

# **Preservation Action Plan: Digital Still Image AKA Raster Images National Archives and Records Administration (NARA)**

DRAFT 20190801

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## **Electronic Record or Digital Surrogate Types and Associated Formats**

Digital still images are digitally encoded representation of the tonal and brightness information of a subject into a bitmap. Data from digital cameras and scanning devices record light characteristics as numerical values into a grid or raster of picture elements (pixels). The term raster data is often contrasted with vector data, in which geometrical points, lines, curves, and shapes are based upon mathematical equations, thus creating an image without specific mapping of data to pixel. Bit-depth, spatial resolution, and color encoding, for example, are all important characteristics of still images.

There are two types of raster file digital image record types: Digital still photographs of natural, real-world scenes or subjects produced by digital cameras, and scanned images of textual documents, illustrations, posters, graphics, cartographic records, photographic prints, slides, and negatives. Image file formats are standardized means of organizing and storing rasterized data that can be used on a computer display or printer. Out of the hundreds of raster image file formats the most common types: JPEG/JFIF, TIFF, PNG, GIF, and JPEG2000 are listed in NARA Bulletin 2014-04 below.

<https://www.archives.gov/records-mgmt/policy/transfer-guidance-tables.html#digitalphotographs>

## **Essential Characteristics of this Record Type**

To render an authentic digital photograph one must preserve the structural, technical, and descriptive metadata that allow certain appearance characteristics to persist. Many of the characteristics native to raster image file formats are the result of industry efforts to develop common standards and interoperability. Many file formats for Digital Photography and scanning are the same except that most digital cameras create native camera raw proprietary formats, JPEG and DNG and rarely TIFF, JPEG2000, PNG, or GIF.

Appearance is a critical characteristic for this record type due to the common purpose or use of this type of record is to depict scenic information or to render the informational and artifactual aspects of a scanned original. Tone fidelity, resolution, bit depth, color encoding as well as compression algorithms all contribute to the preservation of the file. There is widespread adoption of most formats and rendering and display platforms. A unique characteristic for

scanned multi-page documents is descriptive and administrative metadata that may be held external to the electronic record and could be a risk for long term identification of the context.

### Appearance

Name	Definition	Function Description
Size	determined by bit-depth, spatial resolution, compression, and color encoding	
Color	color mode, color space	mathematical representations of color information needed to encode and decode color information such as Hue, Chroma, lightness, white point
Bit-depth	the number of bits used to indicate color and tone information of a pixel	High or low bit depth contributes to the pleasing transformation of color accuracy, gradients, and tonal information. Also greatly affects issues such as signal clipping and transformative image editing
Orientation	Portrait versus Landscape	

### Structure

Name	Definition	Function Description
Layout Structure	Embedded technical metadata captured at the time of creation describing, among other things: File format/encoding; Compression; Resolution; Bit depth; and EXIF (Exchangeable Image File Format) information	

## Behavior

Name	Definition	Function Description
Display	Image	The only essential behavior for a digital photograph is the ability to visually render it. Other functionality, such as photo enhancement or manipulation, may be available in the user's native software environment but is not inherent to the record.

## Context

Name	Definition	Function Description
Technical Metadata	This includes but is not limited to: Originator: Unique identification number assigned at creation; origination date; coding history; levels; camera type	Most standard (See acceptable and preferred below) Digital Still images Files conform to the technical metadata elements described in ANSI/NISO Z39.87 and could contain or link to: data on the digitizing process including file structural specifics, sample rate and bit depth, and other elements used by rendering software and hardware.
Descriptive Metadata	This includes but is not limited to: Unique photograph identification number; Caption/Title; creator/Photographer; Copyright	Digital still images could contain, or link to, metadata that describe any attribute that could be displayed in a photograph, such as those described in Dublin Core or International Press Telecommunications Council (IPTC) standards.

## Current NARA Transfer Guidance for this Record Type

Preferred:

- Tagged Image File Format (TIFF)

Acceptable:

- JPEG File Interchange Format (JFIF) with Joint Photographic Experts Group (JPEG) compression
- Digital Negative (DNG)
- Portable Network Graphics (PNG)
- JPEG2000 (JP2)

## Current NARA Public Access/Reference Format(s) for this Record Type

*This Plan references existing public access file formats for electronic records at NARA, determined with a survey of the available public access formats in the National Archives Catalog. These references do not represent recommended public access formats under NARA policies. They are intended for informational purposes only.*

Reference Format: JPEG

Public Access Format: JPEG, GIF, PNG, TIFF

## Comments and Notes

Tagged Image File Format (TIFF) 4, 5, & 6. TIFF Revision 6.0 Final — June 3, 1992 Adobe Systems Incorporated: (<http://partners.adobe.com/public/developer/en/tiff/TIFF6.pdf>)

JPEG File Interchange Format (JFIF) with Joint Photographic Experts Group (JPEG) compression. ISO/IEC 10918-5 Information technology – Digital Compression and coding of continuous-tone still images: JPEG Interchange File Format: ([http://www.iso.org/iso/home/store/catalogue\\_tc/catalogue\\_detail.htm?csnumber=54989](http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=54989))  
ISO/IEC 10918-1:1994 Information technology – Digital Compression and coding of continuous-tone still images: Requirements and guidelines: ([http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=18902](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=18902))

Digital Negative (DNG). Adobe Digital Negative (DNG) Specification Version 1.4.0.0: ([http://www.images.adobe.com/www.adobe.com/content/dam/Adobe/en/products/photoshop/pdfs/dng\\_spec\\_1.4.0.0.pdf](http://www.images.adobe.com/www.adobe.com/content/dam/Adobe/en/products/photoshop/pdfs/dng_spec_1.4.0.0.pdf))

Portable Network Graphics (PNG). ISO/IEC 15948:2004 Information technology -- Computer graphics and image processing -- Portable Network Graphics (PNG): Functional specification: ([http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=29581](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=29581))

Jpeg2000 (JP2). ISO/IEC 15444-1:2004 Information technology – JPEG 2000 image coding system: Core coding system: ([http://www.iso.org/iso/catalogue\\_detail.htm?csnumber=37674](http://www.iso.org/iso/catalogue_detail.htm?csnumber=37674))

[GIF 89a specification](http://www.w3.org/Graphics/GIF/spec-gif89a.txt) (<http://www.w3.org/Graphics/GIF/spec-gif89a.txt>). Reproduced at W3C site.

[www.jpeg.org](http://www.jpeg.org) (<http://www.jpeg.org/>). The Joint Photographic Experts Group Web site.

# Tagged Image File Format (TIFF)

versions 1-6

NARA Format ID: NF00419

## Extension(s):

- tif
- tiff

## Documentation

- <https://www.adobe.io/open/standards/TIFF.html>
- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000022.shtml>
- [http://www.loc.gov/preservation/digital/formats/content/tiff\\_tags.shtml](http://www.loc.gov/preservation/digital/formats/content/tiff_tags.shtml)
- <http://www.digitizationguidelines.gov/guidelines/digitize-tiff.html>
- <http://www.nationalarchives.gov.uk/PRONOM/fmt/353>
- <http://jhove.sourceforge.net/tiff-hul.html>
- <http://www.fileformat.info/format/tiff/>
- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000188.shtml>
- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000073.shtml>
- <https://tools.ietf.org/html/rfc3950>
- Murray, James D. and William vanRyper. Encyclopedia of Graphics File Formats, 2nd Edition. Sebastopol, CA: O'Reilly & Associates, 1996.

## Risk and Prioritization Analysis

Low Risk

Moderate Risk

High Risk

26 Numeric Risk Rating

26 Numeric Prioritization Rating

## Proposed Preservation Plan

Retain file format in its existing format.

Transform file to a new format.

**Selected Format:** TIFF 6.0

Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.

Procure/develop tools to transform the format to the preferred normalized form.

- Provide Additional Information** so that the record type remains understandable/usable over time.
- Explore Additional Options**

**Justification:** TIFF 6.0 is well documented and well supported. Files with the .FX, .EP, and .IT are subtypes of TIFF 6.0, but conversion to TIFF should be considered. However they may not be read by all readers or editors, and some color management may be lost.

#### **Preferred Processing and Transformation Tool(s)**

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.
- Adobe Photoshop
- GraphicsMagick
- GNU Image Manipulation Program
- darktable

#### **Preferred Viewer/Access Software**

- Adobe Photoshop
- Adobe Elements
- GraphicsMagick
- GNU Image Manipulation Program
- darktable

# Tagged Image File Format (TIFF)

## Tagged Image File Format for Electronic Photography (TIFF/EP)

NARA Format ID: NF00420

### Extension(s):

- tif
- tiff

### Documentation

- <https://www.adobe.io/open/standards/TIFF.html>
- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000022.shtml>
- [http://www.loc.gov/preservation/digital/formats/content/tiff\\_tags.shtml](http://www.loc.gov/preservation/digital/formats/content/tiff_tags.shtml)
- <http://www.digitizationguidelines.gov/guidelines/digitize-tiff.html>
- <http://www.nationalarchives.gov.uk/PRONOM/fmt/353>
- <http://jhove.sourceforge.net/tiff-hul.html>
- <http://www.fileformat.info/format/tiff/>
- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000188.shtml>
- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000073.shtml>
- <https://tools.ietf.org/html/rfc3950>
- Murray, James D. and William vanRyper. Encyclopedia of Graphics File Formats, 2nd Edition. Sebastopol, CA: O'Reilly & Associates, 1996.

### Risk and Prioritization Analysis

Low Risk

Moderate Risk

High Risk

**24 Numeric Risk Rating**

**22 Numeric Prioritization Rating**

### Proposed Preservation Plan

Retain file format in its existing format.

Transform file to a new format.

**Selected Format:** TIFF 6.0

Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.

- Procure/develop tools** to transform the format to the preferred normalized form.
- Provide Additional Information** so that the record type remains understandable/usable over time.
- Explore Additional Options**

**Justification:** TIFF 6.0 is well documented and well supported. Files with the .FX, .EP, and .IT are subtypes of TIFF 6.0, but conversion to TIFF should be considered. However they may not be read by all readers or editors, and some color management may be lost.

#### **Preferred Processing and Transformation Tool(s)**

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.
- Adobe Photoshop
- GraphicsMagick
- GNU Image Manipulation Program
- darktable

#### **Preferred Viewer/Access Software**

- Adobe Photoshop
- Adobe Elements
- GraphicsMagick
- GNU Image Manipulation Program
- darktable

# Tagged Image File Format (TIFF)

## Tagged Image File Format for Image Technology (TIFF/IT)

NARA Format ID: NF00421

### Extension(s):

- tif
- tiff

### Documentation

- <https://www.adobe.io/open/standards/TIFF.html>
- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000022.shtml>
- [http://www.loc.gov/preservation/digital/formats/content/tiff\\_tags.shtml](http://www.loc.gov/preservation/digital/formats/content/tiff_tags.shtml)
- <http://www.digitizationguidelines.gov/guidelines/digitize-tiff.html>
- <http://www.nationalarchives.gov.uk/PRONOM/fmt/353>
- <http://jhove.sourceforge.net/tiff-hul.html>
- <http://www.fileformat.info/format/tiff/>
- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000188.shtml>
- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000073.shtml>
- <https://tools.ietf.org/html/rfc3950>
- Murray, James D. and William vanRyper. Encyclopedia of Graphics File Formats, 2nd Edition. Sebastopol, CA: O'Reilly & Associates, 1996.

### Risk and Prioritization Analysis

Low Risk

Moderate Risk

High Risk

**28 Numeric Risk Rating**

**26 Numeric Prioritization Rating**

### Proposed Preservation Plan

Retain file format in its existing format.

Transform file to a new format.

**Selected Format:** TIFF 6.0

Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.

- Procure/develop tools** to transform the format to the preferred normalized form.
- Provide Additional Information** so that the record type remains understandable/usable over time.
- Explore Additional Options**

**Justification:** TIFF 6.0 is well documented and well supported. Files with the .FX, .EP, and .IT are subtypes of TIFF 6.0, but conversion to TIFF should be considered. However they may not be read by all readers or editors, and some color management may be lost.

#### **Preferred Processing and Transformation Tool(s)**

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.
- Adobe Photoshop
- GraphicsMagick
- GNU Image Manipulation Program
- darktable

#### **Preferred Viewer/Access Software**

- Adobe Photoshop
- Adobe Elements
- GraphicsMagick
- GNU Image Manipulation Program
- darktable

# Tagged Image File Format (TIFF)

## Tagged Image File Format for Internet Fax (TIFF-FX)

NARA Format ID: NF00422

### Extension(s):

- tif
- tiff

### Documentation

- <https://www.adobe.io/open/standards/TIFF.html>
- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000022.shtml>
- [http://www.loc.gov/preservation/digital/formats/content/tiff\\_tags.shtml](http://www.loc.gov/preservation/digital/formats/content/tiff_tags.shtml)
- <http://www.digitizationguidelines.gov/guidelines/digitize-tiff.html>
- <http://www.nationalarchives.gov.uk/PRONOM/fmt/353>
- <http://jhove.sourceforge.net/tiff-hul.html>
- <http://www.fileformat.info/format/tiff/>
- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000188.shtml>
- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000073.shtml>
- <https://tools.ietf.org/html/rfc3950>
- Murray, James D. and William vanRyper. Encyclopedia of Graphics File Formats, 2nd Edition. Sebastopol, CA: O'Reilly & Associates, 1996.

### Risk and Prioritization Analysis

Low Risk

Moderate Risk

High Risk

**29 Numeric Risk Rating**

**27 Numeric Prioritization Rating**

### Proposed Preservation Plan

Retain file format in its existing format.

Transform file to a new format.

**Selected Format:** TIFF 6.0

Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.

- Procure/develop tools** to transform the format to the preferred normalized form.
- Provide Additional Information** so that the record type remains understandable/usable over time.
- Explore Additional Options**

**Justification:** TIFF 6.0 is well documented and well supported. Files with the .FX, .EP, and .IT are subtypes of TIFF 6.0, but conversion to TIFF should be considered. However they may not be read by all readers or editors, and some color management may be lost.

#### **Preferred Processing and Transformation Tool(s)**

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.
- Adobe Photoshop
- GraphicsMagick
- GNU Image Manipulation Program
- darktable

#### **Preferred Viewer/Access Software**

- Adobe Photoshop
- Adobe Elements
- GraphicsMagick
- GNU Image Manipulation Program
- darktable

# Joint Photographers Experts Group (JPEG) JPEG File Interchange Format (JFIF) 1.00, 1.01, 1.02 RAW JPEG Stream

NARA Format ID: NF00220

## Extension(s):

- jpg
- jpeg

## Documentation

- <https://jpeg.org/about.html>
- <http://www.nationalarchives.gov.uk/PRONOM/Format/proFormatSearch.aspx?status=detailReport&id=670>
- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000017.shtml>
- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000018.shtml>
- <http://www.loc.gov/preservation/digital/formats/fdd/fdd000150.shtml>
- [https://en.wikipedia.org/wiki/Motion\\_JPEG](https://en.wikipedia.org/wiki/Motion_JPEG)

## Risk and Prioritization Analysis

**Low Risk**

**Moderate Risk**

**High Risk**

**36 Numeric Risk Rating**

**24 Numeric Prioritization Rating**

## Proposed Preservation Plan

**Retain** file format in its existing format.

**Transform** file to a new format.

**Selected Format:**

**Procure/develop tools** to preserve, manage and provide access to records of this type in their existing form.

**Procure/develop tools** to transform the format to the preferred normalized form.

**Provide Additional Information** so that the record type remains understandable/usable over time.

**Explore Additional Options**

**Justification:** JPEG is well documented and well supported. It is unclear if “Raw JPEG Stream jpg” files in the holdings are motion jpeg files or concatenated single frame image data in a sequence.

### **Preferred Processing and Transformation Tool(s)**

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.
- Adobe Photoshop
- GraphicsMagick
- GNU Image Manipulation Program
- darktable

### **Preferred Viewer/Access Software**

- Adobe Photoshop
- Adobe Elements
- GraphicsMagick
- GNU Image Manipulation Program
- darktable

# Joint Photographers Experts Group (JPEG) JTIP (JPEG Tiled Image Pyramid)

NARA Format ID: NF00221

- **jtip**

## Documentation

- <https://jpeg.org/about.html>
- <http://www.nationalarchives.gov.uk/PRONOM/Format/proFormatSearch.aspx?status=detailReport&id=670>
- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000017.shtml>
- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000018.shtml>
- <http://www.loc.gov/preservation/digital/formats/fdd/fdd000150.shtml>
- [https://en.wikipedia.org/wiki/Motion\\_JPEG](https://en.wikipedia.org/wiki/Motion_JPEG)

## Risk and Prioritization Analysis

- Low Risk**
- Moderate Risk**
- High Risk**
- 5 Numeric Risk Rating**
- 5 Numeric Prioritization Rating**

## Proposed Preservation Plan

- Retain** file format in its existing format.
- Transform** file to a new format.
  - Selected Format:** JPEG
- Procure/develop tools** to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools** to transform the format to the preferred normalized form.
- Provide Additional Information** so that the record type remains understandable/usable over time.
- Explore Additional Options**

**Justification:** JPEG is well documented and well supported. JTIP is a multi-resolution format, created for image presentation and allows presentation of images in various sizes and resolutions. JTIP is not widely used and is no longer supported.

### **Preferred Processing and Transformation Tool(s)**

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.
- Adobe Photoshop
- GraphicsMagick
- GNU Image Manipulation Program
- darktable

### **Preferred Viewer/Access Software**

- Adobe Photoshop
- Adobe Elements
- GraphicsMagick
- GNU Image Manipulation Program
- darktable

## Exchangeable image file format (Exif)

### NARA Format ID:

- NF00177 (Exchangeable Image File Format Compressed 2.0)
- NF00178 (Exchangeable Image File Format Compressed 2.1)
- NF00179 (Exchangeable Image File Format Compressed 2.2)
- NF00180 (Exchangeable Image File Format Uncompressed 2.1)
- NF00181 (Exchangeable Image File Format Uncompressed 2.2)

### Extension(s)

- exif

### Documentation

- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000146.shtml>
- <http://web.archive.org/web/20131018091152/http://exif.org/Exif2-2.PDF>
- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000147.shtml>
- <https://www.media.mit.edu/pia/Research/deepview/exif.html>
- <https://en.wikipedia.org/wiki/Exif>

### Risk and Prioritization Analysis

**Low Risk**

**Moderate Risk**

**High Risk**

**38 Numeric Risk Rating**

**38 Numeric Prioritization Rating**

### Proposed Preservation Plan

**Retain** file format in its existing format.

**Transform** file to a new format.

#### **Selected Format:**

**Procure/develop tools** to preserve, manage and provide access to records of this type in their existing form.

**Procure/develop tools** to transform the format to the preferred normalized form.

**Provide Additional Information** so that the record type remains understandable/usable over time.

**Explore Additional Options**

**Justification:** It is unclear if the files consist of [thumbnails](#) for previewing the picture in file managers, or in photo manipulation software. Exif data are embedded within the image file itself. Many image manipulation programs recognize and preserve Exif data when writing to a modified image. Many image gallery programs also recognize Exif data and optionally display it alongside the images.

### **Preferred Processing and Transformation Tool(s)**

- libexif for C
- Adobe XMP Toolkit
- Exiv2 for C++
- Metadata Extractor for Java
- PIL/Pillow for Python
- ExifTool for Perl

### **Preferred Viewer/Access Software**

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.
- Adobe Photoshop
- GraphicsMagick
- GNU Image Manipulation Program
- darktable

# Exchangeable image file format Audio 2.2 (Exif)

NARA Format ID: NF00176

## Extension(s)

- exif

## Documentation

- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000146.shtml>
- <http://web.archive.org/web/20131018091152/http://exif.org/Exif2-2.PDF>
- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000147.shtml>
- <https://www.media.mit.edu/pia/Research/deepview/exif.html>
- <https://en.wikipedia.org/wiki/Exif>

## Risk and Prioritization Analysis

Low Risk

Moderate Risk

High Risk

40 Numeric Risk Rating

40 Numeric Prioritization Rating

## Proposed Preservation Plan

Retain file format in its existing format.

Transform file to a new format.

### Selected Format:

Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.

Procure/develop tools to transform the format to the preferred normalized form.

Provide Additional Information so that the record type remains understandable/usable over time.

Explore Additional Options

**Justification:** It is unclear if the files consist of thumbnails for previewing the picture in file managers, or in photo manipulation software. Exif data are embedded within the image file itself. Many image manipulation programs recognize and preserve Exif data when writing to a modified image. Many image gallery programs also recognize Exif data and optionally display it alongside the images.

### **Preferred Processing and Transformation Tool(s)**

- libexif for C
- Adobe XMP Toolkit
- Exiv2 for C++
- Metadata Extractor for Java
- PIL/Pillow for Python
- ExifTool for Perl

### **Preferred Viewer/Access Software**

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.
- Adobe Photoshop
- GraphicsMagick
- GNU Image Manipulation Program
- darktable

# Graphics Interchange Format (GIF) 1987a

NARA Format ID: NF00202

## Extension(s)

- gif

## Documentation

- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000133.shtml>
- <http://www.nationalarchives.gov.uk/PRONOM/fmt/4>
- <http://www.nationalarchives.gov.uk/PRONOM/Format/proFormatSearch.aspx?status=detailReport&id=619>
- <https://www.w3.org/Graphics/GIF/spec-gif87.txt>
- <https://www.w3.org/Graphics/GIF/spec-gif89a.txt>

## Risk and Prioritization Analysis

Low Risk

Moderate Risk

High Risk

14 Numeric Risk Rating

14 Numeric Prioritization Rating

## Proposed Preservation Plan

Retain file format in its existing format.

Transform file to a new format.

### Selected Format:

Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.

Procure/develop tools to transform the format to the preferred normalized form.

Provide Additional Information so that the record type remains understandable/usable over time.

Explore Additional Options

**Justification:** Widely adopted. Many software tools exist for encoding and decoding. Natively supported by Web browsers.

### **Preferred Processing and Transformation Tool(s)**

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.
- Adobe Photoshop
- GraphicsMagick
- GNU Image Manipulation Program
- darktable

### **Preferred Viewer/Access Software**

- Many software tools exist for encoding and decoding. Natively supported by Web browsers.

# Graphics Interchange Format (GIF) 1989a

NARA Format ID: NF00203

## Extension(s)

- gif

## Documentation

- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000133.shtml>
- <http://www.nationalarchives.gov.uk/PRONOM/fmt/4>
- <http://www.nationalarchives.gov.uk/PRONOM/Format/proFormatSearch.aspx?status=detailReport&id=619>
- <https://www.w3.org/Graphics/GIF/spec-gif87.txt>
- <https://www.w3.org/Graphics/GIF/spec-gif89a.txt>

## Risk and Prioritization Analysis

Low Risk

Moderate Risk

High Risk

26 Numeric Risk Rating

26 Numeric Prioritization Rating

## Proposed Preservation Plan

Retain file format in its existing format.

Transform file to a new format.

### Selected Format:

Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.

Procure/develop tools to transform the format to the preferred normalized form.

Provide Additional Information so that the record type remains understandable/usable over time.

Explore Additional Options

**Justification:** Widely adopted. Many software tools exist for encoding and decoding. Natively supported by Web browsers.

### **Preferred Processing and Transformation Tool(s)**

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.
- Adobe Photoshop
- GraphicsMagick
- GNU Image Manipulation Program
- darktable

### **Preferred Viewer/Access Software**

- Many software tools exist for encoding and decoding. Natively supported by Web browsers.

## Portable Network Graphic (PNG)

### NARA Format ID:

- NF00381 (1.0)
- NF00382 (1.1)
- NF00383 (1.2)

### Extension(s)

- png

### Documentation

- <http://www.libpng.org/pub/png/spec/1.2/PNG-Contents.html>
- <https://www.w3.org/TR/REC-png.pdf>
- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000153.shtml>

### Risk and Prioritization Analysis

Low Risk

Moderate Risk

High Risk

29 Numeric Risk Rating

29 Numeric Prioritization Rating

### Proposed Preservation Plan

Retain file format in its existing format.

Transform file to a new format.

#### Selected Format:

Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.

Procure/develop tools to transform the format to the preferred normalized form.

Provide Additional Information so that the record type remains understandable/usable over time.

Explore Additional Options

**Justification:** The PNG format is widely supported by graphics programs and web browsers.

### Preferred Processing and Transformation Tool(s)

- Adobe Photoshop
- Corel's Photo-Paint and Paint Shop Pro
- GIMP
- GraphicConverter
- ImageMagick
- IrfanView

### **Preferred Viewer/Access Software**

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.
- The PNG format is widely natively supported by graphics programs and most web browsers
- Adobe Photoshop
- GraphicsMagick
- GNU Image Manipulation Program
- darktable

## Raw Bitmap/Windows Bitmap Raw Stream

### NARA Format ID:

- NF00395 (Raw Bitmap)
- NF00444 (Windows Bitmap Raw Stream)

### Extension(s):

- bmp

### Documentation

- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000189.shtml>
- [https://en.wikipedia.org/wiki/BMP\\_file\\_format](https://en.wikipedia.org/wiki/BMP_file_format)

### Risk and Prioritization Analysis

- Low Risk
  - Moderate Risk
  - High Risk
- 8 Numeric Risk Rating  
-18 Numeric Prioritization Rating

### Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.  
**Selected Format:** TIFF
- Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools to transform the format to the preferred normalized form.
- Provide Additional Information so that the record type remains understandable/usable over time.
- Explore Additional Options See Justification below

**Justification:** Used primarily for system-related and ephemeral purposes, such as icons, screen-grabs, and passing of bit-mapped images between Windows applications. Bitmaps are not usually delivered to the public; it is unclear if the files represent software specific functions or represent raster image files. It is unclear if files characterized as “Raw Bitmap” are the same as “Windows Bitmap Raw Stream.”

### **Preferred Processing and Transformation Tool(s)**

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.

### **Preferred Viewer/Access Software**

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.

# Windows Bitmap 1.0

NARA Format ID: NF00441

## Extension(s):

- bmp

## Documentation

- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000189.shtml>
- [https://en.wikipedia.org/wiki/BMP\\_file\\_format](https://en.wikipedia.org/wiki/BMP_file_format)

## Risk and Prioritization Analysis

- Low Risk
  - Moderate Risk
  - High Risk
- 0 Numeric Risk Rating**  
**-2 Numeric Prioritization Rating**

## Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.  
**Selected Format: TIFF**
- Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools to transform the format to the preferred normalized form.
- Provide Additional Information so that the record type remains understandable/usable over time.
- Explore Additional Options See Justification below

**Justification:** Used primarily for system-related and ephemeral purposes, such as icons, screen-grabs, and passing of bit-mapped images between Windows applications. Bitmaps are not usually delivered to the public; it is unclear if the files represent software specific functions or represent raster image files.

## Preferred Processing and Transformation Tool(s)

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.

#### **Preferred Viewer/Access Software**

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.

# Windows Bitmap 3.0

NARA Format ID: NF00442

## Extension(s):

- bmp

## Documentation

- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000189.shtml>
- [https://en.wikipedia.org/wiki/BMP\\_file\\_format](https://en.wikipedia.org/wiki/BMP_file_format)

## Risk and Prioritization Analysis

- Low Risk
  - Moderate Risk
  - High Risk
- 3 Numeric Risk Rating**  
**1 Numeric Prioritization Rating**

## Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.  
**Selected Format: TIFF**
- Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools to transform the format to the preferred normalized form.
- Provide Additional Information so that the record type remains understandable/usable over time.
- Explore Additional Options See Justification below

**Justification:** Used primarily for system-related and ephemeral purposes, such as icons, screen-grabs, and passing of bit-mapped images between Windows applications. Bitmaps are not usually delivered to the public; it is unclear if the files represent software specific functions or represent raster image files.

## Preferred Processing and Transformation Tool(s)

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.

#### **Preferred Viewer/Access Software**

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.

# Windows Bitmap 3.1 NT

NARA Format ID: NF00443

## Extension(s):

- bmp

## Documentation

- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000189.shtml>
- [https://en.wikipedia.org/wiki/BMP\\_file\\_format](https://en.wikipedia.org/wiki/BMP_file_format)

## Risk and Prioritization Analysis

- Low Risk
  - Moderate Risk
  - High Risk
- 3 Numeric Risk Rating**  
**1 Numeric Prioritization Rating**

## Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.  
**Selected Format: TIFF**
- Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools to transform the format to the preferred normalized form.
- Provide Additional Information so that the record type remains understandable/usable over time.
- Explore Additional Options See Justification below

**Justification:** Used primarily for system-related and ephemeral purposes, such as icons, screen-grabs, and passing of bit-mapped images between Windows applications. Bitmaps are not usually delivered to the public; it is unclear if the files represent software specific functions or represent raster image files.

## Preferred Processing and Transformation Tool(s)

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.

#### **Preferred Viewer/Access Software**

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.

## OS/2 Bitmap 1.0, 2.0

NARA Format ID: NF00350

### Extension(s)

- bmp

### Documentation

- <https://www.fileformat.info/format/os2bmp/egff.htm>
- [http://fileformats.archiveteam.org/wiki/OS/2\\_bitmap\\_family](http://fileformats.archiveteam.org/wiki/OS/2_bitmap_family)

### Risk and Prioritization Analysis

Low Risk

Moderate Risk

High Risk

**45 Numeric Risk Rating**

**43 Numeric Prioritization Rating**

### Proposed Preservation Plan

Retain file format in its existing format.

Transform file to a new format.

**Selected Format: TIFF**

Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.

Procure/develop tools to transform the format to the preferred normalized form.

Provide Additional Information so that the record type remains understandable/usable over time.

Explore Additional Options See Justification below

**Justification:** This is an obsolete, proprietary, operating system-specific implementation of a Bitmap file that should be converted to a standard TIFF.

### Preferred Processing and Transformation Tool(s)

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.

## **Preferred Viewer/Access Software**

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.

# Truevision TARGA

NARA Format ID: NF00428

## Extension(s):

- tga

## Documentation

- <http://fileformats.archiveteam.org/wiki/TGA>
- <https://fileinfo.com/extension/tga>
- [https://en.wikipedia.org/wiki/Truevision\\_TGA](https://en.wikipedia.org/wiki/Truevision_TGA)

## Risk and Prioritization Analysis

- Low Risk
- Moderate Risk
- High Risk
- 5 Numeric Risk Rating
- 7 Numeric Prioritization Rating

## Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.  
**Selected Format:** TIFF
- Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools to transform the format to the preferred normalized form.
- Provide Additional Information so that the record type remains understandable/usable over time.
- Explore Additional Options See Justification below

**Justification:** This is an obsolete, proprietary, operating system-specific implementation of a Bitmap file that should be converted to a standard TIFF.

## Preferred Processing and Transformation Tool(s)

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.

#### **Preferred Viewer/Access Software**

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.

# Sun Raster Image

NARA Format ID: NF00417

## Extension(s):

- sun
- ras

## Documentation

- <http://fileformats.archiveteam.org/wiki/TGA>
- [https://en.wikipedia.org/wiki/Sun\\_Raster](https://en.wikipedia.org/wiki/Sun_Raster)
- [https://en.wikipedia.org/wiki/Truevision\\_TGA](https://en.wikipedia.org/wiki/Truevision_TGA)

## Risk and Prioritization Analysis

- Low Risk
- Moderate Risk
- High Risk
- 2 Numeric Risk Rating
- 0 Numeric Prioritization Rating

## Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.
  - Selected Format:** TIFF
  - Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
  - Procure/develop tools to transform the format to the preferred normalized form.
  - Provide Additional Information so that the record type remains understandable/usable over time.
  - Explore Additional Options See Justification below

**Justification:** This is an obsolete, proprietary, operating system-specific implementation of a Bitmap file that should be converted to a standard TIFF.

## Preferred Processing and Transformation Tool(s)

- ImageMagick
- IrfanView
- LibreOffice
- PaintShop Pro

#### **Preferred Viewer/Access Software**

- ImageMagick
- IrfanView
- LibreOffice
- PaintShop Pro

# Windows Metafile Image

NARA Format ID: NF00448

## Extension(s):

- wmf

## Documentation

- [https://en.wikipedia.org/wiki/Windows\\_Metafile](https://en.wikipedia.org/wiki/Windows_Metafile)
- <https://docs.microsoft.com/en-us/windows/desktop/gdiplus/-gdiplus-metafiles-about>
- <http://www.fileformat.info/format/wmf/egff.htm>

## Risk and Prioritization Analysis

- Low Risk
- Moderate Risk

✓ High Risk

-14 Numeric Risk Rating

-16 Numeric Prioritization Rating

## Proposed Preservation Plan

Retain file format in its existing format.

✓ Transform file to a new format.

**Selected Format: JPEG**

**Procure/develop tools** to preserve, manage and provide access to records of this type in their existing form.

**Procure/develop tools** to transform the format to the preferred normalized form.

**Provide Additional Information** so that the record type remains understandable/usable over time.

**Explore Additional Options**

**Justification:** Windows Metafile is specific to Microsoft Windows, many non-Windows-based applications support this format as a method for interchanging data with Windows applications. It is unclear if these files represent raster image or vector based files.

## Preferred Processing and Transformation Tool(s)

- Native Microsoft Windows graphics programs or standard Raster image editing programs such as Photoshop

**Preferred Viewer/Access Software**

- Native Microsoft Windows graphics programs or standard Raster image editing programs such as Photoshop

## Digital Negative versions 1.0; 1.1; 1.3; 1.4

NARA Format ID: NF00161

### Extension(s):

- dng

### Documentation

- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000188.shtml>
- [http://web.archive.org/web/20051108165239/http://www.adobe.com/products/dng/pdfs/dng\\_spec.pdf](http://web.archive.org/web/20051108165239/http://www.adobe.com/products/dng/pdfs/dng_spec.pdf)
- <https://helpx.adobe.com/photoshop/digital-negative.html>

### Risk and Prioritization Analysis

**Low Risk**

**Moderate Risk**

**High Risk**

**26 Numeric Risk Rating**

**26 Numeric Prioritization Rating**

### Proposed Preservation Plan

**Retain** file format in its existing format.

**Transform** file to a new format.

#### **Selected Format:**

**Procure/develop tools** to preserve, manage and provide access to records of this type in their existing form.

**Procure/develop tools** to transform the format to the preferred normalized form.

**Provide Additional Information** so that the record type remains understandable/usable over time.

**Explore Additional Options**

**Justification:** The DNG format is considered a preservation format for camera raw data.

### ***Preferred Processing and Transformation Tool(s)***

- Existing graphics programs.

- Adobe Photoshop
- Corel's Photo-Paint and Paint Shop Pro
- GIMP
- GraphicConverter
- ImageMagick
- IrfanView

### **Preferred Viewer/Access Software**

- The DNG format is widely supported by graphics programs.
- Adobe Photoshop
- Corel's Photo-Paint and Paint Shop Pro
- GIMP
- GraphicConverter
- ImageMagick
- IrfanView

# CALS Compressed Bitmap

NARA Format ID: NF00139

## Extension(s):

- cal

## Documentation

- [https://en.wikipedia.org/wiki/CALS\\_Raster\\_file\\_format](https://en.wikipedia.org/wiki/CALS_Raster_file_format)
- <https://www.fileformat.info/format/cals/egff.htm>
- [https://en.wikipedia.org/wiki/CALS\\_\(DOD\)](https://en.wikipedia.org/wiki/CALS_(DOD))
- <https://apps.dtic.mil/dtic/tr/fulltext/u2/a206066.pdf>

## Risk and Prioritization Analysis

Low Risk

Moderate Risk

High Risk

21 Numeric Risk Rating

19 Numeric Prioritization Rating

## Proposed Preservation Plan

Retain file format in its existing format.

Transform file to a new format.

**Selected Format:** JPEG, JPEG 2000

**Procure/develop tools** to preserve, manage and provide access to records of this type in their existing form.

**Procure/develop tools** to transform the format to the preferred normalized form.

**Provide Additional Information** so that the record type remains understandable/usable over time.

**Explore Additional Options**

**Justification:** The CALS raster format is a standard developed by the Computer Aided Acquisition and Logistics Support (CALS) office of the United States Department of Defense to standardize graphics data interchange for electronic publishing, especially in the areas of technical graphics, CAD/CAM, and image processing applications. It is not clear if these files are image related, textual, graphics, or a combination.

### **Preferred Processing and Transformation Tool(s)**

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.

### **Preferred Viewer/Access Software**

Analysis of the Tools is based on:

- Most common raster file image editing software such as Adobe Photoshop should be able to perform this function.

# Adobe Photoshop

NARA Format ID: NF00105

## Extension(s):

- psd

## Documentation

- <https://www.adobe.com/devnet-apps/photoshop/fileformatashtml/>

## Risk and Prioritization Analysis

Low Risk

Moderate Risk

High Risk

10 Numeric Risk Rating

8 Numeric Prioritization Rating

## Proposed Preservation Plan

Retain file format in its existing format.

Transform file to a new format.

**Selected Format:** TIFF, JPEG2000

**Procure/develop tools** to preserve, manage and provide access to records of this type in their existing form.

**Procure/develop tools** to transform the format to the preferred normalized form.

**Provide Additional Information** so that the record type remains understandable/usable over time.

**Explore Additional Options**

**Justification:** This is a native Photoshop file used to retain certain editing functions and is considered an intermediate production file. These files should be converted to a standardized flattened format.

## Preferred Processing and Transformation Tool(s)

- Adobe Photoshop
- Other programs may be able to edit and view this file

## **Preferred Viewer/Access Software**

- Adobe Photoshop
- Other programs may be able to edit and view this file

# MacPaint Graphic

## MacPaint Image

### NARA Format ID:

- NF00240 (Graphic)
- NF00241 (Image)

### Extension(s):

- pntg
- mac
- pic

### Documentation

- <http://fileformats.archiveteam.org/wiki/MacPaint>
- <https://en.wikipedia.org/wiki/MacPaint>
- <https://www.computerhistory.org/atcm/macpaint-and-quickdraw-source-code/>

### Risk and Prioritization Analysis

- Low Risk
  - Moderate Risk
  - High Risk
- 34 Numeric Risk Rating  
-42 Numeric Prioritization Rating

### Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.  
**Selected Format:** TBD, preferably TIFF or JPEG
- Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools to transform the format to the preferred normalized form.
- Provide Additional Information so that the record type remains understandable/usable over time.
- Explore Additional Options

**Justification:** MacPaint is a bitmap-based image editing computer program that was produced by Apple. It is unclear if “graphics” are different from “image” files. It must be determined if these files can be transformed into another format.

### **Preferred Processing and Transformation Tool(s)**

- Konvertor
- Netpbm: macptopbm. Use the `-extraskip 128` option if the file has a MacBinary header.
- XnView
- Farbfeld Utilities
- Deark
- CloudPaint: online MacPaint simulator
- MacPaint and QuickDraw Source Code, at the Computer History Museum
- ImageMagick
- Tom's Editor (supports MacPaint files with 512 and 640 offset)

### **Preferred Viewer/Access Software**

- Konvertor
- Netpbm: macptopbm. Use the `-extraskip 128` option if the file has a MacBinary header.
- XnView
- Farbfeld Utilities
- Deark
- CloudPaint: online MacPaint simulator
- MacPaint and QuickDraw Source Code, at the Computer History Museum
- ImageMagick
- Tom's Editor (supports MacPaint files with 512 and 640 offset)

# PCPaint Image

NARA Format ID: NF00356

## Extension(s):

- pic

## Documentation

- <https://en.wikipedia.org/wiki/PCPaint>

## Risk and Prioritization Analysis

- Low Risk
- Moderate Risk
- High Risk
- 34 Numeric Risk Rating
- 39 Numeric Prioritization Rating

## Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.  
**Selected Format:** TBD, preferably TIFF or JPEG
- Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools to transform the format to the preferred normalized form.
- Provide Additional Information so that the record type remains understandable/usable over time.
- Explore Additional Options

**Justification:** PCPaint is an early bitmap-based image editing computer program that was produced for early IBM PCs. It is unclear if these files can be transformed into another format.

## Preferred Processing and Transformation Tool(s)

- PaintShop
- Konvertor
- XnView
- Farbfeld Utilities
- Deark
- ImageMagick

## Preferred Viewer/Access Software

- PaintShop
- Konvertor
- XnView
- Farbfeld Utilities
- Deark
- ImageMagick

# Scitex CT Image

NARA Format ID: NF00405

## Extension(s):

- sct

## Documentation

- [http://fileformats.archiveteam.org/wiki/Scitex\\_CT](http://fileformats.archiveteam.org/wiki/Scitex_CT)
- [https://en.wikipedia.org/wiki/Scitex\\_CT](https://en.wikipedia.org/wiki/Scitex_CT)

## Risk and Prioritization Analysis

- Low Risk
  - Moderate Risk
  - High Risk
- 17 Numeric Risk Rating  
-27 Numeric Prioritization Rating

## Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.  
**Selected Format:** TBD, preferably TIFF or JPEG
- Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools to transform the format to the preferred normalized form.
- Provide Additional Information so that the record type remains understandable/usable over time.
- Explore Additional Options

**Justification:** This format has no currently available specifications of documentation to aid in reformatting. It is unclear if this format can be migrated at all.

## Preferred Processing and Transformation Tool(s)

- PaintShop
- Konvertor
- XnView
- Farbfeld Utilities
- Deark
- ImageMagick

## Preferred Viewer/Access Software

- PaintShop
- Konvertor
- XnView
- Farbfeld Utilities
- Deark
- ImageMagick

# PaintShopPro Browser Cache File

NARA Format ID: NF00355

## Extension(s):

- jbf

## Documentation

- <https://fileinfo.com/extension/jbf>
- <http://extension.nirsoft.net/jbf>

## Risk and Prioritization Analysis

Low Risk

Moderate Risk

High Risk

-24 Numeric Risk Rating

-26 Numeric Prioritization Rating

## Proposed Preservation Plan

Retain file format in its existing format.

Transform file to a new format.

**Selected Format:** TBD, preferably TIFF or JPEG

Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.

Procure/develop tools to transform the format to the preferred normalized form.

Provide Additional Information so that the record type remains understandable/usable over time.

Explore Additional Options

**Justification:** Cache file created by the image browser component of Corel Paint Shop Pro (PSP); contains thumbnails for image files that have been viewed; enables the program to quickly display image previews; automatically updated each time users browse images. These files may be temporary files and not represent archival records.

## Preferred Processing and Transformation Tool(s)

- Corel Paint Shop Pro XI
- Corel PaintShop Photo Pro X3
- Corel PaintShop Pro X5
- Paint Shop Pro 9
- Paint Shop Pro 8

- Paint Shop Pro 6
- Paint Shop Pro 7

#### **Preferred Viewer/Access Software**

- Corel Paint Shop Pro XI
- Corel PaintShop Photo Pro X3
- Corel PaintShop Pro X5
- Paint Shop Pro 9
- Paint Shop Pro 8
- Paint Shop Pro 6
- Paint Shop Pro 7

## PaintShopPro versions 2/3/4/5/6/7/8

NARA Format ID: NF00354

### Extension(s):

- psp

### Documentation

- [https://en.wikipedia.org/wiki/PaintShop\\_Pro](https://en.wikipedia.org/wiki/PaintShop_Pro)
- <https://fileinfo.com/extension/psp>
- <http://fileformats.archiveteam.org/wiki/Ext:psp>

### Risk and Prioritization Analysis

- Low Risk
  - Moderate Risk
  - High Risk
- 5 Numeric Risk Rating  
-7 Numeric Prioritization Rating

### Proposed Preservation Plan

- Retain** file format in its existing format.
- Transform** file to a new format.  
**Selected Format:** TIFF or JPEG
- Procure/develop tools** to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools** to transform the format to the preferred normalized form.
- Provide Additional Information** so that the record type remains understandable/usable over time.
- Explore Additional Options**

**Justification:** The software is still available, but this is a proprietary format.

### Preferred Processing and Transformation Tool(s)

- Corel Paint Shop Pro XI
- Corel PaintShop Photo Pro X3
- Corel PaintShop Pro X5
- Paint Shop Pro 9
- Paint Shop Pro 8
- Paint Shop Pro 6
- Paint Shop Pro 7

## **Preferred Viewer/Access Software**

- Corel Paint Shop Pro XI
- Corel PaintShop Photo Pro X3
- Corel PaintShop Pro X5
- Paint Shop Pro 9
- Paint Shop Pro 8
- Paint Shop Pro 6
- Paint Shop Pro 7

## JPEG 2000

NARA Format ID: NF00219

### Extension(s):

- jp2
- jpeg2000
- jpeg2000-image
- x-jpeg2000-image

### Documentation

- <https://jpeg.org/jpeg2000/>
- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000139.shtml>
- <http://citeseer.ist.psu.edu/viewdoc/download?doi=10.1.1.20.7328&rep=rep1&type=pdf>
- <https://www.iso.org/standard/33877.html>

### Risk and Prioritization Analysis

**Low Risk**

**Moderate Risk**

**High Risk**

**26 Numeric Risk Rating**

**16 Numeric Prioritization Rating** (The lower the number, the higher the priority)

### Proposed Preservation Plan

**Retain** file format in its existing format.

**Transform** file to a new format.

**Selected Format:**

**Procure/develop tools** to preserve, manage and provide access to records of this type in their existing form.

**Procure/develop tools** to transform the format to the preferred normalized form.

**Provide Additional Information** so that the record type remains understandable/usable over time.

**Explore Additional Options**

**Justification:** Widely adopted. Many software tools exist for encoding and decoding.

### Preferred Processing and Transformation Tool(s)

- Adobe Photoshop

- Other programs may be able to edit and view this file  
[https://en.wikipedia.org/wiki/JPEG\\_2000#Application\\_support](https://en.wikipedia.org/wiki/JPEG_2000#Application_support)

#### **Preferred Viewer/Access Software**

- Adobe Photoshop
- Other programs may be able to edit and view this file  
[https://en.wikipedia.org/wiki/JPEG\\_2000#Application\\_support](https://en.wikipedia.org/wiki/JPEG_2000#Application_support)

# Camera RAW file

NARA Format ID: NF00140

## Extension(s)

- cr2
- crw
- dcr
- kdc
- nrw
- orf
- pef
- raf
- srf
- x3f
- raw

## Documentation

- [https://en.wikipedia.org/wiki/Raw\\_image\\_format](https://en.wikipedia.org/wiki/Raw_image_format)

## Risk and Prioritization Analysis

- Low Risk
  - Moderate Risk
  - High Risk
- 13 Numeric Risk Rating  
-15 Numeric Prioritization Rating

## Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.  
**Selected Format: DNG**
- Procure/develop tools** to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools** to transform the format to the preferred normalized form.
- Provide Additional Information** so that the record type remains understandable/usable over time.
- Explore Additional Options**

**Justification:** Preferable to convert from proprietary manufacturer file to Adobe DNG. However, there is some support for camera raw files from major camera manufacturers and there is some desire to retain the raw sensor data.

### **Preferred Processing and Transformation Tool(s)**

- Adobe Camera RAW
- Adobe Photoshop
- ACDSee Pro
- darktable
- dcraw
- ExifTool
- ImageMagick
- LightZone

### **Preferred Viewer/Access Software**

- Adobe Camera RAW
- Adobe Photoshop
- ACDSee Pro
- darktable
- dcraw
- ExifTool
- ImageMagick
- LightZone

# Nikon Electronic Format RAW Image

NARA Format ID: NF00341

## Extension(s):

- nef
- nrw
- ndf
- ndr

## Documentation

- [https://en.wikipedia.org/wiki/Raw\\_image\\_format](https://en.wikipedia.org/wiki/Raw_image_format)
- <http://fileformats.archiveteam.org/wiki/Nikon>
- <https://fileinfo.com/extension/nef>

## Risk and Prioritization Analysis

- Low Risk
  - Moderate Risk
  - High Risk
- 0** Numeric Risk Rating  
**-8** Numeric Prioritization Rating

## Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.  
**Selected Format: DNG**
- Procure/develop tools** to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools** to transform the format to the preferred normalized form.
- Provide Additional Information** so that the record type remains understandable/usable over time.
- Explore Additional Options**

**Justification:** Preferable to convert from proprietary manufacturer file to Adobe DNG. However, there is some support for camera raw files from major camera manufacturers and there is some desire to retain the raw sensor data.

### **Preferred Processing and Transformation Tool(s)**

- Adobe Camera RAW
- Adobe Photoshop
- ACDSee Pro
- darktable
- dcraw
- ExifTool
- ImageMagick
- LightZone

### **Preferred Viewer/Access Software**

- Adobe Camera RAW
- Adobe Photoshop
- ACDSee Pro
- darktable
- dcraw
- ExifTool
- ImageMagick
- LightZone

## Icon file format

NARA Format ID: NF00210

### Extension(s):

- ico

### Documentation

- [https://en.wikipedia.org/wiki/ICO\\_\(file\\_format\)](https://en.wikipedia.org/wiki/ICO_(file_format))
- [https://docs.microsoft.com/en-us/previous-versions/ms997538\(v=msdn.10\)](https://docs.microsoft.com/en-us/previous-versions/ms997538(v=msdn.10))
- <https://blogs.msdn.microsoft.com/oldnewthing/20101018-00/?p=12513>

### Risk and Prioritization Analysis

- Low Risk
  - Moderate Risk
  - High Risk
- 12 Numeric Risk Rating  
-20 Numeric Prioritization Rating

### Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.  
Selected Format:   TBD
- Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools to transform the format to the preferred normalized form.
- Provide Additional Information so that the record type remains understandable/usable over time.
- Explore Additional Options

**Justification:** The ICO file format is an image file format for computer icons in Microsoft Windows. It is not clear if these are standalone raster image files or part of a software directory structure.

### Preferred Processing and Transformation Tool(s)

- Windows OS

### Preferred Viewer/Access Software

- Windows OS

# PiCture eXchange (PCX)

NARA Format ID: NF00359

## Extension(s):

- pcx

## Documentation

<https://en.wikipedia.org/wiki/PCX>

<http://www.ffmpeg.org/general.html#Image-Formats>

<https://www.fileformat.info/format/pcx/egff.htm>

## Risk and Prioritization Analysis

- ✓ Low Risk
  - Moderate Risk
  - High Risk
- 27 Numeric Risk Rating  
25 Numeric Prioritization Rating

## Proposed Preservation Plan

- ✓ Retain file format in its existing format.
- ✓ Transform file to a new format.
  - Selected Format:** PNG, JPEG
  - Procure/develop tools** to preserve, manage and provide access to records of this type in their existing form.
  - Procure/develop tools** to transform the format to the preferred normalized form.
  - Provide Additional Information** so that the record type remains understandable/usable over time.
  - Explore Additional Options**

**Justification:** It was the native file format for PC Paintbrush and became one of the first widely accepted DOS imaging standards, although it has since been succeeded by more sophisticated image formats, such as BMP, JPEG, and PNG. Retain as long as there are programs that can open the file. It is unclear what data could be lost through conversion to another format.

## Preferred Processing and Transformation Tool(s)

- Photoshop
- PaintShop Pro
- ACDSSee

- GIMP
- ImageMagick
- IrfanView
- LView
- XnView
- GraphicConverter

#### **Preferred Viewer/Access Software**

- Photoshop
- PaintShop Pro
- ACDSee
- GIMP
- ImageMagick
- IrfanView
- LView
- XnView
- GraphicConverter

# Adobe PhotoDeluxe

NARA Format ID: NF00104

## Extension(s):

- pdd

## Documentation

- [https://en.wikipedia.org/wiki/Adobe\\_PhotoDeluxe](https://en.wikipedia.org/wiki/Adobe_PhotoDeluxe)
- <https://archive.org/details/PhotoDeluxe3HE>
- <https://fileinfo.com/extension/pdd>

## Risk and Prioritization Analysis

- Low Risk
  - Moderate Risk
  - High Risk
- 1 Numeric Risk Rating  
-3 Numeric Prioritization Rating

## Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.  
**Selected Format:** TIFF, JPEG, JPEG 2000
- Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools to transform the format to the preferred normalized form.
- Provide Additional Information so that the record type remains understandable/usable over time.
- Explore Additional Options

**Justification:** Proprietary format; transform into standard format.

## Preferred Processing and Transformation Tool(s)

- Adobe Photoshop and other adobe image editing software

## Preferred Viewer/Access Software

- Adobe Photoshop and other adobe image editing software

## CorelDraw Wavelet Image File

**NARA Format ID: NF00149**

**Extension(s):**

- wi

**Documentation**

- Wavelet Compressed raster Image created as an export from a CorelDraw vector graphic file.
- <https://en.wikipedia.org/wiki/CorelDRAW>
- <https://fileinfo.com/extension/wi>

**Risk and Prioritization Analysis**

- Low Risk
  - Moderate Risk
  - High Risk
- 29 Numeric Risk Rating**  
**-37 Numeric Prioritization Rating**

**Proposed Preservation Plan**

- Retain file format in its existing format.
- Transform file to a new format.  
**Selected Format: TIFF**
- Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools to transform the format to the preferred normalized form.
- Provide Additional Information so that the record type remains understandable/usable over time.
- Explore Additional Options

**Justification:** This is a proprietary compressed bitmap format which should be converted into an uncompressed TIFF bitmap.

**Preferred Processing and Transformation Tool(s)**

- CorelDraw
- LizardTech DjVu

**Preferred Viewer/Access Software**

- Adobe Photoshop

- Adobe Elements
- GraphicsMagick
- GNU Image Manipulation Program
- darktable

# Fractal Image File

NARA Format ID: NF00196

## Extension(s)

- fif

## Documentation

- Wavelet Compressed raster Image created as an export from a CorelDraw vector graphic file.
- [http://fileformats.archiveteam.org/wiki/Fractal\\_Image\\_Format](http://fileformats.archiveteam.org/wiki/Fractal_Image_Format)
- [https://en.wikipedia.org/wiki/Fractal\\_compression](https://en.wikipedia.org/wiki/Fractal_compression)

## Risk and Prioritization Analysis

- Low Risk
- Moderate Risk

✓ High Risk

-23 Numeric Risk Rating

-31 Numeric Prioritization Rating

## Proposed Preservation Plan

Retain file format in its existing format.

✓ Transform file to a new format.

**Selected Format:** TBD, preferably TIFF

Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.

**X Procure/develop tools** to transform the format to the preferred normalized form.

Provide Additional Information so that the record type remains understandable/usable over time.

Explore Additional Options

**Justification:** This is a proprietary raster format which should be converted into an uncompressed TIFF bitmap.

## Preferred Processing and Transformation Tool(s)

- Konvertor
- XnView
- Genuine Fractals Photoshop plug-in

## Preferred Viewer/Access Software

- Adobe Photoshop
- Adobe Elements
- GraphicsMagick
- GNU Image Manipulation Program
- darktable

## Kodak PhotoCD

NARA Format ID: NF00224

### Extension(s):

- pcd

### Documentation

- <http://fileformats.archiveteam.org/wiki/Ext:pcd>
- [https://en.wikipedia.org/wiki/Photo\\_CD](https://en.wikipedia.org/wiki/Photo_CD)

### Risk and Prioritization Analysis

- Low Risk
  - Moderate Risk
  - High Risk
- 12 Numeric Risk Rating  
-20 Numeric Prioritization Rating

### Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.  
**Selected Format: JPEG**
- Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools to transform the format to the preferred normalized form.
- Provide Additional Information so that the record type remains understandable/usable over time.
- Explore Additional Options

**Justification:** This is a proprietary format that is no longer supported in the marketplace. Kodak never released the specification, but the specification has been reverse-engineered so conversion to JPEG is possible.

### Preferred Processing and Transformation Tool(s)

- ImageMagick
- IrfanView

### Preferred Viewer/Access Software

- IrfanView



## MET Metafile

NARA Format ID: NF00248

### Extension(s)

- met

### Documentation

- <https://people.sc.fsu.edu/~jburkardt/data/met/met.html>
- <https://www.fileformat.info/format/os2metafile/egff.htm>
- <https://fileinfo.com/extension/met>

### Risk and Prioritization Analysis

- Low Risk
  - Moderate Risk
  - High Risk
- 0 Numeric Risk Rating**  
**-8 Numeric Prioritization Rating**

### Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.  
**Selected Format:** TIFF, JPEG2000
- Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools to transform the format to the preferred normalized form.
- Provide Additional Information so that the record type remains understandable/usable over time.
- Explore Additional Options

**Justification:** This is a proprietary format that is no longer supported in the marketplace. It can contain raster or vector image data, so must be transformed on a case-by-case review. A version of this format is associated with OS/2.

### Preferred Processing and Transformation Tool(s)

- CorelDraw
- OpenOffice

## Preferred Viewer/Access Software

- CorelDraw
- OpenOffice

# FAX Image File

NARA Format ID: NF00191

## Extension(s)

- fax

## Documentation

- <https://www.fileformat.info/format/fax/egff.htm>
- <https://en.wikipedia.org/wiki/Fax>

## Risk and Prioritization Analysis

- Low Risk
  - Moderate Risk
  - High Risk
- 7 Numeric Risk Rating  
-15 Numeric Prioritization Rating

## Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.  
**Selected Format:** TIFF, JPEG2000
- Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools to transform the format to the preferred normalized form.
- Provide Additional Information so that the record type remains understandable/usable over time.
- Explore Additional Options

**Justification:** FAX files are generally a variant of the TIFF format. Experimentation is needed to determine the best tool for opening and converting these files.

## Preferred Processing and Transformation Tool(s)

- Common raster file image editing software such as Adobe Photoshop should be able to perform this function, but this must be verified.
- Adobe Photoshop
- GraphicsMagick
- GNU Image Manipulation Program

## **Preferred Viewer/Access Software**

- Adobe Photoshop
- Adobe Elements
- GraphicsMagick
- GNU Image Manipulation Program