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# **PyEDFlib Documentation**

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# CONTENTS

<b>1</b>	<b>Description</b>	<b>3</b>
<b>2</b>	<b>Requirements</b>	<b>5</b>
<b>3</b>	<b>Download</b>	<b>7</b>
<b>4</b>	<b>License</b>	<b>9</b>
<b>5</b>	<b>Contents</b>	<b>11</b>
	<b>Index</b>	<b>51</b>



PyEDFlib is a free Open Source wavelet toolbox for reading / writing *EDF/EDF+/BDF* files.

```
import pyedflib
import numpy as np

file_name = pyedflib.data.get_generator_filename()
f = pyedflib.EdfReader(file_name)
n = f.signals_in_file
signal_labels = f.getSignalLabels()
sigbufs = np.zeros((n, f.getNSamples()[0]))
for i in np.arange(n):
    sigbufs[i, :] = f.readSignal(i)
```



## DESCRIPTION

PyEDFlib is a [Python](#) library to read/write *EDF/EDF+/BDF* files based on EDFlib.

*EDF* stands for [European Data Format](#), a data format for EEG data, first published in 1992. In 2003, an improved version of the file protocol named *EDF+* has been published.

The definition of the *EDF/EDF+* format can be found under [edfplus.info](http://edfplus.info).

The *EDF/EDF+* format saves all data with 16 Bit. A version of the format which saves all data with 24 Bit, called *BDF*, was introduced by the company [BioSemi](#).

The PyEDFlib [Python](#) toolbox is a fork of the [python-edf toolbox from Christopher Lee-Messer](#). and uses the EDFlib from Teunis van Beelen.





## REQUIREMENTS

PyEDFlib requires:

- Python  $\geq 3.5$
- Numpy  $\geq 1.9.1$



## DOWNLOAD

The most recent *development* version can be found on GitHub at <https://github.com/holgern/pyedflib>.

The latest release, including source and binary package for Windows, is available for download from the [Python Package Index](#) or on the [Releases Page](#).



## LICENSE

This code is licensed under the same BSD-style license that Teunis released [edflib](#) under and with the same disclaimer.



## CONTENTS

## 5.1 API Reference

## 5.1.1 EDF/BDF file writer edfwriter

**class** pyedflib.**EdfWriter**(*file\_name*, *n\_channels*, *file\_type=1*)

Bases: object

## Methods

<i>blockWritePhysicalSamples</i> (data)		Writes physical samples (uV, mA, Ohm) must be filled with samples from all signals where each signal has n samples which is the samplefrequency of the signal.
<i>close</i> ()		Closes the file.
<i>setAdmincode</i> (admincode)		Sets the admincode.
<i>setBirthdate</i> (birthdate)		Sets the birthdate.
<i>setDatarecordDuration</i> (duration)		Sets the datarecord duration.
<i>setDigitalMaximum</i> (edfsignal, digital_maximum)		Sets the maximum digital value of signal edfsignal.
<i>setDigitalMinimum</i> (edfsignal, digital_minimum)		Sets the minimum digital value of signal edfsignal.
<i>setEquipment</i> (equipment)		Sets the name of the param equipment used during the aquisition.
<i>setGender</i> (gender)		Sets the gender.
<i>setHeader</i> (fileHeader)		Sets the file header
<i>setLabel</i> (edfsignal, label)		Sets the label (name) of signal edfsignal ("FP1", "SaO2", etc.).
<i>setPatientAdditional</i> (patient_additional)		Sets the additional patientinfo to <i>patient_additional</i> .
<i>setPatientCode</i> (patient_code)		Sets the patientcode to <i>patient_code</i> .
<i>setPatientName</i> (patient_name)		Sets the patientname to <i>patient_name</i> .
<i>setPhysicalDimension</i> (edfsignal, ...)		Sets the physical dimension of signal edfsignal ("uV", "BPM", "mA", "Degr.", etc.)
<i>setPhysicalMaximum</i> (edfsignal, physical_maximum)	physi-	Sets the physical_maximum of signal edfsignal.
<i>setPhysicalMinimum</i> (edfsignal, physical_minimum)	cal_	Sets the physical_minimum of signal edfsignal.
<i>setPrefilter</i> (edfsignal, prefilter)		Sets the prefilter of signal edfsignal ("HP:0.1Hz", "LP:75Hz N:50Hz", etc.)
<i>setRecordingAdditional</i> (recording_additional)		Sets the additional recordinginfo

continues on next page

Table 1 – continued from previous page

<code>setSamplefrequency</code> (edfsignal, samplefrequency)	Sets the samplefrequency of signal edfsignal.
<code>setSignalHeader</code> (edfsignal, channel_info)	Sets the parameter for signal edfsignal.
<code>setSignalHeaders</code> (signalHeaders)	Sets the parameter for all signals
<code>setStartdatetime</code> (recording_start_time)	Sets the recording start Time
<code>setTechnician</code> (technician)	Sets the technicians name to <i>technician</i> .
<code>setTransducer</code> (edfsignal, transducer)	Sets the transducer of signal edfsignal
<code>set_number_of_annotation_signals</code> (...)	Sets the number of annotation signals.
<code>update_header</code> ()	Updates header to edfile struct
<code>writeAnnotation</code> (onset_in_seconds, ...[, ...])	Writes an annotation/event to the file
<code>writePhysicalSamples</code> (data)	Writes n physical samples (uV, mA, Ohm) belonging to one signal where n is the samplefrequency of the signal.
<code>writeSamples</code> (data_list[, digital])	Writes physical samples (uV, mA, Ohm) from data belonging to all signals The physical samples will be converted to digital samples using the values of physical maximum, physical minimum, digital maximum and digital minimum.

<b>blockWriteDigitalSamples</b>	
<b>blockWriteDigitalShortSamples</b>	
<b>writeDigitalSamples</b>	
<b>writeDigitalShortSamples</b>	

**blockWriteDigitalSamples**(data)

**blockWriteDigitalShortSamples**(data)

**blockWritePhysicalSamples**(data)

Writes physical samples (uV, mA, Ohm) must be filled with samples from all signals where each signal has n samples which is the samplefrequency of the signal.

data\_vec belonging to one signal. The size must be the samplefrequency of the signal.

## Notes

buf must be filled with samples from all signals, starting with signal 0, 1, 2, etc. one block equals one second The physical samples will be converted to digital samples using the values of physical maximum, physical minimum, digital maximum and digital minimum The number of samples written is equal to the sum of the samplefrequencies of all signals Size of buf should be equal to or bigger than sizeof(double) multiplied by the sum of the samplefrequencies of all signals Returns 0 on success, otherwise -1

All parameters must be already written into the bdf/edf-file.

**close**()

Closes the file.

**setAdmincode**(admincode)

Sets the admincode.

This function is optional and can be called only after opening a file in writemode and before the first sample write action.

## Parameters



**admincode** [str] admincode which is written into the header

**setBirthdate**(*birthdate*)

Sets the birthdate.

#### Parameters

**birthdate:** date object from datetime

#### Notes

This function is optional and can be called only after opening a file in writemode and before the first sample write action.

#### Examples

```
>>> import pyedflib
>>> from datetime import datetime, date
>>> f = pyedflib.EdfWriter('test.bdf', 1, file_type=pyedflib.FILETYPE_BDFPLUS)
>>> f.setBirthdate(date(1951, 8, 2))
>>> f.close()
```

**setDatarecordDuration**(*duration*)

Sets the datarecord duration. The default value is 100000 which is 1 second. ATTENTION: the argument “duration” is expressed in units of 10 microSeconds! So, if you want to set the datarecord duration to 0.1 second, you must give the argument “duration” a value of “10000”. This function is optional, normally you don’t need to change the default value. The datarecord duration must be in the range 0.001 to 60 seconds. Returns 0 on success, otherwise -1.

#### Parameters

**duration** [integer] Sets the datarecord duration in units of 10 microSeconds

#### Notes

This function is NOT REQUIRED but can be called after opening a file in writemode and before the first sample write action. This function can be used when you want to use a samplerate which is not an integer. For example, if you want to use a samplerate of 0.5 Hz, set the samplefrequency to 5 Hz and the datarecord duration to 10 seconds. Do not use this function, except when absolutely necessary!

**setDigitalMaximum**(*edfsignal*, *digital\_maximum*)

Sets the maximum digital value of signal edfsignal. Usually, the value 32767 is used for EDF+ and 8388607 for BDF+.

#### Parameters

**edfsignal** [int] signal number

**digital\_maximum** [int] Sets the maximum digital value

## Notes

This function is optional and can be called only after opening a file in writemode and before the first sample write action.

**setDigitalMinimum**(*edfsignal*, *digital\_minimum*)

Sets the minimum digital value of signal *edfsignal*. Usually, the value -32768 is used for EDF+ and -8388608 for BDF+. Usually this will be  $-(\text{digital\_maximum} + 1)$ .

### Parameters

**edfsignal** [int] signal number

**digital\_minimum** [int] Sets the minimum digital value

## Notes

This function is optional and can be called only after opening a file in writemode and before the first sample write action.

**setEquipment**(*equipment*)

Sets the name of the param equipment used during the aquisition. This function is optional and can be called only after opening a file in writemode and before the first sample write action.

### Parameters

**equipment** [str] Describes the measurement equipiment

**setGender**(*gender*)

Sets the gender. This function is optional and can be called only after opening a file in writemode and before the first sample write action.

### Parameters

**gender** [int] 1 is male, 0 is female

**setHeader**(*fileHeader*)

Sets the file header

**setLabel**(*edfsignal*, *label*)

Sets the label (name) of signal *edfsignal* ("FP1", "SaO2", etc.).

### Parameters

**edfsignal** [int] signal number on which the label should be changed

**label** [str] signal label

## Notes

This function is recommended for every signal and can be called only after opening a file in writemode and before the first sample write action.

**setPatientAdditional**(*patient\_additional*)

Sets the additional patientinfo to *patient\_additional*.

### Notes

This function is optional and can be called only after opening a file in writemode and before the first sample write action.

**setPatientCode**(*patient\_code*)

Sets the patientcode to *patient\_code*.

### Notes

This function is optional and can be called only after opening a file in writemode and before the first sample write action.

**setPatientName**(*patient\_name*)

Sets the patientname to *patient\_name*.

### Notes

This function is optional and can be called only after opening a file in writemode and before the first sample write action.

**setPhysicalDimension**(*edfsignal*, *physical\_dimension*)

Sets the physical dimension of signal *edfsignal* (“uV”, “BPM”, “mA”, “Degr.”, etc.)

#### Parameters

- **edfsignal** – int
- **physical\_dimension** – str

### Notes

This function is recommended for every signal and can be called only after opening a file in writemode and before the first sample write action.

**setPhysicalMaximum**(*edfsignal*, *physical\_maximum*)

Sets the *physical\_maximum* of signal *edfsignal*.

#### Parameters

- edfsignal: int** signal number
- physical\_maximum: float** Sets the physical maximum

### Notes

This function is required for every signal and can be called only after opening a file in writemode and before the first sample write action.

**setPhysicalMinimum**(*edfsignal*, *physical\_minimum*)

Sets the *physical\_minimum* of signal *edfsignal*.

#### Parameters

- edfsignal: int** signal number
- physical\_minimum: float** Sets the physical minimum

## Notes

This function is required for every signal and can be called only after opening a file in writemode and before the first sample write action.

**setPrefilter**(*edfsignal*, *prefilter*)

Sets the prefilter of signal *edfsignal* (“HP:0.1Hz”, “LP:75Hz N:50Hz”, etc.)

### Parameters

- **edfsignal** – int
- **prefilter** – str

## Notes

This function is optional for every signal and can be called only after opening a file in writemode and before the first sample write action.

**setRecordingAdditional**(*recording\_additional*)

Sets the additional recordinginfo

## Notes

This function is optional and can be called only after opening a file in writemode and before the first sample write action.

**setSamplefrequency**(*edfsignal*, *samplefrequency*)

Sets the samplefrequency of signal *edfsignal*.

## Notes

This function is required for every signal and can be called only after opening a file in writemode and before the first sample write action.

**setSignalHeader**(*edfsignal*, *channel\_info*)

Sets the parameter for signal *edfsignal*.

*channel\_info* should be a dict with these values:

‘label’ : channel label (string, <= 16 characters, must be unique) ‘dimension’ : physical dimension (e.g., mV) (string, <= 8 characters) ‘sample\_rate’ : sample frequency in hertz (int). Deprecated: use ‘sample\_frequency’ instead. ‘sample\_frequency’ : number of samples per record (int) ‘physical\_max’ : maximum physical value (float) ‘physical\_min’ : minimum physical value (float) ‘digital\_max’ : maximum digital value (int,  $-2^{15} \leq x < 2^{15}$ ) ‘digital\_min’ : minimum digital value (int,  $-2^{15} \leq x < 2^{15}$ )

**setSignalHeaders**(*signalHeaders*)

Sets the parameter for all signals

### Parameters

**signalHeaders** [array\_like]

containing dict with

‘label’ [str] channel label (string, <= 16 characters, must be unique)

‘dimension’ [str] physical dimension (e.g., mV) (string, <= 8 characters)

**‘sample\_rate’** : sample frequency in hertz (int). Deprecated: use ‘sample\_frequency’ instead.

**‘sample\_frequency’** [int] number of samples per record

**‘physical\_max’** [float] maximum physical value

**‘physical\_min’** [float] minimum physical value

**‘digital\_max’** [int] maximum digital value ( $-2^{15} \leq x < 2^{15}$ )

**‘digital\_min’** [int] minimum digital value ( $-2^{15} \leq x < 2^{15}$ )

**setStartdatetime**(*recording\_start\_time*)

Sets the recording start Time

#### Parameters

**recording\_start\_time**: **datetime object** Sets the recording start Time

**setTechnician**(*technician*)

Sets the technicians name to *technician*.

#### Notes

This function is optional and can be called only after opening a file in writemode and before the first sample write action.

**setTransducer**(*edfsignal*, *transducer*)

Sets the transducer of signal edfsignal

#### Parameters

- **edfsignal** – int
- **transducer** – str

#### Notes

This function is optional for every signal and can be called only after opening a file in writemode and before the first sample write action.

**set\_number\_of\_annotation\_signals**(*number\_of\_annotations*)

Sets the number of annotation signals. The default value is 1 This function is optional and can be called only after opening a file in writemode and before the first sample write action Normally you don’t need to change the default value. Only when the number of annotations you want to write is more than the number of seconds of the duration of the recording, you can use this function to increase the storage space for annotations Minimum is 1, maximum is 64

#### Parameters

**number\_of\_annotations** [integer] Sets the number of annotation signals

**update\_header**()

Updates header to edfile struct

**writeAnnotation**(*onset\_in\_seconds*, *duration\_in\_seconds*, *description*, *str\_format*='utf-8')

Writes an annotation/event to the file

**writeDigitalSamples**(*data*)

**writeDigitalShortSamples**(*data*)

**writePhysicalSamples(*data*)**

Writes *n* physical samples (uV, mA, Ohm) belonging to one signal where *n* is the samplefrequency of the signal.

*data\_vec* belonging to one signal. The size must be the samplefrequency of the signal.

**Notes**

Writes *n* physical samples (uV, mA, Ohm) from *data\_vec* belonging to one signal where *n* is the samplefrequency of the signal. The physical samples will be converted to digital samples using the values of physical maximum, physical minimum, digital maximum and digital minimum. The number of samples written is equal to the samplefrequency of the signal. Call this function for every signal in the file. The order is important! When there are 4 signals in the file, the order of calling this function must be: signal 0, signal 1, signal 2, signal 3, signal 0, signal 1, signal 2, etc.

All parameters must be already written into the bdf/edf-file.

**writeSamples(*data\_list*, *digital=False*)**

Writes physical samples (uV, mA, Ohm) from *data* belonging to all signals. The physical samples will be converted to digital samples using the values of physical maximum, physical minimum, digital maximum and digital minimum. If the samplefrequency of all signals are equal, then the data could be saved into a matrix with the size (N,signals). If the samplefrequency is different, then *sample\_freq* is a vector containing all the different samplefrequencys. The data is saved as list. Each list entry contains a vector with the data of one signal.

If *digital* is True, digital signals (as directly from the ADC) will be expected. (e.g. int16 from 0 to 2048)

All parameters must be already written into the bdf/edf-file.

This section describes functions used to perform reading of a EDF/BDF file.

### 5.1.2 EDF/BDF file reader **edfreader**

**class pyedflib.EdfReader**

Bases: pyedflib.\_extensions.\_pyedflib.CyEdfReader

This provides a simple interface to read EDF, EDF+, BDF and BDF+ files.

**Attributes**

**admincode**

**annotations\_in\_file**

**birthdate**

**datarecord\_duration** datarecord duration in seconds (as a double)

**datarecords\_in\_file** number of data records

**equipment**

**file\_duration** file duration in seconds

**filetype**

**gender**

**handle** edflib internal int handle

**patient** patient name?

**patient\_additional**  
**patientcode**  
**patientname**  
**recording\_additional**  
**signals\_in\_file**  
**startdate\_day**  
**startdate\_month**  
**startdate\_year**  
**starttime\_hour**  
**starttime\_minute**  
**starttime\_second**  
**starttime\_subsecond**  
**technician**

## Methods

<i>close()</i>	Closes the file handler
<i>file_info_long()</i>	Returns information about the opened EDF/BDF file
<i>getAdmincode()</i>	Returns the Admincode.
<i>getBirthdate([string])</i>	Returns the birthdate as string object
<i>getDigitalMaximum([chn])</i>	Returns the maximum digital value of signal edfsignal.
<i>getDigitalMinimum([chn])</i>	Returns the minimum digital value of signal edfsignal.
<i>getEquipment()</i>	Returns the used Equipment.
<i>getFileDuration()</i>	Returns the duration of the file in seconds.
<i>getGender()</i>	Returns the Gender of the patient.
<i>getHeader()</i>	Returns the file header as dict
<i>getLabel(chn)</i>	Returns the label (name) of signal chn ("FP1", "SaO2", etc.).
<i>getPatientAdditional()</i>	Returns the additional patientinfo.
<i>getPatientCode()</i>	Returns the patientcode
<i>getPatientName()</i>	Returns the patientname
<i>getPhysicalDimension(chn)</i>	Returns the physical dimension of signal edfsignal ("uV", "BPM", "mA", "Degr.", etc.)
<i>getPhysicalMaximum([chn])</i>	Returns the maximum physical value of signal edfsignal.
<i>getPhysicalMinimum([chn])</i>	Returns the minimum physical value of signal edfsignal.
<i>getPrefilter(chn)</i>	Returns the prefilter of signal chn ("HP:0.1Hz", "LP:75Hz N:50Hz", etc.)
<i>getRecordingAdditional()</i>	Returns the additional recordinginfo
<i>getSampleFrequencies()</i>	Returns samplefrequencies of all signals.
<i>getSampleFrequency(chn)</i>	Returns the samplefrequency of signal edfsignal.
<i>getSignalHeader(chn)</i>	Returns the header of one signal as dicts

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Table 2 – continued from previous page

<i>getSignalHeaders()</i>	Returns the header of all signals as array of dicts
<i>getSignalLabels()</i>	Returns all labels (name) ("FP1", "SaO2", etc.).
<i>getStartdatetime()</i>	Returns the date and starttime as datetime object
<i>getTechnician()</i>	Returns the technicians name
<i>getTransducer</i> (chn)	Returns the transducer of signal chn ("AgAgCl cup electrodes", etc.).
<i>make_buffer</i>	utility function to make a buffer that can hold a single datarecord.
<i>open</i> (file_name, annotations_mode, ...)	
<i>readAnnotations()</i>	Annotations from a edf-file
<i>readSignal</i> (chn[, start, n, digital])	Returns the physical data of signal chn.
<i>read_digital_signal</i>	<i>read_digital_signal</i> (self, signalnum, start, n, np.ndarray[np.int32_t, ndim=1] sigbuf read @n number of samples from signal number @signum starting at @start into numpy int32 array @sigbuf sigbuf must be at least n long
<i>readsignal</i>	read @n number of samples from signal number @signum starting at @start into numpy float64 array @sigbuf sigbuf must be at least n long

<b>check_open_ok</b>	
<b>digital_max</b>	
<b>digital_min</b>	
<b>file_info</b>	
<b>getNSamples</b>	
<b>load_datarecord</b>	
<b>physical_dimension</b>	
<b>physical_max</b>	
<b>physical_min</b>	
<b>prefilter</b>	
<b>read_annotation</b>	
<b>samplefrequency</b>	
<b>samples_in_datarecord</b>	
<b>samples_in_file</b>	
<b>signal_label</b>	
<b>transducer</b>	

**close()**

Closes the file handler

**file\_info()****file\_info\_long()**

Returns information about the opened EDF/BDF file

**getAdmincode()**

Returns the Admincode.

**Parameters****None**



### Examples

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> f.getAdmincode()==' '
True
>>> f.close()
```

#### **getBirthdate**(*string=True*)

Returns the birthdate as string object

##### Parameters

None

### Examples

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> f.getBirthdate()=='30 jun 1969'
True
>>> f.close()
```

#### **getDigitalMaximum**(*chn=None*)

Returns the maximum digital value of signal edfsignal.

##### Parameters

**chn** [int] channel number

### Examples

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> f.getDigitalMaximum(0)
32767
>>> f.close()
```

#### **getDigitalMinimum**(*chn=None*)

Returns the minimum digital value of signal edfsignal.

##### Parameters

**chn** [int] channel number

### Examples

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> f.getDigitalMinimum(0)
-32768
>>> f.close()
```

#### **getEquipment()**

Returns the used Equipment.

##### **Parameters**

None

### Examples

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> f.getEquipment()=='test generator'
True
>>> f.close()
```

#### **getFileDuration()**

Returns the duration of the file in seconds.

##### **Parameters**

None

### Examples

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> f.getFileDuration()==600
True
>>> f.close()
```

#### **getGender()**

Returns the Gender of the patient.

##### **Parameters**

None

## Examples

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> f.getGender()==' '
True
>>> f.close()
```

### **getHeader()**

Returns the file header as dict

#### **Parameters**

None

### **getLabel(*chn*)**

Returns the label (name) of signal *chn* (“FP1”, “SaO2”, etc.).

#### **Parameters**

**chn** [int] channel number

## Examples

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> f.getLabel(0)=='squarewave'
True
>>> f.close()
```

### **getNSamples()**

### **getPatientAdditional()**

Returns the additional patientinfo.

#### **Parameters**

None

## Examples

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> f.getPatientAdditional()==' '
True
>>> f.close()
```

### **getPatientCode()**

Returns the patientcode

#### **Parameters**

None

### Examples

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> f.getPatientCode()==' '
True
>>> f.close()
```

#### **getPatientName()**

Returns the patientname

##### **Parameters**

None

### Examples

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> f.getPatientName()=='X'
True
>>> f.close()
```

#### **getPhysicalDimension(*chn*)**

Returns the physical dimension of signal edfsignal (“uV”, “BPM”, “mA”, “Degr.”, etc.)

##### **Parameters**

**chn** [int] channel number

### Examples

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> f.getPhysicalDimension(0)=='uV'
True
>>> f.close()
```

#### **getPhysicalMaximum(*chn=None*)**

Returns the maximum physical value of signal edfsignal.

##### **Parameters**

**chn** [int] channel number

### Examples

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> f.getPhysicalMaximum(0)==1000.0
True
>>> f.close()
```

#### **getPhysicalMinimum**(*chn=None*)

Returns the minimum physical value of signal edfsignal.

##### Parameters

**chn** [int] channel number

### Examples

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> f.getPhysicalMinimum(0)==-1000.0
True
>>> f.close()
```

#### **getPrefilter**(*chn*)

Returns the prefilter of signal chn (“HP:0.1Hz”, “LP:75Hz N:50Hz”, etc.)

##### Parameters

**chn** [int] channel number

### Examples

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> f.getPrefilter(0)==' '
True
>>> f.close()
```

#### **getRecordingAdditional**()

Returns the additional recordinginfo

##### Parameters

**None**

## Examples

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> f.getRecordingAdditional()==' '
True
>>> f.close()
```

### **getSampleFrequencies()**

Returns samplefrequencies of all signals.

#### **Parameters**

None

## Examples

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> all(f.getSampleFrequencies()==200.0)
True
>>> f.close()
```

### **getSampleFrequency(*chn*)**

Returns the samplefrequency of signal edfsignal.

#### **Parameters**

**chn** [int] channel number

## Examples

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> f.getSampleFrequency(0)==200.0
True
>>> f.close()
```

### **getSignalHeader(*chn*)**

Returns the header of one signal as dicts

#### **Parameters**

None

### **getSignalHeaders()**

Returns the header of all signals as array of dicts

#### **Parameters**

None

### **getSignalLabels()**

Returns all labels (name) (“FP1”, “SaO2”, etc.).

#### **Parameters**

None

## Examples

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> f.getSignalLabels()==['squarewave', 'ramp', 'pulse', 'noise', 'sine 1 Hz',
↪ 'sine 8 Hz', 'sine 8.1777 Hz', 'sine 8.5 Hz', 'sine 15 Hz', 'sine 17 Hz',
↪ 'sine 50 Hz']
True
>>> f.close()
```

### getStartdatetime()

Returns the date and starttime as datetime object

#### Parameters

None

## Examples

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> f.getStartdatetime()
datetime.datetime(2011, 4, 4, 12, 57, 2)
>>> f.close()
```

### getTechnician()

Returns the technicians name

#### Parameters

None

.. code-block:: python

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> f.getTechnician()==' '
True
>>> f.close()
```

### getTransducer(*chn*)

Returns the transducer of signal *chn* (“AgAgCl cup electrodes”, etc.).

#### Parameters

**chn** [int] channel number

## Examples

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> f.getTransducer(0)==' '
True
>>> f.close()
```

### **readAnnotations()**

Annotations from a edf-file

#### **Parameters**

**None**

### **readSignal(*chn*, *start*=0, *n*=None, *digital*=False)**

Returns the physical data of signal *chn*. When *start* and *n* is set, a subset is returned

#### **Parameters**

**chn** [int] channel number

**start** [int] start pointer (default is 0)

**n** [int] length of data to read (default is None, by which the complete data of the channel are returned)

**digital: bool** will return the signal in original digital values instead of physical values

#### **Examples**

```
>>> import pyedflib
>>> f = pyedflib.data.test_generator()
>>> x = f.readSignal(0,0,1000)
>>> int(x.shape[0])
1000
>>> x2 = f.readSignal(0)
>>> int(x2.shape[0])
120000
>>> f.close()
```

## 5.1.3 EDF/BDF highlevel functions

`pyedflib.highlevel.change_polarity(edf_file, channels, new_file=None, verify=True, verbose=False)`

Change polarity of certain channels

#### **Parameters**

**edf\_file** [str] from which file to change polarity.

**channels** [list of int] the indices of the channels.

**new\_file** [str, optional] where to save the edf with inverted channels. The default is None.

**verify** [bool, optional] whether to verify the two edfs for similarity. The default is True.



**verbose** [str, optional] print progress or not. The default is True.

#### Returns

**bool** True if success.

`pyedflib.highlevel.rename_channels(edf_file, mapping, new_file=None, verbose=False)`

A convenience function to rename channels in an EDF file.

#### Parameters

**edf\_file** [str] an string pointing to an edf file.

**mapping** [dict] a dictionary with channel mappings as key:value. eg: {'M1-O2':'A1-O2'}

**new\_file** [str, optional] the new filename. If None will be edf\_file + '\_renamed' The default is None.

**verbose** [bool, optional] print progress or not. The default is False.

#### Returns

**bool** True if successful, False if failed.

`pyedflib.highlevel.anonymize_edf(edf_file, new_file=None, to_remove=['patientname', 'birthdate'],  
new_values=['xxx', ''], verify=False, verbose=False)`

Anonymize an EDF file by replacing values of header fields.

This function can be used to overwrite all header information that is patient specific, for example birthdate and patientname. All header fields can be overwritten this way (i.e., all `header.keys()` given `_, _, header = read_edf(edf_file, digital=True)`).

#### Parameters

**edf\_file** [str] Filename of an EDF/BDF.

**new\_file** [str | None] The filename of the anonymized file. If None, the input filename appended with '\_anonymized' is used. Defaults to None.

**to\_remove** [list of str] List of attributes to overwrite in the *edf\_file*. Defaults to ['patientname', 'birthdate'].

**new\_values** [list of str] List of values used for overwriting the attributes specified in *to\_remove*. Each item in *to\_remove* must have a corresponding item in *new\_values*. Defaults to ['xxx', ''].

**verify** [bool] Compare *edf\_file* and *new\_file* for equality (i.e., double check that values are same). Defaults to False

**verbose** [bool, optional] print progress or not. The default is False.

#### Returns

**bool** True if successful, or if *verify* is False. Raises an error otherwise.

`pyedflib.highlevel.drop_channels(edf_source, edf_target=None, to_keep=None, to_drop=None,  
verbose=False)`

Remove channels from an edf file. Save the file. For safety reasons, no source files can be overwritten.

#### Parameters

**edf\_source** [str] The source edf file from which to drop channels.

**edf\_target** [str, optional] Where to save the file.If None, will be edf\_source+'dropped.edf'. The default is None.

**to\_keep** [list, optional] A list of channel names or indices that will be kept. Strings will always be interpreted as channel names. 'to\_keep' will overwrite any droppings proposed by to\_drop. The default is None.

**to\_drop** [list, optional] A list of channel names/indices that should be dropped. Strings will be interpreted as channel names. The default is None.

**verbose** [bool, optional] print progress or not. The default is False.

#### Returns

**edf\_target** [str] the target filename with the dropped channels.

`pyedflib.highlevel.compare_edf(edf_file1, edf_file2, verbose=False)`

Loads two edf files and checks whether the values contained in them are the same. Does not check the header or annotations data.

Mainly to verify that other options (eg anonymization) produce the same EDF file.

#### Parameters

**edf\_file1** [str] edf file 1 to compare.

**edf\_file2** [str] edf file 2 to compare.

**verbose** [bool, optional] print progress or not. The default is False.

#### Returns

**bool** True if signals are equal, else raises error.

`pyedflib.highlevel.read_edf_header(edf_file, read_annotations=True)`

Reads the header and signal headers of an EDF file and it's annotations

#### Parameters

**edf\_file** [str] EDF/BDF file to read.

#### Returns

**summary** [dict] header of the edf file as dictionary.

`pyedflib.highlevel.write_edf_quick(edf_file, signals, sfreq, digital=False)`

wrapper for write\_pyedf without creating headers. Use this if you don't care about headers or channel names and just want to dump some signals with the same sampling freq. to an edf

#### Parameters

**edf\_file** [str] where to store the data/edf.

**signals** [np.ndarray] The signals you want to store as numpy array.

**sfreq** [int] the sampling frequency of the signals.

**digital** [bool, optional] if the data is present digitally (int) or as mV/uV. The default is False.

#### Returns

**bool** True if successful, else False or raise Error.

`pyedflib.highlevel.write_edf(edf_file, signals, signal_headers, header=None, digital=False, file_type=-1, block_size=1)`

Write signals to an edf\_file. Header can be generated on the fly with generic values. EDF+/BDF+ is selected based on the filename extension, but can be overwritten by setting file\_type to pyedflib.FILETYPE\_XXX

#### Parameters

**edf\_file** [np.ndarray or list] where to save the EDF file

**signals** [list] The signals as a list of arrays or a ndarray.

**signal\_headers** [list of dict] a list with one signal header(dict) for each signal. See pyedflib.EdfWriter.setSignalHeader..

**header** [dict] a main header (dict) for the EDF file, see pyedflib.EdfWriter.setHeader for details. If no header present, will create an empty header

**digital** [bool, optional] whether the signals are in digital format (ADC). The default is False.

**file\_type: int, optional** choose file\_type for saving. EDF = 0, EDF+ = 1, BDF = 2, BDF+ = 3, automatic from extension = -1

**block\_size** [int] set the block size for writing. Should be divisor of signal length in seconds. Higher values mean faster writing speed, but if it is not a divisor of the signal duration, it will append zeros. Can be any value between  $1 \leq \leq 60$ , -1 will auto-infer the fastest value.

#### Returns

**bool** True if successful, False if failed.

pyedflib.highlevel.**read\_edf**(*edf\_file*, *ch\_nrs=None*, *ch\_names=None*, *digital=False*, *verbose=False*)  
Convenience function for reading EDF+/BDF data with pyedflib.

Will load the edf and return the signals, the headers of the signals and the header of the EDF. If all signals have the same sample frequency will return a numpy array, else a list with the individual signals

#### Parameters

**edf\_file** [str] link to an edf file.

**ch\_nrs** [list of int, optional] The indices of the channels to read. The default is None.

**ch\_names** [list of str, optional] The names of channels to read. The default is None.

**digital** [bool, optional] will return the signals as digital values (ADC). The default is False.

**verbose** [bool, optional] Print progress bar while loading or not. The default is False.

#### Returns

**signals** [np.ndarray or list] the signals of the chosen channels contained in the EDF.

**signal\_headers** [list] one signal header for each channel in the EDF.

**header** [dict] the main header of the EDF file containing meta information.

pyedflib.highlevel.**make\_signal\_headers**(*list\_of\_labels*, *dimension='uV'*, *sample\_rate=256*,  
*sample\_frequency=None*, *physical\_min=-200.0*,  
*physical\_max=200.0*, *digital\_min=-32768*, *digital\_max=32767*,  
*transducer=""*, *prefiler=""*)

A function that creates signal headers for a given list of channel labels. This can only be used if each channel has the same sampling frequency

#### Parameters

**list\_of\_labels** [list of str] A list with labels for each channel.

**dimension** [str, optional] dimension, eg mV. The default is 'uV'.

**sample\_rate** [int, optional] sampling frequency. The default is 256. Deprecated: use 'sample\_frequency' instead.

**sample\_frequency** [int, optional] sampling frequency. The default is 256.

**physical\_min** [float, optional] minimum value in dimension. The default is -200.

**physical\_max** [float, optional] maximum value in dimension. The default is 200.

**digital\_min** [int, optional] digital minimum of the ADC. The default is -32768.

**digital\_max** [int, optional] digital maximum of the ADC. The default is 32767.

**transducer** [str, optional] electrode type that was used. The default is ‘’.

**prefiler** [str, optional] filtering and sampling method. The default is ‘’.

### Returns

**signal\_headers** [list of dict] returns n signal headers as a list to save several signal headers.

```
pyedflib.highlevel.make_signal_header(label, dimension='uV', sample_rate=256,  
                                     sample_frequency=None, physical_min=- 200, physical_max=200,  
                                     digital_min=- 32768, digital_max=32767, transducer="",  
                                     prefiler="")
```

A convenience function that creates a signal header for a given signal. This can be used to create a list of signal headers that is used by pyedflib to create an edf. With this, different sampling frequencies can be indicated.

### Parameters

**label** [str] the name of the channel.

**dimension** [str, optional] dimension, eg mV. The default is ‘uV’.

**sample\_rate** [int, optional] sampling frequency. The default is 256. Deprecated: use ‘sample\_frequency’ instead.

**sample\_frequency** [int, optional] sampling frequency. The default is 256.

**physical\_min** [float, optional] minimum value in dimension. The default is -200.

**physical\_max** [float, optional] maximum value in dimension. The default is 200.

**digital\_min** [int, optional] digital minimum of the ADC. The default is -32768.

**digital\_max** [int, optional] digital maximum of the ADC. The default is 32767.

**transducer** [str, optional] electrode type that was used. The default is ‘’.

**prefiler** [str, optional] filtering and sampling method. The default is ‘’.

### Returns

**signal\_header** [dict] a signal header that can be used to save a channel to an EDF.

```
pyedflib.highlevel.make_header(technician="", recording_additional="", patientname="",  
                               patient_additional="", patientcode="", equipment="", admincode="",  
                               gender="", startdate=None, birthdate="")
```

A convenience function to create an EDF header (a dictionary) that can be used by pyedflib to update the main header of the EDF

### Parameters

**technician** [str, optional] name of the technician. The default is ‘’.

**recording\_additional** [str, optional] comments etc. The default is ‘’.

**patientname** [str, optional] the name of the patient. The default is ‘’.

**patient\_additional** [TYPE, optional] more info about the patient. The default is ‘’.

**patientcode** [str, optional] alphanumeric code. The default is ‘’.

**equipment** [str, optional] which system was used. The default is ‘’.

**admincode** [str, optional] code of the admin. The default is ''.

**gender** [str, optional] gender of patient. The default is ''.

**startdate** [datetime.datetime, optional] startdate of recording. The default is None.

**birthdate** [str/datetime.datetime, optional] date of birth of the patient. The default is ''.

#### Returns

**header** [dict] a dictionary with the values given filled in.

`pyedflib.highlevel.phys2dig(signal, dmin, dmax, pmin, pmax)`  
converts physical values to digital values

#### Parameters

**signal** [np.ndarray or int] A numpy array with int values (digital values) or an int.

**dmin** [int] digital minimum value of the edf file (eg -2048).

**dmax** [int] digital maximum value of the edf file (eg 2048).

**pmin** [float] physical maximum value of the edf file (eg -200.0).

**pmax** [float] physical maximum value of the edf file (eg 200.0).

#### Returns

**digital** [np.ndarray or int] converted digital values

`pyedflib.highlevel.dig2phys(signal, dmin, dmax, pmin, pmax)`  
converts digital edf values to physical values

#### Parameters

**signal** [np.ndarray or int] A numpy array with int values (digital values) or an int.

**dmin** [int] digital minimum value of the edf file (eg -2048).

**dmax** [int] digital maximum value of the edf file (eg 2048).

**pmin** [float] physical maximum value of the edf file (eg -200.0).

**pmax** [float] physical maximum value of the edf file (eg 200.0).

#### Returns

**physical** [np.ndarray or float] converted physical values

## 5.2 Development notes

This section contains information on building and installing PyEDFlib from source code as well as instructions for preparing the build environment on Windows and Linux.

### 5.2.1 Preparing Windows build environment

To start developing pyedflib code on Windows you will have to install a C compiler and prepare the build environment.

#### Installing Microsoft Visual C++ Compiler for Python 2.7

Downloading Microsoft Visual C++ Compiler for Python 2.7 from <https://www.microsoft.com/en-us/download/details.aspx?id=44266>.

After installing the Compiler and before compiling the extension you have to configure some environment variables.

For build execute the util/setenv\_win.bat script in the cmd window:

```
rem Configure the environment for builds.
rem Convince setup.py to use the SDK tools.
set MSSdk=1
set DISTUTILS_USE_SDK=1
```

#### Next steps

After completing these steps continue with *Installing build dependencies*.

### 5.2.2 Preparing Linux build environment

There is a good chance that you already have a working build environment. Just skip steps that you don't need to execute.

#### Installing basic build tools

Note that the example below uses aptitude package manager, which is specific to Debian and Ubuntu Linux distributions. Use your favourite package manager to install these packages on your OS.

```
aptitude install build-essential gcc python-dev git-core
```

#### Next steps

After completing these steps continue with *Installing build dependencies*.

### 5.2.3 Installing build dependencies

#### Setting up Python virtual environment

A good practice is to create a separate Python virtual environment for each project. If you don't have `virtualenv` yet, install and activate it using:

```
curl -O https://raw.githubusercontent.com/pypa/virtualenv/master/virtualenv.py
python virtualenv.py <name_of_the_venv>
. <name_of_the_venv>/bin/activate
```

## Installing Cython

Use `pip` (<http://pypi.python.org/pypi/pip>) to install Cython:

```
pip install Cython>=0.16
```

## Installing numpy

Use `pip` to install `numpy`:

```
pip install numpy
```

Numpy can also be obtained via scientific python distributions such as:

- [Anaconda](#)
- [Enthought Canopy](#)
- [Python\(x,y\)](#)

---

**Note:** You can find binaries for 64-bit Windows on <http://www.lfd.uci.edu/~gohlke/pythonlibs/>.

---

## Installing Sphinx

`Sphinx` is a documentation tool that converts reStructuredText files into nicely looking html documentation. Install it with:

```
pip install Sphinx
```

`numpydoc` is used to format the API documentation appropriately. Install it via:

```
pip install numpydoc
```

## 5.2.4 Building and installing PyEDFlib

### Installing from source code

Go to <https://github.com/holgern/pyedflib> GitHub project page, fork and clone the repository or use the upstream repository to get the source code:

```
git clone https://github.com/holgern/pyedflib.git pyedflib
```

Activate your Python virtual environment, go to the cloned source directory and type the following commands to build and install the package:

```
python setup.py build
python setup.py install
```

To verify the installation run the following command:

```
python setup.py test
```

To build docs:

```
cd doc
make html
```

### Installing from source code in Windows

Go to <https://github.com/holgern/pyedflib> GitHub project page, fork and clone the repository or use the upstream repository to get the source code:

```
git clone https://github.com/holgern/pyedflib.git pyedflib
```

Install Microsoft Visual C++ Compiler for Python 2.7 from <https://www.microsoft.com/en-us/download/details.aspx?id=44266>

Activate your Python virtual environment, go to the cloned source directory and type the following commands to build and install the package:

```
util\setenv_win.bat
python setup.py build_ext --inplace
python setup.py install --user
```

To verify the installation run the following command:

```
python runtests.py
```

To build docs:

```
cd doc
make html
```

### Installing a development version

You can also install directly from the source repository:

```
pip install -e git+https://github.com/holgern/pyedflib.git#egg=pyedflib
```

or:

```
pip install pyedflib==dev
```

### Installing a regular release from PyPi

A regular release can be installed with pip or easy\_install:

```
pip install pyedflib
```



### 5.2.5 Testing

We are currently using AppVeyor and CircleCI for continuous integration.

If you are submitting a patch or pull request please make sure it does not break the build.

#### Running tests locally

Tests are implemented with `nose`, so use one of:

```
$ nosetests pyedflib
```

```
>>> pyedflib.test()
```

Note doctests require `Matplotlib` in addition to the usual dependencies.

### 5.2.6 Guidelines for new releases for pyedflib

vX.X.X refers to the release number

#### Tag the release and trigger bulding of wheels in appvoyer

Change ISRELEASED in setup.py to True and commit.

Appveyor will now build wheels for windows.

Tag the relase with

```
`git tag -s vX.X.X`
```

and push the tag to master.

#### Clean up source

Remove untraced files with `git clean`

First check which files will be deleted:

```
`git clean -x`
```

Then run without -n:

```
`git clean -x`
```

Create the source distribution files with:

```
`python setup.py sdist --formats=gztar,zip`
```

## Upload the release and windows wheels to pypi

Download all wheels from Appveyor and put them into the dist directory

Register all files with

```
`twine register dist\filename_which_should_uploaded.whl`
```

and upload with

```
`twine upload dist\filename_which_should_uploaded.whl`
```

## Prepare for continued development

Increment the version number in setup.py and change ISRELEASED to False.

## 5.2.7 Something not working?

If these instructions are not clear or you need help setting up your development environment, go ahead and open a ticket on [GitHub](#).

## 5.3 Resources

### 5.3.1 Code

The [GitHub repository](#) is now the main code repository.

If you are using the Mercurial repository at Bitbucket, please switch to Git/GitHub and follow for development updates.

### 5.3.2 Questions and bug reports

Use [GitHub Issues](#) to post questions and open tickets.

## 5.4 PyEDFlib

### 5.4.1 Release Notes

#### PyEDFlib 0.1.6 Release Notes

##### Contents

- *PyEDFlib 0.1.6 Release Notes*
  - *Authors*
  - \* *Issues closed for v0.1.6*
  - \* *Pull requests for v0.1.6*

- Faster writing of BDF/EDF files

- bug fixes

## Authors

- Holger Nahrstaedt

## Issues closed for v0.1.6

- #5: edf writer code executing really slow

## Pull requests for v0.1.6

## PyEDFlib 0.1.7 Release Notes

### Contents

- *PyEDFlib 0.1.7 Release Notes*
  - *Authors*
    - \* *Issues closed for v0.1.7*
    - \* *Pull requests for v0.1.7*

- Fix Crash on 64 Bit
- Fix strings on python 3
- Fix edf handle
- Fix getSignalHeaders

## Authors

- Matthias Klumpp +
- Holger Nahrstaedt
- Jukka Zitting +

A total of 3 people contributed to this release. People with a “+” by their names contributed a patch for the first time. This list of names is automatically generated, and may not be fully complete.

### Issues closed for v0.1.7

- #7: Handling of wrong paths
- #8: Wrong and misleading docstring for setDatarecordDuration
- #9: How to close an already opened file?
- #10: Incorrect results from calling read\_digital\_signal when opening more than one file

### Pull requests for v0.1.7

- #12: Fix getSignalHeaders
- #13: Don't crash when writing files on 64bit machines

## PyEDFlib 0.1.8 Release Notes

### Contents

- *PyEDFlib 0.1.8 Release Notes*
  - *Authors*
  - \* *Issues closed for v0.1.8*

- Fix proper reading of EDF/BDF files
- Fix writing of EDF/BDF files

### Authors

- Holger Nahrstaedt

### Issues closed for v0.1.8

- #11: IOError: malloc error
- #14: CHB-MIT (Physionet) error - regular EDF not supported anymore

## PyEDFlib 0.1.9 Release Notes

### Contents

- *PyEDFlib 0.1.9 Release Notes*
  - *Authors*
  - \* *Issues closed for v0.1.9*
  - \* *Pull requests for v0.1.9*

- Fix proper reading of EDF/BDF files
- Bug fixes
- Improved error messages

## Authors

- Zaccharie Ramzi +
- Holger Nahrstaedt

## Issues closed for v0.1.9

- [#16](#): Double rounding when writing to file leads to accumulating errors
- [#17](#): Error with chb17b\_69 in CHB-MIT (Physionet) Database

## Pull requests for v0.1.9

- [#15](#): Essentially corrected a typo in readme

## PyEDFlib 0.1.10 Release Notes

### Contents

- *PyEDFlib 0.1.10 Release Notes*
  - *Authors*
  - \* *Issues closed for v0.1.10*

- Add function for access subset of data
- Improved error messages

## Authors

- Holger Nahrstaedt

## Issues closed for v0.1.10

- [#19](#) : IOError: the file is not EDF(+) or BDF(+) compliant (Label)
- [#20](#) : access subset of data

## PyEDFlib 0.1.11 Release Notes

### Contents

- *PyEDFlib 0.1.11 Release Notes*
  - *Authors*
    - \* *Issues closed for v0.1.11*
    - \* *Pull requests for v0.1.11*

- Bug fixes

### Authors

- Holger Nahrstaedt
- Steffen Heimes +

A total of 2 people contributed to this release. People with a “+” by their names contributed a patch for the first time. This list of names is automatically generated, and may not be fully complete.

### Issues closed for v0.1.11

- #21 : Cannot open file containing accented character on Windows

### Pull requests for v0.1.11

- #23: Fixed Typo edfreader and improve edfwriter

## PyEDFlib 0.1.12 Release Notes

### Contents

- *PyEDFlib 0.1.12 Release Notes*
  - *Authors*
    - \* *Issues closed for v0.1.12*
    - \* *Pull requests for v0.1.12*

- small bug fixes

## Authors

- Holger Nahrstaedt

## Issues closed for v0.1.12

- #24 : Issues reading EDF's
- #25 : file\_info\_long() method is broken.

## Pull requests for v0.1.12

## PyEDFlib 0.1.15 Release Notes

### Contents

- *PyEDFlib 0.1.15 Release Notes*
  - *Authors*
    - \* *Issues closed for v0.1.15*
    - \* *Pull requests for v0.1.15*

- Fix Documentation (Add class functions)
- Add build for python 3.7
- add close() on EdfReader

## Authors

- Holger Nahrstaedt
- skjerns

## Issues closed for v0.1.15

- Fix issue #48 - DOC
- Fix issue #60 - No Windows binaries for python 3.7 on PyPI
- Fix issue #62 - Install via pip fails on Windows (no file stdio.h)
- Fix issue #42 - Problem with setGender
- Fix issue #43 - Writer as context manager

## Pull requests for v0.1.15

- PR #49 - Added option to get digital samples

## PyEDFlib 0.1.16 Release Notes

### Contents

- *PyEDFlib 0.1.16 Release Notes*
  - *Authors*
    - \* *Issues closed for v0.1.16*
    - \* *Pull requests for v0.1.16*

- Add high-level functions

## Authors

- Holger Nahrstaedt
- skjerns

## Issues closed for v0.1.16

- Fix issue #64 - request to provide a sample script to de-identify edf

## Pull requests for v0.1.16

- PR #69 - Fix docstring of method setDigitalMaximum
- PR #66 - Add support for PEP 517 & 518
- PR #65 - Added high-level functions

## PyEDFlib 0.1.17 Release Notes

### Contents

- *PyEDFlib 0.1.17 Release Notes*
  - *Authors*

- Fix readme
- Fix docs
- Add python 3.8 to CI



## Authors

- Holger Nahrstaedt

## PyEDFlib 0.1.19 Release Notes

### Contents

- *PyEDFlib 0.1.19 Release Notes*
  - *Authors*
    - \* *Issues closed for v0.1.19*
    - \* *Pull requests for v0.1.19*

## Authors

- Holger Nahrstaedt
- skjerns
- LucaCerina

## Issues closed for v0.1.19

- Fix issue #87 - Gender and patient name can't be properly anonymized

## Pull requests for v0.1.19

- PR #85 - Add subsecond precision
- PR #89 - Assert that physical\_min is different from physical\_max
- PR #90 - Add support for gender removal

## PyEDFlib 0.1.19 Release Notes

### Contents

- *PyEDFlib 0.1.19 Release Notes*
  - *Authors*
    - \* *Issues closed for v0.1.19*
    - \* *Pull requests for v0.1.19*

## Authors

- Holger Nahrstaedt
- skjerns
- LucaCerina

## Issues closed for v0.1.19

- Fix issue #87 - Gender and patient name can't be properly anonymized

## Pull requests for v0.1.19

- PR #85 - Add subsecond precision
- PR #89 - Assert that physical\_min is different from physical\_max
- PR #90 - Add support for gender removal

## PyEDFlib 0.1.20 Release Notes

### Contents

- *PyEDFlib 0.1.20 Release Notes*
  - *Authors*
    - \* *Issues closed for v0.1.20*
    - \* *Pull requests for v0.1.20*

## Authors

- Holger Nahrstaedt
- skjerns

## Issues closed for v0.1.20

- Fix issue #91 - Fix date given as string (backwards compatible)

### Pull requests for v0.1.20

- PR #93 - Automatically set blocksize // speed up writing

### PyEDFlib 0.1.21 Release Notes

#### Contents

- *PyEDFlib 0.1.21 Release Notes*
  - *Authors*
    - \* *Issues closed for v0.1.21*
    - \* *Pull requests for v0.1.21*

- Include unit tests into python package
- Add manylinux builds
- Fix unit test für ARM

### Authors

- Holger Nahrstaedt
- skjerns

### Issues closed for v0.1.21

- Fix issue #99 - The pyedflib File Package does not support Chinese path
- Fix issue #105 - Take hours/days to write signals into edf file using `highlevel.write_edf?`
- Fix issue #109 - `highlevel.read_edf` fails with `ValueError`

### Pull requests for v0.1.21

- PR #100 - adding unicode read/write tests + workaround windows unicode files
- PR #103 - Verbose options default to False
- PR #106 - add warnings for header length
- PR #107 - Prevent fortran layout
- PR #109 - Round sample rates up to 3 decimals not to int
- PR #116 - fixed wrong variable use in `rename_channel` function

## PyEDFlib 0.1.22 Release Notes

### Contents

- *PyEDFlib 0.1.22 Release Notes*
  - *Authors*
    - \* *Issues closed for v0.1.22*
    - \* *Pull requests for v0.1.22*

- Fix manylinux wheel uploading
- Remove test artifacts from wheel

### Authors

- Holger Nahrstaedt
- skjerns

### Issues closed for v0.1.22

### Pull requests for v0.1.22

## PyEDFlib 0.1.23 Release Notes

### Contents

- *PyEDFlib 0.1.23 Release Notes*
  - *Authors*
    - \* *Issues closed for v0.1.23*
    - \* *Pull requests for v0.1.23*

- Use cibuildwheel for wheel building

### Authors

- Holger Nahrstaedt
- skjerns
- LucaCerina
- wmvavliet
- cfranklin11
- BlakeJC94

### Issues closed for v0.1.23

- #145 Typo in write\_edf documentation
- #142 set\_physical\_minimum return value is missing
- #133 Trigger UTF8-filename warning only if it's really the case
- #132 Add warning if header is too long or contains unrecognized header fields

### Pull requests for v0.1.23

- #124 updated edfWriter:setSignalHeaders to update default dicts instead of overwriting
- #126 Fix annotation bytestring
- #127 Cleanup travis buildscript
- #125 non-empty data check in edfwriter to prevent unknown OS error
- #121 Fix sample frequencies for record duration != 1
- #134 add warnings if dmin/dmax/pmin/pmax is out of bounds
- #135 split up Errors in FileNotFoundError and OSError
- #136 suppress warnings in tests
- #114 Be less strict about prefilter fields
- #137 improved speedup write with F-contiguous arrays

## 5.5 Indices and tables

- [genindex](#)
- [search](#)



## A

`anonymize_edf()` (in module `pyedflib.highlevel`), 29

## B

`blockWriteDigitalSamples()` (`pyedflib.EdfWriter` method), 12

`blockWriteDigitalShortSamples()` (`pyedflib.EdfWriter` method), 12

`blockWritePhysicalSamples()` (`pyedflib.EdfWriter` method), 12

## C

`change_polarity()` (in module `pyedflib.highlevel`), 28

`close()` (`pyedflib.EdfReader` method), 20

`close()` (`pyedflib.EdfWriter` method), 12

`compare_edf()` (in module `pyedflib.highlevel`), 30

## D

`dig2phys()` (in module `pyedflib.highlevel`), 33

`drop_channels()` (in module `pyedflib.highlevel`), 29

## E

`EdfReader` (class in `pyedflib`), 18

`EdfWriter` (class in `pyedflib`), 11

## F

`file_info()` (`pyedflib.EdfReader` method), 20

`file_info_long()` (`pyedflib.EdfReader` method), 20

## G

`getAdmincode()` (`pyedflib.EdfReader` method), 20

`getBirthdate()` (`pyedflib.EdfReader` method), 21

`getDigitalMaximum()` (`pyedflib.EdfReader` method), 21

`getDigitalMinimum()` (`pyedflib.EdfReader` method), 21

`getEquipment()` (`pyedflib.EdfReader` method), 22

`getFileDuration()` (`pyedflib.EdfReader` method), 22

`getGender()` (`pyedflib.EdfReader` method), 22

`getHeader()` (`pyedflib.EdfReader` method), 23

`getLabel()` (`pyedflib.EdfReader` method), 23

`getNSamples()` (`pyedflib.EdfReader` method), 23

`getPatientAdditional()` (`pyedflib.EdfReader` method), 23

`getPatientCode()` (`pyedflib.EdfReader` method), 23

`getPatientName()` (`pyedflib.EdfReader` method), 24

`getPhysicalDimension()` (`pyedflib.EdfReader` method), 24

`getPhysicalMaximum()` (`pyedflib.EdfReader` method), 24

`getPhysicalMinimum()` (`pyedflib.EdfReader` method), 25

`getPrefilter()` (`pyedflib.EdfReader` method), 25

`getRecordingAdditional()` (`pyedflib.EdfReader` method), 25

`getSampleFrequencies()` (`pyedflib.EdfReader` method), 26

`getSampleFrequency()` (`pyedflib.EdfReader` method), 26

`getSignalHeader()` (`pyedflib.EdfReader` method), 26

`getSignalHeaders()` (`pyedflib.EdfReader` method), 26

`getSignalLabels()` (`pyedflib.EdfReader` method), 26

`getStartdatetime()` (`pyedflib.EdfReader` method), 27

`getTechnician()` (`pyedflib.EdfReader` method), 27

`getTransducer()` (`pyedflib.EdfReader` method), 27

## M

`make_header()` (in module `pyedflib.highlevel`), 32

`make_signal_header()` (in module `pyedflib.highlevel`), 32

`make_signal_headers()` (in module `pyedflib.highlevel`), 31

## P

`phys2dig()` (in module `pyedflib.highlevel`), 33

## R

`read_edf()` (in module `pyedflib.highlevel`), 31

`read_edf_header()` (in module `pyedflib.highlevel`), 30

`readAnnotations()` (`pyedflib.EdfReader` method), 28

`readSignal()` (`pyedflib.EdfReader` method), 28

`rename_channels()` (in module `pyedflib.highlevel`), 29

## S

`set_number_of_annotation_signals()` (*pyedflib.EdfWriter method*), 17

`setAdmincode()` (*pyedflib.EdfWriter method*), 12

`setBirthdate()` (*pyedflib.EdfWriter method*), 13

`setDatarecordDuration()` (*pyedflib.EdfWriter method*), 13

`setDigitalMaximum()` (*pyedflib.EdfWriter method*), 13

`setDigitalMinimum()` (*pyedflib.EdfWriter method*), 14

`setEquipment()` (*pyedflib.EdfWriter method*), 14

`setGender()` (*pyedflib.EdfWriter method*), 14

`setHeader()` (*pyedflib.EdfWriter method*), 14

`setLabel()` (*pyedflib.EdfWriter method*), 14

`setPatientAdditional()` (*pyedflib.EdfWriter method*), 14

`setPatientCode()` (*pyedflib.EdfWriter method*), 15

`setPatientName()` (*pyedflib.EdfWriter method*), 15

`setPhysicalDimension()` (*pyedflib.EdfWriter method*), 15

`setPhysicalMaximum()` (*pyedflib.EdfWriter method*), 15

`setPhysicalMinimum()` (*pyedflib.EdfWriter method*), 15

`setPrefilter()` (*pyedflib.EdfWriter method*), 16

`setRecordingAdditional()` (*pyedflib.EdfWriter method*), 16

`setSamplefrequency()` (*pyedflib.EdfWriter method*), 16

`setSignalHeader()` (*pyedflib.EdfWriter method*), 16

`setSignalHeaders()` (*pyedflib.EdfWriter method*), 16

`setStartdatetime()` (*pyedflib.EdfWriter method*), 17

`setTechnician()` (*pyedflib.EdfWriter method*), 17

`setTransducer()` (*pyedflib.EdfWriter method*), 17

## U

`update_header()` (*pyedflib.EdfWriter method*), 17

## W

`write_edf()` (*in module pyedflib.highlevel*), 30

`write_edf_quick()` (*in module pyedflib.highlevel*), 30

`writeAnnotation()` (*pyedflib.EdfWriter method*), 17

`writeDigitalSamples()` (*pyedflib.EdfWriter method*), 17

`writeDigitalShortSamples()` (*pyedflib.EdfWriter method*), 17

`writePhysicalSamples()` (*pyedflib.EdfWriter method*), 17

`writeSamples()` (*pyedflib.EdfWriter method*), 18