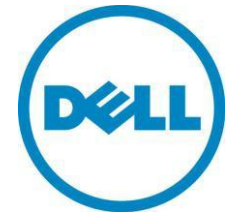


PowerEdge T610



Technical Guide



The PowerEdge T610 server delivers balanced high performance, energy efficiency and room for growth.

This document is for informational purposes only. Dell reserves the right to make changes without further notice to any products herein. The content provided is as is and without express or implied warranties of any kind.

Dell, PowerEdge, OpenManage, and ReadyRails are trademarks of Dell, Inc. Citrix and XenServer are registered trademarks of Citrix Systems, Inc. and/or one or more of its subsidiaries, and may be registered in the United States Patent and Trademark Office and in other countries. Intel, Xeon, and SpeedStep are registered trademarks and MMX is a trademark of Intel Corporation in the U.S. and other countries. Broadcom is a registered trademark and NetXtreme is a trademark of Broadcom Corporation and/or its affiliates in the United States, certain other countries and/or the EU. Emulex is a registered trademark of Emulex Corporation. ENERGY STAR is a registered trademark of the U.S. Environmental Protection Agency. eToken is a trademark of Aladdin Knowledge Systems, Ltd. Linux is a registered trademark of Linus Torvalds. Matrox is a registered trademark of Matrox Electronic Systems Ltd. Microsoft, Windows, Windows Server, SQL Server, Hyper-V, and BitLocker are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries. Novell and SUSE are registered trademarks of Novell, Inc. in the United States and other countries. Oracle is a registered trademark and Solaris is a trademark of Oracle Corporation and/or its affiliates. Red Hat is a registered trademark of Red Hat, Inc. in the United States and other countries. Symantec is a trademark owned by Symantec Corporation or its affiliates in the U.S. and other countries. VMware and vSphere are registered trademarks and ESX and ESXi are trademarks of VMware, Inc. in the United States and/or other jurisdictions. Other trademarks and trade names may be used in this document to refer to either the entities claiming the marks and names or their products. Dell disclaims proprietary interest in the marks and names of others.

©Copyright 2012 Dell Inc. All rights reserved. Reproduction or translation of any part of this work beyond that permitted by U.S. copyright laws without the written permission of Dell Inc. is unlawful and strictly forbidden.

December 2012 | Version 5.0

Table of Contents

1	Product Comparison	7
1.1	Overview	7
1.1.1	Customer-Inspired Design	7
1.1.2	Energy Efficient	7
1.1.3	Enhanced Virtualization	7
1.1.4	Easy to Manage	7
1.1.5	Dell Services	8
1.2	Comparison	8
2	Key Technologies	10
2.1	Overview	10
2.2	Detailed Information	10
3	System Overview	11
4	Mechanical	13
4.1	Chassis Description	13
4.2	Dimensions and Weight	13
4.3	Front Panel View and Features	13
4.4	Back Panel View and Features	15
4.5	Power Supply Indicators	15
4.6	NIC Indicators	16
4.7	Internal Chassis Views	16
4.8	Rails and Cable Management	16
4.9	Fans	17
4.10	LCD Control Panel	17
4.11	Security	18
4.11.1	Cover Latch	18
4.11.2	Bezel	18
4.11.3	Hard Drive	18
4.11.4	TPM	18
4.11.5	Power Off Security	19
4.11.6	Intrusion Alert	19
4.11.7	Secure Mode	19
4.12	USB Peripherals	19
4.13	Battery	19
4.14	Field Replaceable Units (FRU)	19
4.15	User Accessible Jumpers, Sockets, and Connectors	19
5	Power, Thermal, and Acoustic	20
5.1	Power Efficiencies	20
5.2	Main Power Supply	20
5.3	Power Supply Specifications	21
5.4	Heat Dissipation	21
5.5	Environmental Specifications	22
5.6	Power Consumption Testing	23
5.7	Maximum Input Amps	23
5.8	Energy Smart Enablement	23
5.9	ENERGY STAR Compliance	24
5.10	Acoustics	24
6	Processors	25

- 6.1 Overview 25
- 6.2 Features 25
- 6.3 Supported Processors 26
- 6.4 Processor Configurations 27
 - 6.4.1 Single Processor Configuration 27
 - 6.4.2 Processor Power Voltage Regulation Modules (EVRD 11.1) 27
- 6.5 Processor Installation 27
- 7 Memory 28
 - 7.1 Overview 28
 - 7.2 DIMMs Supported 28
 - 7.2.1 Memory Modes 28
 - 7.2.2 DIMM Population Rules 29
 - 7.3 Speed 29
 - 7.4 DIMM Slots 30
 - 7.5 Low Voltage DIMMs 30
 - 7.6 Mirroring 30
 - 7.7 Sparing 31
 - 7.8 Memory Scrubbing 31
 - 7.9 Advanced ECC (Lockstep) Mode 31
 - 7.10 Optimizer (Independent Channel) Mode 31
 - 7.11 Supported Configurations 31
- 8 Chipset 32
 - 8.1 Overview 32
 - 8.2 Intel I/O Hub (IOH) 32
 - 8.3 IOH QuickPath Interconnect (QPI) 32
 - 8.4 Intel Direct Media Interface (DMI) 32
 - 8.5 PCI Express 32
 - 8.6 Intel I/O Controller Hub 9 (ICH9) 33
- 9 BIOS 34
 - 9.1 Overview 34
 - 9.2 Supported ACPI States 34
 - 9.3 I²C (Inter-Integrated Circuit) 34
- 10 Embedded NICs/LAN on Motherboard (LOM) 36
- 11 PCI Slots 37
 - 11.1 Overview 37
 - 11.2 Quantities and Priorities 37
 - 11.3 PCI Card Dimensions 37
- 12 Storage 38
 - 12.1 Overview 38
 - 12.2 Internal Hard Disk Drives 38
 - 12.2.1 Hard Disk Drive Carriers 39
 - 12.2.2 Empty Drive Bays 39
 - 12.2.3 Hard Drive LED Indicators 39
 - 12.3 RAID Configurations 39
 - 12.4 Storage Controllers 41
 - 12.4.1 SAS 6/iR 41
 - 12.4.2 PERC 6/i 41
 - 12.4.3 PERC H200 41
 - 12.4.4 PERC H700 42
 - 12.5 Optical Drives 43

- 12.6 Tape Drives..... 43
- 12.7 External Storage Support..... 43
- 13 Video..... 44
- 14 Rack Information..... 45
 - 14.1 Overview 45
 - 14.2 Rails..... 45
 - 14.3 Cable Management Arm (CMA) 47
 - 14.4 Rack View 47
- 15 Operating Systems..... 49
- 16 Systems Management..... 50
 - 16.1 Overview 50
 - 16.2 Server Management..... 50
 - 16.3 Embedded Server Management..... 51
 - 16.4 Dell Lifecycle Controller and Unified Server Configurator 51
 - 16.5 Integrated Dell Remote Access Controller 51
 - 16.6 iDRAC Express..... 52
 - 16.7 iDRAC6 Enterprise..... 52
 - 16.8 iDRAC6 Enterprise with Virtual Flash (vFlash) Media..... 52
- 17 Peripherals..... 55
- Appendix A. Statement of Volatility..... 56
- Appendix B. Certifications 60
 - A 1. Regulatory Certifications 60
 - A 2. Product Safety Certifications..... 60
 - A 3. Electromagnetic Compatibility..... 61
 - A 4. Ergonomics, Acoustics and Hygienics..... 61
- Appendix C. Additional Information and Options 63

Tables

- Table 1. Comparison of PowerEdge T610 to T410 and T710.....8
- Table 2. Product Features Summary 11
- Table 3. Chassis Dimensions 13
- Table 4. Power Supply Status 15
- Table 5. Power Supply Specifications 21
- Table 6. Environmental Specifications..... 22
- Table 7. Acoustical Performance (2.5” HDD System)..... 24
- Table 8. Acoustical Performance (3.5” HDD System)..... 24
- Table 9. Intel Xeon Processor 5500 and 5600 Series Features..... 25
- Table 10. Supported Processors 26
- Table 11. Supported Hard Drives..... 38
- Table 12. Factory RAID Configurations 40
- Table 13. Storage Card Support Matrix..... 42
- Table 14. Graphics Video Modes 44
- Table 15. Supported Racks..... 46
- Table 16. Rail Adjustability Ranges and Depth 46
- Table 17. Unified Server Configurator Features and Description..... 51
- Table 18. Features List for Base Management Functionality, iDRAC, and vFlash Media 53
- Table 19. T610 Volatility Table 56
- Table 20. Product Safety Certifications..... 60

Table 21. Electromagnetic Compatibility Certifications..... 61
 Table 22. Ergonomics, Acoustics and Hygienics..... 62
 Table 23. Industry Standards 63

Figures

Figure 1. Front View (Tower Configuration) 14
 Figure 2. Front View (Rack Configuration) 14
 Figure 3. Back View 15
 Figure 4. Internal Chassis View 16
 Figure 5. Fans and Cooling Shroud 17
 Figure 6. LCD Control Panel..... 18
 Figure 7. Power Supplies 21
 Figure 8. Memory Channel Layout..... 29
 Figure 9. Dell 2.5” Hard Drive Carrier 39
 Figure 10. T610 ReadyRails Sliding Rails with Optional CMA 45
 Figure 11. 2U Threaded Rack Adapter Brackets Kit 46
 Figure 12. T610 Mounted in C1 Sliding Rails..... 47
 Figure 13. T610 CMA Mounted on the Side Opposite the Power Supplies (Recommended)..... 48

1 Product Comparison

1.1 Overview

The Dell™ PowerEdge™ T610 is a tower form-factor server designed to deliver the highest levels of performance, availability and expandability in a two-socket server. Featuring up to two powerful Intel® processors, the T610 offers large memory capacity, high I/O bandwidth and extensive storage capacity, satisfying today's compute requirements and also allowing it to grow as your business grows. The T610 features straightforward systems management to ease IT administration and energy efficiency to help manage power consumption and budget.

1.1.1 Customer-Inspired Design

Inspired by our customers, the T610 is built to simplify daily operations and maximize uptime. Logical component layout and power supply placement provide a straightforward installation and deployment experience. Dell PowerEdge servers provide a graphical and interactive LCD panel in the front of the server, used for monitoring system health, assessing alerts and performing configuration. The T610 has an AC power meter and ambient temperature thermometer built into the server which can be monitored on the display without any software tools. Moreover, the T610 takes advantage of Dell's system commonality. Once your IT managers learn one system, they understand how to manage all of Dell's 11th generation servers.

1.1.2 Energy Efficient

The T610 helps reduce power consumption while delivering higher performance than previous generations of Dell tower servers. Enhancements include the latest highly efficient, standards-based Energy Smart components, updated energy-efficient power supply units (PSUs) and power and thermal management that can be automated at the convenience of the system administrator. The T610 can help to reduce power consumption and budget and ease the day of the systems administrator as well.

1.1.3 Enhanced Virtualization

Featuring the Intel® Xeon® processor 5500 and 5600 series, up to 100% more memory capacity than the previous server generations, integrated I/O and embedded hypervisors, the Dell PowerEdge T610 delivers better overall system performance and greater virtual machine-per-server capacity than ever before.

With optional factory-integrated virtualization capabilities, tailored solutions can be created, allowing you to streamline deployment and reduce the time taken to deliver new solutions to your user base. For example, choose your hypervisor from market leaders such as VMware, Citrix and Microsoft, and enable virtualization with a few mouse clicks.

1.1.4 Easy to Manage

The Dell OpenManage™ portfolio of systems management offerings streamline and simplify operational tasks throughout the complete server lifecycle, from initial provisioning and deployment to ongoing monitoring, troubleshooting and problem resolution, to applying BIOS and driver updates and pulling administrative reports. Based on open standards, Dell OpenManage™ systems management capabilities can be applied locally and to remote systems, remaining available out-of-band, independent of the operating system (OS) state, and functional even in virtualized (hypervisor) environments. Designed to deliver comprehensive lifecycle management, the OpenManage portfolio

of systems management solutions help you to save time, save money and reduce the complexity of managing your IT infrastructure.

1.1.5 Dell Services

Dell Services can help reduce IT complexity, lower costs and eliminate inefficiencies by making IT and business solutions work harder for you. The Dell Services team takes a holistic view of your needs and designs solutions for your environment and business objectives, leveraging proven delivery methods, local talent, and in-depth domain knowledge.

1.2 Comparison

Table 1. Comparison of PowerEdge T610 to T410 and T710

Feature	T410	T610	T710
Processor	Intel Xeon processor 5500 and 5600 series	Intel Xeon processor 5500 and 5600 series	Intel Xeon processor 5500 and 5600 series
Front Side Bus	6.4 GT/s QuickPath Interconnect (QPI) links	6.4 GT/s QuickPath Interconnect (QPI) links	6.4 GT/s QuickPath Interconnect (QPI) links
Number of Sockets	2	2	2
Number of Cores	2, 4, or 6	2, 4, or 6	2, 4, or 6
L2/L3 Cache	4MB, 8MB, and 12MB	4MB, 8MB, and 12MB	4MB, 8MB, and 12MB
Chipset	Intel 5500	Intel 5520	Intel 5520
DIMMs	8 x DDR3	12 x DDR3	18 x DDR3
Min/Max RAM	1GB/128GB	1GB/192GB	1GB/192GB
Drive Bays	Optional hot-plug 6 x 2.5" or 6 x 3.5"	Hot-plug 8 x 2.5" or 8 x 3.5"	Hot-plug 16 x 2.5" or 8 x 3.5"
Hard Drive Types	SATA SSD, SAS, nearline SAS, SATA	SAS SSD, SATA SSD, SAS, nearline SAS, SATA	SAS SSD, SATA SSD, SAS, nearline SAS, SATA
External Drive Bays	2 x 5.25"	2 x 5.25"	2 x 5.25"
Embedded Hard Drive Controller	PERC H200, PERC H700, SAS 6/iR, PERC 6/i, PERC S100, PERC S300	PERC H200, PERC H700, SAS 6/iR, PERC 6/i, PERC S100, PERC S300	PERC H200, PERC H700, SAS 6/iR, PERC 6/i, PERC S100, PERC S300

Feature	T410	T610	T710
Optional Storage Controller	Non-RAID: SAS 5/E LSI 2032 (for tape backup unit only) 6Gbps SAS HBA RAID: SAS 6/iR PERC H200 PERC 6/i PERC H700 PERC 6/E PERC H800	Non-RAID: SAS 5/E LSI 2032 (for tape backup unit only) 6Gbps SAS HBA RAID: SAS 6/iR PERC H200 PERC 6/i PERC H700 PERC 6/E PERC H800	Non-RAID: SAS 5/E LSI 2032 (for tape backup unit only) 6Gbps SAS HBA RAID: SAS 6/iR PERC H200 PERC 6/i PERC H700 PERC 6/E PERC H800
Availability	Optional hot-plug hard drives Optional hot-plug redundant power ECC memory Memory mirroring Quad-pack LED or LCD diagnostic	Hot-plug hard drives Optional hot-plug redundant power Optional redundant cooling ECC memory Memory mirroring LCD diagnostic One dual-port embedded NIC with TOE	Hot-plug hard drives Optional hot-plug redundant power Hot-plug redundant cooling ECC memory Memory mirroring LCD diagnostic Two dual-port embedded NICs with TOE
Server Management	Baseboard Management Controller (BMC), IPMI 2.0, Dell OpenManage™ Optional: iDRAC6 Express, iDRAC6 Enterprise, vFlash media	Baseboard Management Controller (BMC), IPMI 2.0, Dell OpenManage™, iDRAC6 Express Optional: iDRAC6 Enterprise, vFlash media	Baseboard Management Controller (BMC), IPMI 2.0, Dell OpenManage™, iDRAC6 Express Optional: iDRAC6 Enterprise, vFlash media
I/O Slots	4 PCIe x8 (x4 routing) 1 PCIe x16 (x8 routing)	2 PCIe x8 3 PCIe x4 Gen 2	1 PCIe x16 4 PCIe x8 1 PCIe x4
NIC/LOM	Broadcom® BCM5716 2 x GbE Optional: various NICs available	Broadcom® BCM5709c 2 x GbE with TOE Optional: various NICs available	Broadcom® BCM5709c 4 x GbE with TOE Optional: various NICs available
USB	2 front, 4 back, 1 internal	2 front, 6 back, 1 internal	2 front, 6 back, 1 internal
Power Supplies	Non-redundant 525W or Optional hot-plug redundant 2 x 580W	Hot-plug redundant 2 x 570W (Energy Smart) or 2 x 870W (High-output)	Hot-plug redundant 2 x 1100W
Fans	Non hot-plug, non-redundant	Non hot-plug, optional redundant	Hot-plug redundant

2 Key Technologies

2.1 Overview

Key features of the PowerEdge T610 include dual Intel® Xeon® 5500 and 5600 series quad-core and six-core processors, DDR3 memory, Intel® 5520 I/O Hub (IOH) with QuickPath architecture, dual-port Gigabit Ethernet controller with TOE, PCI Express Generation 2, iDRAC6 with integrated video controller, internal SD Module, iDRAC6 Express, and optional iDRAC6 Enterprise.

2.2 Detailed Information

The Intel® Xeon® processor 5500 and 5600 series is designed specifically for servers and workstation applications. The processor features quad-core and six-core processing to maximize performance and performance/watt. Refer to section 6 for more details.

3 System Overview

Table 2 summarizes the features for the PowerEdge T610. For the latest information on supported features for the PowerEdge T610, visit Dell.com.

Table 2. Product Features Summary

Feature	Technical Specification	
Form Factor	Tower or 5U rack-mountable	
Processors	Latest quad-core or six-core Intel® Xeon® processors 5500 and 5600 series	
Processor Sockets	2	
Front Side Bus or HyperTransport	Intel® QuickPath Interconnect (QPI)	
Cache	Up to 12MB	
Chipset	Intel® 5520	
Memory ¹	Up to 192GB (12 DIMM slots/6 per-processor): 1GB/2GB/4GB/8GB/16GB DDR3 800MT/s, 1066MT/s or 1333MT/s	
I/O Slots	Two PCIe x8 Three PCIe x4 Gen2 One x4 storage slot	
RAID Controller	Internal Controllers: PERC H200 (6Gb/s) PERC H700 (6Gb/s) (non-volatile battery-backed cache: 512MB, 1GB) SAS 6/iR PERC 6/i (battery-backed cache: 256MB) PERC S100 (software based) PERC S300 (software based)	External Controllers: PERC H800 (6Gb/s) (non-volatile battery-backed cache: 512MB, 1GB) PERC 6/E (battery-backed cache: 256MB, 512MB) External HBAs (non-RAID): 6Gbps SAS HBA SAS 5/E HBA LSI2032 PCIe SCSI HBA
Drive Bays	8 x 2.5" hard drives or 8 x 3.5" hard drives Optional support for half-height tape backup unit	
Maximum Internal Storage	Up to 24TB	
Hard Drives ¹	Hot-plug Hard Drive Options: 2.5" SAS SSD, SATA SSD, SAS (15K, 10K), nearline SAS (7.2K), SATA (7.2K) 3.5" SAS (15K, 10K), nearline SAS (7.2K), SATA (7.2K)	

Feature	Technical Specification
Communications	<p>One dual-port embedded Broadcom® NetXtreme II™ 5709c Gigabit Ethernet NIC with failover and load balancing.</p> <p>Optional 1GBe and 10GBe Add-in NICs:</p> <p>Broadcom NetXtreme II 57711 Dual Port Direct Attach 10Gb Ethernet PCI-Express Network Interface Card with TOE and iSCSI Offload</p> <p>Intel® Gigabit ET Dual Port Server Adapter and Intel Gigabit ET Quad Port Server Adapter</p> <p>Dual Port 10GB Enhanced Intel Ethernet Server Adapter X520-DA2 (FCoE ready for future enablement)</p> <p>Brocade® CNA dual-port adapter</p> <p>Emulex® CNA iSCSI HBA stand up adapter OCE10102-IX-D Emulex CNA iSCSI HBA stand up adapter OCE10102-FX-D Brocade FC4 and 8 GB HBAs</p>
Power Supply	Two hot-plug redundant 570W (Energy Smart) or two hot-plug redundant 870W
Availability	DDR3 memory; ECC; hot-plug hard drives; optional hot-plug redundant power supplies; dual embedded NICs with failover and load balancing support; optional PERC6/i or PERC H700 integrated daughtercard controller with battery-backed cache; optional redundant cooling; toolless chassis; fibre and SAS cluster support; validated for Dell/EMC SAN
Video	Integrated Matrox® G200 with 8MB shared video memory
Remote Management	iDRAC6
Systems Management	Dell™ OpenManage™
Rack Support	ReadyRails™ sliding rails with optional cable management arm for 4-post racks (optional adapter brackets required for threaded hole racks)
Operating Systems	<p>Microsoft® Windows Server® 2012</p> <p>Microsoft Windows® Small Business Server 2011</p> <p>Microsoft Windows Small Business Server 2008</p> <p>Microsoft Windows Server 2008 SP2, x86/x64 (x64 includes Hyper-V®)</p> <p>Microsoft Windows Server 2008 R2 SP1, x64 (includes Hyper-V v2)</p> <p>Microsoft Windows HPC Server 2008</p> <p>Novell® SUSE® Linux Enterprise Server</p> <p>Red Hat® Enterprise Linux®</p> <p>Oracle® Solaris™</p> <p>Optional Embedded Hypervisors:</p> <p>Citrix® XenServer®</p> <p>VMware® vSphere® including ESX™ and ESXi™</p> <p>Red Hat Enterprise Virtualization®</p> <p>For more information on the specific versions and additions, visit Dell.com/OSsupport.</p>
Featured Database Applications	Microsoft® SQL Server® solutions (see Dell.com/SQL) Oracle® database solutions (see Dell.com/Oracle)
<p>¹GB 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 PowerEdge T610 is a tower or rack-mount (5U) chassis design that supports the following features:

- LCD control panel, bezel, and hard-drive carriers
- Toolless rack latches
- LOM0 and iDRAC MAC address labels
- Support for internal persistent storage:
 - Internal USB and SD card slots
 - One external vFlash media slot (on optional iDRAC6 Enterprise card)
- Updated efficient power supplies

4.2 Dimensions and Weight

Table 3 details the dimensions and weight for the PowerEdge T610 rack and tower configurations.

Table 3. Chassis Dimensions

Configuration	Height	Width	Depth	Weight (max config)	Weight (empty)
Rack	217.7mm (8.57in)	482.5mm (19in)	621mm (24.4in)	35kg (77lb)	20.2kg (44.53lb)
Tower	441mm (17.4in)	274mm (10.8in)	621mm (24.4in)	35kg (77lb)	20.2kg (44.30lb)

4.3 Front Panel View and Features

Figure 1 and Figure 2 show the front views of the PowerEdge T610.



Figure 1. Front View (Tower Configuration)



Figure 2. Front View (Rack Configuration)

See the Front-Panel Features and Indicators section in the About Your System chapter of the *PowerEdge T610 Hardware Owner's Manual* on Support.Dell.com for more information.

4.4 Back Panel View and Features

Figure 3 shows the back view of the PowerEdge T610.








Figure 3. Back View

See the Back-Panel Features and Indicators section in the About Your System chapter of the *PowerEdge T610 Hardware Owner's Manual* on Support.Dell.com for more information.

4.5 Power Supply Indicators

The PowerEdge T610 redundant power supplies have one status bi-color LED: green for AC power present and amber for a fault as detailed in Table 4.

Table 4. 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 T610 Hardware Owner's Manual* on Support.Dell.com for more information.

4.6 NIC Indicators

See the NIC Indicator Codes section in the About Your System chapter of the *PowerEdge T610 Hardware Owner's Manual* on Support.Dell.com for more information.

4.7 Internal Chassis Views

Figure 4 shows the internal view of the PowerEdge T610 server.

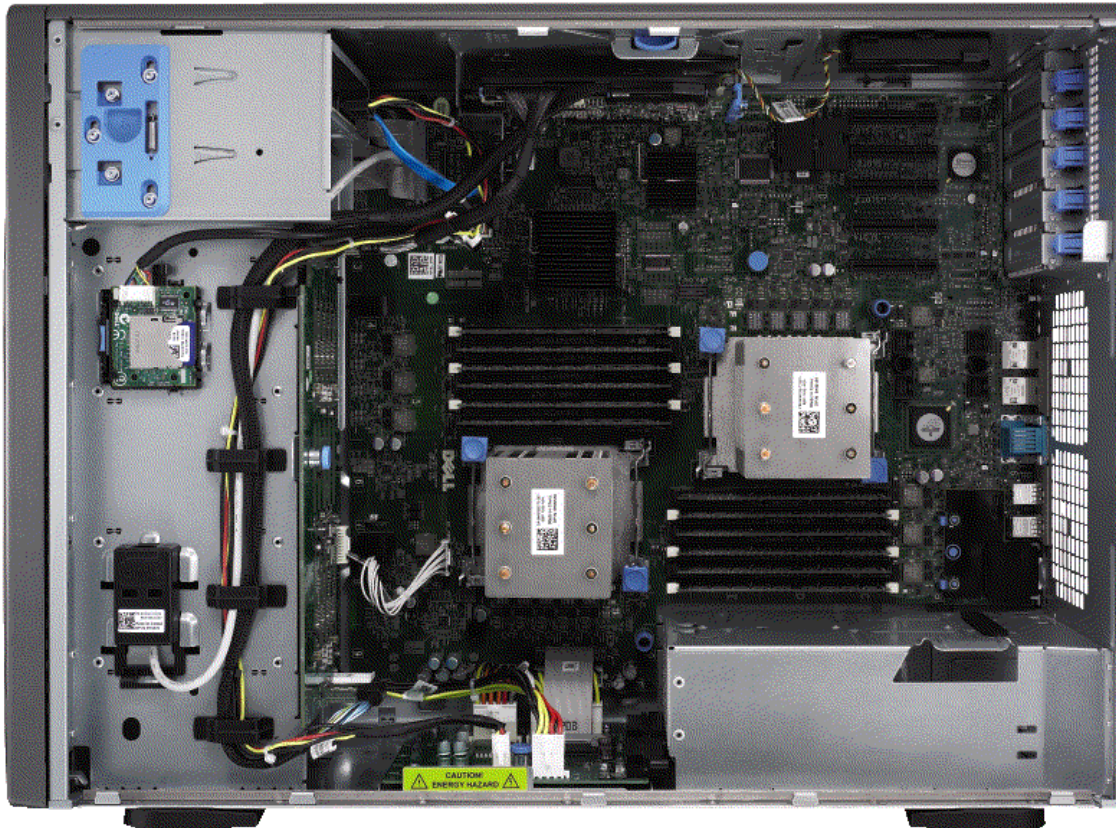


Figure 4. Internal Chassis View

4.8 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
- Tooled installation in 19" EIA-310-E compliant threaded hole 4-post racks (requires the 2U Threaded Rack Adapter Brackets Kit)
- Full extension of the system out of the rack to allow serviceability of key internal components
- Optional cable management arm (CMA)

See section 14 for more details.

4.9 Fans

Two or four 92 mm single-rotor fans are mounted in the back of the cooling shroud. Each fan has a single-wire harness that plugs into the planar fan connectors (FAN1 through FAN4). In a non-redundant configuration, two fans must be installed towards the back of the chassis.

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

The T610 power supply units have integrated fans. They are cooled by fans in the front section. The system requires a blank module in place of the empty power supply slot.

All system fans are pulse-width modulated (PWM) fans. Redundant cooling (optional) is supported.



Figure 5. Fans and Cooling Shroud

4.10 LCD Control Panel

The LCD control panel is located on the front of the system chassis to provide user access to buttons, display, and I/O interfaces. See Figure 6. The control panel includes the following features:

- ACPI-compliant power button with an integrated green power LED (controlled by iDRAC6)
- 128x20 pixel LCD with controls:
 - Two navigation buttons
 - Select button
 - System ID button
- Non-maskable Interrupt (NMI) button (recessed)
- Ambient temperature sensor



Figure 6. LCD Control Panel

The LCD panel is a graphics display controlled by the iDRAC6. Both iDRAC6 and BIOS can send error codes and messages to the display.

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

BIOS has the ability to enter a secure mode through Setup, which locks the Power and NMI buttons. When in this mode, the power button can still be used to turn on the server even when the power button is disabled in System Setup.

For more information on the LCD panel, see the LCD Panel Features section in the About Your System chapter in the *PowerEdge T610 Hardware Owner's Manual* on Support.Dell.com.

4.11 Security

For additional information regarding the following security features, see the *PowerEdge T610 Hardware Owner's Manual* on Support.Dell.com.

4.11.1 Cover Latch

The PowerEdge T610 comes with a tooled latch on the side cover of the system that secures it to the chassis. A locked bezel secures the cover latch.

4.11.2 Bezel

A metal bezel is mounted to the chassis. A lock on the bezel is used to protect un-authorized access to system hard drives and the control panel. System status on the LCD is viewable even when the bezel is installed.

The bezel is standard for both the T610 tower and rack systems.

4.11.3 Hard Drive

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

4.11.4 TPM

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

4.11.5 Power Off Security

The control panel is designed so 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.

4.11.6 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.

4.11.7 Secure Mode

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

4.12 USB Peripherals

The port on the control panel is for an optional USB key and is located inside the chassis. Some possible applications of the USB key are listed as follows:

- User custom boot and pre-boot OS for ease of deployment or diskless environments
- USB license keys for software applications like eToken™ or Sentinel Hardware Keys
- Storage of custom logs or scratch pads for portable user defined information (not hot-swappable)

4.13 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 ICH chip.

4.14 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 storage enclosure processor (SEP) and the power supply microcontroller are also used to store FRU data.

4.15 User Accessible Jumpers, Sockets, and Connectors

See the Jumpers and Connectors chapter in the *PowerEdge T610 Hardware Owner's Manual* on Support.Dell.com.

5 Power, Thermal, and Acoustic

5.1 Power Efficiencies

One of the main features of the Dell 11th generation servers is enhanced power efficiency. The T610 achieves higher power efficiency by implementing the following features:

- User-selectable power cap (subsystems 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
- Use of switching regulators instead of linear regulators
- Closed-loop thermal throttling
- Increased rear venting and 3D venting
- Pulse-width modulated (PWM) fans with an increased number of fan zones and configuration-dependent fan speeds
- Use of DDR3 memory (lower voltage compared to DDR2, UDIMM)
- Processor VR dynamic phase shedding
- Memory VR static phase shedding
- Random time interval for system start
- Ability for 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)
- Active Power Controller (BIOS-based CPU P-state manager)
- Ability to power down or throttle memory
- Option to disable a processor core
- Ability to turn off embedded NICs or PCIe lanes when not being used
- Option to run PCIe at Gen1 speeds instead of Gen2

5.2 Main Power Supply

The base redundant system consists of two hot-plug 570W Energy Smart (energy efficient) power supplies in a 1+1 configuration. A redundant 870W high-output power supply is also available.

The power supplies connect indirectly to the planar through the power distribution board (PDB). There is a power cable that connects the PDB to the backplane. Another cable also connects the PDB to the optical and tape drives.

Field replaceable unit (FRU) data is stored in the memory of the power supply microcontroller. Additionally, the power supply firmware can be updated by the iDRAC over the PMBus.

Power is soft-switched, allowing power cycling with a switch on the front of the system enclosure, or through software control (through server management functions).



Figure 7. Power Supplies

5.3 Power Supply Specifications

Table 5. Power Supply Specifications

Feature	Specification
Wattage	870 Watt (high output)
	570 Watt (Energy Smart)
Voltage	90-264 VAC, autoranging, 47-63Hz
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.

5.4 Heat Dissipation

High output (870W) power supply: 2968.6 BTU/hr maximum

Energy Smart (570W) power supply: 1944.9 BTU/hr maximum

5.5 Environmental Specifications

Table 6. Environmental Specifications

Fresh Air: temperature, humidity, altitude de-rating	
Continuous operation	<p>When operating in the expanded temperature range, system performance may be impacted, and ambient temperature warnings may be reported on the LCD and in the System Event Log.</p> <p>≤ 10% of annual operating hours: 5°C to 10°C and 35°C to 40°C (with no direct sunlight on the equipment) at 5% to 85% relative humidity with 26°C dew point (maximum wet bulb temperature). Outside the standard operating temperature (10°C to 35°C), the system can operate down to 5°C or up to 40°C for a maximum of 10% of its annual operating hours. For temperatures between 35°C and 40°C (95°F to 104°F), de-rate maximum allowable dry bulb temperature by 1°C per 175m above 950m (1°F per 319 ft above 3117 ft).</p> <p>≤ 1% of annual operating hours: -5°C to 5°C and 40°C to 45°C (with no direct sunlight on the equipment) at 5% to 90% relative humidity with 26°C dew point (maximum wet bulb temperature). Outside the standard operating temperature (10°C to 35°C), the system can operate down to -5°C or up to 45°C for a maximum of 1% of its annual operating hours. For temperatures between 40°C and 45°C (104°F to 113°F), de-rate maximum allowable dry bulb temperature by 1°C per 125m above 950m (1°F per 228 ft above 3117 ft).</p> <p>Expanded operation restrictions:</p> <ul style="list-style-type: none"> • No cold startup below 5°C • Maximum altitude for the operating temperature must be 3050m (10,000ft)
Expanded operation	-40° to 65°C (-40° to 149°F) with a maximum temperature gradation of 20°C per hour
Temperature	
Operating	See Fresh Air for temperature information
Storage	-40° to 65°C (-40° to 149°F) with a maximum temperature gradation of 20°C per hour
Relative Humidity	
Operating	See Fresh Air for humidity information
Storage	5% to 95% at a maximum wet bulb temperature of 33°C (91°F); atmosphere must be condensing at all times
Maximum Vibration	
Operating	0.26 Grms at 5-350Hz for 5 minutes in operational orientations
Storage	1.54 Grms at 10-250Hz for 10 minutes in all orientations
Maximum Shock	
Operating	Half sine shock in all operational orientations of 31 G 5% with a pulse duration of 2.6ms 10%
Storage	Half sine shock on all six sides of 71G 5% with a pulse duration of 2ms 10% Square wave shock on all six sides of 27G 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 de-rated 1°F/550ft
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 Dell.com/environmental_datasheets.

5.6 Power Consumption Testing

Feature	Energy Smart Power Supply	High Output Power Supply
Dimensions	L-206.4mm ¹ x W-67.5mm x H-76.5mm	
Status Indicators	1 x bi-color Light Emitting Diode	
Integrated Fans	1 x 60mm	
Fixed Input Plug	IEC-C14	
AC Cord Rating	15 Amps @ 120 VAC, 10 Amps @ 240 VAC	
Input Voltage	90 – 264VAC	
Auto-ranging	Yes	
Line Frequency	47 – 63Hz	
Maximum Inrush Current	55 Amps per supply for 10ms or less	
Hot-Swap Capability	Yes	
Output Power	570 Watts	870 Watts
Maximum Heat Dissipation	1944.9 BTU per hour	2968.6 BTU per hour
Efficiency (20% - 100% Load)	86.9 – 90.5% @ 115 VAC 88 – 92% @ 230 VAC	85 – 88% @ 115 VAC 87 – 90% @ 230 VAC

¹ Does not include the power supply handle or ejection tab

5.7 Maximum Input Amps

Maximum input current (high-output power supply):

- 12A @ 90 VAC
- 6A @ 180 VAC

Maximum input current (Energy Smart power supply):

- 7.8A @ 90 VAC
- 3.9A @ 180 VAC

5.8 Energy Smart Enablement

The 11G family of PowerEdge servers implements aspects of the Dell Energy Smart strategy. This strategy offers the following:

- Energy Smart components on a portfolio level, such as high-capacity and Energy Smart power supplies
- Systems with either a lowest power footprint configuration or a best performance per watt configuration
- Energy Smart components (such as DIMMs or hard drives) selected without cherry picking or screening individual manufacturer's components based on energy consumption

5.9 ENERGY STAR Compliance

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

5.10 Acoustics

The acoustical design of the PowerEdge T610 reflects adherence to Dell's high sound quality standards. Sound quality is different from sound power level and sound pressure level in that it describes how humans respond to annoyances in sound, like whistles, hums, etc. One of the sound quality metrics in the Dell specification is prominence ratio of a tone as shown in Table 7 and Table 8.

Table 7. Acoustical Performance (2.5" HDD System)

Typical Configuration @ 23 ± 2 °C				Operating Mode	L _{WA} -UL (Bels)	L _{pA} (dBA)	Prominent Tones
CPUs	HDDs	Power Supplies	Optical Drive				
2	4	2	1	Idle	5.2	36	None
				HDD Active	5.3	37	None

Table 8. Acoustical Performance (3.5" HDD System)

Typical Configuration @ 23 ± 2 °C				Operating Mode	L _{WA} -UL (Bels)	L _{pA} (dBA)	Prominent Tones
CPUs	HDDs	Power Supplies	Optical Drive				
2	4	2	1	Idle	5.6	38	None
				HDD Active	5.7	40	None

The acoustical specification for the T610 is Category III-C.

Definitions

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

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

L_{WA}-UL: The upper limit sound power level (L_{WA}) calculated per section 4.4.2 of ISO 9296 (1988) and measured in accordance to ISO7779 (1999).

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

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

6 Processors

6.1 Overview

The Intel® Xeon® processor 5500 and 5600 series 2S is the microprocessor designed specifically for servers and workstation applications. The Intel Xeon processor 5500 series features quad-core processing to maximize performance and performance/watt for data center infrastructures and highly dense deployments. The Intel 5600 series features six-core processing, offering enhanced system-level performance, virtualization, and energy efficiency. The Intel Xeon processor also feature Intel's Core™ micro-architecture and Intel 64 architecture for flexibility in 64-bit and 32-bit applications and operating systems.

The Intel Xeon processor uses a 1366-contact Flip-Chip Land Grid Array (FC-LGA) package that plugs into a surface mount socket. The PowerEdge T610 provides support for up to two processors.

Table 9. Intel Xeon Processor 5500 and 5600 Series Features

Feature	5500 Series	5600 Series
Number of Cores	4	6
Last Level Cache	8MB shared	12MB shared
Multi-processor support	1-2 processors	1-2 processors
Front Side Bus (FSB) (MT/s)/ Link Frequency (GT/s)	Up to 6.4 GT/s	Up to 6.4 GT/s
Max Thermal Design Power (TDP)	130W (workstation) 95W (server)	130W (workstation) 95W (server)
Max Frequency	>3GHz	>3GHz
Memory Controller	Integrated 3-channel DDR3	Integrated 3-channel DDR3
Process Technology	45nm	32nm
Intel® Trusted Execution Technology	No	Yes
Intel® Advanced Encryption Security- New Instructions	No	Yes
Intel® Virtualization Technology	Yes	Yes
Intel® 64	Yes	Yes
Intel® Hyper-Threading Technology	Yes	Yes
Socket	LGA1366	LGA1366

6.2 Features

Key features of the Intel Xeon processor 5500 and 5600 series include:

- Two, four, or six cores per processor

- Two point-to-point QuickPath Interconnect links at 6.4 GT/s
- 1366-pin FC-LGA package
- 32 nm and 45 nm process technology
- No termination required for non-populated processors (must populate CPU socket 1 first)
- Integrated QuickPath DDR3 memory controller 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
- Ability to executes up to four instructions per clock cycle
- Simultaneous Multi-Threading (SMT) capability
- Support for CPU Turbo Mode (on certain processors)—increases processor frequency if operating below thermal, power, and current limits for streaming SIMD (Single Instruction, Multiple Data) Extensions 2, 3, and 4
- Intel 64 Technology 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
- Support for DDR3L, 1.35V DIMMs for even lower system power (5600 series)
- Support for memory sparing (5600 series)
- AES-NI (hardware encryption assist) for more efficient encryption for uses such as online transactions SSL (5600 series)
- Intel TXT (Trusted Execution Technology) provides hardware assisted protection against emerging software attacks (5600 series)

6.3 Supported Processors

For the latest information on supported processors for the PowerEdge T610, visit Dell.com.

Table 10. Supported Processors

Model	Speed	Power	Cache	Cores	QPI Speed
X5680	3.33GHz	130W	12M	6	6.4GT/s
X5670	2.93GHz	95W	12M	6	6.4GT/s
X5660	2.80GHz	95W	12M	6	6.4GT/s
X5650	2.66GHz	95W	12M	6	6.4GT/s
L5640	2.26GHz	60W	12M	6	5.86GT/s
X5677	3.46GHz	130W	12M	4	6.4GT/s
X5667	3.06GHz	95W	12M	4	6.4GT/s
E5640	2.66GHz	80W	12M	4	5.86GT/s
E5630	2.53GHz	80W	12M	4	5.86GT/s
L5630	2.13GHz	40W	12M	4	5.86GT/s
E5620	2.40GHz	80W	12M	4	5.86GT/s
L5609	1.86GHz	40W	12M	4	4.8GT/s
X5560	2.80GHz	95W	8M	4	6.4GT/s

Model	Speed	Power	Cache	Cores	QPI Speed
E5530	2.40GHz	80W	8M	4	5.86GT/s
L5520	2.26GHz	60W	8M	4	5.86GT/s
E5507	2.26GHz	80W	4M	4	4.8GT/s
E5506	2.13GHz	80W	4M	4	4.8GT/s
E5503	2.00GHz	80W	4M	2	4.8GT/s

6.4 Processor Configurations

6.4.1 Single Processor Configuration

The PowerEdge T610 is designed so that a single processor placed in the CPU1 socket functions normally. The system will halt during power-on self-test (POST) if a single processor is placed in the CPU2 socket. If using a single processor, the T610 requires a heatsink blank in the CPU2 socket for thermal reasons.

6.4.2 Processor Power Voltage Regulation Modules (EVRD 11.1)

Voltage regulation to the Intel Xeon processor 5500 and 5600 series 2S is provided by EVRD (Enterprise Voltage Regulator-Down). EVRDs are embedded on the planar. Processor core voltage is not shared between processors. EVRDs support static phase shedding and power management via the PMBus.

6.5 Processor Installation

Refer to the Processors section in the Installing System Components chapter of the *Dell PowerEdge T610 Systems Hardware Owner's Manual* on Support.dell.com for processor installation and removal instructions.

7 Memory

7.1 Overview

The PowerEdge T610 utilizes DDR3 memory, providing a high performance, high-speed memory interface capable of low latency response and high throughput. The T610 supports Registered ECC DDR3 DIMMs (RDIMM) or Unbuffered ECC DDR3 DIMMs (UDIMM).

Key features of the T610 memory system include:

- Registered (RDIMM) and Unbuffered (UDIMM) DDR3 technology
- Each channel carries 64 data and eight ECC bits
- Support for up to 192 GB of RDIMM memory (twelve 16 GB RDIMMs)
- Support for up to 24 GB of UDIMM memory (twelve 2 GB UDIMMs)
- Support for 1066/1333MT/s single and dual rank DIMMs
- Support for 1066MT/s quad rank DIMMs
- Support for 1.35V low voltage (LV) DIMMs with 5600 series processors
- Single DIMM configuration with DIMM at socket DIMM A1
- Support ODT (On Die Termination)
- Clock gating (CKE) to conserve power when DIMMs are not accessed
- DIMMs will enter a low power self-refresh mode
- I²C access to SPD EEPROM and thermal sensors
- Single Bit Error Correction
- SDDC (Single Device Data Correction, x4 or x8 devices)
- Multi Bit Error Detection
- Support for Closed Loop Thermal Management on RDIMMs and UDIMMs
- Support for Advanced ECC mode
- Support for Memory Optimized mode
- Support for Memory Mirroring
- Support for Memory Sparring with 5600 series processors

7.2 DIMMs Supported

The DDR3 memory interface consists of three channels with up to two RDIMMs or UDIMMs per channel for single- or dual-rank and up to two RDIMMs per channel for quad-rank. The interface uses 2GB, 4GB, 8GB, or 16GB RDIMMs. Also supported are 1GB or 2GB UDIMMs.

7.2.1 Memory Modes

The memory mode is dependent on how the memory is populated in the system, according to the following configurations:

- Three channels per processor populated identically
 - Typically, the system will be set to run in Memory Optimized (Independent Channel) mode in this configuration.
 - This mode offers the most DIMM population flexibility and system memory capacity, but offers the least number of RAS (reliability, availability, service) features.
 - All three channels must be populated identically.
- The first two channels per processor populated identically with the third channel unused

- Typically, two channels operate in Advanced ECC (Lockstep) mode with each other by having the cache line split across both channels.
- This mode provides improved RAS features (SDDC support for x8-based memory).
- For memory mirroring, two channels operate as mirrors of each other (writes go to both channels and reads alternate between the two channels).
- For Memory Mirroring, two channels operate as mirrors of each other—writes go to both channels and reads alternate between the two channels.
- One channel per processor populated
 - This is a simple Memory Optimized mode.
 - Mirroring is not supported.

7.2.2 DIMM Population Rules

The following DIMM population rules apply:

- If DIMMs of different speeds are mixed, all channels will operate at the fastest common frequency. RDIMMs and UDIMMs cannot be mixed.
- If memory mirroring is enabled, identical DIMMs must be installed in the same slots across both channels.
- The third channel of each processor is unavailable for memory mirroring.
- The T610 supports up to 12 DIMMs. DIMMs must be installed in each channel starting with the DIMM slot farthest from the processor. Population order is identified by the silkscreen designator and the System Information Label (SIL) located on the chassis cover.
- DIMM slot population for each memory mode is listed as follows:
 - Memory Optimized: [1, 2, 3], [4, 5, 6]
 - Advanced ECC or Mirrored: [2, 3], [5, 6]
 - Quad Rank or UDIMM: [1, 2, 3], [4, 5, 6]

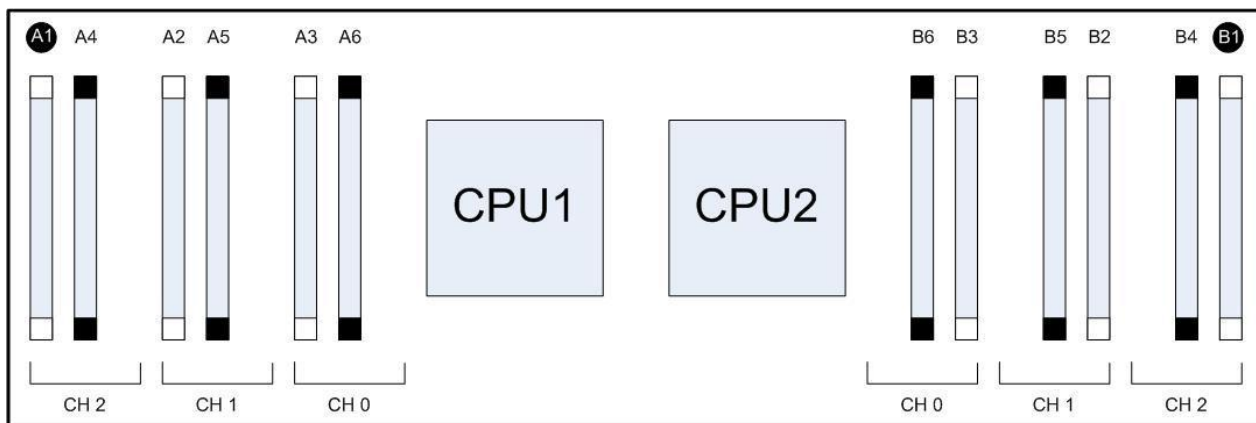


Figure 8. Memory Channel Layout

7.3 Speed

The memory frequency is determined by a variety of inputs:

- Speed of the DIMMs
- Speed supported by the processor
- Configuration of the DIMMs

The memory speed of each channel depends on the memory configuration:

- For single- or dual-rank memory modules:

- One memory module per channel supports up to 1333MT/s
- Two memory modules per channel supports up to 1066MT/s
- For quad-rank memory modules:
 - One memory module per channel supports up to 1066MT/s
 - Two memory modules per channel are limited to 800MT/s, regardless of memory module speed

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

For quad-rank DIMMs mixed with single- or dual-rank DIMMs, the quad-rank DIMM must be installed in the slot with the white ejection tabs (the first DIMM slot in each channel). There is no requirement for the order of single- and dual-rank DIMMs.

7.4 DIMM Slots

The PowerEdge T610 has 12 DIMM slots for memory. It does not have any riser cards for DIMM population.

The first DIMM slot in each channel is color-coded with white ejection tabs for ease of installation. The DIMM sockets are placed 450 mils (11.43 mm) apart, center-to-center to provide enough space for sufficient airflow to cool stacked DIMMs.

7.5 Low Voltage DIMMs

With the introduction of the Intel® Xeon® processor 5600 series, low voltage (LV) DIMMs have been added for selected memory configurations for the PowerEdge T610. Only this processor series supports operating DIMMs at the lower voltage (1.35V, also referred to as DDR3L). The Intel Xeon 5500 processor series does not support low voltage operation. However, they can be operated at 1.5V. Therefore, DDR3L DIMMs can be used in systems with either processor series, and the platform will automatically choose the appropriate operating voltage based on the processor populated.

LV DIMMs operate at 1.35V, creating power savings vs. standard memory which operates at 1.5V. In order to achieve power savings, all DIMMs in the system must be of the LV type. If the system detects a mixture of standard and LV DIMMs, the BIOS will operate all memory at 1.5V. When operating at the lower voltage, additional frequency and population restrictions can take effect. For example, 3 DIMMs per channel operation is not supported at low voltage.

The DDR3L standard is completely backward compatible at standard voltage. DDR3L DIMMs can operate at 1.5V without any limitations beyond standard voltage DDR3 DIMMs. As part of the addition of LV DIMMs, the platform has certain default behaviors. Whenever possible, if there is no performance degradation, the platform will default to 1.35V operation when using DDR3L DIMMs. In certain cases, where a configuration is populated that cannot support 1.35V or a performance degradation would result, the platform defaults to 1.5V operation. There are also options to override default voltage within allowed limits.

7.6 Mirroring

The T610 system supports memory mirroring if identical memory modules are installed in the two channels closest to the processor (memory not installed in the farthest channel). Mirroring must be enabled in the System Setup program. In a mirrored configuration, the total available system memory is one-half of the total installed physical memory.

7.7 Sparing

Systems with the Intel Xeon processor 5600 series support memory sparing. Sparing requires identical memory installed in all three channels. One of the three channels is considered the Spare Channel, and two-thirds of the total installed memory is usable and is the amount reported during POST and in BIOS setup.

7.8 Memory Scrubbing

The T610 memory interface supports memory demand and patrol scrubbing, single-bit correction and multi-bit error detection. Correction of a x4 or x8 device failure is also possible with (SDDC) in the Advanced ECC mode. Additionally, correction of a x4 device failure is possible in the Memory Optimized mode.

7.9 Advanced ECC (Lockstep) Mode

In this configuration, the two channels closest to the processor are combined to form one 128-bit channel. This mode supports SDDC for both x4- and x8-based memory modules. Memory modules must be identical in size, speed and technology in corresponding slots.

7.10 Optimizer (Independent Channel) Mode

In Optimizer (Independent Channel) mode, all three channels are populated with identical memory modules. This mode permits a larger total memory capacity but does not support SDDC with x8-based memory modules.

A minimal single-channel configuration of 1 GB memory modules per processor is also supported in this mode.

7.11 Supported Configurations

See the System Memory section in the Installing System Components chapter in the *Dell PowerEdge T610 Systems Hardware Owner's Manual* on Support.dell.com.

8 Chipset

8.1 Overview

The PowerEdge T610 planar incorporates the Intel® Xeon® 5520 processor series chipset for I/O and processor interfacing. This chipset is designed to support the Intel Xeon 5500 and 5600 processor series family, QuickPath Interconnect, DDR3 memory technology, and PCI Express Generation 2. The chipset consists of the Intel 5520 chipset I/O Hub (IOH) and ICH9.

8.2 Intel I/O Hub (IOH)

The planar uses the Intel 5520 chipset IOH to provide a link between the Intel Xeon processor series 5500 and 5600 processor(s) and the I/O components. The main components of the IOH consist of two full-width QuickPath Interconnect links (one to each processor), 36 lanes of PCI Express Gen2, a x4 Direct Media Interface (DMI), and an integrated IOxAPIC.

8.3 IOH QuickPath Interconnect (QPI)

The QuickPath Architecture consists of serial point-to-point interconnects for the processors and the IOH. The T610 has a total of three QuickPath Interconnect (QPI) links—one link connecting the processors, and multiple links connecting both processors with the IOH. 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 implemented in the IOH and processors features four layers:

- **Physical layer**—Consists of the actual connection between components. Supports Polarity Inversion and Lane Reversal for optimizing component placement and routing.
- **Link layer**—Responsible for flow control and the reliable transmission of data.
- **Routing layer**—Responsible for the routing of QPI data packets.
- **Protocol layer**—Responsible for high-level protocol communications, including the implementation of a MESIF (Modify, Exclusive, Shared, Invalid, Forward) cache coherence protocol.

8.4 Intel Direct Media Interface (DMI)

The DMI connects the Intel 5520 chipset 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 PCI Express

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

The IOH has two x2 PCIe Gen2 ports (1 GB/s) and eight x4 PCIe Gen2 ports (2GB/s). The x2 ports can be combined as a x4 link; however, this x4 link cannot be combined with any of the other x4 ports. Two neighboring x4 ports can be combined as a x8 link, and both resulting x8 links can combine to form a x16 link.

8.6 Intel I/O Controller Hub 9 (ICH9)

ICH9 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 (ports are unused on T610)
- PCI Bus 32-bit Interface Rev 2.3 running at 33MT/s
- Up to six Serial ATA (SATA) ports with transfer rates up to 300MB/s (T610 features two SATA port for optional internal optical drive or tape backup)
- Six UHCI and two EHCI (high-speed 2.0) USB host controllers, with up to twelve USB ports
- Eight external USB ports and two internal ports dedicated for Unmanaged Internal Persistent Storage (UIPS)
- Power management interface (ACPI 3.0b compliant)
- 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 (T610 BIOS is connected to the ICH9 using SPI)

9 BIOS

9.1 Overview

The PowerEdge T610 BIOS is based on the Dell BIOS core and supports the following features:

- Simultaneous Multi-Threading (SMT) support
- Processor Turbo Mode support
- PCI 2.3 compliant
- Plug and Play 1.0a compliant
- MP (Multiprocessor) 1.4 compliant
- Ability to 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 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 Extensible Firmware Interface (UEFI) 2.1 support
- Power management support including DBS, Power Inventory and multiple power profiles
- Intel TXT (5600 processor series)
- Intel AESNI (5600 processor series)

The T610 BIOS does not support the following:

- BIOS language localization
- BIOS recovery after bad flash (can be recovered from iDRAC6 Express)

9.2 Supported ACPI States

Advanced Configuration and Power Interface (ACPI) is a standard interface for enabling the operating system to direct configuration and power management.

The Intel Xeon processor 5500 and 5600 series supports the following C-States: C0, C1, C1E, C3, and C6. The T610 supports all of the available C-States.

9.3 I²C (Inter-Integrated Circuit)

I²C is a simple bi-directional two-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. This design concept solves the many interfacing problems encountered when designing digital control circuits. These I²C devices perform communication functions between intelligent control devices (such as microcontrollers), general-purpose circuits (such as LCD drivers, remote I/O ports, memories) and application-oriented circuits.

The PowerEdge T610 BIOS accesses the I²C through the ICH9 (Intel I/O Controller Hub 9). There are two multiplexers (MUX) on the ICH9 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, and USB Hub through four split segments.

BIOS controls both the MUXes 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)

The PowerEdge T610 has an embedded dual-port Gigabit Ethernet controller with TCP Offload Engine (TOE) support. The embedded Broadcom® 5709C dual-port LAN controller is on the T610 planar as an independent Gigabit Ethernet interface device. The following information details the features of the LAN device:

- x4 PCI Express Gen2 capable interface (controller operated at Gen1 speed)
- Integrated MAC and PHY
- 3072x18 Byte context memory
- 64 KB receive buffer
- TOE (TCP Offload Engine)
- iSCSI controller (enabled through optional hardware key)
- 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

11 PCI Slots

11.1 Overview

The PowerEdge T610 has five PCI Express expansion slots and one dedicated storage slot, which are detailed as follows:

- Two x8 PCIe Gen2 slots for full-height full-length cards connected to the IOH
- Three x4 PCIe Gen2 slots for full-height half-length cards connected to the IOH
- One x4 PCIe Gen1 slot for a dedicated storage controller card connected to the IOH

The system supports 25W maximum power for the first two PCIe cards and 15W for the third, fourth, and fifth PCIe cards. The lower-power support on the third, fourth, and fifth cards is due to system thermal limitations and not due to system power requirements.

The system does not support hot-plugging or hot-removal of PCI Express cards.

For more information on installing expansion cards and expansion-card priority, see the Expansion Cards and Expansion-Card Risers section in the Installing System Components chapter of the *Dell PowerEdge T610 Systems Hardware Owner's Manual* on Support.Dell.com.

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 T610 Systems Hardware Owner's Manual* on Support.Dell.com.

11.3 PCI Card Dimensions

For information about PCIe slots and card dimensions, see the Expansion Cards and Expansion-Card Risers section in the Installing System Components chapter in the *Dell PowerEdge T610 Systems Hardware Owner's Manual* on Support.Dell.com.

12 Storage

12.1 Overview

The PowerEdge T610 is available in two different hard-drive configurations:

- 8 x 2.5" hard drives
- 8 x 3.5" hard drives

Each configuration has a unique chassis and hard-drive backplane. Both chassis have eight hot-swap-capable Serial Attached SCSI (SAS) or Serial ATA (SATA) slots with two LED indicators per slot, two mini-SAS cable connectors for connecting the backplane to the integrated SAS 6/iR (PERC H200) or PERC 6/i (PERC H700), a 10-pin planar signal connector, and an 8-pin PDB power connector.

For SATA and SAS mixing, two SAS drives (in bay 0 and 1) are supported with the 2.5" or 3.5" backplane. In this configuration, one pair of drives will be SAS and the remaining six drives will be SATA.

12.2 Internal Hard Disk Drives

The T610 system supports up to eight 2.5" or 3.5" hard disk drives. See Table 11 for information on supported hard drives. For the most up-to-date information on supported hard drives, visit Dell.com.

Table 11. Supported Hard Drives

Form Factor	Capacity	Speed	Type
2.5"	160GB, 250GB, 500GB, 1TB	7.2K	SATA
2.5"	500GB, 1TB	7.2K	NL SAS
2.5"	146GB, 300GB, 600GB, 900GB	10K	SAS
2.5"	73GB, 146GB	15K	SAS
2.5"	50GB, 100GB	N/A	SATA SSD
2.5"	149GB	N/A	SAS SSD
3.5"	250GB, 500GB, 1TB, 2TB, 4TB	7.2K	SATA
3.5"	500GB, 1TB, 2TB, 3TB	7.2K	NL SAS
3.5"	146GB	10K	SAS
3.5"	146GB, 300GB, 450GB, 600GB	15K	SAS

The following additional guidelines apply for hard-drive configurations:

- Up to eight SAS or up to eight SATA drives are supported
- For SAS and SATA mixing, two SAS and up to six SATA drives are possible (two SAS drives must be installed in slots 0 and 1)
- One mixed 2.5" and 3.5" hard drive configuration is allowed:
 - A pair of 2.5" 10,000 rpm SAS drives must be installed with an adapter in a 3.5" hard drive carrier in drive slots 0 and 1

- The remaining hard drives must be 3.5" hard drives and must be either all SAS or all SATA
- Solid state drives (SSDs) require the PERC 6/i (PERC H700) integrated storage controller and cannot be mixed with any other type of hard drive

12.2.1 Hard Disk Drive Carriers

The T610 supports the Dell 2.5" and 3.5" hard drive carriers. See Figure 9.



Figure 9. Dell 2.5" Hard Drive Carrier

12.2.2 Empty Drive Bays

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.

The T610 does not support diskless configuration.

12.2.3 Hard Drive 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 T610 Systems Hardware Owner's Manual* on Support.Dell.com.

12.3 RAID Configurations

See Table 12 for information on factory RAID configurations. For information on additional configurations, visit Dell.com.

Table 12. Factory RAID Configurations

				Non-Mixed Drives All SATA, all SAS, or all SSD	
Configuration Type	Configuration		Description	Min HDD	Max HDD
SAS/SATA— No RAID	0	MSS	Integrated SAS/SATA No RAID (SAS 6/iR, PERC H200)	2.5" = 1 3.5" = 1	2.5" = 8 3.5" = 8
				Non-Mixed Drives All SATA, all SAS, or all SSD	
Configuration Type	Configuration		Description	Min HDD	Max HDD
SAS/SATA— RAID	1	MSSR0	Integrated SAS/SATA RAID 0 (SAS 6/iR, PERC H200, PERC6/i, PERC H700)	2.5" = 1 3.5" = 1	2.5" = 8 3.5" = 8
	2	MSSR1	Integrated SAS/SATA RAID 1 (SAS 6/iR, PERC H200, PERC6/i, PERC H700)	2.5" = 2 3.5" = 2	2.5" = 2 3.5" = 2
	3	MSSR5	Integrated SAS/SATA RAID 5 (PERC 6/i, PERC H700)	2.5" = 3 3.5" = 3	2.5" = 8 3.5" = 8
	4	MSSR6	Integrated SAS/SATA RAID 6 (PERC 6/i, PERC H700)	2.5" = 4 3.5" = 4	2.5" = 8 3.5" = 8
	5	MSSR10	Integrated SAS/SATA RAID 10 (PERC 6/i, PERC H700)	2.5" = 4 3.5" = 4	2.5" = 8 3.5" = 8
	6	MSSR1R1	Integrated SAS/SATA RAID 1/RAID 1 (SAS 6/iR, PERC H200, PERC 6/i, PERC H700)	2.5"=2+2 3.5"=2+2	2.5" = 2+2 3.5" = 2+2
	7	MSSR1R5	Integrated SAS/SATA RAID 1/RAID 5 (PERC 6/i, PERC H700)	2.5"=2+3 3.5"=2+3	2.5" = 2+6 3.5" = 2+6
SSD—RAID	12	MSSR1	Integrated SSD RAID 1 (PERC 6/i, PERC H700)	2.5"=2 3.5"=N/A	2.5"=2 3.5"=N/A
				Non-Mixed Drives All SATA, all SAS, or all SSD	
Configuration Type	Configuration		Description	Min HDD	Max HDD
SSD—RAID	13	MSSR5	Integrated SSD RAID 5 (PERC 6/i, PERC H700)	2.5" = 3 3.5"=N/A	2.5" = 8 3.5"=N/A
	14	MSSR10	Integrated SSD RAID 10 (PERC 6/i, PERC H700)	2.5" = 4 3.5"=N/A	2.5" = 8 3.5"=N/A

				Mixed SATA + SAS Min 2xSAS + 1xSATA 2.5" = Max 2xSAS + 6xSATA 3.5" = Max 2xSAS + 6xSATA	
Configuration Type	Configuration		Description	Min HDD	Max HDD
SAS + SATA— No RAID	8	MSS-X	Integrated SAS/SATA No RAID (SAS 6/iR, PERC H200)	2.5" = 3 3.5" = 3	2.5" = 6 3.5" = 6
SAS + SATA— RAID	9	MSSR1R1-X	Integrated SAS/SATA RAID 1/RAID 1 (SAS 6/iR, PERC 6/i, PERC H200, PERC H700)	2.5" = 2+2 3.5" = 2+2	2.5" = 2+2 3.5" = 2+2
	11	MSSR1R5-X	Integrated SAS/SATA RAID 1/RAID 5 (PERC 6/i, PERC H700)	2.5" = 2+3 3.5" = 2+3	2.5" = 2+6 3.5" = 2+6
				Mixed SSD + SAS Min 2xSSD + 1xSAS 2.5" = Max 2xSSD + 6xSAS	
Configuration Type	Configuration		Description	Min HDD	Max HDD
SSD + SAS— RAID	15	MSSR1R5-X	Integrated SSD/SAS RAID 1/RAID 5 (PERC 6/i, PERC H700)	2.5" = 2+3 3.5" = N/A	2.5" = 2+6 3.5" = N/A

12.4 Storage Controllers

12.4.1 SAS 6/iR

The T610 internal SAS 6/iR HBA is an expansion card that installs into the dedicated internal storage slot. It incorporates two four-channel SAS IOCs for connection to SAS or SATA hard disk drives. It is designed in a form factor that allows the same card to be used in the PowerEdge T610 and PowerEdge T610.

12.4.2 PERC 6/i

If you want an internal RAID solution, select the PERC 6/i or PERC H700. The PERC 6/i uses the LSI 1078 ROC (RAID on Chip) processor with a PCI Express host interface and DDR2 memory, and it installs into the dedicated internal storage slot. A battery is also available for backup.

12.4.3 PERC H200

The H200 SAS HBA is an expansion card that installs into the dedicated internal storage slot. It incorporates two four-channel 6 Gb/s SAS IOCs for connection to SAS hard disk drives. It is designed in a form factor that allows the same card to be used in other 11G 2U rack-form factor platforms.

12.4.4 PERC H700

If you want an internal RAID solution, select the PERC H700 or PERC 6/i. The PERC H700 card has its own processor with a PCI Express Gen2 host interface and DDR2 memory and installs into the dedicated internal storage slot. A battery is also available for backup. It supports the internal 6 Gb/s backplane interface for internal storage options (SAS, SATA, or SSD HDD). The PowerEdge T610 supports both 256MB and 512MB cache options on the internal H700.

Table 13. Storage Card Support Matrix

	Product	Usage	T610 Support	Slot	PCIe Con	PCI Bracket	I/O Con	RAID	Battery Backup
PERC SAS/SATA	PERC 6/i Integrated (PERC H700)	Internal Backplane Storage (HDD, SSD)	Yes—Max 1	Storage slot	x8	No	x4 int x4 int	0, 1, 5, 6, 10, 50, 60	Yes
	PERC 6/E Adapter (PERC H800)	External SAS / SATA Storage	Yes—Max 2 (MD1000 and MD1020)	PCIe slot	x8	Yes	x4 ext x4 ext	0, 1, 5, 6, 10, 50, 60	Yes
	PERC 5/E Adapter	External Legacy Storage	Yes—Max 2 (MD1000 only)	PCIe slot	x8	Yes	x4 ext x4 ext	0, 1, 5, 10, 50	Yes
SAS HBA SAS/SATA	SAS 6/iR Integrated (PERC H200)	Internal Backplane Storage (No tape or SSD support)	Yes—Max 1	Storage slot	x8	No	x4 int x4 int	0, 1	No
	SAS 5/iR Adapter	Internal SAS tape	Yes—Max 2	PCIe slot	x8	Yes	x4 int	N/A	No
	SAS 5/E Adapter (SAS 6G HBA)	External SAS (DAS, tape)	Yes—Max 2	PCIe slot	x8	Yes	x4 ext x4 ext	None	No
ICH SATA	On Planar via chipset	Internal SATA optical/tape (No HDD)	Yes—2 ports for Optical and/or Tape	N/A	N/A	N/A	x1 int	N/A	N/A
LSI SCSI	LSI 2032 Adapter	Internal/External SCSI tape or external legacy SCSI storage	Yes—Max 2	PCIe slot	x4	Yes	x1 int x1 ext	N/A	N/A

A maximum of 2 external storage controllers (Dell PERC and SAS cards) are allowed in the system in addition to the integrated storage controller.

12.5 Optical Drives

Optical drives are optional in all PowerEdge T610 systems and connect to the planar through the SATA interface. The following internal optical drives are available on the PowerEdge T610:

- DVD-ROM
- DVD+RW

If an optical drive is not ordered with the system, a blank is installed in its place. In the absence of a tape drive, an optional second SATA optical drive can be installed in the bay adjacent to the first optical drive. IDE (PATA) optical drives are not supported.

12.6 Tape Drives

The PowerEdge T610 supports a maximum of one half-height tape backup unit (TBU), which is optional in all T610 systems and connects to the planar SATA, SCSI controller card, or SAS controller card. IDE tape drives are not supported.

Internal and external tape drives and tape libraries are supported. For more information on supported tape drives and tape libraries, see Dell.com/storage.

12.7 External Storage Support

External storage devices are supported. For more information, see Dell.com/storage.

13 Video

The PowerEdge T610 Integrated Dell Remote Access Controller (iDRAC6) incorporates an integrated video subsystem, connected to the 32-bit PCI interface of the ICH9. This logic is based on the Matrox® G200. The device only supports 2D graphics. The integrated video core shares its video memory with the iDRAC6 128 MB DDR2 application space memory. This memory is also used for the KVM buffer. The resolutions supported are listed in Table 14.

Table 14. Graphics 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 PowerEdge T610 provides toolless support for racks with square or unthreaded round mounting holes including all generations of Dell racks. They also support tooled mounting in 4-post threaded racks using an optional adapter brackets kit. 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.

The T610 is not compatible with any other Dell rails including previous generation rails, but it does use the same rails as the T710. The T610 supports sliding rails only. Static rails are not supported. Mounting in 2-post racks is not supported.

14.2 Rails

The ReadyRails sliding rails for the T610 support toolless 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).

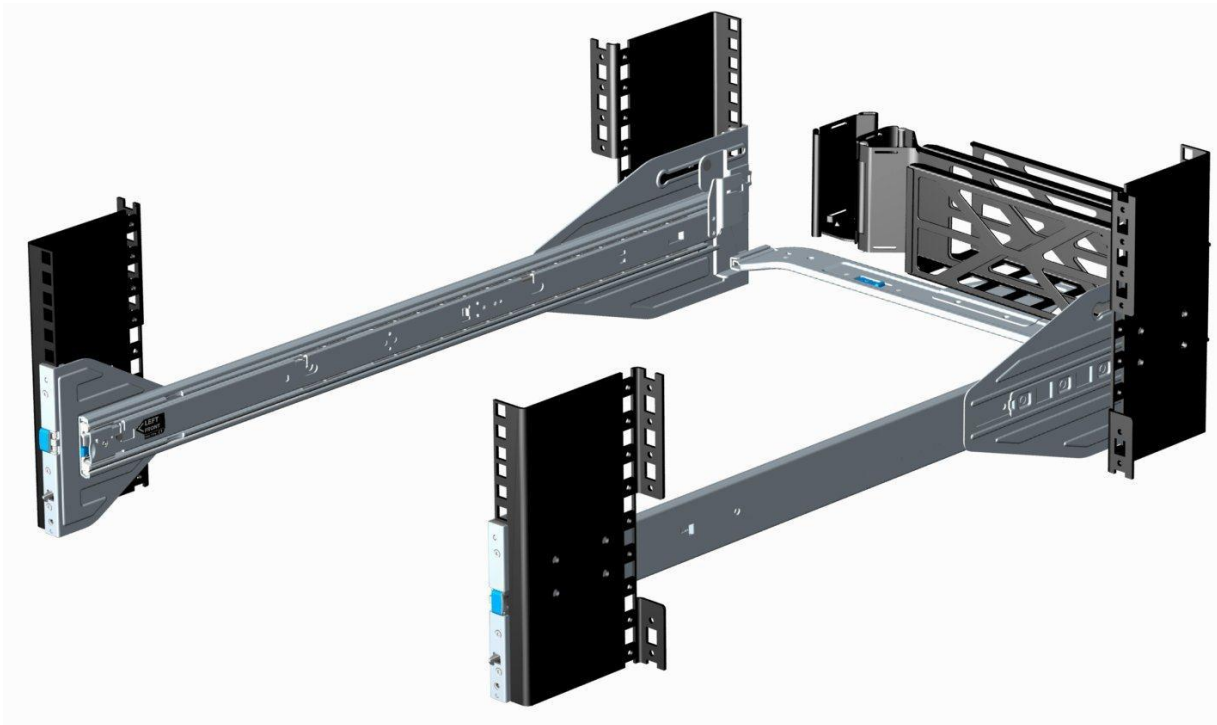


Figure 10. T610 ReadyRails Sliding Rails with Optional CMA

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

The adapter bracket kit includes 6 brackets to accommodate different rail lengths, plus 4 sets of custom screws in common thread sizes. A detailed *Getting Started Guide* is included in the kit along with directions for installing the brackets and mounting the rails into the brackets.

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

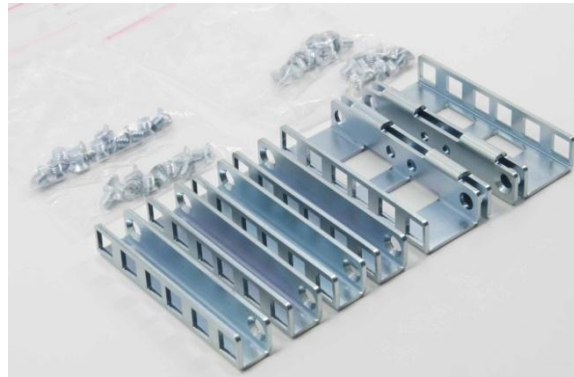


Figure 11. 2U Threaded Rack Adapter Brackets Kit

Below is a summary of the rack types supported by the T610 rails. Note that mounting in 2-post racks is not supported.

Table 15. Supported Racks

Product	Rail ID	Mounting Interface	Rail Type	Rack Types Supported				
				4-Post			2-Post	
				Square	Round	Thread	Flush	Center
T610	C1	ReadyRails	Sliding	✓	✓	✓	X	X

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

Other factors to consider when deploying the T610 include the spacing between the front and rear mounting flanges of the rack, the type and location of any equipment mounted in the back of the rack such as power distribution units (PDUs), and the overall depth of the rack.

Table 16. Rail Adjustability Ranges and Depth

Product	Rail ID	Mounting Interface	Rail Type	Rail Adjustability Range (mm)						Rail Depth (mm)	
				Square		Round		Threaded		Without CMA	With CMA
				Min	Max	Min	Max	Min	Max		
T610	C1	ReadyRails	Sliding	692	756	678	749	657	770	760	840

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

14.3 Cable Management Arm (CMA)

The optional cable management arm (CMA) for the T610 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 T610 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
- Hook-and-loop straps are used rather than plastic tie wraps to eliminate the risk of cable damage during cycling
- 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 using simple and intuitive snap-in designs

14.4 Rack View

The T610 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 12. T610 Mounted in C1 Sliding Rails

The T610 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 13 shows a T610 system with a CMA installed.

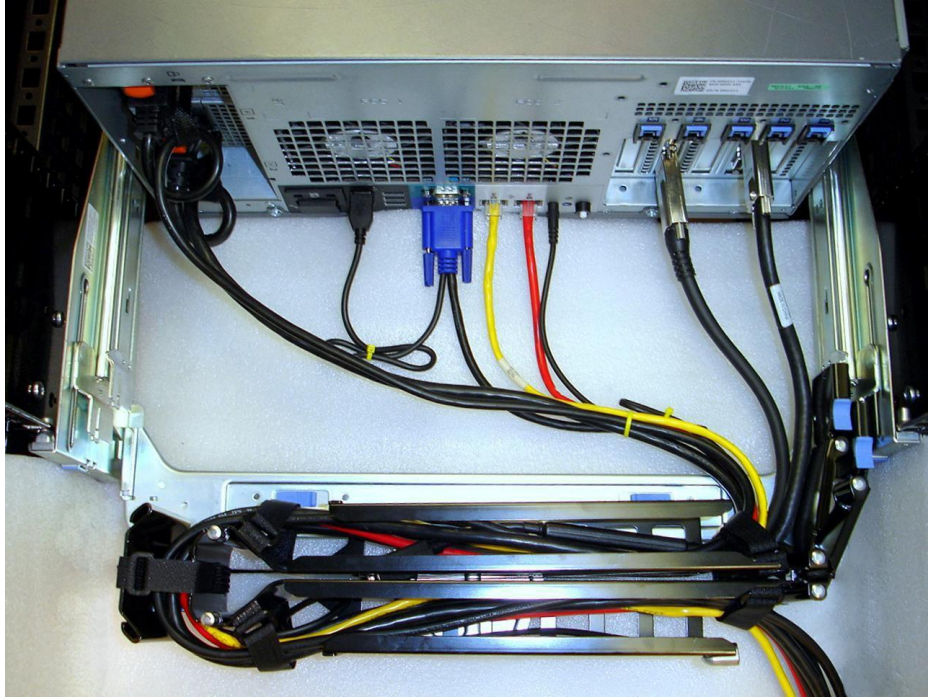


Figure 13. T610 CMA Mounted on the Side Opposite the Power Supplies (Recommended)

15 Operating Systems

For detailed information, see the following:

- Operating System Support Matrix for Dell PowerEdge Systems on Dell.com
- Dell PowerEdge T610 Systems Getting Started With Your System guide on Support.Dell.com

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 PowerEdge T610 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 the 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 T610. 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 T610 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			✓	✓
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

The T610 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. Statement of Volatility

The Dell PowerEdge T610 contains both volatile and non-volatile (NV) components. Volatile components lose their data immediately upon removal of power from the component. Non-volatile components continue to retain their data even after the power has been removed from the component. Components chosen as user-definable configuration options (those not soldered to the motherboard) are not included in the Statement of Volatility. Configuration option information (pertinent to options such as microprocessors, system memory, remote access controllers, and storage controllers) is available by component separately. The NV components detailed in Table 19 are present in the PowerEdge T610 server.

Table 19. T610 Volatility Table

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

LOM (LAN [Network Interface] on Motherboard) Memory	Details
Size:	4Mb (1MB)
Type: [Flash PROM, EEPROM]:	Flash
Can user programs or operating system write data to it during normal operation?	Yes, under software control.
Purpose? [boot code]	Contains LOM boot code and configuration data
How is data input to this memory?	Requires vendor provided firmware file and loader program used during factory assembly or possible field update. A system loaded with arbitrary data in firmware memory would not operate.
How is this memory write protected?	Software control
Server System FRU	Details
Size:	4KB
Type: [Flash PROM, EEPROM]:	SEEPROM
Can user programs or operating system write data to it during normal operation?	No
Purpose? [boot code]	Store System FRU
How is data input to this memory?	BMC controller write
How is this memory write protected?	Not write protected
Power Supply FRU	Details
Size:	256 bytes
Type: [Flash PROM, EEPROM]:	SEEPROM
Can user programs or operating system write data to it during normal operation?	No
Purpose? [boot code]	Store power supply information
How is data input to this memory?	Programmed by the power supply manufacturer
How is this memory write protected?	Not write protected
TPM (Trusted Platform Module; for boards shipped outside of China. Boards sold to destinations in China have S-TPM.)	Details
Size:	Unspecified size of user ROM, RAM, EEPROM; 128 bytes of OTP memory included
Type: [Flash PROM, EEPROM]:	ROM, RAM, EEPROM

Can user programs or operating system write data to it during normal operation?	Yes, operating systems and applications that conform to the TCG standard can write data to the TPM during normal operation. Access to the NV Storage is controlled by the TPM owner.
Purpose? [boot code]	Trusted Platform Module NV storage. May be used to securely storage of encryption keys.
How is data input to this memory?	TCG TPM Specification defined command interface or Using TPM Enabled operating systems
How is this memory write protected?	As defined by the TCG TPM Specification, protection of this NV memory area is configurable by the TPM owner.
Backplane Firmware and FRU	Details
Size:	32KB
Type: [Flash PROM, EEPROM]:	Flash
Can user programs or operating system write data to it during normal operation?	No
Purpose? [boot code]	Backplane Firmware and FRU data storage
How is data input to this memory?	Loading flash memory requires a vendor provided firmware file and loader program which is executed by booting up the system from a floppy or OS based executable containing the firmware file and the loader. System loaded with arbitrary data in firmware memory would not operate.
Embedded Bootable Memory Device	Details
Size:	1GB
Type: [Flash PROM, EEPROM]:	MMC
Can user programs or operating system write data to it during normal operation?	Yes
Purpose? [boot code]	Optional embedded boot device
How is data input to this memory?	Factory installed or via USB bus
How is this memory write protected?	Not write protected
Server BMC (Baseboard Management Controller) Firmware Flash Memory	Details
Size:	16MB Flash
Type: [Flash PROM, EEPROM]:	SPI Flash

Can user programs or operating system write data to it during normal operation?	No
Purpose? [boot code]	Stores the BMC Firmware
How is data input to this memory?	Loading flash memory requires a vendor provided firmware file and loader program which is executed by booting up the system from a floppy or OS based executable containing the firmware file and the loader. A system loaded with arbitrary data in firmware memory would not operate.
How is this memory write protected?	Software write protected

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

Appendix B. Certifications

A 1. Regulatory Certifications

Regulatory compliance certificates can be located at the following sites:

- <http://ausreactorprd01/reactor/xCertSearch.asp>
- http://www.dell.com/content/topics/global.aspx/about_dell/values/regulatory_compliance/dec_conform?c=us&l=en&s=corp

A 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

A 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

A 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. Additional Information and Options

The PowerEdge T610 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.AMD.com/design/chipsets/industry/lpc.htm
PCI Express PCI Express Base Specification Rev. 2.0	http://www.pcisig.com/specifications/pciexpress/
PMBus Power System Management Protocol Specification, v1.1	http://pmbus.info/specs.html
SAS Serial Attached SCSI, v1.1	http://www.t10.org/cgi-bin/ac.pl?t=f&f=sas1r10.pdf
SATA Serial ATA Rev. 2.6; SATA II, Extensions to SATA 1.0a, Rev. 1.2	http://sata-io.org/
SMBIOS System Management BIOS Reference Specification, v2.6	http://www.dmtf.org/standards/smbios/
TPM Trusted Platform Module Specification, v1.2	http://www.trustedcomputinggroup.org/resources/tpm_main_specification

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