



***Sports and Fast-paced  
Event Photography with the  
Olympus CAMEDIA E-100 ZOOM RS***



CAMEDIA

**OLYMPUS**

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**OLYMPUS**

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## **Foreword**

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This technology paper is provided to illustrate the technical advances that enable fast-paced action and event photography with the Olympus' CAMEDIA E-100 ZOOM RS and to demonstrate how these technical advances can benefit professional and serious amateur digital photographers.

The CAMEDIA E-100 ZOOM RS SLR (single lens reflex) is specifically targeted by Olympus to professionals and serious amateur digital photographers and offers "best of class" features such as a 10x aspherical optical zoom lens, (equivalent to a 380mm lens), a innovative pre-capture image caching mode and 15 frames per second burst capability. It also features image stabilization to steady the lens and a precision electronic viewfinder.

Up until now, most digital camera manufacturers have tried to produce digital cameras that in many ways mimic traditional film cameras, especially with pro or prosumer digital cameras. The introduction of the CAMEDIA E-100 ZOOM RS represents a unique circumstance in which Olympus has purposely pushed the technology envelope to provide features that specifically address the critical needs of sports and fast-paced event digital photographers, an industry first.

The E-100 ZOOM RS includes a bevy of "digital-specific" features that go well beyond the capabilities of traditional professional quality film cameras. After all, why go digital if you aren't allowed to utilize the efficiencies of digital processes to their fullest extent?

We invite you to read further about the uniquely "digital-specific" features of the CAMEDIA E-100 ZOOM RS SLR and how it allows fast-paced event and sports photography to be even better.

John Knaur  
Olympus America, Inc.

For More Information about the CAMEDIA E-100 ZOOM RS SLR go to:

<http://e-100rs.olympus.com>

For More Example Photographs for the CAMEDIA E-100 ZOOM RS go to:

<http://www.camediagallery.com>

# Digital Camera Overview

The worldwide adoption of digital photography in the past four years has simply been astounding and dwarfs the adoption growth rate of other entrenched devices such as inkjet printers and scanners. By 2002, consumer digital cameras will surpass flatbed scanners in yearly adoption and this will have taken just 7 years in comparison to 12 years for flatbed scanners to reach this equivalent adoption rate. The worldwide forecast now puts consumer digital camera shipments at over 50 million units by 2005. It took PC's over 14 years to reach this level of penetration. By comparison, digital cameras will reach this same penetration in 9 years.

In 1999 alone, worldwide consumer digital camera shipments, excluding toy cameras exceeded 5.8 million units and represented over \$2.9 billion in street valued revenue. In the U.S., unit shipments exceeded 2.5 million representing over \$1.3 billion in street valued revenue with a projected five-year compound average growth rate, (CAGR) out to 2005 of 39.8%. (All sources: Imerge Consulting Group - 2000)

## Plateaus of Adoption

Unit shipments and revenue only tell part of the dynamic story of digital cameras. The adoption of digital cameras has occurred in stages or plateaus, driven entirely upon technical advances. The first plateau occurred with the introduction of a viewable color LCD, providing instant gratification to consumers in 1995.

With the second plateau of adoption in 1996, Olympus set out to move digital cameras away from being just novelty products for viewing images, to products people could actually benefit from, by providing the industry's most regarded "optical path". The optical path is a combination of lens quality, internal opto-electronics, image processing (algorithms),

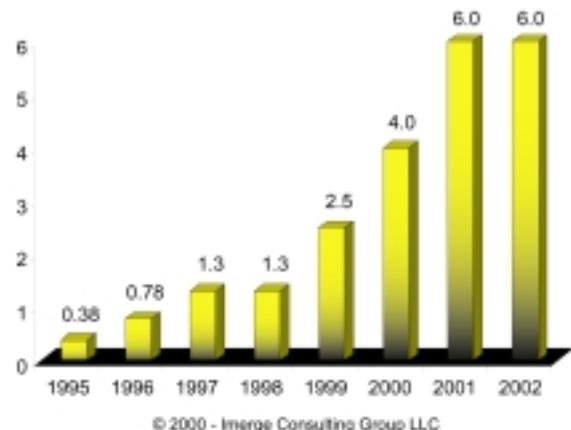
and color science, all working in tandem to provide users sharper, more accurate images.

Olympus again led the third plateau of adoption with the introduction of 1.3 mega-pixel resolution in a consumer digital camera. This resolution would later become the industry benchmark for representing "photo-quality". Photo-quality images are simply the equivalent in image quality to a consumer film camera when output to a 4" x 6" print on photo-grade paper. But resolution alone cannot provide photo-quality images. It is the resolution provided by the CCD sensor in tandem to the camera's internal opto-electronics and entire optical path.

## The Move to Digital Specific Attributes

Currently the state of digital camera development is entering a new era driven by higher resolutions and advanced feature-sets which move digital cameras beyond the capabilities of film cameras by using "digital specific" attributes. In-fact, from 1995, (the first year consumer digital cameras were introduced) until present, digital camera resolutions have increased at a phenomenal average rate of 45.8%.

Consumer Digital Camera Maximum Resolution History and Forecast



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As digital cameras move well above the “photo-quality” benchmark, resolutions are a driving attribute but not the principal driver for adoption. Rather it is these aforementioned “digital specific” attributes that will compel consumers and professionals to purchase digital cameras over film cameras.

Olympus again is among the first to recognize this shift and has begun a new phase of design and development of digital

cameras that are produced to meet the specific needs of photographers using “digital specific” processes. One of these categories among professional and prosumers is action, sports and fast-paced event photography. As you will see by reading further, the CAMEDIA E-100 ZOOM RS and its unique capabilities specifically address the needs of this category of photographers like no other digital camera on the market, at any price point.

## ***New 10x Optical Zoom Lens with Image Stabilization***

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The CAMEDIA E-100 ZOOM RS’s optical lens and image stabilization is designed to be digitally specific for action, sports and fast-paced event photography. The new 10x optical zoom, which is a 6.4-70mm in digital lens terms, (equivalent to 35mm-380mm in traditional 35mm film photography) is one of the industry’s first 10x zoom lens in an affordably priced digital camera. The CAMEDIA E-100 ZOOM RS’s back-saving weight is just over 1-1/3 lb. compared to a professional film camera and lens assembly of equivalent focal length weighing in at about 25 lb.

### **Expanded Focal Length Means More Creativity, Greater Control**

This extension of the focal length out to an equivalent 380mm allows digital photographers to compose images that were impossible in the past. In many circumstances, a sports photographer cannot be right next to the subject matter. This new expanded focal length lens allows the photographer to pull the subject into range, shoot tighter images,

create compactions of foreground to background and control selective depth-of-field that would be otherwise impossible with shorter focal length lenses.

Walter Urie, a southern California commercial photographer for 20 years recently used the CAMEDIA E-100 ZOOM RS for a series of on-location shoots in Moab, Utah. Walter specializes in annual report and advertising photography on-location and has used a number of digital and film cameras for his work. Walter’s award winning images have been featured in Communications Arts Magazine and he currently teaches photography at Orange Coast College. He has worked with Mercedes Benz, Isuzu, 3Com and many others.

Walter Urie talks about his experiences with the CAMEDIA E-100 ZOOM RS on location, “This camera and lens combination allowed me to compose images that would otherwise have been impossible. I’ve never used a still camera with this kind of zoom range. It was incredibly useful. It

## ***Pre-capture Mode***

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zoomed very smoothly and fluidly. One of the difficulties I've encountered when using other digital cameras is the short focal length zoom lens allows you to have tremendous depth-of-field. Conversely, if you want or need a selective depth-of-field, it's difficult to get that with other digital cameras. With this lens' ability to zoom out so far, selective focusing becomes easy."

### **Image Stabilization - Sharper Images at Slower Shutter Speeds**

Walter continues, "another situation I had was at a flat-track motorcycle race at dusk. Light levels were low and I was forced to shoot without a tripod. I was able to handhold the camera at full zoom with the on-board image stabilization while panning and got sharp, crisp images. This would have been impossible to do with a 35mm film camera. The lens would be far too heavy at this focal length to handhold. With image stabilization you can shoot at slower shutter speeds to compensate for low light and still produce a sharp image."



The pre-capture ability on the CAMEDIA E-100 ZOOM RS is exclusively an Olympus technology and is one attribute that truly sets this digital camera apart from any others. Like many other features, it was designed with action, sports and fast-paced event photography in mind.

### **Previous Work-around**

An inherent attribute of any digital camera is the slight time lag from when the shutter button is depressed and the time the image is actually captured. One method digital photographers have used to counter this is to try and anticipate when the precise moment of capture will occur and start depressing the shutter button well before the moment of intended capture. This has been a hit-and-miss proposition for nearly all photographers.

The CAMEDIA E-100 ZOOM RS's "pre-capture" capabilities alleviate the need for this clumsy technique and completely removes the anxiety of missing "the critical moment" for digital photographers.

### **Caching to a 9 Mb Buffer**

The "pre-capture" process begins by holding down the shutter button halfway, (see the diagram entitled CAMEDIA E-100

Panning in low light  
using the CAMEDIA  
E-100 ZOOM RS's  
image stabilization  
© 2000 Walter Urie

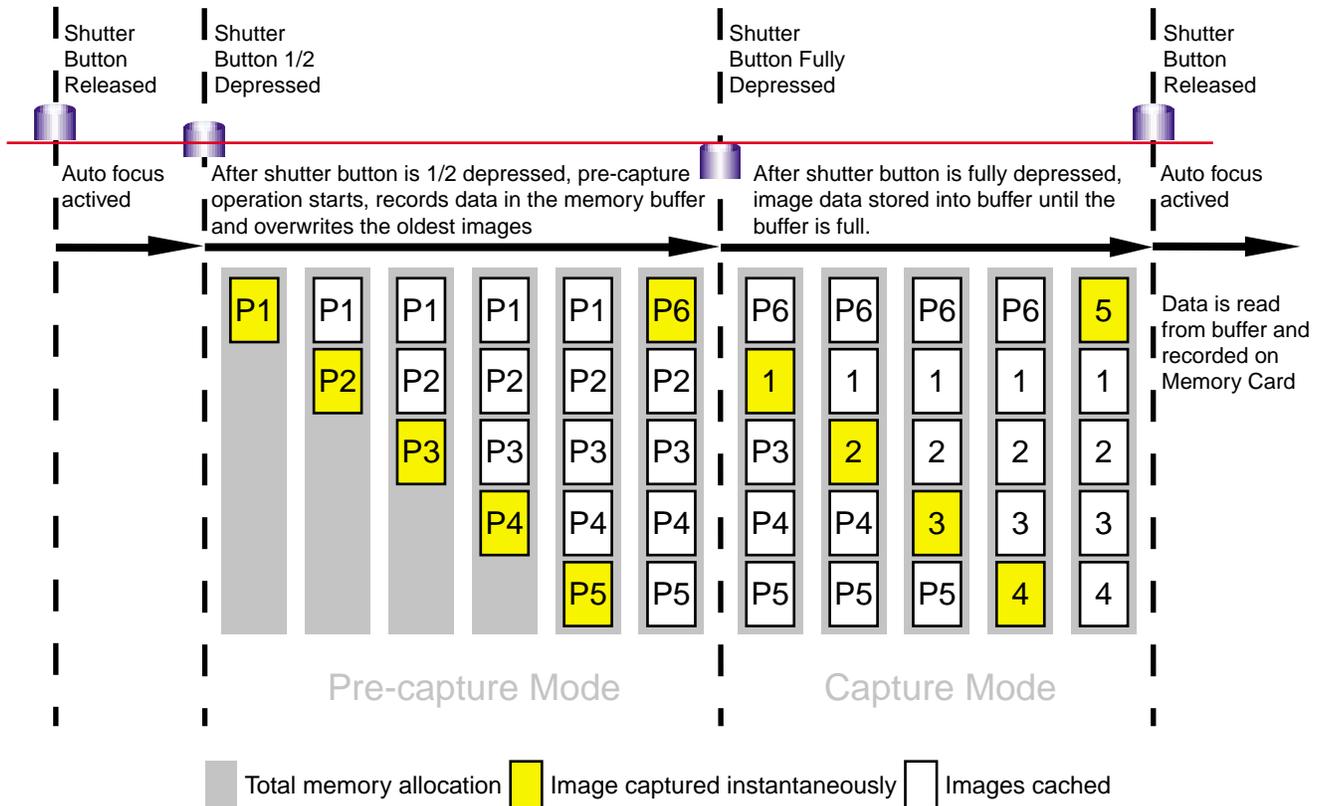
ZOOM RS Sequential Image Cache) when you think the critical moment you want to capture is near. Five sequential images are then cached in the on-board 9 Mb buffer, and are rolled over as long as the shutter button remains halfway depressed.

In the pre-capture mode, the sixth image overwrites the number one image, number seven overwrites the number two pre-captured image and so-on until the shutter button is either depressed fully, moving the camera into the sequential "capture" mode or the shutter button is released stopping the

pre-capture and capture altogether. This guarantees that you will not suffer from missed opportunities due to shutter lag and allows you to capture the precise moment you need.

Walter Urie comments, "going back to the motorcycle races I shoot with the CAMEDIA E-100 ZOOM RS, I wanted to catch the riders, which were going very, very fast at an exact spot on the curve using a panning technique. I was following the action and as the riders entered the designated area, I started to depress the shutter button halfway down. Out of 100 pans, I was able to capture accurately and with precision 95 pans."

### CAMEDIA E-100 ZOOM RS Sequential Image Cache





## ***15 Frames per Second Frame Rate Capable Capture***

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Just 5 years ago, if you had a professional film camera that could provide 7-8 frames per second with a motor drive, you had a top of the line camera. The CAMEDIA E-100 ZOOM RS provides more than double that frame rate as part of its digital specific design attributes. This allows the user to capture subtleties in photo illustration, for example capturing a golf swing.

According to pro shooter Walter Urie, "when you're photographing action, this camera gives you the opportunity to capture the exact moment I wanted and capture the action every single time."

Capturing a golf swing at 15 FPS with the CAMEDIA E-100 ZOOM RS © 2000 Walter Urie

## ***The Benefits of the CAMEDIA E-100 ZOOM RS's Progressive Scan CCD***

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Most consumer and professional digital cameras are not designed to be “digital specific” like the CAMEDIA E-100 ZOOM RS is for action and sports event photography. The majority of digital cameras have a maximum shutter speed of 1/500<sup>th</sup> of a second due to their incorporation of an interlaced CCD sensor. The CAMEDIA E-100 ZOOM RS incorporates a progressive scan CCD with 1/10,000<sup>th</sup> of a second capability. Why does this matter? An interlaced CCD digital camera has a fast enough shutter speed for most typical applications, but falls short if you are trying to capture lateral movement in sports or event photography.

A progressive scan CCD refers to a very simple and intuitive operation of the sensor when all lines are output in ascending order. In order to accomplish this progression, a digital camera must not have a frame store within the CCD sensor, or have a frame transfer CCD or a full-frame, interline transfer CCD.

The full-frame interline transfer CCD sensor incorporated in the CAMEDIA E-100 ZOOM RS with an interlined frame store has the same resolution as the sensor area. Simpler interlaced cameras with a standard interline transfer CCDs have frame stores with only half the vertical resolution.

The line scan order is really not the most relevant issue. Whether a digital camera is able to capture a moving object with full resolution, is. There is no mechanical shutter in a CCD sensor and so the term “progressive scan” has been used instead of the term “full frame shutter”. Let’s concentrate on what this means in an actual shooting situation.

Imagine that you are about to photograph an event where there are World-class athletes running laterally in front of you

and you want to stop the action with your digital camera without causing blurring. Or the situation could be college or professional football, or your local children’s soccer game. Unless the action is coming straight to you, the chances that blurring will occur when following fast action are great.

Ask any professional NFL football photographer and they will tell you that they would prefer to shoot at higher shutter speeds than 1/500<sup>th</sup> of a second, light permitting. At 1/500<sup>th</sup> of a second there is a risk that some of their images that show lateral motion will be blurred and unusable.

In summation, cameras with a full frame shutter, such as the CAMEDIA E-100 ZOOM RS are designated as “progressive scan” cameras and have the ability to capture moving objects with full horizontal and vertical resolution. This allows them to capture at much higher shutter speeds than standard interlaced CCD digital cameras, which can only capture moving objects with half the vertical resolution (but full horizontal resolution).

The CAMEDIA E-100 ZOOM RS allows the user to capture the fastest action possible without blurring, even shooting 200-MPH race cars while panning.

## The Importance of Matching Lens to CCD

More than 200 years ago, Newton showed that white light was composed of multiple wavelengths, (RGB) which are now called photons. These waves of light pass through a lens on a camera and are supposed to be "imaged" at the same point, onto film emulsion for example. When the photons are not imaged properly onto the film plane, chromatic aberration occurs and is most commonly caused by using single lens construction. Incorporating two lenses made of different materials can solve chromatic aberration with film camera lenses. The net effect of chromatic aberration is unintended color artifacts such as halos and wild colors.

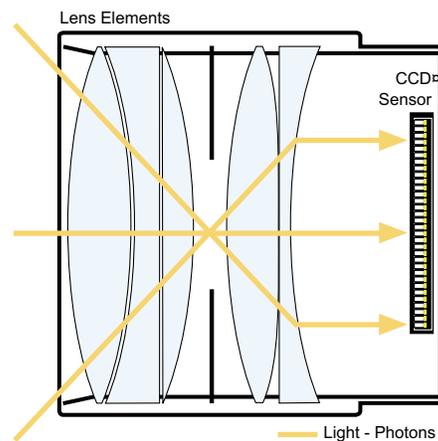
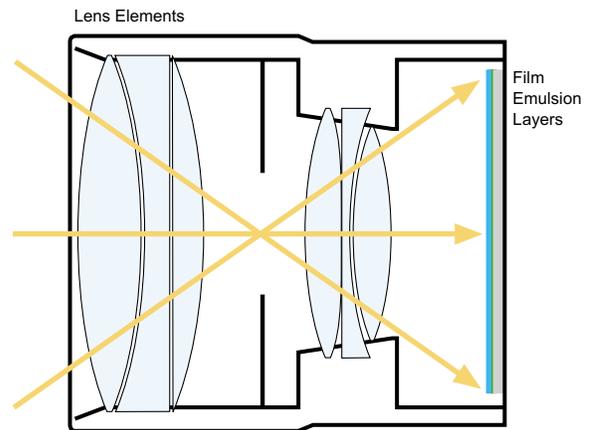
The marriage between lens and CCD is critical to delivering the best possible images. Post imaging processing can only do so much to help a poor image. Remember the old axiom, garbage in - garbage out.

The same holds true for uncorrected lenses made for digital cameras and the net effect it causes are unwanted artifacts, noise and a degraded image. Unbeknownst to many in the industry, digital camera lenses require different construction than film camera lenses. If a manufacturer, (and some do) tries to place a lens designed for a film camera onto a digital camera, the net effect is chromatic aberration and only a small portion of the lens will actually throw light onto the CCD. This gross under-utilization also causes a loss in edge-to-edge sharpness that could be delivered to the CCD.

The digital camera lens construction of the CAMELIA E-100 ZOOM RS contains a concave element that forces photons coming through the lens into a straight-ahead alignment to the 28 MHz high-speed progressive scan CCD. All CCD sensors are very picky about how light is delivered to them and they don't like oblique angles of light hitting them, which

causes a digital form of chromatic aberration. Film emulsion layers are designed to read light from an oblique angle and the fall-off from the lens. Olympus found that in order to get the best possible images from a digital camera, the light coming into a CCD must be straight on.

The CAMELIA E-100 ZOOM RS Lens  
Elements and Interaction with the CCD



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## **DualSlot Media Capability**

The dual slot media capability on the CAMEDIA E-100 ZOOM RS is an exclusively unique Olympus feature that allows the user to simultaneously write to either a 2M, 4M, 8M, 16M, 32M, and 64M SmartMedia NAND flash card or a Type I or Type II CompactFlash card. Or, you can opt to use one type of media at a time. This capability allows the user more flexibility in their choice of flash media and allows the camera to be “media agnostic”.

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## **Voice Annotation Capability with QuickTime™ File Capture**

Often professional photographers on the move need to have the ability to quickly jot down a subject’s name or a notation of where the image was shot for publication. In the “good ol days”, pros had to carry a notepad and pencil in their breast pockets ready for taking quick notes of who, what and where. Again, the digital-specific features allow the user to annotate an image with useful information. Why have new-world capture technology with old-world notations.

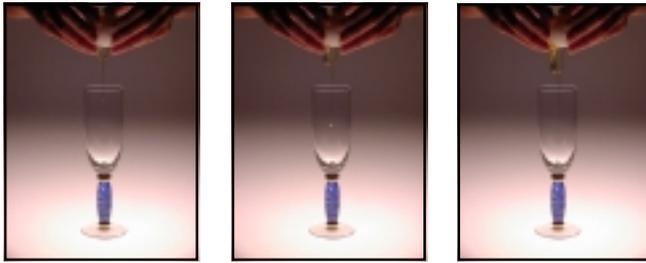
The CAMEDIA E-100 ZOOM RS solves this problem by allowing up to 5 seconds of voice annotation per image and saves it as a QuickTime™ audio file so the user has a digital notation to go with the image file.

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## **New Accurate Electronic LCD Viewfinder**

Viewfinders on most digital cameras use TTL (through the lens) viewing and because some digital camera lenses are slightly over-sized compared to the size of the CCD, give an inaccurate view of the area that is actually being captured. This misrepresentation on a professional level can mean the difference between having an acceptable image or not. This is especially true with professional photographers since many pros choose to strategically place important elements of composition on the outer fringes of the image to keep overzealous picture editors from cropping their images too much.

The new EVF (Electronic Viewfinder) on the CAMEDIA E-100 ZOOM RS represents the area being captured with 100% accuracy since it is reading directly from the CCD, not through the lens. What you see really is what you get.



## ***The Criticality of Neutral Color Management***

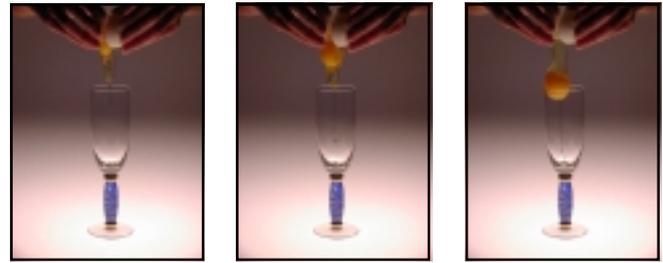
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The CAMEDIA E-100 ZOOM RS's color management system allows the user to capture with "neutral color" that is truer to the intended values of the original subject. The camera's post processing provides advanced algorithms that keeps the image from being too warm on the Kelvin scale or too cool, (3200° K represents tungsten light, 5500° K represents high noon daylight). Often adjusting an image in either direction causes unwanted noise, which often effects image quality. With Olympus's Neutral Color Management, you can color correct the image in either direction without negatively effecting the image quality.

## ***Shooting with Color or Black and White Preset***

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Previously, digital photojournalists and sports photographers haven't had the option to preset the mode they wished to shoot in, i.e. black and white or RGB color. The E-100 RS solves this problem, in-camera. In many cases, digital photographers are forced to shoot in color and later convert images to black and white. There are a few reasons why this is not acceptable to most professionals. First, color images take up much more storage on the camera's memory card(s) than black and white images, which could mean the difference between having enough storage or not on a shoot.



One of the benefits of pre-selecting a black and white mode is to let the camera do the work to discard the unnecessary color data before saving to the camera's storage media. Secondly, after-capture converting takes up valuable time, a PC and an image editing application, which could mean the difference in a missed deadline. Lastly, wouldn't it be better to check the black and white image in comparison with real life values while its there in front of you rather than "visioning" what it should have looked like afterward?

Photographer Walter Urie adds, "I specialize in black and white photography and I'm very picky. I was extremely impressed in the way this camera translated color to black and white tonal values."

## ***90° Image Rotation in Playback***

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Shooting in a vertical format is an absolute necessity for professional and prosumer photographers. The problem is, most digital cameras don't rotate the images on playback for you to see them properly and users are forced to accomplish this basic task on a PC with image editing software. Not anymore! Again, Olympus overcame this problem with a "digital specific" feature on the CAMEDIA E-100 ZOOM RS that allows you to rotate your images 90° on playback, so there's no need to use a PC or editing software.



## Summation

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After reading about all the “digital specific” attributes that this innovative digital camera has to offer we hope that you now understand their practical applications and benefits for on-location sports, action and fast-paced event photography. The CAMEDIA E-100 ZOOM RS has many other attributes not mentioned but the areas where this camera is specifically differentiated from other digital cameras include the 10x optical zoom lens with image stabilization, pre-capture modes, 15 frames per second frame rate capture capabilities, the fast progressive scan CCD, matching lens to CCD for accuracy, the dual slot media capability, the accurate electronic LCD viewfinder, Olympus’ neutral color management, voice annotation capabilities, the black and white presets, and 90 degrees of rotation in playback capabilities.

Hopefully you also have an understanding of the positioning of this digital camera in the marketplace as a whole. To quote professional photographer Walter Urie, “there is no doubt that this camera was designed specifically for action, sports and events and is even easy enough for parents to use. It provides all the tools anyone would need for this type of application and be successful at it. It had everything I needed to be successful in my location photography”.

No digital camera is complete without quality print output. The CAMEDIA E-100 ZOOM RS is designed to produce professional-quality prints on the new Olympus P-400 dye sublimation A4 printer. All you do is plug your media card in and you can use the printer’s controls to crop and print.

### **Ron Tussy**

Principal Imaging Analyst

Imerge Consulting Group LLC



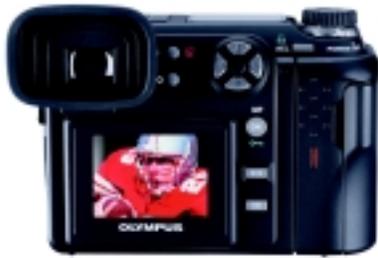
Olympus P-400 dye sublimation A4 printer

## << Specifications of the E-100 SLR <<

Model name	<b>Olympus CAMEDIA E-100 ZOOM RS Digital Camera</b>
Product Type	Digital EVF SLR Camera with 4.5cm/1.8inch color TFT LCD monitor
Memory	3V (3.3V) SmartMedia (SSFDC) Card (4M,8M,16M 32M and 64MB) One 8 MB card including Panorama function is supplied with camera CompactFlash Type II flash memory. Micro-Drive not recommended
Recording system	Still image ; JPEG (DCF: "Design rule for Camera File system"), TIFF (non-compress), DPOF support 10 Bit A>D Converter QuickTime™ JPEG Motion VGA and 1/8 VGA
Number of storable pictures with 8MB SmartMedia card	4: TIFF 1368 X 1024 28: SHQ JPEG 1368 X 1024 84: HQ JPEG 1368 X 1024 96: SQ1 1280 X 960      68: SQ2 1280 X 960 152: SQ1 1024 X 768      104: SQ2 1024 X 768 328: SQ1 640x480      264: SQ2 640 X 480 16 sec. 30 fps Motion JPEG 640 X480 32 sec. 15 fps Motion JPEG 640 X 480 32sec. 30 fps Motion JPEG 160 X 120 64 sec. 15 fps Motion JPEG 160 X 120
Image pickup element	1/2 inch CCD solid-state images pickup 1.51 Million Pixel (effective 1.4 Megapixel Image) RGB Progressive Scan : 28MHz (High Speed CCD)
White balance	iESP full-auto TTL, Preset Manual (Daylight, Cloudy, Florescent and Tungsten) "One Touch" Manual
Lens	Olympus lens 6.8– 70 mm 2.8-3.5, Glass Aspherical Zoom Lens (Equivalent to 35 - 380 mm lens on 35 mm camera) Image Stabilized System with 2.7x Digital Super Telephoto Optional 0.8x B-28 Wide-Angle or 1.7x B-300 Telephoto: [E series lenses can also be used].
Filter Size	49mm (To attach accessory lens an filters) 49>55mm Step up needed for thick filters
Photometric system	Digital-"ESP" Multi-Pattern metering system, Center-weighted Spot meter and, (8 area memorized) multi-spot metering
Exposure control	S-Program mode with Portrait, Landscape, Sports, Night Scene and Custom setup modes Programmed auto exposure, Aperture priority, Shutter priority +/- 2Ev by 1/3EV steps exposure compensation Auto Bracketing: select-able from 1/3EV, 2/3 EV and 1EV; 3 or 5 images Aperture priority: Wide ; F2.8 – 8.0, Tele ; 3.8 – 8.0, 1/3EV steps Shutter priority: 2 - 1/10000 sec. (Electrical CCD and mechanical shutter), 1/3EV steps Manual exposure: shutter speed, 16 sec. –1/1000 sec.
ISO	Auto, user selectable, 100, 200, 400 equivalent ISO
Focusing	iESP TTL or spot system autofocus (contrast detection system) with focusing illuminator. Focusing range: 24"/0.6 m–∞ (infinity) wide-angle, 79"/2m–∞ (infinity) Telephoto: 4.3"/0.1m- 24" wide-angle macro, 79"/1m-79"/2m telephoto macro- stepless (iESP off in rapid shooting mode.) Manual focus (manual focus setting by gauge) with focusing range: 24"/0.6 m–∞ (infinity):240 steps

AF Illuminator working range	Standard mode: 24"/0.6m-10'/3m (Can be turned off) User selectable on/off controls
Viewfinder	EVF (Electronic Viewfinder) SLR viewfinder 100% accurate image view, (Full Information/Mode AV,SV/Spot/CW/ESP/+/-/AF/Flash/Buffer) .55" Color LCD EVF (Low Battery Drain)
LCD monitor	4.5cm/1.8inch wider angle color TFT LCD monitor with 113,500 pixels (made from Low-temperature poly-silicon), 100% accurate image view
Flash modes	Built-in Flash : Auto-Flash (low-& back-light), Read-Eye Reducing Flash, Off, Fill-in External terminal: Off, Auto, Forced activation Slow Synchronization (First-Curtain Synchronization effect, Second-Curtain Synchronization effect)
External terminal	5 pin TTL connector for FL-40 or PC sync, Optional Bracket and cable needed
Flash working range	Wide; approx. 30"/0.8 – 18'/5.6m, telephoto; approximately. 8"/0.2 –9'/2.8m ( ISO 100)
Battery charging time	Less than 6 sec. (at normal temperature with new battery) for flash
Sequence mode	SHQ JPEG (1368 X 1024) 15/7.5/5/3 frames per sec. up to 10 frames HQ JPEG (1368 X 1024) 15/7.5/5/3 frames per sec. up to 16 frames SQ1/SQ2 (1280 X 960) 15/7.5/5/3 frames per sec. up to 21/7 frames SQ1/SQ2 JPEG (1024 X 768) 15/7.5/5/3 frames per sec. up to 27/17 frames SQ1/SQ2 JPEG (640 X 480) 15/7.5/5/3 frames per sec. up to 47/123 frames less than 1.2 second shot to shot at all times (unlimited quantity)
Pre-Capture	Begins capturing image before shutter release: User adjustable from 1-5 photos
Cancel Shot Recording	Cancels recording to Memory Card Preparing camera to immediately start shooting.
Selftimer / remote controller	12 second delay / 2 sec. after optional remote controller operation E-10 Remote Cable (Bulb won't work)
Setting memorization	Possible
Outer Connector	DC input terminal, Data input/output USB interface (Storage Class) Audio/Video Output terminal ( NTSC), external flash terminal for FL-40 (5-pinn TTL) or PC sync with optional cables and bracket.
Operating environment	Operation : 32F/0C – 104F/40C, 30 – 90 % Humidity Storage : -4F/-20C – 140F/60C, 10 – 90% Humidity
Power Supply	4 x AA Ni-MH batteries and charger included/ 2 x Lithium battery CR-V3 (LB-01); Optional 7AU-AC adapter / 4 x AA Lithium batteries /Use only high capacity AA Alkaline batteries (Manganese batteries cannot be used.)
Date/Time/Calendar	Simultaneous recording onto image data.
Automatic calendar system	Up to year 2030
Dimensions	4.25"/10.8cm (W) x 3.25"/8.25cm (H) x 5.6"/14.23cm (D) (excluding projections)
Weight	21.8oz/603g (without batteries and SmartMedia Card)

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