IT12-1

Selecting and Configuring Top-Notch Workstations and Peripherals

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Topics Covered

- Workstations
- Graphics Cards
- Monitors
- Peripherals/Interfaces
- Mobile Computing

Selection Criteria

Concerns include:

- Performance
- Cost
- Quality
- Ease of installation
- Compatibility/Interoperability
- Future-proofing

Research Resources

- Product reviews
- Official benchmark results
- Your own benchmark testing
- Benchmarks
  - Cadalyst: www.cadalyst.com
  - Standard Performance Evaluation Corporation (SPEC): www.spec.org
    especially specAPC application benchmarks:
    - 3ds max 4.2
    - Maya 5
    - Pro/E 2001
    - SolidEdge V12
    - SolidWorks 2003
    - Unigraphics V17

spec

Workstations

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System Issues

- Case design
  - Serviceability
  - Expansion
  - Size
- Built-in ports
  - Legacy?
  - Sound
  - ATA (IDE)
  - SATA
  - Ethernet
  - USB
  - FireWire
  - IrDA
- Power saving issues
  - Sleep modes
  - Hibernate
  - Fan noise, temperature control
- System monitoring
  - DMI, instrumentation
  - SMART hard drives
  - Software to monitor and administer these
- Removable media

System Power Modes

Instantly Available PC

- S0=On
- S1=CPU off, RAM on
- S2=CPU off, RAM on
- S3=CPU off, RAM on low, PS on low
- S4=CPU, RAM off, system saved to disk
- S5=Completely off

Component Performance

- Processor support
  - Intel Pentium 4, Xeon; AMD Athlon, Opteron
- Graphics Card
- Hard Disks
  - SCSI, IDE, RAID
- Memory
  - SDRAM, RDRAM, DDR SDRAM
- Motherboard can limit
  - Memory type & amount
  - Hard disk type & number
  - Graphics card type & size (AGP Pro not widespread enough)

System Configuration vs. Performance

- Low-end
  - Single 1.8GHz
  - 256MB RAM
  - Single IDE
  - 64MB Graphics card
- High-end
  - Dual 2.4 GHz
  - 1GB RAM
  - 128MB graphics
  - RAID

	AutoCAD CADMARK (lower is better)	SolidWorks 2001 Plus SPECapc (higher is better)	Pro/E 2000i2 SPECapc (higher is better)	visualNastran 4D (lower is better)
BOXX low-end	86.27 seconds	1.77	2.47	1 hour, 15 minutes
BOXX high-end	74.50 seconds	2.60	5.06	34 minutes
Compaq Evo W4000	121.33 seconds	1.44	3.05	1 hour, 09 minutes
Compaq Evo W6000	73.61 seconds	2.82	5.38	27 minutes
Dell Precision 530	73.23 seconds	2.69	5.42	27 minutes
TriStar low-end	99.83 seconds	1.57	3.08	1 hour, 16 minutes
TriStar high-end	74.23 seconds	2.74	4.42	26 minutes
Polywell low-end	79.09 seconds	1.86	3.45	1 hour, 28 minutes
Polywell high-end	72.57 seconds	2.73	4.42	26 minutes
Xi low-end	77.80 seconds	1.88	3.45	1 hour 17 minutes
Xi high-end	74.53 seconds	2.75	5.45	28 minutes

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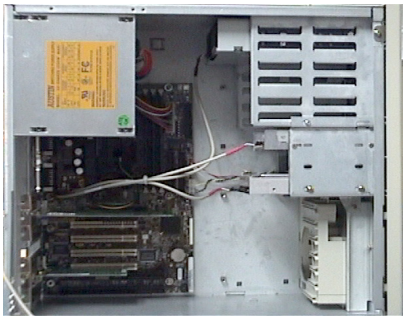
Peripherals

Hard Drive Connectivity

- Most using IDE/ATA, with old ribbon cable design
- Serial ATA (SATA) here, but performance is inconsistent
- Some older high-end systems supported SCSI SCA all-in-one connector for easier installation and upgrades—no equivalent for SATA as yet, unfortunately



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Ease of Installation

Hardware interfaces are important

- Legacy, outdated
  - Serial
  - Parallel
  - PS/2
  - SCSI
- Modern
  - USB 1.1 and 2.0
  - 1394a and 1394b (a.k.a. FireWire and i.LINK)
  - IrDA
  - Bluetooth
  - Wi-Fi

FireWire Benefits

- Fast: 100, 200, 400, 800MB/s
- More power supplied on cable than with USB (1.5 amperes at 30 volts)
- Devices can be daisy-chained
- Can be used for networking
- Better streaming multimedia (isochronous) support
- Devices can talk to each other without going through PC (this peer-to-peer design means better performance, more flexible configurations)
- 4-pin, 6-pin, and new connectors
- Newer Macs have the new FireWire 800 connector

Quality

- Various quality/standards logos exist
  - Designed for Windows…
  - Windows Hardware Quality Labs (WHQL)
  - Wi-Fi
  - USB
  - FireWire
  - Bluetooth
- Even these standards don't always tell the full story

Compatibility/Interoperabil

What to look for in products:

- Input devices
  - Direct Input and/or HID (keyboards, mice, 3D controllers, joysticks, etc.)
- Storage devices
  - USB Mass Storage Class
  - FireWire SBP-2
- Digital cameras & Scanners
  - PTP, WIA, USB Mass Storage Class
- Standard Connectors for FireWire and USB

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How to Check for These Standards

- USB & FireWire storage devices
  - Requires Windows 98 SE and higher, or Mac OS 8.6 and higher
  - Literature advertises "driverless installation" for these operating systems, but requires driver for Windows 98 first-edition
  - FireWire device specs list "SBP-2"
- Digital cameras & scanners
  - Literature says works best with Windows Me or XP, or lists Picture Transfer Protocol (PTP)

3D Input Hardware

- Available USB Interfaces
  - Multi-Axis controller (§ 4.1, ID 8)
  - 3D Game Controller (§ 4.1, ID 8)
  - 6-Axis Joystick (§ 8.1, ID 1)
- Hardware available:
  - 3Dconnexion SpaceBall 4000 FLX USB, 3D Keyboard (multi-axis controller)
  - 3Dconnexion CadMan, SpaceMouse USB, Cyberpuck (emulates a 6-axis joystick; discontinued)
  - P5 Glove (not sure which USB standard yet)
- Most software only supports legacy, proprietary APIs, making ubiquitous use non-existent, installation difficult.

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Monitors

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Standards

- Color quality
- Connection
- Software-based control interface
- Image Quality

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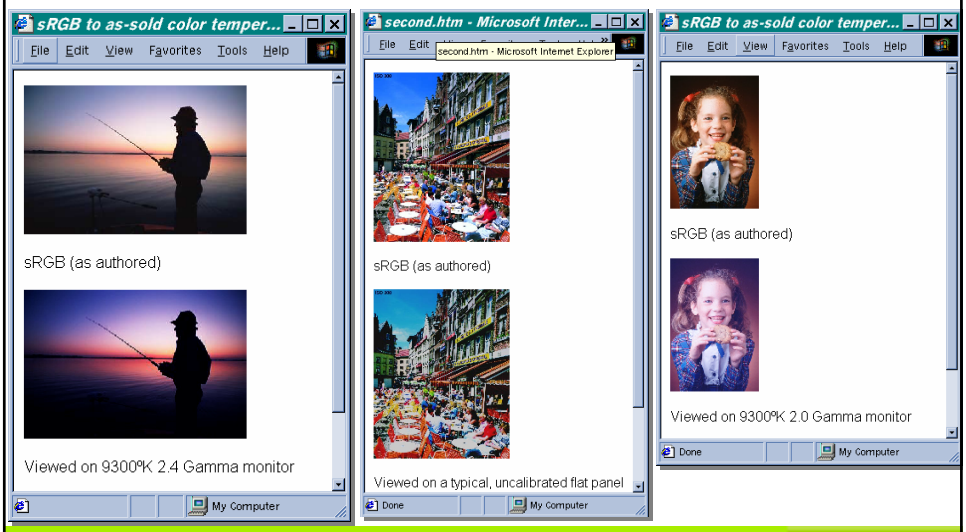
sRGB Color Space

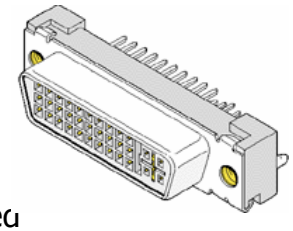
- A precise definition for RGB that allows sRGB images to be reproduced accurately on different platforms and media under varying ambient lighting conditions.—HTML 3.2 specification, 1997
- The standard color space for:
  - The Web, since the HTML 3.2 specification
  - Windows 98 and higher
  - PNG, SVG, and the Digital camera JPEG format (EXIF)
  - Most color printers, especially HP DeskJets and DesignJets

Why sRGB is Needed

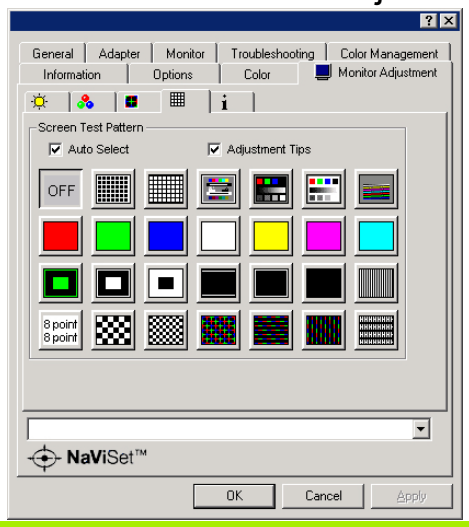


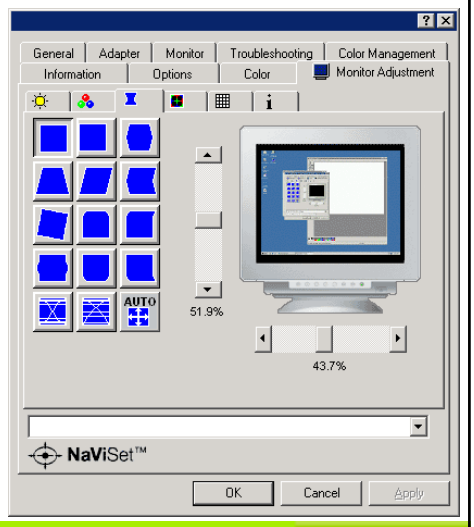
Monitor Connections

- Input connectors
  - Bad: VGA, BNC, 13W3
  - Good: DVI-D, DVI-A
  - Better: DVI-I, M1
  - Best: Yet-to-be-invented, but needed



Better Monitor Adjustments: DDC/CI





Monitor Quality

- DisplayMate monitor tests
  - DisplayMate.com
- CRT monitors: prefer DVI-A or DVI-I inputs, 144Hz refresh at decent resolution for stereoscopic support
- LCD monitors: prefer DVI-D or DVI-I inputs, wide viewing angle (170 degrees is best) with no color shifting when angle changes

Graphics Cards

Graphics Card Performance

- More memory allows
  - higher resolution & color depth
  - more storage for textures
  - quad buffering for stereoscopic support
  - buffers for quality features such as full-scene anti-aliasing
  - 32MB going-going-gone, 64MB should be considered the minimum CAD configuration, 128MB and higher are important for creating or viewing textured 3D models and even large assemblies sans textures

Graphics Card Features

- Ideal Connectors
  - Two DVI-I + one VESA Stereo Sync
- Drivers
  - Both OpenGL and Direct X
  - WHQL drivers on WindowsUpdate.com
- Configuring for performance
  - Try several driver options (DX vs. OpenGL; latest WHQL vs. latest from vendor)—you may be surprised.
- AGP 4X vs. AGP 8X vs. AGP Pro 50 & 110

Digital Video Connector Confusion

- DVI is new standard
  - Provides best signal quality for analog and digital monitors
  - Several different connector flavors
  - Problems in initial spec with interoperability
  - These problems led to the M1 connector
  - Limited bandwidth not enough to support large, high-DPI displays such as IBM's T221 (Big Bertha)—it requires up to two dual-channel DVI connections to achieve its full 3840x2400 (QUXGA-W) resolution

Flash Memory NonStandards

- PC Card (PCMCIA)
- Compact Flash (CF)
- SmartMedia (SM
- Multimedia Card (MMC) and Secure Digital (SD)
- MemoryStick (MS), MagicGate (MG), Memory Stick Pro
- XD
- Pete's Picks:
  - PC Card, CF, and Memory Stick
- Universal reader
  - OnSpec KIOSK (reads CF, SM, MMC, SD, and MS) www.onspecinc.com
  - Dazzle/Zio 8-in-1 (CF, SM, MMC, SD, MS, MG) http://www.ziocorp.com/products/8in1.html

Mobile Computers

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What to Look for in a Laptop

- Memory expansion
  - Some laptops now supporting 1GB
- Hard drive size
- Graphics
  - Quadro FX Go (NVIDIA)
  - Mobility FireGL (ATI)
- Displays
- Ports: USB, 6-pin FireWire, IrDA, DVI, 2 PC Card slots, audio
- Integrated Wi-Fi and Bluetooth
- Mini PCI for expandability

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What to Look for in PDAs, etc.

- IrDA port
  - IrOBEX
  - vCard
  - Can reliably beam and receive vCards and files from another PDA, laptop, or wristwatch without installing special software
- Color screen with at least 16-bit color
- Reflective screen for outdoor readability (e.g. transflective)
- CF and MS slot

Tablet PC

- Still very new
  - Hardware, OS are clearly a 1.0 (maybe 1.1) release
- Will be a big thing going forward
- Cool software now
  - Corel Grafigo
  - Alias Sketchbook Pro
  - Others (Adobe, @Last, CATIA)

Miscellaneous

Digital Cameras

- EXIF: standard JPEG image format with metadata (including embedded sound)
- sRGB: Standard color space for EXIF, Web, Windows.
- PTP: Picture Transfer Protocol (A platform and transport independent standard for communicating with digital still cameras)
- WIA: Windows-only camera control interface

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Suggested Reading

- Intel Ease of Use
  - Developer.intel.com/technology/easeofuse/
- Microsoft Ease of Use
  - http://www.microsoft.com/whdc/hwdev/platform/pcdesign/default.mspx
- Instantly Available PC / On Now technology
  - http://www.microsoft.com/whdc/hwdev/tech/onnow/OnNowWDM.mspx
- PC Design Guide
  - www.pcdesguide.org (now defunct)

Tools and Resources

WindowsUpdate.com

- Method for distributing WHQL drivers and other system updates
- Built in to Windows 98, 2000, XP
- Some products not included on site—vendors need to be pressured
- Corporate.windowsupdate.com—searchable catalog of WHQL drivers for Windows 98, 2000, even 95 and NT 4.0 (defunct)
- Windows XP flavor of WindowsUpdate.com also has searchable catalog (hidden by default)

Why Signed WHQL Drivers?

- Untested drivers that leak memory and harm the operating system are the #1 cause of system lockups
- A digital signature gives customers confidence that the driver has been tested for stability, and that it hasn't been tampered with since it passed compatibility testing
- Windows 2000 and XP will not overwrite drivers that shipped in the box with an unsigned version due to driver ranking, unless the unsigned driver has a better Plug and Play ID match
- Digital signatures promote driver quality, improve the end-user experience, reduce support costs and TCO

Source: Microsoft's WinHEC 2000 proceedings.

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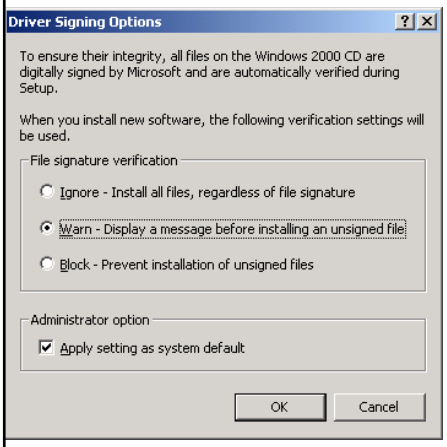
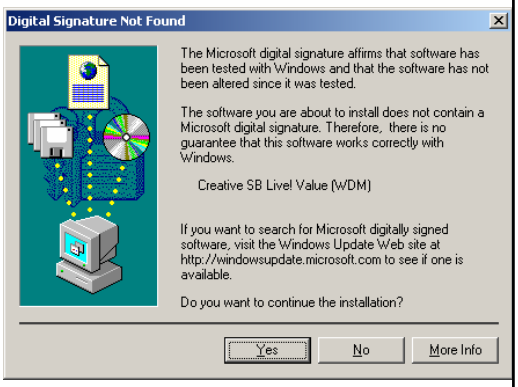
Windows 2000 & XP





Driver Quality

- WHQL tested drivers
- Signed drivers (Windows 2000/XP only)
- WindowsUpdate
  - Corporate.windowsupdate.com (defunct)
- Driver verifier: verifier.exe
  - Searches for unsigned drivers, can also test drivers for stability
  - Windows 2000/XP only

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How to use Driver Verifier

- Turn on the verifier
- Run device through it's paces
- Sleep, hibernate, and resume
- Disable/Enable from device manager
- Surprise remove device
  - Remove/Undock while hibernated
  - Detach from port

Future Directions?

- Web Cam
- Array Microphones
- Proximity Sensors
- Remote Data Companion
- Activity-Based Keyboard

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Contacting Me

Day Job

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Published by CMP Media, former owner of a certain CAD magazine

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Pete's Guide...to technology and everything else

Personal Web Site

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