Sustainability of Digital Formats: Planning for Library of Congress Collections

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Introduction
The flexible and extensible TIFF format has provided long service for digital imaging. TIFF files declare and describe their content by means of *tags* in the header and in Image File Directories (IFDs) within the file. Tags can indicate the basic geometry of the image, define how the image data is arranged, and indicate such facts as whether one or another image compression option has been used. TIFF tags defined by the 1992 TIFF 6.0 specification fall in the first two source categories listed below: *baseline* and *extended*. The specification also established procedures for further extension, and this has led to the establishment of tags in the two additional categories: *private* and *private IFD*. Some of the private and private IFD tags have been codified in additional specifications: TIFF/EP (ISO 12234-2, 2001), TIFF/IT (ISO 12639, 2004), DNG, and EXIF_2_2, discussed in the private IFD section below. Although the format description for DNG at this Web site (at the time of writing) describes version 1.1 (DNG_1_1; published by Adobe in 2005), the tag list below includes new tags added in DNG versions 1.2, 1.3, and 1.4 (2012).

Although not a true TIFF implementation, Windows Media Photo/HD Photo (WMP_1_0; now standardized as JPEG XR, ISO/IEC 29199-2:2012) employs a container format that borrows heavily from TIFF and adds a few new tags of interest, further extending the tag set in at least an informal sense. There are other proprietary or industry specifications that continue to extend TIFF, e.g., GeoTIFF_1_0, HylaFAX, and the Molecular Dynamics GEL format, and some of these tags have been folded into the table and identified in the short definitions or notes.

The TIFF specification requires that tags be encoded in numerical order and that is the sequence used in the table below. The GPS and interoperability tags appear to employ separate numerical series and they have been omitted from the table; comments welcome. The fifth column in the table indicates the *source* for each tag, and these sources are described below. The table and the data it contains owe a great debt to the AWare Systems Web site. Many references in these tables are linked to additional information provided at the AWare site. Interested persons may also wish to consult Ross Finlayson's TIFF Web page, available through Internet Archive.

Sources for tag specifications

• **TIFF Baseline**. The *baseline* set of tags were documented in TIFF 5.0 and carried over on pages 11-47 of the 1992 TIFF 6.0 specification.

• **TIFF Extended**. The *extended* set includes some additional tags and added values for existing tags, as documented on pages 48-115 of the TIFF 6.0 specification.

• **TIFF Private**. Originally, the term *private* meant just that. The TIFF 6.0 specification (page 8) states, "An organization might wish to store information meaningful to only that organization . . . . Tags numbered 32768 or higher, sometimes called private tags, are reserved for that purpose. Upon request, the TIFF administrator . . . will allocate and register one or more private tags for an organization . . . . You do not need to tell the TIFF administrator what you plan to use them for, but giving us this information may help other developers to avoid some duplication of effort." Over time, however, many private tags have become well established and well documented, e.g., tag 34675 for the ICC profile, dubbed *InterColorProfile* in the TIFF/EP standard. Thus, many members of the private tag class can be viewed as open *extensions* rather than as containers for secret information.

• **TIFF/EP**, **TIFF/IT**, and **DNG**. A number of tags, some of which may once have been "private," have been defined in TIFF/EP (ISO 12234-2, 2001), TIFF/IT (ISO 12639, 2004), and DNG_1_1, an Adobe-sponsored extension of the TIFF 6.0 specification. As noted above, although this Web site's most recent description for DNG is version 1.1 (specfication published 2005), this tag list includes new tags added in versions 1.2, 1.3, and 1.4.

• **TIFF Private IFD** The TIFF 6.0 specification (page 9) states, "If you need more than 10 tags, we suggest that you reserve a single private tag, define it as a LONG TIFF data type, and use its value as a pointer (offset) to a

private IFD [image file directory] or other data structure of your choosing. Within that IFD, you can use whatever tags you want, since no one else will know that it is an IFD unless you tell them." As with *private tags*, we can understand *private IFDs* as an extension to TIFF, often very public and well documented.

The private IFD tags of greatest interest to the Library of Congress are those associated with the EXIF_2_2 specification, pertaining to image generation by digital still cameras. Exif is an abbreviation for *EXchangeable Image File format*, although Exif does not relate to TIFF as, say, JFIF relates to JPEG_DCT. The Exif IFD is pointed to by the Private Exif IFD tag 34665. This and other Exif tags are listed in the numerical table below.

For links to Exif specifications and other related information, see EXIF_2_2. The Exif standard established three private IFDs, and tags from the main Exif IFD are included in the list below. Tags for the other two Exif IFDs are listed at the Aware Web site: GPS IFD, for positioning information, and Interoperability IFD, used to encode compability information. With numerical sequences of their own, the GPS and Interoperability tags are not included in the table below. A third-party listing of all Exif tags is available from Exiv2.

• **HD Photo tags.** Although not a true TIFF implementation, Windows Media Photo/HD Photo (WMP_1_0; now standardized as JPEG XR, ISO/IEC 29199-2:2012) employs a container format that borrows from TIFF and adds a few new tags of interest, further extending the tag set in at least an informal sense.

Tags in Numerical Order

Code		Name	Short description	Source of tag	Note
Dec	**Hex**				
254	00FE	NewSubfileType	A general indication of the kind of data contained in this subfile.	Baseline	Usage rule in JHOVE TIFF module. Mandatory for TIFF/EP.
255	00FF	SubfileType	A general indication of the kind of data contained in this subfile.	Baseline	
256	0100	ImageWidth	The number of columns in the image, i.e., the number of pixels per row.	Baseline	Mandatory for TIFF 6.0 classes B, G, P, R, and Y.[1] Mandatory for TIFF/EP. Mandatory for primary TIFF IFD in Exif. (Note that for JPEG compressed data, a JPEG marker is used instead of this tag. See JEITA CP-3451: Exif 2.2.)
257	0101	ImageLength	The number of rows of pixels in the image.	Baseline	Mandatory for TIFF 6.0 classes B, G, P, R, and Y.[1] Mandatory for TIFF/EP. Mandatory for primary TIFF IFD in Exif. (Note that for JPEG compressed data, a JPEG marker is used instead of this tag. See JEITA CP-3451: Exif

					2.2.)
258	0102	BitsPerSample	Number of bits per component.	Baseline	Mandatory for TIFF 6.0 classes G, P, R, and Y.[1] Mandatory for TIFF/EP. Mandatory for primary TIFF IFD in Exif. (Note that for JPEG compressed data, a JPEG marker is used instead of this tag. See JEITA CP-3451: Exif 2.2.) Required by DLF benchmark guidelines (available via Internet Archive).
259	0103	Compression	Compression scheme used on the image data.	Baseline	Sample values: 1=uncompressed and 4=CCITT Group 4. Mandatory for TIFF 6.0 classes B, G, P, R, and Y.[1] Mandatory for TIFF/EP. Mandatory for primary TIFF IFD in Exif. (Note that this tag is omitted when primary image is JPEG compressed. See JEITA CP-3451: Exif 2.2.) Required by DLF benchmark guidelines (available via Internet Archive).
262	0106	PhotometricInterpretation	The color space of the image data.	Baseline	Sample values: 1=black is zero and 2=RGB. Document also states "RGB is assumed to be sRGB; if RGB, an ICC profile should be present in the 34675 tag." Mandatory for TIFF 6.0 classes

					B, G, P, R, and Y.[1] Mandatory for TIFF/EP. Mandatory for [GeoTIFF_1_0](#). Mandatory for primary TIFF IFD in Exif. (Note that for JPEG compressed data, a JPEG marker is used instead of this tag. See [JEITA CP-3451: Exif 2.2](#).) Required by [DLF benchmark guidelines (available via Internet Archive).](#)
263	0107	[Threshholding](#)	For black and white TIFF files that represent shades of gray, the technique used to convert from gray to black and white pixels.	Baseline	Usage rule in JHOVE [TIFF module](#).
264	0108	[CellWidth](#)	The width of the dithering or halftoning matrix used to create a dithered or halftoned bilevel file.	Baseline	
265	0109	[CellLength](#)	The length of the dithering or halftoning matrix used to create a dithered or halftoned bilevel file.	Baseline	Usage rule in JHOVE [TIFF module](#).
266	010A	[FillOrder](#)	The logical order of bits within a byte.	Baseline	
269	010D	[DocumentName](#)	The name of the document from which this image was scanned.	Extended	Also used by HD Photo.
270	010E	[ImageDescription](#)	A string that describes the subject of the image.	Baseline	Also used by HD Photo
271	010F	[Make](#)	The scanner manufacturer.	Baseline	Also used by HD Photo. Mandatory for TIFF/EP.
272	0110	[Model](#)	The scanner model name or number.	Baseline	Also used by HD Photo. Mandatory for TIFF/EP.
273	0111	[StripOffsets](#)	For each strip, the byte offset of that strip.	Baseline	Mandatory for TIFF 6.0 classes B, G, P, R, and Y.[1] (Files outside of these classes may use tiles and tags 322, 323, 324, and 325; [Comments welcome](#).)

					Mandatory in TIFF/EP for stripped images. For Exif, mandatory in primary TIFF IFD.
274	0112	Orientation	The orientation of the image with respect to the rows and columns.	Baseline	Mandatory for TIFF/EP.
277	0115	SamplesPerPixel	The number of components per pixel.	Baseline	Mandatory for TIFF 6.0 classes R and Y.[1] For Exif, mandatory in primary TIFF IFD. Required by DLF benchmark guidelines
278	0116	RowsPerStrip	The number of rows per strip.	Baseline	Mandatory for TIFF 6.0 classes B, G, P, R, and Y.[1] (Files outside of these classes may use tiles and tags 322, 323, 324, and 325; Comments welcome.) Mandatory in TIFF/EP for stripped images. For Exif, mandatory in primary TIFF IFD.
279	0117	StripByteCounts	For each strip, the number of bytes in the strip after compression.	Baseline	Mandatory for TIFF 6.0 classes B, G, P, R, and Y.[1] (Files outside of these classes may use tiles and tags 322, 323, 324, and 325; Comments welcome.) Mandatory in TIFF/EP for stripped images. For Exif, mandatory in primary TIFF IFD.
280	0118	MinSampleValue	The minimum component value used.	Baseline	
281	0119	MaxSampleValue	The maximum component value used.	Baseline	
282	011A	XResolution	The number of pixels per ResolutionUnit in the ImageWidth direction.	Baseline	Xresolution is a Rational; ImageWidth (Tag

					256) is the numerator and the length of the source (measured in the units specified in ResolutionUnit (Tag 296)) is the denominator. Mandatory for TIFF 6.0 classes B, G, P, R, and Y.[1] Mandatory for TIFF/EP. For Exif, mandatory in primary TIFF IFD. Required by [DLF benchmark guidelines (available through Internet Archive).](#)
283	011B	YResolution	The number of pixels per ResolutionUnit in the ImageLength direction.	Baseline	Mandatory for TIFF 6.0 classes B, G, P, R, and Y.[1] Mandatory for TIFF/EP. For Exif, mandatory in primary TIFF IFD. Required by [DLF benchmark guidelines (available through Internet Archive).](#)
284	011C	PlanarConfiguration	How the components of each pixel are stored.	Baseline	Mandatory for TIFF/EP.
285	011D	PageName	The name of the page from which this image was scanned.	Extended	Also used by HD Photo
286	011E	XPosition	X position of the image.	Extended	
287	011F	YPosition	Y position of the image.	Extended	
288	0120	FreeOffsets	For each string of contiguous unused bytes in a TIFF file, the byte offset of the string.	Baseline	
289	0121	FreeByteCounts	For each string of contiguous unused bytes in a TIFF file, the number of bytes in the string.	Baseline	
290	0122	GrayResponseUnit	The precision of the information contained in the GrayResponseCurve.	Baseline	
291	0123	GrayResponseCurve	For grayscale data, the optical density of each possible pixel value.	Baseline	
292	0124	T4Options	Options for Group 3 Fax compression	Extended	

293	0125	T6Options	Options for Group 4 Fax compression	Extended	
296	0128	ResolutionUnit	The unit of measurement for XResolution and YResolution.	Baseline	Mandatory for TIFF 6.0 classes B, G, P, R, and Y.[1] Mandatory for TIFF/EP. For Exif, mandatory in primary TIFF IFD.
297	0129	PageNumber	The page number of the page from which this image was scanned.	Extended	Also used by HD Photo
301	012D	TransferFunction	Describes a transfer function for the image in tabular style.	Extended	
305	0131	Software	Name and version number of the software package(s) used to create the image.	Baseline	Also used by HD Photo. Mandatory for TIFF/EP.
306	0132	DateTime	Date and time of image creation.	Baseline	Also used by HD Photo. Usage rule in JHOVE TIFF module. Mandatory for TIFF/EP.
315	013B	Artist	Person who created the image.	Baseline	Also used by HD Photo
316	013C	HostComputer	The computer and/or operating system in use at the time of image creation.	Baseline	Also used by HD Photo
317	013D	Predictor	A mathematical operator that is applied to the image data before an encoding scheme is applied.	Extended	
318	013E	WhitePoint	The chromaticity of the white point of the image.	Extended	
319	013F	PrimaryChromaticities	The chromaticities of the primaries of the image.	Extended	
320	0140	ColorMap	A color map for palette color images.	Baseline	Mandatory for TIFF 6.0 class P.[1]
321	0141	HalftoneHints	Conveys to the halftone function the range of gray levels within a colorimetrically-specified image that should retain tonal detail.	Extended	
322	0142	TileWidth	The tile width in pixels. This is the number of columns in each tile.	Extended	Mandatory for TIFF 6.0 files that use tiles. (Files that use strips employ tags 273, 278, and 279.) Mandatory in TIFF/EP for tiled images.

323	0143	TileLength	The tile length (height) in pixels. This is the number of rows in each tile.	Extended	Referenced in JHOVE TIFF module for files that use tiles. (Files that use strips employ tags 273, 278, and 279.) Mandatory in TIFF/EP for tiled images.
324	0144	TileOffsets	For each tile, the byte offset of that tile, as compressed and stored on disk.	Extended	Mandatory for TIFF 6.0 files that use tiles. (Files that use strips employ tags 273, 278, and 279.) Mandatory in TIFF/EP for tiled images.
325	0145	TileByteCounts	For each tile, the number of (compressed) bytes in that tile.	Extended	Mandatory for TIFF 6.0 files that use tiles. (Files that use strips employ tags 273, 278, and 279.) Mandatory in TIFF/EP for tiled images.
326	0146	BadFaxLines	Used in the TIFF-F standard, denotes the number of 'bad' scan lines encountered by the facsimile device.	Extended	
327	0147	CleanFaxData	Used in the TIFF-F standard, indicates if 'bad' lines encountered during reception are stored in the data, or if 'bad' lines have been replaced by the receiver.	Extended	
328	0148	ConsecutiveBadFaxLines	Used in the TIFF-F standard, denotes the maximum number of consecutive 'bad' scanlines received.	Extended	
330	014A	SubIFDs	Offset to child IFDs.	Extended	
332	014C	InkSet	The set of inks used in a separated (PhotometricInterpretation=5) image.	Extended	
333	014D	InkNames	The name of each ink used in a separated image.	Extended	
334	014E	NumberOfInks	The number of inks.	Extended	
336	0150	DotRange	The component values that correspond to a 0% dot and 100% dot.	Extended	Usage rule in JHOVE TIFF module.
337	0151	TargetPrinter	A description of the printing environment for which this separation is intended.	Extended	
338	0152	ExtraSamples	Description of extra components.	Baseline	
339	0153	SampleFormat	Specifies how to interpret each data sample in a pixel.	Extended	

340	0154	SMinSampleValue	Specifies the minimum sample value.	Extended	
341	0155	SMaxSampleValue	Specifies the maximum sample value.	Extended	
342	0156	TransferRange	Expands the range of the TransferFunction.	Extended	
343	0157	ClipPath	Mirrors the essentials of PostScript's path creation functionality.	Extended	Usage rule in JHOVE TIFF module.
344	0158	XClipPathUnits	The number of units that span the width of the image, in terms of integer ClipPath coordinates.	Extended	Usage rule in JHOVE TIFF module.
345	0159	YClipPathUnits	The number of units that span the height of the image, in terms of integer ClipPath coordinates.	Extended	
346	015A	Indexed	Aims to broaden the support for indexed images to include support for any color space.	Extended	
347	015B	JPEGTables	JPEG quantization and/or Huffman tables.	Extended	
351	015F	OPIProxy	OPI-related.	Extended	
400	0190	GlobalParametersIFD	Used in the TIFF-FX standard to point to an IFD containing tags that are globally applicable to the complete TIFF file.	Extended	
401	0191	ProfileType	Used in the TIFF-FX standard, denotes the type of data stored in this file or IFD.	Extended	
402	0192	FaxProfile	Used in the TIFF-FX standard, denotes the 'profile' that applies to this file.	Extended	
403	0193	CodingMethods	Used in the TIFF-FX standard, indicates which coding methods are used in the file.	Extended	
404	0194	VersionYear	Used in the TIFF-FX standard, denotes the year of the standard specified by the FaxProfile field.	Extended	
405	0195	ModeNumber	Used in the TIFF-FX standard, denotes the mode of the standard specified by the FaxProfile field.	Extended	
433	01B1	Decode	Used in the TIFF-F and TIFF-FX standards, holds information about the ITULAB (PhotometricInterpretation = 10) encoding.	Extended	
434	01B2	DefaultImageColor	Defined in the Mixed Raster Content part of RFC 2301, is the default color needed in areas where no image is available.	Extended	
512	0200	JPEGProc	Old-style JPEG compression field. TechNote2 invalidates this part of the specification.	Extended	
513	0201	JPEGInterchangeFormat	Old-style JPEG compression field. TechNote2 invalidates this part of the specification.	Extended	

514	0202	JPEGInterchangeFormatLength	Old-style JPEG compression field. TechNote2 invalidates this part of the specification.	Extended	
515	0203	JPEGRestartInterval	Old-style JPEG compression field. TechNote2 invalidates this part of the specification.	Extended	
517	0205	JPEGLosslessPredictors	Old-style JPEG compression field. TechNote2 invalidates this part of the specification.	Extended	
518	0206	JPEGPointTransforms	Old-style JPEG compression field. TechNote2 invalidates this part of the specification.	Extended	
519	0207	JPEGQTables	Old-style JPEG compression field. TechNote2 invalidates this part of the specification.	Extended	
520	0208	JPEGDCTables	Old-style JPEG compression field. TechNote2 invalidates this part of the specification.	Extended	
521	0209	JPEGACTables	Old-style JPEG compression field. TechNote2 invalidates this part of the specification.	Extended	
529	0211	YCbCrCoefficients	The transformation from RGB to YCbCr image data.	Extended	Mandatory for TIFF/EP YCbCr images.
530	0212	YCbCrSubSampling	Specifies the subsampling factors used for the chrominance components of a YCbCr image.	Extended	Mandatory for TIFF/EP YCbCr images.
531	0213	YCbCrPositioning	Specifies the positioning of subsampled chrominance components relative to luminance samples.	Extended	Mandatory for TIFF/EP YCbCr images.
532	0214	ReferenceBlackWhite	Specifies a pair of headroom and footroom image data values (codes) for each pixel component.	Extended	Mandatory for TIFF 6.0 class Y.[1] Mandatory for TIFF/EP YCbCr images.
559	022F	StripRowCounts	Defined in the Mixed Raster Content part of RFC 2301, used to replace RowsPerStrip for IFDs with variable-sized strips.	Extended	
700	02BC	XMP	XML packet containing XMP metadata	Extended	Also used by HD Photo
18246	4746	Image.Rating	Ratings tag used by Windows	Exif private IFD	
18249	4749	Image.RatingPercent	Ratings tag used by Windows, value as percent	Exif private IFD	
32781	800D	ImageID	OPI-related.	Extended	
32932	80A4	Wang Annotation	Annotation data, as used in 'Imaging for Windows'.	Private	
33421	828D	CFARepeatPatternDim	For camera raw files from sensors with CFA overlay.	TIFF/EP spec, p. 23 Exif private IFD	Mandatory in TIFF/EP for CFA files.

33422	828E	CFAPattern	For camera raw files from sensors with CFA overlay.	TIFF/EP spec, p. 23 Exif private IFD	Mandatory in TIFF/EP for CFA files.
33423	828F	BatteryLevel	Encodes camera battery level at time of image capture.	TIFF/EP spec, p. 45 Exif private IFD	
33432	8298	Copyright	Copyright notice.	Baseline	Also used by HD Photo. Mandatory for TIFF/EP
33434	829A	ExposureTime	Exposure time, given in seconds.	Exif Private IFD TIFF/EP spec, p. 38	
33437	829D	FNumber	The F number.	Exif Private IFD TIFF/EP spec, p. 39	
33445	82A5	MD FileTag	Specifies the pixel data format encoding in the Molecular Dynamics GEL file format.	Private	
33446	82A6	MD ScalePixel	Specifies a scale factor in the Molecular Dynamics GEL file format.	Private	
33447	82A7	MD ColorTable	Used to specify the conversion from 16bit to 8bit in the Molecular Dynamics GEL file format.	Private	
33448	82A8	MD LabName	Name of the lab that scanned this file, as used in the Molecular Dynamics GEL file format.	Private	
33449	82A9	MD SampleInfo	Information about the sample, as used in the Molecular Dynamics GEL file format.	Private	
33450	82AA	MD PrepDate	Date the sample was prepared, as used in the Molecular Dynamics GEL file format.	Private	
33451	82AB	MD PrepTime	Time the sample was prepared, as used in the Molecular Dynamics GEL file format.	Private	
33452	82AC	MD FileUnits	Units for data in this file, as used in the Molecular Dynamics GEL file format.	Private	
33550	830E	ModelPixelScaleTag	Used in interchangeable GeoTIFF_1_0 files.	Private	

33723	83BB	[IPTC/NAA](#)	IPTC-NAA (International Press Telecommunications Council-Newspaper Association of America) metadata.	TIFF/EP spec, p. 33	Tag name and values defined by IPTC-NAA Info Interchange Model & Digital Newsphoto Parameter Record. Called *IPTS* at AWare Web site.
33918	847E	[INGR Packet Data Tag](#)	Intergraph Application specific storage.	Private	
33919	847F	[INGR Flag Registers](#)	Intergraph Application specific flags.	Private	
33920	8480	[IrasB Transformation Matrix](#)	Originally part of Intergraph's GeoTIFF tags, but likely understood by IrasB only.	Private	
33922	8482	[ModelTiepointTag](#)	Originally part of Intergraph's GeoTIFF tags, but now used in interchangeable [GeoTIFF_1_0](#) files.	Private	In [GeoTIFF_1_0](#), either this tag or 34264 must be defined, but not both
34016	84E0 [Comments welcome.](#)	Site	Site where image created.	TIFF/IT spec, 7.2.3	Hex value not provided in TIFF/IT spec 7.2.3. Hex value determined by decimal converter tool.
34017	84E1 [Comments welcome.](#)	ColorSequence	Sequence of colors if other than CMYK.	TIFF/IT spec, 7.2.8.3.2	For BP and BL only[2] Hex value not provided in TIFF/IT spec 7.2.8.3.2. Hex value determined by decimal converter tool.
34018	84E2 [Comments welcome.](#)	IT8Header	Certain inherited headers.	TIFF/IT spec, 7.2.3	Obsolete Hex value not provided in TIFF/IT spec 7.2.3. Hex value determined by decimal converter tool.
34019	84E3 [Comments welcome.](#)	RasterPadding	Type of raster padding used, if any.	TIFF/IT spec, 7.2.6	Hex value not provided in TIFF/IT spec 7.2.6. Hex value determined by decimal converter tool.
34020	84E4 [Comments welcome.](#)	BitsPerRunLength	Number of bits for short run length encoding.	TIFF/IT spec, 7.2.6	For LW only[2] Hex value not provided in TIFF/IT spec 7.2.6. Hex value determined by decimal converter tool.

34021	84E5 Comments welcome.	BitsPerExtendedRunLength	Number of bits for long run length encoding.	TIFF/IT spec, 7.2.6	For LW only[2] Hex value not provided in TIFF/IT spec 7.2.6. Hex value determined by decimal converter tool.
34022	84E6 Comments welcome.	ColorTable	Color value in a color pallette.	TIFF/IT spec, 7.2.8.4	For BP and BL only[2] Hex value not provided in TIFF/IT spec 7.2.8.4. Hex value determined by decimal converter tool.
34023	84E7 Comments welcome.	ImageColorIndicator	Indicates if image (foreground) color or transparency is specified.	TIFF/IT spec, 7.2.9	For MP, BP, and BL only[2] Hex value not provided in TIFF/IT spec 7.2.9. Hex value determined by decimal converter tool.
34024	84E8 Comments welcome.	BackgroundColorIndicator	Background color specification.	TIFF/IT spec, 7.2.9	For BP and BL only[2] Hex value not provided in TIFF/IT spec 7.2.9. Hex value determined by decimal converter tool.
34025	84E9 Comments welcome.	ImageColorValue	Specifies image (foreground) color.	TIFF/IT spec, 7.2.8.4	For MP, BP, and BL only[2] Hex value not provided in TIFF/IT spec 7.2.8.4. Hex value determined by decimal converter tool.
34026	84EA Comments welcome.	BackgroundColorValue	Specifies background color.	TIFF/IT spec, 7.2.8.4	For BP and BL only[2] Hex value not provided in TIFF/IT spec 7.2.8.4. Hex value determined by decimal converter tool.
34027	84EB Comments welcome.	PixelIntensityRange	Specifies data values for 0 percent and 100 percent pixel intensity.	TIFF/IT spec, 7.2.8.4	For MP only[2] Hex value not provided in TIFF/IT spec 7.2.8.4. Hex value

					determined by decimal converter tool.
34028	84EC [Comments welcome.](#)	TransparencyIndicator	Specifies if transparency is used in HC file.	TIFF/IT spec, 7.2.8.4	For HC only[2] Hex value not provided in TIFF/IT spec 7.2.8.4. Hex value determined by decimal converter tool.
34029	84ED [Comments welcome.](#)	ColorCharacterization	Specifies ASCII table or other reference per ISO 12641 and ISO 12642.	TIFF/IT spec, 7.2.8.4	Hex value not provided in TIFF/IT spec 7.2.8.4. Hex value determined by decimal converter tool.
34030	84EE [Comments welcome.](#)	HCUsage	Indicates the type of information in an HC file.	TIFF/IT spec, 7.2.6	For HC only[2] Hex value not provided in TIFF/IT spec 7.2.6. Hex value determined by decimal converter tool.
34031	84EF [Comments welcome.](#)	TrapIndicator	Indicates whether or not trapping has been applied to the file.	TIFF/IT spec, 7.2.6	Hex value not provided in TIFF/IT spec 7.2.6. Hex value determined by decimal converter tool.
34032	84F0 [Comments welcome.](#)	CMYKEquivalent	Specifies CMYK equivalent for specific separations.	TIFF/IT spec, 7.2.8.3.4	Hex value not provided in TIFF/IT spec 7.2.8.3.4. Hex value determined by decimal converter tool.
34033	84F1 [Comments welcome.](#)	Reserved	For future TIFF/IT use	TIFF/IT spec	Hex value not provided in TIFF/IT spec. Hex value determined by decimal converter tool.
34034	84F2 [Comments welcome.](#)	Reserved	For future TIFF/IT use	TIFF/IT spec	Hex value not provided in TIFF/IT spec. Hex value determined by decimal converter tool.
34035	84F3 [Comments welcome.](#)	Reserved	For future TIFF/IT use	TIFF/IT spec	Hex value not provided in TIFF/IT spec. Hex value determined by decimal converter tool.

34264	85D8	ModelTransformationTag	Used in interchangeable GeoTIFF_1_0 files.	Private	In GeoTIFF_1_0, either this tag or 33922 must be defined, but not both
34377	8649	Photoshop	Collection of Photoshop 'Image Resource Blocks'.	Private	
34665	8769	Exif IFD	A pointer to the Exif IFD.	Private	Also used by HD Photo. For Exif, mandatory in primary TIFF IFD, if present.
34675	8773	InterColorProfile	ICC profile data.	TIFF/EP spec, p. 47 Exif private IFD	Also called *ICC Profile*. Also used by HD Photo
34732	87AC	ImageLayer	Defined in the Mixed Raster Content part of RFC 2301, used to denote the particular function of this Image in the mixed raster scheme.	Extended	
34735	87AF	GeoKeyDirectoryTag	Used in interchangeable GeoTIFF_1_0 files.	Private	Mandatory in GeoTIFF_1_0
34736	87B0	GeoDoubleParamsTag	Used in interchangeable GeoTIFF_1_0 files.	Private	
34737	87B1	GeoAsciiParamsTag	Used in interchangeable GeoTIFF_1_0 files.	Private	
34850	8822	ExposureProgram	The class of the program used by the camera to set exposure when the picture is taken.	Exif Private IFD TIFF/EP spec, p. 41	
34852	8824	SpectralSensitivity	Indicates the spectral sensitivity of each channel of the camera used.	Exif Private IFD TIFF/EP spec, p. 48	
34853	8825	GPSInfo	A pointer to the Exif-related GPS Info IFD.	TIFF/EP spec, p. 34 Exif private IFD	Also called *GPS IFD*.
34855	8827	ISOSpeedRatings	Indicates the ISO Speed and ISO Latitude of the camera or input device as specified in ISO 12232.	Exif Private IFD TIFF/EP spec, p. 47	

34856	8828	OECF	Indicates the Opto-Electric Conversion Function (OECF) specified in ISO 14524.	Exif Private IFD TIFF/EP spec, p. 48	
34857	8829	Interlace	Indicates the field number of multifield images.	TIFF/EP spec, p. 22 Exif private IFD	
34858	882A	TimeZoneOffset	Encodes time zone of camera clock relative to GMT.	TIFF/EP spec, p. 38 Exif private IFD	
34859	882B	SelfTimeMode	Number of seconds image capture was delayed from button press.	TIFF/EP spec, p. 45 Exif private IFD	
34864	8830	SensitivityType	The SensitivityType tag indicates PhotographicSensitivity tag, which one of the parameters of ISO 12232. Although it is an optional tag, it should be recorded when a PhotographicSensitivity tag is recorded. Value = 4, 5, 6, or 7 may be used in case that the values of plural parameters are the same.	Exif private IFD	
34865	8831	StandardOutputSensitivity	This tag indicates the standard output sensitivity value of a camera or input device defined in ISO 12232. When recording this tag, the PhotographicSensitivity and SensitivityType tags shall also be recorded.	Exif private IFD	
34866	8832	RecommendedExposureIndex	This tag indicates the recommended exposure index value of a camera or input device defined in ISO 12232. When recording this tag, the PhotographicSensitivity and SensitivityType tags shall also be recorded.	Exif private IFD	
34867	8833	ISOSpeed	This tag indicates the ISO speed value of a camera or input device that is defined in ISO 12232. When recording this tag, the PhotographicSensitivity and SensitivityType tags shall also be recorded.	Exif private IFD	
34868	8834	ISOSpeedLatitudeyyy	This tag indicates the ISO speed latitude yyy value of a camera or input device that is defined in ISO 12232. However, this tag shall not be	Exif private IFD	

			recorded without ISOSpeed and ISOSpeedLatitudezzz.		
34869	8835	ISOSpeedLatitudezzz	This tag indicates the ISO speed latitude zzz value of a camera or input device that is defined in ISO 12232. However, this tag shall not be recorded without ISOSpeed and ISOSpeedLatitudeyyy.	Exif private IFD	
34908	885C	HylaFAX FaxRecvParams	Used by HylaFAX.	Private	
34909	885D	HylaFAX FaxSubAddress	Used by HylaFAX.	Private	
34910	885E	HylaFAX FaxRecvTime	Used by HylaFAX.	Private	
36864	9000	ExifVersion	The version of the supported Exif standard.	Exif Private IFD	Mandatory in the Exif IFD.
36867	9003	DateTimeOriginal	The date and time when the original image data was generated.	Exif Private IFD TIFF/EP spec, p. 37	Mandatory for TIFF/EP.
36868	9004	DateTimeDigitized	The date and time when the image was stored as digital data.	Exif Private IFD	
37121	9101	ComponentsConfiguration	Specific to compressed data; specifies the channels and complements PhotometricInterpretation	Exif Private IFD	
37122	9102	CompressedBitsPerPixel	Specific to compressed data; states the compressed bits per pixel.	Exif Private IFD TIFF/EP spec, p. 27	
37377	9201	ShutterSpeedValue	Shutter speed.	Exif Private IFD TIFF/EP spec, p. 39	
37378	9202	ApertureValue	The lens aperture.	Exif Private IFD TIFF/EP spec, p. 39	
37379	9203	BrightnessValue	The value of brightness.	Exif Private IFD TIFF/EP spec, p. 40	
37380	9204	ExposureBiasValue	The exposure bias.	Exif Private IFD TIFF/EP spec, p. 40	

37381	9205	[MaxApertureValue](#)	The smallest F number of the lens.	Exif Private IFD TIFF/EP spec, p. 40	
37382	9206	[SubjectDistance](#)	The distance to the subject, given in meters.	Exif Private IFD TIFF/EP spec, p. 44	
37383	9207	[MeteringMode](#)	The metering mode.	Exif Private IFD TIFF/EP spec, p. 41	
37384	9208	[LightSource](#)	The kind of light source.	Exif Private IFD TIFF/EP spec, p. 46	
37385	9209	[Flash](#)	Indicates the status of flash when the image was shot.	Exif Private IFD TIFF/EP spec, p. 42	
37386	920A	[FocalLength](#)	The actual focal length of the lens, in mm.	Exif Private IFD TIFF/EP spec, p. 44	
37387	920B	FlashEnergy	Amount of flash energy (BCPS).	TIFF/EP spec, p. 43 Exif Private IFD	
37388	920C	SpatialFrequencyResponse	SFR of the camera.	TIFF/EP spec, p. 49 Exif Private IFD	
37389	920D	Noise	Noise measurement values.	TIFF/EP spec, p. 49 Exif Private IFD	
37390	920E	FocalPlaneXResolution	Number of pixels per FocalPlaneResolutionUnit (37392) in ImageWidth direction for main image.	TIFF/EP spec, p. 18 Exif	

				Private IFD	
37391	920F	FocalPlaneYResolution	Number of pixels per FocalPlaneResolutionUnit (37392) in ImageLength direction for main image.	TIFF/EP spec, p. 19 Exif Private IFD	
37392	9210	FocalPlaneResolutionUnit	Unit of measurement for FocalPlaneXResolution(37390) and FocalPlaneYResolution(37391).	TIFF/EP spec, p. 19 Exif Private IFD	
37393	9211	ImageNumber	Number assigned to an image, e.g., in a chained image burst.	TIFF/EP spec, p. 32 Exif Private IFD	
37394	9212	SecurityClassification	Security classification assigned to the image.	TIFF/EP spec, p. 33 Exif Private IFD	
37395	9213	ImageHistory	Record of what has been done to the image.	TIFF/EP spec, p. 33 Exif Private IFD	
37396	9214	SubjectLocation	Indicates the location and area of the main subject in the overall scene.	Exif Private IFD TIFF/EP spec, p. 45	Called SubjectArea (from Exif spec) at AWare Web site
37397	9215	ExposureIndex	Encodes the camera exposure index setting when image was captured.	TIFF/EP spec, p. 47 Exif Private IFD	
37398	9216	TIFF/EPStandardID	For current spec, tag value equals *1 0 0 0*.	TIFF/EP spec, p. 16 Exif Private IFD	Mandatory in TIFF/EP.
37399	9217	SensingMethod	Type of image sensor.	TIFF/EP spec, p. 22 Exif Private IFD	Mandatory in TIFF/EP.
37500	927C	MakerNote	Manufacturer specific information.	Exif Private IFD	

37510	9286	UserComment	Keywords or comments on the image; complements ImageDescription.	Exif Private IFD	
37520	9290	SubsecTime	A tag used to record fractions of seconds for the DateTime tag.	Exif Private IFD	
37521	9291	SubsecTimeOriginal	A tag used to record fractions of seconds for the DateTimeOriginal tag.	Exif Private IFD	
37522	9292	SubsecTimeDigitized	A tag used to record fractions of seconds for the DateTimeDigitized tag.	Exif Private IFD	
37724	935C	ImageSourceData	Used by Adobe Photoshop.	Private	
40091	9c9b	XPTitle	Title tag used by Windows, encoded in UCS2	Exif Private IFD	
40092	9c9c	XPComment	Comment tag used by Windows, encoded in UCS2	Exif Private IFD	
40093	9c9d	XPAuthor	Author tag used by Windows, encoded in UCS2	Exif Private IFD	
40094	9c9e	XPKeywords	Keywords tag used by Windows, encoded in UCS2	Exif Private IFD	
40095	9c9f	XPSubject	Subject tag used by Windows, encoded in UCS2	Exif Private IFD	
40960	A000	FlashpixVersion	The Flashpix format version supported by a FPXR file.	Exif Private IFD	Mandatory in the Exif IFD
40961	A001	ColorSpace	The color space information tag is always recorded as the color space specifier.	Exif Private IFD	Mandatory in the Exif IFD
40962	A002	PixelXDimension	Specific to compressed data; the valid width of the meaningful image.	Exif Private IFD	
40963	A003	PixelYDimension	Specific to compressed data; the valid height of the meaningful image.	Exif Private IFD	
40964	A004	RelatedSoundFile	Used to record the name of an audio file related to the image data.	Exif Private IFD	
40965	A005	Interoperability IFD	A pointer to the Exif-related Interoperability IFD.	Private	
41483	A20B	FlashEnergy	Indicates the strobe energy at the time the image is captured, as measured in Beam Candle Power Seconds	Exif Private IFD	
41484	A20C	SpatialFrequencyResponse	Records the camera or input device spatial frequency table and SFR values in the direction of image width, image height, and diagonal direction, as specified in ISO 12233.	Exif Private IFD	
41486	A20E	FocalPlaneXResolution	Indicates the number of pixels in the image width (X) direction per FocalPlaneResolutionUnit on the camera focal plane.	Exif Private IFD	

41487	A20F	FocalPlaneYResolution	Indicates the number of pixels in the image height (Y) direction per FocalPlaneResolutionUnit on the camera focal plane.	Exif Private IFD	
41488	A210	FocalPlaneResolutionUnit	Indicates the unit for measuring FocalPlaneXResolution and FocalPlaneYResolution.	Exif Private IFD	
41492	A214	SubjectLocation	Indicates the location of the main subject in the scene.	Exif Private IFD	
41493	A215	ExposureIndex	Indicates the exposure index selected on the camera or input device at the time the image is captured.	Exif Private IFD	
41495	A217	SensingMethod	Indicates the image sensor type on the camera or input device.	Exif Private IFD	
41728	A300	FileSource	Indicates the image source.	Exif Private IFD	
41729	A301	SceneType	Indicates the type of scene.	Exif Private IFD	
41730	A302	CFAPattern	Indicates the color filter array (CFA) geometric pattern of the image sensor when a one-chip color area sensor is used.	Exif Private IFD	
41985	A401	CustomRendered	Indicates the use of special processing on image data, such as rendering geared to output.	Exif Private IFD	
41986	A402	ExposureMode	Indicates the exposure mode set when the image was shot.	Exif Private IFD	
41987	A403	WhiteBalance	Indicates the white balance mode set when the image was shot.	Exif Private IFD	
41988	A404	DigitalZoomRatio	Indicates the digital zoom ratio when the image was shot.	Exif Private IFD	
41989	A405	FocalLengthIn35mmFilm	Indicates the equivalent focal length assuming a 35mm film camera, in mm.	Exif Private IFD	
41990	A406	SceneCaptureType	Indicates the type of scene that was shot.	Exif Private IFD	
41991	A407	GainControl	Indicates the degree of overall image gain adjustment.	Exif Private IFD	
41992	A408	Contrast	Indicates the direction of contrast processing applied by the camera when the image was shot.	Exif Private IFD	
41993	A409	Saturation	Indicates the direction of saturation processing applied by the camera when the image was shot.	Exif Private IFD	
41994	A40A	Sharpness	Indicates the direction of sharpness processing applied by the camera when the image was shot.	Exif Private IFD	

41995	A40B	DeviceSettingDescription	This tag indicates information on the picture-taking conditions of a particular camera model.	Exif Private IFD	
41996	A40C	SubjectDistanceRange	Indicates the distance to the subject.	Exif Private IFD	
42016	A420	ImageUniqueID	Indicates an identifier assigned uniquely to each image.	Exif Private IFD	
42032	a430	CameraOwnerName	Camera owner name as ASCII string.	Exif Private IFD	
42033	a431	BodySerialNumber	Camera body serial number as ASCII string.	Exif Private IFD	
42034	a432	LensSpecification	This tag notes minimum focal length, maximum focal length, minimum F number in the minimum focal length, and minimum F number in the maximum focal length, which are specification information for the lens that was used in photography. When the minimum F number is unknown, the notation is 0/0.	Exif Private IFD	
42035	a433	LensMake	Lens manufacturer name as ASCII string.	Exif Private IFD	
42036	a434	LensModel	Lens model name and number as ASCII string.	Exif Private IFD	
42037	a435	LensSerialNumber	Lens serial number as ASCII string.	Exif Private IFD	
42112	A480	GDAL_METADATA	Used by the GDAL library, holds an XML list of name=value 'metadata' values about the image as a whole, and about specific samples.	Private	
42113	A481	GDAL_NODATA	Used by the GDAL library, contains an ASCII encoded nodata or background pixel value.	Private	
48129	BC01	PixelFormat	A 128-bit Globally Unique Identifier (GUID) that identifies the image pixel format.	HD Photo Feature Spec, p. 17	
48130	BC02	Transformation	Specifies the transformation to be applied when decoding the image to present the desired representation.	HD Photo Feature Spec, p. 23	
48131	BC03	Uncompressed	Specifies that image data is uncompressed.	HD Photo Feature Spec, p. 23	
48132	BC04	ImageType	Specifies the image type of each individual frame in a multi-frame file.	HD Photo Feature Spec, p. 27	

48256	BC80	ImageWidth	Specifies the number of columns in the transformed photo, or the number of pixels per scan line.	HD Photo Feature Spec, p. 21	
48257	BC81	ImageHeight	Specifies the number of pixels or scan lines in the transformed photo.	HD Photo Feature Spec, p. 21	
48258	BC82	WidthResolution	Specifies the horizontal resolution of a transformed image expressed in pixels per inch.	HD Photo Feature Spec, p. 21	
48259	BC83	HeightResolution	Specifies the vertical resolution of a transformed image expressed in pixels per inch.	HD Photo Feature Spec, p. 21	
48320	BCC0	ImageOffset	Specifies the byte offset pointer to the beginning of the photo data, relative to the beginning of the file.	HD Photo Feature Spec, p. 22	
48321	BCC1	ImageByteCount	Specifies the size of the photo in bytes.	HD Photo Feature Spec, p. 22	
48322	BCC2	AlphaOffset	Specifies the byte offset pointer the beginning of the planar alpha channel data, relative to the beginning of the file.	HD Photo Feature Spec, p. 22	
48323	BCC3	AlphaByteCount	Specifies the size of the alpha channel data in bytes.	HD Photo Feature Spec, p. 23	
48324	BCC4	ImageDataDiscard	Signifies the level of data that has been discarded from the image as a result of a compressed domain transcode to reduce the file size.	HD Photo Feature Spec, p. 25	
48325	BCC5	AlphaDataDiscard	Signifies the level of data that has been discarded from the planar alpha channel as a result of a compressed domain transcode to reduce the file size.	HD Photo Feature Spec, p. 26	
50215	C427	Oce Scanjob Description	Used in the Oce scanning process.	Private	
50216	C428	Oce Application Selector	Used in the Oce scanning process.	Private	
50217	C429	Oce Identification Number	Used in the Oce scanning process.	Private	
50218	C42A	Oce ImageLogic Characteristics	Used in the Oce scanning process.	Private	
50341	c4a5	PrintImageMatching	Description needed.	Exif Private IFD	
50706	C612	DNGVersion	Encodes DNG four-tier version number; for version 1.1.0.0, the tag contains the bytes *1, 1,*	DNG spec (1.3,	

			0, 0. Used in IFD 0 of DNG files.	2009), p. 17 Exif Private IFD	
50707	C613	[DNGBackwardVersion](#)	Defines oldest version of spec with which file is compatible. Used in IFD 0 of DNG files.	[DNG spec](#) (1.3, 2009), p. 17 Exif Private IFD	
50708	C614	[UniqueCameraModel](#)	Unique, non-localized nbame for camera model. Used in IFD 0 of DNG files.	[DNG spec](#) (1.3, 2009), p. 18 Exif Private IFD	
50709	C615	[LocalizedCameraModel](#)	Similar to 50708, with localized camera name. Used in IFD 0 of DNG files.	[DNG spec](#) (1.3, 2009), p. 19 Exif Private IFD	
50710	C616	[CFAPlaneColor](#)	Mapping between values in the CFAPattern tag and the plane numbers in LinearRaw space. Used in Raw IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 19 Exif Private IFD	Required for non-RGB CFA images.
50711	C617	[CFALayout](#)	Spatial layout of the CFA. Used in Raw IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 20 Exif Private IFD	
50712	C618	[LinearizationTable](#)	Lookup table that maps stored values to linear values. Used in Raw IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 21 Exif Private IFD	
50713	C619	[BlackLevelRepeatDim](#)	Repeat pattern size for BlackLevel tag. Used in Raw IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 21 Exif Private IFD	

50714	C61A	BlackLevel	Specifies the zero light encoding level.Used in Raw IFD of DNG files.	DNG spec (1.3, 2009), p. 22 Exif Private IFD	
50715	C61B	BlackLevelDeltaH	Specifies the difference between zero light encoding level for each column and the baseline zero light encoding level. Used in Raw IFD of DNG files.	DNG spec (1.3, 2009), p. 22 Exif Private IFD	
50716	C61C	BlackLevelDeltaV	Specifies the difference between zero light encoding level for each row and the baseline zero light encoding level. Used in Raw IFD of DNG files.	DNG spec (1.3, 2009), p. 23 Exif Private IFD	
50717	C61D	WhiteLevel	Specifies the fully saturated encoding level for the raw sample values. Used in Raw IFD of DNG files.	DNG spec (1.3, 2009), p. 24 Exif Private IFD	
50718	C61E	DefaultScale	For cameras with non-square pixels, specifies the default scale factors for each direction to convert the image to square pixels. Used in Raw IFD of DNG files.	DNG spec (1.3, 2009), p. 24 Exif Private IFD	
50719	C61F	DefaultCropOrigin	Specifies the origin of the final image area, ignoring the extra pixels at edges used to prevent interpolation artifacts. Used in Raw IFD of DNG files.	DNG spec (1.3, 2009), p. 25 Exif Private IFD	
50720	C620	DefaultCropSize	Specifies size of final image area in raw image coordinates. Used in Raw IFD of DNG files.	DNG spec (1.3, 2009), p. 26 Exif Private IFD	
50721	C621	ColorMatrix1	Defines a transformation matrix that converts XYZ values to reference camera native color space values, under the first calibration illuminant. Used in IFD 0 of DNG files.	DNG spec (1.3, 2009), p. 27 Exif	

				Private IFD	
50722	C622	ColorMatrix2	Defines a transformation matrix that converts XYZ values to reference camera native color space values, under the second calibration illuminant. Used in IFD 0 of DNG files.	DNG spec (1.3, 2009), p. 28 Exif Private IFD	
50723	C623	CameraCalibration1	Defines a calibration matrix that transforms reference camera native space values to individual camera native space values under the first calibration illuminant. Used in IFD 0 of DNG files.	DNG spec (1.3, 2009), p. 28 Exif Private IFD	
50724	C624	CameraCalibration2	Defines a calibration matrix that transforms reference camera native space values to individual camera native space values under the second calibration illuminant. Used in IFD 0 of DNG files.	DNG spec (1.3, 2009), p. 29 Exif Private IFD	
50725	C625	ReductionMatrix1	Defines a dimensionality reduction matrix for use as the first stage in converting color camera native space values to XYZ values, under the first calibration illuminant. Used in IFD 0 of DNG files.	DNG spec (1.3, 2009), p. 30 Exif Private IFD	
50726	C626	ReductionMatrix2	Defines a dimensionality reduction matrix for use as the first stage in converting color camera native space values to XYZ values, under the second calibration illuminant. Used in IFD 0 of DNG files.	DNG spec (1.3, 2009), p. 30 Exif Private IFD	
50727	C627	AnalogBalance	Pertaining to white balance, defines the gain, either analog or digital, that has been applied to the stored raw values. Used in IFD 0 of DNG files.	DNG spec (1.3, 2009), p. 31 Exif Private IFD	
50728	C628	AsShotNeutral	Specifies the selected white balance at the time of capture, encoded as the coordinates of a perfectly neutral color in linear reference space values. Used in IFD 0 of DNG files.	DNG spec (1.3, 2009), p. 31 Exif Private IFD	

50729	C629	AsShotWhiteXY	Specifies the selected white balance at the time of capture, encoded as x-y chromaticity coordinates. Used in IFD 0 of DNG files.	DNG spec (1.3, 2009), p. 32 Exif Private IFD	
50730	C62A	BaselineExposure	Specifies in EV units how much to move the zero point for exposure compensation. Used in IFD 0 of DNG files.	DNG spec (1.3, 2009), p. 32 Exif Private IFD	
50731	C62B	BaselineNoise	Specifies the relative noise of the camera model at a baseline ISO value of 100, compared to reference camera model. Used in IFD 0 of DNG files.	DNG spec (1.3, 2009), p. 33 Exif Private IFD	
50732	C62C	BaselineSharpness	Specifies the relative amount of sharpening required for this camera model, compared to reference camera model. Used in IFD 0 of DNG files.	DNG spec (1.3, 2009), p. 33 Exif Private IFD	
50733	C62D	BayerGreenSplit	For CFA images, specifies, in arbitrary units, how closely the values of the green pixels in the blue/green rows track the values of the green pixels in the red/green rows. Used in Raw IFD of DNG files.	DNG spec (1.3, 2009), p. 34 Exif Private IFD	
50734	C62E	LinearResponseLimit	Specifies the fraction of the encoding range above which the response may become significantly non-linear. Used in IFD 0 of DNG files.	DNG spec (1.3, 2009), p. 34 Exif Private IFD	
50735	C62F	CameraSerialNumber	Serial number of camera. Used in IFD 0 of DNG files.	DNG spec (1.3, 2009), p. 35 Exif Private IFD	
50736	C630	LensInfo	Information about the lens. Used in IFD 0 of DNG files.	DNG spec (1.3, 2009), p. 35 Exif	

				Private IFD	
50737	C631	ChromaBlurRadius	Normally for non-CFA images, provides a hint about how much chroma blur ought to be applied. Used in Raw IFD of DNG files.	DNG spec (1.3, 2009), p. 36 Exif Private IFD	
50738	C632	AntiAliasStrength	Provides a hint about the strength of the camera's anti-aliasing filter. Used in Raw IFD of DNG files.	DNG spec (1.3, 2009), p. 36 Exif Private IFD	
50739		ShadowScale	Used by Adobe Camera Raw to control sensitivity of its shadows slider. Used in IFD 0 of DNG files.	DNG spec (1.3, 2009), p. 37 Exif Private IFD	
50740	C634	DNGPrivateData	Provides a way for camera manufacturers to store private data in DNG files for use by their own raw convertors. Used in IFD 0 of DNG files.	DNG spec (1.3, 2009), p. 37 Exif Private IFD	
50741	C635	MakerNoteSafety	Lets the DNG reader know whether the Exif MakerNote tag is safe to preserve. Used in IFD 0 of DNG files.	DNG spec (1.3, 2009), p. 38 Exif Private IFD	
50778	C65A	CalibrationIlluminant1	Illuminant used for first set of calibration tags. Used in IFD 0 of DNG files.	DNG spec (1.3, 2009), p. 26 Exif Private IFD	
50779	C65B	CalibrationIlluminant2	Illuminant used for second set of calibration tags. Used in IFD 0 of DNG files.	DNG spec (1.3, 2009), p. 27 Exif Private IFD	
50780	C65C	BestQualityScale	Specifies the amount by which the values of the DefaultScale tag need to be multiplied to achieve best quality image size. Used in Raw IFD of DNG	DNG spec (1.3, 2009), p. 25	

			files.	Exif Private IFD	
50781		RawDataUniqueID	Contains a 16-byte unique identifier for the raw image file in the DNG file. Used in IFD 0 of DNG files.	[DNG spec](#) (1.3, 2009), p. 39 Exif Private IFD	
50784	C660	[Alias Layer Metadata](#)	Alias Sketchbook Pro layer usage description.	Private	
50827		OriginalRawFileName	Name of original file if the DNG file results from conversion from a non-DNG raw file. Used in IFD 0 of DNG files.	[DNG spec](#) (1.3, 2009), p. 39 Exif Private IFD	
50828		OriginalRawFileData	If the DNG file was converted from a non-DNG raw file, then this tag contains the original raw data. Used in IFD 0 of DNG files.	[DNG spec](#) (1.3, 2009), p. 40 Exif Private IFD	
50829		ActiveArea	Defines the active (non-masked) pixels of the sensor. Used in Raw IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 41 Exif Private IFD	
50830		MaskedAreas	List of non-overlapping rectangle coordinates of fully masked pixels, which can optimally be used by DNG readers to measure the black encoding level. Used in Raw IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 42 Exif Private IFD	
50831		AsShotICCProfile	Contains ICC profile that, in conjunction with the AsShotPreProfileMatrix tag, specifies a default color rendering from camera color space coordinates (linear reference values) into the ICC profile connection space. Used in IFD 0 of DNG files.	[DNG spec](#) (1.3, 2009), p. 42 Exif Private IFD	
50832		AsShotPreProfileMatrix	Specifies a matrix that should be applied to the camera color space coordinates before processing the values through the ICC profile specified in the AsShotICCProfile tag. Used in IFD 0 of DNG files.	[DNG spec](#) (1.3, 2009), p. 43 Exif Private IFD	

50833		CurrentICCProfile	The CurrentICCProfile and CurrentPreProfileMatrix tags have the same purpose and usage as the AsShotICCProfile and AsShotPreProfileMatrix tag pair, except they are for use by raw file editors rather than camera manufacturers. Used in IFD 0 of DNG files.	[DNG spec](#) (1.3, 2009), p. 44 Exif Private IFD	
50834		CurrentPreProfileMatrix	The CurrentICCProfile and CurrentPreProfileMatrix tags have the same purpose and usage as the AsShotICCProfile and AsShotPreProfileMatrix tag pair, except they are for use by raw file editors rather than camera manufacturers. Used in IFD 0 of DNG files.	[DNG spec](#) (1.3, 2009), p. 44 Exif Private IFD	
50879	C6BF	ColorimetricReference	The DNG color model documents a transform between camera colors and CIE XYZ values. This tag describes the colorimetric reference for the CIE XYZ values. 0 = The XYZ values are scene-referred. 1 = The XYZ values are output-referred, using the ICC profile perceptual dynamic range. Used in IFD 0 of DNG files.	[DNG spec](#) (1.3, 2009), p. 45 Exif Private IFD	
50931	C6F3	CameraCalibrationSignature	A UTF-8 encoded string associated with the CameraCalibration1 and CameraCalibration2 tags. Used in IFD 0 of DNG files.	[DNG spec](#) (1.3, 2009), p. 46 Exif Private IFD	
50932	C6F4	ProfileCalibrationSignature	A UTF-8 encoded string associated with the camera profile tags. Used in IFD 0 or CameraProfile IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 46 Exif Private IFD	
50933	C6F5	ExtraCameraProfiles	A list of file offsets to extra Camera Profile IFDs. The format of a camera profile begins with a 16-bit byte order mark (MM or II) followed by a 16-bit "magic" number equal to 0x4352 (CR), a 32-bit IFD offset, and then a standard TIFF format IFD. Used in IFD 0 of DNG files.	[DNG spec](#) (1.3, 2009), p. 47	
50934	C6F6	AsShotProfileName	A UTF-8 encoded string containing the name of the "as shot" camera profile, if any. Used in IFD 0 of DNG files.	[DNG spec](#) (1.3, 2009), p. 47 Exif Private	

				IFD	
50935	C6F7	NoiseReductionApplied	Indicates how much noise reduction has been applied to the raw data on a scale of 0.0 to 1.0. A 0.0 value indicates that no noise reduction has been applied. A 1.0 value indicates that the "ideal" amount of noise reduction has been applied, i.e. that the DNG reader should not apply additional noise reduction by default. A value of 0/0 indicates that this parameter is unknown. Used in Raw IFD of DNG files.	DNG spec (1.3, 2009), p. 48 Exif Private IFD	
50936	C6F8	ProfileName	A UTF-8 encoded string containing the name of the camera profile. Used in IFD 0 or Camera Profile IFD of DNG files.	DNG spec (1.3, 2009), p. 48 Exif Private IFD	
50937	C6F9	ProfileHueSatMapDims	Specifies the number of input samples in each dimension of the hue/saturation/value mapping tables. The data for these tables are stored in ProfileHueSatMapData1 and ProfileHueSatMapData2 tags. Allowed values include the following: HueDivisions >= 1; SaturationDivisions >= 2; ValueDivisions >=1. Used in IFD 0 or Camera Profile IFD of DNG files.	DNG spec (1.3, 2009), p. 49 Exif Private IFD	
50938	C6FA	ProfileHueSatMapData1	Contains the data for the first hue/saturation/value mapping table. Each entry of the table contains three 32-bit IEEE floating-point values. The first entry is hue shift in degrees; the second entry is saturation scale factor; and the third entry is a value scale factor. Used in IFD 0 or Camera Profile IFD of DNG files.	DNG spec (1.3, 2009), p. 50 Exif Private IFD	
50939	C6FB	ProfileHueSatMapData2	Contains the data for the second hue/saturation/value mapping table. Each entry of the table contains three 32-bit IEEE floating-point values. The first entry is hue shift in degrees; the second entry is saturation scale factor; and the third entry is a value scale factor. Used in IFD 0 or Camera Profile IFD of DNG files.	DNG spec (1.3, 2009), p. 50-1 Exif Private IFD	
50940	C6FC	ProfileToneCurve	Contains a default tone curve that can be applied while processing the image as a starting point for user adjustments. The curve is specified as a list of 32-bit IEEE floating-point value pairs in linear gamma. Each sample has an input value in the range	DNG spec (1.3, 2009), p. 51 Exif Private IFD	

			of 0.0 to 1.0, and an output value in the range of 0.0 to 1.0. The first sample is required to be (0.0, 0.0), and the last sample is required to be (1.0, 1.0). Interpolated the curve using a cubic spline. Used in IFD 0 or Camera Profile IFD of DNG files.		
50941	C6FD	ProfileEmbedPolicy	Contains information about the usage rules for the associated camera profile. The valid values and meanings are: 0 = "allow copying"; 1 = "embed if used"; 2 = "embed never"; and 3 = "no restrictions". Used in IFD 0 or Camera Profile IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 52 Exif Private IFD	
50942	C6FE	ProfileCopyright	Contains information about the usage rules for the associated camera profile. The valid values and meanings are: 0 = "allow copying"; 1 = "embed if used"; 2 = "embed never"; and 3 = "no restrictions". Used in IFD 0 or Camera Profile IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 52 Exif Private IFD	
50964	C714	ForwardMatrix1	Defines a matrix that maps white balanced camera colors to XYZ D50 colors. Used in IFD 0 or Camera Profile IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 53 Exif Private IFD	
50965	C715	ForwardMatrix2	Defines a matrix that maps white balanced camera colors to XYZ D50 colors. Used in IFD 0 or Camera Profile IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 54 Exif Private IFD	
50966	C716	PreviewApplicationName	A UTF-8 encoded string containing the name of the application that created the preview stored in the IFD. Used in Preview IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 54 Exif Private IFD	
50967	C717	PreviewApplicationVersion	A UTF-8 encoded string containing the version number of the application that created the preview stored in the IFD. Used in Preview IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 55 Exif Private IFD	
50968	C718	PreviewSettingsName	A UTF-8 encoded string containing the name of the conversion settings (for example, snapshot name) used for the preview stored in the	[DNG spec](#) (1.3, 2009), p. 55	

			IFD. Used in Preview IFD of DNG files.	Exif Private IFD	
50969	C719	PreviewSettingsDigest	A unique ID of the conversion settings (for example, MD5 digest) used to render the preview stored in the IFD. Used in Preview IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 56 Exif Private IFD	
50970	C71A	PreviewColorSpace	This tag specifies the color space in which the rendered preview in this IFD is stored. The valid values include: 0 = Unknown; 1 = Gray Gamma 2.2; 2 = sRGB; 3 = Adobe RGB; and 4 = ProPhoto RGB. Used in Preview IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 56 Exif Private IFD	
50971	C71B	PreviewDateTime	This tag is an ASCII string containing the name of the date/time at which the preview stored in the IFD was rendered, encoded using ISO 8601 format. Used in Preview IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 57 Exif Private IFD	
50972	C71C	RawImageDigest	MD5 digest of the raw image data. All pixels in the image are processed in row-scan order. Each pixel is zero padded to 16 or 32 bits deep (16-bit for data less than or equal to 16 bits deep, 32-bit otherwise). The data is processed in little-endian byte order. Used in IFD 0 of DNG files.	[DNG spec](#) (1.3, 2009), p. 57 Exif Private IFD	
50973	C71D	OriginalRawFileDigest	MD5 digest of the data stored in the OriginalRawFileData tag. Used in IFD 0 of DNG files.	[DNG spec](#) (1.3, 2009), p. 58 Exif Private IFD	
50974	C71E	SubTileBlockSize	Normally, pixels within a tile are stored in simple row-scan order. This tag specifies that the pixels within a tile should be grouped first into rectangular blocks of the specified size. These blocks are stored in row-scan order. Within each block, the pixels are stored in row-scan order. Used in Raw IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 58 Exif Private IFD	
50975	C71F	RowInterleaveFactor	Specifies that rows of the image are stored in interleaved order. The value of the tag specifies the number of interleaved fields. Used in Raw IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 59 Exif Private	

				IFD	
50981	C725	ProfileLookTableDims	Specifies the number of input samples in each dimension of a default "look" table. The data for this table is stored in the ProfileLookTableData tag. Allowed values include: HueDivisions >= 1; SaturationDivisions >= 2; and ValueDivisions >= 1. Used in IFD 0 or Camera Profile IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 59 Exif Private IFD	
50982	C726	ProfileLookTableData	Default "look" table that can be applied while processing the image as a starting point for user adjustment. This table uses the same format as the tables stored in the ProfileHueSatMapData1 and ProfileHueSatMapData2 tags, and is applied in the same color space. However, it should be applied later in the processing pipe, after any exposure compensation and/or fill light stages, but before any tone curve stage. Each entry of the table contains three 32-bit IEEE floating-point values. The first entry is hue shift in degrees, the second entry is a saturation scale factor, and the third entry is a value scale factor. Used in IFD 0 or Camera Profile IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 60 Exif Private IFD	
51008	C740	OpcodeList1	Specifies the list of opcodes (image processing operation codes) that should be applied to the raw image, as read directly from the file. Used in Raw IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 61 Exif Private IFD	
51009	C741	OpcodeList2	Specifies the list of opcodes (image processing operation codes) that should be applied to the raw image, just after it has been mapped to linear reference values. Used in Raw IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 61 Exif Private IFD	
51022	C74E	OpcodeList3	Specifies the list of opcodes (image processing operation codes) that should be applied to the raw image, just after it has been demosaiced. Used in Raw IFD of DNG files.	[DNG spec](#) (1.3, 2009), p. 62 Exif Private IFD	
51041	C761	NoiseProfile	Describes the amount of noise in a raw image; models the amount of signal-dependent photon (shot) noise and signal-independent sensor readout noise, two common sources of noise in raw images. Used in	[DNG spec](#) (1.3, 2009), p. 62-3 Exif	

			Raw IFD of DNG files.	Private IFD	
51089	C791	OriginalDefaultFinalSize	If this file is a proxy for a larger original DNG file, this tag specifics the default final size of the larger original file from which this proxy was generated. The default value for this tag is default final size of the current DNG file, which is DefaultCropSize * DefaultScale.	[DNG spec](#) (1.4, 2012), p. 74	
51090	C792	OriginalBestQualityFinalSize	If this file is a proxy for a larger original DNG file, this tag specifics the best quality final size of the larger original file from which this proxy was generated. The default value for this tag is the OriginalDefaultFinalSize, if specified. Otherwise the default value for this tag is the best quality size of the current DNG file, which is DefaultCropSize * DefaultScale * BestQualityScale.	[DNG spec](#) (1.4, 2012), p. 75	
51091	C793	OriginalDefaultCropSize	If this file is a proxy for a larger original DNG file, this tag specifics the DefaultCropSize of the larger original file from which this proxy was generated. The default value for this tag is the OriginalDefaultFinalSize, if specified. Otherwise, the default value for this tag is the DefaultCropSize of the current DNG file.	[DNG spec](#) (1.4, 2012), p. 75	
51107	C7A3	ProfileHueSatMapEncoding	Provides a way for color profiles to specify how indexing into a 3D HueSatMap is performed during raw conversion. This tag is not applicable to 2.5D HueSatMap tables (i.e., where the Value dimension is 1). The currently defined values are: 0 = Linear encoding (method described in DNG spec); 1 = sRGB encoding (method described in DNG spec).	[DNG spec](#) (1.4, 2012), p. 73	
51108	C7A4	ProfileLookTableEncoding	Provides a way for color profiles to specify how indexing into a 3D LookTable is performed during raw conversion. This tag is not applicable to a 2.5D LookTable (i.e., where the Value dimension is 1). The currently defined values are: 0 = Linear encoding (method described in DNG spec); 1 = sRGB encoding (method described in DNG spec).	[DNG spec](#) (1.4, 2012), p. 72-3	
51109	C7A5	BaselineExposureOffset	Provides a way for color profiles to increase or decrease exposure during raw conversion.	[DNG spec](#) (1.4, 2012), p.	

			BaselineExposureOffset specifies the amount (in EV units) to add to th e BaselineExposure tag during image rendering. For example, if the BaselineExposure value fo r a given camera model is +0.3, and the BaselineExposureOffset value for a given camera profile used to render an image for that camera model is -0.7, then th e actual default exposure value used during rendering will be +0.3 - 0.7 = -0.4.	71	
51110	C7A6	DefaultBlackRender	This optional tag in a color profile provides a hint to the raw converter regarding how to handle the black point (e.g., flare subtraction) during rendering. The currently defined values are: 0 = Auto; 1 = None. If set to Auto, the raw converter should perform black subtraction during rendering. The amount and method of black subtraction may be automatically determined and may be image-dependent. If set to None, the raw converter should not perform any black subtraction during rendering. This may be desirable when using color lookup tables (e.g., LookTable) or tone curves in camera profiles to perform a fixed, consistent level of black subtraction.	DNG spec (1.4, 2012), p. 71	
51111	C7A7	NewRawImageDigest	This tag is a modified MD5 digest of the raw image data. It has been updated from the algorithm used to compute the RawImageDigest tag be more multi-processor friendly, and to support lossy compression algorithms. The details of the algorithm used to compute this tag are documented in the Adobe DNG SDK source code.	DNG spec (1.4, 2012), p. 76	
51112	C7A8	RawToPreviewGain	The gain (what number the sample values are multiplied by) between the main raw IFD and the preview IFD containing this tag.	DNG spec (1.4, 2012), p. 76	
51125	C7B5	DefaultUserCrop	Specifies a default user crop rectangle in relative coordinates. The values must satisfy: 0.0 <= top < bottom <= 1.0; 0.0 <= left < right <= 1.0. The default values of (top = 0, left = 0, bottom = 1, right = 1) correspond exactly to the default crop rectangle (as specified by the DefaultCropOrigin and DefaultCropSize tags).	DNG spec (1.4, 2012), p. 70	

[1]TIFF image classes are described in the 1992 TIFF 6.0 specification and may be summarized as follows:
• Class B. Baseline bilevel.

- Class G. Baseline grayscale.
- Class P. Baseline palette-color.
- Class R. Baseline RGB.
- Class Y. Extension YCbCr.

[2]The TIFF/IT specification (ISO 12639, 2004) defines the following image categories:
- CT. Color continuous-tone picture.
- LW. Color line art.
- HC. High-resolution continuous-tone.
- MP. Monochrome continuous-tone picture.
- BP. Binary picture.
- BL. Binary line art.
- SD. Screened data image.
- FP. Final page.

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