



Standard of Japan Electronics and Information Technology Industries Association

*JEITA CP-3461B*

**Design rule for Camera File system:  
DCF Unified Version 2.0**

Established in September, 2003

Revised in April, 2010

Prepared by:

AV&IT Standardization Committee

Published by:

Japan Electronics and Information Technology Industries Association

Japan Electronics and Information Technology Industries Association (JEITA) and Camera & Imaging Products Association (CIPA) jointly formulated this standard.

The following standards are technically equivalent.

JEITA:

CP-3461B Design rule for Camera File system: DCF Version 2.0 (Edition 2010)

CIPA:

DC-009-2010 Design rule for Camera File system: DCF Version 2.0 (Edition 2010)



**JEITA**

THIS DOCUMENT IS PROVIDED ON AN “AS IS” BASIS WITHOUT WARRANTY OF ANY KIND, EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NONINFRINGEMENT.

IN NO EVENT SHALL EITHER JEITA, JEITA’S MEMBERS, THEIR SUBSIDIARIES OR THEIR AFFILIATES BE LIABLE FOR ANY DAMAGES WHATSOEVER (INCLUDING WITHOUT LIMITATION, LOSS OF BUSINESS PROFITS, LOSS OF BUSINESS INFORMATION, LOSS OF BUSINESS INTERRUPTION OR OTHER COMPENSATORY, INCIDENTAL OR CONSEQUENTIAL DAMAGES) ARISING OUT OF THIS DOCUMENT OR THE USE THEREOF EVEN IF JEITA, JEITA’S MEMBERS, THEIR SUBSIDIARIES OR THEIR AFFILIATES HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

JEITA, JEITA’S MEMBERS, THEIR SUBSIDIARIES OR THEIR AFFILIATES DISCLAIMS AND SHALL HAVE NO OBLIGATION OF DEFENSE, CONTRIBUTION OR INDEMNIFICATION WITH RESPECT TO ANY ACTUAL OR ALLEGED INTELLECTUAL PROPERTY INFRINGEMENT ARISING OUT OF THIS DOCUMENT OR THE USE THEREOF.

# Contents

Introduction .....	1
Revision History .....	1
1. Scope .....	2
2. Definitions .....	2
2.1. Definition of Terms .....	2
2.2. Verbal forms for the expression of provisions .....	7
2.3. Definition of characters used in directory and file names .....	8
3. Overview .....	9
3.1. DCF and recording media .....	9
3.2. Configuration of DCF specification .....	9
3.3. Approach to playback compatibility .....	9
3.4. Classification of functions .....	10
3.5. Categories of DCF-compatible equipment .....	11
3.6. Workflow for editing an image with application software .....	12
3.6.1 Actions .....	13
4. DCF Media Standard .....	14
4.1. Large-capacity memory media .....	14
4.1.1 File system .....	14
4.2. Directory definition .....	14
4.2.1 DCF image root directory .....	14
4.2.2 DCF directories .....	14
4.2.3 Other directories .....	15
4.2.4 Directory example .....	15
4.3. File definition .....	15
4.3.1 DCF file names .....	15
4.3.2 DCF objects .....	16
4.3.2.1 Purpose of DCF objects .....	16
4.3.2.2 Object definition .....	16
4.3.2.3 Files included in objects .....	16
4.3.2.4 Object file attributes .....	17
4.3.2.5 Object operation .....	17
4.4. DCF basic files .....	17
4.4.1 Purpose .....	17
4.4.2 Directory, file names and extensions .....	17
4.4.3 Images in a DCF basic file .....	17
4.4.4 Data structure of a DCF basic main image .....	18
4.4.4.1 Data structure .....	18
4.4.4.2 Data compression .....	18
4.4.4.3 Pixel count .....	18
4.4.4.4 Image aspect ratio .....	18
4.4.5 Attribute information .....	18
4.4.5.1 Exif tag structure .....	18
4.4.5.2 Information about shooting conditions and camera .....	18
4.4.5.3 DCF basic file identifying information .....	19
4.4.5.4 Color space .....	20
4.4.6 DCF basic thumbnail data structure .....	20
4.4.6.1 Image data format .....	20
4.4.6.2 Compressed data .....	20
4.4.6.3 Number of pixels .....	21
4.4.6.4 Layout .....	21
4.4.7 Image data format in DCF basic files .....	22
4.5. DCF optional files .....	22
4.5.1 Purpose .....	22

- 4.5.2 Directory, file names and extensions..... 22
- 4.5.3 Data structure of a DCF optional file main image ..... 22
  - 4.5.3.1 Data structure..... 22
  - 4.5.3.2 Data compression ..... 22
  - 4.5.3.3 Pixel count..... 22
  - 4.5.3.4 Image aspect ratio..... 22
- 4.5.4 Attribute information ..... 23
  - 4.5.4.1 Exif tag structure ..... 23
  - 4.5.4.2 Image-related information ..... 23
  - 4.5.4.3 DCF optional file identifying information ..... 23
  - 4.5.4.4 Color space ..... 24
- 4.5.5 DCF optional file thumbnail data structure ..... 26
  - 4.5.5.1 Image data format..... 26
  - 4.5.5.2 Compressed data..... 26
  - 4.5.5.3 Number of pixels ..... 26
  - 4.5.5.4 Layout ..... 26
- 4.5.6 Image data format in DCF optional files ..... 27
- 4.6. DCF thumbnail files ..... 27
  - 4.6.1 Purpose ..... 27
  - 4.6.2 Directory, file name and extension ..... 27
  - 4.6.3 Image data structure ..... 27
    - 4.6.3.1 Data format ..... 27
    - 4.6.3.2 Compressed data specification..... 28
    - 4.6.3.3 Pixel count..... 28
    - 4.6.3.4 Image aspect ratio..... 28
  - 4.6.4 Attribute information ..... 28
    - 4.6.4.1 Exif tag structure ..... 28
    - 4.6.4.2 Image-related information ..... 29
    - 4.6.4.3 DCF thumbnail identification information ..... 29
    - 4.6.4.4 Color space ..... 30
  - 4.6.5 DCF thumbnail file data structure..... 30
- 4.7. Tag requirement levels ..... 31
- 4.8. File structure example ..... 32
- 5. Writer Specification ..... 33
  - 5.1. Directories ..... 33
    - 5.1.1 Creating directories ..... 33
      - 5.1.1.1 DCF image root directory..... 33
      - 5.1.1.2 DCF directories ..... 33
      - 5.1.1.3 Other directories..... 33
    - 5.1.2 Deleting directories..... 33
  - 5.2. Files ..... 33
    - 5.2.1 Creating files..... 33
      - 5.2.1.1 Image files..... 33
      - 5.2.1.2 DCF thumbnail files..... 33
      - 5.2.1.3 Other files making up a DCF object ..... 34
      - 5.2.1.4 Files without a DCF file name ..... 34
    - 5.2.2 File number..... 34
    - 5.2.3 Deleting files ..... 34
      - 5.2.3.1 DCF objects ..... 34
      - 5.2.3.2 Files that are not DCF objects ..... 35
- 6. Reader Specification..... 35
  - 6.1. Directories (common to Reader 1 and 2)..... 35
    - 6.1.1 Playback..... 35
      - 6.1.1.1 Playback scope..... 35
      - 6.1.1.2 Playback method..... 35
    - 6.1.2 Deletion ..... 35

6.2. Files ..... 35

6.2.1 Playback ..... 35

6.2.1.1 Reader 1 playback scope ..... 35

6.2.1.2 Reader 2 playback scope ..... 36

6.2.1.3 DCF extended image files (common to Reader 1 and 2) ..... 36

6.2.1.4 Supported pixel count specification ..... 36

6.2.2 Playback method (common to Reader 1 and 2)..... 36

6.2.3 DCF optional files and color space transformation ..... 37

6.2.4 Handling of color-related tags (common to Reader 1 and 2) ..... 37

6.2.5 Deletion (common to Reader 1 and 2) ..... 37

6.2.5.1 DCF objects ..... 37

6.2.5.2 Files that are not DCF objects ..... 38

6.3. Directory number and file number display (common to Reader 1 and 2) ..... 38

7. Other Points to Note ..... 39

7.1. Naming directories under the DCF image root directory..... 39

7.1.1 When lower-case letters are used in a directory name ..... 40

7.1.2 When directory numbers are duplicated across DCF directories..... 40

7.1.3 Handling of directories that are not DCF directories ..... 40

7.2. Naming of files in a DCF directory ..... 41

7.2.1 When lower-case letters are used in the file name ..... 41

7.2.2 When file numbers are duplicated across DCF basic files or DCF optional files..... 41

7.2.3 Handling of files without DCF file names ..... 41

7.3. Updating of tag data when saving ..... 42

7.3.1 Handling of date and time tags..... 42

7.3.2 Handling of Make, Model, and Software tags ..... 42

7.4. DCF object bulk operations..... 42

7.5. Identification of DCF optional files..... 43

8. References..... 44

Annex A Data Verification..... 45

Annex B Relation to JPEG and Exif Standards ..... 46

Annex C Notes on Image File Playback ..... 48

Annex D Limits on DCF Object Operations ..... 49

Annex E Notes on DCF Optional Color Space Use ..... 50

## Introduction

This document is a standard that edits and recompiles the “Design Rule for Camera File System DCF Unified Version” (JEITA CP-3461A + CIPA DC-009-2009) (hereinafter called “the DCF Standard Unified Version 2.0”) that was defined by JEITA and CIPA in ways that included incorporating the necessary portion of Annex F “Guidelines for Handling Exif/DCF” into the main text. Additionally, expressions that resulted in ambiguous interpretation were clarified and errors were corrected. In addition, specifications concerning FAT, application for devices with embedded memory, and 4. “DCF Media” were revised in order to respond to greater file capacity.

## Revision History

Rev.	Date	Comment
1.0	October 1998	Published First Edition 1.0 <ul style="list-style-type: none"> <li>● Established file rules and file storage rules</li> <li>● Established designation of sRGB</li> <li>● Established thumbnail specifications</li> </ul>
2.0	September 2003	Published Revision 2.0 <ul style="list-style-type: none"> <li>● Added DCF optional files (extended color space)</li> <li>● Corrected misprints and omissions throughout the text</li> </ul>
Unified Version 2.0	June 2009	Published Unified Version 2.0 <ul style="list-style-type: none"> <li>● Added CIPA-issued “Guidelines for Handling Exif/DCF” (CIPA DCG-004-2009) as Annex 6</li> <li>● Added explication of 2.0 as Annex 7</li> <li>● Corrected misprints and omissions throughout the text</li> </ul>
2.0 (Edition 2010)	April 2010	Published Revision 2.0 (Edition 2010) <ul style="list-style-type: none"> <li>● Restructured the main standard text, guidelines, explications, etc., of DCF Unified Version 2.0</li> <li>● Clarified specification levels and revised the scope of application</li> <li>● Revised items pertaining to file system</li> <li>● Corrected misprints and omissions for the entire text</li> </ul>

# 1. Scope

This standard specifies the file system to be used when handling image files and sound files that are prepared using a format that is in accordance with the Exif Standard with DCF media that were formatted by an FAT file system (FAT12, FAT16, FAT32, exFAT,) etc., that can guarantee their interoperability as media.

The standard applies to devices, recording media, and application software that handle image files and sound files when such files are handled as Exif/DCF files.

As devices mentioned above, the applicable items are devices with functions such as capturing, recording, displaying, editing, and printing of images.

Specifically, examples of capture/recording devices include DSC, DVC, and camera phones, etc. Examples of display/playback devices include image display devices such as DVT, digital photo frames, and car navigation systems. In addition, image storage devices include image storers and home servers. Image printing devices include printers.

As application software mentioned above, the applicable items are application software providing functions for editing, displaying, and recording metadata as well as importing and editing images.

# 2. Definitions

## 2.1. Definition of Terms

DCF	The standard specified in this document
Exif Standard	“Digital Still Camera Image File Format Standard (Exif) of the Japan Electronics and Information Technology Industries Association (JEITA)
JPEG Standard	ISO/IEC 10918-1 ITU-T Recommendation T81 information technology – Digital compression and coding of continuous-tone still images – Requirements and guidelines
DSC	Digital still camera
DTV	Digital television
PC	Personal computer
DCF-compatible	Compliant with the DCF
DCF media	Removable memory recorded in compliance with the DCF or,