Pro Display XDR

Technology Overview

February 2020

Contents

Introduction

Displays are incredibly important to many professionals: Video editors, photographers, colorists, 3D animators, and more rely on display front-of-screen quality to see the true color, contrast, and detail in their content and produce their life's best work.

Historically, the best front-of-screen quality has been found in a class of displays called "reference monitors," lauded by the industry for their wide color gamut and high contrast, but restricted by their 4K limitation, size, weight, and incredibly high price points that limit their usability to a very select group of professionals.

Apple Pro Display XDR reimagines the potential of a reference display, overcoming many of the limitations and delivering incredible front-of-screen quality plus every feature requested by pros, all at an accessible price point.

Introducing innovative display technologies, Pro Display XDR sets a new industry standard for incredible reference-quality imaging—1000 nits of sustained full-screen brightness, 1600 nits peak,[1] and a 1,000,000:1 contrast ratio at 6K resolution—at a fraction of the size, weight, and price of traditional reference monitors. This makes it possible for all professionals throughout the workflow to view, create, edit, color, animate, and more, with the true-to-life image quality of a reference display.

Key Features

32-inch LCD

- Pro Display XDR boasts a massive 32-inch LCD display with edge-to-edge glass and only 9 mm borders.

Retina 6K resolution

- With 6016-by-3384 resolution and 218 pixels per inch, Pro Display XDR is the largest Retina display Apple has ever made. Its 20.4 million pixels make it almost 40 percent larger than iMac with 5K Retina display, giving pros even more room for tools and content.

P3 wide color gamut, 10-bit color depth

- P3 wide color gamut and true 10-bit color depth provide over a billion colors and incredibly smooth gradients.

Extreme Dynamic Range (XDR)

- Extreme Dynamic Range takes brightness and contrast to a level never seen before, for images that are truer to life than ever.
- Pro Display XDR sustains a production-ready 1000 nits of full-screen brightness and up to 1600 nits peak, enabled by an advanced light efficiency algorithm in the timing controller (TCON) and the innovative cooling system.
- An astonishing contrast ratio of 1,000,000:1 provides front-of-screen quality only seen in reference displays.

Superwide viewing angle

- An Apple-designed, industry-leading polarizer technology provides 25x better off-axis contrast than a typical LCD display.

Reference modes

- Industry-standard reference modes for HDR, HDTV, NTSC video, digital cinema, and more are available as presets on Pro Display XDR.

Thunderbolt 3 connectivity

- Pro Display XDR connects seamlessly to Mac with one Thunderbolt 3 cable. Connect up to six with certain configurations of Mac Pro.

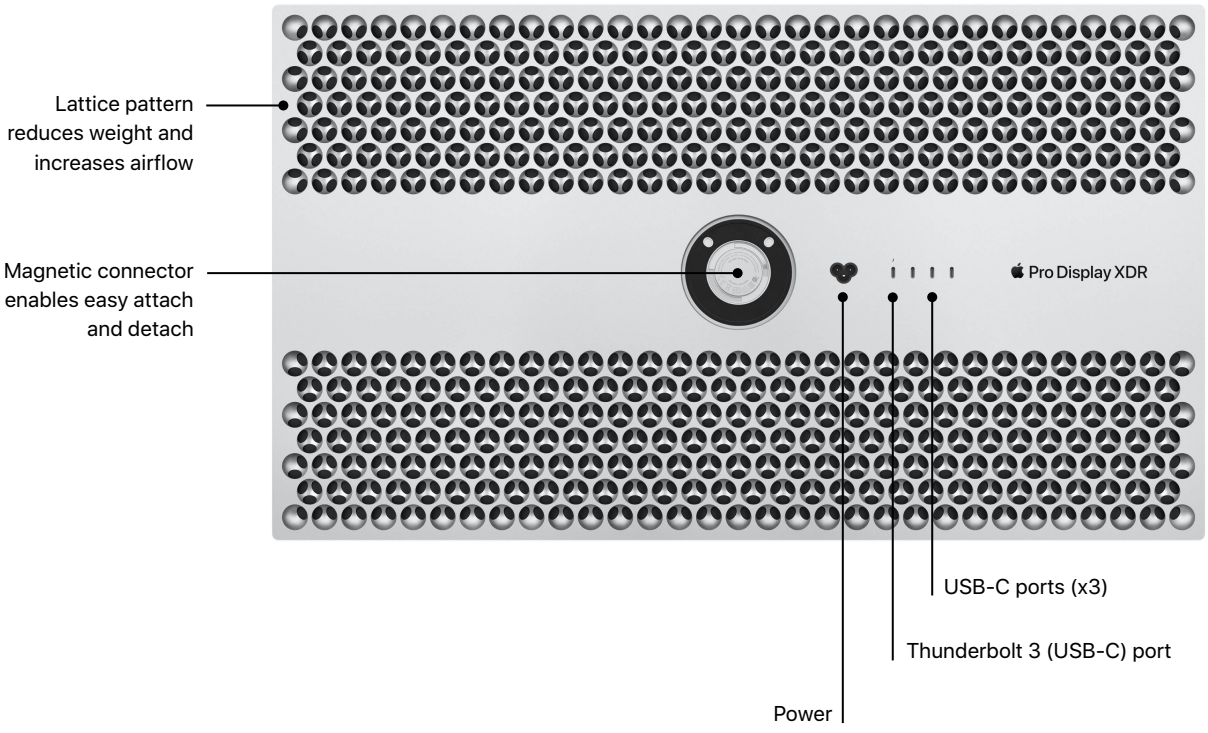
Nano-texture glass option

- Standard glass with anti-reflective coating provides extremely low reflectivity. For less controlled lighting conditions, an incredibly innovative nano-texture glass option scatters light while maintaining color and contrast.

Stunning, professional design

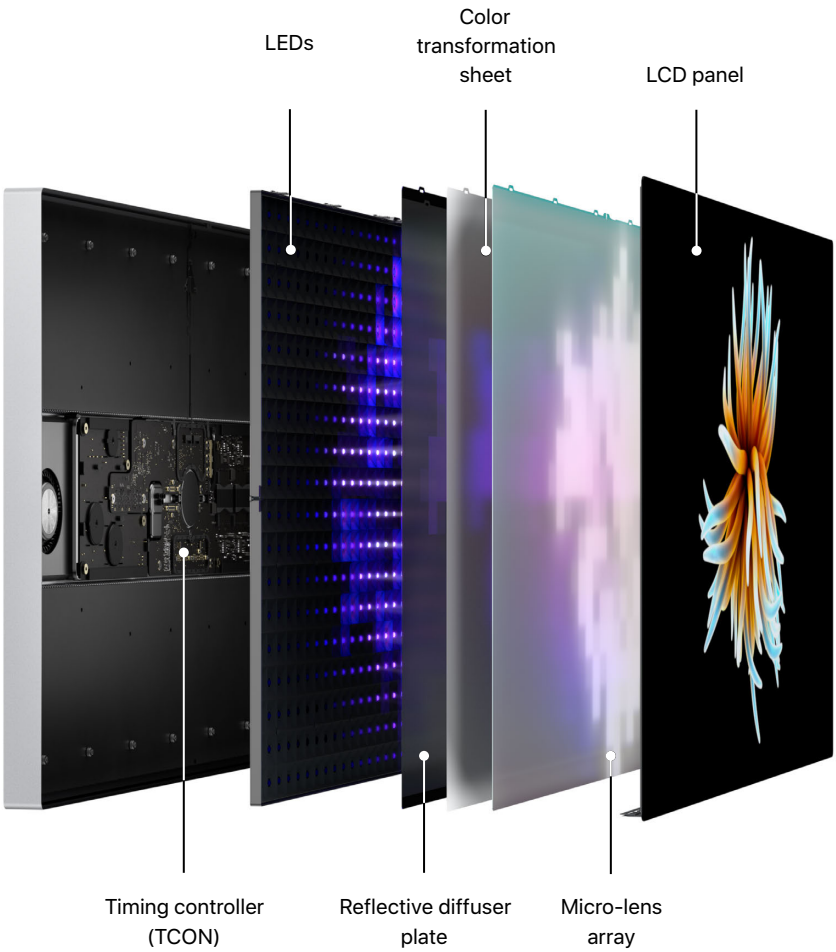
- Pro Display XDR has a stunning design, with every element built for pros and featuring the same gorgeous and functional lattice pattern as the new Mac Pro.


1-inch thin aluminum enclosure
32-inch Retina display with superwide viewing angle
9 mm thin bezel around the entire display


Lattice pattern reduces weight and increases airflow
Magnetic connector enables easy attach and detach
Pro Display XDR
USB-C ports (x3)
Thunderbolt 3 (USB-C) port
Power

Display Panel

The display panel on Pro Display XDR is comprised of many Apple-designed components that are tightly integrated to produce incredible image fidelity. An LED backlighting system with local dimming provides a 1,000,000:1 contrast ratio and up to 1600 nits peak brightness. The Retina 6K LCD panel powers over 20 million pixels in true 10-bit color for stunning color accuracy. The entire panel is managed by a custom timing controller, seamlessly synchronizing pixel switching and LED modulation. An industry-leading polarizer provides extremely accurate off-axis viewing and is paired with either a standard or nano-texture cover glass for minimal reflectivity.



LED Backlighting System

Pro Display XDR uses an Apple-designed 2D backlighting system that was chosen over competing display technologies, such as OLED, for its better uniformity, sustained thermal and brightness performance, off-axis viewing characteristics, and resistance to permanent burn-in.

In contrast to more common edge-lit LED technology that diffuses light evenly across the display at the same brightness level, Pro Display XDR uses a locally dimmed backlight comprised of 576 individually controlled LEDs. This technology enables exhibiting incredibly bright image areas and deep blacks simultaneously, delivering a stunning 1,000,000:1 contrast ratio. The locally dimmed backlighting system also enables thin, symmetrical borders around the display, without the need to place LEDs along the edge.

The maximum brightness of Pro Display XDR is dependent on the displayed image. The display can support 1000 nits for any image and can sustain this brightness indefinitely in environments up to 25° C (77° F). It can also support 1600 nits for highlights in up to 39 percent of the screen area, when the rest of that image is black or at brightness up to 500 nits. This is referred to as Extreme Dynamic Range (XDR) because it far outperforms typical HDR specifications for desktop displays.

The Apple-designed 2D backlighting system also improves upon the trade-offs of typical local dimming systems. The extreme brightness of the LEDs can cause light leakage—or "blooming"—when LED zones are larger than the pixel size of an image's small features or details.

Pro Display XDR introduces several innovations related to light shaping that reduce negative effects such as blooming, while maintaining image fidelity and extreme brightness and contrast:

1. Blue LEDs are used due to their simple light profile and narrow peak range of spectrum.
2. Each blue LED contains an internal reflective layer that directs light. A highly customized lens with a gel-like material (referred to as a batwing lens because of its shape) further bends the light from the LED.
3. An Apple-designed cavity reflector made of plastic film is layered on top of the LED system. It is geometrically optimized to precisely direct light upwards, while reducing light spreading and preserving light uniformity.
4. To improve uniformity, a reflective film on the rear of the diffuser plate reflects light back into the cavity, resulting in even more uniformity than a typical diffuser plate implementation.
5. A color transformation sheet with hundreds of layers precisely controls the wavelength spectrum that passes through, converting blue light from the LEDs into white light.
6. Finally, a light homogenizer uses a micro-lens array to provide color and brightness uniformity around the edges of the backlighting system.

LCD Panel

Pro Display XDR has a 32-inch LCD panel with a 6K resolution of 6016 by 3384 pixels and density of 218 pixels per inch for a total of 20.4 million pixels. The 6K resolution is much higher than most reference displays on the market, and has 116 percent more screen real estate for tools and UI than a 4K display, while maintaining the ability to show 4K content pixel for pixel.

Supporting 99 percent of the P3 wide color gamut, Pro Display XDR has a true 10-bit color depth panel. It is capable of displaying over a billion colors at a per-pixel level for more precise color, even with challenging imagery such as sunsets.

Viewing angle is just as important for color accuracy, as off-axis viewing can distort both color and content. This is especially important when multiple people need to view the display because not everyone can stand on-axis at the same time. Pro Display XDR uses an industry-leading compensation polarizer on the LCD panel that is optimized at the molecular level to improve off-axis viewing. The result is a 25x reduction in off-axis light leakage compared to a typical LCD display, minimizing blooming while maintaining a more accurate image.

Screen real estate on Pro Display XDR

Timing Controller (TCON)

Timing controllers are generally used to control the timing and display of the pixels on an LCD panel. On Pro Display XDR, an Apple-designed TCON controls the LED and LCD layers of the display separately, treating them as two distinct displays with custom algorithms to seamlessly synchronize them into the final image. It also stores the individual light characteristics from the factory calibration data for each of the 576 LEDs.

Local dimming is controlled at over 10 times the display's default refresh rate to ensure seamless synchronization between LCD pixel switching and LED modulation. The TCON constantly monitors the brightness histogram to understand the blooming potential of the content on the display, and makes lighting adjustments to minimize bloom. The TCON also detects certain patterns that may be difficult for the LCD panel to display, and optimizes the display at the pixel level to minimize artifacts.

Native Refresh Rates

For professional workflows such as video editing, Pro Display XDR can set refresh rates to match the frame rate of a video for editing or viewing. Available refresh rates include 60Hz, 59.94Hz, 50Hz, 48Hz, and 47.95Hz. For information on changing refresh rates, please see the Apple Support article, Change the refresh rate on your Apple Pro Display XDR.

Cover Glass

Light scattering on nano-texture cover glass

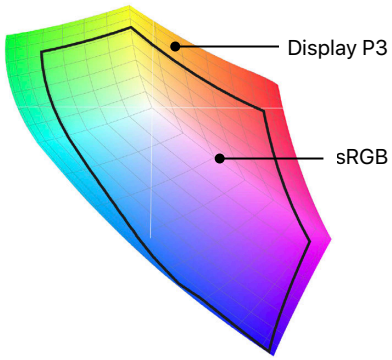
The standard cover glass on Pro Display XDR has an on-axis reflection of 1.65 percent due to a custom anti-reflective coating that reduces glare by 3x.

A nano-texture version of the cover glass is also available for professionals who have to work in less controlled lighting environments and prefer a display with further reduced glare. The textured surface is produced via an etching process to create nanostructures on the glass. The result is an innovative matte finish that effectively scatters light reflections for less perceived glare, while minimizing impact to sharpness, color, and contrast. For information on cleaning your Pro Display XDR, please see the Apple Support article, How to clean your Apple Pro Display XDR.

Reference Display Technologies

When all advantages and limitations are considered, 2D backlighting is a superior desktop display technology compared to others such as OLED or Dual Cell LCD. OLED displays can produce high nit range content on a small portion of the display but only for a short time before overheating, in addition to the risk of burn-in. Dual Cell LCD displays use two layered LCD panels, which are effective for high contrast but require more power to operate and have poor off-axis viewing due to a parallax effect created by the layered panels.

Display Characteristics



Display P3 and sRGB color spaces

Display Accuracy

Every Pro Display XDR undergoes a state-of-the-art factory display calibration process on the assembly line to ensure accuracy of individual backlight LEDs and tight calibration control relative to key industry specifications. This process ensures Pro Display XDR has extremely close consistency between units, enabling workflows that require reference displays across multiple parts of the content creation process.

The calibrated LCD panel in Pro Display XDR targets the P3 wide color primaries. The color gamut afforded by the P3 primaries is larger than sRGB, offering richer and more saturated colors, especially with certain reds, yellows, and greens.

In addition, the factory calibration process enables Pro Display XDR to accurately reproduce a variety of color spaces used by media today, including BT.709, BT. 601, and even sRGB. In color-managed pro applications, Pro Display XDR can work with content encoded in BT.2020—the color space for Ultra HD content. The display will accurately reproduce colors within its native P3 gamut, while allowing BT.2020 color data to be preserved throughout the workflow.

Pro Display XDR is a true 10-bit display. Bit depth refers to the number of colors that can be displayed per pixel. For example, an 8-bit display can produce 256 colors per channel (RGB) for a total of 16.7 million color combinations per pixel. A 10-bit display is capable of 1024 colors per channel—over 1 billion color combinations per pixel—which is 64 times the amount of colors of 8-bit. This especially impacts images that have subtle gradients such as sunsets.

Workspace Considerations for Pro Display XDR

Pro Display XDR is designed to work in many environments, from an office desk to an on-set film production to a lighting-controlled color grading suite. The Pro Stand and VESA mount options—along with the relatively light weight of the display—make Pro Display XDR flexible enough to fit into any workspace.

Using the included Apple Thunderbolt 3 Pro Cable, connect one end to the Thunderbolt 3 (USB-C) port on the back of Pro Display XDR and the other end to your Mac. Make sure the cable is connected directly to a Thunderbolt 3 port on your Mac, not daisy-chained through another Thunderbolt device or hub. This ensures that the display receives the bandwidth to support its advanced capabilities.

The default mode for Pro Display XDR is designed for general use in home and office settings, as well as in other environments with variable lighting conditions. When used with macOS Catalina, the dual ambient light sensors (ALS) gauge the brightness and color of the lighting near the display. This information is used to automatically adjust the backlight brightness, content black level, and white point (if True Tone is enabled) to optimize the viewing experience. Note that direct light sources in close proximity to the rear of the display are not recommended as they may inadvertently alter the viewing experience.

While the default mode is appropriate for many uses, Pro Display XDR is designed to support professional content creation workflows for several types of media. Many media types rely on industry-driven specifications or standards that describe optimal display requirements and viewing conditions. Pro Display XDR provides reference modes that tailor the display's characteristics to match these requirements for a more accurate and consistent workflow.

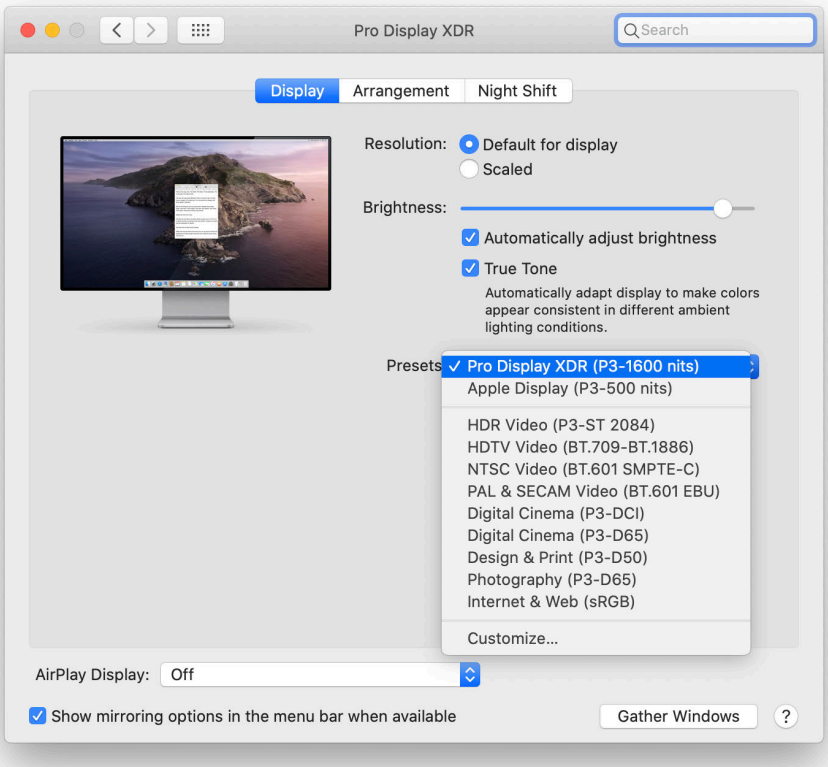
Reference Modes

When performing color-critical content work on Pro Display XDR, it is recommended that you use the reference mode associated with your media type to achieve more exacting results. When a reference mode is selected, the display relies on its sophisticated calibration algorithm to appropriately adjust its color primaries, white point, transfer function (gamma), and luminance.

It is important to follow industry specifications for the viewing environment associated with each media type, as several reference modes are designed to work only in those specified conditions.

Switching between reference modes takes only a few seconds, and can be managed by navigating to Displays preferences on macOS. If you need to frequently switch between several modes, you can set specific modes to be easily accessible from the Displays menu on the right side of the menu bar.

Although Pro Display XDR can sustain 1000 nits of brightness across the entire screen indefinitely in environments up to 25° C (77° F), nit ranges higher than 1000 or environments warmer than 25° C may have an impact on sustained brightness. A Reference Status Indicator in the menu bar will indicate when the display is unable to sustain the desired brightness required by the image content in the currently selected reference mode.



Built-in Reference Modes

Pro Display XDR (P3-1600 nits)

Configures the display for general use in office and home environments. This mode is based on the wide color P3 primaries used by Apple displays and includes Extreme Dynamic Range (XDR) support up to 1600 nits (peak).

Color Primaries	P3 (wide color)
White Point	≈D65[2]
Transfer Functions	SDR: Gamma 2.20 (power-law curve) HDR: Perceptual Quantizer (PQ)
Peak HDR Luminance	1600 nits peak with 39% screen coverage (XDR)
Peak SDR Luminance	Up to 500 nits, based on brightness control
Brightness Control	User selectable, up to 500 nits
Automatic Adjustments	HDR tone mapping, screen brightness and black level, white point (True Tone) are automatically adjusted for ambient lighting conditions in macOS. Automatic brightness adjustment and True Tone can be disabled in Displays preferences.

Apple Display (P3-500 nits)

Configures the display for general use in office and home environments. This mode is based on the wide color P3 primaries and supports a brightness range of up to 500 nits similar to Apple built-in displays. It can be used to evaluate content intended for viewing on Apple products without XDR capabilities.

Color Primaries	P3 (wide color)
White Point	≈D65[2]
Transfer Function	Gamma 2.20 (power-law curve)
Peak HDR Luminance	500 nits
Peak SDR Luminance	Up to 500 nits, based on brightness control
Brightness Control	User selectable, up to 500 nits
Automatic Adjustments	HDR tone mapping, screen brightness and black level, white point (True Tone) are automatically adjusted for ambient lighting conditions in macOS. Automatic brightness adjustment and True Tone can be disabled in Displays preferences.

HDR Video (P3-ST 2084)
Configures the display for reference use in 4K or ultra high-definition video production workflows up to 1000 nits (full screen sustained) using the wide color P3 primaries and the high dynamic range SMPTE ST-2084 EOTF. This mode is for a controlled viewing environment set up per ITU-R BT.2100.

Color Primaries	P3 (wide color)
White Point	D65
Transfer Functions	SDR: Gamma 2.20 (power-law curve) HDR: Perceptual Quantizer (PQ)
Peak HDR Luminance	1000 nits (full screen)
Peak SDR Luminance	100 nits
Brightness Control	Fixed at 100 nits
Automatic Adjustments	None, all controls are fixed for use in controlled viewing conditions (16 lux)

HDTV Video (BT.709-BT.1886)
Configures the display for use in high-definition video production workflows targeting the ITU-R BT.709 and BT.1886 recommendations. This mode is for a controlled viewing environment set up per ITU-R BT.2035.

Color Primaries	Rec.709
White Point	D65
Transfer Function	BT.1886
Peak SDR Luminance	100 nits
Brightness Control	Fixed at 100 nits
Automatic Adjustments	None, all controls are fixed for use in controlled viewing conditions (10 lux)

NTSC Video (BT.601 SMPTE-C)
Configures the display for use in standard definition or archival video production workflows targeting the ITU-R BT.601 recommendation and SMPTE-C color primaries. This mode is for a controlled viewing environment set up per ITU-R.2035.

Color Primaries	SMPTE-C
White Point	D65
Transfer Function	BT.1886
Peak SDR Luminance	100 nits
Brightness Control	Fixed at 100 nits
Automatic Adjustments	None, all controls are fixed for use in controlled viewing conditions (10 lux)

PAL & SECAM Video (BT.601 EBU)
Configures the display for use in standard definition or archival video production workflows targeting the ITU-R BT.601 recommendation and EBU Tech 3213 color primaries. This mode is for a controlled viewing environment set up per ITU-R BT.2035.

Color Primaries	EBU
White Point	D65
Transfer Function	BT.1886
Peak SDR Luminance	100 nits
Brightness Control	Fixed at 100 nits
Automatic Adjustments	None, all controls are fixed for use in controlled viewing conditions (10 lux)

Digital Cinema (P3-DCI)
Configures the display for use in motion picture and post-production workflows using the P3 theatrical color space and digital cinema white point. This mode is for a controlled viewing environment set up per SMPTE RP 431-2:2011.

Color Primaries	P3 (wide color)
White Point	DCI
Transfer Function	Gamma 2.60 (power-law curve)
Peak SDR Luminance	48 nits
Brightness Control	Fixed at 48 nits
Automatic Adjustments	None, all controls are fixed for use in controlled viewing conditions (0.03 lux)

Digital Cinema (P3-D65)
Configures the display for use in motion picture and post-production workflows using the P3 theatrical color space with the D65 white point. This mode is for a controlled viewing environment set up per SMPTE RP 431-2:2011.

Color Primaries	P3 (wide color)
White Point	D65
Transfer Function	Gamma 2.60 (power-law curve)
Peak SDR Luminance	48 nits
Brightness Control	Fixed at 48 nits
Automatic Adjustments	None, all controls are fixed for use in controlled viewing conditions (0.03 lux)

Design & Print (P3-D50)

Configures the display for use in graphic design, printing, and publishing workflows. It includes wide color P3 primaries for a wider color gamut than a typical sRGB display. Instead of D65, it uses the D50 white point typically used to evaluate the color of printed output per the ISO 3664:2009 and ISO 12646:2015 specifications.

Color Primaries	P3 (wide color)
White Point	D50
Transfer Function	Gamma 2.20 (power-law curve)
Peak SDR Luminance	160 nits
Brightness Control	Fixed at 160 nits
Automatic Adjustments	None, all controls are fixed for use in controlled viewing conditions (32 lux)

Photography (P3-D65)

Configures the display for use in typical digital photography workflows. It includes wide color P3 primaries with the D65 white point typically used for screen-based viewing of photographic content. It is for appropriately set up and controlled viewing environments.

Color Primaries	P3 (wide color)
White Point	D65
Transfer Function	Gamma 2.20 (power-law curve)
Peak SDR Luminance	160 nits
Brightness Control	Fixed at 160 nits
Automatic Adjustments	None, all controls are fixed for use in controlled viewing conditions (64 lux)

Internet & Web (sRGB)

Configures the display for use in content creation workflows targeting the web or other internet-based usages. This mode uses the broadly supported sRGB (IEC 61966-2-1:1999) color space per the W3C CSS Color Module Level 3 recommendation. It is for appropriately set up and controlled viewing environments.

Color Primaries	sRGB
White Point	D65
Transfer Function	sRGB ICC V2
Peak SDR Luminance	80 nits
Brightness Control	Fixed at 80 nits
Automatic Adjustments	None, all controls are fixed for use in controlled viewing conditions (64 lux)

Pro Display XDR and macOS

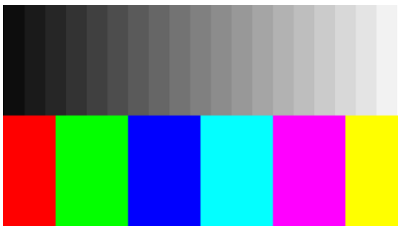
Pro Display XDR has several characteristics that set it apart from traditional reference monitors. Note: Pro Display XDR requires macOS Catalina 10.15.2 or later when used with a Mac.

Typical reference monitors can be used with only one type of media at a time. If they are configured to work with HDR media, standard dynamic range media may appear incorrect onscreen. Pro Display XDR works with the color management capabilities of macOS Catalina to enable you to work simultaneously with different media types more effectively.

macOS Catalina plays a key role in the playback and display of HDR media on Pro Display XDR. When displaying HDR content in Pro Display XDR (P3-1600 nits) or HDR Video (P3-ST 2084) reference modes, the display-referred PQ transfer function is used to accurately communicate luminance. Content that exceeds the brightness capabilities of the active reference mode will be either clipped or tone mapped by the media frameworks built into the operating system. For example, in the HDR Video (P3-ST 2084) reference mode, any content that exceeds 1000 nits brightness is clipped by media frameworks built into macOS. With Pro Display XDR (P3-1600 nits) and other modes, tone mapping is automatically applied. See Built-in Reference Modes section for more details. Lastly, the media frameworks also process Dolby Vision dynamic metadata and map Hybrid Log-Gamma (HLG) into the PQ transfer function during playback.

Importance of Color-Tagged Media
The built-in color management in macOS relies on color tagging to understand the authoring intent of images and video files. This also extends to identifying high dynamic range media. For detailed information on the tags required to properly signal HDR, see High Dynamic Range Metadata for Apple Devices.

Some third-party apps use their own internal color management or tone mapping systems rather than those provided by macOS. These apps may need to be updated to take advantage of Pro Display XDR features. Check with the developers of the apps used in your workflow to determine compatibility. If you develop your own custom workflow solutions, refer to the following developer support documents: Implementing Tone Mapping on Reference Displays and Displaying HDR Content in a Metal Layer.



SDR and HDR Test Patterns
To assist in evaluating calibration on Pro Display XDR, Apple provides a set of QuickTime Movie Test Pattern Files that include appropriately color-tagged and calibrated SDR and HDR references that can be measured with your in-house spectroradiometer. The test pattern files can be found in the related resources area of the AVFoundation Developer page.

Customized Reference Modes and In-Field Recalibration

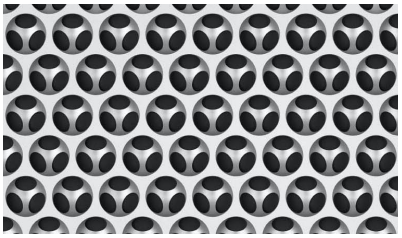
While Pro Display XDR ships with a variety of reference modes for common media types, you may have differing needs for your workflow. There are two upcoming features for Pro Display XDR related to customizing your display.

In an upcoming version of macOS, you will be able to create customized Pro Display XDR reference modes by selecting from several color gamut, white point, and transfer function options.[3] These customized reference modes can be saved into the display for easy deployment across your facility.

Many professional workflows also incorporate display recalibration into the production process to validate screen-to-screen accuracy and consistency over time. Support for performing in-field recalibration of Pro Display XDR will also be available in an upcoming version of macOS.[3] Note: Due to the wide color primaries and peak brightness capabilities of Pro Display XDR, use of a spectroradiometer—such as from Photo Research or Colorimetry Research—is recommended for calibration. Other calibration devices, such as colorimeters, may not have the necessary precision to calibrate Pro Display XDR.

Enclosure

Enclosure Design



Lattice Design
The lattice pattern on the rear of Pro Display XDR is machined into the aluminum and more than doubles the surface area exposed to air for more efficient cooling.

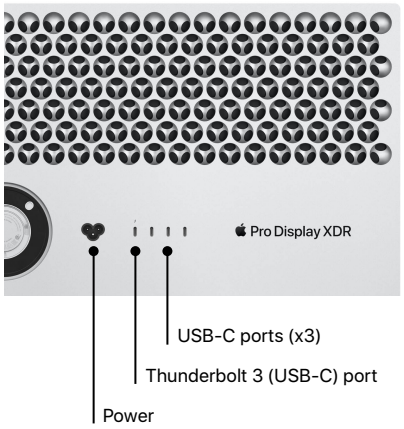
The enclosure on Pro Display XDR is designed to quietly and efficiently cool the system, and plays a critical role in enabling the display to sustain an extreme level of brightness indefinitely. The lattice pattern machined into the aluminum has many advantages. It more than doubles the surface area exposed to air, facilitating additional airflow and acting as a heat sink. Inlet and exhaust vents work through this pattern to draw in cool air and eject hot air away from the system, limiting the potential for hot air to be reingested.

In most usage scenarios, the fans are inaudible from user position, operating at up to 16 dBA in typical room conditions. In contrast, most reference displays operate at much higher decibel levels, up to 40 dBA in some models.

Pro Display XDR is also designed for portability, weighing just 16.49 pounds.[4] It is designed for convenient transport, whether from home to office or from set to studio. This is a fraction of the weight of typical reference monitors.

Reference displays are also power hungry, requiring extremely high wattage to run. Pro Display XDR is the first reference-quality display to qualify as Energy Star compliant at just 140W,[5] making it one of the most energy-efficient models available.

Connections and Compatibility



Pro Display XDR has four ports on the back for seamless connectivity. One upstream port connects to Mac Pro or other compatible Thunderbolt 3 host and provides 96W for host charging. Three USB-C ports provide USB 2 for connecting and charging peripheral devices.

At launch, Pro Display XDR is compatible with the following devices at native 6K resolution:

- 2019 Mac Pro with Apple GPU module
- 2019 16-inch MacBook Pro
- 2018 and later 15-inch MacBook Pro
- 2019 21.5-inch and 27-inch iMac
- Mac computers with Thunderbolt 3 ports connected to Blackmagic eGPU or Blackmagic eGPU Pro

Pro Display XDR requires a GPU capable of supporting DisplayPort 1.4 with Display Stream Compression (DSC) and Forward Error Correction (FEC), or a GPU supporting DisplayPort 1.4 with HBR3 link rate and Thunderbolt Titan Ridge for native 6K resolution. If multiple displays are being used with the same Mac, each display can be configured independently for settings such as reference modes and orientation. For more information on supported devices, please visit Set up and use Apple Pro Display XDR.

Teranex Mini SDI to DisplayPort 8K HDR box by Blackmagic Design

You can connect Pro Display XDR to a Windows or Linux PC equipped with a GPU that supports DisplayPort over Thunderbolt or DisplayPort Alt-mode over USB-C. The host will use Pro Display XDR VESA Extended Display Information Data (EDID) to discover the display capabilities and choose from the available resolution and display mode options. For compatibility purposes, some reference modes will offer a BT.2020 capability to the host, but the color space of the display will be limited to P3. For information on operating Pro Display XDR with Windows 10, please visit the Apple Support article, How to use Pro Display XDR with Boot Camp.

With an SDI convertor box such as Teranex Mini SDI to DisplayPort 8K HDR by Blackmagic Design, Pro Display XDR can be hooked up directly to a camera or other SDI source without a computer. The SDI convertor box can also change reference modes, provide scopes and overlays, and apply a LUT (lookup table).

Mounting the Display

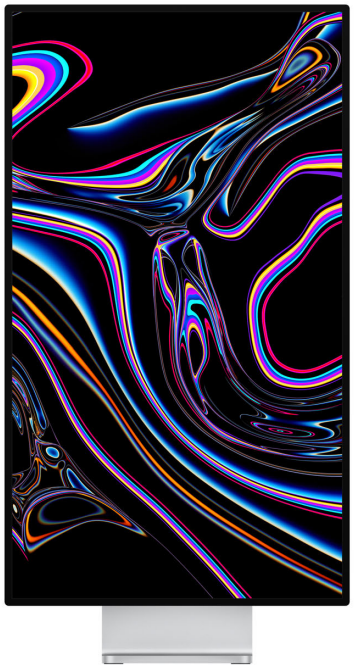
Pro Stand Design
The arm on the innovative Pro Stand is designed to make Pro Display XDR feel weightless.

Pro Display XDR can be mounted with either Pro Stand or a VESA Mount Adapter (sold separately). Pro Stand makes every adjustment of your display feel seamless, with –5° to +25° precision tilting and 120 mm of height adjustment to adapt to any viewing condition. The stand's leg is made by one of the largest extrusion presses in the world for an aluminum design that's formed at near-final shape.

With Pro Stand, the display even rotates from landscape to portrait, and automatically rotates content to match orientation in macOS by leveraging the built-in accelerometer. So the display feels weightless, effortlessly moves where you want it, then stays put.

The magnetic connector on Pro Stand makes it easy to attach and detach from its polar-opposite magnet on the back of Pro Display XDR. These magnets guide the connection, while latches automatically engage and securely lock the stand to the display. Detaching it is as simple as lifting the display to its top position and unlocking the slider. And for pros who have unique mounting setups for their displays, an optional VESA Mount Adapter attaches to the display in a matter of seconds for quick and easy mounting. For more details, see Attach Pro Display XDR to VESA Mount Adapter.

Technical Support



Portrait mode

Repair service for Pro Display XDR is provided through AppleCare. Additional coverage is available through AppleCare+. AppleCare+ for Apple Display provides three years of global repair coverage, both parts and labor, and it includes up to two incidents of accidental damage. In addition to bringing in your device for service, you can also schedule an onsite service appointment in many countries where Apple certified technicians will come to your location.[6] For additional information on AppleCare coverage, please visit the AppleCare+ for Apple Display page.

Technical Specifications

Display

Retina 6K Display

32-inch (diagonal) IPS LCD display with oxide TFT technology

Resolution: 6016 by 3384 pixels (20.4 million pixels) at 218 pixels per inch (ppi)

Aspect ratio: 16:9

XDR (Extreme Dynamic Range)

Brightness: 1000 nits sustained (full screen), 1600 nits peak[1]

Contrast ratio: 1,000,000:1

Color: P3 wide color gamut, 10-bit depth for 1.073 billion colors

SDR brightness: 500 nits

Viewing angle: Superwide angle with high-fidelity color and contrast at 89º left, 89º right, 89º up, 89º down

Fully laminated; 1.65% reflectivity (typical)

Technology

2D backlighting system using 576 full array local dimming zones

Apple-designed timing controller (TCON) chip engineered to precisely control high-speed modulation of both 20.4 million LCD pixels and 576 LEDs in backlight for seamless synchronization

True Tone technology with dual ambient light sensor (ALS) design to ensure an accurate viewing experience in any ambient lighting condition

Refresh Rates

47.95Hz 48.00Hz 50.00Hz
59.94Hz 60.00Hz

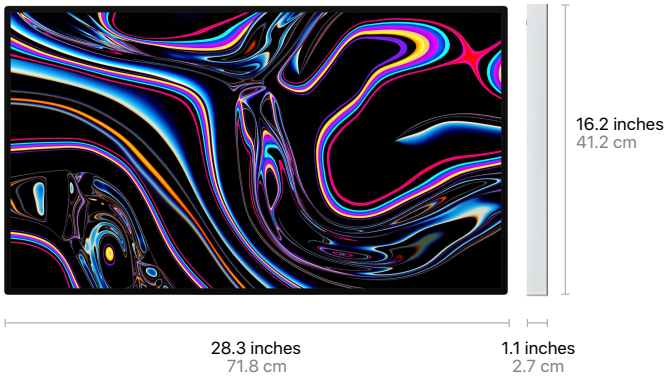
Reference Modes

Available reference modes:

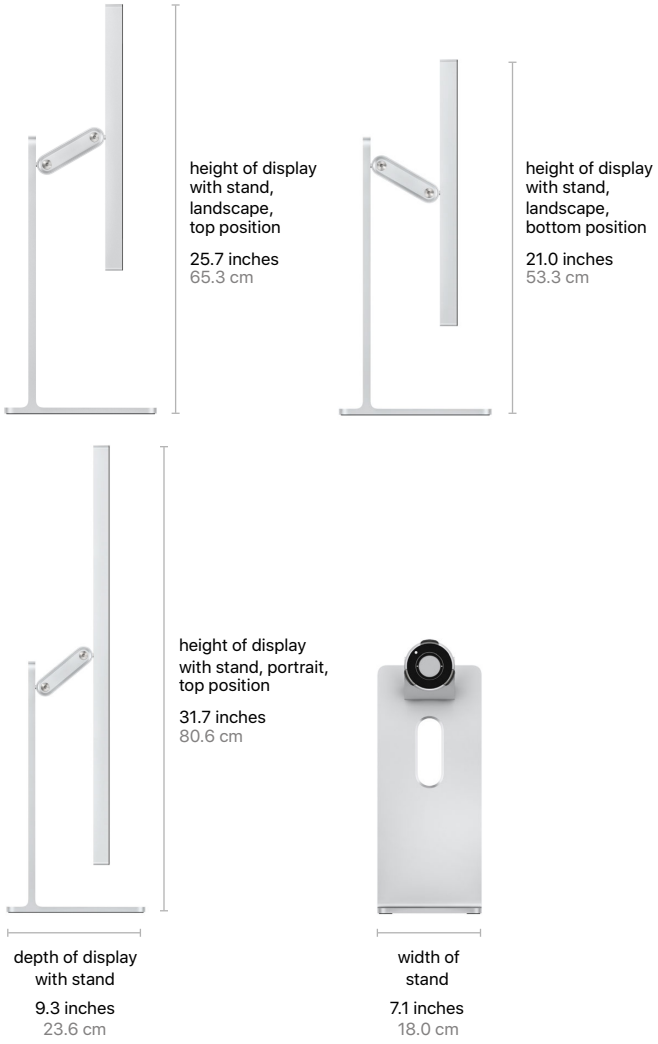
Pro Display XDR (P3-1600 nits)
HDR Video (P3-ST 2084)
NTSC Video (BT.601 SMPTE-C)
Digital Cinema (P3-DCI)
Design & Print (P3-D50)
Internet & Web (sRGB)
Apple Display (P3-500 nits)
HDTV Video (BT.709-BT.1886)
PAL & SECAM Video (BT.601 EBU)
Digital Cinema (P3-D65)
Photography (P3-D65)

Size and Weight

Width: 28.3 inches (71.8 cm)
Depth: 1.1 inches (2.7 cm)
Height: 16.2 inches (41.2 cm)
Weight: 16.49 pounds (7.48 kg)[4]



Pro Stand



Height adjustment: the system allows for a total height adjustment of 120 mm (60 mm in each direction from the midpoint)

Orientation: landscape or portrait

Tilt: –5° to +25°

Display with stand size and weight

Depth (tilt 25°): 10.9 inches (27.8 cm)
Weight: 25.99 pounds (11.78 kg)[4]

Landscape orientation

Width: 28.3 inches (71.8 cm)
Height in top position: 25.7 inches (65.3 cm)
Height in bottom position: 21.0 inches (53.3 cm)

Portrait orientation

Width: 16.2 inches (41.2 cm)
Height in top position: 31.7 inches (80.6 cm)

Stand size and weight

Width: 7.1 inches (18.0 cm)
Depth: 9.3 inches (23.6 cm)
Weight: 9.5 pounds (4.3 kg)[4]
Height (arm 0°, tilt 0°): 17.0 inches (43.3 cm)
Height (arm 45°, tilt 25°): 19.6 inches (49.7 cm)

Attach and detach

Effortlessly attaches and detaches for quick and easy transportation. The puck-shaped magnetic connector is designed to attach to the back of the display and locks Pro Stand and the display together. To detach, simply unlock the slider and tilt the display far back to release the magnets, then lift the display off Pro Stand.

VESA Mount Adapter

Size and weight

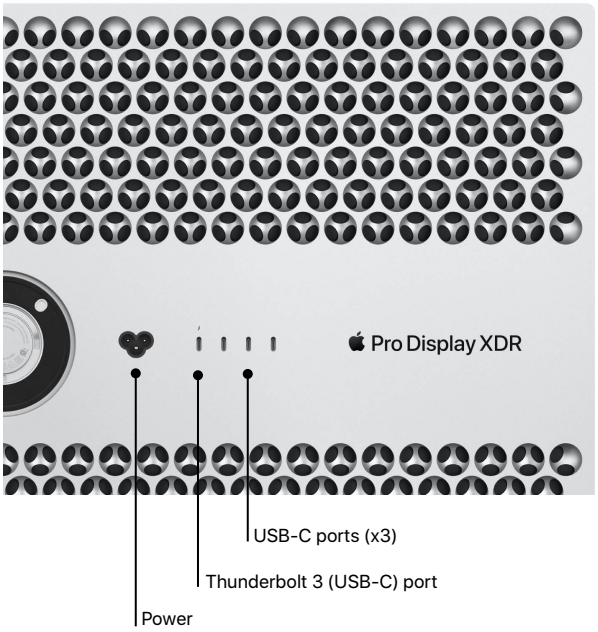
Width: 4.7 inches (11.9 cm)
Height: 4.7 inches (11.9 cm)
Depth: 0.72 inch (1.83 cm)
Weight: 0.62 pound (0.28 kg)[4]

Attach

Easy-to-attach alternative to Pro Stand. With a similar design to the magnetic connector on Pro Stand, it can be placed and secured quickly and easily using the included Apple-designed tool.

Compatible with 100 x 100 mm VESA stand or mount.

Connections



One Thunderbolt 3 (USB-C) port, three USB-C ports

One upstream port for Mac Pro or other Thunderbolt 3 host (96W host charging)

Three USB-C (USB 2) ports for charging or syncing[7]

Electrical and Operating Requirements

Line voltage: 100–240V AC

Frequency: 50Hz to 60Hz, single phase

Operating temperature: 50° to 95° F (10° to 35° C)

Relative humidity: 5% to 95% noncondensing

Maximum altitude: tested up to 16,400 feet (5000 meters)

For More Information

For more information about Pro Display XDR, Mac Pro, macOS Catalina, and other Apple products, visit apple.com/mac.

[1]In temperatures less than 25° C. [2]In this reference mode, Pro Display XDR uses a slight variation of D65 to best match a visually perceived D65 white point. [3]All unreleased features are subject to change. [4]Weight varies by configuration and manufacturing process. [5]Maximum power with host and accessory charging in use is rated at 290W. [6]Not available in all countries. Please refer to your country's AppleCare product website for specific information about rights provided by consumer law, AppleCare+ service fees, terms and conditions, and product purchase information. [7]For the 16-inch MacBook Pro, USB-C ports have USB 3.1 Gen 1 data transfer speeds.