PowerEdge 14th generation (14G) acoustical performance and dependencies

This technical white paper provides reference PowerEdge 14th generation (14G) acoustical data as functions of configurations and operating modes.

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October 2018

DELL EMC

A Dell EMC document category

Revisions

Date	Description
October 2017	Initial release
March 2018	Add PowerEdge R840, R940xa
October 2018	Add PowerEdge R240, R340, R740XD2

October 2018 | Rev 1.0

Table of contents

Overview

Dell EMC PowerEdge delivers sound quality and smooth transient response in addition to sound power levels and sound pressure levels oriented to deployment environments. Sound quality describes how disturbing or pleasing a person finds a sound, as a function of a variety of psychoacoustical metrics and thresholds. Tone prominence is one such metric. Transient response refers to how sound changes with time. Sound power level, sound pressure level, and loudness refer to amplitude of sound. A reference for comparison to sound pressure levels and loudness for familiar noise sources is given in Table 1. A more extensive description of Dell EMC PowerEdge acoustical design and metrics is available in the white paper, "*Dell Enterprise Acoustics"*[1].

Table 1 Acoustical reference points and output comparisons

Value measured at your ears		Equivalent familiar noise experience
LpA, dBA, re 20 µPa	Loudness, sones	
90	80	Loud concert
75	40	Data center, vacuum cleaner, voice must be elevated to be heard
60	10	Conversation levels
45	4	Whispering, open office layout, normal living room
35	2	Quiet office
30	1	Quiet library
20	0	Recording studio

[1] *Dell Enterprise Acoustics*

Format

Acoustical data for Dell EMC PowerEdge 14G servers are presented in this single document instead of several documents. It is also a living document and will periodically be updated, e.g., firmware updates, new servers, etc. The date at which the acoustical data were last updated is provided per server model. The Dell EMC Enterprise Infrastructure Planning Tool[2] (EIPT) is another source of Dell EMC PowerEdge acoustical output, but it is a tool that provides values that have been modeled, rather than measured, per input scenario. Acoustics for previous Dell EMC servers, e.g., 13G, may also be found online.[3]

PowerEdge acoustical design principles

PowerEdge 14G acoustical design is built on the following principles:

- *Appropriate*: sound power levels and sound quality limits are appropriate for the end users' application.
- *Minimized*: sound quality is designed to reduce distraction e.g., minimized tones, hums, buzzes, sharpness. Vibration is minimized to prevent audible rattles and reduce disturbances to rotational drive performance.
- *Consistent*: acoustical output quickly reaches target values during system state changes and maintains and does not oscillate in steady state system operation.
- *Efficient*: fan speeds are minimized while achieving reliability and performance tenets[4] to ensure efficient power-thermal operation.

Acoustical design is closely tied to thermal design, and Dell EMC PowerEdge Multi-Vector Cooling and frequently asked questions about PowerEdge 14G thermal design, behavior, and capabilities are addressed in online publications[5, 6].

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[2] *Dell EMC Enterprise Infrastructure Planning Tool (EIPT) at www.dell.com/calc*
[3] *Dell 13G PowerEdge Acoustical Performance & Dependencies*
[4] *Thermal Design Tenets of PowerEdge 14G Servers*
[5] *PowerEdge Multi-Vector Cooling*
[6] *FAQs on PowerEdge 14G Thermal Design, Behavior, and Capabilities*

1 PowerEdge R240 acoustics

Dell EMC PowerEdge R240 is a rack-mount server appropriate for attended data center environment. However, lower acoustical output is attainable with proper hardware or software configurations. For example, the minimum configuration of R240 is quiet enough for typical office environment.

Table 5 summarizes the sound power, sound pressure level, and prominent tone performance of the R240 in a 23±2°C environment.

1.1 Acoustical performance

R240 acoustical performance is characterized for 3 configurations: Minimum, Typical and Feature Rich. Table 5 summarizes the configuration and acoustical performance of the PE R240. Each configuration has been tested according to Dell EMC acoustical standards for rack-mounted servers.

1.2 PowerEdge R240 acoustical dependencies

- Ambient Temperature. For a similar workload fan speeds (and thus, acoustical noise) may increase as ambient temperature increases.
- High Wattage CPU. High-power (TDP) CPU parts may result in higher acoustical noise output.
- Rear Drives. When rear drives are installed in R540, fan speed may increase for cooling the drives, and hence both idle and operating acoustical outputs may be higher.
- System Thermal Profile Selected in BIOS. The default setting is “Power Optimized (DAPC)”, which generally means lower fan speed and acoustics. If “Performance Optimized” is selected, fan speed and acoustical noise may increase.

1.3 Methods to reduce acoustical output of the R240

Although the R240 is designed for use in data centers, some users may prefer a quieter system. Dell EMC suggests the following list of possible solutions to reduce acoustical output of the R240. An important note: In most cases, the idle fan speed of the system cannot be lowered without changing the configuration of the system, and in some cases, even a configuration change may not reduce idle fan speeds.

- Enable sound cap in IDRAC GUI. Sound cap, a setting in the BIOS, can be toggled on/off during boot up. When enabled, sound cap reduces the acoustics of the system at the expense of some performance.
- Reduce Ambient Temperature. Lowering the ambient temperature allows the system to cool components more efficiently than at higher ambient temperatures.
- Replace Third Party PCI Cards with similar Dell Supported Temperature PCI Controlled Cards, if available. Dell EMC works diligently with card vendors to validate and develop PCI cards to meet Dell EMC’s exacting standards for thermal performance

Table 2 Acoustical performance of R240

Configuration		Minimum	Typical-1	Typical-2	Feature Rich
CPU Type		Intel E-2124	Intel E-2124	Intel E-2124	Intel E-2126G
CPU TDP		71 W	71 W	71 W	80 W
CPU Quantity		1	1	1	1
Memory Type		8GB UDIMM	8GB UDIMM	16GB UDIMM	16GB UDIMM
DIMM Quantity		1	1	2	4
Backplane Type		2x 3.5" Cabled	4x 3.5" Cabled	4X 3.5" Hot-plug	4X 3.5" Hot-plug
Fan Quantity		2 x 4028	3 x 4028	4 x 4028	4 x 4028
HDD Type		3.5" SATA 1-TB	3.5" SATA 1-TB	3.5" SATA 2-TB	3.5" SATA 2-TB
HDD Quantity		1	2	2	4
PSU Type		250 W	250 W	250 W	250 W
PSU Quantity		1	1	1	1
PCI 1				PERC H330	PERC H330
PCI 2		-			
PCI 3		-			
Acoustical Performance: Idle/ Operating @ 25 °C Ambient					
LwA-UL[2] (Bels)	Idle[1]	4.6	4.6	5.1	5.2
	Operating[1]	4.7	4.8	5.1	5.2
LpA[3] (dBA)	Idle[1]	39	39	43	43
	Operating[1]	40	40	43	43
Prominent tones[4]		No prominent tones[4] in Idle[1] and Operating[1]			
Acoustical Performance: Idle @ 28 °C Ambient					
LwA-UL[2] (Bels)		5.5	5.7	6.1	6.1
LpA[3] (dBA)		38	41	45	44
Acoustical Performance: Max. Loading @ 35 °C Ambient					
LwA-UL[2] (Bels)		7.7	7.7	7.8	7.8
LpA[3] (dBA)		59	61	62	62

Footnotes:

1. Idle means the state in which the product is doing nothing but running OS, and values for Operating are the maximum of acoustical output for active HDDs or active processors.
2. LwA-UL is the upper limit sound power levels (LwA) calculated per section 4.4.1 of ISO 9296 (1988) with data collected in accordance with ISO 7779 (2010) from a single sample with a total 0.3 bel production deviation applied.
3. LpA is the A-weighted sound pressure level at the bystander position per section 4.3 of ISO 9296 (1988) and measured in accordance to ISO 7779 (2010). The system is placed in a 24U rack enclosure, 25cm above a reflective floor.
4. Prominent tone: Criteria of D.6 and D.11 of ECMA-74 12th ed. (2012) are followed to determine if discrete tones are prominent. The system is placed in center of ISO 7779 table and the acoustic transducers are at front & rear bystander positions.

2 PowerEdge R340 acoustics

Dell EMC PowerEdge R340 is a rack-mount server appropriate for attended data center environment. However, lower acoustical output is attainable with proper hardware or software configurations. For example, the minimum configuration of R340 is quiet enough for typical office environment.

Table 5 summarizes the sound power, sound pressure level, and prominent tone performance of the R340 in a 23±2°C environment.

2.1 Acoustical performance

R340 acoustical performance is characterized for two configurations: Typical and Feature Rich. Table 5 summarizes the configuration and acoustical performance of the PE R340. Each configuration has been tested according to Dell EMC acoustical standards for rack-mounted servers.

2.2 PowerEdge R340 acoustical dependencies

- Ambient Temperature. For a similar workload fan speeds (and thus, acoustical noise) may increase as ambient temperature increases.
- High Wattage CPU. High-power (TDP) CPU parts may result in higher acoustical noise output.
- Rear Drives. When rear drives are installed in R540, fan speed may increase for cooling the drives, and hence both idle and operating acoustical outputs may be higher.
- System Thermal Profile Selected in BIOS. The default setting is “Power Optimized (DAPC)”, which generally means lower fan speed and acoustics. If “Performance Optimized” is selected, fan speed and acoustical noise may increase.

2.3 Methods to reduce acoustical output of the R340

Although the R340 is designed for use in data centers, some users may prefer a quieter system. Dell EMC suggests the following list of possible solutions to reduce acoustical output of the R340. An important note: In most cases, the idle fan speed of the system cannot be lowered without changing the configuration of the system, and in some cases, even a configuration change may not reduce idle fan speeds.

- Enable sound cap in IDRAC GUI. Sound cap, a setting in the BIOS, can be toggled on/off during boot up. When enabled, sound cap reduces the acoustics of the system at the expense of some performance.
- Reduce Ambient Temperature. Lowering the ambient temperature allows the system to cool components more efficiently than at higher ambient temperatures.
- Optimize Third Party PCI Card Options.
- Replace Third Party PCI Cards with similar Dell Supported Temperature PCI Controlled Cards, if available. Dell EMC works diligently with card vendors to validate and develop PCI cards to meet Dell EMC’s exacting standards for thermal performance.

Table 3 Acoustical performance of R340

Configuration		Typical	Feature Rich
CPU Type		Intel E-2124	Intel E-2126G
CPU TDP		71 W	80 W
CPU Quantity		1	1
Memory Type		16GB UDIMM	32GB UDIMM
DIMM Quantity		2	4
Backplane Type		4X 3.5" Hot-plug	8x 2.5" hot swap
Fan Quantity		4 x 4056	4 x 4056
HDD Type		3.5" SATA 2-TB	2.5" SAS 300 GB 15k
HDD Quantity		2	8
PSU Type		350 W	350 W
PSU Quantity		2	2
PCI 1		2x 1GbE Broadcom	2x 1GbE Broadcom
PCI 2		PERC H330	PERC H730
PCI 3			
Acoustical Performance: Idle/ Operating @ 25 °C Ambient			
LwA-UL[2] (Bels)	Idle[1]	4.9	5.2
	Operating[1]	4.9	5.3
LpA[3] (dBA)	Idle[1]	38	42
	Operating[1]	38	42
Prominent tones[4]		No prominent tones[4] in Idle[1] and Operating[1]	
Acoustical Performance: Idle @ 28 °C Ambient			
LwA-UL[2] (Bels)		5.2	5.5
LpA[3] (dBA)		37	38
Acoustical Performance: Max. Loading @ 35 °C Ambient			
LwA-UL[2] (Bels)		8.4	8.4
LpA[3] (dBA)		67	67

Footnotes:

1. Idle means the state in which the product is doing nothing but running OS, and values for Operating are the maximum of acoustical output for active HDDs or active processors.
2. LwA-UL is the upper limit sound power levels (LwA) calculated per section 4.4.1 of ISO 9296 (1988) with data collected in accordance with ISO 7779 (2010) from a single sample with a total 0.3 bel production deviation applied.
3. LpA is the A-weighted sound pressure level at the bystander position per section 4.3 of ISO 9296 (1988) and measured in accordance to ISO 7779 (2010). The system is placed in a 24U rack enclosure, 25cm above a reflective floor.
4. Prominent tone: Criteria of D.6 and D.11 of ECMA-74 12th ed. (2012) are followed to determine if discrete tones are prominent. The system is placed in center of ISO 7779 table and the acoustic transducers are at front & rear bystander positions.

3 PowerEdge T140 acoustics

Dell EMC PowerEdge T140 is a tower server appropriate for quiet office environment. The acoustical output is not noticeable under idle or typical operating condition.

3.1 T140 Acoustical performance data

Acoustical performance for two configurations are provided: typical and feature rich. Table 4 contains a summary of the configuration and acoustical performance of the PE T140. Each configuration has been tested according to Dell EMC acoustical standards for tower servers.

3.2 PowerEdge T140 acoustical dependencies

- Ambient Temperature. For a similar workload fan speeds (and thus, acoustical noise) may increase as ambient temperature increases.
- High Wattage CPU. High-power (TDP) CPU parts may result in higher acoustical noise output.
- System Thermal Profile Selected in BIOS. The default setting is “Power Optimized (DAPC)”, which generally means lower fan speed and acoustics. If “Performance Optimized” is selected, fan speed and acoustical noise may increase.
- HDD quantity and operating condition. With extremely low noise emitted from T140’s cooling fans, HDD noise is more noticeable than other PE towers.

Table 4 Acoustical performance of T140

Configuration		Minimum	Typical	Feature Rich
CPU Type		Intel E2124	Intel E2124	Intel E2146G
CPU TDP		71 W	71 W	80 W
CPU Quantity		1	1	1
Memory Type		8GB, UDIMM	16GB, UDIMM	16GB, UDIMM
DIMM Quantity		1	2	2
HDD Type		7.2K RPM SATA	7.2K RPM SATA	7.2K RPM SATA
HDD Quantity		1	2	4
PSU Type		290W Cabled	290W Cabled	290W Cabled
PSU Quantity		1	1	1
Internal PERC		None	None	PERC H330
Acoustical Performance: Idle/ Operating @ 25 °C Ambient				
LwA-UL(2) (Bels)	Idle(1)	3.6	3.6	3.7
	Operating(1)	3.8	4.4	4.8
LpA(3) (dBA)	Idle(1)	22	24	23
	Operating(1)	27	28	32
Prominent tones4		No prominent tones4 in Idle1 and Operating1		
Acoustical Performance: Idle @ 28 °C Ambient				
LwA-UL2 (Bels)		3.9	3.9	3.9
LpA3 (dBA)		26	26	26
Acoustical Performance: Max. Loading @ 35 °C Ambient				
LwA-UL2 (Bels)		5.2	5.2	5.2
LpA3 (dBA)		36	36	36

Footnotes:

1. Idle means the state in which the product is doing nothing but running OS, and values for Operating are the maximum of acoustical output for active HDDs or active processors.
2. LwA-UL is the upper limit sound power levels (LwA) calculated per section 4.4.1 of ISO 9296 (1988) with data collected in accordance with ISO 7779 (2010) from a single sample with a total 0.3 bel production deviation applied.
3. LpA is the A-weighted sound pressure level at the bystander position per section 4.3 of ISO 9296 (1988) and measured in accordance to ISO 7779 (2010).
4. Prominent tone: Criteria of D.6 and D.11 of ECMA-74 12th ed. (2012) are followed to determine if discrete tones are prominent. The system is placed in center of ISO 7779 table and the acoustic transducers are at front & rear operator positions.

4 PowerEdge T340 acoustics

Dell EMC PowerEdge T340 is a tower server appropriate for typical environment. However, lower acoustical output is attainable with proper hardware or software configurations. For example, the minimum configuration of T340 is quiet enough for a quieter office environment.

4.1 T340 Acoustical performance data

Acoustical performance for two configurations are provided: typical and feature rich. Table 5 contains a summary of the configuration and acoustical performance of the PE T340. Each configuration has been tested according to Dell EMC acoustical standards for tower servers.

4.2 PowerEdge T340 acoustical dependencies

- Ambient Temperature. For a similar workload fan speeds (and thus, acoustical noise) may increase as ambient temperature increases.
- High Wattage CPU. High-power (TDP) CPU parts may result in higher acoustical noise output.
- System Thermal Profile Selected in BIOS. The default setting is “Power Optimized (DAPC)”, which generally means lower fan speed and acoustics. If “Performance Optimized” is selected, fan speed and acoustical noise may increase.

4.3 Methods to reduce acoustical output of the T340

Although the T340 is designed for use in typical office environment, some users may prefer a quieter output. Dell EMC suggests the following. It is important to note that in most cases, the baseline idle fan speed of the system cannot be lowered without changing the configuration of the system, and in some cases, even a configuration change may not reduce idle fan speeds.

- Reduce Ambient Temperature. Lowering the ambient temperature allows the system to cool components more efficiently than at higher ambient temperatures.
- Optimize Third Party PCI Card Options.
- Replace Third Party PCI Cards with similar Dell Supported Temperature PCI Controlled Cards, if available. Dell EMC works diligently with card vendors to validate and develop PCI cards to meet Dell EMC’s exacting standards for thermal performance.
- HDD Quantity. An incremental reduction in acoustical output may be gained by reducing the quantity of HDDs.

Table 5 Acoustical performance of T340

Configuration		Minimum	Typical	Feature Rich
CPU Type		Intel E2124	Intel E2124	Intel E2146G
CPU TDP		71 W	71 W	80 W
CPU Quantity		1	1	1
Memory Type		8GB, UDIMM	16GB, UDIMM	32GB, UDIMM
DIMM Quantity		1	2	4
Back Plane Type		4x 3.5”	8x 3.5”	8x 3.5”
HDD Type		7.2K RPM SATA	7.2K RPM SATA	10K RPM SAS
HDD Quantity		1	4	8
PSU Type		350W Cabled	495W Hot-Swap	495W Hot-Swap
PSU Quantity		1	2	2
Internal PERC		None	None	PERC H330
Acoustical Performance: Idle/ Operating @ 25 °C Ambient				
LwA-UL(2) (Bels)	Idle(1)	3.8	3.9	4.3
	Operating(1)	4.3	4.8	4.8
LpA(3) (dBA)	Idle(1)	23	26	27
	Operating(1)	30	31	34
Prominent tones4		No prominent tones4 in Idle1 and Operating1		
Acoustical Performance: Idle @ 28 °C Ambient				
LwA-UL2 (Bels)		5.1	5.1	5.1
LpA3 (dBA)		35	35	35
Acoustical Performance: Max. Loading @ 35 °C Ambient				
LwA-UL2 (Bels)		6.8	6.8	6.8
LpA3 (dBA)		52	52	52

Footnotes:

5. Idle means the state in which the product is doing nothing but running OS, and values for Operating are the maximum of acoustical output for active HDDs or active processors.
6. LwA-UL is the upper limit sound power levels (LwA) calculated per section 4.4.1 of ISO 9296 (1988) with data collected in accordance with ISO 7779 (2010) from a single sample with a total 0.3 bel production deviation applied.
7. LpA is the A-weighted sound pressure level at the bystander position per section 4.3 of ISO 9296 (1988) and measured in accordance to ISO 7779 (2010).
8. Prominent tone: Criteria of D.6 and D.11 of ECMA-74 12th ed. (2012) are followed to determine if discrete tones are prominent. The system is placed in center of ISO 7779 table and the acoustic transducers are at front & rear operator positions.

5 PowerEdge T440 acoustics

Dell EMC PowerEdge T440 is a tower server appropriate for a general use space environment. However, lower acoustical output is attainable with proper hardware or software configurations. For example, the minimum configuration of T440 is quiet enough for typical office environment.

Table 2 summarizes the sound power, sound pressure level, and prominent tone performance of the T440 in a 23±2°C environment.

5.1 T440 Acoustical performance data

Acoustical performance for two configurations are provided: typical and feature rich. Table 2 contains a summary of the configuration and acoustical performance of the PE T440. Each configuration has been tested according to Dell EMC acoustical standards for tower servers.

5.2 PowerEdge T440 acoustical dependencies

- Ambient Temperature. For a similar workload fan speeds (and thus, acoustical noise) may increase as ambient temperature increases.
- High Wattage CPU. High-power (TDP) CPU parts may result in higher acoustical noise output.
- System Thermal Profile Selected in BIOS. The default setting is “Power Optimized (DAPC)”, which generally means lower fan speed and acoustics. If “Performance Optimized” is selected, fan speed and acoustical noise may increase.

5.3 Methods to reduce acoustical output of the T440

Although the T440 is designed for use in a general use space, some users may prefer a quieter output. Dell EMC suggests the following. It is important to note that in most cases, the baseline idle fan speed of the system cannot be lowered without changing the configuration of the system, and in some cases, even a configuration change may not reduce idle fan speeds.

- Reduce Ambient Temperature. Lowering the ambient temperature allows the system to cool components more efficiently than at higher ambient temperatures.
- Optimize Third Party PCI Card Options.
- Replace Third Party PCI Cards with similar Dell Supported Temperature PCI Controlled Cards, if available. Dell EMC works diligently with card vendors to validate and develop PCI cards to meet Dell EMC’s exacting standards for thermal performance.
- HDD Quantity. An incremental reduction in acoustical output may be gained by reducing the quantity of HDDs.

Table 6 Acoustical performance of T440

Configuration		Typical	Feature Rich
CPU Type		Intel Xeon Silver 4116	Intel Xeon Gold 5120
CPU TDP		85 W	105 W
CPU Quantity		2	2
Memory Type		8GB, 2667MHz, DDR4	16GB, 2667MHz, DDR4
DIMM Quantity		4	8
Backplane Type		3.5” x 8	2.5" x 16
SYSTEM Fan Quantity		1	2
HDD Type		3.5" SATA 7.2k	2.5" 15K SAS
HDD Quantity		4	8
PSU Type		750 W	1100 W
PSU Quantity		2	2
PCI 1		PERC H330	PERC H730P
PCI 2		Quadport	2x 10GB NIC
PCI 3		-	-
PCI 4		-	-
Acoustical Performance: Idle/ Operating @ 25 °C Ambient			
LwA-UL[2] (Bels)	Idle[1]	4.5	5.3
	Operating[1]	5.1	5.7
LpA[3] (dBA)	Idle[1]	30	37
	Operating[1]	35	41
Prominent tones[4]	Idle[1]	No prominent tones[4]	
	Operating[1]		
Acoustical Performance: Idle @ 28 °C Ambient			
LwA-UL[(2)] (Bels)		4.7	5.4
LpA[3] (dBA)		32	38
Acoustical Performance: Max. Loading @ 35 °C Ambient			
LwA-UL[2] (Bels)		6.3	6.8
LpA[3] (dBA)		48	53

Footnotes:

9. Idle means the state in which the product is doing nothing but running OS, and values for Operating are the maximum of acoustical output for active HDDs or active processors.
10. LwA-UL is the upper limit sound power levels (LwA) calculated per section 4.4.1 of ISO 9296 (1988) with data collected in accordance with ISO 7779 (2010) from a single sample with a total 0.3 bel production deviation applied.
11. LpA is the A-weighted sound pressure level at the bystander position per section 4.3 of ISO 9296 (1988) and measured in accordance to ISO 7779 (2010).
12. Prominent tone: Criteria of D.6 and D.11 of ECMA-74 12th ed. (2012) are followed to determine if discrete tones are prominent. The system is placed in center of ISO 7779 table and the acoustic transducers are at front & rear operator positions.

6 PowerEdge T640 acoustics

Dell EMC PowerEdge T640 is a rackable tower server appropriate for typical office environment. However, for HPC usage with GPGPU, it is recommended to install T640 in an unattended data center environment.

Table 3 summarizes the sound power, sound pressure level, and prominent tone performance of the T640 in a 23±2°C environment.

6.1 Acoustical performance

To capture the breadth of potential customer specifications and deployments, the T640 has been tested in four configurations: minimum, typical, feature rich, and GPGPU. Table 3 provides a summary of the configuration and acoustical performance of the PE T640. Each configuration has been tested according to Dell EMC acoustical standards for tower servers.

6.2 PowerEdge T640 acoustical dependencies

- Ambient Temperature. For a similar workload fan speeds (and thus, acoustical noise) may increase as ambient temperature increases.
- High Wattage CPU. High-power (TDP) CPU parts may result in higher acoustical noise output.
- NVDIMM. Fan speeds may increase under certain workloads and configurations with NVDIMMs present.
- NVMe SSD. NVMe SSD consumes more power than other SATA/ SAS drives. It requires higher fan speeds for cooling, and thus increased acoustical output is expected.
- System Thermal Profile Selected in BIOS. The default setting is “Power Optimized (DAPC)”, which generally means lower fan speed and acoustics. If “Performance Optimized” is selected, fan speed and acoustical noise may increase.

6.3 Methods to reduce acoustical output of the T640

T640 acoustical output is highly depending on system configuration. Except for system configured with GPGPUs, T640 is appropriate for usages in typical office environments.

- Reduce Ambient Temperature. Lowering the ambient temperature allows the system to cool components more efficiently than at higher ambient temperatures.
- Optimize Third Party PCI Card Options.
- Replace Third Party PCI Cards with similar Dell Supported Temperature PCI Controlled Cards, if available. Dell EMC works diligently with card vendors to validate and develop PCI cards to meet Dell EMC’s exacting standards for thermal performance.
- HDD Quantity. An incremental reduction in acoustical output may be gained by reducing the quantity of HDDs.

Table 7 Acoustical performance of T640

Configuration		Minimum	Typical	Feature Rich	GPGPU
CPU Type		Intel Xeon Bronze	Intel Xeon Gold 5118	Intel Xeon Gold 6140	Intel Xeon Bronze
CPU TDP		85W	105W	140W	85W
CPU Quantity		1	2	2	2
Memory Type		8GB, 2133MHz,	16GB, 2400MHz,	16GB, 2667MHz,	16GB, 2667MHz,
DIMM Quantity		1	8	16	16
Backplane Type		8x3.5"	8x3.5"	18x3.5"	16x2.5"
HDD Type		7.2K RPM SATA	7.2K RPM SAS	7.2K RPM SAS	10K RPM SAS
HDD Quantity		1	4	18	8
Flash Drive Type		SSD	SSD	SSD	SSD
Flash Drive Quantity		None	4	None	4
PSU Type		495W	750W	1600W	1600W
PSU Quantity		1	2	2	2
Internal PERC		None	H730P	H730P	H730P
PCI 1		None	Dual port 10gb NIC	Dual port 10gb NIC	None
PCI 2		None	None	None	None
PCI 3		None	None	None	nVIDIA 300W GPU
PCI 4		None	None	None	Dual port 10gb NIC
PCI 5		None	None	None	None
PCI 6		None	None	None	nVIDIA 300W GPU
Acoustical Performance: Idle/ Operating @ 25 °C Ambient					
LwA-UL[2] (Bels)	Idle[1]	4.0	4.1	5.4	6.5
	Operating[1]	4.3	4.7	5.4	8.8
LpA[3] (dBA)	Idle[1]	29	30	40	49
	Operating[1]	31	34	41	73
Prominent tones[4]		No prominent tones[4] in Idle[1] and Operating[1]			
Acoustical Performance: Idle @ 28 °C Ambient					
LwA-UL[2] (Bels)		4.1	4.3	5.5	6.9
LpA[3] (dBA)		33	34	42	54
Acoustical Performance: Max. Loading @ 35 °C Ambient					
LwA-UL[2] (Bels)		5.4	5.4	6.1	7.1
LpA[3] (dBA)		40	41	49	55

Footnotes:

1. Idle means the state in which the product is doing nothing but running OS, and values for Operating are the maximum of acoustical output for active HDDs or active processors.
2. LwA-UL is the upper limit sound power levels (LwA) calculated per section 4.4.1 of ISO 9296 (1988) with data collected in accordance with ISO 7779 (2010) from a single sample with a total 0.3 bel production deviation applied.
3. LpA is the A-weighted sound pressure level at the bystander position per section 4.3 of ISO 9296 (1988) and measured in accordance to ISO 7779 (2010).
4. Prominent tone: Criteria of D.6 and D.11 of ECMA-74 12th ed. (2012) are followed to determine if discrete tones are prominent. The system is placed in center of ISO 7779 table and the acoustic transducers are at front and rear operator positions.

7 PowerEdge R440 acoustics

Dell EMC PowerEdge R440 is a rack-mount server appropriate for attended data center environment. However, lower acoustical output is attainable with proper hardware or software configurations. For example, the typical configuration of R440 is quiet enough for a general use space in typical office environment. Table 4 summarizes the sound power, sound pressure level, and prominent tone performance of the R440 in a 23±2°C environment.

7.1 Acoustical performance

To capture the breadth of potential customer specifications and deployments, the R440 has been tested in three configurations: two typical and one feature rich configuration. Table 4 summarizes the configuration and acoustical performance of the PE R440. Each configuration has been tested according to Dell EMC acoustical standards for rack-mounted servers.

7.2 PowerEdge R440 acoustical dependencies

- Ambient Temperature. For a similar workload fan speeds (and thus, acoustical noise) may increase as ambient temperature increases.
- High Wattage CPU. High-power (TDP) CPU parts may result in higher acoustical noise output.
- NVDIMM. Fan speeds may increase under certain workloads and configurations with NVDIMMs present.
- NVMe SSD. NVMe SSD consumes more power than other SATA/ SAS drives. It requires higher fan speeds for cooling, and thus increased acoustical output is expected.
- System Thermal Profile Selected in BIOS. The default setting is “Power Optimized (DAPC)”, which generally means lower fan speed and acoustics. If “Performance Optimized” is selected, fan speed and acoustical noise may increase.

7.3 Methods to reduce acoustical output of the R440

Although the R440 is designed for use in data centers, some users may prefer a quieter system. Dell EMC suggests the following list of possible solutions to reduce acoustical output of the R440. An important note: In most cases, the idle fan speed of the system cannot be lowered without changing the configuration of the system, and in some cases, even a configuration change may not reduce idle fan speeds.

- Enable sound cap in IDRAC GUI. Sound cap, a setting in the BIOS, can be toggled on/off during boot up. When enabled, sound cap reduces the acoustics of the system at the expense of some performance.
- Reduce Ambient Temperature. Lowering the ambient temperature allows the system to cool components more efficiently than at higher ambient temperatures.
- Optimize Third Party PCI Card Options.
- Replace Third Party PCI Cards with similar Dell Supported Temperature PCI Controlled Cards, if available. Dell EMC works diligently with card vendors to validate and develop PCI cards to meet Dell EMC’s exacting standards for thermal performance.

Table 8 Acoustical performance of R440

Configuration		Typical-1	Typical - 2	Feature Rich
CPU Type		Intel Xeon Gold 5120	Intel Xeon Gold 6130	Intel Xeon Gold 6140
CPU TDP		105 W	125 W	140 W
CPU Quantity		1	2	2
Memory Type		8GB, 2667MHz, DDR4	8GB, 2667MHz, DDR4	16GB, 2667MHz, DDR4
DIMM Quantity		2	8	8
Backplane Type		3.5” x 4	2.5” x 8	2.5” x10
HDD Type		10K RPM SAS	10K RPM SAS	10K RPM SAS
HDD Quantity		2	6	6
NVMe Drive Quantity		None	None	2
PSU Type		550 W Hot-Swap	550 W Hot-Swap	550 W Hot-Swap
PSU Quantity		2	2	2
Internal PERC		PERC H330	PERC H330	None
PCI 1		Intel NIC [2x10GbE + 2x 1 GbE]	Intel NIC [2x10GbE + 2x 1 GbE]	Intel NIC [2x10GbE + 2x 1 GbE]
Acoustical Performance: Idle/ Operating @ 25 °C Ambient				
LwA-UL(2) (Bels)	Idle(1)	5.5	5.5	5.5
	Operating(1)	5.6	5.9	6.2
LpA(3) (dBA)	Idle(1)	34	34	34
	Operating(1)	34	39	40
Prominent tones4		No prominent tones4 in Idle1 and Operating1		
Acoustical Performance: Idle @ 28 °C Ambient				
LwA-UL2 (Bels)		5.8	5.8	5.8
LpA3 (dBA)		36	36	36
Acoustical Performance: Max. Loading @ 35 °C Ambient				
LwA-UL2 (Bels)		7.0	7.0	7.0
LpA3 (dBA)		48	48	48

Footnotes:

1. Idle means the state in which the product is doing nothing but running OS, and values for Operating are the maximum of acoustical output for active HDDs or active processors.
2. LwA-UL is the upper limit sound power levels (LwA) calculated per section 4.4.1 of ISO 9296 (1988) with data collected in accordance with ISO 7779 (2010) from a single sample with a total 0.3 bel production deviation applied.
3. LpA is the A-weighted sound pressure level at the bystander position per section 4.3 of ISO 9296 (1988) and measured in accordance to ISO 7779 (2010). The system is placed in a 24U rack enclosure, 25cm above a reflective floor.
4. Prominent tone: Criteria of D.6 and D.11 of ECMA-74 12th ed. (2012) are followed to determine if discrete tones are prominent. The system is placed in center of ISO 7779 table and the acoustic transducers are at front & rear bystander positions.

8 PowerEdge R540 acoustics

Dell EMC PowerEdge R540 is a rack-mount server appropriate for attended data center environment. However, lower acoustical output is attainable with proper hardware or software configurations. For example, the minimum configuration of R540 is quiet enough for typical office environment.

Table 5 summarizes the sound power, sound pressure level, and prominent tone performance of the R540 in a 23±2°C environment.

8.1 Acoustical performance

R540 acoustical performance is characterized for two configurations: typical and feature rich. Table 5 summarizes the configuration and acoustical performance of the PE R540. Each configuration has been tested according to Dell EMC acoustical standards for rack-mounted servers.

8.2 PowerEdge R540 acoustical dependencies

- Ambient Temperature. For a similar workload fan speeds (and thus, acoustical noise) may increase as ambient temperature increases.
- High Wattage CPU. High-power (TDP) CPU parts may result in higher acoustical noise output.
- Rear Drives. When rear drives are installed in R540, fan speed may increase for cooling the drives, and hence both idle and operating acoustical outputs may be higher.
- System Thermal Profile Selected in BIOS. The default setting is “Power Optimized (DAPC)”, which generally means lower fan speed and acoustics. If “Performance Optimized” is selected, fan speed and acoustical noise may increase.

8.3 Methods to reduce acoustical output of the R540

Although the R540 is designed for use in data centers, some users may prefer a quieter system. Dell EMC suggests the following list of possible solutions to reduce acoustical output of the R540. An important note: In most cases, the idle fan speed of the system cannot be lowered without changing the configuration of the system, and in some cases, even a configuration change may not reduce idle fan speeds.

- Enable sound cap in IDRAC GUI. Sound cap, a setting in the BIOS, can be toggled on/off during boot up. When enabled, sound cap reduces the acoustics of the system at the expense of some performance.
- Reduce Ambient Temperature. Lowering the ambient temperature allows the system to cool components more efficiently than at higher ambient temperatures.
- Optimize Third Party PCI Card Options.
- Replace Third Party PCI Cards with similar Dell Supported Temperature PCI Controlled Cards, if available. Dell EMC works diligently with card vendors to validate and develop PCI cards to meet Dell EMC’s exacting standards for thermal performance.

Table 9 Acoustical performance of R540

Configuration		Typical	Feature Rich
CPU Type		Intel Xeon Gold 5120	Intel Xeon Gold 6138M
CPU TDP		105 W	125 W
CPU Quantity		2	2
Memory Type		8GB, 2667MHz, DDR4	16GB, 2667MHz, DDR4
DIMM Quantity		2	8
Backplane Type		3.5” x 8	3.5” x12 + rear 3.5” x2
Fan Quantity		5 Standard Fan	6 High Performance Fan
HDD Type		3.5" NLSAS 7.2k	12x 3.5" NLSAS 7.2k + 2x 3.5" NLSAS 7.2k (rear)
HDD Quantity		6	12+2
PSU Type		750 W	750 W
PSU Quantity		2	2
PCI 1		PERC H330	PERC H730P
PCI 2		-	LOM Mezz 10Gb E
PCI 3		-	2x INTEL M.2 card
Acoustical Performance: Idle/ Operating @ 25 °C Ambient			
LwA-UL[2] (Bels)	Idle[1]	5.5	6.6
	Operating[1]	5.6	6.9
LpA[3] (dBA)	Idle[1]	35	47
	Operating[1]	36	51
Prominent tones[4]		No prominent tones[4] in Idle[1] and Operating[1]	
Acoustical Performance: Idle @ 28 °C Ambient			
LwA-UL[2] (Bels)		5.9	6.9
LpA[3] (dBA)		40	52
Acoustical Performance: Max. Loading @ 35 °C Ambient			
LwA-UL[2] (Bels)		6.9	7.6
LpA[3] (dBA)		51	58

Footnotes:

1. Idle means the state in which the product is doing nothing but running OS, and values for Operating are the maximum of acoustical output for active HDDs or active processors.
2. LwA-UL is the upper limit sound power levels (LwA) calculated per section 4.4.1 of ISO 9296 (1988) with data collected in accordance with ISO 7779 (2010) from a single sample with a total 0.3 bel production deviation applied.
3. LpA is the A-weighted sound pressure level at the bystander position per section 4.3 of ISO 9296 (1988) and measured in accordance to ISO 7779 (2010). The system is placed in a 24U rack enclosure, 25cm above a reflective floor.
4. Prominent tone: Criteria of D.6 and D.11 of ECMA-74 12th ed. (2012) are followed to determine if discrete tones are prominent. The system is placed in center of ISO 7779 table and the acoustic transducers are at front & rear bystander positions.

9 PowerEdge R640 acoustics

Dell EMC PowerEdge R640 is a rack-mount server appropriate for attended data center environment. However, lower acoustical output is attainable with proper hardware or software configurations. For example, the minimum configuration of R640 is quiet enough for typical office environment.

Table 6 summarizes the sound power, sound pressure level, and prominent tone performance of the R640 in a 23±2°C environment.

9.1 Acoustical performance

To capture the breadth of potential customer specifications and deployments, the R640 has been tested in three configurations: minimum, typical, and feature rich. Table 6 summarizes the configuration and acoustical performance of the PE R640. Each configuration has been tested according to Dell EMC acoustical standards for rack-mounted servers.

9.2 PowerEdge R640 acoustical dependencies

- Ambient Temperature. For a similar workload fan speeds (and thus, acoustical noise) may increase as ambient temperature increases.
- High Wattage CPU. High-power (TDP) CPU parts may result in higher acoustical noise output.
- NVDIMM. Fan speeds may increase under certain workloads and configurations with NVDIMMs present.
- NVMe SSD. NVMe SSD consumes more power than other SATA/ SAS drives. It requires higher fan speeds for cooling, and thus increased acoustical output is expected.
- Rear Drives. When rear drives are installed in R640, fan speed may increase for cooling the drives, and hence both idle and operating acoustical outputs may be higher.
- System Thermal Profile Selected in BIOS. The default setting is “Power Optimized (DAPC)”, which generally means lower fan speed and acoustics. If “Performance Optimized” is selected, fan speed and acoustical noise may increase.

9.3 Methods to reduce acoustical output of the R640

Although the R640 is designed for use in data centers, some users may prefer a quieter system. Dell EMC suggests the following list of possible solutions to reduce acoustical output of the R640. An important note: In most cases, the idle fan speed of the system cannot be lowered without changing the configuration of the system, and in some cases, even a configuration change may not reduce idle fan speeds.

- Enable sound cap in IDRAC GUI. Sound cap, a setting in the BIOS, can be toggled on/off during boot up. When enabled, sound cap reduces the acoustics of the system at the expense of some performance.
- Reduce Ambient Temperature. Lowering the ambient temperature allows the system to cool components more efficiently than at higher ambient temperatures.
- Optimize Third Party PCI Card Options.
- Replace Third Party PCI Cards with similar Dell Supported Temperature PCI Controlled Cards, if available. Dell EMC works diligently with card vendors to validate and develop PCI cards to meet Dell EMC’s exacting standards for thermal performance.

Table 10 Acoustical performance of R640

Configuration		Minimum	Typical	Feature Rich
CPU Type		Intel Xeon Bronze 3104	Intel Xeon Gold 5120	Intel Xeon Gold 6142
CPU TDP		85 W	105 W	150 W
CPU Quantity		1	2	2
Memory Type		8GB, 2667MHz, DDR4	16GB, 2667MHz, DDR4	32GB, 2667MHz, DDR4
DIMM Quantity		2	12	6
Backplane Type		3.5” x 4	2.5” x 8	2.5” x10
HDD Type		7.2K RPM SATA	10K RPM SAS	10K RPM SAS
HDD Quantity		1	8	10
PSU Type		495 W	750 W	1100 W
PSU Quantity		1	2	2
PCI 1		PERC H330	PERC H730P	PERC H730P
PCI 2		-	Intel NIC [2x10GbE + 2x 1 GbE]	Intel NIC [2x10GbE + 2x 1 GbE]
PCI 3		-	-	FC16 Single Port
PCI 4		-	-	FC16 Single Port
Acoustical Performance: Idle/ Operating @ 25 °C Ambient				
LwA-UL[2] (Bels)	Idle[1]	4.9	5.0	5.3
	Operating[1]	5.0	5.2	5.9
LpA[3] (dBA)	Idle[1]	35	36	39
	Operating[1]	37	39	46
Prominent tones[4]	Idle[1]	No prominent tones[4]		
	Operating[1]			
Acoustical Performance: Idle @ 28 °C Ambient				
LwA-UL[2] (Bels)		5.9	6.1	6.0
LpA[3] (dBA)		46	48	48
Acoustical Performance: Max. Loading @ 35 °C Ambient				
LwA-UL[2] (Bels)		6.5	8.0	8.4
LpA[3] (dBA)		53	69	72

Footnotes:

1. Idle means the state in which the product is doing nothing but running OS, and values for Operating are the maximum of acoustical output for active HDDs or active processors.
2. LwA-UL is the upper limit sound power levels (LwA) calculated per section 4.4.1 of ISO 9296 (1988) with data collected in accordance with ISO 7779 (2010) from a single sample with a total 0.3 bel production deviation applied.
3. LpA is the A-weighted sound pressure level at the bystander position per section 4.3 of ISO 9296 (1988) and measured in accordance to ISO 7779 (2010). The system is placed in a 24U rack enclosure, 25cm above a reflective floor.
4. Prominent tone: Criteria of D.6 and D.11 of ECMA-74 12th ed. (2012) are followed to determine if discrete tones are prominent. The system is placed in center of ISO 7779 table and the acoustic transducers are at front & rear bystander positions.

10 PowerEdge R740/740XD acoustics

Dell EMC PowerEdge R740/R740XD is a rack-mount server appropriate for attended data center environment. However, lower acoustical output is attainable with proper hardware or software configurations. For example, the minimum configuration of R740 /R740XD is quiet enough for typical office environment.

To capture the breadth of potential customer specifications and deployments, three configurations: minimum, typical, and feature rich were tested for acoustical performance. Tables 7 and 8 summarize the configuration details and acoustical performance of PE R740, R740XD. Each configuration has been tested according to Dell EMC acoustical standards for rack-mounted servers.

Tables 7 and 8 summarize the sound power and sound pressure level acoustical performance of the R740 and R740XD in a 23±2°C, 28°C and 35°C environment.

10.1 PowerEdge R740/R740XD acoustical dependencies

- Ambient Temperature. For a similar workload fan speeds (and thus, acoustical noise) may increase as ambient temperature increases.
- High Wattage CPU. High-power (TDP) CPU parts may result in higher acoustical noise output.
- NVDIMM. Fan speeds may increase under certain workloads and configurations with NVDIMMs present.
- NVMe SSD. NVMe SSD consumes more power than other SATA/ SAS drives. It requires higher fan speeds for cooling, and thus higher acoustics is expected.
- Middle and Rear Drives. When the dedicated middle and rear drives are installed in R740XD, fan speeds will be increased for cooling the drives, and hence both idle and operating acoustical outputs may be higher.
- GPGPU cards: A configuration with any GPGPU card may be significantly louder than the typical configuration.
- System Thermal Profile Selected in BIOS. The default setting is “Power Optimized (DAPC)”, which generally means lower fan speed and acoustics. If “Performance Optimized” is selected, fan speed and acoustical noise may increase.

Table 11 Acoustical Performance of R740

Configuration		Minimum	Typical	Feature Rich
CPU Type		Intel Xeon Silver 4114	Intel Xeon Gold 5118	Intel Xeon Gold 6152
CPU TDP		85W / 10C	105W / 12C	140W / 22C
CPU Quantity		1	2	2
Memory Type		8GB, 2667MHz, DDR4	16GB, 2667MHz, DDR4	32GB, 2667MHz, DDR4
Memory Quantity		2	12	6
Backplane Type		3.5” x 8	2.5” x 8	2.5” x16
HDD Type		3.5” 7.2K RPM SATA	2.5”, 10K RPM SAS	2.5”, 10K RPM SAS
HDD Quantity		1	8	16
PSU Type		495 W	750 W	1100 W
PSU Quantity		2	2	2
NDC		4 ports: 2x10Gb+2x1Gb	4 ports: 2x10Gb+2x1Gb	4 ports: 2x10Gb+2x1Gb
PCI 1		-	NIC 10Gb	FC16 1-port HBAs
PCI 2		-	-	NIC 10Gb
PCI 3		-	-	-
PCI 4		-	PERC Adapter H730P	-
PCI 5		-	-	-
PCI 6		-	-	PERC Adapter 740p
PCI 7		-	-	FC16 1-port HBAs
Others		Mini PERC H330	-	-
Acoustical Performance: Idle/ Operating @ 25 °C Ambient				
LwA-UL[2] (Bels)	Idle[1]	5.0	5.1	5.2
	Operating[1]	5.0	5.1	5.2
LpA[3] (dBA)	Idle[1]	35	33	36
	Operating[1]	35	33	36
Prominent tones[4]		No prominent tones[4] in Idle[1] and Operating[1]		
Acoustical Performance: Idle @ 28 °C Ambient				
LwA-UL[2] (Bels)		5.0	5.3	5.5
LpA[3] (dBA)		35	36	40
Acoustical Performance: Max. Loading @ 35 °C Ambient				
LwA-UL[2] (Bels)		8.2	8.3	8.4
LpA[3] (dBA)		69	70	74

Table 12 Acoustical performance of R740XD

Configuration		Typical	Feature Rich
CPU Type		Intel Xeon Gold 5118	Intel Xeon Gold 6152
CPU TDP		105W / 12C	140W / 22C
CPU Quantity		2	2
Memory Type		16GB, 2667MHz, DDR4	32GB, 2667MHz, DDR4
Memory Quantity		12	6
Backplane Type		2.5” x 24	2.5” x 24
HDD Type		2.5”, 10K RPM SAS	2.5”, 10K RPM SAS
HDD Quantity		12	24x2.5" front, 4x2.5" middle, 4x2.5" rear
PSU Type		750 W	1600 W
PSU Quantity		2	2
NDC		4 ports: 2x10Gb+2x1Gb	4 ports: 2x10Gb+2x1Gb
PCI 1		NIC 10Gb	FC16 1-port HBAs
PCI 2		-	FC16 1-port HBAs
PCI 3		-	NIC 10Gb
PCI 4			
PCI 5			
PCI 6		PERC Adapter H730P	-
Others		-	Mini PERC H740p, BOSS Module
Acoustical Performance: Idle/ Operating @ 25 °C Ambient			
LwA-UL[2] (Bels)	Idle[1]	5.4	6.7
	Operating[1]	5.5	7.0
LpA[3] (dBA)	Idle[1]	38	49
	Operating[1]	39	50
Prominent tones[4]		No prominent tones[4] in Idle[1] and Operating[1]	
Acoustical Performance: Idle @ 28 °C Ambient			
LwA-UL[2] (Bels)		5.5	6.8
LpA[3] (dBA)		40	49
Acoustical Performance: Max. Loading @ 35 °C Ambient			
LwA-UL[2] (Bels)		8.3	8.9
LpA[3] (dBA)		70	75

Footnotes:

1. Idle means the state in which the product is doing nothing but running OS, and values for Operating are the maximum of acoustical output for active HDDs or active processors.
2. LwA-UL is the upper limit sound power levels (LwA) calculated per section 4.4.1 of ISO 9296 (1988) with data collected in accordance with ISO 7779 (2010) from a single sample with a total 0.3 bel production deviation applied.
3. LpA is the A-weighted sound pressure level at the bystander position per section 4.3 of ISO 9296 (1988) and measured in accordance to ISO 7779 (2010). The system is placed in a 24U rack enclosure, 25cm above a reflective floor.
4. Prominent tone: Criteria of D.6 and D.11 of ECMA-74 12th ed. (2012) are followed to determine if discrete tones are prominent. The system is placed in a 24U rack enclosure and the acoustic transducers are at front & rear bystander positions.

10.2 Methods to reduce acoustical output of the R740/R740XD

Although the R740, R740XD are designed for use in data centers, some users may prefer a quieter system. Dell EMC suggests the following list of possible solutions to reduce acoustical output of the R740, R740XD. An important note: In most cases, the idle fan speed of the system cannot be lowered without changing the configuration of the system, and in some cases, even a configuration change may not reduce idle fan speeds.

- Enable sound cap in IDRAC GUI. Sound cap, a setting in the BIOS, can be toggled on/off during boot up. When enabled, sound cap reduces the acoustics of the system at the expense of some performance.
- Reduce Ambient Temperature. Lowering the ambient temperature allows the system to cool components more efficiently than at higher ambient temperatures.
- Optimize Third Party PCI Card Options.
- Replace Third Party PCI Cards with similar Dell Supported Temperature PCI Controlled Cards, if available. Dell EMC works diligently with card vendors to validate and develop PCI cards to meet Dell EMC's exacting standards for thermal performance.

11 PowerEdge R740XD2 acoustics

Dell EMC PowerEdge R740XD is a rack-mount server appropriate for unattended data center environment. However, lower acoustical output is attainable with proper hardware or software configurations. For example, the minimum configuration of R740XD2 is quiet enough for attended data center.

Table 5 summarizes the sound power, sound pressure level, and prominent tone performance of the R740XD2 in a 23±2°C environment.

11.1 Acoustical performance

R740XD2 acoustical performance is characterized for two configurations: Minimum and Typical. Table 5 summarizes the configuration and acoustical performance of the PE R740XD2. Each configuration has been tested according to Dell EMC acoustical standards for rack-mounted servers.

11.2 PowerEdge R740XD2 acoustical dependencies

- Ambient Temperature. For a similar workload fan speeds (and thus, acoustical noise) may increase as ambient temperature increases.
- High Wattage CPU. High-power (TDP) CPU parts may result in higher acoustical noise output.
- Rear Drives. When rear drives are installed in R740XD2, fan speed may increase for cooling the drives, and hence both idle and operating acoustical outputs may be higher.
- System Thermal Profile Selected in BIOS. The default setting is “Power Optimized (DAPC)”, which generally means lower fan speed and acoustics. If “Performance Optimized” is selected, fan speed and acoustical noise may increase.

11.3 Methods to reduce acoustical output of the R740XD2

Although the R740XD2 is designed for use in data centers, some users may prefer a quieter system. Dell EMC suggests the following list of possible solutions to reduce acoustical output of the R740XD2. An important note: In most cases, the idle fan speed of the system cannot be lowered without changing the configuration of the system, and in some cases, even a configuration change may not reduce idle fan speeds.

- Enable sound cap in IDRAC GUI. Sound cap, a setting in the BIOS, can be toggled on/off during boot up. When enabled, sound cap reduces the acoustics of the system at the expense of some performance.
- Reduce Ambient Temperature. Lowering the ambient temperature allows the system to cool components more efficiently than at higher ambient temperatures.
- Replace Third Party PCI Cards with similar Dell Supported Temperature PCI Controlled Cards, if available. Dell EMC works diligently with card vendors to validate and develop PCI cards to meet Dell EMC’s exacting standards for thermal performance.

Table 13 Acoustical performance of R740XD2

Configuration		Minimum	Typical
CPU Type		Intel Xeon SILVER 4116	Intel Xeon Gold 5118
CPU TDP		85 W	105 W
CPU Quantity		2	2
Memory Type		8GB, 2667MHz, DDR4	16GB, 2667MHz, DDR4
DIMM Quantity		4	12
Backplane Type		2x (3.5" x12)	2x (3.5" x12) + rear 3.5” x2
Fan Quantity		6 High Performance Fan	6 High Performance Fan
HDD Type		3.5" NLSAS 7.2k	12x 3.5" NLSAS 7.2k + 2x 2.5" SSD SAS (rear)
HDD Quantity		12	24+2
PSU Type		750 W	1100 W
PSU Quantity		2	2
PCI 1			LOM Mezz 10Gb E
PCI 2		-	LAN
PCI 3		-	LAN
Internal PERC		PERC H330	PERC H730P
Acoustical Performance: Idle/ Operating @ 25 °C Ambient			
LwA-UL[2] (Bels)	Idle[1]	6.3	7.7
	Operating[1]	6.3	7.7
LpA[3] (dBA)	Idle[1]	44	60
	Operating[1]	44	60
Prominent tones[4]		No prominent tones[4] in Idle[1] and Operating[1]	
Acoustical Performance: Idle @ 28 °C Ambient			
LwA-UL[2] (Bels)		6.9	8.0
LpA[3] (dBA)		50	63
Acoustical Performance: Max. Loading @ 35 °C Ambient			
LwA-UL[2] (Bels)		8.3	8.7
LpA[3] (dBA)		64	69

Footnotes:

1. Idle means the state in which the product is doing nothing but running OS, and values for Operating are the maximum of acoustical output for active HDDs or active processors.
2. LwA-UL is the upper limit sound power levels (LwA) calculated per section 4.4.1 of ISO 9296 (1988) with data collected in accordance with ISO 7779 (2010) from a single sample with a total 0.3 bel production deviation applied.
3. LpA is the A-weighted sound pressure level at the bystander position per section 4.3 of ISO 9296 (1988) and measured in accordance to ISO 7779 (2010). The system is placed in a 24U rack enclosure, 25cm above a reflective floor.
4. Prominent tone: Criteria of D.6 and D.11 of ECMA-74 12th ed. (2012) are followed to determine if discrete tones are prominent. The system is placed in center of ISO 7779 table and the acoustic transducers are at front & rear bystander positions.

12 PowerEdge R940 acoustics

Dell EMC PowerEdge R940 is a rack server appropriate for data center applications. It is not appropriate for use in a general use or office space environment. If reduced acoustics are desired for a specific application or redeployment, consult the acoustical dependency section below.

In minimum and typical configuration the R940 meets Dell EMC acoustical standards appropriate for attended data center applications. In feature rich configurations, the PowerEdge R940 is appropriate for unattended data center applications, only.

Table 10 summarizes the sound power, sound pressure level, and prominent tone performance of the R940 in a 23±2°C environment. Table 11 provides baseline performance data for the R940 in a 28°C environment. Finally, Table 12 provides acoustical performance data for an R940 deployed in a 35°C environment and operating with a full CPU & memory workload.

12.1 Acoustical configurations

The R940 acoustical performance has been evaluated in three configurations: minimum, typical, and feature rich, to capture the breadth of potential customer specifications and deployments. A description of the acoustical configurations is provided in Table 9. Each configuration has been tested according to Dell EMC acoustical standards for rack-mounted servers.

Table 14 R940 acoustical configurations

Component	Minimum	Typical	Feature Rich
Planar	Single	Dual	Dual
CPU Type	Intel Xeon Gold 6130	Intel Xeon Platinum 8170	Intel Xeon Platinum 8180
CPU TDP	125 W	165 W	205 W
CPU Quantity	2	4	4
Memory Type	8GB, 266.7MHz, DDR4	32GB, 266.7MHz, DDR4	32GB, 266.7MHz, DDR4
DIMM Quantity	8	32	48
NVDIMM Type	-	16GB, 266.7MHz, DDR4	-
NVDIMM Quantity	0	4	0
Backplane Type	x8	x24	x24
HDD Type	10K RPM SAS	10K RPM SAS	10K RPM SAS
HDD Quantity	4	12	12
Flash Drive Type	-	SSD, 800GB, NVME	SSD, 800GB, NVME
Flash Drive Quantity	0	4	12
PSU Type	1100 W	1600 W	2400 W
PSU Quantity	2	2	2
NDC	4 Port, 1G, RNDC	4 Port, 1G, RNDC	4 Port, 1G, RNDC
PCI 1	PERC 10 H740P	PERC 10 H740P	PERC 10 H740P
PCI 2	Empty	Empty	Empty
PCI 3	Empty	Empty	Empty
PCI 4	Empty	Empty	Empty
PCI 5	Empty	Empty	Empty
PCI 6	Empty	Empty	PERC 10 H740P
PCI 7	Empty	Empty	Empty
PCI 8	Not Available	Empty	PCIe SSD Extender
PCI 9	Not Available	Empty	Empty
PCI 10	Not Available	Empty	Empty
PCI 11	Not Available	PCIe SSD Extender	PCIe SSD Extender
PCI 12	Not Available	PCIe SSD Extender	PCIe SSD Extender
PCI 13	Not Available	Empty	Empty
PCI 14	Not Available	Empty	Empty

12.2 PowerEdge R940 acoustical performance

Table 15 Acoustical performance of R940 in 23±2°C environment

Minimum Configuration		Idle[1]	Operating[2]
Sound Power Level	LwA-UL[3]	6.3 bels	6.3 bels
A-weighted Sound Pressure Level	LpA[4]	45 dBA	46 dBA
Prominent Tones, per ECMA-74		No Tones	No Tones
Typical Configuration			
Sound Power Level	LwA-UL	6.4 bels	6.4 bels
A-weighted Sound Pressure Level	LpA	46 dBA	47 dBA
Prominent Tones, per ECMA-74		No Tones	No Tones
Feature Rich Configuration			
Sound Power Level	LwA-UL	7.0 bels	7.0 bels
A-weighted Sound Pressure Level	LpA	52 dBA	52 dBA
Prominent Tones, per ECMA-74		No Tones	No Tones

Table 16 Acoustical performance of R940 in 28°C environment

Minimum Configuration		Idle
Sound Power Level	LwA-UL[3]	6.4 bels
A-weighted Sound Pressure Level	LpA[4]	45 dBA
Prominent Tones, per ECMA-74		No Tones
Typical Configuration		
Sound Power Level	LwA-UL	6.4 bels
A-weighted Sound Pressure Level	LpA	46 dBA
Prominent Tones, per ECMA-74		No Tones
Feature Rich Configuration		
Sound Power Level	LwA-UL	7.0 bels
A-weighted Sound Pressure Level	LpA	52 dBA
Prominent Tones, per ECMA-74		No Tones

Table 17 Acoustical performance of R940 in 35°C environment

Minimum Configuration		CPU TDP Load
Sound Power Level	LwA-UL[3]	6.5 bels
A-weighted Sound Pressure Level	LpA[4]	47 dBA
Prominent Tones, per ECMA-74		No Tones
Typical Configuration		
Sound Power Level	LwA-UL	8.6 bels
A-weighted Sound Pressure Level	LpA	70 dBA
Prominent Tones, per ECMA-74		Tones Present
Feature Rich Configuration		
Sound Power Level	LwA-UL	9.1 bels
A-weighted Sound Pressure Level	LpA	73 dBA
Prominent Tones, per ECMA-74		Tones Present

Footnotes:

1. Idle values are recorded when server is powered on with only the operating system running
2. Operating values represented here are the maximum observed acoustical output for either a CPU workload or an HDD workload as prescribed in ECMA-74 12th Edition (2012).
3. LwA-UL is the upper limit sound power levels (LwA) calculated per section 4.4.1 of ISO 9296 (1988) with data collected in accordance with ISO 7779 (2010) from a single sample with a total 0.3 bel production deviation applied.
4. LpA is the mean of A-weighted sound pressure level measured at four bystander positions per section 4.3 of ISO 9296 (1988) and measured in accordance to ISO 7779 (2010). The system is placed in a 24U rack enclosure, 25cm above a reflective floor.
5. Prominent tone: Criteria of D.6 and D.11 of ECMA-74 12th ed. (2012) are followed to determine if discrete tones are prominent. The system is placed in a 24U rack enclosure and the acoustic transducers are at front & rear bystander positions.

12.3 PowerEdge R940 acoustical dependencies

- Ambient Temperature. For a similar workload fan speeds (and thus, acoustical noise) may increase as ambient temperature increases.
- High Wattage CPU. High-power (TDP) CPU cards may result in higher acoustical noise output.
- USB 3.0 Keys in Front USB Ports. USB 3.0 keys installed in front USB ports can induce heating of the ambient airflow sensor and may increase fan speeds in configurations that include airflow-controlled (i.e. not temperature controlled) PCI or NDC cards.
- NVDIMM. Fan speeds may increase under certain workloads and configurations with NVDIMMs present.
- PCIe SSD Extender Cards. PCIe SSD Extender cards require airflow-controlled cooling; configurations that include PCIe SSD extender cards may exhibit increased idle fan speeds (hence, idle acoustical noise) vs. configurations without airflow-controlled cooling devices installed.
- System Thermal Profile Selected in BIOS. The default setting is “Power Optimized (DAPC)”, which generally means lower fan speed and acoustics. If “Performance Optimized” is selected, fan speed and acoustical noise may increase.

12.4 Methods to Reduce Acoustical Output of the R940

Although the R940 is designed for use in data centers, some users may prefer a quieter system. Dell EMC suggests the following list of possible solutions to reduce R940 acoustical output. An important note: In most cases, idle fan speed of the system cannot be lowered without changing the configuration of the system, and in some cases, even a configuration change may not reduce idle fan speeds.

- Enable sound cap in IDRAC GUI. Sound cap, a setting in the BIOS, can be toggled on/off during boot up. When enabled, sound cap reduces the acoustics of the system at the expense of some performance.
- Reduce Ambient Temperature. Lowering the ambient temperature allows the system to cool components more efficiently than at higher ambient temperatures.
- Optimize Third Party PCI Card Options. Consider optimal slot locations and ensure that the airflow target, predicted by iDRAC, is appropriate for the cards installed in the system.
- Replace Third Party PCI Cards with similar Dell Supported Temperature Controlled PCI Cards, if available. Dell EMC works diligently with card vendors to validate and develop PCI cards to meet Dell EMC's exacting standards for thermal performance.

13 PowerEdge M640 acoustics

In M1000e chassis, Dell EMC PowerEdge M640 is a blade server appropriate for unattended data center environment. In VRTX chassis, Dell EMC PowerEdge M640 is a blade server appropriate for attended data center environment or general use space in office environment. Table 13 summarizes the sound power level, sound pressure level, and prominent tone performance of the M640 in a 23±2°C environment.

13.1 Acoustical performance

To capture the breadth of potential customer specifications and deployments, the M640 has been tested in both M1000e and VRTX with different configurations. Table 13 summarizes the configuration and acoustical performance of the PE M640. Each configuration has been tested according to Dell EMC acoustical standards for rack-mounted servers.

13.2 PowerEdge M640 acoustical dependencies

- Ambient Temperature. For a similar workload fan speeds (and thus, acoustical noise) may increase as ambient temperature increases. Please note there is ambient temperature restriction for M640, defined in DPN: 2P9GM.
- High Wattage CPU. High-power (TDP) CPU cards may result in higher acoustical noise output.
- NVMe SSD. NVMe SSD consumes more power than other SATA/ SAS drives. It requires higher fan speeds for cooling, and thus increased acoustical output is expected.
- System Thermal Profile Selected in BIOS. The default setting is “Power Optimized (DAPC)”, which generally means lower fan speed and acoustics. If “Performance Optimized” is selected, fan speed and acoustical noise may increase.

Table 18 Acoustical performance of M640

Configuration		Minimum	Typical - 1	Typical - 2
Host Chassis		M1000e	M1000e	VRTX
CPU Type		Intel Xeon Gold 5115	Intel Xeon Gold 5118	Intel Xeon Gold 5118
CPU TDP		85W	105 W	105 W
CPU Quantity per blade		1	2	2
Memory Type		4GB, 2667MHz, DDR4	8GB, 2667MHz, DDR4	8GB, 2667MHz, DDR4
DIMM Quantity per blade		4	12	4
Backplane Type		2.5” x 2	2.5” x 2	2.5” x 2
HDD Type		7.2K RPM SATA	10K RPM SAS	10K RPM SAS
HDD Quantity per host chassis		1	2	2
PSU Type		2700 W	2700 W	1100 W
PSU Quantity per host chassis		3	3	2
PERC		None	H330 Mini	H330 Mini
PCI		4x 1GbE NDC	4x 1GbE NDC	4x 1GbE NDC
Blade q’ty per host chassis		8	8	3
Acoustical Performance: Idle/Operating @ 23 °C Ambient				
LwA-UL[2] (Bels)	Idle[1]	7.1	7.3	5.4
	Operating[1]	7.2	7.6	5.8
LpA[3] (dBA)	Idle[1]	54	56	37
	Operating[1]	56	60	42
Prominent tones[4]		No prominent tones[4] in Idle[1] and Operating[1]		
Acoustical Performance: Max. Loading @ 35 °C Ambient				
LwA-UL[2] (Bels)		8.3	9.6	7.5
LpA[3] (dBA)		67	79	57

Footnotes:

1. Idle means the state in which the product is doing nothing but running OS, and values for Operating are the maximum of acoustical output for active HDDs or active processors.
2. LwA-UL is the upper limit sound power levels (LwA) calculated per section 4.4.1 of ISO 9296 (1988) with data collected in accordance with ISO 7779 (2010) from a single sample with a total 0.3 bel production deviation applied.
3. LpA is the average bystander position A-weighted sound pressure level calculated per section 4.3 of ISO 9296 (1988) and measured in accordance with ISO 7779 (2010).
4. M1000e is installed in a Dell 42-U rack such that the bottom of the Enclosure is at 25-cm from the floor of the chamber
5. VRTX is placed on the floor, and adjacent to the standard test table with a distance of 7.5-cm from the vertical plane formed by the edge of the top of the table (with reference to Figure C.4.c of ECMA-75 [2012] Section C.15.2.)
6. Prominent tone: Criteria of D.6 and D.11 of ECMA-74 12th ed. (2012) are followed to determine if discrete tones are prominent.
7. M1000e is installed in a Dell 42-U rack such that the bottom of the Enclosure is at 75 +/- 3-cm from the floor of the chamber. The acoustic transducers are at front and rear bystander positions.
8. VRTX is placed on the floor, and adjacent to the standard test table with a distance of 7.5-cm from the vertical plane formed by the edge of the top of the table (with reference to Figure C.4.c of ECMA-75 [2012] Section C.15.2.) The acoustic transducers are at front and rear bystander positions.

14 PowerEdge FC640 acoustics

Dell EMC PowerEdge FC640 is a blade server appropriate for data center environment.

Table 14 summarizes the sound power, sound pressure level, and prominent tone performance of the FC640 in a 23±2°C environment.

14.1 Acoustical performance

To capture the breadth of potential customer specifications and deployments, the FC640 has been tested in FX chassis with different configurations. Table 14 summarizes the configuration and acoustical performance of the PE FC640. Each configuration has been tested according to Dell EMC acoustical standards for rack-mounted servers.

14.2 PowerEdge FC640 acoustical dependencies

- Ambient Temperature. For a similar workload fan speeds (and thus, acoustical noise) may increase as ambient temperature increases. Please note there is ambient temperature restriction for FC640, defined in DPN: 2P9GM.
- High Wattage CPU. High-power (TDP) CPU cards may result in higher acoustical noise output.
- NVMe SSD. NVMe SSD consumes more power than other SATA/ SAS drives. It requires higher fan speeds for cooling, and thus increased acoustical output is expected.
- System Thermal Profile Selected in BIOS. The default setting is “Power Optimized (DAPC)”, which generally means lower fan speed and acoustics. If “Performance Optimized” is selected, fan speed and acoustical noise may increase.

Table 19 Acoustical performance of FC640

Configuration		Typical	Feature Rich
CPU Type		Intel Xeon Gold 5118	Intel Xeon Gold 6140
CPU TDP		105 W	140 W
CPU Quantity per sled		2	2
Memory Type		8GB, 2667MHz, DDR4	16GB, 2667MHz, DDR4
DIMM Quantity per sled		8	12
Backplane Type		2.5” x 2	2.5” x 2
HDD Type		10K RPM SAS	10K RPM SAS
HDD Quantity per host chassis		2	2
PSU Type		1600 W	1600 W
PSU Quantity per host chassis		3	3
PERC		H330 Mini	H330 Mini
PCI		4x 1GbE NDC	4x 1GbE NDC
Sled q’ty per host chassis		4	4
Acoustical Performance: Idle/ Operating @ 23 °C Ambient			
LwA-UL[2] (Bels)	Idle[1]	6.3	5.9
	Operating[1]	6.9	7.4
LpA[3] (dBA)	Idle[1]	47	44
	Operating[1]	54	60
Prominent tones[(4)]		No prominent tones[4] in Idle[1] and Operating[1]	
Acoustical Performance: Max. Loading @ 35 °C Ambient			
LwA-UL[(2)] (Bels)		8.5	8.9
LpA[(3)] (dBA)		70	76

Footnotes:

1. Idle means the state in which the product is doing nothing but running OS, and values for Operating are the maximum of acoustical output for active HDDs or active processors.
2. LwA-UL is the upper limit sound power levels (LwA) calculated per section 4.4.1 of ISO 9296 (1988) with data collected in accordance with ISO 7779 (2010) from a single sample with a total 0.3 bel production deviation applied.
3. LpA is the average bystander position A-weighted sound pressure level calculated per section 4.3 of ISO 9296 (1988) and measured in accordance with ISO 7779 (2010). FX chassis is installed in a Dell 42-U rack such that the bottom of the Enclosure is at 25-cm from the floor of the chamber.
4. Prominent tone: Criteria of D.6 and D.11 of ECMA-74 12th ed. (2012) are followed to determine if discrete tones are prominent. FX chassis is installed in a Dell 42-U rack such that the bottom of the Enclosure is at 75-cm from the floor of the chamber. The acoustic transducers are at front and rear bystander positions.

15 PowerEdge C6420 acoustics

Dell EMC PowerEdge C6420 is a rack-mount server appropriate for unattended data center environment.

Table 15 summarizes the sound power, sound pressure level, and prominent tone performance of the C6420 in a 23±2°C environment.

15.1 Acoustical performance

The C6420 acoustics has been characterized in two typical configurations. Table 15 summarizes the configuration and acoustical performance of the PE C6420. Each configuration has been tested according to Dell EMC acoustical standards for rack-mounted servers.

15.2 PowerEdge C6420 acoustical dependencies

- Ambient Temperature. For a similar workload fan speeds (and thus, acoustical noise) may increase as ambient temperature increases. Please note there is ambient temperature restriction for C6420, defined in DPN: 2P9GM.
- High Wattage CPU. High-power (TDP) CPU cards may result in higher acoustical noise output.
- NVMe SSD. NVMe SSD consumes more power than other SATA/ SAS drives. It requires higher fan speeds for cooling, and thus increased acoustical output is expected.
- System Thermal Profile Selected in BIOS. The default setting is “Power Optimized (DAPC)”, which generally means lower fan speed and acoustics. If “Performance Optimized” is selected, fan speed and acoustical noise may increase.

Table 20 Acoustical performance of C6420

Configuration		Typical - 1	Typical -2
CPU Type		Intel Xeon Gold 6130	Intel Xeon Gold 5120
CPU TDP		125 W	105 W
CPU Quantity per sled		2	2
Memory Type		16GB, 2667MHz, DDR4	8GB, 2667MHz, DDR4
DIMM Quantity per sled		12	12
Backplane Type		2.5” x 24	3.5” x 12
HDD Type		10K RPM SAS	7.2K RPM SAS
HDD Quantity per host chassis		8	16
PSU Type		1600 W	1600 W
PSU Quantity per host chassis		2	2
PERC		H330 Mini	H330 Mini
PCI		Dual Port 10Gbe	Single port EDR IB
Acoustical Performance: Idle/ Operating @ 25 °C Ambient			
LwA-UL[2] (Bels)	Idle[1]	7.2	7.2
	Operating[1]	7.3	7.2
LpA[3] (dBA)	Idle[1]	58	58
	Operating[1]	58	58
Prominent tones[4]		No prominent tones[4] in Idle[1] and Operating[1]	
Acoustical Performance: Idle @ 28 °C Ambient			
LwA-UL[2] (Bels)		8.5	8.5
LpA[3] (dBA)		71	71
Acoustical Performance: Max. Loading @ 35 °C Ambient			
LwA-UL[2] (Bels)		9.0	9.0
LpA[3] (dBA)		75	75

Footnotes:

5. Idle means the state in which the product is doing nothing but running OS, and values for Operating are the maximum of acoustical output for active HDDs or active processors.
6. LwA-UL is the upper limit sound power levels (LwA) calculated per section 4.4.1 of ISO 9296 (1988) with data collected in accordance with ISO 7779 (2010) from a single sample with a total 0.3 bel production deviation applied.
7. LpA is the A-weighted sound pressure level at the bystander position per section 4.3 of ISO 9296 (1988) and measured in accordance to ISO 7779 (2010). The system is placed in a 24U rack enclosure, 25cm above a reflective floor.
8. Prominent tone: Criteria of D.6 and D.11 of ECMA-74 12th ed. (2012) are followed to determine if discrete tones are prominent. The system is placed in a 24U rack enclosure and the acoustic transducers are at front & rear bystander positions.

16 PowerEdge R840 acoustics

Dell EMC PowerEdge R840 is a rack-mount server appropriate for attended data center environment. However, lower acoustical output is attainable with proper hardware or software configurations.

Table 16 summarizes the sound power, sound pressure level, and prominent tone performance of the R840 in a 23±2°C environment.

16.1 Acoustical performance

R840 acoustical performance is characterized for three configurations: minimum, typical and feature rich. Table 16 summarizes the configuration and acoustical performance of the PE R840. Each configuration has been tested according to Dell EMC acoustical standards for rack-mounted servers.

16.2 PowerEdge R840 acoustical dependencies

- Ambient Temperature. For a similar workload fan speeds (and thus, acoustical noise) may increase as ambient temperature increases.
- High Wattage CPU. High-power (TDP) CPU parts may result in higher acoustical noise output.
- Rear Drives. When rear drives are installed in R840, fan speed may increase for cooling the drives, and hence both idle and operating acoustical outputs may be higher.
- System Thermal Profile Selected in BIOS. The default setting is “Power Optimized (DAPC)”, which generally means lower fan speed and acoustics. If “Performance Optimized” is selected, fan speed and acoustical noise may increase.

16.3 Methods to reduce acoustical output of the R840

Although the R840 is designed for use in data centers, some users may prefer a quieter system. Dell EMC suggests the following list of possible solutions to reduce acoustical output of the R840. An important note: In most cases, the idle fan speed of the system cannot be lowered without changing the configuration of the system, and in some cases, even a configuration change may not reduce idle fan speeds.

- Enable sound cap in IDRAC GUI. Sound cap, a setting in the BIOS, can be toggled on/off during boot up. When enabled, sound cap reduces the acoustics of the system at the expense of some performance.
- Reduce Ambient Temperature. Lowering the ambient temperature allows the system to cool components more efficiently than at higher ambient temperatures.
- Optimize Third Party PCI Card Options.
- Replace Third Party PCI Cards with similar Dell Supported Temperature PCI Controlled Cards, if available. Dell EMC works diligently with card vendors to validate and develop PCI cards to meet Dell EMC’s exacting standards for thermal performance.

Table 21 Acoustical performance of R840

Configuration		Minimum	Typical	Feature Rich
CPU Type		Intel Xeon Gold 5115	Intel Xeon Gold 6130	Intel Xeon Platinum 6152
CPU TDP * Quantity		85 W * 4pcs	125 W * 4pcs	140 W * 4pcs
Memory Type * Quantity		8GB, 2666MHz, DDR4	32GB, 2666MHz, DDR4	32GB, 2666MHz, DDR4
Memory Quantity		4	16	48
Backplane Type		2.5” x 8	2.5” x 24	2.5” x 24
HDD Type		2.5” 300GB 10K RPM SAS	2.5” SATA SSD x12 + 2.5” NVME SSD x4	2.5” SATA SSD x16 + 2.5” NVME SSD x8
HDD Quantity		4	16	24
PSU Type * Quantity		750 W * 2 pcs	1100 W * 2pcs	2400 W * 2pcs
PCI 1		-	Qlogic or Emulex FC16	-
PCI 2		-	Qlogic or Emulex FC16	GPGPU 250W
PCI 3		H740P	H740P	H740P
PCI 4		-	-	Qlogic or Emulex FC16
PCI 5		-	-	-
PCI 6		-	-	GPGPU 250W
others location		NDC 2x10GbE	NDC 4x10GbE	NDC 2x25GbE
Acoustical Performance: Idle/ Operating @ 25 °C Ambient				
LwA-UL[2] (Bels)	Idle[1]	5.8	6.6	6.7
	Operating[1]	5.8	6.7	7.1
LpA[3] (dBA)	Idle[1]	43.3	52.0	52.2
	Operating[1]	43.3	52.7	53.9
Prominent tones[4]		No prominent tones[4] in Idle[1] and Operating[1]		
Acoustical Performance: Idle @ 28 °C Ambient				
LwA-UL[2] (Bels)		5.8	6.7	6.7
LpA[3] (dBA)		41.4	52.8	52.2
Acoustical Performance: Max. Loading @ 35 °C Ambient				
LwA-UL[2] (Bels)		6.9	8.1	8.7
LpA[3] (dBA)		51.6	65.6	69.4

Footnotes:

1. Idle means the state in which the product is doing nothing but running OS, and values for Operating are the maximum of acoustical output for active HDDs or active processors.
2. LwA-UL is the upper limit sound power levels (LwA) calculated per section 4.4.1 of ISO 9296 (1988) with data collected in accordance with ISO 7779 (2010) from a single sample with a total 0.3 bel production deviation applied.
3. LpA is the A-weighted sound pressure level at the bystander position per section 4.3 of ISO 9296 (1988) and measured in accordance to ISO 7779 (2010). The system is placed in a 24U rack enclosure, 25cm above a reflective floor.
4. Prominent tone: Criteria of D.6 and D.11 of ECMA-74 12th ed. (2012) are followed to determine if discrete tones are prominent. The system is placed in a 24U rack enclosure and the acoustic transducers are at front & rear bystander positions.

17 PowerEdge R940XA acoustics

Dell EMC PowerEdge R940XA is a rack-mount server appropriate for attended data center environment. However, lower acoustical output is attainable with proper hardware or software configurations.

Table 17 summarizes the sound power, sound pressure level, and prominent tone performance of the R940XA in a 23±2°C environment.

17.1 Acoustical performance

R940XA acoustical performance is characterized for three configurations: minimum, typical and feature rich. Table 17 summarizes the configuration and acoustical performance of the PE R940XA. Each configuration has been tested according to Dell EMC acoustical standards for rack-mounted servers.

17.2 PowerEdge R940XA acoustical dependencies

- Ambient Temperature. For a similar workload fan speeds (and thus, acoustical noise) may increase as ambient temperature increases.
- High Wattage CPU. High-power (TDP) CPU parts may result in higher acoustical noise output.
- Rear Drives. When rear drives are installed in R840, fan speed may increase for cooling the drives, and hence both idle and operating acoustical outputs may be higher.
- System Thermal Profile Selected in BIOS. The default setting is “Power Optimized (DAPC)”, which generally means lower fan speed and acoustics. If “Performance Optimized” is selected, fan speed and acoustical noise may increase.

17.3 Methods to reduce acoustical output of the R940XA

Although the R940XA is designed for use in data centers, some users may prefer a quieter system. Dell EMC suggests the following list of possible solutions to reduce acoustical output of the R940XA. An important note: In most cases, the idle fan speed of the system cannot be lowered without changing the configuration of the system, and in some cases, even a configuration change may not reduce idle fan speeds.

- Enable sound cap in IDRAC GUI. Sound cap, a setting in the BIOS, can be toggled on/off during boot up. When enabled, sound cap reduces the acoustics of the system at the expense of some performance.
- Reduce Ambient Temperature. Lowering the ambient temperature allows the system to cool components more efficiently than at higher ambient temperatures.
- Optimize Third Party PCI Card Options.
- Replace Third Party PCI Cards with similar Dell Supported Temperature PCI Controlled Cards, if available. Dell EMC works diligently with card vendors to validate and develop PCI cards to meet Dell EMC’s exacting standards for thermal performance.

Table 22 Acoustical performance of R940XA

Configuration		Minimum	Typical	Feature Rich
CPU Type		Intel Xeon Gold 5115	Intel Xeon Gold 6130	Intel Xeon Platinum 8160 8160 150W
CPU TDP * Quantity		85 W * 4pcs	125 W * 4pcs	150 W * 4pcs
Memory Type		8GB, 2666MHz, DDR4	32GB, 2666MHz, DDR4	32GB, 2666MHz, DDR4
Memory Quantity		4	16	48
Backplane Type		2.5” x 8	2.5” x 24	2.5” x24 + 2.5” x8
HDD Type		2.5” 300GB 10K RPM SAS	2.5” SATA SSD	2.5” SATA SSD x24 + 2.5' NVME SSD x4
HDD Quantity		4	24	32
PSU Type * Quantity		750 W * 2pcs	1100 W * 2pcs	2400 W * 2pcs
PCI 1		Qlogic or Emulex FC16	Qlogic or Emulex FC16	Qlogic or Emulex FC16
PCI 2		Qlogic or Emulex FC16	Qlogic or Emulex FC16	Qlogic or Emulex FC16
PCI 3		-	-	H740P
PCI 4		-	-	H740P
PCI 5		H740P	H740P	-
PCI 6		-	-	Qlogic or Emulex FC16
others location		NDC 2x10GbE	NDC 4x10GbE	NDC 2x25GbE
Acoustical Performance: Idle/ Operating @ 25 °C Ambient				
LwA-UL[2] (Bels)	Idle[1]	6	6.1	6.3
	Operating[1]	6	6.1	6.4
LpA[3] (dBA)	Idle[1]	43.5	43.5	45.6
	Operating[1]	43.7	43.6	47.3
Prominent tones[4]		No prominent tones[4] in Idle[1] and Operating[1]		
Acoustical Performance: Idle @ 28 °C Ambient				
LwA-UL[2] (Bels)		6.1	6.3	6.4
LpA[3] (dBA)		44.9	46.6	47.2
Acoustical Performance: Max. Loading @ 35 °C Ambient				
LwA-UL[2] (Bels)		6.5	7.2	8.3
LpA[3] (dBA)		48.5	55.2	65.2

Footnotes:

1. Idle means the state in which the product is doing nothing but running OS, and values for Operating are the maximum of acoustical output for active HDDs or active processors.
2. LwA-UL is the upper limit sound power levels (LwA) calculated per section 4.4.1 of ISO 9296 (1988) with data collected in accordance with ISO 7779 (2010) from a single sample with a total 0.3 bel production deviation applied.
3. LpA is the A-weighted sound pressure level at the bystander position per section 4.3 of ISO 9296 (1988) and measured in accordance to ISO 7779 (2010). The system is placed in a 24U rack enclosure, 25cm above a reflective floor.
4. Prominent tone: Criteria of D.6 and D.11 of ECMA-74 12th ed. (2012) are followed to determine if discrete tones are prominent. The system is placed in a 24U rack enclosure and the acoustic transducers are at front & rear bystander positions.

18 Frequently Asked Questions

Question: **Why can I hear my server when it is powered off and plugged in (standby mode)?**

Answer: In standby mode, one of the system fans continue to run at a low speed in order to provide cooling to components that are powered on when the system is plugged in.

Question: **What is sound cap?**

Answer: Sound cap is an iDRAC system profile which provides some system performance capping to achieve reduced acoustics without sacrificing reliability. When sound cap is enabled, acoustics are reduced at the expense of system performance.