wavePlot

Manual (ver. 1.1.4)

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wavePlot is an application software that records and displays the sound of the electronic stethoscope.　With "Time Shift" function, the sound of one minute ago can be re-played.　Waveforms, frequency spectrum and spectrograms (so-called voiceprints) of the sound can be displayed.
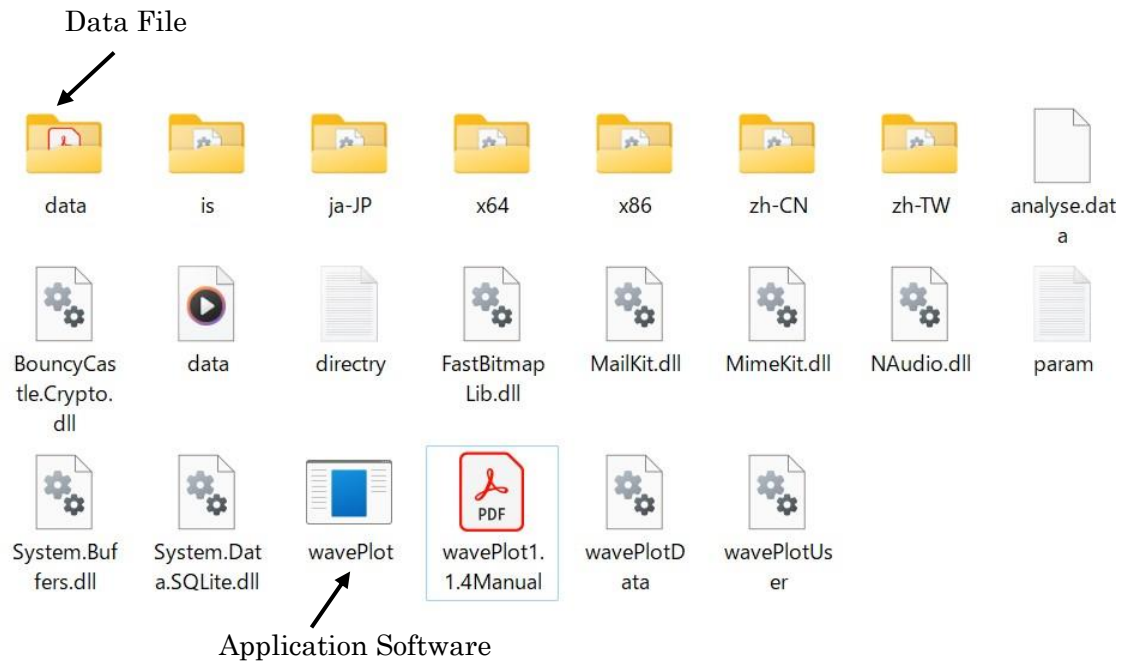
wavePlot has a local database that is not a server-client model, and data can be transferred to the outside by email.

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■ Installation method

Installation is easy, just copy of the entire folder.   If necessary, create a shortcut of wavePlot.exe in another location and start it from there

Data File

| data | is | ja-JP | x64 | x86 | zh-CN | zh-TW | analyse.dat a |

| BouncyCas tle.Crypto. dll | data | directry | FastBitmap Lib.dll | MailKit.dll | MimeKit.dll | NAudio.dll | param |

| System.Buf fers.dll | System.Dat a.SQLite.dll | wavePlot | wavePlot1. 1.4Manual | wavePlotD ata | wavePlotUs er |

Application Software

When you start wavePlot, the following files are created in the folder:

param.txt	Previous configuration is saved.
wavePlotUser.db	Database of users
wavePlotData.db	Database of diagnostics

wavePlotData.db is dependent on the wavePlotUser.db.   When transferring wavePlotData.db because of PC relocation or data exchange, it is necessary to transfer wavePlotUser.db as well.

■   Windows Settings

The connection diagram between electronic stethoscope and headphones, and PC and headphones are as shown below.

The sound from the electronic stethoscope (A) can be heard in the following 2 ways.
1. It can be heard with headphones (B) connected to the electronic stethoscope (A) directly.
2. It can be transferred to a PC (a) (Windows based) through the wireless receiver dongle, then can be heard with headphones (b) connected to the PC (a).

To hear the sound with headphones connected to the PC and see the waveform on the PC, set the PC as follows.

Here are the settings:
(settings → system → sound) in Windows 10.   Set the input to electronic stethoscope and set it to always play with headphones (b) connected to the PC from the properties of the input device.

The output of the sound is set to headphones (b) connected to the PC or headphones (B) connected to the electronic stethoscope according to the usage situation.

■ Let's use the electronic stethoscope first !

When you start up wavePlot (double-click the icon), the following main window
will open.   wavePlot has many functions, but here we will explain the most basic
procedures for capturing and analyzing the sound data.
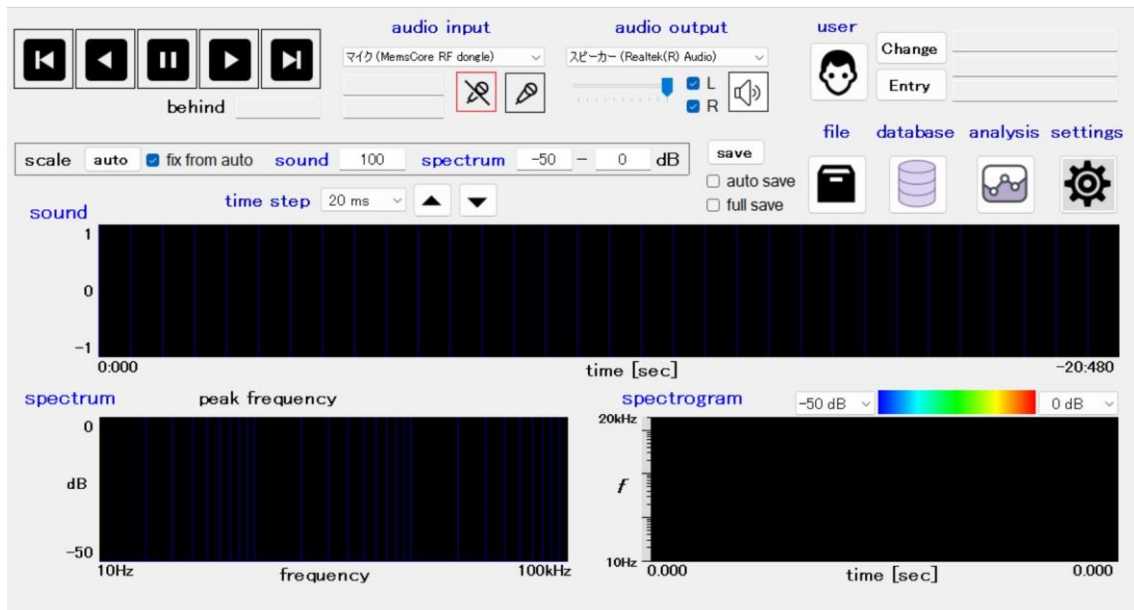
First, check the list under (1) [audio input] and the list under (2) [audio output]
(See figure below).   Select "MemsCore RF dongle" for [audio input].   And select
the built-in speaker of the PC or headphones connected to the PC.
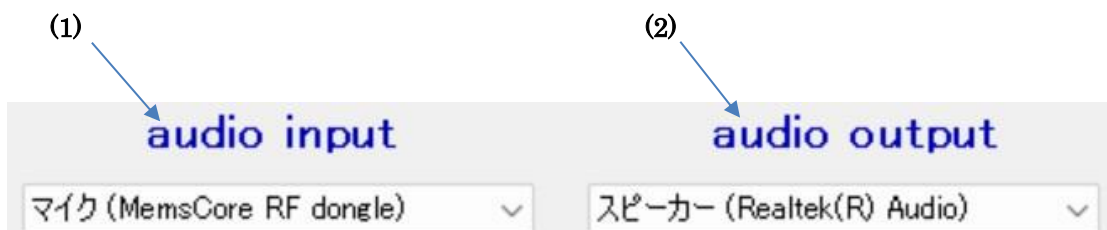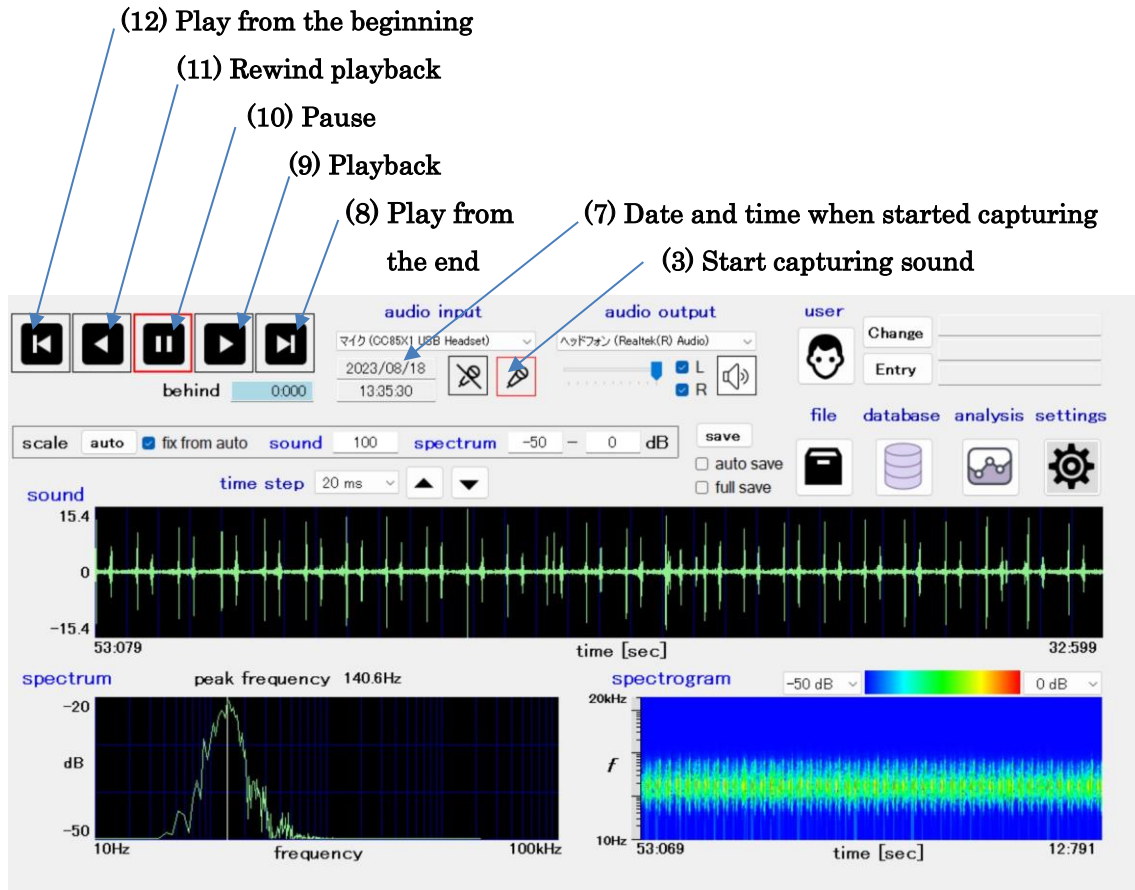
To capture the sound of the electronic stethoscope, click (3) icon.   To finish capturing sound, click (4) icon.   The sound data between the clicks (3) and (4) is stored in the internal memory of the computer.   This record is a 10-minute circular memory (Old data is deleted and new data is overwritten), and can be traced back any time up to 10-minute ago.   After clicking (4) to finish the sound input, the sound data in the internal memory is saved as a .wav file by clicking (5) (see Note 1 below).   To hear the sound with a PC, click (6) to make the icon (6) yellow.   By default, the plot is stopped, and the audio of the display is output.   It is also possible to set the audio to output at the same time as the plot, but it is not recommended because a large number of glitches may appear or the audio output is affected depending on the environment.

Note 1 : Each time you click (5) while inputting sound, the internal memory is saved to a file.   The file name is the start time of the sound recorded.   If it is within 10 minutes from the start of sound input (3), duplicate files are not created.


(4) Stop capturing sound
(3) Start capturing sound
(5) Save
(6) Sound output
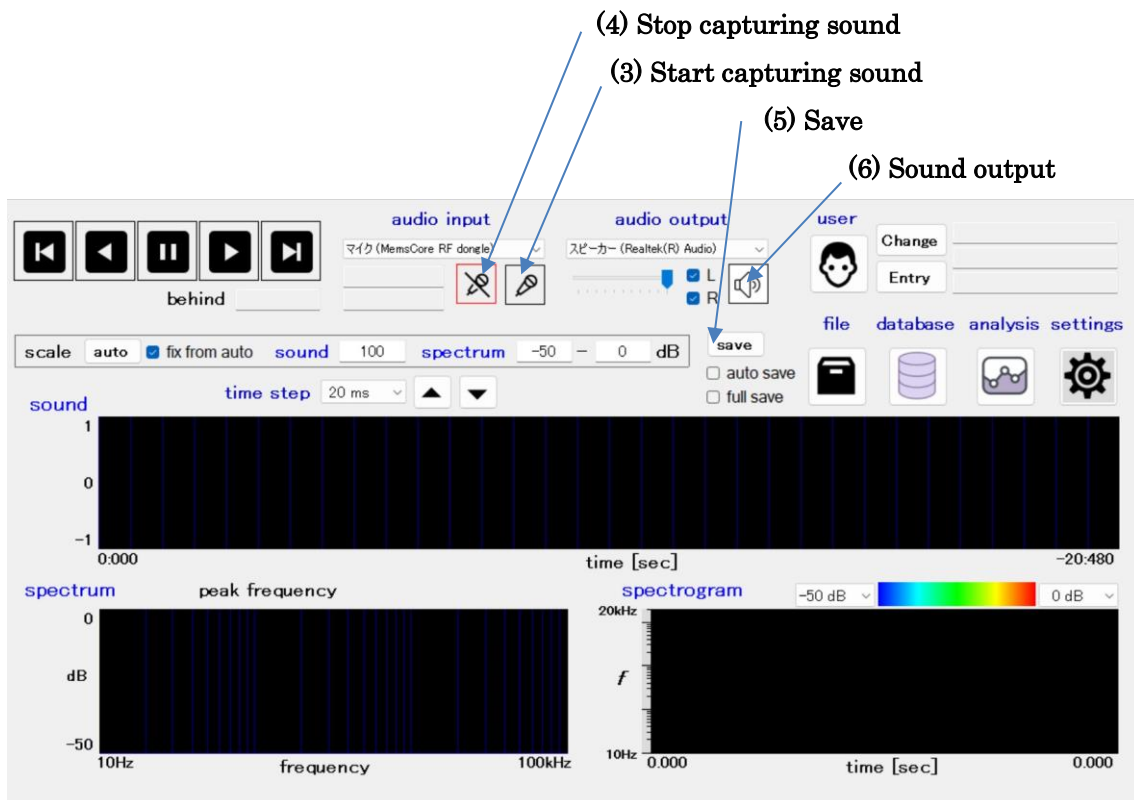
When the button (3) is clicked, the frame of the button (3) turns red, and the time when the button (3) is clicked is displayed in (7).

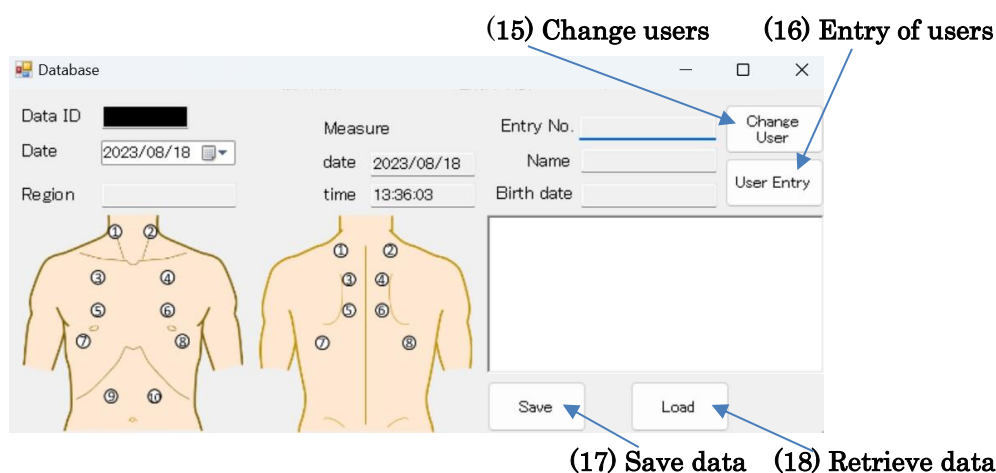(12) Play from the beginning
(11) Rewind playback
(10) Pause
(9) Playback
(8) Play from the end
(7) Date and time when started capturing
(3) Start capturing sound

To reproduce the sound waveform, use the buttons (8) ~ (12).

(8) Play from the end: Play from the sound of the current time
                               When reading data from a file, it goes to the end
(9) Playback: Play from the place where you paused or stop rewinding
                               and play normally
(10) Pause: Stop playback
(11) Rewind playback: Play while rewinding
(12) Play from the beginning: Play from the moment you press the button (3)
                               When reading data from a file, it plays from the
                               beginning

Select the waveform you want to save as diagnostic data by rewinding or playing,
and click (13) database button.

(14) Sound waveform   (13) Database
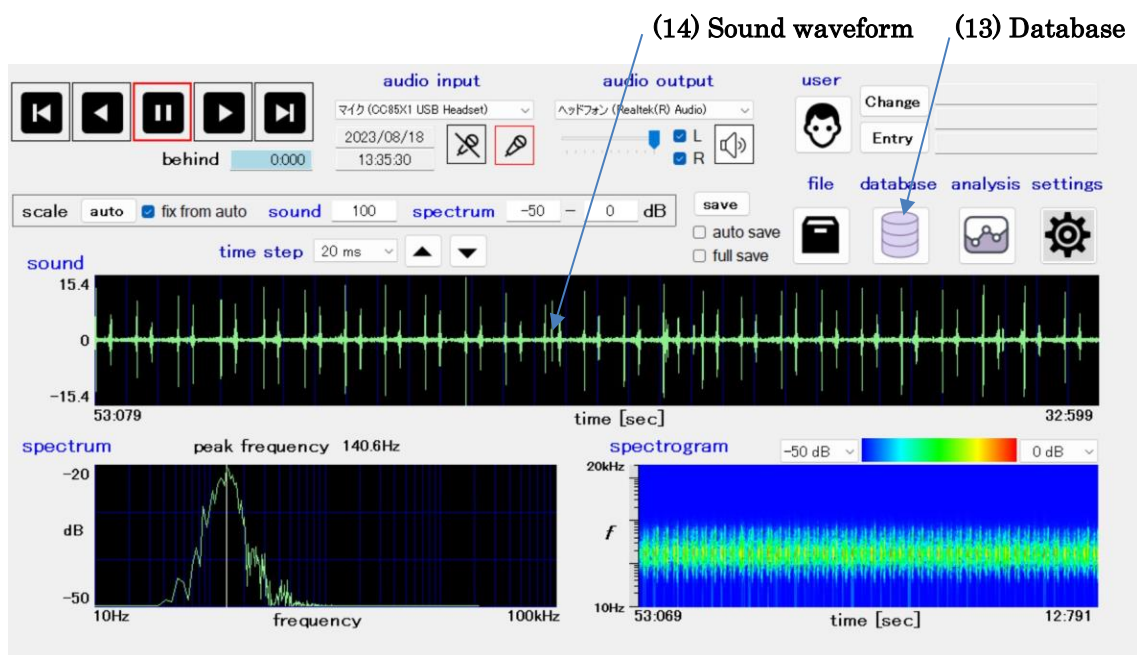
The next window appears with the information from the main window.

(15) Change users   (16) Entry of users


(17) Save data   (18) Retrieve data

When the data is not saved, the [Data number] column is blacked out, and when the
data is saved, the [Data number] is displayed.   If the name and birth date are blank,
select the registered user by clicking (15) button if necessary.   If it is the first time,
register by clicking (16) button, and select the region, write a comment, etc.   Click (17)
save button to register.   Sound data (14) of 20 seconds is registered to the right
starting from the left edge of the sound waveform.   Registration contents other than
sound, measurement date and time can be changed even after saving.   After making
changes, click the [Save] button.   The registered sound data, measurement date and
time cannot be changed.

To analyze the waveform, click (20) Analysis button.

(14) Sound waveform

(20) Analysis
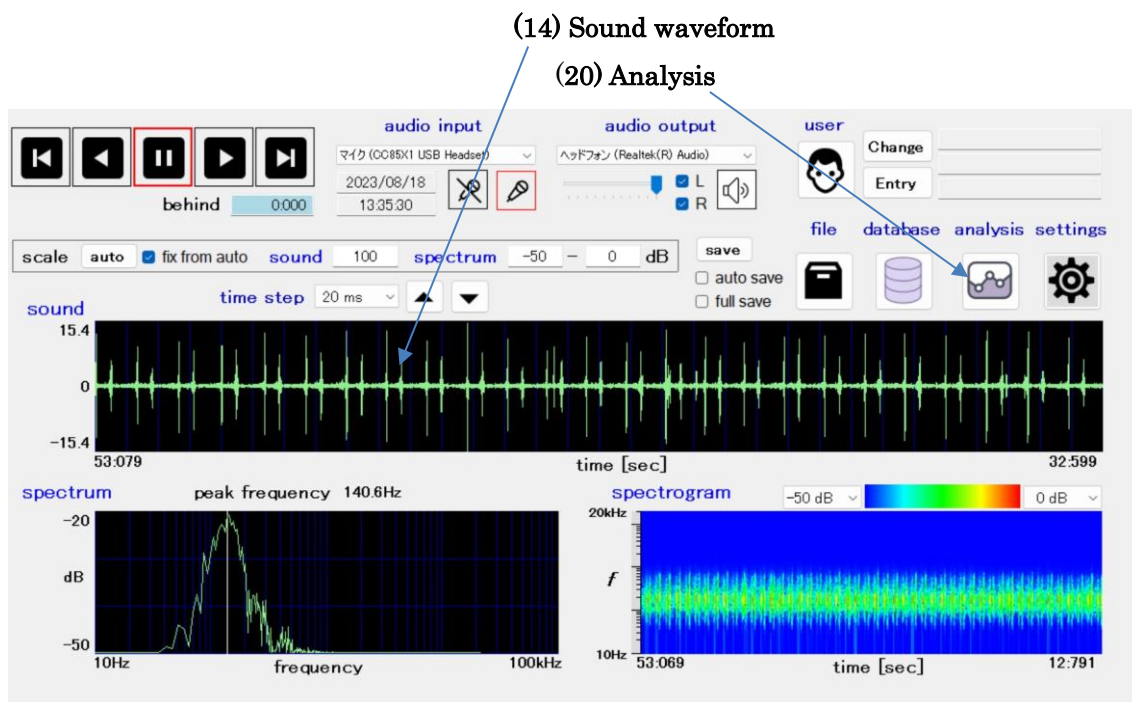
Each time you click it, a window is displayed.　Multiple waveforms can be displayed and compared.　　Click [Read] button on the top left of the window appeared, select the data registered in the database.　The waveform is displayed.　Other sound data can also be read. You can hear the sound or send it by e-mail.

Read
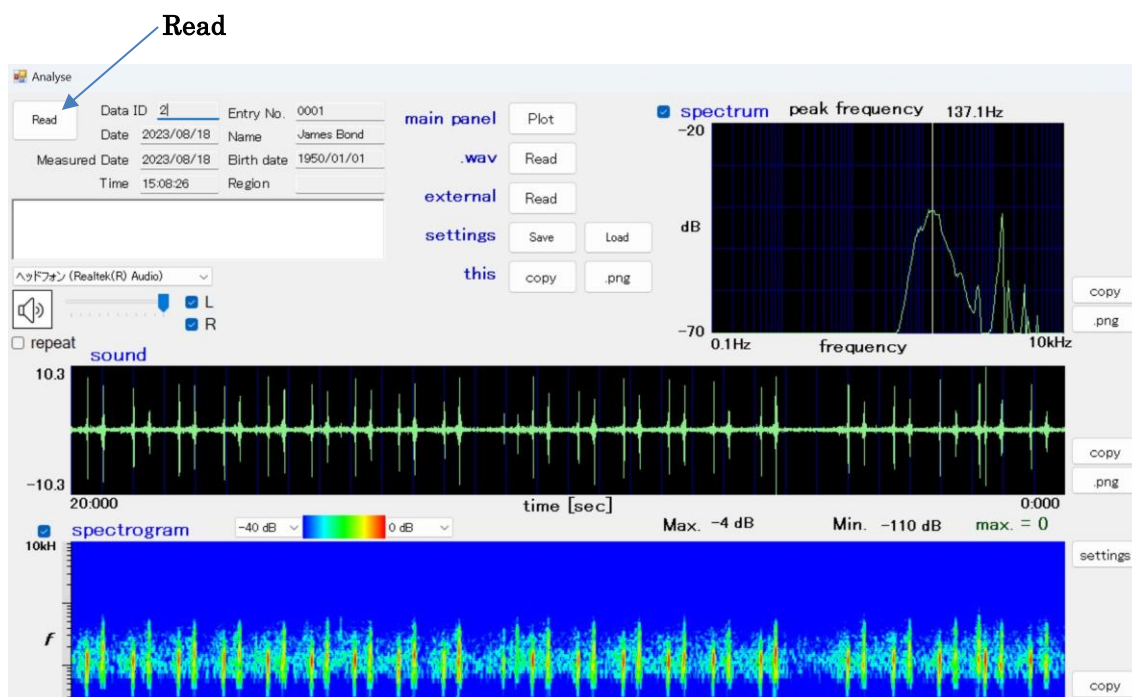
■ Plot scales of sound data

Sound data is plotted in three formats: (14) sound waveform (21) frequency spectrum, and (22) spectrogram.   In (14) sound waveform and (21) frequency spectrum, the vertical axis of the plot is changed from time to time so that the vertical axis is displayed in the full scale at the initial value (auto-scale).

(14) Sound waveform

(21) Frequency spectrum

(22) Spectrogram
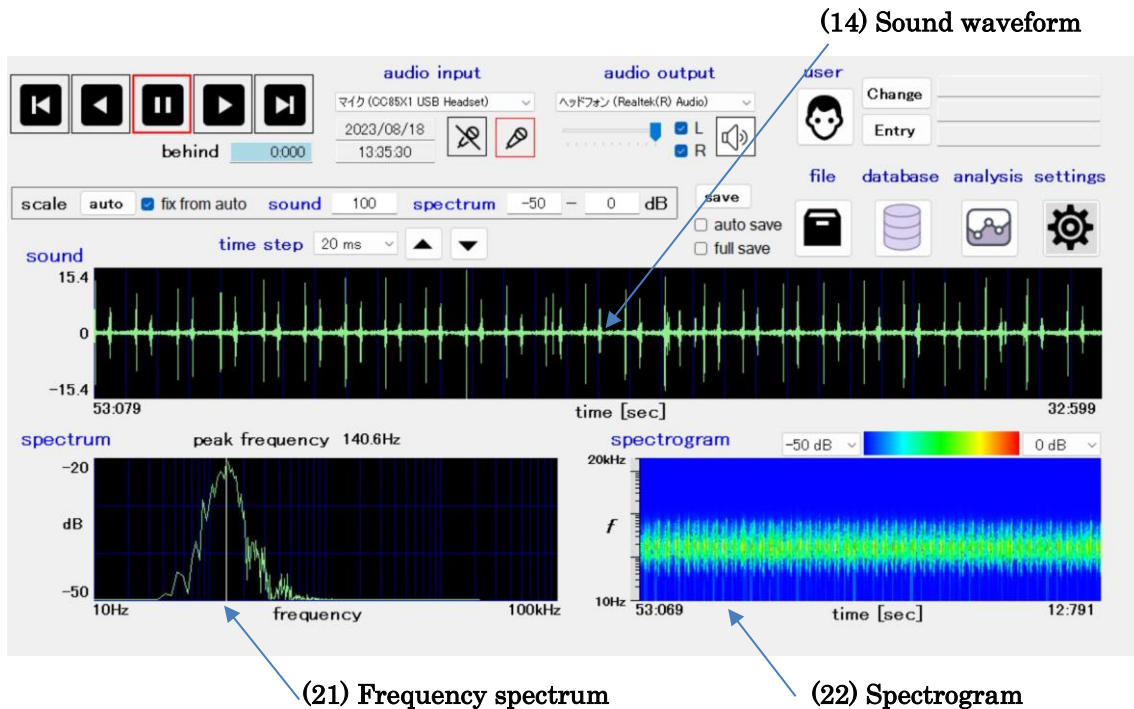
Click the button on the right of Scale to switch to "auto" ⇔ "fixed".

(23)   (24)   (25)

When [auto] is displayed, the vertical axis (amplitude) of (14) the sound waveform and (21) the vertical axis (power of the sound) of the frequency spectrum are automatically scaled to the maximum and minimum values of the data in the plot area.

When [fixed] is displayed, the value of (23) is the maximum and minimum value of the vertical axis of (14) the sound waveform, the value of (24) is (21) the minimum value of the vertical axis of the frequency spectrum, and the value of (25) is the maximum value of the vertical axis of the frequency spectrum.

If you check [fix from auto], the scale of the vertical axis will be fixed.

The horizontal axis of the (14) sound waveform represents time, and its unit can be changed by [time scale].   Since there are 1,024 points on the horizontal axis of the (14) sound waveform, when the time scale is 20 ms, a sound of $0.02 \times 1024 = 20.48$ seconds is displayed in the (14) sound waveform.

time step   20 ms   ▲   ▼
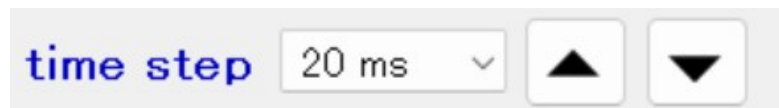
The sound data can be rewound to go back from the present time.   The time when the plotted waveform is behind the current point is displayed in [Delay seconds]. When it is loaded from a file, the time to the end is displayed.

behind   0:000
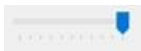
■ Input and output of the sound data

The settings of (1) [audio input] and (2) [audio output] are independent from the Windows settings (p.4).

(1)	(2)
audio input	audio output
マイク (MemsCore RF dongle) ∨	スピーカー (Realtek(R) Audio) ∨
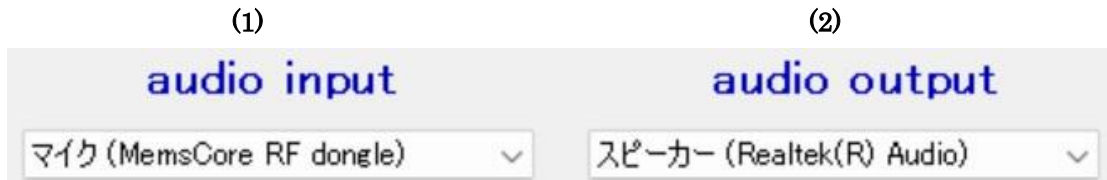
To connect the sound of (1) [audio input] with (2) [audio output] , click the following button.

By clicking it, it turns to yellow that means the connection status.   The volume can be changed with ▮ .   In addition, it is possible to select the left output or right output of stereo by clicking button of ☑L ☑R .
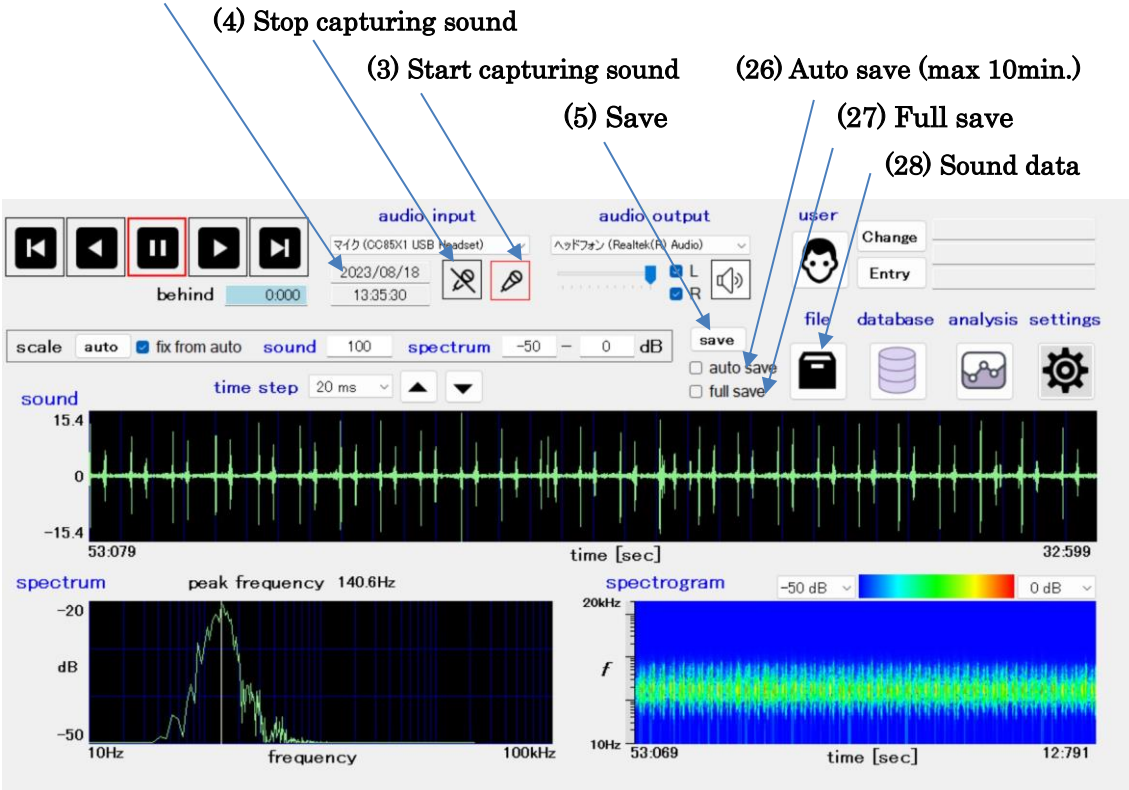
By default, when the plot is in progress, the plot is stopped and the sound of the (14) sound waveform is set to output.

To output sound at the same time as the plot, check the "audio output in plotting" in [settings].   The sound output from the PC speaker may cause a delay in the plot. In addition, depending on the environment, glitch, sound cracking, sound disturbance and sound disconnection may occur.

■Saving and retrieving sound data

The sound after clicking (3) [icon] till clicking (4) [icon] can be saved as a single file by clicking (5) save button.　The file name is given by the first date and time of the sound data.　　If (26) auto save is checked, it will be automatically saved when you click [icon] or (28) file (sound data segment).

(7) Date and time when started capturing

(4) Stop capturing sound

(3) Start capturing sound　　　**(26) Auto save (max 10min.)**

(5) Save　　　**(27) Full save**

(28) Sound data

If the interval between clicking [icon] and clicking [icon] is more than 10 minutes, max10 minutes before clicking [icon] is saved.　Since the sound data of 10 minutes will be a large data, 67MB, if the capacity of the hard disk is small, it is recommended to save it frequently without checking "auto save".

The recent data of max 10 minutes is saved.　　To save more than 10 minutes data, check (27) "full save".　　The sound data will be divided into a units of 11 min. 39 sec. and saved in a file.

The sound data can be retrieved by clicking (28) 🖬 .   When you click (28) 🖬 ,
the following window will open.
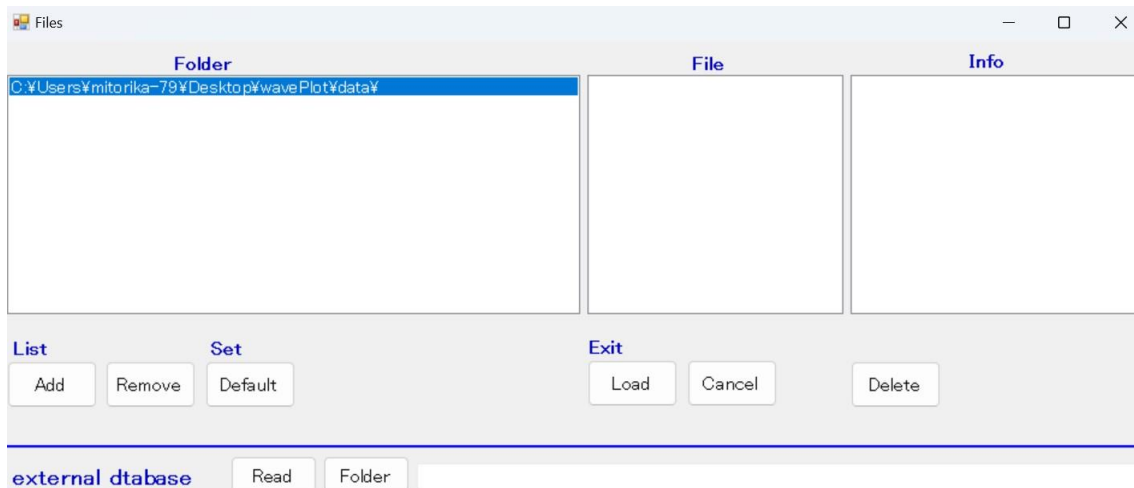
The folder lists on the left shows a list of sound data which will be saved. To add a new
folder, click "Add" and select the folder you want to add. If you want to remove a folder
from the list, click the folder and then click "Remove".   It will not appear in the list,
but the data remains.

The central "File" is a list of the sound data selected in the folder list.   It is identified
by the sound starting date and time.   The actual file name of "2020/12/01 00:36:11" is
wp2020q12q01_00r36r11.wav, and you can hear it as a music file by double-clicking it.

Select and click the audio data from the "File", and click "Load" to load the sound data
into the internal memory, and the waveform can be seen on the main window. To return
to the main window without reading in the internal memory, click "Cancel".

To delete unnecessary sound files, click the files, and then click "Delete" at the bottom
right.   Be careful because the file will be completely deleted.

When you click 🖬 , the folder selected (highlighted) in the "Folder" list is the default
folder.   The sound data is saved in the default folder.   To change the default folder,
select the folder you want to change in the folder list and click "Default".

■ Diagnostic database

Sound data is saved in internal memory for max 10 minutes, and contains unnecessary parts.　A portion necessary for diagnosis can be taken out and the diagnostic data with name etc can be created.

Diagnostic data includes the following registration data:
・Personal name
・Region measured
・Date of registration
・Date and time measured
・Cropped sound data

The snipped sound data is registered for the previous 20 seconds starting from the left edge of (14) the sound waveform.
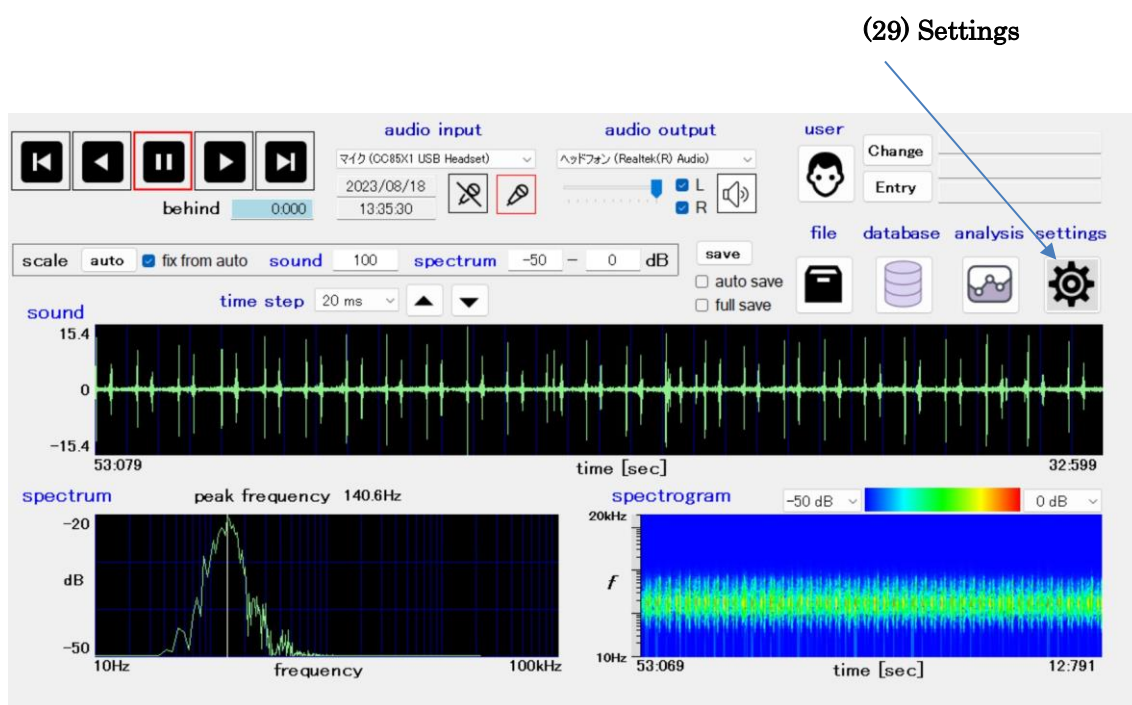
(29) Settings

In the above screen, the sound data from 53.079 to 33.079 second (20 seconds) is saved in the database.　If you want to see the entire data, adjust the "time scale" to 20ms. The 20-second snipped time can be changed in the (29) Settings.　Click (29) ⚙ and change the analyze time length.

Individual names can be registered along with entry number and date of birth. In case of the same names, the date of birth is used to distinguish personal identification. Since there is a possibility that both date of birth and name are same, the entry number should be entered. User registration is done by clicking (32) user entry.

(31) User change

(32) User entry

When you click (32) user entry, the next window will open. New users are entered by clicking "Entry" button. To modify the registered contents of users, click the entry No. or name of user, then click "Edit" button.
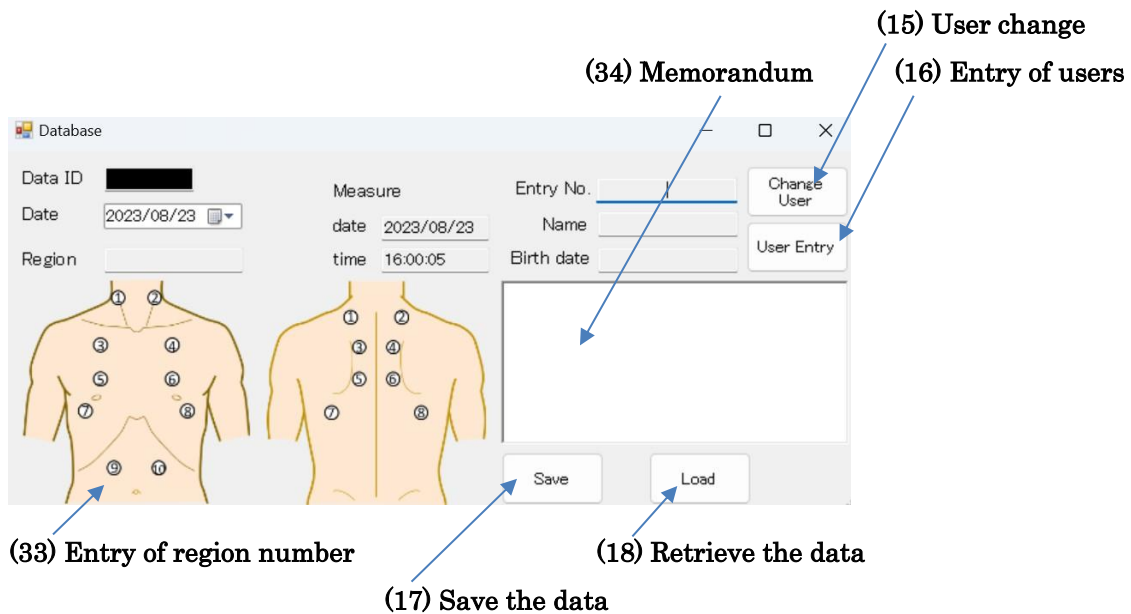

| Entry No.	name	Birth day	Creation date	Update date
0001	James Bond	1950/01/01	2023/08/10	2023/08/10
0002	Wonder Woman	1960/01/01	2023/08/10	2023/08/10
0003	Super Man	1940/01/01	2023/08/10	2023/08/10

Diagnosis data can be entered with the following steps:

1. Sound data for diagnosis is displayed in the (14) sound waveform by playback and rewinding.
2. When you click the database, the following window appears.

(15) User change

(34) Memorandum   (16) Entry of users

(33) Entry of region number   (18) Retrieve the data

(17) Save the data

3. Enter the measured region by clicking region number.
4. If necessary, enter a memorandum in (34) blank space.
5. Save the diagnostic data in the database by clicking (17) "Save".

If you want to modify the user name, region, memorandum etc. of the data entered, click (18) "Load" to retrieve the data.   The entered contents will be displayed on the window.   You can modify the data any time.   To save the modified data, click (17) "Save".   Diagnostic data can be plotted with [icon], audio output and send by e-mail.

Note 5: If you click the region number, you can enter region name also.

Note 6:   User name of (31)(32) displayed in the main window is the user currently being diagnosed.   When [icon] is clicked, the contents of the right of (31) (32) are automatically entered in the left column of (15) (16).

■ Display of the data saved in the database

Data can be displayed by clicking analysis ⌇, and the following window will open.
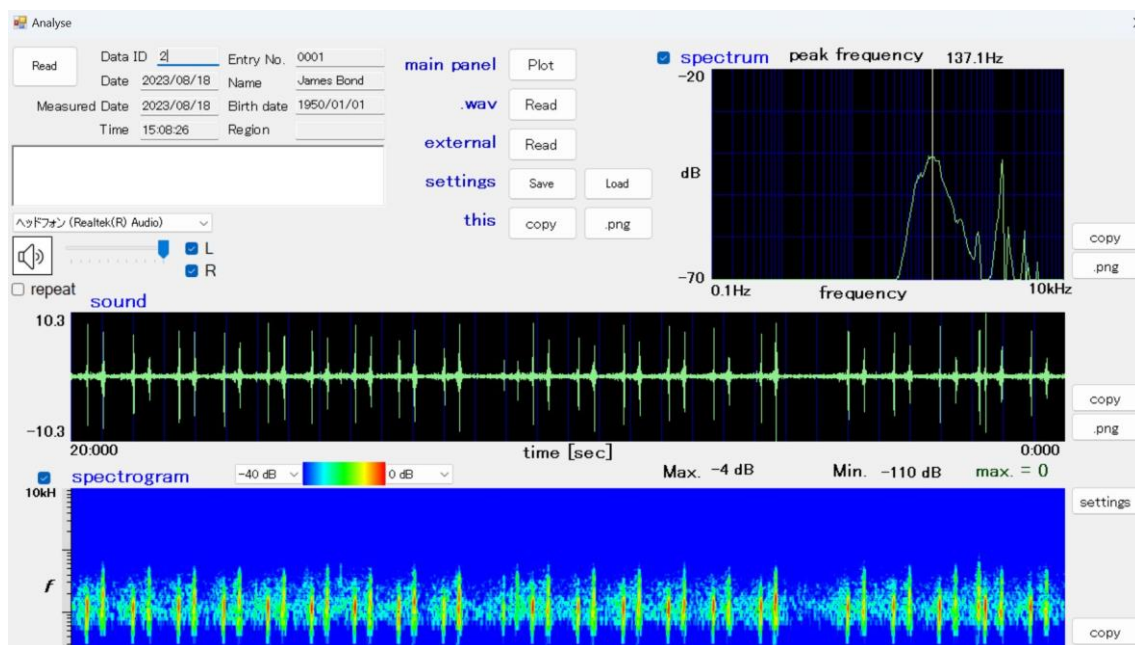
By clicking "Read" button on the top left, you can select the data.   It will be plotted, and you can hear it.   If you click ⌇ again, you can display another data and compare those data on the same window.

Data can be sent by email.   Mail settings can be made in "Settings" on the main window.   When you click ✉≡ , the background changes to red while sending email, and returns to the original color when finished.
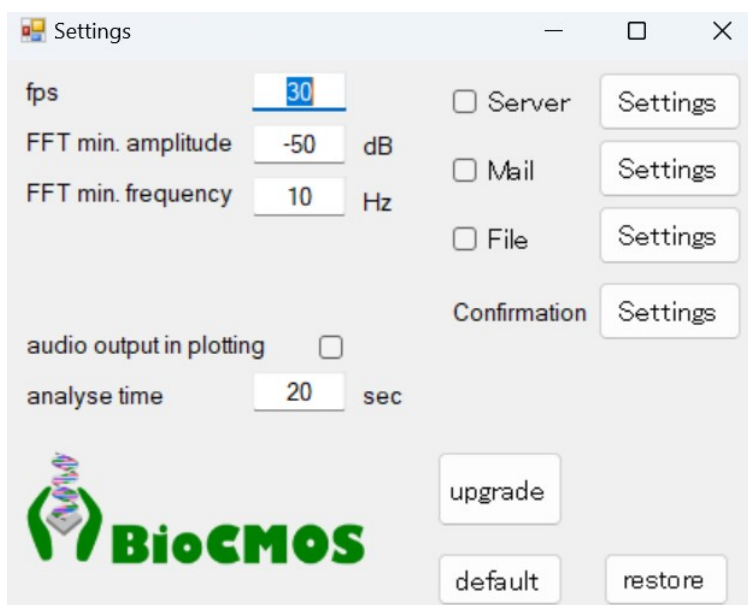When an error occurs, the background changes to pink.

■ Settings:

To change the settings, click (29) Settings on the main window.
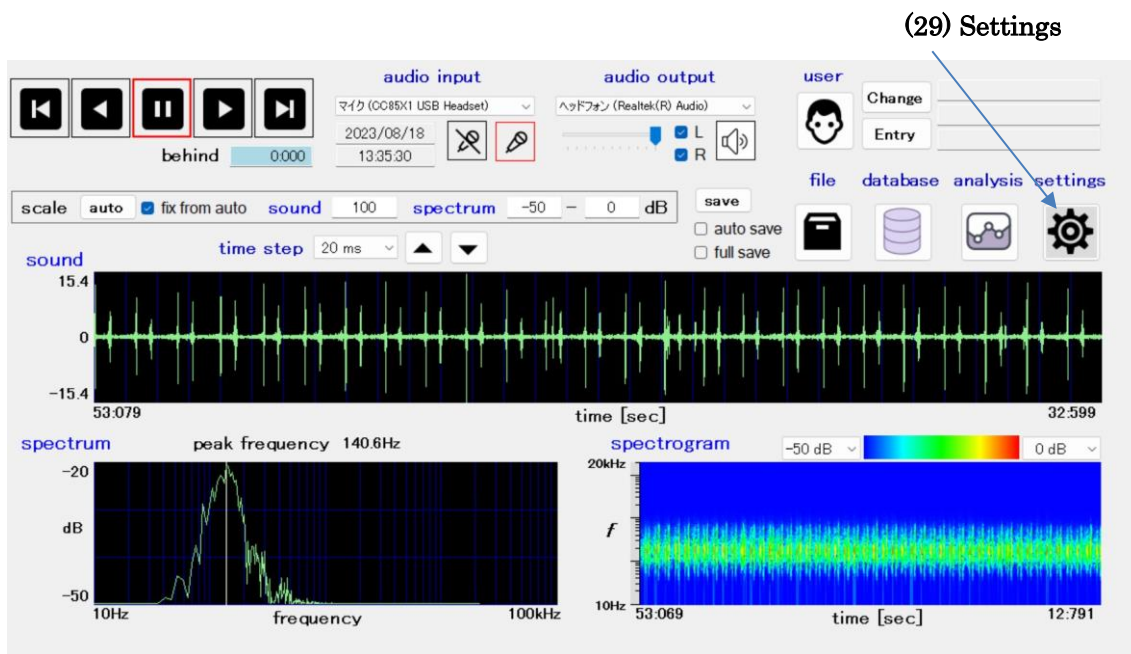
The following window will open:

When you click "default" button in the bottom right, the setting will be default.

When you click "restore" button, the setting will return to the settings before clicking.

fps (frames per second)：　Number of times to update the plot of the
sound waveform in 1 second.　If the performance
of the PC is low and the plot cannot keep up with
the plot, fps should be reduced.

FFT min amplitude:　　　Minimum frequency spectrum

FFT min frequency:　　　Minimum horizontal plot of frequency spectrum

audio output in plotting:　If you check box, the sound will be output at the
same time as the plot.

analyze time:　　　　　Sound time of diagnostic data saved in the database

Settings of email on the right:

【mail from】　　　　　Enter your email address in xxxx@xxxx format

【to】　　　　　　　　Enter the recipient's email address in xxxx@xxxx format.

【smtp server】　　　　Enter the address of the SMTP server

【smtp port number】　　Enter the port number of the SMTP server.

【account name】　　　Enter your account name of the SMTP server.

【password】　　　　　Enter your account password of the SMTP server

【MP3】　　　　　　　Sound data is set to attach .wav files by default.
20-second wav file becomes to 2MB and is too
large to send by email.　If you want to send it in MP3
format, check it here.　The file size will be compressed
to about 1/10

【.zip】　　　　　　　Create a compressed file (zip) at the same time as creating
a mail file

【password】　　　　　Enter the password of the compressed file (zip).