Dell Precision R5400 Workstation/FX100 Technical Guide

Dell Precision™ R5400
Rack Workstation
Technical Guide

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Dell Precision Workstations

Dell Precision workstations have been the world's leading workstation brand for the last eight years[1] and continue to deliver value to customers by combining relevant new technologies and focussing on the core values of the product family. These are:

- **Performance**
  Providing relevant technologies that can drive applications as fast as possible
- **Application Focus**
  Working closely with the key software partners to help ensure reliability and performance through certification and excellent support.
- **Scalability**
  Designing systems that can scale with your application's needs and company's needs.
- **Managed for Business**
  Building our solutions around industry standards and helping simplify your IT
- **Optimized solutions**
  Recognizing the wide range of application areas for workstations and offering the flexibility in our systems to help optimize them to suit our customers requirements

Dell partners with strategic Independent Software Vendors (ISVs) to certify system and application compatibility so that applications can run gracefully on Dell Precision workstations. Through rigorous testing, Dell also targets compatibility and optimized performance in demanding work environments such as Computer Aided Design (CAD), engineering, and architecture, making the Dell Precision range a perfect platform for demanding workstation users.

Dell Precision Workstations

Dell offers a very broad range of ISV certified workstations. This guide covers the R5400 rack form factor. Such a broad range helps provides a wide choice ranging from ISV certified mobile workstations to performance focussed desktop and rack workstations.

The R5400 rack workstation is built around the latest Intel® Xeon™ core architecture and shares that architecture with the Dell Precision T5400 and T7400 desktop workstations. This results in the efficiencies of sharing common peripherals like graphics cards and SATA hard drives and memory.

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The Dell Precision R5400 Rack Workstation

The Dell Precision R5400 is a high performance dual socket 2U rack workstation that provides an industry-standard alternative to blade workstations providing fully scalable high performance graphics options.

Looking for a high-end workstation that can deliver world class performance and exceptional processing and graphics power but is engineered for a high density rack environment? Then look no further. Developed in close collaboration with hardware and software partners, the Dell Precision R5400 rack workstation delivers no compromise, high performance workstation technologies in a flexible 2U chassis – an ideal solution for centralizing critical customer data and workstation assets in secure locations (data-centers, OEM customer enclosures, etc.).

This is particularly attractive for high performance clusters/render farms, crowded heat, and acoustically sensitive environments like financial trading or factory floors. Optimized for performance, reliability, and scalability in environments where space is at a premium, the Dell Precision R5400 helps you power through complex tasks with configuration options simply not available on blade workstations today.

The Dell FX100 Remote Access Device

The Dell FX100 Remote Access Device is a high-performance communication solution using PC-over-IP® technology enabling remote user access to the full performance of a host system. The Dell FX100 is an ideal partner for the Dell Precision R5400 Rack Workstation to provide a superb remote user experience.

Performance Architecture

Intel Xeon Quad-core and Dual core Processors

64-bit Quad core and dual-core processors can provide increased performance in multi-tasking environments and can enable increased performance for multi-threaded software applications. Separate applications, or threads, split tasks across up to the two processor cores, meaning instructions can run concurrently to help complete projects fast.

The Dell Precision R5400 features up to 8 high-performance Xeon cores providing up to 24MB of cache memory and dual 1333MHz front side buses to deliver outstanding processing power for CPU intensive applications performance.

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Processors

Dual-Core (6MB L2 cache) & Quad-Core (2X 6MB L2 cache) Intel Xeon Processors. 45nm architecture with Intel Virtualization Technology and Intel Trusted Execution Technology (TXT)

Chipset

Intel 5400 chipset, which supports the latest generation of multi-core Intel® Xeon Processors, advanced ECC memory, and scalable industry standard graphics and storage options.

Networking

Broadcom® 5754 NetXtreme 10/100/1000 Gigabit Ethernet controller.

Key features of the Intel5400 Chipset on the Dell Precision R5400 workstation

- Support for 64-bit Intel Xeon quad-core and dual core processors
- Support for up to 32GB[2] ECC system memory
- DDR2 fully buffered DIMM 667MHz ECC memory and quad channel memory channels
- 1333MHz front side bus
- Serial ATA hard drive support with host based RAID 0, 1

Quad Channel DDR2 FB DIMM Memory

Quad channel FB DIMM memory delivers outstanding memory bandwidth and performance.

PCI-Express (PCI-E) Bus

Dual x16 Gen 1 graphics slots provide support for high performance industry standard graphics cards

Graphics

The Dell Precision R5400 offers a range of graphics cards from entry 2D to high performance OpenGL 3D with up to 768MB[3] of graphics memory. Offerings include the NVIDIA® NVS 290, NVIDIA Quadro® FX 570, FX1700, FX3700, FX4600 and ATI® FireGL® V3600.

Through comprehensive multi-monitor support, the R5400 graphics options from NVIDIA and ATI (AMD) enable workstation users who want additional real-estate to connect up to four displays (directly attached) and get a range of multi-monitor functionality that can help make

them more productive. Up to two monitors can be remotely attached via the FX100 Remote Access Solution (R5400 remote access host card and user portal).

Applications and ISV Certifications

To meet the needs of demanding workstation users, Dell demands that professional workstation applications are rigorously tested and certified by the ISV (Independent Software Vendor) so that customers can be assured the utmost level of performance, functionality, and reliability of their solution. With dedicated development and testing resources, Dell's stringent workstation certification requirements are designed to deliver one benefit above all others: peace of mind.

Geoscience, *"The Tools Used to Explore, Drill and Maintain The Oil and Gas Industry"*

Upstream Analysis, Seismic Measuring and Interpretation, Oil Reservoir and Delivery Management

HALLIBURTON
Digital and Consulting Solutions
Landmark
GeoProbe

Schlumberger
GeoFrame
Petrel 32/64 (in process)

Paradigm
A VISION FOR ENERGY
Product Family

Upstream Exploration, Reservoir Management, Downstream Management and Maintenance

Medical Imaging/Scanning, Tools Used by Doctors and Scientists To Enhance Patient Care

CT/MRI Scanning, Gray and Color Scale Diagnostic Displays, Visual Medical Software

BARCO
Display Products
Certification

PLANAR
Display Products
Certification

EMAGEON
RadSuite
CardSuite

EDA (Electronic Design and Automation)
GIS (Geographic Information Systems)
AEC (Architectural, Engineering and Construction)

Circuitry and PCB Engineering, Mapping and Geo Exploration, Building and Infrustructure Design

Mentor Graphics
BoardStation EX Flow 2006
Expedition Flow 2005 SPac1
DMS 2005 SPac2
Pads Flow 2007

Autodesk
AutoCAD
AutoCAD LT

BENTLEY
MicroStation

Arc/INFO
Arc/VIEW
ESRI

Finance

Stock Trading, Market, Risk Analyses

Bloomberg	Murex	Intex Solutions
BrokerTec	Market Axess	Reuters
Global Trade Tech	Thomson Financial	...others

Dell Precision Customers drive these applications and others in the Finance World Wheather as a Trader's Station or computing risk analysis in the background, the strength of Precision is necessary. These companies have no formal Cerification process.

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Connectivity

Integrated Modem

The Dell Precision R5400 features an optional integrated 56K v.92 capable modem for convenience while traveling. The modem supports Wake-on-Ring for unattended telephony, fax access, and remote systems management

The RJ-11 port is located on the back side of the system

The Dell Precision R5400 features an integrated dual Broadcom 5754 NetXtreme 10/100/1000 Gigabit Ethernet controllers that support Wake-on-LAN from all power states (Off, Hibernate, and Standby) allowing remote systems management

The RJ-45 ports are located on the back of the system

Expandability

Dual Riser cards for PCI/PCIe/PCI-X Card Expansion

The Dell Precision R5400 offers two (2 slot) I/O riser cards.

One riser provides dual x16 Gen 1 PCI-e slots providing support for up to two full length, full height industry standard graphics cards up to a total of 300 watts.

There is a choice of second riser card options. The default option provides a PCI-e x16 slot wired as x8 (25 watts) and a 64Bit PCI X slot.

An alternative riser card option provides a 32Bit 5 volt PCI slot along with a 64Bit PCI X slot

Removable Media Drives

The Dell Precision R5400 is designed with a single optical media bay that can house a CD-RW/DVD Combo, DVD-ROM, or DVD+/-RW drive. An external USB external floppy drive is also available.

Hard Disk Drives

The Dell Precision R5400 offers a range of SATA hard drives up to 1TB[4] at 7,200 RPM and up to 160GB at 10,000 RPM. Two drives are supported with optional host based RAID 0, 1 for increased I/O performance or enhanced reliability.

Memory

The Dell Precision R5400 offers users a choice of 667MHz fully buffered DIMM quad-channel memory capacities, with configurations up to 32GB[3] in 4 DIMM slots.

Operating System Support

All Dell Precision Workstations including the R5400 offer the choice of Microsoft® Windows Vista® and Windows XP (Via Microsoft Windows Vista downgrade program) 32bit or 64bit version operating systems. Red Hat® Enterprise Linux® Version 5 is another factory installed option (support provided for Version 4 as well).

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Dell Precision <u>Factory Installed</u> OS Choices:

- Windows XP Pro 32 & 64bit, SP3 Via Vista downgrade program
- Windows Vista Ultimate-32 & 64bit, SP1
- Windows Vista Business-32 & 64bit, SP1
- Red Hat Enterprise Linux V5 64Bit   (V4 supported)

Benefits of 64 bit OS:

- 64-bit native applications can deliver more data more quickly, so memory-intensive applications can run more quickly and efficiently.

- Data in memory can be accessed thousands of times faster than it is on a disk drive. Applications can preload substantially more data into virtual memory, allowing rapid access by the 64-bit processor.

- Ability to address more than 4GB^3 of physical system memory.

- Freedom to maximize your resources by hosting your 32-bit applications and scalable, high performing 64-bit applications on the same platform.

Energy Star

What is Energy Star?

Energy Star 4 is a configurable option on the new Dell Precision R5400.

ENERGY STAR® qualified products and practices can help you save money and reduce greenhouse gas emissions by meeting strict energy efficiency guidelines set by the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy. You can help reduce electricity usage and its environmental impact by power managing or turning off your product when it is not in use for extended periods of time, particularly at night and on weekends.

What are the potential benefits of the Energy Star 4 specification?

Desktops, Notebooks, and Workstations manufactured after July 20, 2007 that bear the ENERGY STAR label meet the more stringent 4.0 requirements. Because of these requirements, your computer has a highly efficient power supply and other hardware specific features that can help save electricity and help reduce green-house gas emissions.

Moreover, Energy Star compliant computers can save even more energy by using ENERGY STAR power management features, which allow the computer to enter a very low power mode when not in use for a specified period of time.

Energy Star® configured systems combined with power management settings are designed to provide Dell customers significant TCO savings

For more information on Energy Star, please visit http://www.energystar.gov

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Dell Precision R5400 Views and Connections
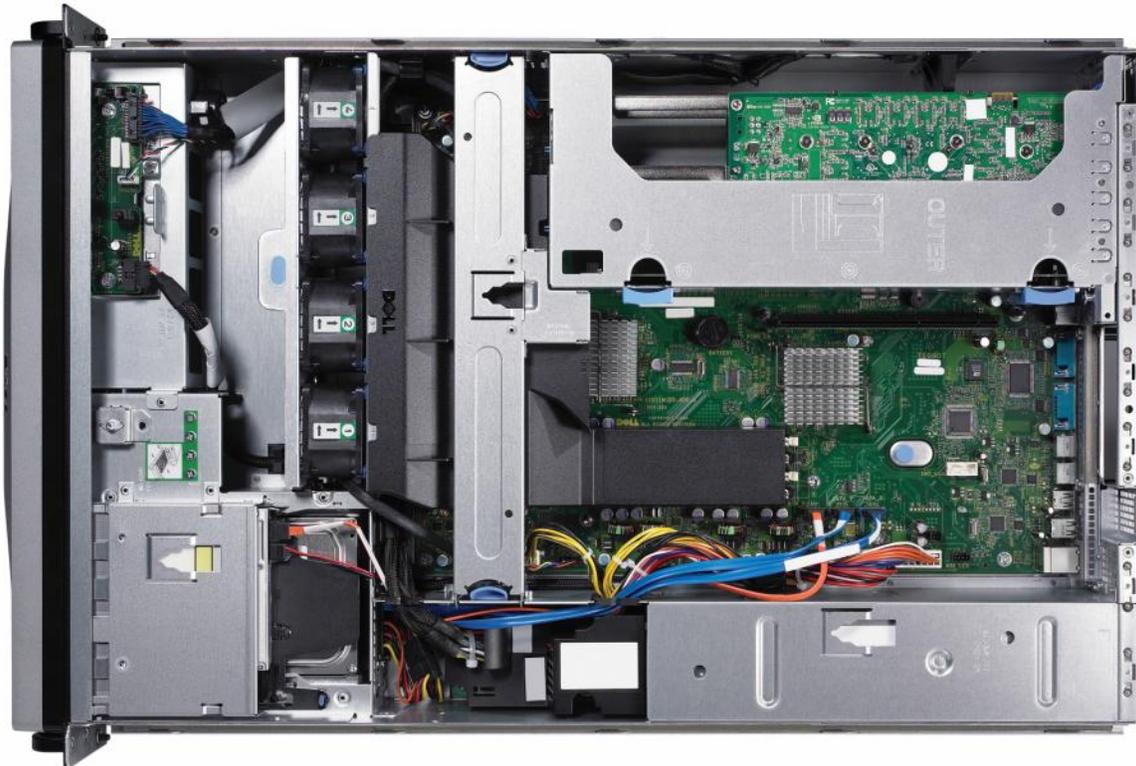
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R5400 With Rails And Front Bezel
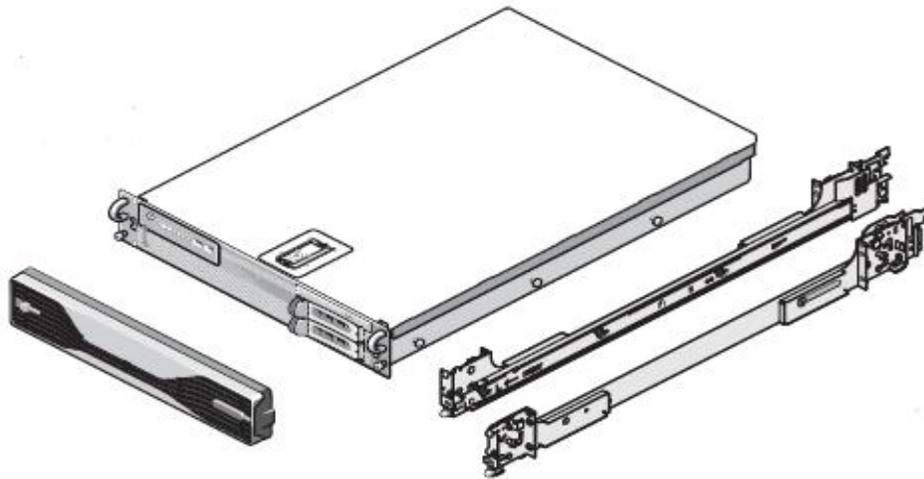
R5400 Front View
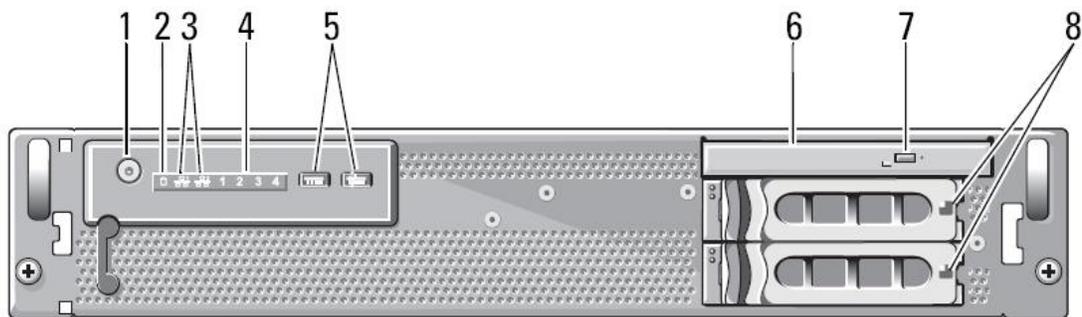
1	power button, power light	2	drive activity light
3	network activity lights (2)	4	diagnostic lights (4)
5	USB 2.0 connectors (2)	6	optical drive
7	optical drive eject button	8	hard drive bays (2)

R5400 Rear View
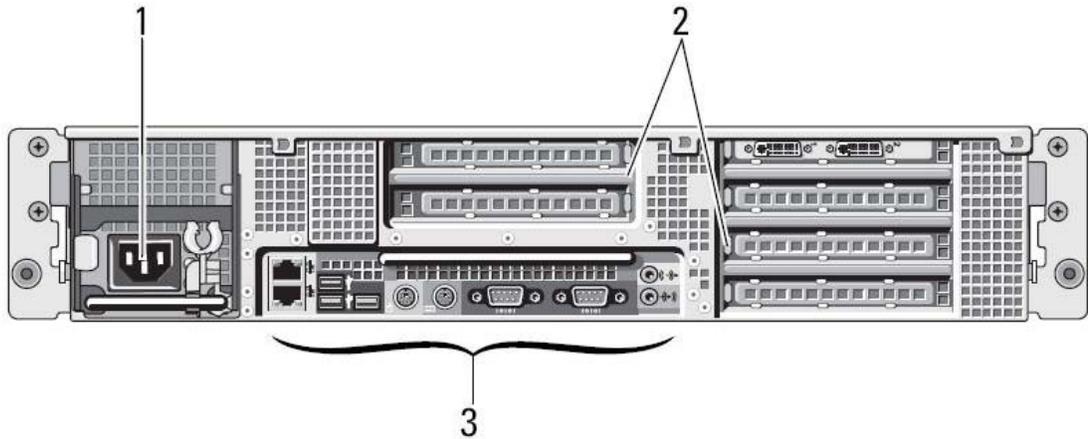
1	power connector	2	expansion card slots
3	back panel connectors		

R5400 Rear Panel Connectors

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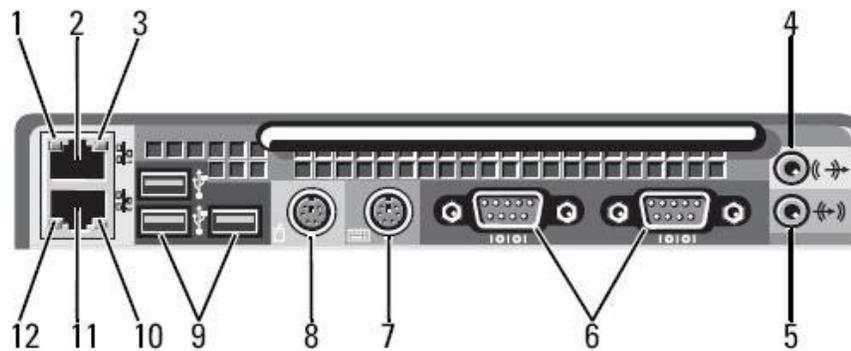
1	network link integrity light	2	network adapter connector (primary)
3	network activity light	4	line-out connector
5	line-in connector	6	serial connectors (2)
7	keyboard connector	8	mouse connector
9	USB 2.0 connectors (3)	10	network activity light
11	network adapter connector (secondary)	12	network link integrity light

Marketing System Configurations

NOTE: **Offerings may vary by region.**

Operating System

NOTE: **One of the following Operating Systems will be preinstalled.**

	R5400
Windows Vista® operating system	Windows Vista® Ultimate (32 and 64 bit), Windows Vista® Business (32 and 64 bit) (SP1 when available)
Windows XP® operating system	Windows® XP Professional SP2 (32 and 64 bit) (SP3 when available) via Vista downgrade rights
Other	Red Hat Enterprise Linux 5.1 64bit Factory Installed, (Red Hat Linux V4 supported)

Chipset

	R5400
Chipset	
Intel® 5400 Chipset (Seaburg)	Yes
TPM 1.2 Security Device (Trusted Platform Module)	Yes
Dual Broadcom® NetXtreme 10/100/1000 Gigabit Ethernet controllers	Yes

Processor

NOTE: **Processor numbers are not a measure of performance.**

Processor (speed, system bus, wattage, cache)	R5400
Intel® Xeon® Quad-core (Harpertown) and Dual-core (Wolfdale) Processors	
Quad-Core Intel Xeon Processor E5405 2.0GHz/1333MHz FSB, 80 watts, 64-bit, 2 X 6MB L2 cache	Supports one or two
Quad-Core Intel Xeon Processor E5410 2.33GHz/1333MHz FSB, 80 watts, 64-bit, 2 X 6MB L2 cache	Supports one or two
Quad-Core Intel Xeon Processor E5420 2.5GHz/1333MHz FSB, 80 watts, 64-bit, 2 X 6MB L2 cache	Supports one or two
Quad-Core Intel Xeon Processor E5430 2.66GHz/1333MHz FSB, 80 watts, 64-bit, 2 X 6MB L2 cache	Supports one or two
Quad-Core Intel Xeon Processor E5440 2.83GHz/1333MHz FSB, 80 watts, 64-bit, 2 X 6MB L2 cache	Supports one or two

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Processor (speed, system bus, wattage, cache)	R5400
Quad-Core Intel Xeon Processor E5450 3.0GHz/1333MHz FSB, 80 watts, 64-bit, 2 X 6MB L2 cache	Supports one or two
Dual-Core Intel Xeon Processor L5240 3.0GHz/1333MHz FSB, 80 watts, 64-bit, 6MB L2 cache	Supports one or two
Dual-Core Intel Xeon Processor X5260 3.33GHz/1333MHz FSB, 80 watts, 64-bit, 6MB L2 cache	Supports one or two

Memory

The R5400 supports a minimum of 1GB of ECC memory (2 X 512MB FB DIMMs) and a maximum of $32GB^2$ of ECC memory (8 X 8GB FB DIMMs).

NOTE: The entire 4GB to 32GB memory range is available to 64-bit operating systems only.

	R5400
The Dell Precision T5400 has a quad-channel memory bus architecture, Dell recommends that all four memory channels be populated with 4 DIMMs for maximum performance.	667MHz Fully Buffered ECC DIMM memory across 4 memory channels
Memory Latency	DDR2 667 MHz CL555
DIMM Slots	4
DIMM Capacities	512MB, 1GB, 2GB, 4GB, 8GB
Minimum Memory Configuration	1GB
Maximum Memory	$32GB^2$
Memory configurations	
$1GB^2$ ECC FB DIMM 667MHz, (2 X 512MB)	Supported option
$2GB^2$ ECC FB DIMM, 667MHz, (4 x 512MB)	Supported option
$2GB^2$ ECC FB DIMM, 667MHz, (2 X 1GB)	Supported option
$4GB^2$ ECC FB DIMM, 667MHz, (4 X 1GB)	Supported option
$4GB^2$ ECC FB DIMM, 667MHz, (2 X 2GB)	Supported option
$8GB^2$ ECC FB DIMM, 667MHz, (4 X 2GB)	Supported option
$16GB^2$ ECC FB DIMM, 667MHz, (4 X 4GB)	Supported option
$32GB^2$ ECC FB DIMM, 667MHz, (4 X 8GB)	Supported option

Hard Drives and Removable Storage

Internal Hard Drives - Accessible behind removable front bezel	R5400

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Maximum internal SATA Hard drives	2
Maximum Internal storage capacity (2 hard drives)	2.0TB[1] (2 X 1.0TB[1])
Optional Host based (software) RAID via Intel chipset	RAID 0,1
Available Hard Drives:	
80GB[4] 3.5" SATA 3.0Gbit/s 7200 RPM, 8MB cache HDD	Supports one or two
80GB[4] 2.5" SATA 3.0Gbit/s 10K RPM, 16MB cache HDD	Supports one or two
160GB[4] 3.5" SATA 3.0Gbit/s 7200 RPM HDD	Supports one or two
160GB[4] 2.5" SATA 3.0Gbit/s 10K RPM HDD	Supports one or two
250GB[4] 3.5" SATA 3.0Gbit/s 7200 RPM, 8MB cache HDD	Supports one or two
300GB[4] 2.5" SATA 3.0Gbit/s 10K RPM, 16MB cache HDD	Supports one or two
320GB[4] 3.5" SATA 3.0Gbit/s 7200 RPM, 8MB cache HDD	Supports one or two
500GB[4] 3.5" SATA 3.0Gbit/s 7200 RPM, 8MB cache HDD	Supports one or two
750GB[4] 3.5" SATA 3.0Gbit/s 7200 RPM, 16MB cache HDD	Supports one or two
1.0TB[4] 3.5" SATA 3.0Gbit/s 7200 RPM, 16MB cache HDD	Supports one or two

Removable Storage

Maximum Internal Optical drive bays - Accessible behind removable front bezel	1
8X DVD-ROM with Cyberlink Power DVD™ (SATA)	optional
8X DVD+/-RW w/ Cyberlink PowerDVD™ and Roxio Creator™ (SATA)	optional
24X CD-RW/DVD Combo Drive with Cyberlink Power DVD™ (SATA)	optional
USB External Floppy Drive	optional

External System I/O Ports

See chassis diagrams section for port/connector locations	**R5400**
USB 2.0	2 on front panel, 3 on back panel and 1 internal (Udoc)
Serial Ports	2
PS/2 Ports	2
RJ45 Ports (Gigabit Ethernet)	2 on rear panel
Audio Connectors	Stereo line-in and line-out on back panel
Front Panel Power switch	1
Front Panel LEDs	2 for NIC connectivity indication 1 HDD activity

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I/O Slots – via two riser cards	R5400
Riser 1	2 standard PCIe x16 Gen 1 full length graphics slots each up to150W (300W total)
Riser 2 – Choice of Either:	1 PCIX 64-bit @ 100MHz; 1 PCIe x16, wired as x8 (default) **OR** 1 PCIX 64-bit @ 100MHz; 1 PCI 32-bit; 5V

Bays

	R5400
Internal 3.5" hard disk drive bays - accessible behind removable front bezel	2
External 5.25" slim-line optical bay - accessible behind removable front bezel	1

Security

	R5400
Hardware (requires optional software)	TPM 1.2 Security Device (Trusted Platform Module)
Removable Front bezel	Key lock
Chassis Intrusion Alert	integrated

Audio

	R5400
Controller	Integrated High Definition Audio (Rev 1.0 Specification) with Sigmatel STAC9200 High Definition Audio CODEC and Intel ESB2's integrated AC97/ High Definition digital controller

Optional Cards

	R5400
Network	Broadcom® NetXtreme 10/100/1000 Gigabit Ethernet controller PCI Express card.

Communication	IEEE 1394a card

Power

	R5400
750m Watt 80 % + efficiency PSU (tool-less removable)	integrated

Graphics Controller and Display Options

	R5400
NVIDIA® Quadro® NVS 290 with 256MB^3 DDR2 Graphics Memory	*Single or dual (local monitor attach) card configurations*
ATI® Fire GL® V3600 with 256MB^3 DDR2 Graphics Memory	*The R5400 supports one or two graphics cards of the same type.*
NVIDIA Quadro FX 570 with 512MB^3 DDR3 Graphics Memory	
NVIDIA Quadro FX 1700 with 512MB^3 DDR2 Graphics Memory	
NVIDIA Quadro FX 3700 with 512MB^3 DDR3 Graphics Memory	
NVIDIA Quadro FX 4600 with 768GB^3 DDR3 Graphics Memory	

NVIDIA Quadro NVS 290 with 256MB^3 DDR2 Memory	**R5400**
Bus Type	PCIe X16
Frame Buffer Memory	256MB^3 DDR2
Frame buffer Memory interface	64bit
Frame buffer Memory bandwidth	4.8GB/s
Maximum Power Consumption	21W
Dual Link DVI	Not supported
Multiple Display Support	Yes, dual via DMS-59 connector
Graphics/ Video API Support	Open GL 2.1 and Direct X 10
Maximum Resolution	Max : 1920 X1200 @ 60Hz Digital
External connectors	2 DVI-I

ATI Fire GL v3600 with 256MB^3 DDR2 Memory	**R5400**
Bus Type	PCIe X16
Frame Buffer Memory	256MB^3 DDR2

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ATI Fire GL v3600 with 256MB^3 DDR2 Memory	R5400
Frame buffer Memory interface	128Bit
Frame buffer Memory bandwidth	16GB/s
Maximum Power Consumption	44 watts
Dual Link DVI	Yes
Multiple Display Support	Yes
Graphics/ Video API Support	Open GL 2.1 and Direct X 10
Maximum Resolution	Max : 2560 x 1600 @ 60Hz Digital
External connectors	2 DVI-I

NVIDIA Quadro FX 570 with 256MB^3 DDR3 Memory	R5400
Bus Type	PCIe X16
Frame Buffer Memory	256MB^3 DDR2
Frame buffer Memory interface	128bit
Frame buffer Memory bandwidth	12.8GB/s
Maximum Power Consumption	38W
Dual Link DVI	2
Multiple Display Support	Yes
Graphics/ Video API Support	Open GL 2.1 and Direct X 10
Maximum Resolution	Max : 2560 X 1600 @ 60Hz Digital
External connectors	2 DVI-I

NVIDIA Quadro FX 1700 with 512MB^3 DDR2 Memory	R5400
Bus Type	PCIe X16
Frame Buffer Memory	512MB^3 DDR2
Frame buffer Memory interface	128bit
Frame buffer Memory bandwidth	12.8GB/s
Maximum Power Consumption	42W
Dual Link DVI	2
Multiple Display Support	Yes

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NVIDIA Quadro FX 1700 with 512MB[3] DDR2 Memory	R5400
Graphics/ Video API Support	Open GL 2.1 and Direct X 10
Maximum Resolution	Max : 2560 X 1600 @ 60Hz Digital
External connectors	2 DVI-I

NVIDIA Quadro FX 3700 with 512MB[3] DDR3 Memory	R5400
Bus Type	PCIe X16
Frame Buffer Memory	512MB[3] DDR3
Frame buffer Memory interface	256bit
Frame buffer Memory bandwidth	51.2GB/s
Maximum Power Consumption	78W
Dual Link DVI	2
Multiple Display Support	Yes
Graphics/ Video API Support	Open GL 2.1 and Direct X 10
Maximum Resolution	Max : 2560 X 1600 @ 60Hz Digital
External connectors	2 DVI-I

NVIDIA Quadro FX 4600 with 768MB[3] DDR3 Memory	R5400
Bus Type	PCIe X16
Frame Buffer Memory	768MB[3] DDR3
Frame buffer Memory interface	384bit
Frame buffer Memory bandwidth	67.2GB/s
Maximum Power Consumption	134W
Dual Link DVI	2
Multiple Display Support	Yes
Graphics/ Video API Support	Open GL 2.1 and Direct X 10
Maximum Resolution	Max : 2560 X 1600 @ 60Hz Digital
External connectors	2 DVI-I

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Displays

	R5400
Dell 30 inch UltraSharp™ 3008WFP Widescreen, Adjustable Stand	All Optional Note: the 30" flat panel requires a graphics card capable of dual-link display to support the full resolution
Dell 30 inch UltraSharp™ 3007WFP Widescreen, Adjustable Stand	
Dell 30 inch UltraSharp™ 2709WFP Widescreen, Adjustable Stand	
Dell 24 inch UltraSharp™2408WFP Widescreen, Adjustable Stand	
Dell 22 inch UltraSharp™ 2208FPW Widescreen, Adjustable Stand	
Dell 20 inch UltraSharp™ 2009FPW Widescreen, Adjustable Stand	
Dell 20 inch UltraSharp™ 2007FP Flat Panel, Adjustable Stand	
Dell 19 inch UltraSharp™ 1908FP Flat Panel, Adjustable Stand	
Dell 19 inch UltraSharp™ 1907FPV Flat Panel, Adjustable Stand	
Dell 17 inch UltraSharp™ 1707FPV Flat Panel, Adjustable Stand	
Dell 22 inch E228FP Widescreen Flat Panel, Analog	
Dell 20 inch E207FP Widescreen Flat Panel, Analog	
Dell 17 inch UltraSharp™ 1708FP Flat Panel, Adjustable Stand	
Dell 17 inch E773c (16 inch viewable) Conventional CRT	
Dell 17 inch E178FP Widescreen Flat Panel, Analog	
Dell 19 inch E198FP Widescreen Flat Panel, Analog	
22 inch SP2208WFP Wide Flat Panel with Webcam	
Dell 17 inch E178FP Flat Panel, Analog	

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Communications - Network Adapter (NIC)

	R5400
Dual Broadcom® 5754 NetXtreme 10/100/1000 Gigabit Ethernet controllers	Integrated on system board
Manageability	WOL, PXE
Management Capabilities Alerting	ASF2.0

Communications – Modem

V.92 Data/Fax Controllerless Modem	R5400
Bus	PCI
External Connector	RJ-11

Audio and Speakers

Audio	R5400
Integrated High Definition Audio Specification, Revision 1.0 The R5400 motherboard has an integrated two-chip audio solution comprised of Sigmatel's STAC9200 High Definition Audio CODEC and the ESB2's integrated AC97/High Definition digital controller	**R5400**
Line-In	integrated Rear
Line-Out	integrated Rear

Speakers

Internal chassis speaker	integrated
Dell A225 Speakers	Optional
Dell AS501PA Sound Bar w/ Power Adapter for all Entry Flat Panel Displays	Optional
Dell AX510 Sound Bar for all UltraSharp Flat Panel Displays	Optional
Logitech Z-4 Speaker System	Optional

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Keyboard and Mouse

	R5400
Keyboard	
Dell USB Entry Quietkey Keyboard, no hot keys	Optional
Enhanced USB Multimedia Keyboard , 8 Hot Keys	Optional
Smartcard Reader Keyboard, USB	Optional
Mouse	
Dell USB Optical Mouse with scroll, All Black Design	Optional
Dell USB Optical 2 Button Scroll Mouse	Optional

Rack Rails

Sliding Rapid/Versa Rails and Cable Management Arm, Universal R5400 fits industry standard 19" racks including Dell Power Edge server racks.	Optional

Dell FX100 Remote Access Device

Remote access host card for FX100 Remote Access Device (goes into R5400 PCI-e slot and requires Dell FX100 Remote Access Device portal	Optional
Dell FX100 Remote Access Device (Portal for remote user – requires R5400 remote access host card)	Optional

Remote Access

Host Card
- PCIe x1 card for host workstation
- 2 DVI-I ports
- 1 RJ45 jack for 10/100/1000 Mbps Ethernet

Portal Device
- Remote power button (controls workstation host)
- Disconnect button (disconnects portal and host card)
- Built to run on standard 10/100/1000 BaseT Ethernet networks
- Allows true, transparent USB bridging over IP networks
- Same plug-and-play experience as local workstation
- Provides flexible user authorization by allowing USB port disabling or filtering by device type or user profile
- On-board audio controller connects to standard audio codecs
- Requires supplied codec for Windows® XP
- Operates in conjunction with any operating system and application

- No modification or additional host drivers required
- Management and media communication protected by secure SSL and IPSec

Video

- 2 DVI-I ports with one DVI-I to VGA (DB-15) adapter supplied
- Video Control Display Data Control (DDC) for automatic setting of resolution and refresh rate

Video Resolution

- Single DVI at 1920x1200
- Dual DVI at 1600x1200

I/O Ports

- 4 USB 1.1 connectors – 2 front, 2 rear
- 1 audio mic-in jack – front
- 1 audio headphone out jack – front
- 1 audio line-out jack – rear
- 1 RJ45 jack for 10/100/1000 Mbps Ethernet

Portal Dimensions

- Height 9.13" (232 mm)
- Width 3.7" (94mm)
- Length 6.85" (174 mm)
- Kensington® Lock port

Environmental

- Environmental with humidity and temperature range:
- Operating: 0 to 35 (degrees C) 5% - 85%RH
- Storage: -40 to 60 (degrees C) 5% - 95%RH
- Air Flow: Natural convection – top down with side vents
- BTU/hr: At nominal 15W AC power operation ~52 BTU
- At full 25W AC power operation ~85 BTU
- Sound Level (db): 0 db – fanless with no moving parts

Power Consumption

- 12v DC
- 30 watts or less
- Current at 115V: 150mA (nominal)
- 10W (0.8A) DC nominal – using a 36W AC/DC adapter
- Current at 200V: 75mA (nominal)
- 2.5mm inside diameter and 6.5mm outside diameter
- 1 DC-in jack
- External power adapter with worldwide autosensing
- 100-240v VAC, 50/60 Hz support.

Environmental & Regulatory

You can find additional Safety Best Practices information on the Regulatory Compliance Homepage on www.dell.com at the following location: www.dell.com/regulatory_compliance.

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Service and Support

NOTE: For more details on Dell Service Plans please to go to www.dell.com/service/service_plans/

	R5400
3 Year Limited Hardware Warranty[5] (3-3-0)	Standard
3 Year Next Business Day On-site[6] Service (3-3-3)	Optional
ProSupport	Optional

R5400 Detailed Engineering Specifications

System Dimensions (Physical)

NOTE: System Weight* and Shipping Weight* is based on a typical configuration and may vary based on PC configuration.   A typical configuration includes: graphics, one hard drive, one optical drive.

	R5400
Chassis Weight* pounds/kilograms	45.97 lb (20.85 kg)
Chassis Dimensions: (HxWxD) - inches/centimeters without front bezel	
Height inches/centimeters	3.40 in (8.66 cm)
Width inches/centimeters	17.5 in (44.4 cm)
Depth inches/centimeters	27 in (68.5 cm)

*Weights are approximates and may change based on system configuration and included accessories.

System Level Environmental and Operating Conditions

	R5400
Temperature	
Operating	10° to 35° C (50° to 95° F) with a maximum temperature gradation of 10°C per hour
Non-Operating (Storage)	–40° to 65° C (–40° to 149° F) with a maximum temperature gradation of 20°C per hour
Relative Humidity (maximum)	10% to 90% (non-condensing)
Operating	20% to 80% (noncondensing) with a maximum humidity gradation of 10% per hour
Non-Operating (Storage)	5% to 95% (noncondensing) with a maximum humidity gradation of 10% per hour
Maximum wet bulb (MWB)	38°C under any conditions

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	R5400
Maximum vibration	
Operating	0.26 G at 5–350 Hz for 2 minutes per side (operational sides only)
Non-Operating (Storage)	0.5 G at 3–200 Hz for 15 min
Maximum Shock	
Operating	40 G +/- 5% with pulse duration of 2 msec +/- 10% (equivalent to 20 in/sec [51 cm/sec])
Non-Operating (Storage)	105 G +/- 5% with pulse duration of 2 msec +/- 10% (equivalent to 50 in/sec [127 cm/sec])
Maximum Altitude	
Operating	–16 to 3048 m (–50 to 10,000 ft)
Non-Operating	–16 to 10,600 m (–50 to 35,000 ft
Airborne contaminant level	G2 or lower as defined by ISA-S71.04-1985

Power

	R5400
Power Supply Wattage	750W
AC Input Voltage Range	Autoranging power supply: 90–240 VAC at 50–60 Hz
Maximum heat dissipation	For 750 W power supply: 2559 BTU/hr **NOTE:** Heat dissipation is calculated based upon the power supply rating.
Backup battery	3-V CR2032 lithium coin-cell
Energy Star 4.0 Compliant 80% efficient Power Supply	integrated

Audio

	R5400
Integrated High Definition Audio Specification, Revision 1.0 The R5400 motherboard has an integrated two-chip audio solution comprised of Sigmatel's STAC9200 High Definition Audio CODEC and the ESB2's integrated AC97/High Definition digital controller	
Line-In	**Rear**
Line-Out	**Rear**

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BIOS Defaults

System Info	Lists the computer name, BIOS version, service tag, express service code, asset tag, and ownership tag. None of these fields are changeable.
Processor Info	Identifies the processors' type, clock speed, bus speed, L2 cache, processor ID, microcode version, multi core capability, HT capability, and 64-bit technology
Memory Info	Indicates the amount of installed memory, memory speed, channel mode (single, dual, or quad), and memory technology. Each slot is also identified by calling out the amount and type of memory populated.
PCI Info	Displays what (if anything) is inserted into each PCI slot.
Date/Time	Displays and controls the current date and time settings. Changes take effect immediately.
Boot Sequence	The computer attempts to boot from the sequence of devices specified in this list. **Default Setting:** • Onboard or USB Floppy Drive • Onboard SATA Hard Drive • Onboard IDE Hard Drive • Any add-in hard disks that are detected (listed in the order that they are detected w/ USB Device usually being detected last) • Onboard or USB CD-ROM Drive • Any other bootable add-in devices that are detected (listed in the order that they are detected w/ Onboard Network Controller usually being detected first)
Drives	
Diskette Drive	NOTE: Regardless of what the System Setup shows, the system does not have the option to ship with a floppy drive. This field determines how the BIOS configures floppy drives. Operation Systems with USB support will recognize floppy drives regardless of this setting. • **Off** Floppy drives are disabled • **On** Floppy drives are enabled NOTE: The USB Controller setup option will affect floppy operation. **Default setting:** On
SATA-0	This field allows the user to enable or disable a SATA device. **Default setting:** On

SATA-1	This field allows the user to enable or disable a SATA device. **Default setting:** On
SATA-2	This field allows the user to enable or disable a SATA device. **Default setting:** On
SATA Operation	This field configures the operating mode of the integrated hard drive controller. The settings are: • **RAID Autodetect/AHCI** – RAID if signed drives, otherwise AHCI • **RAID Autodetect/ATA** – RAID if signed drives, otherwise ATA • **RAID On** – SATA is configured for RAID on every boot 🖉 **NOTE:** Changing this setting will change how the drives are listed. The information for the drives will not reflect these changes until after a reboot. **Default setting:** RAID Autodetect/AHCI
SMART Reporting	This field controls whether hard drive errors for integrated drives are reported during system startup. This technology is part of the SMART (Self Monitoring Analysis and Reporting Technology) specification. The settings are Off and On. **Default setting:** Off
<td colspan="2" align="center">**Onboard Devices**</td>
Integrated NIC	This field enables and disables the integrated Network Interface Controller (NIC). The settings are • **Off** – Integrated NIC is disabled • **On** – Integrated NIC is enabled • **On w/ PXE** – Integrated NIC is on (with PXE enabled) • **On w/ RPL** – Integrated NIC is on (with RPL enabled) 🖉 **NOTE:** PXE or RPL is needed only if intending to boot to an Operating System located on a server, not if you are booting to an OS located on a hard drive in this system. **Default setting:** On
Integrated NIC 2	This field enables and disables the integrated Network Interface Controller (NIC). The settings are • **Off** – Integrated NIC 2 is disabled • **On** – Integrated NIC 2 is enabled **Default setting:** On
Integrated Audio	This field enables or disables the integrated audio controller. The settings are: • **Off** – Integrated Audio is disabled • **Auto** – Use the add-in Audio controller • **On** – Integrated Audio is enabled **Default setting:** Auto
USB Controller	This field enables or disables the integrated USB controller. The settings are: • **Off** – The USB controller is disabled

	• **On** – The USB controller is enabled • **No Boot** – The USB controller is the enabled; however, BIOS will not recognize USB storage devices **NOTE:** Operating systems with USB support will recognize USB storage devices regardless of the **No Boot** setting. **Default setting:** On
Front USB Ports	This field enables or disables the front USB connectors. The settings are: • **Off** – The front USB connectors are disabled • **On** – The front USB connectors are enabled **Default setting:** On
Serial Port #1	This field determines how this integrated serial connector operates. The settings are: • **Off** – the connector is disabled • **Auto** – BIOS selects between COM1 and COM3, if both resources are in use the connector is disabled • **COM1** – the connector is configured at 3F8h with IRQ4 • **COM3** – the connector is configured at 3E8h with IRQ4 **Default setting:** Auto
Serial Port #2	This field determines how this integrated serial connector operates. The settings are: • **Off** – the connector is disabled • **Auto** – BIOS selects between COM2 and COM4, if both resources are in use the connector is disabled • **COM2** – the connector is configured at 2F8h with IRQ3 • **COM4** – the connector is configured at 2E8h with IRQ3 **Default setting:** Auto
PS/2 Mouse Port	This field enables or disables the integrated legacy PS/2-compatible mouse controller. **Default setting:** On
Video	
Primary Video	This field allows the user to specify the order in which the system assigns primary video controller when 2 or more controllers are available in the system. This selection matters only if there are 2 or more video controllers present. The settings are: • **Option 1** – 1) PCI-E slot1, 2) PCI-X slot2, 3) PCI-E slot4, 4) PCI-E slot3 • **Option 2** – 1) PCI-E slot3, 2)PCI-E slot4, 3) PCI-E slot1, 4) PCI-X slot2 **Default setting:** Option 2
Performance	
SpeedStep	This field specified whether Enhanced SpeedStep Technology will be enabled for all suported processor(s) in

	the system. The settings are: • **Off** – Disable Enhanced SpeedStep Technology • **On** – Enable Enhanced SpeedStep Technology **Default setting:** Off
Virtualization	This field specifies whether a Virtual Machine Monitor (VMM) can utilize the additional hardware capabilities provided by Intel® Virtualization Technology. The settings are: • **Off** – Disable Virtualization Technology • **On** – Enable Virtualization Technology The system will need power off and restart in order for the change to take effect. **Default setting:** Off
VT for Direct I/O	This field specifies whether a Virtual Machine Monitor (VMM) can utilize the additional hardware capabilities provided by Intel® Virtualization Technology for Direct I/O. The settings are: • **Off** – Disable Virtualization Technology for Direct I/O • **On** – On Virtualization Technology for Direct I/O **Default setting:** Off
Limit CPUID Value	This field limits the maximum value the processor Standard CPUID Function will support. Some operating systems will not complete installation when the maximum CPUID Function supported is greater than 3. • **Off** – The CPUID Function will not be limited to 3 • **On** – The CPUID Function will be limited to 3 **Default setting:** Off
HDD Acoustic Mode	This field allows the user to optimize the IDE drives performance and acoustic noise level based on personal preferences. • **Bypass** – Do nothing (needed for older drives) • **Quiet** – Slower, but quieter • **Suggested** – Allow drive manufacturer to select mode • **Performance** – Faster, but possibly noisier **Default setting:** Bypass
Snoop Filter	This field allows users to turn of/off the snoop filter. • **Off** – Snoop Filter is disabled • **On** – Snoop Filter is enabled **Default setting:** On
ACL Prefetch	This field allows users to turn of/off Adjacent Cache Line Prefetch.

	• **Off** – Prefetch is disabled • **On** – Prefetch is enabled **Default setting:** Off
HW Prefetch	This field allows users to turn on/off Hardware Prefetch. • **Off** – Prefetch is disabled • **On** – Prefetch is enabled **Default setting:** On
Security	
Admin Password	This option provides restricted access to the computer's System Setup program in the same way that access to the system can be restricted with the System Password option. The settings are **Set** and **Not Set**. If the option is **Not Set**, type a password and confirm it to enable this option. If the option is **Set**, there will be a "lock icon" at the top right corner of every screen in setup. To disable the password, type the old password and then press <Enter> twice to leave the new and confirm password fields blank. **Default setting:** Not Set
System Password	Displays the current status of the system's password security feature and allows a new system password to be assigned and verified. The settings are **Set** and **Not Set**. If the option is **Not Set**, type a password and confirm it to enable this option. If the option is **Set**, the computer will not boot until the correct password is entered. To disable the password, type the old password and then press <Enter> twice to leave the new and confirm field blank. **Default setting:** Not Set
SATA-0 Password SATA-1 Password	If supported by the hard drive, this field allows the user to set a password for the hard drive. The drive password is used to prohibit an unauthorized user from using the drive. The settings are **Not Set** and **Set**.
SATA-2 Password	This drive is a CD or DVD drive. Drive security is not available.
Password Changes	This option locks the system password field with the admin password. When the field is locked, a valid admin password is required to modify or delete the system password. **Default setting:** Unlocked
Chassis Intrusion	When enabled, this option alerts the user, during the next computer startup, that the computer cover has been opened. The settings are **On**, **On-Silent**, and **Off**. **Default setting:** On-Silent
Intrusion Alert	This option displays in system setup only if a chassis intrusion event occurred. If an intrusion has been detected, the following message is displayed. A chassis intrusion has been detected. Press <Enter> to acknowledge and clear this event. The system will be armed to look for future security breaches. Press <Esc> otherwise.
TPM Security	This field controls the TPM security device. The settings are:

	• **Off** – TPM security device is Off • **On** – TPM security device is On **Default setting:** Off
Execute Disable	This field controls the Execute Disable Memory Protection Technology. The settings are: • **Off** – Execute Disable Memory Protection Technology is Off • **On** – Execute Disable Memory Protection Technology is On **Default setting:** On
Computrace	This field lets you activate or disable the BIOS module interface of the optional Computrace® software. The settings are as follows: • **Disable** — Permanently block the Computrace module interface. • **Deactivate** — Block the Computrace module interface. • **Activate** — Permit the Computrace module interface. The Absolute Software antitheft solution is **deactivated** by default. Note that the **Activate** and **Disable** options **permanently** activate and disable, respectively, the feature and allow no further changes. **Default setting:** Deactivated
<td colspan="1" align="center">**Power Management**</td>	
AC Recovery	Determines what happens when AC power is restored to the computer. The settings are **Off**, **On**, and **Last**. **Default setting:** Off
Auto Power On	This field specifies when to use the Auto Power Time setting to turn the system on. The settings are: • **Off** – Do not use the Auto Power Time • **Everyday** – Turn system power on every day at the time set in Auto Power Time • **Weekdays** – Turn system power on Monday through Friday at the time set in Auto Power Time This feature does not work if you turn off your computer using a power strip or surge protector. **Default setting:** Off
Auto Power Time	Sets the specific time to automatically turn on the computer. Use this setting in conjunction with the **Auto Power On** setting. Time is kept in a 24-hour format (hours:minutes). Change the start-up time by pressing the right- or left-arrow key to increase or decrease the numbers, or type numbers the time fields.
Low Power Mode	This field determines how aggressive the system is at conserving power while in Hibernate Mode or when turned Off. The settings are: • **Off** – Add more functionality • **On** – Conserve more power **NOTE:** With this option set to On, the integrated NIC is disabled with the system is in the Hibernate or Off state. Only add-in NIC cards are able to remotely wake the system. **Default setting:** Off

Remote Wake-Up	The system can be powered up remotely from Suspend, Hibernate, or Off. When Low Power Mode is On, the system can only be powered up from Suspend. If Remote Wake Up from Hibernate or Off is also required, Low Power Mode must be set to Off. The settings are: • **Off** – NIC cannot wake up the system • **On** – NIC can wake up the system • **On w/ Boot to NIC** – NIC can wake up the system and the system will boot from the network **Default setting:** Off
Suspend Mode	The options are **S1**, a suspend state where the computer is running in a low power mode, and **S3**, a standby state where the power is reduced or turned off for most components, however, system memory remains active. **Default setting:** S3
Maintenance	
Service Tag	This field displays the Service Tag and allows it to be set if one is not already assigned.
ASF Mode	This field controls the Alert Standards Format (ASF) management mechanism. The settings are: • **On** – Full ASF 2.0 functionality (RMCP) • **Alert Only** – Send ASF messages on event or error • **Off** – All ASF functionality disabled **Default setting:** Off
SERR Message	This field controls the SERR message mechanism. Some graphics cards require that the SERR message mechanism be disabled. The settings are: • **Off** – Do not use the SERR Message Mechanism • **On** – Use the SERR Message Mechanism **Default setting:** On
Load Defaults	This option allows you to reset every option back to the way it was when the system left the factory. **Cancel** and **Continue**.
Event Log	Displays the system event log. Options are **Mark All Entries** and **Clear Log**.
POST Behavior	
Fast Boot	This field speeds up the boot process by bypassing some compatibility steps. The settings are: • **Off** – Do not skip any steps in the boot process • **On** – boot quickly **Default setting:** On
Numlock Key	This option involves the rightmost bank of keys on your keyboard. When set to **On**, this option activates the numeric and mathematical features shown at the top of each key. When set to **Off**, this option activates the cursor-control functions labeled on the bottom of each key. **Default setting:** On
POST Hotkeys	This field specifies whether the sign-on screen displays a message stating the keystroke sequence required to enter the Setup program or the QuickBoot feature. The settings are: **Setup & Boot Menu** – Display both messages (F2=Setup and F12=Boot Menu) **Setup** – Display Setup message only (F2=Setup) **Boot Menu** – Display QuickBoot message only (F12=Boot Menu) **None** – Neither message is displayed **Default setting:** Setup & Boot Menu

Keyboard Errors	This option disables or enables keyboard error reporting when the system boots. Options are **Report**, or **Do Not Report**. **Default setting:** Report

External connectors

Serial	two back panel 9-pin connectors (16550C-compatible)
Video	DVI or VGA connector on graphics card
Network adapter	two back panel RJ-45 connectors (for integrated 1 GB NICs)
PS/2 (keyboard and mouse)	two back panel 6-pin mini-DIN
USB	two front-panel and three back-panel USB 2.0-compliant connectors
Audio	two back panel connectors (line-in and line-out)

System board connectors

SATA	three 7-pin connectors
Internal USB	one 10-pin connector
Fans	two 4-pin connectors two 5-pin connectors
PCI (on center riser)	one 124-pin connector
PCI-X (on center riser)	one 188-pin connector
PCI Express x8 (on center riser)	one 164-pin connector
PCI Express x16 (on outer riser)	two 164-pin connectors
Front control panel	one 20-pin connector
Front panel USB	one 10-pin connector
Processor	two 775-pin connectors
Memory	four 240-pin connectors
Power	12V three 6-pin connectors
Power (main)	one 24-pin connector

PCI Connectors

PCI

connector	one
connector size	124 pins
connector data width (max)	32 bits
PCI-X	
connector	one
connector size	188 pins
connector data width (max)	64 bits
PCI Express x8	
connector	x16 (supports x8, x4 and x1 cards)
connector size	164 pins
connector data width (max)	x8 PCI Express lane
PCI Express x16	
connector	two x16
connector size	164 pins
connector data width (max)	x16 PCI Express lane

1. Source: IDC Worldwide Quarterly Workstation Tracker, August 2008
2. Up to 1GB may not be available with 32-bit operating systems due to system resource requirements
3. Significant system memory may be used to support graphics, depending on system memory size and other factors.
4. GB means 1 billion bytes and TB equals 1 trillion bytes; actual capacity varies with preloaded material and operating environment and will be less.
5. For a copy of our guarantees or limited warranties, please write Dell USA L.P., Attn: Warranties, One Dell Way, Round Rock, TX 78682. For more information, visit www.dell.com/warranty.
6. Service may be provided by third-party. Technician will be dispatched if necessary following phone-based troubleshooting. Subject to parts availability, geographical restrictions and terms of service contract. Service timing dependent upon time of day call placed to Dell. U.S. only.