Canon

EOS 5D

WHITE PAPER

THE CANON EOS 5D CAMERA:

THE WORLD'S FIRST PREMIUM DSLR

Table of Contents

I. OVERVIEW

In the Canon DSLR lineup, the gap between the EOS 20D camera, at about $1,500, and the new EOS-1D Mark II N camera, at about $4,000, represents an irresistible marketing and engineering opportunity. Of course, many combinations of size, performance, ruggedness and complexity are possible, especially for Canon. Canon has the inestimable advantage of being able to mix original design elements with existing, proven, successful components and software, as appropriate, from the EOS-1Ds Mark II, the EOS-1D Mark II and new Mark II N, the EOS 20D and the EOS Digital Rebel XT cameras. Because Canon manufactures not only its own CMOS sensors but also the machinery that makes those sensors, as well as the devices that test and maintain that machinery, Canon has extraordinary control over the manufacturing process. Canon has developed leading mold making and metalworking technologies, and it makes virtually all of the critical electronic and optical parts in its DSLRs. Consequently, the occasion of a new camera brings with it the possibility of some new and very special items to throw into the mix. That is exactly what has happened with the new Canon EOS 5D Digital SLR.

The heart of the EOS 5D SLR is its all-new, specific to the 5D model, 12.8 megapixel full-frame, Canon-designed and -manufactured single-plate CMOS sensor. Each pixel is a very large 8.2µm, and is therefore able to receive a great deal of light, producing not only excellent resolution but a wide range of ISO settings and low noise levels on a par with the 8.2 megapixel EOS-1D Mark II camera. The DIGIC II Image Processor, DDR SDRAM and 4-channel reading enable an incredible burst performance of 60 Large/Fine JPEGs or 17 RAW images at 3 fps.

Also newly developed for the EOS 5D camera are the 9-point AF unit with 6 invisible Supplemental AF points and a more durable shutter rated to 100,000 shots as required in a professional camera. This shutter mechanism has to be large enough to handle the full-frame sensor, which, in turn, has required the development of a new, large mirror box assembly.

New and shared with the concurrently-introduced EOS-1D Mark II N camera, is the 2.5 inch, approximately 230,000 pixel, wide-view monitor, which is an absolute delight

1Ds Mark II | 1D Mark II N | 5D | 20D | Digital Rebel XT

to use. Also new and shared with the EOS-1D Mark II N camera is the Picture Style approach to the management of image characteristics, which users will appreciate for its ease of use and more coherent set of controls.

Trim and convenient size and weight are important parts of the EOS 5D camera's character. At 810 grams, the 5D model is unusually easy to carry and to hold, especially when its resolution and full-frame sensor are taken into account. It is roughly the size of the original EOS 1 film SLR sans booster. When combined with compact new top-quality lenses such as the EF 24-105mm f/4L IS USM or the EF 70-300mm f/4-5.6 IS USM, the result is a unique tool: a lightweight, high performance camera with outstanding optics at a modest price. If 1-Series heft is required, the optional BG-E4 Battery Grip is available. It provides a comfortable vertical shooting grip and doubles shooting capacity.

At an estimated selling price of $3,299[1], the Canon EOS 5D Digital SLR has actually invented a new category: the mid-price, high-end DSLR or, as Canon prefers to say, the first Premium DSLR camera.

[1] Actual selling price will be set by dealers and may vary.

II. SUMMARY OF NEW AND IMPROVED FEATURES

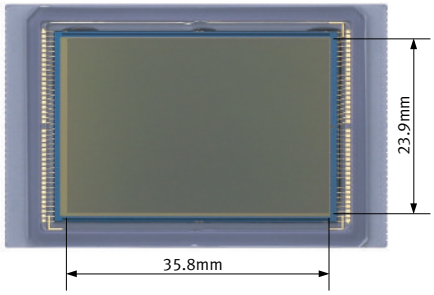
- World's smallest and lightest full-frame digital SLR (as of August 2005)
- Full-size 12.8 megapixel Canon-designed and -manufactured CMOS image sensor with large 8.2µm square pixels for ultra-fine detail and high image quality
- Incredible value at an estimated selling price of $3,299[3] in complete Power Kit form with full software package including new Digital Photo Professional v2.0
- New Picture Style function for easy, customizable and complete image control
- DIGIC II Image Processor and 4-channel reading for fast 3 fps continuous shooting, even at full resolution
- Outstanding burst performance: 60 Large/Fine JPEG or 17 RAW frames
- Fast, 0.2 second startup
- Newly developed 9-point AF unit with 6 invisible Supplemental AF points, improved AI SERVO AF subject tracking and improved focusing from a defocused state
- 3 AF points work with f/2.8 or faster lenses for enhanced precision
- Improved 35-zone exposure metering
- Spot metering, approximately 3.5% of viewfinder area
- Rugged body built using magnesium alloy (including battery grip) and stainless steel chassis
- Compact and lightweight for a DSLR with a full-frame sensor
- New, more durable shutter rated to 100,000 shots for professional use
- New 2.5 inch, approximately 230,000 pixel, wide-view LCD monitor
- 6 selectable JPEG recording modes, RAW and simultaneous RAW+JPEG
- Interchangeable focusing screens: 3 types
- Shutter speeds to 1/8000 sec. and X sync at 1/200 sec.
- More advanced PictBridge functions
- New automatic noise reduction function
- Wide ISO range: 100 to 1,600 in 1/3 stop increments (extendable to 50 and 3,200)
- Ultra-precise white balance (9 types), WB bracketing (blue-amber and magenta-green, even on RAW and RAW+JPEG shots) and WB correction
- Full-featured INFO screen (including RGB histogram and AF frame displays)
- Quick review images enlargeable

- Powerful new Jump function for image viewing (jump by 10 or 100 images, date or folder)
- Storage of one set of frequently used camera settings
- 21 Custom functions with 57 settings
- Flexible folder creation and selection
- USB 2.0 Hi-Speed connection for fast image transfers
- Compatible with wireless/wired LAN image transmission via optional WFT-E1/E1A
- Original image verification system with optional DVK-E2
- Sculpted Canon logo, electroplated “EOS 5D” badge and higher density matte finish for quality look and feel
- Optional battery grip, BG-E4, accepts up to 2 battery packs (BP-511A/511/512/514) or a set of six AA-size batteries for long periods of continuous shooting

[2] As of August, 2005
[3] Actual selling price will be set by dealers and may vary.

III. PERFORMANCE AND RELIABILITY

Remarkable New Full-Frame 12.8 Megapixel CMOS Sensor

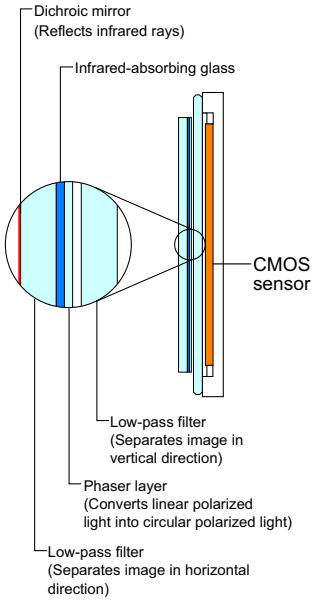


CMOS sensor (actual size)

The heart of the Canon EOS 5D Digital SLR is its extraordinary new, Canon-designed and –manufactured, full-frame, single-plate 12.8 megapixel sensor. This is enough resolution for a double page spread in a magazine, a large print of the bride and groom, facial detail in group shots or a landscape of impressive dimensions. The sensor's 35.8mm x 23.9mm size means that each pixel can be a generous 8.2µm, resulting in exceptionally low shadow noise. The sensor's low power consumption extends battery life and also lowers noise. A finer CMOS production process and optimized photodiode construction increase the light-sensitive area of each pixel and improve dynamic range as well.

The full-size sensor maximizes the performance of EF lenses, the world's largest selection of autofocus lenses. With the full-size sensor, EF lenses — even wide-angle lenses — have the same look and feel that they have with conventional SLR cameras, preserving their optical signatures.

The anti-aliasing filter, which also functions as the CMOS sensor package's cover glass, consists of an infrared-blocking filter, a primary low-pass filter, a phase plate and a secondary low-pass filter. While other cameras, such as the EOS 20D camera, have three crystal plates, the EOS 5D model's filter has one independent crystal plate doing double duty as the cover glass. This reduces cost without affecting the filter's performance.



Cross section of infrared cut, low-pass filter

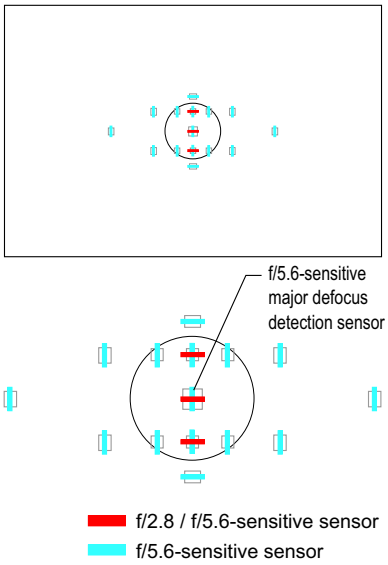
Also significant are the large microlens array that gathers light for the photodiodes with great efficiency and the second-generation, on-chip, noise reduction circuit that effectively minimizes random noise and eliminates fixed-pattern noise. A wide standard ISO range is possible, 100 to 1,600, extendable to 50 and 3,200. Further, 4-channel reading is performed per line, so shooting can continue at 3 fps, even at 12.8 megapixels per frame resolution. The result is very high resolution and exceptionally low image noise, on the same level

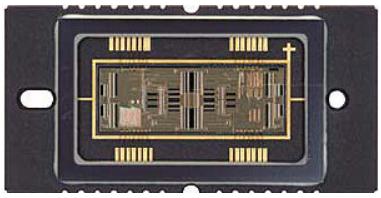
as the EOS-1D Mark II camera. Seen in its totality, this is groundbreaking performance: top-of-the-mark image quality in a beautifully balanced package for thousands less than ever before.

Sophisticated New AF System

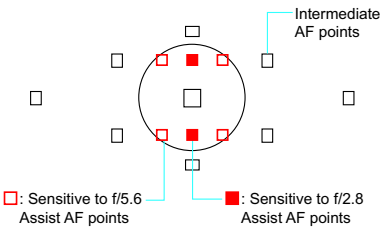
The EOS 5D camera has a new 9-point AF unit with six Supplemental AF points, a new AF algorithm and new AF circuitry. The new AF system improves subject detection and focusing precision at the center, the most frequently used area, and significantly enhances subject tracking performance. The nine AF points are concentrated at the center, but the extreme left and right AF points are located in the same positions as the corresponding AF points on the EOS-1Ds Mark II. In addition, the six Supplemental AF points, grouped around the center of the image, provide highly accurate focusing and do an especially good job of tracking the subject in the AI SERVO AF mode. These Supplemental AF points are not visible in the finder and cannot be selected manually, but they can be seen in the ZoomBrowser or ImageBrowser software. They are used during automatic AF point selection (AF calculation speed and accuracy are as good as, or better than, the EOS 20D's) and as AF area expansion points when the center AF point is selected in C.Fn-17-1, "Expanded AF point activation area." They do not function in the One-Shot AF mode.

AF sensor positions





AF sensor



AF points and invisible AF points

The EOS 5D camera has three autofocus modes plus manual focus (MF). In One-Shot AF, when focus is achieved, the AF operation stops and locks. Predictive AI SERVO AF tracks subject movement and focuses continuously until the start of exposure. AI Focus AF provides automatic switching from One-Shot AF to Predictive AI Servo AF when subject motion is detected. The manual focus mode provides a focus confirmation light, an illuminated superimposed AF point display (enabled/disabled with C.Fn-10) and a beeper (enabled/disabled with the power switch). AF-Assist is provided by EOS-dedicated Speedlites equipped with a near-infrared (peak wavelength approx. 700nm) AF-Supplemental beam.

In AI SERVO AF mode and with automatic AF point selection set, a total of fifteen AF points, including the six Supplemental AF points, will function automatically. As with

previous cameras, focusing starts from the center AF point. If it cannot track the subject, the other AF points will help. The Supplemental AF points enhance subject tracking performance and enable a smoother transition from the center AF point to adjacent AF points. When C.Fn-17-1, AI SERVO AF and the center AF point are set together, subject tracking is improved because the seven AF points within the spot metering circle will be active: the center AF point and the six Supplemental AF points.

The center AF point has a special hybrid design. With f/2.8 or faster lenses, focusing is a two-step process. First, the f/5.6-sensitive cross-type sensor is used to focus. When focus is almost achieved, a switch is made to the f/2.8-sensitive horizontal line-sensitive sensor for high-precision focusing. The center AF point's f/5.6-sensitive, vertical/horizontal line-sensitive sensors each have two lines in a zigzag pattern, making a total of four lines for cross-type focusing at the center. The f/5.6 horizontal line-sensitive AF point can now do a better job of detecting major defocus conditions, improving focusing while the lens is way out of focus. All six Supplemental AF points are f/5.6-sensitive. The two Supplemental AF points directly above and below the center are also f/2.8-sensitive when a lens of f/2.8 or brighter is used.

Predictive AF can focus track a subject approaching at 186 mph up to 66 feet away with an EF 300mm f/2.8L IS USM lens. The EOS 5D camera uses the same statistical prediction computation as the EOS-1Ds Mark II camera, incorporating data of past focusing operations. Because it can repeat more focusing operations in a short length of time, the predictive AF control can operate effectively from the first shot, even if a subject is moving erratically or if the subject's movement changes just before shutter release. (In this case, as with the EOS-1D Mark II camera, when focusing is possible, the lens drive is executed based on the focusing result right before shutter release.) For still subjects, too, AI SERVO AF is a useful option. Focus control is exceptionally stable; the lens does not move, even minutely. If the subject should move unexpectedly, focus detection is always active to enable subject tracking.

Highly Durable New High-Speed Shutter

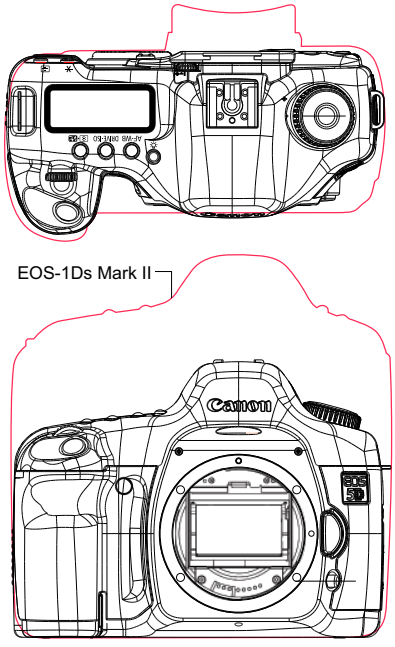
The EOS 5D camera has a newly developed, high-speed and highly durable shutter unit that was designed to meet the demanding requirements of a full-frame sensor in a relatively compact body. The shutter is a vertical travel, focal plane type with two parallelogram link curtains. Each curtain has four blades, three KN Mylar and one Duralumin. The high-torque shutter cocking mechanism, curtain configuration and lightweight blades enable a top shutter speed of 1/8000 sec. with all speeds electronically controlled, and a maximum X-sync speed of 1/200 sec. The metal shutter plate and lever, high-strength cocking gear and a cocking motor that uses a carbon brush account for the remarkable-in-this-price-class 100,000-cycle life this unit enjoys. This is a level of durability expected in a professional camera. For example, based on

Shutter unit

Canon's test standards, the EOS-1D Mark II and –1Ds Mark II cameras are rated at 200,000 shots; the EOS-1v model is rated at 150,000 shots and the EOS-1n camera is rated at 100,000. In another clever bit of reliability engineering, because the electronic X-contact has been added to the sync contacts, the shutter unit's X-sync function uses an optically detected, contactless switch instead of a mechanical switch. This contributes to high durability and high reliability when a Speedlite is used, and also can handle trigger circuit voltages up to 250V from non-dedicated flash units, whether they are connected through the hot shoe or the provided PC socket.

Design and Construction

The EOS 5D Digtial SLR has a solid, substantial and organic feel that complements its compact dimensions and reasonable weight. Truly, it is a premium camera. The top, front and rear covers and battery grip are made of magnesium alloy, known for being lightweight and strong. Also, the USB port, video terminal and other external interface connectors concealed under the left cover use special engineering plastic with excellent electromagnetic shielding properties.



Size comparison

The EOS 5D camera's basic internal construction and major parts' configuration are the same as those of the EOS 20D model. The 5D camera has an improved grip and mode dial, a modified terminal cap shape and clearer rear controls. The pentaprism has an all-new shape necessitated by the full-frame sensor and all associated components such as the mirror, mirror box and shutter. Thanks to the design and manufacturing know-how accumulated with previous EOS Digital cameras, as well as the low-pass filter integrated with the CMOS cover glass, the EOS 5D model can be both more compact than one might expect a high performance DSLR with a full-frame sensor to be, and more affordable as well.

The camera body consists of a stainless steel chassis and a mirror box made of high-strength engineering plastic. The mirror box, to which the mount and imaging element are attached, is very securely attached to the chassis to prevent the flange focal distance from changing due to static pressure on the attached lens. Since the grip and front cover are one piece, body rigidity is excellent.

The exterior surface finish is a high-density black satin finish with a leathery touch that feels smooth in the hands. The three grip surfaces are covered with rubber. The electroplated "EOS 5D" badge and recessed and painted Canon logo give a quality appearance to the camera.

Power Sources

The EOS 5D camera is normally powered by one Battery Pack BP-511A/514/511/512. (The BP-511A/514 holds 1,390mAh, 26% more than the 1,100mAh of the BP-511/512.) With a fully charged BP-511A or BP-514, the EOS 5D can take approximately 800 shots at 20ºC/68ºF or 400 shots at 0ºC/32ºF. The 5D's accessory battery grip, the BG-E4, takes up to two of the same series of battery packs, effectively doubling shooting time, or uses six easy-to-obtain AA-size batteries (alkaline, lithium or Oxyride) when using the supplied BGM-E2 battery magazine. Note that alkaline batteries cannot be used at temperatures below 10ºC/ 50ºF. Conveniently, the BG-E4 has its own Main dial and shutter button for comfortable vertical shooting. Its front and rear covers use the same magnesium alloy as the EOS 5D's exterior, contributing to a solid feel as well as a professional, integrated appearance.

BG-E4

BGM-E2

A menu item, [Auto power off], allows the camera to go into standby mode after 1,2, 4, 8, 15 or 30 minutes of non-operation. Startup time is approximately 0.2 seconds, virtually instantaneous. Date/time backup is handled by one lithium CR2016 battery with a life of approximately 5 years. An accessory AC Adapter Kit, the ACK-E2, is also available.

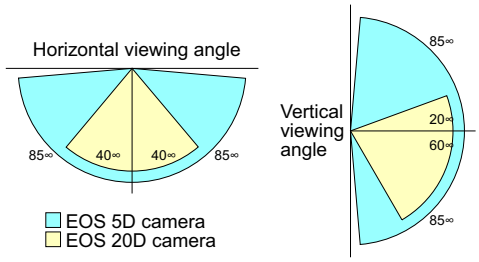
E-TTL II Autoflash

The EOS 5D camera features Canon's sophisticated E-TTL II flash control system that incorporates improved flash exposure control, lens focusing distance data and flash color temperature information. The EOS 5D camera has built-in flash exposure compensation and flash exposure bracketing (FEB) with the 580EX, 550EX, MR-14EX and MT-24EX Speedlites. Wireless flash, using these units as well as the ST-E2 transmitter and 430EX or 420EX Speedlites (as slaves only), is possible with as many as three slave groups. High-speed sync (FP, or focal plane, flash) enables flash synchronization at all shutter speeds up to 1/8000 sec. The camera's hot shoe has a locking pin hole to prevent Speedlite slippage and the PC flash connector is threaded, also for security.

IV. CONTROLS AND DISPLAY

High Performance LCD Screen

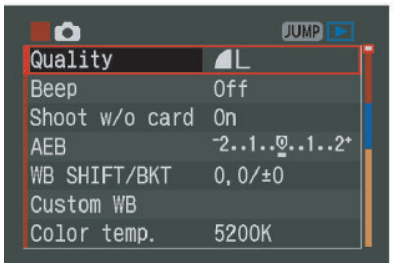
The EOS 5D camera has a 2.5 inch polysilicon TFT LCD screen with approximately 230,000 pixels. It has an exceptionally wide viewing angle of 170 degrees, and the display area is double that of the EOS 20D's 1.8 inch screen. Previous LCD screens had a narrow vertical viewing angle. Picture brightness was lost if it was viewed from even a slight vertical angle and image review involved some uncertainty. The new screen maintains the same brightness from almost any viewing angle. Brightness is adjustable in five levels with the menu item [LCD brightness]. The backlight uses six LED modules that illuminate the large monitor evenly. By comparison, the 20D model's 1.8 inch screen uses three LED modules.



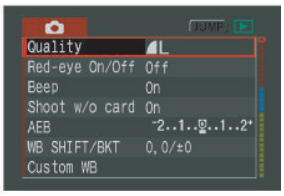
Actual LCD monitor viewing angle

Along with the larger screen, the menu text is also larger and easier to read. The full-featured INFO screen includes file sizes, RGB histogram and AF frame displays. In addition, Quick Review images are now enlargeable.

EOS 5D (2.5in.)

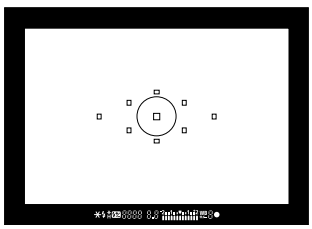


EOS 20D (1.8in.)



Menu comparison (actual size)

Large, Bright Viewfinder With Interchangeable Focusing Screens

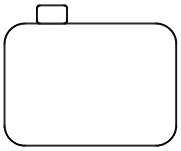


Viewfinder information

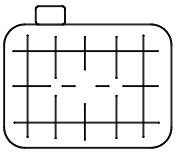
The viewfinder optics of the EOS 5D camera are newly developed. They provide 96% vertical and horizontal coverage with .71X magnification, a 20mm eyepoint and –3 to +1 dpt dioptric adjustment. The result is a large and bright view that is very much like that of the EOS-1Ds Mark II (100% view, .7x magnification, 20mm eyepoint, same range of dioptric adjustment).

Also like the EOS-1Ds Mark II, the EOS 5D features interchangeable focusing screens. The standard screen is the Ee-A, designed to work with all EF lenses down to f/5.6

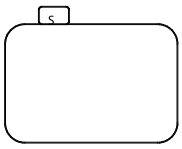
maximum aperture. Like the Ee-D and Ee-S, it has the Precision Matte random microlens construction with elements of varying size and sensitivity. Two optional screens are available, the Ee-D grid-type, also good for all lenses down to f/5.6 maximum aperture, and the Ee-S, having finer microlenses than the other two types, intended for lenses f/2.8 or faster, with a steeper-than-normal parabola of focus for easier manual focusing. Because these screens have differing metering characteristics, C.Fn.-00 must be set to match the screen in use.



Ee-A:
Standard Focusing Screen



Ee-D:
Grid Screen



Ee-S:
Sharp focusing Screen

The information display in the finder, below the focusing screen, is like the display of the EOS 20D, with the addition of an indicator for FE lock: AE lock, AEB in progress (blinks), Flash ready, insufficient flash warning during FE lock (blinks), High-speed sync (FP flash), FE lock, FEB shooting (blinks), Flash exposure compensation, Shutter speed (if camera shake will occur, it blinks), bulb, FE lock (FEL), Processing data (buSY), Aperture (if unsuitable, it blinks), Exposure level display (Exposure compensation, Manual exposure level, AEB level, Flash exposure compensation, Red-Eye Reduction lamp on time display), White balance correction, Max. burst, AF focus confirmation (blinks when focus cannot be achieved), MF focus confirmation, No CF card warning (no CF).

Finder blackout time is 145 ms at shutter speeds of 1/60 sec. and faster. There is no mirror cut-off with lenses up to EF 600mm f/4L. Mirror lock-up is enabled with C.Fn-12-1. Depth-of-field preview is provided via a button on the lower left front of the camera.

New Picture Style

Picture Style selection screen

Canon's new Picture Style function unifies settings for image processing parameters (previously Tone Curve, Sharpness and Contrast) and color matrix (previously Standard, Portrait, High and Low Saturation and Adobe RGB) and provides one easy-to-use point of access for the control of Sharpness, Contrast, Color Tone and Saturation. In the past, some users of the EOS-1D line had difficulty understanding the effect of disparate settings on final image characteristics. Also, some thought that their images looked soft because they did not recognize that Canon's default setting for EOS-1 class DSLRs deliberately applies no sharpening. Picture Style makes it simple for users to get optimum image quality by making a selection, which is more or less like selecting a particular film type in the past on the basis of color characteristics, contrast and sharpness.

The first three Picture Styles, Standard, Portrait and Landscape, include Sharpness levels 3, 2 and 4, respectively and do not anticipate major post-processing efforts. The Standard image looks crisp, like a successful snapshot, and the Color Tone and

Saturation are set to obtain vivid colors. The Portrait Style has Color Tone and Saturation set to obtain natural skin tones. Sharpness, one step weaker than in Standard, is kinder to skin. With the Landscape Style, Color Tone and Saturation are set to achieve deep, vivid blues and greens for skies and foliage. The Sharpness is set one step more than Standard so that the outlines of mountains, trees and buildings look crisp. The fourth Style, Neutral, is the same as the default setting for previous EOS-1D series cameras. Natural color reproduction is obtained and no sharpness is applied, anticipating the knowledgeable post-processing for which this setting is ideal. Like Neutral, the Faithful Picture Style applies no sharpening. It is the same as Digital Photo Professional's Faithful setting. When the subject is photographed under a color temperature of 5200K, the color is adjusted colorimetrically to match the subject's color, even with JPEG images. Each of these five preset Picture Styles can be altered manually in the menu for Sharpness, Contrast, Color Tone and Saturation, so personal settings are easy to develop.

The sixth Picture Style is Monochrome, identical to the EOS 20D camera's monochrome setting. Sharpness is preset at 3 and Contrast is at its middle value. Instead of the inappropriate Color Tone and Color Saturation, settings for Filter Effects (None, Yellow, Orange, Red, Green) and Toning Effect (None, Sepia, Blue, Purple, Green) are offered. User defined PC Settings, set with software under development, may become available at release or separately, as may additional, downloadable Picture Styles.

New Automatic and Intelligent Noise Reduction Function

Because noise is difficult to see on a camera's LCD screen, even one as large and detailed as the EOS 5D camera's, it is hard to know whether noise reduction should be turned on or not. On the EOS 5D model, C.Fn-2, noise reduction for long exposures, has three settings:On, Off or Auto noise reduction. In Auto with exposures of 1 second or longer, if noise caused by a long exposure or high temperature, such as spotty noise or reddish corners, is detected, noise reduction is performed automatically, regardless of ISO. This setting is highly effective and useful for photographers at all levels.

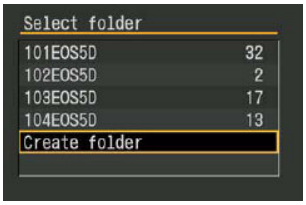
When C.Fn-2 is set to On, noise reduction is always performed for exposures of 1 second or longer, also regardless of ISO. This setting is most valuable in the uncommon occurrence of noise that cannot be detected automatically, such as that generated by low temperatures.

Like the EOS-1Ds Mark II model, the EOS 5D digital SLR enables continuous shooting even while noise reduction is performed, as long as the buffer memory has room. Cleverly, when shutter speed-priority AE or manual exposure is set and continuous shooting is done at the same shutter speed, noise reduction will be performed in a single process on all shots based on the first shot.

Flexible and Convenient Folder Creation and Selection

As with EOS-1D cameras, folders in which the images are to be saved can be created and the image file numbers can also be reset, both through menu selections. The folder names are appended with the camera name, starting with 100EOS5D and going as high

as 999EOS5D. Any folder can be selected for saved images, except during playback. Up to 9999 images can be saved in a folder, as opposed to 100 in the EOS 20D camera. Folders are created automatically if the file number reaches 9999 or if the CF card does not have a Design rule for Camera File-system compliant (DCIM) folder.



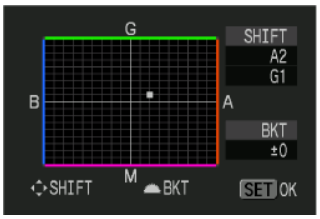
Folder creation/selection screen

Ultra-precise White Balance

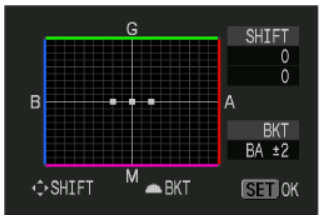
The EOS 5D digital SLR has an extensive and highly accurate set of white balance controls and adjustments. First, it has nine types of white balance: Auto (which uses the AWB algorithm of the EOS-1Ds Mark II model), Daylight (approx. 5,200K), Shade (approx. 7,000K), Cloudy/Twilight/Sunset (approx. 6,000K), Tungsten light (approx. 3200K), White Fluorescent light (approx. 4,000K), Flash (approx. 6,000K), Custom (Take a picture of a white subject serving as the white balance standard; then set "Custom WB" mode on the on-screen menu to specify that image) and Color Temperature (set manually from 2,800K to 10,000K in 100 degree increments).

The color temperature of all nine white balance modes listed here can be adjusted or corrected (using the Multi-controller, pushable in all directions) in +/- 9 levels of blue/amber bias and +/- 9 levels of magenta/green bias. White balance correction can fine tune color within the range from 2,000K to 10,000K.

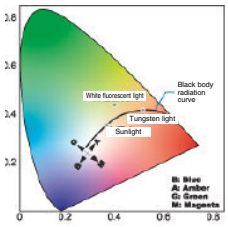
White balance bracketing of up to +/- 3 stops in whole-stop increments can be implemented with a single shutter release. (When WB-BKT is set, the "shots remaining" will decrease to about one third the normal number.) Either blue/amber or magenta/ green bracketing is possible separately. White balance correction and auto exposure bracketing can also be set in combination with white balance bracketing, in which case nine images will be saved to the CF card (with commensurately extended write times). Significantly on the EOS 5D model, white balance bracketing can be used with RAW and RAW+JPEG shots.



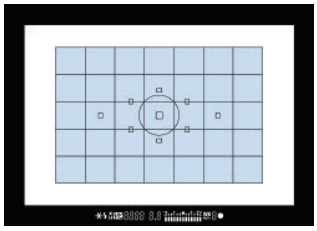
WB correction



WB bracketing



Extensive Exposure Control


Metering zones

The EOS 5D Digital SLR uses the same 35-zone metering sensor as the EOS 20D, but it has metering functions on a par with the EOS 1D Series. The sensor and the metering optics are positioned behind the pentaprism with the metering lens magnification set to obtain the optimum correlation between the nine AF points and the

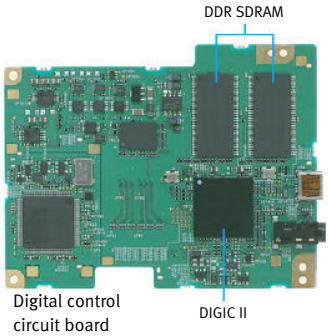
metering sensor zone areas. Evaluative (set automatically in the Full Auto mode), partial, spot (updated for each shot during continuous shooting) and centerweighted average metering modes are provided. Partial metering reads approximately 8% of the viewfinder area at the center, and spot metering reads approximately 3.5% of the viewfinder area. The basic characteristics of the evaluative metering system and the E-TTL II autoflash metering system have been adjusted to make them just like those in the EOS 20D, which has the same 35-zone metering sensor and One-Shot AF with nine AF points.

The shooting modes are P (programmed AE, shiftable), Tv (shutter-priority AE), Av (aperture-priority AE), M (manual), Bulb, Full Auto (non-shiftable) and C (Camera setting registration, a saved set of custom settings). Basic Zone modes and Depth-of-Field AE are not offered. For flash photography, E-TTL II autoflash and averaged flash exposure (C.Fn-14-1) are both available. Metering begins when the shutter release is pressed halfway. Metering time lasts from approximately four seconds before exposure until approximately 2 seconds after exposure. Multiple exposures are not possible.

Auto Exposure Bracketing can range up to +/- 2 stops in 1/2 or 1/3 stop increments. It can be affected in P (shutter or aperture varied), Tv (aperture varied), Av (shutter varied) or M (shutter varied). It is not settable in the Full Auto mode. The bracketing sequence is: standard exposure, decreased exposure, increased exposure; C.Fn-9 allows changes to this order. AEB can be used in conjunction with the self-timer or WB-BKT (nine images will be generated).

In the One-Shot AF mode with evaluative metering, AE lock takes effect when focus is achieved. Manual AE lock is enabled with the AE lock button (rear, top right). There is no AE lock in Full Auto. During evaluative metering, AE lock is applied to the exposure setting obtained by the selected AF point. During partial, spot or center-weighted average metering, AE lock is applied to the exposure setting obtained by the center point. The same button functions as an FE lock button when an EX-series Speedlite is attached.

Image Recording, Processing and Protection



As with the EOS-1Ds Mark II camera, high-speed and high quality image processing is executed by the DIGIC II Image Processor. The DIGIC II and the DDR SDRAM (rather than the SDR SDRAM in the EOS 20D) buffer memory and 4-channel reading work together to attain a continuous shooting speed of approximately 3 fps and a maximum burst of 60 frames, Large/Fine JPEG, 17 RAW, or 12 RAW+JPEG.

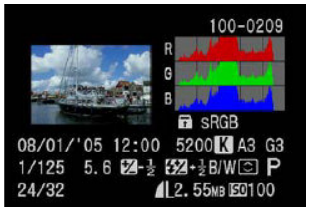
In addition to RAW alone, the EOS 5D camera offers six choices of image recording quality: Large (12.7 megapixels, either Fine/low compression or Normal/high compression), Medium (6.7 megapixels, Fine/low compression or Normal/high compression) or

Small (4.2 megapixels, Fine/low compression or Normal/high compression). RAW+JPEG simultaneous recording is enabled in all JPEG recording modes so each of these six choices can be combined with RAW, creating a total of thirteen image recording quality possibilities. The RAW and JPEG images are saved as separate files on the CF card.

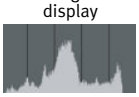
With the menu's [Protect] function, a single image can be protected or unprotected. Images that were erase-protected with the camera cannot be erased, except during formatting. A single image, or all images stored on a CF card, can be erased if they are unprotected.

Image Playback

The EOS 5D Digital SLR provides for a great variety of playback options: single image, shooting information display (including a reduced size image, Folder number, File number, Histogram, Color space, Shooting date/time, AF point, ISO speed, Metering mode, Shooting mode, Shutter speed, Aperture, Exposure compensation amount, White balance correction amount, Playback number/Total images recorded, Protect, Recording quality Original image verification data appended, White balance, Color temperature- displayed only when WB setting is K, Monochrome and File size in MB) camera settings information (date/time, WB correction amount, WB-BKT setting, Color space, Picture style, Flash exposure compensation amount, Auto power-off, Auto rotated image, Color temperature, CF card space remaining, ISO speed, Register camera settings- shooting mode only, File number and Folder number), nine-image index, magnified view, jump display, auto playback, image protection and image rotation.



Histogram display



Shooting information

Camera settings

Jump Menu

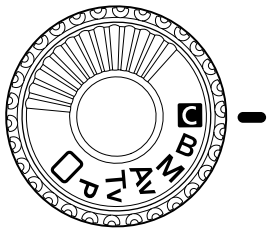
The powerful new Jump function helps the user to locate a desired image quickly in a large group. After pressing the JUMP button, press the SET button and turn the Quick Control Dial to select a jump mode. Then, turn the Quick Control Dial or the Main Dial to jump. One can jump by ten images (forward or back), a hundred images (forward or back), by shooting date (previous or following day with the day's last shot displayed first) or by folder (previous or next with the newest shot displayed first). Conveniently, it is possible to jump while in the 9-image index display, during magnified view and during menu display.

With the Magnify button, the image can be magnified in the single image display from approximately 1.5x to 10x in 15 steps. Right after shooting, magnified or reduced view

is enabled by choosing C.Fn-18-1, shooting priority, and pressing the Direct Print button and the Magnify/Reduce button simultaneously.

Menus The EOS 5D Digital SLR has three menus: Shooting, Playback and Setup. They are color coded red, blue and yellow, respectively. The Shooting menu offers control of recording quality, Beep on/off, Shoot without CF card on/off, Auto Exposure Bracketing, White Balance shift and bracket, Custom White Balance, Color Temperature, Color Space and Picture Style. The Playback menu controls Protect, Rotate, Print Order, Auto Play, Review time, AF points display/not and Histogram Brightness/RGB. The Setup menu has settings for Auto power off, Auto rotate, LCD brightness, Date/Time, File numbering, Select/Create folder, Language (15 choices), Video system, Communication, Format, Custom Functions, Clear settings, Register camera settings and Sensor cleaning. This is a degree of control suited to pros and serious amateurs alike.

Customization A full complement of twenty-one Custom Functions with fifty-seven settings is provided on the EOS 5D camera. Three additions have been made to the functions provided by the EOS 20D. C.Fn-00 must be set to match the installed focusing screen (0-Ee-A, 1-Ee-D, 2-Ee-S). C.Fn-17-1 is used to improve subject acquisition performance when the center AF point is selected in AI SERVO AF mode. (C.Fn-17-0 is the Standard setting.) C.Fn-18, [LCD displ → Return to shoot] controls the way in which one is able to return instantly to shooting from menu viewing or image playback. The choices are 0 [With Shutter Button Only] or 1 [Also with AE Lock button, etc.], in which case all shooting controls will work instantly, even during menu operation or image playback. This becomes particularly helpful when the camera is set to Custom Function 4-1 or 4-3, in which AF is started by pressing the AE lock button.



Mode dial in the Custom position

Under the menu's Setup tab, [Camera setting registration] allows users to store one set of frequently used camera settings, both Shooting Settings and Menu Settings included. The settings that will be saved can be displayed on the LCD panel by turning the Mode dial to C. The following settings cannot be saved: time information, language, communication setting, video output and those settings that cannot be reset to default with the camera reset function.

V. SOFTWARE PACKAGE, COMPATIBILITY AND SUPPORT

Extensive Software Package

The EOS 5D Digital SLR will be packaged with the EOS Digital Solution Disk, Ver. 11, which includes ZoomBrowser EX 5.5, ImageBrowser 5.5, EOS Capture 1.5 (Windows/ Macintosh), PhotoStitch 3.1 (Windows/Macintosh) and a set of PTP, WIA and TWAIN Drivers (Windows). At no extra cost, the camera will also come with Digital Photo Professional, Ver. 2.0, an immensely useful tool for professional digital workflow.

Enhanced PictBridge Functions

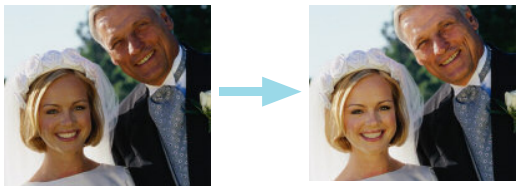
New "Contact" Printing

When used in conjunction with PictBridge compatible third-party printers, Canon cameras can print directly without a computer. Now, the collaboration between Canon PIXMA photo printers and Canon cameras has been extended so that, beginning with Canon's exceptional Fall 2005 line of PictBridge compatible models, useful new functions will be available. First, there's Contact Printing, featuring easy-to-see thumbnail images, with a simulated 35mm filmstrip background. Each frame measures 36mm x 24mm, exactly the size of contact prints made from 35mm film, in a five-rows-of-seven 35-image layout.

Two New Layouts With Exif Data

The second new option is a 20-image layout with Exif shooting information printed next to each frame: camera model, lens model, extender usage, shooting mode, shutter speed, aperture setting, exposure compensation (not shown if no compensation is used), ISO, white balance, file number and date. This layout and the contact sheet offer a useful solution to the problem of archiving and retrieving digital images. A third new choice makes a single print with Exif information printed underneath.

Face Brightener



Face Brightener, which makes dark, backlit faces brighter, is an effect that appeared originally in Easy-Photo-Print Ver. 3.0. It is now available, without a computer, in the new series of Canon PictBridge printers. It provides an easy way to correct for underexposure caused, in most cases, by backlighting of the subject.

New Paper Sizes

Three new paper sizes have been added: 4" x 8", 8" x 10" and 10" x 12". An extended selection of new paper sizes and types is scheduled to be available for Canon PIXMA Photo Printers announced in the second half of 2005.

Interfaces

The EOS 5D Digital SLR has the same interface set as the EOS 20D model: USB 2.0 Hi-Speed, mini B port, NTSC/PAL Video output terminal, a PC terminal for non-dedicated flash units and an N3-type remote control terminal.

VI. SPECIFICATIONS

TYPE

Type: Digital AF/AE SLR
Recording Media: CompactFlash (CF) Card Type I and II
Sensor Size: 1.41 x 0.94 in./35.8 x 23.9mm
Compatible Lenses: Canon EF lenses (except EF-S lenses)
Lens Mount: Canon EF mount

IMAGING ELEMENT

Type: High-sensitivity, High-resolution, Single-plate, CMOS Sensor
Effective Pixels: Approx. 12.8 Megapixels
Total Pixels: Approx. 13.3 Megapixels
Aspect Ratio: 3:2 (Horizontal : Vertical)
Color Filter System: RGB primary color filters
IR Cut Low-pass Filter: Fixed position in front of the image sensor

RECORDING SYSTEM

File Format: Design rule for Camera File system (JPEG) and RAW, Exif 2.21 compliant
Image Compression: JPEG and RAW
File Size (on CF Card): (1) Large/Fine: Approx. 4.6MB (4368 x 2912) (2) Large/Normal 2.3MB (4368 x 2912) (3) Medium/Fine: Approx. 2.7MB (3168 x 2112) (4) Medium/ Normal: Approx. 1.4MB (3168 x 2112) (5) Small/Fine: Approx. 2.0MB (2496 x 1664) (6) Small/Normal: Approx. 1.0MB (2496 x 1664) (7) RAW: Approx. 12.9 MB (4368 x 2912)
Folder Settings: Automatic, Manual, Manual reset and folder creation, Folder selection
File Numbering: (1) Continuous numbering, (2) Auto reset, (3) Manual reset
Processing Parameters: Standard parameters plus up to three custom processing parameter sets and monochrome can be set
Color Matrix: Five Standard types, two types that can be registered with color matrix
Backup Image Recording: Enabled (Same image recordable on CF Card
Interface: USB 2.0 Hi-Speed, NTSC/PAL for video output

WHITE BALANCE

Settings: Auto, Preset (Daylight, Shade, Cloudy/Twilight/Sunset, Tungsten Light, White Fluorescent Light, Flash), Manual (Custom, Color Temperature)
Auto White Balance: Auto White Balance with the image sensor
Color Temperature Compensation: White balance bracketing: ±3 stops in full-stop increments White Balance Correction: Blue/Amber bias +/- 9 levels
Compensation: Magenta/Green bias +/- 9 levels Blue/Amber bias and Magenta/Green bias cannot be set together during White Balance Bracketing.

VIEWFINDER

Type: Eye-level SLR with fixed pentamirror
Coverage: Approx. 96% horizontally and vertically (coverage against JPEG Large)
Magnification: 0.71x (-1 diopter with 50mm lens at infinity)
Eyepoint: 20mm
Built-in Dioptric Adjustment: -3.0 to +1.0 diopter
Focusing Screen: Interchargeable (3 types), Standard focusing screen: Ee-A Quick-return half mirror (Transmission: reflection ratio of 40:60, no mirror
cut-off with EF 600mm f/4 or shorter lens)
Mirror: Quick-return half mirror (transmittance: reflectance ratio of 40:60)
Viewfinder Information: AF (AF points, focus confirmation light), Exposure (shutter speed, aperture, spot metering circle, exposure level, AE lock, exposure compensation, AEB level), Flash (flash ready, red-eye reduction lamp on, high-speed sync, FE lock, FEB shooting, flash exposure compensation, insufficient flash warning during FE lock), White balance correction, Maximum burst, CF card full warning, CF card error warning, No CF card warning
Depth-of-Field Preview: Enabled with depth-of-field preview button
Eyepiece Shutter: None (eyepiece cover provided on strap)

AUTOFOCUS

Type: TTL-CT-SIR AF-dedicated CMOS Sensor
AF Points: 9 AF points (plus 6 invisible Supplemental AF points)
AF Working Range: EV -0.5-18 (at ISO 100 at 68°F/20°C)
Focusing Modes: Autofocus (One-Shot AF, Predictive AI Servo AF, AI Focus AF (automatic switching between One-Shot/Predictive AI Servo AF)), Manual Focus (MF)
AF Point Selection: Manual selection, Automatic selection
Selected AF Point Display: Superimposed in viewfinder and indicated on LCD monitorl
AF-assist Beam: Emitted by the dedicated Speedlite

EXPOSURE CONTROL

Metering Modes: Max. aperture TTL metering with 35-zone SPC
(1) Evaluative metering (link to all AF points)
(2) Partial metering (approx. 8% of viewfinder)
(3) Spot metering (approx. 3.5% of viewfinder)
(4) Center-weighted average metering
Metering Range: EV 1–20 (at 68°F/20°C with 50mm f/1.4 lens, ISO 100)
Exposure Control Systems: Program AE (Shiftable), Shutter speed-priority AE, Aperture-priority AE, Full Auto, E-TTL II autoflash program AE, Manual, Manual Exposure
ISO Speed Range: Equivalent to ISO 100–1600 (in 1/3-stop increments), ISO speed can be expanded to ISO 50 and 3200
Exposure Compensation: (1) Manual, (2) AEB (Auto Exposure Bracketing) Bracketing range: ±2 stops in 1/2- or 1/3-stop increments
AE Lock: Auto: Applied in One-Shot AF mode with evaluative metering when focus is achieved Manual: By AE lock button

SHUTTER

Type: Vertical-travel, mechanical, focal-plane shutter with all speeds electronically-controlled
Shutter Speeds: 1/8000 to 30 sec. (1/3-stop increments), X-sync at 1/200 sec.
Shutter Release: Soft-touch electromagnetic release
Self-Timer: 10 sec. or 2 sec. delay
Remote Control: Remote control with N3 type terminal

FLASH

EOS-dedicated Speedlite: E-TTL II autoflash with EX-series Speedlite
PC Terminal: Provided

DRIVE SYSTEM

Drive Modes: Single, Continuous (approx. 3 fps), Self-timer
Continuous Shooting Speed: Approx. 3 fps (at 1/250 sec. or faster for all recording quality settings)
Max. Burst: JPEG: approx. 60 frames (JPEG/Large), RAW: approx. 17 frames, JPEG+RAW: approx. 12 frames

LCD MONITOR

Type: TFT color liquid-crystal monitor Monitor Size 2.5 in.
Pixels: Approx. 230,000
Coverage: 100% for JPEG images
Brightness Adjustment: 5 levels provided

IMAGE PLAYBACK

Image Display Format: Single image, 9-image index, Magnified zoom (approx. 1.5x to 10x), Auto play, Auto play right after shooting
Highlight Alert: In the single image (INFO) mode, the highlight portions containing no image information will blink

IMAGE PROTECTION AND ERASE

Protection: A single image can be protected or unprotected
Erase: A single image or all images stored in a CF card can be erased if they are unprotected

MENUS

Menu Categories: (1) Shooting (2) Playback (3) Setup
LCD Monitor Language: 15 (English, German, French, Dutch, Danish, Finnish, Italian, Norwegian, Swedish, Spanish, Russian, Simplified/Traditional Chinese, Korean, Japanese)
Firmware Update: Enabled by the user

POWER SOURCE

Battery: One Battery Pack BP-511A/BP-514/BP-511/ BP-512
Shooting Capacity: Approx. 800 (68ºF/20ºC), approx. 400 ((32ºF/0ºC)

* The above figures apply when a fully-charged Battery Pack BP-511A is used.

Battery Check: Automatic
Power Saving: Provided. Power turns off after 1, 2, 4, 8, 15, 30 min.
Back-up Battery: One CR2016 Lithium Battery

DIMENSIONS AND WEIGHT

Dimensions (W x H x D): 6.0 x 4.4 x 3.0 in./152 x 113 x 75mm
Weight: 28.6 oz./810g (Body only. Battery: 2.9 oz./82g)

WORKING CONDITIONS

Working Temperature Range: 32–104°F/0–40°C
Working Humidity: 85% or less

- All the specifications above are based on Canon's testing and measuring standards. Shooting Capacity data complies with CIPA standard.
- The camera's specifications and physical appearance are subject to change without notice.

VII. CONCLUSION

The Canon EOS 5D Digital SLR is an extraordinary product. It has very high resolution, modest dimensions and weight, remarkable ease of use, great accuracy, high-quality construction and a superior software package. With the exception of EF-S lenses, it enjoys essentially complete compatibility with the Canon EOS system, the overwhelming choice of professionals everywhere. At an estimated selling price of $3,299[4], it has no rival, no competitor, no challenger.

The EOS 5D model will appeal to an enormous range of photographers. Landscape and nature photographers, both amateur and professional, will love the 12.8 megapixel resolution and the camera's backcountry maneuverability. Wedding and portrait photographers will appreciate the resolution of group shots as well as the camera's size and weight and its full frame sensor. Then, there are many photographers who have been dedicated to film and have postponed the purchase of a DSLR. They've waited for a time when there would be no sacrifice in quality tied to the film-to-digital switch. They will surely see that the EOS 5D model is the camera they have been waiting for. Everyone will be amazed by the value that the EOS 5D Digital SLR represents.

One of the interesting parts of the success of the EOS 20D model has been how many of them are used regularly by professionals. For an estimated selling price below $1,500, pros have a 685-gram camera with a magnesium alloy body, a stainless steel chassis, 8-megapixel resolution and 5 fps speed. For many of them, 1-Series weight or expense is a substantial negative. The combination of the EOS 20D and the 5D cameras make an ideal pairing for many of these professionals: a common interface making switching back and forth intuitive and error-free, a choice of high quality or high speed, as required, a camera bag that's easy on the back, shoulders and neck and a total cost that shooters, spouses and accountants will all approve of.

So, Canon has hit another home run. The combination of great design and manufacturing expertise with obvious marketing savvy has produced a camera that stands alone in an entirely new and exceptionally appealing class. It is the world's first Premium DSLR.

[4]Actual selling price will be set by dealers and may vary.