The Panasonic Lumix™ DMC-FZ1 and DMC-FZ2 Beta FAQ

1 Preamble

1.1 About this FAQ

The FZ1 FAQ is maintained by Alex Oren.

This document was last updated on 23-Dec-2004.
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Since I reside in Canada, this FAQ has a North-American bias. Most of the information and the links are in English. When linking to sites in other languages, a machine translation is provided (some of the Russian text I translated myself).

1.2 Legal mumbo jumbo

2 General information

2.1 Introduction

2.1.1 Briefly, what are the FZ1 and FZ2?

The Panasonic Lumix DMC-FZ1 was announced in September 2002. It is a 2 megapixel digital camera with a Leica lens providing a 12X stabilized optical zoom. It comes in two varieties, DMC-FZ1S (silver) and DMC-FZ1K (black). Except for the colour, there are no differences between the two models (but see §2.1.5 below).

The DMC-FZ2 was announced in August 2003 as a successor to the FZ1 (see §2.1.4 below) and was distributed in Asia, Europe, Mexico and Canada.

Since the FZ1's Firmware (§3.3 below) can be easily upgraded to support all the functionality of the FZ2, this FAQ will use the terms interchangeably unless explicitly referring to a specific model. In that case the camera will be referred to as the "FZ2", the "original FZ1" (original firmware) or the "FZ1v2" (upgraded firmware version 2.0).

Both cameras have been superseded by the DMC-FZ3 and are no longer in production.

2.1.2 What is so special about the FZ1?

The FZ1 has a unique combination of features that includes:

- An excellent second-generation Leica DC Vario-ELMARIT lens.

- A 12X optical zoom (the 35mm equivalent of 35–420mm focal length).
- An Optical Image Stabilizer (OIS) that helps eliminate jiggle.
- A maximum aperture of f/2.8 across the entire zoom range.
- A fast burst mode that captures 4–7 frames at 4fps.
- A relatively compact size (11cm x 7cm x 8cm) and weight (350gr including memory card and battery).
- Inexpensive (see §2.1.3 below).

The above makes the FZ1 a camera that is very versatile and fun to use (it's been jokingly said that the FZ stands for "Fun Zoom").

2.1.3 Where can I get the FZ1?

You can find a new FZ1 for US$250 and lower. Search Froogle, PriceGrabber or CNET Shopper for current deals. Also try FatWallet. Another option to consider is ebay.

2.1.4 What are the differences between the FZ1 and FZ2?

The DMC-FZ2 has the following additional features:

- A Shutter Priority mode (1/2000 to 8 seconds in 1/3EV steps).
- An Aperture Priority mode (f/2.8 to f/8.0 in 1/3EV steps).
- Manual white balance adjustment up to +/-1500°K in 300°K steps, in all white balance modes except [AUTO].
- The zoom magnification ratio is shown on the LCD and the EVF (as 1X to 12X).
- Slightly lower JPEG compression in the 1600 x 1200 mode supposedly resulting in higher quality (but file size is increased by 15–20%).
- The FZ2 stays at full aperture and max ISO until you depress the shutter button. This helps focusing and framing in dim lighting.

Some of the functional differences are presented in this table.

Note that the FZ1's Firmware (see §3.3 below) can be easily upgraded to support all the features of the FZ2.

The hardware differences between the cameras are insignificant and consist of:
- The [Normal] (red camera picture) dial position is marked [P/A/S] (for "Program / Aperture / Shutter" exposure modes) on the FZ2.
- The FZ2 has an additional rubber gasket in front of the IR-blocking filter.

2.1.5 Does the colour make any difference?

The choice of colour is mostly a personal preference. However, it may be influenced by other factors:

Black absorbs more heat than silver, which could be an issue in a hot climate. Scratches on the black FZ1 are less visible. Finally, its colour matches the hood adapter and some people perceive it as more "professional".

Silver reflects more light, which can be an issue with wildlife photography.

2.2 Additional sources of information

2.2.1 Where can I get more info about the FZ1 and FZ2?

For official information from Panasonic, check the links in §2.1.1 above. Also see the interactive 3D demo

Some of the FZ10 information on the Panasonic global site also applies to the FZ1. In particular, the pages about the Leica DC Vario-Elmarit lens, Mega O.I.S. (except the "mode 2" which the FZ1 does not have) and the Venus Engine LSI.

The DMC-FZ1 Operating Instructions, DMC-FZ2 Operating Instructions, Software Manual and USB Driver are available for download from Panasonic.

You can read reviews of the FZ1 in English at DCRP, Steve's Digicams, Megapixel, Europe for Visitors, ZDNet and Washington Post. A review in Spanish is available at quesabesde.com. There is also a review of the FZ2 by Alexey Klimov in the Russian Computerra magazine (machine translation by WordLingo or PROMT).

User reviews and opinions are available on DPReview (FZ1, FZ2), PCPhotoReview and epinoins. There are also comments by professional photographers on Panasonic's site.

There are several forums dedicated to the discussion of the Panasonic Lumix digital cameras on camera review sites. The most active one is on Digital Photography Review. Another one is on Steve's Digicams (with Bob Kozlarek, a Panasonic engineer, participating under the alias "Panasonic"). Although both forums have a predominance of users of newer cameras, there are still quite a few FZ1-related posts.

Additionally, there is the PanaLumix Yahoo group, the Panasonic DMC FZ1 FZ2 bulletin board and an FZ1 forum in Russian (containing its own FAQ) on iXBT. Fred Moore has some FZ1-related topics of interest on his site.

Finally, the Panasonic DMC FZ-10 rough guide by Dr. David P.S. Fong and the Panasonic Lumix DMC-FZ3 FAQ can be somewhat relevant to FZ1 users as well.

2.2.2 Where can I see sample images?

You can find several FZ1 and FZ2 public photo galleries by searching photo sites like smugmug (1, 2, 3), Pbase (1, 2), ImageStation (1, 2), photoSIG (1, 2, 3, 4) and photofile.ru.

Camera review sites, like DCRP and Steve's Digicams, usually have image galleries as well.

Also see the personal galleries of Fred Moore and Arthur (Russian). While not exactly a gallery, Hans-Georg Michna's Kenya 2003 travel report has a lot of great pictures taken with an FZ1.

For more, try searching on Google.

2.3 The other side of the coin

2.3.1 What are the FZ1's limitations and how to overcome them?

"Small, cheap, full-featured. Pick any two."

There were several compromises made with the FZ1 so, while it is an excellent outdoor long-zoom camera, it does have drawbacks that make it less ideal for some other uses. The main issues that people mentioned are:

Size:

Because of its big lens, the FZ1 is not a pocket camera. While it will fit in a coat pocket, waist pack or a belt pouch, it won't go in your shirt pocket.

Resolution:

The 2 megapixels of the FZ1 will be limiting if you intend to print pictures larger than 8" x 10" (20cm x 25cm) or like to crop a lot.

However, the high quality lens provides sharper pictures than many higher-megapixel counterparts, the long reach should minimize the need for cropping and you can use an interpolation tool for the occasional large print (see § 8.1.3 below).

Sensor size and noise:

The FZ1's small photosites result in a fair amount of noise at ISO 400 (borderline at ISO 200).

However, the fast lens and OIS allow the use of wider apertures and lower shutter speeds with ISO 100 or 50.

Low light performance:

The FZ1 is not the best choice if you want to shoot mostly in poorly lit rooms. It has no AF assist light nor LCD/EVF gain to help you focus and frame in dim light, the official range of the built-in flash is only 2.1m (users report longer ranges) and there is no hotshoe for an external one.

However, the FZ1's OIS and the f/2.8 aperture allows the use of slower shutter speeds, which helps when shooting stationary subjects in low light conditions. Unfortunately, this does not help with low light action shots (e.g., indoor sports). But then, I don't know of any camera in the same price range that is suitable for these conditions.

Focusing in dark conditions can be improved with an "aftermarket" focus assist (see §6.7.3 below).

Limited manual controls:

The FZ2 has no "full manual" mode and no manual focus. The original FZ1 has very minimal controls and should be upgraded to firmware version 2.0 (FZ2 equivalent, a.k.a FZ1v2) that offers more manual settings.

No lossless mode:

The FZ1 does not support recording RAW or TIFF files, just JPEGs.

No histogram:

The FZ1 does not provide a histogram to help you find the desired exposure.

Limited night photography mode:

The original FZ1 has a very limited night mode and should be upgraded to firmware version 2.0 (FZ2 equivalent, a.k.a FZ1v2). The FZ2 can use the shutter priority mode for better control but it still cannot use the widest aperture (f/2.8) with the slowest shutter speed (8 seconds).

Movie clips:

The FZ1 can shoot movie clips of unlimited length but only at 320 x 240 and 10fps. The clips use the QuickTime .MOV format (Motion JPEG) and not the more popular MPEG format. The zoom, focus and exposure are fixed while movie recording is in progress.

2.3.2 Are there long-zoom alternatives to the FZ1?

In October 2003, Panasonic announced the Lumix DMC-FZ10 (reviews, manual), featuring higher resolution (4MP), full manual exposure controls (including program AE shift and exposure assist), manual focus ring, stronger flash, hotshoe, live histogram, 30fps movie mode, composition guides, etc. On the other hand, it is bulkier, heavier and more expensive (naturally), its CCD is even denser and it suffers from higher Chromatic Aberration effects.

In July 2004 Panasonic announced 3 new cameras in the FZ family: the DMC-FZ3, DMC-FZ15 and DMC-FZ20.

The DMC-FZ3 (gallery, reviews, manual) is a replacement of the FZ1 and FZ2. It has a 3MP resolution, manual exposure, enhanced focusing and metering modes, scene modes, stronger flash, AF assist, longer and continuous bursts, 30fps movie mode, uncompressed TIFF format, live histogram and highlight display, composition guides, better ergonomics and a Venus-II engine that improves the stabilization, shutter response, burst speed and length and image processing (improved colour and reduced noise, CA and vignetting). Keep in mind that the CCD is still /3.2" and the lowest sensitivity was raised to ISO 80 so image noise is increased. Also see comparison pictures by "Gobo".

The DMC-FZ20 (gallery, reviews, manual) is a similar upgrade of the FZ10, featuring similar improvements in addition to 5MP resolution (same 1/2.5" CCD), adjustable noise reduction and a marginally longer reach (36 – 432mm equivalent) but a slightly slower burst.
The DMC-FZ15 (reviews, manual) has similar improvements but retains the FZ10's resolution, zoom range and burst speed and excludes the hotshoe and sound.

Video Direct Electronics offers a table summarizing the features of the 2004 Lumix line.

Other cameras with stabilized long zooms include the Canon PowerShot S1 IS, The Nikon Coolpix 8800 and the Minolta DiMAGE Z3, DiMAGE A1 and DiMAGE A2 as well as the long discontinued Olympus C-2100 UZ, Pro90 IS (2.6MP) and several Sony Mavicas.

In November 2003, the Japanese DOS/V magazine did a comparative review of 7 long zoom cameras that included the FZ2 and the FZ10 (translations by Excite Japan, Babelfish and WorldLingo).
In June 2004, PC Magazine also published a Super Zooms review (but without the FZ1).

If any of these cameras tickles your fancy, I suggest searching for a review on DPReview, DCRP or Imaging-resource.

3 Technical details

3.1 Hardware

3.1.1 The FZ1 lens rattles when it is turned off. Is it normal?

Yes, it is normal. There is some free movement of the lens when the camera is powered off.

From the FZ2 manual: "When the power is [OFF], this camera chatters if it is shaken. However, this is not a malfunction."

3.1.2 I got a bad pixel on the LCD.

The manual says:

> *Extremely high precision technology is employed to produce the LCD monitor screen featuring a total of approximately 114,000 pixels. The result is more than 99.99% effective pixels with a mere 0.01% of the pixels inactive or always lit. However, this is not a malfunction and does not affect the recorded picture.*

Therefore, Panasonic considers up to 11 bad LCD pixels as normal.

3.1.3 Is the FZ1 sensitive to infrared radiation?

A camera's IR sensitivity is determined by its sensor and the efficiency of its IR blocker. The FZ1 is sensitive enough to allow IR photography with a suitable filter and long shutter times. See §5.8 below for details.

For comparison, the Olympus C-2100UZ and the Nikon Coolpix 950 are over ten times more sensitive to IR than the FZ1 while the newer Lumix models (such as the DMC-FZ10, DMC-FZ20 and DMC-FZ3) are much less sensitive.

3.1.4 What's under the hood?

Arthur, an Electronics Engineer from St. Petersburg, has dissected his FZ1 and provided some images with comments in Russian (the translations by Babelfish, WordLingo and PROMT are pretty poor as they choke on slang words). There are images of the flash (with controller and capacitor), back cover, backplane, main board (front and back), EVF, lens (with motors and cables), CCD (also enlarged and with socket). As a bonus, he has a photo of the inside of the Panasonic 8MB SD card.

Also see these photos of the FZ1 backplane, Venus engine LSI, lens diagram and lens cross-section (here, here and here).

3.1.5 How does the internal flash operate?

"Aleksk" measured the flash parameters. Here's a translation of his original post (in Russian):

> *When the built-in flash of the camera fires, a very short pre-flash of a constant strength and duration (20µs) is fired first. It is used by the photosensor to rapidly estimate the amount of reflected light.*
>
> *Obviously, this high-speed exposure measurement method is designed to save battery life, since the energy of the pre-flash is weaker than that of the main one by more than an order of magnitude. The short duration is not sufficient for measuring the reflected light through the lens (the pre-flash is probably substantially longer in cameras that support TTL metering). The measured light affects the intensity of the main flash, which fires 98ms later.*

The duration of the main flash, when photographing remote objects, is 600µs and its intensity is 15% higher than of the pre-flash.

It was possible to measure the main flash only when it was stronger than the pre-flash (photographing a far object). When photographing near objects, the oscillograph was triggered by the pre-flash and missed the weaker main flash. We assume that the intensity of the main flash is determined precisely in 98ms and is reflected in its amplitude (not the duration). The 600µs duration is very close to the fastest shutter speed of the FZ1 (1/2000s) so it is possible to shoot very fast processes with the flash without smearing the image.

3.1.6 Where can I order parts for my FZ1?

Go to Panasonic's Parts and Accessories page, enter "dmcfz1" as the Model number and click on the "List Parts by Model" button.

You can also browse and order parts from PartSolver.

3.2 File storage

3.2.1 What file system does the FZ1 use?

The FZ1 memory cards use DCF-compatible DOS FAT12 and FAT16 file systems. The root directory always contains two folders, DCIM and MISC.

The DCIM (*Digital Camera IMage*) folder is the root of the DCF file system, as described in the Design rule for Camera File system version 1.0 specification. It can contain subfolders named 100_PANA up to 999_PANA. A folder *nnn*_PANA can hold JPEG image files named P*nnn*0001.JPG up to P*nnn*0999.JPG.

The MISC folder in the root directory holds the AUTPRINT.MRK file that specifies the DPOF print information in accordance with the Digital Print Order Format version 1.10 specification (full specification is not currently available online).

3.2.2 What about movie clips and sound files?

Movie clips are saved in QuickTime Motion-JPEG format. They are created along with a 320x240 JPEG image containing the first frame of the clip.

Sound files that are attached to an image are also saved in QuickTime format containing a copy of the corresponding image as a 640x480 JPEG and are sampled in 8-bit mono at 8000Hz.

Both have the same file name as their corresponding image file with the extension MOV.

3.2.3 How does the image numbering system work?

The images are numbered "*nnn–xxxx*" where *nnn* corresponds to a folder number (starting from 100) and *xxxx* corresponds to an image number in that folder. The actual file name of the image will be P*nnnxxxx*.JPG in folder *nnn*_PANA.

The image number starts from 0001 and is incremented until it reaches some number between 0900 and 0999 (may vary). Then, a new folder is created by incrementing the folder number (e.g., the second folder will be 101_PANA) and the process is repeated.

The image number in the current folder can be reset to 0001 via a menu option but it will not affect the folder numbering.

3.2.4 What happens to the numbering if I change memory cards?

The FZ1 keeps tack of the folder number and image number internally and will try to continue the sequence even if the card is formatted or a different card is inserted. This can cause unexpected results if the newly inserted card already contains images.

If the needed folder does not exist on the new card, it will be created.

If the folder exists and already contains an image with a number equal to or higher than the one the camera tries to write, the camera will increase the number to one after the highest number in this folder. If that results in an image number above 999, the next folder will be created instead and the image number will reset to 0001. If the next folder also exists, the camera will continue incrementing the folder number until it reaches one that does not yet exist and can be created.

3.2.5 How do I force the next picture's number to be "*nnn–xxxx*"?

If you want to increase the folder number, make sure that the currently used folder contains a file whose image number is 999. You can do it by renaming an existing file or copying a new one. Next, create all the _PANA folders up to (*nnn* - 1). The next image number that the FZ1 will record will be "*nnn*–0001".

If you want to decrease the folder number, perform a similar procedure but continue creating folders from the currently used one up to 999_PANA. That will cause the folder counter to wrap around. Make sure the folder you wish to use **does not** exist (it will be created when you take a picture).

If you want to increase the image number in the currently used folder, make sure that the highest image number in the folder is (*xxxx* - 1). The next image number that the FZ1 will record will be "*nnn–xxxx*".

Hans-Georg Michna has some additional information on changing the image counter.

3.3 Firmware

3.3.1 How do I find the firmware version of my camera?

Follow the instructions in §4.3.1 below.

3.3.2 Is there a firmware upgrade?

Indeed there is, and quite a dramatic one!

Panasonic released the DMW-VUZ1 upgrade kit that upgrades the FZ1 firmware to version 2.0, effectively converting the camera into an FZ2. This upgrade came on an 8MB SD card and was sold in Japan for about ¥6000.

An upgraded FZ1 is functionally equal to an FZ2.

3.3.3 How can I get the upgrade outside of Japan?

Unfortunately, the DMW-VUZ1 upgrade is only offered for sale by Panasonic Japan.

It is possible to download the FIRMWARE.BIN upgrade file from DriverGuide (registration required) and also here, here and here. The size of the file should be 831,096 bytes. Additional instructions are available from Fred Moore's site.

You can transfer the file to the root folder of an SD card using an external reader or the camera itself.

Please note that downloading and installing this file is an illegal copyright violation in most jurisdictions and, in the words of a Panasonic representative, is "not recommended".

3.3.4 How do I upgrade my FZ1's firmware?

Warning: while I have yet to hear of a botched upgrade, the possibility always exists. Proceed at your own risk!

The FIRMWARE.BIN file should be in the root folder of an SD card, with the DCIM and MISC folders.

Make sure that the battery is full or that you are using the AC adapter (preferably both), since running out of charge during the upgrade may turn your camera into the equivalent of an expensive paperweight.

Turn the camera off, insert the upgrade card into the camera and turn the dial to [`Playback`].

Turn the camera back on. At this point you should see the upgrade menu. Choose the [`FIRM+EEP`] option (on the left-hand side) and push [`SET`].
Warning: selecting any other option ([`FIRM Only`] or [`EEP Only`]) may produce unexpected (and undesired) results.

The LCD will turn blue and the on/off light will start blinking.

Wait a couple of minutes until the on/off light stops blinking (the camera will beep when done if the speaker is enabled), turn the camera off, remove the upgrade card and insert another card into the camera. Voila!

Note: the upgrade will reset all settings to their defaults and will also reset the image numbering.

3.3.5 Will the upgrade void my warranty?

Not if you obtained it in a legitimate manner, as neither the documentation of the FZ1 nor the one that comes with the DMW-VUZ1 upgrade kit mention that possibility.

Otherwise, you may be out of luck. Quoting a post by Gail Bjork:

> *I just called Panasonic and applying the firmware upgrade to a camera bought in the U.S. voids the warranty. The upgrade is not available at U.S. sites.*

3.3.6 Can I revert to the original firmware after the upgrade?

According to Panasonic, no.

4 Camera controls

4.1 Menu settings

4.1.1 What are the different White Balance settings?

There are five WB settings: [Auto], [Daylight], [Cloudy], [Halogen] and [Manual]. If the currently selected WB mode is not [Auto], it is indicated by an icon on the display.

On an FZ2 or FZ1v2, the WB can be manually adjusted, which will turn the WB mode icon blue or red. The WB adjustments are retained even after powering the camera off. See §4.2.5 below for details.

The White Balance can even be set for movie clips, by setting/adjusting it in [Normal] mode and then turning the dial to [Movie] mode.

Also see §5.5 below for WB suggestions.

4.1.2 What are the [A] and [S] AE modes and how do I use them?

The [S] and [A] modes allow you to manually set the shutter speed or the aperture value on an FZ2 and FZ1v2. In both modes the ISO sensitivity must be set manually.

In the [A] mode, the user sets the aperture to a value between f/2.8 and f/8.0 in 1/3EV steps and the camera automatically determines the shutter speed value to use for the desired exposure. This mode is used when you want control over the Depth Of Field.

Due to mechanical constraints, not all shutter speeds are available at wide apertures. See the following table for the official values:

Aperture	Shutter speed
f/2.8 – f/3.7	1 – 1/1000 sec.
f/4.0 – f/5.2	1 – 1/1300 sec.
f/5.6 – f/7.3	1 – 1/1600 sec.
f/8.0	1 – 1/2000 sec.

In the [S] mode, the user sets the shutter speed to a value between 8 sec. and 1/2000 sec. in 1/3EV steps and the camera automatically determines the aperture value to use for the desired exposure. This mode is suitable for fast action (high shutter speeds) or night photography (low shutter speeds).

Due to mechanical constraints, not all aperture values are available at high shutter speeds. See the following table for the official values:

Shutter speed	Aperture
1 – 1/1000 sec.	f/2.8 – f/8.0
1/1300 sec.	f/4.0 – f/8.0
1/1600 sec.	f/5.6 – f/8.0
1/2000 sec.	f/8.0

However, experiments with slow shutter speeds show that the aperture size is also constrained at low shutter speeds (1/5 second and slower, depending on the ISO setting). See §5.3.6 below for details.

Also see this explanation of AE modes.

4.1.3 What is the difference between the two picture quality levels?

The quality level affects the compression level of the pictures (Data Compression Ratio).
The FZ1 compresses pictures using the lossy JPEG algorithm so the higher the compression – the more information is lost.

The [Fine] setting emphasizes quality over size. In this mode, the original FZ1 uses approximately 3.4 bits/pixel for 1600x1200 images (1:7 compression) while the FZ2 and the FZ1v2 use approximately 4 bits/pixel (1:6 compression).

The [Standard] setting emphasizes size over quality. In this mode, the original FZ1 uses approximately 1.7 bits/pixel for 1600x1200 images (1:14 compression) while the FZ2 and the FZ1v2 use approximately 2 bits/pixel (1:12 compression).

The difference in discernable quality between these settings is very small but the compression effects may be more noticeable in the [Standard] mode, particularly near areas of high contrast. If you intend to post-process your images or to print them at large sizes, the [Fine] setting will provide better results. However, using the higher compression you will be able to fit twice as many images on the memory card.

4.1.4 What does the [Spot] mode do?

The [SPOT] mode is used both for focusing and exposure metering.

In [SPOT] mode, the camera will search only attempt to focus on a small area in the centre of the frame instead of searching a large area for high contrast. It may make focusing more accurate in some cases (e.g., if there is a fence or branches in front of or behind the subject, see example by "dres") but more difficult in others (e.g., moving subjects).

Similarly, the exposure metering will use this small area to calculate the exposure, instead of averaging out the whole scene.

It is possible to separate spot focusing from spot metering by using the [FOCUS] button. Engage [Spot] mode, set focusing mode to [Focus] (see §4.1.7 below), prefocus with the [FOCUS] button and disengage [Spot] mode.

Here's a good example of spot metering.

4.1.5 What the Auto Sensitivity option and should I use it?

The [Auto] sensitivity option tends to choose high ISO values at low light levels. Given the FZ1's small sensor size it can result in unacceptable noise levels. Forcing the sensitivity to ISO 50 or 100 may overcome this but at the cost of longer shutter speeds.

When the ISO Sensitivity is set to [Auto], the FZ1 may chose a "half stop" sensitivity level that is not available as a manual choice, such as ISO 75, 150 or 300.

The [Auto] Sensitivity setting is not available in the [A] (Aperture Priority) and [S] (Shutter Priority) AE modes. If it was set to [Auto] and you switch to one of the priority modes, the sensitivity will default to ISO 100.

4.1.6 What is Continuous Autofocus good for?

When this option is selected, the camera continuously adjusts the focus. Even though the final focus is set by the shutter release or the [FOCUS] button, the focusing lag will be shorter because the focus is already close to the desired. The downside is that is continuous focusing puts an additional drain on the battery.

4.1.7 What is the difference between the two Autofocus Trigger options?

When the AF Trigger is set to [Shutter], the camera will try to refocus every time you press (or half-press) the shutter release. When the AF Trigger is set to [Focus], pressing the [FOCUS] button will lock the focus so it will not change until you press [FOCUS] again, turn the camera off or switch to [Simple] or [Night Portrait] mode. This is the closest thing to a manual focus that the FZ1 offers and will reduce the lag when taking a picture and allow for very quick shot-to-shot times.

Since the half-press of the shutter normally both sets the auto focus AND the exposure, using the [FOCUS] button allows to break up these two operations. Thus, you can concentrate on the exposure using different parts of the subject (especially when in spot mode) and then reframe for composition without changing the focus point.

Also, the [Focus] mode allows you to zoom out after prefocusing without losing the focus.

4.1.8 Should I use the Digital Zoom?

The FZ1 has an additional up to 3X digital zoom (up to 2X in burst or bracketing modes) that magnifies the image at the expense of resolution.

Unfortunately, since the FZ1 is only a 2MP camera, there is very little room for digital zoom. Another issue with digital zoom is that it amplifies the effects of camera shake so, as the manual says, "the stabilizer function may be less effective in the digital zoom zone".

Nevertheless, the FZ1's digital zoom will, in most cases, yield superior results to external cropping and interpolation because it is done prior to sharpening and JPEG compression (see post by "AlanF").

In case you want to crop in post processing, see §8.1.3 below.

4.1.9 Are the Colour Effect settings useful?

The [Warm] and [Cool] settings are redundant in the FZ2 and FZ1v2 since the WB adjustment provides for finer control (see §4.2.5 below for details).

Some people also prefer changing the picture to greyscale in post-processing instead of using the [B/W] setting because of the manual control.

4.1.10 What setting should I use for Picture Adjustment?

The "Picture Adjustment" menu setting controls the contrast, sharpness and colour saturation of the image. The [Natural] setting provides the lowest enhancement (resulting in soft pictures), [Standard] provides medium enhancement and [Vivid] provides the highest.

The in-camera sharpening throws away some picture information and can also emphasize noise. Therefore, if you plan on doing any post-processing, use the [Natural] setting and use your image editing software to achieve the desired results.

Otherwise, if you want the most pleasing results straight from the camera, the [Standard] or [Vivid] settings may work better in certain situations. The decision is highly subjective and depends on the too many factors to give a general advice.

4.1.11 Should I turn the stabilizer on or off?

It is usually best to keep the stabilizer turned on.

The stabilizer is mostly useful at long zoom values where the effects of camera shake are much more pronounced (see §5.2 below). It can add the equivalent of over 2 stops to the shutter time, that is – you can use a shutter speed

than is 5 times (or even more) longer than you would have to use without stabilization before camera shake will affect the picture.

On the other hand, the stabilization consumes battery power and also tends to make it harder to track an object that moves erratically (like a flying bird).

Panasonic also recommends turning the OIS off when taking pictures using a tripod. When long exposure times are used with a tripod, the OIS element *does* move and the pictures can come out a little blurry.

4.2 Modes and adjustments

4.2.1 How do the various modes set the exposure parameters?

The [Portrait] mode tries to keep the aperture as wide as possible. The [Night Portrait] mode (without the flash) sets the aperture to f/6.5 or f/8, depending on the light level. The [Sport] mode prefers a narrower aperture than the [Normal] and [Macro] modes. The [Panning] mode tries to use a shutter speed of 1/30 second if possible.

"Aleksk" created a nice graph showing how the various modes select the aperture and shutter speed at various lighting levels. Here's a legend:
X-axis: exposure value (stops), Y-axis: aperture, the numbers are the shutter speeds.
Green line (squares) - [Panning] mode. Red line (Xs) - [Night Portrait] mode without flash.
Purple line (full circles) - [Sport] mode. Black line (full squares) - [Normal] and [Macro] modes.
Blue line (diamonds) - [Portrait] mode.

4.2.2 How does the exposure adjustment work?

The exposure adjustment affects the shutter speed in all modes except [S] (where it affects the aperture).

4.2.3 Can I set the aperture and the shutter speed at the same time?

The FZ1 does not have a full manual mode where you can set everything independently.

However, you can simulate it by fixing the ISO sensitivity, choosing the [S] (Shutter Priority) or [A] (Aperture Priority) mode to set one parameter and then adjusting the exposure to affect the other.

When in [S] mode, an exposure adjustment of 1EV is equivalent to one aperture stop.
When in [A] mode, an exposure adjustment of 1EV is equivalent to doubling (or halving) the shutter speed.

4.2.4 Does the exposure bracketing always centre on +0EV?

No, it centres on the exposure adjustment value that you select (which defaults to +0EV).

4.2.5 Where is the White Balance adjustment?

There is no White Balance adjustment on the original FZ1; use the "Colour Effect" setting instead (see §4.1.9 above).

On the FZ2 or the FZ1v2, the White Balance of each WB mode except [Auto] can be further manually adjusted up to +/-1500°K in 300°K steps. When a WB mode is manually adjusted, its icon turns blue ("cooler") or red ("warmer"). The WB adjustments are retained even after powering the camera off.

The White Balance adjustment is only accessible when "Colour Effect" is set to [Off] and the White Balance is *not* [Auto]. It is accessed by the [▲] button and appears after the EV bracketing adjustment (3rd or 4th press, depending on the active AE mode).

The White Balance cannot be set in [Simple] mode. It is also not accessible in [Movie] mode but can be set by setting/adjusting it in [Normal] mode and then turning the dial to [Movie] mode.

Since the difference between the [Daylight] and [Cloudy] modes is very small (the [Cloudy] setting is just a little warmer, perhaps 400°K), one of them can be pre-adjusted to serve as a "scene" setting (e.g., snow, greenery, etc.)

See also §4.1.1 above for WB modes and §5.5 below for WB suggestions.

4.3 Hidden options

Warning: Messing around with undocumented hidden options may damage your equipment. Proceed at your own risk!

4.3.1 What is the firmware version of my camera?

With the FZ1 in [Playback] mode, hold down the [BURST] button and press [SET]. You firmware info will now be overlaid in red on the picture display. You need to enable the display of image detail information (second press on the [DISPLAY] button) and have at least one picture saved in the camera in order to view it).
Repeat the procedure to revert to the normal display.

The original FZ1 comes with firmware versions 1.03, 1.04 or 1.05. The FZ2 comes with firmware version 1.00 or 1.05. No differences between different firmware versions of the same model have been reported.

Here are examples of a plain FZ1, an FZ2 and an upgraded FZ1v2 firmware info:

FZ1	FZ2	Upgraded FZ1
VER 1.04:0105 FZ1:00B5 OIS VER 1.00:100B 03.14 19:27	VER 1.05:0010 FZ2:0050 OIS VER 1.00:100B 08.27 14:08	VER 2.00:0200 FZ1:0063 OIS VER 1.00:100B 10.23 22:23

Of course, you can find out the firmware version by checking the EXIF data of a picture that was taken by the camera (using a suitable EXIF viewer).

4.3.2 My FZ1 only sends a signal over the A/V cable in [Playback] mode.

The FZ1 is able to display an image over the A/V cable in all modes. If it works only in [Playback] mode, you can try resetting the camera's Initial Settings to USA. After that, the camera will display an image over the A/V cable in recording modes as well (but only NTSC).

Note: The above is true for an FZ1 set to US settings. I have not tested the other settings.

4.3.3 How do I reset the Initial Settings?

1) With the camera off, set it to [Normal] mode. Simultaneously press the [▲] and [BURST] buttons. While holding both buttons, turn the camera on.
2) Set the camera to [Playback] mode. Simultaneously press the [▲] and [BURST] buttons. While holding both buttons, turn the camera off.
3) Turn the camera on and set it to [Normal] mode. Simultaneously press the [▶] and the [MENU] buttons. While holding both buttons, turn the camera off.

The camera will display the "Initial settings" menu, allowing you to select one of:

```
JAPAN
USA
UK.EU.ASIA
PM
KOREA
```

Selecting an entry should reset the camera's initial settings to the corresponding region.

Note: Sometimes only step #3 is required.

Note: This procedure may switch all the camera settings to their defaults, and reset the image numbering!

5 Photographing problems and techniques

5.1 Focus and sharpness

See the Focusing with the Panasonic FZ1/FZ2 FAQ by Bryan Thresher for more information.

5.1.1 Why do objects blur as I zoom in on them?

Unless the continuous autofocus is enabled, the FZ1 will only focus when you tell it to (by pressing the [FOCUS] button or half-pressing the shutter release button). Zooming in decreases the depth of field so exact focus becomes more critical.

Turning continuous autofocus on will alleviate this but will put additional drain on the battery. Alternatively, just refocus after zooming in.

5.1.2 Why are my pictures out of focus?

First, make sure that the camera was able to focus. If a steady green circle appears above the centre of the frame, the camera obtained focus. Otherwise, if the green circle is flashing, the camera failed to obtain focus and is focused on an arbitrary distance.

Second, keep in mind that it takes some time for the camera to obtain focus. In poor lighting conditions it can take over a second so keep the camera steady and pointed at the subject after pressing the shutter release button until you hear the "click" of the picture being taken.

Third, the fact that the camera obtained focus does not necessarily mean that it has focused on the subject that you had in mind.

The FZ1 can only focus on vertical changes in contrast and will not focus on horizontal lines (e.g., Venetian blinds). Therefore, if the focusing area includes some sharply defined verticals in front or behind the subject, the camera may focus on those instead.

Using [Spot] mode can help to focus more precisely but it is sometimes difficult to aim exactly at a contrast area. To help, you can set the AF Trigger to [Focus], zoom in, prefocus on a sharp detail, then zoom out and shoot. Also see §4.1.4 above for information on [Spot] mode and §4.1.7 above for information on the AF Trigger.

Tip: when only horizontal detail is present in a scene, rotating the camera sideways when prefocusing will enable it to obtain focus. A slight rotation is often enough but the closest the details are to 90º relative to the camera's X-axis, the faster it will focus.

5.1.3 I focused correctly but parts of the picture are still out of focus.

Taking pictures at wide aperture, long zoom and close distance can result in a very shallow depth of field (DOF). This is especially noticeable in Macro shots.

For example, when taking a picture of a subject 2m away at full telephoto (55.2mm focal length) and f/2.8 aperture, the DOF is only about 2cm deep. Everything over 1cm behind or in front of the focusing point will appear out of focus.

In order to minimize the effect, consider closing the aperture, reducing the zoom or moving away from the subject.

5.1.4 How do calculate the DOF?

Try Don Fleming's On-line Depth of Field Calculator or John Hendry's Gadget bag.

Choose the "Panasonic Lumix DMC-FZ1" camera (the Circle of Confusion is 0.004), set the focal distance between 4.6 (Wide) and 55.2 (Tele) and the aperture between f/2.8 and f/8.0.

For Microsoft Excel users, try the excellent DOF calculation spreadsheet from Christophe Vlaminck's FZ1 page.

5.1.5 How do I verify that the camera focused correctly?

When using the [FOCUS] button to lock the focus, you can zoom in to check the focus, then zoom out again and take the picture.

In other focusing modes (or when taking pictures at maximum zoom), this can only be done after the picture was taken. The most accurate way is to look at the picture using an image viewer on the computer sized to 100% or more. Another way is to review the picture in-camera at high magnification (up to 16X in [Playback] mode or up to 8X using the [PREVIEW] button).

5.1.6 What aperture setting gives the best optical results?

Using a wide aperture increases the possibility of chromatic aberrations while a narrow one may lead to image degradation due to diffraction effects.

Several people stated that the "sweet spot" of the FZ1's lens is around f/5.6. Therefore, everything else being equal, the [Sport] mode (which usually chooses an aperture of f/4.5 – f/5.6) should produce the sharpest images.

This, of course, ignores other considerations like exposure and DOF.

5.2 Camera shake

5.2.1 I closed the aperture and lowered the sensitivity but the picture is still blurry.

You may be experiencing the results of camera shake (a.k.a jiggle).

When you close the aperture and lower the sensitivity, the camera lowers the shutter speed in order to let enough light reach the sensor. If the shutter remains open for too long, the OIS cannot compensate and you get blur resulting from the jiggle.

It is possible to distinguish between jiggle effects and focus problems. Jiggle effects appear similar to streaking while out of focus areas display a more uniform fuzziness.

5.2.2 Does the jiggle warning indicate excessive shake?

No. It indicates that the currently chosen focal distance and shutter speed *may* be susceptible to camera shake. The jiggle warning will appear at the following shutter speeds:

Approx. zoom	Jiggle warning at
1X – 4.5X	1/30 sec. or slower
4.5X – 5.5X	1/40 sec. or slower
5.5X – 6.5X	1/50 sec. or slower
6.5X – 9X	1/60 sec. or slower
9X – 11X	1/80 sec. or slower
12X	1/100 sec. or slower

5.2.3 How do I deal with the jiggle?

Make sure the OIS is turned on and check the shutter speed.

Panasonic designed the OIS for optimal performance at shutter speeds of 1/125 seconds and faster. While people report success at lower speeds as well, a slow shutter speed (or a combination of slow speed and long zoom) may be beyond the ability of the OIS to correct, particularly it the camera is not held by a very steady pair of hands.

The FZ1 will display the shutter jiggle alert when it thinks that its ability to compensate is limited. Please note that the FZ1 does not actively sense the jiggle and its decision to display the alert is based solely on the current settings (such as zoom length and shutter speed).

There are some shooting techniques that may help achieve a steadier shot. In particular:

- **Use the EVF.** It allows you to steady the camera against your face.
- **Use target-shooting techniques.** They apply to cameras as well…
  Lock your joints, slowly exhale and gently squeeze the shutter release button.
- **Use the 2 sec. timer.** It will avoid the jar from pressing the shutter release button.
- **Use the burst mode and pick the best picture.**
- **Use the flash.** It will allow faster shutter speeds.

Also see Moose Peterson's suggestions on Proper Handholding Technique and Proper Technique for Wide Angle & Telephoto Lenses.

If the above does not help, you should reduce the zoom length, increase the shutter speed and/or secure the camera in place by using a tripod, a monopod or a beanbag.

5.3 Exposure and brightness

5.3.1 How does the camera determine the exposure?

The FZ1 can use either matrix or spot evaluation (see §4.1.4 above).

In matrix mode, the light reflectance of the whole scene is averaged out and the result is assumed to be equal to a "middle tone" (a shade that reflects 18% of the light that hits it). If the actual scene is lighter or darker than a middle tone, the camera will respectively under-expose or over-expose the picture (unless the user compensates the exposure).

In spot mode, only a small area in the centre of the frame is metered. When you point the spot at different lighting levels in a scene, you may notice the colours changing intensity. You can use this to your advantage – pan around and when you find the combination you like, half-press the shutter release button to lock the desired exposure, re-compose and shoot.

5.3.2 Why do the aperture/shutter values on the LCD become red?

The colour of the aperture and shutter speed values on the LCD becomes red when the camera thinks that it cannot achieve adequate exposure under the available lighting and the end result will probably be over or under-exposed.

Note that the exposure warning will not appear when the flash is active.

5.3.3 Can I trust the auto exposure calculation?

Actually, the FZ1 tends to overexpose.

Users report that an exposure correction of -1/3EV to -2/3EV in daylight is usually adequate but it is advisable to experiment with exposure bracketing or use the [SPOT] mode to fine-tune the exposure.

5.3.4 But doesn't the image on the LCD reflect the actual picture?

The brightness of the screen may differ from that of recorded pictures. In particular, when taking pictures in dark places using slow shutter speeds, the subject will look dark on the screen but the actual recorded picture will be much brighter. Reviewing the picture is recommended.

5.3.5 How do I increase the exposure in low light conditions?

The exposure depends on the combination of the lighting, shutter speed, aperture size and sensor sensitivity.

As the widest possible aperture size of the FZ1 is f/2.8 and the slowest shutter speed that it can choose in the [P] (Program) mode is 1/8 second, you can increase the exposure by switching to another mode, raising the ISO sensitivity or increasing the light (e.g., by using the flash).

The original FZ1 has only the [Night Portrait] mode for longer exposures. In that mode, the slowest shutter speed it will use is 1 second with the flash on and 8 seconds with the flash off. However, the aperture will be set to f/6.5 or f/8 and exposure compensation will not work.

The FZ2 and FZ1v2 can use slower shutter speeds in the [A] (Aperture priority) mode (1 second or faster shutter speed) and in the [S] (Shutter priority) mode (8 seconds or faster shutter speeds).

5.3.6 How can I control the exposure for night shots?

The original FZ1 can only use slow shutter speeds in the [Night Portrait] mode with the flash off. It will set the aperture to f/6.5 or f/8 (to ensure a high DOF) and a shutter speed of up to 8 seconds. Exposure compensation does not affect the aperture in the [Night Portrait] mode, although it can affect the shutter speed.

The FZ2 and the FZ1v2 are more flexible, as they can use the [S] (Shutter priority) mode to select a long shutter speed and adjust the aperture size using exposure compensation. Unfortunately, the aperture sizes at low speed are

artificially limited, probably to ensure a high DOF in case the camera fails to obtain focus. See the following table for details:

Shutter speed	Aperture at ISO 50
up to 1.0 sec.	f/2.8 – f/8.0
1.3 sec.	f/3.3 – f/8.0
1.6 sec.	f/4.0 – f/8.0
2.0 – 2.5 sec.	f/4.6 – f/8.0
3.2 – 4.0 sec.	f/5.6 – f/8.0
5.0 – 6.0 sec.	f/7.3 – f/8.0
8.0 sec.	f/8.0

The exact values depend on the ISO setting. At higher sensitivities, the aperture closes down even more (proportional to the sensitivity increase).

It is possible to open up the aperture by using the exposure compensation. For example, a +2EV setting at ISO 50 and 8 sec. shutter speed will result in an f/4.6 aperture.

Adding exposure bracketing can achieve even wider apertures (+/-1EV at the conditions above will result in f/4.6, f/3.3 and f/6.5 apertures) but will disable the dark frame subtraction (see §5.4.2 below) and result in more noise due to "warm" pixels (although it is possible to do manual dark frame subtraction in post-processing).

5.3.7 Where can I learn more about exposure?

There are articles about exposure metering on megapixel and PhotoZone.
Gil T. "Art4Less" wrote an informative post on spot metering.
Neil van Niekerk has several exposure techniques on his site.
The Exposure strategies page on Jeremy McCreary's dpFWIW has a lot of additional information about exposure (as well as noise, sharpening, white balance, DOF, camera shake, etc. thrown in).

5.4 Noise

5.4.1 How do I deal with excessive noise?

First, use the [`Natural`] Picture Adjustment. This will soften the picture (you can always sharpen it in post-processing) and reduce the amount of noise.

Second, lower the ISO sensitivity. Using ISO 100 or even 50 instead of the Auto setting can reduce the noise (but you may have to open the aperture and/or lower the shutter speed to compensate).

Third, use a post-processing tool such as Neat Image, Noise Ninja, Helicon NoiseFilter or NoiseWare.
However, these tools may not produce optimal results with FZ1 pictures taken at high ISO sensitivities, as the camera will try to compress noisy images even more to achieve a desired file size, losing detail in the process.

5.4.2 Why does my camera pause after taking pictures at low shutter speeds?

After taking a picture with slow shutter speed (half a second or more), the FZ1 may pause, displaying "PLEASE WAIT" for a time equal to the shutter speed. During that time, the camera does a dark frame subtraction to combat the effect of hot pixels. Also see here.

In other words, the long exposure time causes some of the CCD sensors to leak charge and appear as bright dots. Immediately taking a second picture with the shutter closed will produce a frame with only the hot pixels, which can be then subtracted from the original frame. This method of noise reduction is what causes the delay.

5.4.3 Can I forego the noise reduction and avoid the delay?

Yes, by switching to burst mode.

The FZ1's dark frame subtraction does not operate in burst mode (or bracketing mode) and, due to the slow shutter speed, you can release the shutter buffer quickly enough so only one picture is taken.

However, this will introduce a lot of noise and hot pixels into your picture. To demonstrate, try the following experiment:

Set the camera to the [P] (Shutter Priority) mode and set the shutter speed to 8 seconds. Switch to burst mode. Hold the lens cover tightly against the lens and click the shutter release button.
After the camera takes a picture, switch to [Preview] mode and enlarge the display to 16X. Pan around and enjoy the view of noise and hot pixels. Repeat at different ISO sensitivities (at ISO 50 only the hot pixels will be apparent, at ISO 400 you will see lots of noise as well).

Now, try the same with the noise reduction enabled (cancel burst mode). See the difference?

5.5 Colour

5.5.1 Why is the colour of my photographs off?

If your photographs have an unnatural reddish bluish cast, you should change the camera's White Balance. See § 4.1.1 above.

The [Auto] WB setting is ideal for flash photography. It is also quite good for outdoor photography in good lighting conditions, although the [Cloudy] mode often gives more accurate results. Indoors, the [Halogen] setting gives decent results but manually setting the WB is preferred.

To learn more about White Balance, read the articles on megapixel and Jeremy McCreary's dpFWIW.

5.5.2 What is the best way to set the WB manually?

The manual suggests aiming the camera at a white surface when setting the WB manually.
However, since the WB setting only affects the red/blue tint, you can use any warmth-neutral colour, such as various shades of grey. The 18% grey cards used for exposure settings work well.

A more convenient alternative that gives surprisingly good results is holding a translucent Pringles lid against the lens like a filter and pointing the camera at the scene (or the light source) while setting the WB. It is also possible to create a "White Balance cap" with it.

Other suggestions include Coffee filters (single or stacked), a Styrofoam coffee cup, etc. or the more "professional" but expensive ExpoDisc.

5.5.3 Why is there a colour fringe around some details in my picture?

This is a result of chromatic aberrations that can appear (usually around hard edges) when photographing at long focal ranges and wide apertures. For an in-depth explanation see Paul van Walree's optics page.

To minimize chromatic aberration, try stopping down (increasing the f-stop number) when taking the photograph or lower the zoom.

Chromatic aberrations can also be reduced in post-processing using tools like Panorama Tools (explanations here and here) or Flo's UnDistort filter.

5.6 Flash photography

5.6.1 The flash is too weak!

First, make sure to remove any adapters from the camera before taking flash pictures, as they may reflect the pre-flash into the flash sensor and cause it to miscalculate the required flash intensity. Alternatively, you can cover the adapter with a non-reflective material (or put a black tape over it) to alleviate this problem.

Keep in mind that Panasonic recommends putting the lens ring back on after removing the adapter.

Second, according to the manual, the FZ1's flash is effective up to 2.1m at ISO 100. Although its actual reach seems to be longer than the official figure, objectively, it is a fairly weak flash; so do not expect miracles.

That said, it is possible to make the FZ1 fire the flash at full intensity by covering the flash sensor (with a finger or otherwise) when taking a picture.

5.6.2 I need a much stronger flash.

You can use an external slave flash. See §6.6.1 below for details.

5.7 Macro photography

5.7.1 What are the FZ1's Macro capabilities?

The FZ1's minimum focusing distance depends on the focal distance. In the [Macro] mode, the FZ1's official minimum focusing distance is 5cm at the wide-angle setting but it rapidly rises to about 120cm at the telephoto end. The actual minimum focusing distance is better, between 2cm and 3.5cm at wide angle have been reported (YMMV).

Experimentation showed that the shortest focusing distance actually applies up to a focal length of about 99mm (35mm equivalent), which corresponds to approximately 2.8X zoom. At this setting, you get the best chance of filling your frame with the subject while reducing distortions.

At this setting and the closest focusing distance I could manage, my FZ1 achieves frame coverage of 25mm (64 pixels/mm) with small pincushion distortion and no vignetting. Not up to the Nikon CoolPix 4500 (17mm frame coverage at half-zoom, giving a distortion-free 133 pixels/mm) but still very decent.

5.7.2 How do I zoom to 2.8X?

Since the FZ2 and the FZ1v2 display the zoom multiplier as an integer, you can reach the 2.8X setting if you zoom to 3X; then, using very small nudges to the zoom lever, back up until the zoom display changes to 2X and finally give it another tiny nudge towards the "T" end. The resulting zoom setting will be close to 2.8X.

The original FZ1 does not display the zoom multiplier at all so you'd have to guess (or upgrade).

5.7.3 Can I control the shutter/aperture in Macro mode?

The [A] (Aperture priority) and [S] (Shutter priority) modes of the FZ2 (or FZ1v2) allow you to focus at the same distances as the [Macro] mode. You can use the [A] mode to control the DOF of your close-ups.

5.7.4 How do I use the FZ1's flash for Macro pictures?

The biggest problem with using the flash for macro pictures is that the protruding lens will cast a shadow on the subject. However, here a suggestion from Chris Pilot:

> *You can use the FZ1 flash for macros; you just have to use a trick involving a rubber band and an index card to create a bounce flash.*
>
> *You pop-up the flash, put the rubber band underneath the flash had and then stretch the other end around the viewfinder. This pulls the flash back on the hinge so it's pointing up at about a 45-degree angle from the norm. You can use the flash in this configuration for normal shots as a bounce flash off a relatively low ceiling. For macro shots or shots needing more direct but diffused light, you can then taper or notch an index card and attach it under the rubber band on the flash head or use another rubber band if you didn't have to double the first rubber band around the flash head a couple of times to make it the right size. At about the halfway point of the index card, bend it so it angles a little forward to project the light toward your macro subject.*
>
> *This is definitely a "home-job" technique, but it works very well, and I've used it to take some macro pictures for eBay auctions. You get no shadow from the lens, and the light is diffused just enough to provide nice, even lighting.*

5.7.5 How can I improve on the FZ1's Macro capabilities?

Use an add-on macro or close-up lens. See §6.3.3 below.

5.7.6 I am having troubles focusing with the add-on lens.

If only a part of the image is in focus, try to increase the depth of field by closing down the aperture (see §5.1.3 above). This will increase the DOF but will decrease the shutter speed as well and may require a tripod.

However, even at narrow apertures, the DOF may be so shallow that any slight movement can throw the image out of focus. In that case, after locking the focus, try moving the camera in and out ever so slightly to obtain a better focus. It takes practice, as very slight changes may result in a big difference and low light or windy conditions make it that much more difficult. A tripod also helps to minimize unwanted camera movement.

5.8 Infrared photography

5.8.1 What is infrared photography?

The sensor used in digital cameras is also sensitive to "near infrared" light just beyond the limit of visibility.

Blocking most (or all) visible light allows the camera to record only the near infrared light. The resulting images are quite different from those taken "normally" since objects often reflect infrared and visible light differently. The effect is very noticeable in pictures that contrast green leaves and clouds, which are good IR reflectors, with water and the sky, which are not.

However, photographers are usually interested in capturing visible light so most cameras have infrared blocking filters of varying strengths.

Also see this Wikipedia article.

5.8.2 How suitable is the FZ1 for infrared photography?

Under optimal lighting conditions, using low zoom, wide aperture and high ISO sensitivity, the FZ1 can be used with "shallow" IR filter to take handheld, properly exposed infrared pictures. A darker filter, dimmer lighting and/or lower ISO setting will probably require a tripod.

Note that the original FZ1 can only take infrared pictures (with a suitable filter) in [`Night Portrait`] mode. The FZ2 and FZ1v2 can use the shutter priority mode.

5.8.3 How does the FZ1 compare?

Newer cameras (including the DMC-FZ10 and newer Lumix FZ models) have stronger IR-blocking filters and are less suitable for infrared photography.

Some older cameras have weaker IR-blocking filters. Notable cases are the Nikon Coolpix 950 and the Olympus C-2020 and C-2100UZ, which are over ten times (about 3.5 stops) more sensitive to IR than the FZ1.

The best unmodified digital cameras for infrared photography are probably the Sony CyberShot models with the "NightShot" feature (DSC-F707, DSC-F717, DSC-F828, DSC-V1) that moves the IR-blocking filter out of the way. Similar or better results can be achieved by removing the IR-blocking filter altogether from an already IR-sensitive camera.

5.8.4 What IR filter works best with the FZ1?

Quoting Andrzej Wrotniak:

> *I believe the most useful, general-purpose IR filter for digital photography is **Hoya R72** (#89B). It blocks visible light well enough (if not entirely) to provide a well-pronounced IR effect, while still allowing for non-exotic exposure times. The small amount of visible (far red) light which this filter lets through does not affect pictures enough to spoil the IR effect, while coloring your images red (or purple), therefore they need to be converted to monochrome in postprocessing.*

Technically speaking, the Hoya R72 has a 50% light cut-off at 720nm and 100% cut-off at 680nm. Here's a chart.

See also "infrared filters" in §6.2.1 below.

5.8.5 How does the IR filter affect exposure?

When used with the Hoya R72 or equivalent infrared filter, the FZ1 takes a hit of approximately 9 stops. That is, the amount of light reaching the sensor would be about 500 times less than if no filter was used.

To compensate, much longer shutter times are needed for IR photography. For example, a picture taken at 1/1000 sec. under normal lighting will need to be taken at 1/2 sec. with the R72 (assuming the same aperture and ISO sensitivity).

5.8.6 Why are leaves so bright in IR photographs?

Quoting a post from Steve Steppe:

> *Chlorophyll transmits IR. Leaves are growing in spring and summer, and there's a high rate of photosynthesis. The higher the rate of photosynthesis, the greater the amount of infrared reflection, so the leaves appear white. In autumn, when the leaves have lost their chlorophyll and aren't carrying on photosynthesis, the leaves won't appear white.*

Quoting a post from Karl Norris:

> *Healthy green leaves contain a lot of chlorophyll, and chlorophyll absorbs the blue and red light from the sun. More important here is that the chlorophyll converts the blue and red light to near infrared radiation by a process called fluorescence. This radiation emitted from the leaf peaks in the 750nm region of the spectrum, and this coincides with the peak sensitivity of a silicon detector covered by an IR blocker and a Hoya R72 filter. The green leaf has a reflectivity of about 75% in the 750nm region, but the fluorescence emission makes the camera think the reflectance is greater than 100%. The camera can not distinguish the difference between the reflectance and the fluorescence, so the total radiation from the leaf is recorded by the camera as a bright source, compared to surrounding objects. This bright radiation can be processed to appear as red, green, blue, or whatever color the photographer desires. Keep in mind the radiation in the 750nm region is not visible to the human eye.*

5.8.7 Can I photograph body heat at night?

Quoting a post from Steve Steppe:

> *The visible spectrum is in the range of 400-700nm (nanometers) wavelength. The range from 700-1200nm is more properly called "near infrared", and this is the range that digital cameras are sensitive to. This is actually reflected from objects, the source being either the sun or incandescent light.*
>
> *"Far infrared", or "thermal" IR (which is what you were thinking of) is in the range of 3000nm and higher, and most digital camera sensors are not sensitive to those longer wavelengths. Those are the wavelengths given off by body heat, and the FZ1 will not pick that up.*

Quoting yet another post from Steve Steppe:

> *Shooting at night won't provide enough light, since near infrared is only reflected - the source is the sun or incandescent lamps. And the FZ1 won't pick up thermal infrared. (Moonlight is reflected sunlight, but you'd need a MUCH longer exposure than the FZ1 is capable of.)*

5.8.8 So what do I do and what will it look like?

There are workflow explanations in this thread and this post.
Also see the Enhance digital infrared photos technique article.

One issue with infrared photography is composition, as the IR filter is very dark (or even opaque). Using a tripod and pre-composing before putting the filter on will help.

You can see sample FZ1 and FZ2 infrared photos in these galleries by Chris Pilot (1, 2), Fred Moore (1, 2, 3), David Bryant, Harlan Saperstein, Bobby Pearce and Johnny Yeo.

5.8.9 Where can I learn more about digital IR photography?

There are several sites with good explanations:
- Jens Roesner's photography site,
- The Infrared basics for digital photographers page on Jeremy McCreary's dpFWIW,
- The Fine Art Infrared Photography site,
- The Infrared Photography With a Digital Camera page on Andrzej Wrotniak's Photo Tidbits site.
- Clive Warren's official Infrared Photography FAQ.

6 Accessories and add-ons

6.1 Lens attachments and adapters

6.1.1 What type of filters, lenses and converters will fit the FZ1?

You can use anything with a 55mm thread diameter natively. Other diameters will require a step-up ring, a step-down ring or a special adapter. Usually, a larger thread diameter implies a bigger lens and therefore a sharper image with less vignetting.

6.1.2 How do I attach these accessories?

You cannot screw filters directly to the camera body as the lens extends on power-up. Instead, the accessories attach to the supplied hood adaptor.

However, the threads on the hood adaptor end about 1–2 mm before the edge. That gap reduces the number of threads that an accessory can grip when it is screwed on. Several owners recommended sanding off the front of the adapter to get enough a better grip.

6.1.3 Is there an alternative to the hood adapter?

Mr. Ryuji Yoshida in Japan makes aluminium alloy adapters for the FZ1. He recently cut back production but may have some in stock. To order, send him an email. Payment is by PayPal.

Both the 155 and the 295 Yoshida adapters have 55mm threads. The 295 is 3mm shorter, bringing the filters closer to the lens and reducing vignetting (however, the fit may be too close for some lenses). The 152 adapter has 52mm threads. All the adapters are available in Black or Silver colours.

Pete Liontas from Permaraal stated that they will have 55mm anodized aluminium adapters for the FZ1 in August (November and still no word).

6.1.4 Can I leave the adapter on all the time?

It is best to take the adapter (and anything that is attached to it) off when using the flash, because the pre-flash reflection from the adapter can confuse the flash sensor, resulting in weaker flash output and underexposed pictures.

6.2 Filters

6.2.1 What types of filters can I use?

UV and Skylight filters:

As the FZ1 has very low UV sensitivity, a UV filter will usually be used as a lens protector. The necessity of this is debatable; some users always have an adapter with UV filter screwed on the camera while others prefer not to introduce another unnecessary optical element.

Skylight filters serve a similar purpose but are often tinted to achieve a "warming" effect.

Neutral Density filters:

A neutral density filter will allow the use of a wide aperture and longer shutter speeds even in bright light letting less light through. A 2X ND filter (.30 density) is equivalent to -1EV, a 4X (.60 density) to -2EV and an 8X (.90 density) to -3EV.

ND filters are used to either slow the shutter speed (to blur motion) or open up the aperture (to lower the DOF) without affecting the resulting exposure.

Graduated ND filters are grey at one end and clear at the other. They are typically used to balance out bright skies against darker foreground scenes.

Polarizing filters:

A polarizing filter can darken the blue of the sky, highlight clouds, suppress unwanted highlights and reduce reflections off water, glass, metal or sunlit foliage.

The cheaper linear polarizers will work with the FZ1 just as well as the more expensive circular ones.

Read more about polarizers and their use on Luminous Landscape and Jens Roesner's photography site.

Infrared filters:

The Hoya R72 (see §5.8.4 above) is an inexpensive, high quality IR filter. It is "shallow" (passes some visible red light) and therefore does not require very long shutter times. Equivalent filters are the Schott-Glass RG 695, the B+W 092, the Heliopan 5695/569 and the Wratten 89B.

Other types of filters:

The effects of most other types of filters can be easily duplicated with either camera settings or post-processing. See How To: Filters For The Digital Camera from the August 2003 issue of Outdoor Photographer.

6.2.2 So which filters are recommended?

Panasonic offers two native filters for the FZ1: the DMW-LMC55 MC Protector and the DMW-LND55 ND Filter. However, less expensive and higher quality third-party alternatives exist.

Quoting a post from Darrell Spreen:

> *The biggest difference between filters is the accuracy of their spectral response. Those that have the best reputation in that regard are B+W, Heliopan, Tiffen and Hoya.*

Christophe Vlaminck wrote:

> *I noticed that B+W filters have less thread than Cokin ones. With Cokin filters, there is no need to sand off the front of the adapter* (see §6.1.2 above).

Most people prefer using multicoated filters to minimize flare and internal reflections (ghosting). However, they are more expensive and sensitive to dirt (which can damage the coatings) and the differences in the results are not always apparent.

6.2.3 Where can learn more about filters?

Check Jim Altengarten's Primer on Using Filters (Part 1 and Part 2), Dante Stella's Practical Filter FAQ, Thom Hogan's Filtration 101 and Betty Sederquist's Filter Basics.
For more in-depth information, check the Filter options for digital cameras and Using a polarizer effectively pages on Jeremy McCreary's dpFWIW.
Also check the list of links on Robert Monaghan's Photographic Filters page.

6.3 Lenses and converters

6.3.1 What teleconverter lenses are recommended?

The following teleconverter lenses got positive comments:

- The Olympus TCON-1.7X telephoto conversion lens (a.k.a TCON-17).
  Vignetting is visible at about 3–4X zoom.
- The Olympus TCON-14B 1.45X tele extension lens.
  A very high quality lens that requires a step-up to 62mm. Can be used with a wider range of focal lengths than the TCON-17 and offers better optical quality.
- The Canon TL-55 1.4X teleconverter (specifications).
  Smaller and lighter than the TCON-17. Reported to have better centre sharpness but more edge distortion. Vignetting is visible at about 3X zoom.
- The Sony VCL-HGD1758 High Grade 1.7X telephoto lens (specifications).
  A high quality lens that requires a step-up to 58mm. Stops vignetting above 2–3X zoom.
- The Raynox DCR-1540PRO 1.54X high definition telephoto conversion lens.
  Requires a step-down to 52mm. Designed to be used at maximum telephoto.
- The Raynox DCR-2020PRO 2.2X lens.
  Bigger than the 1540 and has somewhat lower resolution. Requires a step-up to 62mm. Designed to be used at maximum telephoto.

According to a post by "JinE", the actual magnification factor of the adapters is often less than the published one.

For samples and comparisons of various teleconverter lenses, check out the following:
- An excellent FZ10-oriented comparison by "10kzoomfz" on Pbase,
- C-2100UZ and FZ10 Test Images on pemaraal online,
- A comparison of the TCON-17 and the TL-55 by Debbie,
- An FZ10-oriented post comparing the TCON-17 and the Raynox DCR-2020PRO by "twg",
- FZ-10 oriented Raynox DCR-2020PRO tests by Ronald Welch and a post and gallery by Gil,
- Ching-Kuang Shene's FZ-10 oriented comparison,
- Kazutoku's converter lens comparison (translations by Excite Japan, Babelfish and WorldLingo).

6.3.2 What wide-angle lenses are recommended?

As the FZ1 caters mostly to the long reach crowd, there are not many wide-angle lens recommendations. However, the following got positive comments:

- The Olympus WCON-07 0.7X wide conversion lens.
- The Olympus WCON-08E 0.8X wide conversion lens (a.k.a WCON-08) and the equivalent B-28.
- The Sony VCL-HGD0758 0.7X wide-angle conversion lens.
  A much bigger and heavier lens than the Olympus ones. Requires a step-down from 58mm.
- Raynox has several wide-angle converters: DCR-720 (0.72X, 52mm, samples), DCR-770 (0.77X, 52mm), DCR-6600PRO (0.66X, 52mm) and HD-7000PRO (0.7X, 58mm).

For comparisons of different wide-angle converters, see the following:
- A G3-oriented comparison on Lensmate,
- An FZ1-oriented comparison on Overseas Cruise Maniacs (translations by Excite Japan, Babelfish and WorldLingo),
- Ching-Kuang Shene's FZ-10 oriented post and comparison,
- Kazutoku's converter lens comparison (translations by Excite Japan, Babelfish and WorldLingo).

6.3.3 What close-up and macro lenses are recommended?

Multi-element achromatic lenses are preferred. See this post by Fred Moore for comparison of single-element and multi-element lenses.

The following close-up lenses got positive comments:

- The Olympus B-Macro (a.k.a MCON-40).
  A 2-element, +2.5 dioptre macro lens with a 55mm thread.
- The Olympus MCON-35.
  A 2-element, +3 dioptre multi-coated macro lens. Requires a step-up to 62mm.
- The Nikon 4T (52mm thread) and 6T (62mm thread).
  Good, inexpensive, 2-element, +2.9 dioptre lenses. Some samples here and here.
- The Raynox DCR-150 (+4.8 dioptre) and DCR-250 (+8 dioptre).
  3-element lenses with a 43mm thread (universal adapter included). Also available together as the CM-2000 Macro Explorer set. Will cause vignetting at zoom settings below 4X. See samples.

For samples and comparisons of various close-up lenses, see the following:
- A comparison between the Nikon 6T and the Sigma macro lens by David de SAINT MICHEL,
- Ching-Kuang Shene's post comparing a Nikon 6T to a single-element lens.

Also see Bob Johnson's Close-Up Diopters page and Greg Erker's list of Achromatic Close-up Lenses.

6.4 Memory cards

6.4.1 What memory cards should I get?

While the FZ1 will accept the older MMC cards, you should stick to Secure Digital, which are faster and available in higher capacities.

The 256MB, 512MB and 1GB SD cards from Panasonic, SimpleTech and Kingmax are consistently recommended for their high speed and excellent reliability.

6.4.2 Which card is faster?

Currently, the "fast" SD cards use a 4-bit parallel interface at 25MHz and claim transfer rates up to 10MB/sec. New cards by Panasonic and Sandisk claim 20MB/sec. speeds but this speed can only be achieved with equipment that supports it.

The actual performance may differ and is influenced by the device the card is inserted in and by access characteristics. With the FZ1, the difference between the fast and slow cards will manifest in the recovery time after a burst and will also be felt when using a high-speed card reader.

Panasonic tech support provided a chart that compares the speed of the FZ10 and the FZ20 using Panasonic SD cards. The FZ1 should be the same speed as the FZ10.

There are several benchmarks and comparisons of memory cards (including SD) by Hans-Jürgen Reggel, Rob Galbraith, Pocket PC thoughts, Digit-Life, Pocket PC Thoughts and iXBT (translation by PROMT).

6.4.3 Can I use the SD card in equipment that accepts Compact Flash?

Not natively, as the format is different, but you can get an SD to CF adapter.

If you plan on using the adapter in another digital camera, make sure that you get one that fully encloses the SD card, such as the Panasonic BN-CSDABP3 (machine translations by Excite Japan, Babelfish and WorldLingo) or the Minolta DiMage SD-CF1.

6.5 Batteries

6.5.1 What batteries should I get?

The FZ1, FZ2 and FZ10 use the same 7.2v, 680mAh, Lithium-Ion battery pack. The Panasonic battery pack part numbers are CGA-S002A or, in Japan, DMW-BM7. Their charge time is close to 90 minutes and they are good for about 200 shots.

Unfortunately, there are some counterfeit batteries floating around. They look very similar (sometimes identical) to the original Panasonic batteries but have sub-par performance. Telltale signals are: Bluish colour, shorter than usual charge time, bad fit in the camera or the charger, etc. More information by 10kzoomfz, Burl1201 and xuen2001.

Some (but not all) generic batteries perform as well as, or even better than, Panasonic's. Several people reported good experience with batteries from Eagle Imports (also try their ebay store or PowerGears site). Here's a quote from a post by their representative Zach:

> *Our ebay items on eagleimportsintl, dnal, eagleimportsales, powergears, and portapowerusa can also be found on our website if anyone needs to buy direct. We have a 1-year warranty on all our new batteries.*

Eagle imports also sell a wall/car charger.

Another alternative are the Power2000 ACD-225 batteries available from Battery Barn and B&H. They are advertised as 800mAh and, according to reports, last about 20 minutes longer (although they are more expensive).

The DB-S002 battery by CTA (sold here) also claims to be 800mAh. No reports on it though.

For battery care and handling, see §7.2.3 below.

6.5.2 What about external battery packs?

You can connect and external power source to the "DC in" socket of the FZ1. The manual says that the FZ1 uses a DC 8.4v power source but in practice, battery packs that supply 7.2v will work OK.

Several good external battery packs are:

- The Digipower DPS-9000. See review on Imaging Resource and images by "10kzoomfz".
- The MAHA PowerBank Li-Ion Battery Pack MH-DPB140LI (1400mAh) and MH-DPB220LI (2200mAh). See reviews on Imaging Resource and Steve's Digicams.

It is also possible to build an external power supply for the FZ1 by serially connecting 6 AA batteries. A set of 7 batteries will also work within the specifications (the voltage of a NiMH AA battery is 1.2v).

Here is a quote from "slowhands":

> *I have lots of AA NiMH batteries (1800-2300 mAh) so I bought 2 Radio Shack quad AA battery holders (270-383), 2 9v battery tails (comes in a 3 pack), a 6' cord and the appropriate Adapter Plug 4.7mm OD, 1.7mm ID (273-1706), wired it up.*
>
> *I use 7 AA NiMH batteries to get the right voltage, and simply plugged a fake battery in the 8th slot (OK, it's a short segment of cardboard tube off a coat hanger, with aluminium foil core to make the connections).*
>
> *I slide the battery pack in a belt pouch (old camera case) and run the cord to the FZ10 input. Works GREAT and utilizes my existing rechargeable AA's. My belt pouch holds both my FZ10 battery kit plus a kit for my flash.*
>
> *If you don't have spare rechargeable AA's, you can also consider rechargeable R/C battery packs (also from Radio Shack).*

Note: The FZ1 will not go into sleep mode while getting power from an external power source.

Note: The FZ1 will not use the internal battery while getting power from an external power source.

6.6 Flashes

6.6.1 Can I use an external flash with the FZ1?

You can use a slave flash. Some recommended units are the Vivitar DF200 and the Phoenix D91-BZS or D92-BZS. Other, cheaper units are the Sunpak (018ST, DS-20 and Remote lite II) and the Nissin Digislave.

6.6.2 Can I use a regular external flash with the FZ1?

You can use a slave trigger unit that attaches to an external flash such as a Vivitar SL2, Wein (also here) PND "digital peanut" or a HAMA HA6967. You can even build one yourself.

Make sure that the flash or trigger is designed to work with digital cameras; otherwise it may not recognize the pre-flash and fire too early. The FZ1 actually fires off a low power pre-flash (for exposure calculation) prior to the main discharge. If the slave fires on the pre-flash, the excess light may cause the camera to close down and produce very dark images.

6.6.3 How do I attach the flash the FZ1?

As the FZ1 has no external flash attachment, you would have to either use the flash with a flash bracket or position it separately.

An interesting alternative is the Sunpak's Digital Compact Flash Adapter (about US$30). It is a bracket with a built-in slave unit that will fire almost any standard shoe-mount flash when the camera's on-board flash pops. With five firing modes, you can vary the delay to work with your camera's sync timing and/or built-in pre-flashes.

Michael Meissner wrote:

> *The simplest flash brackets just hold the flash, and you can get them starting at $10 or so.*
>
> *More expensive brackets will allow you to position the flash so that it is always above the lens, no matter whether you have the camera in landscape or portrait orientation. Having the flash come from above mimics the sun, and also many of the shadows will fall straight behind the subject where they may not be seen (if you use a flash on the hot-shoe and shot in portrait mode, all of the shadows will be on the side opposite the flash). The bracket can either flip the flash between the two positions, or rotate the camera. If you are going to mount the bracket on a tripod, you want the rotate the camera type of bracket.*
>
> *Another thing the more expensive brackets can do is raise the flash up much higher which gives you more range to shoot subjects before red-eye becomes noticeable.*
>
> *My Stroboflip is a rather compact bracket, which allows me to keep it on the camera at all times (including in the camera bag), and just attach the flash head as needed. However, because it puts the flash only 9" or so above the flash, I have to be careful if I'm not using bounce flash to keep subjects 9' or closer. My new Pro-RL can raise the flash 18" away from the lens. One feature of both of these brackets that I didn't appreciate until using it, is they sit on a table top without tipping over, which allows me to put the rig down if I need to take a break or use both hands. Another useful thing about them is they are made out of metal – I have had the flash shoe part come apart in two of my earlier brackets, and another one starting having cracks in the plastic after some heavy use.*

6.7 Miscellaneous

6.7.1 What carrying cases fit the FZ1?

For carrying the camera without adapters and/or converters, some small bags that fit snugly are the Lowepro D-Res 25AW and the Tamrac 5693.

There are other, larger bags that can hold the camera with accessories by Lowepro (D-Res 30AW, D-Res 200 AW, D-Res 220 AW, Nova Micro AW, Edit 120, Rezo TLZ 10, SlipLock Pouch 50 AW and others), M-Rock (Appalachian), Tamrac (5694, 5696 and others) and Olympus.

Chris Pilot also posted some recommendations.

6.7.2 Are there more compact alternatives to a tripod or monopod?

When a tripod (and even a monopod) is impractical, there are several other options for stabilizing the camera.

One alternative is to use a beanbag. They are inexpensive and you can even make your own by filling a bag with polystyrene beads, rice or even sand. To use it, make a hollow in the bag with your arm and to nestle the camera in it. The disadvantage of the beanbag is that it does not offer the height of the tripod and has to rest on something.

Another alternative is to attach a length of rope to a 1/4-20 thread eye bolt (1/4 inch diameter with 20 threads per inch), screw the bolt into the tripod mound, drop the rope to the ground, step on it, and then exert a slight upward pressure on the camera body. See description with pictures of the string tripod by Wim Wiskerke.

These and other ideas are summarized in the "thoughts on camera supports" post by Peter Madeley.

6.7.3 Any suggestions for an AF assist?

While the FZ1 does not have a built-in AF assist light, an "aftermarket" one can be used.

You can shine a laser pointer on the subject. Make sure to use one with a pattern (or "hologram") instead of just a dot.
Warning: Class 2 and 3A (or above) laser pointers can cause damage to the eyes. Exercise caution!

You can also use a small flashlight to illuminate the subject. Several people recommended the Solitaire Maglight, the V1 Power Lenser or the Princeton Tec Pulsar II. There are reports that infrared illumination may also work.

7 Care and handling

7.1 Photographing in unusual conditions

7.1.1 Is there a problem shooting in very cold weather?

The FZ1 users' manual suggests an operating temperature between 0°C and 40°C. However, this is not a hard limit (quoting a post by a Panasonic engineer: "The temperature we advertise is that at which we do testing. Using the camera within that range will not cause any performance degradation.")

While the camera should work in lower temperatures, the Li-Ion battery will not operate at full efficiency (and may even cease working at all). Carrying an extra battery in an inner pocket and switching between them once in a while will help. Also consider using an external battery pack.

Another problem is condensation forming on an in the camera when coming from a cold environment into a warm and humid one. The best advice seems to be to place the cold camera into a sealed plastic bag before coming in and to let it warm up to room temperature before opening the bag. Also see this post from Staci.

7.1.2 What about very hot weather?

When operating in very hot conditions, the CCD noise will increase. Keeping the camera shielded from exposure to heat sources (such as strong direct sunlight) may help. Also note that the silver body absorbs less heat than the black one.

7.2 Maintenance

7.2.1 How do I protect the LCD from scratches and smears?

You can get a pack of self-adhesive laminating sheets (Avery brand is reported to be suitable), cut them to size, place one over the LCD and replace when needed. Alternatively, a pack of LCD protectors (a.k.a PDA covers) will work but these can give a slightly artifactual crystalline look to the screen.

7.2.2 How do I clean the LCD?

Most people have found that a typical microfiber cleaning cloth is the best solution; others use a piece of eyeglasses wiper (available in local optical stores).

7.2.3 What about battery maintenance?

Li-Ion batteries have a lifetime of 2-3 years whether the battery is used or not. They provide 300-500 discharge/charge cycles and do not suffer from a "memory effect". Li-Ion batteries prefer partial rather than full discharges.

When storing the battery, keep it at about 40% charge level in a cool place (15ºC recommended). Prolonged storage is not recommended, as irreversible capacity loss will occur after 6-12 months.

The above was taken from An overview of laptop battery technology and How to prolong lithium-based batteries articles. For more information about rechargeable batteries see Battery University and Batteries in a Portable World by Isidor Buchmann. Also see §6.5 above.

8 External resources

8.1 Auxiliary software

8.1.1 What EXIF viewer should I use?

The excellent freeware Exif-Viewer by Ralph Bibinger understands Panasonic makernotes (vendor-specific EXIF fields).

8.1.2 How can I work with the FZ1's movie clips?

You can edit the clips with QuickTime Pro.

Several tools to convert the clips to other formats are mentioned here.
I had good experience converting the clips to MPEG format using TMPGenc with the QTreader plugin.

8.1.3 How do I crop or enlarge my photos?

Check the Digital Photo Interpolation Review or Tom Arah's Sample The Best - Image Resampling for a comparison of interpolation tools.

8.1.4 Are there any FZ1 specific post-processing helper files?

There are several noise profiles for the original FZ1 and the FZ1v2 to be used with Neat Image.

Bernard Rome and Serge Gagnon created an FZ-series specific action file for Adobe Photoshop (version 6 or above) that can sharpen images, clean noise, lighten shadows, set colour balance and enhance colours.

8.2 Helpful sites

8.2.1 Where do I get other digital photography related information and tutorials?

For general digital photography questions, check Chris Friesen's rec.photo.digital FAQ and Ronald Parr's Digital Photography FAQ. Both are slightly dated but still relevant.

For more in-depth discussions, tutorials and techniques check the comprehensive lists of links and resources on Digital Outback Photo and Northlight Images.

Other recommended sites that not mentioned on the pages above include Petteri's Photo Lessons and Photoxels.

8.2.2 How can I share my pictures and clips?

There are several good photo album-sharing sites and some of them are free.

Sony's Imagestation allows sharing movie clips as well as photos but only in MPEG format (also see next question).

Links to other photo gallery sites can be found here.