UNITED STATES PATENT AND TRADEMARK OFFICE
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BEFORE THE PATENT TRIAL AND APPEAL BOARD
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APPLE INC.
Petitioner

v.

MAXELL, LTD.
Patent Owner
_____

Case No. IPR2020-00597
U.S. Patent No. 8,339,493
_____

DECLARATION OF DAVID ETCHELLS

I, David Etchells, declare as follows:

1.   My name is David Etchells. I am over the age of eighteen (18) and otherwise competent to make this declaration. The statements made in this declaration are to the best of my knowledge and recollection. I have personal knowledge of the facts set forth in this Declaration, and, for facts stated on information and belief, I have been provided with information by a person having personal knowledge of such facts. If called as a witness, I could and would testify competently under oath to the facts stated in this declaration. I am being paid at my standard hourly rate of $250.00 as a non-technical witness.

2.   I am the Founder, Publisher, and Editor in Chief of Imaging Resource, a Photography News and Review website. I launched the Imaging Resource website on April 1, 1998, to provide photographers with unbiased, detailed information on digital cameras, particularly actual sample photos shot under carefully-controlled conditions. In addition to my managerial role, I have authored numerous product reviews and articles published by Imaging Resource.

3.   I have been a photographer for all my life, starting photography in 1970, maintaining a dark room for personal use while earning a BSEE and MSEE degree from UCLA with a specialization in semiconductor physics.

4.   Prior to founding Imaging Resource, I worked in the California aerospace industry and delved deeply into image processing architectures while

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working at the Hughes Research Labs in Malibu, California and was named as an inventor on three image-processing patents. I also ran a Macintosh-based systems integrator (Perspect Systems) in LA in the early 1990s. Some of our clients produced huge volumes of photography for mail-order catalogs, and a study I did for one of our clients in 1992 on the economics and performance of digital studio cameras turned into a widely-circulated industry report, recognized in the Seybold Report and marketed through the Future Image organization.

5.   During my work for Imaging Resource, I wrote a product review for the Casio QV8000SX digital camera. My review of the QV8000SX digital camera was first posted on Imaging Resource's website on January 26, 2000. A copy of this product review is attached to this Declaration as Appendix A. I downloaded this product review from the Imaging Resource website approximately January 2020.

6.   In order to begin my product review, I reached out to Casio requesting the QV8000SX digital camera, and Casio provided me with a QV8000SX digital camera. An email attached as Appendix B and dated November 1, 1999, confirms that I had received the QX8000SX digital camera from Casio at least as early as November 1, 1999. This email (Appendix B) is between a colleague, Mike Pasini, and me. In the email, I write to Mr. Pasini that we just received the Casio QV-8000SX:

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One/two additions: The new Casios look pretty interesting, but we've only
just gotten them in, haven't looked at *any* results yet.
(That's the QV-2000UX, and QV-8000SX)
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(Appendix B).

7.   I received the Casio QV8000SX digital camera in its original

packaging. Included in the packaging, along with the camera itself, was a paper copy

of a user manual, which is still in my possession. A photocopy of this paper user

manual is attached to this declaration as Appendix C. Photos of the Casio

QV8000SX camera, user manual, and original packaging, which I currently have in

my possession, are attached as Appendix D.

8.   My standard practice both in 1999 and since then has been to request

from a company the open market, consumer version of the product for which

Imaging Resource will perform a product review. Because Imaging Resource is a

website dedicated to providing comprehensive product reviews to consumers of the

products, my standard practice both in 1999 and since has been to perform the

product review on the consumer version of the product available to consumers.

Based upon information and belief, the Casio QV8000SX camera provided by Casio

to me for preparing the product review was the consumer version of the product (i.e.,

the version a consumer would purchase). The photos of Appendix D include photos

of the original packaging for the camera that I received (and which, as I stated in

above ¶ 7, I currently have in my possession). In my opinion, the original packaging

appears to be packaging for a camera to be sold to a user. It is my recollection the Casio QV8000SX camera was available for purchase by the time I received the camera from Casio (by at least November 1, 1999) and by the time Imaging Resource posted the product review (January 26, 2000). For example, the product review (Appendix A at page 18) references the QV-8000 as one of the most versatile cameras on the market and having one of the widest zoom ranges on the market.

9.   I was not required to sign a non-disclosure agreement or otherwise restricted in any way from the distribution of materials relating to the Casio QV8000SX digital camera. Casio did not require any confidentiality from me or Imaging Resource as part of preparing and publishing the product review of the Casio QV8000SX camera.

10.   Attached as Appendix E is an email dated November 22, 1999, from my colleague at Imaging Resource, Stephanie Boozer, to me where Ms. Boozer refers to "working on the Casio and hope to complete it tonight or in the morning." (Appendix E). Ms. Boozer is referring to working on the product review for the Casio QV8000SX. I know this, because my response to Ms. Boozer, also provided at Appendix E, refers to her being available to shoot test photos for the QV-8000SX:

```
If you're available to shoot with the QV-8000 tomorrow, that'd be fine,
otherwise, I'll probably just look to have you come out right after
Thanksgiving. We'll be leaving sometime Wednesday afternoon, won't be
back until Saturday night late.
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(Appendix E). Later in the day on November 22, 1999, Ms. Boozer sent me another

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email (Appendix F) with the "Casio text" referenced from her email in Appendix E. As can be seen in the attachment information to the email of Appendix E, the filename for the attachment was "Casio QV-8000SX.rtf."

```
Stephanie Boozer, 11/22/99 6:32 PM -0500, Casio QV-8000SX text

X-From_: stephanie@quink.com  Mon Nov 22 18:26:06 1999
Date: Mon, 22 Nov 1999 18:32:43 -0500
From: Stephanie Boozer <stephanie@quink.com>
X-Accept-Language: en
To: Dave Etchells <detchells@imaging-resource.com>
Subject: Casio QV-8000SX text

Here's the Casio text.  See you in the morning between 11 & 12...

Stephanie

Content-Type: application/rtf; x-mac-type="52544620"; x-mac-creator="4D535744";
 name="Casio QV-8000SX.rtf"
Content-Description: Unknown Document
Content-Disposition: inline;
 filename="Casio QV-8000SX.rtf"

Attachment converted: G3 HD:Casio QV-8000SX.rtf (RTF /MSWD) (0000CC40)
```
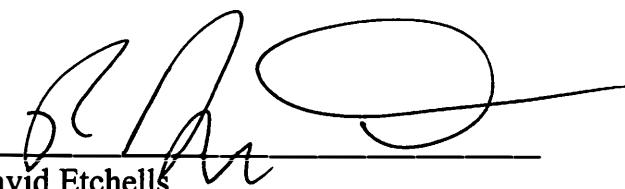
11.   Attached as Appendix G is a listing of EXIF data from an image file of an image taken with the Casio QV8000SX. As can be seen towards the bottom of Appendix G, the "Image Generated" and "Image Digitized" date is December 7, 1999. The EXIF data file is the data file generated by the QV8000SX camera corresponding to a particular JPG image file stored by the camera. As shown at the top of Appendix G, the filename for the image file is "Q8DBASF.JPG."

12.   Attached as Appendix H is the JPG image file for Appendix G, namely the file "Q8DBASF.JPG."

13.   Attached as Appendix I is a screen capture of Imaging Resource's stored files related to the Casio QV8000SX, as indicated by the folder info "Q8K" at the top of the document. Appendix I shows the filename "Q8DBASF.JPG" having a saved date of January 7, 2000.

14.   Attached as Appendix J is an email dated January 10, 2000, from my colleague, Ms. Boozer, to me, attaching the QV-8000 image analysis (see subject line of the email and the filename of the attachment on the email). The referenced "image analysis" would have been a discussion of the quality of the images taken by the Casio QV8000SX to include with the product review.

I declare that all statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

By: _____
      David Etchells

Date: ___2/20/20_____

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Casio QV-8000SX

Casio delivers 2 million pixels, and "real camera" features (including full-manual exposure!)

(Review first posted 1/26/2000

*1.3 megapixel CCD, 1280x960 images

*8X (!) optical zoom, plus 2x/4x digital zoom

*Time exposures to 64 seconds (!)

*Full-manual exposure option

EZ Print Link

Readers have requested free-formatted versions of our reviews (without the graphical accouterments of our page design), to make printing easier. We are accommodating this request with special copies of each review, formatted to allow the text flow to be dictated by the browser window. Click **here** for a print-optimized page.

Manufacturer Overview

Casio was one of the very first companies to produce digital cameras for consumers, and their original QV-10 digicam introduced digicam users to the wonders of LCD viewscreens. What a concept! It's become almost mandatory these days, but back when the QV-10 was first introduced, the feature was a real eye-opener.

Highlights

- 1.3 megapixel CCD delivering up to 1280 x 960 pixel images.
- 2.5 inch low glare, Hyper Amorphous TFT color LCD panel (122,100 pixels at 555 x 220).
- F/3.2-3.5, 6 to 48mm, 8x zoom(!), swivel lens (equivalent to a 40 to 320mm on a 35mm camera).
- 2x/4x digital zoom.
- Apertures of F/3.2, F/4.8 and F/8.
- Shutter speed options from Bulb to 64 (!) to 1/2000 seconds.
- Multi-pattern, spot and center weighted exposure metering options.
- Exposure compensation from -2 to +2 EV in 0.25 EV increments.
- Program AE, Aperture Priority, Shutter Priority, and Full Manual exposure modes.
- Contrast detect TTL autofocus with manual and infinity focus modes as well as focus lock.
- Panorama mode supports full 360 degree in-camera display.
- White balance with four modes.
- Built-in flash with four modes (Auto, On, Off and Red-Eye Reduction).Multi-pattern, center point and spot metering modes
- Movie and still capture modes.
- USB and serial connections.
- Wired remote control.
- DPOF (Digital Print Order Format) compatibility for image printing.
- Image capture in JPEG (Exif.Ver.2.1) for still images and AVI files for movie images

Executive Overview

Casio labels the QV-8000SX as a "versatile" digital camera on its packaging, and the product certainly lives up to that billing. It boasts a plethora of features and operating modes, including a full 8x optical zoom lens that swivels separately from the body, flexible exposure options, including aperture and shutter-priority autoexposure calculation, time exposures up to 64 seconds(!) and much more. Here's a quick rundown of the major camera features; see the individual sections of the full review for more detail.

We really like the rotating lens concept (invented by Casio, introduced way back in digicam prehistory on their original QV-10), and would like to see it adopted by more manufacturers. The fact that the lens doesn't protrude very much from the camera body is another plus, keeping the entire camera reasonably compact and pocketable (for large pockets, at least). Additionally, the camera is quite lightweight (due to its all plastic body), adding to its portability. Control-wise, all the buttons and levers are laid out so that one handed operation is possible (a definite benefit in some shooting situations).

The QV-8000SX relies solely on its LCD for viewfinder operation, making it harder to use in very bright conditions, and also eliminating the power-saving option of using the camera with the LCD turned off. (We're big proponents of the dual optical/LCD viewfinder approach, as seen in Casio's QV-2000UX, which we reviewed previously.) The lack of an optical viewfinder also makes it more difficult to take advantage of the astonishing low-light capability of the QV-8000, since the live LCD viewfinder display only requires a moderate amount of light to work. For all that, the LCD is at least big and bright, at 2.5 inches and 122,100 pixels. An information display of camera settings and options can be canceled and recalled by hitting the Display button, with the exception of the flash mode icon and center focus target mark, which are always present. We were pleased with the optional grid function that superimposes a grid of light gray lines over the LCD image, significantly assisting with image composition and alignment.

The QV-8000SX has a 6 to 48mm, 8x zoom lens (equivalent to a 40 to 320mm lens on a 35mm camera). As we mentioned earlier, the lens actually swivels a full 270 degrees, enabling you to point the lens all the way back at yourself (useful during self-timer shots so you can see the countdown on the LCD panel). Filter threads on the inside lip of the lens accommodate 43mm diameter filters. Focus ranges from 1.3 feet (0.4m) to infinity at the wide angle end and from 3.3 feet (1m) to infinity at the telephoto end. In macro mode, focus ranges from 0.4 to 19.7 inches (1 to 50 cm) with auto focus and from 3.9 inches (10cm) to infinity with manual focus. The aperture can be manually or automatically controlled, with options of F/3.2, F/4.8 and F/8. A manually controlled 2x or 4x digital zoom option extends the optical zoom (8x) capabilities up to 32x, but with lesser image quality as a side effect. Focus options include Manual and Infinity modes.

The QV-8000SX is unusual in that it provides both fully automatic and optional manual exposure modes. You thus

have full auto, aperture or shutter priority, or full manual exposure options. Programmed modes such as Night Scene, Portrait and Landscape set up the camera for special shooting, saving time with preset options.

A built-in flash offers four operating modes: Auto, On, Off and Red-Eye Reduction. Auto puts the camera in control of the flash; On fires the flash with every exposure; Off completely suppresses the flash and Red-Eye Reduction emits a small pre-flash before firing the full flash to prevent the Red-Eye Effect. Normal flash power provides a working range from 1.6 to 8.2 feet (0.5 to 2.5m) and from 0.3 to 1.6 feet (0.1 to 0.5m) in macro mode and flash intensity is adjustable, with Strong, Normal or Weak settings.

Six white balance modes (Auto, Daylight, Shade, Tungsten, Fluorescent and Manual) are available. Automatic mode lets the camera govern white values based on existing light. Daylight, Shade, Tungsten and Fluorescent settings adjust white balance for various natural and artificial light values. Probably the most accurate when shooting under artificial light, the Manual setting sets the white value based on a sheet of white paper held in front of the lens.

Other exposure options include exposure compensation (EV adjustment), adjustable from -2 to +2 EV in .25 EV increments, resetting after each shot. Three metering options include Multi, Center and Spot settings. Multi averages the exposure based on the entire image while Center averages the values from a large area in the center of the image. Spot metering determines the exposure value from a small spot directly in the center of the frame.

The Quick Shutter and Continuous Recording options enable you to catch fast paced action shots. Quick Shutter records up to five images in approximately one second intervals with one multiple presses of the shutter button while Continuous Recording captures up to five images at approximately 0.25 second intervals while you hold the shutter button down. Shooting intervals in both modes depend on the image size and resolution and available CompactFlash space. To capture moving action, the movie recording mode records up to 10 second movies in 320 x 240 pixel AVI format. An interesting option here is the Past movie mode, which records events that occurred before the shutter button was pressed (the camera actually records images to a buffer memory and once the shutter button is pressed, copies those images to the CompactFlash).

You can also record a 360 degree panorama image (or up to nine consecutive shots) on the QV-8000SX through the Panorama record mode. A helpful feature is that after the first image is exposed, the right edge of the preceding image remains on the screen to help you line up the next shot properly. Images can be linked together in the camera (for playback only) or on the computer via the included Panorama Editor software (Windows users only).

Other recording options include the ability to record images in monochrome black and white or sepia tones, adding a little creativity to your shots. The self-timer counts down from two or 10 seconds once the shutter button is pressed and a separate timer function allows you to record a series of images at set intervals (from one to 60 minutes and up to 250 shots).

For image playback, US and Japanese models of the QV-8000SX come with an NTSC video connection cable (European models come with PAL) to connect the camera to your television set. If desired, the TV can also be used as a viewfinder when composing images, helpful in manually focusing on macro subjects, or in studio settings where you have to interact with the subject from in front of the camera. (Kid photography, etc.) Playback mode allows you to view images individually or as thumbnails, nine to a screen. You can also play back movies and panoramic images in the camera. A playback zoom feature lets you enlarge images and scroll around within the enlarged view.

Four AA alkaline, lithium or NiMH batteries keep the QV-8000SX running (you can also take advantage of the included AC adapter). Since the lack of the optical viewfinder reduces battery conservation options, we highly recommend keeping a spare set of batteries with you.

USB, serial and Mac adapter cables come with the QV-8000SX, as well as a software CD with PhotoLoader, Panorama Editor, Picture Works MediaCenter, QuickTime, Adobe ActiveShare, Adobe Acrobat Reader, Internet Explorer 5.0 and a trial version of Picture Works Web Publisher. For some reason, Casio only includes software compatible with Windows 95, 98 and NT 4.0, so Mac users must fend for themselves, or order the $10 accessory PhotoLoader program for Macs. When inserted into your computer, the CD displays a detailed menu with options to install the various software applications, read about the applications, register your camera online, go directly to the Casio website, open the accessory listing or fill out an accessory order form. Most of the software included offers relatively basic image correction and manipulation capabilities, but the trial version of Picture Works Web Publisher creates customized web pages that incorporate your QV-8000SX images. Additionally, Adobe Active Share allows you to post images to the ActiveShare.com website for easy viewing by family and friends

In the end, the QV-8000SX offers capabilities that both the novice and the expert photo consumer will appreciate.

From the full manual capabilities to complete automatic control, the camera accommodates a variety of users. Plus, its compact shape and light weight make it a portable option for those of you on the go. We confess to some skepticism when we saw the "ultra versatile" billing on the QV-8000's box, but have to admit it's one of the most flexible digicams we've seen to date. (January, 2000).

Design

At first glance, the QV-8000SX doesn't look too different from some of the digital camcorders out on the market. We personally like swivel-lens designs, as they give the consumer more shooting flexibility in both still and movie modes. The QV-8000SX's lens actually turns a full 270 degrees, meaning you can point the lens back at yourself! The lens is protected by a lens cap that avoids being a nuisance through its ability to clip onto the wrist/shoulder strap. (A nice little design touch, other manufacturers take note!) As for its other design features, the QV-8000SX gives you a nice hand grip, via the battery compartment, and an overall sleek design. The all plastic body makes the camera surprisingly light weight for its size, at only 11.6 ounces (330g) without the batteries. It's also fairly compact at 5.6 x 3.1 x 2.8 inches (142.5 x 77.5 x 71mm), excluding any protrusions.

The front of the camera offers a minimalist design aesthetic, with smooth contours and few controls or features. The only control on the front is the slightly awkward optical zoom lever, which we've become accustomed to controlling on other digicams with our thumb on a back panel control.

The back panel of the camera features the LCD monitor, various function controls and the Record/Play mode switch. Here too, the design is very minimal with clean lines and shapes.

Both sides of the camera are feature free, with the exception of the wrist/shoulder strap attachment on the side opposite the lens.

The top of the camera carries the shutter button, power switch, mode dial, menu and various other buttons. The I/O and AC adapter jacks are covered by a plastic flap that snaps closed.

Finally, the bottom of the camera holds the plastic tripod mount, locking battery compartment and CompactFlash slot. One note here is that the placement of the battery and CompactFlash compartments makes it impossible to change out either one while mounted to a tripod (a design issue we notice when doing studio work).

Viewfinder

The QV-8000SX has done away with the optical viewfinder, utilizing the LCD monitor as its sole viewfinder. In some respects, this makes sense since the LCD viewfinder provides a TTL (through the lens) view, and is therefore more true to the captured image. Alternatively, when it comes to power conservation, optical viewfinders really help squeeze

the most out of the batteries. Just keep this in mind and have some spare batteries handy. Optical viewfinders are also very handy in both very bright and very dim light, where the image on the LCD can be difficult or impossible to see. The 2.5 inch, low glare, color Hyper Amorphous TFT LCD monitor displays images at 122,100 pixels (555 x 220). An information display can be canceled or recalled by hitting the Display button, with the exception of the flash mode icon and center focus target mark, which are always present. There's also a very handy grid function that can be turned on or off, helping you line up shots. (We really like this optional grid of light gray horizontal and vertical lines, as we've very often ended up with digicam images that were slightly rotated, when we thought everything was nice and level. You can always rotate the photo after the fact in an image editor, but it's preferable by far to avoid the problem in the first place.)

Optics

A 6 to 48mm, 8x zoom lens comes on the QV-8000SX (equivalent to a 40 to 320mm lens on a 35mm camera). This is a much longer zoom ratio than is typical of digicams (most have only a 3x zoom), and we really liked the extra flexibility it affords. It's interesting to note the impact of a longer zoom on the effective camera resolution. Consider the situation where you want to capture a distant object, and want to fill the frame with it. If a 3x zoom will do that, then a 2 megapixel camera clearly wins the resolution war, with 1600 pixels horizontally. Suppose though, that the subject is twice as far away: The 3x zoom on a 2 megapixel camera ends up only delivering 800 pixels worth of resolution on the subject itself (assuming that it now only fills half the frame). Compare this to the QV-8000, which could zoom out to 6x, and fill the frame with the subject, devoting the full 1280 pixels to it. In this case at least, the QV-8000 actually delivers more useful resolution than the 2 megapixel model. Then consider that the QV-8000 goes all the way out to 8x! For distant subjects (wildlife?), the QV-8000 is actually a better choice than a 2 megapixel camera with only a 3x zoom (or even a 5x zoom).

We really liked swiveling lens on the QV-8000, which rotates a full 270 degrees, letting you point the lens all the way back at yourself, straight down or anywhere in between. Filter threads on the inside lip of the lens allow you to attach 43mm diameter filters or accessory lenses. Focus ranges from 1.3 feet (0.4m) to infinity at the wide angle end and from 3.3 feet (1m) to infinity at the telephoto end. In macro mode, focus ranges from 0.4 to 19.7 inches (1 to 50 cm) in auto focus and from 3.9 inches (10cm) to infinity in manual focus mode. Aperture can be manually or automatically controlled, with options of F/3.2, F/4.8 and F/8.

The 1cm minimum focusing distance in Macro mode can produce some really amazing close-ups. The zoom lens seems to have a much more limited range of focal lengths in macro mode (we'd guess it's only about a 1.2x zoom at that setting), but the detail the camera can capture is incredible: The minimum capture area is an amazing 0.71 x 0.95 inches (18 x 24 mm). The only limitation we found with this incredible macro capability is that the width of the lens itself can make it difficult to get adequate light into the subject: You may find it helpful to make a conical "light tent" out of a piece of white paper or diffusion material, as shown at right. With this sort of arrangement, you can shine lights onto the diffusion material from multiple angles, and obtain very even illumination, despite the extremely short working distance. You do pay one price for the extraordinary macro capability: At the shortest focusing distances, the lens appears to suffer from considerable "curvature of field", which means that the corners of the image will be out of focus when the center is sharp. This effect is most noticeable at the 1cm focusing distance, decreasing as you move out to greater distances.

A 2x / 4x digital zoom option extends the 8x optical zoom capabilities up to 32x, but the image quality always suffers as a result of digital enlargement. Digital zoom automatically saves images at the 640 x 480 pixel size. The QV-8000SX offers manual focus and Infinity modes, both accessed by a control button beneath the LCD monitor. Manual focus is adjusted by the plus and minus buttons on top of the camera, after pressing the MF button under the viewfinder. After a few seconds though, the +/- buttons return to their normal exposure-compensation function. No focus feedback is provided other than the view in the LCD: For fine focusing, we'd like the option of having feedback

Appendix A

from the camera, or at least being able to see a magnified view in the LCD. Infinity mode sets the focus at infinity for quick shooting of far away subjects.

Exposure

Exposure control on the QV-8000SX can be fully automatic, or you can take advantage of several programmed modes. Aperture and Shutter Speed Priority modes allow you to control either the aperture and the shutter speed individually or both at the same time (full manual). In the menu system, both aperture and shutter speed have entries with options of "Auto", or several manual settings. Picking a manual setting for aperture, but leaving the shutter option set to auto results in "aperture priority" metering. The opposite set of choices produces "shutter priority" metering. Manually selecting values for both settings gives you full manual exposure control, a very rare commodity in the digicam marketplace. Additionally, program modes such as Night Scene, Portrait and Landscape save time when shooting in special situations. While in full automatic mode, you have the ability to change white balance, exposure compensation (EV) and the flash. You also have control over image sharpness, color saturation and image contrast through the Record Details menu. Here's a more detailed description of the QV-8000SX's exposure options:
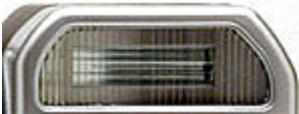
Flash

The built-in flash on the QV-8000SX resides directly on top of the lens, so that when the lens spins around, so does the flash. This is convenient, and almost mandatory for a rotating-lens design like the QV-8000, but the close proximity of the flash tube to the lens makes it much more difficult to eliminate the red-eye effect in shots of people. Four flash modes are available: Auto, On, Off and Red-Eye Reduction. Auto mode puts the camera in charge of judging light levels and whether or not to fire the flash. The On setting fires the flash with every exposure and the Off setting prevents it from firing at all. Red-Eye Reduction mode emits a small pre-flash before firing the full flash to help prevent the occurrence of the Red-Eye Effect. Working range for the flash runs from 1.6 to 8.2 feet (0.5 to 2.5m) in normal, wide angle mode and from 0.3 to 1.6 feet (0.1 to 0.5m) in macro mode. An icon on the LCD monitor clues you in to the selected flash mode, which is changed by pressing the Flash button until the desired icon appears (Auto mode has no icon). Flash intensity can be changed via the Record Details menu, with options of Strong, Normal and Weak. We'd loved to have seen an option for external flash on the QV-8000, given the extraordinary flexibility it offers otherwise. The good news here though, is that its flash is a "single pop" design, producing only a single flash in normal operating mode. This makes it easy to use with conventional optical strobe triggers for use with external flash units. (Many digicams produce a double flash in normal exposure mode, the first "pop" being used for white balance and metering, and the second making the actual exposure. These cameras require special "smart" triggers to sync properly with external strobes.)

White Balance

Six white balance modes are available on the QV-8000SX: Auto, Daylight, Shade, Tungsten, Fluorescent and Manual. In Automatic mode, the camera assesses light type and levels and assigns the appropriate white values. Daylight, Shade, Tungsten and Fluorescent settings all do as they sound by adjusting white balance for varying natural and artificial light sources. Manual white balance allows you to set the white value based on a sheet of white paper held in front of the lens (usually the most accurate in special lighting situations). A little-known benefit of manual white balance options like this is that you can use them to deliberately introduce color casts into your images, by using off-white objects as your reference targets: Experiment with this a bit, and see what happens!

Exposure Compensation (EV adjustment)

To adjust for lighter or darker exposures, exposure compensation (EV adjustment) is adjustable from -2 to +2 in .25 EV increments. The setting is only good for one exposure, as the EV value automatically reverts to zero once the shutter button is pressed.

Metering

The QV-8000SX allows you to change exposure metering options via the Record Details menu with options of Multi, Center and Spot. The Multi setting takes readings from the entire image and then bases the exposure on the average of those values. Center weighted metering averages the values from a large area in the center of the image. Spot metering takes the exposure value from a reading at the direct center of the image. Unlike the EV adjustment setting, the metering setting can not only persist from shot to shot, but from one shooting session to the next, even if the

camera is powered down in the interim. You can select whether or not the camera remembers the metering preference via a setting on the "Mode 2" options menu.

Quick Shutter

The Quick Shutter function allows you to record up to five images at approximately one second intervals (depending on image information and memory card space) with one press of the shutter button. The mode can be used in Automatic, Night Scene, Landscape or Portrait recording modes. As you shoot, the camera continuously processes the images you've already captured in the background, saving them to the memory card. When you pause, the camera "catches up" with you, and when you shoot rapidly, you get ahead of it. The camera displays the current status of the memory buffer (temporary image storage) as you shoot and it processes, via a set five small circles in the LCD viewfinder. Filled-in circles indicate full memory spaces, empty ones indicate space available. We found both the Quick Shutter mode and this memory-usage feedback very useful in our shooting: It's nice to know what's going on inside the camera, and it helps you plan your shots a bit.

Continuous Recording

The Continuous Recording option allows you to record up to five images at approximately 0.25 second intervals with one press of the shutter button (depending on the image information and CompactFlash space). Like Quick Shutter, Continuous Recording is available in Automatic, Night Scene, Landscape and Portrait recording modes. Flash is unavailable in this mode and focus and exposure settings are locked with the first image.

Movie Recording

The QV-8000SX allows you to record movies approximately 10 seconds long in 320 x 240 pixel AVI format. The Past Movie mode allows you to capture events that occurred before the shutter button was pressed, meaning that the camera actually continuously records images into a buffer and once the shutter button is pressed, records the information to the CompactFlash memory card. Normal Movie mode simply starts recording at the press of the shutter button and stops when the button is let go. (The Past Movie mode is really mind-boggling for people who haven't seen anything like it before. "How does the camera know when you're going to press the trigger?" is a common question. - Great fun for parties!)

Panorama Recording

You can record a 360 degree panorama image on the QV-8000SX through the Panorama record mode. A total of nine consecutive images can be recorded in the panoramic series. After the first image in the series is shot, the right edge of the preceding image remains on the screen to help you line up the next shot. You can actually record more images in a series by recording the first nine, uploading them to a computer and then recording more. The images can then be linked in Windows based computers via the included Panorama Editor software. What's really slick though, is that you can actually preview the panoramas you've shot while the images are still in the camera! When the camera is in panorama mode, there's a playback option by which the camera performs a crude stitching operation all by itself, and then displays the resulting panoramic image on the LCD for you to scroll around in at will. Very slick!

Night Scene Mode

The Night Scene mode records subjects with dark backgrounds. The slowest shutter speed available in this mode is one second, but a slower one can be set in Shutter Speed Priority mode (up to 64 seconds). We confess to not being sure exactly what the Night Scene mode is actually doing, since it doesn't appear to increase CCD sensitivity at all. It does however, bias the camera toward slower shutter speeds, even when the flash is used. This equates to a "slow synchro" mode, which allows more ambient light into pictures taken with flash. (This is useful for brightening backgrounds and avoiding the stark silhouettes that on-camera flashes can produce.)

Landscape Mode

Per the description in the QV-8000's manual, landscape mode sets the focus and aperture so that everything from background to foreground is in focus simultaneously. A more photographic description would be that it biases the camera's exposure system to use smaller lens apertures, producing greater depth of field. (This would also be useful for macro shooting, something you'd never guess from the mode's name and description in the manual.)

Monochrome and Sepia Recording

Monochrome and sepia expand your creative options by letting you record images in black and white or sepia tones. Once recorded in monochrome, images cannot be converted back to color.

Portrait Recording

Portrait mode adjusts the focus and aperture so that the subject is in focus and the background is slightly blurred.

(Just the opposite of "Landscape Mode" above: It biases the camera to use wider apertures, producing shallower depth of field.)

Self-Timer

The self-timer on the QV-8000SX gives you a two or 10 second countdown before firing the shutter once the shutter button is pressed. You can swivel the lens around during self-timer recording to see the countdown on the LCD monitor. - Very helpful to keep everybody clued in as to when the shutter is actually going to release.

Timer

The Timer function allows you to record a series of images at set intervals (from one to 60 minutes) with approximately 250 maximum shots available depending on the amount of CompactFlash space. (Very neat feature, for time-lapse photography!)

Shutter Speed Priority

Shutter Speed Priority mode allows you to control the shutter speed from 64 to 1/2000 seconds. The Bulb setting keeps the shutter open for as long as the shutter button is held down (up to 64 seconds). The included wired remote control works best with the Bulb setting, preventing any slight camera movement due to pressing the shutter button. Casio also notes that with slower shutter speeds, the chance of image static or noise increases.

This would be a good point to talk about the QV-8000's absolutely amazing low-light capability: When we first saw the specs for the camera, we almost laughed - Who were they trying to kid? 64 seconds? 64 seconds?! All you'd see would be colored snow! When we actually shot some very long time exposures with the camera though, we were totally humbled: It really *can* take long exposures like that! We didn't actually take a 64 second shot, but we did go all the way out to 48 seconds in our studio tests, and the results absolutely blew us away! The images were cleaner than those from most other cameras when trying for a 4 second exposure, let alone a 48 second one! We could see some of what Casio's doing, in that they evidently capture a "black-reference" image immediately after the time-exposure shot itself, and using it to subtract-out the noise. (You'll notice that time exposures actually take about twice as long to complete as the shutter speed selected would indicate. The extra time is that required for the black-reference image to be captured.) Still, even allowing for this trick, Casio must have come up with something genuinely new: Other manufacturers have used the black-reference approach before, but nobody has gotten the noise down to the level that Casio has achieved here. Whatever they're doing also bodes well for future, higher-resolution cameras, because image noise becomes an increasing problem as pixel counts scale higher and the individual pixel sensors become smaller on the CCD.

Overall, the QV-8000 completely captures the low-light picture-taking crown, at least as of this writing in January, 2000. Nothing else we've seen to date even comes close to it: If you're looking for a digicam to experiment with long time exposures, the QV-8000 is it. Don't even bother looking at anything else!

One fly in the ointment: The QV-8000 does have one major shortcoming for low-light photography though. As we noted earlier, the LCD viewfinder is completely non-functional under even moderately dim conditions. Some kind of optical viewfinder absolutely should have been included on the unit, and its lack makes low-light work rather difficult. (Plan on jerry-rigging some sort of gunsight-type framing guide atop the lens housing for any serious low-light work.)

Aperture Priority

An alternative to Shutter Speed Priority, Aperture Priority allows you to set the lens aperture at F/3.2, F/4.8 or F/8.

Full-Manual Mode

Not actually a separate camera mode, but worth mentioning because the capability is so sought-after, and so surprisingly rare in current digicams. On the QV-8000, you can set the shutter speed and aperture completely independent of each other, and aren't required (as on some cameras) to have one under the camera's control if you're manipulating the other. Very nice!

Shutter Lag / Cycle Times

When you press the shutter release on a camera, there's usually a lag time before the shutter actually fires. This time allows the autofocus and autoexposure mechanisms to do their work and can amount to a fairly long delay in some situations. Since this number is almost never reported on, and can significantly affect the picture taking experience, we now routinely measure it using a special electronic test setup that's accurate to 0.01 seconds.

The QV-8000 is actually fairly quick, as digicams go: A full autofocus cycle results in a shutter lag of only about 0.85 seconds: Not blazingly fast, but certainly not bad by comparison with competing cameras. If the lens is prefocused by half-pressing the shutter button prior to the shot itself, the shutter delay drops to only 0.15 seconds, a very good

number indeed. Using manual focus, the shutter delay is 0.20 seconds.

Shot-to-shot cycle times are also quite good, particularly when using the Quick Shutter mode. We clocked the camera at 1.6 seconds shot-to-shot using manual focus in high resolution mode and 1.53 seconds shot-to-shot in low resolution mode. Autofocus would presumably add about 0.6 seconds to these times. We never managed to fill the memory buffer in low-resolution mode, as it emptied quicker than we could take the next shot. In high resolution mode, we managed 10 shots before the buffer filled, and even then, cycle time only rose to 3 seconds. In continuous mode, the camera captured five frames in 1.09 seconds, a frame rate of 3.67 frames per second, reasonably close to the 4 frames per second claimed by Casio.

The camera also starts up in only 4.24 seconds (from "off" to the first shot acquired), switches from record to play mode in anywhere from 1 to 3.5 seconds (depending on the resolution mode and how much processing it needs to do on the current image), and switches back from play to record mode in 1.4-2.0 seconds (from playback to the first image captured).

Overall, we found the QV-8000 surprisingly quick compared to the current crop of cameras (January 2000), particularly competing 1.3 megapixel models.

User Interface

The QV-8000SX offers uncomplicated menu navigation through a series of 3D graphic menus typical of Casio's standard user interface. It shares the visually attractive interface design we reported on earlier in our coverage of the QV-2000UX. The placement of function controls allows for one handed operation if necessary, but two hands is always easier. Here's a look at the individual controls:

Shutter Button

Located on top of the camera, in the center of the circular power toggle switch. In all record modes, the shutter button sets focus and exposure when half pressed and fires the shutter when fully pressed. When navigating through menus, the shutter button acts as the OK button to accept menu selections.

Power Switch

Located on top of the camera, this circular switch toggles back and forth to turn the camera on and off.

Zoom Control

Located on the front of the camera, about where your right index finger would wrap around the grip, this slide control operates the zoom lens. If the digital telephoto control option is set to "auto", pressing the zoom control toward "T" again after the lens has reached its maximum telephoto setting engages the digital zoom function. Pressing it again increases the digital zoom from 2x to 4x.

Menu Button

Located on top of the camera, this button accesses the menu system for whatever camera mode is currently selected. It also acts as the cancel button when navigating through the menus.

+/- Buttons

Appendix A

Located on top of the camera, these buttons are marked with a + and - sign.

- In both Record and Playback modes, they navigate through menu selections.
- In Record mode, they control exposure compensation (EV) and manual focus settings.
- In Playback mode, they scroll through captured images on the CompactFlash card.

Mode Dial

Located on top of the camera, this notched dial selects between the following modes:

- **Timer:** puts the camera in Timer mode for recording a series of images at selected time intervals.

- **Panorama Mode:** sets up the camera for recording panoramic images.

- **Movie Mode:** records up to 10 second movies as 320 x 240 AVI files.

- **Normal Mode:** puts the camera in standard, automatic capture mode.

- **Night Scene Mode**: sets up the camera for recording subjects in dark areas and backgrounds.

- **Portrait Mode:** adjusts focus and aperture for portraits-where the subject is in focus and the background is slightly blurred.

- **Landscape Mode:** adjusts focus and aperture so that foreground and background are both in focus.

Rec/Play Switch

Located beneath the Mode Dial, on the back panel of the camera, this switch selects between Record and Playback, for each of the major camera operating modes listed above.

Display Button

Located at the bottom right of the LCD monitor, this button cancels and recalls the information display on the monitor. In the Record menu, this button switches between the normal and Details menu systems.

Self-Timer Button

Marked with the standard "clock" icon, and located beneath the LCD monitor, to the left of the Display button, this button cycles between two second self-timer, 10 second self-timer and self-timer off modes.

Manual Focus / Infinity / Macro Button

Located beneath the LCD monitor, to the left of the Display button, this button cycles between Manual Focus, Infinity and Macro modes.

Flash / Folder Button

Located at the bottom left of the LCD monitor, marked with the traditional flash symbol and a black folder icon.

- In Record mode, this button selects the desired flash mode from Auto, On, Off and Red-Eye Reduction.
- In Playback mode, this button allows you to select a different folder on the memory card for playback.

Wired Remote

The QV-8000SX is unusual in that it includes a wired remote control unit in the box with the camera. Few cameras include remotes, but we find them very handy for studio or macro work, where you don't want to disturb the camera (presumably mounted on a tripod) by pressing the button. A remote can also give you more freedom to work with the subject from in front of the camera, without having to run back and forth. The cable on the QV-8000's remote is only a few feet long, but still very useful for situations where you don't want to jostle the camera/tripod setup. The QV-8000's remote is also unusual in the degree of control it gives you over the camera: Most remotes only provide a subset of on-camera functions, but the QV-8000's remote lets you control every aspect of the camera's operation, duplicating all the on-camera controls (except the record/play toggle).

Camera Modes and Menus

Timer Mode

Accessed by turning the mode dial to the black timer symbol, this mode allows you to capture a series of up to 250 images at anywhere from one to 60 minute intervals. (Note that you almost certainly will want to run the camera from the AC adapter when shooting long time-lapse sequences.) Putting the camera in this mode automatically calls up the Timer Setting menu with these options:

- Shots: choose from one to 250 shots.
- Interval: choose from one to 60 minutes.
- Start Time: sets the start time for recording. (You can delay the start of the sequence up to 24 hours, using the camera's 24-hour clock.)

Panorama Mode

Sets up the camera to record up to nine images in secession to compose a panoramic image. Pressing the Menu button in this mode calls up a series of menus. These menus are identical to those used in the other recording modes, so we'll cover them here, and then just once, here. The QV-8000SX has two sets of menus: The default set, providing a somewhat simpler interface, but more limited functions, and the "Details" version, which gives access to the camera's more advanced features. In this section, we'll show the default menu first, followed by some of the sub-menus from the Details mode.

Record Menu

- **Quality/Size:** selects between Fine, Normal and Economy qualities and between 1280 x 960 or 640 x 480 image sizes.
- **Movie Mode:** selects between Normal and Past movie recording modes.

- **Color:** selects between Color, Black and White and Sepia recording modes.
- **Digital Zoom:** sets the digital zoom to Off, Auto, 2x or 4x.
- **Time Stamp:** sets the format of the time stamp that can be applied to your images, and turns it on or off.
- **Setup:** sets the following camera options:
- **Card Browser:** sets the card browser file type. (A very interesting feature: See our comments in the "Image Storage and Interface" section below.)
- **Format:** formats the CompactFlash card.
- **Date:** sets the camera date and time.
- **Video Out:** sets the video output signal to NTSC or PAL.
- **Language:** sets the camera language to either English or Japanese.
- **Beep:** turns the camera beep on and off.

Hitting the Display button while in the Record menu pulls up the Details menu with these sub-menus:

Picture Menu

- **Quality:** sets the image quality to Fine, Normal or Economy.
- **Size:** sets image size to 1280 x 960 or 640 x 480.
- **Sharpness:** sets image sharpness to Hard, Normal or Soft.
- **Saturation:** sets color intensity to High, Normal or Low.
- **Contrast:** sets image contrast to High, Normal or Low.

Functions 1 menu

- **Aperture:** sets the aperture to F/3.2, F/4.8 or F/8.
- **Shutter Speed:** sets the shutter speed to Auto or Manual (with options of Bulb and timed exposures from 64 to 1/2000 seconds).
- **Shutter Mode:** selects between Single, Quick and Continuous shooting modes.
- **Metering:** selects between Multi, Center and Spot metering options.
- **White Balance:** selects between Auto, Daylight, Shade, Tungsten, Fluorescent and Manual white balance settings.
- **Flash Intensity:** sets the flash intensity to Strong, Normal or Weak.

Functions 2 Menu

- **Movie Mode:** selects between Normal and Past movie recording modes.
- **Digital Zoom:** turns the digital zoom on or off and sets it to Auto, 2x and 4x.
- **Color:** selects between Color, Black and White and Sepia recording modes.
- **Grid:** turns an on-screen alignment grid on and off. (Very handy for aligning shots!)
- **Time Stamp:** turns the time stamp function on and off and sets the format.

Options Menu

- **Power Save:** sets power save options for conserving battery power: Sleep (Off, 30 seconds, one minute or two minutes) and Auto Power Off (Off, two, five or 10 minutes).
- **Mode 1:** specifies which of the following settings are retained when the camera is powered off: Focus, Flash and Digital Zoom.
- **Mode 2:** specifies which of the following settings are retained when the camera is powered off: Metering, White Balance, Flash Intensity, Aperture and Shutter Speed.

Appendix A

Setup Menu

- **Card Browser:** sets the card browser file type.
- **Format:** formats the CompactFlash card.
- **Date:** sets the camera date and time.
- **Video Out:** sets the video output signal at NTSC or PAL.
- **Language:** sets the camera language at either English or Japanese.
- **Beep:** turns the camera beep on and off.

Movie Record Mode

Accessed by turning the mode dial to the black movie camera icon, this mode allows you to record up to 10 second movies (depending on available CompactFlash memory space). Pressing the Menu button in this mode pulls up the same Record and Details menu as in Panorama mode.

Normal Record Mode

Accessed by turning the mode dial to the green rectangular symbol, this option selects the QV-8000's default operating mode. Pressing the Menu button pulls up the same Record and Details menus, which means you can control aperture or shutter speed if desired, although the default is a fully-automatic (commonly called "program") mode, in which the camera controls all exposure parameters..

Night Scene Mode

Accessed by turning the mode dial to the black moon and star symbol, this mode sets up the camera for recording images of subjects with dark backgrounds, as we described earlier in the "Exposure" section. Pressing the Menu button in this mode pulls up the same Record and Details menus.

Portrait Mode

Accessed by turning the mode dial to the black portrait symbol, this mode sets the aperture and focus so that the subject is in focus and the background is slightly blurred. (A bias toward wider lens apertures.) Pressing the Menu button in this mode pulls up the same Record and Details menus as in the other modes.

Landscape Mode

Accessed by turning the mode dial to the black landscape symbol, this mode sets aperture and focus so that both the foreground and background are in focus simultaneously. (A bias toward smaller lens apertures.) Pressing the Menu button pulls up the same Record and Details menus.

Playback Mode

Accessed by switching the Rec/Play switch to the Play position in any camera operating mode, this sub-mode allows you to view captured images and movies in any camera recording mode. Pressing the Menu button in this mode pulls up the Playback menu with the following sub-menus:

View Menu

- **Zoom:** enlarges the image on the LCD monitor screen. You can scroll around the enlarged view by pressing the +/-, flash, or MF buttons.
- **9 Multi:** displays nine thumbnail images on the screen at one time. This is handy for rapidly stepping through all the pictures on the memory card.
- **Slide Show:** automatically scrolls through captured images, one at a time.

Tools Menu

- **Protect:** protects images against deletion (single image, folder or all). (Note that "protected" images will still be deleted if the memory card is reformatted.)
- **DPOF:** specifies images for printing (single image, folder or all).
- **Screen Saver**: turns the camera's screen saver function on or off.

Appendix A

Delete Menu

- **Select:** deletes a single image.
- **Folder:** deletes an entire folder.
- **All:** deletes all images on the CompactFlash card.

Setup Menu

- **Card Browser:** selects the card browser file type.
- **Format:** formats the CompactFlash card.
- **Date:** sets the date and time as well as sets the display format for the date and time.
- **Video Out:** selects between NTSC and PAL video output signals.
- **Language:** selects between English and Japanese camera languages.
- **Beep:** turns the camera beep on and off.

Pressing the Display button with the Playback menu up pulls up the basic playback menu, offering all of the above options except for the Protect and Screen Saver settings.

Image Storage and Interface

The QV-8000SX utilizes CompactFlash (Type I) as its image storage medium. An 8MB card comes with the camera, with upgrades available to 15MB, 30MB, 48MB and 64MB. (Third parties currently (January 2000) offer Type I CF cards in capacities as large as 128MB.) An interesting feature is that the QV-8000SX creates an HTML file with four card browser options available (compatible with Microsoft Internet Explorer 4.01 or later and Netscape Communicator 4.5 or later). QuickTime 3 or later is required to play back movie images on your computer. The four different card browser formats let you choose how much information is recorded with each image (a very detailed chart in the manual explains the settings). We found the HTML image indexes very handy for viewing pictures shot with the camera, and for seeing the exposure settings they were shot with. The four "card browser" options provide a range of display options designed to offer as much functionality as possible with a variety of different web browsers. (The more sophisticated options even include JavaScript code for a web browser-based slide-show function!)

The QV-8000SX organizes images into storage folders, assigned numbers from 100 to 998. Within each folder, images are numbered from 0001 to 9900 and each folder contains up to 100 files. An extremely detailed directory tree in the manual shows exactly how information is encoded onto the CompactFlash card by the camera.

You can protect individual images on the CompactFlash card through the Playback menu in Playback mode, preventing accidental deletion of images. (Although, as noted earlier, it's important to remember that "protected" images will still be erased when you reformat the memory card.) If you want to erase images, the Delete menu in Playback mode gives you the option of deleting individual images, a folder or all images that aren't protected.

Below are the approximate numbers of still images that will fit on an 8MB card and their compression ratios:

Still Images:

Resolution/Quality vs Image Capacity	Ultra Resolution		High Resolution	
	Images	Approx. Compression	Images	Approx. Compression
Fine Quality	13	8:1	39	6:1

Normal Quality	16	11:1	48	8:1
Economy Quality	29	19:1	63	11:1

Video Out

US and Japanese models of the QV-8000SX come with an NTSC video connection cable (European models come with PAL) for connecting the camera to a television set. (Provided the set has a separate "raw video" input.) This connection enables the TV to act as the LCD monitor when composing and playing back images. As we noted earlier, this can be helpful in manually focusing on macro subjects, or in studio settings where you have to interact with the subject from in front of the camera. (Kid photography, etc.) TV playback can also be handy when using the camera as a presentation device.

Power

The QV-8000SX runs on four AA alkaline, lithium, NiCd or NiMH batteries. An AC adapter comes with the camera, useful for conserving batteries when playing back images, connecting to the computer or television, or capturing long time-lapse sequences. Casio estimates that a standard set of AA alkaline batteries allows you to record up to 400 shots (1020 for lithium and 620 for NiMH) and they recommend keeping the flash turned off when not in use and taking advantage of the power save settings in the setup menus to help conserve battery power. We feel per-shot ratings of this sort are of relatively little value in deciding how long you'll actually be able to use a camera, particularly with ones like the QV-8000 that rely on their LCD screen as a viewfinder. (How many times do you simply run off 500 shots as fast as you can trip the shutter?) A more useful rating would be how long the camera will operate in various modes with typical NiMH rechargeable batteries. The QV-8000 has fairly low power consumption for a camera with such a large LCD display, but by the same token consumes more power than cameras offering optical viewfinders. Overall, the QV-8000 seems to do a good job of regulating its power consumption (turning off the LCD screen when it's charging the flash, for instance) to maximize battery life. The 510 mA power consumption in capture mode leads us to estimate a typical battery life of about 2 hours with 1200-1300 mAh NiMH cells. (This is a bit less than the batteries' capacity rating would suggest, because the batteries are rated at a relatively low power drain, and total capacity decreases as the load increases.) We actually tested the power consumption of the QV-8000 with a couple of sets of batteries, with wildly varying results: A set of 1200mAh cells lasted just less than an hour, while a new set of 1600 mAh units (recently released by Kodak) powered the camera in capture mode continuously for two hours and 35 minutes!

The table below shows the power consumption figures we measured in various operating modes, via the external power connector.

Operating Mode	Power Drain
Capture Mode, w/LCD	510 mA
Capture Mode, half pressed shutter	510 mA
Memory Write (transient)	510 mA
Flash Recharge (transient)	470 mA
Image Playback	360 mA

Included Software

The QV-8000SX comes with a USB, serial and Macintosh adapter cable for connecting and downloading images to a computer. A CD packaged with the camera comes with Casio's PhotoLoader, Panorama Editor, Picture Works Technology's MediaCenter with a trial version of their Web Publisher add-on for it, Apple's QuickTime for Windows, Adobe ActiveShare, Adobe Acrobat Reader, Internet Explorer 5.0 as its main software applications (a USB driver and

various other odds and ends also come on the CD for assistance in installation). Unfortunately for Mac users, the included software is only compatible with Windows 95, 98 and NT 4.0. The included cables support the Mac platform, but Mac users will need to order a copy of PhotoLoader for the Mac for $9.99 extra.

Immediately when you insert the software CD, a menu comes up with options to install the various software applications, find out about the software, register your camera online, go directly to the Casio website, open the accessory catalog or fill out an accessory order form. The PhotoLoader software is responsible for downloading images and movies from the camera onto your computer. Once the images have been moved, Picture Works Media Center allows you to organize, enhance or prepare images for the Internet. The trial version of Picture Works Web Publisher allows you to create customized web pages in 30 seconds or less (up to 15 pages in the trial version). Adobe Active Share lets you perform minor image correction and connects you with ActiveShare.com for instant image sharing with family and friends. Quicktime 3 is the medium for movie playback and works with the included copy of Internet Explorer. And finally, Panorama Editor lets you connect your recorded panoramic shots and play back 360 degree images. Overall, a very complete software package, albeit one limited to Windows users.

Test Results

In keeping with our standard policy, our comments here are rather condensed, summarizing our key findings: For a full commentary on each of the test images, see the QV-8000's "pictures" page.

As with all Imaging Resource camera tests, we encourage you to let your own eyes be the judge of how well the devices performed: Explore the images on the pictures page, to see how well the QV-8000SX performed, and how its images compare to other cameras you may be considering buying.

Well, Casio calls the QV-8000SX a "Feature Rich" digicam, and it certainly lived up to that billing - It packs more features, options, and capabilities than any other 1.3 megapixel digicam we've tested to date! (January, 2000)

In our testing, the QV-8000SX produced excellent pictures overall. Its color and tonal rendition were excellent, our only (slight) criticism being that its resolution was only average for a 1.3 megapixel camera, testing-out at 600 lines per picture height in both horizontal and vertical directions. As noted, color was very good, with clean primaries, good handling of pastels and decent saturation. The camera handled the always-difficult red/magenta separation of our Davebox target very well, as well as the tricky blues in our outdoor portrait test. The only minor shortcoming we found in its color-handling was a slight weakness with the subtractive primaries. (cyan, magenta, and yellow.)

The QV-8000's lens is quite good, particularly considering it's exceptional 8:1 zoom ratio. (Longer-ratio lenses are much trickier to design optically than shorter-ratio ones.) As could be expected from such a long-ratio lens, geometric distortion is a bit higher than some cameras, at 0.9% barrel distortion in the wide-angle position, transitioning to 0.6% pincushion at the telephoto end. (While this is more than we like to see, we have to point out that some 3x zoom cameras show this much distortion.) Chromatic aberration was particularly low, showing none at all at short focal lengths, and only the barest hint at telephoto.

There were two features we'd really have liked to see on the QV-8000: An external flash connector, and some sort of optical viewfinder. The LCD viewfinder is pretty accurate though, showing between 89 and 92% of the final image area, as the lens moves from wide angle to tele.

The reason we'd so like to have seen an optical viewfinder on the QV-8000 is so we could take better advantage of its *absolutely amazing* low-light capability.(!) The QV-8000SX walked away with the low-light crown in our tests, producing usable images at lower light levels than any camera we've tested to date (January, 2000). Our fancy exposure meter only reads down to about 1/16 of a foot-candle, and the QV-8000 produced a surprisingly good image even at that light level. (That's REALLY dark, to the point we have a hard time seeing our way around the studio!)

The QV-8000SX also offers excellent macro capability, focusing down to an incredible 1 centimeter(!) from the front of the lens. This close approach and the large diameter of the lens make it tricky getting light into the subject, but the minimum capture area is a very tiny 0.71 x 0.95 inches (24.2 x 18.1 mm).At this microscopic level, there's a fair bit of barrel distortion evident, and a goodly amount of curvature of field as well, but if you need to get really close for a reasonable price, the QV-8000SX can do the job!

Overall, the QV-8000SX turned in a very good performance. It's incredible feature list is what makes it a real standout though.

Conclusion

We were frankly surprised by the tremendous functionality offered by the QV-8000SX: Its fully-automatic exposure mode is perfect for novices, yet it offers one of the broadest range of exposure options of any camera we've tested. Its

8x optical zoom lens provides one of the widest zoom ranges in the market today, and its low-light capabilities go beyond anything we've seen to date (January, 2000). About the only additional features we could possibly ask for are an optical viewfinder (please!), and an option to connect to an external flash. Overall, the QV-8000 is one of the most versatile and capable 1.3 megapixel cameras on the market, and an excellent value for anyone looking for maximum flexibility in a digital camera.

Reader Sample Images!

Do you have a QV-8000SX camera? If you'll post an album of your samples on one of the photo-sharing services and email us at photos@imaging-resource.com, we'll list the album here for others to see!

Visit David Bogdan's sample images at the Photo Album Collection at the Imaging Resource Photo Club!

For More Info:
View the data sheet for the QV-8000SX
View the test images from the QV-8000SX

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```
To: Mike Pasini <70516.1007@compuserve.com>
From: Dave Etchells <detchells@imaging-resource.com>
Subject: Re: TIPS 1.0a Test Drive
Cc:
Bcc: "ƒ:  People:  Mike Pasini"
X-Attachments: :G3 Volume 2:13635:V1N4NewDigicams.rtf:


At 9:46 PM -0500 11/1/99, Mike Pasini wrote:
```

> > How does this sound: Segment the market into resolution ranges (under a
> > megapixel, 1.3-1.5, 2.0+), and then list the recent cameras that we're
> > aware of in each category, with a brief blurb about each. Three problems:
> > 1) We haven't yet tested all the new cameras, so can't comment with equal
> > authority on them, 2) It can't possibly be comprehensive, and 3) to really
> > do it justice would (a) take way more time than I have, and (b) take more
> > space than I want to devote to it.
>
> Sounds good. Not every camera needs a blurb ("coming soon" will do). I
> think a breakdown of the cameras available in each of those three major
> categories will be very helpful as people start to think about these things
> for the holiday season. If we structure it as a list, you can just write
> blurbs for the models you feel strongly about. And that will catch their
> eye first time through.

```
Just sent you an email with no attachment on this - here it is, attached
to this reply.

I ended up not making anywhere near an exhaustive list, just the ones that
seemed noteworthy.

One/two additions: The new Casios look pretty interesting, but we've only
just gotten them in, haven't looked at *any* results yet.
(That's the QV-2000UX, and QV-8000SX)

Best,
Dave E.
```

Appendix B

LCD Digital Camera

QV-8000SX

User's Guide

DPOF

8000 · 2
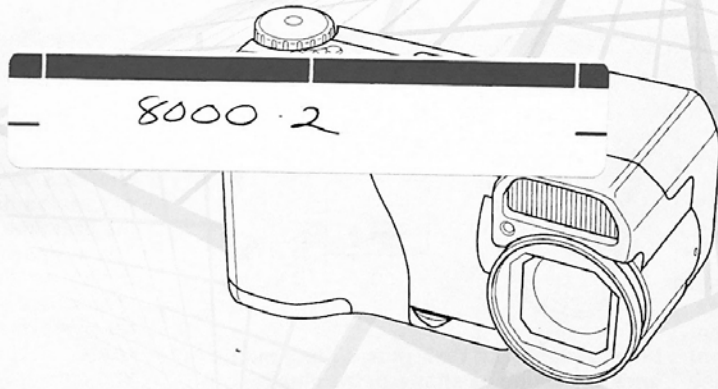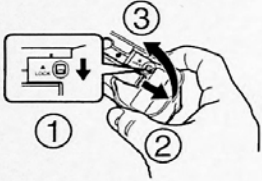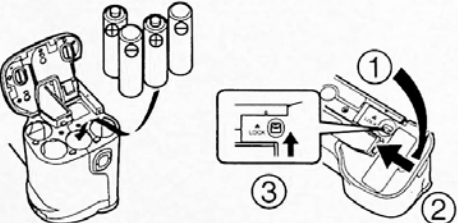
If you need help with
your camera, please
call: 1(800)435-7732

CASIO

QUICK REFERENCE

The section provides a general outline of operational procedures.

Loading Batteries (page 38)
Setting the Current Date and Time (page 44)

1

On the bottom of the camera, slide the battery compartment cover lock towards the front of the camera (①) to release the cover.

Grasping both sides of the battery compartment cover, swing it open (② ③).

2

Load batteries so their plus (+) and minus (–) ends are facing as shown in the illustration.

Close the battery compartment cover (① ②), and then slide the battery compartment cover lock towards the back of the camera to lock the cover in place (③).

3

• Be sure to use the procedure on page 44 to set the time and date before using the camera for the first time.

• File name assignment and time stamping will not be performed correctly if the time and date are wrong.

2

Recording Images (page 46)

5

After confirming that the Auto Focus operation is complete (the operation lamp lights green), press the shutter button all the way down to record the image.

4

After composing the image on the monitor screen, press the shutter button about half way and hold it there.

* The camera's Auto Focus feature automatically focuses the image.

3

Slide the POWER Switch in the direction indicated by arrow to turn on the camera.

Operation lamp

2

Set the dial to ▣ for normal recording.

1

Slide the Function Switch to REC.

3

Appendix C
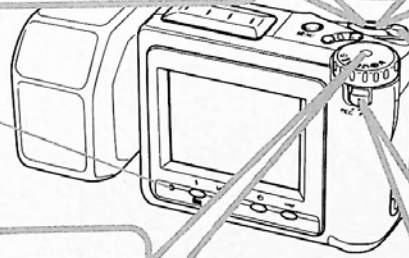
QUICK REFERENCE

Playing Back Images (page 79)

3 Use [+] and [−] to scroll through the images stored in camera memory.

2 Slide the POWER Switch in the direction indicated by arrow.
• The image you recorded appears on the monitor screen.

1 Slide the Function Switch to PLAY.

4

Deleting Images (page 92)

4 Double check to make sure that you really want to delete the image you selected.
* Press MENU to exit the image delete operation.

2 Press MENU.

3 Use [+] and [–] to select "Delete", and then press the shutter button.

↓

Use [+] and [–] to select "Select", and then press the shutter button.

↓

Use [+] and [–] to select an image you want to delete and then press the shutter button. Selected images are indicated by 🗑.
* Note that the first time you display an image its 🗑 icon is turned on.

5 Press DISP.

↓

Use [+] and [–] to select "Yes", and then press the shutter button.

1 Slide the Function Switch to PLAY.

5

Appendix C

CONTENTS

INTRODUCTION
Congratulations upon your selection of the QV-8000SX LCD Digital Camera.
To get the most out of the QV-8000SX, be sure to carefully read this manual and follow the instructions contained in it.

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                    Apple EX1007 Page 33

CONTENTS

- CASIO COMPUTER CO., LTD. assumes no responsibility for any damage or loss resulting from the use of this manual.
- CASIO COMPUTER CO., LTD. assumes no responsibility for any loss or claims by third parties which may arise through the use of the QV-8000SX.
- CASIO COMPUTER CO., LTD. assumes no responsibility for any damage or loss caused by deletion of data as a result of malfunction, repairs, or battery replacement. Be sure to back up all important data on other media to protect against its loss.
- *Windows and Internet Explorer are registered trademarks of Microsoft Corporation.*
- *Macintosh is a registered trademark of Apple Computer, Inc.*
- *COMPACTFLASH™ and ⟡ logo are registered trademarks of SanDisk Corporation.*
- *Other company, product and service names used herein may also be trademarks or service marks of others.*
- *The USB driver uses software by Phoenix Technologies Ltd.*
  Compatibility Software Copyright © 1997
  Phoenix Technologies Ltd., All Rights Reserved.

8

FEATURES

Continuous recording (page 57)
Continuous recording of high-quality images at 0.25-second intervals is just like have a motor drive on the camera.

DCF Data Storage (page 104)
DCF (Design rule for Camera File system) data storage protocol provides image inter-compatibility between the digital camera and printers.

Digital Print Order Format (DPOF) (page 95)
Images can be easily printed in the sequence you want using a DPOF compatible printer. DPOF can also be used by professional print services when specifying images to produce prints.
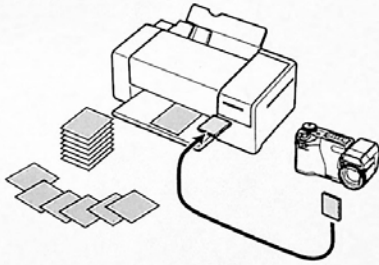
Simple image management (page 106)
Images are stored on a large-capacity CompactFlash memory card. A new Card Browser feature produces thumbnails of all images on a card quickly and easily.

9

FEATURES

Movie and panorama images (pages 80, 81)

A buffer lets you capture images of events that occurred before you pressed the shutter button.
A built-in function lets you combine up to nine images into breathtaking panoramas.

Easy-to-understand graphic interface (page 32)

All camera operations can be performed on graphic based interactive menu screens. CASIO high-resolution HAST LCD makes screen images clearer and more colorful than ever before.

CASIO original metering system

Light metering includes innovative multi-pattern metering.

Megapixel CCD

Images are recorded by a 1.31-megapixel CCD for amazing resolution and clarity.
Some slight image noise may be caused when using slow shutter speeds.

Easy connection to other devices (page 99)

USB, DIGITAL, and VIDEO OUT terminals provide easy connection to other devices.

TV

Desktop Computer

Notebook Computer

Appendix C
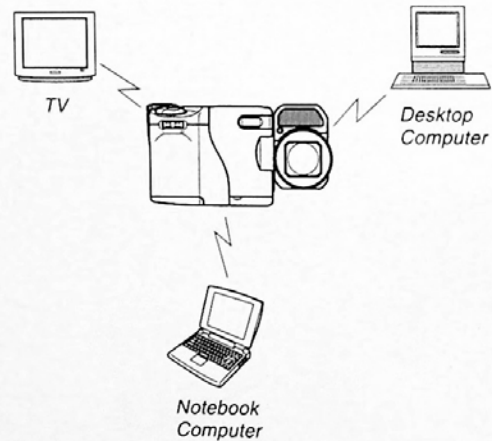
32X zoom is produced using 8X optical zoom together with 4X digital zoom.
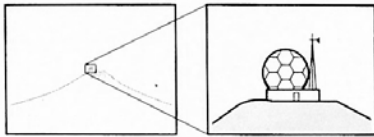
page 58

Macro Feature
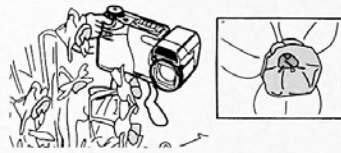
page 61

Landscape Mode

page 66

Portrait Mode

page 67

Night Scene

page 65

Shutter Speed Priority

page 70

11

Appendix C
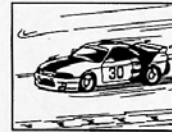
FEATURES

Aperture Priority
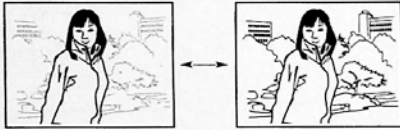
page 71

Date and Time Stamping

99/9/12

page 44

Self-timer

page 68

9-image Screen

page 83

Timer

page 69

Slide Show

page 84

12

Display Zoom

page 82

Image Protection

page 90

Wired Remote Controller

page 21

13
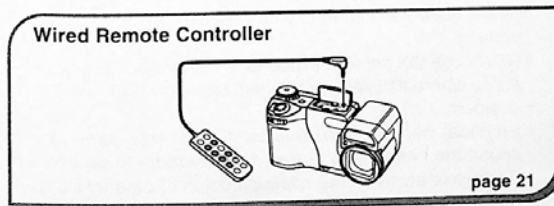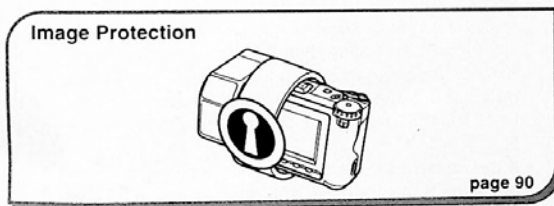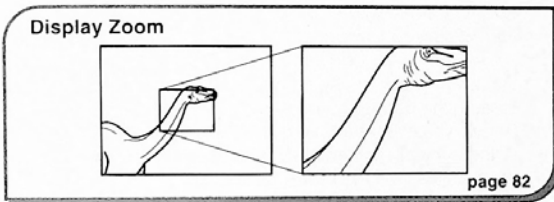
PRECAUTIONS

General Precautions

Be sure to observe the following important precautions whenever using the QV-8000SX.

All references in this manual to "this camera" and "the camera" refer to the CASIO QV-8000SX Digital Camera.

- Never try to take pictures or use the built-in display while operating a motor vehicle or while walking. Doing so creates the danger of serious accident.
- Never try to open the case of the camera or attempt your own repairs. High-voltage internal components create the risk of electrical shock when exposed. Always leave maintenance and repair work up to authorized CASIO service providers.
- Never fire the flash in the direction of a person operating a motor vehicle. Doing so can interfere with the driver's vision and create the danger of accident.
- Never fire the flash while it is too close to the subject's eyes. Intense light from the flash can cause eye damage if it is fired too close to the eyes, especially with young children. When using the flash, the camera should be at least one meter from the eyes of the subject.
- Keep the camera away from water and other liquids, and never let it get wet. Moisture creates the danger of fire and electrical shock. Never use the camera outdoors in the rain or snow, at the seashore or beach, in the bathroom, etc.

- Should foreign matter or water ever get into the camera, immediately turn power off, unplug the AC adaptor from the power outlet, and contact your dealer or nearest CASIO service provider. Using the camera under these conditions creates the danger of fire and electrical shock.
- Should you ever notice smoke or a strange odor coming out of the camera, immediately turn power off and unplug the AC adaptor from the power outlet. Using the camera under these conditions creates the danger of fire and electrical shock. After making sure there is no more smoke coming from the camera, take it to your nearest CASIO service provider for repair. Never attempt your own maintenance.
- At least once a year, unplug the AC adapter from the power outlet and clean the area around the prongs of the plug. Dust build up around the prongs can create the danger of fire.
- If the camera's case should ever become cracked due to dropping it or otherwise subjecting it to rough treatment, immediately turn power off, unplug the AC adaptor from the power outlet, and contact your nearest CASIO service provider.
- Never use the camera inside of an air craft or in any other areas where its use is prohibited. Doing so can result in an accident.
- Physical damage and malfunction of this camera can cause the image data stored in its memory to be deleted. Be sure to always keep backup copies of data by transferring them to personal computer memory.

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• Never open the battery compartment cover, disconnect the AC adaptor from the camera or unplug it from the wall socket while recording images. Doing so will not only make storage of the current image impossible, it can also corrupt other image data already stored in camera memory.

Operating conditions

• This camera is designed for use in temperatures ranging from 0°C to 40°C.
• Do not use or keep the camera in the following areas.
  — In areas subject to direct sunlight
  — In areas subject to high humidity or dust
  — Near air conditioners, heaters, or other areas subject to temperature extremes
  — Inside of a closed vehicle, especially one parked in the sun
  — In areas subject to strong vibration

Condensation

• When you bring the camera indoors on a cold day or otherwise expose it to a sudden change of temperature, there is the possibility that condensation can form on the exterior or on interior components. Condensation can cause malfunction of the camera, so you should avoid exposing it to conditions that might cause condensation.
• To keep condensation from forming, place the camera into a plastic bag before moving it into a location that is much warmer or colder than your current location. Leave it in the plastic bag until the air inside the bag has a chance to reach the same temperature as the new location. If condensation does form, remove the batteries from the camera and leave the battery compartment cover open for a few hours.

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About the camera's backlight...

- The camera is equipped with a fluorescent light source to provide the back lighting for its LCD.
- The normal service life of the backlight is approximately six years, when the camera is used for about two hours a day.
- Should the LCD image appear abnormally dark, take the camera to your dealer or an authorized CASIO service provider to have the light source replaced. Note that you will be charged for this replacement.
- Under very cold conditions, the backlight may require more time than normal to light, or reddish bands may appear in the displayed image. These conditions do not indicate malfunction, and normal operation should return at higher temperatures.

Monitor Screen

Recording

- The image shown on the monitor screen during recording is intended for composition purposes only, so its quality does not match that of the image as it is recorded. The image is recorded in accordance with the quality setting made with the procedure under "Quality Settings" on page 53.
- A dimly lit subject can slow down monitor screen refresh or cause static in the displayed image.

Playback

This camera is designed for high-speed scrolling of images during playback. Because of this, the playback image that initially appears on the monitor screen does not show the full resolution of the image as recorded. When you stop at the image you want, the monitor screen refreshes and shows the image in its full resolution.

Lens

- Camera performance can be adversely affected by fingerprints or dirt on the lens surface. Never touch the lens surface with your fingers.
- Should the lens become dirty, use a blower to blow off dirt and dust, or a soft, dry cloth to wipe off the lens.

Date Setting

No data setting is made before the camera is shipped from the factory. Be sure to use the procedure on page 44 to set the time and date before using the camera for the first time. File name assignment and time stamping will not be performed correctly if the time and date are wrong.

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GUIDELINES LAID DOWN BY FCC RULES FOR USE OF THIS UNIT IN THE U.S.A. (not applicable to other areas).

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTICE

This equipment has been tested and found to comply with the limits for a Class B peripheral, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC WARNING

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
Properly shielded cables with ferrite core must be used for connection to host computer and/or peripherals in order to meet FCC emission limits.

THE SPECIAL VIDEO CABLE THAT COMES WITH THE CAMERA
—— THE CAMERA TO A VIDEO IN TERMINAL OF A COMPUTER
THE SPECIAL CONNECTION CABLE THAT COMES WITH QV-Link SOFTWARE
—— THE CAMERA TO A PROPER TERMINAL OF A COMPUTER

Declaration of Conformity

Model Number:	QV-8000SX
Trade Name:	CASIO COMPUTER CO.,LTD.
Responsible party:	CASIO INC.
Address:	570 MT. PLEASANT AVENUE, DOVER,NEW JERSEY 07801
Telephone number:	973-361-5400

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

CASIO COMPUTER CO.,LTD.   QV-8000SX

FC Tested To Comply With FCC Standards

FOR HOME OR OFFICE USE

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UNPACKING

Check to make sure that all of the items shown below are included with your camera. If something is missing, contact your dealer as soon as possible.

Camera
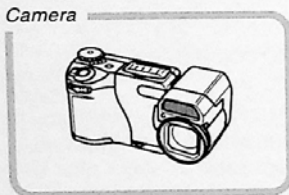
Wired Remote Controller
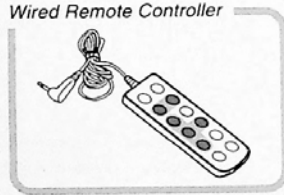
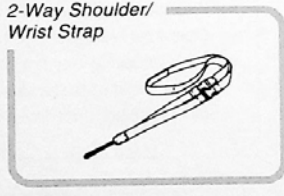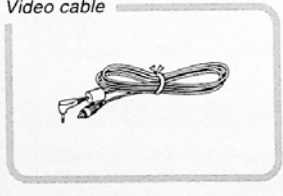Lithium Battery for wired
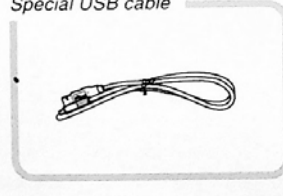remote controller (CR2025)
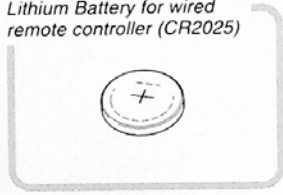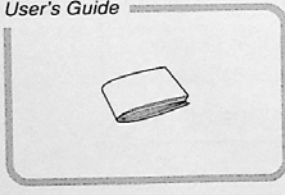
Soft case

Lens cap
Attached to the lens.
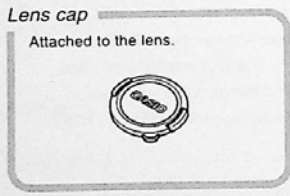
2-Way Shoulder/
Wrist Strap

Video cable

Special USB cable

User's Guide

Using the Lens Cap

Be sure to affix the lens cap whenever you are not using the camera. When affixing the lens cap, position it as shown in the illustration and press at the points indicated by the arrows.

Clip

• A clip on the back of the lens cap lets you fasten it to the camera strap.

Attaching the Strap

The two-way strap that comes with the camera can be used either as a shoulder strap or a wrist strap. Pass the wrist strap through the hole on the side of the camera as shown in the illustration.

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Appendix C
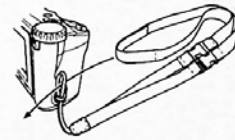
Using the Strap as a Wrist Strap

Detach the upper strap from the main strap (Figure 1), and then attach the two buckles of the main strap to each other (Figure 2).
Press the buckles together until they snap securely into place.

Upper strap

(Figure 1)   (Figure 2)
          Main strap
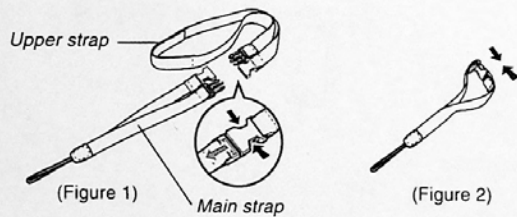
Using the Strap as a Shoulder Strap

Attach the strap to the camera so the shoulder pad is on the inside of the loop.
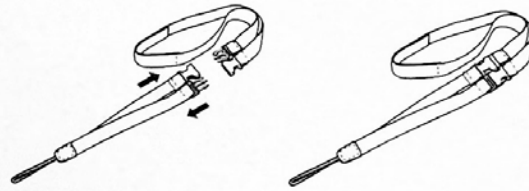
▶▶ IMPORTANT! ◀◀

- Be sure to keep the strap around your wrist whenever using the camera to protect against accidentally dropping it.
- The supplied strap is intended for use with this camera only. Do not use for any other application.
- Never swing the camera around by the strap.
- Allowing the camera to swing freely from your neck can result in damage to the camera due to its bumping against other objects. It also creates the danger of the camera becoming caught in a door or on other objects, resulting in personal injury.

20

Using the Soft Case

Keep the camera in its soft case to protect it when not in use.

Make sure the lens is facing up and the monitor screen is facing down.

The pocket inside the soft case can be used to store the wired remote controller and memory cards.
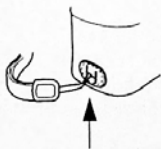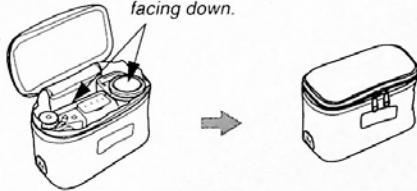
If you want to hang the camera from your shoulder while it is in the soft case, pass the shoulder strap through the hole in the side of the case.

Using the Wired Remote Controller

The wired remote controller that comes with the camera can be used to control the camera. When using a slow shutter speed or telephoto, you can avoid blurring of the image due to camera movement by mounting the camera on a tripod and using the wired remote controller to trigger the record operation. You can also use remote control for playback during presentations.

General Guide

Plug

FOCUS LOCK ON/OFF

SHUTTER

ZOOM W — ZOOM T

MENU — MF/∞/♣ (FOCUS)

[–] — [+]

SET — ⚡/📁 (FLASH/FOLDER)

DISP — ⏱ (SELF-TIMER)

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Apple EX1007 Page 47
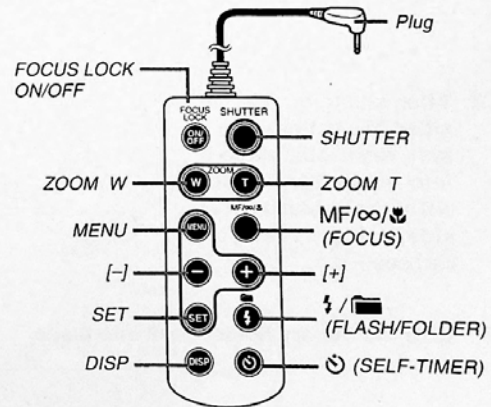
Replacing the Wired Remote Controller Battery

The wired remote controller is powered by a single CR2025 lithium battery.

1. **While pressing the battery holder lock, pull the battery holder from the wired remote controller.**

Battery holder

Battery holder lock
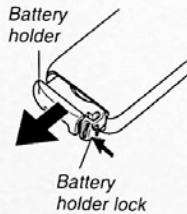
2. **After wiping off the two sides of a battery with a soft, dry cloth, place it into the battery holder with the positive (+) side facing up (so you can see it).**
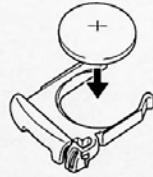
3. **Slide the battery holder back into place.**

Failure of the wired remote controller to operate probably means that the battery needs to be replaced.

Battery Precautions

⚠ CAUTION

- Keep batteries out of the reach of small children. If swallowed accidentally, contact a physician immediately.
- Misuse of a battery can cause it to leak, which damages and corrodes the area around the battery and creates the danger of fire and personal injury. Be sure to observe the following precautions.
- When loading the battery, make sure its positive (+) and negative (−) sides are facing correctly.
- Use only the battery type that is specified for this unit.
- Never try to charge a battery or take it apart, and never allow its poles to become connected to each other by metal (shorted). Do not expose batteries to heat or dispose of them by burning.
- Dead batteries tend to leak battery fluid. Never leave a dead battery in the wired remote controller.

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Connecting to the Camera

Turn off camera power and then attach the plug of the wired remote controller to the camera's DIGITAL terminal.

DIGITAL terminal
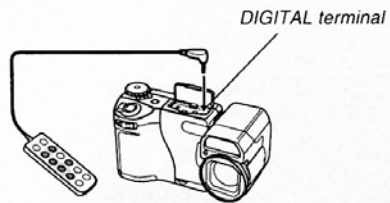
Wired Remote Controller Buttons

The buttons of the wired remote controller have the same basic functions as the buttons on the camera, except for the differences described below.

To perform this operation:	Do this:
Focus Lock	**Wired remote controller:** Press the FOCUS LOCK ON/OFF button to turn on focus lock, compose the image, and then press the SHUTTER button. • Pressing FOCUS LOCK ON/OFF again cancels focus lock. • Pressing the remote controller's SHUT-TER performs the focus operation, followed by recording of the image. **Camera:** Press the shutter button half way, compose the image, and then press the shutter button (page 49).
Menu screen item selection	**Wired remote controller:** Highlight the item on the camera's monitor screen, and then press the SET button. **Camera:** Highlight the item on the camera's monitor screen, and then press the shutter button (page 32).

Appendix C

GENERAL GUIDE

The following illustrations show the names of each component, button and switch on the camera.

Lens

Dial
(page 27)

AC Power terminal
(page 41)

Shutter button
(page 46)

DIGITAL terminal
(page 98)

Light sensor
(page 51)

POWER switch
(page 46)

Flash
(page 50)

ZOOM slider
(page 58)

USB port
(page 98)

Lens
(page 27)

VIDEO OUT terminal
(page 98)

MEMORY card slot cover
(page 34)

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Top and Display

Terminal panel cover
(page 26)

LCD
(page 30)

MENU button
(page 32)

⚡/📁 (FLASH/FOLDER) button
(pages 50, 89)

[+]

[−]

Operation lamp
(page 28)

Function switch
(page 46)

MF/∞/🌷 (FOCUS) button
(pages 59, 60, 61)

DISP button
(pages 30, 32)

⏱ (SELF-TIMER) button
(page 68)

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Appendix C

Bottom

Tripod screw hole

Battery compartment lock
(page 38)
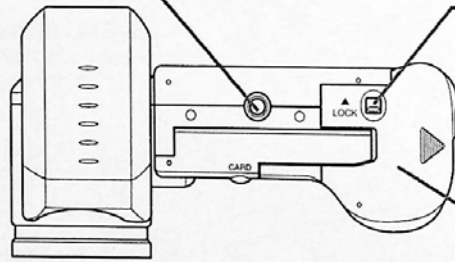
Battery compartment cover
(page 38)

Opening the
Terminal Panel
Cover

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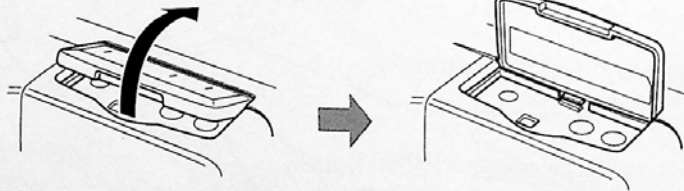
Dial
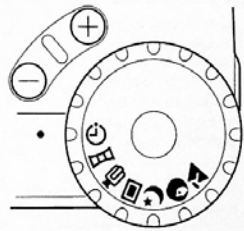
(timer icon)	Timer Mode	(page 69)
(panorama icon)	Panorama Mode	(page 64)
(movie icon)	Movie Mode	(page 62)
(normal icon)	Normal Mode	(page 46)
(night scene icon)	Night Scene Mode	(page 65)
(portrait icon)	Portrait Mode	(page 67)
(landscape icon)	Landscape Mode	(page 66)

Lens Filters

The area around the lens of the camera is threaded to allow use of commercially available lens filters with a diameter of 43mm. Simply screw the lens filter into place.

▶▶▶ **IMPORTANT!** ◀◀◀

- Certain types of filters can cause the problems described below. Be sure to carefully check any filter for these problems before purchasing it.
  * The frame around the outside of some filters may block light from the lens, resulting in shadows in the image.
  * Some filters can interfere with proper operation of Auto Focus and the flash unit.
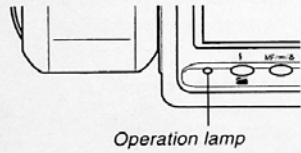 * Filter performance may not be equivalent to that obtained with a film-based camera.
- Do not use multiple filters with this camera.
- Do not use a lens hood. Doing so causes incorrect firing of the flash unit.

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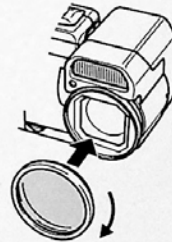
Operation Lamp

The operation lamp shows the operational status of the camera.

Operation lamp

Record Mode

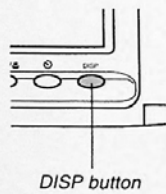| Lamp Color	On	Flashing
Green	Auto Focus operation complete	Please wait (after power on)
	Monitor screen turned off due to sleep state activation or data communication	Image store operation in progress
		Power off
		Low battery
Amber	Exposure warning	Flash is charging
Red	Cannot focus	Memory error
	Memory full	
	Cannot charge the flash	

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Playback Mode

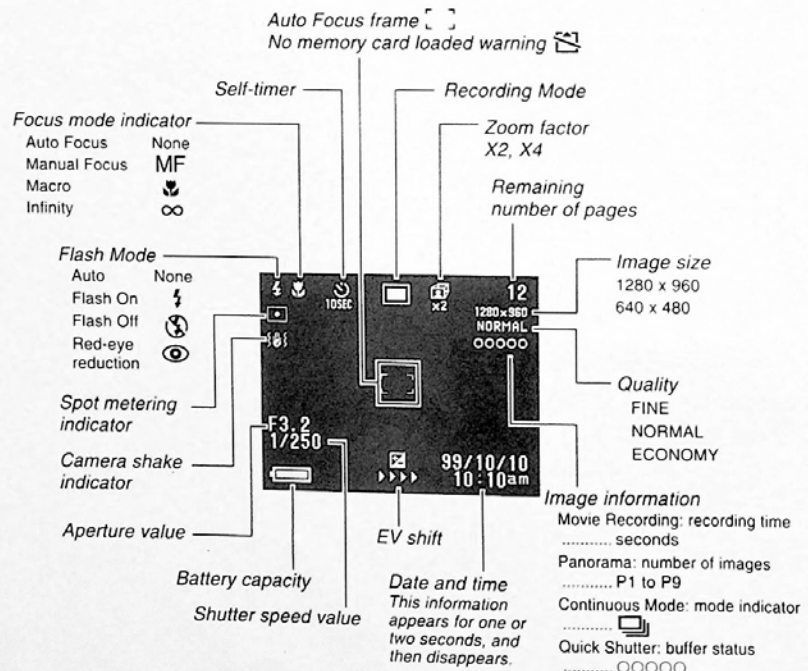| Lamp Color	On	Flashing
Green	Monitor screen turned off due to data communication.	Please wait (after power on)
		Delete operation in progress
		Format operation in progress
		Power off routine in progress
		Low battery
Red	—	Memory error

Low Battery Warning

Lights (red), after which camera power turns off automatically.

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MONITOR SCREEN

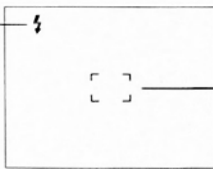Pressing DISP causes various indicators to appear on the monitor screen.

DISP button

Recording Mode

Auto Focus frame
No memory card loaded warning

Self-timer

Recording Mode

Focus mode indicator
Auto Focus   None
Manual Focus   MF
Macro
Infinity   ∞

Zoom factor
X2, X4

Remaining number of pages

Flash Mode
Auto   None
Flash On   ⚡
Flash Off
Red-eye reduction

Image size
1280 x 960
640 x 480

12
1280×960
NORMAL
○○○○○

Spot metering indicator

Camera shake indicator

F3.2
1/250

Quality
FINE
NORMAL
ECONOMY

99/10/10
10:10am

Aperture value

EV shift

Battery capacity

Date and time
This information appears for one or two seconds, and then disappears.

Shutter speed value

Image information
Movie Recording: recording time
.... seconds
Panorama: number of images
.... P1 to P9
Continuous Mode: mode indicator
.... ▱
Quick Shutter: buffer status
.... ○○○○○

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Screen when shutter is pressed half way

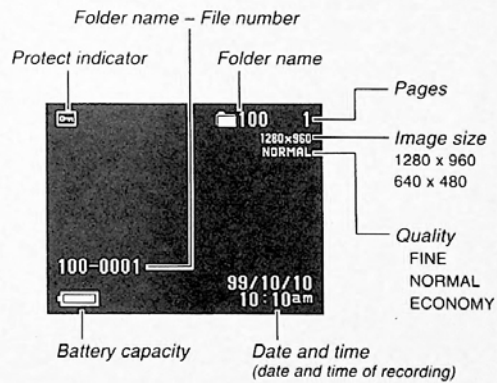Flash Mode (🗲 ⊚)

🗲

Auto Focus Frame
• Focusing complete:
  Green
• Focusing failed:
  Red

Flash indicator appears to indicate that flash will be fired (when auto flash is selected).

Recording Mode Indicators

⌚	Timer	☾	Night Scene
◿	Panorama	◑	Portrait
🎬	Movie	⛰	Landscape
▣	Normal		

Playback Mode

Folder name – File number

Protect indicator   Folder name

📁100   1◄   Pages

1280×960   Image size
NORMAL   1280 x 960
                  640 x 480

100-0001   Quality
                  FINE
                  NORMAL
99/10/10   ECONOMY
10:10am

Battery capacity   Date and time
                     (date and time of recording)

Changing the Display Language

Use the following procedure to switch the display language between English and Japanese.

1. Press MENU.
2. Select "Set Up" → "Language".
3. Select the display language you want.

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Menu Screens

Pressing MENU displays the menu screen. The contents of the menu screen depend on whether you are in the PLAY Mode or REC Mode. While the menu screen is on the display, press DISP to toggle between the basic menu and the advanced menu.

In this User's Guide, the basic menu is always used for items that appear on both the basic menu and advanced menu. The basic menu displays settings required for basic functions, while the advanced menu includes settings for all functions.

Sample Display: REC Mode

Basic Menu

Category   On-screen Guidance

↑
DISP
↓

Advanced Menu

Category   Function

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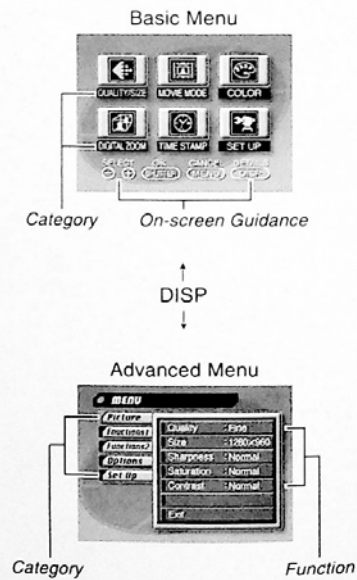
Making menu settings

1. Slide the Function Switch to PLAY or REC.

2. Press MENU.

3. Press DISP to toggle between the basic menu and the advanced menu.

4. Use [+] and [−] to select the category or function you want, and then press the shutter button.

    [+] [−]   : Item selection

    Shutter button : Execution of a selection

    MENU   : Returns to the previous screen or cancels settings.

• Make settings in accordance with the guidance messages that appear on the monitor screen.

5. After making the settings you want, select "Exit" and then press the shutter button.

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MEMORY CARDS

This camera uses a memory card (CompactFlash cards) for image memory.
Use the procedure below to insert the memory card into the camera before you try to use it for the first time.

▶▶▶ **IMPORTANT!** ◀◀◀

- Make sure that the power of the camera is turned off before you insert or remove a memory card.
- When inserting a memory card into the camera, make sure that the card is oriented correctly. Make sure that the correct side of the card is facing up, and that you insert the correct end of the card into the camera.
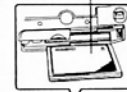
Inserting a Memory Card into the Camera

1. Open the memory card slot cover.
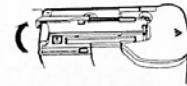
2. As shown in the illustration, slide the memory card into the slot and push it in as far as it will go.

   - If the Eject button is extended, press it in before sliding the memory card into the slot.

   Surface marked with arrow

   Eject button
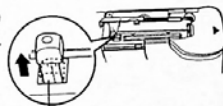
3. Close the memory card slot cover.

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Removing a Memory Card from the Camera

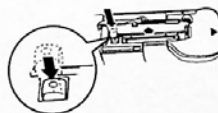1. Open the memory card slot cover.

2. Press the eject button so it extends from the camera.
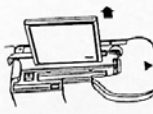
    Eject button

3. Press the eject button once again to eject the card.

4. Remove the memory card.

5. Close the memory card slot cover.
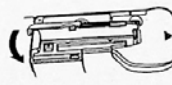
▶▶ IMPORTANT! ◀◀

- Insert only memory cards into the memory card slot. Inserting any other type of card can cause malfunction.
- Should water or any other foreign matter get into the memory card slot, immediately turn off power, unplug the AC adaptor, and contact your original retailer or nearest CASIO Service Provider.
- Never eject the CompactFlash card while the card slot is facing downwards. Doing so creates the danger of the CompactFlash card falling, which can corrupt image data on the card.

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Appendix C

Formatting a Memory Card

You can format a memory card to delete all of the data stored on it.

▶▶ IMPORTANT! ◀◀

- Formatting a memory card deletes all images on the card, even if some or all of the images are protected (page 90).
- Data deleted by a memory card format operation cannot be recovered! Be sure to carefully check and confirm that you no longer need the data stored in a memory card before formatting it.

1. Press MENU.

2. Select "Set Up" → "Format".

3. In response to the confirmation message that appears, select "Yes" to start formatting the card.

Memory Card Precautions

- Images cannot be recorded with this camera unless a memory card is installed in it.
- Be sure to use only CASIO brand CompactFlash cards. Proper operation with other memory cards is not guaranteed.
- Static electricity, electrical noise, and other electrical phenomena can cause corruption or even total loss of the data stored on a memory card. Because of this, you should always make backup copies of important images on other media (magnetic optical disk, floppy diskette, computer hard disk, etc.).
- Memory card problems can be corrected by reformatting the memory card (page 116). Reformatting a memory card deletes all images stored on the card, but you can use a computer to copy the images you want to keep to the computer's hard disk before reformatting your card. If you plan to be recording images where you do not have access to a computer, it is a good idea to take along an extra memory card or two just in case you experience an unexpected memory card problem.

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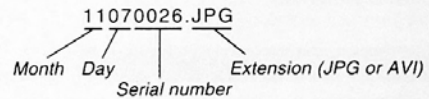Appendix C   IPR2020-00597
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• Formatting is recommended for any memory card that you suspect contains corrupted image data (due to a DE-CODE ERROR, strange image colors, malformed images) or newly purchased memory cards.

• Before starting a format operation, load a full set of new batteries (alkaline or lithium) into the camera or connect the AC adaptor to power the camera. Interruption of camera power during the format operation results in improper formatting, making it impossible to use the memory card.

Memory Card Folder Precautions

• The camera automatically creates folders (directories) on the memory card and assigns them names based on dates (month and day). Any image you record is automatically stored into the folder that corresponds to the date it is recorded.

• Up to 900 folders can be created on a single card. The following shows a typical folder name.

100_0719

Serial number | Day
Month
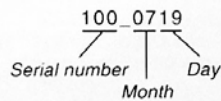
• Up to 250 image files can be stored in each folder. The following shows a typical file name.

11070026.JPG

Month Day   Extension (JPG or AVI)
Serial number

• When you try to save the 251st image to a folder, the camera automatically creates a new folder and store the image there.

• The above maximum number of files and folders are absolute maximums. The actual number of folders and files may be less due to memory card capacity and the size of each image.

• Panorama images are divided into multiple images and stored on the memory card.

• See "USING CompactFlash CARDS WITH YOUR COMPUTER" on page 103 for information about how files and folders are organized.

POWER SUPPLY

The camera features a two-way power supply that lets you use either batteries (AA-size alkaline, lithium or Ni-MH) or household AC current.

Loading Batteries

Be sure that camera power is turned off whenever loading or replacing batteries.

1. On the bottom of the camera, slide the battery compartment cover lock towards the front of the camera (①) to release the cover.

2. Grasping both sides of the battery compartment cover, swing it open (② ③).

3. Load batteries so their plus (+) and minus (−) ends are facing as shown in the illustration.

4. Close the battery compartment cover (① ②), and then slide the battery compartment cover lock towards the back of the camera to lock the cover in place (③).

Be sure to use **alkaline**, **lithium** or **Ni-MH** batteries. Never use manganese batteries (see precautions on the next page).

• Make sure the battery compartment cover is locked securely. Failure to do so can result in the cover opening, creating the danger of personal injury and corruption of image data.

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Appendix C

Standard Battery Life

This camera can be powered using AA-size alkaline, lithium or Ni-MH batteries.

The battery life reference values given below indicate the amount of time at standard temperature (25°C) until power automatically turns off due to battery failure. They do not guarantee that batteries will perform the amount of service indicated. Battery life is reduced by low temperatures and continued use.

Type of Operation	AA-size Alkaline Batteries LR6	AA-size Lithium Batteries FR6	AA-size Ni-MH
Continuous Playback	110 minutes	280 minutes	160 minutes
Continuous Recording	400 shots	1020 shots	620 shots

- The above figures are approximations only.
- The above guidelines are based on the following battery types:
  Alkaline: MX1500 (AA) DURACELL ULTRA
  Lithium: Energizer
  Ni-MH (Nickel-metal hydride): CASIO NP-H3
- Battery life varies with brand.
- Figures are based on continuous recording under the following conditions.
  Flash turned off
  One zoom slider switching between T (Telephoto) and W (Wide-angle)

Battery life is greatly affected by how much you use flash, zoom and other functions, and how long you leave power turned on.

● **About rechargeable batteries**
- Use only the nickel-metal hydride batteries (NP-H3) that are available from your dealer as options for this camera. Proper camera operation is not guaranteed when other rechargeable batteries are used.
  Nickel-metal hydride Batteries (4-battery set)/Quick Charger Set BC-1HB4
  Nickel-metal hydride Batteries (4-battery set) NP-H3P4
- Be sure to keep all four batteries together as a set at all times, for both charging and powering the camera. Mixing batteries from different sets can shorten overall battery life and cause malfunction of the camera.
- Rechargeable batteries cannot be charged while they are loaded in the camera.

● **Tips for Prolonging Battery Life**
- Use the ⚡ button to turn off the flash when you are not using it.
- You can also use the power save settings (page 42) to protect against wasting battery power when you forget to turn off the camera.

● **How low temperature affects battery life**
- The life of alkaline batteries is shortened by use under very cold temperatures. The life of alkaline batteries used at 0°C is about one fifth of what it is at normal temperatures (about 25°C). When shooting under very cold temperatures, we recommend use of lithium or nickel metal hydride batteries, which are not so dramatically affected by cold. If you must use alkaline batteries, be sure to have plenty of spares on hand.

Battery Handling Precautions

Incorrect use or handling of batteries can cause them to leak or burst and seriously damage your camera. Be sure to note the following important precautions to avoid problems with batteries.

⚠
CAUTION

- Use only LR6 (AM-3) type alkaline or FR6 type lithium or Ni-MH (nickel-metal hydride) dry cell batteries with this camera. Never mix old batteries with new ones. Doing so can result in bursting or leaking of batteries, creating the danger of fire or personal injury.
- Always make sure that the positive (+) and negative (–) ends of the batteries are facing correctly, as noted by the markings on the camera itself. Improper loading of batteries can result in bursting or leaking of batteries, creating the danger of personal injury or soiling of objects nearby.

- Remove batteries from the camera if you do not plan to use it for more than two weeks.
- Never recharge batteries, never allow direct connection between two ends of a battery, and never try to take batteries apart.
- Do not expose batteries to direct heat or dispose of them by burning. Doing so can create the danger of explosion.
- Never mix batteries of different types.

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- Dead batteries are susceptible to leakage, which can cause serious damage to your camera. Remove batteries from the camera as soon as you notice they are dead.
- The batteries that power the camera normally become warm as they discharge.

Battery Capacity Indicator

The battery capacity indicator (shown only when the image information display is turned on) changes in the following sequence as battery power decreases: "▭" → "▭" → "▭" → "▭". If you continue to use the camera while the battery level is "▭" or "▭", camera power will automatically turn off.