

Tech Source

GFX 400 Series Installation and Reference Manual

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442 S. North Lake Blvd.
Altamonte Springs, FL 32701
(407) 262-7100
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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 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 400 Series product(s). The products in this series include:

- GFX 420
- GFX 440
- GFX 450

These cards are single slot PCI cards designed to enhance the graphics capabilities of your Sun Microsystems desktops and servers such as the Sun Blades, Ultra Sun Fire and Enterprise servers, while providing multi-head capability (up to 4 heads). All products in the GFX 400 Series line are capable of supporting resolutions of up to 1920x1200 analog and up to 1280x1024 digital (DVI). The cards can also simultaneously support 8 and 24-bit visuals.

The features and product differentiation between individual models are summarized in the table below:

	GFX 420	GFX 440	GFX 450
Number of Heads (Max)	2	4	2
Video Output	2 analog or 2 DVI	4 analog or 4 DVI	1 analog + 1 DVI or 2 analog
Framebuffer Size	64MB (32MB/head)	128MB (32MB/head)	32MB (shared)

These products support Sun's Solaris operating system (version 2.5.1 and higher). All systems vary to a degree, therefore knowledge of the features of your system and an understanding of UNIX shell scripts are helpful during the installation process.

From this point forward, all GFX 400 series products will collectively be referred to as GFX 400, except when describing individual models. Also, Tech Source, Inc. may 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 400 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 PCI Local Bus slot, and remove the bracket and screw. Ground yourself by touching the metal part on the case.
- Step 2: Install the GFX 400 card firmly into the PCI Local Bus 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 GFX 400 card supports analog or digital displays. See Section B.4 for a description of the parts and adapters that are available.

Each port on the GFX 420 and GFX 440 cards supports two displays with a custom splitter cable attached to the port. (Please refer to Appendix B for more information on the cables.) These cards support both analog and digital displays. It is a matter of choosing the right dual monitor adapter (splitter cable). Two versions of this splitter cable are available. One provides two standard analog VGA (DB-15) ports; this cable is bundled with the card. For digital displays, a cable with dual DVI ports is available. This cable can be purchased directly from Tech Source, Inc.

The GFX 450 has one DVI-I and one HD-15 connector. The DVI-I connector supports both analog and DVI output. Therefore, connect the appropriate cable depending on your monitor type. The HD-15 supports analog video only. Either head can be configured as console see section 3.5.1.

Please note that some Sun monitors may require a DB-15 to 13W3 adapter (Refer to Appendix B, Section B.5).

Step 4: Turn ON the monitor before turning ON the computer so that the GFX 400 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 400 card is now installed and ready for software installation. Refer to Chapter 3 for installing the GFX 400 Series Driver Software.

2.2 Resolution Settings

For monitors that support the DDC2B/EDID (Display Data Channel) protocol, the GFX 400 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 400 card is listed in the table below.

Board	Resolution	Refresh	Bits/Pixels	Sync
GFX 420	Auto Detect	-	8	separate/composite
GFX 440	Auto Detect	-	8	separate/composite
GFX 450	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 1152x900@66Hz.

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Chapter 3

SOFTWARE INSTALLATION

3.1 Overview

This chapter describes the software installation method for the “GFX 400 Series 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:

- TSImko 32-bit System Software/Device Driver
- TSImkox 64-bit System Software/Device Driver (Solaris 7 & above only)
- TSImkow OpenWindows System Support Software
- TSImkonn Manual pages

3.2 Requirements

The software currently supports the following Sun PCI based systems:

- Sun Blade 100
- Sun Blade 150
- Sun Blade 1000
- Sun Blade 1500
- Sun Blade 2000
- Sun Blade 2500
- Sun Fire v220
- Sun Fire v240
- Ultra 5

- Ultra 10
- Ultra 30
- Ultra 60
- Ultra 80
- Ultra AX
- Ultra Axi
- Enterprise 250
- Enterprise 450
- Enterprise 2500
- Enterprise 3000

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

The following are prerequisites for installing the “GFX 400 Series Driver Software”:

- The system is running Solaris 2.5.1 or higher.
- OpenWindows Version 3.5 or higher has already been installed on the system.
- At least 2MB of disk space is available in `"/usr"` and `"/."`
- One or more GFX 400 cards are presently installed in the desktop/server.

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

3.3 Installing GFX 400 Series 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 400 Series Driver Software” from a CD-ROM.

1. Install a GFX 400 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 400 Series 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.

NOTE: Upon reboot, new device names will be created in the `/dev/fbs` directory, one for each head.

The GFX 400 device names have a prefix `mk0#`, where `#` represents the instance number assigned by the operating system. For the GFX 450 product, a single device name is created. For instance, it may be called `mk00`. The GFX 420 presents itself has two separate devices to the operating system. Therefore, two device names will be created for the GFX 420, for example, `mk00` and `mk01`. With the Quad-head GFX 440, four device names will be created, one for each of the four heads (displays).

NOTE: During boot-up, all GFX 400 cards may present themselves as instances of GFX 450. That is by design.

3.4 Changing Resolution and Bit-Depth on GFX 400 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 resolution is 1152x900@66Hz 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 `mk0config` utility can be used any time after installation to change these parameters and to turn on dual screen mode.

NOTE: Dual Screen Mode is available only on the GFX 450 card and is described in Section 3.5 of this manual. In this mode, the GFX 450 can only be configured to a bit depth of 24-bits.

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

The next two sections describe two methods of using `mkoconfig` to configure the GFX 400 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 400 card, type:

```
prompt# mkoconfig -i
```

NOTE: If X Windows is running on the GFX 400 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 400 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)
's'	saves current settings and exits
'h'	help
'q'	exits the program without saving any changes

NOTE: To enable the dual screen feature (GFX 450 only), select the "sync" menu and enter "w". Please see Section 3.5 for a description of this feature.

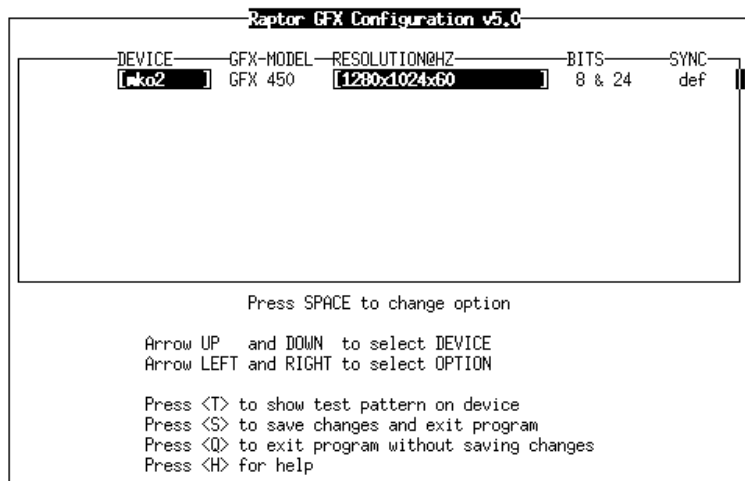


Figure 3.1 - GFX 400 Configuration Utility

3.4.2 Non-Interactive Configuration

Sometimes it is convenient to configure the GFX 400 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:

<code>-dev <device></code>	selects the device to configure
<code>-res <resolution></code>	sets the resolution
<code>-res \?</code>	shows resolutions
<code>-file machine system</code>	specifies whether to modify <code>OWconfig</code> from <code>/etc/openwin/server/etc</code> or <code>/usr/openwin/server/etc</code> respectively
<code>-depth 8 24</code>	changes the bit depth to 8 only or 8+24 mode
<code>-defaults</code>	resets device to default parameters
<code>-doublewidth TRUE FALSE</code>	Enable/Disable the dual screen output feature. Please refer to Section 3.5.
<code>-24only TRUE FALSE</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</code>	<code>TRUE FALSE</code>	Turn off the off-screen cached pixmap feature. Default is <code>TRUE</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 8+24 for all resolutions.

3.4.2.1 Examples

To configure the resolution on the GFX 400 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 400 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 TRUE
```

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

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

3.5 Dual-Screen Mode (GFX 450 only)

The GFX 450 has the ability to support two displays - either two analog displays or one analog and the other DVI (digital). In either 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. This is in contrast to what is available on the GFX 420 and GFX 440, where each head serves as an independent X Window screen and windows cannot be moved between screens unless the X Server is started up with "xinerama" enabled.

For the GFX 420 and GFX 440, each of the heads is driven by an individual graphics processor (GPU) and DAC. However, the GFX 450 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 450 Console Display Configuration

In console mode (i.e. prior to starting X Windows), only one head will be used. The firmware will determine which head to use according to the following rules:

DDC From Monitor 0 (DVI Port)	DDC From Monitor 1 (VGA Port)	Output	Resolution
Present	Present	Monitor 0	DDC from Monitor 0
Present	Absent	Monitor 0	DDC from Monitor 0
Absent	Present	Monitor 1	DDC from Monitor 1
Absent	Absent	Monitor 0	1152x900@66

Note: When the console resolution is changed using the methods outlined in Appendix A, the output will default to Monitor 0 unless the "tsi-default-head" variable is set as described below:

This behavior can be overridden by the `tsi-default-head` variable as in the following `nvrामrc` setting.

For example, to set the default console to Monitor 1:

```
ok nvedit
    0: 1 value tsi-default-head
    1: <ctrl-c>
ok nvstore
ok setenv use-nvrामrc? true
ok reset-all
```

NOTE: Head 0 is the DVI connector and head 1 is the DB15 connector.

If the GFX 450 is not the console device, the driver will still use the same rule described above to determine which head should be the default head.

To override this behavior, you can set the "tsi-default-head" variable in the `mko.conf` file under `/platform/sun4u/kernel/drv`.

For example, to set the default head to Monitor 1 on non-console devices, add the following to the `mko.conf` file:

```
tsi-default-head=1;
```

When X Server is started in single-screen mode on a non-console device, the default head will be used for output.

NOTE: The `tsi-default-head` setting in the `nvrarc` will only affect the console device and the `tsi-default-head` setting in `mko.conf` will affect only non-console GFX 450 devices. The system **MUST** be rebooted for the changes to take effect.

3.5.2 OpenWindows (Dual-Screen Mode) Configuration

Again, note that this applies to GFX 450 cards only. This card can be configured under OpenWindows (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 450 card to dual screen mode, simply specify "doublewidth [TRUE:FALSE]" on the command line as described in section 3.4.2.

```
prompt# /usr/sbin/mkoconfig -dev /dev/fbs/mko0 \  
-doublewidth TRUE
```

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

In dual-head configurations, OpenWindows 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 this 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 400 Card as the Console (Optional)

This section describes how to configure the GFX 400 card to be the console device for your system.

NOTE: If the procedure for your system is not described below, please contact Tech Source, Inc.

3.6.1 GFX 400 Card as the Only Framebuffer

3.6.1.1 Ultra 5 and Ultra 10

The GFX 400 card can be configured to be the console device. To do so, disable the on-board card on the Ultra 5 or 10. At the "ok" prompt, type:

```
ok setenv pcib-probe-list 1,3
ok reset
```

Once the system is reset, all console messages will be directed to the GFX 400 card.

NOTE: To restore the motherboard's 8-bit graphics device as the console for any reason, simply add it back to the `pcib-probe-list` as below:

```
ok setenv pcib-probe-list 1,2,3
ok reset
```


3.6.1.2 Sun Blade 1000, 1500, 2000, Ultra 30, Ultra 60, Ultra 80 and other systems without any built-in frame buffers

If no other framebuffer is present in a Sun Blade 1000 or another supported system, then the GFX 400 will be the console by default, provided that the board is in a valid, probed PCI slot.

3.6.1.3 Sun Blade 100

By default, the onboard video card is the last item in the pci-probe-list. After being properly installed in the system, if the GFX 400 card is the only other graphics card in the system, it will be probed first, and will automatically be made the console.

However, any graphics card or head can be made the console. Follow the procedure below to set the console manually.

1. At the `ok` prompt, type the following to display a list of the installed graphics devices:

```
ok show-displays
a) /pci@1f,0/SUNW,m64B@13
b) /pci@1f,0/pci@5/SUNW,Expert3D-Lite@1
c) /pci@1f,0/pci@5/pci@1/TSI,mko@c
d) /pci@1f,0/pci@5/pci@1/TSI,mko@8
e) /pci@1f,0/pci@5/pci@1/TSI,mko@4
f) /pci@1f,0/pci@5/pci@1/TSI,mko@0
g) NO SELECTION
Enter Selection, q to quit:
```

2. Type a letter at the prompt to select the graphics card you want to be the default console display.

In this example, type `a` to select the onboard M64 graphics device.

```
Enter Selection, q to quit: a
/pci@1f,0/SUNW,m64B@13 has been selected
Type ^Y ( Control-Y ) to insert it in the
  command line.
e.g. ok nvalias mydev ^Y
```

3. Set the selected device as the console device by typing:

```
ok setenv output-device <Control-Y>
```
4. Power off the system.
5. Connect your monitor cable to the onboard VGA connector on your system back panel.
6. Power on the system.

3.6.2 GFX 400 Card with a Secondary Framebuffer

The GFX 400 card can be made the console device when other secondary framebuffers are present in the system.

To configure the GFX 400 card as the console when UPA based device or other framebuffers are in the system, the `output-device` variable in NVRAM must be changed to the actual path of the desired GFX 400 card. This path can best be determined by searching for the string "TSI" in the / tree at the "ok" prompt.

For example, to find the PCI devices, at the "ok" prompt, type the following:

```
ok show-devs
```

You should see at least one entry containing the string "TSI", ie. "TSI,mk@#", where '#' will be a digit representing the PCI slot containing the GFX 400 card.

Use this entry as the console device for your desired GFX 400 card.

For example, if the path to the device "TSI,mko#" is "/pci@1f,4000", then type the following command:

NOTE: Replace '#' with whatever your GFX 400 device requires.

```
ok setenv output-device /pci@1f,4000/TSI,mko#  
ok reset
```

Once the system is reset, all console messages will be directed to the GFX 400 card.

NOTE: To restore the default graphics device as the console for any reason, simply set the `output-device` variable back to its default value of `screen` as below:

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

3.6.2.1 Other PCI Framebuffers

To make the GFX 400 card the console device when other PCI framebuffers are present in the system, it may be necessary to change the `pcia-probe-list` to probe the GFX 400 slot before that of the secondary framebuffer (in addition to making the changes in 3.6.1.1, if applicable).

Determine the slot numbers that correspond to these framebuffers, then ensure that the GFX 400 device slot number precedes that of the secondary framebuffer in the `pcia-probe-list`.

For example, if the GFX 400 device is located in slot 3, and the secondary framebuffer is located in slot 1, then update the `pcia-probe-list` so that slot 3 is probed BEFORE slot 1.

A possible configuration may resemble the following:

```
ok setenv pcia-probe-list 3,2,1,4  
ok reset-all
```

Once the system is reset, all console messages will be directed to the GFX 400 card.

Chapter 4

OPENWINDOWS

4.1 Overview

This section describes how to start up OpenWindows on a GFX 400 card. The GFX 400 device name will be `mko#`, where '#' represents the device instance number. GFX 420 and GFX 440 cards can have multiple device names – one for each head. A GFX 450 card however, will have a single device name corresponding to both heads.

To set the resolution and bit-depth for OpenWindows, please use the `mkoconfig` utility as described in Section 3.4.

4.1.1 GFX 400 Card as the Console

If the GFX 400 device is the console, type:

```
prompt# openwin
```

4.1.2 GFX 400 Card as the Secondary Framebuffer

If the PGX card is the console and the GFX 400 device is the second card, to start OpenWindows on both cards, in multiscreen mode, type:

```
prompt# openwin -dev /dev/fbs/m640 \  
              -dev /dev/fbs/mko0
```

The order of the devices corresponds to the order of the screens.

<p>NOTE: In the above example the <code>mko</code> device number is 0. This may be different in your configuration. Please check in <code>/dev/fbs/</code> or <code>dmesg</code> for the correct device numbers.</p>

4.1.3 Supporting Multiple GFX 400 Heads

GFX 420 and GFX 440 support multiple heads per card, OpenWindows can be started on each head in a multi-screen configuration. For example, a GFX 440 with four devices named, mko0, mko1, mko2 and mko3, the command to invoke OpenWindows on all four screens is:

```
prompt# openwin -dev /dev/fbs/mko0 -dev
/dev/fbs/mko1 -dev /dev/fbs/mko2 dev
/dev/fbs/mko3
```

Note: The order of the screens can be changed by just rearranging the order in which the devices are specified on the command line.

4.2 Common Desktop Environment (CDE)

If you have installed CDE and would like CDE to appear on the GFX 400 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
```

If the GFX 400 card is the console device, then there is no need to modify the `Xservers` file.

The sample `Xservers.mk0` file which is provided, assumes that the GFX 400 card is the only framebuffer on which to start CDE:

```
:0 Local local_uid@console root \  
/usr/openwin/bin/Xsun :0 -dev \  
/dev/fbs/mk00 -nobanner
```

NOTE: If the name of your GFX 400 device is something other than `mk00`, 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/mk00` and uses the device named `/dev/fbs/m640` (the built in graphics device on Sun Ultra 5/10 systems) as a secondary framebuffer:

```
:0 Local local_uid@console root \  
/usr/openwin/bin/Xsun :0 -dev /dev/fbs/mk00 \  
-dev /dev/fbs/m640 -nobanner
```

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Chapter 5

ADVANCED FEATURES

5.1 Overview

The GFX 400 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 400 Series 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 450 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 v1.1.1 or higher must already be installed on your system.

NOTE: In OpenGL v1.1.1 for Solaris, there is a bug in the DPA PCI 24-bit support that causes the red and blue colors to be swapped. There is a patch from Sun (Patch ID 106022-07) that fixes this problem. It is fixed in OpenGL v1.1.2.

Chapter 6

REMOVING GFX 400 SERIES DRIVER SOFTWARE

6.1 Overview

To find out if any “GFX 400 Series Software” exists on your system, type:

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

If you see any response to the command, then you currently have some “GFX 400 Series Driver Software” installed.

To uninstall the “GFX 400 Driver Software”, enter the following command:

For Solaris 2.6 and Solaris 2.5.1, type:

```
prompt# pkgrm TSImkonn TSImkow TSImko
```

For Solaris 7, Solaris 8 and Solaris 9, type:

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

<p>Warning: This uninstall procedure may not work with older versions of the TSI software. It is important to use the procedure provided with the previous version.</p>
--

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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 400 card can be configured to be the console in a typical SPARC desktop/server. Every GFX 400 card type has its own default console resolution and default depth as shown in the following table:

Board	Resolution	Refresh	Bits/Pixels	Sync
GFX 420	Auto Detect	-	8	Separate/composite
GFX 440	Auto Detect	-	8	Separate/composite
GFX 450	Auto Detect	-	8	Separate/composite

It is possible to change the default resolution on all GFX 400 cards. 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 400 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 400 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 400 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 400 cards by using one of the 40 preinstalled resolution modes. These resolution settings are identified by video modes 1-40.

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
33	1600x1200@85
34	1600x1280@76*

Appendix A – Changing the Console Resolution

35	1920X1080X60
36	1920X1080X72*
37	1920X1080X80
38	1920X1200@60
39	1920X1200@70
40	1920X1200@76

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

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.

NOTE: To obtain the timing parameters required to use the video-timing method, please contact Tech Source with your monitor's requirements.

A.5 Troubleshooting

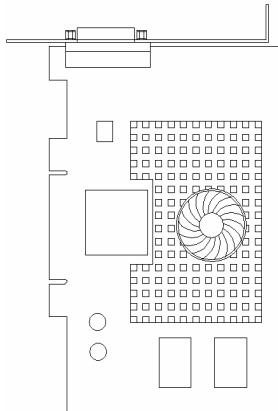
Problem	Solution
Used the method described in the Appendix to configure the console resolution, but the card still defaults to something other than the resolution specified.	<p>A priority scheme is used to determine the boot console resolution. The GFX 400 firmware checks the various methods in the order 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. output-device method (Section A.2)2. video-timing method (Section A.4)3. video-mode method (Section A.3)4. DDC2B/EDID (Section A.1.3)5. Default resolution for the card

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Appendix B

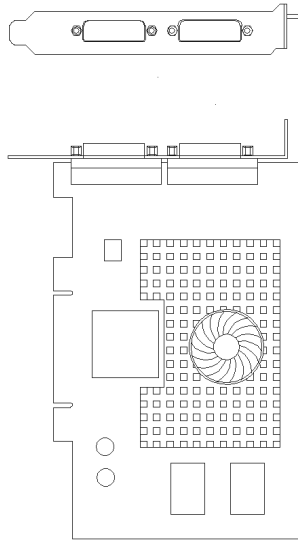
CARD SPECIFICATIONS

B.1 GFX 420 Card and Specifications



Frame Buffer:	64 Megabytes (32MB/head)
Hardware Cursor:	3 color, 64 x 64 bitmap
Color Lookup Table(s):	256 entries
PCI Interface:	33 MHz, 32-bit, Ver 2.1
Video Interface:	Analog, (50 ohm) TMDS (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:	165mm x 114mm (6.5"x 4.5")
Dot Clock Max:	360MHz (analog) 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 440 Card and Specifications



Frame Buffer: 128 Megabytes (32MB/head)

Hardware Cursor: 3 color, 64 x 64 bitmap

Color Lookup Table(s): 256 entries

PCI Interface: 33 MHz, 32-bit, Ver 2.1

Video Interface: Analog, (50 ohm) TMDS (DVI)

Temperature Rating: 0⁰ to 55⁰ C operating
-40⁰ to 75⁰ C non-operating

Humidity Rating: 20 to 80% operating (non-condensing)
5 to 95% non-operating (non-condensing)

Power Rating: +5V @ 3 Amps

Dimensions: 165mm x 114mm
(6.5" x 4.5")

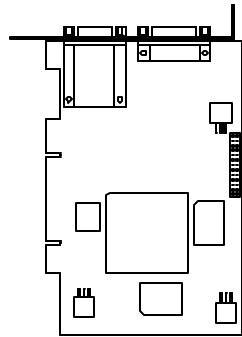
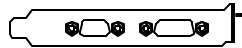
Dot Clock Max: 360MHz (analog)
135MHz (digital)

Video Sync: Separate, composite

Video Connector: LFH-60 (x2) (15pm D-shell, VGA or DVI-I using splitter cable)

Boot Support: IEEE 1275 Compliant F Code

B.3 GFX 450 Card and Specifications



Frame Buffer:	32 Megabytes
Hardware Cursor:	3 color, 64 x 64 bitmap
Color Lookup Table(s):	256 entries
PCI Interface:	33 MHz, 32-bit, Ver 2.1
Video Interface:	Analog, (50 ohm) TMDS (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:	149.8mm x 97mm (5.90" x 3.8")
Dot Clock Max:	360MHz (primary) 230MHz (secondary) 135MHz (digital)
Video Sync:	Separate, composite
Video Connector:	15pm D shell VGA (x1), DVI-I (x1)
Boot Support:	IEEE 1275 Compliant F Code

B.4 GFX 400 Series Cabling

B.4.1 GFX 450

GFX 450 has one DVI-I and one HD-15 connector. The DVI-I connector supports both analog and DVI output. Therefore, connect the appropriate cable depending on your monitor type. The HD-15 supports analog video only.

B.4.2 GFX 420 and GFX 440

Both of these cards have LFH60 connectors for video output and require special splitter cables. Detailed descriptions for connecting various monitors are provided in the sub sections below.

Attach the GFX 400 Series dual-monitor adapters (splitter cables) to the connectors on the bracket of your GFX 400 Series card. Make sure the connectors are firmly in place. The other end of each adapter has DVI connectors to plug into each of the two displays. Please refer to illustrations in **Figures B.1 and B.2**

B.4.2.1 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.

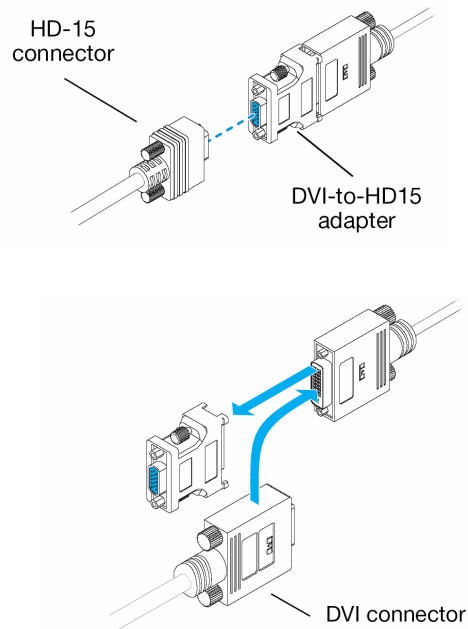


Figure B.1

B.4.2.2 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.

Make sure all connectors are firmly in place.

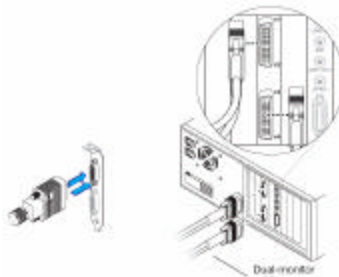


Figure B.2

NOTE: Monitors are numbered consecutively based on which connector each is attached to (Refer to **Figure B.3**). Numbering starts with the primary display – the one that first displays information when you restart your computer. If another graphic card is installed in your computer, display numbering may be different.

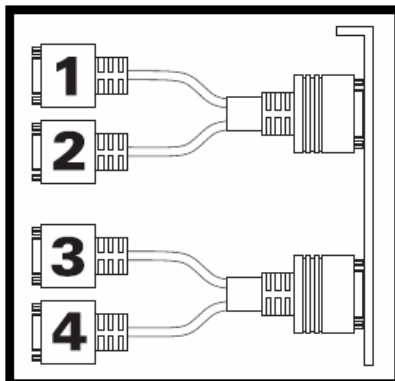


Figure B.3

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 400 Series adapters that support digital monitors use DVI-D connectors – these adapters don't use P&D or MDR-20 connectors.

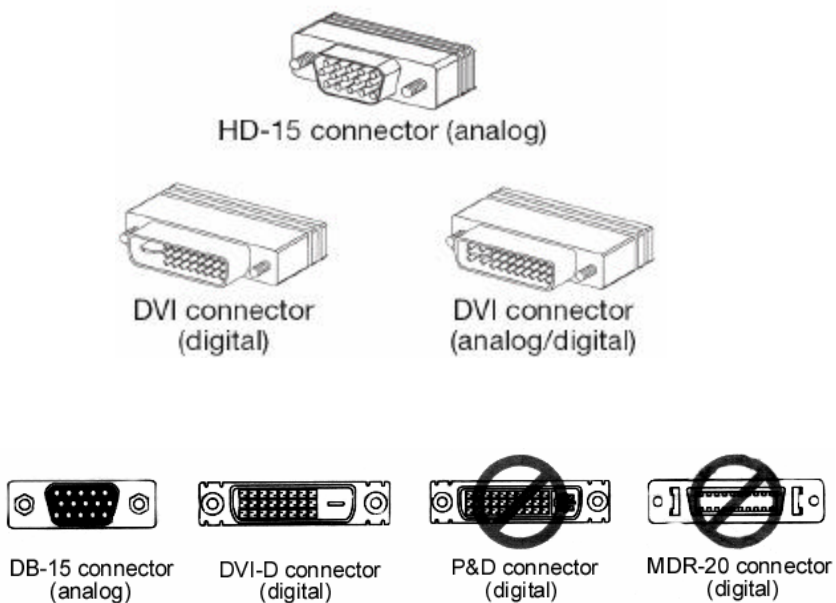
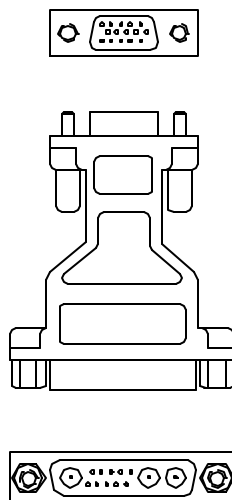


Figure B.4

B.5 Special Adapter for Some Sun Monitors

The GFX 400 Series have 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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