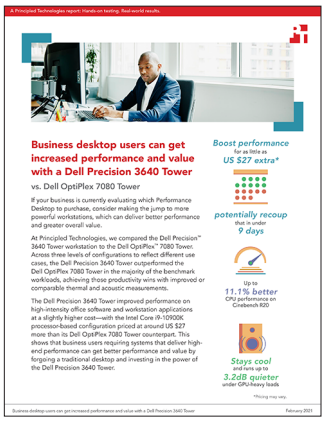

The science behind the report:

Business desktop users can get increased performance and value with a Dell Precision 3640 Tower

This document describes what we tested, how we tested, and what we found. To learn how these facts translate into real-world benefits, read the report Business desktop users can get increased performance and value with a Dell Precision 3640 Tower.

We concluded our hands-on testing on November 18, 2020. During testing, we determined the appropriate hardware and software configurations and applied updates as they became available. The results in this report reflect configurations that we finalized on October 21, 2020 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

Our results

To make the following ROI calculations, we assumed an hourly salary plus benefits of US $35.96. This hourly rate comes from the average total compensation for private industry workers, reported by the U.S. Bureau of Labor Statistics for June 2020, at https://www.bls.gov/news.release/ecec.t04.htm.

Table 1: ROI calculations.

Processor	Cost (USD)		Value per hour worked (USD)	Benchmark used	% win on benchmark	Time to payback (hours)	Time to payback (workdays at 2 hrs/day)
	Precision 3640 Tower	OptiPlex 7080 Tower					
Intel Core i7-10700	$1,535.88	$1,490.06	$1.08	SYSmark 2018	3.02%	42.42	21.21
Intel Core i9-10900	$2,366.94	$2,101.31	$0.93	SYSmark 2018	2.61%	285.62	142.81
Intel Core i9-10900K	$2,617.00	$2,590.31	$1.60	SPECworkstation3	4.47%	16.68	8.34

Table 2: Benchmark results for Intel Core i7-10700 processor-powered systems. Higher scores are better.

Benchmark	Dell Precision 3640 Tower	Dell OptiPlex 7080 Tower	Difference	Percent difference
SYSmark 2018				
Overall Rating	1,940	1,883	57.0	3.0%
Productivity	1,592	1,590	2.0	0.1%
Creativity	2,862	2,672	190.0	7.1%
Responsiveness	1,602	1,573	29.0	1.8%
Cinebench R20				
Overall Rating	3,941	3,547	394.0	11.1%
SPECworkstation 3				
Media and Entertainment	1.87	1.46	0.41	28.0%
Product Development	2.01	1.42	0.59	41.5%
Life Sciences	1.73	0.99	0.74	74.7%
Financial Services	2.00	1.89	0.11	5.8%
Energy	0.91	0.80	0.11	13.7%
General Operations	2.04	1.98	0.06	3.0%
GPU Compute	0.92	0.43	0.49	113.9%
SPECviewperf13				
3dsmax-06	41.92	15.54	26.38	169.7%
catia-05	74.08	9.14	64.94	710.5%
creo-02	55.92	13.85	42.07	303.7%
energy-02	0.87	0.33	0.54	163.6%
maya-05	67.26	22.41	44.85	200.1%
medical-02	24.29	3.80	20.49	539.2%
showcase-02	21.13	9.56	11.57	121.0%
snx-03	89.83	3.12	86.71	2779.1%
sw-04	93.47	27.11	66.36	244.7%

Table 3: Thermal and acoustic results for Intel Core i7-10700 processor-powered systems. Lower temperatures and dB are better.

Test	Dell Precision 3640 Tower	Dell OptiPlex 7080 Tower	Difference
Thermal tests (°C)			
Idle			
CPU Average	29.1	27.6	1.50
GPU Average	31.4	32.3	0.90
PassMark BurnInTest @ 80%			
CPU Average	81.0	78.7	2.30
GPU Average	32.7	37.6	4.90
Unigine Heaven			
CPU Average	41.7	35.6	6.10
GPU Average	69.5	63.5	6.00
Acoustic tests (dB)			
Idle			
Average dB after 30 minutes	26.8	27.0	-0.20
PassMark BurnInTest @ 80%			
Average dB after 30 minutes	31.1	26.7	4.40
Unigine Heaven			
Average dB after 30 minutes	26.5	26.8	-0.30

Table 4: Benchmark results for Intel Core i9-10900 processor-powered systems. Higher scores are better.

Benchmark	Dell Precision 3640 Tower	Dell OptiPlex 7080 Tower	Difference	Percent difference
SYSmark 2018				
Overall Rating	2,003	1,952	51.0	2.6%
Productivity	1,681	1,593	88.0	5.5%
Creativity	3,032	2,984	48.0	1.6%
Responsiveness	1,577	1,566	11.0	0.7%
Cinebench R20				
Overall Rating	4,543	4,434	109.0	2.4%
SPECworkstation 3				
Media and Entertainment	2.45	2.62	-0.2	-6.4%
Product Development	2.63	2.11	0.5	24.6%
Life Sciences	2.29	1.76	0.5	30.1%
Financial Services	2.38	2.54	-0.2	-6.2%
Energy	1.55	1.41	0.1	9.9%
General Operations	2.11	2.04	0.1	3.4%
GPU Compute	1.82	2.97	-1.2	-38.7%
SPECviewperf13				
3dsmax-06	113.02	144.42	-31.4	-21.7%
catia-05	186.05	87.69	98.4	112.1%
creo-02	158.08	128.6	29.5	22.9%
energy-02	20.38	11.09	9.3	83.7%
maya-05	166.54	198.1	-31.6	-15.9%
medical-02	63.26	38.67	24.6	63.5%
showcase-02	53.16	76.08	-22.9	-30.1%
snx-03	188.71	15.03	173.7	1155.5%
sw-04	157.39	77.64	79.8	102.7%

Table 5: Thermal and acoustic results for Intel Core i9-10900 processor-powered systems. Lower temperatures and dB are better.

Test	Dell Precision 3640 Tower	Dell OptiPlex 7080 Tower	Difference
Thermal tests (°C)			
Idle			
CPU Average	30.4	28.9	1.5
GPU Average	28.1	32.0	3.9
PassMark BurnInTest @ 80%			
CPU Average	81.7	80.8	0.9
GPU Average	30.5	34.7	4.2
Unigine Heaven			
CPU Average	58.1	54.6	3.5
GPU Average	69.0	79.3	10.3
Acoustic tests (dB)			
Idle			
Average dB after 30 minutes	27.0	26.7	0.3
PassMark BurnInTest @ 80%			
Average dB after 30 minutes	31.2	26.5	4.7
Unigine Heaven			
Average dB after 30 minutes	29.6	38.0	8.4

Table 6: Benchmark results for Intel Core i9-10900K processor-powered systems. Higher scores are better.

Benchmark	Dell Precision 3640 Tower	Dell OptiPlex 7080 Tower	Difference	Percent difference
SYSmark 2018				
Overall Rating	2,088	2,087	1.0	0.0%
Productivity	1,720	1,724	-4.0	-0.2%
Creativity	3,250	3,206	44.0	1.3%
Responsiveness	1,627	1,644	-17.0	-1.0%
Cinebench R20				
Overall Rating (Higher is better)	5,666	5,585	81.0	1.4%
SPECworkstation 3				
Media and Entertainment	3.14	2.98	0.2	5.3%
Product Development	2.96	2.53	0.4	16.9%
Life Sciences	2.77	2.41	0.4	14.9%
Financial Services	2.99	2.93	0.1	2.0%
Energy	1.8	1.73	0.1	4.0%
General Operations	2.1	2.2	-0.1	-4.5%
GPU Compute	4.05	4.38	-0.3	-7.5%
SPECviewperf13				
3dsmax-06	191.32	208.87	-17.6	-8.4%
catia-05	280.43	148.62	131.8	88.6%
creo-02	276.61	213.54	63.1	29.5%
energy-02	39.04	22.88	16.2	70.6%
maya-05	292	309.49	-17.5	-5.6%
medical-02	106.34	60.96	45.4	74.4%
showcase-02	106.26	123.18	-16.9	-13.7%
snx-03	344.15	21.83	322.3	1476.5%
sw-04	187.4	110.88	76.5	69.0%

Table 7: Thermal and acoustic results for Intel Core i9-10900K processor-powered systems. Lower temperatures and dB are better.

Test	Dell Precision 3640 Tower	Dell OptiPlex 7080 Tower	Difference
Thermal tests (°C)			
Idle			
CPU Average	32.6	29.3	3.3
GPU Average	33.0	33.5	0.5
PassMark BurnInTest @ 80%			
CPU Average	81.2	78.4	2.8
GPU Average	32.6	37.5	4.9
Unigine Heaven			
CPU Average	62.2	58.6	3.6
GPU Average	83.3	81.8	1.5
Acoustic tests (dB)			
Idle			
Average dB after 30 minutes	26.8	27.5	0.7
PassMark BurnInTest @ 80%			
Average dB after 30 minutes	35.5	28.0	7.5
Unigine Heaven			
Average dB after 30 minutes	35.6	38.8	3.2

System configuration information

Table 8: Detailed information on the Intel Core i7-10700 processor-powered systems we tested.

System configuration information	Dell Precision 3640 Tower	Dell OptiPlex 7080 Tower
Processor		
Vendor	Intel	Intel
Name	Core i7	Core i7
Model number	10700	10700
Core frequency (GHz)	2.9-4.8	2.9-4.8
Number of cores	8	8
Cache	16MB	16MB
Memory		
Amount (GB)	16	16
Number of DIMMS	2 x 8GB	2 x 8GB
Type	DDR4	DDR4
Speed (MHz)	2,933	2,933
Graphics		
Vendor	NVIDIA	NVIDIA
Model number	NVIDIA Quadro P620	NVIDIA GeForce GT730
Video RAM	2GB GDDR5	2GB GDDR5
Storage		
Amount	512GB	512GB
Type	M.2 PCIe NVMe	M.2 PCIe NVMe
Connectivity/expansion		
Wired internet	Intel I219-LM	Intel I219-LM
Wireless internet	N/A	N/A
Bluetooth	N/A	N/A
USB	**Front:** 2 USB 3.2 Gen 2 Type-A 1 USB 3.2 Gen 2 Type-A with Power Share 1 USB 3.2 Gen 2 Type-C **Rear:** 4 USB 3.2 Gen 2 Type-A 2 USB 2.0 Type-A	**Front:** 2 USB 2.0 Ports (1 with PowerShare) 1 USB 3.2 Gen 2 Type-A 1 USB 3.2 Gen 2 Type-C **Rear:** 1 USB 3.2 Gen 2 Type-A 3 USB 3.2 Gen 1 Type-A 2 USB 2.0 Ports with Power On
Video	2 DisplayPort 1.4 4 Mini DisplayPort	4 DisplayPort 1.4
Operating system		
Vendor	Microsoft	Microsoft
Name	Windows 10 Pro	Windows 10 Pro
Build number or version	10.0.19041	10.0.19041

System configuration information	Dell Precision 3640 Tower	Dell OptiPlex 7080 Tower
BIOS		
BIOS name and version	Dell 1.3.2	Dell 1.1.5
Dimensions		
Width (in)	6.95	6.65
Depth (in)	13.58	11.84
Height (in)	13.19	14.45

Table 9: Detailed information on the Intel Core i9-10900 processor-powered systems we tested.

System configuration information	Dell Precision 3640 Tower	Dell OptiPlex 7080 Tower
Processor		
Vendor	Intel	Intel
Name	Core i9	Core i9
Model number	10900	10900
Core frequency (GHz)	2.8-5.2	2.8-5.2
Number of cores	10	10
Cache	20MB	20MB
Memory		
Amount (GB)	32	32
Number of DIMMS	2 x 16GB	2 x 16GB
Type	DDR4	DDR4
Speed (MHz)	2,933	2,933
Graphics		
Vendor	NVIDIA	NVIDIA
Model number	NVIDIA Quadro P2200	NVIDIA GeForce GTX 1660 Super
Video RAM	5GB GDDR5	6GB GDDR6
Storage		
Amount	512GB	512GB
Type	M.2 PCIe NVMe	M.2 PCIe NVMe

System configuration information	Dell Precision 3640 Tower	Dell OptiPlex 7080 Tower
Connectivity/expansion		
Wired internet	Intel I219-LM	Intel I219-LM
Wireless internet	N/A	N/A
Bluetooth	N/A	N/A
USB	**Front:** 2 USB 3.2 Gen 2 Type-A 1 USB 3.2 Gen 2 Type-A with Power Share 1 USB 3.2 Gen 2 Type-C **Rear:** 4 USB 3.2 Gen 2 Type-A 2 USB 2.0 Type-A	**Front:** 2 USB 2.0 Ports (1 with PowerShare) 1 USB 3.2 Gen 2 Type-A 1 USB 3.2 Gen 2 Type-C **Rear:** 1 USB 3.2 Gen 2 Type-A 3 USB 3.2 Gen 1 Type-A 2 USB 2.0 Ports with Power On
Video	6 DisplayPort 1.4	3 DisplayPort 1.4 1 HDMI 2.0
Operating system		
Vendor	Microsoft	Microsoft
Name	Windows 10 Pro	Windows 10 Pro
Build number or version	10.0.19041	10.0.19041
BIOS		
BIOS name and version	Dell 1.3.2	Dell 1.1.5
Dimensions		
Width (in)	6.95	6.65
Depth (in)	13.58	11.84
Height (in)	13.19	14.45

Table 10: Detailed information on the Intel Core i9-10900K processor-powered systems we tested.

System configuration information	Dell Precision 3640 Tower	Dell OptiPlex 7080 Tower
Processor		
Vendor	Intel	Intel
Name	Core i9	Core i9
Model number	10900K	10900K
Core frequency (GHz)	3.7-5.3	3.7-5.3
Number of cores	10	10
Cache	20MB	20MB
Memory		
Amount (GB)	32	32
Number of DIMMS	2 x 16GB	2 x 16GB
Type	DDR4	DDR4
Speed (MHz)	2,933	2,933

System configuration information	Dell Precision 3640 Tower	Dell OptiPlex 7080 Tower
Graphics		
Vendor	NVIDIA	NVIDIA
Model number	NVIDIA Quadro RTX4000	NVIDIA GeForce RTX 2070 Super
Video RAM	8GB GDDR5	8GB GDDR6
Storage		
Amount	512GB	512GB
Type	M.2 PCIe NVMe	M.2 PCIe NVMe
Connectivity/expansion		
Wired internet	Intel I219-LM	Intel I219-LM
Wireless internet	N/A	N/A
Bluetooth	N/A	N/A
USB	**Front:** 2 USB 3.2 Gen 2 Type-A 1 USB 3.2 Gen 2 Type-A with Power Share 1 USB 3.2 Gen 2 Type-C **Rear:** 4 USB 3.2 Gen 2 Type-A 2 USB 2.0 Type-A	**Front:** 2 USB 2.0 Ports (1 with PowerShare) 1 USB 3.2 Gen 2 Type-A 1 USB 3.2 Gen 2 Type-C **Rear:** 1 USB 3.2 Gen 2 Type-A 3 USB 3.2 Gen 1 Type-A 2 USB 2.0 Ports with Power On
Video	5 DisplayPort 1.4 1 USB 3.2 Type-C	5 DisplayPort 1.4 1 HDMI 2.0
Operating system		
Vendor	Microsoft	Microsoft
Name	Windows 10 Pro	Windows 10 Pro
Build number or version	10.0.19041	10.0.19041
BIOS		
BIOS name and version	Dell 1.3.2	Dell 1.1.5
Dimensions		
Width (in)	6.95	6.65
Depth (in)	13.58	11.84
Height (in)	13.19	14.45

How we tested

Measuring performance: benchmarks

SYSmark 2018

Avoiding antivirus software conflicts

SYSmark 2018 is not compatible with any virus-scanning software, so we uninstalled any such software present on the systems before we installed the benchmark.

Avoiding pre-installed software conflicts

SYSmark 2018 installs the following applications, which its test scripts employ:

Productivity

- Adobe® Acrobat® Pro DC
- AutoIT 3.3.14.2
- BowPad64-2.3.3 installer
- Google® Chrome®
- Microsoft® Excel® 2016
- Microsoft® OneNote® 2016
- Microsoft® Outlook® 2016
- Microsoft® PowerPoint® 2016
- Microsoft® Word 2016
- Windows Zip

Creativity

- Adobe® Photoshop® CC 2017
- Adobe® Lightroom® Classic CC
- CyberLink PowerDirector® 2015

Responsiveness

- Adobe Acrobat Pro DC
- Adobe Lightroom Classic CC
- Adobe Photoshop CC 2017
- CyberLink PowerDirector 2015
- Google Chrome
- Microsoft Excel 2016
- Microsoft OneNote 2016
- Microsoft Outlook 2016
- Microsoft PowerPoint 2016
- Microsoft Word 2016

If any of these applications already exist on the system under test, they could cause problems with the benchmark due to software conflicts. To avoid any such issues, we uninstalled all conflicting pre-installed software applications—including different versions of any of the programs SYSmark 2018 uses—before we installed the benchmark.

Using the SYSmark built-in Configuration Tool

This tool supports three levels of configuration:

1. Only makes changes that are REQUIRED for the benchmark to run.
2. Additionally, makes changes that are RECOMMENDED for repeatable results.
3. Additionally, makes OPTIONAL changes that help ensure best results.

The Configuration tool makes the following configuration changes at each of the three levels:

Level 1 - Required

- Disables User Account Control (UAC)
- Set DPI Scaling to 100%
- Disables Low Battery Actions
- Disables Network Proxies
- Disables System Sleep and Hibernate
- Disables Windows Update

Level 2 - Recommended

- Disables User Account Control (UAC)
- Set DPI Scaling to 100%
- Disables Low Battery Actions
- Disables Network Proxies
- Disables System Sleep and Hibernate
- Disables Windows Update
- Create BAPCo power scheme
- Set Power Plan Type to High Performance
- Set CPU High Performance
- Disables Disk Defrag
- Disables Windows Error Reporting
- Disables Windows Lock Screen
- Disables Windows Pop-ups
- Disables Screen Saver and Monitor Timeout
- Disables Windows Sidebar/Gadgets
- Disables Desktop Slideshow
- Disables Windows Defender
- Disables Windows Firewall
- Set Font Smoothing

Level 3 - Optional

- Disables Hard Disk Timeout
- Disables System Restore
- Ignores Laptop Lid Close

We chose the official BAPCo 'Run Benchmark' default as outlined in the BAPCo SYSmark2018 User Guide http://bapco.com/wp-content/uploads/2018/10/BAPCo_SYSmark2018_user_guide.pdf which runs the benchmark using the Required and Recommended options.

Setting up the test

1. Install SYSmark 2018 with the default options.

Running the test

1. Launch SYSmark 2018.
2. Click the Settings Gear icon.
3. For iterations, enter 3.
4. Verify that Conditioning Run is enabled.
5. Enable Process Idle Tasks.
6. Enter a name for the benchmark run.
7. To return to the main menu, click Back.
8. Click Run Benchmark.
9. When the benchmark finishes, record the SYSmark 2018 benchmark results.

SPECworkstation 3

Setting up the test

1. Go to https://www.spec.org/gwpg/wpc.static/workstation3-info.html and purchase and download the vendor license of the benchmark.
2. Unzip the SPECworkstation_304.zip file to C:\.
3. Navigate to the extracted SPECworkstation_304 directory and click on the SPECworkstation_304.exe to install.
4. Shut down the system.

Running the test

1. Boot the system.
2. Select Windows Start.
3. Type `cmd`, and press Ctrl+Shift+Enter.
4. Type `Cmd.exe /c start /wait Rundll32.exe advapi32.dll,ProcessIdleTasks` Do not interact with the system until the command completes.
5. After the command completes, wait five minutes before running the test.
6. Launch SPECworkstation.
7. Change the iterations to 3, and check the box next to Official Run.
8. Click the OpenCL/CUDA Configuration button, select the discrete graphics card option, and select CUDA.
9. Click Run Benchmark.
10. When the test is complete, record the results.

SPECviewperf 13

Setting up the test

1. Go to https://www.spec.org/gwpg/gpc.static/vp13info.html and purchase and download the vendor license of the benchmark.
2. Unzip the SPECviewperf13.zip file to C:\.
3. Navigate to the extracted SPECviewperf13 directory and click on the SPECgpcViewperf13.0.exe to install.
4. Shutdown the system.

Running the test

1. Boot the system.
2. Select Windows Start.
3. Type `cmd`, and press Ctrl+Shift+Enter.
4. Type `Cmd.exe /c start /wait Rundll32.exe advapi32.dll,ProcessIdleTasks` Do not interact with the system until the command completes.
5. After the command completes, wait five minutes before running the test.
6. Launch SPECviewperf.
7. Change the iterations to 3.
8. Click Run.
9. When the test is complete, record the results.

Cinebench R20

Setting up the test

1. Download and install Cinebench from https://www.maxon.net/en-us/products/cinebench-r20-overview/.

Running the test

1. Boot the system.
2. Select Windows Start.
3. Type `cmd`, and press Ctrl+Shift+Enter.
4. Type `Cmd.exe /c start /wait Rundll32.exe advapi32.dll,ProcessIdleTasks` Do not interact with the system until the command completes.
5. After the command completes, wait five minutes before running the test.
6. Launch Cinebench.
7. Click Run.
8. When the test is complete, record the results.
9. Repeat steps 1 through 8 twice more.

Measuring thermals

Measuring system temperature while idle

Setting up the test

1. Download and install HWiNFO from https://www.hwinfo.com/download/.

Running the test

1. Boot the system.
2. Select Windows Start.
3. Type `cmd`, and press Ctrl+Shift+Enter.
4. Type `Cmd.exe /c start /wait Rundll32.exe advapi32.dll,ProcessIdleTasks` Do not interact with the system until the command completes.
5. After the command completes, wait five minutes before running the test.
6. Launch HWiNFO.
7. Confirm that Sensors-only is selected, and click Run.
8. Click the gear icon to open Settings. Under the Show values area, deselect all options except Temperatures.
9. Click OK.
10. Click the Logging Start button, and allow the system to sit idle for 30 minutes.
11. After 30 minutes, click Logging Stop in HWiNFO and use the created CSV file to find and report the average CPU and GPU temperature during the 30-minute duration.
12. Power the system off for one hour and allow it to return to room temperature.
13. Repeat steps 1 through 12 two more times.

Measuring system temperature while running PassMark BurnInTest

Setting up the test

1. Download and install HWiNFO from https://www.hwinfo.com/download/.
2. Download and install PassMark BurnInTest from https://www.passmark.com/products/burnintest/.
3. Launch PassMark BurnInTest.
4. From the Configuration menu, select Test selection.
5. Deselect all subsystems other than CPU.
6. Set the CPU load to 80.
7. Set the test to Auto Stop after 35 minutes and click OK.

Running the test

1. Boot the system.
2. Select Windows Start.
3. Type `cmd`, and press Ctrl+Shift+Enter.
4. Type `Cmd.exe /c start /wait Rundll32.exe advapi32.dll,ProcessIdleTasks` Do not interact with the system until the command completes.
5. After the command completes, wait five minutes before running the test.
6. Launch HWiNFO.
7. Confirm that Sensors-only is selected, and click Run.
8. Click the gear icon to open Settings. Under the Show values area, deselect all options except Temperatures.
9. Click OK.
10. Launch PassMark BurnInTest.
11. Simultaneously click the Logging Start button in HWiNFO and click GO in PassMark BurnInTest. Allow the system to run the test for 30 minutes.
12. After 30 minutes click Logging Stop in HWiNFO and use the created CSV file to find and report the average CPU and GPU temperature during the 30 minute duration.
13. Power the system off for one hour, and allow it to return to room temperature.
14. Repeat steps 1 through 13 two more times.

Measuring system temperature while running Unigine Heaven

Setting up the test

1. Download and install HWiNFO from https://www.hwinfo.com/download/.
2. Download and install Unigine Heaven from https://benchmark.unigine.com/heaven.
3. Launch Unigine Heaven.
4. Beside API, select DirectX 11 from the drop-down box.
5. Beside Quality, select Ultra from the drop-down box.
6. Beside Tessellation, select Normal from the drop-down box.
7. Confirm that both Stereo 3D and Multi-monitor are set to Disabled.
8. Beside Anti-aliasing, select x4 in the drop-down box.
9. Uncheck the Full Screen option.
10. Set the resolution to 1920x1080.

Running the test

1. Boot the system.
2. Select Windows Start.
3. Type `cmd`, and press Ctrl+Shift+Enter.
4. Type `Cmd.exe /c start /wait Rundll32.exe advapi32.dll,ProcessIdleTasks` Do not interact with the system until the command completes.
5. After the command completes, wait five minutes before running the test.
6. Launch HWiNFO.
7. Confirm that Sensors-only is selected, and click Run.
8. Click the gear icon to open Settings.Under the Show values area, deselect all options except Temperatures.
9. Click OK.
10. Launch Unigine Heaven.
11. Simultaneously click the Logging Start button in HWiNFO and click RUN in Unigine Heaven. Allow the system to run the test for 30 minutes.
12. After 30 minutes, click Logging Stop in HWiNFO and use the created CSV file to find and report the average CPU and GPU temperature during the 30 minute duration.
13. Power the system off for 1 hour, and allow it to return to room temperature.
14. Repeat steps 1 through 13 two more times.

Measuring acoustics

These tests requires the following items:

- Extech SDL600 Sound Level Meter/Datalogger with SD card

Setting up the test

1. Place the system under test in a sound-proofed professional sound booth.
2. Set the Extech SDL600 on a tripod so that it is two feet in front of, and one foot above the system under test.

Measuring acoustics while idle

Running the test

1. Boot the system.
2. Select Windows Start.
3. Type `cmd`, and press Ctrl+Shift+Enter.
4. Type `Cmd.exe /c start /wait Rundll32.exe advapi32.dll,ProcessIdleTasks` Do not interact with the system until the command completes.
5. After the command completes, wait five minutes before running the test.
6. Start the Extech SDL600 Sound Level Meter/Datalogger, and allow the system to run at idle for 30 minutes.
7. At the end of the 30 minutes, stop the Extech SDL600 and record the average Idle (dB).
8. Shut down the system for one hour to let it return to room temperature.
9. Repeat steps 1-8 two more times.

Measuring acoustics while running PassMark BurnInTest

Setting up the test

1. Download and install PassMark BurnInTest from https://www.passmark.com/products/burnintest/.
2. Launch PassMark BurnInTest.
3. From the Configuration menu, select Test selection and duty cycles.
4. Deselect all subsystems other than CPU.
5. Set the CPU load to 80.
6. Set the test to Auto Stop after 35 minutes, and click OK.

Running the test

1. Boot the system.
2. Select Windows Start.
3. Type `cmd`, and press Ctrl+Shift+Enter.
4. Type `Cmd.exe /c start /wait Rundll32.exe advapi32.dll,ProcessIdleTasks` Do not interact with the system until the command completes.
5. After the command completes, wait five minutes before running the test.
6. Launch PassMark BurnInTest.
7. Simultaneously start the Extech SDL600 Sound Level Meter/Datalogger and click GO in PassMark BurnInTest. Allow the system to run the test for 30 minutes.
8. At the end of 30 minutes, stop the Extech SDL600 and record the average sound level (dB) while running PassMark BurnInTest.
9. Shut down the system for one hour and let it return to room temperature.
10. Repeat steps 1 through 9 two more times.

Measuring acoustics while running Unigine Heaven

Setting up the test

1. Download and install Unigine Heaven from https://benchmark.unigine.com/heaven.
2. Launch Unigine Heaven.
3. Beside API, select DirectX 11 from the drop-down.
4. Beside Quality, select Ultra from the drop-down.
5. Beside Tessellation, select Normal from the drop-down.
6. Confirm that both Stereo 3D and Multi-monitor are set to Disabled.
7. Beside Anti-aliasing, select x4 from the drop-down.
8. Uncheck the Full Screen option.
9. Set the resolution to 1920x1080.

Running the test

1. Boot the system.
2. Select Windows Start.
3. Type `cmd`, and press Ctrl+Shift+Enter.
4. Type `Cmd.exe /c start /wait Rundll32.exe advapi32.dll,ProcessIdleTasks` Do not interact with the system until the command completes.
5. After the command completes, wait five minutes before running the test.
6. Launch Unigine Heaven.
7. Simultaneously start the Extech SDL600 Sound Level Meter/Datalogger and click RUN in Unigine Heaven. Allow the system to run the test for 30 minutes.
8. At the end of 30 minutes, stop the Extech SDL600 and record the average sound level (dB) while running Unigine Heaven.
9. Shut down the system for one hour and let it return to room temperature.
10. Repeat steps 1 through 9 two more times.

Read the report at http://facts.pt/IT0TC9p ▶

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