

Technologies Explained – EOS-1D X

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Canon full frame CMOS sensor

Designed by Canon and working in combination with Canon's DIGIC processing technology, the 35mm full-frame CMOS sensor created for the EOS-1D X features a range of technical improvements to achieve the highest level of performance in this class of camera.

Signal conversion in Canon's CMOS sensors is handled by individual amplifiers at each pixel site. Unnecessary charge transfer operations are avoided, vastly speeding up the process of getting the signal to the image processor. Noise generation is reduced, power consumption is limited, and the ability to provide faster frame rates is made possible.

The manufacturing process of the CMOS semiconductor has been refined, with a new photodiode construction for improved sensitivity and, for the first time, gapless microlenses are used on a Canon full frame sensor, offering improved light-gathering capabilities to permit higher ISO settings.

Canon's CMOS technology integrates advanced noise reduction circuitry at each pixel site, delivering virtually noise-free images and a wide default ISO speed range of 100 – 51200 (expandable from 50 to 204800). A new high-speed 16-channel read-out combines with the dual "DIGIC 5+" image processors to support high speed shooting of up to 14fps. New circuitry also optimises power efficiency, ensuring the EOS-1D X offers similar power consumption to the EOS-1D Mark IV despite higher shooting speeds and the introduction of a full-frame 18.1MP sensor.

DIGIC 5+

Image information is processed by Canon's Dual "DIGIC 5+" processors, purpose-built to complement the camera's 18.1 MP full-frame CMOS sensor. The dual "DIGIC 5+" processors enable the EOS-1D X to achieve ultra-fast shooting speeds of up to 14fps at full resolution, capturing maximum detail, accurate colours and low noise even in low-light conditions.

The DIGIC 5+ processor working in tandem with the CMOS sensor, allows users of the EOS-1D X to shoot at ISO speeds up to two stops faster than previously possible and achieve the same quality. Multiple exposure shots are also supported and in-camera

correction of lens lateral and axial chromatic aberration is also implemented for every image captured, even when shooting at maximum speed.

The DIGIC processors work with a high speed DDR-SDRAM image buffer – reading, processing, compressing and writing image data fast enough to keep the buffer clear during long continuous shooting bursts.

61 point AF system

The EOS-1D X includes Canon's next generation autofocus (AF) system, offering a more reliable, accurate and faster AF system than ever before. Combining a 61-point AF sensor with the metering sensor, the system collects a host of information regarding the subject, scene and conditions. This data is processed using a new AF algorithm to ensure enhanced precision and improved tracking of moving subjects creating a system that can cope with the varying demands of professional photographers.

The 61-point AF sensor features 41 cross-type points and five dual cross-type points for enhanced accuracy at a maximum wide aperture setting of f/2.8. The EOS-1D X can also detect a subject that is completely out of focus by employing the entire sensor, rather than just a single AF point, ensuring rapid and effective AF control at all times.

Combining with the camera's highly advanced EOS iTR system (intelligent Tracking and Recognition) to detect subject colour and faces, the AF tracking system is also greatly enhanced. Instead of solely using AF information, the camera also uses colour information detected by the new RGB metering sensor to track subjects. The camera remembers the colour of a focused subject, before continuously focus-tracking that subject according to its colour to ensure stable and accurate tracking across the frame. Similarly, the ability to accurately detect faces enables users to focus-track a face that was initially in focus without the risk of the AF point switching should another subject enter the frame. Ideal for sports and action sequences, the accuracy of the EOS-1D X's AF and metering systems enables photographers to concentrate exclusively on composition rather than focusing.

A range of AF presets provide exceptional reliability when shooting traditionally difficult scenes and subjects. Six different "Cases" are designed for a range of differing shooting challenges, and can be customised according to subjects and shooting conditions using a built-in AF Configuration Tool.

The six different "Cases" include:

- **Case 1** – Is a versatile multi-purpose setting: The all-round setting ideal for numerous scenes and subjects.
- **Case 2** – Allows continuous tracking of subjects, ignoring possible obstacles: Designed to continue to focus-track a subject, even when the subject momentarily moves away from the AF points. Ideal for shooting action with subjects that move about the frame, like freestyle skiing, tennis and butterfly swimming.
- **Case 3** – Instantly focus on subjects suddenly entering AF points: This setting enables focusing to adjust immediately when a new subject is detected. It is most effective when you want to shoot different subjects one-after-the-other, such as alpine downhill skiing, or the start of a bicycle road race.
- **Case 4** – For subjects that accelerate or decelerate quickly: Designed for continuous focus-tracking of moving subjects that may change in speed or direction, such as during cornering in motor sports or a football player avoiding a tackle.
- **Case 5** – For erratic subjects moving in any direction: For use only with 61 point automatic selection AF, Zone AF, and AF point expansion modes, this setting is ideal for continuously focus-tracking subjects that may move rapidly up/down or left/right during shooting. The camera continues to track the subject by switching automatically to the nearest AF points. Common shooting situations would include figure skating and air races.
- **Case 6** – For subjects that change speed and move erratically: For use only with 61 point automatic selection AF, Zone AF, and AF point expansion modes. This setting is similar to Case 4 but is employed when using multiple AF points. This setting enables tracking of subject movements by automatically switching the AF points. Ideal for basketball or rhythmic gymnastics.

AI Servo III

AI Servo AF uses a form of Artificial Intelligence (AI) to determine the speed and direction of moving subjects, and then focuses the camera lens to a predicted position (Focus Prediction Function) in order to increase the probability of obtaining a sharp photograph.

As the EOS-1D X now employs an AF microprocessor and an AE DIGIC 4 microcomputer to ensure faster, more accurate processing of the increased amount of data from the

sensors that combine to create the new AF system. The AI Servo AF is even more effective in tracking moving subjects in challenging conditions. In addition, the EOS-1D X UI system has been improved to make it easier to customise the AI Servo AF to cope with the changing demands of professional shoots.

AI Servo III offers a number of improvements over AI Servo II, for even higher precision and more stable control. The predictive AF performance has also been improved by eliciting feedback from professional photographers and enabling parameters such as “tracking sensitivity”, “acceleration/deceleration tracking” and “AF point auto switching” of the AI Servo AF, to be easily adjusted to suit different shooting conditions.

Metering system

The EOS-1D X employs a highly detailed 252-zone metering system, using a 100,000 pixel RGB AE sensor with a dedicated DIGIC 4 processor in the new EOS iSA (Intelligent Subject Analysis) metering system. The metering system can be linked to individual AF points for increased accuracy in spot metering, or used with automatic AF point selection when center spot metering is set.

The RGB sensor is also used for flash metering as well as subject detection, to accurately evaluate colour and detect faces to feed into the metering, flash metering and AF systems. An improved evaluative metering algorithm ensures that colours which can typically lead to over or under-exposure of a scene (for example a predominance of green or yellow) are compensated, to ensure the correct exposure is obtained across the scene. The colour information and face detection information also feed into the E-TTL autoflash algorithm to ensure the correct exposure of a face or main subject.

EOS Movie

The EOS Movie function allows EOS-1D X users to record 1080p HD movies with full manual control and selectable frame rates.

Thanks to the large full-frame CMOS sensor, photographers have greater ability to control depth of field. The exposure of the movie can be controlled in Manual mode, allowing full control of shutter speeds and apertures. It is possible to select frame rates from: 30 (29.97), 25, and 24 (23.976), with 60 (59.94) and 50 available at resolutions of 720p. The combination of sensor and dual “DIGIC 5+” processors also greatly reduces colour fringing and moiré for professional quality footage.

EOS Movie can be activated quickly and easily with a new Live View shooting/Movie shooting button, and a new menu tab has been introduced which is dedicated to movies, allowing settings to be changed quickly and easily mid-shoot.

In an improvement over previous EOS models, the EOS-1D X supports a new intra-frame codec for increased quality and lower compression – ideal for editing in post-production by professional film-makers. Sound recording levels can also be checked and changed during recording on the Quick Control screen.

Picture Styles

Picture Style presets simplify in-camera control over image quality and can be likened to different film types – each one offering a different colour response. Within each selectable preset, photographers have control over sharpness, contrast, colour tone and saturation. The camera's factory default configuration is set to deliver immediately-usable JPEG images without need for additional menu settings. Picture Style presets applied to a RAW image can be revised with Canon's Digital Photo Professional software.

The six presets are:

1. **Standard** – for crisp, vivid images that don't require post-processing
2. **Portrait** – optimises colour tone and saturation and weakens sharpening to achieve attractive skin tones
3. **Landscape** – for punchier greens and blues with stronger sharpening to give a crisp edge to mountain, tree and building outlines
4. **Neutral** – ideal for post-processing
5. **Faithful** – adjusts colour to match the subject colour when shot under a colour temperature of 5200K
6. **Monochrome** – for black and white shooting with a range of filter effects (yellow, orange, red and green) and toning effects (sepia, blue, purple and green)

Picture Style Auto

In addition to the Picture Style presets, the EOS-1D X includes Picture Style Auto, offering precise control over the colours within each scene based on information drawn from the EOS Scene Detection System. Picture Style Auto works not only with normal scenes, but is especially suited for nature scenes such as sunsets.

Auto Lighting Optimizer

The Auto Lighting Optimizer (ALO) automatically corrects the image brightness and contrast for images suffering from underexposure, low contrast, or backlit situations, assisted by face detection technology. With DIGIC 5+'s low-noise image processing and corrective algorithm, the correction is performed without affecting the natural gradation.

The EOS-1D X now incorporates the EOS Scene Detection System to achieve the best balance of brightness and contrast for images taken under different conditions, including sunset and high-saturation scenes. When used with evaluative metering, the Auto Lighting Optimizer ensures the correct exposure of both the subject and background.

Clear View II LCD

The EOS-1D X's 3.2-inch LCD monitor has 1.04 million dots with a viewing angle of 170°. Clear View II has been designed to combat glare by removing the air gap between the LCD's protective cover and the liquid crystal display. The air gap is filled with a photo-elastic material, which suppresses the reflections from the surface of the liquid crystal, caused by the sharp change in refractive index as light travels through the air gap.

Intelligent viewfinder

The intelligent viewfinder of the EOS-1D X offers 100% coverage of the scene and offers a .76x magnification to ensure every detail can be viewed up close. The EOS-1D X is the first EOS to provide AF information and a grid display using a translucent LCD to help improve the viewfinder's utility beyond simply framing a shot.

EOS Integrated Cleaning System

The EOS Integrated Cleaning System combats sensor dust in three important ways: Reduce, Repel and Remove.

1. **Reduce** – Internal camera mechanisms are designed to minimise dust generation. The body cap prevents dust generation through wear on the cap itself.
2. **Repel** – Anti-static technologies, including a special fluorine coating, are applied to the low-pass filter covering the front of the sensor so as not to attract dust. An anti-dust fluorine coating on the front surface of the sensor's protective glass layer also makes it easier to repel stickier or damp dust particles.

3. Remove – Improving on the previous ultrasound-based cleaning system that used hi-frequency vibrations to shake dust from the infrared filter for a period of approximately one second after each start up, the EOS-1D X features a new carrier-wave-based Self-Cleaning Sensor Unit derived from Canon's USM technology. The new system rolls dust particles to the edge of the sensor, and is highly effective in removing even small particles that only become visible when using small apertures such as f/22 or higher.

Canon Dust Delete Data system, which can map the position of visible dust on the sensor. This can then be deleted automatically after the shoot with the latest Digital Photo Professional software.

Software

Digital Photo Professional Software

Digital Photo Professional software provides high speed, high quality processing of lossless RAW images. Processing with Digital Photo Professional allows real-time display and immediate application of image adjustments, giving control over RAW image variables such as white balance, dynamic range, exposure compensation, noise reduction and colour tone – plus the ability to view Auto Focus points on an image. The Lens Aberration correction tool allows precise correction of different types of distortion and chromatic aberration. A new optical enhancement function optimises image quality by maximizing optical performance.

Digital Photo Professional supports sRGB, Adobe RGB, ColorMatch RGB, Apple RGB and Wide Gamut RGB colour spaces. ICC (International Colour Consortium) profiles can be attached to TIFF or JPEG images when converted from RAW. This allows faithful reproduction of colours in software applications that support ICC profiles, such as Adobe Photoshop. For improved efficiency, a set of image adjustments can be saved as a recipe and applied.

EOS Utility

The latest version of EOS Utility provides essential support for Live View remote shooting, camera configuration and image transfers. Tightly integrated with Digital Photo Professional, EOS Utility can be configured to monitor 'hot' folders, automatically renaming and moving incoming images to a structured file system. Users can also tag their images with EXIF data, including copyright information.

Picture Style Editor

Picture Style Editor allows photographers to create individual Picture Styles that meet their personal requirements. Each Picture Style contains detailed information on how specific colours should be represented within an image. Once new Picture Styles have been created, they can be uploaded directly into the camera and applied to JPEG or RAW images. When working with RAW files in DPP, both personal Picture Styles and predetermined Picture Styles can all be adjusted.