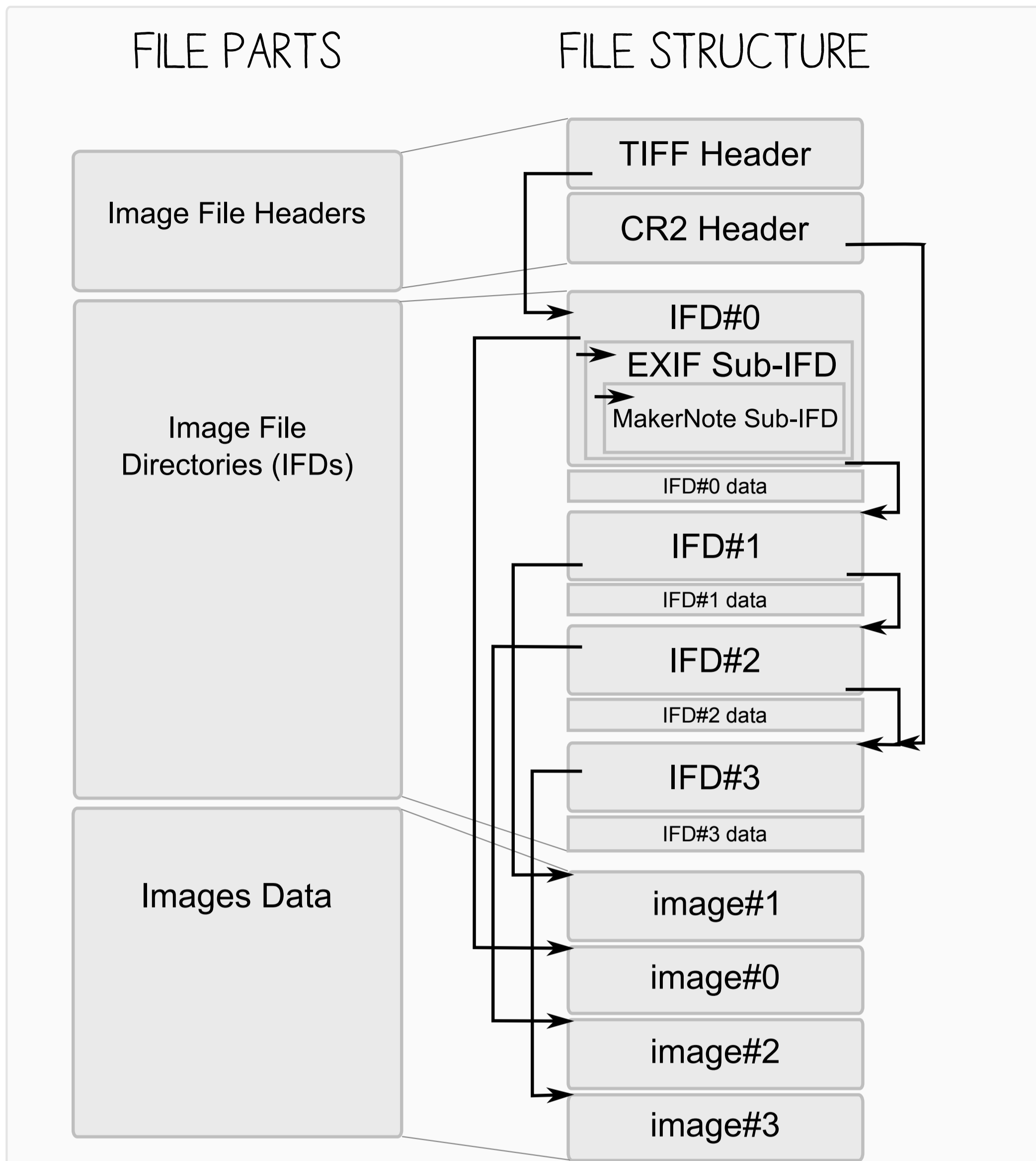


CANON RAW V2 FORMAT



IFD STRUCTURE

```

0 1 2 3 4 5 6 7 8 9 A B C D E F
00: 11000001 03000100 00004014 00000101
20: 03000100 00008000 00000201 03000300
30: 0000e200 00000301 03000100 00000600
: ...
: 69870400 01000000 b2010000 3eb60000
    
```

- 1 - number of IFD entries (2 bytes, ushort)
- 2 - sequence of IFD entries (12 bytes each entry)
- 3 - offset of next IFD (4 bytes, ulong)

IFD ENTRY STRUCTURE

1 - Tag_ID (2 bytes, ushort). See *1
 2 - Tag_type (2 bytes, ushort). See table on right
 3 - Tag_count (4 bytes, ulong)
 4 - Tag_value / offset to value (4 bytes, ulong)

TIFF types =
 1: ubyte, unsigned 8bits
 2: string, ASCII, 0 terminated
 3: ushort, unsigned 16bits
 4: ulong, unsigned 32bits
 5: urational, numerator & denominator ulongs
 6: byte, signed 8bits
 7: ubyte sequence
 8: short, signed 16bits
 9: long, signed 32 bits
 10: rational, signed 2 longs
 11: single precision (2 bytes) IEEE format
 12: double precision (4 bytes) IEEE format

EXAMPLES

```

0001 0300 01000000 40140000 --> 0x0100 (ImageWidth), 3 (ushort), 1, 0x1440 (5184 pixels)

1001 0200 0e000000 ee000000 --> 0x0110 (Model), 2 (string), 14,
                                0xee (offset to "Canon EOS 60D\0")

00ee: 4361 6e6f6e20 454f5320 36304400 (stored just after IFD, in IFD data area)
    
```

ANALYSIS EXAMPLE

TIFF HEADER

```

0 1 2 3 4 5 6 7 8 9 A B C D E F
0000: 49492a00 10000000
    
```

ASCII: "II*....."

FIELDS: endianness, magic number, offset to first IFD
 VALUES: 0x4949 "II" (Intel), 0x2a "*" (42), 0x10

CR2 HEADER

```

0008: 43520200 14b70000
    
```

ASCII: "CR....."

FIELDS: Canon raw marker, version, offset to RAW IFD
 VALUE: "CR", 2, 0xb714

IFD#0

```

0010: 11000001 03000100 00004014 00000101
0020: 03000100 00008000 00000201 03000300
0030: 0000e200 00000301 03000100 00000600
0040: 00000f01 02000600 0000e800 00001001
0050: 02000e00 0000e000 00001101 04000100
0060: 000054e2 00001201 03000100 00000100
0070: 00001701 04000100 000088c2 10001a01
0080: 05000100 0000e010 00001b01 05000100
    
```

number of entries: 0x11
 next IFD offset: 0xb63e

Tag_ID	Tag_type	Count	Tag_value
0x0100 (ImageWidth)	3 (ushort)	1	0x1440 (5184 pixels)
0x0101 (ImageHeight)	3 (ushort)	1	0xd80 (3456 pixels)
...
0x0110 (Model)	2 (string)	14	0xee (offset to "Canon EOS 60D\0")
0x0111 (StripOffset)	4 (ulong)	1	0xe254 (offset to image data)
0x0112 (Orientation)	3 (ushort)	1	1 (Horizontal)
0x0117 (StripByteCounts)	4 (ulong)	1	0x10c288 (image data length)
0x011a (XResolution)	5 (urational)	1	0x10e (offset to [0x0000048, 0x00000001])
...
0x8769 (EXIF)	4 (ulong)	1	0x1b2 (offset to EXIF sub-directory)

EXIF SUB-IFD

```

01b2: 2600 9a820500 01000000 80030000
01c0: 9d820500 01000000 80030000 22880300
    
```

number of entries: 0x26
 next IFD offset: 0 (last)

0x829a (ExposureTime)	5 (urational)	1	0x380 (offset to [0xd, 1]) = 13 sec
0x829d (FNumber)	5 (urational)	1	0x388 (offset to [9, 1] = F9.0)
...
0x927c (MakerNote)	7 (bytesteq)	45204	0x3d8 (offset to MakerNote sub-IFD)
...
0xa435 (LensSerialNumber)	2 (string)	12	0xb632 (offset to "0000117fd7\0\0")

MAKERNOTE SUB-IFD

```

03d8: 29000100 03003100
03e0: 0000ca05 00000200 03000400 00002c06
    
```

number of entries: 0x29
 next IFD offset: 0 (last)

MakerNote trailer:
 0x4949, "II": Intel byte order
 0x2a, 42: TIFF magic number
 0x3d8: ptr to MakerNote sub-IFD

0x0001 (CanonCameraSettings)	3 (ushort)	49	0x5ca (offset)
0x0002 (CanonFocalLength)	3 (ushort)	4	0x62c (offset)
...
0x4018 (LightingOpt)	4 (ulong)	3	0xb426 (offset)
0x4019 (LensInfo)	7 (bytesteq)	30	0xb432 (offset)
0x4020 (AmbienceInfo)	4 (ulong)	5	0xb450 (offset)

IFD#1

```

b63e: 0200
b640: 01020400 01000000 74d70000 02020400
b650: 01000000 e00a0000 5cb60000
    
```

number of entries: 2
 next IFD offset: 0xb65c

0x0201 (ThumbnailOffset)	4 (ulong)	1	0xd774 (offset to image data)
0x0202 (ThumbnailLength)	4 (ulong)	1	0xae0 (image data length)

IFD#2

```

b65c: 0d000001
b660: 03000100 00009c02 00000101 03000100
b670: 0000b001 0000 ...
b690: 03000100 00000200 00001101 04000100
b6a0: 0000dca4 11001501 03000100 00000300
b6b0: 00001601 03000100 0000b001 00001701
b6c0: 04000100 0000806b 1a001c01 03000100
    
```

number of entries: 0xd
 next IFD offset: 0xb714

0x0100 (ImageWidth)	3 (ushort)	1	0x29c (668 pixels)
0x0101 (ImageHeight)	3 (ushort)	1	0x1b0 (432 pixels)
...
0x0111 (StripOffset)	4 (ulong)	1	0x11a4dc (offset to image data)
0x0115 (SamplesPerPixel)	3 (ushort)	1	3
0x0116 (RowsPerStrip)	3 (ushort)	1	0x1b0 (432 pixels)
0x0117 (StripByteCounts)	4 (ulong)	1	0x1a6b80 (image data length)
...
0xc5c6 (?)	4 (ulong)	1	3
0xc6dc (?)	4 (ulong)	4	0xb704 (offset to array)

IFD#3

```

b714: 07000301 03000100 00000600
b720: 00001101 04000100 0000c24 2c001701
b730: 04000100 0000515f 2301d8c5 04000100
b740: 00000100 0000e0c5 04000100 00000300
b750: 000040c6 03000300 00006eb7 0000c5c6
b760: 04000100 00000100 00000000 00000200
b770: c0066007
    
```

number of entries: 7
 next IFD offset: 0 (last)

0x0103 (Compression)	3 (ushort)	1	6 (jpeg old-style)
...
0x0111 (StripOffset)	4 (ulong)	1	0x2c24dc (offset to image data)
0x0117 (StripByteCounts)	4 (ulong)	1	0x1235f51 (image data length)
...
0xc640 (Cr2slices)	3 (ushort)	3	0xb76e (offset to [2, 0x6c0, 0x760])
0xc65c (?)	4 (ulong)	1	1

IMAGE#1

```

d774: ffd8ffdb 00840001 01010101
    
```

IMAGE#0

```

e254: ffd8ffdb 00840006 04040604
    
```

IMAGE#2

```

11a4d0: 1c6d3820 d24da126 db3fffd9 fd070408
    
```

IMAGE#3

```

2c24dc: ffd8ffc4
2c24e0: 00420000 01040203 01010101 01000000
    
```

Images #0 and #1 are compressed in lossy (classic) jpeg.
 0xFFD8 marker is Start Of Image (SOI)
 0xFFDB marker is Define Quantization Table (DQT) for lossy compression
 0xFFD9 marker is the End Of Image (EOI). Image #0 ends at 0x11a4dc

Image #2 starts at 0x11a4dc, in RGB, 16 bits per color, little endian.
 Data length is 3 * 16bits * nb_pixels. Here 3*2*668*432 = 0x1a6b80
 0x07fd is the first color value (Red) of the first pixel value.

Raw image compressed in ITU-T81 lossless Jpeg:
 0xFFD8 marker is Start Of Image (SOI)
 0xFFC4 marker is Define Huffman Table(s) (DHT) for lossless compression. Length is 0x42 bytes (without marker)
 0xFFC3 marker is Start Of Frame (SOF3). Length is 0x14 bytes. Jpeg bits=14, high=0xdbc, wide=0x538, nb_components=4
 0xFFDA marker is Start Of Scan (SOS). Length is 0xe bytes
 Compressed data starts here at 0x2c2548. cr2slices[] values from IFD#3 must be used after decompression for unslicing: image has 2 (vertical) slices of 0x6c0 pixels width and a last slice of 0x760 pixels.
 0xFFD9 is the End Of Image (EOI) marker. Start 0x2c24dc + length 0x1235f51 = 0x14f842d (markers are included)

*1: ExifTool by Phil Harvey, http://www.sno.phy.queensu.ca/~phil/exiftool/