

Canon announces 10MP Rebel XTi/400D

Wednesday, August 23, 2006 | by Rob Galbraith

Canon today has revealed an update to its entry-level EOS Digital Rebel XT/350D digital SLR. Called the EOS Digital Rebel XTi in North America, the EOS Kiss Digital X in Japan and the EOS 400D everywhere else, the new model is built around a 10.08 million image pixel CMOS sensor that, for the first time in a Canon digital SLR, incorporates an ultrasonic self-cleaning mode for removing dust particles from the sensor. While Canon is targeting the consumer with the Rebel XTi/400D, the new model looks to have just enough of the good stuff to serve as a viable backup camera for the pro digital SLR shooter.



Front View: The Canon EOS Digital Rebel XTi. [Click to enlarge.](#)

(Photo courtesy Canon).

Overview

Here's a quick glimpse at what's new in the Rebel XTi/400D, relative to the camera it replaces:

- It produces 10.08 million pixel photos from a 22.2mm x 14.8mm CMOS sensor
- The sensor cover glass includes a piezoelectric device designed to apply dust-clearing ultrasonic vibration during camera startup, shutdown or manually at anytime
- The camera can create a map of any stubborn gunk not removed by the sensor's self-cleaning action and embed that into JPEG or CR2 metadata. Digital Photo Professional v2.2 will be able to apply the dust map for one-step removal of unwelcome dust blobs from pictures
- Rebel XTi/400D autofocus is the same 9-point system used in the EOS 30D (and EOS 20D before that)
- The twin LCD displays of the Rebel XT/350D have been replaced in the Rebel XTi/400D by a single 2.5 inch (diagonal), 230,000 pixel, 160 degree viewing angle TFT rear LCD

- A sensor beneath the viewfinder eyepiece detects when the camera is brought to your eye and shuts off the rear LCD automatically (the lone rear LCD is the entry-point for almost all basic settings except exposure mode)
- Burst depth is a Canon-specified 27 Large Fine JPEG and 10 RAW CR2 frames
- The Rebel XTi/400D is the latest Canon digital SLR to incorporate a Picture Style menu for extensive control over colour, contrast and sharpening, including the ability to turn off sharpening of in-camera JPEGs entirely
- The camera offers an extended range of printing controls when linked to a compatible Canon photo printer

Canon EOS Digital Rebel XTi/400D Features

Image sensor The heart of the camera is a new 10.08 million image pixel, 22.2mm x 14.8mm Canon-designed and manufactured CMOS image sensor with a 5.7um x 5.7um pixel pitch, bayer pattern RGB filter array, high-efficiency microlenses and two-part optical low pass/IR cut filter. The focal length cropping factor is approximately 1.6x, relative to 35mm film; the sensor's

physical dimensions are identical to that of the Rebel XT/350D, which makes the sensor ever so slightly smaller than that of Canon's EOS 30D and previous midrange digital SLRs. The sensor's data is read out in 2 channels; Canon's DIGIC II is the imaging engine. Capture bit depth is 12 bits per colour, which is then converted to 8 or 16 bits per colour depending on file format and processing.

Chuck Westfall, Canon USA's Director of Media and Customer Relationship, says that dynamic range and noise levels with the Rebel XTi/400D are nearly identical to the camera it replaces, despite the smaller pixel size of the new model (5.7µm square vs 6.4µm square for the Rebel XT/350D). This, says Westfall, is because of an improved fill factor - the gap between the sensor's microlenses has been reduced, and the light-sensitive area of each pixel has been further increased through other design improvements. If true, this is likely to make the Rebel XTi/400D the best high-ISO performer of the new crop of 10MP cameras that have emerged in 2006.

Death to dust Canon is billing the Rebel XTi/400D's attack on dust as the most comprehensive available from any camera maker, owing to its 1-2 punch of ultrasonic vibration to shake off loose particles, and the simplified removal from image files any particles that remain and that are showing up as dust blobs in pictures.

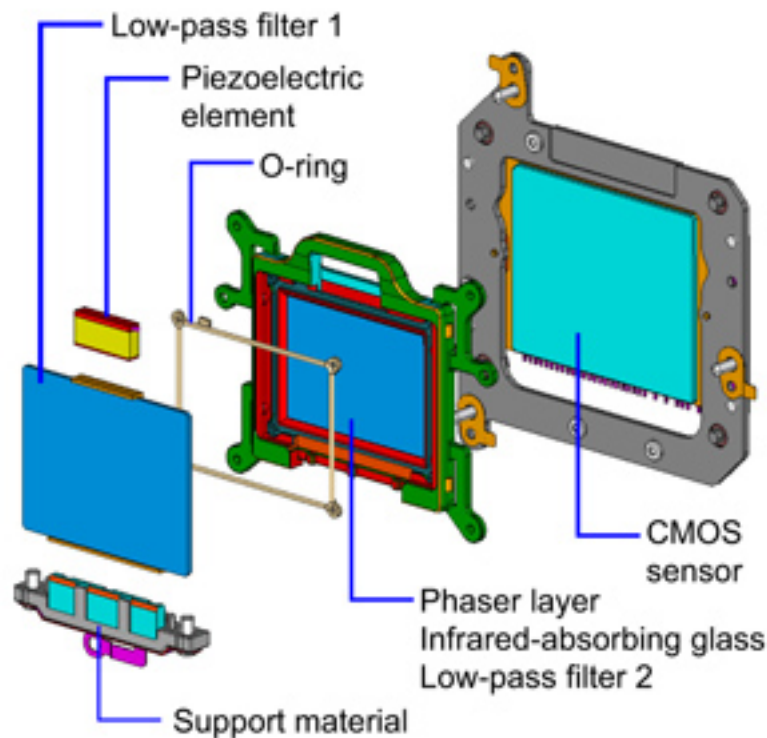
Plus, Canon has also refined the design of the camera itself to reduce the number of particles taking up residence on the sensor cover glass in the first place.

Canon has tackled the generation of dust by treating the camera's shutter blades to reduce the number of particles they cast off in normal operation. The body cap supplied with the camera as well is designed to not produce minute plastic shavings when it's twisted on and off the lens mount (this more-sculpted body cap design began shipping on Canon digital SLRs in the first half of 2005).

The suppression of dust is accomplished in three ways. First, the front surface of the sensor cover glass is treated with an anti-static coating. Second, an adhesive strip has been placed at the base of the sensor to catch bits of debris that's been vibrated off the cover glass or is otherwise roaming free inside the mirror box. Third, the low-pass filter (of which the sensor cover glass is part) has been split into two discrete components. One is mated directly to the sensor, while the other sits a short distance out from the sensor, with a gap in between, all in one sealed unit.

As a result of this low-pass filter design, dust landing on the cover glass sits further away from the sensor and is therefore somewhat more likely to reside outside the depth of focus range. Put another way, the further

a dust blob sits from the sensor the more likely it is to be blurred to the point where it isn't visible. Westfall indicates that certain Canon digital SLRs in the past, including the D30, D60 and 10D, also had a gap between the sensor and low-pass filter (though in those cameras the filter was a single plate, not two distinct components as it is the Rebel XTi/400D). Based on our recollection of the dust characteristics of those earlier cameras, it seems likely that Rebel XTi/400D's images will still show bigger clumps of dust, at least when a smaller lens aperture is used (since this has the effect of increasing the depth of focus at the image plane).



Keeping it Clean: The components making up the sensor unit in the Rebel XTi/400D. (Graphic courtesy Canon)

The removal of dust is where the real magic happens in the Rebel XTi/400D. The camera can be configured so that when the camera is switched on, and when the camera is turned off, it will automatically run a brief ultrasonic vibration routine on the sensor unit. Alternatively, the vibration routine can be engaged manually through a menu selection, and the camera can also be set to not vibrate at startup and shutdown.

A piezoelectric element mated to the sensor unit performs the vibration, which is meant to shake loose particles that are resting lightly on the cover glass. Loosened dust collects on a sticky strip at the base of the sensor.

Next, to deal with dust specs that the vibration routine can't clear away, Canon has incorporated the ability to create a map of the dust residing on the cover glass. Briefly, this is how it works: the camera is used to shoot an all-white object such as a wall, and from that a dust map, called Dust Delete Data in Canon parlance, is generated and stored in the camera.

Thereafter, any JPEG or RAW CR2 photo can optionally and automatically have the Dust Delete Data embedded into the picture's metadata. Later, the Dust Delete Data can be applied to the picture using the Stamp tool within v2.2 of Digital Photo Professional (which is bundled with the camera).



Coming Clean: The steps to creating and storing Dust Delete Data in the Rebel XTi/400D. (Screenshots courtesy Canon).

The result is promised to be a quick and fairly goof-proof blending away of particle spots from Rebel XTi/400D photos. The blending algorithm is able to compare the Dust Delete Data and image data in a way that enables it to handle light and dark specs and light and dark backgrounds differently, for more seamless spec removal. Only one Dust Delete Data set can be housed in the camera at a time; storing a new dust map overwrites the previous one.

Other manufacturers, such as Olympus across several digital SLR models and, most recently, Sony in its Alpha DSLR-A100, have incorporated sensor vibration to clear dust. And, Nikon offers the ability in several of its cameras to create a dust reference that can be applied in Nikon software to automatically remove dust specs from RAW NEF photos. Westfall notes, however, that Canon is

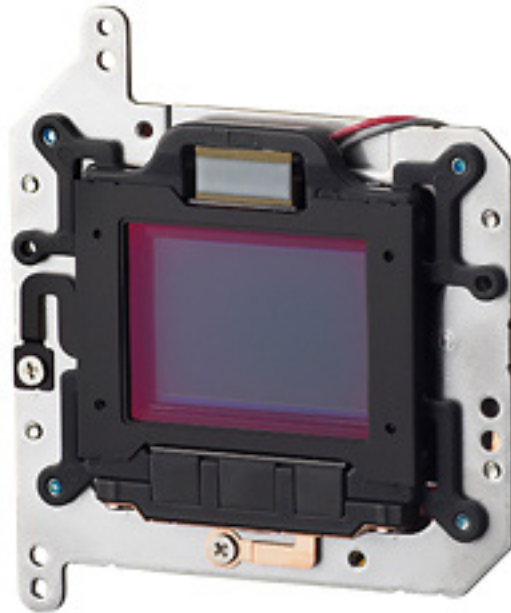
the first digital SLR maker to incorporate both into a single model, for what he describes as the most complete anti-dust strategy available. Canon even has a name for it: the EOS Integrated Cleaning System.

We hope all this translates into cleaner pictures with less hassle for Rebel XTi/400D owners, and it does sound like Canon's approach will be broader than that of the competition. That said, we would have preferred to see Canon go further by offering the ability to apply the Dust Delete Data-based blending routine to JPEGs and possibly even CR2s right in the camera, rather than having to use Digital Photo Professional (DPP) later. Plus, restricting the function to DPP, and to the separate Stamp tool window (DPP has several functions, including the Stamp tool, that are accessible only in workflow-stalling independent windows), will probably limit the uptake of this particular feature. We're also a bit nervous that the inclusion of Dust Delete Data in JPEGs and CR2s might introduce file opening problems for third-party applications not tuned to handle the revised structure of files from this camera.

(We hope our file compatibility concerns turn out to be unfounded, since we don't have any information about how or in what form Dust Delete Data is stored.)

Still, based on how the EOS Integrated Cleaning System has been described to us, it sounds like a positive start to handling dust in the Canon digital SLR family. We hope

that Canon is beavering away already on making the image cleaning part of the process happen in an even more seamless manner in future models.



Shake it up: The sensor unit of the Rebel XTi/400D. Click to enlarge.
(Photo courtesy Canon)

Brush or swab cleaning is still possible with the Rebel XTi/400D. Nothing about the new design of the sensor prevents this, says Westfall, though obviously if Canon's self-cleaning routine works well there will be much less of a need for brush-based cleaning in particular. Plus, the camera retains the sensor cleaning menu option for locking up the mirror and opening the shutter to gain safe access to the sensor cover glass.

File format options and file dimensions: File format options are JPEG, RAW .CR2 and simultaneous RAW + JPEG.

Maximum file resolution, when the camera is set to RAW .CR2 or Large JPEG, is 3888 x 2592 pixels (about 10.08MP). A full-resolution, 8-bits per colour photo from the Rebel XTi/400D opens into Photoshop as a 28.8MB file; at 16-bits per colour, 57.7MB.

Shutter and mirror: The shutter and mirror mechanism carry over mostly unchanged from the Rebel XT/350D, though as already noted the shutter has been treated to reduce the number of particles flying from its blades onto the cover glass. Shutter lag is rated at 100ms; mirror blackout time is 170ms.

The Rebel XTi/400D has a top shutter speed of 1/4,000 and a standard top flash sync speed of 1/200 (plus full TTL flash at up to 1/8000 with a compatible EX-series Speedlite set to High Speed Sync; the built-in popup flash is also capable of High Speed Sync operation). It's not possible to cheat the flash sync well above the standard top flash sync speed with non-dedicated strobes.

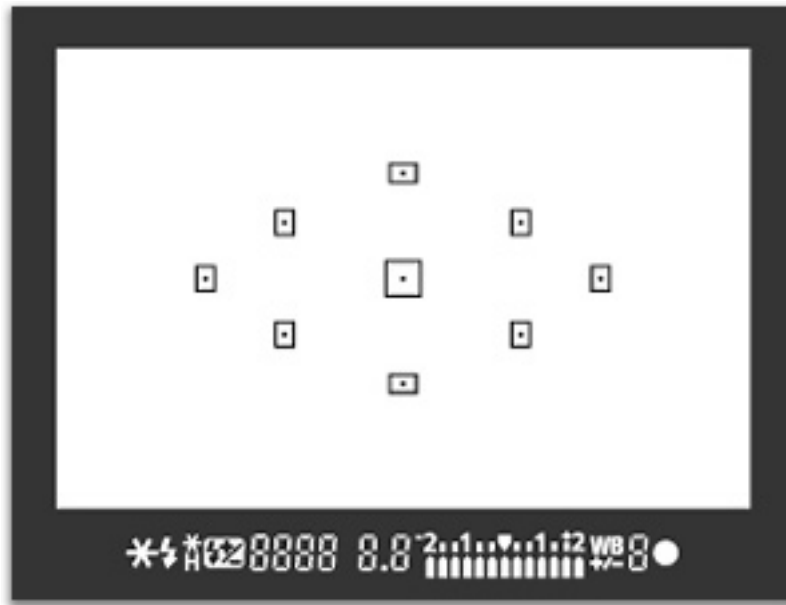
The shutter mechanism is rated for 100,000 cycles.

Startup time: The camera is ready to shoot when first turned on in 0.2 seconds (200ms). With the Rebel XTi/400D set to automatically run its ultrasonic

vibration at startup, the total time it takes for the electronics to ready themselves and the vibration routine to complete is somewhat longer than 0.2 seconds, though we don't have a precise total time specification yet. That said, Canon has designed the camera so that it won't lock out the photographer while the vibration is active. Pressing the shutter button is all that's required to immediately cancel the vibration operation and take a picture.

Frame rate and burst depth: The camera will fire at 3 fps (this rate isn't adjustable) up to a Canon-specified 27 Large Fine JPEG, 10 RAW and 8 RAW+Large Fine JPEG frames. Note that actual burst depth in a Canon digital SLR is usually dependent on scene content and ISO (especially ISO), where higher ISO settings translate into a reduced number of frames per burst when the camera is set to JPEG in particular. Therefore, Canon's burst depth specifications should be considered only as rough guidelines.

Autofocus: The much-maligned (by us) 7-point autofocus system of the Rebel XT/350D has been replaced by the much-liked (also by us) 9-point system pioneered in the EOS 20D and more recently in the EOS 30D (a variant is also in the EOS 5D). We didn't like the older 7-point system because its focus tracking was so poor; by comparison, the 9-point system as implemented in the EOS 20D and 30D offers capable, decent autofocus of both static and moving subjects, second only to Canon's current crop of Canon's 1-series digital SLRs in our experience.



A Look Inside: The 9-point autofocus point arrangement inside the Rebel XTi/400D's pentamirror viewfinder. (Graphic courtesy Canon)

Like the other cameras that share the same autofocus module, the centre AF point acts as a cross-type sensor with lenses whose maximum aperture are f/5.6 or faster. If an f/2.8 or faster lens is used, the centre AF point detects focus with 3x greater precision than with slower lenses. Unlike those other cameras, the Rebel XTi/400D autofocus algorithm has been tuned to better match its 3 fps shooting rate. Plus, the AF markings in the viewfinder act somewhat differently: a red dot lights up in the middle of the active AF square - just like the Rebel XT/350D - rather than the perimeter of the AF square turning red.

The features of the Rebel XTi/400D that are likely to

garner the most attention are its 10.08 million image pixel photos and sensor self-cleaning, but if the autofocus works as well in this camera as it does in other Canon models, then it may be this aspect of the new camera that makes it a viable option for working pros seeking a second or third body for not too much money.



Rear View: Basic settings such as ISO and focus mode are chosen in a display mode that's new to Canon digital SLRs. Click to enlarge.
(Photo courtesy Canon)

The camera's software bundle includes Digital Photo Professional (DPP) 2.2 for Windows and Mac. In addition to support for automatic dust zapping when Dust Delete Data is present in a Rebel XTi/400D picture file's metadata, and improvements to the RGB tone curve adjustment

control, the only other change we're aware of is on the Mac side: DPP 2.2 will ship as a Universal Binary for native speed on both PowerPC and Intel-based Macs.

Availability

The Canon EOS Digital Rebel XTi/400D is slated to ship in mid-September 2006 in the U.S. at an estimated street price of US\$799, or US\$899 in a kit with the EF-S 18-55mm f/3.5-5.6 II. The body will be available in both silver and black. The EOS Digital Rebel XT will remain in the lineup, in the U.S. and perhaps other Canon regions too, for at least the rest of 2006. In the U.S. the Rebel XT will have an estimated street price going forward of US\$699 for the body and US\$799 with the EF-S 18-55mm f/3.5-5.6 II.

