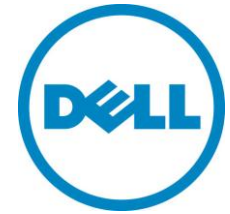


PowerEdge R910



Technical Guide



The Dell PowerEdge R910 is easy to deploy, manage and maintain. Designed to save customers time and money and to focus on what matters most: their people and their business.

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Table of Contents

1	Product Comparison	6
1.1	Overview	6
1.2	Purpose-Built for Reliability	6
1.3	Efficient Infrastructure.....	6
1.4	Intelligent Platforms, Connected Foundations.....	6
1.5	Comparison	7
2	Key Technologies.....	8
2.1	Overview	8
2.2	Intel Processors Feature Set.....	8
2.3	Memory Controller	9
2.4	Internal Dual SD Module (IDSM)	9
2.5	10Gb Embedded NIC	9
3	System Information	10
4	Mechanical	13
4.1	Chassis Description.....	13
4.2	Dimensions and Weight.....	13
4.3	Front Panel View and Features	14
4.4	Back Panel View and Features	15
4.5	Power Supply Indicators.....	15
4.6	NIC Indicators.....	15
4.7	Rails and Cable Management	16
4.8	Fans	16
4.9	Security.....	16
4.9.1	Cover Latch	16
4.9.2	Bezel	16
4.9.3	Hard Drive.....	16
4.9.4	Trusted Platform Module (TPM).....	16
4.9.5	Power Off Security	17
4.9.6	Intrusion Alert	17
4.9.7	Secure Mode	17
4.10	USB Key	17
4.11	Battery.....	17
4.12	Field Replaceable Units (FRU).....	17
4.13	User Accessible Jumpers, Sockets, and Connectors.....	17
5	Power, Thermal, Acoustic	18
5.1	Power Supplies and Power Subsystem	18
5.2	Environmental Specifications.....	20
5.3	Thermal.....	21
5.4	Acoustics	21
6	Processors.....	24
6.1	Overview	24
6.2	Features	24
6.3	Supported Processors	25
6.4	Processor Configurations.....	25
6.5	Additional Processor Information	26
7	Memory	27
7.1	Overview	27
7.2	Slots and Risers.....	27
7.3	Key Features of the Memory Subsystem	27
7.4	Memory Speed Limitations.....	28

7.5	Sparing.....	28
7.6	Mirroring.....	28
7.7	RAID.....	28
7.8	Supported Configurations.....	28
8	Chipset.....	29
8.1	Intel 7500 Chipset I/O Hub (IOH).....	29
8.2	IOH QuickPath Interconnect (QPI).....	29
8.3	PCI Express Generation 2.....	29
8.4	Direct Media Interface (DMI).....	29
8.5	Intel I/O Controller Hub 10 (ICH10).....	29
8.6	PCI Express Connectors.....	30
9	BIOS.....	31
9.1	Overview.....	31
9.2	I2C.....	31
10	Embedded NICs/LAN on Motherboard (LOM).....	32
10.1	Overview.....	32
10.2	Option 1: 1GbE I/O riser.....	32
10.3	Option 2: 10Gb I/O riser.....	32
11	PCI Slots.....	33
11.1	Overview.....	33
11.2	Quantities and Priorities.....	33
11.3	PCI Card Dimensions.....	33
12	Storage.....	34
12.1	Overview.....	34
12.2	Backplanes.....	34
12.2.1	2.5" x4 Backplane.....	34
12.2.2	2.5" x16 Backplane.....	34
12.3	Flash BIOS Memory.....	34
12.4	Drives.....	34
12.5	RAID Configurations.....	35
12.6	Storage Controllers.....	37
12.6.1	PERC H200.....	37
12.6.2	PERC H700.....	37
12.6.3	PERC H800.....	38
12.6.4	Storage Card Support Matrix.....	38
12.7	LED Indicators.....	39
12.8	Optical Drives.....	39
13	Video.....	40
14	Rack Information.....	41
14.1	Overview.....	41
14.2	Rails.....	41
14.3	Cable Management Arm (CMA).....	42
14.4	Rack View.....	42
15	Operating Systems.....	44
16	Systems Management.....	45
16.1	Overview.....	45
16.2	Server Management.....	45
16.3	Embedded Server Management.....	46
16.4	Dell Lifecycle Controller and Unified Server Configurator.....	46
16.5	Integrated Dell Remote Access Controller.....	46
16.6	iDRAC Express.....	47
16.7	iDRAC6 Enterprise.....	47
16.8	iDRAC6 Enterprise with Virtual Flash (vFlash) Media.....	47

17	Peripherals.....	50
17.1	USB peripherals.....	50
Appendix A.	Volatility.....	51
Appendix B.	Certifications	60
B 1.	Regulatory Certifications	60
B 2.	Product Safety Certifications.....	60
B 3.	Electromagnetic Compatibility.....	61
B 4.	Ergonomics, Acoustics and Hygienics	61
Appendix C.	Industry Standards	62

Tables

Table 1.	Comparison of PowerEdge R910 to R710 and R810	7
Table 2.	Features Summary	10
Table 3.	Power Supply Status	15
Table 4.	Power Supply System Configurations.....	19
Table 5.	Power Supply Specifications.....	20
Table 6.	Environmental Specifications.....	20
Table 7.	Acoustical Performance	23
Table 8.	Supported Intel Xeon E7-8800 Product Family	25
Table 9.	Supported Intel Xeon E7-4800 Product Family	25
Table 10.	Supported Intel Xeon Processor 7500 Series	25
Table 11.	Supported Hard Drives.....	35
Table 12.	RAID Configurations.....	35
Table 13.	Storage Card Support Matrix.....	38
Table 14.	Supported Video Modes	40
Table 15.	Rack Types Supported	42
Table 16.	Rail Adjustability Range and Depth.....	42
Table 17.	Unified Server Configurator Features and Description.....	46
Table 18.	Features List for Base Management Functionality, iDRAC, and vFlash Media	48
Table 19.	Volatility Information.....	51
Table 20.	Product Safety Certifications.....	60
Table 21.	Electromagnetic Compatibility Certifications.....	61
Table 22.	Ergonomics, Acoustics and Hygienics.....	61
Table 23.	Industry Standards	62

Figures

Figure 1.	Dimensions	13
Figure 2.	Front Panel View	14
Figure 3.	Back Panel View	15
Figure 4.	Power Supply	18
Figure 5.	2.5” Hard Drive Carrier	35
Figure 6.	ReadyRails Sliding Rails with Optional CMA	41
Figure 7.	R910 Mounted in the B2 Sliding Rails.....	43
Figure 8.	R910 CMA Mounted on the Side Opposite the Power Supplies (Recommended)	43

1 Product Comparison

1.1 Overview

The Dell™ PowerEdge™ R910 provides performance and reliability in a scalable 4U, four-socket server. The memory density and powerful I/O capability of the R910 makes it a great virtualization environment for large workload consolidation. The R910 provides extreme reliability, from the processor-level Intel® Advanced RAS (Reliability, Availability, Serviceability) Technology to the internal dual SD modules it uses for hypervisor redundancy. The built-in reliability of Dell servers minimizes downtime for mission-critical workloads.

The R910 is designed to maximize the efficiency of each component of the server—memory, I/O and energy consumption. The R910 also has intelligence integrated into the hardware in the form of the Lifecycle Controller, making the management of your infrastructure easier.

1.2 Purpose-Built for Reliability

The PowerEdge R910 is built for reliability through factory integration and validation. The Dell “one-touch” process is designed to ensure one person is responsible for the entire server build, resulting in greater quality control. Every fully configured Dell server is tested (and re-tested) before it leaves the factory, providing customers with a fully configured and tested, ready-to-deploy server.

In addition, an internal dual (redundant) SD module provides failover for the hypervisor. This feature was designed based on customer reliability feedback. Dell listened and delivered.

With Intel Advanced RAS Technology features never before seen in an industry-standard server, the PowerEdge R910 can automatically monitor, report, and recover from hardware errors to maintain data integrity and keep mission-critical services online.

1.3 Efficient Infrastructure

To maximize workload capability in the data center, performance resources, power efficiency, I/O and memory scalability are essential. The PowerEdge R910 delivers the high-performing Intel Xeon® E7-4800 and E7-8800 product family or the Intel Xeon processor 7500 series, up to 2 TB of DDR3 memory, and 2 x 10Gb optional LOM with ten PCIe slots to help consolidate inefficient workloads.

The PowerEdge R910 uses an energy-efficient design that leverages Energy Smart technologies. It includes power management features that enable power capping, power inventory, and power budgeting in your specific environment. The design also considers the layout of the internal components to allow airflow direction to keep the server cool.

1.4 Intelligent Platforms, Connected Foundations

The PowerEdge R910 follows the eleventh-generation PowerEdge behavioral specifications with the same system design commonality and usability as the entire portfolio. All eleventh-generation servers are designed to make the user experience easier while saving time and money.

Dell system management solutions focus on simplicity, efficiency, cost containment and reduction, and an adherence to open standards. Our systems management solutions are complemented by, connected to, and integrated with third-party offerings, delivering comprehensive solutions across the complete solutions stack.

The Lifecycle Controller is a chip that is integrated on the server. It helps to simplify administrator tasks by performing a complete set of provisioning functions such as system deployment, system updates, hardware configuration, and diagnostics in a pre-OS environment—all from a single, intuitive interface called the Unified Server Configurator (USC).

1.5 Comparison

A product comparison of the PowerEdge R910 to the R710 and R810 servers is detailed in Table 1.

Table 1. Comparison of PowerEdge R910 to R710 and R810

Feature	PowerEdge R710	PowerEdge R810	PowerEdge R910
Chipset	Intel® 5520	Intel® 7500	Intel® 7500
Processor	Intel Xeon® 5500/5600 Quad-core or six-core	Intel Xeon® E7-2800, E7-4800, and E7-8800 product family Intel Xeon processor 6500 and 7500 series	Intel Xeon® E7-4800 and E7-8800 product family Intel Xeon processor 7500 series
Sockets	2	2 or 4	4
Memory	Up to 18 x DDR3	Up to 32 x DDR3	Up to 64 x DDR3
DIMM Capacity	1, 2, 4, 8, and 32GB	1, 2, 4, 8, 16, and 32GB	1, 2, 4, 8, 16, and 32GB
Slots	4 PCIe Gen2 slots + 1 storage slot: Two x8 slots Two x4 slots One x4 storage slot	6 PCIe Gen2 slots + 1 storage slot: Five x8 slots One x4 slot One storage x4 slot	Standard: 7 PCIe Gen2 slots (two x4, four x8, one x16) Optional: 10 PCIe Gen2 (six x4, four x8) (Slot5 is G1)
Hard Drive Bays	8 x 2.5" or 6 x 3.5" Hot-plug	6 x 2.5" Hot-plug	16 x 2.5" Hot-plug
Power Supply	Hot-plug, redundant	Hot-plug, redundant	Hot-plug, redundant
NIC/LOM	Broadcom® BCM5709C 4 x iSCSI TOE Optional: various NICs available	Broadcom® BCM5709C 4 x iSCSI TOE Optional: various NICs available	1GbE or 10Gb Embedded NIC Options: 4-port (4 x 1GbE) Embedded NIC Broadcom 5709c, or 4-port (2 x 10Gb SFP+ and 2 x 1GbE) Embedded NIC Broadcom® 57711 + Broadcom 5709c Optional: various NICs available
Server Management	iDRAC6 Express, BMC, IPMI 2.0, Dell™ OpenManage™ Optional: iDRAC6 Enterprise, vFlash media	iDRAC6 Express, BMC, IPMI 2.0, Dell™ OpenManage™ Optional: iDRAC6 Enterprise, vFlash media	iDRAC6 Express, BMC, IPMI 2.0, Dell™ OpenManage™ Optional: iDRAC6 Enterprise, vFlash media

2 Key Technologies

2.1 Overview

The Intel® Xeon® E7-4800 and E7-8800 product family and the Intel Xeon processor 7500 series are designed specifically for server applications. These processors feature 4-core, 6-core, 8-core, and 10-core processing to maximize performance and performance/watt for data center infrastructures and highly dense deployments. These Intel Xeon processors also feature Intel Core™ micro-architecture and Intel 64 architecture for flexibility in 64-bit and 32-bit applications and operating systems.

The PowerEdge R910 implements a number of new technologies:

- Intel® Xeon® E7-8800 and E7-4800 product family
- 32GB low-voltage (LV) DIMMs
- Fusion-io® solid-state storage cards

The Dell™ PowerEdge™ R910 also implements some existing key technologies:

- Intel 7500 chipset
- DDR3 RDIMM memory
- Internal dual SD module
- 6G SAS technology
- 10GbE Embedded NIC

2.2 Intel Processors Feature Set

Key features of the Intel Xeon E7-4800 and E7-8800 product family include:

- Up to ten cores per processor
- Up to 30 MB shared L3 cache
- 32 nm process technology
- Intel Trusted Execution Technology (TXT) and AESNI (AES New Instructions)
- RAS DDDC (Double Device Data Correct)
- Intel HyperThreading (2 threads/core)

Key features of the Intel Xeon processor 7500 series include:

- Up to eight cores per processor
- Four full-width, bidirectional point-to-point Intel® QuickPath Interconnect (QPI) links at 6.4 GT/s
- Four Intel® Scalable Memory Interconnects (SMI) at 6.4 GT/s
- Socket - LS, LGA 1567 package
- No termination required for non-populated processors (must populate CPU socket 1 first)
- 64-byte cache line size
- RISC/CISC hybrid architecture
- Compatible with existing x86 code base
- Optimized for 32-bit code
- MMX support
- Execute Disable Bit
- Intel® Wide Dynamic Execution (Executes up to four instructions per clock cycle)
- Simultaneous Multi-Threading (SMT) capability (2 threads/core)
- Support for CPU Turbo Mode on certain models (increases processor frequency if operating below thermal, power, and current limits)
- Streaming SIMD (Single Instruction, Multiple Data) Extension 4

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- Intel® 64 Technology
- Intel® VT-x and VT-d Technology for virtualization support
- Enhanced Intel® SpeedStep® Technology
- Demand-based switching for active CPU power management as well as support for ACPI P-States, C-States, and T-States

2.3 Memory Controller

The PowerEdge R910 features Intel® 7500 Scalable Memory Interconnect (SMI), which includes:

- Up to 4 Gb DRAM support
- Up to 32 GB RDIMMs
- Low voltage DDR3L RDIMMs
- Up to 6.4 GT/s
- DDR3 channels (up to 1333 MT/s)

2.4 Internal Dual SD Module (IDSM)

The PowerEdge R910 also offers a second internal USB port dedicated for embedded hypervisor for virtualization operating systems like Citrix and VMware through a dual SD-to-USB daughter card called an Internal Dual SD Module. The IDSM port is located on the back of the I/O riser board. The SD Flash Cards contain a bootable OS image for virtualized platforms. IDSM consists of up to two SD cards that are mirrored when set in the redundant mode for the higher availability.

2.5 10Gb Embedded NIC

10Gb I/O cards (Embedded NICs) are designed to provide higher data throughput for demanding applications like virtualization.

The 10Gb NICs are Broadcom® BCM57711 Gigabit MAC with BCM8727 SFP+ PHY. Features include:

- x8 PCI Express Gen2 capable interface
- SFP+ interface supported with SR and LRM optics or direct attached cable
- TOE (TCP Offload Engine)
- iSCSI controller
- RDMA controller (RNIC) (enabled through an optional hardware key)
- NC-SI (Network Controller-Sideband Interface) connection
- Wake-On-LAN (WOL)
- PXE 2.0 remote boot
- iSCSI boot
- IPv4 and IPv6 support
- Bare metal deployment support

3 System Information

Table 2 lists a summary of features for the Dell™ PowerEdge™ R910. For the latest information on supported features, visit Dell.com.

Table 2. Features Summary

Feature	Details
Processor	Intel® Xeon® E7-4800 and E7-8800 product family Intel Xeon processor 7500 series Two or four 4-core, 6-core, 8-core, or 10-core 95W, 105W, and 130W TDP options
Front Side Bus	Intel® QuickPath Interconnect (QPI)
# Cores	4, 6, 8, or 10 cores
L2/L3 Cache	12MB, 16MB, 24MB, 30MB
Chipset	Intel 7510
Maximum Internal ¹ Storage	Up to 16TB
Memory ¹	Up to 2TB (64 DIMM slots): 1GB/2GB/4GB/8GB/16GB/32GB DDR3 up to 1333MT/s
Hard Drive Bays	Hot-plug hard drives Up to sixteen 2.5" drives
Hard Drive Types	SATA SSD, SAS, nearline SAS, SATA
External Drive Bay(s)	External USB floppy Optional SATA half-height optical drives such as DVD-ROM or DVD+RW Optional SATA or SCSI half-height (or full-height) tape back-up drive
Hard Drive Controller	Internal: PERC H200 or PERC H700 Optional: PERC H800 and 6Gbps SAS
BIOS	4MB flash for system BIOS and Video BIOS
Video	Integrated Matrox® G200, 8MB shared video memory
Availability	Hot-plug hard drives, hot-plug power; Memory SDDC, ECC, Control Line Parity, Redundant Cooling, Add Interactive LCD with hot-plug hard drive chassis
Server Management	Dell™ Embedded Server Management provides IPMI 2.0 compliance.
Remote Management	iDRAC6 Express + Optional iDRAC6 Enterprise
I/O Slots	Standard: 7 PCIe Gen2 slots (two x4, four x8, one x16) Optional: 10 PCIe Gen2 (six x4, four x8) The storage controller card has a dedicated slot (PCIe x8) apart from the available 10 PCIe slots.
RAID	PERC H200, PERC H700, PERC H800 and 6Gbps SAS

Feature	Details
Network Interface Cards	<p>Embedded NICs: 1GbE or 10Gb embedded NIC options with iSCSI offload Broadcom® 5709c 4-port (4 x 1GbE) Embedded NIC or Broadcom 57711 4-port (2 x 10GbE + 2 x 1GbE) Embedded NIC + Broadcom 5709c</p> <p>Optional NICs: Broadcom 57710 Single Port 10GbE NIC, Copper CAT6 PCIe-8 Intel DA 10GbE NIC, Dual Port, Optical, PCIe-8 Intel 10GbE Single Port 10GbE NIC, Copper, PCIe-8 Broadcom NetXtreme® II 5709 Gigabit NIC with TOE and iSOE, Quad Port, Copper, PCIe-4 (low-profile option) Broadcom 5709 Dual Port 1GbE NIC with TOE PCIe-4 (low-profile option) Broadcom 5709 Dual Port 1GbE NIC with TOE iSCSI, PCIe-4 (low-profile option) Broadcom NetXtreme II 57711 10GbE NIC w/TOE & iSOE, Dual Port, SFP+, PCIe-8 Intel Gigabit ET NIC, Dual Port, Copper, PCIe-4 (low-profile option) Intel Gigabit ET NIC, Quad Port, Copper, PCIe-4 (low-profile option) Brocade® CNA Dual-port adapter Emulex® CNA iSCSI HBA stand up adapter OCE10102-IX-D Emulex CNA iSCSI HBA stand up adapter OCE10102-FX-D Brocade CNA BR1020 QLogic QLE2660 FC16 Single Port, PCIe 3.0 x4 QLogic QLE2662 FC16 Dual Port, PCIe 3.0 x4</p>
USB	<p>Total: 5 ports, USB 2.0 compliant 2 back 2 front 1 internal</p>
Power Supplies	<p>Hot-plug redundant power supply units 4 x 750W (Energy Smart) or 4 x 1100W (high-output)</p>
Front Panel	<p>The system control panel is located on the front of the system chassis to provide user access to buttons, display, and I/O interfaces LCD on front panel for error messaging</p>
System ID	<p>System ID switch with LED indicator at back side and LCD indication at front side 128x20 pixel LCD with controls on front panel for system ID and error messaging System ID for PowerEdge R910 is 0x02d3</p>
Fans	<p>Redundant Cooling</p>
Chassis	<p>4U rack-mount Chassis depth is 29.6"</p>
Rack Support	<p>ReadyRails™ sliding rails for tool-less mounting in 4-post racks with square or unthreaded round holes, with support for optional tool-less cable management arm</p>

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Feature	Details
Operating Systems	<p>Microsoft® Windows Server® 2012 Microsoft Windows Server 2008 SP2, x86/x64 (x64 includes Hyper-V®) Microsoft Windows Server 2008 R2 SP1, x64 (includes Hyper-V) Microsoft Windows HPC Server 2008 Novell® SUSE® Linux Enterprise Server Red Hat® Enterprise Linux®</p> <p>Virtualization Options: VMware® vSphere® ESXi™ Red Hat Enterprise Virtualization®</p> <p>For more information on the specific versions and additions, visit Dell.com/OSsupport.</p>
Systems Management	<p>Baseboard Management Controller (BMC), IPMI 2.0 compliant, Dell™ OpenManage™ featuring Dell Management Console, Unified Server Configurator, Lifecycle Controller enabled with optional iDRAC6 Express, iDRAC6 Enterprise, and vFlash media</p>
<p>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.</p>	

4 Mechanical

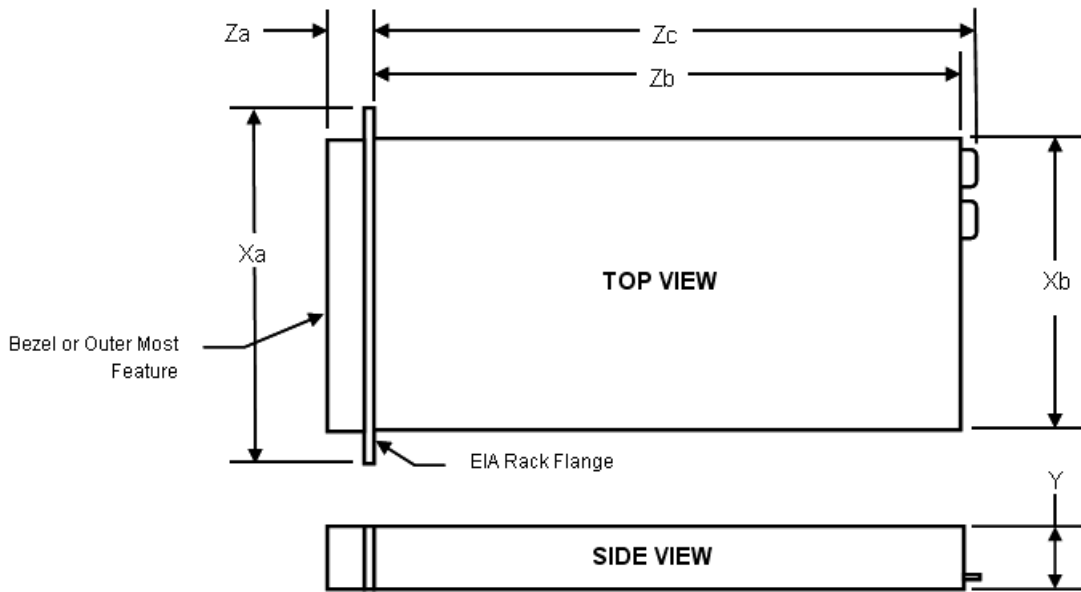
4.1 Chassis Description

The Dell™ PowerEdge™ R910 fits in a rack mount 4U chassis. The R910 chassis brings some new features over previous generations, including:

- DIMMs on memory risers
- Updated industrial design including a new LCD, bezel, and hard drive carriers
- Toolless rack latches
- Pull-out tray for Express Service Tag and customer labels
- Support for persistent storage (internal USB and SD card slots and external SD card slot)
- Updated, easier power supply removal process

4.2 Dimensions and Weight

The R910 weight with maximum configuration is 47.60 kg (105 lb). Weight empty is 26.31 kg (58 lb).



Xa (width with rack latches)	Xb (width without rack latches)	Y (Height)	Za (depth with bezel)	Za (depth without bezel)	Zb (depth without power supply and bezel)	Zc (depth with power supply)
482.4mm	422.0mm	172.6mm	35.0mm	20.4mm	699.0mm	753.0mm

Figure 1. Dimensions

4.3 Front Panel View and Features



Figure 2. Front Panel View

The following components and connectors are located on the front of the R910:

- Power-on indicator, power button
- USB connectors; connects USB devices to the system; two 4-pin, USB 2.0-compliant
- LCD menu buttons which allow you to navigate the control panel LCD menu
- LCD panel which provides system ID, status information, and system error messages
- Non-Maskable Interrupt (NMI) button
- Ambient temperature sensor
- System identification button
- Optical drive (optional)
- Hard drives

The LCD panel is a graphics display controlled by the iDRAC. Error codes can be sent to the display by either ESM or BIOS. See the Front-Panel Features and Indicators section in the About Your System chapter of the *PowerEdge R910 Hardware Owner's Manual* on Support.Dell.com/Manuals for more information.

BIOS has the ability to enter a Secure Mode through Setup, which locks the Power and NMI buttons. When in this mode, pressing either button has no effect and does not mask other sources of NMI and power control.

The system control panel is located on the front of the system chassis to provide user access to buttons, display, and I/O interfaces. See the Front-Panel Features and Indicators section in the About Your System chapter of the *PowerEdge R910 Hardware Owner's Manual* on Support.Dell.com/Manuals for more information.

Features of the system control panel include:

- ACPI-compliant power button with an integrated green power LED (controlled by iDRAC6)
- 128x20 pixel LCD panel with controls
- Two navigation buttons
- One select button
- One system ID button
- Non-Maskable Interrupt (NMI) button (recessed)
- Ambient temperature sensor
- Two external USB 2.0 connectors

4.4 Back Panel View and Features

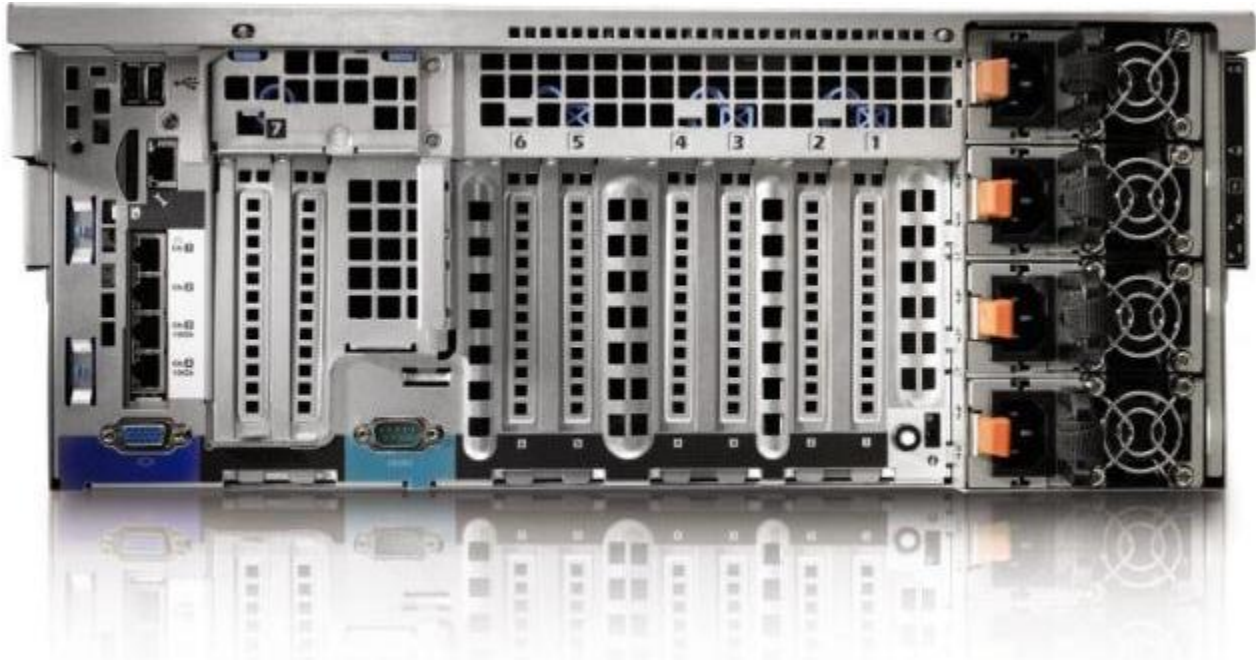







Figure 3. Back Panel View

For detailed information, see the Back-Panel Features and Indicators section in the About Your System chapter of the *PowerEdge R910 Hardware Owner’s Manual* on Support.Dell.com/Manuals.

4.5 Power Supply Indicators

The PowerEdge R910 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 R910 Hardware Owner’s Manual* on Support.Dell.com/Manuals for more information.

4.6 NIC Indicators

See the NIC Indicator Codes section in the About Your System chapter of the *PowerEdge R910 Hardware Owner’s Manual* on Support.Dell.com/Manuals for more information.

4.7 Rails and Cable Management

ReadyRails™ 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. (Note: Threaded 4-post racks require Dell's fixed shelf or third-party adapter brackets available through Dell Software & Peripherals.)
- Full extension of the system out of the rack to allow serviceability of key internal components
- Optional cable management arm (CMA) except on racks less than 1m in depth including Dell 4200 and 2400 racks.

Measurements and adjustment ranges for the rack:

- Rail depth without the CMA: 755 mm
- Rail depth with the CMA: 883 mm
- Square-hole rack adjustment range: 686-883 mm
- Round-hole rack adjustment range: 672-876 mm

See Section 14, Rack Information, for more information.

4.8 Fans

Six 120mm single-rotor hot-pluggable fans are mounted in a fan bay in the back of the chassis. Each fan has a single wire harness that plugs into the planar fan connectors (FAN1 through FAN6).

The Embedded Server Management (ESM) logic in the system controls and monitors the speed of the fans. A fan speed fault or over-temperature condition results in a notification by ESM.

The R910 power supply units have integrated fans. The system requires a blank in place of the empty power supply slot. System fan speed is pulse-width modulated.

The iDRAC6 controls and monitors the speed of the fans. A fan speed fault or over-temperature condition results in a notification by iDRAC6.

4.9 Security

4.9.1 Cover Latch

A tooled latch is integrated in the side cover to secure it to the tower chassis. A locked bezel secures the cover latch.

4.9.2 Bezel

A lock on the bezel is used to protect unauthorized access to system hard drives and the system cover. System status (through the LCD) is viewable when the bezel is installed.

4.9.3 Hard Drive

The front bezel of the system contains a lock. A locked bezel secures the system hard drives.

4.9.4 Trusted Platform Module (TPM)

TPM is used to generate/store keys, protect/authenticate passwords, and create/store digital certificates. TPM can also be used to enable the BitLocker™ hard drive encryption feature in Windows Server 2008.

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TPM is enabled through a BIOS option and uses HMAC-SHA1-160 for binding. A Trusted Computing Module (TCM) version of the planar is available for use where TCM is the standard, for example, in China.

4.9.5 Power Off Security

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

4.9.6 Intrusion Alert

A switch mounted on the cooling shroud is used to detect chassis intrusion. When the cover is opened, the switch circuit closes to indicate intrusion to the iDRAC6. When enabled, the software can provide notification to the customer that the cover has been opened.

4.9.7 Secure Mode

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

4.10 USB Key

An optional USB memory key installed inside your system can be used as a boot device, security key, or mass storage device. The USB connector must be enabled by the Internal USB Port option in the Integrated Devices screen of the System Setup program.

To boot from the USB memory key, configure the USB memory key with a boot image and then specify the USB memory key in the boot sequence in the System Setup program.

4.11 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 ICH10 chip.

4.12 Field Replaceable Units (FRU)

The planar contains a serial EEPROM to store FRU information including Dell part number, part revision level, and serial number. The backplane SEP and the power supply microcontroller are also used to store FRU data.

4.13 User Accessible Jumpers, Sockets, and Connectors

For detailed information, see the Jumpers and Connectors section in the *PowerEdge R910 Hardware Owner's Manual* on Support.Dell.com/Manuals.

5 Power, Thermal, Acoustic

The Dell™ PowerEdge™ R910 achieves enhanced power efficiency by implementing the following features:

- User-selectable power cap (subsystems will throttle to maintain the specified power cap)
- Improved power budgeting
- Larger heat-sinks for processors and IOH
- Accurate inlet temperature
- Power supply and voltage regulator (VR) efficiency improvements
- Switching regulators instead of linear regulators
- Closed loop thermal throttling
- Increased back venting and 3D venting
- PWM fans with an increased number of fan zones and configuration-dependent fan speeds
- Use of DDR3 memory (lower voltage than DDR2)
- Processor VR dynamic phase shedding
- Memory VR static phase shedding
- Random time interval for system start
- Allows an entire rack to power on without exceeding the available power
- BIOS Power/Performance options page
- BIOS-based CPU P-state manager (power management in a virtualized environment)
- Ability to slow down or throttle memory
- Ability to disable a processor core
- Ability to turn off items not being used (USB ports, embedded NICs, unused PCIe lanes)
- Option to run PCIe at Gen1 speeds instead of Gen2

5.1 Power Supplies and Power Subsystem

PowerEdge R910 supports two types of power supply units:

- 1100W high-output
- 750W Energy Smart



Figure 4. Power Supply

The power supply bay is designed to prevent unsupported power supplies from being installed. Mixing of 1100W and 750W power supplies is *not* supported. R910 power supplies have embedded cooling fans and one bi-colored status LED.

The PowerEdge R910 power supplies have a FRU EEPROM; FRU data is stored in the memory of the power supply microcontroller. iDRAC can update the power supply firmware over the PMBus. Power is “soft-switched,” allowing power cycling using a switch on the front of the system enclosure or

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through a software control (through server management functions). The power system is compatible with industry standards, such as ACPI and the Microsoft Windows Server Hardware Design Guide.

If not using all four power supplies, it is preferred that the power supply be installed starting from PS1 bay in order to avoid power loss in the PDB copper planes. However, there is nothing that prevents the use of the rest of the bays in that case. The empty bays should be populated with the PS sheet metal blanks for thermal reasons.

The system power distribution consists of one, two, three or four AC-to-DC power supplies connected to the planar through the PDB. The power supply only provides +12V and +12Vaux. The power supplies connect indirectly to the planar through the power distribution board (PDB). There is a power cable that connects the PDB and the backplane. Another cable also connects the PDB to the optical and/or tape drives. There are no cables involved for delivering the power from the power supplies to the motherboard.

The 12V power is then distributed to the rest of the subsystems like the backplane and optical drive from the motherboard using cables. There are several voltage regulators in the system to supply different voltage levels needed by different logic devices.

R910 has four power supply bays. Power supply system configurations are shown in Table 4.

Table 4. Power Supply System Configurations

Power Supply	Configuration
High-output power supply (1100W)	Non-redundant configuration (1+0)
	Redundant Energy Optimal configuration (1+1)
	Non-redundant Full-power configuration (2+0)
	Failover configuration (2+1)
	Redundant Full-power configuration (2+2)
Energy Smart power supply (750W)	Non-redundant configuration (1+0)
	Redundant Energy Optimal configuration (1+1)
	Non-redundant Full-power configuration (2+0)
	Failover configuration (2+1)
	Redundant Full-power configuration (2+2)

There are two different redundancy modes with two of the power supplies. One is (2+0) non-redundant capable of running full system configuration, and the other is (1+1) redundant running limited configuration. You can switch the mode between (1+1) and (2+0) using the iDRAC GUI only for the two power supply cases, depending on if the system is capable of supporting the new mode or not. The other modes of redundancy are automatics based on the functional supplies present when AC is applied and the system is powered on.

In the (2+2) mode, if the power supplies are evenly split across two separate grids on the AC line side, then this mode would also be considered “AC or Grid” redundant in addition to power.

Table 5. Power Supply Specifications

AC Power supply (per power supply)	
Wattage	1100W (High Output PSU)
	750W (Energy Smart PSU)
Voltage	90-264V, 47-63Hz, auto-ranging
Heat dissipation	8407 BTU/hr maximum (with two or four 1100W power supplies)
	5732 BTU/hr maximum (with two or four 750W power supplies)
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

5.2 Environmental Specifications

Table 6 details the environmental specifications for the R910.

Table 6. Environmental Specifications

Temperature	
Operating	10°C 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 feet.
Storage	-40°C 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 in operational orientations
Storage	1.54 Grms at 10-250Hz in all orientations
Maximum Shock	
Operating	Half sine shock in all operational orientations of 31G +/- 5% with a pulse duration of 2.6 ms +/- 10%
Storage	Half sine shock on all six sides of 71G +/- 5% with a pulse duration of 2 ms +/-10%; Square wave shock on all six sides of 27 G with velocity change @ 235 in/sec or greater
Altitude	
Operating	-16 to 3048m (-50 to 10,000ft) Note: For altitudes above 2950 feet, the maximum operating temperature is derated 1°F/550 feet
Storage	-16 to 10,600m (-50 to 35,000ft)

Airborne contaminant level
Class G1 or lower as defined by ISA-S71.04-1985 (G1 maximum corrosive contaminant levels measured at $\leq 50\%$ relative humidity)

For additional information about environmental measurements for specific system configurations, see [Product Safety, EMC, and Environmental Datasheets](#) on Dell.com.

5.3 Thermal

The PowerEdge R910 delivers uncompromising computing performance with a robust thermal and acoustical design that quietly and efficiently maintains the server's temperatures. Thermal management of the R910 takes inventory of the system configuration and monitors component temperatures throughout the system to intelligently control system fans and throttle components when needed to maintain desired power consumption and reliability levels. The R910 is designed to maintain full performance across the entire ambient temperature operating range (10°C to 35°C). Because of its optimized thermal management, the R910 is significantly quieter and has higher performance than its predecessor R900 (including higher-powered processors and twice the memory slots and hard drive count).

Thermal features for the R910 include the following:

- Optimized airflow impedance for optimum cooling efficiency
- Custom air baffling directs airflow through the components to maintain proper cooling
- Custom designed heat sinks maintain processor, IOH, and chipset temperatures within thermal design targets
- Highly Optimized Fan Control Algorithm:
 - Base fan speeds are a function of hardware configuration and ambient temperature to minimize airflow for a given environment.
 - PID control algorithms are used for both processor and DIMMs to maintain appropriate thermal margin
 - Double refresh switching allows for DIMM temperature excursions up to 95°C while maintaining performance and thermal design targets
 - The R910 thermal algorithm monitors the thermal sensor on each DIMM to maintain DIMM temperatures below the typical 85°C specification in normal operating conditions.
 - Under extreme operating conditions, the thermal algorithm can switch the DIMMs into Double Refresh mode, allowing an additional 10°C of thermal headroom. In Double Refresh mode, the DIMMs are allowed to operate as high as 95°C.

5.4 Acoustics

The acoustical design of the PowerEdge R910 reflects the following:

- **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, and this is listed in Table 7.
- **Noise ramp and descent at bootup:** Fan speeds, hence noise levels, ramp during the boot process in order to add a layer of protection for component cooling in the case that the system were not to boot properly.
- **Noise levels vs. configurations:** Hardware configurations do result in different noise levels. For example, processor-power dependence is shown in the following table.

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The acoustical performance for two different processor power configurations of the PowerEdge R910 are shown in Table 7.

Table 7. Acoustical Performance

105W Configuration @ 23±2 °C Ambient					Operating Mode	LwA-UL (bels)	LpA (dBA)	Prominent Tones
Processors	Hard Drives	Power Supply	DIMM	RAID				
4 x Intel® Xeon® E7540 (105W)	4 x 15K 2.5" SAS	4 x 1100W	16 x 2GB	PERC H800	Standby	3.2	16	None
					Idle	5.7	38	None
					Stressed processor	5.6	38	None
130W Configuration @ 23±2 °C Ambient					Operating Mode	LwA-UL (bels)	LpA (dBA)	Prominent Tones
Processors	Hard Drives	Power Supply	DIMM	RAID				
4 x Intel® Xeon® E7540 (130W)	4 x 15K 2.5" SAS	4 x 1100W	16 x 8GB	PERC H800	Standby	3.2	16	None
					Idle	6.4	45	None
					Stressed processor	6.4	45	None

Definitions

Standby: AC Power is connected to power supplies but the system is not turned on.

Idle: Reference ISO7779 (2010) definition 3.1.7; system is running in its OS but no other specific activity.

Stressed Processor: An operating mode per ISO7779 (2010) 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 (2010).

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 (2010) Section 8.6.2.

Prominent tones: Criteria of D.6 and D.11 of ECMA-74 11th ed. (2010) 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 3rd (2010), Section 8.6.2.

6 Processors

6.1 Overview

The Intel® Xeon® processor 7500 series and the Intel Xeon E7-4800 and E7-8800 product family are designed specifically for high-end server applications. The processors feature up to ten-core processing to maximize performance and performance/watt for data center infrastructures and highly dense deployments. These processors also feature Intel Core™ micro-architecture and Intel 64 architecture for flexibility in 64-bit and 32-bit applications and operating systems.

The Intel Xeon processor 7500 series uses a 1567-contact Flip-Chip Land Grid Array (FC-LGA) package that plugs into a surface-mount socket (Socket-L5). The PowerEdge R910 provides support for up to four processors.

Selective processors in the Intel Xeon processor 7500 series and Intel Xeon E7-4800 and E7-8800 product family also support Turbo Mode. Turbo Mode is an OS-controlled operation that automatically allows the processor to run faster than the marked frequency if the processor is operating below power, temperature, and current limits.

6.2 Features

Key features of the Intel Xeon E7-4800 and E7-8800 product family include:

- Up to ten cores per processor
- Four point-to-point QuickPath Interconnect links at 6.4 GT/s
- 32 nm process technology
- Intel HyperThreading (2 threads/core)
- Up to 30 MB shared L3 cache
- Intel Trusted Execution Technology (TXT) and AESNI (AES New Instructions)
- RAS DDDC (Double Device Data Correct)

Key features of the Intel processor 7500 series include:

- Up to eight cores per processor
- Four point-to-point QuickPath Interconnect links at 6.4 GT/s
- 1567-pin FC-LGA(Flip Chip-Land Grid Array) package
- 45 nm process technology
- No termination required for non-populated CPUs (must populate CPU socket 1 first)
- Two Integrated DDR3 memory controllers
- Each memory controller supports two Intel Scalable Memory Interconnects (SMI) for a total of 4 SMIs
- 64-byte cache line size
- RISC/CISC hybrid architecture
- Compatible with existing x86 code base
- Intel MMX™ support
- Execute Disable Bit
- Intel Wide Dynamic Execution
- Executes up to four instructions per clock cycle
- Simultaneous Multi-Threading (SMT) capability
- Support for CPU Turbo Mode (on certain models)
- Increases processor frequency if operating below thermal, power and current limits
- Streaming SIMD (Single Instruction, Multiple Data) Extensions 2, 3, and 4
- Intel 64 Technology

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- Intel VT-x and VT-d Technology for virtualization support
- Enhanced Intel SpeedStep® Technology
- Demand-based switching for active processor power management as well as support for ACPI P-States, C-States and T-States

6.3 Supported Processors

Table 8. Supported Intel Xeon E7-8800 Product Family

Model	Speed	TDP Power	Cache	Cores	QPI Speed
E7-8867L	2.13GHz	105W	30M	10	6.4GT/s
E7-8837	2.66GHz	130W	24M	8	6.4GT/s

Table 9. Supported Intel Xeon E7-4800 Product Family

Model	Speed	TDP Power	Cache	Cores	QPI Speed
E7-4870	2.40GHz	130W	30M	10	6.4GT/s
E7-4860	2.26GHz	130W	24M	10	6.4GT/s
E7-4850	2.00GHz	130W	24M	10	6.4GT/s
E7-4830	2.13GHz	105W	24M	8	6.4GT/s
E7-4820	2.00GHz	105W	18M	8	5.86GT/s
E7-4807	1.86GHz	95W	18M	8	4.80GT/s

Table 10. Supported Intel Xeon Processor 7500 Series

Model	Speed	TDP Power	Cache	Cores	QPI Speed
X7560	2.26GHz	130W	24M	8	6.4GT/s
X7550	2.00GHz	130W	18M	8	6.4GT/s
E7540	2.00GHz	105W	18M	6	6.4GT/s
L7555	1.86GHz	95W	24M	8	5.86GT/s
L7545	1.86GHz	95W	18M	6	5.86GT/s
E7530	1.86GHz	105W	12M	6	5.86GT/s
E7520	1.86GHz	105W	18M	4	4.8GT/s

6.4 Processor Configurations

The system is designed such that at least both CPU1 and CPU2 processors are required to access all the I/O expansion slots. There are two IOH QPI-to-PCIe bridges in order to provide sufficient PCIe lanes to meet the MRD requirements. IOH1 is the legacy bridge that is connected to CPU1 whereas IOH2 is connected to CPU2. If only CPU1 is populated, the I/Os behind IOH2 (slots 1, 2, 3, 4 and 6) will not be available.

The system will not boot up if the CPUs are not installed correctly. The supported CPU configuration is either 2-processors or 4-processors.

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6.5 Additional Processor Information

Refer to the Processors section in the Installing System Components chapter of the *Dell PowerEdge R910 Systems Hardware Owner's Manual* on Support.Dell.com/Manuals for additional processor information.

7 Memory

7.1 Overview

The Dell™ PowerEdge™ R910 uses DDR3 memory providing a high-performance, high-speed memory interface capable of low latency response and high throughput. The R910 supports Registered ECC DDR3 DIMMs (RDIMM).

R910 uses the Intel® Xeon® processor 7500 series that has two integrated memory controllers. Each of those memory controllers then has two Scalable Memory Interconnect (SMI) channels that connect to the memory buffer. The R910 has both the SMI channels from each controller routed to the memory riser with two memory buffers connected.

The SMI channels from each controller operate in lockstep (the DIMMs need to be populated in matched pairs behind lockstep channel). Each memory buffer has two DDR3 channels that can support up to two DIMMs per channel.

The DDR3 memory interface consists of 16 memory buffers, each of which has two DDR3 memory channels. Each channel supports up to two RDIMMs for single/dual/quad rank. By limiting to two DIMMs per DDR channel, the system can support DIMMs at 1333 MT/s.

The R910 memory interface supports memory demand and patrol scrubbing, single-bit correction and multi-bit error detection. Correction of a x4 or x8 device failure (chip kill) is supported with SDDC. The following properties/rules apply to R910:

- DIMMs must be populated in matched pairs for each processor (A1/A2, A3/A4). Single DIMM operation is not supported.
- If DIMMs of different speeds are mixed, all channels will operate at the fastest common frequency. Note that R910 only supports DDR3 1333 MT/s modules.
- Memory mirroring and sparing configurations will be supported as follows:
 - Memory sparing will be allowed on configurations with \geq 64GB populated
 - Memory mirroring will be enabled on configurations with \geq 64GB populated
- The first DIMM slot in each channel is color-coded with white ejection tabs for ease of installation.
- In the case of mixed-rank population, populate the DIMM with the highest number of ranks first (in sockets with white ejection tabs)
- DIMM sockets are placed 0.450" (11.43 mm) apart, center-to-center in order to provide enough space for sufficient airflow to cool stacked DIMMs. DIMMs must be installed in each channel starting with the DIMM farthest from the processor (DIMM 1). Population order is identified by silkscreen and a label. The order is dependent on the memory configuration used.

7.2 Slots and Risers

R910 has 8 memory risers; each memory riser has 8 DIMM slots. So there are a total of 64 DIMMs. See the *Dell PowerEdge R910 Systems Hardware Owner's Manual* on Support.Dell.com/Manuals for detailed information.

7.3 Key Features of the Memory Subsystem

Registered (RDIMM) ECC DDR3 technology:

- Each channel carries 64 data and 8 ECC bits
- Support for up to 2 TB of memory (with sixty-four 32 GB RDIMMs)
- Support for 1333 MT/s single, dual, and quad rank DIMMs
- Support ODT (On Die Termination)

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- Clock gating (CKE) to conserve power when DIMMs are not accessed (DIMMs enter a low power self-refresh mode)
- I²C access to SPD EEPROM for access to RDIMM thermal sensors
- Single-Bit Error Correction
- SDDC (Single Device Data Correction – x4 or x8 devices)
- Support for Closed Loop Thermal Management on RDIMMs
- Multi-Bit Error Detection
- Support for Memory Mirroring in limited configurations
- Support for Memory (Rank) Sparing in limited configurations

7.4 Memory Speed Limitations

The memory frequency is determined by a variety of inputs:

- Speed of the DIMMs
- Speed supported by the processor (note the DDR3 speed is 1/6 the frequency of the SMI link)
- BIOS can limit frequency to DDR3 800 MT/s based on user power savings configuration in the SETUP menu

The PowerEdge R910 supports DDR3 1333 MT/s DIMMs. Some processor models will have lower SMI link speeds resulting in slower DDR3 buses. The supported frequencies are as follows:

- SMI link speed at 4.8GT/sec => DDR3 800 MT/s
- SMI link speed of 5.86 GT/sec => DDR3 978 MT/s
- SMI link speed of 6.4 GT/sec => DDR3 1067 MT/s

7.5 Sparing

For rank sparing, one rank on each lockstep Intel 7500 Scalable Memory Interconnect (SMI) pair will be reserved as a spare, and in the event that another rank exceeds a threshold of correctable ECC errors, the “failing” rank will be copied to the spare. Once that operation is complete, the failed rank will be disabled.

7.6 Mirroring

For mirroring, the PowerEdge R910 supports 2P/4P configurations for 64GB and larger only. When mirroring is enabled, only half of the physical memory is visible to the system software. A full copy of the memory is maintained, and in the event of an uncorrectable error, the system will switch over to the mirrored copy. The R910 uses intra-socket mirroring.

7.7 RAID

The PowerEdge R910 does not support memory RAID.

7.8 Supported Configurations

See the System Memory section in the Installing System Components chapter in the *Dell PowerEdge R910 Systems Hardware Owner's Manual* on Support.Dell.com/Manuals.

8 Chipset

The Dell™ PowerEdge™ R910 system-board incorporates the Intel® 7500 chipset for I/O and processor interfacing. The Intel 7500 chipset is designed to support the Intel Xeon® E7-4800 and E7-8800 product family, and the Intel Xeon processor 7500 series, QPI interconnect, DDR3 memory technology, and PCI Express Generation 2. The Intel 7500 chipset consists of the EX IOH, Intel® 7500 Scalable Memory Buffer, and the ICH10 South Bridge.

8.1 Intel 7500 Chipset I/O Hub (IOH)

The R910 motherboard incorporates dual Intel 7500 chipset IOH to provide a link between the four Intel Xeon processor 7500 series sockets and the I/O components. The main components of the IOH consist of two full-width QPI links (one to each processor), 72 lanes of PCIe Gen2, and a x4 DMI link to connect directly to the ICH10 South Bridge.

8.2 IOH QuickPath Interconnect (QPI)

The QuickPath Architecture consists of serial point-to-point interconnects for the processors and the IOH. The PowerEdge R910 has a total of four QuickPath Interconnect (QPI) links including one link connecting the processors and links connecting both processors with the IOH and links connecting both IOHs. Each link consists of 20 lanes (full-width) in each direction with a link speed of 6.4 GT/s. An additional lane is reserved for a forwarded clock. Data is sent over the QPI links as packets.

The QuickPath Architecture features four layers. The physical layer consists of the actual connection between components, and supports polarity inversion and lane reversal for optimizing component placement and routing. The link layer is responsible for flow control and the reliable transmission of data. The routing layer is responsible for the routing of QPI data packets. The protocol layer is responsible for high-level protocol communications, including the implementation of a MESIF (modify, exclusive, shared, invalid, forward) cache coherence protocol.

8.3 PCI Express Generation 2

PCI Express Generation 2 (PCIe Gen2) is a serial point to point interconnects for I/O devices. PCIe Gen2 doubles the signaling bit rate of each lane from 2.5 Gb/s to 5 Gb/s. Each of the PCIe Gen2 ports is backwards compatible with Gen1 transfer rates.

8.4 Direct Media Interface (DMI)

The DMI (previously called the Enterprise Southbridge Interface) connects the Boxboro-EX Legacy IOH with the Intel I/O Controller Hub (ICH). The DMI is equivalent to a x4 PCIe Gen1 link with a transfer rate of 1 GB/s in each direction.

8.5 Intel I/O Controller Hub 10 (ICH10)

ICH10 is a highly integrated I/O controller, supporting the following functions:

- Six x1 PCIe Gen1 ports, with the capability of combining ports 1-4 as a x4 link
- Used on PowerEdge R910 for slot 5
- PCI Bus 32-bit Interface Rev 2.3 running at 33 MT/s
- Up to six Serial ATA (SATA) ports with transfer rates up to 300 MB/s
- R910 features one SATA port for optional internal optical drive
- Six UHCI and two EHCI (High-Speed 2.0) USB host controllers, with up to twelve USB ports (R910 has four external USB ports and one internal ports dedicated for IDSM and embedded storage)
- Power management interface (ACPI 3.0b compliant)

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- Platform Environmental Control Interface (PECI)
- Intel Dynamic Power Mode Manager
- I/O interrupt controller
- SMBus 2.0 controller
- Low Pin Count (LPC) interface to Super I/O, Trusted Platform Module (TPM), and SuperVU
- Serial Peripheral Interface (SPI) support for up to two devices (R910 BIOS flash device is connected to the ICH10 using SPI)

8.6 PCI Express Connectors

The R910 planar incorporates four 164-pin PCI Express-style x8 (slots 1, 2, 3 and 5) and three 164-pin PCI Express-style x16 connectors (slots 4, 6 and 7) for connectivity to the PCIe cards. Only one x16 (slot 7) out of the three physical connectors is electrically x16 as well. The other two (slots 4 and 6) are electrically x8 using a x16 physical connector for double wide GPGPU adapters.

9 BIOS

9.1 Overview

The Dell™ PowerEdge™ R910 BIOS is based on the Dell BIOS core, and supports the following features:

- Intel® Xeon® E7-4800 and E7-8800 product family, and Intel Xeon processor 7500 series support
- Simultaneous Multi-Threading (SMT) support
- CPU Turbo Mode support
- PCI 2.3 compliant
- Plug and Play 1.0a compliant
- MP (Multiprocessor) 1.4 compliant
- Boot from hard drive, optical drive, iSCSI drive, USB key, and SD card
- ACPI support
- Direct Media Interface (DMI) support
- PXE and WOL support for on-board NICs
- Memory mirroring and spare bank 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
- Unified Server Configurator (UEFI 2.1) support
- Power management support including DBS, Power Inventory and multiple Power Profiles

9.2 I2C

I2C is a simple bi-directional 2-wire bus for efficient inter-integrated circuit control. All I2C-bus compatible devices incorporate an on-chip interface which allows them to communicate directly with each other via the I2C-bus. These I2C devices perform communication functions between intelligent control devices (e.g., microcontrollers), general-purpose circuits (e.g., LCD drivers, remote I/O ports, memories) and application-oriented circuits.

The PE R910, BIOS accesses the I2C through the ICH10 (Intel I/O Controller Hub 10). There are two MUX's on ICH10's I2C bus.

- One MUX (U_ICH_SPD) controls the DIMM SPDs through four split segments
- The other MUX (U_ICH_MAIN) controls the clock buffers, TOE, USB Hub through four split segments.
- BIOS controls both the MUX's through the two select lines using GPIO pins.

The Clock chip, USB hub, and the front panel EEPROM device addresses are located on the IOH I2C bus.

10 Embedded NICs/LAN on Motherboard (LOM)

10.1 Overview

The Dell™ PowerEdge™ R910 supports two options for Embedded NICs (I/O riser card):

- 4-port 1GbE using 2x Broadcom 5709c
- 4-port (2 x 10Gb SFP+ & 2 x 1GbE) using 1 x Broadcom 57711 & 1 x Broadcom 5709c

iSCSI offload is standard on both options.

10.2 Option 1: 1GbE I/O riser

Two dual-port Broadcom BCM5709C Gigabit Ethernet controllers with support circuitry are embedded on the R910 1GbE IO riser board. Features of the LAN device include:

- x4 PCI Express Gen2 capable interface (R910 operates dual-port controllers at Gen1 speed)
- MAC and PHY integrated
- 3072x18 Byte context memory
- 64 KB receive buffer
- TOE (TCP Offload Engine)
- iSCSI controller
- RDMA controller (RNIC) (enabled through an optional hardware key)
- NC-SI (Network Controller-Sideband Interface) connection
- Wake-On-LAN (WOL)
- PXE 2.0 remote boot
- iSCSI boot
- IPv4 and IPv6 support
- Bare metal deployment support

10.3 Option 2: 10Gb I/O riser

In addition to a Broadcom BCM5709C dual port Ethernet controller, there is a dual-port 10 Gb MAC controller along with the external PHY embedded on the R910 10 Gb IO riser board. The devices are Broadcom BCM57711 Gigabit MAC with BCM8727 SFP+ PHY. Features include:

- x8 PCI Express Gen2 capable interface
- SFP+ interface supported with SR and LRM optics or direct attached cable
- TOE (TCP Offload Engine)
- iSCSI controller
- RDMA controller (RNIC) (enabled through an optional hardware key)
- NC-SI (Network Controller-Sideband Interface) connection
- Wake-On-LAN (WOL)
- PXE 2.0 remote boot
- iSCSI boot
- IPv4 and IPv6 support
- Bare metal deployment support

Four functional power supplies (2+2 configuration) are required to use the 10Gb I/O riser.

11 PCI Slots

11.1 Overview

The Dell™ PowerEdge™ R910 planar provides seven PCI Express expansion slots as the base. There is an option to expand the x16 Slot7 with a PCIe riser to four x4 additional slots, bringing the total number of open expansion slots to ten with the riser option. There is also a dedicated storage slot. The following requirements apply to the R910 PCIe slots:

- Supports 25 W maximum power capability for each expansion slot
- Does not support hot-plugging of PCIe cards
- does not support full-length PCIe cards

11.2 Quantities and Priorities

Refer to the Expansion Cards and Expansion-Card Risers section in the Installing System Components chapter of the *Dell PowerEdge R910 Systems Hardware Owner's Manual* on Support.Dell.com/Manuals.

11.3 PCI Card Dimensions

Refer to the Expansion Cards and Expansion-Card Risers section in the Installing System Components chapter of the *Dell PowerEdge R910 Systems Hardware Owner's Manual* on Support.Dell.com/Manuals.

12 Storage

12.1 Overview

The Dell™ PowerEdge™ R910 system supports up to sixteen 2.5” hard disk drives. See Table 11 for details.

12.2 Backplanes

R910 supports either a sixteen-drive backplane or a four-drive backplane for 2.5” drives.

Depending on the type of backplane, there are sixteen or four hot-plug capable Serial Attached SCSI (SAS) or Serial ATA (SATA) drive slots with two LED indicators per slot, up to two Mini-SAS cable connectors for connecting the backplane to the integrated PERC H200 or H700 storage adapters, and a 20-pin planar signal/power connector. PERC H200 storage adapter will only be supported with the 2.5” 4-drive HDD backplane.

12.2.1 2.5” x4 Backplane

The four-drive 2.5” backplane assembly is detailed as follows:

- Only 2.5” drives are supported in this configuration
- One mini-SAS cable is used to connect channel “A” of the integrated PERC H200 or H700 storage controller card to the four-drive backplane.
- Mixing SATA and SAS is **not** supported.

12.2.2 2.5” x16 Backplane

The sixteen-drive 2.5” backplane assembly is detailed as follows:

- Only 2.5” drives are supported in this configuration
- Two mini-SAS cables are used to connect both channels of the integrated PERC H700 storage card to the sixteen-drive backplane.
- A SAS expander is used to map 16 drives to the PERC H700 (2 x4 SAS) controller
- Mixing SATA and SAS is **not** supported.
- Mixing SAS and SSD is supported.

12.3 Flash BIOS Memory

A Flash EEPROM resides on the SPI Bus for BIOS and configuration storage. A 16 Mbit device is utilized for this function. The Flash memory permits the BIOS to be upgraded in the field. The Flash BIOS may be write-protected by software.

12.4 Drives

The PowerEdge R910 supports the new 2.5” hard drive carriers. These carriers implement new industrial design to match the front bezel.

For the slots that are not occupied by drives, a carrier blank is provided to maintain proper cooling, maintain a uniform appearance to the unit, and provide EMI shielding.

R910 supports diskless configuration.



Figure 5. 2.5” Hard Drive Carrier

Each hard 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.

Table 11. Supported Hard Drives

Hard Drive Type (2.5”)	Capacities
SAS	73GB, 146GB, 300GB, 600GB, 900GB
SATA	1TB
SATA SSD	50GB, 100GB
SAS SSD	149GB
Nearline SAS	500GB, 1TB

12.5 RAID Configurations

Table 12. RAID Configurations

Configuration Type	Configuration		Description	Non-mixed drives (all SATA HDD, all SAS HDD, or all SATA SSD or all SAS SSD) 2.5” Drives			
				x4 Backplane		x16 Backplane	
				Min Drives	Max Drives	Config Type	Max Drives
Diskless Configuration	C0	NCZ	Diskless Configuration	0	0	X	X
SAS/SATA/SATA SSD/SAS SSD—No RAID	C1	MSS	Integrated SAS/SATA/SSD No RAID (PERC H200, PERC H700)	1	4	X	X

SAS/SATA/ SATA SSD/SAS SSD—RAID	C2	MSSRO	Integrated SAS/SSD RAID 0 (PERC H200, PERC H700)	2	4	2	16
	C3	MSSR1	Integrated SAS/SSD RAID 1 (PERC H200, PERC H700)	2	2	2	2
	C4	MSSR5	Integrated SAS/SSD RAID 5 (PERC H700)	3	4	3	16
	C5	MSSR6	Integrated SAS/SSD RAID 6 (PERC H700)	4	4	4	16
	C6	MSSR10	Integrated SAS/SSD RAID 10 (PERC H700, PERC H200)	4	4	4	16
	C7	MSSR50	Integrated SAS/SSD RAID 50 (PERC H700)	X	X	6	16
	C8	MSSR60	Integrated SAS/SSD RAID 60 (PERC H700)	X	X	8	16
	C9	MSSR1R1	Integrated SAS/SSD RAID 1/ RAID 1 (PERC H700, PERC H200)	4 (2+2)	4 (2+2)	4 (2+2)	4 (2+2)
	C10	MSSR1R5	Integrated SAS/SSD RAID 1/RAID 5 (PERC H700)	X	X	5 (2+3)	16 (2+14)
	C11	MSSR1R6	Integrated SAS/SSD RAID 1/RAID 6 (PERC H700)	X	X	5 (2+4)	16 (2+14)
Configuration Type	Configuration	Description	Mixed SATA SSD/SAS 2.5" Drives				
			x4 Backplane		x16 Backplane		
			Min Drives	Max Drives	Min Drives	Max Drives	
SSD/SAS— RAID	C12	MSSROR1-X	Integrated SSD/SAS RAID 0/RAID 1 (PERC H200, PERC H700) RAID 0 set is SSD, RAID 1 set is SAS	1+2	1+2	1+2	14+2
	C13	MSSR1R1-X	Integrated SSD/SAS RAID 1/RAID 1 (PERC H200, PERC H700) RAID 1 set is SSD, second RAID 1 set is SAS	2+2	2+2	2+2	2+2
	C14	MSSR1R5-X	Integrated SSD/SAS RAID 1/RAID 5 (PERC H700)	X	X	2+3	2+14

			RAID 1 set is SSD, RAID 5 set is SAS				
	C15	MSSR1R10-X	Integrated SSD/SAS RAID 1/RAID 10 (PERC H700) RAID 1 set is SSD, RAID 10 set is SAS	X	X	2+4	2+14
	C16	MSSR1R50-X	Integrated SSD/SAS RAID 1/RAID 50 (PERC H700) RAID 1 set is SSD, RAID 50 set is SAS	X	X	2+6	2+14
	C17	MSSR10R50-X	Integrated SSD/SAS RAID 10/RAID 50 (PERC H700) RAID10 set is SSD, RAID 50 set is SAS	X	X	4+6	8+8

Additional RAID requirements are listed as follows:

- All connection types are backplane.
- X indicates not supported.
- The x16 backplane is supported only by PERC H700.
- The x4 backplane is supported by both PERC H200 and PERC H700.
- SATA drives are supported only on the x4 backplane. A maximum of only one SATA drive is allowed and is only in the C1 configuration.

12.6 Storage Controllers

12.6.1 PERC H200

The PERC H200 integrated HBA is a SAS 2.0 6Gb native PCIe half-length half-height expansion card that plugs into a dedicated x8 storage slot. It supports RAID 0, RAID 1, RAID 10 and non-RAID hard drive configurations. It incorporates one four-channel mini-SAS internal connector (SFF8087) for connection to internal x4 2.5” drive backplane. Since there are a maximum of up to 4-drives, the second mini-SAS connector from H200 to the backplane would not get used. PERC H200 will only be supported when the 4-drive 2.5” backplane is present on R910.

12.6.2 PERC H700

For customers who need a more advanced hardware RAID solution, the PERC H700 (formerly known as PERC 7/iR) is an option. The PERC H700 is a SAS 2.0 6Gb half-length PCIe x8 expansion card that uses the LSI 2108 ROC (RAID on Chip) processor running at 800MT/s with a PCI Express host interface and DDR2 memory. It supports 512MB cache that is battery backed. It supports RAID 0, RAID 1, RAID 5, RAID 6, RAID 50, RAID 60 and PRL-11 hard drive configurations. It incorporates two four-channel mini-SAS connectors (SFF8087) for connection to internal x4 or x16 2.5” drive backplanes. The second mini-SAS connectors would not get used when connecting PERC H700 to the x4 internal backplane.

12.6.3 PERC H800

The R910 can support up to four PERC 800 adapter cards for access to external SAS direct-attach storage. Features of the PERC H800 include:

- LSI 2108 (Liberator) ROC
- 6Gb/s SAS
- x8 PCIe Gen2
- 800 MT/s Core PPC
- DDRII, 800 MT/s, mini-DIMM
- 512MB dual mini-SAS connectors
- Supports connection to Dell PowerVault™ MD1220 and PowerVault MD1200 6Gb enclosures only

12.6.4 Storage Card Support Matrix

Table 13. Storage Card Support Matrix

	Storage Card	Usage	PowerEdge R910 Support	Slot	PCIe Con	PCI Bracket	I/O Con	RAID	Battery Backup
PERC SAS/SATA	PERC H700 Integrated	Internal Backplane Storage	Yes—Max 1	Storage slot	x8	No	2 x4 mini-SAS int	0, 1, 5, 6, 10, 50, 60, PRL-11	Yes
	PERC H800 Adapter	External SAS/SATA Storage	Yes—Max 4 (PowerVault MD1200 and PowerVault MD1220)	PCIe slot	x8	Yes	x4 ext x4 ext	0, 1, 5, 6, 10, 50, 60, PRL-11	Yes
	PERC 6/E Adapter	External Legacy Storage	Backup to H800—Max 2 (MD1000 PowerVault MD1000 only and MD1020 PowerVault MD1120)	PCIe slot	x8	Yes	x4 ext x4 ext	0, 1, 5, 10, 50	Yes
SAS HBA SAS/SATA	PERC H200 Integrated	Internal Backplane Storage	Yes—Max 1	Storage slot	x8	No	x4 mini-SAS int	0, 1, 10	No
	6Gbps SAS HBA	External SAS tape and RBODs	Yes—Max 2	PCIe slot	x8	Yes	x4 int	None	No
	SAS 5/E Adapter	External SAS (DAS, Tape)	Backup to 6Gbps SAS HBA—Max 2	PCIe slot	x8	Yes	x4 ext x4 ext	None	No

ICH10 SATA	On Planar via chipset	Internal SATA Optical (No HDD)	Yes—1 port for Optical	—	—	—	x1 int	—	—
LSI 2032 SCSI	LSI 2032 Adapter	External SCSI Tape or External legacy SCSI storage	Yes—Max 2	PCIe slot	x4	Yes	SCSI (ext)	—	—

12.7 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 storage enclosure processor (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 *Dell PowerEdge R910 Systems Hardware Owner's Manual* on Support.Dell.com/Manuals.

12.8 Optical Drives

SATA optical drives are optional in all R910 systems and connect to the planar via the SATA interface to ICH10. IDE (PATA) optical drives are not supported.

The following internal optical drives are available on R910: DVD-ROM and DVD+RW.

If the optical drive is not ordered with the system, a blank is installed in its place.

13 Video

The Dell™ PowerEdge™ R910 Integrated Dell Remote Access Controller 6 (iDRAC6) incorporates an integrated video subsystem, connected to the 32-bit PCI interface of the ICH10. This logic is based on the Matrox® G200. The device only supports 2D graphics.

The video device outputs are multiplexed between the front and back video ports. If a monitor is connected to the front video connector, it will take precedence over the rear connection, thereby removing the display from the rear connection.

The integrated video core shares its video memory with the iDRAC6's 128 MB DDR2 application space memory. This memory is also used for the KVM buffer.

The R910 system supports the following 2D graphics video modes:

Table 14. Supported Video Modes

Resolution	Refresh Rate (Hz)	Color Depth (bit)
640 x 480	60, 72, 75, 85	8, 16, 32
800 x 600	56, 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	60, 75, 85	8, 16
1280 x 1024	60	32

14 Rack Information

14.1 Overview

The ReadyRails™ sliding rail system for the Dell™ PowerEdge™ R910 provides tool-less support for racks with square or unthreaded round mounting holes including all generations of Dell racks. 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.

Important notes:

- The R910 is not compatible with any other Dell rails including previous generation rails, but it does use the same rails as the R810 and R815.
- The R910 supports sliding rails only. Static rails are not supported.
- Threaded hole racks require Dell's fixed shelf or adapter brackets available from Rack Solutions.
- The CMA is not supported on racks that are less than 1m in depth including Dell's 4200 and 2400 racks.

14.2 Rails

The ReadyRails sliding rails for the R910 support tool-less mounting in 19"-wide, EIA-310-E compliant square hole and unthreaded round hole racks and are available with or without the optional cable management arm (CMA).

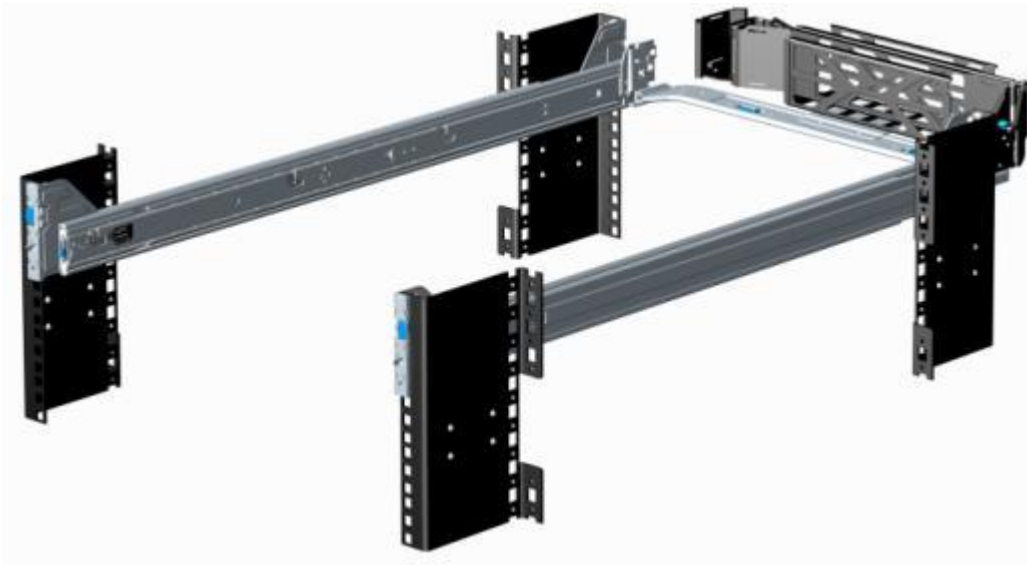


Figure 6. ReadyRails Sliding Rails with Optional CMA

As noted below, the R910 rails do not support mounting in threaded hole or 2-post racks*.

Table 15. Rack Types Supported

Rail Identifier	Mounting Interface	Rail Type	Rack Types Supported				
			4-Post			2-Post	
			Square	Round	Thread	Flush	Center
B2	ReadyRails™	Sliding	✓	✓	✗	✗	✗

*Adapter brackets are available from Rack Solutions that allow the R910 sliding rails to mount in threaded racks. The only option available for 2-post racks is to mount the system on a fixed shelf.

Other factors to consider when deploying the R910 include the spacing between the front and back 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. For example, use of the CMA requires racks that are a minimum of 1m in depth with the PDUs or other rack accessories positioned on the sides or back of the rack away from the CMA.

Table 16. Rail Adjustability Range and Depth

Rail Adjustability Range (mm)						Rail Depth (mm)	
Square		Round		Threaded		Without CMA	With CMA
Min	Max	Min	Max	Min	Max		
686	883	672	876	—	—	755	883

The min-max values listed above represent the allowable distance between the front and back mounting flanges in the rack. Rail depth without the CMA represents the minimum depth of the rail with the outer CMA brackets removed (as measured from the front mounting flanges of the rack).

14.3 Cable Management Arm (CMA)

The optional cable management arm (CMA) for the R910 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 R910 CMA include:

- Large U-shaped baskets to support dense cable loads
- Open vent pattern for optimal airflow
- Fully reversible (can be mounted on either side) with no conversion required
- Utilizes hook-and-loop straps rather than plastic tie wraps to eliminate the risk of cable damage during cycling
- Includes a low profile fixed tray to both support and retain the CMA in its fully closed position
- Both the CMA and the tray mount without the use of tools via simple and intuitive snap-in designs

14.4 Rack View

The R910 ReadyRails sliding rails are a “drop-in” design, meaning that the system is installed vertically into the rails by inserting the shoulder nuts on the sides of the system into the J-slots in the inner rail members with the rails in the fully extended position.



Figure 7. R910 Mounted in the B2 Sliding Rails

The R910 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.



Figure 8. R910 CMA Mounted on the Side Opposite the Power Supplies (Recommended)

15 Operating Systems

For detailed information, see the following:

- [Operating System Support Matrix for Dell PowerEdge Systems](#) on Dell.com
- *Dell PowerEdge R910 Systems Getting Started With Your System* guide on Support.Dell.com/Manuals

16 Systems Management

16.1 Overview

Dell delivers open, comprehensive, and integrated solutions that help you reduce the complexity of managing disparate IT assets. Combining Dell PowerEdge Servers with a wide selection of Dell developed systems management solutions gives you choice and flexibility, so you can simplify and save in IT environments of any size. To help you meet your server management 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 and sized appropriately, and supported comprehensively.

16.2 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 (SBUU):** Dell Systems Build and Update Utility assists in OS install and pre-OS hardware configuration and updates.
- **Server Update Utility (SUU):** This DVD has an inventory tool for managing updates to firmware, BIOS, and drivers for either Linux or Windows varieties.
- **OpenManage Server Administrator (OMSA):** The OpenManage Server Administrator tool provides a comprehensive, one-to-one (one console to one server) systems management solution, designed for system administrators to manage systems locally and remotely over a network. OMSA allows system administrators to focus on managing their entire network by providing comprehensive one-to-one systems management.
- **Management Console:** Dell IT Assistant (ITA) 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 Baseboard Management Controller (BMC) 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 peripherals, and Dell OpenManage™ software.
- **Dell Management Console (DMC):** The Dell Management Console is a systems management console that enables systems administrators to discover and inventory devices on your network. It provides functions such as health and performance monitoring of networked devices, and patch management capabilities for Dell systems. DMC differs from the IT Assistant management console (described above) in that with DMC, value-add plug-ins that enable advanced functionality can be purchased and added to the base DMC product.

16.3 Embedded Server Management

The Dell™ PowerEdge™ R910 implements circuitry for the next generation of Embedded Server Management. It is Intelligent Platform Management Interface (IPMI) v2.0 compliant. The iDRAC (Integrated Dell Remote Access Controller) is responsible for acting as an interface between the host system and its management software and the periphery devices.

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.

16.4 Dell Lifecycle Controller and Unified Server Configurator

Embedded management is comprised of interdependent pieces:

- Dell Lifecycle Controller
- Unified Server Configurator
- iDRAC6

Dell Lifecycle Controller powers the embedded management features. It includes integrated and tamper-proof storage for system-management tools and enablement utilities (firmware, drivers, etc.). Lifecycle Controller enables pre-OS server deployment, OS installation, platform updates, platform configuration, and diagnostics capabilities.

Dell Unified Server Configurator (USC) is a graphical user interface (GUI) that aids in local server provisioning in a pre-OS environment. To access the Unified Server Configurator, press the <F10> key within 10 seconds of the Dell logo appearance during the system boot process. Table 17 details current functionality enabled by the USC.

Table 17. 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.

16.5 Integrated Dell Remote Access Controller

The integrated Dell Remote Access Controller (iDRAC6) provides IT Administrators comprehensive yet straightforward management of remote servers, by delivering “as if you are there” presence and control. iDRAC6 helps users to save time and money by eliminating travel to the remote server(s), whether that server is located in a different room, a different building, a different city, or in a

different country. iDRAC6 is a purchasable option and is available as three offerings: iDRAC6 Express, iDRAC6 Enterprise, and Virtual Flash (vFlash) media:

- iDRAC6 Express is most appropriate for small-to-medium customers with limited remote management needs.
- iDRAC6 Enterprise is appropriate for large data center customers with distributed servers.
- iDRAC6 with vFlash Media is provided for large enterprise customers with requirements for system management automation.

16.6 iDRAC Express

The iDRAC Express is standard on the PowerEdge R910. In addition to providing a Lifecycle Controller, the iDRAC6 Express offers the following key features:

- Graphical web interface
- Standard-based interfaces
- 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 18.

16.7 iDRAC6 Enterprise

The optional iDRAC6 Enterprise card provides access to advanced iDRAC6 features. The iDRAC6 Enterprise connects directly to the R910 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

16.8 iDRAC6 Enterprise with Virtual Flash (vFlash) Media

The iDRAC6 Enterprise can be upgraded by adding the vFlash Media card. This is an 8 GB Dell-branded SD card that enables a persistent 256 MB virtual flash partition. The vFlash media delivers the following key features:

- Support for 8 GB SD storage media
- Can be used as a repository for a pre-OS image, eliminating the need to maintain a network infrastructure for OS deployment
- Can also be used for permanent diagnostics image for use after system failures, or permanent failsafe image for periodic configuration changes

A more detailed feature list for iDRAC6 Express, iDRAC6 Enterprise, and vFlash media is shown in Table 18.

Table 18. Features List for Base Management Functionality, iDRAC, and vFlash Media

Feature	Base Management Functionality	iDRAC 6 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			✓	✓
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			✓	✓

Dell

Feature	Base Management Functionality	iDRAC 6 Express	iDRAC6 Enterprise	vFlash 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			✓	✓

17 Peripherals

17.1 USB peripherals

The Dell™ PowerEdge™ R910 supports the following USB devices:

- DVD (bootable; requires two USB ports)
- USB Key (bootable)
- Keyboard (only one USB keyboard is supported)
- Mouse (only one USB mouse is supported)

Appendix A. Volatility

The Dell™ PowerEdge™ R910 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 following NV components are present in the PowerEdge R910 server.

Table 19. Volatility Information

Server BIOS Memory (SPI Flash, IC)	
Size:	4 MB
Type [Flash PROM, EEPROM]:	Flash EEPROM (Serial Peripheral Interface)
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	Boot Code, Configuration Information, EUFI environment
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 will not operate.
How is this memory write protected?	Software write protected
Server CMOS (Complementary Metal-Oxide Semiconductor) Memory	
Size:	512 Bytes
Type [Flash PROM, EEPROM]:	Battery-Backed NVRAM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	RTC and storing system 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. Removing CMOS battery will clear to factory defaults settings as well.
Server BMC (Baseboard Management Controller)/iDRAC Express Boot Block Flash	
Size:	2 MB
Type [Flash PROM, EEPROM]:	Serial Flash

Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	iDRAC boot loader and configuration (i.e. MAC address), Lifecycle log.
How is data input to this memory?	Data pre-programmed or update using Dell utility which is a DOS or Windows or Linux based executable containing firmware file and loader
How is this memory write protected?	Software write protected
Remarks	Bad contents yield the iDRAC inoperable and is unrecoverable in the customer environment. Note the lifecycle log is automatically updated by the iDRAC as various system component FW, HW and SW versions are changed.
Server BMC/iDRAC Express Internal Flash	
Size:	1 GB
Type [Flash PROM, EEPROM]:	NAND Flash
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	iDRAC Operating System plus Managed System Services Repository (i.e., Unified Server Configurator, OS drivers, diagnostics, rollback versions of various programmables)
How is data input to this memory?	iDRAC OS: 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 without a good iDRAC firmware image yields a non-functional iDRAC. Managed Services Repository: Various partitions are loaded via vendor-provided firmware file and loader program just like iDRAC OS.
How is this memory write protected?	Software write protected
System Event Log (SEL) Memory and Baseboard FRU	
Size:	4 KB
Type [Flash PROM, EEPROM]:	SERIAL EEPROM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	Store system events from BMC and BIOS. FRU information for board such as PPID, MAC addresses etc.
How is data input to this memory?	For SEL, BMC writes to it. For FRU, data is pre-programmed or input using

	Dell utility at ICT/Functional Tester during board assembly.
How is this memory write protected?	Software write protected
FRU Memory for the I/O Risers (1GbE or 10Gb) and Memory Riser	
Size:	256 Bytes
Type [Flash PROM, EEPROM]:	EEPROM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	FRU information for boards such as board name, PPID, manufacturing date etc.
How is data input to this memory?	Data pre-programmed or using Dell utility at ICT/Functional Tester during board assembly.
How is this memory write protected?	Not write protected
DIMM Modules SPD (Serial Presence Detect) EEPROM (up to 64 depending on the number of DIMM modules present)	
Size:	256 Bytes
Type [Flash PROM, EEPROM]:	EEPROM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	DIMM information and temperature settings
How is data input to this memory?	Data preprogrammed by the DIMM vendors (lower 128 bytes). Also during boot sequence, data is written to SPD EEPROM (upper 128 Bytes).
How is this memory write protected?	Not write protected
TPM (Trusted Platform Module) (if applicable)	
Size:	128 Bytes
Type [Flash PROM, EEPROM]:	EEPROM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	Stores encryption keys for TPM functionality
How is data input to this memory?	Data is pre-programmed by vendor. Keys are updated using TPM-enabled operating systems.
How is this memory write protected?	Software write protected
Remarks	F2 BIOS setup option to enable/activate/clear
TPM Alternative Plug-in Module (if applicable)	
Size:	256 Bytes
Type [Flash PROM, EEPROM]:	EEPROM

Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	Stores encryption keys for TPM functionality
How is data input to this memory?	Data is pre-programmed by vendor. Keys are updated using TPM enabled operating systems.
How is this memory write protected?	Software write protected
Remarks	F2 BIOS setup option to enable/activate/clear
Server CPLD Devices (x2 per baseboard)	
Size:	2280 macro-cells and 256 macro-cells
Type [Flash PROM, EEPROM]:	Internal Flash EEPROM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	System power sequence control, error/config detection, and BIOS-BMC interaction.
How is data input to this memory?	Programming CPLD(s) requires a vendor-provided logic file and loader program which is executed by booting up the system from a floppy or OS-based executable containing the logic file and the loader. System loaded with arbitrary data in CPLD(s) will not operate.
How is this memory write protected?	Software write protected
Remarks	Need AC cycle after updating CPLD
Broadcom® 5709/57711 PCI-e Network Interface Controller Flash	
Size:	1MB
Type [Flash PROM, EEPROM]:	Serial Flash
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	Embedded Network Controller FW and config data
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 have the network ports operational.
How is this memory write protected?	Software write protected
Remarks	There is a quantity of 2 SPI flash on both the I/O risers. On 1GbE I/O riser, both flash parts are for the two 5709C controllers whereas on 10Gb I/O riser, one is for 5709C and the other one is

	for 57711 network controller.
Broadcom 8727 PHY (Physical Layer) EEPROM (applicable to only 10Gb I/O riser)	
Size:	32KB
Type [Flash PROM, EEPROM]:	Serial EEPROM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	Stores the PHY firmware
How is data input to this memory?	Data is preprogrammed or update using Dell LOM FW update utility. System loaded with arbitrary data in firmware memory will not have the 10Gb SFP+ network ports operational
How is this memory write protected?	Software write protected
Remarks	10Gb I/O riser is optional
10 Gb I/O riser CPLD (applicable to only 10Gb I/O riser when present)	
Size:	64 Macrocells
Type [Flash PROM, EEPROM]:	CPLD
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	Stores the standby power delivery routing to 10Gb network controller and its PHY
How is data input to this memory?	Data is preprogrammed at board build
How is this memory write protected?	Software write protected
Remarks	10Gb I/O riser is optional
Dell PERC H700i storage controller CPLD/Flash/NVSRAM etc. (if applicable)	
Size:	FRU: 256 Bytes Boot ROM: 8 KB Flash: 8 MB CPLD: 128 Macrocells NVSRAM: 128 KB iButton key EEPROM: 128 Bytes Battery-Backed Cache: 512 MB
Type [Flash PROM, EEPROM]:	FRU, EEPROM, Flash, CPLD, Non-volatile SRAM and a 1-wire EEPROM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	Flash stores the storage controllers firmware CPLD controls the power sequencing & battery backup logic NVSRAM stores the controller configuration

	FRU stores the PPID, manufacturing date etc. Battery-Backed Cache: Stores the data if the cache is not cleared and battery backup unit is enabled in the case of a power loss.
How is data input to this memory?	FRU/CPLD data is preprogrammed at board build. NVS RAM is updated by the storage controller Flash is updated by Dell provided update package Cache stores the data before getting written to the disks when WriteBack policy is enabled with battery backup.
How is this memory write protected?	FRU is not write protected but other components detailed above in the Size row are software write protected.
Remarks	PERC H700i controller is optional
Dell PERC H200i storage controller Flash/NVS RAM/FRU (if applicable)	
Size:	FRU: 256 Bytes Boot ROM: 8 KB Flash: 8 MB NVS RAM: 128 KB
Type [Flash PROM, EEPROM]:	Flash (NOR), EEPROM and NVS RAM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	Flash stores the storage controllers firmware NVS RAM stores the controller configuration FRU stores the PPID, manufacturing date etc.
How is data input to this memory?	FRU data is preprogrammed at board build. NVS RAM is updated by the storage controller Flash is updated by Dell provided update package
How is this memory write protected?	FRU is not write protected but everything else is software write protected
Remarks	PERC H200i controller is optional
Server (4- or 16-drive SAS) Backplane Storage Controller Memory	
Size:	32KB
Type [Flash PROM, EEPROM]:	Embedded Microcontroller Flash
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	Stores the server storage backplane FW and FRU

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
Remarks	There is quantity of “1” PSoC device on the 4-drive backplane versus “2” on the 16-drive backplane.
Server (16-drive SAS only) Backplane SAS Expander EEPROM	
Size:	4MB
Type [Flash PROM, EEPROM]:	Flash EEPROM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	Store SAS expander firmware and configuration data
How is data input to this memory?	Data pre-programmed or update using Dell utility which is a DOS-based executable containing the firmware file and loader.
How is this memory write protected?	Software write protected
Remarks	Ensure that SAS x16 BP cables are attached to planar prior to update. After update, the system should be AC cycled before update takes effect.
Power Supply Firmware and FRU (Field Replacement Unit) Memory	
Size:	1100W LiteOn: 4KB FLASH with 256 Bytes RAM 1100W/750W Emerson: 8K and 16K FLASH with 384 and 1024 Bytes RAM respectively 750W Delta: Flash ROM size 48K bytes and EEPROM size 1K bytes
Type [Flash PROM, EEPROM]:	FLASH, EEPROM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	Stores PSU controller firmware. FRU information for boards such as name, manufacturing date etc.
How is data input to this memory?	FRU and firmware data pre-programmed by the PSU vendors. PSU firmware can be updated by Dell provided update package.
How is this memory write protected?	Software write protected
Remarks	The number of these devices depends on the number of PSUs installed.

Dell Internal Dual SD Module (IDSM) microcontroller flash (if present)	
Size:	256 KB
Type [Flash PROM, EEPROM]:	EEPROM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	Store firmware for IDSM functionality
How is data input to this memory?	Loading flash memory requires a vendor-provided firmware file and loader program. IDSDM module loaded with arbitrary data in firmware memory would not operate.
How is this memory write protected?	Software write protected
Remarks	IDSM is an option
Dell Internal Dual SD Module (IDSM) write journal flash (if present)	
Size:	8 MB
Type [Flash PROM, EEPROM]:	EEPROM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	Store write journal for shutdown recovery
How is data input to this memory?	IDSM microcontroller writes to and read from these memory via SPI interface during operation.
How is this memory write protected?	Software write protected
Remarks	IDSM is an option
SD card(s) (if present) for IDSM (one or two SD cards depending on the redundancy mode ordered with it)	
Size:	Multiple (1GB, 2GB, 8GB)
Type [Flash PROM, EEPROM]:	Secure Digital NAND Flash
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	Normal usage is embedded Hypervisor OS but not limited
How is data input to this memory?	Factory load, OS run time usage and OS updates and configuration changes.
How is this memory write protected?	Media-write protection or software-write protected
Remarks	IDSM is an option
vFlash for iDRAC Enterprise	
Size:	Multiple
Type [Flash PROM, EEPROM]:	Secure Digital NAND Flash

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Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [boot code]	Storage of logs, user images like files, drivers, OS's etc.
How is data input to this memory?	Preloaded media before installation, or remote out-of-band upload of user data (i.e., ISO images, files) or local server read/write capability to use like a hard disk.
How is this memory write protected?	Media write protection or Software write protected
Remarks	iDRAC Enterprise and vFlash are optional

Appendix B. Certifications

B 1. Regulatory Certifications

Regulatory compliance certificates can be located at the following sites:

- http://www.dell.com/content/topics/global.aspx/about_dell/values/regulatory_compliance/dec_conform?c=us&l=en&s=corp

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 20.

Table 20. 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
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 21.

Table 21. 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 22.

Table 22. Ergonomics, Acoustics and Hygienics

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

Appendix C. Industry Standards

The Dell™ PowerEdge™ R910 system conforms to the industry standards detailed in Table 23.

Table 23. 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.intel.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
UEFI Unified Extensible Firmware Interface Specification, v2.1	http://www.uefi.org/specs/

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Standard	URL for Information and Specifications
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.msp