

Canon

EOS-1D X MARK III

WHITE PAPER



Still Imaging

Written by Rudy Winston, Canon U.S.A., Inc.

EOS-1D X Mark III

Content

	Page
Abstract	3
1.0 INTRODUCTION	3
2.0 THE DIGITAL SLR IN THE PROFESSIONAL WORLD: MEETING THE PROS' DEMANDS	6
3.0 THE CANON EF LENS SYSTEM	6
4.0 KEY ENHANCEMENTS IN THE EOS-1D X MARK III	7
4.1 A New Generation Processor: Canon's DIGIC X	8
4.2 Performance	9
4.3 Burst Rates During RAW, RAW + JPEG Shooting	12
4.4 Shooting Speeds, Live View	13
4.5 Autofocus	14
4.5.1 High-Res AF Sensor — a New Concept in SLR AF Sensor Design	14
4.5.2 AF Sensor — Huge Overall Improvements in AF Performance	16
4.5.3 191 AF Point AF System	16
4.5.4 AF Area — the Size of the Active Focus Area	17
4.5.5 Full-time Red, Dot-matrix Display of AF Points and Zones	19
4.5.6 AF Point Navigation	19
4.5.7 AF Processing — Separate DIGIC 8 Processor for AF & Exposure Tasks	20
4.5.8 Viewfinder Shooting: AI Servo AF — Autofocus with Moving Subjects	21
4.5.9 AI Servo AF Control — the AF “Cases”	22
4.5.10 AI Servo AF: Subject Tracking with AF Priority (People)	25
4.5.11 Subject Tracking Settings > AF Priority (People) > Enable	25
4.5.12 Head Detect AF Explained	26
4.5.13 Subject Tracking Settings > AF Priority (People) > Disable	27
4.5.14 Summary: AF through the Viewfinder	28
4.5.15 Live View Autofocus	28
4.5.16 New Priority in Developing Live View AF	30
4.5.17 AF Controls are Virtually Identical to Those for Viewfinder Shooting	30
4.5.18 Practical Benefits and Features, with Live View AF	31
4.5.19 Summary: Live View AF	31
4.6 Metering and E-TTL Flash	32
4.6.1 New 400,000 Pixel RGB Metering Sensor	32
4.6.2 Four Primary Metering Modes	32
4.6.3 Face Detection: AF and Metering	34
4.6.4 Separate DIGIC 8 Processor for Metering and AF	34
4.6.5 E-TTL Flash Metering	35
4.6.6 New: E-TTL Face Priority	35
4.6.7 New: Continuous Flash Control	36

4.6.8	New: E-TTL Balance	36
4.6.9	New: Speedlite Operation During Live View	37
4.6.10	Additional Flash Features, Unique to EOS-1D Series	37
4.6.11	Flash System Summary	39
4.7	Image Quality	40
4.7.1	Totally New 20.1 Million Pixel CMOS Image Sensor	40
4.7.2	Why 20 Million Pixels?	41
4.7.3	ISO Sensitivity Range and Control Options	42
4.7.4	New: High Detail Low-Pass Filter Enhances Detail, Minimizes Risk of Moiré	43
4.7.5	High-Resolution Processing	43
4.7.6	Digital Lens Optimizer (DLO) — Maximizing EF lens Optical Performance	44
4.7.7	A New In-camera File Type: HDR-PQ HEIF Files	44
4.7.8	New: Clarity Image Control Option	46
4.7.9	Traditional Canon Image Controls with the EOS-1D X Mark III	46
4.7.10	Image Quality Summary	47
4.8	The Body: Controls, Layout, Operation and Battery Power	47
4.8.1	EOS-1D X Mark III Body and Control Layout	48
4.8.2	New: Full Touchscreen Interface	48
4.8.3	Optical Viewfinder	49
4.8.4	New: Smart Controller	50
4.8.5	Illuminated Operating Buttons	52
4.8.6	Dual CFexpress Card Slots	53
4.8.7	Battery Power	54
4.8.8	Expanded Reset Camera Settings	55
4.8.9	Summary — Camera Controls and Operations	55
4.9	Durability, Weather-Resistance	56
4.10	500,000-Cycle Durability	57
4.10.1	New High-Performance Mechanical Shutter	58
5.0	CONCLUSION	58

ABSTRACT

This white paper provides in-depth information on the Canon EOS-1D X Mark III camera and its primary accessories, at the time of its launch in early 2020. Three white papers in total, written by Canon U.S.A., Inc staff (with significant input from designers, engineers, product planners and R&D staff at the Canon, Inc. headquarters in Japan), will cover three distinct areas:

- Still imaging features and design — *the topic of this white paper*
- Networking and Wi-Fi® enhancements
- Video features, capabilities and technologies



1.0 INTRODUCTION

The unveiling of a new, professional Canon camera is a significant moment — for Canon's professional and serious enthusiast customers; for the Canon brand, in both a present-day and historical context; and for the photography industry in general.

Canon has delivered bold solutions to the demanding professional photographic community since the introduction of the first Canon F-1 (35mm SLR camera) in 1971. In the ensuing 49 years between 1971 and 2020, the photographic world has seen seismic shifts in the way pictures are taken and viewed — and, not surprisingly, in what demanding professional photographers and serious photo enthusiasts want at the highest level of camera design and operation.

The late 1970s and early 1980s saw complete transitions in camera design from totally mechanical, manual cameras to electronic, auto exposure cameras. The late 1980s began a period of fundamental change from manual focus SLRs to an overwhelming acceptance of autofocus. And the early 21st century witnessed a near-complete shift from film-based, analog imaging to digital imaging.

Through it all, Canon has been there with professional cameras, targeting the working pro in fields as varied as photojournalism and sports, to studio portraiture and scientific work.

Among the highlights include:

1971: Canon F-1 system is introduced

A complete system, with the centerpiece being the Canon F-1 camera: Canon's first camera targeting the professional photographer. A supremely durable camera, it accepts accessory viewfinders, focus screens, backs and motor drives. The Canon FD lens system makes its debut at the same time.



The original Canon F-1 was Canon's first professional, "system" camera. Shown here is a commemorative version, celebrating Canon's involvement in the 1976 Summer Olympics. The updated Canon F-1n was introduced shortly thereafter.

1976: Canon F-1n is introduced

A refined version of the F-1, showcasing an important aspect of Canon engineering and R&D; listening to the feedback of professional users, and responding with updated products.

1981: Canon New F-1 debuts

The professional photo industry is ready to embrace automatic exposure, and Canon introduces an even more durable, flexible camera — with a modular design for photographers to transition from full manual exposure to Shutter-priority or Aperture-priority auto exposure, as they desire. So-called "New FD" mount lenses are introduced in this general time frame, perhaps most significantly the New FD 400mm f/2.8L, which quickly became an industry standard in high-end professional sports photography.

1987: The EOS-1

A completely new direction in professional photography, delivering pro-level autofocus in a sleek, totally new design and control layout. Perhaps among the most significant development, beyond the AF system and EF lenses: the Quick Control Dial, an entirely new method of exposure control for both manual and automatic exposure modes.



2001: The EOS-1D

Another dramatic shift in the photographic industry, as digital imaging sweeps aside film photography for most professional applications. The EOS-1D is Canon's first professional digital SLR, with more resolution than other pro DSLRs of the time, 45 focus points and 8 fps shooting speeds — class-leading at the time.

2012: The EOS-1D X

Not simply a new, refined model — the EOS-1D X is Canon's first *full-frame*, truly professional digital SLR, with superb durability, 18.1 million pixel resolution, a new 100,000-pixel RGB metering sensor and an industry-leading 12 fps continuous shooting speed.



All of which brings us to 2020, and the launch of Canon's latest professional camera: the EOS-1D X Mark III. We'll discuss this camera, concentrating on it from the perspective of the still-image shooter, in this document.

2.0 The Digital SLR in the Professional World: Meeting the Pros' Demands

We've used the term "professional camera" a number of times already, but not really qualified what it entails, let alone defined it. Since the 1960s, the camera industry has come to use the term "professional camera" to label cameras at the highest level — but more importantly, those that prioritize the needs of working professional photographers. Since then, many serious users have come to accept that a professional, interchangeable lens camera will have most of the following attributes:

- Excellent designed-in durability and reliability, from the outer body shell to its internal mechanics and electronics. A camera that prioritizes withstanding heavy use, even in harsh environmental conditions, regardless of added size, weight and cost.
- Outstanding viewfinder performance: an eye-level viewfinder presenting a large view, with outstanding center-to-corner sharpness, along with excellent contrast and appearance of detail — vital to being able to quickly ascertain sharp focus, with either manual or autofocus.
- Excellent responsiveness and designed-in lack of shutter "lag time."
- Speed and performance. From the 1970s (with add-on motor drives) through modern-day (with built-in drives), cameras that target the professionals must offer the ability to shoot continuous pictures rapidly; for decades, this has been an important tool for photojournalists, sports and wildlife photographers. And, in modern, pro-level digital SLRs, the ability to shoot at fast frame rates for prolonged periods, without fear of slow-downs, is especially important.
- System compatibility. Lenses are a huge part of this, of course. But it extends to other areas, from viewfinder accessories to various power supply and Wi-Fi® options, enabling the professional working in the most demanding conditions to tailor his or her cameras for the job at hand.

Other cameras in a camera-maker's full product line may be smaller and lighter, may sometimes have higher pixel resolution or more features, but the professional camera first and foremost must meet the needs of the working pro. Since the introduction of the first Canon F-1 in 1971, there has never been a time when Canon did not have an SLR model ready to meet those challenges. In 2020, the launch of the EOS-1D X Mark III maintains that commitment to working professionals.

3.0 The Canon EF Lens System

Along with the camera that sits at the top of a camera-maker's line, there's no greater statement of commitment to the professional and demanding enthusiast than a camera system's line of lenses. In the Canon EF system, introduced with the first EOS 650 and EOS 620 cameras in 1987 — two years before the advent of the professional Canon EOS-1 — Canon has a 30-plus year legacy of autofocus optics to meet the challenges of imaging at the highest levels.

This isn't the forum to go into specific detail of each lens, or even to record historical lens highlights. But looking at the EF lens system in early 2020 — even as a new, mirrorless-based Canon RF lens line is being developed — there is a complete lens system to support the

unlimited, varied needs of working professional and dedicated amateur photographers. The options include:

- A full series of superb, wide-aperture telephoto lenses, for wildlife, nature, sports and photojournalism. EF L-series lenses from the 200mm f/2L IS through the 800mm f/5.6L IS offer a complete telephoto lens system to meet photographers' needs *today*.
- Two series of pro-level zoom lenses, with both f/2.8 and f/4 maximum apertures.
- A series of compact, fixed focal length "bag lenses" for anything from travel and street photography to photojournalism — ranging from the 14mm f/2.8L to the compact and Image Stabilized EF 24mm f/2.8, 28mm f/2.8 and 35mm f/2 lenses.
- A full range of macro lenses, including the long focal length EF 180mm f/3.5L and the specialized MP-E 65mm 1~5x macro photo lens, which replaces the traditional bellows unit for high-magnification close-up work.
- The industry's widest selection of tilt-shift lenses for 35mm-based autofocus digital cameras, from an ultra-wide TS-E 17mm f/4L to a unique TS-E 135mm f/4L. These lenses are a solid example of problem-solving tools, aimed at the professional user.

Canon's commitment to the digital SLR customer was underscored in late 2018, with the introduction of two entirely new EF super-telephoto lenses: the EF 400mm f/2.8L IS III USM and EF 600mm f/4L IS III USM — by far the lightest super-telephotos with these focal length/aperture specs to date from Canon.

The bottom line: the Canon EF lens system is ready today to meet the wide-ranging demands of nearly any professional photographer or videographer.

4.0 Key Enhancements in the EOS-1D X Mark III

This white paper aims to provide technical insight into the important new capabilities and features of the EOS-1D X Mark III. Right up front, it's important to be clear: nearly everything inside this camera is newly-developed and newly-engineered. It's easy to look at the exterior, see a very similar shape and control layout, and presume that it's a gently warmed-over version of its predecessor. We hope to explain, in the following pages, why that assumption would be a mistake.

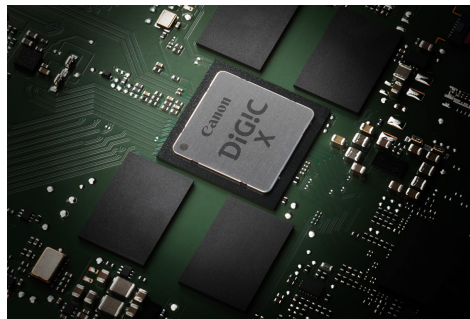
The significant new enhancements in the EOS-1D X Mark III are the following — and we'll discuss all that are relevant to still-image shooting in more detail:

- Totally revamped AF system for viewfinder shooting, highlighted by a completely new concept in AF sensors; 191-point AF in the viewfinder.
- Significant improvements to Live View AF using Canon's Dual Pixel CMOS AF technology.
- New detection technologies for AF tracking, for both viewfinder and Live View shooting, including totally new Head Detection AF that can detect and focus upon human heads and take over for Face Detection AF if a detected face becomes obscured.
- Drive speed improvements and incredible increases in buffer size and burst rates.

- Dual CFexpress memory cards — a commitment to performance.
- Important changes to Network and Wi-Fi® capability, targeting the professional photojournalism and news markets.
- Image quality improvements: completely new CMOS image sensor (even though pixel count is virtually the same as predecessor); totally new approach to low-pass filtration on sensor; sharpening-priority image processing; standard ISO range now up to ISO 102,400; new PQ HEIF file option for in-camera images tailored to HDR monitors and TVs.
- Entire camera — not just the shutter mechanism — durability tested to 500,000 exposures.
- Video performance raised, including 4K at 60p (from full width of image sensor); 5.5K RAW video recording to in-camera CFexpress cards; 120p full HD.
- Canon's first-ever Smart Controller, an optical pointing device combining back-button AF Start with full-time AF point location adjustment at same controller.

4.1 A New Generation Processor: Canon's DIGIC X

Performance lies at the core of every EOS-1D series camera, and a completely new, from the ground up central processing unit is a major factor in the EOS-1D X Mark III's design. This is the DIGIC X processor, a single processor that replaces two DIGIC 6+ processors in the previous EOS-1D X Mark II camera.



Dual processors have been a significant design feature of recent EOS-1D models, so the change to a single, new DIGIC X processor is a huge display of the confidence Canon engineers have in this unit's processing power.

Among the new performance and image quality-based improvements this outstanding, powerful processor brings to the EOS-1D X Mark III include:

- Improved noise-reduction processing.
- Sharpness-based image processing.
- Dedicated sections ("blocks") of the processor for specific Dual Pixel CMOS AF tasks, and for subject detection (including the new Head Detection AF, and AF tracking capabilities for both viewfinder and Live View shooting).

- Image processing performance up to approximately 3.1x faster than two DIGIC 6+ processors.
- Continuous processing speeds up to approximately 380x faster than two DIGIC 6+ processors.
- A significant reduction in power consumption vs. previous Dual DIGIC 6+ processors.

4.2 Performance

Performance in a professional camera is not simply sheer fps shooting speeds. Responsiveness at the shutter button; burst rates (how many continuous shots can be taken in a row before the camera runs out of buffer space and has to slow down or stop); write speeds (length of time to clear the buffer after a burst of continuous shots); viewfinder black-out times; autofocus read-and-react times and its ability to consistently focus upon moving subjects; and even flash sync speeds become part of the equation to the working professional or serious enthusiast photographer.

Performance has always been at the forefront of Canon professional cameras, especially those wearing the EOS-1 moniker. Predictably, the EOS-1D X Mark III has eclipsed all previous-generation EOS models in the overall performance it puts in the hands of photographers. We'll outline the factors that make this a reality in the next few pages.

First, a quick review of what the EOS-1D X Mark III offers, relative to its predecessor, the Mark II version:

	EOS-1D X Mark III	EOS-1D X Mark II
<i>Pixel resolution</i>	20.1 million pixels	20.2 million pixels
<i>fps, viewfinder shooting (max)</i>	16 fps	14 fps
<i>fps, Live View (max)</i>	20 fps	16 fps
<i>Burst Rate, RAW images</i>	Over 1,000	Approx. 170 (<i>with CFast card</i>)
<i>Memory card type</i>	CFexpress	CFast 2.0; Compact Flash
<i>Max. card transfer speeds (theoretical)</i>	1.97 GB/sec	600 MB/sec (<i>CFast</i>)

The EOS-1D X Mark III is the highest-performance Canon EOS camera yet, as of October 2019 (the time of its public *development* announcement). And, many of these capabilities are achieved with the SLR form factor, using a moving mirror and an AF system using a dedicated AF sensor during viewfinder shooting.

Factors that contribute to this include:

CFexpress Memory Cards

The EOS-1D X Mark III is the first Canon EOS still camera to make the complete switch to high-speed, CFexpress-type memory cards, compatible with the CFexpress v.1.0 standard. The exceptional read/write speeds of this new technology are a strong contributor to not only the camera's top shooting speed of 16 fps (20 fps during Live View recording), but to its incredible increases in burst rate performance.

As shown above, CFexpress cards have maximum theoretical transfer speeds approximately 3x faster than previous CFast 2.0 cards (used in the previous EOS-1D Mark II camera), and nearly 12x the theoretical maximum transfer times of UDMA 7-compliant CF cards.

CFexpress maximum transfer speeds: 1.97 GB/sec.

CFast 2.0 maximum transfer speeds: 600 MB/sec.

CF — UDMA 7 maximum transfer speeds: 167 MB/sec.

Be aware that CFexpress cards are made in three distinct physical sizes: Type A, Type B and Type C. This is analogous to different sizes for SD memory cards, such as Mini SD, Micro SD and SD, to accommodate different devices. *The Canon EOS-1D X Mark III uses Type B-sized CFexpress cards* (Type A are physically smallest, and Type C are larger in actual dimensions).

The EOS-1D X Mark III is only compatible with CFexpress cards, Type B size, and cannot use any other memory card type. This applies to similar-size XQD-type memory cards... *XQD cards cannot be used in this camera*, and Canon engineers have not announced any planned firmware changes to allow XQD cards to become compatible, as of the development announce date for the EOS-1D X Mark III.

DIGIC X Processor

This is another huge factor in the speed and performance of the EOS-1D X Mark III, as well as improvements in its image quality (more on that later). The role of the central processing unit in a digital camera cannot be overstated. It manages operational tasks, contributes strongly to AF performance and controls the sequence of image data movement from the image sensor to being written on the memory card. And, it has a huge role in still-image quality (especially for images processed in camera, such as JPEGs), and in terms of video quality and performance as well.

For nearly two decades, Canon engineers have taken great pride in developing digital camera processors that were designed from the ground-up to strictly handle the calculations and operations needed within a digital camera — rather than using generic processors, and then relying on software alone to perform the critical tasks imposed with digital imaging.

Previous-generation EOS-1D series cameras beginning with the EOS-1D Mark III (introduced in 2007; not to be confused with the subject of this white paper, the EOS-1D XMark III) have achieved their performance via *two* full-fledged Canon DIGIC processors.

For example, prior to the EOS-1D X Mark III, the EOS-1D X Mark II (introduced in 2016), used two DIGIC 6+ processors, Canon's latest and highest-performance processors at the time, to achieve its performance. Another EOS model noted for high performance, the EOS 7D Mark II (introduced in 2014), uses dual DIGIC 6 (not the more powerful 6+ version) to achieve its 10 fps shooting performance.

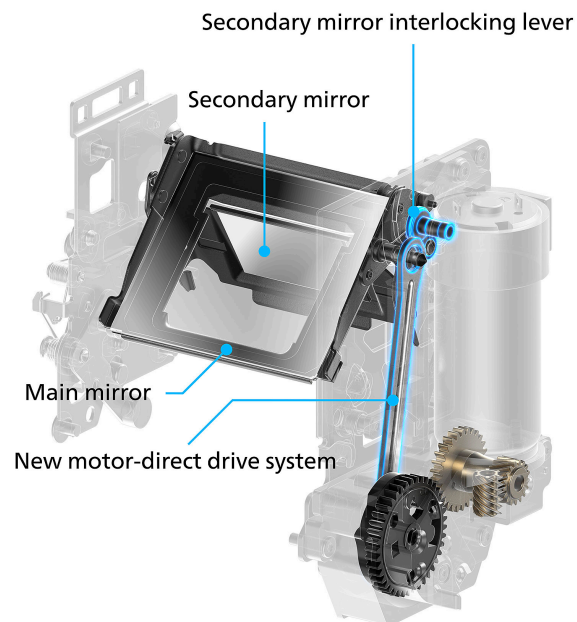
DIGIC X is so far advanced — the 1D X Mark III is the first Canon EOS camera to utilize it — that Canon engineers are confident using only one DIGIC X central processing unit.

In fact, Canon engineers state that this single processor is significantly superior in speed and processing power vs. two DIGIC 6+ processors used in the previous camera.

The combination of huge speed advances in two areas: memory card transfer speeds, with CFexpress cards, and a new, robust DIGIC X processor, are significant factors in the remarkable performance of this new, professional DSLR camera.

Mirror Enhancements

A critical factor in shooting speed, during through-the-viewfinder shooting with digital SLR cameras, is mirror movement. This includes the main SLR mirror, and equally important, the secondary sub-mirror, which sits behind the main mirror, and directs light rays to the camera's AF sensor during viewfinder shooting.



The mirror drive mechanism of the EOS-1D X Mark III has been totally redesigned, and boasts the following benefits:

- A much stronger and more robust mirror frame and linkage join both the main and sub-mirrors, compared to the previous independently-controlled structure of the main and sub-mirrors in the EOS-1D X Mark II.
- Movement of both main and sub-mirror is now joined; both are “braked” into their resting position simultaneously.
- Both mirrors are now motor-controlled, with sub-mirror movement completely coordinated with the main mirror’s movement, providing greater control of the sub-mirror’s movement during each exposure. Previous EOS-1D series models used spring power for the sub-mirror’s movement, which could not be controlled as precisely as the new motorized system — especially at the top and bottom extremes of both mirror’s movements.

- Sub-mirror bounce, especially upon return to its viewing position, is substantially reduced by the motorized control system — directly giving the AF system more time to get a stabilized view of light rays directed to the AF sensor. This is a vital concern in any digital SLR's viewfinder-based AF system, particularly when shooting at high fps rates.
- Drive speed of the mirror control motor is increased.
- Mechanical shock from mirror collision forces, at the top and bottom of the main mirror's travel, and vibrations from the motor are all significantly improved.

The results are two-fold: first, an even more stable view, with black-out between frames even further reduced (the main and sub-mirror “up” times, where the viewfinder is blacked-out, are less than any previous Canon EOS SLR camera, according to Canon engineers). And secondly, improvements in drive speed during viewfinder shooting to an outstanding 16 fps, without need to lock the mirror or resort to a fixed, semi-transparent mirror structure.

New Mechanical Shutter

A totally new mechanical shutter works in tandem with the mirror mechanism to improve both shooting speed (fps rates) and durability. *The mechanical shutter, in fact, can operate at up to 20 fps during Live View operation.* We'll discuss shutter and camera durability later in this document.

AF Processing Speed

Many factors combine to deliver Canon's highest-performance EOS-ID series camera yet. The EOS-ID X Mark III's AF processing speed is one of these... working every time AF is called upon, the AF system's read-and-react time, and ability to continually process AI Servo AF information during viewfinder shooting, works hand-in-hand with the mechanical improvements, to deliver speed with reliability to professional photographers. AF calculations can be performed in less time, meaning the camera's mechanical drive systems don't have to “wait” an extra split-second during high-speed shooting for AF information to be calculated and updated.

4.3 Burst Rates During RAW, RAW + JPEG Shooting

The gain from 14 fps to 16 fps, during viewfinder shooting, may appear on paper to be a modest improvement. But the EOS-ID X Mark III's improvements in *burst rate* — the number of continuous shots that can be fired, at the fastest fps rates, before the camera slows down or stops — are stunning.

Simply stated, the EOS-ID X Mark III offers 5x or more the burst rates that the previous Mark II model offered.

Where this really comes into play are those action situations where a photographer suddenly has a clean, uninterrupted view of important subject movement. Anything from a bird in flight, suddenly appearing in front of a clean background, to a running back at a football game bursting through the line of scrimmage and breaking a 60-yard run right toward the camera, are examples where speed *and* burst rate can combine to make or break a professional imaging opportunity.

	EOS-1D X Mark III	EOS-1D X Mark II
<i>RAW burst rate</i>	Over 1,000 images	Approx. 170 images
<i>RAW + JPEG burst rate</i>	Over 1,000 images	Approx. 81 images

Looked at another way, a photographer shooting RAW images with the previous EOS-1D X Mark II (14 fps max., through the viewfinder) could shoot at top speed for about 12 seconds, until the camera's buffer filled, and the camera had to slow down or stop. In the same situation, the Mark III photographer can shoot *for more than a minute*, at a faster 16 fps speed.

Once again, numerous factors, from the change to CFexpress cards to the big improvements in processing speeds of the new DIGIC X processor, contribute to make this outstanding improvement in burst rate a reality.

4.4 Shooting Speeds, Live View

While it's true that most users will want to shoot still images with the EOS-1D X Mark III using its optical, eye-level viewfinder, the camera's Live View offers some compelling performance-oriented possibilities. This is especially true in cases where the photographer can work with a monopod- or tripod-mounted camera and lens.

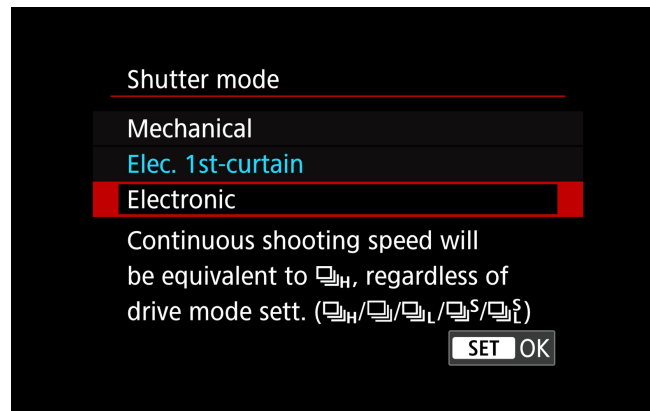


There isn't space on this page to illustrate a 20 fps sequence, but the EOS-1D X Mark III's Live View makes this possible — with Servo AF for every frame

Major improvements for the EOS-1D X Mark III in Live View include:

- Maximum shooting speed of 20 fps.
- Choice of mechanical shutter, electronic first curtain shutter or totally electronic (silent) shutter operation in Live View (all at up to 20 fps).
- Servo AF now possible, for reliable Live View AF with moving subjects (previous EOS-1D X Mark II offered One-Shot AF only during Live View, locking focus at position for first frame in a sequence).
- Major enhancements to Live View AF performance, including focus tracking (following a subject moving across the frame, laterally or up and down), Face Detect AF, Eye Detect AF and Head Detect AF — we'll explore these in detail, when we discuss the Mark III's AF system.

Live View now becomes a viable shooting option for wildlife, sports and other photographers, in part because it offers even faster fps shooting speeds, along with the possibility of virtually silent shooting when the user selects Shutter mode — electronic in the camera's red shooting menu during Live View operation.

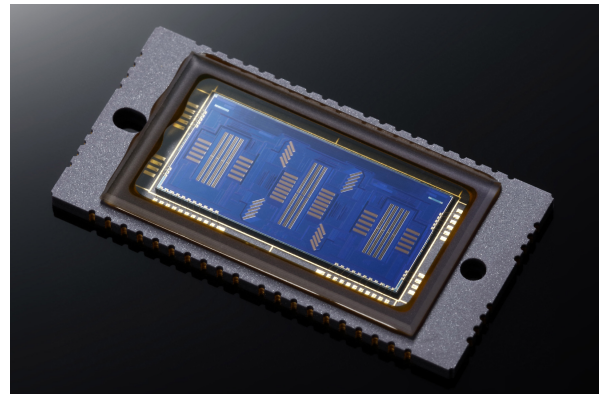
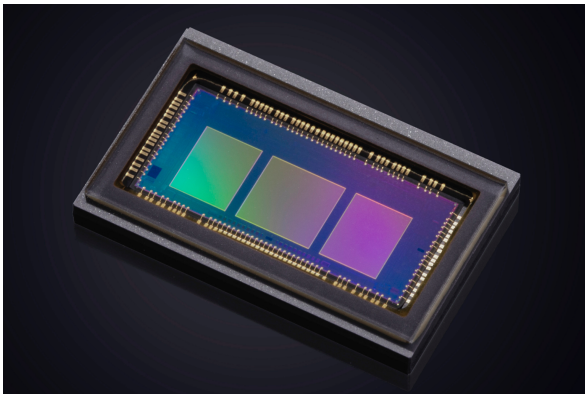


4.5 Autofocus

Some of the biggest EOS-1D X Mark III changes and enhancements are under the umbrella of autofocus. This entails two entirely separate AF systems: the viewfinder-based system, with its independent AF sensor, and the Live View/video system, which reads focus using Dual Pixel CMOS AF, directly from the imaging sensor. We'll look first at the viewfinder-based AF system.

4.5.1 High-Res AF Sensor — a New Concept in SLR AF Sensor Design

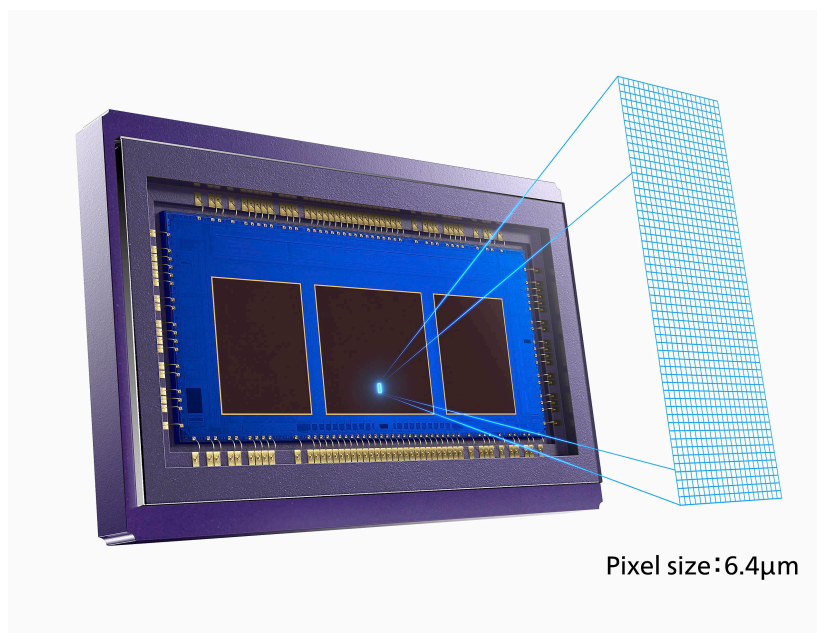
At the risk of getting a bit technical, one of the most significant advancements in the EOS-1D X Mark III is its dedicated AF sensor, *again for viewfinder shooting*. For the first time, Canon engineers have developed an AF sensor based on square pixels, distributed over an area, and not traditional pairs of light-sensitive lines of pixels for focus detection.



The difference between the Mark III's new High Resolution AF sensor and the 61-point AF sensor used in the previous-generation EOS-1D X Mark II is clear in these two studio photos. The concept of pixels on the AF sensor arranged in line pairs, two lines for each AF point, has been previously used in all EOS AF SLRs. Instead of pairs of lines, the EOS-1D X Mark III uses a much finer, high-resolution pixel array, with pixels 28x more dense than on the previous sensor. With so many more pixels, a 191-point AF array is possible.

This new AF sensor offers the following:

- 28x more dense array of pixels on the AF sensor, for focus detection — much greater pixel miniaturization at the AF sensor... the result is greater AF precision.
- Approx. 100x more pixels on AF sensor than previous Canon 61-point AF sensors.
- Significant improvements in AF precision and accuracy, especially when an AF point is aimed at subjects with extremely detailed subject patterns, or diagonal lines.
- Superior AF responsiveness in dim lighting conditions (now down to EV -4, at the center AF point, in One-Shot AF, during viewfinder shooting).
- Superior AF performance in extreme high-brightness situations (AF capability expanded two stops in extreme brightness, from EV 19 to EV 21).
- 191 AF points available to the photographer during viewfinder shooting.
- *(Depending upon lens + extender combination)* AF with effective f/8 maximum aperture lens + compatible Canon EF tele extenders, at up to all 191 AF points, and cross-type AF coverage at up to 65 AF points at f/8.
- AF support with EF lenses (using compatible EF tele extenders) up to 1,200mm in focal length (EF 600mm + EF 2x III; EF 800mm + EF 1.4x III).



Another graphic illustrating the High-res AF Sensor, a Canon engineering first in the EOS-1D X Mark III. Area-type coverage, using much smaller and finely-arrayed pixels on the AF sensor, increases focus precision, and makes the 191-point AF array possible.

4.5.2 AF Sensor — Huge Overall Improvements in AF Performance

Even with a pixel layout on the AF sensor that's about 28x as dense as in previous AF line sensors, the EOS-1D X Mark III AF operation speeds during viewfinder AF are significantly faster.

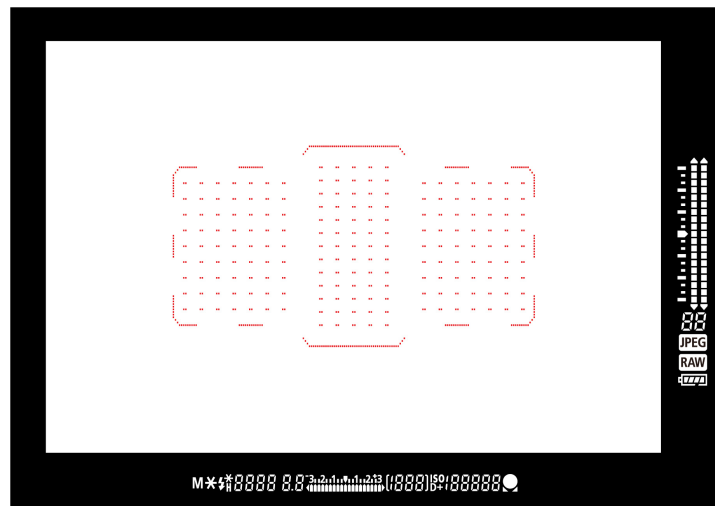
A series of factors contribute to this:

- AF detection speeds at the sensor are faster.
- Read-out speeds of data from the AF sensor are approximately 2x faster.
- Processing speeds of AF data off the sensor are up to an incredible 40x faster than from the previous EOS-1D X Mark II AF system, according to Canon engineers.

And, this is the first Canon AF sensor for digital SLRs (viewfinder shooting) to *directly output digital data*, right off the sensor. Previous EOS cameras with traditional line-based AF sensors required an analog-to-digital conversion step for AF sensor information, before sending it to the processor handling AF data.

4.5.3 191 AF Point AF System

Greeting the photographer looking through the Mark III's viewfinder is an array of 191 AF points. Every point can be manually selected by the photographer, and a variety of AF Area selection possibilities are available as well.



The 191-point AF array covers virtually the same amount of the picture area as the previous 61-point system in the EOS-1D Mark II camera, in terms of horizontal and vertical coverage of the frame (One reason to consider switching over to Live View with the Mark III is the increased height and width of AF coverage by Live View's Dual Pixel CMOS AF system, for users who need AF capability toward the outer edges of the picture area).

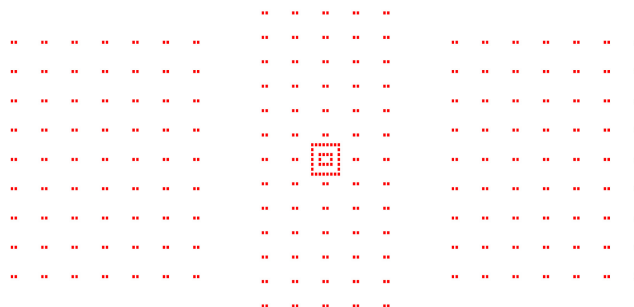
Up to 155 of these AF points — again, any of which can be selected by the photographer — are cross-type AF points, providing both horizontal and vertical subject detection (*number and location of cross-type AF points will vary, depending on the lens, or lens + extender, that's mounted*). When the rear AF point select button is pressed, those AF points which are

not cross-type will blink in the viewfinder, so it's immediately evident when a user is ready to move AF points or areas that the continuously-lit points offer cross-type coverage.

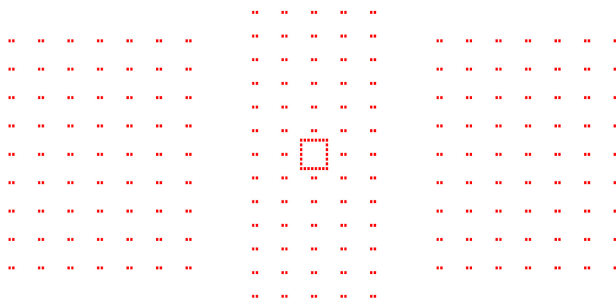
As with previous-generation EOS-1D series cameras, the number of AF points, and the number/availability of cross-type points, can vary, depending upon the lens, or lens + extender model, currently in use.

4.5.4 AF Area — the Size of the Active Focus Area

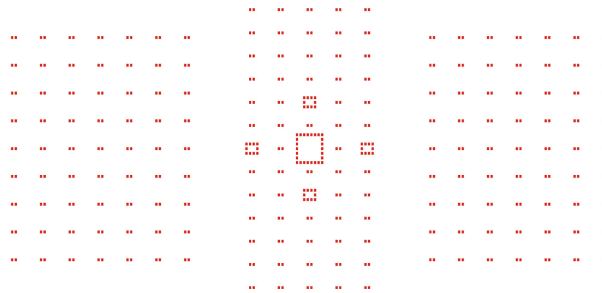
AF Area is Canon's feature to change the size of the point(s) used for AF sampling during viewfinder shooting (it's called AF Method during Live View and video recording). Like the previous Mark II model, this camera makes the following possible:



Spot AF, using a single AF point (smaller sampling area than conventional 1-point AF)

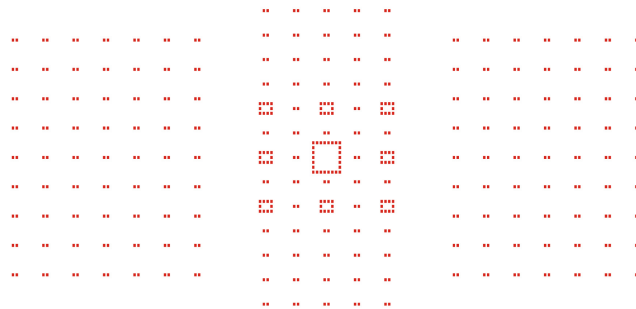


1-point AF

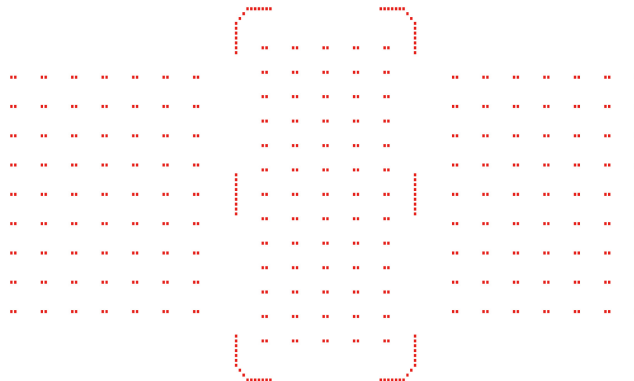


AF Point Expansion

(add 4 or 8 surrounding points, around a single primary AF point)

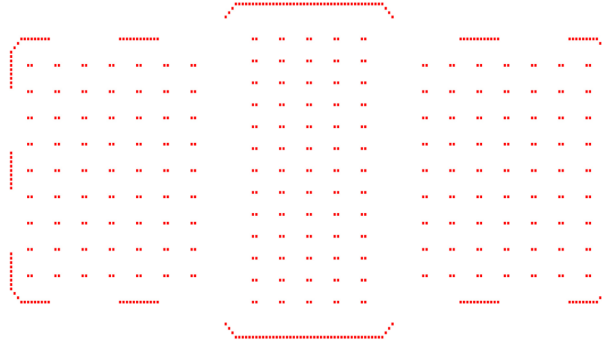


Zone AF



Large Zone AF

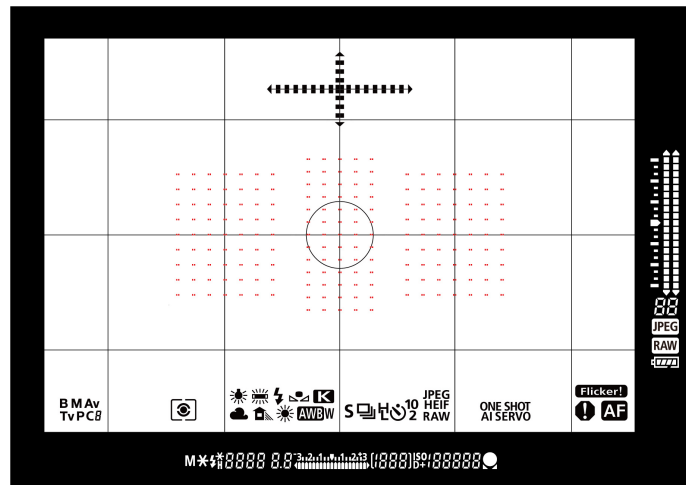
(during viewfinder shooting, any of three vertically-arrayed zones of AF points)



Automatic AF point selection (all AF points available; depending upon menu choices, camera uses one or more AF points upon camera-determined primary subject[s])

4.5.5 Full-time Red, Dot-matrix Display of AF Points and Zones

The Mark III's viewfinder continues to be a hybrid display, with projected red AF points and AF zone indicators, and a black LCD overlay display of available grid lines, aspect ratio lines and various settings/warnings that appear within the picture area. The red AF display is now via a dot-matrix system, in part because of the finer information required to clearly display 191 AF points.



You won't see all this information appearing simultaneously in the EOS-1D X Mark III viewfinder, but this graphic illustrates the hybrid LCD and illuminated, red dot-matrix display of AF points. The AF points appear exclusively in red, and are not part of the black LCD overlay in the finder. The camera offers extensive control of the amount of information displayed.

4.5.6 AF Point Navigation

Manually moving from one AF point to another may seem like an even more time-consuming operation, with 191 available AF points. However, a key new control on the back of the camera addresses some concerns here — Canon's Smart Controller.



The AF-ON button now serves two roles — it's also the 1D X Mark III's innovative Smart Controller. Note that below the Smart Controller, the 8-way Multi-controller, seen on previous high-end EOS models, is also available. Both can be customized for quick manual movement of AF points or AF Areas.

This is an optical-sensing pointing device, combined with the AF-ON button function. Press it to activate AF. Touch it — don't press it — and gently run your thumb across its surface, to manually move AF points (that could be anything from a single AF point to a large AF zone). We'll discuss this important new control in more detail when we examine the camera body and operations of the EOS-1D X Mark III.

Other methods of AF point navigation mimic those on the previous Mark II model:

- Multi-controller on back of camera (two Multi-controllers, for horizontal and vertical hand-held orientation, are available).
- Press AF Point Select button, and turn Main Dial and/or Quick Control Dial to navigate horizontally or vertically, respectively.
- Significantly enhanced Subject Detection, when set for Automatic AF Point Selection — including during viewfinder shooting. This is a powerful new capability in the Mark III, so we'll discuss it at length shortly.

4.5.7 AF Processing — Separate DIGIC 8 Processor for AF & Exposure Tasks

Huge increases in in-camera processing speed and data volumes are a big underlying aspect of the cumulative performance gains in the Mark III camera. We've already spoken about the significantly new DIGIC X primary processor. During viewfinder shooting, the EOS-1D X Mark III adds a dedicated DIGIC 8 processor, previously Canon's highest-performance processor, strictly for AF management and control of the 400,000 pixel RGB metering sensor.

This dedicated processor for viewfinder AF plays a huge role in the EOS-1D X Mark III's AF subject detection capabilities, and its metering and exposure control as well (including E-TTL flash metering, which is updated in the Mark III). And, the dedicated DIGIC 8 processor works in tandem with the central DIGIC X processor for the powerful new Head Detection AF.

Other highlights include: a much faster processor, dedicated for AF tasks (viewfinder and Live View); a much more sophisticated AF sensor, yet with processing speeds up to 40x as fast; direct digital data output from the AF sensor; and overall camera system tasks handled

by a powerful DIGIC X processor. The AF system plays a key role in the performance increases in the EOS-1D X Mark III. And even more so, understanding the new technologies under the camera's hood emphasizes that virtually everything inside this camera is new, and that all contribute to the superb design and operation of this camera.

4.5.8 Viewfinder Shooting: AI Servo AF — Autofocus with Moving Subjects

Always a key feature with EOS-1 series professional cameras, the Mark III's ability to maintain focus upon challenging moving subjects is at the highest level of any Canon EOS digital SLR to date. The combination of the completely new, high-resolution AF sensor, upgraded AF data and processing speeds throughout the shooting sequence for each frame, and of course the robust new AF processing all work together to enhance the Mark III's ability to get consistently sharp frames, even at up to 16 fps during viewfinder.

Along with faster internal AF speed, Canon engineers have developed an entirely new AF data processing sequence and procedure — an AF algorithm — now called AI Servo AF IV. This is a substantial technological update, leveraging all the AF system improvements we've discussed, from the new AF sensor to the new DIGIC 8 AF processor and overall DIGIC X primary processor.

One specific improvement in AF system speed is that the rate of separate AF detections during AI Servo AF shooting is significantly faster in the Mark III camera. In other words, in the brief fraction of a second between shots at up to 16 fps, when the mirror is in its down position, the AF system performs more sampling operations, more separate AF readings.

The aforementioned improvements in control of the main mirror and especially its sub-mirror make a strong contribution here, with their ability to arrest bounce and vibration from collision forces at the end of the two mirrors' travel. This gives the AF sensor a longer, more stable look at a subject, between frames, during high-speed viewfinder shooting. With more information to work with, the entire AF system can perform more critical lens drive commands to sustain sharpness upon a moving subject.

Two additional areas of AF performance with moving subjects have been specifically enhanced with the EOS-1D X Mark III, and its through-the-viewfinder AI Servo AF with moving subjects. These are based on processing improvements within the new AF system of the Mark III:

- Improved AF performance when shooting through heat-induced "haze" (the shimmering "heat waves" that can appear on hot days, especially with distant subjects using long super-telephoto lenses).



Working with long telephotos and distant subjects, it's not uncommon to encounter visible heat waves, especially in hot temperatures. The EOS-1D X Mark III is the first Canon EOS camera with specific AF processing designed to minimize focusing fluctuations from these waves, and provide sharper focus on the intended subjects. This doesn't eliminate the visible heat waves — but it improves the camera's ability to put sharp focus where you want.

- Superior AI Servo AF consistency when focusing upon subjects moving *away* from the camera.

4.5.9 AI Servo AF Control — the AF “Cases”

Ask any experienced action photographer, and he or she will tell you: there are different types of subject movements, and different challenges that the wildlife, sports or commercial photographer confronts with these varieties of subjects and their motion. There can be a huge difference in the movement of a 100-meter dash sprinter running straight at the camera, compared to the rapidly-changing directions an animal eluding a fast-moving predator at a watering hole.

Canon has addressed these in previous-generation, high-end EOS cameras with a menu-driven system called the AF Configuration Tool. In previous EOS models, it offered a series of six different “Cases,” numbered 1–6. Each tailored the camera's AI Servo AF system for different types of moving subjects. *Primarily, it worked by providing different levels of adjustment to three separate parameters which influence how AF with moving subjects works:*

Tracking Sensitivity

Will the camera instantly try to refocus, if the active AF point(s) suddenly are upon a new subject? Or, conversely, will AF deliberately resist making sudden, major focus changes, allowing a photographer to return his or her active AF points upon an original subject?

Accel./Decel. Tracking

Should AI Servo AF expect subjects to be at a steady, relatively continuous speed? Or, should the camera expect movement with sudden, quick changes in speed (think of basketball action near the hoop, or interior line play in American football)?

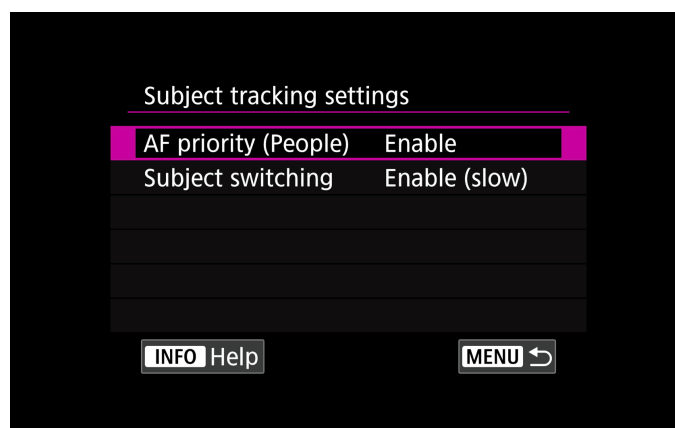
AF Point Auto Switching (prior to the EOS-1D X Mark III):

When the AF system was set for a large focus area — Zone AF, Large Zone AF or Automatic AF point selection — how quickly would the system automatically change active AF point(s) to keep them on a laterally-moving subject?

In the new EOS-1D X Mark III, several important factors have changed. First and foremost: these settings now apply to both viewfinder shooting (during AI Servo AF), and Live View shooting (during Servo AF).

Users still do have the ability to tailor how the AF system deals with subject movement, when it's set to AI Servo AF during viewfinder shooting. But there are some differences. These include:

- ***Vastly superior subject detection capability***
When set to any of the larger AF Area settings (Zone AF, Large Zone AF, or Automatic AF point selection/Face Detect + Tracking AF), the EOS-1D X Mark III offers robust subject detection capabilities. These include Face Detect AF, and totally new Head Detection AF. We'll discuss these in more detail in a moment.
- ***New: "AF Point auto switching" replaced by "Subject Tracking Settings"***
The entire third variable in the previous AF Configuration Tool (AF Point auto switching) has been removed, and replaced by a separate line-item elsewhere in the Mark III's AF menu. It's no longer part of the "Cases" in the AF Configuration Tool. This is the Subject Tracking Settings entry.



Leveraging the improved subject detection capabilities in the EOS-1D X Mark III, this gives users two Subject Tracking Setting options, which are completely independent of the remaining AF Cases. The photographer can select:

- ***AF Priority (People)*** — Enable, or Disable
When enabled, this calls upon the AF system to recognize and prioritize prominent faces. Priority is on a person — for example, shooting a horse and rider, AF system will try to put active AF points on the rider, not the horse, even if the horse's head is nearer to camera, and more prominent in the scene.
- ***Subject Switching*** — Disable; Enable (slow); Enable
Disable: AF points will stay locked on to initial subject, once the AF system has acquired it. In other words, once focus points are upon a subject (or part of a subject), the AF system will strongly resist switching to another subject that may enter the AF array.
- ***Enable (slow):*** With AF Priority (People) active, will switch from body to head/face of detected human subjects, and will tend to stay with original detected person. With

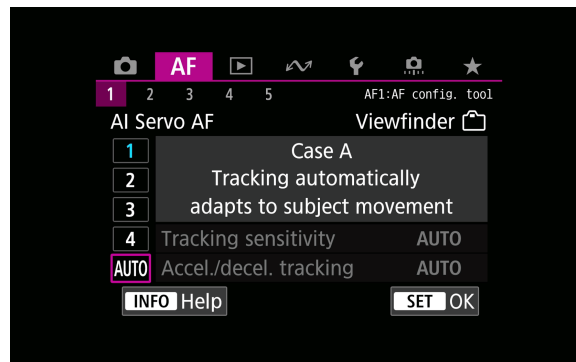
(People) priority disabled, AF will switch to new subjects — or to another part of the primary subject — if there are noticeable changes in composition, etc.

- **Enable:** Camera will change AF points more freely and readily, to pick up nearest or most prominent subject.

Two fundamental EOS-1D X Mark III options for AI Servo AF control:

- 1) **Select any of four possible AF Cases**
 - * Cases 5 and 6 have been removed, and replaced by the separate Subject Tracking Settings (described directly above).
- 2) **Select Case AUTO** — camera reads subject and movement, and assigns the Case it feels best captures that movement. It's auto adjustment of details of AI Servo AF settings, with ability to adjust on-the-fly as subjects and situations change.
 - * Totally new capability
 - * Incorporates the potential variables of Case 1 ~ 4 on the EOS-1D X Mark III

Again, this applies during viewfinder shooting with AI Servo AF, and now during Live View's Servo AF, when photographing moving subjects (Please note that the AF Cases don't apply to Movie Servo AF, during video recording).



The four AF Cases:

Case 1 — *Versatile multi-purpose setting*

Like previous EOS models with the AF Cases, Case 1 especially tailors the camera to expect relatively continuous subject movement.

Case 2 — *Continue to track subjects, ignoring possible obstacles*

Reduced Tracking Sensitivity... camera will tend to “lock-on” to an initial moving subject, and if there’s an interruption or sudden change during AI Servo AF, resist changing to new subjects.

Case 3 — *Instantly focus on subjects suddenly entering AF points*

The opposite of Case 2... the Mark III will immediately respond to changes at the active AF point(s), and re-focus upon a new subject that appears.

Case 4 — *For subjects that accelerate or decelerate quickly*

Tunes the AI Servo AF to expect changes in subject speed and movement.

The final option — Case A (Auto)

Camera adjusts AI Servo AF tuning, using information from subjects being focused upon.

4.5.10 AI Servo AF: Subject Tracking with AF Priority (People)

“AF Tracking” for Canon engineers means the AF system’s ability to change AF points automatically, to follow a subject that’s not simply moving toward or away from the camera, but that’s moving across (or up and down) around the picture area.

Subject Tracking Settings allow the photographer to point the camera in certain directions, figuratively speaking, and ready the AF system to handle this automatic changing of AF points, to keep these kinds of moving subjects in focus as they move around the active AF area.

Again, Subject Tracking Settings are a totally separate line-item in the camera’s magenta-colored AF menu area, and are in addition to a user’s choice of AI Servo AF settings for Cases 1 thru 4, plus Case Auto.

Because these involve the camera being able to automatically change AF points, be aware that Subject Tracking Settings have no effect when Spot AF, 1-point AF or AF Point Expansion are selected. *They strictly impact the Zone AF, Large Zone AF, and especially Automatic AF point selection (or Face Detect + Tracking, in Live View) AF Areas* — those where the camera normally automatically selects which AF point(s) are active at any given moment.

4.5.11 Subject Tracking Settings > AF Priority (People) > Enable

Instructed to prioritize people, the camera’s AF system combines with the 400,000 pixel RGB metering sensor to identify human faces in the scene. When shooting through the viewfinder, two separate types of identification are now active:

Face Detect AF

Human faces are identified, and one or more AF points will appear on the detected face. If more than one face is detected, the AF system will choose the most prominent one (based on its size and proximity to the center of the active AF area). Because this is a subject tracking setting, if that face were to move left or right, or even up or down, the active AF points will continue to stay upon it, as long as the face is within the AF point array.

Head Detect AF

This is totally new for Canon — and likewise enabled if “AF Priority (People)” is activated. The idea here is to be able to identify not simply faces, but human heads. This is especially powerful when a full face can’t be identified (such as a face partially obscured by a visor on a hat).

And, if Face Detection is initially active, but a subject’s face becomes unrecognizable for any reason (sudden strong back-light, subject turns away from camera, etc.), the EOS-1D X Mark III’s AF system can seamlessly switch from Face Detect AF to Head Detect AF, and maintain recognition of the primary subject.



Photographing people, through both the viewfinder and during Live View, the EOS-1D X Mark III can switch seamlessly from Face Detect AF, when using a large AF Area, to powerful new Head Detect AF. In a sequence of pictures of a subject like this, if the person were to momentarily turn away from the camera (so a face is no longer visible), Head Detect AF immediately responds and puts active AF points upon the head area of the person. Unlike previous Face Detect AF systems without this type of back-up, the Mark III's AF is much less likely to switch to the subject's mid-section, or drift to the background or another area in the scene.

4.5.12 Head Detect AF Explained

Head Detection AF takes over for Face Detect AF, when parts of the face such as eyes cannot be detected, but it's still possible to detect a human form. Again, it really comes into its own with subjects wearing helmets or other headgear.

Head Detect AF is supported by "deep learning." Canon engineers have established a database of thousands of images of heads in varying types of positions, including turned away from the camera, and even wearing various types of sports helmets. Deep learning has been applied to the AF system (within the DIGIC X processor) to leverage this info for immediate recognition of human subjects, when traditional Face Detect AF cannot read sufficient information to confirm a subject.

Interestingly, this transition from Face Detect AF to Head Detect AF leverages both the DIGIC 8 processor (normally the primary source of AF tracking control) *and* the more powerful, central DIGIC X processor. DIGIC X is the source of Head Detect AF data, and its deep learning support library — but the transition from Face Detect AF to Head Detect AF is extremely smooth, even in the middle of a 16 fps shooting sequence.

Head Detect AF is a powerful new technology, further enhancing the EOS-1D X Mark III's AF performance in situations where the photographer is comfortable relying on using a broad AF Area, and letting the camera automatically maintain focus points upon an erratically moving human subject.

A few important points about subject detection AF with the EOS-1D X Mark III:

1. The concepts explained here apply to Live View shooting, at up to 20 fps, as well as shooting through the viewfinder. The text above specifically addresses viewfinder shooting.
2. Eye Detect AF is not possible during viewfinder shooting (it is possible during Live View shooting, in a fashion similar to mirrorless cameras such as the EOS R).
3. Accordingly, Face Detect AF, Eye Detect AF and Head Detect AF are all active when Subject Tracking Settings > AF Priority (People) is enabled during Live View.

4. In both viewfinder and Live View shooting, AF Priority (People) means exactly that... Canon makes no claims that the EOS-ID X Mark III can recognize and focus upon faces of animals or other non-human subjects.

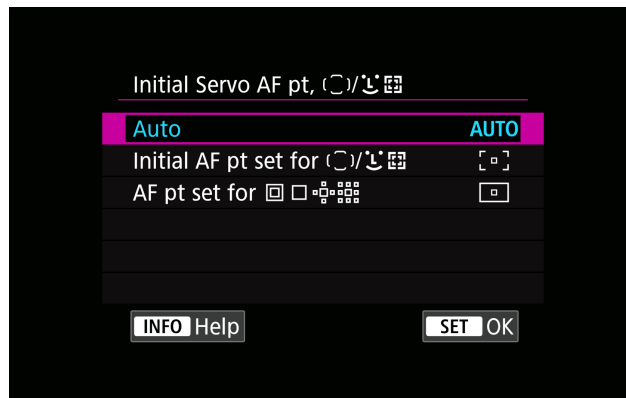
4.5.13 Subject Tracking Settings > AF Priority (People) > Disable

Turning off “people” subject detection is also a valid AF setting, in situations where the user may want the camera to be able to track a moving subject — such as a motorcycle on a curvy mountain road, an animal or bird moving across the frame, or any other non-human subject. With AF priority (People) turned off, the camera still can initially grab focus upon this type of subject, and then follow it (within the active AF Area) as it moves across or up/down around the frame.

The linking of the 191-point AF system with the separate, 400,000 pixel RGB metering system, gives the Mark III a powerful system to initially read your primary subject’s color, shape and relative size in the finder, and then identify that as you begin to shoot. For instance, if the subject was a yellow car, it’s relatively easy to put the initial AF point upon the subject (Initial Servo AF pt. on the 4th magenta-colored AF menu screen; see below), and let the viewfinder’s 191-point AF system track that car as it meanders around to different parts of the frame.

With human subject detection disabled in AI Servo AF (or Live View’s Servo AF), *if Automatic AF point selection (all AF points active) is set*, users have three choices to define where the camera begins to focus on non-human subjects — like the hypothetical yellow car just mentioned:

- **AUTO**
The camera will normally select the nearest, prominent subject in the scene as the starting point for AF and subject tracking, especially if it’s toward the center of the frame
- **Initial AF point set for [Auto AF point selection/Face Detect + Tracking AF]**
When the AF Area is set for Automatic AF point selection (a thin border appears around the entire AF array in the viewfinder), *and the camera is set to AI Servo AF*, the user can manually select any AF point he or she desires within the AF array, and that single point will be where AF begins from. *This can be independent of any previous manually selected AF point that the user may have worked with in Spot AF, 1-point AF or AF Point Expansion AF Areas.*
- **AF point set for [Spot AF, 1-point AF, AF Point Expansion]**
Whichever of the 191 AF points a user was working with before switching the AF Area over to Automatic AF point selection, that same point is maintained as the starting point for AF tracking when all points are active.



4.5.14 Summary: AF through the Viewfinder

Many professional still-image shooters will rarely use Live View, and for those prospective EOS-1D X Mark III customers, there's incredible power in this camera's through-the-viewfinder AF system. It goes well beyond the expansion of AF points from 61 to 191 in the Mark III, even though for some, that'll be the most obvious thing they see upon initially handling the camera.

Every aspect of this camera's AF capability has been enhanced, making it one of the most solid DSLRs in terms of AF in the entire camera industry.

The user who prefers just a single, manually-selected AF point and AI Servo AF will find strong support with the camera's rock-solid focus capabilities, its incredible 16 fps speeds and even more incredible burst rates when shooting RAW or RAW + JPEG images.

Photographers who prefer to let the camera do more of the work — especially those who have been tempted by modern mirrorless cameras, and capabilities like Face Detection — will again find the EOS-1D X Mark III a powerful tool for rapid shooting. The camera's new Head Detection — supported by deep learning technology, with libraries of data stored in the DIGIC X processor — can be a highly beneficial feature along with Face Detection. As mentioned, if faces become obscured, the camera can still put focus on a subject's head, and track the primary head around the scene within the 191-point AF array. And, impressively, do so at shooting speeds up to 16 fps, during viewfinder shooting.

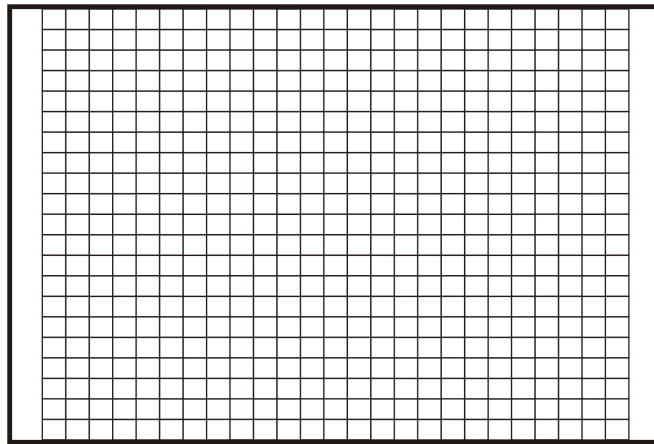
The EOS-1D X Mark III's outstanding AF performance doesn't end if it's switched to Live View. In fact, a host of important new features grace this camera during Live View operation, making this an appealing option for certain types of DSLR photography, even with fast-moving subjects. We'll explore this next, in this white paper.

4.5.15 Live View Autofocus

Strong improvements have been made to the EOS-1D X Mark III's Live View autofocus as well. With its potential for 20 fps shooting, even completely silently (with the Electronic Shutter active), Live View now becomes a useful option to still photographers in more situations. This is especially true when photographers can monopod- or tripod-mount the Mark III camera and lens.

Since this is a digital SLR, there are some important differences when users compare the AF system for Live View with the 191-point AF system used for viewfinder shooting. Some of the major points to consider include:

- Two totally separate AF detection systems are at work here. Live View (and video) AF read focus off the 20.1 million pixel imaging sensor, using Canon's Dual Pixel CMOS AF. Viewfinder AF, as described above, uses a totally separate, dedicated AF sensor, and does not read off the CMOS image sensor.
- Live View AF can cover an area up to 100% of the image (vertical dimension) and 90% in the horizontal dimension. This is a far greater area of total AF coverage of the picture area than is possible with the viewfinder AF system, for technical reasons (Note: this is lens-dependent; with certain Canon EF lenses or older Canon EF tele extenders, Live View AF coverage changes to approx. 80% x 80% of the picture area, horizontal & vertical).



With many current Canon EF lenses, Live View (and video) offer AF coverage over nearly the entire picture area. The 525 possible AF points available during Face Detect + Tracking (automatic AF point selection) are shown here. If a single point is manually selected, it can be moved around this entire active area, to any of 3,869 possible positions.

- Live View AF adds Eye Detect AF to its subject detection technologies.
- Like the Mark III's viewfinder AF, Live View does incorporate the new Head Detection technology — an important addition to Face Detection and Eye Detection. It can seamlessly take over if a face suddenly turns away, or becomes partially covered.
- Head Detection AF: the “deep learning” applied to the DIGIC X processor to study a large library of sports-based images of heads is optimized *separately* for Live View AF, as well as for the 191-point AF system used in viewfinder shooting.
- Unlike previous 1D-series versions, the EOS-1D X Mark III can perform Servo AF for moving subjects with Live View — and can do so up to the camera's maximum 20 fps shooting speed in Live View.
- The Mark III offers 525 distinct AF zones, when its AF Method is set to Face Detect + Tracking — nearly 4x the 143 zones offered the mirrorless EOS R camera.
- A single AF point can be moved to any of 3,869 distinct positions within the active AF area (assuming 100% x 90% AF coverage), allowing tremendous precision in where subject is focused upon.

- Dual Pixel CMOS AF is able to work with lens + extender combinations having maximum effective apertures as slow as f/11. (Viewfinder-based AF can function at effective maximum apertures of f/8 or faster.) This opens the door to autofocus during Live View shooting with extreme telephoto combinations, such as an effective 1,600mm with the EF 800mm f/5.6L IS and a Canon EF 2x III tele extender.

4.5.16 New Priority in Developing Live View AF

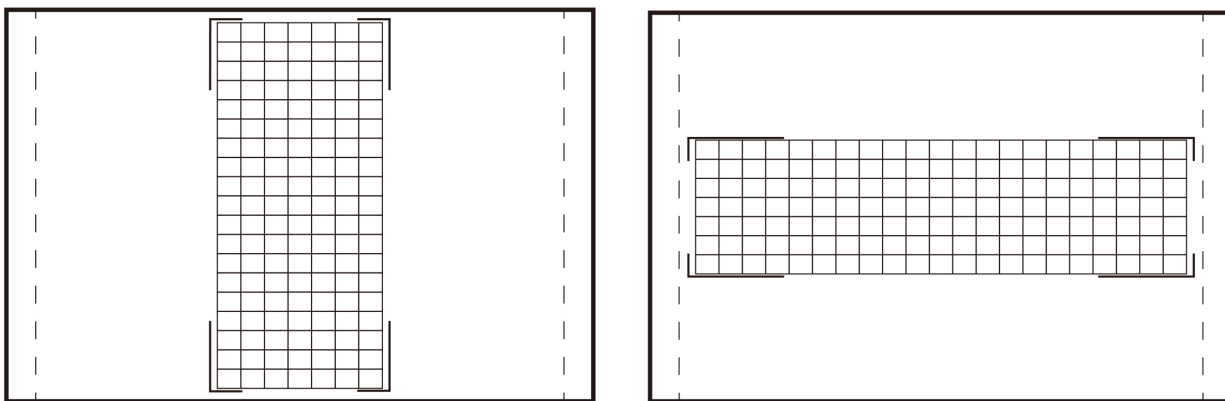
In developing the EOS-1D X Mark III, Canon engineers took a fresh look at Live View and its potential for the working professional. One example: research and development of the Live View Servo AF was subject to the same demanding testing and standards as viewfinder-based AI Servo AF. To repeat, the Mark III is the first EOS-1D series camera to offer Servo AF during Live View, still-image shooting.

Another example: Depth info is added to Live View AF. In cases where background colors or tones are similar to those of a subject, the AF system in the Mark III can use depth info to further isolate the primary subject, and resist any tendencies for the focus to drift toward the background.

4.5.17 AF Controls are Virtually Identical to Those for Viewfinder Shooting

There's less difference in the AF menu when the camera shifts from viewfinder to Live View shooting than any previous Canon EOS digital SLR camera:

- All AF "Cases," including the new Case A (Auto), are available to control Live View Servo AF (remember, the previous-generation EOS-1D X Mark II wasn't able to perform any Servo AF in Live View).
- Servo AF can be user-adjusted: the same Tracking Sensitivity, Accel./Decel. Tracking and independent Subject Tracking settings are available (they function identically as those for viewfinder shooting).
- AF Method (similar to "AF Area"): Large Zone AF (vertical) and Auto AF Point Selection are available. Live View adds an option for *horizontal*/Large Zone AF, not possible during viewfinder shooting with the 191-point AF array. Note that in Live View, the choice of AF sampling size is referred to as "AF Method;" AF Area is used in menus during viewfinder shooting.



In Live View, EOS-1D X Mark III users have the option to choose Vertical or Horizontal Large Zone AF methods. Either can be moved manually by the photographer.

4.5.18 Practical Benefits and Features, with Live View AF

In addition to those just mentioned, critical DSLR photographers will find that Live View AF brings some additional features, which can bring precision and performance to their primary task — getting good, sharp pictures in as many conditions as possible. A few of these include...

Critical manual focus viewing tools:

MF Peaking

A focus assist that works over the entire LCD screen, during Live View, by adding a distinct colored “band” around edges of any detail which is in sharp focus. This can be activated when an EF lens is set to MF; after One-Shot AF if focus is locked (with EF lenses offering electronic manual focusing, if Lens Electronic MF is activated in the LV AF menu); and with fully manual focus TS-E or MP-E lenses.

Focus Guide

With an EF lens set for Manual focus, tap the LCD screen to position a single reference AF point precisely where sharpest focus is desired, and turn the focus ring. Focus Guide marks appear above or below the focus box, and these align (and turn green) when sharpest focus is manually set. This can be combined with MF peaking, giving Live View users both a point-based method of focus confirmation, and MF Peaking giving a sharpness reference across the entire frame.

Focus Magnification

In any AF Method other than Face Detect + Tracking, press the rear “magnify” button, and users can toggle through 5x or 10x magnified views, and revert back to a full-image view. This can be done in either One-Shot AF or Servo AF with Live View, although Servo AF cannot be actively focusing when the magnify button is pressed.

4.5.19 Summary: Live View AF

It may seem of secondary importance in a digital SLR, but the EOS-1D X Mark III’s Live View offers strong AF possibilities, once again making Live View a viable option in some professional applications. Its focus tracking capabilities, highlighted by Face/Eye/Head Detection technologies (as well as Dual Pixel CMOS AF’s ability to focus over most of the picture area) put compelling tools within easy reach of the Mark III photographer.

The AF capabilities are on top of other Live View potential advantages for still photographers:

- Superior low-light performance — AF down to EV -6, and the low-light advantages of electronic viewing with the LCD screen.
- Up to 20 fps continuous shooting (vs. 16 fps, maximum, through the viewfinder), and that's with Servo AF active.
- Virtually silent shutter operation, when the Mark III's Electronic Shutter is activated in Live View.

Live View has always had appeal in situations where the photographer can slow down and take his or her time composing and setting-up a shot... tripod operation is an obvious example. With the EOS-1D X Mark III, add a healthy dose of high performance potential to that traditional appeal, and Live View again becomes a tool that some users will want to work with from time to time.

4.6 Metering and E-TTL Flash

Reliable in-camera metering is something EOS-1D series users have come to expect, and this is yet another area where some significant progress is achieved with the EOS-1D X Mark III. Again, it's not something customers or dealer staff will immediately see the first time they handle the camera — but knowledgeable users will appreciate the changes. We'll discuss the technological updates relating to ambient-light metering and E-TTL flash here.

During viewfinder shooting, metering in SLR cameras is traditionally handled by a separate, dedicated sensor, located in the top of the prism area, aimed down at the camera's focusing screen. That remains the case with the EOS-1D X Mark III.

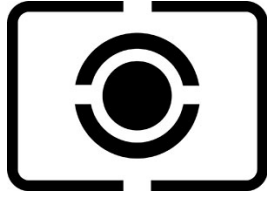
4.6.1 New 400,000 Pixel RGB Metering Sensor

This is Canon's most sophisticated metering sensor to date: an approximately 400,000 pixel, CMOS RGB + IR sensor, in some ways analogous to a small digital imaging sensor. Reading light and color, this metering sensor also provides subject recognition technology during viewfinder shooting, and subject tracking capabilities exceeding those of any previous Canon EOS digital SLR.

The metering sensor teams up with the new, square pixel AF sensor during viewfinder shooting, assisting the AF system with its subject detection capabilities. The metering sensor, with its color recognition capabilities and 400,000 pixel resolution, can recognize an initial subject, and then update the AF system as to its location during Zone AF, Large Zone AF, and Auto AF Point Selection shooting through the viewfinder.

4.6.2 Four Primary Metering Modes

Like previous high-end Canon EOS DSLRs, the EOS-1D X Mark III provides four primary metering modes during ambient-light shooting through the viewfinder.



Evaluative metering

The camera reads most of the picture area, breaking it into 216 distinct metering zones. Evaluative metering teams up with the AF system, which indicates the location of the primary subject in the frame (This can now include detected faces, as explained below).

Based on the brightness of the metering zones in this area, the metering system then performs a sophisticated evaluation of brightness levels throughout the remainder of the picture area, applying its own compensation for uneven lighting in the scene, or problems such as back-lighting or a spot-lit primary subject.

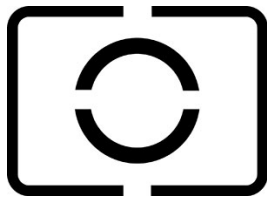
For many photographers — especially those relying on an auto exposure shooting mode — Evaluative metering is a tremendous starting point for exposure control.



Center-weighted metering

A traditional form of overall metering which has been part of the SLR scene for decades, Center-weighted metering reads the entire, 216-zone metering area. But regardless of where the AF system puts focus points, metering is always concentrated on the central area of the frame, with reduced sensitivity as the system reads away from the center.

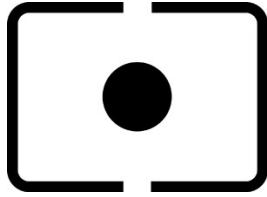
Unlike Evaluative metering, it does no zone-by-zone evaluation of varying brightness levels, and accordingly does not perform its own compensation for tricky lighting. Experienced users may prefer this, because they can apply strictly their own compensation, if and when they encounter difficult lighting situations (With Evaluative metering, any user-applied exposure compensation is on top of, and in addition to, any compensation applied by the metering system).



Partial metering

Reading only 6.2% of the total picture area, Partial metering can be useful for isolating just a part of the scene, when measuring ambient light — such as metering skin tones in a portrait. It's always in the center of the picture area, regardless of which AF point(s) are being used, and there's no way to move it off-center. Like Spot

metering, Partial metering works well with Manual exposure, or when teamed with AE Lock in an auto exposure mode, like Av or Tv.



Spot metering

Even finer metering of a small area of a scene is possible with Spot metering. The EOS-1D X Mark III's Spot metering measures just 1.5% of the picture area, so very precise measurements of shadows, highlights, skin tones, or other important areas in a scene can be measured.

Spot metering is normally at the center of the frame, but with the EOS-1D series, a Custom Function allows Spot metering to match the location of a manually-selected, off-center AF point. This only applies if the user has manually moved his or her AF point off-center; in AF Area (or AF Method, during Live View) settings like Automatic AF Point Select, Spot metering is always at the center.

*An important note: as with previous Canon EOS cameras, these metering modes apply to measuring continuous, ambient light only — not E-TTL flash. Users can apply (for example) Partial or Spot metering for ambient-light measurement in a flash picture, but actual E-TTL flash exposure will be read by the full-area, Evaluative E-TTL flash metering system. Spot metering of flash *is* possible, using Flash Exposure Lock (FEL), but again, it's not activated by a change in metering mode settings.*

4.6.3 Face Detection: AF and Metering

We've discussed the EOS-1D X Mark III's outstanding AF capabilities, taking advantage of Face Detection and new Head Detection technologies. The 400,000 pixel RGB metering sensor is a key player in these capabilities during viewfinder shooting, working in tandem with the AF system to put AF points upon faces, or head when faces are obscured.

But Evaluative metering in the Mark III can also leverage face detection, *and identify a face as the primary subject for metering*. Evaluative metering then factors-in brightness from the remaining metering zones and arrives at a final, balanced exposure.

This has tremendous potential for event, wedding and sports photographers who prefer to work with Auto exposure, since it minimizes exposure from changes in a subject's clothing. A wedding photographer, for example, will usually have less need for exposure compensation when shooting subjects in white and then in dark or black clothing, since Evaluative metering is tuned to identify and concentrate exposure upon faces. And the Evaluative metering will "follow" that primary detected face, during a sequence of pictures, even if it moves from side-to-side in the frame.

4.6.4 Separate DIGIC 8 Processor for Metering and AF

During viewfinder shooting, a dedicated Canon DIGIC 8 processor — applied strictly for AF and metering control — manages this color metering sensor, and its cooperation with the AF sensor. This is in contrast with less-advanced DSLR cameras, which often rely strictly on one central, primary processor to handle AF and metering tasks. And remember, before the

advent of the EOS-1D X Mark III's supremely powerful DIGIC X main processor, DIGIC 8 was Canon's top-of-the-line still-image processor. Now, that same processor teams-up with the DIGIC X, strictly for metering and AF control.

4.6.5 E-TTL Flash Metering

Again, looking first at viewfinder shooting, the same 400,000 pixel RGB + IR sensor that meters ambient light is used for E-TTL flash with Canon EX- and EL-series speedlites. Using the same sensor for ambient and flash metering is nothing new with Canon EOS cameras, but it has some clear advantages in terms of balanced fill flash, where separate inputs must be combined in a final E-TTL flash exposure.



This RGB + IR metering sensor has greater sensitivity to light, and accordingly, the EOS-1D X Mark III now can read the low-power pre-flash from E-TTL speedlites at even greater distances than previous EOS DSLRs. This is especially valuable during bounce flash shooting, as well as shooting through softboxes, umbrellas and diffusers — all of which challenge the single, already-low power pre-flash used for E-TTL flash metering.

Maximum flash sync speed remains 1/250th second, and High Speed Sync is possible with dedicated Canon speedlites.

Like recent EOS-1D series cameras, the Mark III has a dual analog scale running vertically along the right-side of the viewfinder, showing the level of flash exposure (generally, if any E-TTL Flash Exposure Compensation has been applied), relative to the amount of user-applied compensation of ambient light (or, in Manual exposure mode, the actual level of current ambient exposure, based on the camera settings in effect at that moment).

4.6.6 New: E-TTL Face Priority

Located in the camera's External Speedlite Control menu under E-TTL II meter, E-TTL Face Priority is an option for full-area E-TTL flash metering. Again, leveraging the Face Detection technology within the EOS-1D X Mark III's 400,000 pixel RGB + IR metering sensor, it's the first Canon EOS DSLR that can read E-TTL pre-flash information from a detected human face, and concentrate flash metering there. As we discussed with Evaluative metering and Face Priority, this is a big step forward for fast-working event, wedding or news photographers. Flash metering is concentrated upon a primary detected face, and less likely to be as influenced by light or dark clothing, and other unusual objects within a scene.

Photographers also have the option to revert E-TTL flash metering with the Mark III camera to Evaluative, which may be preferable in situations such as fashion photography, where there may be human faces, but the goal is to properly expose more in the scene besides human faces.

Average changes E-TTL flash metering to read the entire 216-zone metering area, with even coverage and sensitivity — no concentration at the zones corresponding to the active AF point(s), nor for any detected faces in the scene. Both Evaluative and Average have been options for E-TTL flash exposure with Canon EOS cameras for some time.

4.6.7 New: Continuous Flash Control

Again located in the External Speedlite Control menu, this is a new feature that allows a choice of how E-TTL flash will be metered when a photographer needs to shoot a quick series of continuous flash pictures, holding the shutter button fully down.

Use E-TTL from 1st shot

This new feature locks-in the flash power for the first shot in a flash sequence, and retains it for a subsequent series of E-TTL flash pictures. In situations where a photographer doesn't anticipate changes in flash-to-subject distance, this can prevent variations in flash exposure from shot to shot, if compositions or subjects within the frame change during the sequence of shots.

E-TTL each shot

This is traditional Canon E-TTL operation when a quick series of shots is taken. A fresh pre-flash reading is fired an instant before each shot is taken, and E-TTL exposure is updated for each picture. In situations where a sequence of flash pictures is needed, but the flash-to-subject distance will likely change — such as a bride coming down a church aisle — this would usually be the preferred setting.

To be clear, Continuous Flash Control (especially the Use E-TTL from 1st shot option) applies to sequences of flash pictures where the camera is set to one of the Continuous DRIVE settings, and the user's finger holds the shutter button fully down.

This can be a reason to change the Continuous Shooting Speed setting the camera's Custom Functions menu (screen #4)... there are many situations where flash at 16 fps or 10 fps — the default DRIVE speeds for High-speed Continuous and Continuous — would be far too fast for effective flash recycle after the first few pictures... any of the Continuous DRIVE settings can be slowed-down to a more practical rate for sequences of flash pictures, down to 1 fps if desired.

4.6.8 New: E-TTL Balance

User-applied adjustment of the overall flash/ambient exposure balance. Even in Manual exposure mode — where ambient exposure, by definition, won't change — this setting lets the photographer make a primary choice of relative flash power, prior to any user-applied flash or ambient exposure compensation.

Ambient Priority

E-TTL flash is toned-down, so that more emphasis is on available light in a scene. In auto exposure modes, like P, Tv or Av, ambient exposure is slightly increased.

Standard

E-TTL blending of flash and ambient, very similar to previous EOS DSLRs. The user's choice of exposure mode (along with the level of ambient light) is the primary factor

in how flash and ambient are integrated. No changes here, compared to past EOS models.

Flash Priority

E-TTL flash is brightened, relative to ambient light. In auto exposure modes, ambient light is slightly darkened, giving emphasis to illumination from the speedlite(s).

4.6.9 New: Speedlite Operation During Live View

Previous Canon EOS cameras could not read the rapid E-TTL pre-flash off the imaging sensor, during Live View shooting. The result was a complex operational sequence for Live View flash operation with EX- or EL-series Canon speedlites. It required a brief but complete shut-down of Live View, metering of E-TTL pre-flash with the mirror down, and then the mirror rising again and exposure taking place.

Advances in the operational speed of EOS-1D X Mark III's 20.1 million pixel CMOS image sensor mean that the sensor can now perform metering of E-TTL pre-flash, and thus Live View flash can be performed with less operational time, and far more quietly than was possible with the previous Mark II model, and other EOS digital SLRs.

While not directly related, it's important to mention here that during Live View, if the Shutter Mode is set for Electronic (silent Live View operation), flash shooting with EOS speedlites is not possible, and any attached speedlite, studio flash, or radio remote system will not fire.

4.6.10 Additional Flash Features, Unique to EOS-1D Series

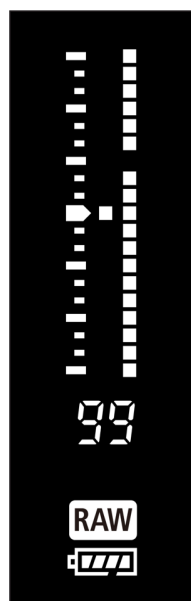
Within the Canon EOS line, EOS-1D series models have offered several flash-oriented features which weren't possible with other cameras in the line-up. These are carried over in the EOS-1D X Mark III, and include:

Flash Metered Manual, with Canon EX- and EL-series speedlites

Manual flash exposure can be metered and confirmed — and directly compared to the ambient light level in a scene — using the Flash Metered Manual feature in EOS-1D series cameras. And, it's done using Spot metering of flash illumination, at the pre-set Manual flash power level, using the Flash Exposure Lock (FEL) button on the camera. *(There's no need to change the camera's basic metering mode to Spot metering here... the spot reading of pre-flash is automatically applied when the FEL button is pressed, with an EX- or EL-series speedlite mounted).*

The photographer needs to pre-set general camera settings (shooting mode, specific shutter speed/aperture if applicable, ISO, and a general Manual flash power level). Aim the center of the viewfinder at a key subject in the scene, and press the FEL button.

A second vertical scale appears, along the far-right side of either the viewfinder, or LCD screen if using Live View. It's a "reverse" scale, with a single blank/black index showing the relative level of flash power, as measured from the FEL pre-flash, at the Manual flash power level set.



Once the FEL button is pressed, Flash Metered Manual displays a distinct “reversed” analog scale, to the right of the familiar vertical scale in the viewfinder that’s used for ambient exposure control. The single open spot at “+1” on the far right indicates that manual flash exposure, at the current ISO, lens aperture and manual flash power level, was measured as one stop over what the camera “thinks” would generate a neutral-gray flash exposure result. To the left, the single index at the middle, zero setting is a measurement of ambient light in the scene (if the camera is in an auto exposure mode, such as Av or Tv, it indicates any user-applied Exposure Compensation to ambient light).

Using Manual exposure mode in the camera as an example, you can easily adjust the final, actual manual flash exposure by just changing the lens aperture — you’ll see the far-right, vertical flash scale shift as you do. If the flash output measured during the FEL pre-flash was far too dark or bright, adjust the Speedlite’s Manual flash power anywhere from Full/1:1 down to 1/128th power, and repeat the procedure. The camera’s ISO can be changed as well.

Also: the relative color and tone of what the center spot area of the viewfinder or LCD screen is aimed at will dictate the read-out of Manual flash exposure, when the FEL button is pressed. Aimed at a bride’s white wedding dress, users will normally get best final results by deliberately over-exposing flash, using the far-right scale (the black reference mark on the scale deliberately placed on the “plus” side, rather than in the dead-center — which normally produces a middle-gray exposure equivalent of the metered subject).

Conversely, a reading off a dark actual subject will usually need to be deliberately shifted down on the scale, to intentionally under-expose the final Manual flash image. A dark subject would then tend to be rendered as a dark-toned subject in the final flash picture, rather than a washed-out gray subject.

In situations where a photographer simply prefers to work with Manual flash, especially if flash-to-subject distance is not expected to change during shooting, Flash Metered Manual can be a quick and effective alternative to automatic, E-TTL flash.

It’s a bit of a hidden feature, so many EOS-1D series users may not even know it’s there. But with any EX- or EL-series speedlite, it’s something to try, and know that it’s available whenever the photographer needs it.

Hold FEL flash readings, by changing Timer Settings

A difficulty with EOS models other than the EOS-1D series, for EX- or EL-series speedlite users, occurs if they use the Flash Exposure Lock (FEL) feature (This applies to Flash Metered Manual, discussed immediately above, as well as traditional FEL, which normally is a tool used during automatic E-TTL flash).

Once the FEL button is pressed, a pre-flash reading is taken, and held in memory for up to 16 seconds. Before the first picture is taken, it can be extended for longer periods, if the user keeps his/her finger pressing the shutter button half-way down.

More daunting is the short time period for holding an FEL reading *after* a picture is taken. Unless deliberate half-pressure is kept on the shutter button once a shot is taken, the meter timer in the camera turns off 2 seconds after a shot is taken. And with that, the deliberate spot reading of pre-flash is lost as well.

Changing the Meter Timer settings can liberate photographers who want to utilize this feature. Keep in mind it also works for Canon's Wireless E-TTL, including radio-based Wireless E-TTL flash, so creative photographers can extend the flash system's usefulness with this ability.

Menu > Custom Functions > C.Fn screen 7 > Timer Duration

16 second timer — this adjusts how long an FEL reading will be held before the first picture is taken, without maintaining constant pressure on the shutter button or AF-ON/Smart Controller, on the EOS-1D X Mark III. This can be extended up to 60 minutes, using the Menu. Take a reading off a critical part of a subject, and before a shot is taken, you have anywhere from 1 second ~ 60 minutes to have the reading stay in-camera.

Timer after release — this is the critical one, since it dictates what happens after the first picture is taken. Normally, the reading disappears 2 seconds after a shot is taken, if pressure is removed from the shutter button or AF-ON button. Using Timer After Release in the menu, this can be changed anywhere from 1 second ~ 60 minutes. Extending it to 30 seconds or 1 minute will often give the photographer plenty of time for a subsequent picture, using the same FEL reading, after each picture is taken with a locked-in reading.

Keep in mind, of course that extending either meter-on timer does use more of the camera's battery power; this is one reason why default times are limited.

4.6.11 Flash System Summary

The EOS-1D X Mark III's advances in autofocus and metering carry-over directly to flash photography with Canon speedlites. The ability to concentrate E-TTL Evaluative flash metering on a primary detected human face has the potential to change some photographers' perceptions about automatic flash exposure, especially for events, weddings and other fast-paced situations. Head Detection AF backs-up this capability, continuing to provide flash metering that can be concentrated upon human subjects when faces are momentarily obscured, turned away, and so on — again, a potential benefit to event photographers or photojournalists, in fast-paced shooting situations.

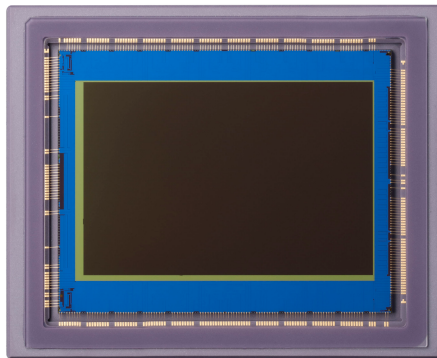
And, new settings in the photographer's hands during speedlite shooting allow even more user-control. Features like E-TTL Balance control, and the choice of holding exposure at the level of the first shot for a sequence of pictures, give photographers methods to further tailor the camera and a Canon speedlite to the situation at hand.

Whether it's a single speedlite on-camera, or up to 15 off-camera speedlites in a complex Wireless E-TTL set-up, the EOS-1D X Mark III holds its own as Canon's top-of-the-line pro camera in these demanding situations.

4.7 Image Quality

Some users or reviewers might quickly conclude that with a 20.1 million pixel sensor, that resulting image quality would be the same as with the previous EOS-1D X Mark II camera. As we'll explain, that would be a serious oversight.

In fact, a broad range of technological improvements in all aspects of the camera's hardware, processing, and software produce image quality gains which will be noticed by the critical, demanding professional users that this camera was designed for. We'll examine how these changes impact image quality, in this section. In keeping with the intent of this White Paper, our comments will center around still-image aspects of Image Quality.



As with so many other systems and components in the EOS-1D X Mark III, the full-frame CMOS image sensor is totally re-designed, providing even greater speed and image quality than previous versions of the camera. Details are explained immediately below.

4.7.1 Totally New 20.1 Million Pixel CMOS Image Sensor

This is a completely re-designed, full-frame image sensor. Capable of Dual Pixel CMOS AF during Live View and video recording, this sensor is entirely designed and manufactured by Canon. Among its highlights:

- Lower noise
Circuitry surrounding each pixel enhances noise control at the individual pixel level.
- Superior sensitivity
Increases in pixel sensitivity to light contribute to lower overall noise (especially at higher ISOs... less amplification of pixel signals is needed with added designed-in sensitivity).
- Increased sensor read-out speed
The read-out circuit is significantly faster at the sensor. This brings improvements in performance from burst shooting of still images (at up to 20 fps, in Live View) to 4K full-frame video. Rolling shutter, a potential gremlin during silent electronic shutter still-image shooting and video, is reduced, and the sensor's read-out speed is a major reason.

4.7.2 Why 20 Million Pixels?

A legitimate question, in an era of digital SLRs and mirrorless cameras boasting 50 million pixels and above. High pixel resolution brings obvious benefits to many landscape and studio photographers, particularly when large printed output is a primary deliverable.

However, a relatively modest pixel count of 20.1 million effective pixels brings its own benefits. Consider the following points:

The overwhelming design goal of the EOS-1D series is performance

This camera was designed first and foremost for sports, wildlife and action photographers. Working press shooters, especially those at major agencies, prioritize speed for both shooting and transferring images — and as anyone who's downloaded an e-mail attachment knows, large files slow down movements of images. Canon consulted heavily with major press and photo agencies in the development of the EOS-1D X Mark III, and the strong consensus was that 20 million pixels was more than sufficient for their needs, including double-page spreads in magazines.

Support for common inkjet print sizes

Directly printing a full-resolution file (5472 x 3648 pixel resolution) — with no interpolation of the pixel information in software, or “re-sizing” a file, before printing:

at 300 dpi — print size 18 x 12 inches / 46 x 30 cm
(essentially, a 13x19-inch direct print... note that at these settings, images from the EOS-1D X Mark III will fill a double-page spread in a US 8.5 x 11-inch magazine page size, or the slightly larger A4-size magazine pages in many markets)

at 200 dpi — print size 27 x 18 inches / 68 x 46 cm
(many wide-format printers can produce excellent quality at 200 dpi)

Of course, at the computer, moderate increases in print size are easily possible, making larger prints a practical option for many users. No one is saying the detail in 60-inch, wide-format prints will match that from a 50 million pixel Canon EOS 5Ds camera, but the EOS-1D X Mark III's 20.1 million pixel sensor's pixel count is viable in today's professional world.

Support for full-page and double-page magazine spreads

Similarly, 20 million pixels (actual resolution 5472 x 3648) provides the working photographer with sufficient pixel resolution for the vast majority of book or magazine publishing tasks. A US-based publication at standard 8.5 x 11-inch size translates into a double-page spread of 17 x 11 inches (43 x 28 cm).

At 300 dpi, as indicated above, a non-interpolated, full-res RAW, JPEG or HEIF files from the EOS-1D X Mark III will fill 18 x 12 inches... in other words, for a double-page spread at typical US publication sizes, the file would need to be reduced slightly in size. A4-size, double-page spreads are likewise well within the realm of what a 20 million pixel sensor can handle, with outstanding potential final print quality.

A strong platform for reducing high-ISO noise

Targeting sports photographers and photojournalists, the EOS-1D series must be able to produce high-quality imagery at high ISO settings. The larger pixels of a 20 million pixel, full-frame CMOS image sensor provide an excellent foundation for delivering minimal noise and high image qualities at ISOs such as 3200, 6400, and above. All else being equal, a high-resolution image sensor, with smaller pixels, tends to be more prone to digital noise at high ISO levels.

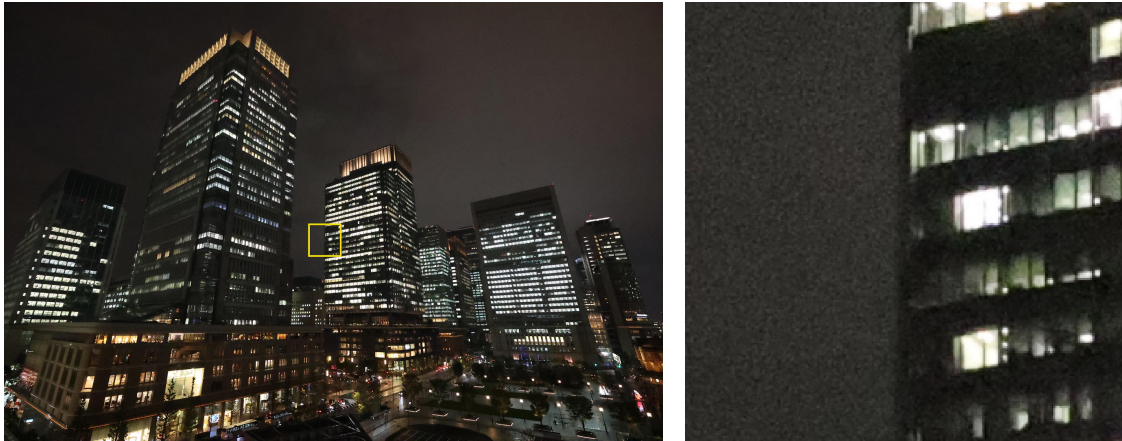
4.7.3 ISO Sensitivity Range and Control Options

Base ISO range on the EOS-1D X Mark III is the broadest to date on a Canon EOS digital SLR camera. The standard, factory-default ISO range is ISO 100–102,400. ISO expansion is available as follows, within the red shooting menu (Screen #2 > ISO Speed Settings > ISO Speed Range [Minimum] and [Maximum]):

L — ISO 50 equivalent
H1 — ISO 204,800 equivalent
H2 — ISO 409,600 equivalent
H3 — ISO 819,200 equivalent

High ISO Noise

A series of new hardware and software combine to lower visible noise at higher ISOs, a critical image quality factor in a camera targeting users who often need to work at elevated ISO settings. As with so many aspects of improved performance with the EOS-1D X Mark III, it's the combination of factors that result in noticeable gains and improvements for critical photographers and videographers.



Impressive high-ISO performance in low light is an important benefit of the new imaging system within the EOS-1D X Mark III. Here, a full image taken at ISO 51,200 is shown on left, with a small cropped section indicated. A magnified, detailed view of that small section shows an example of the camera's noise control.

- New 20.1MP, Canon CMOS sensor
As mentioned above, new sensor architecture attacks high-ISO noise at the pixel level, meaning less noise before brightness signals ever reach the primary processor.
- New DIGIC X processor
Faster processing, handling even more noise-reduction calculations and algorithms for every still image processed in-camera...this applies to video, as well. The advanced noise reduction processing at the sensor is especially effective at the default ISO range, which again extends to ISO 102,400.

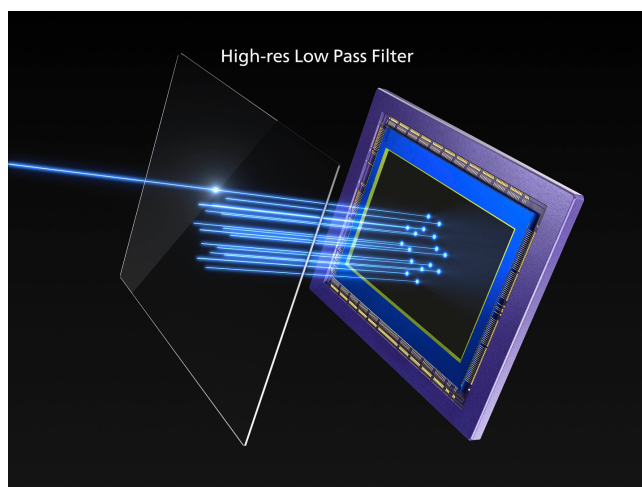
While Canon engineers are careful not to over-promise on results users should expect, overall preliminary comparisons of images show about a 1-stop improvement in general noise performance vs. the previous EOS-1D X Mark II camera.

Another benefit: RAW image files are tuned to deliver better high-ISO noise results, before any noise reduction steps are applied. This is in anticipation that many users will ultimately process RAW files in 3rd-party RAW conversion software.

4.7.4 New: High Detail Low-Pass Filter Enhances Detail, Minimizes Risk of Moiré

The new high detail low-pass filter is another example of completely new engineering for a Canon EOS camera, bringing additional image quality improvements to images from the camera's 20.1 million pixel image sensor.

Traditionally, low-pass filters are a very precise, layered set of thin, "glass" filters immediately in front of the image sensor in digital cameras. Typically, they take a single incoming light ray, and *divide it by the width of one pixel into four different rays*. This scattering of light can lower the appearance of sharpness at high magnifications, but it's been proven over the years to minimize risk of moiré patterns, and false colors.



A Canon first — the High Detail Low-Pass Filter does what its name suggests — breaking a single incoming light ray into 16 separate, precisely controlled rays at the sensor. In concert with the powerful DIGIC X processor, the result is enhanced subject detail and sharpness, and even less risk of moiré patterns and false colors, vs. conventional low-pass filters (which typically break a single ray into four separate rays at the sensor).

What Canon has done is implement an entirely new low-pass filter concept. In the EOS-1D X Mark III, the high detail low-pass filter divides incoming light rays into 16 separate beams, not just four. This point-image separation is optimized for this image sensor, so it improves apparent detail and resolution, while simultaneously separating incoming light into eight radial directions — significantly lowering the risk of rainbow-like moiré patterns, in distant repeating linear detail, or extremely fine subject patterns. In particular, risk of false colors or patterns in diagonal linear subject detail is significantly reduced (moiré is reduced to approximately 1/4th the level previously possible, without lowering visible image detail and resolution), according to Canon engineers, with this new low-pass filter.

4.7.5 High-Resolution Processing

With superior fine detail rendering via the new CMOS image sensor and the significantly enhanced low-pass filter, Canon engineers then targeted processing as another tool to get the absolute maximum levels of detail and quality out of the Mark III's 20.1 million pixel image sensor.

The powerful DIGIC X processor can apply many more processing steps and algorithms during image processing, and Canon engineers accordingly have been able to label the new EOS-1D X Mark III processing as “High-resolution processing.”

As the name suggests, image processing in-camera now leverages sharper details, including minimizing the risk of light “borders” surrounding edges of dark subjects in JPEG images. Enhanced fine detail, especially in diagonal lines, is another benefit of the combination of the sophisticated Low-pass filter, and then upgraded processing. And, once again in tandem with the new low-pass filtration over the image sensor, high resolution processing minimizes the risk of moiré and false colors, especially in images with fine, repeating line patterns at the subject.

4.7.6 Digital Lens Optimizer (DLO) — Maximizing EF lens Optical Performance

Digital Lens Optimizer technology is not new with the EOS-1D X Mark III camera. First seen in 2012, DLO has been a part of RAW image processing with Canon’s Digital Photo Professional software since that time. For years, DLO had to be applied only during RAW image processing in DPP, and users could not enjoy its benefits if shooting in-camera JPEGs.

Digital Lens Optimizer is a processing technology that allows Canon lens engineers to identify specific criteria of lens performance at any given aperture, and across a range of focus distances. Based on thorough analysis of lens development specifics, and exhaustive tests of actual lenses, the engineers can quantify a range of optical imperfections which can occur. Mapped out, DLO now neutralizes and corrects many of these via processing software.

Factors like softness from lens diffraction at small lens apertures, chromatic aberrations (“color fringing”) in specific situations (lateral and axial chromatic aberrations) and even reductions in contrast and resolution at wide-open apertures are identified, and can be specifically addressed, as the shooting situation calls for it. The bottom line is a restoration of original, intended lens sharpness and contrast, even when actual conditions would reduce what the lens is able to deliver. In a way, users can think of DLO as a very smart form of sharpening, tied to the exact lens in use.

First seen in the Canon EOS 5D Mark IV, the DLO effect can be performed in-camera, to JPEG or HEIF images. If activated during RAW image shooting, by default, Canon’s Digital Photo Professional software will apply the DLO corrections to RAW files as they’re opened, and the level of these corrections can be adjusted by the photographer in DPP as desired.

Available File Types

- RAW (full-resolution Canon .CR3 RAW files)
- C-RAW (Compact RAW — full-resolution; Canon .CR3 compact RAW files)
- JPEG (Full or reduced-resolution .JPG files; 8-bits per channel; processed in-camera)
- HEIF (Full resolution .HIF files; 10-bits per channel; processed in-camera)

RAW or C-RAW + JPEG files (any available JPEG resolution) can be taken at any time. If HEIF images are selected, RAW (or C-RAW) + HEIF (full-res only) can likewise be selected by the photographer.

4.7.7 A New In-camera File Type: HDR-PQ HEIF Files

A growing trend in 21st century electronics and computers is a move toward High Dynamic Range displays. Whether in mobile devices such as smartphones, computer displays, or home

TVs, there's increasing awareness of the potential gained by displaying photographic images and video with a wider range of detail in bright areas.

High dynamic range HEIF (High Efficiency Image Format) still image files are a first for Canon EOS cameras, and it offers the EOS-1D X Mark III photographer an alternative to traditional JPEG images. These are full-resolution image files, processed in-camera into a finished file (similarly to how a JPEG image is created).

The difference in these files is that they're 10-bit per channel files (vs. 8-bit per channel with JPEGs), and they specifically extend dynamic range in highlight areas — *when viewed on compatible display devices*. This is based on HDR PQ (Perceptual Quantization) gamma correction. The HDR PQ method is an industry-standard gamma method applied to commercial and web-based movies (as opposed to the HLG method, which is frequently used in TV broadcasts).

In particular, HEIF files are intended to be viewed on HDR-compliant displays and monitors. When viewed on compliant displays, a wider tonal range is visible — without need to edit or process the file. Be aware that many types of computer viewing software are *not* compatible with HEIF files, as of early 2020, so the HEIF file option should not be considered a general, everyday alternative to JPEGs. But there's a clear trend in the electronics world toward increasing adaptation of HDR-compatible displays. HEIF files from the EOS-1D X Mark III can be viewed and edited in versions of Canon's Digital Photo Professional (DPP) software that are compatible with files from the EOS-1D X Mark III camera.

Normally, the choice for RAW and/or JPEG images is done in the Image Type/Size menu area **(Red shooting menu > Screen #2 > Img type/size > select RAW or JPEG)**.

To change from JPEG to HEIF files, a separate menu line-item must be enabled:
Red shooting menu > Screen #4 > HDR PQ Settings > Disable/Enable

A few additional notes on the new HEIF file type:

- Canon expects future updates to select high-end Canon printers, making them compatible with the expanded tonal range of HEIF files, via "HDR Print"
- When shooting HEIF images, Canon recommends that Highlight Tone Priority (D+) be active, to enhance the expanded tonal range effect in bright highlight areas
- Typical file sizes, on camera's memory card:

RAW images — approx. 22.1MB
C-Raw images — approx. 13.1 MB
HEIF images — approx. 7.6 MB
JPEG images (full-resolution, Large/Fine) — approx. 7.6 MB

- Conventional .JPG files (standard dynamic range) can be produced in-camera, from HEIF original files. Please note that in general, JPEGs produced in this manner will not show the benefits of HEIF's added tonal range in highlight areas, even if viewed on HDR-type displays.

(Playback menu > 1st menu screen > HEIF - JPEG conversion > Select image file)

- Two types of display methods can be selected in-camera to enhance the increased highlight detail, and applied during viewing of EOS-1D X Mark III HEIF images (on the camera's LCD screen, and during playback on compatible monitors or HDTVs):

Exposure Priority (mid-tones) ***Tones Priority (highlights)***

Both options apply only to *viewing* of HEIF image files, and do not change tonal values in the actual file itself.

- Both JPEG and HEIF images can be set to 10 levels of compression, in-camera
- Technical aspects of HDR-PQ HEIF images:
 - * Supports HD recording at ITU-R BT.2100 standard (PQ)
 - * Gradation: 10 bits per channel
- For technical reasons, HEIF images cannot be taken during Live View with Electronic shutter (silent shutter) operation active.

4.7.8 New: Clarity Image Control Option

Along with full Canon Picture Style control, the EOS-1D X Mark III introduces a new in-camera control element for Canon photographers: Clarity adjusts the contrast level in mid-tone areas of RAW and JPEG images. The effects are similar to the “Clarity” settings in popular third-party RAW image processing software, although exact settings of course will differ slightly.

The primary point is that unlike overall Contrast control (within Canon’s Picture Style commands) — which varies the appearance of bright highlights and darker shadow areas — Clarity attempts to vary the appearance of contrast within the mid-tones, exclusively. Clarity has little or no impact on highlights and shadows.

This is a separate, independent control from the familiar Picture Style commands:

Red shooting menu > Screen #1 > Clarity > adjustment scale, range -4 to +4 steps

As a practical matter, reducing Clarity can sometimes be beneficial to further soften contrast within skin tones in portraits, and other subjects where subtle rendition is desired. Raising Clarity settings, on the other hand, can give more “snap” to subjects photographed in overcast lighting, without significantly affecting bright or dark areas of the scene.

4.7.9 Traditional Canon Image Controls with the EOS-1D X Mark III

One comforting aspect of the EOS-1D X Mark III is that for previous Canon users, many of the menu items and operations will seem familiar. In terms of image quality, many of the built-in capabilities Canon users have worked with in the past are continued in the Mark III. Some of these include:

Picture Style

Applicable to JPEG images, HEIF images, video files (actually, a potentially important element for any of these file types); and RAW images if processed in Canon’s DPP software. Eight specific “looks,” with variations to color palette and how color is rendered, contrast, sharpening, and color tone; user-adjustment easily possible from factory-default settings.

One change in the EOS-1D Mark III: the default level of sharpening, along with companion Fineness and Threshold detail settings, have been altered for the Auto, Standard, Portrait and Landscape Picture Style settings...users remain able to

completely adjust detail settings to suit their preferences, using the Picture Style menu > Detail Settings commands.

Highlight Tone Priority (HTP)

Built-in correction to extend dynamic range, adding up to a stop of detail in bright highlight areas. Combined with the Neutral Picture Style, this is especially effective when shooting under harsh sunlight, or contrasty indoor lighting (spot lighting on stage, etc.). Two levels of HTP: "Enable" (standard correction of highlights) and "Enhanced" (stronger highlight tonal expansion). Both directly add to tonal range in highlights with JPEG, HEIF and video images; RAW and C-Raw images likewise have added tonal detail, if processed in Canon's DPP software (HTP is ignored if set in-camera, and RAW files are processed in third-party software).

Auto Lighting Optimizer (ALO)

Another Canon technology, introduced with the EOS 5D Mark II and Rebel XSi cameras in 2008. Originally an imaging setting with two tasks: add detail in darker shadow areas (the opposite of HTP) and to slightly alter the tone curve of "flat" images to add more overall contrast. Now, ALO also aims to increase detail and tones in bright highlight areas, so it's an interesting alternative on bright, contrasty days to HTP. Can be disabled, or set to Low, Standard or High levels, in-camera. Again, directly applied to video and JPEG imagery; and applicable to RAW files if shot with the setting active, and then processed in Canon's DPP software.

4.7.10 Image Quality Summary

The knowledgeable user is the foundation of the target audience a professional camera appeals to, and knowledgeable users know that the number of pixels in a digital camera is only one part of its image quality story.

In the EOS-1D X Mark III, it's clear that substantial gains have been made in the name of total image quality, especially concentrating on the needs of many news and event photographers in the camera's target audience. While full-resolution pixel count appears unchanged, the Mark III is loaded with improvements, from the sensor and its low-pass filter array to its processing and noise reduction. Fine detail will be even better depicted in this camera, and yet with reduced potential for moire, high ISO noise and superior rendering of diagonal fine detail.

Whether the final output is .JPG files for on-screen viewing, HEIF images for large-screen HDR displays or RAW images for publication or printed output, there's little doubt that the combination of incredible speed and performance, with low-light capabilities and the overall image quality improvements, combine to make the EOS-1D X Mark III experience a truly satisfying one for the most demanding professionals and serious photo enthusiasts.

4.8 The Body: Controls, Layout, Operation and Battery Power

Overriding any other design considerations in the latest version of the EOS-1D X camera is a continuity of body design. This camera simply must feel familiar, first and foremost, to the experienced Canon EOS user. As we've mentioned before, this obvious external similarity to the previous-generation 1D X Mark II may lead some to think that little if anything has changed on the latest Mark III camera, but as we've discussed on the previous pages, there are indeed substantial changes and improvements throughout nearly every individual system within this camera.



Exterior design ensures a smooth transition for owners of previous-generation EOS-1D series models, when moving to the latest EOS-1D X Mark III.

And, we're only discussing those relevant to still-imaging in this white paper — the changes for video are extensive and impressive, and the camera's network connectivity has been expanded to meet the needs of today's photojournalists, in the most demanding conditions at major world events. Those are discussed in detail in other white paper documents, from Canon U.S.A., Inc.

4.8.1 EOS-1D X Mark III Body and Control Layout

Comparing the previous Mark II to the updated Mark III camera, sharp-eyed viewers will note the following changes on the exterior of the camera body:

- The N-3 type remote control socket has been moved from the grip-side of the body to the left side, joining the other input connections.
- USB connector has been updated to a USB-C connection, supporting SuperSpeed Plus USB (USB 3.1, gen. 2).
- New terminal connector for the optional Wireless File Transmitter WFT-E9 accessory; the EOS-1D X Mark III is not compatible with the previous WFT-E8 series wireless transmitters (please note — the optional Canon WFT-E9a transmitter is required in the North American market; other versions are required in other world regions).
- New Smart Controller for AF point movement, integrated with AF-ON button. This is potentially significant for some users, and we'll discuss it in-depth shortly.
- Card slots for two CFexpress cards. Again, XQD and other card types are not compatible.

Beyond a few very minor changes in body contours, those are the changes that a user will see on the outside of the camera. Now, let's address some of the changes in more detail.

4.8.2 New: Full Touchscreen Interface

When we say "new," we need to be clear: this is new to Canon's EOS-1D X series. Canon's excellent touch-screen interface now comes to the top-of-the-line camera series, after having been a staple of operation in cameras like the EOS 5D Mark IV and mirrorless EOS

R-series cameras for some time. This means the option for touchscreen operation in a multitude of areas:

Menu selection
Image playback; video playback control
Expand or pinch fingers to magnify or reduce playback size (*still images*)
Viewfinder shooting: Quick Control Menu operations
(Shutter speed and/or aperture [mode-dependent]; ISO; Exposure Compensation; Picture Style; White Balance; WB Correction; Auto Lighting Optimizer settings; Flash Exposure Compensation; AF Operation; Metering mode; Drive speed; Custom Controls short-cut)

Live View: Quick Control Menu operations
(AF Method, AF Operation; Drive speed; Metering mode; White Balance; Picture Style; Auto Lighting Optimizer setting)

Live View: AF point/area location
Live View: ISO control; Exposure Compensation control; Shutter speed and/or Aperture control (depending on exposure mode in use)

The touchscreen interface offers user-control, for those who either prefer to totally disable it, or to use it for selected functions only:

Set-up Menu > Screen #3 > Touch Control:

Standard
Sensitive (enhanced touch sensitivity, for dry fingertips, wearing gloves, etc.)
Disable (fully disables touch-screen interface)

Same menu screen > UI magnification

(When enabled, tap the LCD screen twice, with two fingers: magnifies menu screens, Quick Control Menu during viewfinder shooting, etc.)

Same menu screen > Beep

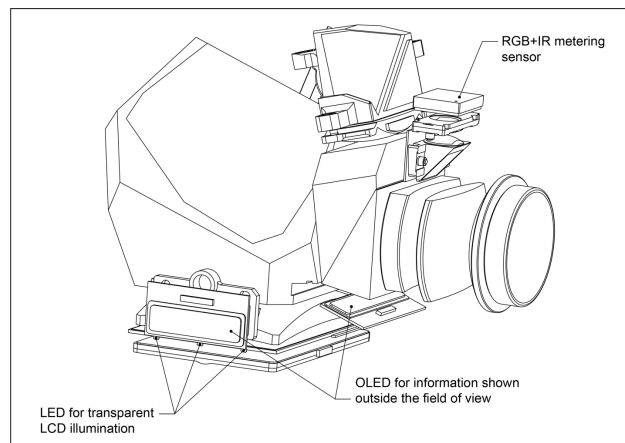
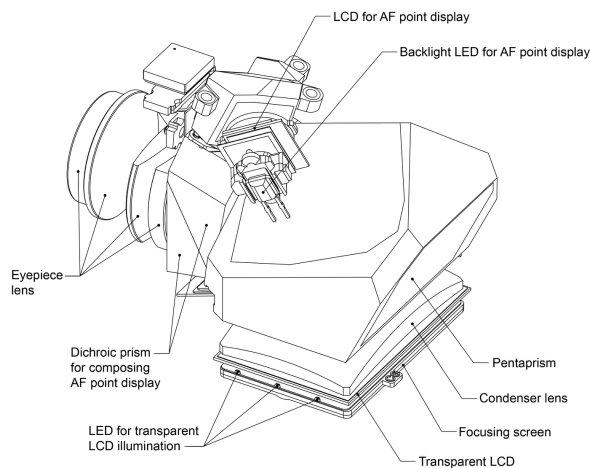
Touch [sound disabled icon] (disables confirmation beep tone, during touch-screen operation)

There are other professional cameras that continue to offer minimal touchscreen access, and to anyone who's operated a smart phone, it's clear that at least in some conditions, touchscreen can be a quick and effective way of working with the camera's settings. Canon engineers are confident that opening up full touchscreen control will be welcomed by many potential EOS-ID X Mark III customers.

4.8.3 Optical Viewfinder

A highlight of Canon professional SLR cameras since the 1970s has been their excellent optical viewfinders. The EOS-ID X Mark III preserves the same eyepiece optics as the previous Mark II camera, and specifications like magnification and eyepoint remain unchanged. This is a good thing: viewfinder display has long been regarded as a strong point in EOS-ID series design.

- Magnification: approx. 0.76x (50mm lens at infinity; diopter at -1m)
- Eyepoint: approx. 20mm
- Viewfinder coverage: approx. 100%



The eyepiece optics are unchanged from Canon's EOS-1D X Mark II camera, but a new dot-matrix illumination system for the 191-point AF system is among the changes further inside the optical viewfinder of the Mark III.

Adding to that is the previously-mentioned mirror performance, delivering less black-out time than any previous EOS-1D series camera, and enabling a steady, clean view through the finder, even during 16 fps high-speed continuous shooting.

One change vs. previous EOS-1D series cameras: the focusing screen is fixed, and not intended to be removed or replaced. Thus, the EOS-1D X Mark III is the first Canon professional camera that is not designed to accept interchangeable focus screens (Previous-generation EOS-1D series cameras were compatible with Canon's optional, accessory Ec-series focus screens).

AF points, and outlines indicating AF Zones are now displayed via a full-time, red illuminated, dot-matrix display in the eye-level viewfinder. Other viewfinder displays, including grid lines, aspect ratio lines, and so on, are via black LCD on top of the focusing screen.

And, one final new touch: while looking through the viewfinder, press the ISO button (on top of the camera)... the time of day, on a 24-hour clock, appears briefly at the bottom of the viewfinder. Of course, you can also adjust ISO while looking through the viewfinder, since it's displayed along with the time of day when the ISO button is pressed.

4.8.4 New: Smart Controller

This is in addition to, and not in place of, the familiar Canon Multi-controller (the 1D X Mark III continues to offer rear Multi-controllers for shooting in both horizontal and vertical orientations). Like the 8-way Multi-controllers, there are two Smart Controllers — again, one for horizontal hand-held orientation, and one in combination with the camera's vertical controls.

The Smart Controller is an optical pointing device, relying on reading the user's thumb movements via an optical sensor — and not through touch-sensitive pressure, or sideways joystick-type movements. By default, glide the right thumb across the Smart Controller's flat surface to move the active AF Area throughout the 191-point AF array in the viewfinder. It works identically during Live View shooting, as well.



Since the Smart Controller is integrated with the traditional Canon AF-ON button, users are free at any time to use “back-button AF” by *pressing* the Smart Controller straight in. Unlike the Multi-controller, there’s no angled or sideways pressing; this AF-ON button responds strictly to being pressed straight inward. And to repeat, AF Point location adjustments require little more than gliding the thumb in any direction along the surface of the Smart Controller. No pressure is needed.

With two functions combined in the Smart Controller, it’s a quick matter to make a change in AF point location, and immediately activate back-button AF by pressing the Smart Controller inward, as soon as the desired AF Point location is reached.

A few user-adjustable changes can be applied to the Smart Controller:

Adjust Smart Controller sensitivity

(C.Fn menu > Screen #7 > Smart Controller > Enable > Press Q-button [sensitivity])

This adjusts how the AF point movement occurs, relative to the amount of movement of your thumb along the Smart Controller’s surface. Set to the “+” side, the heightened sensitivity means very minor movements will result in significant movement of the active AF point or AF Area. On the “-” side of the menu’s scale, you reduce sensitivity, and thumb movements result in reduced movement of the AF points.

Especially for users who intend to combine Smart Controller and AF-ON (back-button AF), it’s worth considering reducing Smart Controller sensitivity, to minimize the risk of accidental movements of AF points once you’ve established a location for them, when the controller is pressed inward for AF activation.

Disable the vertically-positioned Smart Controller

(C.Fn menu > Screen #7 > Smart Controller > Disable vertical [icon] only)

As mentioned above, the EOS-1D X Mark II has two of the innovative Smart Controllers on the back of the camera body. One is clearly positioned to be part of the camera’s extensive vertical controls, for hand-held vertical shooting.

It's certainly possible to disable all vertical controls, with the rotating ON-OFF switch on the bottom-right side of the camera. But it's possible that a photographer may want to shoot a series of vertical pictures, and hand-hold using the vertical controls. Doing so, there's a chance that his or her resting right thumb could touch the Smart Controller's surface, and inadvertently activate it.

With this Custom Function option — disable the vertically-positioned Smart Controller — users can continue to work with the vertical shutter button and other vertical controls, while the Smart Controller is disabled. In a thoughtful touch, Canon engineers preserve the AF-ON function of the vertically-positioned Smart Controller, when users elect to disable the other Smart Controller functionality. Just press the “AF-ON” button, in the vertical orientation, straight-in to activate AF.

Direct AF Point selection by touching Smart Controller alone

(no need to press AF Point Select button first)

(C.Fn menu > Screen #6 > Custom Controls > select Smart Controller > OFF or enabled)

If a user wants direct access to the AF adjustments in the Smart Controller, without first pressing the AF Point Select button, this adjustment within the Custom Controls menu of the EOS-1D X Mark III may be of great interest.

Enable it in the above-mentioned menu, and now, any time the camera is awake, simply gliding the right thumb across the flat surface of the Smart Controller will immediately change the location of active AF points or zones, during either viewfinder or Live View shooting.

Two points to consider:

** Faster, unfettered access to immediate changes in AF Area location*

** Risk of inadvertent changes in AF point location, if AF-ON button is pressed*

(slight changes in thumb movement at the button, even accidental ones, can shift AF point locations). This is especially the case if Sensitivity has not been reduced to a “-” setting, to minimize AF point movement when there's very minor thumb movement on the surface of the Smart Controller.

Smart Controller suggestion:

What some users may want to try is to disable Direct AF Point Selection at the Smart Controller, and activate Direct AF Point Selection at the Multi-controller instead.

Now, quick changes in AF point location can be made at any time, via the 8-way Multi-controller. The Smart Controller can be used without hesitation for back-button AF activation, by pressing it straight in. And any time fast, major AF point location adjustments are desired via the Smart Controller, just press the AF Point Select button first, and quick thumb movements on it will rapidly move AF points around the active area.

4.8.5 Illuminated Operating Buttons

Frequently requested by serious enthusiasts and professionals, select buttons on the rear of the EOS-1D X Mark III are illuminated — a first for Canon EOS cameras.

The buttons in question are:

- The four “playback” buttons, with blue colored icons (below the LCD screen)
- The two top-left buttons — MENU and INFO
- The Q-button, above the Quick Control Dial



The EOS-1D X Mark III offers illumination of the buttons highlighted here in yellow (please note — the yellow highlighting in this graphic is strictly to show the buttons in question, and is NOT the actual illumination!).

The illumination is very low-intensity, through a semi-translucent surface of the 7 buttons in question. The illumination occurs automatically, and cannot be user-controlled (in other words, there’s no direct way to turn button illumination on or off, to completely disable it, and so on).

It’s activated by the following:

- Illuminating the top LCD panel (pressing the illuminator button, on top of camera)
- Pressing MENU button
- Pressing PLAYBACK button
- Displaying Quick Control Menu (pressing Q button on rear of camera)

4.8.6 Dual CFexpress Card Slots

We’ve already discussed the performance benefits that CFexpress memory cards will bring to EOS-1D X Mark III users. Two CFexpress card slots, labeled 1 and 2, operate very similarly to how previous CompactFlash card slots functioned... press a card fully into either slot to install it, and press a projecting gray-colored release button to eject a card, and then grasp the card with two fingers and slide it fully out. CFexpress cards will only install one way, with the card’s primary label facing toward the LCD screen as it’s pushed in.

CFexpress cards allow both standard formatting, and a more extensive Low-level formatting via the Format Card command in the yellow set-up Menu (screen #1).

There are numerous options for recording when two CFexpress cards are installed, including some new possibilities not seen in previous Canon EOS cameras.

Menu > Set-up menu > Screen #1 > Record Func + Card/Folder sel:

New: Still / Video separate

Record still and video image files onto separate CFexpress cards

Still-image record options

** Standard*

(camera records to user-defined primary card only; stops when card is full, even if two cards are installed)

** Auto Switch Card*

(camera records to primary card first, then automatically switches to 2nd card if first card fills)

** Record Separately*

(User defines still image file type to record to card #1 and #2; this is done in red Shooting Menu, screen #2, Image Type/Size menu)

** Record to multiple*

(Create a back-up file — same file type gets recorded to card #1 and #2)

Video record options

** Standard*

(video files recorded to user-defined primary card only)

** Auto Switch Card*

(recording to primary card first; if it fills, immediate switch-over to other card)

** New: Card 1 — RAW; Card 2 — MP4*

(5.5K RAW video recorded to card #1; MP4 secondary file recorded to card #2)

Primary still-image card (#1 or #2)

Primary video card (#1 or #2)

4.8.7 Battery Power

The camera is powered by one Canon LP-E19 battery pack — the same battery used in the previous-generation EOS-1D X Mark II camera. This is a rechargeable lithium-ion battery pack; charging is performed with Canon's dedicated LC-E19 battery charger (can charge one or two battery packs).

Power management is significantly improved in the Mark III camera, and battery life shows this dramatically (the following are based on CIPA-compliant test standards).

EOS-1D X Mark III — *approx. 2,800 still images* (viewfinder shooting)
– Approx. 610 images (Live View shooting)

EOS-1D X Mark II — *approx. 1,210 still images* (viewfinder shooting)
– Approx. 260 images (Live View shooting)

Among the internal changes and improvements in the Mark III camera are hardware adjustments to improve power efficiency, faster internal electronic operations and shut-

down of the DIGIC X imaging engine during Meter Timer Off, all in the name of reducing power consumption.

EOS-1D X Mark III is also compatible with the previous Canon LP-E4N battery pack, used on several previous versions of the EOS-1D camera. This is the battery pack with *gold-colored* labeling. Be aware this is a lower-capacity battery, and maximum shooting speed (and battery life) will be reduced with the LP-E4N battery installed.

The original Canon LP-E4 battery pack (silver-colored label) cannot be used in the EOS-1D X Mark III camera.

4.8.8 Expanded Reset Camera Settings

EOS-1D X Mark III now allows users to reset specific groups of camera settings, while leaving others intact — a direct response to feedback from professional customers. Or, the entire camera can be reset to a complete factory-default state, with one menu command.

Settings can be reset to factory defaults as follows:

Set-up Menu > Screen #4 > Reset camera > Reset Individual Settings:

- * **Basic Settings** (clears primary camera settings)
- * **AF Microadjustment** (clears all settings related to AF Microadjustment)
- * **Root Certificate** (deletes currently-used Root Certificate)
- * **GPS Logger** (clears Log data in camera's internal memory)
- * **Communication settings** (clears all network & Wi-Fi® settings)
- * **Custom Quick Control** (restores all items on screen to factory defaults)
- * **Custom Shooting Mode [C1 – C3]** (clears any stored Custom Shooting settings)
- * **Copyright information** (clears any copyright information)
- * **Custom Functions [C.Fn]** (restores all Custom Functions to factory-default settings)
- * **Custom Controls** (restores any dial/button customization to factory settings)
- * **My Menu** (delete all user-established Menu tabs, and clear all items from My Menu)

Rather than force the user to go into different areas of the menu to reset a handful of particular functions, or to have to spend time scrolling through the menu screens to find a particular setting to clear and reset, this new ability makes it easy to reset particular items as needed. And, using the *Basic Settings* option, a host of major camera settings can be cleared and reset to factory defaults with one menu line-item.

Or, bring the entire camera to a factory-default state, with one menu command:

Set-up Menu > Screen #4 > Reset camera > Factory reset

As the name infers, this is a total reset, clearing virtually all camera settings, including date and time.

In addition, like with previous-generation EOS-1D models, it's possible to save all current camera settings in an EOS-1D X Mark III body to a CFexpress card, install that card in another Mark III body, and upload those settings into the 2nd camera. The only limit here is that it must be another EOS-1D X Mark III camera; previous EOS-1D versions are not compatible with this feature.

4.8.9 Summary — Camera Controls and Operations

While very few controls appear different on the latest EOS-1 X Mark III, there's no question that overall camera operations have been upgraded, to meet the demands of today's professional photographers and videographers.

Changes which go beyond evolutionary include the new combination Smart Controller / AF-ON buttons, illuminated rear buttons, and dual CFexpress card slots. The great thing is that design elements which have been so well received with previous EOS-1D series models have not changed. The optical viewfinder, the overall control layout (including the prominent Quick Control Dial on the back of the camera), and so on, make the camera an easy one for Canon users to transition to, and for newcomers to Canon to acclimate to.

Take note of huge changes in battery life, during still-image shooting when using the viewfinder. The EOS-1D X Mark III can shoot over twice as many shots on a single battery charge as the previous Mark II camera — and over three times as many as EOS models using the smaller LP-E6N battery pack (like the popular EOS 5D Mark IV). And, this is something to compare to high-performance mirrorless competitors, which sometimes have even lower official CIPA-compliant battery performance specs.

This is an easy camera to handle, in spite of being larger than traditional consumer-level DSLRs, and its intuitive control layout means that users can quickly access most features, make the adjustments they need, and create the still images they need to. Operation has always been a part of EOS-1D series design, and nothing about the latest Mark III camera deviates from that design philosophy.

4.9 Durability, Weather-Resistance

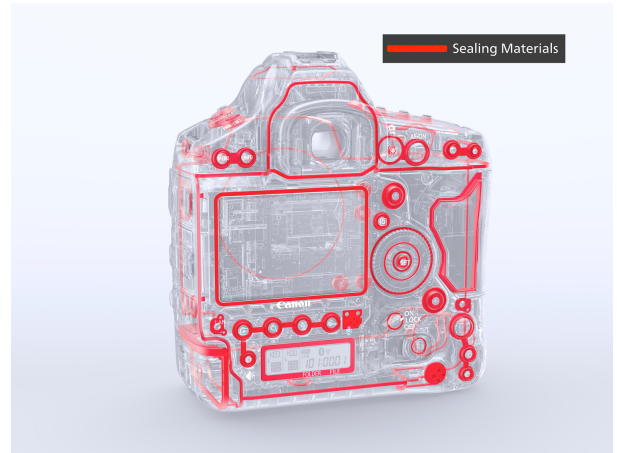
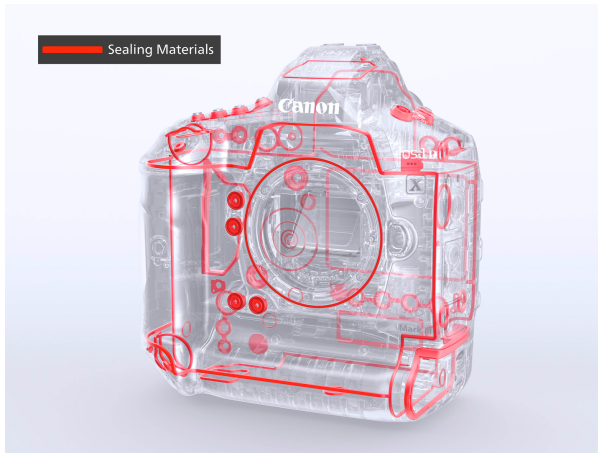
Another traditional strong point of EOS-1D series design, and now elevated to the highest levels yet with the EOS-1D X Mark III.

Durability begins with the body: the same magnesium-alloy exterior shell is used, to provide excellent impact-resistance and rigidity, along with its light weight. A key difference vs. many less-expensive DSLRs is the structure of the mirror box: with the EOS-1D series, the entire mirror box is also an alloy construction, providing excellent internal rigidity and a solid, all-metal structure from the lens mount to the image sensor plane. This mirror box also provides excellent resistance from forces ranging from impact to mounting of long, heavy super-telephoto lenses.



Like previous EOS-1D cameras, the Mark III uses a strong yet lightweight magnesium-alloy camera body. The all-metal mirror box assembly is particularly noteworthy — it's a key structural difference vs. many less-expensive DSLRs, and it endows the camera with remarkable physical strength and durability.

Weather-resistance is extensive, and continues the EOS-1D series tradition of extensive sealing and gasketing at joints in the body, buttons, dials and levers throughout the camera. This of course includes the CFexpress card doors, and the battery access area.



In spite of the Mark III's robust construction, the body is actually about 3 oz. (90g) lighter than the previous Mark II version. A painstaking examination of all components in the camera — mechanical and electronic — resulted in a more powerful performer, but with a lighter overall camera body than before, and without sacrificing any of the camera's legendary durability and strength.

4.10 500,000-Cycle Durability

An impressive statement of designed-in professional durability is the number of cycles (exposures) a camera's shutter is tested to. The updated shutter in the EOS-1D X Mark III is now durability tested to 500,000 exposures (up from 400,000 on the Mark II model). This is Canon's highest claim to date for tested shutter durability.

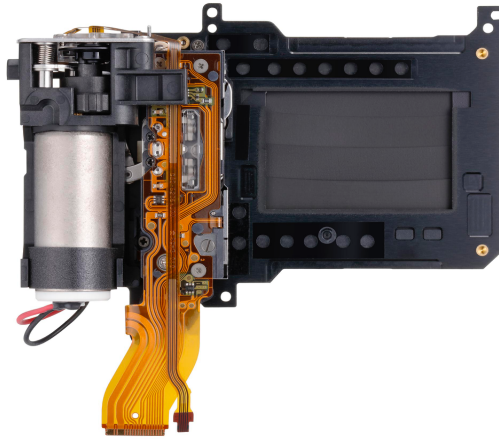
As discussed on the next page, this newly-designed shutter is capable of 20 fps operation, when Mechanical Shutter is selected during Live View shooting.

But here's the most impressive aspect of durability: the entire camera is tested to 500,000 exposures — not just the shutter mechanism. Fully-assembled cameras have passed these extreme durability tests, for viewfinder shooting. This is a strong testament to the new mirror structure (previously discussed), which now uses motor-driven control to raise and lower both the main mirror and the smaller sub-mirror.

These durability numbers are the best yet for Canon EOS SLR cameras, and yet another strong affirmation of the camera's primary mission: to work reliably in the hands of the world's most demanding professional photographers, and in the most demanding physical conditions when necessary.

4.10.1 New High-Performance Mechanical Shutter

The shutter mechanism has long been a key engineering area for Canon designers, consistently refined in successive generations of EOS-1D series cameras to provide ever-increasing levels of speed, accuracy and long-term durability.



Simply stated, this is Canon's most durable and highest-performance mechanical shutter yet in a digital SLR. It's able to fire — in mechanical shutter mode — at up to 20 fps during Live View, and has been durability tested, along with the entire camera, to 500,000 exposures in tests by Canon engineers.

In the EOS-1D X Mark III, a totally new shutter takes these elements a step farther. Able to perform full mechanical shutter (opening and closing curtain) operations at up to 20 fps in Live View, and 16 fps during viewfinder shooting, this shutter exceeds the speed requirements of any previous EOS-1D series shutter. Friction-reducing treatment is applied to high-strength carbon fiber blade surfaces. As important as speed is shutter curtain braking at the end of its travel — a new wet-type braking mechanism is a key aspect of this shutter's speed and reliability.

And of course, the refinements in shutter design are a major aspect of the entire camera's 500,000 exposure durability, in tests performed by Canon, Inc. engineers.

5.0 CONCLUSION

Canon's commitment to the professional photographer began in 1971, and since the launch of that first Canon F-1 camera, the commitment has never waned. The latest example is the EOS-1D X Mark III camera. The needs of today's 21st-century pro photographers have certainly evolved since the early 1970s... 49 years ago, few if any photographers could envision 16 fps shooting speeds, autofocus with features like Face Detection and Head Detection, built-in wireless and extensive networking capabilities and even features we take for granted today, like E-TTL flash, flash sync speeds up to 1/250th second and multi-mode automatic exposure control. But those needs are an everyday reality for the working professional, and Canon engineers have raised the bar in the creation of the latest EOS-1D series camera.

The key to looking at the EOS-1D X Mark III is that virtually every system inside the camera has been thoroughly examined, and updated. Autofocus for still and Live View shooting, metering, E-TTL flash metering and performance, the fastest fps shooting speeds yet in an EOS DSLR, viewfinder display, battery life... the list of what's new and superior to its predecessor is extensive, and the result is a victory for the dedicated enthusiasts and professionals for whom this camera is targeted.

There certainly are a few obvious areas of new, outstanding performance that can be highlighted with the EOS-1D X Mark III. Its incredible burst rates sustain far more continuous shots, at high fps speeds, than any previous Canon EOS camera. Its battery life is more than doubled, using the same battery pack. Its AF subject-detection capabilities make broad-area AF a strongly-appealing alternative to traditional, single AF point in the center shooting for moving subjects.

But it's the combination of so many areas of improvement and refinement that speak loudest to the sophisticated, critical users that this camera is aimed at. Little operational choices, like the new Smart Controller as another method of quick AF point movement, or a newfound consistency in Evaluative and E-TTL flash exposure, using the Face Detection capabilities in both systems.

Along with truly impressive performance, this is a camera that anyone who values strength and durability, outstanding AF and metering systems, operational flexibility and of course, speed and performance, should take a long look at. As of the EOS-1D X Mark III's introduction in early 2020, it's hard to escape the conclusion that for many different types of still photographers, this is Canon's best still-image camera yet.