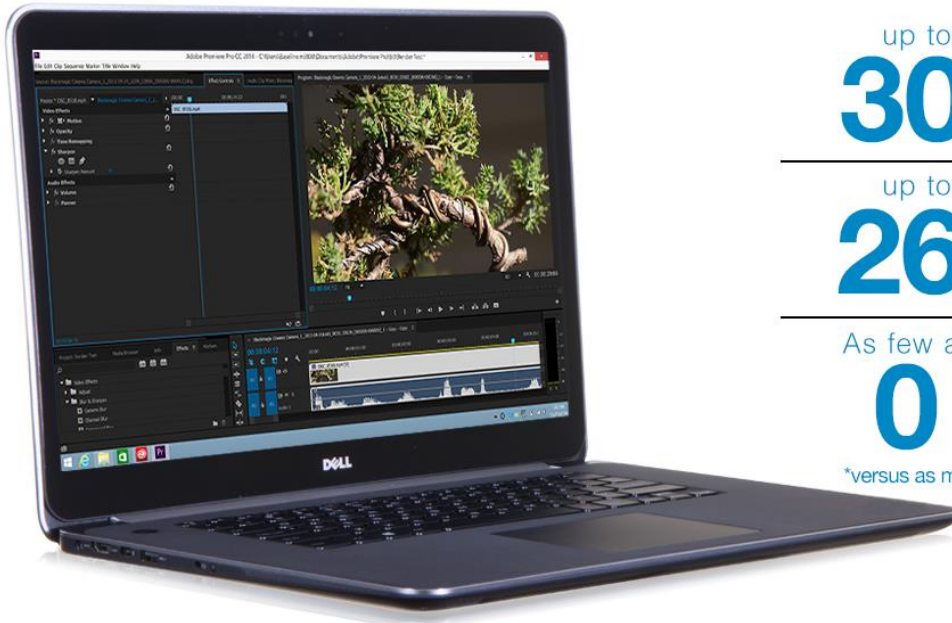# NEW DELL PRECISION M3800 MOBILE WORKSTATION VS. APPLE MACBOOK PRO WITH RETINA DISPLAY

Get better performance with the new Dell Precision™ M3800 in Adobe® Premiere® Pro CC
versus the Apple® MacBook Pro® with Retina® display

up to **30%** faster rendering a video sequence

up to **26%** faster transcoding a video clip

As few as **0** dropped frames during video playback*

*versus as many as 37 with the MacBook Pro

When selecting a notebook for multimedia editing and viewing, performance counts. Demanding professional applications such as Adobe Premiere Pro CC and large files can slow systems without powerful enough hardware to handle them. Should those who invest in a new system choose a Dell Precision M3800 mobile workstation with a professional graphics card or an Apple MacBook Pro with Retina display?

To help answer this question, we compared a Dell Precision M3800 mobile workstation with a NVIDIA® Quadro® K1100M professional graphics card and a 4K Ultra HD touchscreen display (3840×2160), and an Apple MacBook Pro with Retina display (2560×1600), to see how well they performed on tasks commonly performed in Adobe Premiere Pro CC.

The Dell Precision M3800 outperformed the Apple MacBook Pro, taking less time to transcode video and render video sequences and dropping less frames during video playback. It also delivered lower surface temperatures when running an intensive workload, which can mean more comfort and less worrying when working, and offered double the solid-state drive (SSD) storage capacity, which can be critical for storing large multimedia files. These advantages make the Dell Precision M3800 a better choice for users that would benefit from choosing a mobile workstation for demanding professional applications such as Adobe Premiere Pro CC.

SUPERIOR PERFORMANCE SAVES TIME AND BOOSTS PRODUCTIVITY

Those who work in media applications such as Adobe Premiere Pro CC know that productivity depends on how quickly their systems can do work. To help with the buying decision, we compared the Dell Precision M3800 mobile workstation with 4K Ultra HD touchscreen and the Apple MacBook Pro with Retina display, focusing on tasks commonly performed in Adobe Premiere Pro CC.

Figure 1 presents the configuration information for the systems as tested, which differ in some notable ways. While the Dell Precision M3800 and the MacBook Pro both have 4th generation Intel Core i7 processors and 16GB RAM, only the Dell Precision M3800 offers a NVIDIA Quadro K1100M professional graphics card. Another notable difference is that while both systems include solid-state drives (SSDs), the Dell Precision M3800 has two storage bays, each of which can be configured with 1TB SSDs. This means that the Dell Precision M3800 can provide more SSD storage space than the MacBook Pro, which can accommodate only one drive. Appendix A provides more detailed configuration information for the two systems.

	Dell Precision M3800 mobile workstation	Apple MacBook Pro with Retina display
Processor	Intel Core i7-4712HQ (2.3GHz)	Intel Core i7-4870HQ (2.5GHz)
Memory	16GB DDR3 RAM	16GB DDR3 RAM
Storage	512 GB SSD	512GB SSD
Graphics cards	Intel HD Graphics 4600 NVIDIA Quadro K1100M (professional)	Intel Iris™ Pro Graphics 5200 NVIDIA GeForce® GT 750M (consumer)
Display size and resolution	15.6" 3840×2160	15.4" 2560×1600
LCD type	4K Ultra HD display: LED-backlit with IGZO2 technology	Retina display: LED-backlit with IPS technology
Touch screen	10-finger multi-touch	No

Figure 1: Configuration information for the systems we tested.

OUR FINDINGS IN DETAIL

In this section, we present detailed test results, and in Appendix B, we provide the specifics for how we tested.
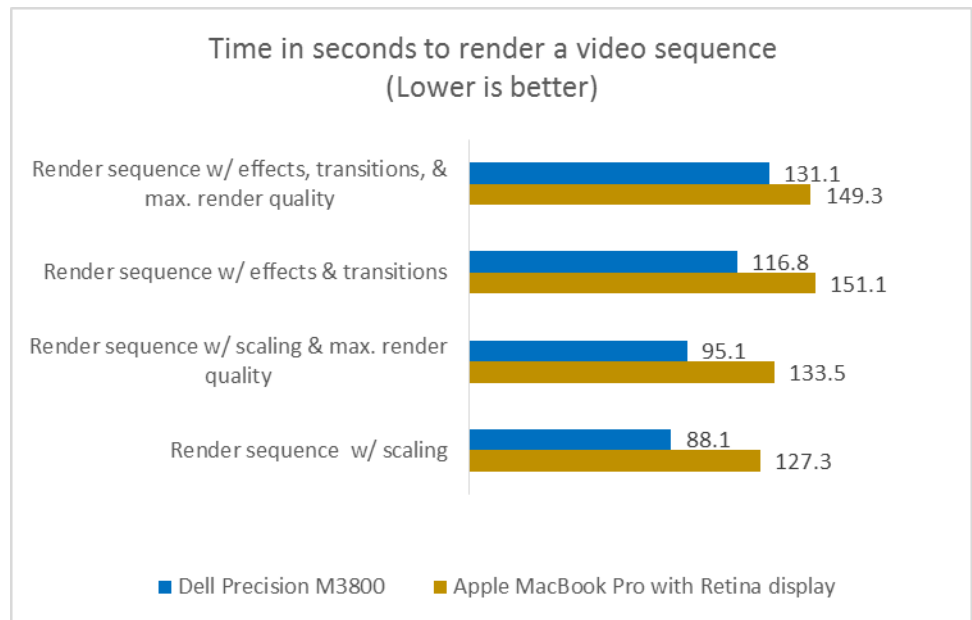
Adobe Premiere Pro CC performance

Adobe Premiere Pro CC is high-end video-editing software. We looked at tasks commonly performed in Adobe Premiere Pro CC to see how the two systems handled

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resource-intensive tasks. We looked at how quickly the systems completed various transcoding and rendering tasks, and determined the number of stutters (dropped frames) that occurred during video playback.

Rendering a video sequence

Rendering video sequences can be time-consuming. We created a project with a sequence to represent a draft of a video project in Premiere and timed how long it took to render the sequence using Adobe Media Encoder. In the export settings, we downscaled the footage from 2400×1350 to 1920×1080. We tested this export with maximum render quality enabled and disabled. The bottom two sets of bars in Figure 2 show our findings—the Dell Precision M3800 rendered the sequence up to 30.8 percent faster than the MacBook Pro, saving over a minute total in just two tasks. A professional user rendering video sequences in Adobe Premiere Pro CC could be more productive with the Dell Precision M3800 mobile workstation than with the MacBook Pro.

Figure 2: The time the two systems took to render video sequences with Adobe Premiere Pro CC, in seconds. Lower numbers are better.

Time in seconds to render a video sequence
(Lower is better)

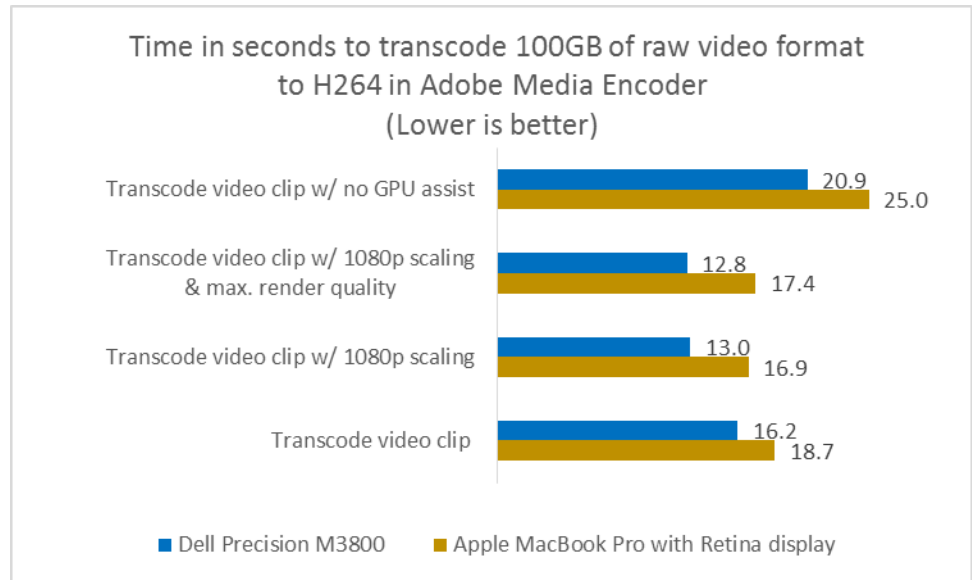|	Dell Precision M3800	Apple MacBook Pro with Retina display
Render sequence w/ effects, transitions, & max. render quality	131.1	149.3
Render sequence w/ effects & transitions	116.8	151.1
Render sequence w/ scaling & max. render quality	95.1	133.5
Render sequence w/ scaling	88.1	127.3

The top two sets of bars in Figure 2 represent our findings when we created a project with a sequence meant to represent a completed video project in Premiere. With maximum render quality enabled, the Dell Precision M3800 rendered the sequence 12.1 percent faster than the MacBook Pro; with maximum render quality disabled, the Dell Precision M3800 was 22.7 percent faster.

Transcoding a video clip

When video editors want to quickly share or review their clips, they often transcode their raw footage to a smaller file size for draft-quality previews. We performed a series of transcoding tasks with the two systems. As Figure 3 shows, the Dell Precision M3800 performed all of them more quickly than did the MacBook Pro. A

New Dell Precision M3800 mobile workstation vs.
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professional user transcoding video in Adobe Premiere Pro CC would save a significant amount of time in a workday with the Dell Precision M3800.

Figure 3: The time the two systems took to transcode video with Adobe Premiere Pro CC, in seconds. Lower numbers are better.

Time in seconds to transcode 100GB of raw video format to H264 in Adobe Media Encoder (Lower is better)

- Transcode video clip w/ no GPU assist: 20.9 (Dell Precision M3800), 25.0 (Apple MacBook Pro with Retina display)
- Transcode video clip w/ 1080p scaling & max. render quality: 12.8, 17.4
- Transcode video clip w/ 1080p scaling: 13.0, 16.9
- Transcode video clip: 16.2, 18.7

■ Dell Precision M3800   ■ Apple MacBook Pro with Retina display

We first transcoded a single video clip from a lossless, camera raw format to a standard compressed format. We took raw footage from the Blackmagic® Cinema Camera and timed how long it took to export using the H.264/MPEG-4 codec. As the bottom set of bars in Figure 3 shows, the Dell Precision M3800 handled transcoding the digital negative files 13.4 percent faster than the MacBook Pro.

Video projects are often shot at higher resolutions than the final video to give video editors room to crop, zoom, and reframe their footage. Downscaling is also used when exporting a large video to small dimensions for YouTube or online viewing. We tested downscaling the test clip from 2400×1350 to 1920×1080 in two ways—with maximum render quality enabled and disabled. Maximum render quality processes footage at a higher bit-per-channel, making for more realistic results and finer gradations in color.[1] As the center two sets of bars in Figure 3 show, the Dell Precision M3800 was up to 26.4 percent faster than the MacBook Pro.
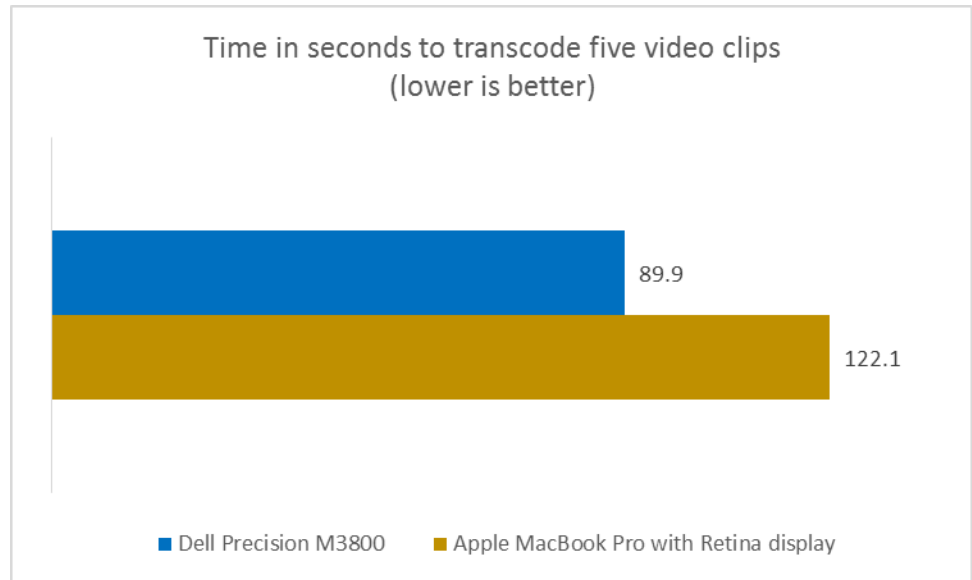
We tested how the hardware performed using software-only acceleration with the Mercury Playback Engine. When this rendering option is selected, only the CPU is used in rendering and computing.[2] The Dell Precision M3800 performed the task 16.4 percent faster than the MacBook Pro.

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[1] blogs.adobe.com/premierepro/2011/02/cuda-mercury-playback-engine-and-adobe-premiere-pro.html
[2] blogs.adobe.com/premierepro/2011/02/red-yellow-and-green-render-bars.html

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Figure 4 shows the results when we performed batch transcoding with Premiere—transcoding a set of five clips simultaneously. The Dell Precision M3800 did the job in 26.4 percent less time—over 32 seconds faster—than the MacBook Pro.
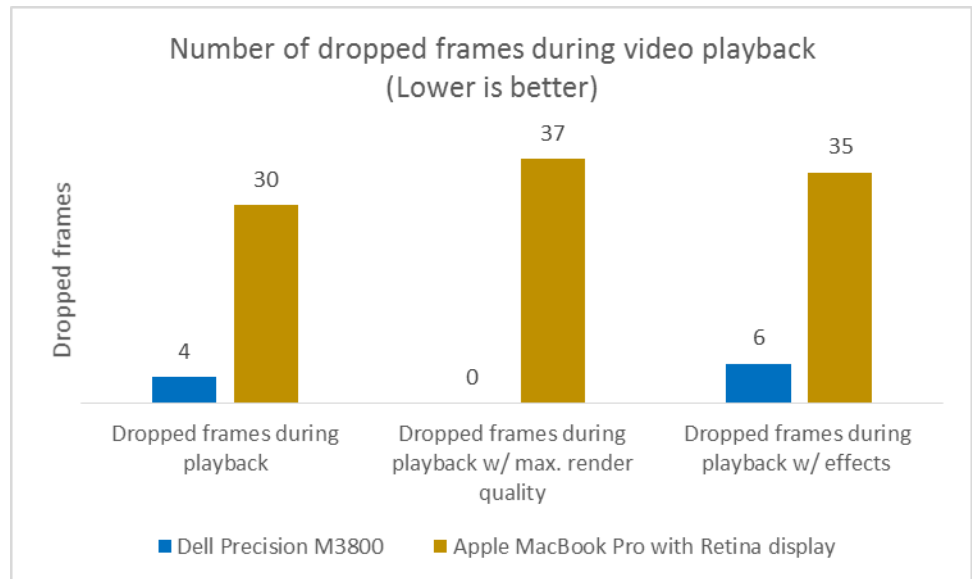
Figure 4: The time the two systems took to batch transcode five video clips with Adobe Premiere Pro CC, in seconds. Lower numbers are better.

Time in seconds to transcode five video clips
(lower is better)

- Dell Precision M3800: 89.9
- Apple MacBook Pro with Retina display: 122.1

■ Dell Precision M3800   ■ Apple MacBook Pro with Retina display

Video playback quality

When frames are dropped during video playback, the video appears to stutter. When many frames are dropped, the video can be almost unwatchable, making it difficult for a video editor to get a sense of motion or progression. Stuttering video can also call the integrity of the source footage into question. Figure 5 presents the results of our testing to measure the number of dropped frames.

Figure 5: The number of dropped frames for the two systems during video playback with Adobe Premiere Pro CC. Lower numbers are better.

Number of dropped frames during video playback
(Lower is better)

Dropped frames

	Dell Precision M3800	Apple MacBook Pro with Retina display
Dropped frames during playback	4	30
Dropped frames during playback w/ max. render quality	0	37
Dropped frames during playback w/ effects	6	35

■ Dell Precision M3800   ■ Apple MacBook Pro with Retina display

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We created a project with a video sequence and used Premiere's dropped frame indicator to determine the number of stutters that occurred during playback. We configured the sequence to preview video at full resolution (2400×1350) and began playing the video sequence on the program monitor. After 5 minutes of playback, we stopped and reported how many frames each system dropped. When we previewed the test sequence, the MacBook Pro dropped 30 frames and the Dell Precision M3800 dropped only 4 frames—86.7 percent fewer dropped frames.

We ran the same test with maximum render quality enabled for the test sequence. When we previewed this test sequence, the MacBook Pro dropped 37 frames and the Dell Precision M3800 dropped none.

Finally, we created another project with a video sequence and added effects to simulate a finished video project in Premiere. We previewed the video again at 2400x1350 and played the footage for 5 minutes before recording the number of dropped frames. The MacBook Pro dropped 35 frames and the Dell Precision M3800 dropped only 6 frames—82.9 percent fewer dropped frames.

Surface temperature

The temperature at which a system operates while running an intensive workload can be significant. High operating temperatures can also cause hardware reliability to degrade, and comfort issues can arise when workers place systems on their laps—no one wants to hold an extremely warm system for long. With an eye to system reliability and user comfort, we measured the surface temperature of the two systems in our study. As Figure 6 shows, the Dell Precision M3800 was cooler than the MacBook Pro when running an intensive workload—24.1 degrees cooler on the top and 5.9 degrees cooler on the bottom.

Figure 6: Surface temperature of the two systems, in degrees Fahrenheit. Lower is better.

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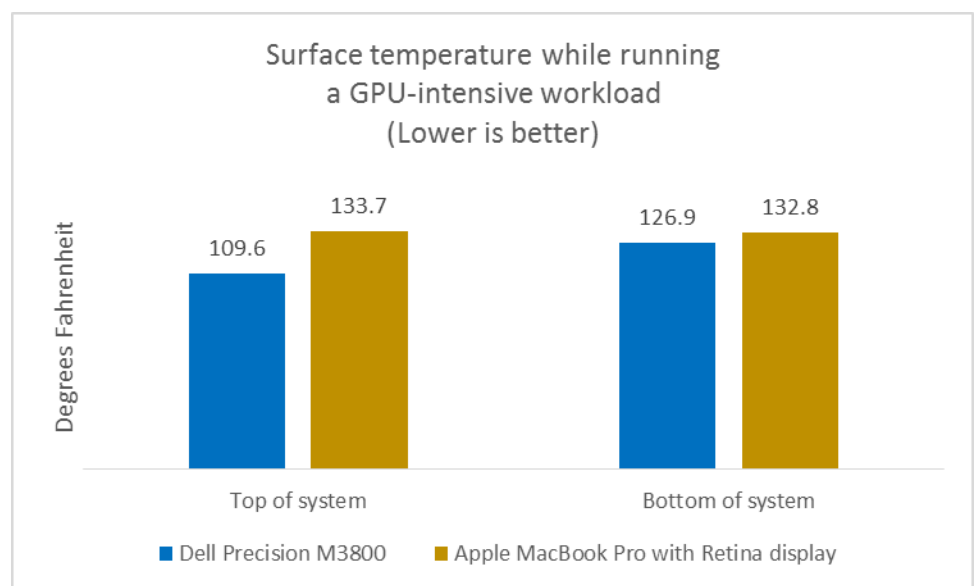
CONCLUSION

In media editing, some of the most common tasks are also the most resource intensive. Looking at tasks commonly performed in Adobe Premiere Pro CC, we found that the Dell Precision M3800 mobile workstation outperformed the Apple MacBook Pro across the board in rendering and previewing video—saving valuable time by completing the tasks we timed almost 3 minutes faster than the MacBook Pro. The Dell Precision M3800 also delivered a lower surface temperature while running an intensive workload and offered twice the maximum SSD storage capacity. These advantages make the Dell Precision M3800 a better choice for media editors that could benefit from using a mobile workstation for demanding professional applications such as Adobe Premiere Pro CC.

APPENDIX A – SYSTEM CONFIGURATION INFORMATION

Figure 7 provides detailed configuration information for the test systems.

System	Dell Precision M3800	Apple MacBook Pro with Retina Display
Processor	Intel Core i7-4712HQ	Intel Core i7-4870HQ
Processor frequency (GHz)	2.3	2.5
Processor cores	4	4
Memory amount (GB)	16	16
Memory type	Samsung M471B1G73QH0-YK0	Integrated onboard RAM
Storage	512GB Lite-On® IT LCT-512L9S-11 SSD 1TB Samsung PM851 SSD	512GB Apple SM0512F SSD
Graphics cards	Intel HD Graphics 4600 NVIDIA Quadro K1100M (professional)	Intel Iris™ Pro Graphics 5200 NVIDIA GeForce® GT 750M (consumer)
Display size and resolution	15.6" 3840×2160	15.4" 2560×1600
LCD type	4K Ultra HD display: LED-backlit with IGZO2 technology	Retina display: LED-backlit with IPS technology
Touch screen	10-finger multi-touch	No
OS	Microsoft® Windows 8.1 Pro	OS X® 10.10.1
Ports	2 USB 3.0 1 USB 2.0 1 HDMI 1 Thunderbolt 1 SDXC slot	2 USB 3.0 1 HDMI 2 Thunderbolt 1 SDXC slot
System dimensions (length × width × height)	14.65" × 10" × 0.71"	14.13" × 9.73" × 0.71"
System weight (lbs.)	4.34	4.38

Figure 7: Specifications for the two systems we tested.

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APPENDIX B – HOW WE TESTED

We performed all tests three times and used the median scores. For our Adobe Premiere Pro CC tests, we loaded both systems with the same sets of test footage:

- 100GB of 2K camera raw video (Blackmagic Cinema Camera .DNG)
- 2GB of 6K camera raw video (RED DRAGON® .R3D)
- 10GB of transcoded video (H.264 .mp4)

Note: [bolded brackets] indicate options that we toggled within their respective tasks for different output settings.

ADOBE PREMIERE PRO CC (2014) TESTING

Installing Adobe Premiere Pro CC

Dell Precision M3800

1. Log into Adobe.com and download the Creative Cloud™ installer (creative.adobe.com/products/creative-cloud).
2. Run the installer executable (CreativeCloudSet-Up.exe), and click Yes when the User Account Control dialog appears.
3. When the download and installation is complete, run Creative Cloud.
4. Log in with your Adobe account.
5. Click Continue to accept the license agreement.
6. Next to Premiere Pro CC (2014), click Try, and the app will begin downloading.
7. If Media Encoder CC (2014) does not also begin downloading, download the app.
8. When the downloads are complete, click Start Trial to open Premiere Pro CC.
9. Close the Welcome dialog.
10. Close Premiere Pro CC.
11. Open Media Encoder CC and close the program.
12. Pin Premiere Pro CC and Media Encoder CC to the taskbar.

Apple MacBook Pro

1. Log into Adobe.com and download the Creative Cloud installer (creative.adobe.com/products/creative-cloud).
2. Open CreativeCloudInstaller.dmg, and double-click Creative Cloud Installer to install.
3. Click Open when the warning dialog appears.
4. If prompted, type in the administrator password.
5. When the download and installation is complete, Creative Cloud will automatically open.
6. Log in with your Adobe account.
7. Click Continue to accept the license agreement.
8. Next to Premiere Pro CC (2014), click Try, and the app will begin downloading.
9. If Media Encoder CC (2014) does not also begin downloading, download the app.
10. When the downloads are complete, click Start Trial to open Premiere Pro CC.
11. Close the Welcome dialog.

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12. Close Premiere Pro CC.

13. Open Media Encoder CC and close the program.

14. Pin Premiere Pro CC and Media Encoder CC to the dock.

Rendering sequence (with/without maximum render quality)

Dell Precision M3800

1. Launch Premiere Pro CC.

2. Under Create New, select New Project…

3. Name the document. We named ours `Sequence Test 1`. We left the project and scratch disk locations set to their default locations.

4. Click OK.

5. In the project pane, right-click and select Import…

6. Navigate to the test clip locations. For this test, we imported 6 raw video clips:

   - Blackmagic Cinema Camera_1_2013-04-25_0010_C0010
   - Blackmagic Cinema Camera_1_2013-04-25_0011_C0011
   - Blackmagic Cinema Camera_1_2013-04-25_0012_C0012
   - Blackmagic Cinema Camera_1_2013-04-25_0013_C0013
   - Blackmagic Cinema Camera_1_2013-04-25_0019_C0014
   - Blackmagic Cinema Camera_1_2013-04-25_0020_C0015

7. Drag and drop the clips into the timeline and place them in the same order as listed above (a new sequence will automatically be created when the first clip is added to the timeline). Ensure there are no gaps between clips, and that clips do not overlap.

8. Save the project.

9. Close Premiere Pro CC.

10. Open Media Encoder CC.

11. Click File, Add Premiere Pro Sequence…

12. Navigate to the project folder and open the Premiere project.

13. Click the preset to open the Export Settings window.

14. For our export, we used the following settings:

    - Source Scaling: Scale To Fit
    - Format: H.264
    - Preset: Match Source – High bitrate
    - Video Tab:
      - Uncheck the tick box for Weight & Height and change the dimensions to 1920×1080.
      - Render at Maximum Depth: **[Checked / Unchecked]**
      - Bitrate Encoding: VBR, 1 pass
      - Target Bitrate [Mbps]: 10
      - Maximum Bitrate [Mbps]: 12

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- Effects, Audio, Multiplexer, Captions, and Publish tabs: leave at default.
- Use Maximum Render Quality: **[Checked / Unchecked]**

15. Click OK.
16. Start the timer and click the green play arrow icon.
17. Stop the timer when encoding is complete (a sound will play).
18. The resulting video will have the following properties:

- Length: 01:49
- Dimensions: 1920×1080
- Frame rate: 24 frames / second
- Audio: 2 channel VBR @ 48 kHz
- Size: ~150MB (Will differ between OS X + Windows)

Apple MacBook Pro

1. Launch Premiere Pro CC.
2. Under Create New, select New Project…
3. Name the document. We named ours `Sequence Test 1`. We left the project and scratch disk locations set to their default locations.
4. Click OK.
5. In the project pane, right-click and select Import…
6. Navigate to the test clip locations. For this test, we imported 6 raw video clips:

- Blackmagic Cinema Camera_1_2013-04-25_0010_C0010
- Blackmagic Cinema Camera_1_2013-04-25_0011_C0011
- Blackmagic Cinema Camera_1_2013-04-25_0012_C0012
- Blackmagic Cinema Camera_1_2013-04-25_0013_C0013
- Blackmagic Cinema Camera_1_2013-04-25_0019_C0014
- Blackmagic Cinema Camera_1_2013-04-25_0020_C0015

7. Drag and drop the clips into the timeline and place them in the same order as listed above (a new sequence will automatically be created when the first clip is added to the timeline). Ensure there are no gaps between clips, and that clips do not overlap.
8. Save the project.
9. Close Premiere Pro CC.
10. Open Media Encoder CC.
11. Click File, Add Premiere Pro Sequence…
12. Navigate to the project folder and open the Premiere project.
13. Click the preset to open the Export Settings window.
14. For our export, we used the following settings:

- Source Scaling: Scale To Fit
- Format: H.264

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- Preset: Match Source – High bitrate
- Video Tab:
  - Uncheck the tick box for Weight & Height and change the dimensions to 1920×1080.
  - Render at Maximum Depth: **[Checked / Unchecked]**
  - Bitrate Encoding: VBR, 1 pass
  - Target Bitrate [Mbps]: 10
  - Maximum Bitrate [Mbps]: 12
- Effects, Audio, Multiplexer, Captions, and Publish tabs: leave at default.
- Use Maximum Render Quality: **[Checked / Unchecked]**

15. Click OK.
16. Start the timer and click the green play arrow icon.
17. Stop the timer when encoding is complete (a sound will play).
18. The resulting video will have the following properties:
    - Length: 01:49
    - Dimensions: 1920×1080
    - Frame rate: 24 frames / second
    - Audio: 2 channel VBR @ 48 kHz
    - Size: ~150MB (Will differ between OS X + Windows)

Rendering sequence (with effects and transitions) (with/without Maximum Render Quality)

For this test, we used our previously created project (Sequence Test 1) and added effects and transitions to represent a completed Premiere project. We added the following clips to a sequence in this order:

- Blackmagic Cinema Camera_1_2013-04-25_0010_C0010
- Blackmagic Cinema Camera_1_2013-04-25_0011_C0011
- Blackmagic Cinema Camera_1_2013-04-25_0012_C0012
- Blackmagic Cinema Camera_1_2013-04-25_0013_C0013
- Blackmagic Cinema Camera_1_2013-04-25_0019_C0014
- Blackmagic Cinema Camera_1_2013-04-25_0020_C0015

Dell Precision M3800

1. Launch Premiere Pro CC.
2. Open the Sequence Test 1 project.
3. Select all clips in the sequence timeline.
4. In the project pane, select the Effects tab.
5. Click the arrow next to Video Effects.
6. Click the arrow next to Blur & Sharpen.
7. Drag and drop the Sharpen effect onto the clips selected in the sequence timeline.
8. Navigate to the Effects Control tab. Select each clip from the sequence timeline and adjust the Sharpen Amount parameter to 15.

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9. In the Effects tab, under the Video Effects folder, click the arrow next to Color Correction.
10. Select all clips in the sequence timeline.
11. Drag and drop the Fast Color Corrector effect onto the clips selected in the sequence timeline.
12. Navigate to the Effects Control tab. Select each clip from the sequence timeline and in the Fast Color Corrector settings, change the white balance to #EAEAEA, and adjust the Input Levels to the following:
    - 0 → 10.0
    - 1.0 → 0.9
    - 255.0 → 254.0
13. In the Effects tab, click the arrow next to Video Transitions.
14. Click the arrow next to Dissolve.
15. Click and drag the Film Dissolve effect between each transition in the sequence timeline (for a total of five transitions). A dialog will appear each time warning about repeated frames; click OK.
16. Click and drag the Fast Blur effect onto the second clip (Blackmagic Cinema Camera_1_2013-04-25_0011_C0011).
17. Navigate to the Effects Control tab.
18. Drag the play head in the Effects Control tab to the beginning of the selected clip.
19. Under Fast Blur, click the stopwatch icon next to Blurriness to toggle animation. Change the Blurriness parameter to 100. A keyframe will appear in the Effects Control timeline represented by a diamond icon.
20. Drag the play head in the Effects Control tab to the end of the selected clip.
21. Change the Blurriness parameter to 0. Another keyframe will appear in the Effects Control timeline represented by a diamond icon.
22. Check Repeat Edge Pixels.
23. Save the project as `Sequence Test 2`.
24. Close Premiere Pro CC.
25. Open Media Encoder CC.
26. Click File, Add Premiere Pro Sequence…
27. Navigate to the project folder and open the Premiere project.
28. Click the preset to open the Export Settings window.
29. For our export, we used the following settings:
    - Source Scaling: Scale To Fit
    - Format: H.264
    - Preset: Match Source – High bitrate
    - Video Tab:
        - **[Uncheck the tick box for Weight & Height and change the dimensions to 1920×1080.]**
        - Render at Maximum Depth: **[Checked / Unchecked]**
        - Bitrate Encoding: VBR, 1 pass
        - Target Bitrate [Mbps]: 10
        - Maximum Bitrate [Mbps]: 12

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- Effects, Audio, Multiplexer, Captions, and Publish tabs: leave at default.
- Use Maximum Render Quality: **[Checked / Unchecked]**

30. Click OK.
31. Start the timer and click the green play arrow icon.
32. Stop the timer when encoding is complete (a sound will play).
33. Close Media Encoder CC.

Apple MacBook Pro

1. Launch Premiere Pro CC.
2. Open the Sequence Test 1 project.
3. Select all clips in the sequence timeline.
4. In the project pane, select the Effects tab.
5. Click the arrow next to Video Effects.
6. Click the arrow next to Blur & Sharpen.
7. Drag and drop the Sharpen effect onto the clips selected in the sequence timeline.
8. Navigate to the Effects Control tab. Select each clip from the sequence timeline and adjust the Sharpen Amount parameter to 15.
9. In the Effects tab, under the Video Effects folder, click the arrow next to Color Correction.
10. Select all clips in the sequence timeline.
11. Drag and drop the Fast Color Corrector effect onto the clips selected in the sequence timeline.
12. Navigate to the Effects Control tab. Select each clip from the sequence timeline and in the Fast Color Corrector settings, change the white balance to #EAEAEA, and adjust the Input Levels to the following:
    - 0 → 10.0
    - 1.0 → 0.9
    - 255.0 → 254.0
13. In the Effects tab, click the arrow next to Video Transitions.
14. Click the arrow next to Dissolve.
15. Click and drag the Film Dissolve effect between each transition in the sequence timeline (for a total of five transitions). A dialog will appear each time warning about repeated frames; click OK.
16. Click and drag the Fast Blur effect onto the second clip (Blackmagic Cinema Camera_1_2013-04-25_0011_C0011).
17. Navigate to the Effects Control tab.
18. Drag the play head in the Effects Control tab to the beginning of the selected clip.
19. Under Fast Blur, click the stopwatch icon next to Blurriness to toggle animation. Change the Blurriness parameter to 100. A keyframe will appear in the Effects Control timeline represented by a diamond icon.
20. Drag the play head in the Effects Control tab to the end of the selected clip.
21. Change the Bluriness parameter to 0. Another keyframe will appear in the Effects Control timeline represented by a diamond icon.
22. Check Repeat Edge Pixels.

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23. Save the project as `Sequence Test 2.`
24. Close Premiere Pro CC.
25. Open Media Encoder CC.
26. Click File, Add Premiere Pro Sequence…
27. Navigate to the project folder and open the Premiere project.
28. Click the preset to open the Export Settings window.
29. For our export, we used the following settings:
    - Source Scaling: Scale To Fit
    - Format: H.264
    - Preset: Match Source – High bitrate
    - Video Tab:
        o **[Uncheck the tick box for Weight & Height and change the dimensions to 1920×1080.]**
        o Render at Maximum Depth: **[Checked / Unchecked]**
        o Bitrate Encoding: VBR, 1 pass
        o Target Bitrate [Mbps]: 10
        o Maximum Bitrate [Mbps]: 12
    - Effects, Audio, Multiplexer, Captions, and Publish tabs: leave at default.
    - Use Maximum Render Quality: **[Checked / Unchecked]**
30. Click OK.
31. Start the timer and click the green play arrow icon.
32. Stop the timer when encoding is complete (a sound will play).

Transcoding video clip (no scaling)

For our test, we used 100GB of video raw video footage from a colleague's personal project. We shot the project at 2400×1350 using a Blackmagic Design Cinema Camera, producing .DNG video files. We loaded each system with a folder of the test footage.

Dell Precision M3800

1. Launch Premiere Pro CC.
2. Under Create New, select New Project…
3. Name the document. We named ours `Transcode test 1.` We left the project and scratch disk locations set to their default locations.
4. Click OK.
5. In the project pane, right-click and select Import…
6. Navigate to the test clip location.
7. Select the first DNG file (Blackmagic Cinema Camera_1_2013_04-25_0030_C0020_000000.DNG) and click Open.
8. When the clip is loaded, right-click on the clip and select Export Media…
9. Click on the Output Name, navigate to the desktop, and click Save.
10. For our export, we used the following settings:

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- Source Scaling: Scale To Fit
- Format: H.264
- Preset: Match Source – High bitrate
- Video Tab:
  - Basic Video Settings: click Match Source
  - Render at Maximum Depth: Unchecked
  - Bitrate Encoding: VBR, 1 pass
  - Target Bitrate [Mbps]: 10
  - Maximum Bitrate [Mbps]: 12
- Effects, Audio, Multiplexer, Captions, and Publish tabs: leave at default.

11. Start the timer and click Export.
12. Stop the timer when the Export window closes.
13. Close Premiere without saving changes.

Apple MacBook Pro

1. Launch Premiere Pro CC.
2. Under Create New, select New Project…
3. Name the document. We named ours `Transcode test 1`. We left the project and scratch disk locations set to their default locations.
4. Click OK.
5. In the project pane, control-click and select Import…
6. Navigate to the test clip location.
7. Select the first DNG file (Blackmagic Cinema Camera_1_2013_04-25_0030_C0020_000000.DNG) and click Open.
8. When the clip is loaded, control-click on the clip and select Export Media…
9. Click on the Output Name, navigate to the desktop, and click Save.
10. For our export, we used the following settings:
    - Source Scaling: Scale To Fit
    - Format: H.264
    - Preset: Match Source – High bitrate
    - Video Tab:
      - Basic Video Settings: click Match Source
      - Render at Maximum Depth: Unchecked
      - Bitrate Encoding: VBR, 1 pass
      - Target Bitrate [Mbps]: 10
      - Maximum Bitrate [Mbps]: 12
    - Effects, Audio, Multiplexer, Captions, and Publish tabs: leave at default.
11. Start the timer and click Export.
12. Stop the timer when the Export window closes.
13. Close Premiere without saving changes.

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Transcoding video clip (1080p scaling) (Maximum Render Quality)

We selected a raw video clip to scale from 2400×1350 to 1920×1080.

Dell Precision M3800

1. Launch Premiere Pro CC.
2. Under Create New, select New Project…
3. Name the document. We named ours `Transcode test 2`. We left the project and scratch disk locations set to their default locations.
4. Click OK.
5. In the project pane, right-click and select Import…
6. Navigate to the test clip location.
7. Select the first DNG file (Blackmagic Cinema Camera_1_2013_04-25_0030_C0020_000000.DNG) and click Open.
8. When the clip is loaded, right-click on the clip and select Export Media…
9. Click on the Output Name, navigate to the desktop, and click Save.
10. For our export, we used the following settings:
    - Source Scaling: Scale To Fit
    - Format: H.264
    - Preset: Match Source – High bitrate
    - Video Tab:
      - Uncheck the tick box for Weight & Height and change the dimensions to 1920×1080.
      - Render at Maximum Depth: **[Checked / Unchecked]**
      - Bitrate Encoding: VBR, 1 pass
      - Target Bitrate [Mbps]: 10
      - Maximum Bitrate [Mbps]: 12
    - Effects, Audio, Multiplexer, Captions, and Publish tabs: leave at default.
    - Use Maximum Render Quality: **[Checked / Unchecked]**
11. Start the timer and click Export.
12. Stop the timer when the Export window closes.
13. Close Premiere without saving changes.

Apple MacBook Pro

1. Launch Premiere Pro CC.
2. Under Create New, select New Project…
3. Name the document. We named ours `Transcode test 2`. We left the project and scratch disk locations set to their default locations.
4. Click OK.
5. In the project pane, control-click and select Import…
6. Navigate to the test clip location.
7. Select the first DNG file (Blackmagic Cinema Camera_1_2013_04-25_0030_C0020_000000.DNG) and click Open.

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8. When the clip is loaded, control-click on the clip and select Export Media…

9. Click on the Output Name, navigate to the desktop, and click Save.

10. For our export, we used the following settings:

    - Source Scaling: Scale To Fit
    - Format: H.264
    - Preset: Match Source – High bitrate
    - Video Tab:
        - Uncheck the tick box for Weight & Height and change the dimensions to 1920 x 1080.
        - Render at Maximum Depth: **[Checked / Unchecked]**
        - Bitrate Encoding: VBR, 1 pass
        - Target Bitrate [Mbps]: 10
        - Maximum Bitrate [Mbps]: 12
    - Effects, Audio, Multiplexer, Captions, and Publish tabs: leave at default.
    - Use Maximum Render Quality: **[Checked / Unchecked]**

11. Start the timer and click Export.

12. Stop the timer when the Export window closes.

13. Close Premiere without saving changes.

Transcoding video clip (software only)

Dell Precision M3800

1. Launch Premiere Pro CC.

2. Under Create New, select New Project…

3. Name the document. We named ours `Transcode test 3`. We left the project and scratch disk locations set to their default locations.

4. Change the renderer to Mercury Playback Engine Software Only.

5. Click OK.

6. In the project pane, right-click and select Import…

7. Navigate to the test clip location.

8. Select the first DNG file (Blackmagic Cinema Camera_1_2013_04-25_0010_C0010_000000.DNG) and click Open.

9. When the clip is loaded, right-click on the clip and select Export Media…

10. Click on the Output Name, navigate to the desktop, and click Save.

11. For our export, we used the following settings:

    - Source Scaling: Scale To Fit
    - Format: H.264
    - Preset: Match Source – High bitrate
    - Video Tab:
        - Render at Maximum Depth: Checked
        - Bitrate Encoding: VBR, 1 pass

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- o Target Bitrate [Mbps]: 10
- o Maximum Bitrate [Mbps]: 12
  - • Effects, Audio, Multiplexer, Captions, and Publish tabs: leave at default.
12. Start the timer and click Export.
13. Stop the timer when the Export window closes.
14. Close Premiere without saving changes.

Apple MacBook Pro

1. Launch Premiere Pro CC.
2. Under Create New, select New Project…
3. Name the document. We named ours `Transcode test 3`. We left the project and scratch disk locations set to their default locations.
4. Change the renderer to Mercury Playback Engine Software Only.
5. Click OK.
6. In the project pane, control-click and select Import…
7. Navigate to the test clip location.
8. Select the first DNG file (Blackmagic Cinema Camera_1_2013_04-25_0010_C0010_000000.DNG) and click Open.
9. When the clip is loaded, control-click on the clip and select Export Media…
10. Click on the Output Name, navigate to the desktop, and click Save.
11. For our export, we used the following settings:
    - • Source Scaling: Scale To Fit
    - • Format: H.264
    - • Preset: Match Source – High bitrate
    - • Video Tab:
      - o Render at Maximum Depth: Checked
      - o Bitrate Encoding: VBR, 1 pass
      - o Target Bitrate [Mbps]: 10
      - o Maximum Bitrate [Mbps]: 12
    - • Effects, Audio, Multiplexer, Captions, and Publish tabs: leave at default.
12. Start the timer and click Export.
13. Stop the timer when the Export window closes.
14. Close Premiere without saving changes.

Transcoding five video clips (1080p scaling)

We selected five clips to test scaling from 2400×1350 to 1920×1080.

Dell Precision M3800

1. Launch Premiere Pro CC.
2. Under Create New, select New Project…

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3. Name the document. We named ours `Transcode test 4`. We left the project and scratch disks locations set to their default location.

4. Click OK.

5. In the project pane, right-click and select Import…

6. Navigate to the test clip location. We used the following clips:
   - Blackmagic Cinema Camera_1_2013-04-25_0010_C0010
   - Blackmagic Cinema Camera_1_2013-04-25_0011_C0011
   - Blackmagic Cinema Camera_1_2013-04-25_0012_C0012
   - Blackmagic Cinema Camera_1_2013-04-25_0013_C0013
   - Blackmagic Cinema Camera_1_2013-04-25_0019_C0014

7. Select the first DNG file for each set of footage and click Open.

8. When the clips are all loaded, select all clips, right-click and select Export Media…

9. For our export, we used the following settings:
   - Format: H.264
   - Preset: Match Source – High bitrate
   - Video Tab:
     - Uncheck the tick box for Weight & Height and change the dimensions to 1920 x 1080.
     - Render at Maximum Depth: Unchecked
     - Bitrate Encoding: VBR, 1 pass
     - Target Bitrate [Mbps]: 10
     - Maximum Bitrate [Mbps]: 12
   - Effects, Audio, Multiplexer, Captions, and Publish tabs: leave at default.
   - Maximum Render Quality: Unchecked

10. Click Queue. Adobe Media Encoder CC will launch.

11. Start the timer and click the green play arrow.

12. Stop the timer when the encoding is complete (a sound will play).

13. Close Adobe Media Encoder CC, and close Premiere.

Apple MacBook Pro

1. Launch Premiere Pro CC.

2. Under Create New, select New Project…

3. Name the document. We named ours `Transcode test 4`. We left the project and scratch disk locations set to their default locations.

4. Click OK.

5. In the project pane, control-click and select Import…

6. Navigate to the test clip location. We used the following clips:
   - Blackmagic Cinema Camera_1_2013-04-25_0010_C0010
   - Blackmagic Cinema Camera_1_2013-04-25_0011_C0011
   - Blackmagic Cinema Camera_1_2013-04-25_0012_C0012

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- Blackmagic Cinema Camera_1_2013-04-25_0013_C0013
- Blackmagic Cinema Camera_1_2013-04-25_0019_C0014

7. Select the first DNG file for each set of footage and click Open.

8. When the clips are all loaded, select all clips, control-click and select Export Media…

9. For our export, we used the following settings:

- Format: H.264
- Preset: Match Source – High bitrate
- Video Tab:
    - Uncheck the tick box for Weight & Height and change the dimensions to 1920 x 1080.
    - Render at Maximum Depth: Unchecked
    - Bitrate Encoding: VBR, 1 pass
    - Target Bitrate [Mbps]: 10
    - Maximum Bitrate [Mbps]: 12
- Effects, Audio, Multiplexer, Captions, and Publish tabs: leave at default.
- Maximum Render Quality: Unchecked

10. Click Queue. Adobe Media Encoder CC will launch.

11. Start the timer and click the green play arrow.

12. Stop the timer when the encoding is complete (a sound will play).

13. Close Adobe Media Encoder CC, and close Premiere.

Measuring dropped frames during 5 minutes of video preview at 2400×1350 (Maximum Render Quality)

For this test, we created a project file (Dropped Frames Test 1) with a sequence of clips arranged to be 10 minutes long. We were sure to maintain the same sequence arrangement across platforms. We measured frames dropped during the first 5 minutes of playback from the program monitor.

Dell Precision M3800

1. Launch Premiere Pro CC.
2. Open the project file.
3. Right-click the sequence in the Project pane and select Sequence Settings…
4. Under Video Previews, change the Preview File Format to Microsoft AVI.
5. Change the Codec to Microsoft Video 1.
6. Change the Width and Height to 2400 and 1350.
7. **[Check Maximum Bit Depth. Click OK when the dialog box appears.]**
8. **[Check Maximum Render Quality. Click OK when the dialog box appears.]**
9. Ensure that Composite in Linear Color (requires GPU acceleration or max render quality) is enabled.
10. Click OK.
11. Click OK when the Delete All Previews For This Sequence dialog box appears.
12. In the Program Monitor pane, click the wrench icon to open the settings menu.

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13. Click Show Dropped Frames Indicator.

14. Change Playback Resolution to Full.

15. Change Zoom Level to 100%.

16. Drag the play head in the Timeline pane to the beginning of the sequence.

17. Right-click the Program Monitor pane and select Maximize Panel Group.

18. Click Play, and start the timer.

19. After 5 minutes have elapsed, stop video playback, hover over the circle-shaped Dropped Frames Indicator, and report the number of dropped frames.

Apple MacBook Pro

1. Launch Premiere Pro CC.

2. Open the project file.

3. Control click the sequence in the Project pane and select Sequence Settings…

4. Under Video Previews, change the Preview File Format to QuickTime.

5. Change the Codec to Video.

6. Change the Width and Height to 2400 and 1350.

7. **[Check Maximum Bit Depth. Click OK when the dialog box appears.]**

8. **[Check Maximum Render Quality. Click OK when the dialog box appears.]**

9. Ensure that Composite in Linear Color (requires GPU acceleration or max render quality) is enabled.

10. Click OK.

11. Click OK when the Delete All Previews For This Sequence dialog box appears.

12. In the Program Monitor pane, click the wrench icon to open the settings menu.

13. Click Show Dropped Frames Indicator.

14. Change Playback Resolution to Full.

15. Change Zoom Level to 100%.

16. Drag the play head in the Timeline pane to the beginning of the sequence.

17. Right-click the Program Monitor pane and select Maximize Panel Group.

18. Click Play, and start the timer.

19. After 5 minutes have elapsed, stop video playback, hover over the circle-shaped Dropped Frames Indicator, and report the number of dropped frames.

Measuring dropped frames during 5 minutes of video preview at 2400×1350 (with effects)

For this test, we used an existing project file from a previous test (Sequence Test 3). The project consisted of six clips and a sequence with a specific arrangement of footage that is consistent between both systems. We added gamma correction, color balance, sharpening, and transition effects to all the clips.

Dell Precision M3800

1. Launch Premiere Pro CC.

2. Open the project file.

3. Control click the sequence in the Project pane and select Sequence Settings…

4. Under Video Previews, change the Preview File Format to QuickTime.
5. Change the Codec to Video.
6. Change the Width and Height to 2400 and 1350.
7. Check Maximum Bit Depth. Click OK when the dialog box appears.
8. Check Maximum Render Quality. Click OK when the dialog box appears.
9. Ensure that Composite in Linear Color (requires GPU acceleration or max render quality) is enabled.
10. Click OK.
11. Click OK when the Delete All Previews For This Sequence dialog box appears.
12. In the Program Monitor pane, click the wrench icon to open the settings menu.
13. Click Show Dropped Frames Indicator.
14. Change Playback Resolution to Full.
15. Change Zoom Level to 100%.
16. Drag the play head in the Timeline pane to the beginning of the sequence.
17. Right-click the Program Monitor pane and select Maximize Panel Group.
18. Click Play, and start the timer.
19. After 5 minutes have elapsed, stop video playback, hover over the circle-shaped Dropped Frames Indicator, and report the number of dropped frames.

Apple MacBook Pro

1. Launch Premiere Pro CC.
2. Open the project file.
3. Control click the sequence in the Project pane and select Sequence Settings…
4. Under Video Previews, change the Preview File Format to QuickTime.
5. Change the Codec to Video.
6. Change the Width and Height to 2400 and 1350.
7. Check Maximum Bit Depth. Click OK when the dialog box appears.
8. Check Maximum Render Quality. Click OK when the dialog box appears.
9. Ensure that Composite in Linear Color (requires GPU acceleration or max render quality) is enabled.
10. Click OK.
11. Click OK when the Delete All Previews For This Sequence dialog box appears.
12. In the Program Monitor pane, click the wrench icon to open the settings menu.
13. Click Show Dropped Frames Indicator.
14. Change Playback Resolution to Full.
15. Change Zoom Level to 100%.
16. Drag the play head in the Timeline pane to the beginning of the sequence.
17. Right-click the Program Monitor pane and select Maximize Panel Group.
18. Click Play, and start the timer.

After 5 minutes have elapsed, stop video playback, hover over the circle-shaped Dropped Frames Indicator, and report the number of dropped frames.

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MEASURING SURFACE TEMPERATURE

Test requirements

- FLIR i7 Thermal Imaging Camera
- Unigine Valley Benchmark
- FLIR QuickReport 1.2 SP1

Setting up the test

1. Set the power plan to the manufacturer's default setting.
2. Set the display brightness to 100 percent.
3. Set the remaining power plan settings as follows:
4. Dim the display: Never
5. Turn off the display: Never
6. Put the computer to sleep: Never
7. Disable the screen saver. On the MacBook Pro, disable the lock screen.
8. Place the system under test in a windowless, climate-controlled room.
9. Download Unigine Valley Benchmark for Windows or Mac from https://unigine.com/products/valley/
10. Install Unigine Valley Benchmark with the default options.

Running the test

1. Boot the system.
2. Wait 5 minutes before running the test.
3. Launch Unigine Valley Benchmark.
4. Select the Extreme HD preset, and run the test.
5. After 30 minutes, take an image of the bottom and top of the notebook with a FLIR i7 thermal imaging camera.
6. Record the results.
7. Shut down the notebook and let it cool for an hour.
8. Repeat steps 1 through 7 two more times, and report the average of the three runs.

Reporting the results

1. Open the result photos in FLIR QuickReport 1.2 SP1.
2. Double-click the photo to be analyzed.
3. In the Analyze window, move the cursor to the hottest spot of the drive area on the topside of the laptop and record the temperature reading.
4. Repeat step 3 for the bottom side of the laptop.
5. Repeat steps 1 through 4 for each test photo.

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ABOUT PRINCIPLED TECHNOLOGIES

![Principled Technologies logo]

Principled Technologies, Inc.
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We provide industry-leading technology assessment and fact-based marketing services. We bring to every assignment extensive experience with and expertise in all aspects of technology testing and analysis, from researching new technologies, to developing new methodologies, to testing with existing and new tools.

When the assessment is complete, we know how to present the results to a broad range of target audiences. We provide our clients with the materials they need, from market-focused data to use in their own collateral to custom sales aids, such as test reports, performance assessments, and white papers. Every document reflects the results of our trusted independent analysis.

We provide customized services that focus on our clients' individual requirements. Whether the technology involves hardware, software, Web sites, or services, we offer the experience, expertise, and tools to help our clients assess how it will fare against its competition, its performance, its market readiness, and its quality and reliability.

Our founders, Mark L. Van Name and Bill Catchings, have worked together in technology assessment for over 20 years. As journalists, they published over a thousand articles on a wide array of technology subjects. They created and led the Ziff-Davis Benchmark Operation, which developed such industry-standard benchmarks as Ziff Davis Media's Winstone and WebBench. They founded and led eTesting Labs, and after the acquisition of that company by Lionbridge Technologies were the head and CTO of VeriTest.

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