
EDR4 - Record, display and read data

Revision History

Date	Version	Description
14/06/2024	1.1	Added information to the description of the .dat format
15/04/2021	1.0	First version of document



Supported data formats

EDR4 can save data in two file formats:

- Raw .dat files format;
- Axon Binary File (.abf) format version 2.0.

All data files are accompanied by an Elements Data Header file (.edh) in order to be loadable by EDA.

Dat format

Binary files in .dat format consist of a continuous series of IEEE 754 single-precision (32-bit) binary floating-point values expressed in little endian (least significant bytes first), with no header. The data is arranged in groups of CurrentChannelsNumber+1 values. Each group consists of CurrentChannelsNumber current samples (ordered by channel number) followed by 1 voltage sample corresponding to a given time instant. Groups are arranged in temporal order.

E.g. for a 4 channels device the values will be:

IChan1Sample1, IChan2Sample1, IChan3Sample1, IChan4Sample1, VChanSample1,
IChan1Sample2, IChan2Sample2, IChan3Sample2, IChan4Sample2, VChanSample2,
and so on.

Every value has no scaling and is expressed in the same unit as the current range selected during the recording, e.g. currents might be expressed in pA or nA. Voltage is always expressed in mV.

Please note that this format does not store intrinsically the current range and the sampling rate information, which are stored in the .edh file, so the user will have to recover those pieces of information from there.

Below is shown a simple python script that loads the data of a 4 channels device and plots it:

```
import struct
import numpy as np
import matplotlib.pyplot as plt

# Parameters
CurrentChannelsNumber = 4
data_file = 'file_000.dat'
samplingRate = 100000 # in Hz, assuming a sampling rate of 100kHz

# Function to read binary data
def read_binary_file(file_name, channels):
    data = []
    with open(file_name, 'rb') as f:
        while True:
```

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```
try:
    # Read a group of channels + 1 (voltage) samples
    group = struct.unpack('<' + 'f' * (channels + 1), f.read(4 *
(channels + 1)))
    data.append(group)
except struct.error:
    break
return np.array(data)

# Read the data from the binary file
data = read_binary_file(data_file, CurrentChannelsNumber)

# Separate the current and voltage data
currents = data[:, :CurrentChannelsNumber]
voltage = data[:, CurrentChannelsNumber]

# Generate the time axis based on the sampling rate
time = np.arange(0, len(voltage)) / samplingRate

# Plotting
fig, (ax1, ax2) = plt.subplots(2, 1, figsize=(15, 10))

# Plot current traces
for i in range(CurrentChannelsNumber):
    ax1.plot(time, currents[:, i], label=f'Current Channel {i+1}')
ax1.set_title('Current Traces')
ax1.set_xlabel('Time (s)')
ax1.set_ylabel('Current (nA)')
ax1.legend()

# Plot voltage trace
ax2.plot(time, voltage, label='Voltage', color='red')
ax2.set_title('Voltage Trace')
ax2.set_xlabel('Time (s)')
ax2.set_ylabel('Voltage (mV)')
ax2.legend()

# Show the plot
plt.tight_layout()
plt.show()
```

Abf format

It's the Axon file format used by pClamp software.

Data is saved in “gap-free” acquisition mode.



Recording controls

After connecting to the device, EDR4 starts acquiring and displaying data in real time in the plot window.

All the controls to record the acquired data are available in the Voltage stimulus widget.

Start and stop recording

To start recording data click the recording button . During the recording the button will change icon and the timer will start increasing according to the recording time.



Click the stop recording button  to stop recording.

The path and name of the recorded file are available just below the buttons. The recorded file location is quickly available by clicking on it.

```
Recording path: C:/Users/FCona/EDR4/Recordings  
File: file_1/file_000
```

Recording preferences

In order to select the recording settings click the corresponding button .



Recording properties

Recording path: Users/FCona/EDR4/Recordings/ Browse...

File Name: file

Append date to file name

Data format

.dat
 .abf

Data size

Record for 10.0 s
Split file in chunks 60 s

Recording size on disk: 0.8 MB/s (chunk shorter than recording)

OK Cancel

Users will also automatically be prompted here the very first time a recording is started. Here the user will be able to select the recording path and filename, the format and size. These settings are saved across recordings and also across multiple EDR4 sessions.

Recorded files

Multiple records will be saved with the set name followed by the progressive number (e.g. file, file_1, file_2 and so on) so the user doesn't need to change the recording name everytime a new recording is started.

EDR4 creates a new folder in the location chosen by the user with the same name of the recording files. In this new folder the software creates the following files:

- A header .edh file (which is a text file containing some acquisition setup information, such as current range, sampling rate, etc.).
- The recorded data files.
- A recording lab book file.

For multichannel devices, if .abf format is selected, a different .abf file will be created for every current channel, while a single file .dat file will be created if .dat format is selected.



> EDR4 > Recordings > file_1

Name

 file_lab_book.txt
 file.edh
 file_000.dat

> EDR4 > Recordings > file_2

Name

 file_lab_book.txt
 file.edh
 file_CH016_000.abf
 file_CH015_000.abf
 file_CH014_000.abf
 file_CH013_000.abf

The data files suffix (_000) increases if the “Split files in chunks” option is selected, so the first chunk will end in _000, the second chunk in _001 and so on.

The recording lab book file is a subset of the full lab book file and contains the lab book notes that were taken during the recording.

Be careful to have enough disk space to save data and avoid recording data directly into network drive or Cloud storage service.

Read recorded data

The raw .dat files can be handily read by [EDA](#) (Elements Data Analyzer), or by Python using the “elementsRead.py”, that can be found in the python subfolder in EDR4 installation folder (default path: C:\Program Files (x86)\Elements - EDR4).

.abf files recorded by EDR4 can be read by EDA as well and are compatible with all software that can load abf files.

Both .dat and .abf files can also be read and managed in matlab using EDAmat, available in the matlab subfolder.