Canon

EOS-1D Mark IV

Technology Features

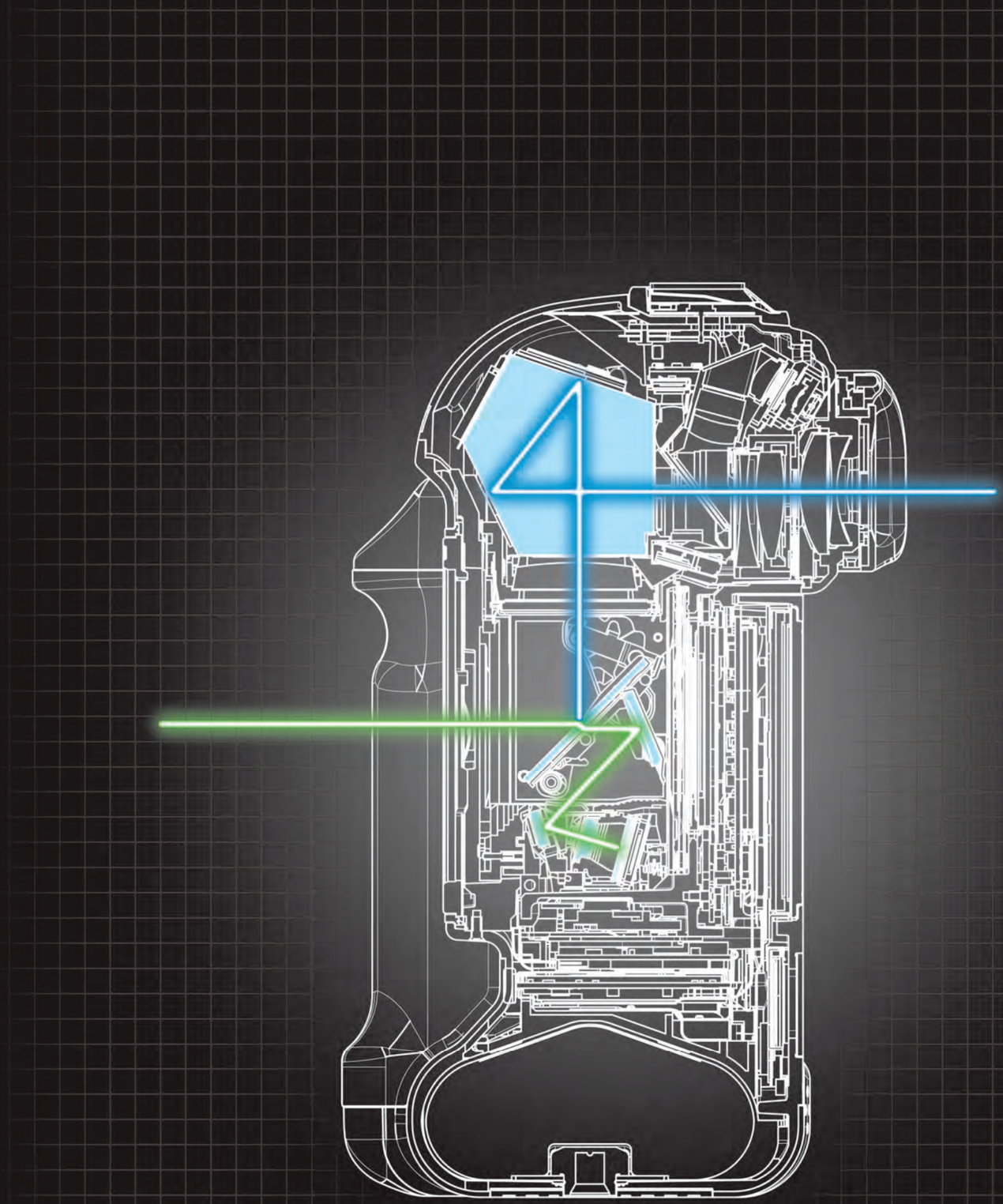
New AF system & Wide ISO Speed Range

The EOS-1D Mark IV, heritage and innovation combined

The EOS-1D Series, launched in 2001, combined exceptional image quality and superb handling. Canon’s goal was to empower photographers to be able to confidently capture decisive moments even in the most challenging shooting conditions. Since its inception, the EOS-1D Series has evolved in performance and functionality without Canon ever wavering from its vision. Every improvement further enhanced the ability of these cameras to capture the decisive moments. As the new flagship of the EOS-1D family, the EOS-1D Mark IV carries on this proud tradition.

The EOS-1D Mark IV is a showcase of Canon’s cutting edge innovation. Through advanced semiconductor, mechanical and material technology, refined manufacturing processes, and even cognitive science, the EOS-1D Mark IV has been designed to surpasses current camera limitations to achieve unprecedented response and performance. In challenging shooting conditions, regardless of shooting style and subject, the EOS-1D Mark IV delivers reliability and precision that allows the photographer the freedom to capture the image no matter what. Incorporating the heritage of its EOS predecessors with latest technological advances, the EOS-1D Mark IV provides professionals with the ability to capture outstanding images with greater confidence than ever before.

More than a new chapter in the continuing story of the evolution of EOS, the EOS-1D Mark IV represents a new beginning, to establish a new foundation for the future of digital cameras. Though a combination of proven innovation and fresh ingenuity, professionals are empowered to challenge the very limits of their photographic potential.



AF Technology

Vision as good as the human eye. New 45-point AF for life's decisive moments.

Canon introduces the ultimate autofocus system.

The human eye focuses instantaneously and a camera's AF system should as well. The closer autofocus comes to the speed, accuracy, and selectivity of the human eye, the better the chance of capturing moments that can be missed in the blink of an eye. To develop an AF system that more closely approaches the responsiveness of the human eye, Canon focused on tightly integrating the three main AF components: in-lens drive motor, cross-type AF sensors, and a multi point AF system.

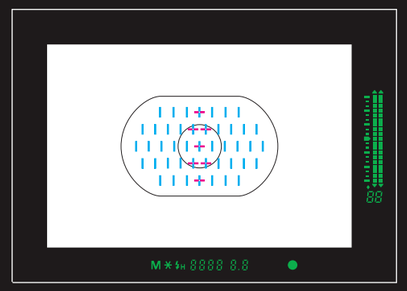
This approach, seen at it's pinnacle in the EOS-1 series cameras, has thrust Canon to the forefront of autofocus technology. The world-renowned AF systems found in EOS cameras are rivaled in performance only by the human eye. In essence, Canon has redefined autofocus, elevating it from mere "convenience" to that of a precision tool that allows professionals to capture life's decisive moments.

Human Eye	Behavior	Components	Canon Technology
Timing	Immediately focuses on subject	Speed and responsiveness	In-lens drive motor, USM, high-speed processing
		Dynamic tracking ability	Predictive algorithm
		Subject tracking ability	High-density of pixels on AF sensor
		Defocus ability	AF sensor optimized for f/5.6 light flux
Conditions	Handles various lighting and subjects	Different subjects	Cross-type metering
		Different light sources	Automatic compensation through light source detection
		Low brightness / low contrast	High-sensitivity AF sensors
Selectivity	Accurately focuses on desired area	Precision	AF sensor optimized for f/2.8 light flux
		Selectable from various AF points	Multi Controller, Custom Functions
		Extended area	Large, elliptical sub-mirror, Z-shaped light path

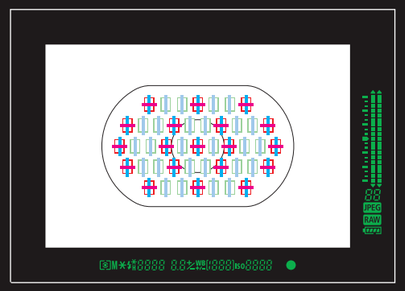
45-point Area AF — Innovative technology for more responsive autofocus.

When first introduced, autofocus was limited to one AF point. Canon pioneered multi point AF systems introducing a five-point system arranged in a line. Compared to the human eye, however, which moves freely to select subjects, the linear arrangement failed to provide the coverage needed to replicate this mobility. What was needed was a revolutionary type of autofocus that would not only cover the entire scene, but also achieve precise focus with virtually any subject. Without these capabilities, an AF system could not fully satisfy the needs of professionals.

Enter Canon, with a groundbreaking 45-point Area AF system.



Employed by EOS-1V (2000) and also used by EOS-1D (2001).
- : f/2.8-compatible points (center AF point compatible at f/4)
- : f/5.6-compatible points



Employed by EOS-1D Mark III (2007).
- : f/2.8-compatible points (center AF point compatible at f/4)
- : f/5.6-compatible points

Canon's 45-point Area AF was made possible by a unique AF optical system that employs a large elliptical sub-mirror. A total of 45 AF points comprised the focusing area — an innovation that dramatically enhanced the freedom of composition and dynamic tracking. This system also employed a seven cross-type AF points optimized for f/2.8 and f/5.6 light flux, resulting in reliable autofocus no matter what the subject.

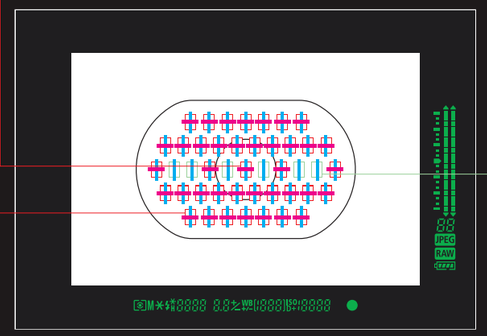
Area AF is improved by increasing the number of cross-type AF points, which allows focusing on a wide range of subjects. The EOS-1D Mark III, Canon's first camera with Area AF, featured 19 cross-type AF points and 26 assist points, heralding a new age in autofocus technology. This AF system included an aspherical secondary image-forming lens that allowed the entire AF area to contain high-precision cross-type AF points — an innovation that elevated AF response and range to even higher levels of performance.

EOS-1D Mark IV autofocus just like the human eye.

Technological advancements and the ever increasing demands of professional photographers made introduction of our 45-point Area AF system essential — to produce autofocus so advanced it rivals the human eye. Containing 39 cross-type AF points and 6 line points, the new AF sensor offers better stability, reliability, and precision. What's more, the system is based on a highly reliable mechanical design and advanced manufacturing processes that meet Canon's high standards for optical performance and quality control.

Center-cross AF point
The central AF point is a cross-type AF point providing vertical line detection at f/2.8-f/4 light flux and horizontal line detection at f/5.6, delivering precision cross-type focusing for all EF lenses f/4 or faster. In addition, horizontal line detection can be performed with slower f/8 lenses such as when using an extender.

Cross AF point
Cross-type AF points provide vertical line detection at f/2.8-f/4 light flux and horizontal line detection at f/5.6. The new Area AF system enables cross-type autofocus with all EF lenses faster than f/2.8 (maximum aperture) plus a limited number of lenses with apertures of f/4.
* f/4 lenses that support cross-type focusing within the 39-point AF frame:
EF17-40mm f/4L USM, EF24-105mm f/4L IS USM, EF70-200mm f/2.8L IS USM with Extender EF1.4 x II, EF200mm f/2L IS USM with Extender EF2 x II, EF300mm f/2.8L IS USM with Extender EF1.4 x II, EF400mm f/2.8L IS USM with Extender EF1.4 x II



EOS-1D Mark IV (2009)
Any of the 45 AF points can be selected.
- : f/2.8-compatible AF points (center AF point compatible at f/4)
- : f/5.6-compatible AF points (center AF point compatible at f/8)

AF points
Horizontal line detection with f/5.6 light flux. These AF points can be selected manually.

Auto AF point selection is frequently used in unpredictable situations, making fast performance a priority. Setting the number of cross-type AF points to 19 via the Auto Selection Custom Function optimizes the efficiency of the f/2.8 line sensors, providing the EOS-1D Mark IV with lighting-fast response.

New AI servo II AF combines responsiveness and stability.

The highly responsive autofocus of EOS-1D cameras makes them excellent for situations requiring continuous shooting at approximately 10 frames per second. The only drawback is the ultra-fast responsive AF system can detect objects that may encroach between the camera and subject, leading to autofocus errors when the AF point is not positioned on the subject. In the past, this could partially be rectified via Custom Functions. Canon, however, developed the EOS-1D Mark IV with an intelligent new AI Servo algorithm that solves this problem. As a result, both AF responsiveness and ability to stay focused on a moving subject even if it leaves the AF area for a short time, have been made possible without having to rely on setting Custom Functions.

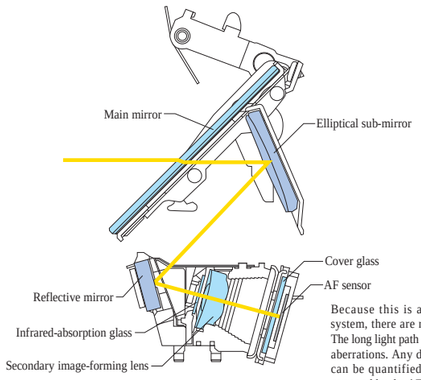
System development anticipating the future.
The evolution of multiple point AF made possible by Canon’s unique vision.

AF optical system with elliptical sub-mirror making, high-precision autofocus possible.

Projecting an image as points of light onto the AF sensor is as important in achieving a multi point Area AF as greater AF-point density and cross-point precision. Conventional AF optical systems that employ field lenses are not well suited to a wide-area, 45-point autofocus system due to light refraction and poor light convergence, which ultimately cause color aberrations.

Canon solves this problem by employing a unique elliptical sub-mirror to create a Z-shaped light path. This technology lengthens the path sufficiently for the light flux to converge naturally, drastically reducing color aberrations to deliver accurate images for more precise autofocus. Increased light convergence also enhances image brightness; another plus for this ground breaking system.

AF optical system employing an elliptical sub-mirror



Because this is a reflective optical system, there are no color aberrations. The long light path also reduces spherical aberrations. Any distortions that occur can be quantified then subsequently corrected by the AF algorithm.

Highly precise, cross-type autofocus compatible with f/2.8 lenses, essential for professional cameras

The EOS-1D Mark IV is equipped with 39 cross-type AF points capable of tracking subjects no matter the colour or amount of detail. All the cross-type AF points consist of high-precision sensors, some of which are compatible with a f/2.8 light flux and others at f/5.6.

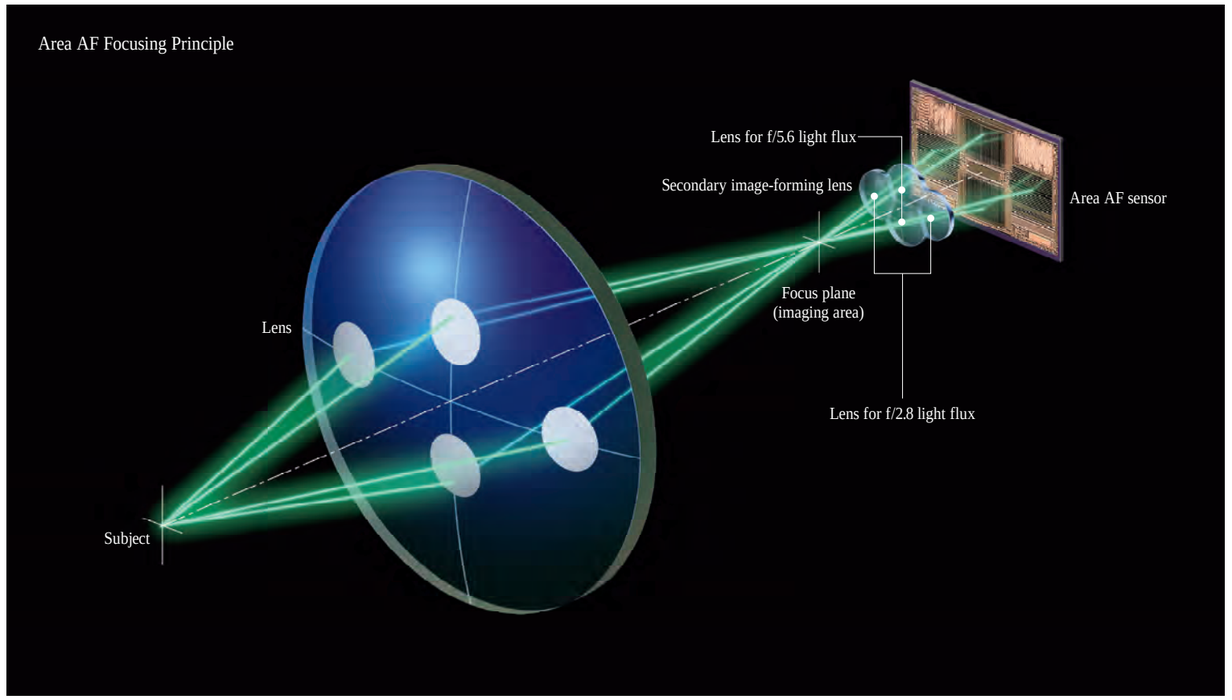
The f/2.8 sensors have a high resolving power, making them ideal for professionals who regularly use fast aperture lenses and require precision focusing. Complementing these are f/5.6 sensors that are superb at defocus detection, enabling the capture of fast-moving subjects as these sensors can operate quickly even if the subject is significantly out of focus.

By combining these two types of AF sensors in one system, the EOS-1D Mark IV provides demanding photographers with high autofocus accuracy and excellent response.

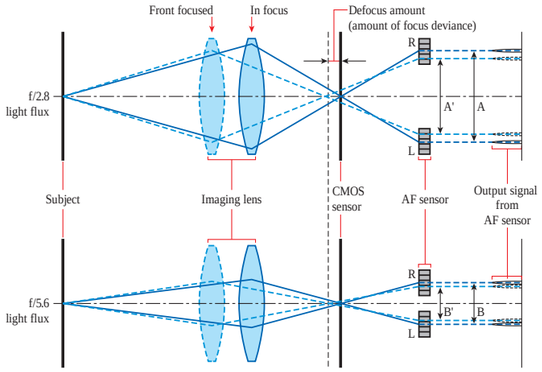
Autofocus accuracy under all lighting conditions thanks to light-source detection.

Phase-difference AF systems are subject to errors caused by varying wavelengths and refraction indices of different light sources. To overcome this problem, the EOS-1D Mark IV employs a light-source detection sensor that automatically compensates for different types of light source. Mounted at the rear of the pentaprism, this sensor assures consistent autofocus performance and reliability even when shooting under hard-to-manage lights such as mercury vapor lamps.

Area AF Focusing Principle



Comparison between f/2.8 and f/5.6 light flux



Accurate TTL phase-detection autofocus

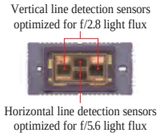
The most widely used autofocus method for digital SLR cameras is TTL phase-detection. This works by measuring the amount of defocus, which is calculated by determining the phase difference between images formed on the right and left of the AF sensor. When comparing images with the same amount of defocus, an image formed by f/2.8 light flux shifts roughly twice as much as an f/5.6 image. Consequently, AF points optimized for f/2.8 light flux can detect even minute shifts in the subject distance, resulting in more accurate autofocus.

Note: Phase difference for the same subject movement (defocus amount)
A-A' = Phase difference on AF sensors at f/2.8 light influx
B-B' = Phase difference on AF sensors at f/5.6 light influx
A-A' is larger than B-B'

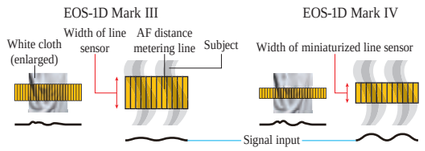
New AF sensor enhances subject detection and focusing accuracy.

Canon developed a new AF sensor to solve problems that typically hamper autofocus, such as low contrast and large defocus. The line sensors used by the new AF system have dramatically less noise, when shooting in dimly lit environments, than conventional AF sensors. Moreover, the central five cross-type AF points feature enhanced light sensitivity and have been reduced in width without affecting minimum brightness requirements. This makes it possible to detect even low-contrast subjects with increased accuracy.

Further improvements have been made to the most frequently used center AF point, the baseline has been lengthened enabling improved focus detection even when the subject is completely out of focus. In addition, four AF points optimized for f/5.6 light flux — two each positioned above and below the center AF point — boast enhanced sensitivity and detection accuracy thanks to the use of two line sensors.



How narrower line widths detect images with low contrast

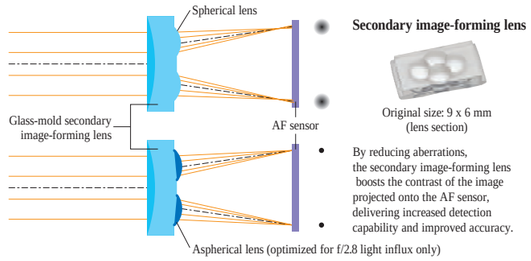


Aspherical secondary image-forming lens, for precision cross-type autofocus over the entire AF area.

Light reflected off mirrors forms an image on the AF sensor via the secondary image-forming lens. The performance of this lens is critical because it directly affects autofocus precision. However, since this is typically a spherical lens, it cannot completely converge parallel light flux onto a single point without causing minute aberrations. These aberrations make it difficult for f/2.8 cross-type AF points to achieve proper focus at the edge of the AF area.

Canon resolved this by use of an ultra-precise, aspherical secondary image-forming lens. Produced using Canon’s own glass-molding technology, this lens has excellent thermal- and pressure-resistant characteristics. This enables all cross-type AF points to achieve maximum accuracy, successfully satisfying the needs of professionals who require accurate edge-to-edge autofocus.

How an aspherical lens improves detection accuracy

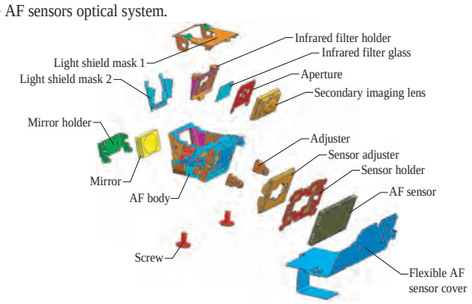


Managing temperatures for outstanding stability.

It is impossible to completely eliminate thermal expansion in an AF system even when thermal-resistant glass is used. Canon corrects this by compensating for temperature changes within the camera. Typically, a camera monitors its internal temperature via a heat sensor, regulating temperature as necessary. The EOS-1D series, however, goes one step further, with an additional sensor positioned near the secondary image-forming lens to provide more accurate temperature management — the ideal solution for professional cameras subject to extreme environments.

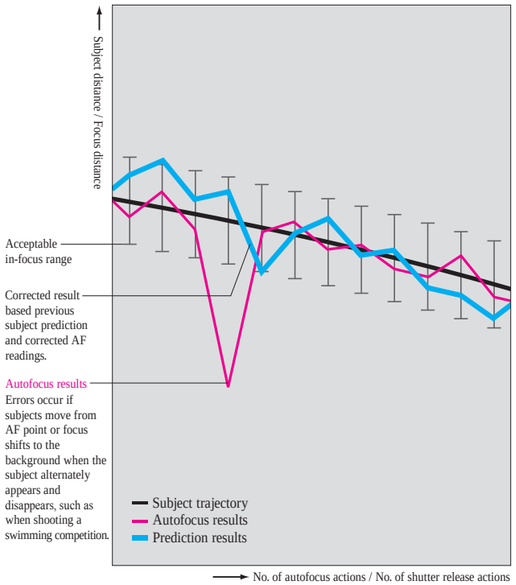
Fully enclosed AF unit ensures high accuracy and resistance to shock and heat.

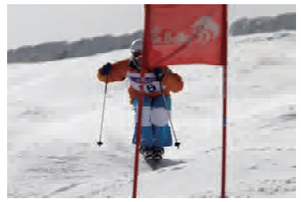
A fully enclosed structure made of highly durable materials protects the AF unit from moisture and thermal expansion. By enhancing robustness of both structure and materials, the AF unit is also resistant to changes caused by pressure. Keeping thermal expansion and contraction to a minimum assures consistent performance of the AF sensors optical system.



Enhanced AI Servo AF reliability and customization options empowering photographers to capture decisive moments.

Detection and compensation of autofocus errors (new AF predictive control)





AI Servo II AF is based on visual cognition, which predicts the movement of a subject, ignoring objects that may appear between the camera and subject. Even if the autofocus system inadvertently calculates the distance to an unwanted object, the result is not conveyed to the lens drive mechanism. This achieves highly accurate calculations resulting in more precise autofocus. It also reduces the need to rely on the camera's Custom Functions in order to achieve better autofocus.

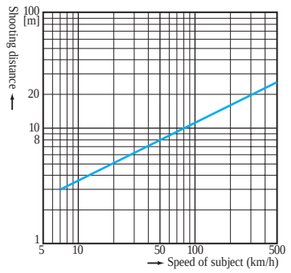
AI Servo II AF delivers higher levels of stability and responsiveness.

Conventional AI Servo AF predicts subject location by analyzing all autofocus data. This often results in errors due to irrelevant objects being inadvertently tracked or the subject moving from the AF points — all of which degrade AI Servo predictive accuracy. In order to deliver precise AI Servo for any photographic situation, Canon utilizes an AI Servo algorithm that includes reliability checks of autofocus results.

Canon conducted extensive field tests that duplicated a wide range of situations experienced by professional photographers. Based on the findings, Canon's engineers developed an algorithm that instantaneously determines whether autofocus calculations are correct, in essence creating "intelligent" AI Servo AF technology that accurately predicts subject movement.

The new AI Servo AF ignores data input if autofocus calculations are suspect, delivering consistent predictive control through the use of more accurate calculations involving prior subject movement.

Dynamic predictive capability



Custom Functions make it easy to set autofocus to handle special shooting situations.

Canon determined the default camera settings based on accommodating the largest number of photographers in the most common shooting situations. But because each photographer has a unique shooting style or sometimes must deal with situations outside the norm, Canon included C.Fn III: AF/Drive. When developing the EOS-1D Mark IV, Canon recognized the need for new AF-related Custom Functions in response to the camera's improved functionality. Fully understanding the new settings will assure photographers get the most out of the EOS-1D Mark IV for the ultimate shooting experience.

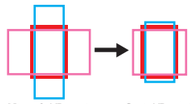
Spot AF for pinpoint AF precision. *C.Fn III-6-7*

To improve subject-tracking performance, the lengths of line sensors extend outside the visible AF point. Spot AF shortens the active area of each line sensor to more closely correspond to the AF point shown in the visible point. This function, which can be enabled with the AF stop button found on super-telephoto lenses, is ideal for situations when the default focus area covered by the AF point is too large, such as when trying to maintain focus on a race car driver's eyes instead of the helmet.

Using Spot AF, the focus area covered by the AF area is reduced to roughly half the default size. When active, the AF point blinks brighter than normal.

Notes:
- Autofocus may take longer when the subject is out of focus.
- For optimal results when using this function, it is essential to keep the subject inside the AF point or AF performance will be reduced.
- Spot AF is only available when using EF lenses that are equipped with an AF stop button.

Spot AF



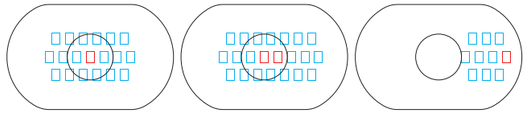
AF Expansion with Selected Point enabling subject tracking by area. *C.Fn III-8*

Custom Function C.Fn III-8 now has a third option that expands the subject-tracking area. When selecting "All 45 points area", up to 18 AF points neighboring the selected AF point become part of the AF frame, automatically shifting to track subject movement. As AF points shift, the expanded AF frame also shifts so that the AF point used for tracking remains at its center.

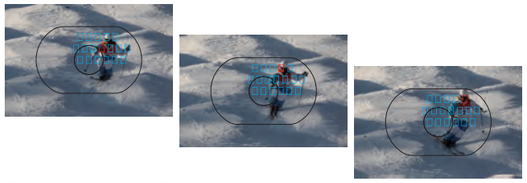
Unlike "AF point auto selection", this setting provides photographers with the ability to begin AI Servo AF with an AF point of their choice, or ensure that the subject remains in focus by limiting the scope of the tracking area. In addition, if "One Shot AF" is enabled, the AF frame gradually expands; first to include the surrounding six AF points, then 18 points and, if needed, 44 points. This ensures focus detection if the subject goes outside the initially selected AF frame.

Note:
When C.Fn III-8-3 is enabled, AF point selection characteristics of C.Fn III-4: AI Servo are identical to the "Release/tracking priority" setting. In this case, subject-tracking sensitivity is determined by C.Fn III-2.

C.Fn III-8-3 AI Servo AF

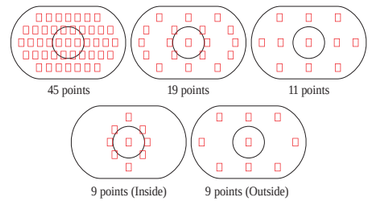


Subject-tracking AF (C.Fn III-8-3)



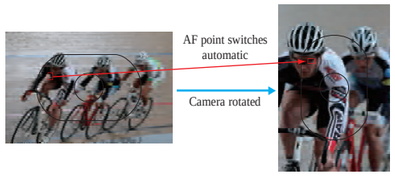
Limit selectable AF points for extra speed with *C.Fn III-10*

Custom Function C.Fn III-10 provides the ability to select the number of available AF points, each with a different AF-point configuration. Options available: 45 points, 19 points, 11 points, 9 points (inner), and 9 points (outer). The Main Dial can be used to select the AF point or photographers can choose to use the more intuitive Multi Controller to choose "AF point selection" via C.Fn III-9.



AF point setting based on camera orientation. *C.Fn III-16*

Custom Function C.Fn III-16 can be used to set a different AF point depending on whether the camera is held horizontally or vertically. Choosing "Set different AF points" allows a different AF point configuration to be employed depending on whether the camera is held horizontally, vertically with the grip up, or vertically with the grip down. When cameras orientation is changed, the AF point set for that position is automatically selected.



C.Fn III: Autofocus/Drive Custom Functions

Number	Item		Operation	
1	USM lens electronic MF	0	Enable after One-Shot AF	
		1	Disable after One-Shot AF	
		2	Disable in AF mode	
2	AI Servo tracking sensitivity		Slow ← -2, -1, 0, +1, +2 → Fast	
3	AI Servo 1st/2nd image priority	0	AF priority / Tracking priority	
		1	AF priority / Drive speed priority	
		2	Release priority / Drive speed priority	
		3	Release priority / Tracking priority	
4	AI Servo AF tracking method	0	Main focus point priority	
		1	Continuous AF track priority	
5	Lens drive when AF impossible	0	Focus search on	
		1	Focus search off	
6	Lens AF stop button function	0	AF stop	
		1	AF start	
		2	AE lock	
		3	AF point: Manual (M) → Auto / Auto → Center (ctr)	
		4	ONE SHOT ←→ AI SERVO	
		5	IS start	
		6	Switch to registered AF point	
		7	Spot AF	
7	AF Microadjustment	0	Disable	
		1	Adjust all by same amount	Forward: -20 …0…+20: Backward
		2	Adjust by lens	Forward: -20 …0…+20: Backward
8	AF expansion with selected point	0	Disable	
		1	Left / right AF point	
		2	Surrounding AF point	
		3	All 45 points area	
9	Multi-controller while meter	0	Off	
		1	AF point selection	

Number	Item		Operation	
10	Selectable AF point	0	45 points	
		1	19 points	
		2	11 points	
		3	9 points (inner)	
		4	9 points (outer)	
11	Switch to registered AF point	0	Disable	
		1	Switch with <✲>	
		2	Only while <✲> is pressed	
12	AF point auto selection	0	○ direct: disable / ⛰: enable	
		1	○ direct: disable / ⛰: disable	
		2	○ direct: enable / ⛰: enable	
13	AF point display during focus	0	On	
		1	Off	
		2	On (when focus achieved)	
14	AF point brightness	0	Normal	
		1	Brighter	
15	AF-assist beam firing	0	Enable	
		1	Disable	
		2	IR AF assist beam only	
16	Orientation linked AF point	0	Same for both vertic./horiz.	
		1	Select different AF points	
17	Mirror lockup	0	Disable	
		1	Enable	
		2	Enable: Down with SET (button)	
18	Continuous shooting speed	Disable		
		Enable		
		Register	High-speed continuous shooting	10 to 2 fps (per shot)
			Low-speed continuous shooting	1 to 9 fps (per shot)
			Apply	
19	Limit continuous shot count	Disable		
		Enable		
		Register	Number limited	99 to 2 fps (per shot)
			Apply	

: New or improved functions

ISO Technology

Control over digital and semiconductor technologies gives birth to the widest ISO range in EOS history.

A first for EOS: Standard ISO range from 100 to 12800 for enhanced versatility.

A wide ISO range gives photographer's added versatility when setting exposure. The standard sensitivity range of the EOS-1D Mark IV covers ISO 100 to 12800, a full seven stops. (In comparison, the EOS-1D Mark III has a five-stop range, from ISO 100 to 3200).
This is the widest ISO range of any EOS Digital camera, offering an unprecedented level of control over exposure without having to rely on flash. Photographers can now use higher shutter speeds in dimly lit environments to maintain the natural ambience of a scene, or attach extenders to lenses with slow apertures. Furthermore, sensitivity can be extended to L: 50, H1: 25600, H2: 51200, and H3: 102400 via a simple Custom Function setting.

ISO12800

Even at ISO 12800, photographers can obtain high-quality photos rivaling those shot at ISO 3200 on other cameras. In addition, since noise has been reduced over the entire ISO range, image quality exceeds that of other EOS cameras for photos shot at the same ISO. Users can also extend the ISO range, and a new ISO Auto function changes the ISO setting if the aperture and shutter speed combination does not allow for proper exposure. This makes it easier for photographers to concentrate on capturing the moment rather than worrying about adjusting exposure.

Noise reduction measures for the "1D" Series begins with the components.

Maximum ISO is mainly determined by the image sensor's signal-to-noise ratio and noise-reduction capability. In order to control these critical elements, Canon CMOS sensors utilize advanced semiconductor technology to produce low-noise images with an extremely wide dynamic range. For example, our "DIGIC 4" Imaging Processor employs a noise-reduction algorithm that closely resembles the eyes and cognitive capacity of humans.
In addition, 1D Series cameras use only high-grade, high-performance semiconductor materials and circuit boards in critical devices such as the amplifier, A/D converter, and front-end processing circuit. These components — developed entirely in-house — lie at the heart of Canon's professional cameras, delivering outstanding performance in terms of reduced noise and enhanced durability.

Imaging control board

Digital control board

Camera control board

Power supply board

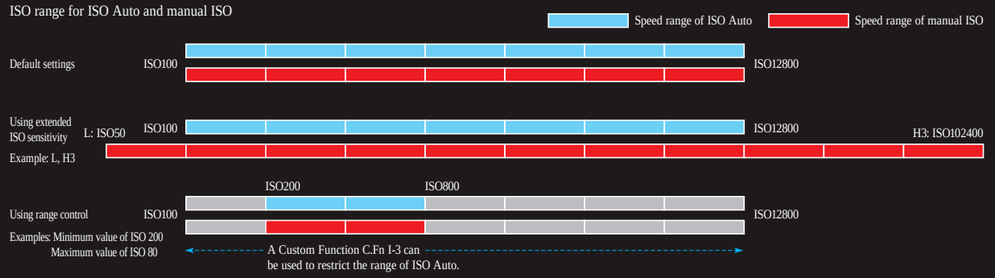
The benefits of high ISO-support extend to low ISO speeds.

Images shot at low ISO speeds can exhibit noise in shadow areas, even if brightened using tone curve adjustments. However, if an image has low noise to begin with, tone curve adjustment can be used more effectively and confidently.
Leveraging low-noise capability at both ends of the ISO scale allows Canon to equip the EOS-1D Mark IV with a variety of image-enhancing functions, such as Peripheral Illumination Correction and Auto Lighting Optimizer. The former adjusts image quality based on the unique optical properties of a lens, while the latter balances images for optimal brightness and contrast to produce photos that closely resemble what the human eye sees. These functions, enabled by default in the EOS-1D Mark IV, ensure improved image quality at all ISO speeds.

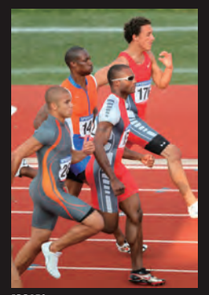
ISO Auto and high sensitivity force a paradigm shift in EOS professional cameras.

Until now, Canon did not equip the 1D Series with an automatic ISO function. The reason was clear: ISO is the most fundamental parameter in setting exposure. Letting the camera set ISO automatically is not particularly desired by professional photographers, many who learned their craft with film cameras and who consider automatic ISO superfluous. But because the ability to change ISO for each frame is an advantage unique to digital cameras, and due to the improved quality of images shot at high ISO speeds, Canon equipped the EOS-1D Mark IV with ISO Auto. This new functionality gives professionals the confidence to rely on higher ISO speeds and more freedom in setting exposure, allowing them to concentrate on getting the shot they envisioned.

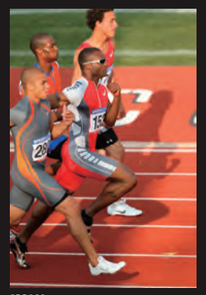
ISO range for ISO Auto and manual ISO



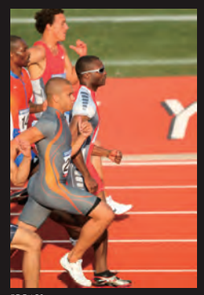
ISO Auto gives photographers a great deal of latitude for setting exposure in Manual mode. When ISO is controlled automatically, the photographer can set the ideal shutter speed and aperture combination, making it possible to capture the subject with the intended sense of motion and depth of field regardless of changes in brightness.



ISO250



ISO200



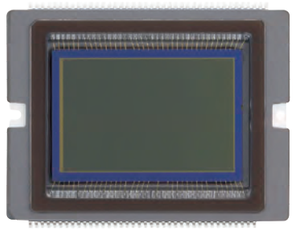
ISO160

Photographed in Manual mode (1/2000 sec. at f/2.8) Should brightness vary, ISO Auto changes the ISO speed accordingly to ensure that motion and depth of field are captured as the photographer intended.

The ultimate in shooting freedom opens the door to a world of expression. ISO range of 100 to 12800 and ISO Auto redefine ease-of-use.

Ultra-sensitive sensor produces a high signal-to-noise ratio and wide dynamic range.

In order to increase ISO sensitivity while maintaining superior image quality, the camera requires a sensor that generates a wide dynamic range and high signal-to-noise ratio. Canon's own APS-H, single-plate CMOS sensor with approximately 16.1 effective megapixels — developed using the latest semiconductor technology — does just this. With a pixel size of only 5.7 µm, extremely low noise, and high maximum ISO, the EOS-1D Series achieves extremely high-quality imaging. Now, thanks to a two-stop wider default ISO range of 100 to 12800, the EOS-1D Mark IV adds a new level of freedom when shooting.



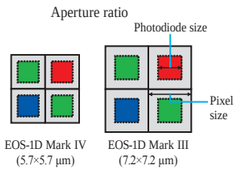
CMOS sensor (Actual Size)

Miniaturization process balances a high pixel count with a wide ISO range.

In manufacturing the CMOS sensor for the EOS-1D Mark IV, Canon introduced a miniaturization process more advanced than that used for the EOS-1D Mark III. In addition to increasing the aperture ratio of photodiodes (photodiode area ÷ pixel size), a new structure with superior photoelectric-conversion efficiency was used. This has allowed the use of a smaller pixel to gather and transfer light.

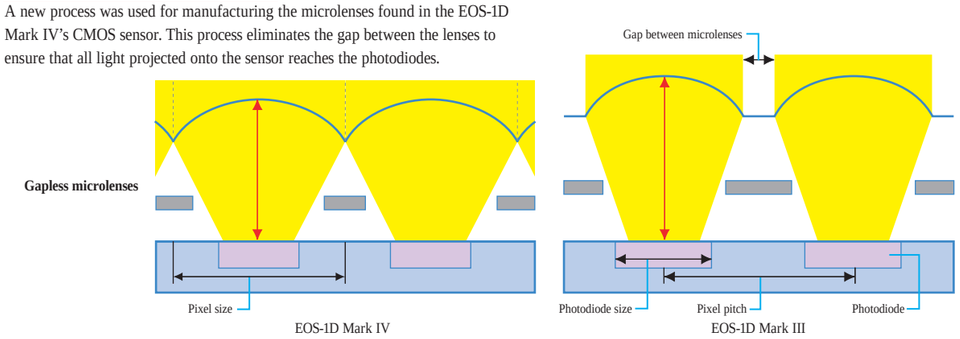
New color filters increases light penetration.

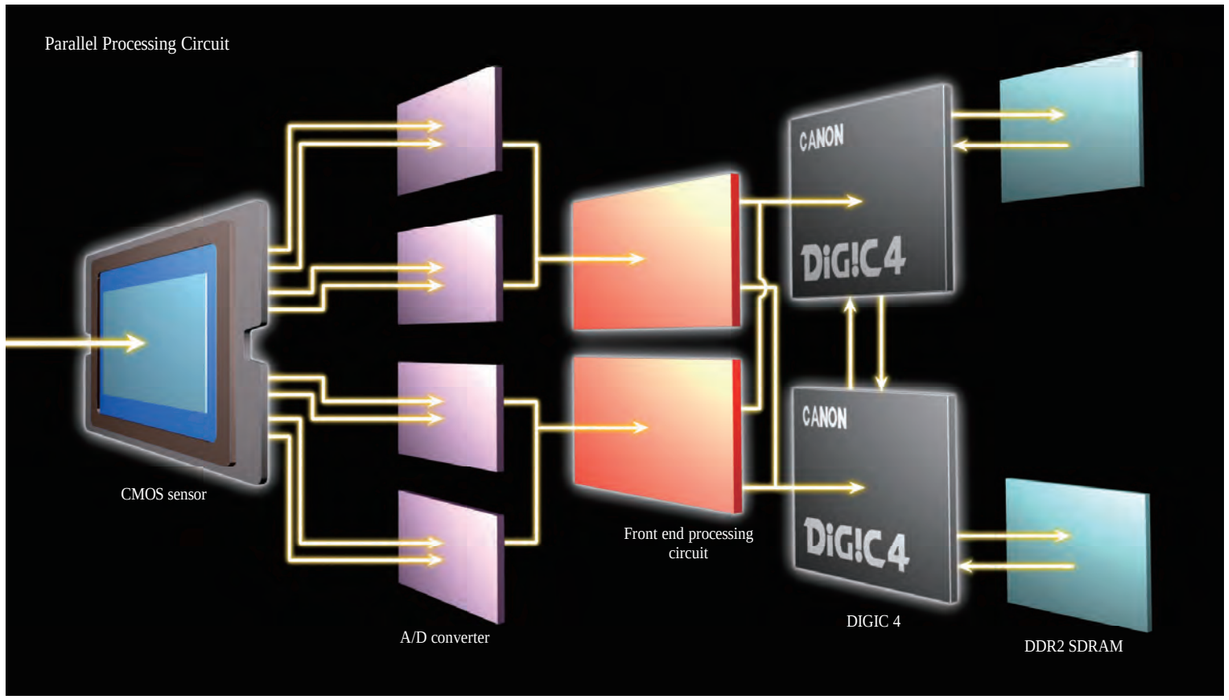
Color filters used in the sensor's bayer pattern use to present a dilemma to engineers. Achieving a higher level of permeation lets more light reach photodiodes, but at the expense of chromatic purity.
Canon has overcome this problem by using new materials for the color filters, achieving increased light sensitivity while maintaining color purity.



Gapless microlenses efficiently collect light.

A new process was used for manufacturing the microlenses found in the EOS-1D Mark IV's CMOS sensor. This process eliminates the gap between the lenses to ensure that all light projected onto the sensor reaches the photodiodes.



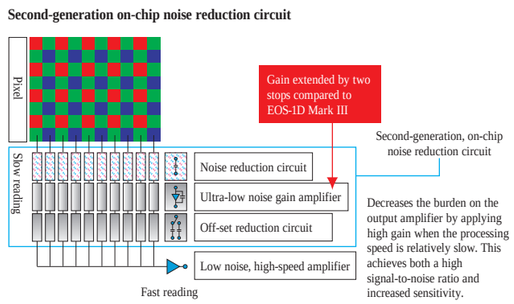


Reduced distance from aperture to photodiode eliminates vignetting while increasing sensitivity.

Reducing the distance from the microlens to the photodiode makes it possible to eliminate a layer that blocks light and causes vignetting. This design also improves light-collection efficiency, which results in increased sensitivity. First employed in the EOS-1Ds Mark III, the design is also used in the new CMOS sensor for the EOS-1D Mark IV.

Advanced amplifier technology suppresses generation, and amplification of noise.

A second-generation, on-chip noise reduction circuit reduces fixed-pattern noise caused by unstable pixel amplifier performance while assuring ample signal output. The preamplifier in the circuit — an ultra-low noise gain amplifier — extends gain by two stops and maintains the initial signal-to-noise ratio thanks to fast processing. In addition, low noise and high sensitivity are achieved by setting the signal output four times higher than that of the EOS-1D Mark III. Moreover, the EOS-1D Mark IV employs a mechanism that suppresses noise emanating from outside the sensor.

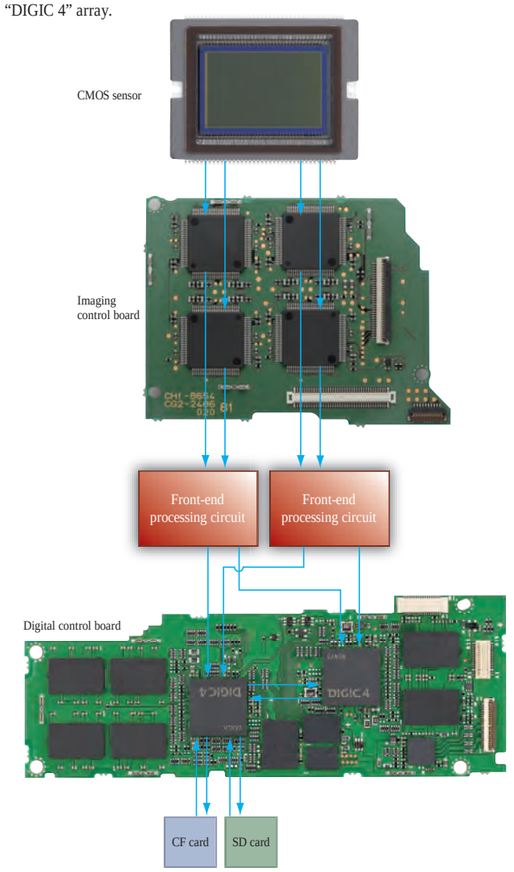


"DIGIC 4" Imaging Processor dramatically increases noise-reduction capabilities.

Natural, high-definition color reproduction at ultra-fast speeds is a hallmark of Canon's latest imaging processor, "DIGIC 4". With a clock speed approximately 25% faster than "DIGIC III" and an image processing circuit three times larger, "DIGIC 4" can devote more resources to eliminating noise. In addition, combined with the low-noise and high sensitivity of the CMOS sensor, the ISO speed is increase by approximately two stops, making possible a top default ISO of 12800.

Ultra-high speed parallel processing made possible by Dual "DIGIC 4".

In order to support continuous shooting at up to 10 frames per second with approximately 16.1 effective megapixels, the EOS-1D Mark IV is equipped with Dual "DIGIC 4" Imaging Processors — a truly powerful combination. Taking advantage of this massive processing power requires that signal-transfer delay from the CMOS sensor be kept to a minimum. To achieve this, two digital front-end processing circuit that control data transfer to the processors have been incorporated in the design. These make possible high-speed signal reading through eight channels and form a parallel processing circuit that works in tandem with the "DIGIC 4" array.



ISO
Technology

Intelligent algorithm keeping noise to an absolute minimum.

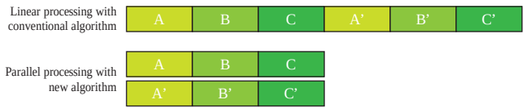
Luminance noise and color noise can lower the quality of photos and prevent the effective use of high ISO settings. Luminance noise is especially troublesome because it's difficult to reduce: insufficient processing leaves a grainy appearance while over processing results in a flat looking image, lacking resolution and gradation. Since achieving a proper balance is difficult, and processing can sometimes do more harm than good, there is a tendency for camera makers to avoid luminance noise reduction altogether. However, Canon has developed an advanced new algorithm that effectively reduces luminance noise. By analyzing noise in the same way as the humans brain does, and taking advantage of the high-speed image processing of "DIGIC 4", the algorithm helps reduce noise more naturally and effectively than other methods and produces smooth gradations in shadow areas.

Parallel processing reduces noise without affecting continuous shooting.

Conventional noise reduction is performed in a series of steps. But "DIGIC 4" employs a powerful new architecture that processes the data in parallel.
This method accelerates noise reduction so it does not affect maximum continuous shooting speed*. In the EOS-1D Mark IV, noise reduction is set to Standard by default, with Low, Strong, and Off settings available.

* The maximum continuous shooting speed decreases when using the Strong setting.

Noise reduction process



Proprietary CMOS sensor and imaging processor working together to reduce noise.

Understanding the nature of noise produced by the CMOS sensor is essential when creating an effective noise-reduction algorithm. Because Canon develops and manufactures its own sensors and imaging processors, we can better comprehend how noise is produced, then develop the most effective method of reducing it.

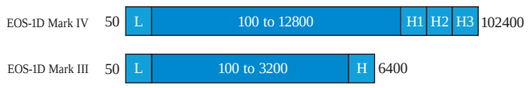
Expanding sensor sensitivity to increase shooting possibilities.

The EOS-1D Mark IV is the first "1" Series camera equipped with ISO Auto. This utilizes the unique advantages of digital cameras, allowing the camera to change ISO on the fly. The default range for ISO Auto is 100 to 12800, adjustable in 1/3-stop increments. However, when setting ISO speeds manually, Custom Functions can be used to expand this range. These new functions make it easy to tailor ISO procedures according to each photographer's style or shooting requirements.

Manual ISO takes advantage of an expanded ISO range.

Custom Function C.Fn I-3: allows the default ISO range to be expanded. Low-end sensitivity can be set to L (ISO 50) and high-end sensitivity to H1 (ISO 25600), H2 (ISO 51200), or H3 (ISO 102400). The expanded ISO range is shown in the normal shooting interface, enabling easy selection when manually setting ISO speeds. The L setting helps avoid overexposure in unusually bright environments while H3 enables shooting fast action in dark places. ISO expansion only works when setting ISO manually; it does not apply to ISO Auto, which restricts ISO speeds between ISO 100 and 12800. Keeping ISO Auto within this range ensures consistently higher quality images than when shooting at an expanded ISO range.

ISO range



Controlling the ISO range helps photographers adjust to changing scenes.

Different situations require different shooting techniques. There may be times when unusually bright conditions preclude the need for a high ISO setting even when fast shutter speeds are required, or when optical image quality is more desirable than the action-stopping capability provided by a high ISO. In situations such as these, photographers can use Custom Function C.Fn I-3 to narrow the default ISO range. The setting affects both ISO Auto and manual ISO operation. Should shooting conditions suddenly change or the photographer wants to disable the setting on the spot, Custom Function C.Fn I-8: Safety Shift can be employed. Choosing "Enable (ISO speed)" in the Exposure / safety shift menu the narrower ISO range can temporarily be cancelled allowing the default range of ISO 100 to 12800 to be used in order to obtain proper exposure in P, Tv, or Av modes.

Note: Choosing "Enable (Tv or Av)" for Custom Function C.Fn I-8: Safety Shift cancels the limited range of available shutter speeds determined by C.Fn I-12 and available apertures selected in C.Fn I-13. The ISO Auto function will adjust ISO speeds accordingly.

How ISO speeds are adjusted when using ISO Auto

Shooting Mode	ISO Range	Control
1) Program AE	C.Fn I-3 Default: 100 to 12800 Expanded: 100 to 12800 Limited: Between the lowest − highest	If a shutter speed is likely to result in a blurred image, the fastest aperture is selected. When the fastest aperture is selected, ISO speed is adjusted. When the range of shutter speeds and apertures are restricted by C.Fn I-12 and C.Fn I-13, ISO speed is adjusted.
2) Shutter Priority AE		When the aperture reaches the lowest or highest value, ISO speed is adjusted.
3) Aperture Priority AE		Based on ISO 100, if the shutter speed is likely to result in a blurred image, ISO speed is adjusted.
4) Manual aperture		ISO speed is adjusted according to the selected aperture.
5) Bulb*1	Fixed at ISO 400	
6) Flash*1	Fixed at ISO 400 (applies to when using flash with Shooting Modes 1 − 5 listed above)	

Notes:
- Choosing "Enable" for "Highlight Tone Priority" in Custom Function C.Fn II-3 sets the minimum ISO to 200.
- When viewing images and movies shot at H3 (ISO 102400) with third-party applications, the ISO may not be displayed due to Exif-format limitations.
- When printing still images shot at H2 (ISO 51200) or H3 (ISO 102400) that contain shooting information, the correct ISO may not be printed.

*1 When ISO 400 is not within the range defined by Custom Function C.Fn I-3, an ISO speed closest to ISO 400 will be used.

*2 When bounce flash is used with Program AE, the ISO speed is automatically set between ISO 400 and 1600. When shooting with flash in daylight using 1), 2), or 3), the ISO speed will be changed to ISO 100 when overexposure is anticipated.

Pushing beyond the limits. It's the Canon way.

The EOS-1 was introduced in 1989. Since then, several generations of the EOS-1 series cameras have satisfied professional demands with cutting edge innovation.

From the beginning, Canon has been committed to improving handling and response to suit the needs of professional press and sports photographers. By pioneering multipoint and cross-type sensor Auto focus solutions, Canon became a leader in the evolution of AF technology from point AF and area AF to predictive AF tracking and feature recognition. All the while, Canon continued to push the boundaries of technology to enable photographers to express their creativity.

The history of the EOS-1 series has seen a succession of Canon technological firsts. With the launch of the EOS-1D Mark IV, Canon's EOS-1 series takes a monumental leap forward in AF precision, AI servo stability, and exposure setting flexibility. While maintaining the EOS-1 tradition, Canon will continue raising the standards on performance and functionality to realize the dreams and desires of professional photographers.