

# Sun™ Monitors

## Just the Facts



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Last Update:08/25/05

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# Product Line Overview

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## Introduction

For almost any type of application — from spreadsheets and word processing to graphics-intensive publishing and visualization — there is a Sun™ color monitor with the features and performance to make the most of each system's capabilities. Sun's monitors are designed to provide complete compatibility, compliance, and excellent screen performance with the full line of Sun workstations. From the 17-inch monitor for mainstream applications to the 19-inch flat-panel liquid-crystal display (LCD) for financial, manufacturing, education, and research, all the way to the 24.1-inch LCD monitor for high-end visualization, Sun's complete line of color monitors provides high refresh rates, high resolution, and flicker-free screens to put a customer's work in the best light.

## Highlights

- All Sun monitors are full-color.
- The sleek, 24.1-inch LCD monitor with many key features, combines state-of-the-art LCD technology and 1920 x 1200 (WUXGA) resolution driven by a high quality digital interface to provide one of the highest quality flat-panel monitors available today for the high-end graphics markets.
- Default high resolution for the 24.1-in LCD monitor provides a high-quality image that is always centered and sized correctly.
- The 21-inch color monitor utilizes flat display (FD) CRT Technology to provide a high-quality CRT for Sun's customers.
- The 19-inch LCD flat-panel display is a 1280 x 1024 (SXGA) resolution product with a high-quality DVI-D digital interface as well as an HD15 (VGA) analog connector for PC compatibility.
- All of Sun's monitors meet the power-saving guidelines set by VESA, Energy Star, and NUTEK.
- All monitors are evaluated and tested for optimal screen performance with Sun workstations' graphics capabilities.
- Monitors and Sun systems are tested together for world-wide safety and regulatory compliance.
- The complete line of high-quality monitors is supported by Sun Enterprise Services division.

## Compatibility

Sun monitors are designed to be fully backward- and forward-compatible with Sun legacy, current, and future workstations and servers wherever possible; frame buffer boards such as TurboGX Plus™ graphics, Sun Creator3D series, Sun Elite3D series, Sun Expert3D graphics, and Sun XVR-100 to XVR-4000 graphics; as well as Sun's thin-client products, such as Sun Ray™ appliances.

## Sun Monitor Overview

Feature	17-inch CRT Monitor	21-inch CRT Monitor	19-inch Flat-Panel TFT-LCD Digital Monitor	24.1-inch Flat-Panel TFT-LCD Digital Monitor
<b>Part Number</b>	X7201A	X7199A	X7202A	X7197A
<b>Screen Size</b>	17-inch (16-inch viewing area)	21-inch (20-inch viewing area)	19-inch, actual image size (equivalent to 21-inch CRT monitor)	24.1-inch, actual image size (equivalent to 27.5-inch CRT monitor)
<b>Dot Pitch</b>	0.24mm	0.20mm horizontal 0.27mm vertical	0.294mm pixel pitch	0.27mm pixel pitch
<b>Resolution</b>	Up to 1280 x 1024	Up to 1600 x 1200	1280 x 1024 @ 60Hz (5:4 aspect ratio)	1920 x 1200 @ 60Hz (16:10 aspect ratio)
<b>Video Input Connectors</b>	HD15 on a 2-meter captive video input cable	Input 1: 15 pin D-sub Input 2: 5 X BNC	DVI-D and HD15	DVI-D, HD15, Component Video (YPbPr) and S-Video and C-Video accessibility
<b>Detachable Cables</b>	none	HD15 to HD15 and HD15 to BNC	DVI-D to DVI-D and HD15 to HD15	DVI-D to DVI-D, HD-15 to HD-15 13W3 to HD-15 Component Video cable (YPbPr) S-Video cable S-Video to Ypb adapter USB 2.0 upstream cable
<b>Viewing Angle</b>	N/A	N/A	±88°	±85°
<b>Weight</b>	16.5kg / 36.4lb	29.0kg / 63.9lb	8.75kg / 19.3lb (display and base)	13.5kg / 29.76lb (display and base)
<b>Dimensions</b>	Height: 421mm/16.6in Width: 420mm/16.5in Depth: 425mm/16.7in	Height: 508mm/20in Width: 504mm/19.8in Depth: 500mm/19.7in	Height: 406-496mm/ 16-19.5in (adjustable stand and screen panel) Width:412.5mm/16.2in Depth: 151mm/5.9in	Height: 480-518mm/ 18.9-20.4in (stand and screen panel) Width: 588mm/23.1in Depth: 277mm/10.9in
<b>Power Consumption</b>	< 100W	< 130W	< 46W	< 95W (includes 10W for USB hub)
<b>Price (US)</b>	\$250.00	\$700.00	\$800.00	\$2,400.00

# 17-inch CRT Monitor

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**Figure 1.** Sun's 17-inch CRT Monitor

## Overview

Appropriate for most business and simple graphic design applications, the 17-inch flat-screen tube/shadow mask (FST) CRT color monitor provides an actual 16-inch viewing area and supports resolutions up to 1280 x 1024 at 76Hz refresh rate. The new version (X7201A) introduced in November 2005 is RoHS compliant.

## Specifications

Feature	Specification
Part Number	X7201A
Screen Size	17-inch flat-screen CRT
Viewable Area	16 inches
Dot Pitch	0.24mm
Resolution (at high refresh rates)	Up to 1280 x 1024
Video Input Connector	HD15 on a captive 2-meter video input cable
Weight	16.5kg / 36.4lb
Dimensions	Height: 421mm / 16.6in Width: 420mm / 16.5in Depth: 425mm / 16.7in
Power Consumption	80W (average), 100W (max)
Image Brightness	100cd/m <sup>2</sup>

## Target Markets

The 17-inch Sun™ monitor is a low-cost monitor for those situations that do not require large amounts of desktop real estate. This monitor is often purchased with Sun servers and the Sun Blade™ 150 workstation

# 21-inch CRT Monitor

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**Figure 2.** Sun's 21-inch CRT Monitor

## Overview

This virtually flat-screen CRT monitor with a 20-inch viewing area delivers sharp, detailed color images consistently across the entire screen — even in the corners. With a horizontal scan rate of 121kHz, it supports any VESA ultra-high resolutions and high stereoscopic video timing of 1280 x 1024 at 112Hz refresh rate. The multiscan capability allows the monitor to display a wide range of resolutions up to 2048 x 1536 if a customer uses it with special third-party frame buffers and systems that support this resolution.

Sun's 21-inch flat-screen display offers outstanding performance and value for demanding graphic professionals. This model offers significant advancements in flat screen CRT design, maximizing picture quality while minimizing valuable desktop real estate. A flatter CRT design also translates into reduced geometric distortion and glare, making it easier on the eyes to work in front of these displays. This is a priority for Sun's information users who spend hours in front of a screen.

## Latest Features

In February 2005, Sun introduced a 21-inch CRT monitor (X7199A), which replaced the 22-inch CRT monitor (X7149A). This monitor supports a default resolution of 1600 x 1200 @ 75Hz, providing 1.92 million pixels of data.

## Target Markets

This 21-inch FD monitor is ideal for a multitude of users. The flat CRT design is designed to maximize image quality while reducing geometric distortion and glare, thus reducing eye fatigue, a priority for many of today's information workers. At the same time, its high resolution capabilities make it suitable

for high-density graphics and the CAD/CAM professional audience. This monitor is also a good fit for challenging desktop publishing, digital imaging applications, and standard business graphics.

## Specifications

Feature	Specification
<b>Part Number</b>	X7199A
<b>Screen Size</b>	21-inch CRT (measured diagonally)
<b>Viewable Area</b>	20 inches
<b>Dot Pitch</b>	0.20mm horizontal 0.27mm vertical
<b>Resolution (at high refresh rates)</b>	Up to 1600 x 1200 (recommended)
<b>Video Input Connectors</b>	Input 1: 15 pin D-sub Input 2: BNC
<b>Weight</b>	29.0kg / 63.9lb
<b>Dimensions</b>	Height: 508mm/20in Width: 504mm/19.8in Depth: 500mm/19.7in
<b>Power Consumption</b>	Approx. 130W
<b>Horizontal Scan</b>	32 to 121kHz
<b>Brightness</b>	90 to 100cd/m <sup>2</sup>
<b>CRT Type</b>	Flat Display(FD), Shadow Mask, 90-degree deflection
<b>Input Signal Levels</b>	Video signal analog RGB: 0.700 Vp-p (positive), 75 Ohms SYNC signal H/V separate or composite sync: TTL 2.2 k, polarity-free sync on green: 0.3 Vp-p (negative)
<b>Image Area</b>	Approx. 396 x 297 mm (w/h) (15 ½ x 11 5/8 inches) or Approx. 371 x 297 mm (w/h) (14 5/8 x 11 5/8 inches)
<b>Deflection Frequency <sup>1</sup></b>	Horizontal: 32 to 121kHz Vertical: 50 to 160Hz
<b>AC Input Voltage/Current</b>	100 to 240V, 50/60Hz, 2.0 to 1.0 A
<b>Operating Temperature</b>	10°C to 40°C
<b>Plug and Play</b>	DDC2B

### Notes:

- Recommended horizontal and vertical timing condition
  - Horizontal sync width duty should be more than 0.5msec.
  - Horizontal blanking width should be more than 1.07msec.
  - Vertical blanking width should be more than 400msec.

## Features

Sun's 21-inch monitor with the latest flat-screen technology provides advanced features and delivers outstanding image performance. Features include a high-contrast picture performance and high resolution rates. Flat-screen technology helps deliver a picture that is natural, detailed, and consistent, with colors that are bright, purer, and more accurate.

Why is a flat image so important? A flat display gives the user optically accurate linearity. Lines in any direction appear perfectly straight. In addition, a flat display eliminates shape distortion.

A layer of glass — essentially a lens — is added to the curved surface to optically correct the picture for a flat screen. Then a flat layer of glass is added. The result is a completely flat screen that, at first glance, appears almost concave. The other effect of having several extra layers of glass is an almost stereoscopic sense of depth to any image.

Additional features include:

- Horizontal radius of 50,000mm
- Digital color restoration
- TCO 99 compliance

# 19-inch Flat Panel TFT-LCD Digital Monitor

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**Figure 3.** Sun's 19-inch Flat-Panel TFT-LCD Digital Monitor

## Overview

The Sun 19-inch Digital LCD monitor provides customers with a full 19-inch actual image area, 24-bit color, a  $\pm 88$ -degree wide-viewing angle, dual video inputs, low power consumption, and a space-saving small footprint profile. This version includes better ergonomics. It's the perfect flat-panel display for financial, medical, manufacturing, education, research, and transportation markets.

## New Features

This display was introduced in November 2005 with part number X7202A and is a replacement for the previous 19-inch LCD with part number X7198A.

This monitor offers the same features offered by the older version and in addition is RoHS compliant. Some of the key features include, improved ergonomics with an adjustable tilt and height stand and rotating base, improved motion performance, and IPS viewing angle technology.

## Target Markets

Flat-panel technology is appealing to an increasing number of Sun's customers. The 19-inch flat-panel's slim, lightweight design is ideal for customers with space and weight constraints. Customers with space efficiency, weight, or power concerns may be interested in using flat-panel alternatives to traditional CRT monitors. Some examples include military, trading floor and financial, and publishing applications, as well as corporate visit centers, hospitals, and radiology clinics

Technical market users include those in software engineering, MCAE/MCAD, EDA, scientific research, R&D, animation, geo-science and geo-engineering, simulation, defense, measurement and control, industrial process analysis, biological and chemical engineering, and imaging.

## Specifications

Feature	Specification
<b>Part Number</b>	X7202A
<b>Screen Size</b>	19-inch, actual image size (equivalent to 21-inch CRT monitor)
<b>Dot Pitch</b>	0.294mm pixel pitch
<b>Resolution</b>	1280 x 1024 @ 60Hz (preferred), @ 76Hz supported (5:4 aspect ratio) Composite sync timings not supported for DVI input
<b>Video Input Connectors</b>	DVI-D and HD15
<b>Viewing Angle</b>	Vertical: $\pm 88^\circ$ Horizontal: $\pm 88^\circ$
<b>Weight</b>	8.7kg / 19.3lb (display and base)
<b>Dimensions</b>	Height: 406.45 – 496.5mm / 16 – 19.5in (stand and screen panel) Width: 412.5mm / 16.2in Depth: 151mm / 5.9in
<b>Power Consumption</b>	46W (maximum)
<b>Brightness</b>	Nominal: 230 cd/m <sup>2</sup>
<b>Display Colors</b>	8-bit/pixel RGB, 24-bit color, 16.7 million colors 256 levels of gray scale
<b>Pixel Response Time</b>	25ms
<b>Contrast Ratio</b>	350:1 (minimum)
<b>Synchronization</b>	Horizontal: 31.5 to 81.8kHz (automatic) Vertical: 56 to 76Hz (automatic)
<b>Input Signal, Terminated</b>	Analog video 0.700Vp-p $\pm 0.2V$ @ 75Ohms Separate and composite sync Digital video T.M.D.S. (PanelLink™)
<b>Maximum Pixel Clock</b>	135MHz
<b>Power Adapter</b>	AC 90 to 264Volt $\pm 10\%$ , 60Hz/50Hz $\pm 3Hz$
<b>Environmental Specifications</b>	<p><b>Temperature</b></p> <ul style="list-style-type: none"> <li>Operating temperature: 10°C to 40°C (50°F to 104°F)</li> <li>Non-Operating temperature: -20°C to 60°C (-4°F to 140°F)</li> </ul> <p><b>Humidity</b></p> <ul style="list-style-type: none"> <li>Operating humidity: 10% to 80% non-condensing</li> <li>Non-Operating humidity: 5% to 95% non-condensing</li> </ul> <p><b>Altitude</b></p> <ul style="list-style-type: none"> <li>Operating altitude: 3km maximum</li> </ul>
<b>Mounting Options</b>	Desktop: Tilt adjustment with enclosed stand Optional: Variable types of mounting available with the use of third party mechanical mounting products including wall mount options (compatible with VESA 4-hole mechanical mounting standard)

## Features

Sun's 19-inch flat-panel color monitor has the following features, making this an attractive alternative to traditional CRT monitors:

- S-IPS LCD technology providing users with:
  - 24-bit color, 256 gray scale levels, 16.7 million colors
  - Exceptional picture quality, with perfect focus in all parts of the screen without geometric distortion
  - High contrast ratio providing excellent readability even in environments with high levels of ambient lighting
  - Viewing at wide angles, providing a consistent, uniform display in all directions even with head movement
  - Fast response time of 25 milliseconds for displaying video and rapidly changing data images, enabling smooth animation and video streaming without ghosting or other artifacts
- High-quality computer interface, digital video interface (DVI-D)
- Low power consumption for high energy efficiency (~70 percent less than comparable CRTs)
- No magnetic field generation or susceptibility, enabling its use in environments where there are strong magnetic fields
- Kensington security lock slot
- Compatibility with the VESA 100mm mechanical mounting standard, allowing third-party interface kits to be used for wall-mounting, rack-mounting, and so on. The display stand is easily removable to accommodate other mounting alternatives.
- Customers may purchase the mounting solutions directly from Ergotron, Inc. Their contact information is as follows:  
Ergotron, Inc., 181 Trapp Road, St. Paul, MN 55112, USA; Phone: (800) 888-8458 or (612) 681-7600; FAX: (612) 6817715; web site: <http://www.ergotron.com>.

## 19-inch Flat-Panel Interfaces — Digital Versus Analog

Digital and analog interfaces offer distinct advantages for interfacing a monitor to a computer system.

The advantage of a digital interface is that the framebuffer does not need to convert the digital signal to analog before transmitting it to the display. With a digital interface, the signal remains digital through the entire transmission process, preventing a possible loss of integrity or distortion in the timing information.

Analog interfaces, on the other hand, offer a compatibility advantage. Since most desktop monitor interfaces are analog, an analog interface allows a flat-panel display to be easily interchanged with existing desktop monitors.

The 19-inch flat-panel monitor provides two input connectors. The first is a DVI-D connector, a digital input connector and the second is an HD15 (VGA) standard analog input connector. Cables are included to support HD15 and DVI-D interfaces. The HD15 to HD15 cable is 1.8 meters in finished length. The DVI-D to DVI-D cables is 3 meters in finished length.

**NOTE:** This monitor cannot operate from composite sync on the DVI input. In the event that a composite sync timing is a requirement, please attach the monitor using the HD15 (VGA) input.

## **Image Quality, Resolution, and Refresh Rates**

The primary or "native" resolution of the Sun 19-inch digital LCD monitor is 1280 x 1024. For best image quality, a flat-panel display's native resolution should be used. In cases where the graphics framebuffer is not capable of driving this resolution, a scaling processor scales lower resolution video input to either maximum screen width or to both maximum screen width and depth. The user selects the option in the on-screen menu (OSM).

Sun's flat-panel monitors use advanced LCD technology which has no flicker in normal operation, and is not influenced by the refresh rate. Refresh rates have no flicker at 60Hz (or even lower). When users run video at rates higher than 60Hz, there is processing overhead. Pixels must be delivered to the display at faster clock rates and there is more dead time during the blanking interval, which is unnecessary for the LCD. This can cause a number of performance issues, included degraded image quality and greater tendency for EMI. The recommended vertical refresh rate for Sun's 19-inch flat-panel monitor is 1280 x1024 @60Hz.

# 24.1-inch Flat-Panel TFT-LCD Digital Monitor

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**Figure 4.** Sun's 24.1-inch Flat-Panel TFT-LCD Digital Monitor

## Overview

The sleek Sun™ 24.1-inch LCD monitor is a high-performance, high-resolution, large-area, full-color, active-matrix TFT liquid-crystal display (LCD) monitor optimized to show the full graphics capabilities of Sun Microsystems' workstations and servers. It combines state-of-the-art LCD technology, a 16:10 aspect ratio, 1920 x 1200 pixel resolution, and  $\pm 85$  degree wide-viewing angle with independently adjustable height and tilt. This monitor is one of the highest quality flat-panel monitors available today for the high-end graphics markets and video monitoring, from conventional Composite video up to maximum HDTV resolution of 1920 x 1080. Its two full-page display capability and picture-in-picture (PIP) feature make it a perfect display for the financial, manufacturing, research, publishing, and defense markets.

## Latest Features

In October 2004, Sun introduced an all new 24.1-inch LCD monitor, part number X7197A. This new display was a complete replacement for the current model, X7134A, which reached EOL at the same time.

The 24.1-inch LCD monitor combines the high resolution and wide-screen display capability of the previous 24.1-inch LCD product, support for four video inputs: DVI-D digital, HD-15 analog, S-video, and C-video. The 13W3 connector is replaced by the HD-15 connector. In addition the new 24.1-inch LCD displays the highest end HDTV (1920 x 1080) in its true native format, either via component inputs or DVI.

## Target Markets

Because of the complexity of information being displayed, many technical and corporate computing users require high image quality and large screen sizes on the desktop. This flat-panel monitor delivers excellent image quality, sharp text, and color uniformity across the entire display area, which can dramatically improve the user's experience. The flat panel also helps minimize distortion and reduce reflective glare, for increased user comfort.

These flat-panel monitors are specifically targeted for graphic professionals, CAD users, and corporate professionals who require high-quality video display and additional screen real estate. It is ideal for the GIS/mapping, geological engineering, and publishing markets where high pixel content is needed.

Customers with space efficiency, weight, or power concerns may be interested in using flat-panel alternatives to traditional CRT monitors. Some examples include military, trading floor and financial, and publishing applications, and corporate visit centers.

## Specifications

Feature	Specification
<b>Screen Size</b>	24.1-inch actual image size (equivalent to 27.5-inch CRT monitor)
<b>Dot Pitch</b>	0.27mm pixel pitch
<b>Active Area</b>	Diagonal = 24.067in / 611.3mm Horizontal = 518.4mm / 20.431in Vertical = 324.0mm / 12.7756in
<b>Maximum Resolution</b>	Digital/analog = 1920 x 1200
<b>Video Input Connectors</b>	DVI-D digital, HD-15 analog, S-video, Composite NTSC or PAL video, and YPbPr (component video for HDTV)
<b>Viewing Angle</b>	Vertical: $\pm 85^\circ$ typical Horizontal: $\pm 85^\circ$ typical
<b>Tilt Angle</b>	-5 degrees (top of display forward) to about +90 degrees
<b>Weight</b>	Display head assembly = 12.47kg / 22.93 lb Stand assembly = 3.1kg / 6.83 lb Total weight = 13.5 kg / 29.76lb
<b>Dimensions - Complete Assembly</b> (including display head and base)	Height = 480 to 518mm / 18.9 to 20.4 in Width = 588mm / 23.15 in Depth = 277mm / 10.95 in Display head depth = 72mm / 2.8 in
<b>Power Consumption</b>	99W (maximum) 8W (5W for Display, 2W for USB, power saver mode)
<b>Brightness</b>	280cd/m <sup>2</sup> (nominal)
<b>Display Colors</b>	8-bit/pixel RGB, 24-bit color, 16.7 million colors 256 levels of gray scale
<b>Pixel Response Time</b>	16ms
<b>Contrast Ratio</b>	1000:1
<b>Synchronization</b>	Horizontal = 31kHz to 80kHz (automatic) Vertical = 56Hz to 76Hz (automatic)

Feature	Specification
<b>Input Signal</b>	Analog video 0.7Vp-p @ 75Ohms Separate and composite sync Digital video T.M.D.S. (PanelLink™)
<b>Maximum Pixel Clock</b>	<--165MHz (analog) 165MHz (digital)
<b>Power Adapter</b>	AC 90 to 264Volt, 60/50Hz ± 3Hz DC 14 Volt/6Amp
<b>MTBF</b>	Monitor assembly = 50,000 hours
<b>Environmental Specifications</b>	<b>Temperature</b> <ul style="list-style-type: none"> <li>Operating temperature: 0°C to 40°C (32°F to 104°F)</li> <li>Non-operating temperature: -20°C to 60°C (-4°F to 140°F)</li> </ul> <b>Humidity</b> <ul style="list-style-type: none"> <li>Operating humidity: 20 to 80% non-condensing</li> <li>Non-operating humidity: 5 to 93% non-condensing</li> </ul> <b>Altitude</b> <ul style="list-style-type: none"> <li>Operating altitude: 3km / 9,843 feet</li> </ul>
<b>Mounting Options</b>	Desktop: Height and tilt adjustment Optional: Variable types of mounting available with the use of third party mechanical mounting products including wall mount options

## Features

The Sun 24-inch LCD monitor combines the following features, making it an attractive display alternative for a wide range of users:

- Advanced PVA LCD technology providing users with:
  - 24-bit color, 256 gray scale levels, 16.7 million colors
  - Exceptional picture quality, with perfect focus in all parts of the screen without geometric distortion
  - High contrast ratio providing excellent readability even in environments with high levels of ambient lighting
  - Viewing at wide angles, providing a consistent, uniform display in all directions even with head movement
  - Fast response time of 18 milliseconds for displaying video and rapidly changing data images, enabling smooth animation and video streaming without ghosting or other artifacts
- Dual Interface, with three switchable input sources:
  - High-quality computer interface. Users can select from either a digital DVI-D or an analog HD-15 input source.
  - Consumer video interface. Users can select from S-video and C-video inputs for DVD, VCR, and other NTSC, PAL, and SECAM video infeed. This feature is particularly useful to analysts dependent on news infeed while working on their systems.
  - The new 24.1-inch LCD displays the highest end HDTV (1920 x 1080) in it's true native format, either via component inputs or DVI.

- Picture-in-picture (PIP) allows the secondary video source to be displayed in a smaller separate window in 400 x 300, 640 x 480, and 800 x 600 resolutions. Most users will select the computer input as the primary "picture" but the consumer interface selected can be switched to the larger image using the On-screen Menu (OSM).
- Picture-by-picture (PBP) allows the two separate video sources selected from each interface to be displayed side by side. This mode is selected in the on-screen menu (OSM)
- Sun's double-hinged stand/mount allows customers to adjust the overall height from 468 to 518mm, as well as tilt the display head for various viewing angles.
- VESA6-point standard mount — Third-party interface kits can be used for wall-mounting, rack-mounting, and so on. The display stand is easily removable to accommodate other mounting alternatives.
- A four-port USB hub eases connection of USB peripheral such as keyboard and mice.
- Easy to use on-screen menu (OSM)
- Low power consumption for high energy efficiency (~45 percent less than comparable CRTs)
- No magnetic field generation or susceptibility, allowing its use in environments where there are strong magnetic fields
- Cable management system
- Kensington security reinforced lock slot

## 24.1-inch Flat-Panel Interfaces — Digital Versus Analog

The 24.1-inch flat-panel monitor provides four input connectors. The high quality computer interface has two connectors. Both the digital (DVI-D) input and the analog (HD-15) input support driving the display to its full 1920 x 1200 pixel resolution. The second interface supports consumer video with component video connectors. Cables are included to support all three interfaces as well as a HD-15 to HD15 pin cable for PC compatibility and an upstream USB cable. The HD-15 is 1.8 meters in finished length. The 13W3 to HD15 is 1.8 meters in finished length. The DVI-D to DVI-D cable is 3 meters finished length.

## Image Quality, Resolution and Refresh Rates

The primary or "native" resolution of the Sun 24.1-inch digital LCD monitor is 1920 x 1200. A secondary resolution of 1920 x 1080 is provided (leaving 60 pixels blank across the top and bottom of the screen) to support graphics framebuffers with a 2 million pixel limit. For best image quality, a flat-panel display's native resolution should be used. In cases where the graphics framebuffer is not capable of driving the preferred resolution, the image will be displayed in the lower resolution, thus providing better image quality but not full screen size. This behavior is directly opposite of the Sun 19-inch digital LCD monitor. The picture below illustrates the 24.1-inch LCD monitor's behavior.

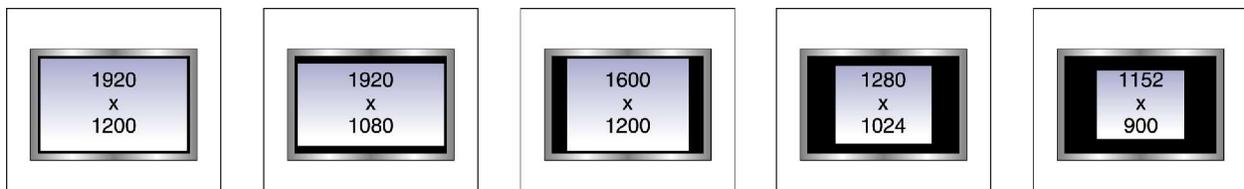


Figure 5. 24.1-inch monitor resolutions

Both of Sun's flat-panel monitors use advanced LCD technology which has no flicker and is not influenced by the refresh rate. Refresh rates have no flicker at 60Hz (or even lower). When users run video at rates higher than 60Hz, there is processing overhead. Pixels must be delivered to the display at faster clock rates and there is more dead time during the blanking interval, which is unnecessary for the LCD. These can cause a number of performance issues, included degraded image quality and greater tendency for EMI. The recommended video timing or "native" resolution for the Sun 24.1-inch flat-panel monitor is 1920 x 1200 @ 60Hz with a secondary video timing of 1920 x 1080 @ 60Hz (leaving 60 pixels blank across the top and bottom of the monitor) to support graphics framebuffers with a 2 million pixel limitation.

# Ordering Information

## Monitor X-Option Part Numbers

Order Number	Description
<b>X7147A</b>	<b>17-inch Entry Color Monitor, Standard Version</b> 17-inch Flat Display CRT Monitor, 16" diagonal viewable area, 0.24mm dot pitch, 1280x1024 @ 75/76Hz, Captive Cable with HD15-pin connector, Universal Power Supply, DDC1/2B, VESA DPMS, TCO'99, WW Agency Compliances, Standard version
<b>X7198A</b>	<b>19-inch TFT LCD Color Monitor, Standard Version</b> 19-inch TFT LCD color monitor (20-inch CRT equivalent); IPS viewing angle; 1280 x 1024 @ 60/76 Hz; analog RGB interface; digital DVI interface; DVI-D, 13W3, and HD15 video output cables; Sun ID enclosure; Sun logo and color; Digital OSD controls; TCO'99; VESA DPMS; universal power supply; WW agency compliance
<b>X7199A</b>	<b>21-inch Color Monitor, Standard Version</b> 21-inch Flat SMT CRT Monitor, 20" diagonal viewable area, 0.20mm Horz./0.27mm Vert. dot pitch, Shadow Mask, 1600x1200@75Hz, 1280x1024@75/76Hz, 1.8-meter detachable video cable with HD15 to HD15 and 2-meter detachable video cable with HD15 to 5xBNC, Universal Power Supply, DDC2B, VESA DPMS, TCO'99, WW agency compliance, Sun logo & color.
<b>X7197</b>	<b>24-inch Flat-Panel Monitor, Standard Version</b> 24.1-inch TFT LCD Color Monitor (27.5-inch CRT equivalent), Advanced PVA wide viewing angle, 1920x1200@60 Hz, digital DVI interface, DVI-D video cable, HD15 interface and HD15 video cable, Composite video interfaces (via separate and HD15 inputs) with adaptation capabilities for S-Video and C-Video, 4-port USB 2.0 hub, DVI-D, HD15, and HD15-13W3 video input cables included, as well as a USB 2 and full contingent of video cables, Digital OSD controls, Universal Power Supply, VESA DPMS, TCO'03, WW agency compliance, Sun ID enclosure, Sun logo and color

## Graphics Accelerator Support

The following table shows which monitor options are supported with which graphics accelerators and options. Note that not all monitors support all resolutions supported by each graphics option.

Graphics Board	Monitors			
	17-inch Entry	19-inch Flat-Panel	22-inch Flat-Screen	24-inch Flat-Panel
Sun PGX64 (X3668A) <sup>1</sup>	X	X	X	X <sup>2</sup>
Sun Creator3D, series 3 (X3670A) <sup>3</sup>	X <sup>8</sup>	X	X	X <sup>4</sup>
Sun Elite3D m6 (X3679A)	X <sup>8</sup>	X	X	
Sun Expert3D (X3678A)	X <sup>8</sup>	X	X	X <sup>5</sup>
Sun Expert3D-Lite (X3684A) <sup>6</sup>	X	X	X	X
Sun XVR-500 (X3685A) <sup>7</sup>	X	X	X	X
Sun XVR-1000 (X3256A)	X <sup>8</sup>	X	X	X
Sun XVR-100 (X3769A) <sup>1</sup>	X	X	X	X
Sun XVR-600 (X3780A) <sup>7</sup>	X	X	X	X
Sun XVR-1200 (X3689A)	X	X	X	X

### Notes:

1. Maximum resolution of 1600 x 1000 @ 76Hz, single-buffered 8/24-bit color mode, preferably for desktop publishing, windowing, and text-based applications.
2. Maximum resolution of 1920 x 1080 @ 60Hz, 8/24-bit color mode. Maximum resolution of 1920 x 1200 @ 60Hz, 8-bit color mode. The later is not generally recommended. Solaris 8 support only. Requires m64 patch 108606-26 or later.
3. Maximum resolution of 1280 x 1024 @ 76Hz, double-buffered, 8/24-bit color mode. Maximum resolution of 1900 x 1200 @ 70Hz single-buffered, 24-bit mode, preferably where very high image resolution and color quality is required.
4. Support for 1920 x 1200 @ 60Hz, single-buffered, 24-bit color mode requires the following patches.  
Solaris 2.6: 105360-42 or later, 1053620-40 or later  
Solaris 7: 106145-26 or later, 106148-14 or later, and 106146-25 or later  
Solaris 8: 108605-25 or later
5. Support for 1920 x 1200 @ 60Hz, double-buffered, 24-bit color mode requires the following patches. Solaris 8 support only. Requires m64 patch 108576-19 or later.
6. Maximum resolution of 1600 x 1000 @ 76Hz single, double or Z-buffered, 24-bit color mode. Support for 1920 x 1080 @ 60Hz, double-buffered, 24-bit color mode requires patch 108676-29 or later.
7. Maximum resolution of 1600 x 1000 @ 76Hz single, double or Z-buffered, 24-bit color mode. Supports 1920 x 1080 @ 60Hz, double-buffered, 24-bit color mode.
8. Requires X3872A video connector adapter, HD15 to 13W3.

## Video Connector Adapter

Adapter	Option Number	Monitors			
		17-inch Entry	19-inch LCD Color	22-inch Flat-Screen Color	24.1-inch LCD Color
<b>Video Connector Adapter, HD15F to 13W3M</b>	X3872A	X <sup>1,3</sup>		X <sup>3</sup>	
<b>Video Connector Adapter, 13W3F to HD15M</b>	X471A				

### Notes:

1. Ultra™ SBus-based systems with either S24™, TurboGX™, or TurboGXplus™ graphics require video connector adapter (HD15F to 13W3M) when the 17-inch entry monitor.
2. Video cable adapter (X471A) required only when using motherboard built in video (PGX™ based) HD15 connector on the Ultra 5 and Ultra 10 systems, and PGX32™ graphics card.
3. 530-3305-01 HD15F to DVI male used on cards with DVI-I port to drive CRTs.

## Warranty

- The 19-inch and 24.1-inch LCD monitors come with a 1-year warranty on parts, labor, and backlight.
- Sun's 17-inch and 21-inch monitors come with a 1-year warranty on parts and labor.

## Regulatory Compliance

These standards help provide a safe product and also meet global regulatory compliance for monitors.

Regulation	Description	17-inch CRT	21-inch CRT	19-inch LCD	24.1-inch LCD
UL 1950	Standard for Safety: Information Technology Equipment Including Electrical Business Equipment	X	X	X	X
CSA C22.2, No. 950	Standard for Safety: Information Technology Equipment Including Electrical Business Equipment	X	X	X	X
IEC 417	Graphic Symbols for use on Equipment. Covered by EN60950.	X	X	X	X
EN 60950	Safety of Information Technology Equipment Including Electrical Business Equipment (Including Nordic Deviations)	X	X	X	X
EMKO-TSE (74-SEC) 20/977 D/F/N/S	Nordic deviations to EN60950 or Demko, Fimko, Nemko, Semko	X	X	X	X
CB Scheme	Report to IEC950 and Nordic deviations	X	X	X	X
ZH1/618	German Ergonomic Regulations for Video Display Workstations	X	X	X	X
EN 29241-3, -7, -8 ISO9241-3, -7, -8	Visual Display Terminals (VDTs) Used for Office Tasks - Ergonomic Requirements - Part 3: Visual Displays, Part 7: Reflections, Part 8: Color Visual Displays	X	X	X	X
ANSI/HFS 100-1988	American National Standard for Human Factors Engineering of Visual Display Terminal Workstations; covered by ISO9241-3	X	X	X	X
DHHS Rule21, Subchapter J	X-Ray Emissions, USA	X	X	X	X
PTB	German X-Ray Decree	X	X	X	X
GOST-R	Russian - EMI regulations; PCT mark	X	X	X	X
Korea, K-Mark, Jeon	Korean Safety and EMC	X	X	X	X
CCC	China -Safety EMI regulations	X	X	X	X
DNHW	Canada - X-Ray		X	X	X

Regulation	Description	17-inch CRT	21-inch CRT	19-inch LCD	24.1-inch LCD
<b>EMI/EMC Regulation</b>					
EN55022 class B (CISPR 22 class B)	Specification for Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment; EMI regulation for CE mark, Europe	X	X	X	X
EN60555-2/EN61000-3-2	Power harmonics, Europe	X	X	X	X
FCC Part 15, Subpart B	Rules for computing devices, USA	X	X	X	X
CSA C108.8 class B	EMI Rules for Computing Devices, Canada (Covered by ICES-003)	X	X	X	X
VCCI Class 2 VCCI Class B	Japanese Regulations for Voluntary Control of Interference	X	X	X	X
BCIQ Class B CNS-13438	Taiwan - EMI regulations Taiwan (BCIQ standard based on CISPR)	X		X	
BMSI	Taiwan EMC		X	X	X
C-Tick class B AS 3548	Australia - EMI regulations Australia Regulations for Control of Interference	X	X	X	X
GOST-R	Russian - EMI regulations; PCT mark	X	X	X	X
MIC	Korea EMC			X	X
CCC	China Safety & EMC	X	X	X	X
EN61000-3-2	Power Harmonics, Europe (01/01/2001)		X	X	X
EN61000-3-3	Voltage Fluctuations (01/01/2001)		X	X	X
<b>Electrical/Immunity</b>					
IEC	IEC1000-4-2 Electrostatic discharge (ESD) IEC1000-4-3 Radiated electromagnetic field IEC1000-4-4 Electrical fast transient IEC1000-4-5 Surge	X	X	X	X
MPR 1990:10 (MPR/TCO)	MPRII, TCO'99	X	X	X	X

## Power Saving Function

All of Sun's current monitors meet the power-saving guidelines set by VESA, Energy Star, and NUTEK. If the monitor is connected to a computer or video graphics board that is display power management signaling (DPMS) compliant, the monitor automatically reduces power consumption.

# Glossary

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AM-LCD	Active-Matrix Liquid Crystal Display. For Active-Matrix LCDs, each subpixel element is activated individually by a Thin-Film Transistor. Both of Sun's LCD monitors utilize AM-TFT-LCD technology.
Backlight	In transmissive LCDs, a light mechanism is housed behind the display and used to transmit light through it, resulting in a high-luminance display.
Contrast ratio	The ratio between white and black reproduction, measured according to the VESA Flat-Panel Display Measurements (FPDM) standard, referenced to a dark-room environment. For CRT's it is rated as an MTF (Modulated Transfer Function), which defines inter-character contrast, due to several facts, including the situation that full-field black for a CRT is often at or below the cut off threshold.
CRT	Cathode Ray Tube. A display technology commonly used for desktop displays prior to implementation of large LCD monitors. Color CRTs contain a large vacuum tube with three electron guns that scan the image onto the screen's phosphor layer.
Component Video (YPbPr)	Video Separated into synchronization and color components to assure maximum quality. The connectors are typical 3 RCA phono connectors, labeled Y, Pb, Pr. It is commonly used for progressive scan or HDTV video whenever it is in an analog form.
Composite-Video (C-Video)	Composite Video, such NTSC or PAL video. A type of video signal in which all information -- the red, blue, and green signals (and sometimes audio signals as well) -- are mixed together. This is the type of signal used by televisions throughout the world prior to HDTV.
DVI	Digital Visual Interface.
DVI-D	25-pin connector that only accepts a digital video signal.
DVI-I	29-pin connector accept digital or analog video signal.
LCD	Liquid-Crystal Display. LCDs consist of liquid-crystal material surrounded on one or both sides by an electrode driving structure, semiconductor control devices, color filters, and polarizing layers. etc .
Luminance	The proper term for Brightness, usually referenced as candelas per meter-squared and sometimes referenced as Foot-Lamberts.
Pixel pitch	The pixel size.
Refresh rate	The rate at which the full screen video content is updated.
Response time	How fast a pixel can turn on and then off, as defined by the VESA Flat-Panel Display Measurements (FPDM) standard.
S-Video	Short for Separate -Video, a technology for transmitting video signals over a cable by dividing the video information into two separate signals: one for color (chrominance), and the other for brightness (luminance).

TFT-LCD	Thin-film-transistor liquid-crystal display. The most common active-matrix LCDs, particularly for high-end laptop and desktop monitors. TFT-LCDs use a matrix of transistors to activate individual cells of liquid-crystal material.
TMDS	Transition-Minimized Differential Signaling (PanelLink™)
VESA	Video Electronic Standards Association. VESA is an organization devoted to developing standards for displays and display interfaces.

# Materials Abstract

All materials are available on SunWIN except where noted otherwise.

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
<b>Product Literature</b>				
- <i>Sun™ Monitors, Just The Facts – 02/23/2005</i>	Reference Guide (this document)	Sales Tool Training	SunWIN, Reseller Web	111780
- <i>Sun™ Monitors, Just The Facts – 05/03/2005</i>	Reference Guide (this document)	Sales Tool Training	SunWIN, Reseller Web	438943
- <i>Sun™ Monitors, Just The Facts – 08/25/2005</i>	Reference Guide (this document)	Sales Tool Training	SunWIN, Reseller Web	451245
<b>External Web Site</b>				
- <i>Monitor Information Site</i>	<a href="http://www.sun.com/products-n-solutions/hw/peripherals/monitors.html">http://www.sun.com/products-n-solutions/hw/peripherals/monitors.html</a>			