PowerEdge R515

Technical Guide

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1 Product Comparison

1.1 Overview

The Dell™ PowerEdge™ R515 is a 2-socket 2U rack server well-suited for database, email, virtualization, workload consolidation, and other applications requiring an immense amount of local storage.

The PowerEdge R515 offers outstanding price for performance with the latest AMD Opteron™ (4 or 6 core) series processors and enterprise-class features, including advanced systems management capabilities, an interactive LCD screen (8 hard drive model) as well as hot-swap hard drives and redundant power supplies for additional business data protection.

The R515 also offers the choice of an 8 or 12 hard drive configuration, delivering up to 25 TB of internal storage space, making it ideally suited to meet the demands of the small- to mid-sized business or data center with superior stability, efficiency, and long-term business value.

1.1.1 Designed to Go the Distance

You've told us you need a server manufacturer that inspires confidence through its reliability, availability, and quality of products. That is why we have designed the PowerEdge R515 for optimal reliability and ease of use, incorporating customer-inspired features that range from robust metal hard-drive carriers and industrial-quality materials to embedded diagnostics and an optional interactive LCD screen.

Our reliability goals are simple: Deliver quality products that stand the test of time.

- A Unified Server Configurator (USC) helps minimize downtime by offering embedded and persistent diagnostics with no media requirements.
- A one-touch quality-control process enables single-person responsibility for an entire server build.
- Every Dell server model is tested and re-tested before it leaves the factory.
- Our operating system, application and software integration testing, and validation help ensure that everything works together right out of the box.
- A focus on product longevity provides longer, fully supported product lifecycles for better investment protection.

1.1.2 Efficient from the Inside Out

The PowerEdge R515 was designed to provide you with a multitude of time- and energy-saving options, not only inside the server, but outside as well.

Inside the server, we have Energy Smart technologies to help you better manage power. This includes low-wattage processors, support for low-voltage DIMMs, and efficient fans that spin in accordance with server workload demands. Internal shrouding and logical component layouts aid with airflow direction, helping to cool the server. Energy-efficient power supplies use power effectively without compromising business productivity.

Outside the server, we have put the external ports, power supplies, and LED lights or LCD screens in the same location as other 11th generation PowerEdge servers for a familiar server-to-server usability and commonality, as well as for easy installation and deployment. The hard drives across the 11G servers are also interchangeable since they share the same drive carriers.

1.1.3 Easy to Manage

As an IT professional, you do not have a lot of time to spend managing and maintaining your systems. That is why the Dell systems-management portfolio focuses on two core principles to make your life easier: simplicity and cost-effectiveness.

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The optional Lifecycle Controller helps you perform system diagnostics, hardware configuration, and system deployment in a pre-operating-system environment from an easy-to-use interface called the Unified Server Configurator (USC). This helps eliminate the need to use and maintain multiple pieces of CD/DVD media and helps get your server up and running fast.

An interactive LCD screen (8 hard drive model) on the front of the server allows for easy setup, monitoring, and maintenance. Plain-language diagnosis and a programmable messaging system can help you address issues quickly to simplify day-to-day monitoring.

The Dell Management Console, which is included with every Dell server, provides you with a consolidated console view of your IT infrastructure.

Automated update notification from Support.Dell.com provides you with the latest updates for firmware, drivers and BIOS so your systems are always running at their best.

1.2 Comparison

Table 1.   Feature Comparison to R510 and R710

Feature	R510	R515 (8 HDD)	R515 (12 HDD)	R710
Processor	Intel® Xeon® processor 5500 or 5600 series	AMD Opteron™ 4100 series	AMD Opteron™ 4100 series	Intel® Xeon® processor 5500 or 5600 series
Form Factor	2U rack	2U rack	2U rack	2U rack
# Sockets	1 or 2	1 or 2	1 or 2	1 or 2
# Cores	2 or 4	4 or 6	4 or 6	2 or 4
Front Side Bus	Intel® QuickPath Interconnect (QPI) 6.4GT/s	HyperTransport-3 (HT-3) 5.2GT/s	HyperTransport-3 (HT-3) 5.2GT/s	Intel® QuickPath Interconnect (QPI) 6.4GT/s
L2/L3 Cache	4MB or 8MB	512KB per core/6MB	512KB per core/6MB	4MB or 8MB
Chipset	Intel® 5500	AMD SR 5670	AMD SR 5670	Intel® 5520
DIMMs	4+4 DDR3 UDIMM or RDIMM 1333/1066/800MHz	8 x DDR3 UDIMM, RDIMM, or LV RDIMM 1333/1066/800/667MHz	8 x DDR3 UDIMM, RDIMM, or LV RDIMM 1333/1066/800/667MHz	18 x DDR3 UDIMM or RDIMM 1333/1066MHz
Min/Max RAM	1GB/128GB	1 GB/128GB[1]	1 GB/64GB	1GB/144GB
HD Bays	4 x 3.5" cabled or 8 x 3.5" hot-plug (supports 2.5" drives with HDD carrier)	8 x 3.5" hot-plug or 8 x 2.5" hot-plug	12 x 3.5" hot-plug + 2 x 2.5" internal cabled or 12 x 2.5" hot-plug + 2 x 2.5" internal cabled	4 x 3.5" with optional flex bay, 6 x 3.5" without flex bay, or 8 x 2.5"
HD Types	SATA (default), SAS and SSD optional with add-in controller	SATA (default), SAS and SSD optional with add-in controller	SATA (default), SAS and SSD optional with add-in controller	SAS and SATA, Nearline SAS and SSD

Feature	R510	R515 (8 HDD)	R515 (12 HDD)	R710
Ext Drive Bay(s)	1 for slim optical drive in 4-HDD and 8-HDD chassis No optical drive in 12-HDD chassis	1 for slim optical drive	No optical drive	Optional flex bay expansion to support half-height tape backup unit
Embedded HD Controller	Chipset-based SATA	Chipset-based SATA	Chipset-based SATA	Chipset-based SATA
Optional Storage Controller	Non-RAID: SAS 5/E LSI 2032 (for tape backup unit only) RAID: SAS 6/iR Modular PERC 6/i PERC 6/E PERC H200 PERC H700 PERC H800	Non-RAID: 6 Gbps SAS HBA RAID: PERC S300 PERC H200 PERC H700 PERC H800	Non-RAID: 6 Gbps SAS HBA RAID: PERC H200 PERC H700 PERC H800	Non-RAID: SAS 5/E LSI 2032 (for tape backup unit only) 6 Gps SAS HBA RAID: SAS 6/iR PERC 6/i PERC 6/E PERC H200 PERC H700 PERC H800
Availability	Hot-plug hard drive, redundant power supply, quad-pack LED diagnostic or LCD (with hot-plug hard drive chassis), memory mirroring	Hot-plug hard drive, redundant power supply, LCD diagnostic	Hot-plug hard drive, redundant power supply, quad-pack LED diagnostic	Hot-plug hard drive, redundant power supply and cooling, ECC memory, Single Device Data Correction (SDDC) supports memory demand and patrol scrubbing, high-availability failover cluster
Server Mgt.	BMC, IPMI 2.0 compliant, full Dell OpenManage™ suite Optional: iDRAC6 Express, iDRAC6 Enterprise, vFlash	BMC, IPMI 2.0 compliant, full Dell OpenManage™ suite Optional: iDRAC6 Express, iDRAC6 Enterprise, vFlash	BMC, IPMI 2.0 compliant, full Dell OpenManage™ suite Optional: iDRAC6 Express, iDRAC6 Enterprise, vFlash	iDRAC6 Express, BMC, IPMI 2.0 compliant, full Dell OpenManage™ suite Optional: iDRAC6 Enterprise, vFlash
I/O Slots	3 PCIe + 1 storage slot or 1 PCIe + 1 storage slot	3 PCIe + 1 storage slot or 1 PCIe + 1 storage slot	3 PCIe + 1 storage slot or 1 PCIe + 1 storage slot	2 PCIe x8 + 2 PCIe x4 or 1 PCIe x16 + 2 PCIe x4
NIC/LOM	2 x GbE LOM Optional: various NICs available	2 x GbE LOM Optional: various NICs available	2 x GbE LOM Optional: various NICs available	Broadcom® BCM5709C 4 x iSCSI TOE Optional: various NICs available
USB	2 front, 2 back, 2 internal	2 front, 2 back, 2 internal	2 front, 2 back, 2 internal	2 front, 2 back, 1 internal
Hypervisor (with internal SD card)	No	No	No	Yes

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Feature	R510	R515 (8 HDD)	R515 (12 HDD)	R710
Power Supplies	4-HDD chassis: non-redundant, 480W (80+ SILVER) 8-HDD and 12-HDD chassis: hot-plug redundant 750W (80+ GOLD) Auto ranging (100V~240V)	Hot-plug redundant 750W (80+ GOLD) Auto ranging (100V~240V)	Hot-plug redundant 750W (80+ GOLD) Auto ranging (100V~240V)	Two hot-plug high efficient 570W or Two hot-plug 870W (1+1)
Fans	Non-redundant, non-hot-pluggable	Non-redundant, non-hot-pluggable	Redundant, non-hot-pluggable	5 hot-plug fans (default processor config) 4 hot-plug fans (single processor config)
Dimensions (HxWxD)	86.4 x 436.6 x 610.2 (mm) 3.40 x 17.19 x 24.09 (in)	86.4 x 436.6 x 610.2 (mm) 3.40 x 17.19 x 24.09 (in)	86.7 x 445.2 x 664.6 (mm) 3.42 x 17.53 x 26.17 (in)	864 x 443.1 x 720.6 (mm) 3.40 x 17.4 x 29.75 (in)
Weight	Max (8-HDD chassis): 22.5 Kg (49.5 lbs) Max (12-HDD chassis): 29.0Kg (63.8 lbs)	Max: 22.5 Kg (49.5 lbs)	Max: 29.0 Kg (63.8lbs)	Max: 26.1 Kg (57.54 lbs)

[1]128 GB maximum memory will be available with 16 GB DIMMs (available Q1 2011).

2 System Overview

Table 2.   Product Features Summary

Feature	Technical Specification	
Form Factor	2U rack	
Processors	AMD Opteron™ 4100 series processors	
Processor Sockets	2	
Front Side Bus or HyperTransport	HyperTransport-3 links	
Cache	L2: 512K/core L3: 6MB	
Chipset	AMD (SR5670 and SP5100)	
Memory[1]	Up to 128GB[2] (8 DIMM slots) 1GB/2GB/4GB/8GB/16GB[2] 1333MHz	
I/O Slots	3 PCIe G2 slots (one x8, two x4) 1 storage slot (x4)	
RAID Controller	**Internal Controllers:** PERC H200 (6Gb/s) PERC H700 (6Gb/s) (non-volatile battery-backed cache: 512MB, 1G) PERC S300 (software based) (8-HDD chassis only)	**External Controllers:** PERC H800 (6Gb/s) (non-volatile battery-backed cache: 512MB, 1G) External HBA (Non-RAID): 6GB/s SAS HBA
Drive Bays	8 HDD chassis: 2.5" or 3.5" SAS, SATA, or SSD	12 HDD chassis: 2.5" or 3.5" SAS, SATA, or SSD + 2 x 2.5" internal cabled
Maximum Internal Storage	16TB (8-HDD chassis) 25.2TB (12-HDD chassis)	
Hard Drives[1]	3.5" SATA (7.2K RPM): 160GB, 250GB, 500GB, 1TB, 2TB 3.5" Nearline SAS (7.2K RPM): 500GB, 1TB, 2TB 3.5" SAS (15K RPM): 146GB, 300GB, 450GB, 600GB	2.5" SAS (10K RPM): 146GB, 300GB, 600GB 2.5" SATA SSD: 50GB, 100GB

Feature	Technical Specification	
Communications	**Optional add-in NICs:** Intel® 10GBase-T Copper Single Port NIC, PCI-E x8 Intel® PRO 1000 PT Single Port Adapter, Gigabit Ethernet NIC, PCIe x1 Intel® Gigabit ET Dual Port Server Adapter, PCIe x4 Intel® Gigabit ET Quad Port Server Adapter, PCIe x4 Intel® Ethernet X520 DA2 Dual-Port 10 Gigabit Server Adapter Intel® X520-T2 Dual-Port 10 Gigabit Ethernet Server Adapter Broadcom® BCM5709C IPV6 Gigabit Copper Dual Port NIC with TOE and iSCSI Offload, PCIe x4 Broadcom® BCM5709C IPV6 Gigabit Copper Dual Port NIC with TOE, PCIe x4 Broadcom® BCM5709C 10/100/1000BASET Quad Port NIC Broadcom® NetXtreme™ II 57711 Dual-Port SFP+/Direct Attach 10Gb Ethernet PCIe with TOE and iSCSI Offload	**Optional add-in HBAs:** Brocade® 1020 10G Converged Network Adapter (CNA)–dual port Emulex® LPe11002 FC4 HBA, Dual Port Emulex® LPe1150 FC4 HBA, Single Port Emulex® LPe12000 8Gbps FC HBA, Single Port Emulex® LPe12002 8Gbps FC HBA, Dual Port Emulex® OCE10102FXD, 10G PCIe FCoE CNA, Dual Port Qlogic® QLE220 FC4 HBA, Single Port Qlogic® QLE2460 FC4 HBA, Single Port Qlogic® QLE2462 FC4 HBA, Dual Port Qlogic® QLE2560 8Gbps FC HBA, Single Port Qlogic® QLE2562 8Gbps FC HBA, Dual Port Qlogic® QLE8152 8Gbps FC HBA, Dual Port Brocade® FC HBA BR815 Brocade® FC HBA BR825
Power Supply	Redundant 750W	
Availability	Hot-plug hard drives, hot-plug redundant power, ECC memory, quad-pack LED diagnostic or interactive LCD (8-HDD chassis only)	
Video	Matrox® G200eW with 8MB memory	
Remote Management	Optional: iDRAC6 Express, iDRAC6 Enterprise, and vFlash (upgrade optional)	
Systems Management	Dell OpenManage™ featuring Dell Management Console BMC, IPMI 2.0 compliant Lifecycle Controller enabled via optional iDRAC6 Express or iDRAC6 Enterprise and vFlash Unified Server Configurator	
Rack Support	ReadyRails™ sliding rails for 4-post racks with support for optional cable management arm or ReadyRails™ static rails for 4-post and 2-post racks	

Feature	Technical Specification
Operating Systems	Microsoft® Windows® Small Business Server 2008
	Microsoft® Windows Server® 2008 SP2, x86/x64 (x64 includes Hyper-V™)
	Microsoft® Windows Server® 2008 SP2 R2, x64 (includes Hyper-V™ v2)
	Microsoft® Windows® HPC Server 2008
	Novell® SUSE® Linux® Enterprise Server
	Red Hat® Enterprise Linux®
	Optional Embedded Hypervisors:
	Citrix® XenServer®
	VMware® vSphere™ 4.1 (including VMware ESX® 4.1 or VMware ESXi™ 4.1)
	For more information on the specific versions and additions, visit www.dell.com/OSsupport
Featured Database Application	Microsoft® SQL Server® solutions (see Dell.com/SQL)

[1]GB means 1 billion bytes and TB equals 1 trillion bytes; actual capacity varies with preloaded material and operating environment and will be less.

[2]128 GB maximum memory will be available with 16 GB DIMMs (available Q1 2011).

3   Mechanical

3.1 Chassis Description

PowerEdge R515 chassis is a 2U rack-mount design that supports the following configurations:

- 8 hard drive chassis:
    - 8 hot-plug 3.5" SAS/SATA hard drives (2.5" SAS/SSD with hard drive carrier)
    - 750W redundant power supplies
    - 11G diagnostic LCD
- 12 hard drive chassis:
    - 12 hot-plug 3.5" SAS/SATA and 2 internal cabled 2.5" SAS/SATA hard drives
    - 750W redundant power supplies
    - Rack-ear diagnostic LED
    - Redundant system cooling

3.2 Dimensions and Weight

Figure 1 details the dimensions and weight for the PowerEdge R515.
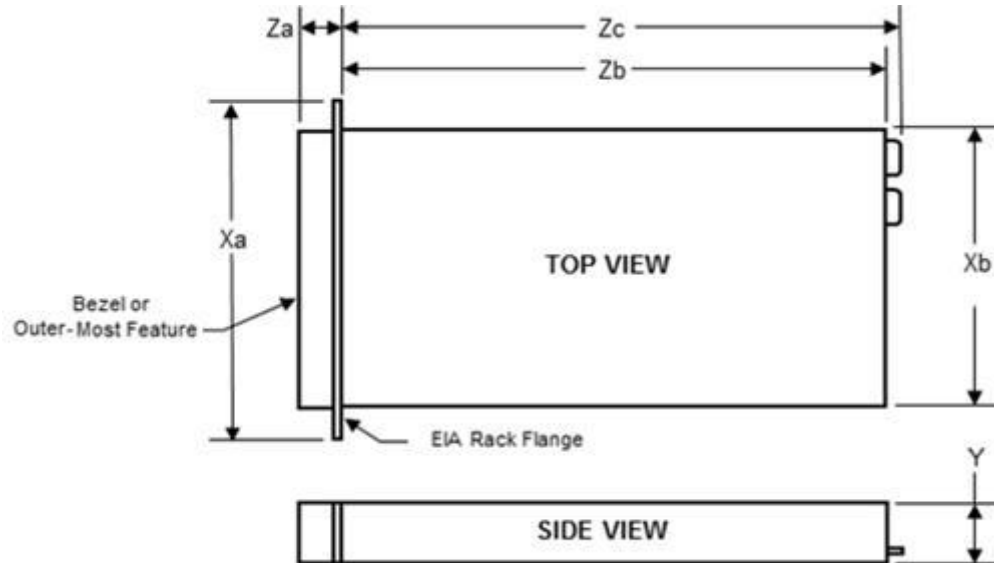
Chassis type	Xa	Xb	Y	Za w/ bezel	Za w/o bezel	Zb*	Zc	Max Weight
8-HDD	482.4mm	436.6mm	86.4mm	35.0mm	21.0mm	610.2mm	642.0mm	22.5Kg
12-HDD	482.4mm	445.2mm	86.76mm	35.0mm	21.0mm	664.65mm	697.05mm	29.0Kg

Figure 1.   R515 Chassis Dimensions

Zb measures to the nominal rear wall external surface where the motherboard I/O connectors reside.

3.3 Front Panel View and Features

The PowerEdge R515 is available in two chassis configurations: 8 hard drive chassis (see Figure 2) and 12 hard drive chassis (as shown in Figure 3). The 8 hard drive chassis has a configuration including the LCD panel, buttons, and connectors on the front panel. The 12 hard drive chassis has a configuration including the LED panel, connectors, and buttons located on the rack ears above the latches. You cannot upgrade a chassis from one configuration to another. Figure 4 shows a front view with the optional bezel.

Figure 2.   Front View (8 Hard Drive Chassis)

Figure 3.   Front View (12 Hard Drive Chassis)

Figure 4.   Front View (With Optional Bezel)

See the Front-Panel Features and Indicators section in the About Your System chapter of the *PowerEdge R515 Hardware Owner's Manual* on Support.Dell.com for more information.

3.4 Back Panel View and Features

Figure 5 shows the back of the PowerEdge R515 server.

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Figure 5.   Back View

See the Back-Panel Features and Indicators section in the About Your System chapter of the *PowerEdge R515 Hardware Owner's Manual* on Support.Dell.com for more information.

3.5 Power Supply Indicators

The PowerEdge R515 redundant power supplies have one status bi-color LED: green for AC power present and amber for a fault as detailed in Table 3.

Table 3.   Power Supply Status

LED	Power Supply Status
⬜	AC Power is not present
🟢	AC Power is present
🟠	Fault of any kind is detected
🟢	DC Power is applied to the system
🟢↔🟠	Redundant power supply mismatch (when hot-plugged/swapped)

See the Power Indicator Codes section in the About Your System chapter of the *PowerEdge R515 Hardware Owner's Manual* on Support.Dell.com for more information.

3.6 NIC Indicators

See the NIC Indicator Codes section in the About Your System chapter of the *PowerEdge R515 Hardware Owner's Manual* on Support.Dell.com for more information.

3.7 Side Views

Figure 6 and Figure 7 show left and right side views of the server.

Figure 6.   Left Side View

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Figure 7.   Right Side View

3.8 Rails and Cable Management

3.8.1   ReadyRails Sliding Rails

ReadyRails^{TM} Sliding Rails for 4-post racks support the following:

- Toolless installation in 19" EIA-310-E compliant square or unthreaded round hole 4-post racks, including all generations of Dell racks
- Tooled installation in 19" EIA-310-E compliant threaded hole 4-post racks (requires the 2U Threaded Rack Adapter Brackets Kit)
- Full extension of the system out of the rack to allow serviceability of key internal components
- Optional cable management arm (CMA)

3.8.2   ReadyRails Static Rails

ReadyRails^{TM} Static Rails for 4-post and 2-post racks support the following:

- Toolless installation in 19" EIA-310-E compliant square or unthreaded round hole 4-post racks, including all generations of Dell racks
- Tooled installation in 19" EIA-310-E compliant threaded hole 4-post and 2-post racks

For more information, see the Rails section the Rack Information chapter.

3.9 Rack View

3.9.1   Sliding Rails

The PowerEdge R515 sliding rails are a stab-in design, meaning that the inner chassis rail members must first be attached to the sides of the system prior to inserting them into the middle (intermediate) and outer cabinet rail members installed in the rack.

The CMA can be mounted to either side of the rails without the use of tools or the need for conversion, but it is recommended that it be mounted on the side opposite the power supplies to allow easier access to the power supplies for service or replacement.

See Figure 8 and Figure 9 for views of the R515 mounted in the B3 sliding rails.

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Figure 8.   R515 Mounted in B3 Sliding Rails

Figure 9.   Back View of R515 Mounted in B3 Sliding Rails with CMA

3.9.2   Static Rails

The R515 static rails are also a stab-in design, but unlike the sliding rails, they do not include middle (intermediate) rail members. After the inner chassis rail members have been attached to the sides of the chassis, they are inserted directly into the outer cabinet rail members installed in the rack.

See Figure 10 for a view of the R515 mounted in B4 static rails.

Figure 10.   R515 Mounted in the B4 Static Rails in 2-Post Center Mount Configuration

3.10 Fans

There are five fan modules in the PowerEdge R515. The types of fan modules differ, depending on one of the following chassis configurations:

- 8 hard drive chassis: 5 single-fan modules
- 12 hard drive chassis: 5 double-fan (stacked) modules (10 fans total)

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3.11 Control Panel/LCD

The PowerEdge R515 includes one of the following control panel configurations:

- LCD panel (8 hard drive chassis only)
- LED panel (12 hard drive chassis only)

3.11.1 LCD Panel Configuration

Figure 11 and Figure 12 show the LCD panel configuration for the PowerEdge R515 with 8 HDDs.

Figure 11.   LCD Panel Configuration

Figure 12.   LCD Panel (Detailed View)

The LCD panel is located on the front of the system chassis to provide user access to buttons, display, and I/O interfaces. Features of the system control panel include the following:

- ACPI-compliant power button with an integrated green power LED (controlled by iDRAC6)
- 128x20 pixel LCD screen
- Two navigation buttons
- One select button
- One system ID button
- Non-maskable Interrupt (NMI) button (recessed)
- Ambient temperature sensor

The LCD panel is a graphics display controlled by iDRAC6. Error codes can be sent to the display by either iDRAC6 or BIOS.

The system's LCD panel provides system information and status messages to signify when the system is operating correctly or when the system needs attention.

The R515 BIOS has the ability to enter a secure mode through Setup, which locks the Power and NMI buttons. When in this mode, the power button can still be used to turn on the system, but it cannot be used to turn off power to the system.

For more information on the LCD panel, see the LCD Panel Features (Optional) section in the About Your System chapter in the *PowerEdge R515 Hardware Owner's Manual* on Support.Dell.com.

3.11.2 LED Panel Configuration

Figure 13 and Figure 14 show the LCD panel configuration for the PowerEdge R515 with 12 HDDs.

Figure 13.   LED Panel Configuration

Figure 14.   LED Panel (Detailed View)

For a complete description of LED indicators, their causes, and possible courses of action to take to resolve an error, see the Diagnostic Lights (Optional) section in the About Your System chapter in the *PowerEdge R515 Hardware Owner's Manual* on Support.Dell.com.

3.12 Security

For additional information regarding the following security features, see the *PowerEdge R515 Hardware Owner's Manual* on Support.Dell.com.

3.12.1 Cover Latch

The PowerEdge R515 comes with a coin lock entry latch on the top cover of the unit and provides security for the entire system. The lock provides for toolless access to the chassis.

3.12.2 Bezel

A metal bezel is an available option and is mounted to the chassis front to provide the Dell ID. A lock on the bezel prevents un-authorized access to system peripherals and the control panel. System status (on the LCD or LED panel) remains viewable with the bezel is installed.

3.12.3 Hard Drive

Hot-plug hard drives are only accessible by opening the bezel, thus locking the bezel secures the hard drives. Cabled hard drives are only accessible by opening the top cover, thus locking the top cover secures the hard drives.

3.12.4 TPM

The TPM is used to generate/store keys, protect/authenticate passwords, and create/store digital certificates. TPM can also be used to store the Microsoft® BitLocker™ keys for hard drive encryption features in Microsoft® Windows Server® 2008. TPM is enabled through a BIOS option and uses HMAC-SHA1-160 for binding. In China, the S-TPM (Socket TPM) is used.

3.12.5 Power Off Security

The control panel is designed such that the power switch cannot be accidentally activated. The lock on the bezel secures the power button behind the bezel. In addition, there is a setting in the CMOS setup that disables the power button function.

3.12.6 Intrusion Alert

A switch inside the chassis is used to detect chassis intrusion. When the system cover is opened, the switch circuit closes to indicate intrusion. When enabled, the software can provide notification to the customer that the cover has been opened.

3.12.7 Secure Mode

BIOS has the ability to enter a secure boot mode through Setup. This mode includes the option to lock out the power and NMI switches on the Control Panel or to set up a system password.

3.13 USB Key

Dell does not offer USB keys for factory installation. The PowerEdge R515 supports two internal USB connectors which can be used for USB keys.

3.14 Battery

A replaceable coin cell CR2032 3V battery is mounted on the planar to provide backup power for the Real-Time Clock and CMOS RAM on the SP5100 chip.

3.15 Field Replaceable Units (FRU)

Parts available for field replacement include:

- Backplane
- CMOS battery
- Expansion card
- Front bezel
- HDD
- I/O panel
- Memory
- ODD
- PDB
- Power supply
- Processor
- Processor shroud
- System board
- System cover
- System fan

For detailed information on replacing parts for the PowerEdge R515, see the Installing System Components chapter in the *PowerEdge R515 Hardware Owner's Manual* on Support.Dell.com.

3.16 User Accessible Jumpers, Sockets, and Connectors

See the Jumpers and Connectors chapter in the *PowerEdge R515 Hardware Owner's Manual* on Support.Dell.com.

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4   Power, Thermal, Acoustic

4.1 Power Supplies

The PowerEdge R515 system is powered by hot-plug redundant 750W power supply units. Power is soft-switched, allowing power cycling using a switch on the front of the system enclosure, or through software control (through server management functions). The power system is compatible with industry standards, such as ACPI and Server 2000.

Two options are available for 750W hot-plug redundant PSUs:

- n+0, hot plug non-redundant
- n+1, hot plug redundant

For a redundant power supply configuration (shown in Figure 15), the second power supply provides hot-pluggable power redundancy. In redundant mode, the system distributes the power load across both power supplies to maximize efficiency. When a power supply is removed with the system powered on, the full power load is picked up by the remaining power supply.

Figure 15.   R515 Redundant Power Supplies

4.2 Power Supply Specifications

Table 4 details power supply specfications.

Table 4.   750W Power Supply Specifications

AC Power Supply (per power supply)	
Wattage	750W (optional redundant)
Voltage	100–240 VAC, auto ranging, 50–60Hz
Maximum inrush current	Under typical line conditions and over the entire system ambient operating range, the inrush current may reach 55A per power supply for 10ms or less

The R515 Energy Smart 750W Power Supply is certified Gold (80 Plus) and Climate Savers 3. It is certified UL approved and incorporates PFC logic.

4.3 Heat Dissipation

Redundant power supply (8 hard drive chassis): 2200 BTU/hr maximum

Redundant power supply (12 hard drive chassis): 2450 BTU/hr maximum

4.4 Environmental Specifications

Table 5 details the environmental specifications for operating and storage of the PowerEdge R515.

Table 5.   Environmental Specifications

Temperature	
Operating	10° to 35°C (50° to 95°F) with a maximum temperature gradation of 10°C per hour **Note**: For altitudes above 2950 feet, the maximum operating temperature is derated 1°F/550 ft.
Storage	-40° to 65°C (-40° to 149°F) with a maximum temperature gradation of 20°C per hour
Relative Humidity	
Operating	20% to 80% (noncondensing) with a maximum humidity gradation of 10% per hour
Storage	5% to 95% (noncondensing) with a maximum humidity gradation of 10% per hour
Maximum Vibration	
Operating	0.26 Grms at 5–350Hz for 15 minutes
Storage	1.87 Grms at 10–500Hz for 15 minutes
Maximum Shock	
Operating	One shock pulse in the positive z axis (one pulse on each side of the system) of 31G for 2.6ms in the operational orientation
Storage	Six consecutively-executed shock pulses in the positive and negative x, y, and z axes (one pulse on each side of the system) of 71G for up to 2ms Square wave shock of 32G @ 270 in/second

Altitude	
Operating	-15.2 to 10,668m (-50 to 35,000ft) Note: For altitudes above 2950 feet, the maximum operating temperature is derated 1°F/550 ft.
Storage	-15.2 to 10,668m (-50 to 35,000ft)

The airborne contaminant level is class G2 or lower as defined by ISA-S71.04-1985.

4.5 ENERGY STAR Compliance

ENERGY STAR® qualified configurations can be accessed from the [ENERGY STAR Compliance results](#) landing page on Dell.com.

4.6 Thermal

The thermal design of the PowerEdge R515 includes the following:

- Closed loop thermal control algorithm: This method uses feedback temperatures to dynamically determine proper fan speeds.
- Comprehensive thermal management: The PowerEdge R515 controls system cooling fan speed based on several different responses from critical component sensors, such as processor temperature, DIMM temperature, IOH temperature, inlet ambient temperature, and system configurations. The thermal management adjusts proper cooling ability for the system according to what the system really needs.
- Optimized Ventilation: The R515 chassis has a custom ventilation design for optimized air flow path. Each component and peripheral is ensured sufficient air for cooling.
- Redundant Cooling: The R515 (12-HDD system) has redundant cooling, which means that other fans take over for cooling if a fan fails.

4.7 Acoustics

The acoustical design of the PowerEdge R515 reflects adherence to Dell's high sound quality standards. Sound quality is different from sound power level and sound pressure level in that it describes how humans respond to annoyances in sound, like whistles, hums, etc. One of the sound quality metrics in the Dell specification is prominence ratio of a tone as shown in Table 6 and 0.

Fan speeds and noise levels ramp up during the boot process to add a layer of protection for component cooling if the system were not to boot properly. Hardware configurations affect system noise levels. Dell's thermal control provides for optimized cooling with varying hardware configurations, as shown in the following tables.

Table 6. Acoustical Performance (8 HDD Chassis)

Typical Configuration @ 23 ± 2 °C				Operating Mode	L_{WA}-UL (Bels)	L_{pA} (dBA)	Prominent Tones
CPU	HDD	RAID	DIMM				
2 x AMD 4180 6 core 2.6GHz	6 x 3.5" 1TB SATA 7,200 rpm	PERC H700	4 x 2GB	Idle	5.3	39	None
				Stressed	5.3	39	None

Max. Configuration @ 23 ± 2 ˚C				Operating Mode	L_{WA}-UL (Bels)	L_{pA} (dBA)	Prominent Tones
CPU	HDD	RAID	DIMM				
2 x AMD 4180 6 core 2.8GHz	8 x 3.5" 600GB SAS 15,000 rpm	PERC H700	8 x 8GB	Idle	5.4	43	Yes
				Stressed	5.5	43	Yes

Table 7.   Acoustical Performance (12 HDD Chassis)

Typical Configuration @ 23 ± 2 ˚C				Operating Mode	L_{WA}-UL (Bels)	L_{pA} (dBA)	Prominent Tones
CPU	HDD	RAID	DIMM				
2 x AMD 4180 6 core 2.6GHz	8 x 3.5" 2TB SATA 7,200 rpm	PERC H700	4 x 4GB	Idle	6.1	45	Yes
				Stressed	6.3	47	Yes
Max. Configuration @ 23 ± 2 ˚C				Operating Mode	L_{WA}-UL (Bels)	L_{pA} (dBA)	Prominent Tones
CPU	HDD	RAID	DIMM				
2 x AMD 4180 6 core 2.8GHz	12 x 3.5" 600GB SAS 15,000 rpm + 2 x SSD 50GB SATA	PERC H700	8 x 8GB	Idle	6.1	45	Yes
				Stressed	6.3	47	Yes

Definitions

Typical configuration: The system is populated with projected average quantity, type, capacity, speed, etc., of components.

Idle: Reference ISO7779 (1999) definition 3.1.7; system is running in its OS but no other specific activity.

Stressed Processor: An operating mode per ISO7779 (1999) definition 3.1.6. The software SPECPower_ssj2008 is utilized to stress the processors. SPECPower is set to 50% loading.

LwA – UL: The upper limit sound power level (LwA) calculated per section 4.4.2 of ISO 9296 (1988) and measured in accordance to ISO 7779 (1999).

LpA: Average bystander A-Weighted sound pressure level. The system is placed in a rack with its bottom at 25 cm from the floor. The acoustic transducers are at the four bystander positions, ref ISO7779 (1999) Section 8.6.2.

Prominent tone: Criteria of D.5 and D.8 of ECMA-74 9th ed. (2005) are followed to determine if discrete tones are prominent. The system is placed in a rack with its bottom at 75 cm from the floor. The acoustic transducer is at front bystander position, ref ISO7779 (1999) Section 8.6.2.

5 Processors

5.1 Overview

The PowerEdge R515 utilizes the latest four and six core offerings from AMD's Opteron 4000 series (C32).

5.2 Features

- Performance for blades and cost-effective DP servers
    - o Up to six cores per processor
    - o Up to 6M L3 Cache for 6-core processor (512KB per core L2)
    - o Enhanced AMD power efficiency features:
        - ▪ CoolCore™ Technology
        - ▪ Enhanced AMD PowerNow!™
        - ▪ APML
    - o Demand-based switching for active processor power management, as well as support for ACPI P-States and C-States
        - ▪ C1E support
        - ▪ AMD CoolSpeed
    - o Dual-channel U/RDDR3 up to 1333 MHz, ECC
    - o Up to 3 DIMMs/channel, 6 per CPU (R515 supports to up 2 DIMMs/channel, 4 per processor)
    - o Low voltage DIMM support (6-core processor only)
    - o Designed for thermally-constrained environments
    - o 45 nm process technology
    - o PCIe Gen 2 with up to 42 lanes with 9 controllers (SR5670)
    - o Single series for UP and DP platforms (enterprise scalability and features for 1P)
- New C32 socket infrastructure
    - o Lower power/thermal bands
    - o Dual 16-bit HT3 links, up to 6.4 GT/s per link
    - o Workload optimized platforms (SR5670 chipset for expandable SMB)

5.3 Supported Processors

Table 8.   Supported Processor Description and Features

Model	Speed	Power	Cores	L2/L3 Cache	HyperTransport	HyperTransport Multiplier	Memory Speed	Process
4122	2.2GHz	95W	4	4 x 512KB/6MB	3.2GHz	11x	1333	45nm
4130	2.6GHz	95W	4	4 x 512KB/6MB	3.2GHz	13x	1333	45nm
4162 EE	1.7GHz	35W	6	6 x 512KB/6MB	3.2GHz	8.5x	1333	45nm
4164 EE	1.7GHz	35W	6	6 x 512KB/6MB	3.2GHz	9x	1333	45nm
4170 HE	2.1GHz	65W	6	6 x 512KB/6MB	3.2GHz	10.5x	1333	45nm
4174 HE	2.3GHz	65W	6	6 x 512KB/6MB	3.2GHz	11.5x	1333	45nm
4176 HE	2.4GHz	65W	6	6 x 512KB/6MB	3.2GHz	12x	1333	45nm
4180	2.6GHz	95W	6	6 x 512KB/6MB	3.2GHz	13x	1333	45nm
4184	2.8GHz	95W	6	6 x 512KB/6MB	3.2GHz	14x	1333	45nm

5.4 Processor Configurations

The PowerEdge R515 is a two-socket server that will operate with either a single processor or dual processors. When the R515 is configured with a single processor, the memory controller is embedded in the processor and supports 4 DIMMs (1 GB minimum and a 32 GB maximum). When two processors are installed in the system, it supports a total of 8 DIMMs (2 GB minimum and a 128 GB maximum (with 16 GB DIMMS— available Q1 2011).

5.5 Processor Installation

See the Processors section in the Installing System Components chapter in the *PowerEdge R515 Hardware Owner's Manual* on Support.Dell.com.

6   Memory

6.1 Overview

The PowerEdge R515 utilizes DDR3 memory providing a high-performance, high-speed memory interface capable of low latency response and high throughput.

Key features of the R515 memory system include the following:

- Support for up to 32 GB of UDIMM memory (8 x 4 GB)
- Support for up to 128 GB of DDR3 RDIMM memory (8 x 16 GB) (16 GB DIMMS available Q1 2011)
- Support for 1333 MHz single- and dual-rank DIMMs
- Support for 1066 MHz quad-rank DIMMS
- Two channels per processor
- Advanced ECC (Chipkill) mode (x4 RDIMM only)
- Online spare
- Parity
- Low voltage (LV) DIMM support (6 core processor only)
- Single bit error correction

6.2 DIMMs Supported

The PowerEdge R515 supports DDR3 RDIMMs and UDIMMs. The memory interface uses 1 GB, 2 GB, 4 GB, 8 GB, and 16 GB (available Q1 2011) RDIMMs and 1 GB, 2 GB, and 4 GB UDIMMs. See Table 9.

Table 9.   DIMMS Supported

UDIMM	RDIMM
1GB, DDR3, 1333MHz, single rank	2GB, DDR3, 1333MHz, single rank
2GB, DDR3, 1333MHz, single rank	4GB, DDR3, 1333MHz, dual rank
4GB, DDR3, 1333MHz, dual rank	8GB, DDR3, 1333MHz, dual rank
1GB, DDR3, 1333MHz, single rank, LV	16GB[1], DDR3, 1333MHz, quad rank
2GB, DDR3, 1333MHz, single rank, LV	2GB, DDR3, 1333MHz, single rank, LV
4GB, DDR3, 1333MHz, dual rank, LV	4GB, DDR3, 1333MHz, dual rank, LV
	8GB[1], DDR3, 1333MHz, dual rank, LV
	16GB[1], DDR3, 1066MHz, quad rank, LV

[1] Available Q1 2011

6.3 DIMM Slots

The DDR3 memory interface consists of two memory channels per processor socket. Each channel supports up to two RDIMMs for single/dual/quad rank or two UDIMMs. Population order is identified by the silkscreen designator and the System Information Label (SIL) located on the chassis cover.

The following DIMM population rules apply:

- Support for DDR3 1333 MHz UDIMMs or 1066/1333 MHz RDIMMs
- 2 channels, up to 2 DIMMs per channel
- Support for 1333 MHz single and dual-rank DIMMs, 1066 MHz quad-rank DIMMs

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The following is not supported:

- Mixing of RDIMMs and UDIMMs
- Use of non-ECC UDIMMs

For more information on memory configuration, see the System Memory section in the Installing System Components chapter in the *PowerEdge R515 Hardware Owner's Manual* on Support.Dell.com.

6.4 Speed

Each processor has 2 DDR3 channels capable of supporting speeds up to 1333 MHz. Single- and dual-rank DIMM types can support speeds up to 1333 MHz. Quad-rank DIMMs can support speeds up to 1066 MHz.

If memory modules with different speeds are installed, they will operate at the speed of the slowest installed memory module(s).

6.5 Sparing

Memory sparing is supported. Sparing requires a fully populated memory configuration (8 DIMMs). See Table 10 (1 processor) and Table 11 (2 processors).

6.6 Mirroring

No mirroring support.

6.7 RAID

No RAID memory support.

6.8 Supported Configurations

Table 10.   Supported Configurations (1 Processor)

System Capacity	DIMM Slots				1 Socket			
	Channel A		Channel B		UDIMM		RDIMM	
	A1	A3	A2	A4	DIMM speed	System speed	DIMM speed	System speed
1GB	1GB	—	—	—	1333	1333	N/A	N/A
2GB	1GB	—	1GB	—	1333	1333	N/A	N/A
2GB	2GB	—	—	—	1333	1333	1333	1333
4GB	1GB	1GB	1GB	1GB	1333	1333	N/A	N/A
4GB	2GB	—	2GB	—	1333	1333	1333	1333
8GB	2GB	2GB	2GB	2GB	1333	1333	1333	1333
4GB	4GB	—	—	—	1333	1333	1333	1333
8GB	4GB	—	4GB	—	1333	1333	1333	1333
16GB	4GB	4GB	4GB	4GB	1333	1066	1333	1066
16GB	8GB	—	8GB	—	N/A	N/A	1333	1333
32GB	8GB	8GB	8GB	8GB	N/A	N/A	1333	1066

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System Capacity	DIMM Slots				1 Socket			
	Channel A		Channel B		UDIMM		RDIMM	
	A1	A3	A2	A4	DIMM speed	System speed	DIMM speed	System speed
32GB[1]	16GB	–	16GB	–	N/A	N/A	1066	1066
64GB[1]	16GB	16GB	16GB	16GB	N/A	N/A	1066	1066

[1] 16 GB DIMMS available Q1 2011

Table 11.   Supported Configurations (2 Processors)

System Capacity	DIMM Slots				DIMM Slots				2 Socket			
	Channel A		Channel B		Channel A		Channel B		UDIMM		RDIMM	
	A1	A3	A2	A4	B1	B3	B2	B4	DIMM speed	System speed	DIMM speed	System speed
2GB	1GB	–	–	–	1GB	–	–	–	1333	1333	N/A	N/A
4GB	1GB	–	1GB	–	1GB	–	1GB	–	1333	1333	N/A	N/A
4GB	2GB	–	–	–	2GB	–	–	–	1333	1333	1333	1333
8GB	1GB	1GB	1GB	1GB	1GB	1GB	1GB	1GB	1333	1333	N/A	N/A
8GB	2GB	–	2GB	–	2GB	–	2GB	–	1333	1333	1333	1333
16GB	2GB	2GB	2GB	2GB	2GB	2GB	2GB	2GB	1333	1333	1333	1333
8GB	4GB	–	–	–	4GB	–	–	–	1333	1333	1333	1333
16GB	4GB	–	4GB	–	4GB	–	4GB	–	1333	1333	1333	1333
32GB	4GB	4GB	4GB	4GB	4GB	4GB	4GB	4GB	1333	1066	1333	1066
32GB	8GB	–	8GB	–	8GB	–	8GB	–	N/A	N/A	1333	1333
64GB	8GB	8GB	8GB	8GB	8GB	8GB	8GB	8GB	N/A	N/A	1333	1066
64GB[1]	16GB	–	16GB	–	16GB	–	16GB	–	N/A	N/A	1066	1066
128GB[1]	16GB	16GB	16GB	16GB	16GB	16GB	16GB	16GB	N/A	N/A	1066	1066

[1] 16 GB DIMMS available Q1 2011

7 Chipset

7.1 Overview

The PowerEdge R515 planar uses a dual IOB configuration using the AMD SR5670 chipset with IO bridges and the SP5100 Southbridge. The SR5670 is designed to support the AMD C32 processor family, HyperTransport-3 Interface (@ 2.6GHz), DDR3 memory technology, and PCI Express Generation 2. The chipset consists of the SR5670 and the SP5100.

7.2 AMD I/O Bridges

The PowerEdge R515 I/O board uses the AMD SR5670 I/O Bridges (IOB) to provide links between the C32 processor(s) and I/O components. The main components of the I/O controllers are configured to use two x16 HyperTransport 3 links (to both processors), up to 42 lanes of PCI Express Gen 2, an x4 PCIe Gen 1 Southbridge Interface (SB Link) and an integrated IOAPIC.

7.3 HyperTransport 3 (HT3)

The HyperTransport 3 (HT3) consists of serial point-to-point interconnects for the processors and the I/O bridges. The PowerEdge R515 has a total of four HT3 links per processor which allows interconnecting each processor with each other and an option for I/O Bridge. Each I/O Bridge has a single x16 HT3 link. A full link consists of 16 lanes (full-width) in each direction with a link speed of 6.4 GT/s. The HT3 clocking for processor HT3 and IOB HT3 are 3.2 GHz and 2.6 GHz, respectively. Therefore, the IOB HT3 link is capable of 5.2 GT/s. For routing, the HT3 links are grouped by x8 Command Address (CAD), x1 Control (CTL), and x1 Clock (CLK) for each RX and TX directions.

7.4 Southbridge Link Interface

The Southbridge (SB) link connects the SR5670 IOB with the AMD Southbridge SP5100. The SB Link (A-Link Express) is equivalent to an x4 PCIe Gen 1 link with a transfer rate of 1 GB/s in each direction.

7.5 AMD SP5100 Southbridge (SP5100)

SP5100 is a highly integrated Southbridge controller, supporting the following functions:

- PCI bus 32-bit interface Rev 2.3 running at 33 MHz
  - Serial ATA (SATA) ports with transfer rates up to 300 MB/s (R515 supports one SATA port for optical devices)
  - Five OHC (full-speed 1.1) and two EHCI (high-speed 2.0) USB host controllers, with up to 12 USB general purpose ports and 2 USB embedded ports (R515 uses 6 ports for internal and external use from the general purpose ports)
- Power management interface (ACPI 3.0b compliant)
- Integrated Micro Controller (IMC) and thermal management

  Note: The iDRAC interfaces the Hardware Thermal Control (HTC), not the SP5100.

- I/O interrupt controller
- SMBus 2.0 controller
- Low Pin Count (LPC) interface to Super I/O, Trusted Platform Module (TPM), and SPI-VU
- Serial Peripheral Interface (SPI) support for up to two devices
- 4 MB BIOS flash connected to the SP5100 using SPI interface

8 BIOS

8.1 Overview

The PowerEdge R515 BIOS is based on the Dell BIOS core and supports the following features:

- AMD C32 processor support
- Simultaneous Multi-Threading (SMT) support
- PCI 2.3 compliant
- Plug and Play 1.0a compliant
- Multiprocessor (MP) 1.4 compliant
- Bootable from hard drive, optical drive, iSCSI drive, USB key, and SD card
- Power management support including DBS, power inventory, and multiple power profiles:
  - Maximum performance
  - OS control (DBS)
  - Active Power Controller
  - Custom
- ACPI 2.0 support (S0, OS-S4, S5 states)
- PXE and WOL support for on-board NICs
- Memory-sparing support
- SETUP access through <F2> key at end of POST
- USB 2.0 (USB boot code is 1.1 compliant)
- F1/F2 error logging in CMOS
- Virtual KVM, CD, and floppy support
- iDRAC supported
- Unified Server Configurator (UEFI 2.1) and UEFI shell support
- SMBIOS 2.5
- PCI-to-PCI bridge 1.0 compliant
- Dell Server Assistant 7.0 support
- System Service support
- Onboard PCI video BIOS support
- SATA enabled for CDROM and HDD
- PCI FW3.0 compliant
- I2O v1.5 ready
- Selectable boot support based on BIOS Boot Specification v1.01
- El Torito CD-ROM Boot 1.0
- Remote BIOS update support
- Remote Configuration Interface (RCI) support
- Console redirection via COM1
- PXE support based on Preboot Execution Environment Specification v2.1
- 2-byte ID support
- ePPID support in flash
- Memory remapping support
- AC recovery staggering power-up
- DIMM mismatch checking

The PowerEdge R515 BIOS does not support the following:

- BIOS language localization
- BIOS recovery after bad flash

8.2 Supported ACPI States

The following ACPI states are supported:

- ACPI compliance: S0, S4, S5
- NO S1, S2, S3 (STR)

State S4 is supported by the OS only.

8.3 Power Management Modes

8.3.1 Dell Active Power Controller

The Dell Active Power Controller (DAPC) is implemented in system BIOS and uses hardware level counters, etc., to determine hardware utilization. The BIOS uses this information to determine when to change the processor's operating frequency. The DAPC is OS independent and means that the OS no longer has control. This provides a consistent power management solution regardless of the installed OS. Some OS(s), particularly hypervisors, do not support power management, thus DAPC provides a solution when there otherwise would not be one.

8.3.2 Power Saving BIOS Setting (OS Control)

With the Power Saving BIOS setting, the OS monitors process/thread level utilization of the processor and uses processor controls to change the processor's operating frequency. For heavy workloads, the OS will run the processor at higher frequencies for additional performance. Lighter workloads do not need high performance, thus the OS will run the processor at lower frequencies.

8.3.3 Maximum Performance

The Maximum Performance mode disables power management. In this mode, the processor frequency is statically set to the highest supported frequency.

The power management features are implemented via two categories: fixed or generic.

Fixed features use bits defined in the ACPI specification for specific capabilities. The fixed-feature bits give the OS complete control over the power management of a device, since the location of the bits is given to the OS in the FACP table. Thus, a driver can directly access bits to control a device's power management.

Generic features have defined enable and status bits, but the functionality is not fully visible to the OS. Dell provides ASL code to handle the details of generic features, allowing the OS to intelligently communicate with system-specific hardware. Table 12 summarizes power management features, and Table 13 describes the possible power profiles.

Table 12.   BIOS Power Management Features

Feature	Type	Enable/Status/ Ctrl bit location	Description
ACPI Mode Switch	Fixed	PCH	The OS uses the SCI_EN bit to switch from legacy mode to ACPI mode.
Sleep States	Fixed	PCH	Supported states: S0 (Working), S4-OS (Hibernation in Microsoft® Windows® 2000), and S5 (soft-off). Not supported: S1 (standby or suspend) and S3.

Feature	Type	Enable/Status/ Ctrl bit location	Description
Power Button	Fixed	PCH	In ACPI mode, OS has control of the power button. In non-ACPI mode, SMI handler owns power button events.
Real-Time Clock	Fixed	PCH	The OS is able to configure the system to wake on the RTC alarm.
Power Mgmt. Timer	Fixed	PCH	24-bit power management timer is used.
Power Mgmt. Event (PME)	Generic	PCH	Each host bus's PME# signal is routed to a separate general-purpose event pin in the chipset. When a device signals PME#, the system wakes (if necessary), the OS detects the event, and a Dell-defined ASL routine handles the event. Wake-on-LAN is one example of a PME.
USB Wake	Generic	N/A	This feature is not supported on this system since the S1 state is not supported.
DBS	N/A	Processor MSRs	This feature does P state transition under Microsoft® Windows®.
C State Support	N/A	Processor and PCH registers	This feature allows multiple C state supports for processor. This feature will work under Windows and ACPI OS that understand C states.
Power Profile Support	N/A	Processor/IMC and PCH chipset registers	11G Servers are the most energy-smart servers that Dell provides. In addition to P,C, and T states, BIOS exposes the power profiles to the OS. Each power profile has specific settings that fine tune processor, MCH, IOH, and Southbridge.

Table 13.   BIOS Power Management Profiles

Profile	Description
Maximum Performance	DBPM Disabled (BIOS sets P-State to MAX) Memory frequency: Maximum Performance Fan algorithm: Maximum Performance
OS Control	Enable OS DBPM Control (BIOS exposes all possible P states to OS) Memory frequency: Maximum Performance Fan algorithm: Minimum Power
Active Power Controller	Enable Dell System DBPM (BIOS does not make all P states available to OS) Memory frequency: Maximum Performance Fan algorithm: Minimum Power

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Profile	Description
Custom	CPU Power and Performance Management: Maximum Performance, Minimum Power, OS DBPM, System DBPM
	Memory Power and Performance Management: Maximum Performance, 1333MHz, 1067MHz, 800MHz, Minimum Power
	Fan Algorithm: Maximum Performance, Minimum Power

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9   Embedded NICs/LAN on Motherboard (LOM)

The Broadcom® 5716 LOM chip is located on the PowerEdge R515 motherboard. The 5716 chip is connected to the IOH via a PCI Express x4 gen2 link. The chip provides two 1xGB Ethernet ports with two RJ-45 connectors on the back of the system. The firmware for the LOM chip resides in a flash part. The PowerEdge R515 supports Wake-On-LAN (WOL) from either port.

10 I/O Slots

10.1 Overview

The PowerEdge R515 includes a total of three PCIe slots and one dedicated internal storage card slot. Two additional PCIe slots are available with the optional Riser 2. All slots are PCI Express Gen 2. See Table 14 and Table 14 for more information.

10.1.1 Riser 1 PCI Expansion Slots

Riser 1 includes three PCIe expansion slots and one dedicated slot for an internal storage card. See Table 14.

Table 14.   Riser 1 PCI Expansion Slots

PCI Slot #	Mechanical	Electrical	Height	Length
1	x8	x4	Full height	Half length
2	x8	x4	Full height	Full length
3	x8	x8	Full height	Half length
4	x8	x4	For dedicated storage controller	

The PowerEdge R515 supports 80W maximum power for the sum total of the PCI cards on Riser 1. Hot-plugging of PCIe cards is not supported.

10.1.2 Riser 2 (Optional) PCI Expansion Slots

The optional Riser 2 is dedicated for an external general-purpose graphics processing unit solution (GPGPU). Riser 2 includes one PCIe expansion slot and one dedicated slot for an internal storage card. See Table 15.

Table 15.   Riser 2 (Optional) PCIe Expansion Slots

PCI Slot #	Mechanical	Electrical	Height	Length
1	x16	x16	Full height	Half length
2	x8	x4	For dedicated storage controller	

The PowerEdge R515 supports 80W maximum power for the sum total of the PCI cards on Riser 2. Hot-plugging of PCIe cards is not supported.

10.2 Boot Order

The boot order can be customized based on bootable devices detected by the BIOS.

10.3 NIC and LOM Enumeration

LOMs will enumerate first in order to have consistent Ethernet assignment (i.e., eth0). NIC enumeration varies depending on configuration.

10.4 PCI Card Dimensions

For information about PCIe slots and card dimensions, see the Back-Panel Features and Indicators section in the About Your System chapter in the *PowerEdge R515 Hardware Owner's Manual* on Support.Dell.com.

11 Storage

11.1 Overview

There are two chassis types for the PowerEdge R515:

- 8 hard drive chassis: 8 x hot- plug 3.5" or 2.5" HDD (in HDD carrier); support for one slim optical disk drive (ODD)
- 12 hard drive chassis: 12 x hot- plug 3.5" or 2.5" HDD (in HDD carrier) and 2 x internal cabled 2.5" HDD; no ODD support

Table 16.   Supported Hard Drives

Form Factor	Capacity	Speed	Type
3.5"	160GB, 250GB, 500GB, 1TB, 2TB	7.2K	SATA
3.5"	500GB, 1TB, 2TB	7.2K	NL SAS
3.5"	146GB	15K	SAS 3Gb
3.5"	300GB, 450GB, 600GB	15K	SAS 6Gb
2.5"	146GB, 300GB, 600GB	10K	SAS
2.5"	50GB	N/A	SSD

11.2 RAID Configurations

Table 17.   Raid Configurations (8 HDD Chassis)

Factory Configuration				No Mixed HDD (must be all 2.5" or 3.5" HDDs)	
Type	#	Name	Description	Min HDD	Max HDD
SW RAID (Add-in card)	C1	ASSR5	RAID5 (PERC S300)	3	8
	C2	ASSR10	RAID10 (PERC S300)	4	8
No RAID (Add-in card)	C3	ASS	No RAID (PERC H200)	1	8
RAID (Add-in card)	C4	ASSR0	RAID0 (PERC H200, PERC H700)	2	8
	C5	ASSR1	RAID1 (PERC PERC H200, PERC H700)	2	2
	C6	ASSR10	RAID10 (PERC H200, PERC H700)	4	8
	C7	ASSR5	RAID5 (PERC H700)	3	8
	C8	ASSR6	RAID6 (PERC H700)	4	8
	C9	ASSR1/R5	RAID1 + RAID5 (PERC H700)	2 + 3	2 + 6

Mixed HDD (SAS + SATA) Factory Configuration				Mixed SAS + SATA (must be all 3.5" HDDs) (ex. Min 2 x SAS + 2 x SATA; max 2 x SAS + 6 x SATA)	
Type	**#**	**Name**	**Description**	**Min HDD**	**Max HDD**
Mix HDD (Add-in card)	C10	ASS-X	No RAID (PERC H200)	2 + 2	2 + 6
	C11	ASSR1/R5-X	RAID1 + RAID5 (PERC H700)	3 + 3	2 + 6
Mixed HDD (SSD + SAS) Factory Configuration				Mixed SSD + SAS (must be all 2.5" HDDs) (ex. Min 2 x SSD + 2 x SAS; max 2 x SSD + 6 x SAS)	
Type	**#**	**Name**	**Description**	**Min HDD**	**Max HDD**
Mix HDD (Add-in card)	C12	ASS-X	No RAID (PERC H200)	2 + 2	2 + 6

Table 18.   RAID Configurations (12 HDD Chassis)

Factory Configuration				No Mixed HDD (must be all 2.5" or 3.5" HDDs)	
Type	**#**	**Name**	**Description**	**Min HDD**	**Max HDD**
No RAID (Add-in card)	C3	ASS	No RAID (PERC H200)	1	12
RAID (Add-in card)	C4	ASSR0	RAID0 (PERC H200, PERC H700)	2	12
	C6	ASSR10	RAID10 (PERC H200, PERC H700)	4	12
	C7	ASSR5	RAID5 (PERC H700)	3	12
	C8	ASSR6	RAID6 (PERC H700)	4	12
	C9	ASSR1/R5	RAID1 + RAID5 (PERC H700)	2 + 3	2 + 10
Mixed HDD (SAS + SATA) Factory Configuration				Mixed SAS + SATA (must be all 3.5" HDDs) (ex. Min 2 x SAS + 2 x SATA; max 2 x SAS + 6 x SATA)	
Type	**#**	**Name**	**Description**	**Min HDD**	**Max HDD**
Mix HDD (Add-in card)	C10	ASS-X	No RAID (PERC H200)	2 + 2	2 + 10
	C11	ASSR1/R5-X	RAID1 + RAID5 (PERC H700)	3 + 3	2 + 10

Table 19.   RAID Configurations (12 HDD Chassis, 12 + 2 HDDs)

(12 + 2 HDD) Factory Configuration				No Mixed HDD (Must be all 2.5" or 3.5" HDDs)		Internal HDD (2.5" SAS) (must be exactly 2 HDDs)
Type	#	Name	Description	Min HDD	Max HDD	
No RAID (Add-in card)	14	ASS/+iR1	No RAID (PERC H200)	1	12	2
RAID (Add-in card)	15	ASSR0/+iR1	RAID0 (PERC H200, PERC H700)	2	12	2
	16	ASSR5/+iR1	RAID5 (PERC H700)	3	12	2
	17	ASSR6/+iR1	RAID6 (PERC H700)	4	12	2
	18	ASSR1/R5/+iR1	RAID1 + RAID5 (PERC H700)	2 + 3	2 + 10	2
	19	ASSR5/R10/+iR1	RAID5 + RAID10 (PERC H700)	4 + 4	4 + 8	2

11.3 Persistent Storage

The PowerEdge R515 offers two types of persistent storage: unmanaged and managed. The following options are available for persistent storage:

- Unmanaged internal SD module
- Managed iDRAC6 Express or Enterprise (optional)

11.4 Internal SD Module (Unmanaged Internal Persistent Storage)

The internal SD module Unmanaged Internal Persistent Storage (UIPS) consists of two ports:

- One port on the control panel board for the USB key
- One port on the internal SD module for the SD card

The UIPS is a feature which enables the following solutions:

- USB license keys used for software application enablement
- User custom-boot OS and pre-boot OS (Loaded into memory and then run; used for ease of deployment, as well as in diskless environments, such as HPCC)
- User custom logs/scratch pad (User-defined information, removable and portable after system is down)

11.5 LED Indicators

Each disk drive carrier has two LED indicators visible from the front of the system. One is a green LED for disk activity and the other is a bicolor (green/amber) LED for status information. The activity LED is driven

by the disk drive during normal operation. The bicolor LED is controlled by the SEP device on the backplane. Both LEDs are used to indicate certain conditions under direction of a storage controller.

For more information, see the Hard-Drive Indicator Patterns section in the About Your System chapter in the *PowerEdge R515 Hardware Owner's Manual* on Support.Dell.com.

11.6 Optical Drives

The PowerEdge R515 supports one SATA interface, DVD-ROM or DVD+/-RW, in the 8 hard drive chassis. The R515 with the 12 hard drive chassis does not support an optical drive.

11.7 Tape Drives

For more information on supported tape drives and tape libraries, see http://www.dell.com/storage.

11.8 External Storage Support

External storage devices are supported. For more information, see http://www.dell.com/storage.

12 Video

The PowerEdge R515 is equipped with a Matrox® G200eW with 8MB memory integrated in the Nuvoton® WPCM450 (BMC controller). The resolutions supported are listed in Table 20.

Table 20.   Graphics Video Modes

Resolution	Refresh Rate (Hz)	Color Depth (bit)
640 x 480	60, 72, 75, 85	8, 16, 32
800 x 600	60, 72, 75, 85	8, 16, 32
1024 x 768	60, 72, 75, 85	8, 16, 32
1152 x 864	75	8, 16, 32
1280 x 1024[1]	60	32
1280 x 1024[2]	60, 75, 85	8, 16
[1]32 bit color only supported at 60Hz for this resolution. [2]85Hz for KVM and 1600x1200 at 60Hz for video out.		

13 Rack Information

13.1 Overview

The ReadyRails™ sliding and static rail systems for the R515 provide toolless support for 4-post racks with square or unthreaded round mounting holes including all generations of Dell racks. Both support tooled mounting in 4-post threaded racks (an optional adapter brackets kit is required for the sliding rails), with the static rails also providing tooled mounting support for 2-post (Telco) racks for added versatility. The optional cable management arm (CMA) can be mounted on either the left or right side of the sliding rails without the use of tools for fast and easy deployment.

Note: The PowerEdge R515 is not compatible with any other Dell rails including previous generation rails, but it does use the same sliding and static rails as the R510.

13.2 Rails

The rail offerings for the R515 consist of two types: sliding rails and static rails.

13.2.1 Sliding Rails

The sliding rails allow the system to be fully extended out of the rack for service and are available with or without the optional cable management arm (CMA). See Figure 16.
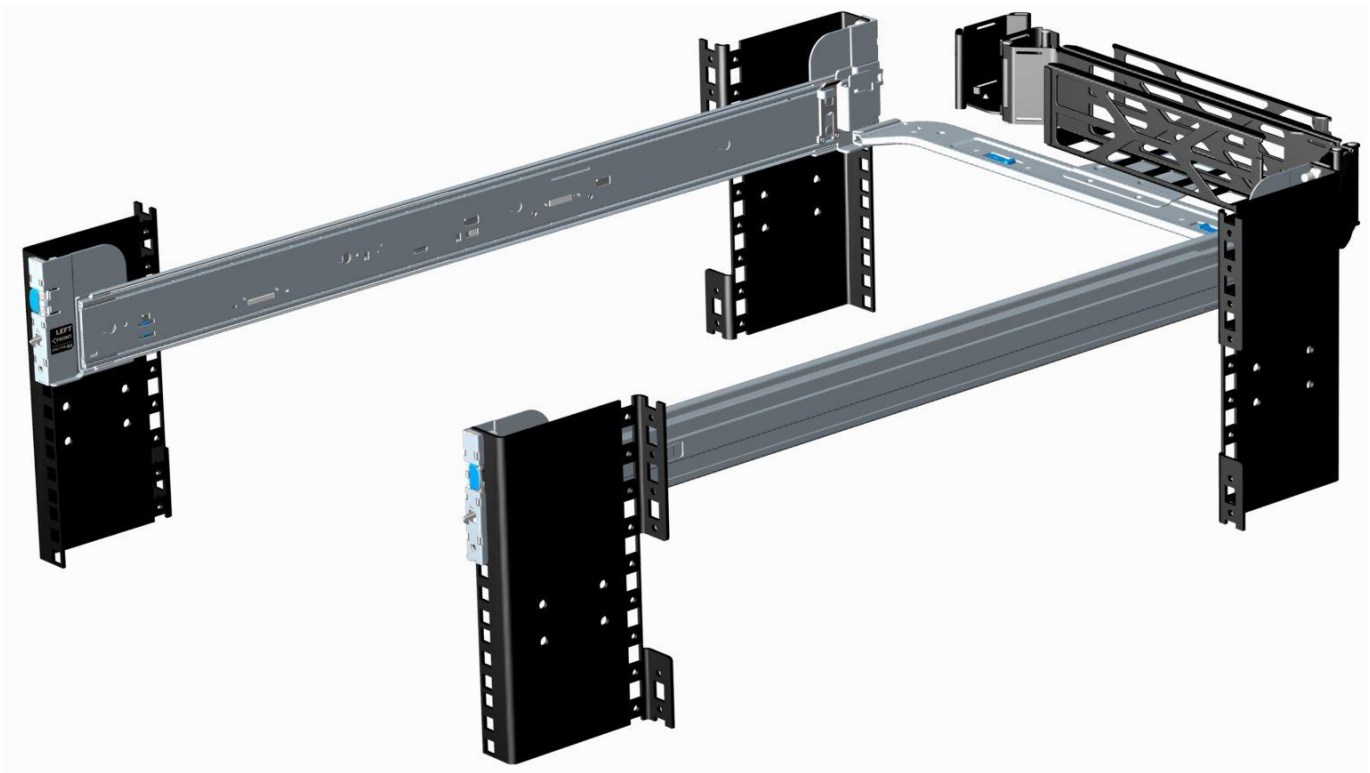
Figure 16.   R515 Sliding Rails with Optional CMA

Sliding rail kits can be used in a threaded hole rack only if threaded rack adapter brackets are installed. The threaded rack adapter brackets are first mounted to the EIA flanges in the rack, and then the sliding rails are mounted into the brackets. The design of the brackets has been optimized to limit the forward shift of the system in the rack to only 17.3 mm.

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The adapter brackets kit includes 6 brackets to accommodate different rail lengths, plus four sets of custom screws in common thread sizes. See Figure 17. A detailed *Getting Started Guide* is included in the kit along with directions for installing the brackets and mounting the rails into the brackets.

Depending on the depth of the rack used, it may be necessary to remove the server's bezel in order to close the door of the rack. A minimum of 58 mm will be needed between the back surface of the door panel and the front face of the EIA flange for the front door to close with the 11G server bezel installed.

Figure 17.   2U Threaded Rack Adapter Brackets Kit

13.2.2 Static Rails

The static rails support a wider variety of racks than the sliding rails but do not support serviceability in the rack and are thus not compatible with the CMA. See Figure 18.

Figure 18.   R515 Static Rails

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One key factor in selecting the proper rails is identifying the type of rack in which they will be installed. Both the sliding rails and the static rails support mounting in 19"-wide, EIA-310-E compliant 4-post racks, but only the static rails, as the more generic or universal solution, support mounting in 2-post (Telco) racks.
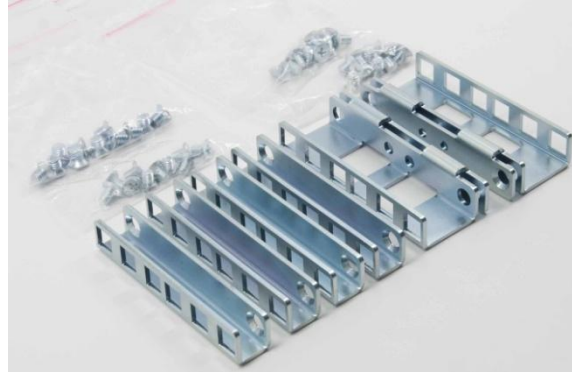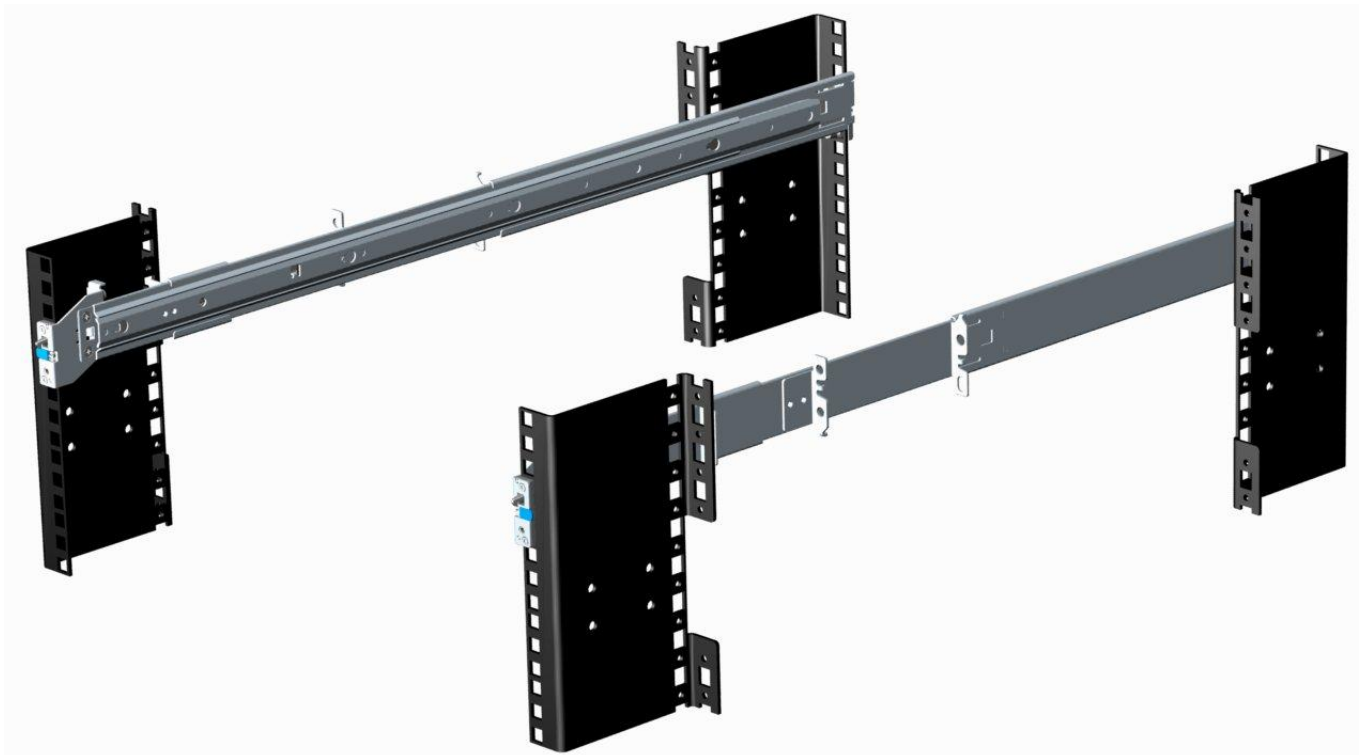
Table 21 provides a summary of the rack types supported by the R515 rails.

Table 21.   Supported Racks

Product	Rail ID	Mounting Interface	Rail Type	Rack Types Supported				
				4-Post			2-Post	
				Square	Round	Thread	Flush	Center
R515	B3	ReadyRails	Sliding	√	√	√*	X	X
	B4	ReadyRails/Generic	Static	√	√	√	√	√

*Requires the 2U Threaded Rack Adapter Brackets Kit (Dell PN PKCR1)

Screws are not included in the static rail kit due to the fact that threaded racks are offered with a variety of thread designations. Users must provide their own screws when mounting the static rails in threaded or 2-post racks.

Other key factors governing proper rail selection include the spacing between the front and rear mounting flanges of the rack, the type and location of any equipment mounted in the back of the rack such as power distribution units (PDUs), and the overall depth of the rack. See Table 22. Due to their reduced complexity and lack of need for CMA support, the static rails offer a greater adjustability range and an overall smaller footprint than the sliding rails.

Table 22.   Rail Adjustability Ranges and Depth

Product	Rail ID	Mounting Interface	Rail Type	Rail Adjustability Range (mm)						Rail Depth (mm)	
				Square		Round		Threaded		without CMA	with CMA
				Min	Max	Min	Max	Min	Max		
R515	B3	ReadyRails	Sliding	686	883	672	876	651	897	714	845
	B4	ReadyRails/ Generic	Static	608	879	594	872	604	890	622	N/A

The adjustment range of the rails is a function of the type of rack in which they are being mounted. The min and max values listed above represent the allowable distance between the front and rear mounting flanges in the rack. Rail depth represents the minimum depth of the rail as measured from the rack front mounting flanges when the rail rear bracket is positioned all the way forward.

13.3 Cable Management Arm (CMA)

The optional cable management arm (CMA) for the R515 organizes and secures the cords and cables exiting the back of the server and unfolds to allow the server to extend out of the rack without having to detach the cables. Some key features of the R515 CMA include:

- Large U-shaped baskets support dense cable loads.
- An open-vent pattern allows optimal airflow.
- The CMA mounting is fully-reversible (can be mounted on either side) with no conversion required.

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- Hook-and-loop straps are utilized (rather than plastic tie wraps) to eliminate the risk of cable damage during cycling.
- A low-profile fixed tray is included to support and retain the CMA in its fully-closed position.
- The CMA and the tray can be mounted without the use of tools using simple and intuitive snap-in designs.

14 Operating Systems and Virtualization

For detailed information, see the following:

- Operating System Support Matrix for Dell PowerEdge Systems on www.Dell.com.
- *Dell PowerEdge R515 Systems Getting Started With Your System* guide on Support.Dell.com.

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15 Systems Management

15.1 Overview/Description

Dell aims on delivering open, flexible, and integrated solutions that help you reduce the complexity of managing disparate IT assets by building comprehensive IT management solutions. Combining Dell PowerEdge Servers with a wide selection of Dell-developed management solutions gives you choice and flexibility, so you can simplify and save in environments of any size. To help you meet your server performance demands, Dell offers Dell OpenManage™ systems management solutions for:

- Deployment of one or many servers from a single console
- Monitoring of server and storage health and maintenance
- Update of system, operating system, and application software

Dell offers IT management solutions for organizations of all sizes—priced, sized, and supported right.

15.2 Server Management

A Dell Systems Management and Documentation DVD and a Dell Management Console DVD are included with the product. ISO images are also available. A brief description of available content:

- Dell Systems Build and Update Utility: Dell Systems Build and Update Utility assists in OS install and pre-OS hardware configuration and updates.
- OpenManage Server Administrator: The OpenManage Server Administrator (OMSA) tool provides a comprehensive, one-to-one systems management solution, designed for system administrators to manage systems locally and remotely on a network. OMSA allows system administrators to focus on managing their entire network by providing comprehensive one-to-one systems management.
- Management Console: Our legacy IT Assistant console is also included, as well as tools to allow access to our remote management products. These tools are Remote Access Service, for iDRAC, and the BMC Management Utility.
- Active Directory Snap-in Utility: The Active Directory Snap-in Utility provides an extension snap-in to the Microsoft Active Directory. This allows you to manage Dell specific Active Directory objects. The Dell-specific schema class definitions and their installation are also included on the DVD.
- Dell Systems Service Diagnostics Tools: Dell Systems Service and Diagnostics tools deliver the latest Dell optimized drivers, utilities, and operating system-based diagnostics that you can use to update your system.
- eDocs: The section includes PDF files for PowerEdge systems, storage peripheral, and OpenManage software.
- Dell Management Console DVD: The Dell Management Console is a Web-based systems management software that enables you to discover and inventory devices on your network. It also provides advanced functions, such as health and performance monitoring of networked devices and patch management capabilities for Dell systems.
- Server Update Utility: In addition to the Systems Management Tools and Documentation and Dell Management Console DVDs, customers have the option to obtain Server Update Utility DVD. This DVD has an inventory tool for managing updates to firmware, BIOS and drivers for either Linux or Windows varieties.

15.3 Embedded Server Management

The PowerEdge R515 implements circuitry for the next generation of Embedded Server Management. It is Intelligent Platform Management Interface (IPMI) v2.0 compliant. The optional iDRAC (Integrated Dell

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Remote Access Controller) is responsible for acting as an interface between the host system and its management software and the periphery devices. These periphery devices consist of the PSUs, the storage backplane, integrated SAS HBA or PERC 6/I, and control panel with display.

The optional upgrade to iDRAC6 provides features for managing the server remotely or in data center lights-out environments. Advanced iDRAC features require the installation of the optional iDRAC6 Enterprise card.

15.4 Lifecycle Controller and Unified Server Configurator

Embedded management is comprised of several interdependent pieces:

- Lifecycle Controller
- Unified Server Configurator
- iDRAC6
- vFlash

Lifecycle controller powers the embedded management features. It is integrated and tamperproof storage for system-management tools and enablement utilities (firmware, drivers, etc.). It is flash partitioned to support multiple, future-use cases.

Dell Unified Server Configurator (USC) is a local 1:1 graphical user interface embedded on Lifecycle Controller that aids in local server provisioning in a pre-OS environment. For servers with iDRAC Express, the Lifecycle Controller offers OS install, platform updates, platform configuration, and diagnostics capabilities. For servers without iDRAC Express, this utility has limited functionality and offers OS install and diagnostics capabilities only.

To access the Unified Server Configurator, press the <F10> key within 10 seconds of the Dell logo's appearance during the system boot process. Table 23 details current functionality enabled by the USC.

Table 23.   Unified Server Configurator Features and Description

Feature	Description
Faster O/S Installation	Drivers and the installation utility are embedded on system, so no need to scour Dell.com.
Faster System Updates	Integration with Dell support automatically directed to latest versions of the Unified Server Configurator, iDRAC, RAID, BIOS, NIC, and Power Supply.
Update Rollback	Ability to recover to previous "known good state" for all updatable components.
More Comprehensive Diagnostics	Diagnostic utilities are embedded on system.
Simplified Hardware Configuration	Detects RAID controller and allows user to configure virtual disk and choose virtual disk as boot device, eliminating the need to launch a separate utility. Also provides configuration for iDRAC, BIOS, and NIC/LOM.

15.5 iDRAC Express

The optional iDRAC Express is the first tier of iDRAC6 upgrades. In addition to upgrading the system with a Lifecycle Controller, the iDRAC6 Express offers the following key features:

- Graphical web interface
- Standard-based interfaces

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- Server Sensor monitoring and fault alerting
- Secure operation of remote access functions including authentication, authorization, and encryption
- Power control and management with the ability to limit server power consumption and remotely control server power states
- Advanced troubleshooting capabilities

For more information on iDRAC6 Express features see Table 24.

15.6 iDRAC6 Enterprise

The optional iDRAC6 Enterprise card provides access to advanced iDRAC6 features. The iDRAC6 Enterprise connects directly to the R515 planar and is mounted parallel to the planar with stand-offs.

Key features for the iDRAC6 Enterprise include:

- Scripting capability with Dell's Racadm command-line
- Remote video, keyboard, and mouse control with Virtual Console
- Remote media access with Virtual Media
- Dedicated network interface

Additionally, the iDRAC6 Enterprise can be upgraded by adding the vFlash Media card. This is a 1 GB Dell branded SD card that enables a persistent 256 MB virtual flash partition. In the future, vFlash will be expanded to include additional features.

A more detailed feature list for iDRAC6 Enterprise and vFlash is included in Table 24.

Table 24.   Features List for BMC, iDRAC, and vFlash

Feature	BMC	iDRAC6 Express	iDRAC6 Enterprise	vFlash Media
Interface and Standards Support				
IPMI 2.0	✓	✓	✓	✓
Web-based GUI		✓	✓	✓
SNMP		✓	✓	✓
WSMAN		✓	✓	✓
SMASH-CLP		✓	✓	✓
Racadm command-line			✓	✓
Conductivity				
Shared/Failover Network Modes	✓	✓	✓	✓
IPv4	✓	✓	✓	✓
VLAN Tagging	✓	✓	✓	✓
IPv6		✓	✓	✓
Dynamic DNS	✓	✓	✓	✓
Dedicated NIC			✓	✓

Feature	BMC	iDRAC6 Express	iDRAC6 Enterprise	vFlash Media
Security and Authentication				
Role-based Authority	✓	✓	✓	✓
Local Users	✓	✓	✓	✓
Active Directory		✓	✓	✓
SSL Encryption		✓	✓	✓
Remote Management and Remediation				
Remote Firmware Update	✓	✓	✓	✓
Server power control	✓	✓	✓	✓
Serial-over-LAN (with proxy)	✓	✓	✓	✓
Serial-over-LAN (no proxy)		✓	✓	✓
Power capping		✓	✓	✓
Last crash screen capture		✓	✓	✓
Boot capture		✓	✓	✓
Serial-over-LAN		✓	✓	✓
Virtual media			✓	✓
Virtual console			✓	✓
Virtual console sharing			✓	✓
Virtual flash				✓
Monitoring				
Sensor Monitoring and Alerting	✓	✓	✓	✓
Real-time Power Monitoring*	✓	✓	✓	✓
Real-time Power Graphing*	✓	✓	✓	✓
Historical Power Counters*	✓	✓	✓	✓
Logging Features				
System Event Log	✓	✓	✓	✓
RAC Log		✓	✓	✓
Trace Log			✓	✓

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16 USB Peripherals

The PowerEdge R515 supports the following USB devices:

- USB key (bootable)
- Keyboard (only one USB keyboard is supported)
- Mouse (only one USB mouse is supported)
- Optional USB DVD-ROM

Appendix A.   Statement of Volatility

The Dell PowerEdge R515 contains both volatile and non-volatile (NV) components. Volatile components lose their data immediately upon removal of power from the component. Non-volatile components continue to retain their data even after the power has been removed from the component. Components chosen as user-definable configuration options (those not soldered to the motherboard) are not included in the Statement of Volatility. Configuration option information (pertinent to options such as microprocessors, system memory, remote access controllers, and storage controllers) is available by component separately. The NV components detailed in Table 25 are present in the PowerEdge R515 server.

Table 25.   R515 Volatility Table

Server BIOS Memory	Details
Size:	32Mbit
Type [e.g., Flash PROM, EEPROM]:	Flash EEPROM
Can user programs or operating system write data to it during normal operation?	No
Purpose? [e.g., boot code]	Boot Code and Configuration Information
How is data input to this memory?	Loading flash memory requires a vendor provided firmware file and loader program which is executed by booting up the system from a floppy or OS based executable containing the firmware file and the loader. System loaded with arbitrary data in firmware memory would not operate.
How is this memory write protected?	Software write protected
Server CMOS (Complementary Metal-Oxide Semiconductor) Memory	**Details**
Size:	512 bytes
Type: [e.g., Flash PROM, EEPROM]:	Battery-backed NVRAM
Can user programs or operating system write data to it during normal operation?	No
Purpose? [e.g., boot code]	RTC and Configuration settings
How is data input to this memory?	F2 Setup Menu during POST
How is this memory write protected?	N/A
Remarks	Jumper on motherboard can be used to clear to factory default settings

LOM (LAN [Network Interface] on Motherboard) Memory	Details
Size:	4Mb (1MB)
Type: [e.g., Flash PROM, EEPROM]:	Flash
Can user programs or operating system write data to it during normal operation?	Yes, under software control.
Purpose? [e.g., boot code]	Contains LOM boot code and config data
How is data input to this memory?	Requires vendor provided firmware file and loader program used during factory assembly or possible field update. A system loaded with arbitrary data in firmware memory would not operate.
How is this memory write protected?	Software control
Server System FRU	**Details**
Size:	4KB
Type: [e.g., Flash PROM, EEPROM]:	SEEPROM
Can user programs or operating system write data to it during normal operation?	No
Purpose? [e.g., boot code]	Store System FRU
How is data input to this memory?	BMC controller write
How is this memory write protected?	Not write protected
Power Supply FRU	**Details**
Size:	256 bytes
Type: [e.g., Flash PROM, EEPROM]:	SEEPROM
Can user programs or operating system write data to it during normal operation?	No
Purpose? [e.g., boot code]	Store power supply information
How is data input to this memory?	Programmed by the power supply manufacturer
How is this memory write protected?	Not write protected

TPM (Trusted Platform Module; For boards shipped outside of China; Boards sold to destinations in China do not have TPM at this time)	Details
Size:	Unspecified size of user ROM, RAM, EEPROM; 128 bytes of OTP memory included
Type: [e.g., Flash PROM, EEPROM]:	ROM, RAM, EEPROM
Can user programs or operating system write data to it during normal operation?	Yes, operating systems and applications that conform to the TCG standard can write data to the TPM during normal operation. Access to the NV Storage is controlled by the TPM owner.
Purpose? [e.g., boot code]	Trusted Platform Module NV storage. May be used to securely storage of encryption keys.
How is data input to this memory?	TCG TPM Specification defined command interface or Using TPM Enabled operating systems
How is this memory write protected?	As defined by the TCG TPM Specification, protection of this NV memory area is configurable by the TPM owner.
Backplane Firmware and FRU	Details
Size:	32KB
Type: [e.g., Flash PROM, EEPROM]:	Flash
Can user programs or operating system write data to it during normal operation?	No
Purpose? [e.g., boot code]	Backplane Firmware and FRU data storage
How is data input to this memory?	Loading flash memory requires a vendor provided firmware file and loader program which is executed by booting up the system from a floppy or OS based executable containing the firmware file and the loader. System loaded with arbitrary data in firmware memory would not operate.

Embedded Bootable Memory Device	Details
Size:	1GB
Type: [e.g., Flash PROM, EEPROM]:	MMC
Can user programs or operating system write data to it during normal operation?	Yes
Purpose? [e.g., boot code]	Optional embedded boot device
How is data input to this memory?	Factory installed or via USB bus
How is this memory write protected?	Not write protected
Server BMC (Baseboard Management Controller) Firmware Flash Memory	Details
Size:	16MB Flash
Type: [e.g., Flash PROM, EEPROM]:	SPI Flash
Can user programs or operating system write data to it during normal operation?	No
Purpose? [e.g., boot code]	Stores the BMC Firmware
How is data input to this memory?	Loading flash memory requires a vendor provided firmware file and loader program which is executed by booting up the system from a floppy or OS based executable containing the firmware file and the loader. System loaded with arbitrary data in firmware memory would not operate.
How is this memory write protected?	Software write protected

To obtain optional component information, please refer to the Dell Statement of Volatility for the individual components. Please direct any questions to your Dell Marketing contact.

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Appendix B.   Certifications

B.1 Regulatory Certifications

Regulatory models:

- E12S (8 HDD chassis)
- E13S (12 HDD chassis)

Regulatory types:

- E12S002 (8 HDD chassis)
- E13S002 (12 HDD chassis)

Regulatory compliance information can be located at the following sites:

- Product Safety, EMC and Environmental Datasheets
- Dell Regulatory Compliance Home Page

B.2 Product Safety Certifications

The product has been certified and bears the Mark, as applicable, of the Product Safety authorities as indicated in Table 26.

Table 26.   Product Safety Certifications

Country/Region	Authority or Mark
Argentina	IRAM
Belarus	BELLIS
Canada	SCC
China	CNCA or CCC
Croatia	KONCAR
European Union	CE
Germany	TUV
IECEE	IECEE CB
Israel	SII
Kazakhstan	OTAN – CKT
Kenya	KEBS
Kuwait	KUCAS
Mexico	NYCE or NOM
Moldova	INSM
Nigeria	SONCAP
Norway	NEMKO
Russia	GOST
Saudi Arabia	KSA ICCP
South Africa	NRCS
Taiwan	BSMI

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Country/Region	Authority or Mark
Ukraine	UKRTEST or UKRSERTCOMPUTER
United States	NRTL
Uzbekistan	STZ

B.3 **Electromagnetic Compatibility**

The product has been certified and bears the Mark, as applicable, of the EMC authorities as indicated in Table 27.

Table 27. **Electromagnetic Compatibility Certifications**

Country/Region	Authority or Mark	Class
Australia/New Zealand	ACMA or C-Tick	Class A
Belarus	BELLIS	Class A
Bosnia & Herzegovina, Montenegro, Serbia	KVALITET	Class A
Canada	ICES	Class A
China	CNCA or CCC	Class A
Croatia	KONCAR	Class A
European Union	CE	Class A
Israel	SII	Class A
Japan	VCCI	Class A
Kazakhstan	OTAN – CKT	Class A
Moldova	INSM	Class A
Norway	NEMKO	Class A
Russia	GOST	Class A
South Africa	SABS	Class A
South Korea	KCC	Class A
Taiwan	BSMI	Class A
Ukraine	UKRTEST or UKRSERTCOMPUTER	Class A
United States	FCC	Class A
Uzbekistan	STZ	Class A
Vietnam	ICT	Class A

B.4 Ergonomics, Acoustics and Hygienics

The product has been certified and bears the Mark, as applicable, of the Ergonomics, Acoustics, and Hygienics authorities as indicated in Table 28.

Table 28.   Ergonomics, Acoustics and Hygienics

Country/Region	Authority or Mark
Belarus	BELLIS
Germany	GS
Russia	GOST

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Appendix C.   Additional Information and Options

The PowerEdge R515 system conforms to the industry standards detailed in Table 29.

Table 29.   Industry Standards

Standard	URL for information and specifications
ACPI Advance Configuration and Power Interface Specification, v2.0c	http://www.acpi.info/
Energy Star EPA Version 1.0 of the Computer Server specification	http://www.energystar.gov/index.cfm?c=archives.enterprise_servers
Ethernet IEEE 802.3-2005	http://standards.ieee.org/getieee802/802.3.html
IPMI Intelligent Platform Management Interface, v2.0	http://www.intel.com/design/servers/ipmi/
DDR3 Memory DDR3 SDRAM Specification, Rev. 3A	http://www.jedec.org/download/search/JESD79-3A.pdf
LPC Low Pin Count Interface Specification, Rev. 1.1	http://developer.AMD.com/design/chipsets/industry/lpc.htm
PCI Express PCI Express Base Specification Rev. 2.0	http://www.pcisig.com/specifications/pciexpress/
PMBus Power System Management Protocol Specification, v1.1	http://pmbus.info/specs.html
SAS Serial Attached SCSI, v1.1	http://www.t10.org/cgi-bin/ac.pl?t=f&f=sas1r10.pdf
SATA Serial ATA Rev. 2.6; SATA II, Extensions to SATA 1.0a, Rev. 1.2	http://sata-io.org/
SMBIOS System Management BIOS Reference Specification, v2.6	http://www.dmtf.org/standards/smbios/
TPM Trusted Platform Module Specification, v1.2	http://www.trustedcomputinggroup.org/resources/tpm_main_specification

Standard	URL for information and specifications
UEFI Unified Extensible Firmware Interface Specification, v2.1	http://www.uefi.org/specs/
USB Universal Serial Bus Specification, Rev. 2.0	http://www.usb.org/developers/docs/
Windows Logo Windows Logo Program System and Device Requirements, v3.10	http://www.microsoft.com/whdc/winlogo/hwrequirements.mspx