

Final Cut Pro Multicam Streaming Summary

	27" iMac (2017) Monterey 12.1	MacBook Pro (M1 Pro) Ventura 13.2.1	Mac mini (2023) Ventura 13.2.1
H.264 4K 720p proxy streams	plays 15 drops at 20	plays 15 drops at 20	plays 15 drops at 20
H.264 4K multicam streams	plays 5 drops at 10	plays 10 drops at 15	plays 10 drops at 15
ProRes 422 4K 720p proxy streams	plays 10 drops at 15	Plays more than 40	Plays more than 40
ProRes 422 4K multicam streams	plays 5 drops at 10	Plays more than 40	Plays more than 40
ProRes 4444 4K 720p proxy streams	plays 5 drops at 10	Plays more than 40	Plays more than 40
ProRes 4444 4K multicam streams	Can't play 5 streams	Plays 15 drops at 20	Plays 15 drops at 20
ProRes 422 8K 1536p proxy streams	plays 2 drops at 4	Plays more than 10	Plays more than 10
ProRes 422 8K multicam streams	Can't play 2 streams	Plays 6 drops at 8	Plays 8 drops at 10

Premiere Pro Multicam Streaming Summary

	27" iMac (2017) Monterey 12.1	MacBook Pro (M1 Pro) Ventura 13.2.1	Mac mini (2023) Ventura 13.2.1
H.264 4K 720p proxy streams	Plays 5 streams, drops frames at 10	Plays 10 streams, drops frames at 15	Plays 10 streams, drops frames at 15
H.264 4K multicam streams	Can't play 5 streams	Plays 5 streams, drops frames at 10	Can't play 5 streams
ProRes 422 4K 720p proxy streams	Plays 5 streams, drops frames at 10	Plays 25 streams, drop frames at 30	Plays 30 streams, drop frames at 35
ProRes 422 4K multicam streams	Can't play 5 streams	Plays 20 streams, drop frames at 25	Plays 25 streams, drop frames at 30
ProRes 4444 4K 720p proxy streams	Plays 5 streams, drops frames at 10	Plays 25 streams, drops frames at 30	Plays 30 streams, drops at 35
ProRes 4444 4K multicam streams	Can't play 5 streams	Plays 20 streams, drops frames at 25	Plays 15 streams, drops at 20
ProRes 422 8K 1536p proxy streams	Can't play 2 streams	Can't play 2 streams	Plays 2 streams, drops frames at 4
ProRes 422 8K multicam streams	Can't play 2 streams	Plays 4 streams, drops frames at 6	Plays 6 streams, drops frames at 8

Comparing Multicam Streaming on an M2 Pro Mac mini

	Final Cut Pro v. 10.6.5	Premiere Pro v. 23.2.0
H.264 4K proxy streams	Plays 15 streams drops frames at 20	Plays 10 streams, drops frames at 15
H.264 4K multicam streams	Plays 10 streams drops frames at 15	Can't play 5 streams
ProRes 422 4K proxy streams	Plays more than 40 streams	Plays 30 streams, drop frames at 35
ProRes 422 4K multicam streams	Plays more than 40 streams	Plays 25 streams, drop frames at 30
ProRes 4444 4K proxy streams	Plays more than 40 streams	Plays 30 streams, drops frames at 35
ProRes 4444 4K multicam streams	Plays 15 streams drops frames at 20	Plays 15 streams drops frames at 20
ProRes 422 8K proxy streams	Plays more than 10 streams	Plays 2 streams, drops frames at 4
ProRes 422 8K multicam streams	Plays 8 streams drops frames at 10	Plays 6 streams, drops frames at 8

PROXY NOTES

All Final Cut Pro proxies were created at 50% of original frame size.

Premiere Pro proxies were created at "Medium resolution" for all 4K files (1280 x 720 pixels)

Premiere Pro proxies were created at "High resolution" for all 8K files (1536 x 864 pixels)

Both Final Cut and Premiere had hardware acceleration of H.264 and ProRes enabled.

Full frame 4K playback stream count was limited by storage bandwidth at 2.5 GB/second.

FCP Results

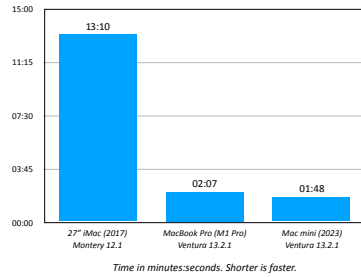
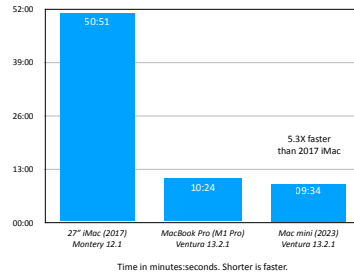
	27" iMac (2017) Monterey 12.1	MacBook Pro (M1 Pro) Ventura 13.2.1	Mac mini (2023) Ventura 13.2.1
Render & export 4:00 8K ProRes 422	13:10	02:07	01:48
Blur & render 4:00 4K ProRes 422	02:29	00:40	00:36

Premiere Results

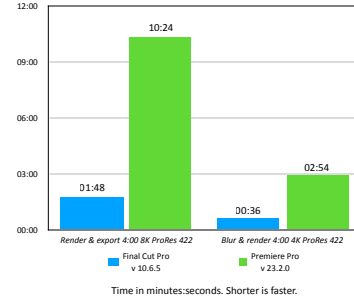
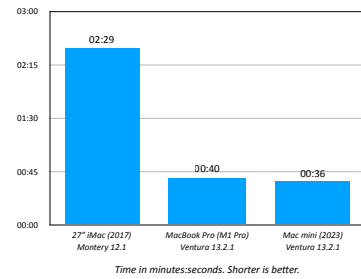
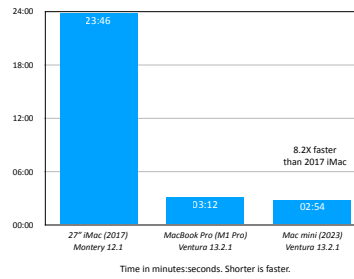
	27" iMac (2017) Monterey 12.1	MacBook Pro (M1 Pro) Ventura 13.2.1	Mac mini (2023) Ventura 13.2.1
Render & export 4:00 8K ProRes 422	50:51	10m 24s	09:34
Blur & render 4:00 4K ProRes 422	23:46	03:12	02:54

Comparing Final Cut Pro to Premiere Pro on a M2 Pro Mac mini

	Final Cut Pro v 10.6.5	Premiere Pro v 23.2.0	Difference
Render & export 4:00 8K ProRes 422	01:48	10m 24s	5.8 X
Blur & render 4:00 4K ProRes 422	00:36	02:54	4.8 X

Render & Export 4-minute 8K ProRes 422 Media
Using Final Cut ProRender & Export 4-minute 8K ProRes 422 Media
Using Adobe Premiere Pro

Comparing render and export speeds on an M2 Pro Mac mini

Blur, Scale, Rotate and Render 4-minute 4K ProRes 422 Media
Using Final Cut ProBlur, Scale, Rotate and Render 4-minute 4K ProRes 422 Media
Using Adobe Premiere Pro

Benchmark Comparisons of Older Macs to New 2023 Mac mini With M2 Pro SoC

		27" iMac (2017) Monterey 12.1	Mac mini (2018) Mojave 10.14.6	MacBook Pro (M1 Pro) Ventura 13.2.1	Mac mini (2023) Ventura 13.2.1	Improvement over 2017 iMac	Improvement over 2018 Mac Mini	Improvement over M1 Pro MacBook
	CPU Cores	4 core 3.8 GHz i5	6 core 3.2 GHz i7	10 core M1 Pro	12 Core M2 Pro			
	GPU Cores	N/A	N/A	16	19			
	RAM	40 GB	8 GB	32 GB	32 GB			
Benchmarks								
	GeekBench 6 (single core)	1,388	N/A	2,386	2,651	1.9 X		11.1%
	GeekBench 6 (multi-core)	4,093	N/A	11,907	14,182	3.5 X		19.1%
	GeekBench 6 (Compute)	41,280	N/A	40,503	49,485	1.2 X		22.2%
	GeekBench 5 (single core)	1,034	957	1,767	1,961	1.9 X	2 X	11.0%
	GeekBench 5 (multi-core)	3,807	3913	12,227	15,110	4 X	3.9 X	23.6%
	Cinebench (single core)	1,076	976	1,524	1,645	1.5 X	1.7 X	7.9%
	Cinebench (multi-core)	4,081	4524	12,184	14,778	3.6 X	3.3 X	21.3%
	Internal drive (write) 3X	739	1870	5,375	6,410	8.7 X	3.4 X	19.3%
	Internal drive (read) 3X	2,458	2396	4,505	3,975	1.6 X	1.7 X	-11.8%
Final Cut Pro Editing								
	Render & export 4:00 8K ProRes 422	13:10	N/A	02:07	01:48	7.3 X		-15.0%
	Blur & render 4:00 4K ProRes 422	02:29	N/A	00:40	00:36	4.1 X		-10.0%
	H.264 4K 50% proxy streams	plays 15 drops at 20	N/A	plays 15 drops at 20	plays 15 drops at 20			
	H.264 4K FCP Multicam streams	plays 5 drops at 10	N/A	plays 10 drops at 15	plays 10 drops at 15			
	ProRes 422 4K 50% proxy streams	plays 10 drops at 15	N/A	Plays more than 40	Plays more than 40			
	ProRes 422 4K Multicam streams	plays 5 drops at 10	N/A	Plays more than 40	Plays more than 40			
	ProRes 4444 4K 50% proxy streams	plays 5 drops at 10	N/A	Plays more than 40	Plays more than 40			
	ProRes 4444 4K multicam streams	can't play 5	N/A	Plays 15 drops at 20	Plays 15 drops at 20			
	ProRes 422 8K 50% proxy streams	plays 2 drops at 4	N/A	More than 10	More than 10			
	ProRes 422 8K multicam streams	can't play 2	N/A	Plays 6 drops at 8	Plays 8 drops at 10			
TESTING NOTES								
	All tests used the same version of Final Cut Pro (10.6.5), the same SSD RAID storage (OWC ThunderBlade), the same FCP library and the same media							
	Storage speeds were measured using AJA System Test (Full 16.2.2.5 version)							
	FCP Background rendering was turned off							
	Bank switching is the fastest way to cause dropped frames during multicam editing							
	Always set the Angle Viewer to display as many streams as possible (up to 16)							
	Changing settings better "Better Performance" and "Better Quality" didn't matter for multicam editing							
	All computers EXCEPT the 2018 Mac mini were running macOS Ventura 13.2.1.							
	The 2018 Mac mini was running Mojave in support of older software which is why I couldn't upgrade it to run the latest version of FCP.							
	All timed tests were run at least three times, then results were averaged.							
	Dropped frames were flagged in Final Cut using a Playback preference setting							

Adobe Premiere Pro Performance Comparison to M2 Pro Mac mini

		27" iMac (2017) Monterey 12.1	MacBook Pro (M1 Pro) Ventura 13.2.1	Mac mini (2023) Ventura 13.2.1	Improvement over 2017 iMac	Improvement over M1 Pro MacBook	Notes
	CPU Cores	4 core 3.8 GHz i5	10 core M1 Pro	12 Core M2 Pro			
	GPU Cores	N/A	16	19			
	RAM	40 GB	32 GB	32 GB			
Premiere Editing							
	Render & export 4:00 8K ProRes 422	50:51	10:24	09:34	5.3 X	8.0%	
	Blur & render 4:00 4K ProRes 422	23:46	03:12	02:54	8.2 X	9.5%	
	H.264 4K 720p proxy streams	Plays 5 streams, drops frames at 10	Plays 10 streams, drops frames at 15	Plays 10 streams, drops frames at 15			
	H.264 4K multicam streams	Can't play 5 streams	Plays 5 streams, drops frames at 10	Can't play 5 streams			Don't know why 5 streams wouldn't play
	ProRes 422 4K 720p proxy streams	Plays 5 streams, drops frames at 10	Plays 25 streams, drop frames at 30	Plays 30 streams, drop frames at 35			
	ProRes 422 4K multicam streams	Can't play 5 streams	Plays 20 streams, drop frames at 25	Plays 25 streams, drop frames at 30			
	ProRes 4444 4K 720p proxy streams	Plays 5 streams, drops frames at 10	Plays 25 streams, drops frames at 30	Plays 30 streams, drops at 35			
	ProRes 4444 4K multicam streams	Can't play 5 streams	Plays 20 streams, drops frames at 25	Plays 15 streams, drops at 20			Storage too slow to support 20 streams.
	ProRes 422 8K 1536p proxy streams	Can't play 2 streams	Can't play 2 streams	Plays 2 streams, drops at 4			I suspect proxy frame size.
	ProRes 422 8K multicam streams	Can't play 2 streams	Plays 4 streams, drops frames at 6	Plays 6 streams, drops at 8			Storage too slow to support 20 streams.

TESTING NOTES

All tests used the same: version of Premiere Pro (23.2.0), SSD RAID storage (OWC ThunderBlade), Premiere project and sequences, and media

All computers were running macOS Ventura 13.2.1.

Premiere auto-rendering was turned off

All timed tests were run three times, then results were averaged, except for the 8K export from the 2017 iMac, where the two results matched.

Dropped frames were flagged in Premiere using the dropped frame indicator

Video previews were stored to the internal hard drive

Media was exported as QuickTime ProRes 422 - Matching the source

Exported files were always stored on the Thunderblade for maximum speed on slower systems.

Render and export actual times were always shorter than the estimate.

ProRes hardware encoding and decoding were enabled.

4K blur applied via an adjustment layer

Proxies for H.264 and 4K ProRes 422 and 4444 files were set to "Medium Quality) 1280 x 720 pixels.

Proxies for 8K ProRes 422 files were set to High Quality - 1536x790 pixels. I think this frame size causes playback problems.

Rendering 8K proxies took a LONG time - roughly five minutes each, but I didn't time it.

Need to allow 5-15 seconds to switch between proxy and original media, may be due to cacheing media files. Otherwise dropped frames ensue.

Most multicam projects periodically dropped frames regardless of stream count. Restarting playback, or restarting the app fixed this.

Premiere Speed Test Individual Results

<i>Computer</i>	<i>Test</i>	<i>4K Blur & Render</i>	<i>8K Export</i>	
M1 Macbook	1	03:13	10:27	
	2	03:10	10:23	
	3	03:13	10:21	
	<i>Average</i>	<i>03:12</i>	<i>10:24</i>	
2017 iMac	1	16:25	50:51	Slow speed due to fusion drive?
	2	19:56	50:51	Fusion drive full?
	3	34:57	N/A	Don't know why speeds vary so much
	<i>Average</i>	<i>23:46</i>	<i>50:51</i>	
M2 Pro Mac mini	1	02:54	09:38	
	2	02:53	09:30	
	3	02:54	09:34	
	<i>Average</i>	<i>02:54</i>	<i>09:34</i>	
		Rendering uses all GPU cores.	Exporting only uses some CPU/GPU cores.	