



Guideline of the Camera & Imaging Products Association

CIPA DCG-001-Translation-2005

“Guideline for Noting Digital Camera Specifications in Catalogs”

Revised Version

**This translation has been made based on the original Guideline (CIPA DCG-001).
In the event of any doubts arising as the contents, the original Guideline is to be the final authority.**

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Standardization Committee

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The JCIA GLA03 guideline was established on March 12, 1998, by Japan Camera Industry Association (JCIA) and has been revised twice since then. The JCIA GLA03 guideline was accepted as is even after Camera & Imaging Products Association (CIPA), an LLC (Limited Liability Company), was established, and has been observed not only by the members of the association but also widely in the world. However, due to the subsequent advancement of technologies, some of the descriptions no longer match the current state-of-the-art, and the guide is thus revised this time.

The revised edition is issued here as CIPA guideline *DCG-001-2005*.

Note that the revised item of JCIA GLA03 is “Number of Effective Pixels” in 5. (1) (1-a).

Guideline for Noting Digital Camera Specifications in Catalogs

1. Foreword

In 1996, a request for unifying the rules for reporting Digital Still Camera (DSC) specifications in catalogs was submitted to the JCIA Digital Camera Study Group, which is now the JCIA Digital Camera Committee. This request was discussed in a Technical Committee in the Study Group, which approved without objection the development of a guideline for the common description of DSC specifications.

After two years of work by the committee, "Guideline for Noting Digital Camera Specifications in Catalogs" was published on March 12, 1998.

Since that time, because of technical innovations and variations in the designs of DSCs, several problems appeared which were not properly addressed in this Guideline, and the Guideline became inadequate for the original purposes.

The new edition of the Guideline addresses these problems.

2. Scope

The purpose of this guideline is to provide uniform information about DSCs from DSC suppliers. Standardization of the rules for representing specifications noted in catalogs or other printed matter will provide accurate knowledge of the products to customers, and help them when they choose, purchase, or use DSCs.

3. Rules for implementation

To realize this scope, each DSC supplier should observe the following rules with sincere effort.

- a) When an item that is described in this guideline is noted in any matter which can easily be noticed by customers, such as catalogs, printed matter which provides specifications of the product, or software, these matters should comply with this guideline.
- b) The revised portions of this Guideline shall be used for products that will be on the market after September 1st, 2001. Even though transitional applications are permitted if there is a reasonable cause, complete adherence to this guideline is required for all new products which are to be launched after January 1st, 2002.
- c) Even though all responsibility, relative to the items mentioned here being used on printed matter or software, is left to the describer's discretion, based on the policy of the describer's organization, any description which might cause customer misunderstanding concerning the excellence of the product, or prevent fair competition by attracting customers, shall be prohibited.

4. Coverage

This Guideline should be used for digital still cameras as defined below.

This Guideline should also be used for a product that is represented as being similar to a digital still camera and might otherwise confuse customers.

<Definition of digital still camera>

A camera which includes a lens and an image sensor, and which records captured still pictures into an internal or a removable digital recording media as its primary function.

Note: The term "Digital Camera" as used herein has the same meaning as the term "Digital Still Camera" until the terminology used by customers as well as industries is unified.

This Guideline is primarily intended for the notation on catalogs and other printed matter that describes the specifications of the product, or on software products. However, it is strongly recommended that notations on the product, representations in advertising, and presentations for marketing promotions also observe this Guideline.

5. Items to be noted in catalogs

Rules to follow in catalog descriptions are defined below for each item.

(1) Number of pixels

Due to technical innovations and the variety of DSCs, the 1998 Guideline, which required DSC vendors to note the specifications of image sensors on printed matter and related software for DSCs, now does not always seem to be realistic.

Therefore, this revised Guideline includes rules to indicate the number of pixels in a way that customers can understand the notations correctly and quickly, as instructed below;

- i) "Number of Effective Pixels" should be listed using the highest priority notation when the image capture performance is described.
- ii) Therefore, in cases where the number of pixels other than the "Number of Effective Pixels" is listed, such as the "Number of Total Pixels" or the "Number of Recorded pixels", DSC vendors should give careful consideration to ensure that these are not confused with the "Number of Effective Pixels".
- iii) In cases where the number of pixels other than "Number of Effective Pixels" are noted along with the "Number of Effective Pixels", the "Number of Effective Pixels" should be noted with the highest priority.

(1-a) “Number of Effective Pixels”

The number of pixels on the image sensor which receive input light through the optical lens, and which are effectively reflected in the final output data of the still image. The Number of Ring Pixels can be included in the “Number of Effective Pixels” as a specification of the DSC.

Ring Pixel: The effective minimum number of pixels surrounding the image area required for the filtering process.

Image Area: The surface area of an image sensor which reflects the focal plane area represented by the output image.

Rules for notation

a) The “Number of Effective Pixels” defined in this Guideline shall be used whenever DSC specifications are presented. The “Number of Effective Pixels” defined in the specification of the image sensor itself thus shall not be used, because the latter has a different definition from the one defined here.

b) For DSCs that use a plurality of image sensors, the number of image sensors and the number of effective pixels corresponding to each image sensor shall be noted. The total number of sampled pixels can also be noted. If the total number of spatially sampled pixels is also noted (ring pixels can be included), the description should clearly state that the noted number is the total number of effective pixels corresponding to all of the image sensors, to avoid consumer misunderstanding.

c) For DSCs that use an image sensor (including a linear sensor) that capture an image by spatial or optical movement, the number of effective pixels of the image sensor and the number of sampling positions should be noted. If the total number of sampled pixels (ring pixels can be included) is also noted, the description should clearly state that the noted number is the total number of effective pixels, to avoid consumer misunderstanding.

d) All numerical values can be rounded off to two decimal places.

Examples of notation

a) “2 M Effective Pixels,” “Number of Effective Pixels 3,150k (or 3.2M)”

b) “Number of Effective Pixels 340k x 3”

“3 x Number of Effective Pixels 340k CCDs”

“Number of Effective Pixels 1,020k (340k x 3)”

“Number of Effective Pixels 1.0M (340k x 3)”

c) In the case of linear sensors:

“Number of Effective Pixels 1000 x 1500”

“Number of Effective Pixels 1000 x 1500 steps”

In the case of area sensors:

“Number of Effective Pixels 340k x 4”

“Number of Effective Pixels 340k x 4 steps”

Note:

- a) The “Number of Effective Pixels” including ring pixels provides a somewhat bigger value than the maximum number of recorded pixels, even for a camera having no pixel interpolation.
- b) The pixels to be used for vibration compensation when taking moving pictures shall not be included.
- c) The optical black area shall not be included.

(1 – b) “Number of Total Pixels”

Specification for the image sensor which indicates the number of total pixels on the image sensor.

Rules for notation

- a) The “Number of Total Pixels” defined in this Guideline shall only be used for explanations of the image sensor. The “Number of Effective Pixels” defined in this Guideline shall be used when specifications of the DSC are reported.
- b) Terms representing Opto-electronic conversion elements, such as “Image sensor”, “Solid state photo sensor” or “CCD”, shall be used.
- c) For DSCs that use a plurality of image sensors, the number of image sensors shall be noted. Reporting only the total number of pixels, instead of reporting the number of pixels in each image sensor, shall not be allowed.
- d) All numerical values can be rounded off to two decimal places.

Examples of notation

- a) “2 M Effective Pixels (Using Number of Total Pixels of 2.1 M CCD)”
- b) “Number of Effective Pixels $340k \times 3$ (Using $3 \times$ Number of Total Pixels of 380k CCD)”

(1 – c) “Number of Recorded Pixels”

The number of pixels comprising one picture frame which is recorded on the digital recording media.

Rules for notation

- a) The “Number of Recorded Pixels”, or other wording which has the same meaning, shall be used.

The term “Resolution” shall not be used for the number of recorded pixels

- b) The number of horizontal and vertical pixels of the brightness signal shall be reported. A notation using the order of horizontal number of pixels followed by vertical number of pixels is recommended, unless the DSC makes no distinction between horizontal and vertical image dimensions.
- c) An additional notation describing the image format, either using a symbolic description such as RGB or YCbCr, or using words such as “YC System”, “Line sequential system”, or “Color difference system”, is recommended. A notation such as “Monochrome signal”, to indicate lack of a color signal, shall be included when no color signal is recorded.
- d) Further notation of the composition ratio of the color signal, such as “4:4:4” or “4:2:2”, is recommended.
- e) Even in cases where the virtual number of pixels is increased by image processing such as interpolation, the total number of recorded pixels is regarded as the “Number of Recorded Pixels”.
- f) All of the numerical values can be rounded off to two decimal places.

Examples of notation

- a) “Number of Recorded Pixels 640×480 (RGB 4:4:4)”
- b) “Number of Recorded Pixels $1,280 \times 960$ (1.2M)”
- c) “Image format : YCbCr 4:2:2”

(1 – d) “Number of Output Pixels”

Number of pixels comprising one picture frame which is provided by the DSC through the output transmission means.

Rules for notation

- a) Wording which indicates the number of pixels provided by the DSC through the transmission means, such as the “Number of Output Pixels”, the “Number of pixels Communicated”, or the “Number of Transmitted Pixels” shall be used.
- b) The number of horizontal and vertical pixels of the brightness signal provided by the DSC shall be reported.

A notation using the order of horizontal number of pixels followed by vertical number of pixels is recommended, unless the DSC makes no distinction between horizontal and vertical image dimensions.

- c) Additional notation of the image format is recommended, but when the image format is described as part of the previously mentioned “Number of Recorded Pixels”, this additional notation can be eliminated.
- d) Further notation of the composition ratio of the color signal, such as “4:4:4” or “4:2:2”, is recommended, but when the composition ratio of color signal is described as part of the previously mentioned “Number of Recorded Pixels”, this additional notation can be eliminated.
- e) Even in cases where the virtual number of pixels is increased by image processing such as interpolation, the total number of output pixels is regarded as the “Number of Recorded Pixels”.
A notation for “Compression” shall be included in cases where the total number of output pixels is decreased as a result of signal compression.
- f) All of the numerical values can be rounded off to two decimal places.

Examples of notation

- a) “Number of Output Pixels 640×480 (RGB 4:4:4)”
- b) “Number of Transmitted Pixels $1,280 \times 960$ (1.2M)”

Note : “Number of Output Pixels” should be distinguished from “Number of Recorded Pixels”

(2) Other notations

(2 – a) “Image File Size”

Amount of information that comprises one image frame stored in the digital storage media.

Rules for notation

- a) “Image File Size”, or similar wording which has the same meaning, should be used.
- b) The amount of data comprising one image frame, including any additional data such as the image header, shall be noted in Bytes (B).
- c) The notation “File” or “Frame”, which indicates “One Image Frame”, shall be used.
- d) In cases where the image file size varies among images, a notation that the file consists of images having various file sizes should be added.
Even in such cases, it is recommended that the approximate average file size for one frame image be noted.
- e) All of the numerical values can be rounded off to two decimal places.

Examples of notation

- a) “Image File Size : 40kB/frame”
- b) “Image File Size Approx. 30-60 kB (Variable file size)”

(2 – b) “Recorded File Format”

The image file format and directory structure used for recording the image on the digital storage media.

Rules for Notation

- a) “Recorded File Format”, or similar wording which has the same meaning, should be used.
- b) In cases where a standard format such as DCF is used, it is recommended that the name of the format along with its version number be provided.
- c) In cases where an original file format is used, the recommended notation is “Original file format”.
- d) For a DSC that arranges the stored image data into a file format in an output stage, wording such as “Output Image File Format”, to distinguish from the “Recorded File Format”, should be used.

Examples of notation

- a) “Recorded File Format : conformed to DCF (Design rule for Camera File System) 1.0”
- b) “Recorded File Format (Non-compressed) : TIFF”
- c) “Recorded Image System : conformed to JPEG (Exif Ver. 2.1)”

(2 – c) “Conversion of focal length of DSC lens into 35mm camera equivalent”

The focal length of a DSC lens converted into that of 35mm camera lens which has the same input field angle as the DSC lens.

Rules for notation

- a) “Converted into 35mm camera” or similar wording should be noted.
- b) The value is to be calculated using the following equation;

“Converted focal length into 35mm camera”

$$= \frac{\text{Diagonal distance of image area in the 35mm camera (43.27mm)}}{\text{Diagonal distance of image area on the image sensor of the DSC}} \times \text{focal length of the lens of the DSC}$$

- c) All of the numerical values can be rounded off to two decimal places.

Example of notation

- a) “Focal Length : 7mm (Corresponds to 50mm in 35mm camera)”

(2 – d) “Image Data Compression Ratio”

The image data compression ratio provided by the image data processing.

Rules for notation

- a) “Image Data Compression Ratio” or similar wording should be used.
- b) The values indicate the ratio of the size of the compressed image data to the size of the image data that was input to the image compression process.
- c) It is recommended that the composition of the input image signal, such as RGB or YC, be noted.
- d) It is recommended that the notation use a fraction with a numerator of 1.
In this case, all numeric values can be rounded off to the left of the decimal point.
- e) In cases where a variable compression system is used, and the compression ratio varies due to the objects in the scene, a notation should be added indicating that the DSC uses a variable compression ratio.

Examples of notation

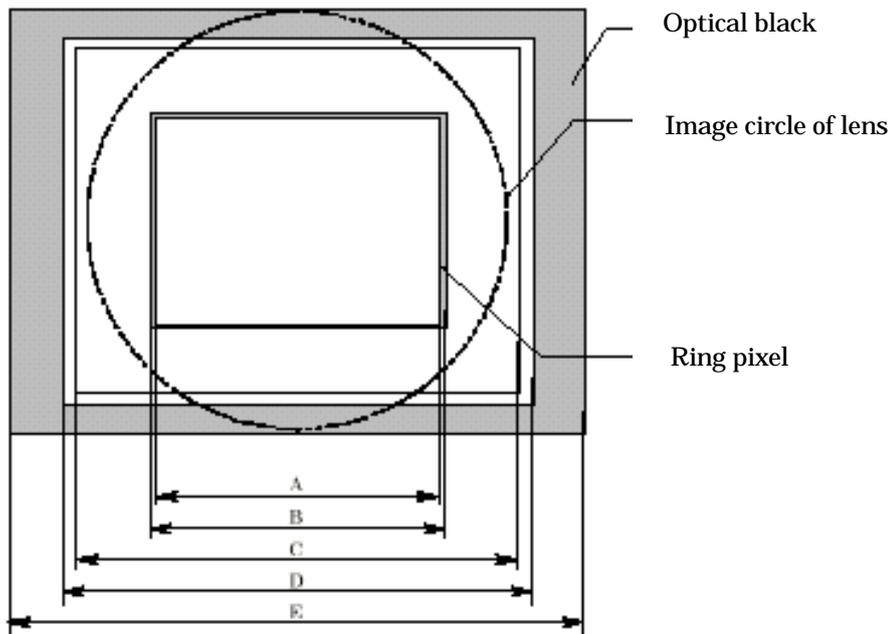
- a) “Image Data Compression Ratio : 1/10”
- b) “Image Data Compression Ratio : 1/15 (Varies with objects)”

Notes

- a) A proposal to use RGB 4:4:4 (three-color data for each pixel) for the basis of the image data compression ratio had been discussed. However, because of the unreasonable case that the compression ratio is not 1/1 when the image data is not compressed, the recommendation to use the actual size of the image data input to the image compression process was adopted.
- b) To avoid confusion in the consumer market caused by the problem mentioned in note a), either the composition of the input image data to be compressed, or the “Image File Size”, should be reported.
- c) Since a notation using the term “bit/pixel” is not easily understood by consumers, this notation is not used in this Guideline.

(Annex 1) Relationship between each pixel-related definition

The following figure shows the relationship between each pixel-related definition.



A : Number of Effective Pixels (Image area without ring pixels)

B : Number of Effective Pixels (With ring pixels)

C : Maximum Pixel available (Pixels guaranteed by opto-electric conversion element vendor)

D : Effective Pixel on image sensor

E : Number of Total Pixels

The relationship between the Number of Effective Pixels A (Without ring pixels), the Number of Recorded Pixels, and the Number of Output Pixels is as follows;

A = Number of Recorded Pixels and Number of Output Pixels (without interpolation or cropping)

A < Number of Recorded Pixels and Number of Output Pixels (with interpolation)

A > Number of Recorded Pixels and Number of Output Pixels (with cropping)

(Annex 2) Examples of notations used in catalogs

Example 1

Image sensor	System	Interlace CCD
	Size	1/1.8"
	Number of Total Pixels	2,110k
Optical Part	Number of Effective Pixels	1,970k
	Focal length of lens	F = 7mm (corresponds to 34mm in 35mm camera)
Recording Part	Number of Recorded Pixels	1,600 × 1,200 (1.9M) 1,280 × 960(1.2M)
	File Format	Conforms to DCF (Design rule for Camera File system) 1.0
	Image File Size	700kB/Frame (fine mode)
	Image Data Compression Ratio	Approx. 1/10

Example 2

Number of Effective Pixels	1,970k
Image sensor	1/1.8" CCD (Total Number of pixels 2,110k)
Focal Length of lens	F=7mm (corresponds to 34mm in 35mm camera)
Number of Recorded Pixels	1,600 × 1,200 (1.9M Pixel) 1,280 × 960 (1.2M Pixel)
File Format	Conforms to DCF (Design rule for Camera File System) 1.0
Image File Size	700kB/Frame (fine mode)
Image Data Compression Ratio	Approx. 1/10

Submitted by Digital Camera Committee
 Drafted by Editing Group, Digital Camera Committee

Developed by Digital Camera Committee

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JCII BLDG., 25, Ichiban-cho, Chiyoda-ku, Tokyo, 102-0082 Japan
TEL +81-3-5276-3891 FAX +81-3-5276-3893

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