Benchmark test results: Copilot+ PCs from Acer compared to MacBook laptops

In this report, we assessed the following devices:

- Copilot+ PCs running Windows 11 Pro
  - Acer Swift 14 AI with Intel® Core™ Ultra 9 288V
  - Acer Swift Go 14 AI with Qualcomm Snapdragon X Plus - X1P42100
- Apple® MacBook® laptops running macOS® Sequoia
  - Apple MacBook Air® 13" with Apple M2
  - Apple MacBook Air 15" with Apple M2
  - Apple MacBook Air 13" with Apple M3
  - Apple MacBook Air 15" with Apple M3
  - Apple MacBook Pro® 14" with Apple M3

We used three benchmarks for performance testing:

- Cinebench 2024
- Geekbench 6 Pro v6.2.2
- Speedometer 2.1 on Microsoft Edge v128.0.2739.67

We tested battery life with four different tests:

- Windows ADK battery test – Web browsing, which Microsoft created and has used extensively (Copilot+ PCs only)
- Windows ADK battery test – Local video playback, which Microsoft created and has used extensively (Copilot+ PCs only)
- Custom battery test – Web browsing, which PT created and has used extensively
- Custom battery test – Local video playback, which PT created and has used extensively

We ran each benchmark on each device three times; here, we report the average scores we saw across the three runs. Because the Windows ADK test uses Windows features, it does not run on macOS, so we ran it on only Copilot+ PCs. For all results, higher is better. (The Time to shut down metric in Windows ADK battery life is a projection of how long the battery should last before the system shuts down.) For complete results and hardware/software disclosures, see the science behind the report.

Test results

Copilot+ PCs running Windows 11 Pro

Table 1: Results of our testing on the Acer Swift 14 AI. For all results, higher is better. For complete results, see the science behind the report.

	Acer Swift 14 AI Intel Core Ultra 9 288V
Cinebench 2024	
Multi-core – Average	537.3
Single-core – Average	125.0
Geekbench 6 Pro v6.2.2	
Multi-core – Average	11,226.3
Single-core – Average	2,865.0
Speedometer 2.1 on Edge v128.0.2739.67	
Runs per minute – Average	480.2
Windows ADK battery test – Web browsing (Battery Saver Dim OFF)	
Total duration (min) – Average	632.3
Projected time to shut down (min) – Average	656.0
Windows ADK battery test – Local video playback (Battery Saver Dim OFF)	
Total duration (min) – Average	907.8
Projected time to shut down (min) – Average	943.3
Custom battery test – Web browsing	
Total duration (min) – Average	620.9
Custom battery test – Local video playback	
Total duration (min) – Average	947.9

Table 2: Results of our testing on the Acer Swift Go 14 AI. For all results, higher is better. For complete results, see the science behind the report.

	Acer Swift Go 14 AI Qualcomm Snapdragon X Plus - X1P42100
Cinebench 2024	
Multi-core – Average	751.0
Single-core – Average	106.6
Geekbench 6 Pro v6.2.2	
Multi-core – Average	11,520.0
Single-core – Average	2,426.3
Speedometer 2.1 on Edge v128.0.2739.67	
Runs per minute – Average	458.3
Windows ADK battery test – Web browsing (Battery Saver Dim OFF)	
Total duration (min) – Average	988.7
Projected time to shut down (min) – Average	1,048.6
Windows ADK battery test – Local video playback (Battery Saver Dim OFF)	
Total duration (min) – Average	1,168.4
Projected time to shut down (min) – Average	1,214.0
Custom battery test – Web browsing	
Total duration (min) – Average	948.9
Custom battery test – Local video playback	
Total duration (min) – Average	1,283.1

Apple MacBook laptops

Table 3: Results of our testing on the Apple devices we tested. For all results, higher is better. For complete results, see the science behind the report.

	Apple MacBook Pro 14" Apple M3	Apple MacBook Pro 14" Apple M3	Apple MacBook Air 15" Apple M2	Apple MacBook Air 15" Apple M2	Apple MacBook Air 13" Apple M2	Apple MacBook Air 13" Apple M3	Apple MacBook Air 13" Apple M3	Apple MacBook Air 15" Apple M3	Apple MacBook Air 15" Apple M3
Cinebench 2024									
Multi-core – Average	708.6	704.0	558.3	557.3	542.6	575.6	592.0	637.0	635.3
Single-core – Average	142.0	142.0	118.0	118.0	118.0	142.0	142.0	141.6	141.0
Geekbench 6 Pro v6.2.2									
Multi-core – Average	12,044.3	12,049.0	12,044.3	12,049.0	10,150.6	12,038.0	12,004.6	12,044.0	12,029.3
Single-core – Average	3,125.0	3,133.0	2,623.6	2,622.0	2,613.0	3,039.3	3,037.0	3,047.0	3,061.3
Speedometer 2.1 on Edge v128.0.2739.67									
Runs per minute – Average	739.6	744.6	640.2	646.3	643.0	729.3	726.0	728.4	719.0
Custom battery test – Web browsing									
Total duration (min) – Average	745.2	709.5	671.4	715.3	656.9	703.9	710.2	699.2	688.9
Custom battery test – Local video playback									
Total duration (min) – Average	1,091.5	1,043.8	803.0	838.7	805.4	901.8	904.0	841.3	820.3

Comparing the Copilot+ PCs to the Apple MacBook laptops

Table 4: For all benchmarks, the lowest average result, the highest average result, and the average of average results for the two Copilot+ PCs we tested, the M2 processor-powered MacBook Air devices we tested, the M3 processor-powered MacBook Air devices we tested, and the M3 processor-powered MacBook Pro devices we tested. For all results, higher is better.

	Copilot+ PC (Acer) devices we tested	M2 processor-powered MacBook Air systems we tested	M3 processor-powered MacBook Air systems we tested	M3 processor-powered MacBook Pro systems we tested
Cinebench 2024				
Multi-core – Lowest average across the group of devices	537.3	542.6	575.6	704.0
Multi-core – Highest average across the group of devices	751.0	558.3	637.0	708.6
Multi-core – Average of averages across the group of devices	644.1	552.7	610.0	706.3
Single-core – Lowest average across the group of devices	106.6	118.0	141.0	142.0
Single-core – Highest average across the group of devices	125.0	118.0	142.0	142.0
Single-core – Average of averages across the group of devices	115.8	118.0	141.6	142.0
Geekbench 6 Pro v6.2.2				
Multi-core – Lowest average across the group of devices	11,226.3	10,150.6	12,004.6	12,044.3
Multi-core – Highest average across the group of devices	11,520.0	12,049.0	12,044.0	12,049.0
Multi-core – Average of averages across the group of devices	11,373.1	11,414.6	12,029.0	12,046.6
Single-core – Lowest average across the group of devices	2,426.3	2,613.0	3,037.0	3,125.0
Single-core – Highest average across the group of devices	2,865.0	2623.6	3,061.3	3,133.0
Single-core – Average of averages across the group of devices	2,645.6	2,619.5	3,046.1	3,129.0
Speedometer 2.1 on Edge v128.0.2739.67				
Runs per minute – Lowest average across the group of devices	458.3	640.2	719.0	739.6
Runs per minute – Highest average across the group of devices	480.2	646.3	729.3	744.6
Runs per minute – Average of averages across the group of devices	469.2	643.2	725.6	742.1
Windows ADK battery test – Web browsing (Battery Saver Dim OFF)				
Total duration (min) – Lowest average across the group of devices	632.3			
Total duration (min) – Highest average across the group of devices	988.7			
Total duration (min) – Average of averages across the group of devices	810.5			
Projected time to shut down (min) – Lowest average across the group of devices	656.0			
Projected time to shut down (min) – Highest average across the group of devices	1,048.6			
Projected time to shut down (min) – Average of averages across the group of devices	852.3			

	Copilot+ PC (Acer) devices we tested	M2 processor-powered MacBook Air systems we tested	M3 processor-powered MacBook Air systems we tested	M3 processor-powered MacBook Pro systems we tested
Windows ADK battery test – Local video playback (Battery Saver Dim OFF)				
Total duration (min) – Lowest average across the group of devices	907.8			
Total duration (min) – Highest average across the group of devices	1,168.4			
Total duration (min) – Average of averages across the group of devices	1,038.1			
Projected time to shut down (min) – Lowest average across the group of devices	943.3			
Projected time to shut down (min) – Highest average across the group of devices	1,214.0			
Projected time to shut down (min) – Average of averages across the group of devices	1,078.6			
Custom battery test – Web browsing				
Total duration (min) – Lowest average across the group of devices	620.9	656.9	688.9	709.5
Total duration (min) – Highest average across the group of devices	948.9	715.3	710.2	745.2
Total duration (min) – Average of averages across the group of devices	784.9	681.2	700.5	727.4
Custom battery test – Local video playback				
Total duration (min) – Lowest average across the group of devices	947.9	803.0	820.3	1,043.8
Total duration (min) – Highest average across the group of devices	1,283.1	838.7	904.0	1,091.5
Total duration (min) – Average of averages across the group of devices	1,115.5	815.7	866.8	1,067.6

The science behind the report

In this section, we list our complete results and describe the solutions on which we tested and our test methodologies.

We concluded our hands-on testing on October 14, 2024. 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 September 16, 2024 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

Our results

To learn more about how we have calculated the wins in this report, go to http://facts.pt/calculating-and-highlighting-wins. Unless we state otherwise, we have followed the rules and principles we outline in that document.

Copilot+ PCs running Windows 11 Pro

Table 5: Results of our testing on the Acer Swift 14 AI. For all results, higher is better.

	Acer Swift 14 AI Intel Core Ultra 9 288V
Cinebench 2024	
Multi-core – Run 1	517.0
Multi-core – Run 2	534.0
Multi-core – Run 3	561.0
Single-core – Run 1	125.0
Single-core – Run 2	125.0
Single-core – Run 3	125.0
Multi-core – Average	**537.3**
Single-core – Average	**125.0**

	Acer Swift 14 AI Intel Core Ultra 9 288V
Geekbench 6 Pro v6.2.2	
Multi-core – Run 1	11,164.0
Multi-core – Run 2	11,273.0
Multi-core – Run 3	11,242.0
Single-core – Run 1	2,871.0
Single-core – Run 2	2,869.0
Single-core – Run 3	2,855.0
Multi-core – Average	**11,226.3**
Single-core – Average	**2,865.0**
Speedometer 2.1 on Edge v128.0.2739.67	
Runs per minute – Run 1	475.0
Runs per minute – Run 2	490.7
Runs per minute – Run 3	475.0
Runs per minute – Average	**480.2**
Windows ADK battery test – Web browsing (Battery Saver Dim OFF)	
Total duration (min) - Run 1	626.0
Projected time to shut down (min) - Run 1	654.0
Total duration (min) - Run 2	626.6
Projected time to shut down (min) - Run 2	640.0
Total duration (min) - Run 3	644.2
Projected time to shut down (min) - Run 3	674.0
Total duration (min) – Average	**632.3**
Projected time to shut down (min) – Average	**656.0**

	Acer Swift 14 AI Intel Core Ultra 9 288V
Windows ADK battery test – Local video playback (Battery Saver Dim OFF)	
Total duration (min) - Run 1	888.7
Projected time to shut down (min) - Run 1	927.0
Total duration (min) - Run 2	909.4
Projected time to shut down (min) - Run 2	939.0
Total duration (min) - Run 3	925.3
Projected time to shut down (min) - Run 3	964.0
Total duration (min) – Average	**907.8**
Projected time to shut down (min) – Average	**943.3**
Custom battery test – Web browsing	
Total duration (min) - Run 1	630.3
Total duration (min) - Run 2	614.2
Total duration (min) - Run 3	618.3
Total duration (min) – Average	**620.9**
Custom battery test – Local video playback	
Total duration (min) - Run 1	921.8
Total duration (min) - Run 2	959.9
Total duration (min) - Run 3	962.0
Total duration (min) – Average	**947.9**

Table 6: Results of our testing on the Acer Swift Go 14 AI. For all results, higher is better.

	Acer Swift Go 14 AI Qualcomm Snapdragon X Plus - X1P42100
Cinebench 2024	
Multi-core – Run 1	749.0
Multi-core – Run 2	751.0
Multi-core – Run 3	753.0
Single-core – Run 1	108.0
Single-core – Run 2	103.0
Single-core – Run 3	109.0
Multi-core – Average	**751.0**
Single-core – Average	**106.6**
Geekbench 6 Pro v6.2.2	
Multi-core – Run 1	11,449.0
Multi-core – Run 2	11,596.0
Multi-core – Run 3	11,515.0
Single-core – Run 1	2,418.0
Single-core – Run 2	2,427.0
Single-core – Run 3	2,434.0
Multi-core – Average	**11,520.0**
Single-core – Average	**2,426.3**
Speedometer 2.1 on Edge v128.0.2739.67	
Runs per minute – Run 1	456.0
Runs per minute – Run 2	460.0
Runs per minute – Run 3	459.0
Runs per minute – Average	**458.3**

	Acer Swift Go 14 AI Qualcomm Snapdragon X Plus - X1P42100
Windows ADK battery test – Web browsing (Battery Saver Dim OFF)	
Total duration (min) - Run 1	950.4
Projected time to shut down (min) - Run 1	1,032.0
Total duration (min) - Run 2	1,004.4
Projected time to shut down (min) - Run 2	1,053.0
Total duration (min) - Run 3	1,011.3
Projected time to shut down (min) - Run 3	1,061.0
Total duration (min) – Average	**988.7**
Projected time to shut down (min) – Average	**1,048.6**
Windows ADK battery test – Local video playback (Battery Saver Dim OFF)	
Total duration (min) - Run 1	1,122.1
Projected time to shut down (min) - Run 1	1,162.0
Total duration (min) - Run 2	1,204.3
Projected time to shut down (min) - Run 2	1,258.0
Total duration (min) - Run 3	1,178.8
Projected time to shut down (min) - Run 3	1,222.0
Total duration (min) – Average	**1,168.4**
Projected time to shut down (min) – Average	**1,214.0**
Custom battery test – Web browsing	
Total duration (min) - Run 1	945.0
Total duration (min) - Run 2	968.0
Total duration (min) - Run 3	933.8
Total duration (min) – Average	**948.9**
Custom battery test – Local video playback	
Total duration (min) - Run 1	1,289.9
Total duration (min) - Run 2	1,271.6
Total duration (min) - Run 3	1,287.7
Total duration (min) – Average	**1,283.1**

Apple MacBook laptops

Table 7: Results of our testing on the Apple devices we tested. For all results, higher is better.

	Apple MacBook Pro 14" Apple M3	Apple MacBook Pro 14" Apple M3	Apple MacBook Air 15" Apple M2	Apple MacBook Air 15" Apple M2	Apple MacBook Air 13" Apple M2	Apple MacBook Air 13" Apple M3	Apple MacBook Air 13" Apple M3	Apple MacBook Air 15" Apple M3	Apple MacBook Air 15" Apple M3
Cinebench 2024									
Multi-core – Run 1	704.0	700.0	559.0	558.0	545.0	581.0	600.0	637.0	635.0
Multi-core – Run 2	709.0	702.0	555.0	554.0	546.0	583.0	599.0	641.0	636.0
Multi-core – Run 3	713.0	710.0	561.0	560.0	537.0	563.0	577.0	633.0	635.0
Single-core – Run 1	142.0	142.0	118.0	118.0	118.0	142.0	142.0	141.0	141.0
Single-core – Run 2	142.0	142.0	118.0	118.0	118.0	142.0	142.0	142.0	141.0
Single-core – Run 3	142.0	142.0	118.0	118.0	118.0	142.0	142.0	142.0	141.0
Multi-core – Average	**708.6**	**704.0**	**558.3**	**557.3**	**542.6**	**575.6**	**592.0**	**637.0**	**635.3**
Single-core – Average	**142.0**	**142.0**	**118.0**	**118.0**	**118.0**	**142.0**	**142.0**	**141.6**	**141.0**
Geekbench 6 Pro v6.2.2									
Multi-core – Run 1	12,078.0	12,054.0	10,135.0	10,170.0	10,152.0	12,006.0	12,029.0	11,969.0	12,054.0
Multi-core – Run 2	12,076.0	12,027.0	10,131.0	10,134.0	10,166.0	12,029.0	11,948.0	12,079.0	12,017.0
Multi-core – Run 3	11,979.0	12,066.0	10,100.0	10,141.0	10,134.0	12,079.0	12,037.0	12,084.0	12,017.0
Single-core – Run 1	3,122.0	3,135.0	2,626.0	2,624.0	2,610.0	3,033.0	3,028.0	3,045.0	3,049.0
Single-core – Run 2	3,134.0	3,137.0	2,623.0	2,622.0	2,610.0	3,043.0	3,043.0	3,046.0	3,065.0
Single-core – Run 3	3,119.0	3,127.0	2,622.0	2,620.0	2,619.0	3,042.0	3,040.0	3,050.0	3,070.0
Multi-core – Average	**12,044.3**	**12,049.0**	**12,044.3**	**12,049.0**	**10,150.6**	**12,038.0**	**12,004.6**	**12,044.0**	**12,029.3**
Single-core – Average	**3,125.0**	**3,133.0**	**2,623.6**	**2,622.0**	**2,613.0**	**3,039.3**	**3,037.0**	**3,047.0**	**3,061.3**

	Apple MacBook Pro 14" Apple M3	Apple MacBook Pro 14" Apple M3	Apple MacBook Air 15" Apple M2	Apple MacBook Air 15" Apple M2	Apple MacBook Air 13" Apple M2	Apple MacBook Air 13" Apple M3	Apple MacBook Air 13" Apple M3	Apple MacBook Air 15" Apple M3	Apple MacBook Air 15" Apple M3
Speedometer 2.1 on Edge v128.0.2739.67									
Runs per minute – Run 1	737.0	744.0	643.0	645.0	643.0	726.0	721.0	728.3.0	722.0
Runs per minute – Run 2	744.0	745.0	640.0	648.0	647.0	732.0	731.0	728.0	716.0
Runs per minute – Run 3	738.0	745.0	637.8	646.0	639.0	730.0	726.0	729.0	719.0
Runs per minute – Average	**739.6**	**744.6**	**640.2**	**646.3**	**643.0**	**729.3**	**726.0**	**728.4**	**719.0**
Custom battery test – Web browsing									
Total duration (min) - Run 1	747.6	709.6	672.2	719.6	663.5	697.6	705.6	706.6	696.6
Total duration (min) - Run 2	752.5	717.5	670.6	709.6	647.5	709.5	714.5	687.5	674.5
Total duration (min) - Run 3	735.6	701.5	671.6	716.6	659.5	704.5	710.5	703.5	695.5
Total duration (min) – Average	**745.2**	**709.5**	**671.4**	**715.3**	**656.9**	**703.9**	**710.2**	**699.2**	**688.9**
Custom battery test – Local video playback									
Total duration (min) - Run 1	1,073.8	1,042.8	807.9	844.7	800.6	918.7	913.7	851.7	829.7
Total duration (min) - Run 2	1,121.8	1,059.7	801.6	838.7	812.7	903.9	899.6	848.6	805.6
Total duration (min) - Run 3	1,078.8	1,028.8	799.7	832.7	803.0	882.7	898.7	823.6	825.6
Total duration (min) – Average	**1,091.5**	**1,043.8**	**803.0**	**838.7**	**805.4**	**901.8**	**904.0**	**841.3**	**820.3**

System configuration information

Table 8: Detailed information on the Acer systems we tested.

System configuration information	Acer Swift Go 14 AI	Acer Swift 14 AI
Processor		
Vendor	Qualcomm	Intel
Model number	Snapdragon X Plus – X1P-42-100	Core Ultra 9 288V
Core frequency (GHz)	3.2	3.3
Number of cores	8	8
Memory		
Amount (GB)	16	32
Type	LPDDR5X	LPDDR5X
Graphics		
Vendor	Qualcomm	Intel
Model number	Adreno X1-45 GPU	Arc 140V GPU
Storage		
Amount	512 GB	1 TB
Type	SSD	SSD
Connectivity/expansion		
Wireless internet	Qualcomm FastConnect 7800 Wi-Fi 7	Killer Wi-Fi 7 BE1750i
Battery		
Rated capacity (Wh)	75	75
Display		
Size (inches)	14.5	14
Resolution	1920x1200	2880x1800
Operating system		
Vendor	Microsoft	Microsoft
Name	Windows 11 Pro	Windows 11 Pro
Version	24H2 Build 26100.1591	24H2 Build 26100.1742

System configuration information	Acer Swift Go 14 AI	Acer Swift 14 AI
BIOS		
BIOS name and version	Insyde Corp. V1.00	Insyde Corp. V1.01
Dimensions		
Height (inches)	0.59	0.66-0.72
Width (inches)	12.7	12.7
Depth (inches)	8.9	8.9
Weight (lbs.)	3.02	2.91

Table 9: Detailed information on the Apple systems we tested.

System configuration information	Apple MacBook Pro 14" Apple M3	Apple MacBook Pro 14" Apple M3	Apple MacBook Air 15" Apple M2	Apple MacBook Air 15" Apple M2	Apple MacBook Air 13" Apple M2	Apple MacBook Air 13" Apple M3	Apple MacBook Air 13" Apple M3	Apple MacBook Air 15" Apple M3	Apple MacBook Air 15" Apple M3
Processor									
Vendor	Apple	Apple	Apple	Apple	Apple	Apple	Apple	Apple	Apple
Model number	M3	M3	M2	M2	M2	M3	M3	M3	M3
Core frequency (GHz)	4.05	4.05	3.49	3.49	3.49	4.05	4.05	4.05	4.05
Number of cores	8	8	8	8	8	8	8	8	8
Memory									
Amount (GB)	8	8	8	8	8	8	8	8	8
Type	Unified	Unified	Unified	Unified	Unified	Unified	Unified	Unified	Unified
Graphics									
Vendor	Apple	Apple	Apple	Apple	Apple	Apple	Apple	Apple	Apple
Model number	M3 10-core GPU	M3 10-core GPU	M2 10-core GPU	M2 10-core GPU	M2 8-core GPU	M3 8-core GPU	M3 8-core GPU	M3 10-core GPU	M3 10-core GPU
Storage									
Amount (GB)	512	512	256	256	256	256	256	256	256
Type	SSD	SSD	SSD	SSD	SSD	SSD	SSD	SSD	SSD
Connectivity/expansion									
Wireless internet	Wi-Fi 6E	Wi-Fi 6E	Wi-Fi 6	Wi-Fi 6	Wi-Fi 6	Wi-Fi 6E	Wi-Fi 6E	Wi-Fi 6E	Wi-Fi 6E

System configuration information	Apple MacBook Pro 14" Apple M3	Apple MacBook Pro 14" Apple M3	Apple MacBook Air 15" Apple M2	Apple MacBook Air 15" Apple M2	Apple MacBook Air 13" Apple M2	Apple MacBook Air 13" Apple M3	Apple MacBook Air 13" Apple M3	Apple MacBook Air 15" Apple M3	Apple MacBook Air 15" Apple M3
Battery									
Rated capacity (Wh)	70	70	66.5	66.5	52.6	52.6	52.6	66.5	66.5
Display									
Size (inches)	14.2	14.2	15.3	15.3	13.6	13.6	13.6	15.3	15.3
Resolution	3,024 x 1,964	3,024 x 1,964	2,880 x 1,864	2,880 x 1,864	2,560 x 1,664	2,560 x 1,664	2,560 x 1,664	2,880 x 1,864	2,880 x 1,864
Operating system									
Vendor	Apple	Apple	Apple	Apple	Apple	Apple	Apple	Apple	Apple
Name	macOS Sequoia	macOS Sequoia	macOS Sequoia	macOS Sequoia	macOS Sequoia	macOS Sequoia	macOS Sequoia	macOS Sequoia	macOS Sequoia
Version	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
BIOS									
BIOS name and version	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dimensions									
Height (inches)	0.61	0.61	0.45	0.45	0.44	0.44	0.44	0.45	0.45
Width (inches)	12.31	12.31	13.40	13.40	11.97	11.97	11.97	13.40	13.40
Depth (inches)	8.71	8.71	9.35	9.35	8.46	8.46	8.46	9.35	9.35
Weight (lbs.)	3.4	3.4	3.3	3.3	2.7	2.7	2.7	3.3	3.3

How we tested

Setting up the systems (Windows)

Setting up and updating the OEM image

1. Boot the system.
2. Follow the on-screen instructions to complete installation, using the default selections when appropriate.
3. Set the Windows (plugged in) Power Mode to Best Performance.
4. Set Screen and Sleep options to Never:
   - Right-click the desktop, and select Display settings.
   - Select System from the left-hand column.
   - Click Power & Battery.
   - For all power options listed under Screen and Sleep, select Never.
5. Disable User Account Control notifications.
   - Select Windows Start, type `UAC` and press Enter.
   - Move the slider control to Never notify, and click OK.
6. Run Windows Update, and install all updates available.
7. Verify the date and time are correct, and synchronize the system clock with the time server.
8. Pause Automatic Windows Updates.
   - Click the Windows Start button.
   - Type `Windows Update settings` and press Enter.
   - From the Pause updates drop-down menu, select Pause for 5 weeks.

Measuring performance (Windows)

Cinebench 2024 benchmark

Setting up the test

1. Download and install Cinebench from https://www.maxon.net/en/downloads/cinebench-2024-downloads.

Running the benchmark

1. Launch Cinebench.
2. Select File→Advanced benchmark.
3. Set the Minimum Test Duration to Off.
4. Select CPU (Multi Core), CPU (Single Core), or GPU, and click Start
5. Record the result.
6. Wait 15 minutes before re-running.
7. Repeat steps 1 through 6 twice more, and report the averages of the results.

Geekbench 6 Pro

Setting up the test

1. Purchase a Pro license, and download and install Geekbench 6 Pro from https://www.geekbench.com/download/.

Running the test

1. Launch Geekbench.
2. Click Run CPU Benchmark.
3. Record the result.
4. Wait 5 minutes before re-running.
5. Repeat steps 1 through 4 twice more, and report the averages of the results.

3DMark

Setting up the test

1. Download 3DMark from http://www.futuremark.com/benchmarks/3dmark/all.
2. To install 3DMark with the default options, double-click the 3DMark installer.exe file.
3. To launch 3DMark, double-click the 3DMark desktop icon.
4. Enter the registration code, and click Register.
5. Exit 3DMark.

Running the test

1. Launch the 3Dmark benchmark.
2. At the 3DMark Home screen, underneath the Wild Life Extreme Benchmark, click Run.
3. When the benchmark run completes, record the results.
4. Perform steps 2 through 3 twice more, and report the averages of the results.

Speedometer 2.1

Running the test

1. In a browser, navigate to https://browserbench.org/Speedometer2.1/.
2. Click Start Test.
3. When the benchmark run completes, record the results.
4. Perform steps 2 through 3 twice more, and report the averages of the results.

Measuring battery life (Windows)

Windows ADK: Local video playback battery rundown

Setting up the test

1. Verify that the displays will remain constant during the test:
   - Right-click the desktop and select Display settings.
   - Uncheck the box next to Change brightness automatically when lighting changes, if available.
   - Uncheck the box next to Change brightness based on content, if available.
   - Select System from the left-hand column.
   - Click Power & Battery.
   - For all power options listed under Screen and Sleep, select Never.
   - Set Turn battery saver on automatically at 20%.
   - Uncheck the box next to Lower screen brightness when user battery saver.
2. Create a folder on the root of C:\ named data
3. Create a folder on the root of C:\ named adk
4. Place adk test files into the C:\data\ folder.
5. Move the contents of the EE_LFSVP_ToS folder into the C:\adk\ folder.
6. Using a nit meter, adjust the screen brightness to as close to 150 nits as possible.
7. Open PowerShell as administrator and run `Set-ExecutionPolicy bypass`
8. Type `A` to choose yes to all, and press enter.
9. Run `Get-ChildItem -Path 'C:\adk' -Recurse | Unblock-File`
10. Navigate to C:\data\prep\.
11. Enter `runme.bat` to run the system prep command.

Running the test

1. After the prep command completes, wait 2 minutes before proceeding.
2. Open an elevated command prompt.
3. Navigate to C:\adk\
4. With the system plugged in and charged to 100%, enter `runjob.cmd` to run the local video playback battery rundown test.
5. Click Run job on this computer.
6. Click Start.
7. At the Assessment is Beginning screen, click next.
8. When prompted to unplug the system, do so.
9. When the test completes, record the results.
10. Plug the system in and charge back to 100%.
11. Repeat steps 2 through 10 twice more, and report the averages of the results.

Windows ADK: Web Browsing battery rundown

Setting up the test

1. Verify that the displays will remain constant during the test:
   - Right-click the desktop, and select Display settings.
   - Uncheck the box next to Change brightness automatically when lighting changes, if available.
   - Uncheck the box next to Change brightness based on content, if available.
   - Select System from the left column.
   - Click Power & Battery.
   - For all power options listed under Screen and Sleep, select Never.
   - Set Turn battery saver on automatically at 20%.
   - Uncheck the box next to Lower screen brightness when user battery saver.
2. Using a nit meter, adjust the screen brightness to as close to 150 nits as possible.
3. Open Edge, and navigate to edge://settings/help to identify the version number for the Edge browser.
4. Apply any Edge updates that are available.
5. Open Device Manager, and make sure there are no yellow bangs or unknown devices.
6. Open the Microsoft Store, and update all applications.
7. Open PowerShell as administrator, and run `Set-ExecutionPolicy bypass`
8. Type `A` to choose yes to all, and press Enter.
9. Run `winget upgrade –all –include-unknown`
10. Open the system settings, and make sure the date and time are synchronized on the system under test.
11. Disable any keyboard backlights.
12. Make sure the Microsoft Edge language is set to English at edge://settings/languages
13. In the Edge settings, remove any profiles that have been added.
14. Open an elevated command prompt.
15. Navigate to C:\data\prep\
16. Enter `runme.bat` to run the system prep command.

Running the test

1. After the prep command completes, wait 2 minutes before proceeding.
2. Create a folder on the root of C:\ named data.
3. Place adk test files into the C:\data\ folder.
4. Navigate to https://developer.microsoft.com/en-us/microsoft-edge/tools/webdriver/
5. Download the appropriate x64 or ARM64 version of the webdriver that matches the current Edge version number.
6. Extract msedgedriver.exe to C:\data\test\bin\
7. Open the parameters.abl.credentials.json file located in C:\data\ asmt\Assessment2\scenarios in notepad and enter the credentials for the outlook.com account used.
8. Open an elevated command prompt.
9. Run `Get-ChildItem -Path 'C:\data' -Recurse | Unblock-File`
10. Navigate to C:\data\asmt\
11. Run `RunJobABLTraining.cmd`

12. Click Start.
13. At the Assessment Beginning screen, click Next.
14. Unplug the system when prompted.
15. When the training command is complete, plug the system back in, and make sure it charges to 100%.
16. Open an elevated command prompt.
17. Navigate to C:\data\asmt\
18. Run `RunJobABLTrained.cmd`
19. When the test is complete, record the results and copy the results folder to Documents.
20. Plug the system in, and charge it back to 100%.
21. Open Explorer, and delete the entire C:\data folder.
22. Repeat steps 1 through 21 twice more, and report the averages of the results.

PT custom test: Local video playback battery rundown

Setting up the test

1. Turn on the systems.
2. Copy the test video file and battery life logger to each system.
3. In Explorer, right-click the script, and click Properties.
4. Check Unblock file, and click OK.
5. Verify that the displays will remain on during the test:
   - Right-click the desktop, and select Display settings.
   - Uncheck the box next to Change brightness automatically when lighting changes, if available.
   - Uncheck the box next to Change brightness based on content, if available.
   - Select System from the left column.
   - Click Power & Battery.
   - For all power options listed under Screen and Sleep, select Never.
   - Set Turn energy saver on automatically at 20%.
   - Check the box next to Lower screen brightness when using energy saver.
6. Set the system volume to 60 dbA with a decibel meter.
7. To bring up a white screen, open a web browser and type `about:blank` into the address bar.
8. Unplug the system.
9. Using a nit meter, adjust the screen brightness to as close to 150 nits as possible.
10. Plug in the system.
11. Open PowerShell as administrator and run `Set-ExecutionPolicy Unrestricted`
12. Type `A` to choose yes to all, and press enter.
13. Open Control Panel, and click Hardware and Sound.
14. Click Power Options, and click Change plan settings on the currently selected power plan.
15. Click Change advanced power settings.
16. Set the Low battery notification on Battery to Off.
17. Open Microsoft Store, click the profile button at the top, and click Settings.
18. Turn off App updates.

Running the test

1. Verify that the system's battery is fully charged.
2. Open an elevated PowerShell and type `start-process "C:\Program Files\Windows Defender\MpCmdRun.exe" ("BuildSFC -Timeout 7200000") -Wait.`
3. After the command completes, type `start "rundll32.exe" ("advapi32.dll,ProcessIdleTasks") -Wait.`
   Do not interact with the system until the command completes.
4. After the command completes, reboot the system.
5. Wait 5 minutes before proceeding.
6. Launch the test video file in full screen mode with Repeat enabled.
7. Open an elevated PowerShellm and navigate to the directory containing the battery life logger script.
8. Type `.\<battery_script_name>.ps1` and press Enter to run the script.
9. Unplug the system when prompted and switch back to the full screen video.
10. When the test is complete, plug in the system and start it.
11. In Explorer, navigate to C:\ptbat\.
12. Open the folder corresponding with the date and time of the test and record the results from batresults_minutes.txt.
13. Repeat steps 1 through 12 twice more, and report the averages of the results.

PT custom test: Web browsing battery rundown

Setting up the test

1. Turn on the systems.
2. Copy the battery life logger and website iterator to each system.
3. In Explorer, right-click each script, and click Properties.
4. Check Unblock file, and click OK.
5. Verify that the displays will remain constant during the test:
   - Right-click the desktop, and select Display settings.
   - Uncheck the box next to Change brightness automatically when lighting changes, if available.
   - Uncheck the box next to Change brightness based on content, if available.
   - Select System from the left column.
   - Click Power & Battery.
   - For all power options listed under Screen and Sleep, select Never.
   - Set Turn energy saver on automatically at 20%.
   - Check the box next to Lower screen brightness when using energy saver.
6. Set the system volume to 60 dbA with a decibel meter.
7. To bring up a white screen, open a web browser and type `about:blank` into the address bar.
8. Unplug the system.
9. Using a nit meter, adjust the screen brightness to as close to 150 nits as possible.
10. Plug in the system.
11. Open PowerShell as administrator and run `Set-ExecutionPolicy Unrestricted`
12. Type `A` to choose yes to all and press enter.
13. Open Control Panel, and click Hardware and Sound.

14. Click Power Options, and click Change plan settings on the currently selected power plan.
15. Click Change advanced power settings.
16. Set the Low battery notification on Battery to Off.
17. Click the Windows start icon, and in the search field, type `regedit`. To open the Registry Editor, press Enter.
18. Navigate to HKEY_LOCAL_MACHINE→SOFTWARE→Policies→Microsoft→Edge.
19. If necessary, create the Edge folder by right-clicking in the right-hand pane, clicking New Key, and typing Edge.
20. Right-click in the right pane, click New DWORD (32-bit) Value, type HideRestoreDialogEnabled, and press enter.
21. Double-click HideRestoreDialogEnabled, and in the value data field, type `1`. Click OK.
22. Open Microsoft Store, click the profile button at the top, and click Settings.
23. Turn off App updates.

Running the test

1. Verify that the system's battery is fully charged.
2. Open an elevated PowerShell and type `start-process "C:\Program Files\Windows Defender\MpCmdRun.exe" ("BuildSFC -Timeout 7200000") -Wait`.
3. After the command completes, type `start "rundll32.exe" ("advapi32.dll,ProcessIdleTasks") -Wait`.
   Do not interact with the system until the command completes.
4. After the command completes, reboot the system.
5. Wait 5 minutes before proceeding.
6. Open an elevated PowerShell and navigate to the directory containing the battery life logger script.
7. Type `.\<battery_script_name>.ps1`
8. Open a second elevated PowerShell and navigate to the directory containing the website iterator script.
9. Type `.\<website_script_name>.ps1 -t`
10. Click Enter in each PowerShell window to run both scripts.
11. Unplug the system when prompted.
12. When the test is complete, plug in the system and start it.
13. In Explorer, navigate to C:\ptbat\.
14. Open the folder corresponding with the date and time of the test and record the results from batresults_minutes.txt.
15. Repeat steps 1 through 14 twice more, and report the averages of the results.

Setting up the system (macOS)

Setting up and updating the OEM image

1. Boot the system.
2. Follow the on-screen instructions to complete installation, using the default selections when appropriate.
3. Set Screen and Sleep options to Never.
   - Select System Settings.
   - Select Lock Screen.
   - Change the following options to Never:
   - Start Screen Saver when inactive.
   - Turn display off on battery when inactive.
   - Turn display off on power adapter when inactive.
   - Require password after screen saver begins or display is turned off.
   - Return to System Settings and select Battery.
   - Set On power adapter setting to High Power (Note: this is not an option available on all Macs).
   - Click Options.
   - Disable the Slightly dim the display on battery option.
4. Disable automatically adjust brightness.
   - Select System Settings.
   - Select Display.
   - Disable Automatically adjust brightness.
5. Run Software Update, and install all updates available.
6. Verify the date and time are correct.
7. Enable Automatic log in.
   - Select System Settings.
   - Click Users & Groups.
   - Select the drop down menu next to the Automatically log in as setting, and select the User account.
8. Disable Automatic Mac Updates.
   - Select System Settings.
   - Click General.
   - Click on Software Update.
   - Click the information icon next to Automatic updates.
   - Disable Check for updates.

Measuring performance (macOS)

Cinebench 2024 benchmark

Setting up the test

1. Download and install Cinebench from https://www.maxon.net/en/downloads/cinebench-2024-downloads.

Running the benchmark

1. Launch Cinebench.
2. Select FileàAdvanced benchmark.
3. Set the Minimum Test Duration to Off.
4. Select either CPU (Multi Core), CPU (Single Core), or GPU, and click Start.
5. Record the result.
6. Wait 15 minutes before re-running.
7. Repeat steps 1 through 6 twice more, and report the averages of the results.

Geekbench 6 Pro

Setting up the test

1. Purchase a Pro license and download and install Geekbench 6 Pro from https://www.geekbench.com/download/.

Running the test

1. Launch Geekbench.
2. Click Run CPU Benchmark.
3. Record the result.
4. Wait 5 minutes before re-running.
5. Repeat steps 1 through 4 twice more, and report the averages of the results.
6. After the first-time setup has successfully finished, the system is ready to run the benchmark.

3DMark

Setting up the test

1. Download 3DMark from the App Store.

Running the test

1. Launch 3Dmark.
2. Scroll through the benchmarks until you reach Wild Life Extreme Benchmark, and click Run.
3. When the benchmark run completes, record the results.
4. Perform steps 2 and 3 twice more, and report the averages of the results.

Speedometer 2.1

Running the test

1. In a browser, navigate to https://browserbench.org/Speedometer2.1/.
2. Click Start Test.
3. When the benchmark run completes, record the results.
4. Perform steps 2 and 3 twice more, and report the averages of the results.

Measuring battery life (macOS)

PT custom test: Local video playback battery rundown

Setting up the test

1. Turn on the systems.
2. Copy the test video file and battery life logger to each system.
3. Open Terminal, and navigate to the directory containing the script.
4. Run `chmod +x .\<script_name>.sh` to make the script executable.
5. Set the system volume to 60 dbA with a decibel meter.
6. Verify that the displays will remain on during the test:
   - Select System Settings.
   - Select Lock Screen.
   - Change the following options to Never:
   - Start Screen Saver when inactive.
   - Turn display off on battery when inactive.
   - Turn display off on power adapter when inactive.
   - Require password after screen saver begins or display is turned off.
   - Return to System Settings and select Battery.
   - Set On power adapter setting to High Power (Note: this is not an option available on all Macs).
   - Click Options.
   - Disable the Slightly dim the display on battery option.
   - Return to System Settings and select Display.
   - Disable Automatically adjust brightness.
7. To bring up a white screen, open a web browser and type `about:blank` into the address bar.
8. Unplug the system.
9. Using a nit meter, adjust the screen brightness to as close to 150 nits as possible.
10. Plug in the system.

Running the test

1. Verify that the system's battery is fully charged.
2. Launch the test video file in full screen mode with Loop enabled.
3. Open Terminal and navigate to the directory containing the battery life logger script.
4. Type `.\<battery_script_name>.sh` and press Enter to run the script.

5. Unplug the system when prompted, and switch back to the full screen video.
6. When the system has shut down, plug in the system, and start it.
7. In Finder, navigate to /var/pt_results/batterylife.
8. Open the folder corresponding with the date and time of the test and records the results from batresults_minutes.txt.
9. Repeat steps 1 through 8 twice more, and report the averages of the results

PT custom test: Web browsing battery rundown

Setting up the test

1. Turn on the systems.
2. Copy the web iterator script and battery life logger to each system.
3. Open Terminal, and navigate to the directory containing the scripts.
4. Run `chmod +x .\<script_name>` for each script to make the scripts executable.
5. Set the system volume to 60 dbA with a decibel meter.
6. Verify that the displays will remain on during the test:
   - Select System Settings.
   - Select Lock Screen.
   - Change the following options to Never:
   - Start Screen Saver when inactive.
   - Turn display off on battery when inactive.
   - Turn display off on power adapter when inactive.
   - Require password after screen saver begins or display is turned off.
   - Return to System Settings and select Battery.
   - Set On power adapter setting to High Power (Note: this is not an option available on all Macs).
   - Click Options.
   - Disable the Slightly dim the display on battery option.
   - Return to System Settings and select Display.
   - Disable Automatically adjust brightness.
7. To bring up a white screen, open a web browser and type `about:blank` into the address bar.
8. Unplug the system.
9. Using a nit meter, adjust the screen brightness to as close to 150 nits as possible.
10. Plug in the system.

Running the test

1. Verify that the system's battery is fully charged.
2. Open Terminal and navigate to the directory containing the battery life logger script.
3. Type `.\<battery_script_name>.sh`.
4. Open a second Terminal, and navigate to the directory containing the website iterator scripts.
5. Type `.\<website_script_name>.sh -t`.
6. Press Enter in each Terminal window to run both scripts.
7. Unplug the system when prompted.
8. When the system has shut down, plug in the system, and start it.
9. In Finder, navigate to /var/pt_results/batterylife.
10. Open the folder corresponding with the date and time of the test and records the results from batresults_minutes.txt.
11. Repeat steps 1 through 10 twice more, and report the averages of the results.

This project was commissioned by Microsoft.

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