Continuous ECG Binary Annotations file (.CBA)

Continuous ECG Binary annotations file (CEBA), is a binary file containing information about the annotations of the Holter.
The format is composed by one header and four section.
The header consist of a predefined 8 characters string ("CEBA 1.0"), used to verify that the file is indeed in the CEBA format.
Each section consist of a beginning string (10 character), the number of items of the section, the list of the items and an ending string (10 character).
The four sections are:

- Beats section: in this section are listed all the beats (see par. 1.1 for the description of the beat item). The beats which are included in a noise region are not present, there is an appropriate section for them: *Beats Under Noise Section*.
- Rhythms section: in this section are listed all the rhythm annotations (see par. 1.2 for the description of a rhythm item);
- Noise Section: in this section are listed all the noise regions (see par. 1.3 for the description of a noise item);
- Beats Under Noise Section: in this section are listed all the beats included in a noise region (which are not present in the *Beats Section*), the items of this section have the same structure of the *Beat Section* ones (see par. 1.1 for the description of a beat item).

All the sections are always present, even when the number of items is 0.

1. File Structure

Description	Nr of bytes	Data Type
Magic Number: "CEBA 1.0"	8 bytes	char[8]
Beats section start string: "BEAT_START"	10 bytes	char[10]
Number of beats	4 bytes	unsigned integer
N*[BEAT ITEM]	See 1.1	
Beat section end string: "BEAT_END!!"	10 bytes	char[10]
Rhythm section start string: "RHYT_START"	10 bytes	char[10]
Number of rhythms	4 bytes	unsigned integer
N*[RHYTHM ITEM]	See 1.2	
Rhythm section end string: "RHYT_END!!"	10 bytes	char[10]
Noise section start string: "NOIS_START"	10 bytes	char[10]

Number of noise regions	4 bytes	unsigned integer
N*[NOISE ITEM]	See 1.3	
Noise section end string: "NOISE_END!!"	10 bytes	char[10]
Beats Under Noise section start: "BT_NOISE_S"	10 bytes	char[10]
Number of beats	4 bytes	unsigned integer
N*[BEAT ITEM]	See 1.1	
Beats Under Noise section end: "BT_NOISE_E"	10 bytes	char[10]

1.1. Beat Item Structure

Description	Nr of bytes	Data Type
Beat Label ID	2 bytes	unsigned integer
Beat position in samples	4 bytes	unsigned integer

Beat Meaning	Label ID
Unknown	0
Normal beat	1
Ventricular beat	2
Supraventricular beat	3
Calibration	4
Bundle Branch Block	5
Paced beat	6
Ventricular escape	7
Fusion beat	8
Artefact	9*

* Artefacts are not valid beats and they indicate a region of the ECG that shall be ignored due to unknown reasons such as noise, signal artefact, flat leads ...

1.2. Rhythm Item Structure

Description	Nr of bytes	Data Type
Rhythm Label ID	2 bytes	unsigned integer
Rhythm annotation starting sample	4 bytes	unsigned integer
Rhythm annotation ending sample	4 bytes	unsigned integer

Rhythm Meaning	Label ID
Atrial Flutter	10
Atrial Tachycardia	11
Atrial Fibrillation	18
First-degree Atrioventricular	19

Block	
Second-degree Atrioventricular Block Mobitz I	20
Second-degree Atrioventricular Block Mobitz II	21
Third-degree Atrioventricular Block	22

1.3. Noise Item Structure

Description	Nr of bytes	Data Type
Noise region starting sample	4 bytes	unsigned integer
Noise region ending sample	4 bytes	unsigned integer