`.
4. Insert the CD-ROM labeled "GFX 550e Driver Software-Solaris Edition" into the CD-ROM drive.

5. If `/cdrom/cdrom0` exists, type:

```
prompt# cd /cdrom/cdrom0
```

Skip to step 6. Otherwise, mount the CD-ROM by typing the following:

```
prompt# mount -F hsfs -O -o ro \  
/dev/dsk/c0t6d0s0 /cdrom
```

```
prompt# cd /cdrom
```

6. The CD-ROM contains an `install_all` script. To install the software, type:

```
prompt# ./install_all
```

This script will ask you a number of yes-or-no questions (generated by Sun's `pkgadd` install script). Answer these questions appropriately.

7. Reboot the system to complete the installation.

<p>NOTE: Upon reboot, new device names will be created in the <code>/dev/fbs</code> directory, one for each head.</p>
--

The GFX 550e device names have a prefix `mk0#`, where `#` represents the instance number assigned by the operating system. For this product, a single device name is created. For instance, it may be called `mk00`.

3.4 Changing Resolution and Bit-Depth on GFX 550e Card

The default resolution and bit-depth is either dictated by EDID information from the connected monitor or by the console resolution that is set (as described in Appendix A). In the absence of either of the above, the default console resolution is 1024x768@75Hz and the default bit-depth is 8-bit.

However, if you should decide to have a different resolution and bit-depth configuration under X Windows, follow the instructions in this section to set your resolution and bit-depth appropriately.

The `mkoconfig` utility can be used any time after installation to change these parameters and to turn on dual screen mode.

Please see the man page on `mkoconfig` for a detailed description.

NOTE: Dual Screen Mode is a feature of this card and is described in Section 3.5 of this manual. In this mode, the GFX 550e can only be configured to a bit depth of 24-bits.

The next two sections describe two methods of using `mkoconfig` to configure the card.

3.4.1 Interactive Configuration

`mkoconfig` has an interactive menu-style interface (See **Figure 3.1**). To use this program to configure your GFX 550e card, type:

```
prompt# mkoconfig -i
```

NOTE: If X Windows is running on the GFX 550e card(s) to be configured, please exit out of it before running `mkoconfig`. Failure to do so could result in a corrupted screen for the remainder of the X Window session.

The GFX 550e device(s) will be listed in the left column of the configuration screen displayed by `mkoconfig`. (See **Figure 3.1**).

A description of the commands is as follows:

Up/Down Arrow	selects the desired graphics device to modify
Left/Right Arrow	selects the parameter to modify (e.g. resolution, bit-depth, or sync)
Space Bar	modifies the parameter for the selected graphics device (will bring up a menu when applicable)
't'	puts a test pattern on the entire display (hit any key to return to the main screen) NOTE: the test pattern feature is disabled if the Xserver is running.
's'	saves current settings and exits
'h'	help
'q'	exits the program without saving any changes

NOTE: To enable the dual screen feature, select the "sync" menu and enter "w". Please see Section 3.5 for a description of this feature.

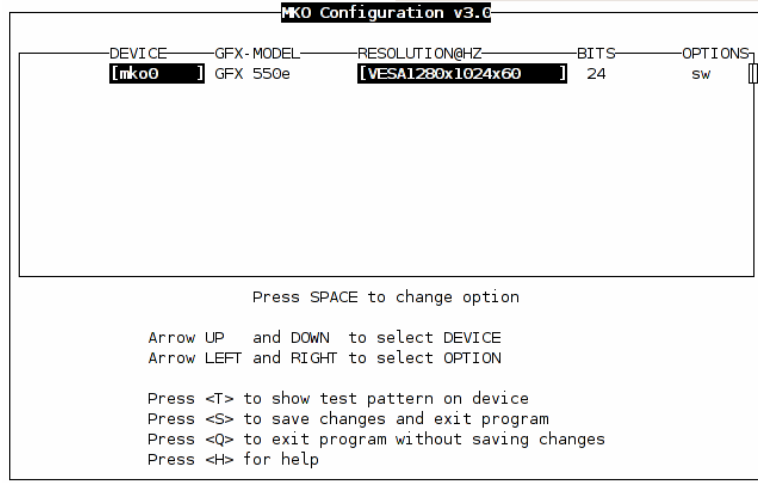


Figure 3.1 - GFX 550e Configuration Utility

3.4.2 Non-Interactive Configuration

Sometimes it is convenient to configure the GFX 550e card non-interactively. This method is especially useful when configuring many systems identically or when the appropriate configuration for the system is already known.

`mkoconfig` uses the same conventions as Sun's `m64config` or `ffbconfig` utilities. All of the parameters, which are set using the interactive version, can be set by specifying the option followed by a desired value. The parameters are:

- `-dev <device>` selects the device to configure
- `-res <resolution>` sets the resolution
- `-res \?` shows resolutions

Chapter 3 – Software Installation

<code>-file machine system</code>	specifies whether to modify OWconfig from /etc/openwin/server/etc or usr/openwin/server/etc respectively
<code>-depth 8 24 8+24</code>	changes the bit depth to 8, 24 or 8+24 mode
<code>-defaults</code>	resets device to default parameters
<code>-doublewide enable disable</code>	Enable/Disable the dual screen output feature. Please refer to Section 3.5.
<code>-24only enable disable</code>	forces all windows to use 24-bit visuals. This will disable 8+24 mode and may prohibit some 8-bit applications from working
<code>-cachedpixmap enable disable</code>	Turn off the off-screen cached pixmap feature. Default is <code>enable</code> .
<code>-propt</code>	displays current settings
<code>-prconf</code>	displays hardware information
<code>-help</code>	shows complete usage listing

NOTE: By default, the bit depth will be set to 24 for all resolutions.

3.4.2.1 Examples

To configure the resolution on the GFX 550e card to 1152x900@66Hz, type the following:

```
prompt# mkoconfig -res 1152x900x66
```

NOTE: If no device is specified, `mkoconfig` configures the console (assuming that the console is a GFX 550e card).

To verify the resolution prior to setting it permanently, add the word "try" after the resolution name. This option will display a test pattern on the screen until a return key is hit. Then the resolution can be accepted or rejected. For example:

```
prompt# mkoconfig -dev /dev/fbs/mko0 \  
-res 1152x900x66 try
```

To set the resolution to 1024x768x60 with a single TrueColor visual (no 8-bit PseudoColor visual):

```
prompt# mkoconfig -res 1024x768x60 \  
-24only enable
```

To display the current settings for `/dev/fbs/mko0`:

```
prompt# mkoconfig -dev /dev/fbs/mko0 -propt
```

3.5 Dual-Screen Mode

The GFX 550e has the ability to support two displays - two digital displays, two analog displays or one analog and one digital. In any case, the card can be configured so that the two displays appear as one unified screen to the X Window display. In other words, windows can be easily moved between the two displays (without the need for a special "xinerama" mode). This "unified screen" mode is also called the "Dual Screen" mode.

The GFX 550e card has only one graphic processor and two DACs. The drawing engine is capable of driving both DACs. See section 3.5.2 for more details.

3.5.1 GFX 550e Console Display Configuration

In console mode (i.e. prior to starting X Windows), only one head will be used.

3.5.2 X Windows (Dual-Screen Mode) Configuration

This card can be configured under X Windows in either a single screen mode or a dual screen mode, using the mkoconfig utility. Section 3.4 discusses the mkoconfig utility.

To configure the GFX 550e card to dual screen mode, simply specify "doublewide [enable:disable]" on the command line as described in section 3.4.2.

```
prompt# /usr/sbin/mkoconfig -dev /dev/fbs/mko0 \  
-doublewide enable
```

When running mkoconfig in the interactive mode (mkoconfig -i), select "w" under the "sync" menu to enable dual-screen mode.

In dual-head configurations, X Windows will act as one single display across two screens. Both heads will be set to the same resolution and each is limited to 1600x1200@60. So, the maximum effective resolution across both screens is 3200x1200@60. In the dual-head mode, only the 24-bit TrueColor visual is supported.

In single-head configurations, the resolution is limited to 1920x1200@76, and supports 8-bit, 24-bit, and 8+24-bit modes.

NOTE: These limits apply to analog output only. Digital output is restricted to 1280x1024@60. Dual-head configurations that include a digital monitor will likewise be limited to 1280x1024@60 for both heads.

3.6 Setting GFX 550e Card as the Console (Optional)

This section describes how to configure the GFX 550e card to be the console device for your system.

3.6.1 GFX 550e Card as the Only Framebuffer

If no other framebuffers are present in a Sun T2000 or another supported system, then the GFX 550e will be the console by default, provided the "output-device" variable is set to screen.

To set the output-device to screen you can remotely log into your system once it has booted and run the following command as super user:

```
# eeprom output-device=screen
```

Alternatively this variable may be set from the ALOM mode by running the following command at the sc prompt:

```
sc>bootmode bootscript="setenv output-device screen"
```

Chapter 4

Configuring the Xservers File

4.1 Overview

This section describes how to configure the Xservers file for use with one or more graphics cards. The GFX 550e device name will be `mko#`, where `#` represents the device instance number. A GFX 550e card however, will have a single device name corresponding to both heads.

To set the resolution and bit-depth or to enable “wide” mode for the Xwindows environment, please use the `mkoconfig` utility as described in Section 3.4.

4.1.1 GFX 550e Card as the Console

If the GFX 550e card is the console device, then there is no need to modify the `Xservers` file.

4.2 Common Desktop Environment (CDE)

If you have installed CDE and would like CDE to appear on the GFX 550e display, you may need to modify your `/etc/dt/config/Xservers` file.

If the file `/etc/dt/config/Xservers` does not exist, please copy it from the `/usr/dt/config` directory. Type:

```
prompt# cp /usr/dt/config/Xservers \  
        /etc/dt/config
```

If the directory does not exist, type:

```
prompt# mkdir /etc/dt/config
prompt# cp /usr/dt/config/Xservers \
        /etc/dt/config
```

The sample `Xservers.mko` file which is provided, assumes that the GFX 550e card is the only framebuffer on which to start CDE:

```
:0 Local local_uid@console root \
/usr/openwin/bin/Xsun :0 -dev \
/dev/fbs/mko0 -nobanner
```

NOTE: If the name of your GFX 550e device is something other than `mko0`, please substitute the correct name in the file.

You may add any other desired command line arguments to the end of this line. For example, you may start CDE on multiple displays. To do this, list each display device following the convention above.

The following configuration displays CDE on the display named `/dev/fbs/mko0` and uses the device named `/dev/fbs/m640` as a secondary framebuffer:

```
:0 Local local_uid@console root \
/usr/openwin/bin/Xsun :0 -dev /dev/fbs/mko0 \
-dev /dev/fbs/m640 -nobanner
```

Chapter 5

ADVANCED FEATURES

5.1 Overview

The GFX 550e card has several advanced features available through the X Server. They are:

- 8+24-bit simultaneous visuals
- Off-screen pixmap caching
- OpenGL support via Sun's DPA extension

5.2 8+24 Simultaneous Visuals

The 8+24 mode simultaneously supports 8 and 24-bit visuals. This addresses the classic colormap flashing issue with a 24-bit visual while providing the 8-bit visual that is required by some legacy applications, such as SoftWindows.

The available visuals are PseudoColor and TrueColor. PseudoColor is the default visual.

5.3 Cached Pixmap

All GFX 550e cards support off-screen pixmap caching. Cached pixmaps are those that are stored in the off-screen memory. These off-screen pixmaps allow faster transfer rates to and from on-screen windows.

The available off-screen memory depends on the amount of video memory, the current resolution, and depth settings. For example, consider the GFX 550e card, which has 32MB of video memory.

If it is running at 1024x768 resolution with a depth of 8-bits, 768K is used for on-screen memory. That leaves 31.2MB available for pixmaps. In 24-bit and 8+24-bit modes, the on-screen memory that is used is 4 times larger than what is used in the 8-bit mode.

The largest pixmaps are stored in off-screen memory. If a larger pixmap replaces a smaller pixmap in the off-screen memory, the smaller pixmap will move to system memory and remain there even after the larger pixmap is destroyed.

5.4 OpenGL Support

OpenGL support is provided through the Direct Pixel Access (DPA) Extension. To use this function, OpenGL v1.5 or higher must already be installed on your system.

Chapter 6

REMOVING GFX 550e DRIVER SOFTWARE

6.1 Overview

To find out if any “GFX 550e Software” exists on your system, type:

```
prompt# pkginfo | grep TSImko
```

If you see any response to the command, then you currently have some “GFX 550e Driver Software” installed.

To uninstall the “GFX 550e Driver Software”, enter the following command:

```
prompt# pkgrm TSImkonn TSImkow TSImkox
```

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Chapter 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 GFX 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.

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

CHANGING THE CONSOLE RESOLUTION

A.1 Overview

The GFX 550e card can be configured to be the console in a typical SPARC desktop/server. The card has a default console resolution and default depth as shown in the following table:

Board	Resolution	Refresh	Bits/Pixels	Sync
GFX 550e	Auto Detect	-	8	Separate/composite

It is possible to change the default resolution on a GFX 550e card. The procedures described in this appendix are:

- EDID Auto-Detect feature
- Output Device Method
- Video-Mode Method
- Video-Timing Method

This appendix includes a troubleshooting section describing possible problems and answers associated with changing the console resolution.

A.1.1 Reason for Changing the Console Resolution

Normally the default console resolution is sufficient for most users. An example of when you might be required to change the default resolution is described below:

- If the monitor does not "sync up" at the default console resolution, it may be necessary to choose a different console resolution.

A.1.2 Guidelines for Changing the Console Resolution

There are some general guidelines to follow when changing the default console resolutions. They are as follows:

- By default, all console resolutions will automatically be set to 8-bit mode.
- It is recommended that you use `mkoconfig -i` to test a resolution before configuring the console to that resolution.
- Digital output on the DVI port is limited to 1280x1024@60.

A.1.3 EDID Auto-Detect Feature

Auto-Detect is limited to 1280x1024@60 on the DVI port only. If overrides are used to exceed this limit, only analog signals will be produced by the DVI port. Digital signals will be turned off.

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 GFX 550e card first checks the Established Timing Identifiers (taking the first one supported) then tries to match the Standard Timings.

<p>NOTE: The monitor must be turned ON prior to booting the system in order for the GFX 550e card to communicate with it. Some adapters and cables may block this signal.</p>

If the Auto-Detect feature fails the card will default to 1152x900@66Hz.

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

A.2 Output-Device Method

To specify the console resolution of a GFX 550e card via the `output-device` environment variable, use the format `screen:rAxBxC` where:

A is the desired horizontal resolution,
B is the desired vertical resolution,
C is the desired refresh rate.

The system will check these values against an internal list of resolutions (see section A.3 for valid list) and use the corresponding entry as the console resolution. For example, to use VESA 1024x768x75 as the console resolution, type the following at the ok prompt:

```
ok setenv output-device screen:r1024x768x75  
ok reset-all
```

<p>NOTE: The new console resolution will take effect following the reset, and will hold the resolution information until the <code>output-device</code> variable is changed manually.</p>
--

A.3 Video-Mode Method

At the "ok" prompt in Boot PROM mode, the console resolution can be easily set on GFX 550e card by using one of the 32 preinstalled resolution modes. These resolution settings are identified by video modes 1-32.

NOTE: The default console of all video modes is 8 bits.

1	640x480@72
2	640x480@75
3	640x480@85
4	800x600@60
5	800x600@72
6	800x600@75
7	800x600@85
8	1024x768@60
9	1024x768@70
10	1024x768@75
11	1024x768@77 *
12	1024x768@85
13	1024x800@85 *
14	1152x900@60
15	1152x900@66 *
16	1152x900@70
17	1152x900@75
18	1152x900@76 *
19	1152x900@85
20	1280x800@76 *
21	1280x1024@60
22	1280x1024@67
23	1280x1024@67 *
24	1280x1024@75
25	1280x1024@76 *
26	1280x1024@85
27	1600x1000@66 *
28	1600x1000@76 *
29	1600x1200@60
30	1600x1200@65
31	1600x1200@70
32	1600x1200@75

NOTE: The resolution followed by a * uses composite sync.

Appendix A – Changing the Console Resolution

NOTE: Please refer to Appendix C for a description of `nvedit` commands.

```
ok nvedit
   0: 8 value video-mode
   1: <ctrl-c>
ok nvstore
ok setenv use-nvramrc? true
ok reset-all
```

NOTE: The last three commands enable the NVRAM. Without these lines, the changes you make with `nvedit` will be ignored.

A.4 Video-Timing Method

If all of the previously described methods fail for your configuration, it is possible to specify the exact timing numbers for a particular resolution. The last method for setting the console resolution also uses `nvedit`. This method is more involved and requires knowledge of all timing parameters for the desired resolution, and is only meant for monitors whose resolutions are not available in the `video-mode` method. Please refer to Appendix C for detailed instructions on using `nvedit`.

NOTE: The video-timing method should be used **only** if the previous methods have been unsuccessful.

For example, to set the console resolution to 1280x1024@76Hz, type the following:

```
ok nvedit
  0: : video-timing " 1280, 384, 32, 64,
      1024, 43, 3, 8, 135000000, 0" ;
  1: <ctrl-c>
ok nvstore
ok setenv use-nvramrc? true
ok reset-all
```

NOTE: The syntax is very important. The spaces must be present exactly as they appear in the example.

NOTE: The last three commands enable the NVRAM. Without these lines, the changes you make with `nvedit` will be ignored.

The following is a brief description of the 10 parameters used in this method.

- horizontal resolution (in pixels)
- horizontal blanking total
- horizontal front porch
- horizontal sync width
- vertical resolution (in lines)
- vertical blanking total
- vertical front porch
- vertical sync width
- dotclock in Hz
- sync value:

0	separate sync
256	sync on green
512	positive vertical sync pulse
1024	positive horizontal sync pulse
2048	composite sync

The sync values can be added together to select more than one of the above.

A.5 Troubleshooting

Problem	Solution
Used the method described in the Appendix to configure the console resolution, but the card still defaults to something other than the resolution specified.	<p>A priority scheme is used to determine the boot console resolution. The GFX 550e firmware checks the various methods in the order of priority discussed below. If it finds the resolution from the current method, it uses it; otherwise, it goes down the priority list to find the resolution information. Finally, if there is no resolution information, it uses the default resolution. The resolution-setting methods are enumerated in order of decreasing priority:</p> <ol style="list-style-type: none">1. <code>output-device</code> method (Section A.2)2. <code>video-timing</code> method (Section A.4)3. <code>video-mode</code> method (Section A.3)4. DDC2B/EDID (Section A.1.3)5. Default resolution for the card

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Appendix B

CARD SPECIFICATIONS

B.1 GFX 550e Card Specifications

Frame Buffer:	32 Megabytes
Hardware Cursor:	3 color, 64 x 64 bitmap
Color Lookup Table(s):	256 entries
PCIe Interface:	PCIe x 1
Video Interface	Analog (75 ohm) or DVI
Temperature Rating:	0 ⁰ to 55 ⁰ C operating -40 ⁰ to 75 ⁰ C non-operating
Humidity Rating	20 to 80% operating (non-condensing) 5 to 95% non-operating (non-condensing)
Power Rating:	+5V @ 3 Amps
Dimensions:	16.13cm x 6.89cm (6.35" x 2.712")
Dot Clock Max:	360MHz (primary) 230MHz (secondary) 135MHz (digital)
Video Sync:	Separate, composite
Video Connector:	LFH-60 (15pm D-shell, VGA or DVI-I using splitter cable)
Boot Support:	IEEE 1275 Compliant F Code

B.2 GFX 550e Cabling

B.2.1 Digital Monitors

The supplied dual-monitor adapter supports digital LCD flat panel displays with a DVI interface. These displays must have a DVI-D or DVI-I input connector. Refer to **Figure B.1** for an illustration. Connect the LCD's video cable to one of the two connectors of the dual monitor adapter.

Make sure the other end of each monitor cable is properly connected to its monitor. See your monitor manuals for more information.

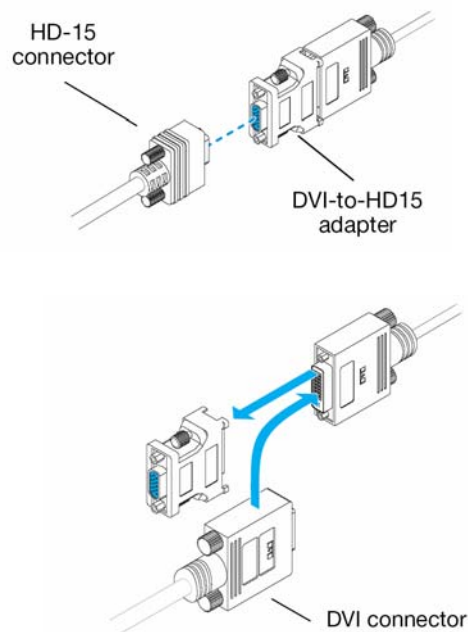


Figure B.1

B.2.2 Analog Monitors

For analog monitors use the DVI to VGA adapter in conjunction with the dual-monitor adapter. Analog monitors typically use HD-15 connectors to connect to the graphics card. Connect the monitor cable to one of the two connectors of the dual-monitor adapter. Refer to **Figure B.1** for an illustration of this connection.

NOTE: Your dual-monitor adapter can only be used with DVI based displays. DVI to VGA adapters are included for use with analog displays.

GFX 550e cables have DVI-D connectors for supporting digital monitors – these adapters don't use P&D or MDR-20 connectors.

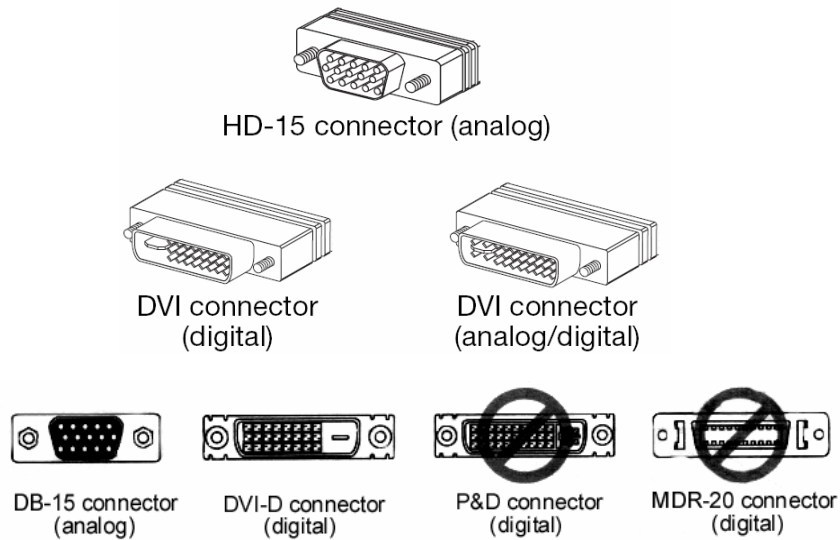
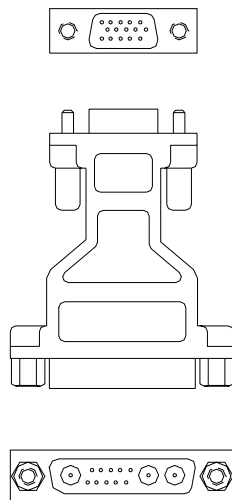


Figure B.4

B.3 Special Adapter for Some Sun Monitors

The GFX550e has a DVI to VGA adapter for use with analog monitors. Some Sun monitors and cables require a 13W3 to VGA adapter such as the 1396 adapter shown below. This adapter provides composite sync on 13W3 connection.



Appendix C

USING NVEDIT TO MODIFY NVRAM

C.1 NVRAM Edit Commands

This section discusses the use of NVRAM. The NVRAM is used to set the resolution in the Video-Mode and Video-Timing methods. To edit the NVRAM, begin `nvedit` at the `ok` prompt. There are several commands that you must use to edit the variables in NVRAM:

<Backspace>	deletes the character preceding the cursor
<Ctrl-l>	lists NVRAM current values
<Ctrl-p>	moves to the previous line
<Ctrl-n>	moves to the next line
<Ctrl-b>	moves to the previous character
<Ctrl-f>	moves to the next character
<Ctrl-u>	deletes to the beginning of the line
<Ctrl-k>	joins the current and next line
<Ctrl-u><Ctrl-k>	deletes the current line
<Ctrl-c>	exits the NVRAM editor (back to the <code>ok</code> prompt)

The changes will only take effect if they are stored using the **`nvstore`** command entered at the `ok` prompt. Once the changes are stored, the NVRAM must be enabled before the system will execute it. This is done by setting the environment variable `use-nvramrc?` to `true`. Please `reset` the system to make the changes effective.

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