

## Tiff

- Tagged Image File Format
  - Interchange of raster-images
- Erste Version von Adobe™ 1986
  - startet mit Version 3, vorherige Drafts wurden als Version definiert
- algorithmische Verarbeitung, automatisiert

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## Scope

- Bilder von Scannern, Frame-Grabbern, Software
- Keine Drucker- oder Page Description Language
- Große und flexible Anzahl von Parametern
- Jedoch geringe Anzahl von notwendigen Parametern
- Offen für neue Entwicklungen

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## Features

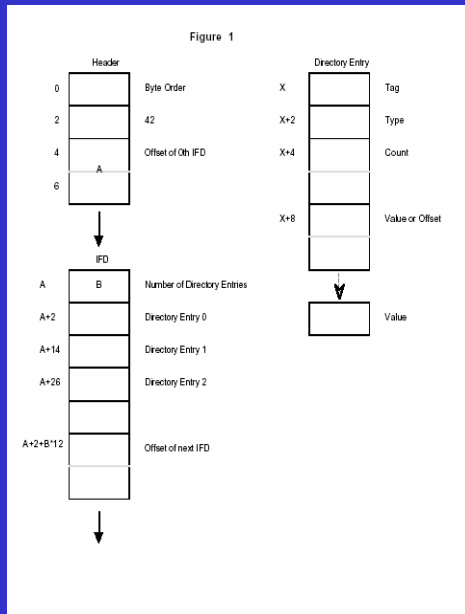
- Binär, Grauwerte, Indexed Color, Full Color
- große Anzahl von Kompressionsverfahren
- Imaging-Hardwareunabhängig
- Plattformunabhängig
- Private Tags (>32768)
  - Reusable Space (65000-65535)

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## Baselin Tiff

- Kern von Tiff
- Maximale Filegröße  $2^{32}$  Bytes
- 8 Byte Header
  - zeigt auf Image File Directory (IFD)
- IFD
  - Informationen über das Bild
  - Zeiger auf Pixel-Daten

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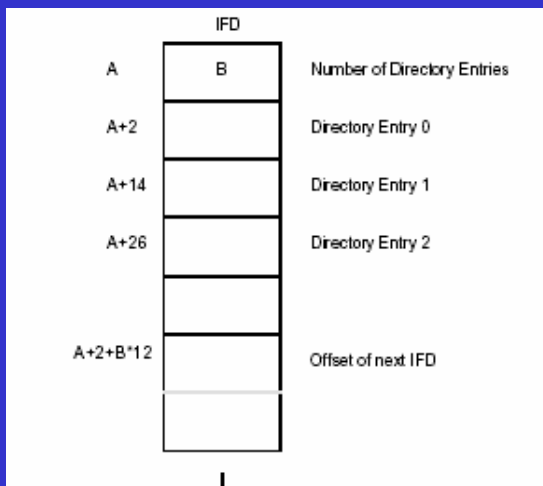
Byte Order  
 0x4949 little  
 endian  
 0x4D4D big endian

42  
 Magic Number for  
 TIFF

Offset to IFD  
 (word boundary)

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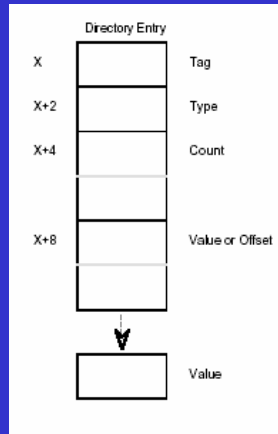
## IFD



- 2 Bytes gefolgt von 14 Byte Einträgen
- Offset zu nächsten IFD
- Mindestens 1 IFD pro File

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# Directory Eintrag



Bytes	Bedeutung
0-1	tag
2-3	typ
4-7	count
8-11	value/offset

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# Typ-Feld

1 = BYTE	8-bit unsigned integer.
2 = ASCII	8-bit byte that contains a 7-bit ASCII code; the last byte must be NUL (binary zero).
3 = SHORT	16-bit (2-byte) unsigned integer.
4 = LONG	32-bit (4-byte) unsigned integer.
5 = RATIONAL	Two LONGs: the first represents the numerator of a fraction; the second, the denominator.
6 = SBYTE	An 8-bit signed (twos-complement) integer.
7 = UNDEFINED	An 8-bit byte that may contain anything, depending on the definition of the field.
8 = SSHORT	A 16-bit (2-byte) signed (twos-complement) integer.
9 = SLONG	A 32-bit (4-byte) signed (twos-complement) integer.
10 = SRATIONAL	Two SLONG's: the first represents the numerator of a fraction, the second the denominator.
11 = FLOAT	Single precision (4-byte) IEEE format.
12 = DOUBLE	Double precision (8-byte) IEEE format.

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# Spezielle Tags

## ImageLength

Tag = 257 (101.H)

Type = SHORT or LONG

The number of rows (sometimes described as *scanlines*) in the image.

## ImageWidth

Tag = 256 (100.H)

Type = SHORT or LONG

The number of columns in the image, i.e., the number of pixels-per scanline.

## RowsPerStrip

Tag = 278 (116.H)

Type = SHORT or LONG

## StripOffsets

Tag = 273 (111.H)

Type = SHORT or LONG

For each strip, the byte offset of that strip.

## StripByteCounts

Tag = 279 (117.H)

Type = SHORT or LONG

For each strip, the number of bytes in that strip *after any compression*.

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# Beispiel

Offset (hex)	Description	Value (numeric values are expressed in hexadecimal notation)
<b>Header:</b>		
0000	Byte Order	4D4D
0002	42	002A
0004	1st IFD offset	00000014
<b>IFD:</b>		
0014	Number of Directory Entries	000C
0016	NewSubfileType	00FE 0004 00000001 00000000
0022	ImageWidth	0100 0004 00000001 000007D0
002E	ImageLength	0101 0004 00000001 00000BB8
003A	Compression	0103 0003 00000001 8005 0000
0046	PhotometricInterpretation	0106 0003 00000001 0001 0000
0052	StripOffsets	0111 0004 000000BC 000000B6
005E	RowsPerStrip	0116 0004 00000001 00000010
006A	StripByteCounts	0117 0003 000000BC 000003A6
0076	XResolution	011A 0005 00000001 0000069E
0082	YResolution	011B 0005 00000001 0000069E
008E	Software	0131 0002 0000000E 000006A6
009A	DateTime	0132 0002 00000014 000006B6
00A6	Next IFD offset	00000000
<b>Values longer than 4 bytes:</b>		
00B6	StripOffsets	Offset0, Offset1, ... Offset187
03A6	StripByteCounts	Count0, Count1, ... Count187
0696	XResolution	0000012C 00000001
069E	YResolution	0000012C 00000001
06A6	Software	"PageMaker 4.0"
06B6	DateTime	"1988:02:18 13:59:59"
<b>Image Data:</b>		
00000700		Compressed data for strip 10
xxxxxxx		Compressed data for strip 179
xxxxxxx		Compressed data for strip 53
xxxxxxx		Compressed data for strip 160

## Required Tags

TagName	Decimal	Hex	Type	Value
ImageWidth	256	100	SHORT or LONG	
ImageLength	257	101	SHORT or LONG	
Compression	259	103	SHORT	1, 2 or 32773
PhotometricInterpretation	262	106	SHORT	0 or 1
StripOffsets	273	111	SHORT or LONG	
RowsPerStrip	278	116	SHORT or LONG	
StripByteCounts	279	117	LONG or SHORT	
XResolution	282	11A	RATIONAL	
YResolution	283	11B	RATIONAL	
ResolutionUnit	296	128	SHORT	1, 2 or 3

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## Matlab-File Handling

```
> fid=fopen('Name','ro');  
> a=fread(fid,1,'short');  
> b=fread(fid,12,'uchar');  
> fseek(fid,100,'bof');  
> fread(fid,1,'long');  
> fclose(fid)
```

Typ	Länge/bit
char	8
short	16
int	32
long	32
ushort	16
uint	32
ulong	32
float	32

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