

PMT Exif 2.2 Metadata Management Guidelines

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1. Introduction

1.1. Purpose

The intent of the PMT Exif 2.2 Metadata Management Guidelines is to help ensure that Exif image files are properly handled when they are edited by software applications that utilize PMT. The tags or PMT metadata objects, provided through the Exif image files include very valuable information about the digital image. When Exif images are manipulated by software applications and a new Exif image file is saved, the Exif tag or PMT metadata object information should be properly maintained. For most PMT metadata objects, the information can be copied from the original Exif file into the newly saved Exif image file. However, certain PMT metadata objects as well as the thumbnail image must be updated to reflect changes due to image manipulation by the software application.

1.2. Scope

This document address the metadata management guidelines for an Exif image file as the following basic edit functions are applied to the image:

- Rotation (90 degree)
- Exposure adjustment
- Brightness/contrast adjustment
- Sharpen
- Trim (crop)
- Red Eye removal
- Backlight
- Flash in face
- White Balance
- Sepia
- Image Outline

1.3. Disclaimer

Eastman Kodak Company reserves the right to change this information without notice, and makes no warranty, expressed or implied, with respect to this information. Kodak shall not be liable for any loss or damage, including consequential or special damages, resulting from the use of this information, even if loss or damage is caused by Kodak's negligence or fault.

1.4. Definitions, Acronyms, Abbreviations

1.4.1. Backlight

Backlight - corrects for common backlighting occurrences in consumer photography (ie. indoor subject standing in front of a brightly lit window.)

1.4.2. Flash in face

Flash in face - Flash in the face corrects for subject overflash, such as when the subject is too close in a flash photography situation.

1.4.3. White Balance

White Balance - corrects for florescent /incandescent lighting conditions

1.4.4. Sepia

Sepia - gives pictures an old-fashioned type of effect (brown tinted monochrome).

1.4.5. Image Outline

Image Outline - an image outline effect.

1.5. References and Applicable Documents

1.5.1. JEITA Exif 2.2 Specification

Title: Standard of Japan Electronics and Information Technology Industries Association ,JEITA CP-3451,Exchangeable image file format for digital still cameras: Exif Version 2.2

Version: 2.2

Date: February 19, 2002, last revision

Author: Standard of Japan Electronics and Information Technology Industries Association ,JEITA

Web Access: The document is available from the following web site:
<http://tsc.jeita.or.jp/WTO-01.htm>
On the web page select "New Standard No.CP –3451" The PDF file requires that your Acrobat Reader has Japanese Font support.

1.5.2. ISO/IEC 10918-1, JPEG Specification

Title: Information technology - Digital compression and coding of continuous-tone still images: Requirements and guidelines, Reference number ISO/IEC 10918-1:1994(E)

Version: 1

Date: 2/15/94

Author: CCIT Study Group VIII and the Joint Photographic Experts Group (JPEG) of ISO/IEC JTC 1/SC 29/WG 10

Web Access: Document is available from Global Engineering Documents. Global Engineering Documents web site is <http://global.ihs.com/>

1.5.3. Eastman Kodak Company JPEG File Implementation Guide

Title: Eastman Kodak Company JPEG File Implementation Guide

Version: 1.2

Date: December 3, 1999

Author: Robert Reisch

Web Access: At the Kodak Developer Relations Group site a registered member that has access to a Personal Access page will be able to down load the Kodak JPEG File Implementation Guide, Version 1.2 . The Kodak Developer Relations Group is located at:

<http://www.kodak.com/go/DRG>

1.5.4. Eastman Kodak Company Picture Metadata Guidelines (for 2000-2001)

Title: Eastman Kodak Company Picture Metadata
Guidelines (for 2000-2001)
Version: 1.0
Date: December 21, 1999
Author: J. R. Milch and R. Reisch
Web Access: At the Kodak Developer Relations Group site a registered
member that has access to a Personal Access page and
will be able to down load the Guideline Document.
The Kodak Developer Relations Group is located at:
<http://www.kodak.com/go/DRG>

1.5.5. Eastman Kodak Company Picture CD Image/Exif File Format V 1.1

Title: Eastman Kodak Company Picture CD
Image/Exif File Format V 1.1
Version: Version 1.1
Date: 03/03/2000
Author: Rob Reisch
Web Access: At the Kodak Developer Relations Group site a registered
member that has access to a Personal Access page
will be able to down load the Eastman Kodak
Company Picture CD Image/Exif File Format V 1.1
The Developer Relations Group is located at:
<http://www.kodak.com/go/DRG>

2. General Description

The metadata management guidelines are comprised of a number of tables. Each table addresses a section of the image file where the PMT metadata object is stored through the Exif Accessor. The first row of each table has a list of operations that will modify an Exif image file. The left-hand column of the table list the PMT metadata objects. **Each cell in the table has a specific instruction or values for the metadata that is based on the operation being conducted. If a group of operations are performed, like Rotate and Trim or Crop then the resultant metadata instructions or values are a combination of the two columns.**

2.1. Format of an Exif JPEG Image File

Figure 1 The Format of an Exif Image File, on the next page provides a general description of the format and structures used in an Exif image file to store metadata. See the JEITA Exif 2.2 Specification for more details.

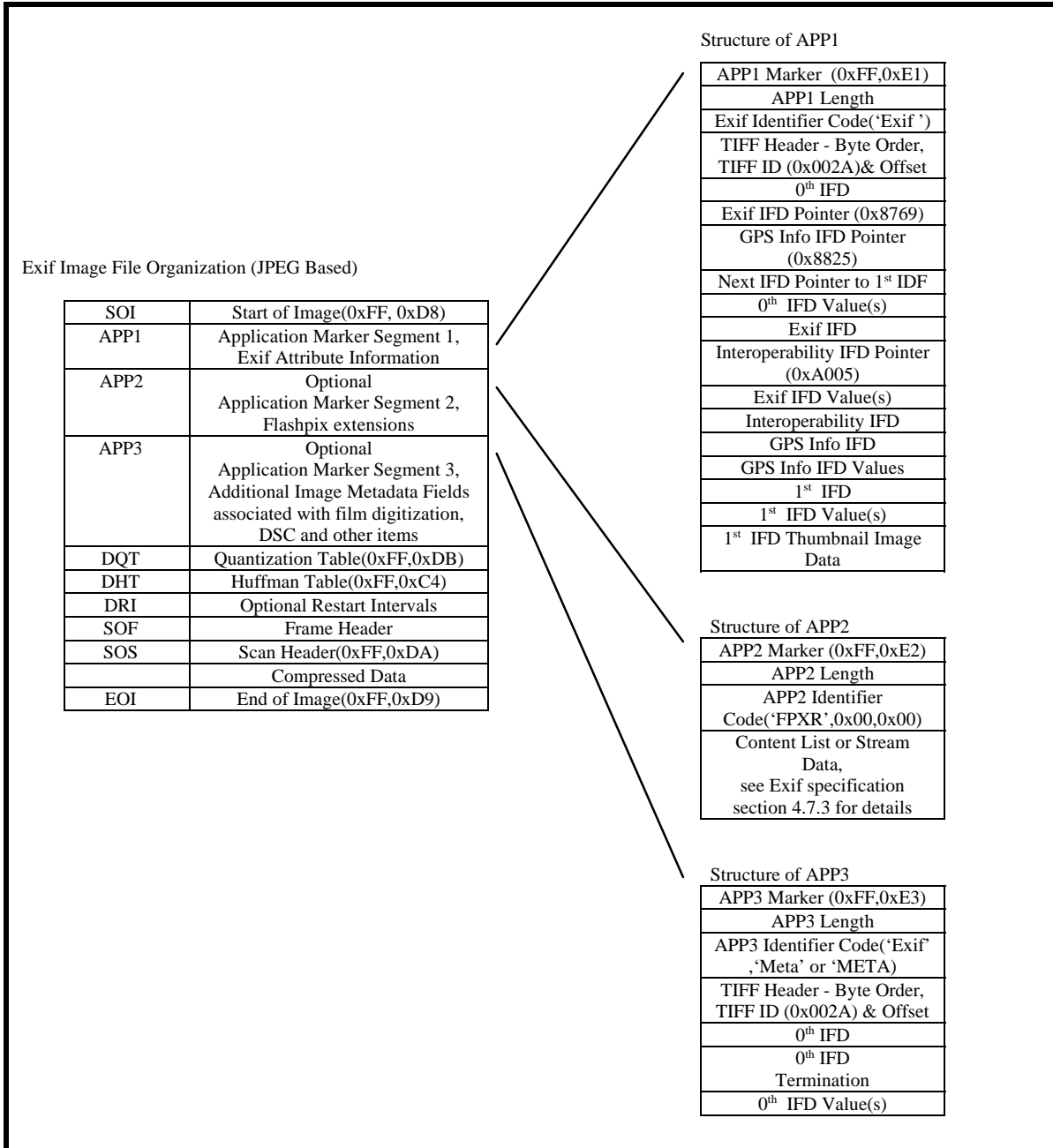


Figure 1 The Format of an Exif Image File (JPEG Based)

3. Specific Guidelines

The following sections of this document are comprised of different portions of an Exif image file that contains the PMT metadata objects. Each section contains a table that lists the defined PMT metadata object in the left-hand column of the table. The first row of the table contains the following operations that will modify an image:

- Rotation (90 degree)
- Exposure Adjustment
- Brightness/contrast adjustment
- Sharpen
- Trim (crop)
- Red Eye removal
- Backlight
- Flash in face
- White Balance
- Sepia
- Image Outline

Each cell in the table has a specific instruction or value for the metadata that is based on the operation being conducted. If a group of operations are performed, like Rotate and Trim then the resultant metadata instructions or values are a combination of the two columns.

The following sections comprising the metadata defined for an Exif JPEG image file:

- 3.1 APP1, 0th IFD, Primary Image
- 3.2 APP1, Exif IFD, Primary Image
 - 3.2.1 APP1, Exif IFD, Interoperability IFD
- 3.3 APP1, GPS Info IFD, Primary Image
- 3.4 APP1, 1st IFD, Compressed Thumbnail Metadata
- 3.5 APP3, 0th IFD, Additional Metadata Items

The sections are combined together and the specific instructions or values shall be applied to the Exif image file as operations that modify the image are applied. If the original Exif image file does not contain one of the listed metadata items then the row of values and instructions are ignored.

Intentionally left blank

3.1. APP1, 0th IFD, Primary Image

PMT Metadata Object Name	Rotation (90 degrees)	Exposure Adjustment	Brightness/ Contrast adjustment	Sharpen	Trim or Crop	Red Eye Removal	Backlight	Flash in face	White Balance	Sepia	Image Outline
SceneContent.ImageDescription	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
CaptureDevice.Make	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
CaptureDevice.Model	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
ImageContainer.Orientation	No Change, set to 1.	No Change, set to 1	No Change, set to 1	No Change, set to 1	No Change, set to 1	No Change, set to 1	No Change, set to 1	No Change, set to 1	No Change, set to 1	No Change, set to 1	No Change, set to 1
ImageContainer.DisplayXResolution	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
ImageContainer.DisplayYResolution	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
ImageContainer.DisplayResolutionUnit	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
ImageContainer.TransferFunction	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
CaptureDevice.Software	Update to indicate the editing software program. PMT metadata object value will change or remain the same.	Update to indicate the editing software program. PMT metadata object value will change or remain the same.	Update to indicate the editing software program. PMT metadata object value will change or remain the same.	Update to indicate the editing software program. PMT metadata object value will change or remain the same.	Update to indicate the editing software program. PMT metadata object value will change or remain the same.	Update to indicate the editing software program. PMT metadata object value will change or remain the same.	Update to indicate the editing software program. PMT metadata object value will change or remain the same.	Update to indicate the editing software program. PMT metadata object value will change or remain the same.	Update to indicate the editing software program. PMT metadata object value will change or remain the same.	Update to indicate the editing software program. PMT metadata object value will change or remain the same.	Update to indicate the editing software program. PMT metadata object value will change or remain the same.
DigitalProcess.ImageFileChangeDateTime	Update, PMT metadata object value will change. See note 1	Update, PMT metadata object value will change. See note 1	Update, PMT metadata object value will change. See note 1	Update, PMT metadata object value will change. See note 1	Update, PMT metadata object value will change. See note 1	Update, PMT metadata object value will change. See note 1	Update, PMT metadata object value will change. See note 1	Update, PMT metadata object value will change. See note 1	Update, PMT metadata object value will change. See note 1	Update, PMT metadata object value will change. See note 1	Update, PMT metadata object value will change. See note 1
CaptureDevice.CameraOwner.CameraOwner	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
ImageContainer.WhitePoint	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change

<u>PMT Metadata Object Name</u>	Rotation (90 degrees)	Exposure Adjustment	Brightness/ Contrast adjustment	Sharpen	Trim or Crop	Red Eye Removal	Backlight	Flash in face	White Balance	Sepia	Image Outline
ImageContainer.PrimaryChromaticities	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
ImageContainer.YCbCrCoefficients	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
ImageContainer.YCbCrPositioning	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
ImageContainer.ReferenceBlackWhite.	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
IntellectualProperty.Copyright	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change

Note 1: Value set to the date and time when the last operation was completed on the image.

3.2. APP1, Exif IFD, Primary Image

<u>PMT Metadata Object Name</u>	Rotation (90 degrees)	Exposure Adjustment	Brightness/ Contrast adjustment	Sharpen	Trim or Crop	Red Eye Removal	Backlight	Flash in face	White Balance	Sepia	Image Outline	
CaptureConditions.ExposureTime	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change	
CaptureConditions.FNumber	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change	
CaptureConditions.ExposureProgram	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change	
CaptureDevice.SpectralSensitivity	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change	
CaptureDevice.ISOSpeedRatings	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change	
CaptureDevice.OECF	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change	
ImageContainer.ExifVersion	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change	
SceneContent.ImageCaptureDateTime. ImageCaptureDateTime	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change	
DigitalProcess.ImageFileCreationDateTime	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change	
ImageContainer.ComponentsConfiguration	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change	
ImageContainer.CompressedBitsPerPixel	The PMT metadata object value will change based on the compression mode applied to the saved image. Therefore, the value will change or remain the same.	The PMT metadata object will change based on the compression mode applied to the saved image. Therefore, the value will change or remain the same.	The PMT metadata object value will change based on the compression mode applied to the saved image. Therefore, the value will change or remain the same.	The PMT metadata object value will change based on the compression mode applied to the saved image. Therefore, the value will change or remain the same.	The PMT metadata object value will change based on the compression mode applied to the saved image. Therefore, the value will change or remain the same.	The PMT metadata object value will change based on the compression mode applied to the saved image. Therefore, the value will change or remain the same.	The PMT metadata object value will change based on the compression mode applied to the saved image. Therefore, the value will change or remain the same.	The PMT metadata object value will change based on the compression mode applied to the saved image. Therefore, the value will change or remain the same.	The PMT metadata object value will change based on the compression mode applied to the saved image. Therefore, the value will change or remain the same.	The PMT metadata object value will change based on the compression mode applied to the saved image. Therefore, the value will change or remain the same.	The PMT metadata object value will change based on the compression mode applied to the saved image. Therefore, the value will change or remain the same.	The PMT metadata object value will change based on the compression mode applied to the saved image. Therefore, the value will change or remain the same.
CaptureConditions.ShutterSpeedValue	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change	
CaptureConditions.Aperture	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change	
CaptureConditions.Brightness	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	
CaptureConditions.ExposureBias	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	
CaptureConditions.MaxApertureValue	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	

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PMT Metadata Object Name	Rotation (90 degrees)	Exposure Adjustment	Brightness/ Contrast adjustment	Sharpen	Trim or Crop	Red Eye Removal	Backlight	Flash in face	White Balance	Sepia	Image Outline
CaptureConditions.SubjectDistance	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
CaptureConditions.MeteringMode	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
CaptureConditions.LightSource	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
CaptureConditions.Flash.Flash	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
CaptureConditions.FocalLength	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
SceneContent.SubjectArea	Update the value of the PMT metadata object to reflect the new subject location.	No Change	No Change	No Change	Update the value of the PMT metadata object to reflect the new subject location..	No Change	No Change	No Change	No Change	No Change	No Change
CaptureDevice.MakerNotes	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
SceneContent.UserComment.UserComment.	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
ImageContainer.FlashPixVersion	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
ImageContainer.ColorSpaceInformation	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
ImageContainer.ActualImageWidth	Update the value of the PMT metadata object. See Note 2	No Change	No Change	No change	Update the value of the PMT metadata object. See Note 3	No Change	No Change	No Change	No Change	No Change	No Change
ImageContainer.ActualImageHeight	Update the value of the PMT metadata object. See Note 4	No Change	No Change	No change	Update the value of the PMT metadata object. See Note 5	No change	No change	No change	No change	No change	No change
SceneContent.RelatedSoundFile	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
CaptureConditions.Flash.Energy	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
CaptureDevice.SpatialFrequencyResponse	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
CaptureDevice.FocalPlaneXResolution	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
CaptureDevice.FocalPlaneY-Resolution	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
CaptureDevice.FocalPlaneResolutionUnit	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
SceneContent.SubjectLocation	Update the PMT object values to indicate the	No Change	No Change	No Change	Update the PMT object values to indicate the	No Change	No change	No change	No change	No change	No change

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<u>PMT Metadata Object Name</u>	Rotation (90 degrees)	Exposure Adjustment	Brightness/ Contrast adjustment	Sharpen	Trim or Crop	Red Eye Removal	Backlight	Flash in face	White Balance	Sepia	Image Outline
	subject location.				subject location.						
CaptureConditions.ExposureIndex	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
CaptureConditions.SensingMethod	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
DigitalProcess.FileSource	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
SceneContent.SceneType	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
CaptureDevice.CFAPattern	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
CaptureConditions.SubjectArea	Update the PMT object values to indicate the subject area.	No Change	No Change	No Change	Update the PMT object values to indicate the subject area.	No Change	No change	No change	No change	No change	No change
CaptureConditions.CustomRendered (see row below) If CaptureConditions.CustomRendered=0 Then	No change	Update the value to 1 that reflects special processing has been applied to the image.	Update the value to 1 that reflects special processing has been applied to the image.	Update the value to 1 that reflects special processing has been applied to the image.	No change	Update the value to 1 if the size of the effected area is significant otherwise no change to the value.	Update the value to 1 that reflects special processing has been applied to the image.	Update the value to 1 that reflects special processing has been applied to the image.	Update the value to 1 that reflects special processing has been applied to the image.	Update the value to 1 that reflects special processing has been applied to the image.	Update the value to 1 that reflects special processing has been applied to the image.
CaptureConditions.CustomRendered (see row above) If CaptureConditions.CustomRendered=1 Then	No Change	No Change. Preferably this edit function should not be conducted.	No Change. Preferably this edit function should not be conducted.	No Change. Preferably this edit function should not be conducted.	No Change	No Change.	No Change. Preferably this edit function should not be conducted.	No Change. Preferably this edit function should not be conducted.	No Change. Preferably this edit function should not be conducted.	No Change. Preferably this edit function should not be conducted.	No Change. Preferably this edit function should not be conducted.
ExposureMode	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
WhiteBalance	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
DigitalZoomRatio	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
FocalLengthIn35mmFilm	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change

PMT Metadata Object Name	Rotation (90 degrees)	Exposure Adjustment	Brightness/Contrast adjustment	Sharpen	Trim or Crop	Red Eye Removal	Backlight	Flash in face	White Balance	Sepia	Image Outline
SceneCaptureType	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
GainControl	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
Contrast	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
Saturation	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
Sharpness	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
DeviceSettingDescription	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
SubjectDistanceRange	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
ImageUniqueID	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change

Note 2: The PixelXDimension (width) equals PixelYDimension (height) value before the rotate 90 degree operation

Note 3: The PixelXDimension (width) equals the number of pixels in the width of the trimmed or cropped image

Note 4: The PixelYDimension (height) equals PixelXDimension (width) value before the rotate 90 degree operation

Note 5: The PixelYDimension (height) equals the number of pixels in the height of the trimmed or cropped image

3.2.1. APP1, Exif IFD, Interoperability IFD

<u>PMT Metadata Object Name</u>	Rotation (90 degrees)	Exposure Adjustment	Brightness/ Contrast adjustment	Sharpen	Trim or Crop	Red Eye Removal	Backlight	Flash in face	White Balance	Sepia	Image Outline
ImageContainer.Interoperability.Index	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
ImageContainer.Interoperability.Version	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change

3.3. APP1, GPS Info IFD, Primary Image

<u>PMT Metadata Object Name</u>	Rotation (90 degrees)	Exposure Adjustment	Brightness/ Contrast adjustment	Sharpen	Trim or Crop	Red Eye Removal	Backlight	Flash in face	White Balance	Sepia	Image Outline
SceneContent.GPS.VersionID	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
SceneContent.GPS.LatitudeRef	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
SceneContent.GPS.Latitude	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
SceneContent.GPS.LongitudeRef	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
SceneContent.GPS.Longitude	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
SceneContent.GPS.AltitudeRef	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
SceneContent.GPS.Altitude	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
SceneContent.GPS.TimeStamp	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
SceneContent.GPS.MeasureMode	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
SceneContent.GPS.Satellites	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
SceneContent.GPS.MeasureMode	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
SceneContent.GPS.DOP	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
SceneContent.GPS.SpeedRef	No Change	No Change	No Change	No Change	No Change	No Change	No change	No change	No change	No change	No change
SceneContent.GPS.Speed	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
SceneContent.GPS.TrackRef	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
SceneContent.GPS.Track	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
SceneContent.GPS.ImgDirectionRef	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
SceneContent.GPS.ImgDirection	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
SceneContent.GPS.MapDatum	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
SceneContent.GPS.DestLatitudeRef	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
SceneContent.GPS.DestLatitude	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
SceneContent.GPS.DestLongitudeRef	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
SceneContent.GPS.DestLongitude	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
SceneContent.GPS.DestBearingRef	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
SceneContent.GPS.DestBearing	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
SceneContent.GPS.DestDistanceRef	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
SceneContent.GPSDestDistance	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
SceneContent.GPS.ProcessingMethod	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
SceneContent.GPS.AreaInformation	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
SceneContent.GPS.DateStamp	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change

Eastman Kodak Company

<u>PMT Metadata Object Name</u>	Rotation (90 degrees)	Exposure Adjustment	Brightness/ Contrast adjustment	Sharpen	Trim or Crop	Red Eye Removal	Backlight	Flash in face	White Balance	Sepia	Image Outline
SceneContent.GPS.Differential	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change

3.4. APP1, 1st IFD, Compressed Thumbnail Metadata

PMT Metadata Object Name	Rotation (90 degrees)	Exposure Adjustment	Brightness/Contrast adjustment	Sharpen	Trim or Crop	Red Eye Removal	Backlight	Flash in face	White Balance	Sepia	Image Outline
ImageContainer.Thumbnail.Compression	No Change, set to 6	No Change, set to 6	No Change, set to 6	No Change, set to 6	No Change, set to 6	No Change, set to 6	No Change, set to 6	No Change, set to 6	No Change, set to 6	No Change, set to 6	No Change, set to 6
ImageContainer.Thumbnail.Orientation	No Change set to 1	No Change set to 1	No Change set to 1	No Change set to 1	No Change set to 1	No Change set to 1	No Change set to 1	No Change set to 1	No Change set to 1	No Change set to 1	No Change set to 1
ImageContainer.Thumbnail.DisplayXResolution	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
ImageContainer.Thumbnail.DisplayYResolution	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
ImageContainer.Thumbnail.DisplayResolutionUnit	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
ImageContainer.Thumbnail.OffsetToJPEGSOI	This PMT metadata object is read only. The Exif tool kit will manage writing this information . Note a new JPEG thumbnail must be generated that reflects the current primary image.	This PMT metadata object is read only. The Exif tool kit will manage writing this information. Note a new JPEG thumbnail must be generated that reflects the current primary image.	This PMT metadata object is read only. The Exif tool kit will manage writing this information . Note a new JPEG thumbnail must be generated that reflects the current primary image.	This PMT metadata object is read only. The Exif tool kit will manage writing this information . Note a new JPEG thumbnail must be generated that reflects the current primary image.	This PMT metadata object is read only. The Exif tool kit will manage writing this information . Note a new JPEG thumbnail must be generated that reflects the current primary image.	This PMT metadata object is read only. The Exif tool kit will manage writing this information . Note a new JPEG thumbnail must be generated that reflects the current primary image.	This PMT metadata object is read only. The Exif tool kit will manage writing this information . Note a new JPEG thumbnail must be generated that reflects the current primary image.	This PMT metadata object is read only. The Exif tool kit will manage writing this information . Note a new JPEG thumbnail must be generated that reflects the current primary image.	This PMT metadata object is read only. The Exif tool kit will manage writing this information . Note a new JPEG thumbnail must be generated that reflects the current primary image.	This PMT metadata object is read only. The Exif tool kit will manage writing this information . Note a new JPEG thumbnail must be generated that reflects the current primary image.	This PMT metadata object is read only. The Exif tool kit will manage writing this information . Note a new JPEG thumbnail must be generated that reflects the current primary image.

PMT Metadata Object Name	Rotation (90 degrees)	Exposure Adjustment	Brightness/ Contrast adjustment	Sharpen	Trim or Crop	Red Eye Removal	Backlight	Flash in face	White Balance	Sepia	Image Outline
ImageContainer.Thumbnail.BytesOfJPEGData	This PMT metadata object is read only. The Exif tool kit will manage writing this information . Note a new JPEG thumbnail must be generated that reflects the current primary image.	This PMT metadata object is read only. The Exif tool kit will manage writing this information. Note a new JPEG thumbnail must be generated that reflects the current primary image.	This PMT metadata object is read only. The Exif tool kit will manage writing this information . Note a new JPEG thumbnail must be generated that reflects the current primary image.	This PMT metadata object is read only. The Exif tool kit will manage writing this information . Note a new JPEG thumbnail must be generated that reflects the current primary image.	This PMT metadata object is read only. The Exif tool kit will manage writing this information . Note a new JPEG thumbnail must be generated that reflects the current primary image.	This PMT metadata object is read only. The Exif tool kit will manage writing this information . Note a new JPEG thumbnail must be generated that reflects the current primary image.	This PMT metadata object is read only. The Exif tool kit will manage writing this information . Note a new JPEG thumbnail must be generated that reflects the current primary image.	This PMT metadata object is read only. The Exif tool kit will manage writing this information . Note a new JPEG thumbnail must be generated that reflects the current primary image.	This PMT metadata object is read only. The Exif tool kit will manage writing this information . Note a new JPEG thumbnail must be generated that reflects the current primary image.	This PMT metadata object is read only. The Exif tool kit will manage writing this information . Note a new JPEG thumbnail must be generated that reflects the current primary image.	This PMT metadata object is read only. The Exif tool kit will manage writing this information . Note a new JPEG thumbnail must be generated that reflects the current primary image.
ImageContainer.Thumbnail.YcbCrCoefficients	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
ImageContainer.Thumbnail.YCbCrPositioning	No Change set to 1, centered, assumed Y:Cb:Cr=4:2:0 sampling	No Change set to 1, centered, assumed Y:Cb:Cr=4:2:0 sampling	No Change set to 1, centered, assumed Y:Cb:Cr=4:2:0 sampling	No Change set to 1, centered, assumed Y:Cb:Cr=4:2:0 sampling	No Change set to 1, centered, assumed Y:Cb:Cr=4:2:0 sampling	No Change set to 1, centered, assumed Y:Cb:Cr=4:2:0 sampling	No Change set to 1, centered, assumed Y:Cb:Cr=4:2:0 sampling	No Change set to 1, centered, assumed Y:Cb:Cr=4:2:0 sampling	No Change set to 1, centered, assumed Y:Cb:Cr=4:2:0 sampling	No Change set to 1, centered, assumed Y:Cb:Cr=4:2:0 sampling	No Change set to 1, centered, assumed Y:Cb:Cr=4:2:0 sampling

3.5. APP3, 0th IFD, Additional Metadata Items

PMT Metadata Object Name	Rotation (90 degrees)	Exposure Adjustment	Brightness/ Contrast adjustment	Sharpen	Trim or Crop	Red Eye Removal	Backlight	Flash in face	White Balance	Sepia	Image Outline
CaptureDevice.FilmProductCode	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
DigitalProcess.ImageSourceEK	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
CaptureConditions.PAR	No Change	No Change	No Change	No Change	Update PMT metadata object value. The value will be set to 0, the complete image is displayed. Therefore the PMT object value will change or remain the same	No Change	No Change	No Change	No Change	No Change	No Change
CaptureDevice.CameraOwner.EK	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
CaptureDevice.SerialNumber.Camera	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
SceneContent.GroupCaption.UserSelectGroupTitle	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
OutputOrder.Information.DealerIDNumber	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
CaptureDevice.FID	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
OutputOrder.Information.EnvelopeNumber	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
OutputOrder.SimpleRenderInst.FrameNumber	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
CaptureDevice.FilmCategory	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
CaptureDevice.FilmGencode	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
CaptureDevice.Scanner.ModelAndVersion	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
CaptureDevice.FilmSize	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change

PMT Metadata Object Name	Rotation (90 degrees)	Exposure Adjustment	Brightness/Contrast adjustment	Sharpen	Trim or Crop	Red Eye Removal	Backlight	Flash in face	White Balance	Sepia	Image Outline
DigitalProcess.ImageRotationStatus	Update the PMT metadata Object value. The value of the PMT Metadata Object must be set to 1, image rotated based on user input. Therefore the value will change or remain the same.	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
DigitalProcess.RollGuid	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
ImageContainer.MetadataNumber	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
DigitalProcess.History.EditTagArray	Update PMT metadata object value. Therefore, the value will change or remain the same. If the PMT metadata object does not exist then add the object. See Note 6 for details.	Update PMT metadata object value. Therefore, the value will change or remain the same. If the PMT metadata object does not exist then add the object. See Note 7 for details.	Update PMT metadata object value. Therefore, the value will change or remain the same. If the PMT metadata object does not exist then add the object. See Note 7 for details.	Update PMT metadata object value. Therefore, the value will change or remain the same. If the PMT metadata object does not exist then add the object. See Note 8 for details.	Update PMT metadata object value. Therefore, the value will change or remain the same. If the PMT metadata object does not exist then add the object. See Note 9 for details.	Update PMT metadata object value. Therefore, the value will change or remain the same. If the PMT metadata object does not exist then add the object. See Note 10 for details.	Update PMT metadata object value. Therefore, the value will change or remain the same. If the PMT metadata object does not exist then add the object. See Note 12 for details.	Update PMT metadata object value. Therefore, the value will change or remain the same. If the PMT metadata object does not exist then add the object. See Note 12 for details.	Update PMT metadata object value. Therefore, the value will change or remain the same. If the PMT metadata object does not exist then add the object. See Note 7 for details.	Update PMT metadata object value. Therefore, the value will change or remain the same. If the PMT metadata object does not exist then add the object. See Note 7 for details.	Update PMT metadata object value. Therefore, the value will change or remain the same. If the PMT metadata object does not exist then add the object. See Note 11 for details.

PMT Metadata Object Name	Rotation (90 degrees)	Exposure Adjustment	Brightness/ Contrast adjustment	Sharpen	Trim or Crop	Red Eye Removal	Backlight	Flash in face	White Balance	Sepia	Image Outline
CaptureConditions.Magnification	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change

Note 6: Add 3, Image rotated, to the Edit Tag Array according to the rules defined in the tag definition. See Appendix A

Note 7: Add 4, Global tone/color adjustment applied. e.g., color balance, contrast adjust, density adjust, etc., to the Edit Tag Array according to the rules defined in the tag definition. See Appendix A

Note 8: Add 5, Global spatial adjustment applied e.g., sharpening, extreme compression, substantial subsampling, blur, noise suppression, etc., to the Edit Tag Array according to the rules defined in the tag definition. See Appendix A

Note 9: Add 2, Image cropped, to the Edit Tag Array according to the rules defined in the tag definition. See Appendix A

Note 10: Add 6, Image retouched e.g., redevy, scratch removal, to the Edit Tag Array according to the rules defined in the tag definition. See Appendix A

Note 11: Add 7, Extensive pixel edit, to the Edit Tag Array according to the rules defined in the tag definition. See Appendix A

Note 12: Add based on the implementation either 4, Global tone/color adjustment applied, or 9, Regional tone/color adjustment applied. e.g., digital "dodge & burn" operation, selective color adjustment, etc., to the Edit Tag Array according to the rules defined in the tag definition. See Appendix A

Note 13: Add 8, Image composited with another image or background, or graphics and/or text added, to the Edit Tag Array according to the rules defined in the tag definition. See Appendix A

Appendix A. Editing Tag Array IFD Entry

The Edit Tags are designed to help manage the maintenance issues associated with metadata as different operations that modify or edit an image are applied. The array contains a summary of the edit operations and therefore only one occurrence of each defined edit functions will be stored in the array. The values of the array are enumerated in the following manner:

1. Digital image created
2. Image cropped
3. Image rotated
4. Global tone/color adjustment applied. e.g., color balance, contrast adjust, density adjust, etc.
5. Global spatial adjustment applied e.g., sharpening, extreme compression , substantial subsampling, blur, noise suppression, etc.
6. Image retouched e.g., redevy, scratch removal
7. Pixels edited extensively, significantly changing the captured scene content. e.g., object removal, image warping or morphing operations
8. Image composited with another image or background, or graphics and/or text added
9. Regional tone/color adjustment applied. e.g., digital "dodge & burn" operation, selective color adjustment, etc.
- 0, 10 - 65535 Reserved for future edit functional definitions

The array's maximum size is the number of defined edit functions, currently nine. The originating system that creates the image will store one element that represents the fact that the digital image has been created (1). Note, there will be only one occurrence of each defined edit function in the Tag Array. Image editing software packages will be responsible for build the summary list of edit operations that have been applied to the image and storing the results in this IFD. The summary of edit functions includes past and current edit activities.

Application Segment	=	APP3
Tag Field	=	50022
Type Field	=	SHORT
Count Field	=	1 to the number of defined edit functions
Value / Offset Field	=	When there are less then 2 elements in the array the values will be stored. If there are more then 2 elements then an Offset to the Editing Tag Array is stored