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# **rawkit Documentation**

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**Note:** *rawkit* is currently unmaintained. Code is provided as-is but no guarantee of support is provided, and there is no guarantee that patches will be merged or reviewed.

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*rawkit* is a ctypes-based set of [LibRaw](#) bindings for Python inspired by [Wand](#). It is licensed under the [MIT License](#).

```
from rawkit.raw import Raw
from rawkit.options import WhiteBalance

with Raw(filename='some/raw/image.CR2') as raw:
    raw.options.white_balance = WhiteBalance(camera=False, auto=True)
    raw.save(filename='some/destination/image.ppm')
```



# CHAPTER 1

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## Requirements

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- Python
  - CPython 2.7+
  - CPython 3.5+
  - PyPy 2.5+
  - PyPy3 2.4+
- LibRaw
  - LibRaw 0.16.x
  - LibRaw 0.17.x
  - LibRaw 0.18.x
  - LibRaw 0.19.x





## CHAPTER 2

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### Installing rawkit

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First, you'll need to install LibRaw:

- *libraw* or *libraw16* on [Arch](#)
- *LibRaw* on [Fedora 21+](#) and [EPEL 6](#)
- *libraw-bin* on [Ubuntu](#) [trusty](#)+
- *libraw-bin* on [Debian](#) [Jessie](#)+

Now you can fetch rawkit from [PyPi](#):

```
$ pip install rawkit
```



## 3.1 Getting Started

If you read the beginning of this documentation, you’ve seen one example of using rawkit already. Let’s see an even simpler form of it:

```
from rawkit.raw import Raw

with Raw(filename='some/raw/image.CR2') as raw:
    raw.save(filename='some/destination/image.ppm')
```

This constructs a `rawkit.raw.Raw` object which loads the file `image.CR2` as a context manager and then saves the output file `image.ppm`. One of the design goals of rawkit is “have sane defaults”, which means that this is pretty much all you need to do to get a decent looking photo. Of course, you probably want to customize how your photo is developed. For this you can use `rawkit.options`.

The `Raw` object you created has a `rawkit.options.Options` object already with the aforementioned sane defaults, so instead of constructing a new object let’s just modify the existing one to tweak the white balance and a few other options:

```
from rawkit.raw import Raw
from rawkit.options import WhiteBalance, colorspace, gamma_curves

with Raw(filename='some/raw/image.CR2') as raw:
    raw.options.white_balance = WhiteBalance(camera=False, auto=True)
    raw.options.colorspace = colorspace.adobe_rgb
    raw.options.gamma = gamma_curves.adobe_rgb
    raw.save(filename='some/destination/image.ppm')
```

By default rawkit uses the white balance written to the raw file by your camera (if available) and falls back to automatically guessing at the white balance if no camera specified white balance is available. However, here we’ve constructed a new `rawkit.options.WhiteBalance` object which does not attempt to use the camera white balance (note that `WhiteBalance` objects are immutable, so you’ll always need to construct a new one if you’re changing the

white balance). We've also changed the colorspace to Adobe RGB instead of the default sRGB, and changed the gamma curve to use the corrective power function for the Adobe RGB colorspace.

Lots of other options can be set. A full list can be found in the API documentation for the `rawkit.options` module.

Of course, we probably don't want to process just one raw file. A common photography workflow is to do some basic level of processing to lots of files at once (eg. an entire days worth of shooting) and then go back and tweak individual photos as necessary. To do this, we can construct our own options object and reuse it:

```
import sys

from rawkit.raw import Raw
from rawkit.options import WhiteBalance, colorspace, gamma_curves
from rawkit.options import Options

opts = Options({
    'white_balance': WhiteBalance(camera=False, auto=True),
    'colorspace': colorspace.adobe_rgb,
})

opts.gamma = gamma_curves.adobe_rgb

for rawfile in sys.argv[1:]:
    with Raw(filename=rawfile) as raw:
        raw.options = opts
        raw.save(filename='{}.ppm'.format(rawfile))
```

As you can see, two methods for setting options on an Options object are presented here: via a dict passed to the constructor, or by manually setting the properties. Because the dict method tolerates arbitrary fields, you must be very careful not to make a typo. Eg. setting:

```
opts = Options({
    'colourspace': colorspace.adobe_rgb,
    'white_blaance': WhiteBalance(greybox=[1034, 1058, 1096, 1085])
})
```

will run without error, but there will be no difference to your output photos. However, trying to set options via:

```
opts = Options()
opts.colourspace = colorspace.adobe_rgb
opts.white_blaance = WhiteBalance(greybox=[1034, 1058, 1096, 1085])
```

Will result in an `AttributeError`. This is the recommended method for manually setting options because it will fail early and loudly!

Now that we've seen the basics (loading and saving raw files and setting options), let's turn our simple example into something useful: A program which will take in the name of one or more raw files and attempt to save them as standard TIFF files. First, we'll snag the arguments and add a bit of error checking (we'll also get rid of the options and just use the defaults for now):

```
import sys

from libraw.errors import FileUnsupported
from rawkit.errors import InvalidFileType
from rawkit.raw import Raw
```

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```

if __name__ == "__main__":
    for rawfile in sys.argv[1:]:
        try:
            with Raw(filename=rawfile) as raw:
                outfile = '{}.tiff'.format(rawfile)
                raw.save(filename=outfile)
                print(
                    'Wrote file: "{}".'.format(
                        outfile
                    )
                )
        except (InvalidFileType, FileUnsupported):
            print(
                'WARNING: File "{}" could not be processed.'.format(
                    rawfile
                ),
                file=sys.stderr
            )

```

Of course, while this works, it's still a bit slow. Let's add a thread pool to the mix and process multiple raw files at once (not that this has anything to do with actually using rawkit, but we might as well do things right):

```

import concurrent.futures
import os
import sys

from libraw.errors import FileUnsupported
from rawkit.errors import InvalidFileType
from rawkit.raw import Raw

def develop_photo(rawfile):
    with Raw(filename=rawfile) as raw:
        outfile = '{}.tiff'.format(rawfile)
        raw.save(filename=outfile)
        return outfile

if __name__ == "__main__":
    with concurrent.futures.ThreadPoolExecutor(max_workers=(
        (os.cpu_count() or 2) * 2)) as executor:
        develop_futures = {executor.submit(develop_photo, raw): raw for raw
            in sys.argv[1:]}
        for future in concurrent.futures.as_completed(develop_futures):
            raw = develop_futures[future]
            try:
                data = future.result()
            except (InvalidFileType, FileUnsupported):
                print(
                    'WARNING: File "{}" could not be processed'.format(raw),
                    file=sys.stderr
                )
            else:
                print('Wrote file: "{}".'.format(data))

```

That's it, you've made a useful application which uses rawkit to develop raw photos! For a slightly more interesting example, take a look at the source to [photoREPL](#), an experimental interface for editing photos from the command line.

## 3.2 Using Rawkit with NumPy

Rawkit can be used to easily access raw data as NumPy arrays.

```
from rawkit.raw import Raw

with Raw(filename='some/raw/image.CR2') as raw:
    pixels = raw.as_array()
    color_filter_array = raw.color_filter_array

    # Randomly chosen pixel
    x = 307
    y = 123

    intensity = pixels[y][x]
    color = color_filter_array[y % 2][x % 2]
    message = 'The pixel at {x},{y} has intensity {i} and color {c}'

    print(message.format(
        x=x,
        y=y,
        i=intensity,
        c=color,
    ))
```

---

## Architecture and Design

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### 4.1 Architecture

When we talk about “rawkit” we’re actually talking about an entire stack of libraries which work together to give you a simple way to work with raw photo data in Python. However, under the hood, rawkit comprises three separate libraries which operate in a teired structure:



The bottom layer is the **LibRaw** C library, which is used to actually extract data from raw photo files, and to do basic processing. LibRaw is not actually bundled with rawkit, and must already be installed on the end users computer. The next layer, also called *libraw*, is a low-level Python library which uses *ctypes* to link to the LibRaw C code. This library, while written in Python, generally just looks and acts like the lower-level C code, albeit with slightly more Pythonic error handling and a few helper functions to make it easier to use from within Python. However, you generally shouldn’t use libraw. Instead, you should use the highest level methods available, *rawkit*. The actual rawkit namespace provides a module which builds on libraw to provide a fully Pythonic interface to the underlying library (eg. `rawkit.Raw` objects, context managers, an API for setting options, etc.). If at all possible, you should use the rawkit module in your applications, but the libraw module is still exposed in case you need to dig down and perform some functionality that is not exposed by rawkit.

More details about each tier can be found below.

### 4.1.1 LibRaw

The foundation of the entire rawkit stack is the [LibRaw](#) C library. LibRaw is maintained by LibRaw, LLC. and does the actual grunt work of loading raw files, extracting data, and developing photos via its dcraw emulation layer. It is the only real dependency of rawkit and must be installed on the end-users computer before this library will actually work.

### 4.1.2 libraw

The `libraw` module is a set of Python bindings which use `ctypes` to talk to the LibRaw library on the users system. The libraw module provides very low level bindings that mostly juts mimic the C structs present in LibRaw. It also defines function and method arguments and return types, allows you to use Python functions as callbacks to LibRaw events, maps LibRaw error codes to actual Python exceptions, and handles the actual linking with `libraw.so` (or the equivalent library on your system). In general, you should never have to call libraw directly. Instead, you should use the higher level API's provided by `rawkit`.

### 4.1.3 rawkit

The `rawkit` module is the highest level part of the rawkit architecture. This module handles raw files in a Pythonic way by abstracting them to a `rawkit.Raw` object which acts as a context manager, and allowing you to set options for how that raw file should be processed. It also contains a set of utility functions (see `rawkit.util`) for dealing with common operations that may not be directly related to raw files (eg. discovering support for raw files, or getting a list of cameras supported by the linked version of LibRaw).



The *rawkit* package provides two modules: *rawkit* and *libraw*. The *rawkit* module provides a high-level Pythonic interface for developing raw photos, while the *libraw* module provides a CTypes based interface for interacting with the low-level LibRaw C APIs. Most of the time, developers will want to use the *rawkit* module instead of using *libraw* directly.

## 5.1 Contents

### 5.1.1 libraw package

#### Introduction

The *libraw* package contains low-level CTYPES based APIs for interfacing with LibRaw by LibRaw, LLC.

While this library can be used on its own to access the full functionality of LibRaw and develop raw photos, we recommend using the higher-level *rawkit* module, which provides a more pythonic interface to LibRaw.

#### Submodules

##### `libraw.bindings` — Low-level LibRaw bindings

The *libraw.bindings* module handles linking against the LibRaw binary.

**class** `libraw.bindings.LibRaw`

Bases: `ctypes.CDLL`

A `ctypes.CDLL` that links against *libraw.so* (or the equivalent on your platform).

**Raises** `ImportError` – If LibRaw cannot be found on your system, or linking fails.

**version**

A string representation of the version of LibRaw which we have linked against. eg.

```
"0.16.1-Release"
```

**Returns** The version

**Return type** str

**version\_number**

A numeric representation of the version of LibRaw which we have linked against in (Major, Minor, Patch) form. eg.

```
(0, 16, 1)
```

**Returns** The version number

**Return type** 3 tuple

## libraw.callbacks — LibRaw callback definitions

**Warning:** You will need to keep a reference to your callback functions for as long as you want to call them from C code, otherwise they may be garbage collected and lead to a segmentation fault.

`libraw.callbacks.data_callback`  
alias of `ctypes.CFunctionType`

`libraw.callbacks.exif_parser_callback`  
alias of `ctypes.CFunctionType`

`libraw.callbacks.memory_callback`  
alias of `ctypes.CFunctionType`

`libraw.callbacks.progress_callback`  
alias of `ctypes.CFunctionType`

## libraw.errors — Pythonic error handling for LibRaw

**exception** `libraw.errors.BadCrop`  
Bases: `libraw.errors.LibRawError`

The cropping coordinates specified are invalid (eg. the top left corner of the cropping rectangle is outside the image).

**exception** `libraw.errors.CanceledByCallback`  
Bases: `libraw.errors.LibRawError`  
Image processing was canceled because the progress callback requested it.

**exception** `libraw.errors.DataError`  
Bases: `libraw.errors.LibRawError`  
Data unpacking failed.

**exception** `libraw.errors.FileUnsupported`  
Bases: `libraw.errors.LibRawError`

The file is not a raw file or is from an unsupported camera.

**exception** `libraw.errors.InputClosed`

Bases: `libraw.errors.LibRawError`

There is no input stream, or the input stream has been closed.

**exception** `libraw.errors.InsufficientMemory`

Bases: `libraw.errors.LibRawError`

Memory allocation failed.

**exception** `libraw.errors.LibRawError`

Bases: `exceptions.Exception`

A base exception class from which all other exceptions that originate in LibRaw inherit.

**exception** `libraw.errors.NoThumbnail`

Bases: `libraw.errors.LibRawError`

The raw file does not contain a thumbnail.

**exception** `libraw.errors.OutOfOrderCall`

Bases: `libraw.errors.LibRawError`

A LibRaw function depends on another function being called first and was invoked out of order.

**exception** `libraw.errors.RequestForNonexistentImage`

Bases: `libraw.errors.LibRawError`

The image file directory in the raw file which you are trying to access does not contain an image.

**exception** `libraw.errors.UnspecifiedError`

Bases: `libraw.errors.LibRawError`

Something bad happened, but we don't know what.

**exception** `libraw.errors.UnsupportedThumbnail`

Bases: `libraw.errors.LibRawError`

The thumbnail format is not supported.

**class** `libraw.errors.c_error`

Bases: `ctypes.c_int`

An error type for LibRaw (since LibRaw errors are ints and you can't distinguish between functions that return an error and functions that return an int that doesn't code for an error).

`libraw.errors.check_call` (*exit\_code*, *func*, *arguments*)

Throws a Python error which corresponds to the given LibRaw exit code.

**Parameters** `exit_code` (*int*) – An exit code returned by a LibRaw function.

**Raises**

- `UnspecifiedError` – We're not sure what happened.
- `FileUnsupported` – The file is not a raw file that we recognize.
- `RequestForNonexistentImage` – The given IFD does not contain an image.
- `OutOfOrderCall` – Something was called out of order (eg. before data was unpacked)
- `NoThumbnail` – The image does not have a thumbnail.
- `UnsupportedThumbnail` – The embedded thumbnail format is unsupported.
- `InputClosed` – The input stream has been closed.

- *InsufficientMemory* – We’re out of memory.
- *DataError* – The unpacking step failed.
- *IOError* – Reading was interrupted (or the file is corrupt).
- *CanceledByCallback* – A callback canceled the operation.
- *BadCrop* – The crop range was invalid.

`libraw.errors.raise_if_error(error_code)`

`raise_if_error()` raises a meaningful exception that corresponds to the given LibRaw integer return value.

**Parameters** `error_code` (*int*) – An exit code returned by a LibRaw function.

**Raises**

- *UnspecifiedError* – We’re not sure what happened.
- *FileUnsupported* – The file is not a raw file that we recognize.
- *RequestForNonexistentImage* – The given IFD does not contain an image.
- *OutOfOrderCall* – Something was called out of order (eg. before data was unpacked)
- *NoThumbnail* – The image does not have a thumbnail.
- *UnsupportedThumbnail* – The embedded thumbnail format is unsupported.
- *InputClosed* – The input stream has been closed.
- *InsufficientMemory* – We’re out of memory.
- *DataError* – The unpacking step failed.
- *IOError* – Reading was interrupted (or the file is corrupt).
- *CanceledByCallback* – A callback canceled the operation.
- *BadCrop* – The crop range was invalid.

## **libraw.structs — LibRaw struct definitions**

**class** `libraw.structs_16.libraw_colordata_t`

Bases: `_ctypes.Structure`

Describes all color data of the image.

**black**

Structure/Union member

**black\_stat**

Structure/Union member

**cam\_mul**

Structure/Union member

**cam\_xyz**

Structure/Union member

**canon\_ev**

Structure/Union member

**cblack**

Structure/Union member

**cmatrix**  
Structure/Union member

**curve**  
Structure/Union member

**data\_maximum**  
Structure/Union member

**flash\_used**  
Structure/Union member

**maximum**  
Structure/Union member

**model2**  
Structure/Union member

**phase\_one\_data**  
Structure/Union member

**pre\_mul**  
Structure/Union member

**profile**  
Structure/Union member

**profile\_length**  
Structure/Union member

**rgb\_cam**  
Structure/Union member

**white**  
Structure/Union member

**class** libraw.structs\_16.libraw\_data\_t  
Bases: `_ctypes.Structure`

A container which comprises the data structures that make up libraw's representation of a raw file.

**color**  
Structure/Union member

**idata**  
Structure/Union member

**image**  
Structure/Union member

**other**  
Structure/Union member

**params**  
Structure/Union member

**parent\_class**  
Structure/Union member

**process\_warnings**  
Structure/Union member

**progress\_flags**  
Structure/Union member

**rawdata**  
Structure/Union member

**sizes**  
Structure/Union member

**thumbnail**  
Structure/Union member

**class** libraw.structs\_16.libraw\_decoder\_info\_t  
Bases: `_ctypes.Structure`

Describes a raw format decoder name and format.

**decoder\_flags**  
Structure/Union member

**decoder\_name**  
Structure/Union member

**class** libraw.structs\_16.libraw\_image\_sizes\_t  
Bases: `_ctypes.Structure`

Describes the size of the image.

**flip**  
Structure/Union member

**height**  
Structure/Union member

**iheight**  
Structure/Union member

**iwidth**  
Structure/Union member

**left\_margin**  
Structure/Union member

**mask**  
Structure/Union member

**pixel\_aspect**  
Structure/Union member

**raw\_height**  
Structure/Union member

**raw\_pitch**  
Structure/Union member

**raw\_width**  
Structure/Union member

**top\_margin**  
Structure/Union member

**width**  
Structure/Union member

**class** libraw.structs\_16.libraw\_imgother\_t  
Bases: `_ctypes.Structure`

Information read from the raw file that is unnecessary for raw processing.

**aperture**  
Structure/Union member

**artist**  
Structure/Union member

**desc**  
Structure/Union member

**focal\_len**  
Structure/Union member

**gpsdata**  
Structure/Union member

**iso\_speed**  
Structure/Union member

**shot\_order**  
Structure/Union member

**shutter**  
Structure/Union member

**timestamp**  
Structure/Union member

**class** libraw.structs\_16.libraw\_internal\_output\_params\_t  
Bases: `_ctypes.Structure`

**fuji\_width**  
Structure/Union member

**mix\_green**  
Structure/Union member

**raw\_color**  
Structure/Union member

**shrink**  
Structure/Union member

**zero\_is\_bad**  
Structure/Union member

**class** libraw.structs\_16.libraw\_iparams\_t  
Bases: `_ctypes.Structure`

The primary parameters of the image.

**cdesc**  
Structure/Union member

**colors**  
Structure/Union member

**dng\_version**  
Structure/Union member

**filters**  
Structure/Union member

**is\_foveon**  
Structure/Union member

**make**  
Structure/Union member

**model**  
Structure/Union member

**raw\_count**  
Structure/Union member

**xtrans**  
Structure/Union member

**class** libraw.structs\_16.libraw\_output\_params\_t  
Bases: `_ctypes.Structure`

Output parameters for processing the image with ddraw.

**aber**  
Structure/Union member

**adjust\_maximum\_thr**  
Structure/Union member

**auto\_bright\_thr**  
Structure/Union member

**bad\_pixels**  
Structure/Union member

**bright**  
Structure/Union member

**ca\_correc**  
Structure/Union member

**cablue**  
Structure/Union member

**camera\_profile**  
Structure/Union member

**cared**  
Structure/Union member

**cclean**  
Structure/Union member

**cfa\_clean**  
Structure/Union member

**cfa\_green**  
Structure/Union member

**cfaline**  
Structure/Union member

**cropbox**  
Structure/Union member

**dark\_frame**  
Structure/Union member

**dcb\_enhance\_f1**  
Structure/Union member



**dcb\_iterations**  
Structure/Union member

**eeci\_refine**  
Structure/Union member

**es\_med\_passes**  
Structure/Union member

**exp\_correc**  
Structure/Union member

**exp\_preser**  
Structure/Union member

**exp\_shift**  
Structure/Union member

**fbdd\_noiserd**  
Structure/Union member

**force\_foveon\_x3f**  
Structure/Union member

**four\_color\_rgb**  
Structure/Union member

**gamm**  
Structure/Union member

**green\_matching**  
Structure/Union member

**green\_thresh**  
Structure/Union member

**greybox**  
Structure/Union member

**half\_size**  
Structure/Union member

**highlight**  
Structure/Union member

**lclean**  
Structure/Union member

**linenoise**  
Structure/Union member

**med\_passes**  
Structure/Union member

**no\_auto\_bright**  
Structure/Union member

**no\_auto\_scale**  
Structure/Union member

**no\_interpolation**  
Structure/Union member

**output\_bps**  
Structure/Union member

**output\_color**  
Structure/Union member

**output\_profile**  
Structure/Union member

**output\_tiff**  
Structure/Union member

**shot\_select**  
Structure/Union member

**sony\_arw2\_hack**  
Structure/Union member

**straw\_ycc**  
Structure/Union member

**threshold**  
Structure/Union member

**use\_auto\_wb**  
Structure/Union member

**use\_camera\_matrix**  
Structure/Union member

**use\_camera\_wb**  
Structure/Union member

**use\_fuji\_rotate**  
Structure/Union member

**use\_rawspeed**  
Structure/Union member

**user\_black**  
Structure/Union member

**user\_cblack**  
Structure/Union member

**user\_flip**  
Structure/Union member

**user\_mul**  
Structure/Union member

**user\_qual**  
Structure/Union member

**user\_sat**  
Structure/Union member

**wf\_deband\_treshold**  
Structure/Union member

**wf\_debanding**  
Structure/Union member

**class** libraw.structs\_16.libraw\_processed\_image\_t

Bases: `_ctypes.Structure`

A container for processed image data.

**bits**

Structure/Union member

**colors**

Structure/Union member

**data**

Structure/Union member

**data\_size**

Structure/Union member

**height**

Structure/Union member

**type**

Structure/Union member

**width**

Structure/Union member

**class** libraw.structs\_16.libraw\_rawdata\_t

Bases: `_ctypes.Structure`

Raw image data (after it has been unpacked) and a backup copy of color info used during post processing.

**color**

Structure/Union member

**color3\_image**

Structure/Union member

**color4\_image**

Structure/Union member

**ioparams**

Structure/Union member

**iparams**

Structure/Union member

**ph1\_black**

Structure/Union member

**raw\_alloc**

Structure/Union member

**raw\_image**

Structure/Union member

**sizes**

Structure/Union member

**class** libraw.structs\_16.libraw\_thumbnail\_t

Bases: `_ctypes.Structure`

Describes the thumbnail image embedded in the raw file.

**tcolors**

Structure/Union member

**tformat**  
Structure/Union member

**theight**  
Structure/Union member

**thumb**  
Structure/Union member

**tlength**  
Structure/Union member

**twidth**  
Structure/Union member

**class** `libraw.structs_16.ph1_t`  
Bases: `_ctypes.Structure`  
Contains color data read by Phase One cameras.

**black\_off**  
Structure/Union member

**format**  
Structure/Union member

**key\_off**  
Structure/Union member

**split\_col**  
Structure/Union member

**t\_black**  
Structure/Union member

**tag\_210**  
Structure/Union member

**tag\_21a**  
Structure/Union member

## **libraw.structs — LibRaw struct definitions**

**class** `libraw.structs_17.libraw_canon_makernotes_t`  
Bases: `_ctypes.Structure`

**AverageBlackLevel**  
Structure/Union member

**CanonColorDataSubVer**  
Structure/Union member

**CanonColorDataVer**  
Structure/Union member

**SpecularWhiteLevel**  
Structure/Union member

**class** `libraw.structs_17.libraw_colordata_t`  
Bases: `_ctypes.Structure`  
Describes all color data of the image.

**FujiExpoMidPointShift**  
Structure/Union member

**OlympusSensorCalibration**  
Structure/Union member

**baseline\_exposure**  
Structure/Union member

**black**  
Structure/Union member

**black\_stat**  
Structure/Union member

**cam\_mul**  
Structure/Union member

**cam\_xyz**  
Structure/Union member

**canon\_ev**  
Structure/Union member

**canon\_makernotes**  
Structure/Union member

**cblack**  
Structure/Union member

**cmatrix**  
Structure/Union member

**curve**  
Structure/Union member

**data\_maximum**  
Structure/Union member

**digitalBack\_color**  
Structure/Union member

**dng\_color**  
Structure/Union member

**flash\_used**  
Structure/Union member

**maximum**  
Structure/Union member

**model2**  
Structure/Union member

**phase\_one\_data**  
Structure/Union member

**pre\_mul**  
Structure/Union member

**profile**  
Structure/Union member

**profile\_length**  
Structure/Union member

**rgb\_cam**  
Structure/Union member

**white**  
Structure/Union member

**class** libraw.structs\_17.libraw\_data\_t  
Bases: `_ctypes.Structure`

A container which comprises the data structures that make up libraw's representation of a raw file.

**color**  
Structure/Union member

**idata**  
Structure/Union member

**image**  
Structure/Union member

**lens**  
Structure/Union member

**other**  
Structure/Union member

**params**  
Structure/Union member

**parent\_class**  
Structure/Union member

**process\_warnings**  
Structure/Union member

**progress\_flags**  
Structure/Union member

**rawdata**  
Structure/Union member

**sizes**  
Structure/Union member

**thumbnail**  
Structure/Union member

**class** libraw.structs\_17.libraw\_decoder\_info\_t  
Bases: `_ctypes.Structure`

Describes a raw format decoder name and format.

**decoder\_flags**  
Structure/Union member

**decoder\_name**  
Structure/Union member

**class** libraw.structs\_17.libraw\_dng\_color\_t  
Bases: `_ctypes.Structure`

**calibration**  
Structure/Union member

**colormatrix**  
Structure/Union member

**illuminant**  
Structure/Union member

**class** `libraw.structs_17.libraw_dnglens_t`  
Bases: `_ctypes.Structure`

**MaxAp4MaxFocal**  
Structure/Union member

**MaxAp4MinFocal**  
Structure/Union member

**MaxFocal**  
Structure/Union member

**MinFocal**  
Structure/Union member

**class** `libraw.structs_17.libraw_gps_info_t`  
Bases: `_ctypes.Structure`

GPS data for the image.

**altitude**  
Structure/Union member

**altref**  
Structure/Union member

**gpsparsed**  
Structure/Union member

**gpsstatus**  
Structure/Union member

**gpstimestamp**  
Structure/Union member

**latitude**  
Structure/Union member

**latref**  
Structure/Union member

**longitude**  
Structure/Union member

**longref**  
Structure/Union member

**class** `libraw.structs_17.libraw_image_sizes_t`  
Bases: `_ctypes.Structure`

Describes the size of the image.

**flip**  
Structure/Union member

**height**  
Structure/Union member

**iheight**  
Structure/Union member

**iwidth**  
Structure/Union member

**left\_margin**  
Structure/Union member

**mask**  
Structure/Union member

**pixel\_aspect**  
Structure/Union member

**raw\_height**  
Structure/Union member

**raw\_pitch**  
Structure/Union member

**raw\_width**  
Structure/Union member

**top\_margin**  
Structure/Union member

**width**  
Structure/Union member

**class** `libraw.structs_17.libraw_imgother_t`

Bases: `_ctypes.Structure`

Information read from the raw file that is unnecessary for raw processing.

**aperture**  
Structure/Union member

**artist**  
Structure/Union member

**desc**  
Structure/Union member

**focal\_len**  
Structure/Union member

**gpsdata**  
Structure/Union member

**iso\_speed**  
Structure/Union member

**parsed\_gps**  
Structure/Union member

**shot\_order**  
Structure/Union member

**shutter**  
Structure/Union member



**timestamp**  
Structure/Union member

**class** libraw.structs\_17.libraw\_internal\_output\_params\_t

Bases: `_ctypes.Structure`

**fuji\_width**  
Structure/Union member

**mix\_green**  
Structure/Union member

**raw\_color**  
Structure/Union member

**shrink**  
Structure/Union member

**zero\_is\_bad**  
Structure/Union member

**class** libraw.structs\_17.libraw\_iparams\_t

Bases: `_ctypes.Structure`

The primary parameters of the image.

**cdesc**  
Structure/Union member

**colors**  
Structure/Union member

**dng\_version**  
Structure/Union member

**filters**  
Structure/Union member

**is\_foveon**  
Structure/Union member

**make**  
Structure/Union member

**model**  
Structure/Union member

**raw\_count**  
Structure/Union member

**software**  
Structure/Union member

**xmpdata**  
Structure/Union member

**xmplen**  
Structure/Union member

**xtrans**  
Structure/Union member

**xtrans\_abs**  
Structure/Union member

```
class libraw.structs_17.libraw_lensinfo_t
    Bases: _ctypes.Structure

    EXIF_MaxAp
        Structure/Union member

    FocalLengthIn35mmFormat
        Structure/Union member

    Lens
        Structure/Union member

    LensMake
        Structure/Union member

    MaxAp4MaxFocal
        Structure/Union member

    MaxAp4MinFocal
        Structure/Union member

    MaxFocal
        Structure/Union member

    MinFocal
        Structure/Union member

    dng
        Structure/Union member

    makernotes
        Structure/Union member

    nikon
        Structure/Union member

class libraw.structs_17.libraw_makernotes_lens_t
    Bases: _ctypes.Structure

    Adapter
        Structure/Union member

    AdapterID
        Structure/Union member

    Attachment
        Structure/Union member

    AttachmentID
        Structure/Union member

    CamID
        Structure/Union member

    CameraFormat
        Structure/Union member

    CameraMount
        Structure/Union member

    CanonFocalUnits
        Structure/Union member
```

**CurAp**  
Structure/Union member

**CurFocal**  
Structure/Union member

**FocalLengthIn35mmFormat**  
Structure/Union member

**FocalType**  
Structure/Union member

**Lens**  
Structure/Union member

**LensFStops**  
Structure/Union member

**LensFeatures\_pre**  
Structure/Union member

**LensFeatures\_suf**  
Structure/Union member

**LensFormat**  
Structure/Union member

**LensID**  
Structure/Union member

**LensMount**  
Structure/Union member

**MaxAp**  
Structure/Union member

**MaxAp4CurFocal**  
Structure/Union member

**MaxAp4MaxFocal**  
Structure/Union member

**MaxAp4MinFocal**  
Structure/Union member

**MaxFocal**  
Structure/Union member

**MinAp**  
Structure/Union member

**MinAp4CurFocal**  
Structure/Union member

**MinAp4MaxFocal**  
Structure/Union member

**MinAp4MinFocal**  
Structure/Union member

**MinFocal**  
Structure/Union member

**Teleconverter**  
Structure/Union member

**TeleconverterID**  
Structure/Union member

**body**  
Structure/Union member

**class** libraw.structs\_17.libraw\_nikonlens\_t  
Bases: `_ctypes.Structure`

**NikonEffectiveMaxAp**  
Structure/Union member

**NikonLensFStops**  
Structure/Union member

**NikonLensIDNumber**  
Structure/Union member

**NikonLensType**  
Structure/Union member

**NikonMCUVersion**  
Structure/Union member

**class** libraw.structs\_17.libraw\_output\_params\_t  
Bases: `_ctypes.Structure`

Output parameters for processing the image with dcrw.

**aber**  
Structure/Union member

**adjust\_maximum\_thr**  
Structure/Union member

**auto\_bright\_thr**  
Structure/Union member

**bad\_pixels**  
Structure/Union member

**bright**  
Structure/Union member

**ca\_correc**  
Structure/Union member

**cablue**  
Structure/Union member

**camera\_profile**  
Structure/Union member

**cared**  
Structure/Union member

**cclean**  
Structure/Union member

**cfa\_clean**  
Structure/Union member

**cfa\_green**  
Structure/Union member

**cfaline**  
Structure/Union member

**coolscan\_nef\_gamma**  
Structure/Union member

**cropbox**  
Structure/Union member

**dark\_frame**  
Structure/Union member

**dcb\_enhance\_f1**  
Structure/Union member

**dcb\_iterations**  
Structure/Union member

**eeci\_refine**  
Structure/Union member

**es\_med\_passes**  
Structure/Union member

**exp\_correc**  
Structure/Union member

**exp\_preser**  
Structure/Union member

**exp\_shift**  
Structure/Union member

**fbdd\_noiserd**  
Structure/Union member

**force\_foveon\_x3f**  
Structure/Union member

**four\_color\_rgb**  
Structure/Union member

**gamm**  
Structure/Union member

**green\_matching**  
Structure/Union member

**green\_thresh**  
Structure/Union member

**greybox**  
Structure/Union member

**half\_size**  
Structure/Union member

**highlight**  
Structure/Union member

**lclean**  
Structure/Union member

**linenoise**  
Structure/Union member

**med\_passes**  
Structure/Union member

**no\_auto\_bright**  
Structure/Union member

**no\_auto\_scale**  
Structure/Union member

**no\_interpolation**  
Structure/Union member

**output\_bps**  
Structure/Union member

**output\_color**  
Structure/Union member

**output\_profile**  
Structure/Union member

**output\_tiff**  
Structure/Union member

**shot\_select**  
Structure/Union member

**sony\_arw2\_options**  
Structure/Union member

**sony\_arw2\_posterization\_thr**  
Structure/Union member

**straw\_ycc**  
Structure/Union member

**threshold**  
Structure/Union member

**use\_auto\_wb**  
Structure/Union member

**use\_camera\_matrix**  
Structure/Union member

**use\_camera\_wb**  
Structure/Union member

**use\_fuji\_rotate**  
Structure/Union member

**use\_rawspeed**  
Structure/Union member

**user\_black**  
Structure/Union member

**user\_cblack**  
Structure/Union member

**user\_flip**  
Structure/Union member

**user\_mul**  
Structure/Union member

**user\_qual**  
Structure/Union member

**user\_sat**  
Structure/Union member

**wf\_deband\_threshold**  
Structure/Union member

**wf\_debanding**  
Structure/Union member

**x3f\_flags**  
Structure/Union member

**class** libraw.structs\_17.**libraw\_processed\_image\_t**  
Bases: `_ctypes.Structure`

A container for processed image data.

**bits**  
Structure/Union member

**colors**  
Structure/Union member

**data**  
Structure/Union member

**data\_size**  
Structure/Union member

**height**  
Structure/Union member

**type**  
Structure/Union member

**width**  
Structure/Union member

**class** libraw.structs\_17.**libraw\_rawdata\_t**  
Bases: `_ctypes.Structure`

Raw image data (after it has been unpacked) and a backup copy of color info used during post processing.

**color**  
Structure/Union member

**color3\_image**  
Structure/Union member

**color4\_image**  
Structure/Union member

**ioparams**  
Structure/Union member

**iparams**  
Structure/Union member

**ph1\_cblack**  
Structure/Union member

**ph1\_rblack**  
Structure/Union member

**raw\_alloc**  
Structure/Union member

**raw\_image**  
Structure/Union member

**sizes**  
Structure/Union member

**class** `libraw.structs_17.libraw_thumbnail_t`  
Bases: `_ctypes.Structure`

Describes the thumbnail image embedded in the raw file.

**tcolors**  
Structure/Union member

**tformat**  
Structure/Union member

**theight**  
Structure/Union member

**thumb**  
Structure/Union member

**tlength**  
Structure/Union member

**twidth**  
Structure/Union member

**class** `libraw.structs_17.ph1_t`  
Bases: `_ctypes.Structure`

Contains color data read by Phase One cameras.

**black\_col**  
Structure/Union member

**black\_row**  
Structure/Union member

**format**  
Structure/Union member

**key\_off**  
Structure/Union member

**split\_col**  
Structure/Union member



**split\_row**  
Structure/Union member

**t\_black**  
Structure/Union member

**tag\_210**  
Structure/Union member

**tag\_21a**  
Structure/Union member

## libraw.structs — LibRaw struct definitions

```
class libraw.structs_18.libraw_P1_color_t
    Bases: _ctypes.Structure

    romm_cam
        Structure/Union member

class libraw.structs_18.libraw_canon_makernotes_t
    Bases: _ctypes.Structure

    AESetting
        Structure/Union member

    AFAreaHeights
        Structure/Union member

    AFAreaMode
        Structure/Union member

    AFAreaWidths
        Structure/Union member

    AFAreaXPositions
        Structure/Union member

    AFAreaYPositions
        Structure/Union member

    AFImageHeight
        Structure/Union member

    AFImageWidth
        Structure/Union member

    AFPoint
        Structure/Union member

    AFPointsInFocus
        Structure/Union member

    AFPointsInFocus1D
        Structure/Union member

    AFPointsInFocus30D
        Structure/Union member

    AFPointsInFocus5D
        Structure/Union member
```

**AFPointsSelected**  
Structure/Union member

**AverageBlackLevel**  
Structure/Union member

**BlackMaskBottomBorder**  
Structure/Union member

**BlackMaskLeftBorder**  
Structure/Union member

**BlackMaskRightBorder**  
Structure/Union member

**BlackMaskTopBorder**  
Structure/Union member

**CanonColorDataSubVer**  
Structure/Union member

**CanonColorDataVer**  
Structure/Union member

**ChannelBlackLevel**  
Structure/Union member

**ContinuousDrive**  
Structure/Union member

**ExposureMode**  
Structure/Union member

**FlashActivity**  
Structure/Union member

**FlashBits**  
Structure/Union member

**FlashExposureLock**  
Structure/Union member

**FlashGuideNumber**  
Structure/Union member

**FlashMeteringMode**  
Structure/Union member

**FlashMode**  
Structure/Union member

**FlashOutput**  
Structure/Union member

**FocusContinuous**  
Structure/Union member

**FocusMode**  
Structure/Union member

**HighlightTonePriority**  
Structure/Union member

**ImageStabilization**  
Structure/Union member

**ManualFlashOutput**  
Structure/Union member

**MeteringMode**  
Structure/Union member

**NumAFPoints**  
Structure/Union member

**PrimaryAFPoint**  
Structure/Union member

**SensorBottomBorder**  
Structure/Union member

**SensorHeight**  
Structure/Union member

**SensorLeftBorder**  
Structure/Union member

**SensorRightBorder**  
Structure/Union member

**SensorTopBorder**  
Structure/Union member

**SensorWidth**  
Structure/Union member

**SpecularWhiteLevel**  
Structure/Union member

**SpotMeteringMode**  
Structure/Union member

**ValidAFPoints**  
Structure/Union member

**class** libraw.structs\_18.libraw\_colordata\_t

Bases: `_ctypes.Structure`

Describes all color data of the image.

**LocalizedCameraModel**  
Structure/Union member

**P1\_color**  
Structure/Union member

**UniqueCameraModel**  
Structure/Union member

**WBCT\_Coeffs**  
Structure/Union member

**WB\_Coeffs**  
Structure/Union member

**baseline\_exposure**  
Structure/Union member

**black**  
Structure/Union member

**black\_stat**  
Structure/Union member

**cam\_mul**  
Structure/Union member

**cam\_xyz**  
Structure/Union member

**canon\_ev**  
Structure/Union member

**cblack**  
Structure/Union member

**ccm**  
Structure/Union member

**cmatrix**  
Structure/Union member

**curve**  
Structure/Union member

**data\_maximum**  
Structure/Union member

**dng\_color**  
Structure/Union member

**dng\_levels**  
Structure/Union member

**flash\_used**  
Structure/Union member

**fmaximum**  
Structure/Union member

**fnorm**  
Structure/Union member

**linear\_max**  
Structure/Union member

**maximum**  
Structure/Union member

**model2**  
Structure/Union member

**phase\_one\_data**  
Structure/Union member

**pre\_mul**  
Structure/Union member

**profile**  
Structure/Union member

**profile\_length**  
Structure/Union member

**rgb\_cam**  
Structure/Union member

**white**  
Structure/Union member

**class** libraw.structs\_18.libraw\_custom\_camera\_t  
Bases: `_ctypes.Structure`

**bm**  
Structure/Union member

**cf**  
Structure/Union member

**flags**  
Structure/Union member

**fsize**  
Structure/Union member

**lf**  
Structure/Union member

**lm**  
Structure/Union member

**max**  
Structure/Union member

**offset**  
Structure/Union member

**rh**  
Structure/Union member

**rm**  
Structure/Union member

**rw**  
Structure/Union member

**t\_make**  
Structure/Union member

**t\_model**  
Structure/Union member

**tm**  
Structure/Union member

**class** libraw.structs\_18.libraw\_data\_t  
Bases: `_ctypes.Structure`

A container which comprises the data structures that make up libraw's representation of a raw file.

**color**  
Structure/Union member

**idata**  
Structure/Union member

**image**  
Structure/Union member

**lens**  
Structure/Union member

**makernotes**  
Structure/Union member

**other**  
Structure/Union member

**params**  
Structure/Union member

**parent\_class**  
Structure/Union member

**process\_warnings**  
Structure/Union member

**progress\_flags**  
Structure/Union member

**rawdata**  
Structure/Union member

**shootinginfo**  
Structure/Union member

**sizes**  
Structure/Union member

**thumbnail**  
Structure/Union member

**class** `libraw.structs_18.libraw_decoder_info_t`  
Bases: `_ctypes.Structure`

Describes a raw format decoder name and format.

**decoder\_flags**  
Structure/Union member

**decoder\_name**  
Structure/Union member

**class** `libraw.structs_18.libraw_dng_color_t`  
Bases: `_ctypes.Structure`

**calibration**  
Structure/Union member

**colormatrix**  
Structure/Union member

**forwardmatrix**  
Structure/Union member

**illuminant**  
Structure/Union member

**class** `libraw.structs_18.libraw_dng_levels_t`  
Bases: `_ctypes.Structure`

**analogbalance**  
Structure/Union member

**dng\_black**  
Structure/Union member

**dng\_blacklevel**  
Structure/Union member

**dng\_cblack**  
Structure/Union member

**dng\_whitelevel**  
Structure/Union member

**class** libraw.structs\_18.libraw\_dnglens\_t  
Bases: `_ctypes.Structure`

**MaxAp4MaxFocal**  
Structure/Union member

**MaxAp4MinFocal**  
Structure/Union member

**MaxFocal**  
Structure/Union member

**MinFocal**  
Structure/Union member

**class** libraw.structs\_18.libraw\_fuji\_info\_t  
Bases: `_ctypes.Structure`

**AFMode**  
Structure/Union member

**ExrMode**  
Structure/Union member

**FlashMode**  
Structure/Union member

**FocusMode**  
Structure/Union member

**FocusPixel**  
Structure/Union member

**FrameHeight**  
Structure/Union member

**FrameRate**  
Structure/Union member

**FrameWidth**  
Structure/Union member

**FujiAutoDynamicRange**  
Structure/Union member

**FujiDevelopmentDynamicRange**  
Structure/Union member

**FujiDynamicRange**

Structure/Union member

**FujiDynamicRangeSetting**

Structure/Union member

**FujiExpoMidPointShift**

Structure/Union member

**FujiFilmMode**

Structure/Union member

**ImageStabilization**

Structure/Union member

**Macro**

Structure/Union member

**Rating**

Structure/Union member

**ShutterType**

Structure/Union member

**WB\_Preset**

Structure/Union member

**class** libraw.structs\_18.libraw\_gps\_info\_t

Bases: `_ctypes.Structure`

GPS data for the image.

**altitude**

Structure/Union member

**altref**

Structure/Union member

**gpsparsed**

Structure/Union member

**gpsstatus**

Structure/Union member

**gpstimestamp**

Structure/Union member

**latitude**

Structure/Union member

**latref**

Structure/Union member

**longitude**

Structure/Union member

**longref**

Structure/Union member

**class** libraw.structs\_18.libraw\_image\_sizes\_t

Bases: `_ctypes.Structure`

Describes the size of the image.



**flip**  
Structure/Union member

**height**  
Structure/Union member

**iheight**  
Structure/Union member

**iwidth**  
Structure/Union member

**left\_margin**  
Structure/Union member

**mask**  
Structure/Union member

**pixel\_aspect**  
Structure/Union member

**raw\_height**  
Structure/Union member

**raw\_pitch**  
Structure/Union member

**raw\_width**  
Structure/Union member

**top\_margin**  
Structure/Union member

**width**  
Structure/Union member

**class** libraw.structs\_18.libraw\_imgother\_t  
Bases: `_ctypes.Structure`

Information read from the raw file that is unnecessary for raw processing.

**FlashEC**  
Structure/Union member

**aperture**  
Structure/Union member

**artist**  
Structure/Union member

**desc**  
Structure/Union member

**focal\_len**  
Structure/Union member

**gpsdata**  
Structure/Union member

**iso\_speed**  
Structure/Union member

**parsed\_gps**  
Structure/Union member

**shot\_order**  
Structure/Union member

**shutter**  
Structure/Union member

**timestamp**  
Structure/Union member

**class** libraw.structs\_18.libraw\_internal\_output\_params\_t  
Bases: `_ctypes.Structure`

**fuji\_width**  
Structure/Union member

**mix\_green**  
Structure/Union member

**raw\_color**  
Structure/Union member

**shrink**  
Structure/Union member

**zero\_is\_bad**  
Structure/Union member

**class** libraw.structs\_18.libraw\_iparams\_t  
Bases: `_ctypes.Structure`

The primary parameters of the image.

**cdesc**  
Structure/Union member

**colors**  
Structure/Union member

**dng\_version**  
Structure/Union member

**filters**  
Structure/Union member

**guard**  
Structure/Union member

**is\_foveon**  
Structure/Union member

**make**  
Structure/Union member

**model**  
Structure/Union member

**raw\_count**  
Structure/Union member

**software**  
Structure/Union member

**xmpdata**  
Structure/Union member

**xmplen**  
Structure/Union member

**xtrans**  
Structure/Union member

**xtrans\_abs**  
Structure/Union member

**class** libraw.structs\_18.libraw\_lensinfo\_t  
Bases: `_ctypes.Structure`

**EXIF\_MaxAp**  
Structure/Union member

**FocalLengthIn35mmFormat**  
Structure/Union member

**InternalLensSerial**  
Structure/Union member

**Lens**  
Structure/Union member

**LensMake**  
Structure/Union member

**LensSerial**  
Structure/Union member

**MaxAp4MaxFocal**  
Structure/Union member

**MaxAp4MinFocal**  
Structure/Union member

**MaxFocal**  
Structure/Union member

**MinFocal**  
Structure/Union member

**dng**  
Structure/Union member

**makernotes**  
Structure/Union member

**nikon**  
Structure/Union member

**class** libraw.structs\_18.libraw\_makernotes\_lens\_t  
Bases: `_ctypes.Structure`

**Adapter**  
Structure/Union member

**AdapterID**  
Structure/Union member

**Attachment**  
Structure/Union member

**AttachmentID**  
Structure/Union member

**CamID**  
Structure/Union member

**CameraFormat**  
Structure/Union member

**CameraMount**  
Structure/Union member

**CanonFocalUnits**  
Structure/Union member

**CurAp**  
Structure/Union member

**CurFocal**  
Structure/Union member

**FocalLengthIn35mmFormat**  
Structure/Union member

**FocalType**  
Structure/Union member

**FocusRangeIndex**  
Structure/Union member

**Lens**  
Structure/Union member

**LensFStops**  
Structure/Union member

**LensFeatures\_pre**  
Structure/Union member

**LensFeatures\_suf**  
Structure/Union member

**LensFormat**  
Structure/Union member

**LensID**  
Structure/Union member

**LensMount**  
Structure/Union member

**MaxAp**  
Structure/Union member

**MaxAp4CurFocal**  
Structure/Union member

**MaxAp4MaxFocal**  
Structure/Union member

**MaxAp4MinFocal**  
Structure/Union member

**MaxFocal**  
Structure/Union member

**MinAp**  
Structure/Union member

**MinAp4CurFocal**  
Structure/Union member

**MinAp4MaxFocal**  
Structure/Union member

**MinAp4MinFocal**  
Structure/Union member

**MinFocal**  
Structure/Union member

**MinFocusDistance**  
Structure/Union member

**Teleconverter**  
Structure/Union member

**TeleconverterID**  
Structure/Union member

**body**  
Structure/Union member

**class** libraw.structs\_18.libraw\_makernotes\_t

Bases: ctypes.Structure

**canon**  
Structure/Union member

**fuji**  
Structure/Union member

**olympus**  
Structure/Union member

**sony**  
Structure/Union member

**class** libraw.structs\_18.libraw\_nikon\_makernotes\_t

Bases: ctypes.Structure

**AFAreaHeight**  
Structure/Union member

**AFAreaMode**  
Structure/Union member

**AFAreaWidth**  
Structure/Union member

**AFAreaXPosition**  
Structure/Union member

**AFAreaYPosition**  
Structure/Union member

**AFImageHeight**  
Structure/Union member

**AFImageWidth**  
Structure/Union member

**AFPoint**  
Structure/Union member

**AFPointsInFocus**  
Structure/Union member

**AFPointsUsed**  
Structure/Union member

**ActiveDLighting**  
Structure/Union member

**ContrastDetectAF**  
Structure/Union member

**ContrastDetectAFInFocus**  
Structure/Union member

**ExposureBracketValue**  
Structure/Union member

**ExternalFlashExposureComp**  
Structure/Union member

**ExternalFlashFlags**  
Structure/Union member

**FlashColorFilter**  
Structure/Union member

**FlashControlCommanderMode**  
Structure/Union member

**FlashExposureBracketValue**  
Structure/Union member

**FlashExposureCompensation**  
Structure/Union member

**FlashExposureCompensation2**  
Structure/Union member

**FlashExposureCompensation3**  
Structure/Union member

**FlashExposureCompensation4**  
Structure/Union member

**FlashFirmware**  
Structure/Union member

**FlashFocalLength**  
Structure/Union member

**FlashGNDistance**  
Structure/Union member

**FlashGroupControlMode**

Structure/Union member

**FlashGroupOutputAndCompensation**

Structure/Union member

**FlashMode**

Structure/Union member

**FlashOutputAndCompensation**

Structure/Union member

**FlashSetting**

Structure/Union member

**FlashSource**

Structure/Union member

**FlashType**

Structure/Union member

**FocusMode**

Structure/Union member

**ImageStabilization**

Structure/Union member

**PhaseDetectAF**

Structure/Union member

**PrimaryAFPoint**

Structure/Union member

**ShootingMode**

Structure/Union member

**VRMode**

Structure/Union member

**VibrationReduction**

Structure/Union member

**class** libraw.structs\_18.libraw\_nikonlens\_t

Bases: `_ctypes.Structure`

**NikonEffectiveMaxAp**

Structure/Union member

**NikonLensFStops**

Structure/Union member

**NikonLensIDNumber**

Structure/Union member

**NikonLensType**

Structure/Union member

**NikonMCUVersion**

Structure/Union member

**class** libraw.structs\_18.libraw\_olympus\_makernotes\_t

Bases: `_ctypes.Structure`

**AFAreas**

Structure/Union member

**AFPoint**

Structure/Union member

**AFPointSelected**

Structure/Union member

**AFResult**

Structure/Union member

**AutoFocus**

Structure/Union member

**ColorSpace**

Structure/Union member

**FocusMode**

Structure/Union member

**ImageStabilization**

Structure/Union member

**OlympusCropID**

Structure/Union member

**OlympusFrame**

Structure/Union member

**OlympusSensorCalibration**

Structure/Union member

**class** libraw.structs\_18.libraw\_output\_params\_t

Bases: ctypes.Structure

Output parameters for processing the image with dcrw.

**aber**

Structure/Union member

**adjust\_maximum\_thr**

Structure/Union member

**auto\_bright\_thr**

Structure/Union member

**bad\_pixels**

Structure/Union member

**bright**

Structure/Union member

**ca\_correc**

Structure/Union member

**cablue**

Structure/Union member

**camera\_profile**

Structure/Union member

**cared**

Structure/Union member



**cclean**  
Structure/Union member

**cfa\_clean**  
Structure/Union member

**cfa\_green**  
Structure/Union member

**cfaline**  
Structure/Union member

**coolscan\_nef\_gamma**  
Structure/Union member

**cropbox**  
Structure/Union member

**custom\_camera\_strings**  
Structure/Union member

**dark\_frame**  
Structure/Union member

**dcb\_enhance\_fl**  
Structure/Union member

**dcb\_iterations**  
Structure/Union member

**eeci\_refine**  
Structure/Union member

**es\_med\_passes**  
Structure/Union member

**exp\_correc**  
Structure/Union member

**exp\_preser**  
Structure/Union member

**exp\_shift**  
Structure/Union member

**fbdd\_noiserd**  
Structure/Union member

**four\_color\_rgb**  
Structure/Union member

**gamm**  
Structure/Union member

**green\_matching**  
Structure/Union member

**green\_thresh**  
Structure/Union member

**greybox**  
Structure/Union member

**half\_size**  
Structure/Union member

**highlight**  
Structure/Union member

**lclean**  
Structure/Union member

**linenoise**  
Structure/Union member

**med\_passes**  
Structure/Union member

**no\_auto\_bright**  
Structure/Union member

**no\_auto\_scale**  
Structure/Union member

**no\_interpolation**  
Structure/Union member

**output\_bps**  
Structure/Union member

**output\_color**  
Structure/Union member

**output\_profile**  
Structure/Union member

**output\_tiff**  
Structure/Union member

**p4shot\_order**  
Structure/Union member

**raw\_processing\_options**  
Structure/Union member

**shot\_select**  
Structure/Union member

**sony\_arw2\_posterization\_thr**  
Structure/Union member

**threshold**  
Structure/Union member

**use\_auto\_wb**  
Structure/Union member

**use\_camera\_matrix**  
Structure/Union member

**use\_camera\_wb**  
Structure/Union member

**use\_dngsdk**  
Structure/Union member

**use\_fuji\_rotate**  
Structure/Union member

**use\_rawspeed**  
Structure/Union member

**user\_black**  
Structure/Union member

**user\_cblack**  
Structure/Union member

**user\_flip**  
Structure/Union member

**user\_mul**  
Structure/Union member

**user\_qual**  
Structure/Union member

**user\_sat**  
Structure/Union member

**wf\_deband\_treshold**  
Structure/Union member

**wf\_debanding**  
Structure/Union member

**class** libraw.structs\_18.libraw\_pentax\_makernotes\_t  
Bases: `_ctypes.Structure`

**AFPointMode**  
Structure/Union member

**AFPointSelected**  
Structure/Union member

**AFPointsInFocus**  
Structure/Union member

**DriveMode**  
Structure/Union member

**FocusMode**  
Structure/Union member

**SRRResult**  
Structure/Union member

**ShakeReduction**  
Structure/Union member

**class** libraw.structs\_18.libraw\_processed\_image\_t  
Bases: `_ctypes.Structure`

A container for processed image data.

**bits**  
Structure/Union member

**colors**  
Structure/Union member

**data**  
Structure/Union member

**data\_size**  
Structure/Union member

**height**  
Structure/Union member

**type**  
Structure/Union member

**width**  
Structure/Union member

**class** libraw.structs\_18.libraw\_rawdata\_t

Bases: `_ctypes.Structure`

Raw image data (after it has been unpacked) and a backup copy of color info used during post processing.

**color**  
Structure/Union member

**color3\_image**  
Structure/Union member

**color4\_image**  
Structure/Union member

**float3\_image**  
Structure/Union member

**float4\_image**  
Structure/Union member

**float\_image**  
Structure/Union member

**ioparams**  
Structure/Union member

**iparams**  
Structure/Union member

**ph1\_cblack**  
Structure/Union member

**ph1\_rblack**  
Structure/Union member

**raw\_alloc**  
Structure/Union member

**raw\_image**  
Structure/Union member

**sizes**  
Structure/Union member

**class** libraw.structs\_18.libraw\_shootinginfo\_t

Bases: `_ctypes.Structure`

**AFPoint**  
Structure/Union member

**BodySerial**

Structure/Union member

**DriveMode**

Structure/Union member

**ExposureMode**

Structure/Union member

**FocusMode**

Structure/Union member

**ImageStabilization**

Structure/Union member

**InternalBodySerial**

Structure/Union member

**MeteringMode**

Structure/Union member

**class** libraw.structs\_18.libraw\_sony\_info\_t

Bases: ctypes.Structure

**SonyCameraType**

Structure/Union member

**class** libraw.structs\_18.libraw\_thumbnail\_t

Bases: ctypes.Structure

Describes the thumbnail image embedded in the raw file.

**tcolors**

Structure/Union member

**tformat**

Structure/Union member

**theight**

Structure/Union member

**thumb**

Structure/Union member

**tlength**

Structure/Union member

**twidth**

Structure/Union member

**class** libraw.structs\_18.ph1\_t

Bases: ctypes.Structure

Contains color data read by Phase One cameras.

**black\_col**

Structure/Union member

**black\_row**

Structure/Union member

**format**

Structure/Union member

**key\_off**  
Structure/Union member

**split\_col**  
Structure/Union member

**split\_row**  
Structure/Union member

**t\_black**  
Structure/Union member

**tag\_210**  
Structure/Union member

**tag\_21a**  
Structure/Union member

**class** `libraw.structs_18.xtrans_params`  
Bases: `_ctypes.Structure`

**line\_width**  
Structure/Union member

**maxDiff**  
Structure/Union member

**max\_bits**  
Structure/Union member

**min\_value**  
Structure/Union member

**q\_points**  
Structure/Union member

**q\_table**  
Structure/Union member

**raw\_bits**  
Structure/Union member

**total\_values**  
Structure/Union member

## 5.1.2 rawkit package

### Introduction

The `rawkit` module contains high-level APIs for manipulating raw photos using the low-level `libraw` module (which in turn uses the even lower-level LibRaw C library).

Eg. quickly processing a raw Canon CR2 file without using the camera white balance and saving it as a PPM image might look like this:

```
from rawkit.raw import Raw
from rawkit.options import WhiteBalance

with Raw(filename='some/raw/image.CR2') as raw:
    raw.options.white_balance = WhiteBalance(camera=False, auto=True)
    raw.save(filename='some/destination/image.ppm')
```

`rawkit.VERSION = '0.6.0'`

The current version of the *rawkit* package.

## Submodules

### `rawkit.errors` — Errors thrown by rawkit

These errors are thrown by various rawkit functions and methods when things go wrong. They will only be raised by rawkit; for lower level errors raised by the underlying libraw bindings, see [\*libraw.errors\*](#).

**exception** `rawkit.errors.InvalidFileType`

Bases: `exceptions.ValueError`

Raised when an invalid file type or file extension is passed to a rawkit method.

**exception** `rawkit.errors.NoFileSpecified`

Bases: `exceptions.ValueError`

Raised when the method or function expects a *filename* argument, but no file name (or a value of *None*) was specified.

### `rawkit.metadata` — Metadata structures

**class** `rawkit.metadata.Metadata` (*aperture, timestamp, shutter, flash, focal\_length, height, iso, make, model, orientation, width*)

Bases: `tuple`

Common metadata for a photo.

Orientation matches the values from the EXIF 2.3 specification:

- 1 - The 0th row is at the visual top of the image, and the 0th column is the visual left-hand side.
- 2 - The 0th row is at the visual top of the image, and the 0th column is the visual right-hand side.
- 3 - The 0th row is at the visual bottom of the image, and the 0th column is the visual right-hand side.
- 4 - The 0th row is at the visual bottom of the image, and the 0th column is the visual left-hand side.
- 5 - The 0th row is the visual left-hand side of the image, and the 0th column is the visual top.
- 6 - The 0th row is the visual right-hand side of the image, and the 0th column is the visual top.
- 7 - The 0th row is the visual right-hand side of the image, and the 0th column is the visual bottom.
- 8 - The 0th row is the visual left-hand side of the image, and the 0th column is the visual bottom.

**aperture**

Alias for field number 0

**flash**

Alias for field number 3

**focal\_length**

Alias for field number 4

**height**

Alias for field number 5

**iso**

Alias for field number 6

**make**  
Alias for field number 7

**model**  
Alias for field number 8

**orientation**  
Alias for field number 9

**shutter**  
Alias for field number 2

**timestamp**  
Alias for field number 1

**width**  
Alias for field number 10

### rawkit.options — High level options for processing raw files

**class** rawkit.options.Options (attrs=None)

Bases: object

Represents a set of options which can be used when processing raw data.

**Parameters** **attrs** (*dict*) – A subscriptable object from which to take the initial state of the options object.

**adjust\_maximum\_threshold**

Automatically adjusts the maximum pixel value based on per channel maximum data.

---

**Note:** If this value is set above 0.99999, the default value will be used instead. If it is set below 0.00001, no adjustment will happen.

---

**Type** float

**Default** 0.75

**Dcraw** None

**Libraw** libraw.structs.libraw\_output\_params\_t.adjust\_maximum\_thr

**auto\_brightness**

Set the brightness automatically based on the image histogram and the *auto\_brightness\_threshold*.

**Type** boolean

**Default** True

**Dcraw** -W

**Libraw** libraw.structs.libraw\_output\_params\_t.no\_auto\_bright

**auto\_brightness\_threshold**

The allowable percentage of clipped pixels when *auto\_brightness* is used.

**Type** float

**Default** 0.001 (0.1%)



**Dcraw** None

**Libraw** `libraw.structs.libraw_output_params_t.auto_bright_thr`

#### **auto\_stretch**

Stretches images taken on cameras with non-square pixels to the correct aspect ratio. For Fuji Super CCD cameras, rotates the image 45 degrees. This guarantees that the output pixels share a 1:1 correspondence with the raw pixels.

**Type** `boolean`

**Default** `True`

**Dcraw** `-j`

**Libraw** `libraw.structs.libraw_output_params_t.use_fuji_rotate`

#### **bad\_pixels\_file**

*Points to a bad pixels map in dcraw format –*

```
column row unix-timestamp\n
```

**Type** `str`

**Default** `None`

**Dcraw** `-P`

**Libraw** `libraw.structs.libraw_output_params_t.bad_pixels`

#### **bps**

Set the bits per sample used for the photo (8 or 16). Setting this to 16 is effectively the same as running dcraw with the `-4` option.

**Type** `int`

**Default** `8`

**Dcraw** `-4`

**Libraw** `libraw.structs.libraw_output_params_t.output_bps`

#### **brightness**

Sets the brightness level by dividing the white level by this value. This is ignored if `auto_brightness` is `True`.

**Type** `float`

**Default** `1.0`

**Dcraw** `-b`

**Libraw** `libraw.structs.libraw_output_params_t.bright`

#### **chromatic\_aberration**

A Red-Blue scale factor that's used to correct for chromatic aberration by scaling the respective channels. eg.

```
# (red_scale, blue_scale)
raw.options.chromatic_aberration = (0.999, 1.001)
```

**Type** `double tuple`

**Default** `(1, 1)`

**Dcrow** -C

**Libraw** libraw.structs.libraw\_output\_params\_t.aber

#### colorspace

Sets the colorspace used for the output image. Supported colorspace are defined as constants in *rawkit.options.colorsaces*.

**Type** int

**Default** rawkit.options.colorsaces.srgb

**Dcrow** -o

**Libraw** libraw.structs.libraw\_output\_params\_t.output\_color

#### cropbox

Crops the image.

**Type** 4 float tuple

**Default** None

**Dcrow** None

**Libraw** libraw.structs.libraw\_output\_params\_t.cropbox

#### dark\_frame

A dark frame in 16-bit PGM format. This may either be a path to an existing file, or an instance of *rawkit.raw.DarkFrame*.

**Type** *rawkit.raw.DarkFrame* str

**Default** None

**Dcrow** -K

**Libraw** libraw.structs.libraw\_output\_params\_t.dark\_frame

#### darkness

Raise the black level of a photo.

**Type** int

**Default** None

**Dcrow** -k

**Libraw** libraw.structs.libraw\_output\_params\_t.user\_black

#### gamma

Sets the gamma-curve of the photo. The two values in the tuple correspond to:

- gamma[0] — Correction function power (inverted Gamma power,  $\gamma^{-1}$ )
- gamma[1] — toe-slope ( $\phi$ )

For a simple power curve, set the toe-slope to zero.

**Type** 2 double tuple

**Default** None

**Dcrow** -g

**Libraw** libraw.structs.libraw\_output\_params\_t.gamm

**green\_matching**

Performs a second post-processing pass to correct for green channel imbalance.

**Type** `boolean`

**Default** `False`

**Dcraw** `None`

**Libraw** `libraw.structs.libraw_output_params_t.green_matching`

**half\_size**

When developing the image, output it at 50% size. This makes developing preview images much faster.

**Type** `boolean`

**Default** `False`

**Dcraw** `-h`

**Libraw** `libraw.structs.libraw_output_params_t.half_size`

**highlight\_mode**

The mode for dealing with highlights in the image. Some constants have been defined in `rawkit.options.highlight_modes` to make things easier, or you can set an integer directly.

Integers that are greater than or equal to 3 will attempt to reconstruct highlights. Lower numbers favor whites, and higher colors favor colors. `rawkit.options.RECONSTRUCT (5)` is a good compromise.

**Type** `int`

**Default** `rawkit.options.highlight_modes.clip`

**Dcraw** `-H`

**Libraw** `libraw.structs.libraw_output_params_t.highlight`

**input\_profile**

Path to an ICC color profile file containing the input profile. Only used if the version of LibRaw that you're linking against was compiled with LCMS support.

Note that LibRaw defines a magic string, 'embed', which causes it to use the profile embedded in the raw image if present. This is the same as setting the `use_camera_profile` option.

**Type** `string`

**Default** `None`

**Dcraw** `-o -p`

**Libraw** `libraw.structs.libraw_output_params_t.camera_profile`

**interpolation**

Sets the interpolation algorithm.

**Type** `rawkit.options.interpolation`

**Default** `ahd`

**Dcraw** `-q`

**Libraw** `libraw.structs.libraw_output_params_t.user_qual`

**keys ()**

A list of keys which have a value other than `None` and which have been set by the user (even if those options are set to the default value).

**Returns** List of option keys which have been set.

**Return type** tuple

**median\_filter\_passes**

Useful for cleaning up color artifacts by running a 3x3 median filter over the R-G and B-G channels.

**Type** int

**Default** 0

**Dcraw** -m

**Libraw** libraw.structs.libraw\_output\_params\_t.med\_passes

**noise\_threshold**

Sets the threshold for noise reduction using wavelet denoising.

**Type** float

**Default** None

**Dcraw** -n

**Libraw** libraw.structs.libraw\_output\_params\_t.threshold

**output\_profile**

Path to an ICC color profile file containing the output profile. Only used if the version of LibRaw that you're linking against was compiled with LCMS support.

**Type** string

**Default** None

**Dcraw** -o -p

**Libraw** libraw.structs.libraw\_output\_params\_t.output\_profile

**rgba\_interpolation**

Determines if we should use four channel RGB interpolation.

**Type** boolean

**Default** False

**Dcraw** -f

**Libraw** libraw.structs.libraw\_output\_params\_t.four\_color\_rgb

**rotation**

Rotates the image by the given number of degrees. Must be a multiple of 90 (0, 90, 180, 270, etc).

The default (None) is to use the rotation provided by the camera.

**Type** int

**Default** None

**Dcraw** -t

**Libraw** libraw.structs.libraw\_output\_params\_t.user\_flip

**saturation**

Determines the saturation level of the output image.

**Type** int

**Default** None

**Dcraw** -S

**Libraw** `libraw.structs.libraw_output_params_t.user_sat`

#### **shot**

Selects the shot to process for raw images that contain multiple images.

**Type** `int`

**Default** `0`

**Dcraw** `-s`

**Libraw** `libraw.structs.libraw_output_params_t.shot_select`

#### **use\_camera\_matrix**

Use the color matrix from the raw's metadata. Only affects Olympus, Leaf, and Phase One cameras (and DNG files).

Note that we differ from the LibRaw defaults on this option. LibRaw defaults to true if the photo is in DNG format or the camera white balance is being used, and false otherwise. rawkit always defaults to true.

**Type** `boolean`

**Default** `True`

**Dcraw** `+M -M`

**Libraw** `libraw.libraw_output_params_t.use_camera_matrix`

#### **use\_camera\_profile**

True if we should use the embedded camera profile (if present in the raw file and we're linking against a version of LibRaw with LCMS support).

**Type** `boolean`

**Default** `True`

**Dcraw** `-o -p`

**Libraw** `libraw.structs.libraw_output_params_t.camera_profile`

#### **values()**

The values of all options which appear in `keys()`.

**Returns** List of options values.

**Return type** `tuple`

#### **white\_balance**

The white balance of the image.

**Type** `rawkit.options.WhiteBalance`

**Default** `WhiteBalance(auto=True, camera=True)`

**Dcraw** `-a -w -A -r`

**Libraw** `libraw.structs.libraw_output_params_t.use_auto_wb  
libraw.structs.libraw_output_params_t.use_camera_wb libraw.  
structs.libraw_output_params_t.greybox libraw.structs.  
libraw_output_params_t.user_mul`

#### **class rawkit.options.WhiteBalance**

Bases: `rawkit.options.WhiteBalance`

Represents the white balance of a photo. If the camera white balance is used, but not present, we fallback to the other options. Other options white balance multipliers stack (eg. you can use auto white balance, and then specify a manual `rgbg` multiplier on top of that).

#### Parameters

- **auto** (*boolean*) – Determines if we should automatically set the WB.
- **camera** (*boolean*) – Causes us to use the camera defined WB if present.
- **greybox** (*4 int tuple*) – Set the WB based on a neutral grey region of the image.
- **rgbg** (*4 float tuple*) – Set the WB manually based on an RGBG channel multiplier.

**Returns** A white balance object.

**Return type** *WhiteBalance*

`rawkit.options.colorsspaces = ColorSpaces(raw=0, srgb=1, adobe_rgb=2, wide_gammut_rgb=3, kodak_prophoto_rgb=4, xyz=5)`  
Constants for setting the colorspace.

- `raw_color` — Raw colorspace (unique to each camera)
- `srgb` — sRGB D65 (default colorspace)
- `adobe_rgb` — Adobe RGB (1998) D65
- `wide_gammut_rgb` — Wide Gamut RGB D65
- `kodak_prophoto_rgb` — Kodak ProPhoto RGB D65
- `xyz` — XYZ colorspace

`rawkit.options.gamma_curves = GammaCurves(linear=[1, 1], bt709=[0.45004500450045004, 4.5], srgb=[2.4, 2.2], adobe_rgb=[2.18456, 2.24]`  
Gamma curves for a few common color profiles.

- `linear` — A basic linear transfer function.
- `bt709` — The BT.709 (Rec. 709) curve used by HDTVs (uses the median power of sRGB, and a similar but shifted transfer function).
- `srgb` — The sRGB gamma curve (uses the max power to account for linear discontinuity and to attain the standard *IEC 61966-2-1* solution  $\$K_0 \approx 0.04045 \$$ ).
- `adobe_rgb` — The correction function power for the Adobe RGB colorspace. The toe-slope is left off.

`rawkit.options.highlight_modes = HighlightMode(clip=0, ignore=1, blend=2, reconstruct=5)`  
Constants for setting the highlight mode.

- `clip` — Clip all highlights to white (default).
- `ignore` — Leave highlights unclipped.
- `blend` — Blend clipped and unclipped highlights.
- `reconstruct` — A good average value for reconstruction of clipped highlights which compromises between favoring whites and favoring colors.

`rawkit.options.interpolation = InterpolationAlgo(linear=0, vng=1, ppg=2, ahd=3, dcb=4, mod=5)`

*Constants for setting the interpolation algorithm – 0. Linear*

1. VNG
2. PPG
3. AHD
4. DCB

5. Modified AHD
6. AFD
7. VCD
8. Mixed VCD and Modified AHD
9. LMMSE
10. AMaZE

Modified AHD (5) through LMMSE (9) are only useful if you’re using a version of LibRaw with the “[LibRaw Demosaic Pack GPL2](#)” built in and AMaZE (10) is only useful if LibRaw was built with the “[LibRaw Demosaic Pack GPL3](#)”. If you attempt to use an interpolation method that’s not built into your version of LibRaw, it will silently fallback to AHD.

Usage example:

```
from rawkit.raw import Raw
from rawkit.options import interpolation

with Raw(filename="RawFile.CR2") as raw:
    raw.options.interpolation = interpolation.ahd
    raw.save("RawFile.ppm")
```

**class** rawkit.options.option(*param=None, ctype=None*)

Bases: object

The *option* decorator is an internal decorator which allows you to define an option in a clean manner (specifying its name and how it maps to the libraw params).

**param\_writer** (*func*)

**setter** (*func*)

**write\_param** (*obj, params*)

rawkit.orientation.get\_orientation(*data*)

## rawkit.raw — High-level raw file API

**class** rawkit.raw.DarkFrame(*filename=None*)

Bases: *rawkit.raw.Raw*

Represents a dark frame—a raw photo taken in low light which can be subtracted from another photos raw data.

Creates a temporary file which is not cleaned up until the dark frame is closed.

**cleanup** ()

Cleanup temp files.

**close** ()

Free the underlying raw representation and cleanup temp files.

**name**

A tempfile in a unique directory.

**Returns** The name of a temp file.

**Return type** str

**save** (*filename=None, filetype='ppm'*)

Save the image data, defaults to using a temp file.

**Parameters**

- **filename** (*str*) – The name of an image file to save.
- **filetype** (*output\_file\_types*) – The type of file to output.

**Raises** `rawkit.errors.InvalidFileType` – If *filetype* is not of type *output\_file\_types*.

**class** `rawkit.raw.Raw` (*filename=None*)

Bases: `object`

Represents a raw file (of any format) and exposes development options to the user.

For example, the basic workflow (open a file, process the file, save the file) looks like this:

```
from rawkit.raw import Raw
from rawkit.options import WhiteBalance

with Raw(filename='some/raw/image.CR2') as raw:
    raw.options.white_balance = WhiteBalance(camera=False, auto=True)
    raw.save(filename='some/destination/image.ppm')
```

**Parameters** **filename** (*str*) – The name of a raw file to load.

**Returns** A raw object.

**Return type** *Raw*

**Raises**

- `rawkit.errors.NoFileSpecified` – If *filename* is None.
- `libraw.errors.FileUnsupported` – If the specified file is not a supported raw type.
- `libraw.errors.InsufficientMemory` – If we run out of memory while loading the raw file.
- `IOError` – If the file does not exist, or cannot be opened (eg. incorrect permissions).

**as\_array** ()

Get a NumPy array of the raw image data

**Returns**

A NumPy array of bayer pixel data structured as a list of rows, or `array([])` if there is no bayer data. The margin with calibration pixels is always included. For example, if the color format is *RGGB*, the array would be of the format:

```
array([
    [R, G, R, G, ...],
    [G, B, G, B, ...],
    [R, G, R, G, ...],
    ...
])
```

**Return type** `array`

**bayer\_data** (*include\_margin=False*)

Get the bayer data and color\_description for an image.

**Returns**



**Tuple of bayer data and color filter array.** This is a convenience method to return `rawkit.raw.Raw.raw_image` and `rawkit.raw.Raw.color_filter_array` as a single tuple.

**Return type** tuple

**close()**

Free the underlying raw representation.

**color(y, x)**

Get the active color of a pixel of bayer data.

**Parameters**

- **y** (*int*) – the y coordinate (or row) of the pixel
- **x** (*int*) – the x coordinate (or column) of the pixel

**Returns** Character representing the color, such as 'R' for red.

**Return type** str

**color\_description**

Get the color\_description of an image.

**Returns** 4 character string representing color format, such as 'RGGB'.

**Return type** str

**color\_filter**

*EXPERIMENTAL* – This method only supports bayer filters for the time being. It will be incorrect when used with other types of sensors.

Get the color filter array for the camera sensor.

**Returns**

**2D array representing the color format array pattern.** For example, the typical 'RGGB' pattern of abayer sensor would be of the format:

```
[
    ['R', 'G'],
    ['G', 'B'],
]
```

**Return type** list

**color\_filter\_array**

*EXPERIMENTAL* – This method only supports bayer filters for the time being. It will be incorrect when used with other types of sensors.

Get the color filter array for the camera sensor.

**Returns**

**Numpy array representing the color format array pattern.** For example, the typical 'RGGB' pattern of abayer sensor would be of the format:

```
array([
    ['R', 'G'],
    ['G', 'B'],
])
```

**Return type** list

**data\_pointer()**

**metadata**

Common metadata for the photo

**Returns** A metadata object.

**Return type** `rawkit.metadata.Metadata`

**process()**

Process the raw data based on `self.options`.

**Raises**

- `libraw.errors.DataError` – If invalid or corrupt data is encountered in the data struct.
- `libraw.errors.BadCrop` – If the image has been cropped poorly (eg. the edges are outside of the image bounds, or the crop box coordinates don't make sense).
- `libraw.errors.InsufficientMemory` – If we run out of memory while processing the raw file.

**raw\_image(include\_margin=False)**

Get the bayer data for an image if it exists.

**Parameters** `include_margin` (*bool*) – Include margin with calibration pixels.

**Returns**

**2D array of bayer pixel data structured as a list of rows**, or [] if there is no bayer data. For example, if the color format is *RGGB*, the array would be of the format:

```
[
    [R, G, R, G, ...],
    [G, B, G, B, ...],
    [R, G, R, G, ...],
    ...
]
```

**Return type** list

**save(filename, filetype=None)**

Save the image data as a new PPM or TIFF image.

**Parameters**

- **filename** (*str*) – The name of an image file to save.
- **filetype** (*output\_file\_types*) – The type of file to output. By default, guess based on the filename, falling back to PPM.

**Raises**

- `rawkit.errors.NoFileSpecified` – If *filename* is None.
- `rawkit.errors.InvalidFileType` – If *filetype* is not None or in *output\_file\_types*.

**save\_thumb(filename=None)**

Save the thumbnail data.

**Parameters** `filename` (*str*) – The name of an image file to save.

**Raises** `rawkit.errors.NoFileSpecified` – If *filename* is None.

**thumbnail\_to\_buffer()**

Convert the thumbnail data as an RGB buffer.

**Returns** RGB data of the thumbnail.

**Return type** bytearray

**to\_buffer()**

Convert the image to an RGB buffer.

**Returns** RGB data of the image.

**Return type** bytearray

**unpack()**

Unpack the raw data.

**unpack\_thumb()**

Unpack the thumbnail data.

**Raises**

- *libraw.errors.NoThumbnail* – If the raw file does not contain a thumbnail.
- *libraw.errors.UnsupportedThumbnail* – If the thumbnail format is unsupported.

**rawkit.raw.output\_file\_types = OutputFileType(ppm='ppm', tiff='tiff')**

Constants for setting the output filetype.

- ppm — PGM data file.
- tiff — TIFF file.

## rawkit.util — Utility functions

These functions perform helpful tasks which don't really fit anywhere else such as searching for Raw files on the disk, or checking what cameras are supported by LibRaw.

**rawkit.util.camera\_list()**

Return a list of cameras which are supported by the currently linked version of LibRaw.

**Returns** A list of supported cameras.

**Return type** str array

**rawkit.util.discover(path)**

Recursively search for raw files in a given directory.

**Parameters** *path* (str) – A tree to recursively search.



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