

Softron™

Electrocardiogram Analysis System

SP2006

Ver 1.0.1

Operating Manual

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1. Launcher Page

1.1 Startup

After the program is installed, a desktop shortcut is created (Figure 1-1). Click it to start the launcher menu, as shown in Figure 1-2.



Figure 1-1 Desktop shortcut



Figure 1-2 Launcher menu

1.2 Interface Description

1.2.1 Menu items

- [ECG Configuration] — Opens the ECG configuration module.
- [ECG Acquisition] — Opens the ECG acquisition module.
- [ECG Playback] — Opens the ECG playback module.
- [ECG Editing] — Opens the ECG editing module.
- [Print] — Opens the print module.
- [About] — Displays the product information page (Figure 1-3).
- [Exit] — Closes the launcher page.



Figure 1-3 Product information

1.2.2 Title bar (Minimize and Restore)

1. Minimize

Click the left side of the title bar to open a menu (Figure 1-4). Menu functions are the same as the two icons on the right side of the title bar.

- Close the launcher page.
- Minimize to the taskbar, as shown in Figure 1-5.

Note: After minimizing, if the icon is hidden, click the expand icon to open the taskbar overflow area to see the minimized icon.



Figure 1-4 Title bar



Figure 1-5 Minimized to taskbar

2. Restore

Right-click the taskbar icon to open the menu shown in Figure 1-6. This menu provides a convenient way to start each module. Click [Restore] to show the launcher menu. Alternatively, double-click the taskbar icon to show the launcher menu.



Figure 1-6 Right-click taskbar icon

2. Configuration

This module sets parameters used when the system runs. Parameters must be set correctly before an experiment. Settings cover sampling, saving, analysis parameters, and waveform display. There are three pages: Configuration

List, Experiment Settings, and Channel Settings. The Configuration List shows all currently available configurations; Experiment Settings and Channel Settings edit a specific configuration.

2.1 Configuration List Page



Figure 2-1 Configuration list

2.1.1 Common configuration operations

As shown in Figure 2-1, the list shows currently available configurations. The column of buttons on the right provides common operations, described below:

1. New configuration

Click the icon; the system loads the default configuration. Change settings as needed.

2. Import configuration

Click the icon to open the Import Configuration dialog (Figure 2-2). Select a folder; the list on the right shows all configuration files in that folder. Check the desired items and click OK to import them into the configuration list. Note: current and default are system-reserved configurations and are filtered from the list.

3. Export configuration

Check the configurations to export in the list, then click the icon to open the Browse Folder dialog (Figure 2-3). Selected configuration files are saved to the specified folder. Note: this icon is enabled only after configurations are checked.



Figure 2-2 Import configuration



Figure 2-3 Export configuration

4. Edit configuration

Double-click a configuration in the list, or select a configuration (Figure 2-1) and click the icon to enter the edit configuration page. The status bar [Configuration] shows the name of the configuration being edited.

5. Rename configuration

Click the icon to open the Edit Configuration dialog (Figure 2-4). Enter the configuration name and comment, then click OK. Notes:

- The configuration name must not duplicate an existing name in the list.

- default and current are system-reserved names and cannot be used.

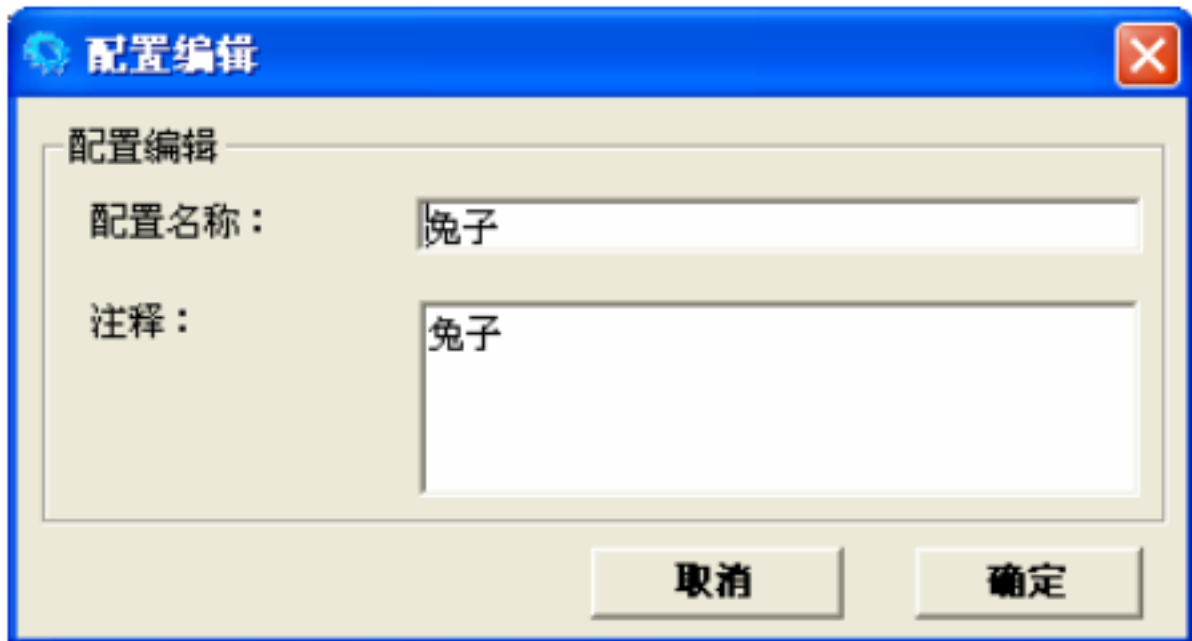


Figure 2-4 Edit configuration

6. Refresh list — Refresh the configuration list.

7. Delete configuration

Check the configurations to delete, click the icon; the system asks for confirmation. Click OK to remove them from the list. Note: this icon is enabled only after items are checked. Note: current is used by the system and cannot be deleted.

2.1.2 Configuration list description

1. Configuration list columns are as shown in Figure 2-5:

- [No.] — Item number in the list.
- [Name] — Configuration file name.
- [Modified] — Last modification time.
- [Remarks] — Configuration remarks.

2. Related operations

- [Click a row] — Selects the configuration. Click [Next] or [Edit Configuration] to edit it.
- [Double-click a row] — Directly edits the configuration.
- [Right-click a row] — Opens a context menu (Figure 2-5): [Delete], [Rename], [Edit], [New].



Figure 2-6 Experimental environment

2.2.1 Sampling and save settings

- Animal species: Select the experimental animal.
- Data count: Number of data points contained in files generated by analysis.
- Save as: Directory where data files are saved.
- File format: Filename format when analysis generates files. Two formats: (1) day-hour-minute-second — the system uses the current time as the filename; (2) user-defined — the system appends “_number” to the defined name as the filename.

Note: To prevent overwriting previous data due to duplicate filenames, under the directory you select the system automatically creates a [date/animal number] subdirectory, and data are saved there. For example, if the specified directory is drive C, the current date is 2007-01-01, and the animal number is 001, data files are saved under C:\20070101\001\.

2.2.2 Data analysis parameter settings

- QTc: QTc calculation method. Selecting different methods uses corresponding parameters A and B.
- A/B: Parameters in the QTc formula.

Descriptions follow (in the formulas below, RR is the measured RR interval):

1) QTc: A = 1000, B = 0 (A and B are the default values for the corresponding QTc formula and can be changed; range -10000 to 10000)

$$QTc = QT \times (1000 / RR)$$

2) Bazett: A = 1000, B = 0

QTc = QT × (A / RR), where A is the set average RR value. Examples:

$$\text{Human, } A = 1000: QTc = QT \times (1000 / RR)$$

$$\text{Dog, } A = 600: QTc = QT \times (600 / RR)$$

3) Fredericia: A = 1000, B = 0

$$QTc = QT \times (A / RR)^{(1/3)}, \text{ where A is the set average RR value}$$

4) Van de Water: A = 0.087, B = 1000

$$QTc = QT - 0.087 \times (RR - 1000); \text{ formula form: } QTc = QT - A \times (RR - B)$$

Todt:

$$QT_c = QT - 0.1 \times (RR - 1000); A = 0.1, B = \text{set average RR (1000)}$$

5) Matunaga's (Logarithmic): $A = 600, B = 0$

$$QT_c = QT \times \log(A) / \log(RR), \text{ where } A \text{ is average RR}$$

Example: $QT_c = QT \times \log(600) / \log(RR)$ [shown as $100 \times QT_c$ in source figure context]

6) Oguchi: $A = 0.55, B = 100$

$$QT_c = QT + 0.55 \times (HR - 100), \text{ where HR is heart rate; formula form: } QT + A \times (HR - B)$$

Hanton:

$$QT_c = QT + 0.535 \times (HR - 100); A = 0.535, B = 100$$

- STi detection method: Effective when measuring mice and rats; indicates the ST-J measurement method.
- Delay, Range: Effective when STi detection method is [S ST-Index] or [R ST-index].
- [QQ-line method] — When QQ line is used as the baseline, ST-J is often 0 (general method).
- [ST-J method] — Uses an independent method to determine ST-J; for animals other than rats and mice.
- [S ST-index] — Measured with the S wave as reference.
- [R ST-index] — Measured with the R wave as reference.

Note: ST-index setting: When measuring ST-J with R or S wave as reference, calculation uses [Delay] and [Range]. For example, when measuring rats, select S ST-index with Delay = 4 and Range = 10; the system takes the average of 10 points (10 ms) starting from the 4th point after the S-wave peak as the ST-J value.

- Calculated value (used in the Print module when exporting data):
- [Representative value] — Measured value of any one beat.
- [Median] — Median of measured values from beats (up to 9).
- [Mean] — Mean of measured values from beats (up to 9).
- Averaging method: Whether to use weighted averaging of beats. Use R+ when the R wave is clear; use S- when the S wave is clear.
- ☐ QRS sound: If checked, a "beep-" sounds each time a peak is detected; otherwise off.
- ☐ Power-line frequency: Filters 50 or 60 Hz waves to reduce light-source effects on the waveform. If enabled, the waveform acquisition module can choose whether to filter data; otherwise filtering cannot be selected and only raw data can be saved.
- ☐ 3-channel: 3-channel mode switch; affects channel mode when the editing module opens saved files. If checked, saved files open in 3-channel mode; otherwise in 1-channel mode. See the editing module description.
- ☐ Time-sequence setting: Whether to set a time sequence for saving analysis files. Only when checked can the time list on the right be set (see 2.2.3); otherwise the right-hand time list cannot be operated.
- ☐ EMG filter: Whether to filter muscle electrostatic noise.

2.2.3 Time settings

Only when [☐ Time sequence] is checked can the time sequence be edited. Up to 200 times can be set here.

a. Interpreting the time list (Figure 2-7)

- [00:00:08] — Save analyzed data once 8 seconds after analysis starts.
- [00:00:05] — Save again 5 seconds after the previous save start time.
- [00:00:08] — Save again after another 8 seconds.
- [-00:00:05] — Save every 5 seconds after the previous save; "-" indicates automatic timed saving.

清除	
1	00:00:08
2	00:00:05
3	00:00:08
4	-00:00:06

Figure 2-7 Time sequence

b. Modify time

Double-click the cell of the time to modify to open the time edit dialog (Figure 2-8).



Figure 2-8 Edit time

- [H M S] — The three edit boxes from left to right are hours, minutes, and seconds. Each accepts only legal numbers. Use the spin controls to increment/decrement, or click a field and use ↑ ↓ keys.
- [Auto acquire] — Automatically time and save according to the set duration. If checked and OK is clicked, subsequent time settings in the list are cleared; the last row is prefixed with “-”.
- [Clear] — Clear H/M/S settings to 0.

c. Add time

If the last row of the time list has a “-” prefix, double-click that row (see b), clear Auto acquire, click OK; an empty row appears. Double-click it to add a time setting.

d. Clear entire time sequence

Click the [Clear] button shown in Figure 2-6 to clear all time settings.

2.2.4 Other operations

- [Exit] — Exit the application.
- [Back] — Return to the home page.
- [Next] — Enter the channel settings page.
- [Save] — Save the current configuration.

2.3 Channel Settings



Figure 2-9 Channel settings

2.3.1 Overall channel settings

- [Number of channels] — Number of acquisition channels; maximum 2.
- [Background color] — Background color of the waveform screen in the acquisition module; click the color square to change.
- [Width] — Horizontal width of the waveform screen; adjust with controls.
- [Height] — Vertical height of the waveform screen; adjust with controls.

2.3.2 Channel list

The list shows current settings for all channels. The number column color is the current channel color (Figure 2-9). Double-click to open the channel settings window (Figure 2-10).



Figure 2-10 Channel settings dialog

Name	Description
Channel color	Color of the current channel; click the square to change
Magnification	Waveform magnification for the channel
Port number	Port number assigned to the channel
Position	Vertical position of the channel
Label	Channel comment; up to 8 letters or Chinese characters, but acquisition module displays at most 4 Chinese characters or 6 letters
Calibration value	Output value when a standard 1 mV waveform is input
Maximum	Calibration maximum
Minimum	Calibration minimum

[Default] — Restore defaults: calibration value 100, maximum 100, minimum 0. Generally leave as default; see 3.2.3 for calibration details.

2.3.3 Configuration remarks

Edit configuration description and remarks in the edit box.

2.3.4 Other operations

- [Exit] — Exit the application.
- [Back] — Return to the experiment settings page.
- [Save As] — Opens Save As dialog; enter a configuration name. Note: default and current are system-reserved and cannot be used.
- [Save] — Save the current configuration.

2.4 Menu Item Descriptions

Group	Menu item	Description
File	Next / Back / Save As / Save / Exit	See 2.1.4, 2.2.4, 2.3.4 for details
Edit	New / Import / Export / Refresh / Edit / Rename / Delete configuration	See 2.1.1
Help	Help / Version information	

2.5 Appendix

2.5.1 Two operating modes of the configuration module

In addition to managing configuration files (master mode), the configuration module also provides configuration editing to the waveform acquisition module (slave mode). When acquisition calls configuration, configuration automatically switches to slave mode; when acquisition exits, both exit together.

The waveform acquisition module calls the configuration module in two places:

- 1) Animal information registration page — modify configuration file, as shown in Figure 2-11.

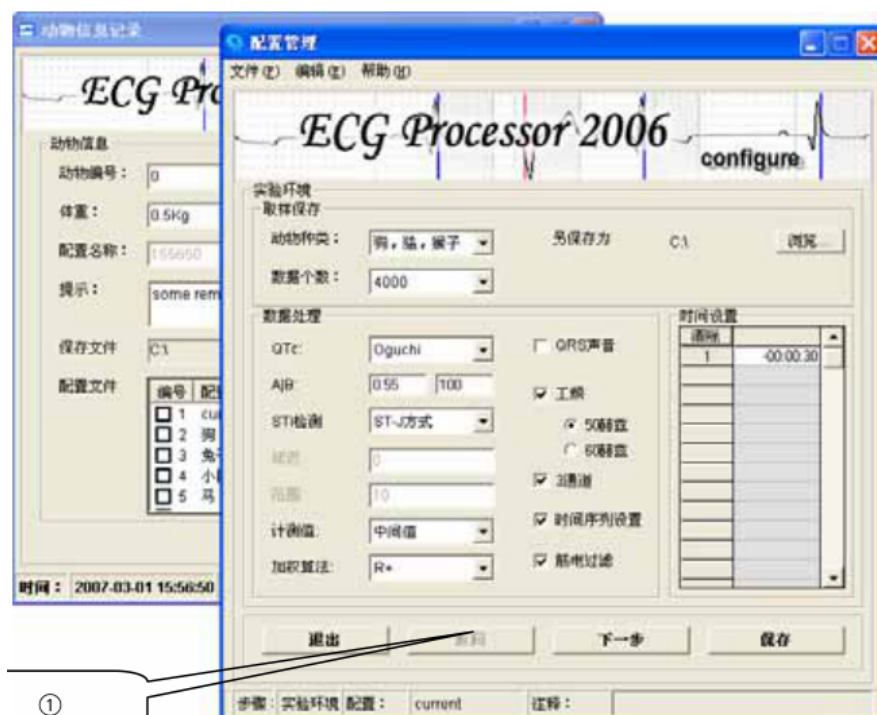


Figure 2-11 Animal information page — configuration details

- ☐ [Back] button is unavailable; configuration automatically enters slave mode. Other settings and editing operations are unchanged.

2) After entering the waveform acquisition page, click Detailed Settings to enter the Channel Settings page of the configuration module (Figure 2-12).

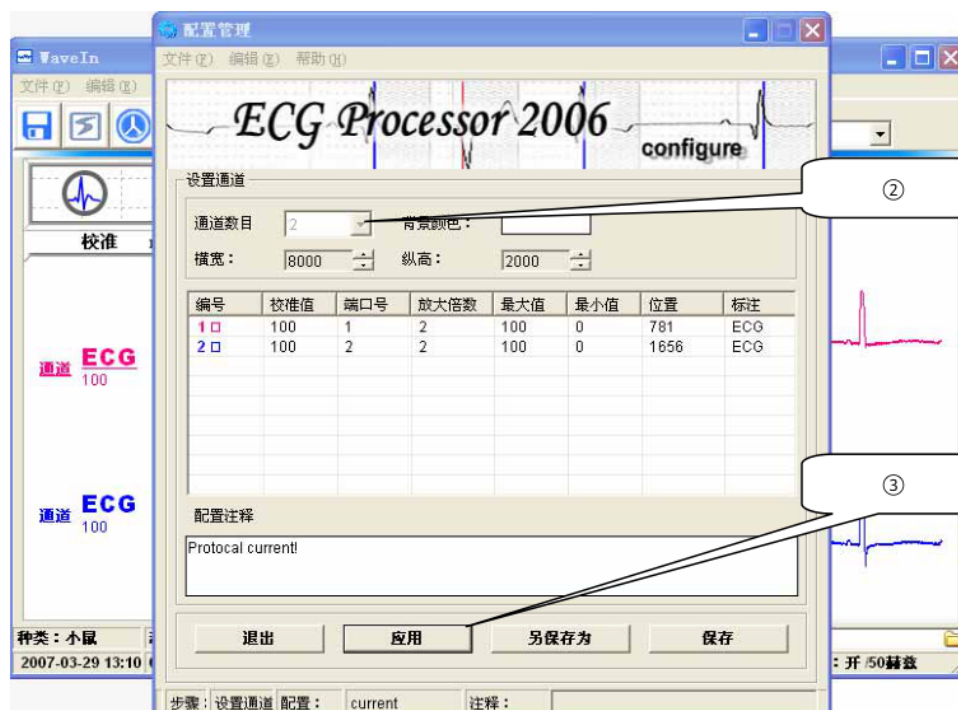


Figure 2-12 Detailed settings from waveform acquisition

- ☐ [Number of channels] cannot be modified.
- ☐ [Back] becomes [Apply], applying your modifications.

Double-click a channel in the channel settings list to open the channel settings dialog; the channel settings page is hidden (Figure 2-13).

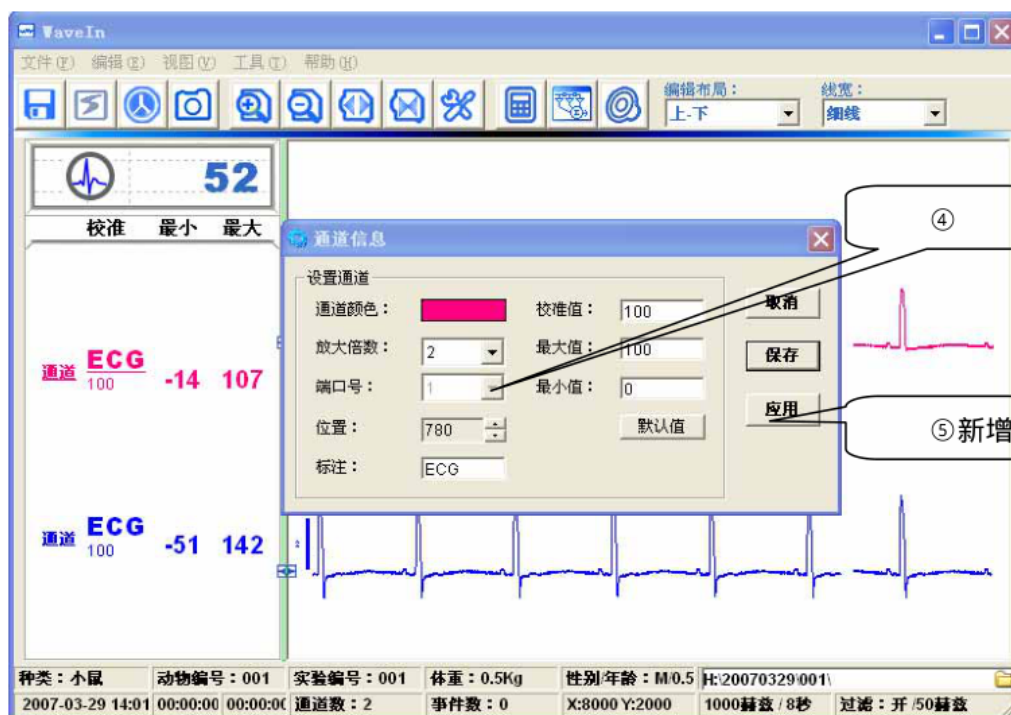


Figure 2-13 Channel settings

- ☐ [Port number] cannot be modified.
- ☐ [Apply] — new button; channel setting changes can be seen immediately.

Click Cancel or Save to return to the page shown in Figure 2-12.

3. ECG Acquisition

The ECG acquisition module acquires and saves experimental data. It includes Animal Information Setting and Waveform Acquisition pages. For an experiment, first set animal information and connect the ECG acquisition device to the computer USB port via USB cable, then acquire waveforms.

3.1 Animal Information Setting Page



Figure 3-1 Animal information setting (ECG device not connected)

As shown in Figure 3-1, the page has the following sections:

3.1.1 Information settings

1. Animal information

- [Animal No.] — Experimental animal number; max 8 characters.
- [Study No.] — Study number for this experiment; max 8 characters.
- [Weight] — Animal body weight; max 8 bytes.
- [Sex/Age] — Animal sex and age; max 8 bytes.

2. Save settings

- [Filename] — When saving acquisition, the file is saved using current time (hour-minute-second).extension (last 3 digits of animal number, zero-padded). Not editable.
- [Comment] — Notes related to the animal or experiment.
- [Save file] — File save path; click Browse to specify location.

3.1.2 Configuration list

1. List description

- [No.] — Item number.
- [Configuration name] — Configuration file name.
- [Remarks] — Configuration remarks.

2. Related operations

- [Click a row] — Select configuration for acquisition; information entry area updates with that configuration's settings.
- [Double-click a row] — Edit the configuration; opens configuration settings (Figure 3-2). See the configuration module.



Figure 3-2 Edit configuration

- Edit selected configuration — same as above.
- Rename selected configuration (Figure 3-3).

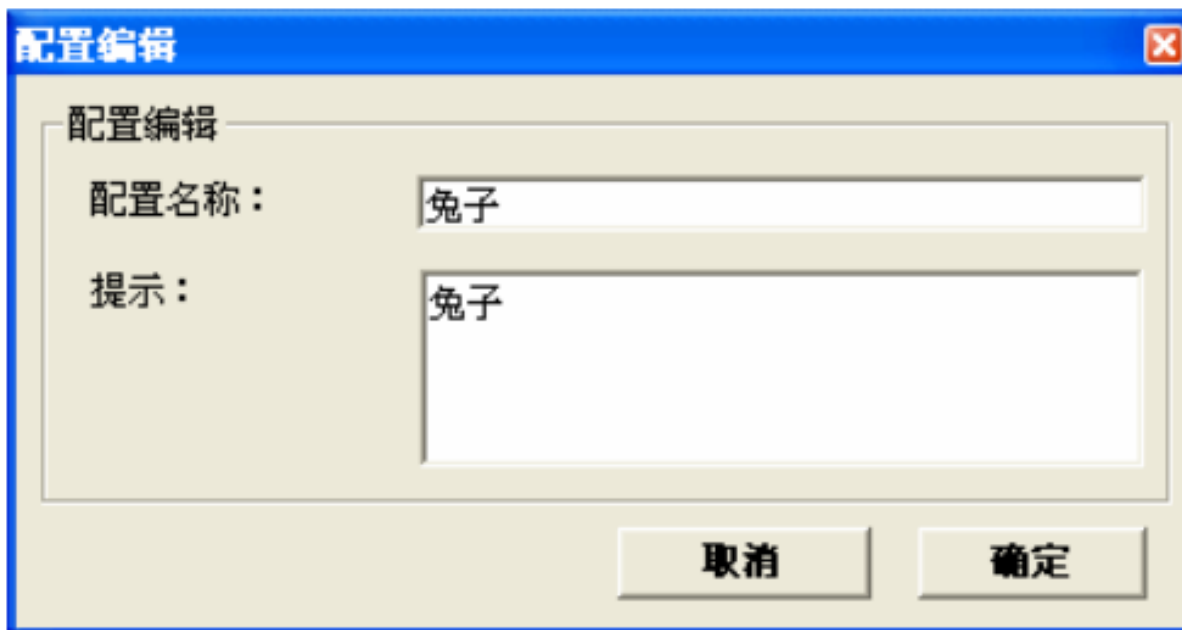


Figure 3-3 Rename configuration

Note: ☐ Changed filename must not duplicate one in the list. ☐ default and current are system-used and cannot be used.

- Delete selected configuration — enabled only after checking an item in the No. column.

3.1.3 Status bar prompts

- [Time] — Current system time; [Filename] updates synchronously (HMS).
- [Prompt] — System status such as USB connection; prompts when user input is inappropriate.

3.1.4 Entering waveform acquisition

After settings are complete, if the USB device is connected, click [Start] to enter the waveform acquisition screen and acquire ECG data. Related buttons:

- [Start] — Unavailable when device is not connected (Figure 3-1); available when connected (Figure 3-4). Click to enter waveform acquisition page (Figure 3-5).
- [Exit] — Exit the application.



Figure 3-4 Animal information setting (ECG device connected)

3.2 Waveform Acquisition Page

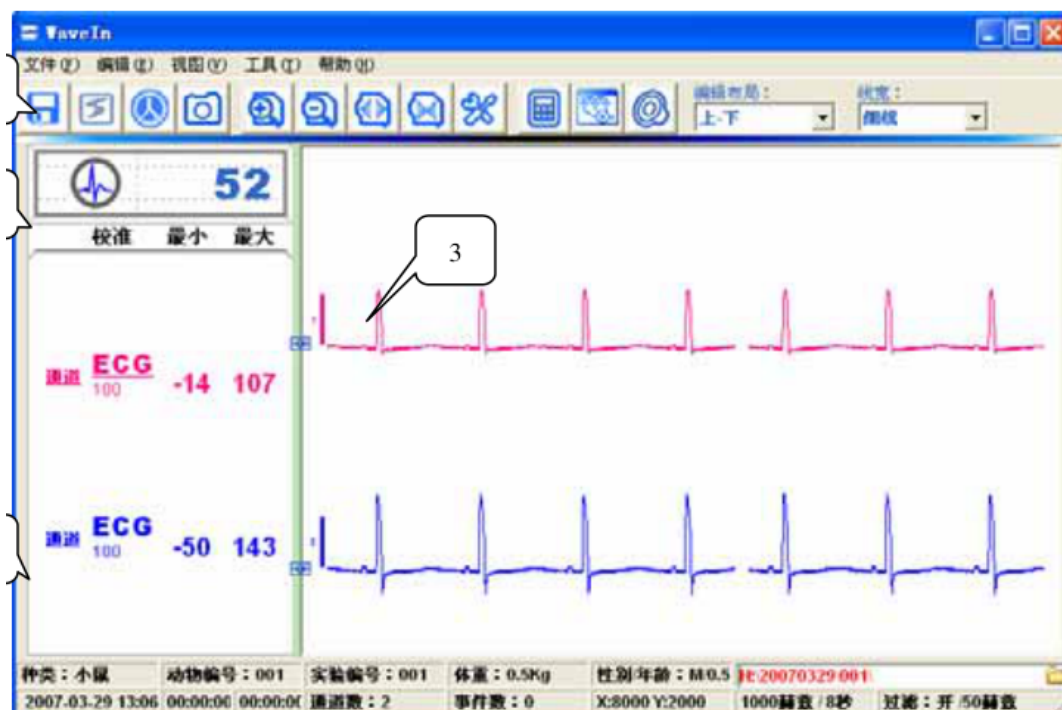


Figure 3-5 Waveform acquisition page

As shown in Figure 3-5, the page has 4 parts:

1. Toolbar — Common operations (Figure 3-6), including:
 - Save raw waveform, generate analysis file, mark events (see 3.2.1)
 - Waveform settings (see 3.2.2)
 - Calibration and other settings (see 3.2.3)



Figure 3-6 Toolbar categories

2. Results area (see 3.2.4) — Current measurement results such as heart rate; waveform min/max, etc.
3. Waveform display area (see 3.2.5)
4. Status bar (see 3.2.6)

3.2.1 Save-related operations

1. Save source data

Save raw waveform data to the specified location. After clicking, long-term saving starts and the button becomes inactive. Thereafter Calibration, Detailed Settings, and Filter buttons are no longer available.

2. Mark event

After clicking, the button activates; each subsequent click marks the event time in the data. Minimum interval between events is 1 second; up to 10 events can be recorded. If 10 events are already marked, another click overwrites the 10th. Marked events appear as corresponding markers in the ECG playback module.

3. Generate analysis file

Snapshot and analyze to generate a file. The system saves data of the configured size before the current time point (specified in ECG configuration). If the ECG editing window is not started, it is started; if already started, it switches to synchronized display mode.

Generate data files according to the time sequence set in the ECG configuration module (called automatic analysis mode). If editing is not started, it is started; if already started, it switches to synchronized display. The button icon changes (with a small red cross in the middle).

After entering automatic analysis mode, the icon indicates the system is in automatic analysis. Click to end automatic analysis; the icon returns and the ECG editing window also closes. Closing the editing window directly also ends automatic analysis.

3.2.2 Waveform settings

- Vertical zoom in — shortcut Ctrl+F1
- Vertical zoom out — shortcut Ctrl+F2
- Horizontal zoom in — shortcut Ctrl+F3
- Horizontal zoom out — shortcut Ctrl+F4
- Detailed settings — calls ECG settings for detailed channel display settings (Figure 3-7). See configuration section 2.3.



Figure 3-7 Channel detailed settings

3.2.3 Calibration and other settings

1. Calibration

After ECG signal acquisition, the signal is amplified. Ideally, input of 1 mV yields an amplified output value of 100, but due to device characteristics the output is often not exactly 100. Therefore calibration is needed before measurement so that output is 100 under a standard input signal. Clicking opens the dialog shown in Figure 3-8.



Figure 3-8 Calibration before ECG acquisition

Calibration procedure:

- ☐ Select a channel whose waveform-area values are positive (check the box in column 1; status bar [Selected channel] shows the channel number). If no channel is selected, [Calibrate] and [OK] are unavailable.

Note: With two channels, one is positive and the other is negative.

- ☐ Click [Calibrate] to update min/max values.
- ☐ Click [OK] to complete calibration of one channel.
- ☐ Swap the two output cables of the calibrator and repeat steps ☐☐☐ to calibrate the other channel.

2. Other settings

1) Filtering

Power-line filter status. If power-line filtering is not enabled in ECG configuration, this button is unavailable. If enabled, click to toggle filter state: with a small red cross, waveform is unfiltered; without, the displayed waveform is filtered.

2) QRS sound switch

Current sound state: with red cross, sound is off; without, sound is on. When on, each QRS wave produces a “beep-” sound.

3) Other

- [Edit layout] — Controls layout when acquisition and editing windows work together (Figure 3-9): top-bottom, left-right, or free custom.



Figure 3-9 Three layout modes for ECG acquisition–editing

- [Line width] — Controls waveform line thickness (thick or thin). When waveforms are dense, horizontal zoom is needed to see changes.

3.2.4 Results area



Figure 3-10 Detection results

As shown in Figure 3-10:

- ☐ Current channel heart rate
- ☐ Channel number — one row per channel's results
- ☐ Channel label, e.g. ECG — see channel settings in configuration
- ☐ Current calibration value — set in calibration
- ☐ Current screen minimum for the channel
- ☐ Current screen maximum for the channel

Note: Clicking any object in a channel row (e.g. ☐☐☐☐ of channel 1) switches the heart-rate display to that channel; subsequent data-file generation uses this channel as the default analysis reference. Switching is not allowed during data saving or automatic analysis.

3.2.5 Waveform display area

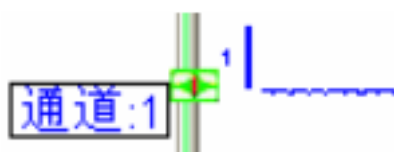


Figure 3-11 Move channel

Move the small scale block of a channel to move the channel up/down. When left-clicking and holding the scale block, a small box on the left shows the channel name (Figure 3-11).

3.2.6 Status bar (animal information, settings information)

1. Animal information (left to right):

Field	Description
Species	Animal species selected in configuration
Animal No.	Set on animal information page
Study No.	Set on animal information page
Weight	Set on animal information page

Field	Description
Sex/Age	Set on animal information page
Storage info	Save path and storage status (see below)

1) Storage information

☐ Not saving and not in automatic analysis

You can click the folder icon in the animal information area of the status bar to change the storage path (Figure 3-12).

☐ Long-term save or automatic analysis

- A) If files exist in the storage path, a flashing prompt warns that files may be overwritten; the path name then appears in red.
- B) If free space on the storage path is less than 1 MB, a flashing prompt (yellow background, red text) appears: disk space < 1 MB; then remaining space flashes. You can change the storage path; data will be saved to the new disk.
- C) If disk space is insufficient and the folder can no longer be written, a flashing prompt (black background, red text) appears: insufficient disk space. You can change the storage path.
- D) If disk space is greater than 1 MB, the folder icon becomes shaded and the storage path cannot be changed.



Figure 3-12 Change storage path

2. Settings information (left to right):

Field	Description
System time	Current system time
Save time	Duration of recorded waveform being saved
Analysis time	Time used in automatic analysis state
Channels	Total number of channels used
Events	Number of marked events; max 10
X:** Y:**	Horizontal width and vertical height of waveform display area
** Hz / ** s	Sampling frequency / time to scan one screen of waveform

Field	Description
Filter: **/** Hz	Power-line filter state / filter frequency

Note: ** represents the corresponding value.

3.3 Menu Item Descriptions

Group	Menu item	Description
File	Save data (Ctrl+S)	Save raw waveform data
File	Analyze by set time (Ctrl+A)	Enter automatic analysis mode
File	Stop analyze by set time (Ctrl+P)	Exit automatic analysis mode
File	Instant save (Ctrl+I)	Snapshot data at current time
File	Save current configuration...	Save current configuration under a name (see note □)
File	Exit (Ctrl+Q)	Exit application; if saving or auto-analyzing, confirmation dialog appears
Edit	Record event (Ctrl+E)	Mark an event
Edit	Calibration (Ctrl+C)	Calibrate measured values; see toolbar calibration
Edit	Thin line / Thick line	Draw waveform with thinner or thicker lines
Edit	User custom (Shift+F1)	Acquisition and editing windows not linked; freely movable
Edit	Top-Bottom (Shift+F2)	Acquisition and editing windows bound; left-right layout
Edit	Left-Right (Shift+F3)	Acquisition and editing windows bound; top-bottom layout
Tools	Zoom in/out (Ctrl+F1/F2)	Vertical zoom
Tools	Stretch/Compress (Ctrl+F3/F4)	Horizontal stretch/compress
Tools	Detailed settings... (Ctrl+D)	Detailed background, channel settings
Tools	Reset (Ctrl+R)	Restore startup settings (H/V zoom, calibration)
Tools	Filter On/Off (Ctrl+F11/F12)	Apply filter; available only when configuration enables power-line filter control
Tools	Sound On/Off (Shift+F11/F12)	QRS sound on/off
Help	About... (Ctrl+H)	Version information

Note: □ Saving current settings as a configuration (Figure 3-13): filename cannot be current or default (system-used). If the name already exists, the system asks whether to overwrite when you click OK.

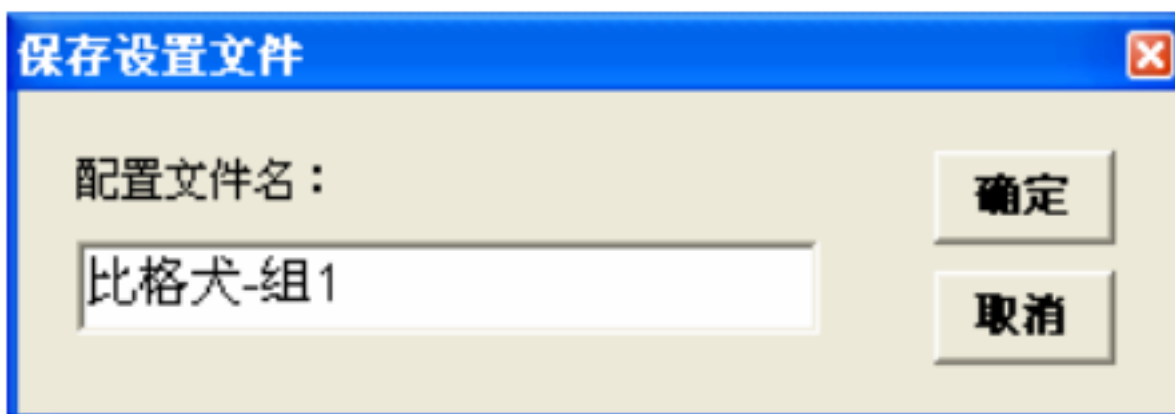


Figure 3-13 Save configuration

4. ECG Playback

During experiments, the ECG acquisition module can record raw waveforms for a long period and store them in a specified folder. Through the ECG playback module, you can browse and extract needed waveforms to generate files for the ECG editing and print modules. Note: recorded raw waveforms cannot be used directly by ECG editing or printing.

4.1 Screen Sections

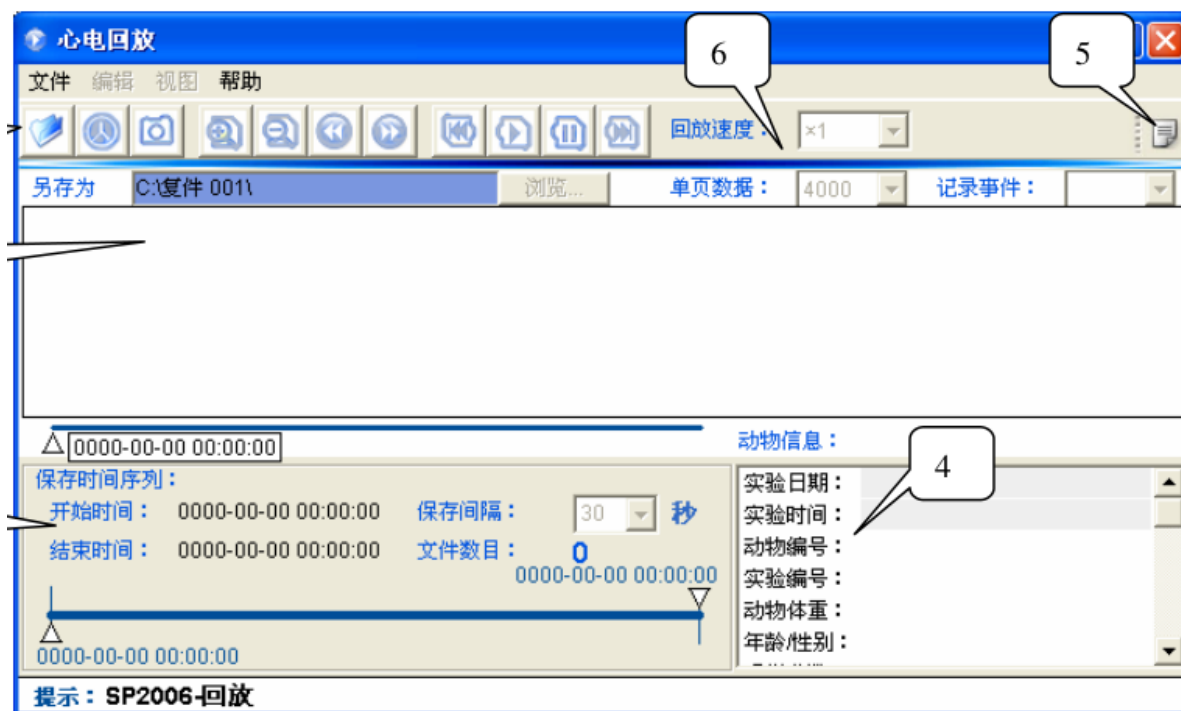


Figure 4-1 ECG playback — initial screen

As shown in Figure 4-1, the screen has the following parts:

1. Tool buttons — Common file, waveform, and playback operations:

- 1) File operations — see 4.1.1
- 2) Waveform control — see 4.1.2
- 3) Playback control — see 4.1.3

2. Waveform display area — Draws waveforms and includes markers for events and save time-sequence settings; see 4.1.4.

3. Save time sequence — Set time intervals and ranges as needed to extract source waveform data and generate analysis files; see 4.1.5.

4. Animal information — see 4.1.6

5. Analysis settings — see 4.1.7

6. Other notes and operations — see 4.1.8

4.1.1 File operations

- Open file
- Generate files according to [3. Save time-sequence settings] below
- Snapshot — save page data visible in the waveform area

4.1.2 Waveform control

- Vertical zoom in
- Vertical zoom out
- Move waveform forward one page — inactive on first page
- Move waveform backward one page — inactive on last page

4.1.3 Playback control

- Jump to beginning

- Start playback
- Pause playback
- Jump to last page

4.1.4 Waveform display area

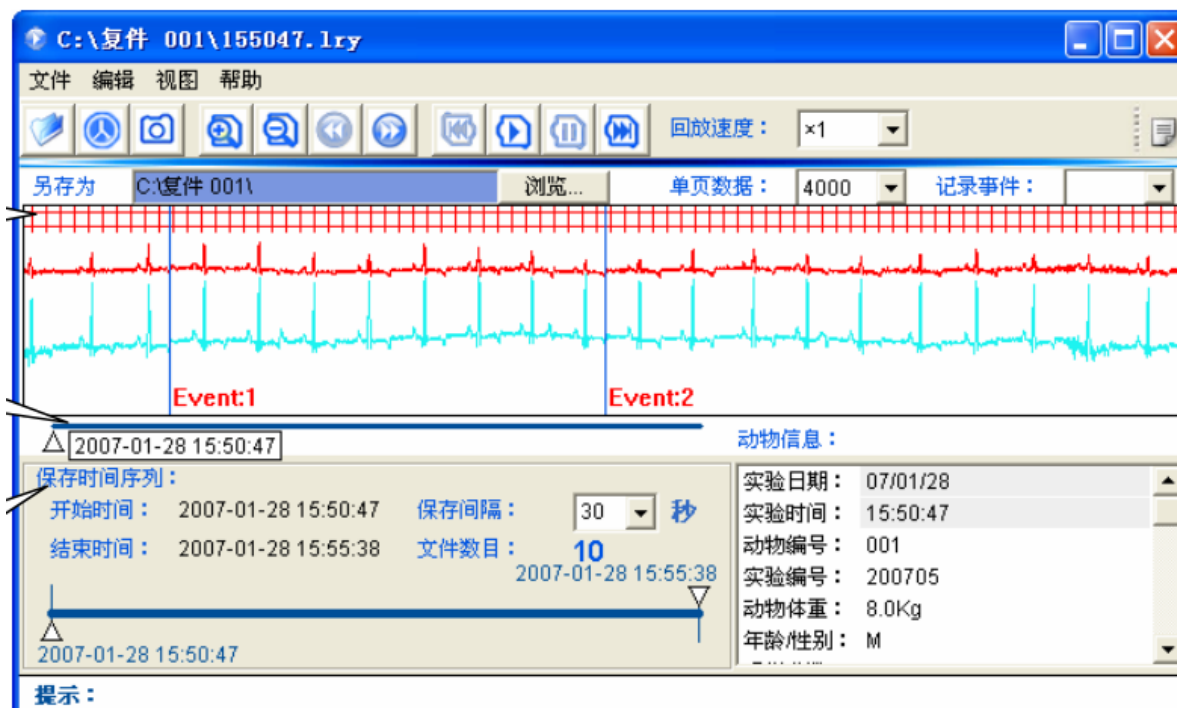


Figure 4-2 After opening a file

The waveform area includes the following content and operations:

1. Time-sequence markers

The grid band above the waveform is a graphical representation of saving by time sequence, showing data start and end. When moving the ☐ icons in the save time-sequence area, you can see the region to extract on the waveform.

2. Event marker lines

If events were recorded when saving the waveform, they appear here. Up to 10 events can be saved during acquisition.

3. Waveform movement

Drag the ☐ marker to move the waveform left/right; the adjacent box shows the movement time.

4.1.5 Save time-sequence settings

As shown in the save time-sequence section of Figure 4-2:

- [Start time] — Start time for converting the waveform by the set times
- [End time] — End time for converting the waveform by the set times
- [Save interval] — How often to generate data; minimum 1 second, maximum = data duration in seconds. Only legal values accepted; illegal input prompts an error.
- [File data] — How many files can be generated

Note: Amount of data saved each time is specified by [Page data].



Figure 4-3 Time range setting

□ marker indicates start time; □ indicates end time. Dragging a marker shows the corresponding time nearby; [Start time] and [End time] update immediately. Waveform area (1) marks the region at the top with a grid.

4.1.6 Animal information

Displays experiment and animal-related information. In Figure 4-4, all areas except those with background color can be changed. Use the scrollbar on the right to see all information.



Figure 4-4 Animal information

Name	Description	Remarks
Experiment date	Y/M/D	Not editable
Experiment time	H:M:S	Not editable
Animal No.	Animal number	Editable; max 8 characters
Study No.	Study number	Editable; max 8 characters
Weight	Animal body weight	Editable; max 8 characters
Sex/Age	Sex and age description	Editable; max 8 characters
Sampling parameters	System sampling settings	Not editable
Remarks	Experiment notes	Editable; max 32 characters

4.1.7 Analysis settings

Click the button to open the analysis settings dialog (Figure 4-5).

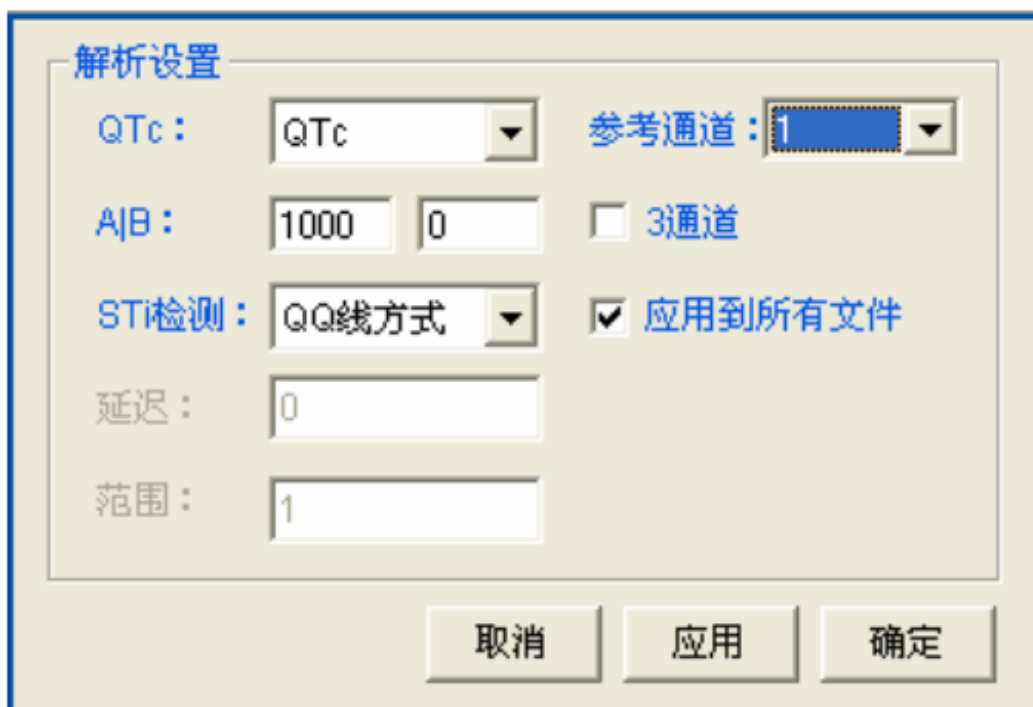


Figure 4-5 Analysis parameter settings

- [QTc, A|B, STi, Delay, Range, Reference channel, 3-channel] — see section 2.2.2.
- [Apply to all files] — If selected, these settings load when opening recorded waveform data. Note: settings persist after the program ends.
- [Cancel] — Close without saving (clicking elsewhere on the main page also closes).
- [Apply] — Update settings without closing.
- [OK] — Update settings and close.

4.1.8 Other notes and operations

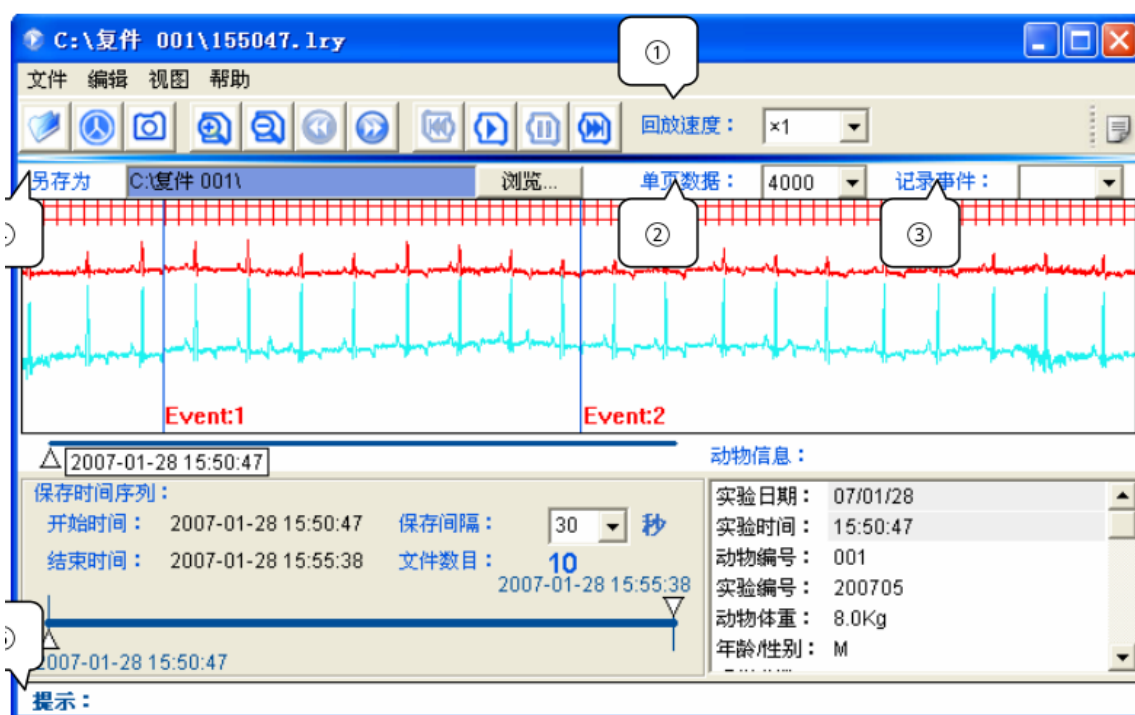


Figure 4-6 After opening a file

As marked in Figure 4-6:

- ☐ Playback speed — controls speed when playing waveforms
- ☐ Page data — number of data points in one screen of the waveform area
- ☐ Recorded events — jump waveform to marked positions
- ☐ Storage path — select folder for generated files
- ☐ Prompt — system status and operation prompts

4.2 Menu Item Descriptions

Group	Menu item	Description
File	Open file...	Open raw waveform file
File	Save by time sequence	Save files by the button-set time settings
File	Save current page	Save page data visible in waveform area
File	Exit	
Edit	Zoom in / Zoom out	Vertical zoom
Edit	Previous / Next page	Previous or next waveform page
Edit	Play / Stop	Start playback / pause
Edit	Move to start / end	First or last page
View	×1/4, ×1/2, ×1, ×2, ×4, ×8	Playback speed relative to default
Help	About...	Version information

5. ECG Editing

The ECG acquisition or playback module can generate compressed small files whose ECG features can be browsed and edited. The editing module can also work synchronously with acquisition to display small files generated by acquisition in a timely manner (note these differ from saved raw files; see the ECG playback module).

5.1 Screen Sections

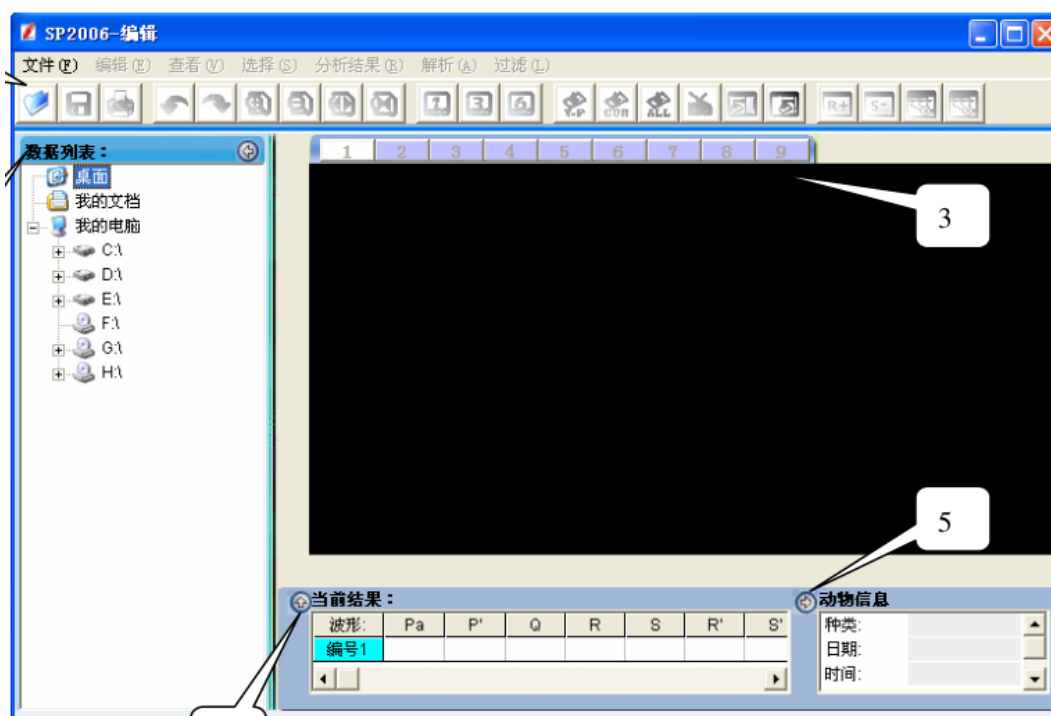


Figure 5-1 Startup page

Note: Before a file is loaded, most menu and toolbar buttons are inactive. They become available after a file is loaded.

As shown: 1 Toolbar, 2 Data file list, 3 Waveform area, 4 Analysis results, 5 Animal information.



Figure 5-2 Toolbar

The toolbar provides common operations:

- 1) File operations — see 5.1.1
- 2) Interface control — see 5.1.2
- 3) Channel mode — see 5.1.3
- 4) Analysis operations — see 5.1.4
- 5) Filter control — see 5.1.5

5.1.1 File operations

Click to open the Open File dialog; after selecting a folder, the system lists ECG data files. Double-click to load. After loading, the title bar shows the full path. Shortcut: Ctrl+O.

Click to open the Save File dialog (Figure 5-3; system defaults to saving the currently analyzed channel). Select channels to save and click OK. When switching channels in the dialog, the waveform area adjusts accordingly. If “two channels” is selected, the other channel is saved with “-1” appended to the current filename (e.g. if open file is 001.001, the other is saved as 001-1.001). Shortcut: Ctrl+S.

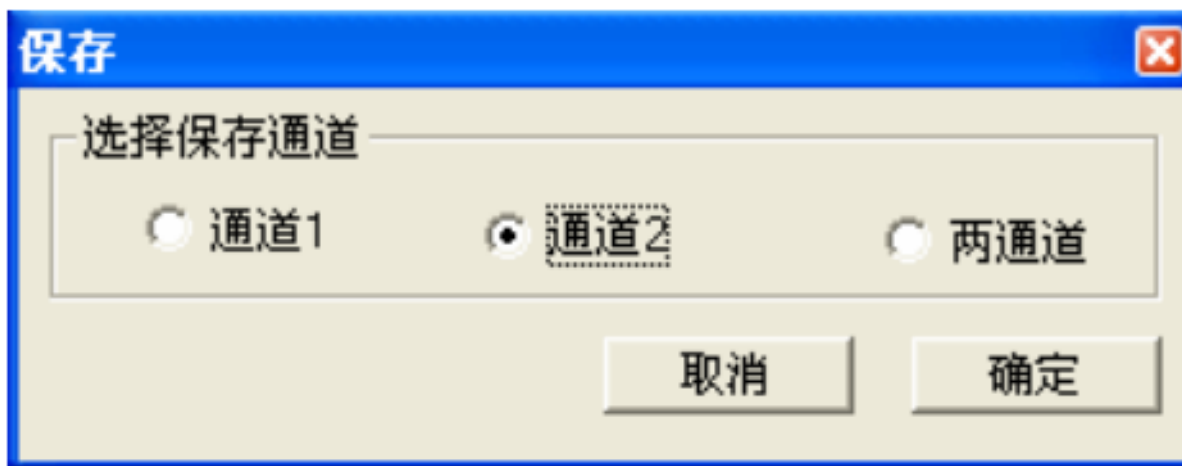


Figure 5-3 Save file

Print current file. Shortcut: Ctrl+P.

5.1.2 Interface control

- Undo last operation — Ctrl+Z
- Redo last operation — Ctrl+Y
- Vertical zoom in selected channel — Ctrl+↑
- Vertical zoom out selected channel — Ctrl+↓
- Horizontal zoom in — Ctrl+→
- Horizontal zoom out — Ctrl+←

5.1.3 Channel mode switching

1-channel mode shows ECG features of different beats of the current channel, while 3- and 6-channel modes show features of different channels for the current beat. Only 1-channel mode can switch among beats (Figure 5-4).

- Switch to 1-channel mode

- Switch to 3-channel mode
- Switch to 6-channel mode

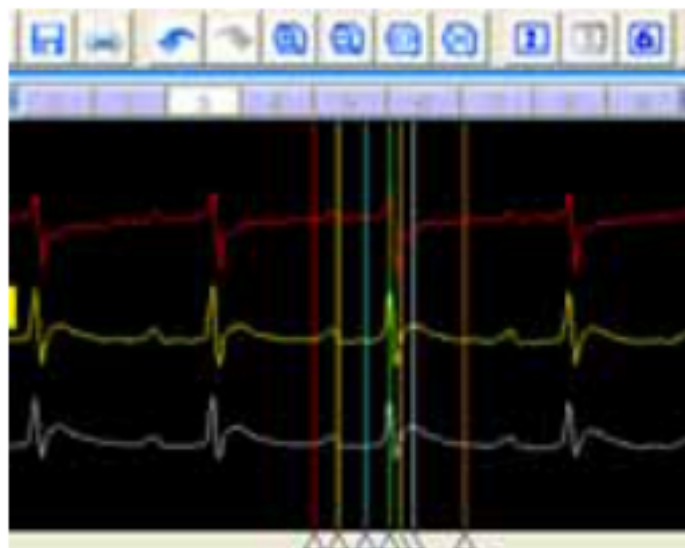


Figure 5-4 1-/3-/6-channel modes

Note: Effects of 1-/3-/6-channel modes on some analysis operations — see 5.1.4.

5.1.4 Analysis operations

- Re-analyze T-wave peak of current beat — shortcut v
- Re-analyze remaining feature values of current beat — shortcut z
- Re-analyze all beats based on R-peak reference position — shortcut x (disabled in 3-/6-channel modes)
- Discard current beat data — not printed — shortcut h
- Analyze earlier part of waveform (disabled in 3-/6-channel) — after switch, jumps to beat 1
- Analyze later part of waveform (disabled in 3-/6-channel) — after switch, jumps to beat 1

5.1.5 Filter control

- Weighted-average filter of current beat with R as complex reference — suitable when R is clear
- Weighted-average filter of current beat with S as complex reference — suitable when S is clear
- Apply average filter to smooth waveform
- Cancel all filtering and restore original waveform

5.1.6 File list

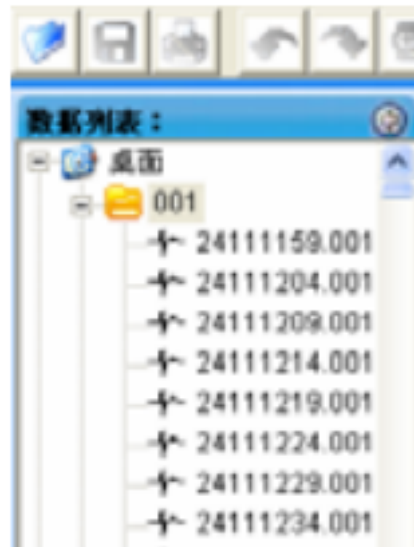


Figure 5-5 Data list

As shown in Figure 5-5, expand the directory tree; the system lists ECG data files under the corresponding directory. Click a data file to load it.

5.1.7 Waveform display area

1. Display waveform and provide convenient feature-line operations; see 5.2 Waveform Editing.

2. Channel operations

[Select channel]

- ☐ Single select: left-click the small square before a channel to select one channel; selected waveform becomes brighter and the marker turns red.
- ☐ Multi-select: hold Ctrl and left-click channel squares to select multiple channels.

Note: If channels 1, 3, 5 are selected, feature-line analysis references channel 1; if 2, 4, 6 are selected, references channel 2.

[Move channel]

Left-click and hold a selected channel's square and drag up/down, or use Edit menu Move channel up/down.

Note: ☐ After switching 1-/3-/6-channel modes, channel positions are adjusted automatically. ☐ Shift+↑↓ moves all channels up/down.

[Show/hide channel] — Right-click a channel square to toggle visibility.

[Channel zoom] — See toolbar 5.1.2.

[Double-click graphics area] — Cancel selection of feature lines and interval regions.

5.1.8 Analysis results display area

The analysis results area has two modes — Current Results and Detailed Results — switched by clicking the button (Figure 5-6). Clicking different list cells causes corresponding responses in the waveform area.

详细结果：

编号1+	Pa	P'	Q	R	S	R'	S'	ST	T	T'	Pd	QRS	RR	PR	QT	
1	28	0	-28	248	-20	0	0	-6	-48	0	30	48	430	70	202	
2	28	0	-29	251	-18	0	0	-1	-36	0	28	48	416	68	202	
3	27	0	-27	247	-17	0	0	-2	-41	0	28	46	470	70	204	
4	28	0	-32	244	-19	0	0	-5	-40	0	28	48	430	72	202	
5	0	0	0	6	0	0	0	-12	-16	18	0	28	272	0	184	
6	0	0	-30	242	-13	5	0	-3	-45	0	0	46	252	0	206	
7	27	0	-24	241	-13	5	0	-1	-44	0	32	46	472	76	202	
8	28	0	-30	246	-21	0	0	-12	-51	0	30	48	484	74	204	
9	27	0	-23	246	-16	5	0	-1	-41	0	30	46	536	72	204	

Figure 5-6 Current results — detailed results

Col	Name	Description
1	Pa	P-wave height
2	P'	If two P waves in a complex, height of 2nd P; else 0
3	Q	Q-wave height
4	R	R-wave height
5	S	S-wave height
6	R'	If two R waves, height of 2nd R; else 0
7	S'	If two S waves, height of 2nd S; else 0
8	ST-J	Height at S–T junction
9	T	T-wave height
10	T'	If two T waves, height of 2nd T; else 0
11	Pd	P-wave width
12	QRS	QRS complex width
13	RR	RR interval
14	PR	PR interval
15	QT	QT interval

Note: Clicking cells in columns 11–15 highlights the cell and marks the corresponding region in the waveform area.

[Current results]

In 1-channel mode, shows analysis of the current beat; in 3-/6-channel mode, shows analysis of the current channel. If multiple channels are selected, shows the last selected channel.

[Detailed results]

In 1-channel mode, shows analysis of 9 beats; in 3-/6-channel mode, shows analysis of 3 or 6 channels.

[Waveform response]

Clicking a cell in the analysis results list causes the waveform display to respond according to the corresponding channel, beat, and interval (Figure 5-7).

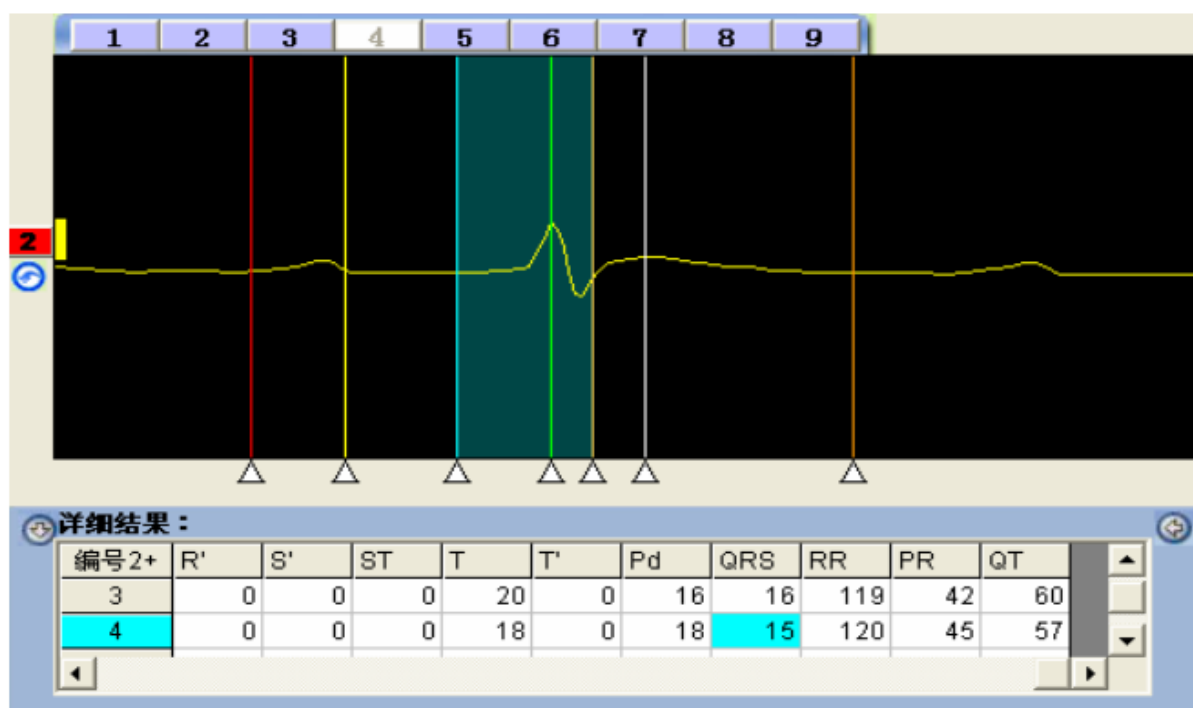


Figure 5-7 Results—graphics correspondence: in detailed results, selecting row 4 selects beat 4; column corresponds to QRS interval

5.1.9 Animal information display area

Displays experiment and animal information. In Figure 5-8, all areas except those with background color can be changed. Click the icon to show/hide this area.

Name	Description	Remarks
Species	Experimental animal	Not editable
Date	Y/M/D	Not editable
Time	H:M:S	Not editable
No.	Animal number	Editable; max 8 characters
Study No.	Study number	Editable; max 8 characters
Weight	Animal body weight	Editable; max 8 characters
Sex/Age	Sex and age	Editable; max 8 characters
Sampling frequency	System sampling settings	Not editable
Heart rate	Calculated mean heart rate	Not editable
Remarks	Experiment notes	Editable; max 32 characters



Figure 5-8 Animal information

5.2 Waveform Editing

5.2.1 Selecting feature lines

□ 8 feature lines

Name	Description	Shortcut
P_start	P-wave start	p
P_end	P-wave end	o
QRS_start	QRS start	q
R_Reference	R-wave reference; other feature lines of a complex are analyzed relative to it	r
QRS_end	QRS complex end	s
ST-J	S-T junction	u
T_peak	T-wave peak	y
T_end	T-wave end	t

Four ways to select a feature line:

- a. Left-click the feature line on the waveform (position must be accurate)
- b. Click the small triangle marker under the feature line
- c. Corresponding item under menu [Analysis Results]
- d. Shortcuts — see table above

Note: The selected feature line becomes dashed and is labeled with its name.

5.2.2 Moving feature lines

To move a feature line, select it first. Then four methods:

- a. Right-click the waveform area; the feature line moves to the mouse position. Feature-line positions constrain movement range. When moving R_Reference, it can only move between preceding and following R.
- b. ← → keys move the selected line one point at a time for fine adjustment
- c. Move the triangle marker under the line
- d. Edit menu last two items: Move feature line left / right

Note: When moving feature lines, data in the analysis results area update immediately.

5.3 Menu Item Descriptions

Group	Menu item	Description
File	Open (Ctrl+O) / Save (Ctrl+S)	See 5.1 file operations
File	Save As	Like Save; after choosing channel, also specify a filename. If two-channel Save As, other file gets "-1"
File	Print (Ctrl+P)	Print currently edited file
File	Sync / Run mode / Edit	Visible only when collaborating with acquisition (slave mode)
File	Exit	
Edit	Undo (Ctrl+Z) / Redo (Ctrl+Y)	Undo/redo edit operations
Edit	Horizontal expand/compress (Ctrl+→/←)	All waveforms
Edit	Vertical expand/compress (Ctrl+↑/↓)	Selected channel
Edit	Move all waveforms	Up/Down/Left/Right (Shift+arrows)
Edit	Move channel up/down (↑/↓)	Selected channel
Edit	Move feature line left/right (←/→)	Selected analysis feature line
View	I / III / VI channel	Channel display modes
View	Animal info show/hide	Show or hide animal information area
View	Directory tree show/hide	Show or hide directory tree
View	Current / Detailed results	Switch analysis results display; see 5.1.8
View	Background Black-White / Color	Waveform area display style
Select	Channels I–VI / Single channel	Select channels
Select	Beats 1–9 / Prev / Next	Switch beats (Ctrl+L / Ctrl+R)
Analysis Results	Feature lines / intervals / Cancel	Select or cancel feature lines and intervals
Analysis	v/z/x/h/j/J	Analyze T peak / current beat / all beats / discard / front / rear part
Analysis	STi calculation methods	QQ-line / ST-J / S ST-index / R ST-index — see 2.2.2
Filter	a:R+ / A:S- average (current beat)	Weighted smoothing suitable for clear R or S
Filter	Smooth filter / Source data (all beats)	Smooth all data or restore source
Help	About...	Version information

5.4 Appendix

5.4.1 Two operating modes

The ECG editing module has two modes: Edit mode (master) and Synchronized acquisition mode (slave). Edit-mode operations are covered in 5.1 and 5.2. Synchronized mode is described below.

1) Entering synchronized mode

Clicking Snapshot or Automatic Analysis in the acquisition module starts the editing module (Figure 5-9). Editing then runs in synchronized mode. If editing is already running, it automatically switches to synchronized mode.



Figure 5-9 Synchronized acquisition — Snapshot / Automatic analysis



Figure 5-10 Synchronized mode

2) Editing module in synchronized mode

In synchronized mode, all operations except menu [Sync] and [Exit] are disabled (Figure 5-10).

- Only [Sync] and [Exit] in the menu are available. [Sync] switches the editing module's working state; [Exit] terminates editing and restores the acquisition module to its pre-sync size.
- The file list shows newly generated files; they cannot be opened in synchronized mode.
- The number at the upper left of the waveform area is the count of analysis-generated files.

3) Editing in synchronized mode

To edit files, click [Edit] under [Sync] to switch to edit mode, then click a generated file in the list to edit. Newly generated files are also added to the list automatically but are not loaded.

6. Printing

The print module can print ECG waveforms and analysis results, and can export analysis results as data usable by Excel. When Print is clicked in the ECG editing module, data are sent to this module and then printed according to settings. Figure 6-1 shows the startup screen.

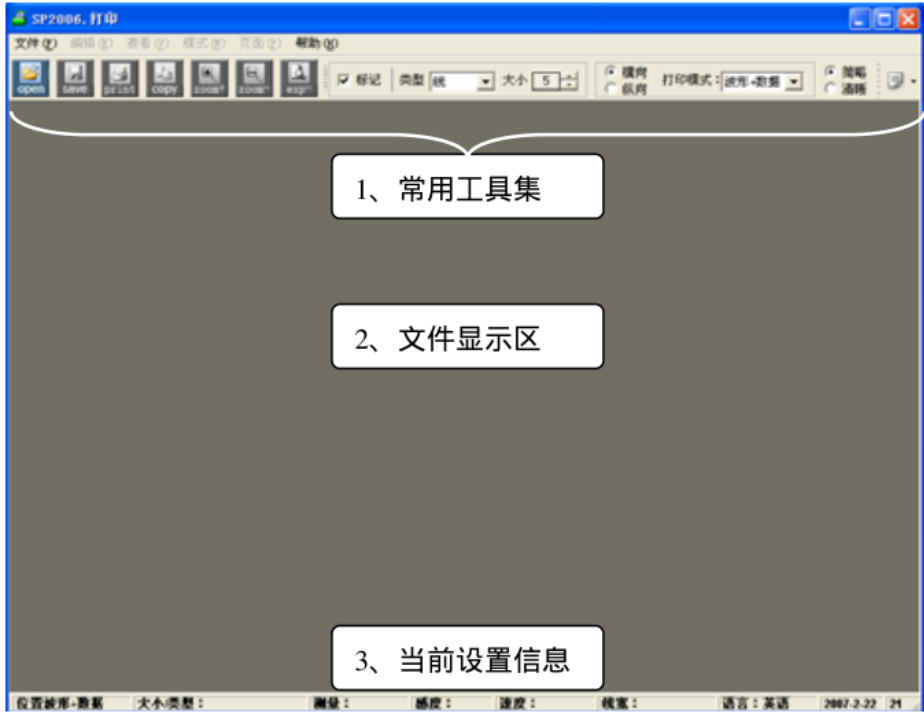


Figure 6-1 Startup screen

1. Common tools; 2. File display area; 3. Current settings information.

6.1 Screen Sections

1. Toolbar — Common operations:

- 1) File operations — open, save, print, etc.; see 6.2
- 2) Print settings — see 6.3

For convenience, the seven toolbar buttons are labeled as follows:



Figure 6-2 Button description

- [1] Open file
- [2] Save file
- [3] Print
- [4] Copy print preview area to clipboard (for paste into Paint, Word, etc.)
- [5] Zoom in print preview
- [6] Zoom out print preview
- [7] Browser show/hide

2. File display area — Details appear after opening data files; see 6.2.2.

3. Current settings information

Name	Description
Print mode	Whether printing analysis results, waveforms, or both

Name	Description
Size style	Current channel mode, paper, page count
Measured value	Calculation method for statistical results
Sensitivity	Vertical waveform scale
Speed	Horizontal waveform scale
Line width	Waveform line thickness
Current time	Y-M-D H

6.2 File Operations

This section describes opening, saving, exporting, and printing files.

6.2.1 Open file

1. Open dialog: As in Figure 6-1, click Open (6.1 [1]) to open the file selection dialog (Figure 6-3).

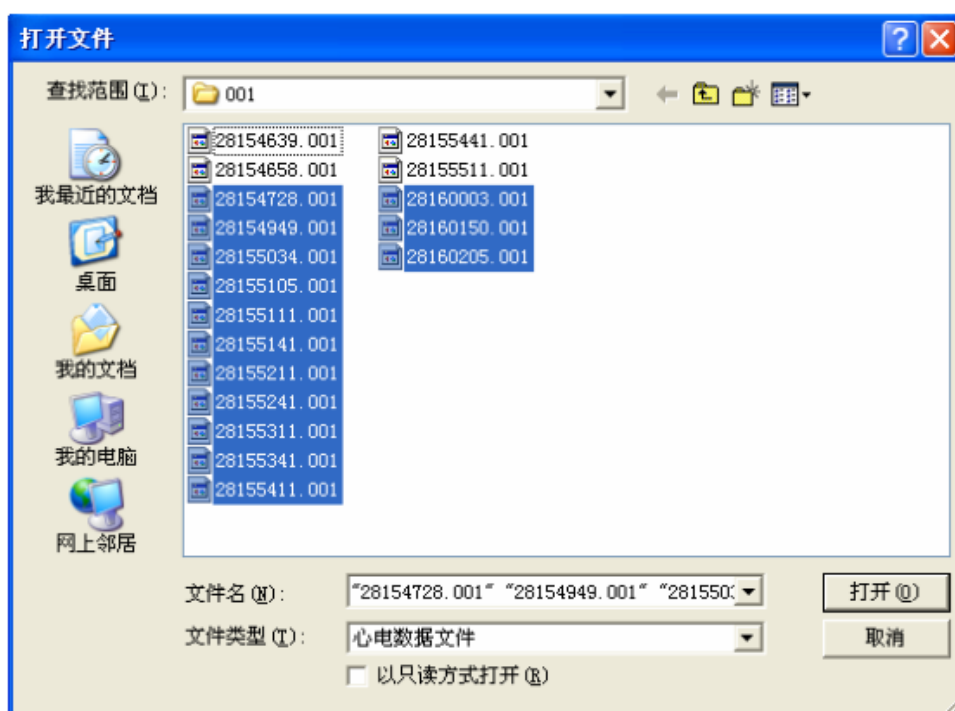


Figure 6-3 Open file

2. Select the directory containing the data; ECG data files are listed. Select files and click [Open] (Figure 6-4). Note: multiple files can be selected (Ctrl or Shift + left click, or drag a selection box).

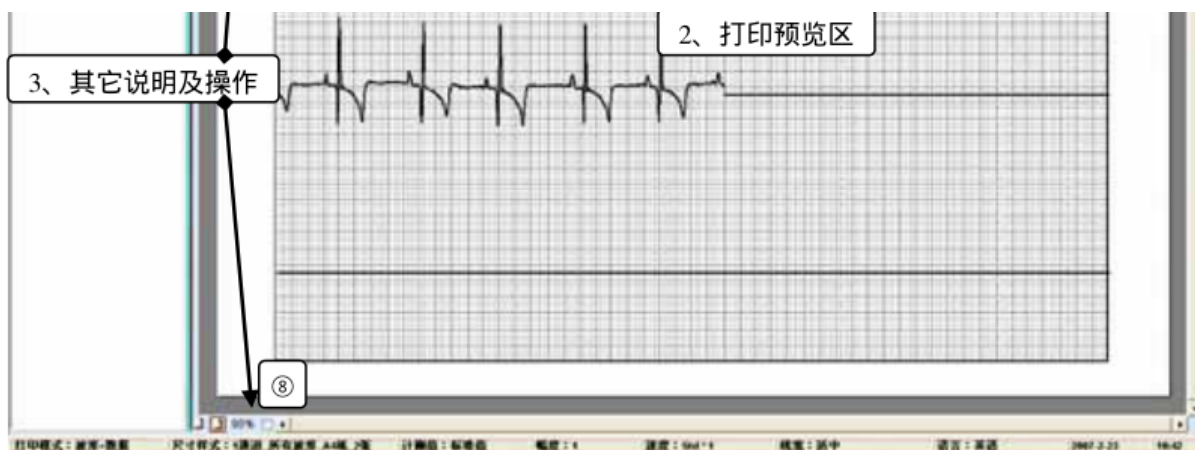


Figure 6-4 Data files loaded

6.2.2 File display area

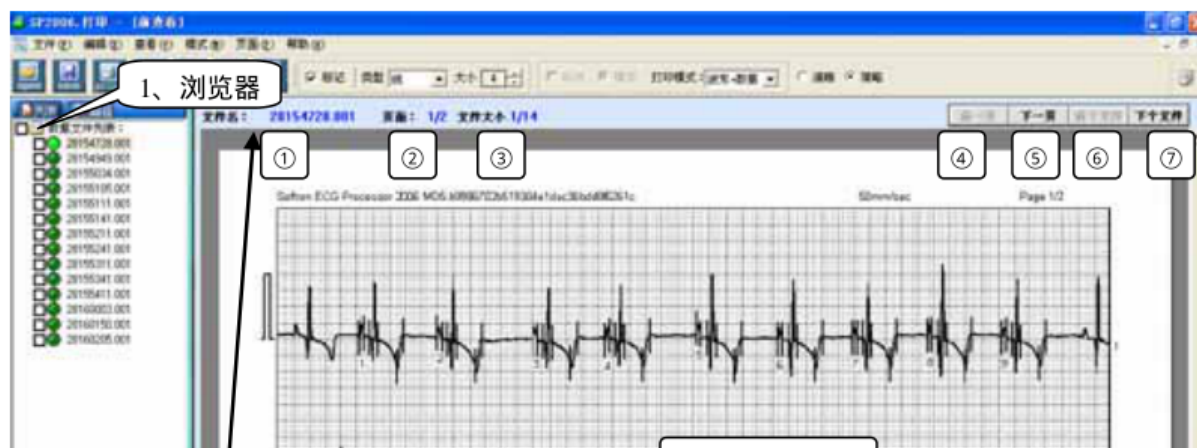


Figure 6-5 Two browser views — List / Path (Explorer)

1. Browser

After files load, [List] view shows the selected file list; [Path] view browses data files under a folder. Clicking a data file adds it to the list if not already present (Figure 6-5).

2. Print preview area

Preview waveforms and data results to be printed. Operations include:

- 1) Double left-click: toggle print area display between 100% and fit-to-window (Figure 6-6).

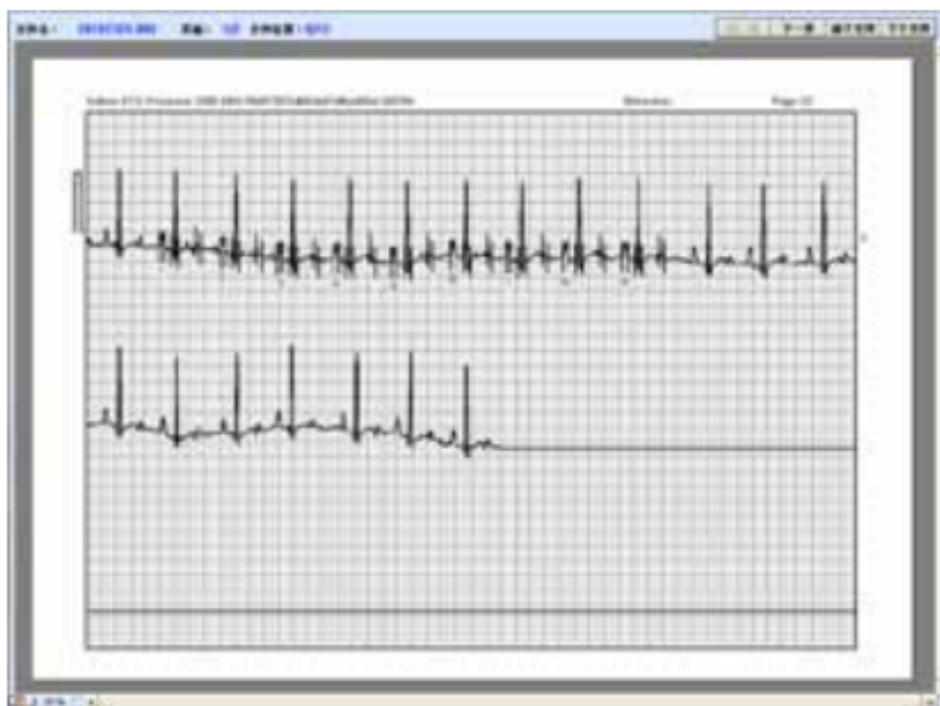


Figure 6-6 Double-click print preview — 100% vs fit

- 2) Right-click print preview to open the menu in Figure 6-7.

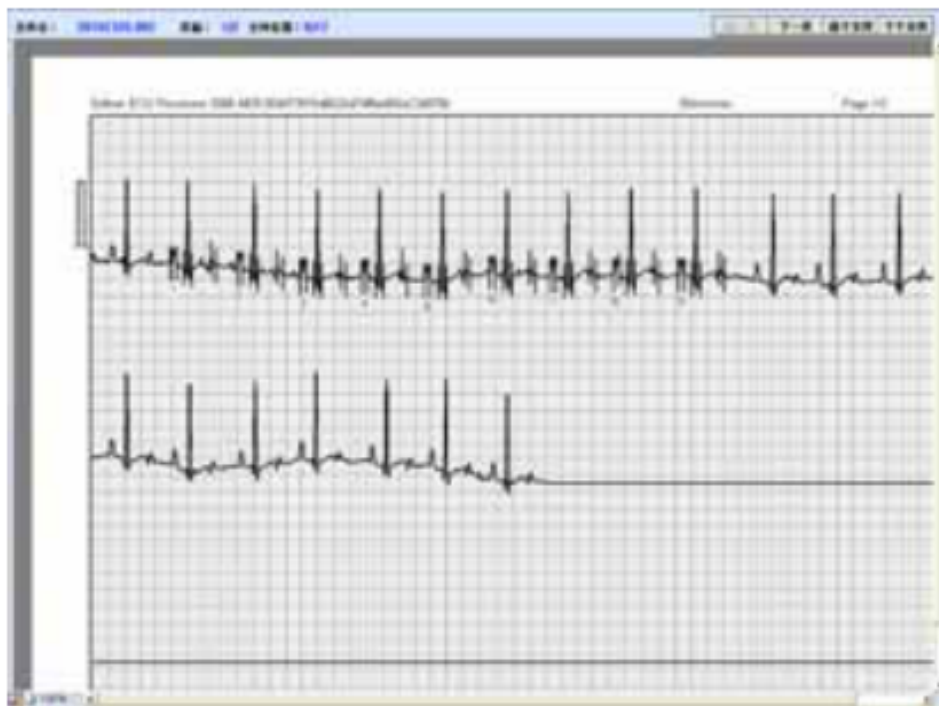


Figure 6-7 Print preview context menu

- [Apply all] — Apply current settings to all files
- [Size: 100%] — Preview at 100%
- [Clear mode] — Preview at actual print quality
- [Toolbar] / [Status bar] / [Browser] — Show/hide (☒ = currently shown)

3. Other notes and operations (as labeled in Figure 6-4):

- ☐ Filename — currently open file
- ☐ Page — [**/**] current page / total pages
- ☐ File position — [**/**] position in list / total files
- ☐ Previous page / ☐ Next page
- ☐ Previous file / ☐ Next file
- ☐ Overall print-area control (Figure 6-8):
 - Function 1 — position of print area in window: top-left or centered

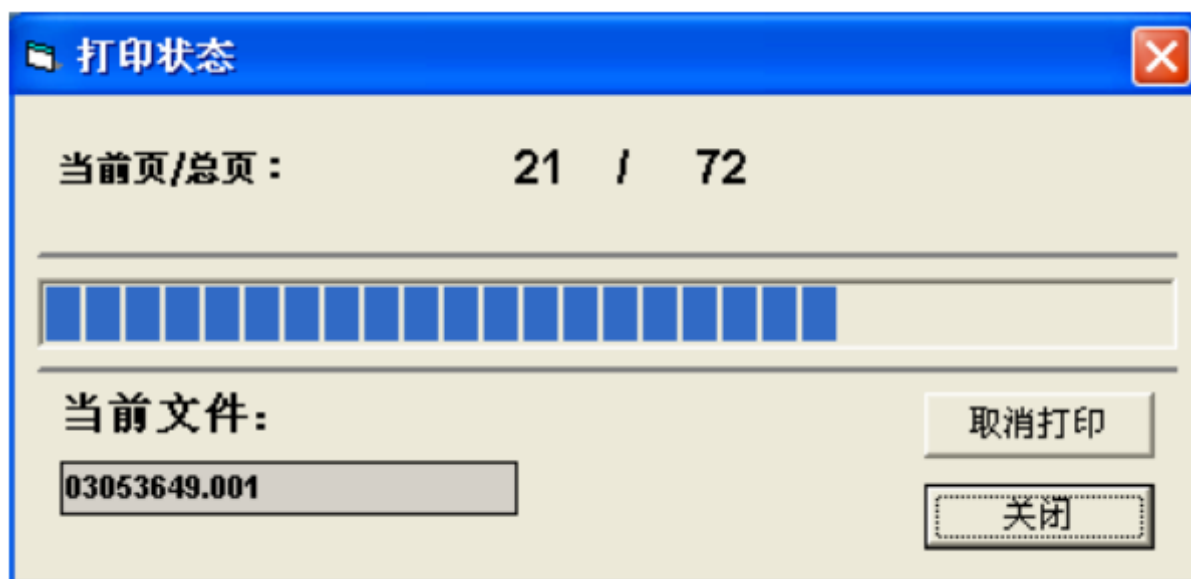


Figure 6-8 Overall print-area control

- Function 2 — zoom of print area. Click [Zoom size] for the menu in Figure 6-9, or type a zoom value in the current-ratio box.



Figure 6-9 Print-area zoom size

6.2.3 Print file

Click the Print toolbar button (6.1 [3]) to open the print dialog (Figure 6-10).

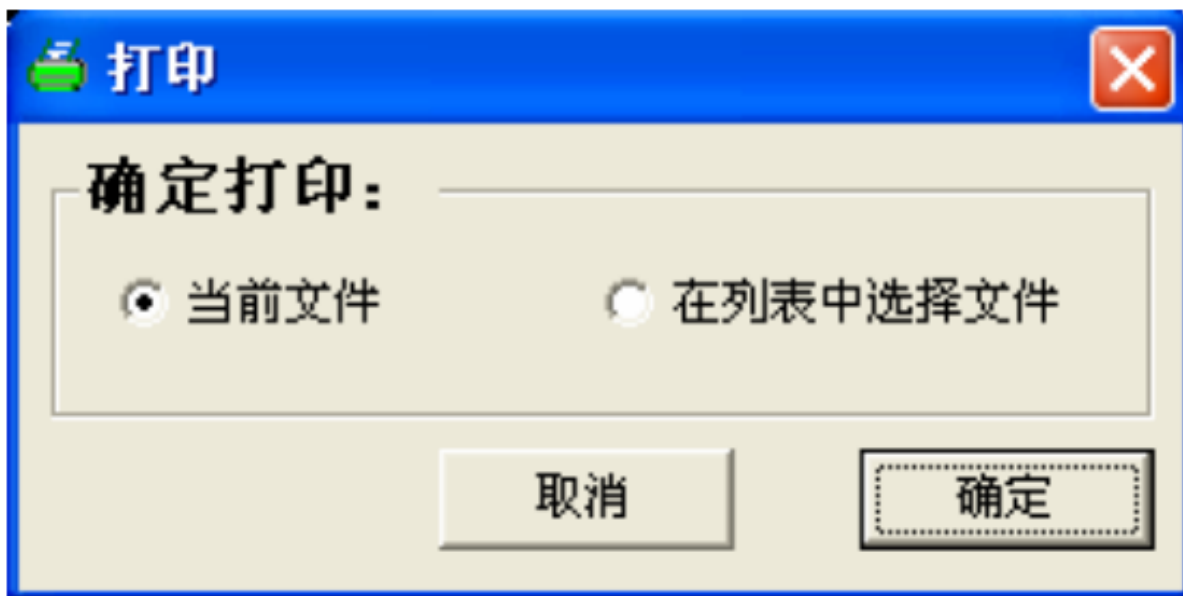


Figure 6-10 Select files to print

- ☐ Current file — print only the open file
- ☐ All files in list — print all checked files in the browser list in order

Click [Print Status] under menu [File] to view current print status (Figure 6-11).

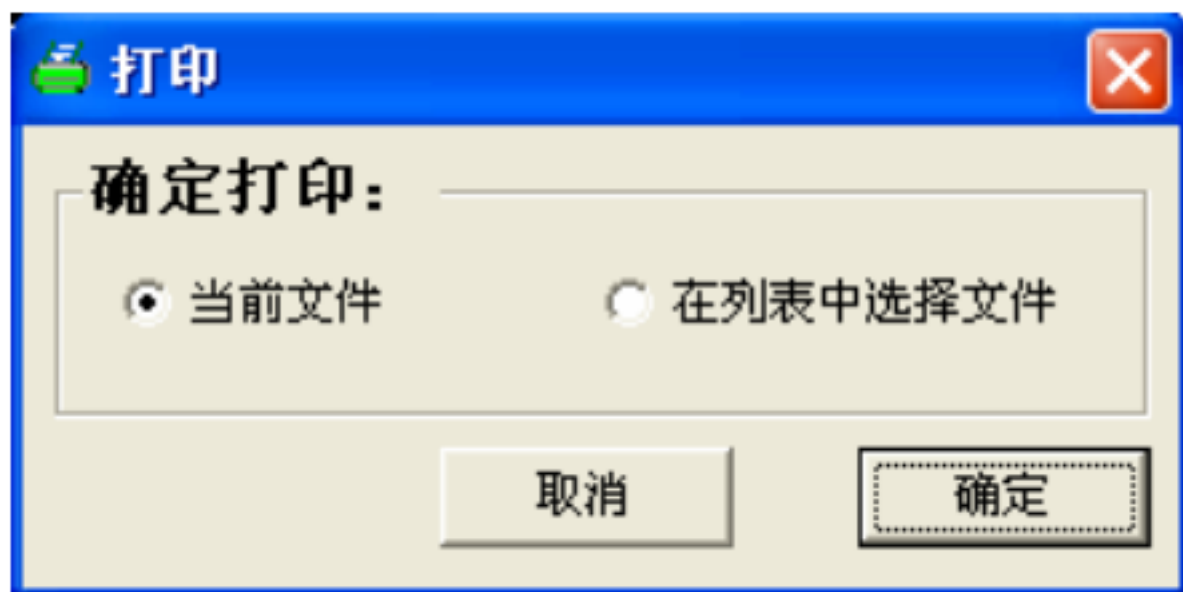


Figure 6-11 Print status

- [Current page / Total] — Printed file number / total files to print
- [Current file] — File currently printing
- [Cancel print] — Cancel print queue and close status window
- [Close] — Close print status window

6.2.4 Save file and export data

Click Save (6.1 [2]) to open a dialog (Figure 6-12). Specify storage path, enter filename (defaults to current), and choose save type (image or data).

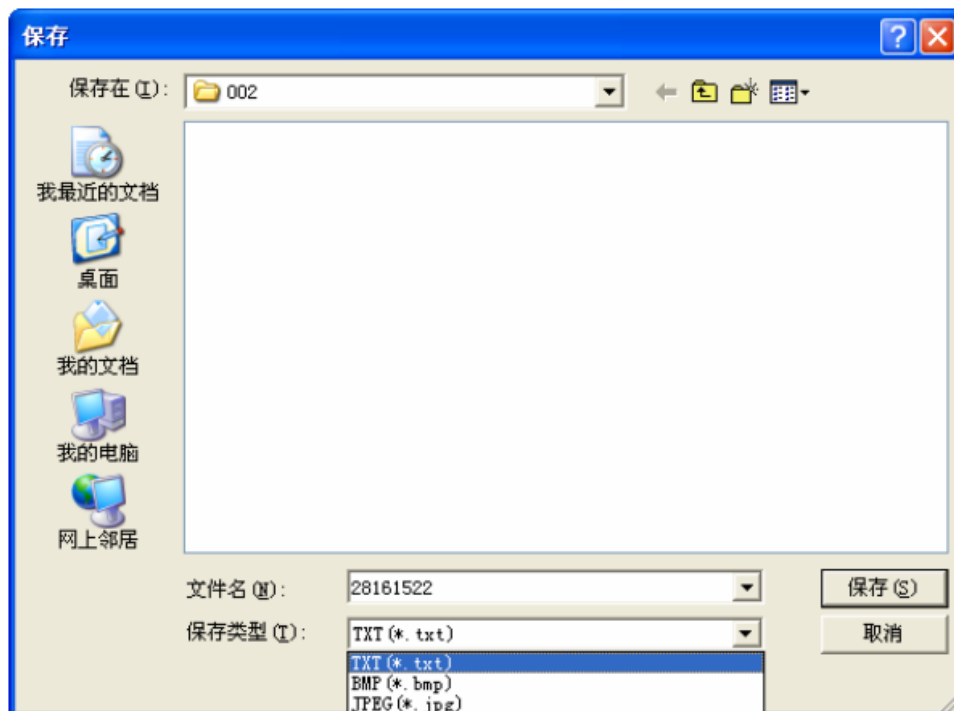


Figure 6-12 Save file / export data

- 1) If type is BMP or JPEG, an image file (.bmp or .jpg) is created in the directory.
- 2) If type is TXT, the export text-data dialog opens (Figure 6-13).

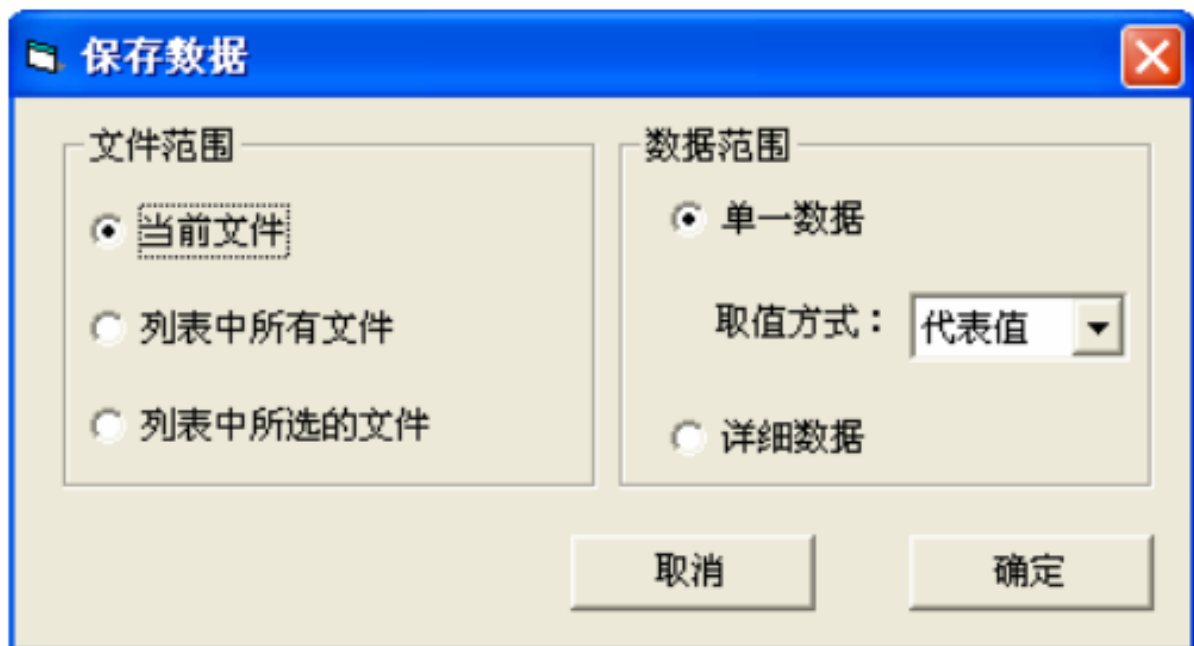


Figure 6-13 Export text data

[File range] specifies which files to export; [Data range] specifies content per file — current channel data or all detailed data. Click OK to create a .txt file; format see 6.5.2.

- [Single data] — One set of beat data per file. Value method: Representative = any one beat; Median = median of up to 9 beats; Mean = mean of up to 9 beats.
- [Detailed data] — Export all analysis results.

6.3 Print Settings

Print settings control printed data and waveform markers, as follows:

页面设置

尺寸/样式：

1导联_所有波形_A4纸_2张

幅度：

1

线宽：

粗

☒ 格线

速度：

Std * 1

校正：

X

-1%

0%

1%

-0.1%

Y

-1%

0%

1%

0.6%

调整范围：1

☐ X/Y 绑定

应用

全部应用

确定

Figure 6-14 Print settings

- ☐ Marker settings — markers for analysis feature positions (Figure 6-15)
- ☐ Mark: whether to mark feature positions on the waveform; Type and Size available only when checked
 - Type: line, ellipse, or triangle
 - Size: 1–20



Figure 6-15 Feature-position markers

- ☐ Landscape / Portrait — paper orientation when printing
- ☐ Print mode — waveform, data, or both
- ☐ Preview mode — brief or clear mode; clear mode previews actual print quality

Click the Settings button on the toolbar to open the print settings page.

- ☐ Page settings:

[Size/Style] — four options:

Option	Meaning
3 leads_1 beat_A4_1 page	3 leads, current beat, one A4 page
6 leads_1 beat_A4_1 page	6 leads, current beat, one A4 page

Option	Meaning
1 lead_10 beats_A4_1 page	1 lead, 10 beats, one A4 page
1 lead_all waveforms_A4_2 pages	1 lead, all waveforms, two A4 pages

Note: Current beat and current lead must be set in the ECG editing module.

- [Amplitude] — ECG display scale; reference ruler scales together
- [Speed] — Horizontal waveform scale; ECG coordinate ruler scales together; affects time per small grid
- [Grid] — Whether to print ECG coordinate grid
- [Line width] — Waveform line width

☐ Calibration: Ideally each small grid of the printed ECG ruler is 1 mm wide and high; if not, adjust via calibration.

X and Y percentage changes can be adjusted with the sliders in Figure 6-16. ☐ X/Y bind] links both. [Adjustment range] click the number to edit (1–10) to set slider range (1%–10%).

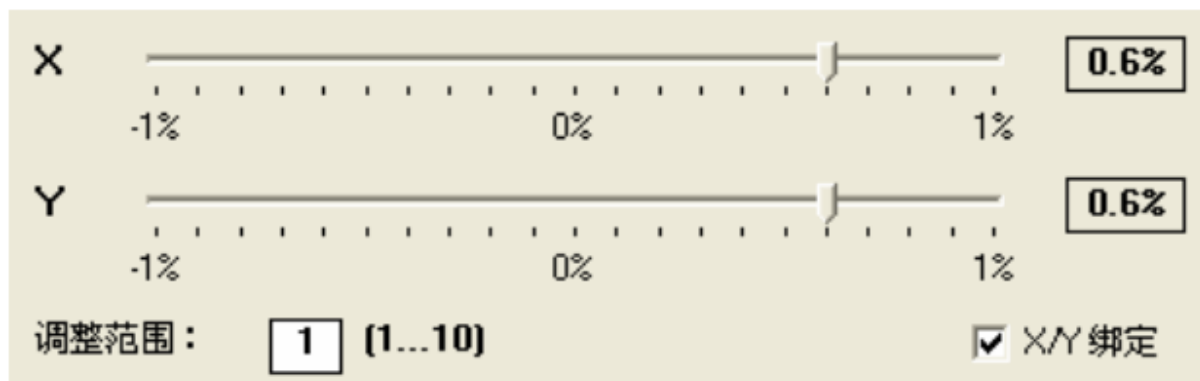


Figure 6-16 Calibrate coordinate ruler

- [Apply] — Apply settings to current file
- [Apply all] — Apply settings to all files
- [OK] — Apply to current file and close settings

6.4 Menu Item Descriptions

Group	Menu item	Description
File	Open (Ctrl+O)	Open file
File	Save (Ctrl+S)	Export text data or image
File	Print setup (Ctrl+T)	System print setup dialog (rarely needed)
File	Print (Ctrl+P)	Print; see 6.2.3
File	Print status (Ctrl+Q)	View print status; see 6.2.3
File	Exit (Ctrl+X)	End program
Edit	Copy to clipboard (Ctrl+C)	Copy print preview to clipboard for other apps
Edit	Apply all (Ctrl+A)	Apply print settings to all files
View	Save window settings (Ctrl+Z)	Save all window settings
View	Toolbar / Status bar (Ctrl+F1/F2)	Show/hide
View	Zoom in / out (Ctrl+I / Ctrl+U)	Print-area view zoom
View	Browser (Ctrl+E)	Show/hide browser
Mode	Waveform+Data (F2) / Data (F4) / Waveform (F3)	What to print
Mode	Print mode settings (Ctrl+G)	Page settings dialog; see 6.3 ☐ ☐
Page	Landscape (Ctrl+H) / Portrait (Ctrl+V)	Paper orientation (as labeled in source)
Page	Brief / Clear preview (Ctrl+N / Ctrl+D)	Preview mode; see 6.3 ☐

Group	Menu item	Description
Page	Markers (Ctrl+M)	Analysis feature markers; see 6.3 □
Help	About... (F1)	Version information

6.5 Appendix

6.5.1 Response to the ECG editing module

When Print is clicked in the ECG editing module, the print module adds the file to the list (if not already present) and opens it; the browser window is then hidden (Figure 6-17). Subsequent operations are the same as 6.2.3 Print file.



Figure 6-17 ECG editing prints the edited file

6.5.2 Exported text data format

1. [Data range] = current channel:

SOFTRON ECG PROCESSOR(2006), ECG Measure datum:

DATE , TIME , ANIMAL , STUDY No. , WEIGHT , SEX/AGE , comment , HR , SAMPLING , Pa , P'a , Q , R , S , R' , S' , ST , T , T' , Pd , QRS , RR , PR , QT , QTc , QTc(G) , QTcT1 , QRSa , AXIS

06/11/03 , 05:35:19 , 001 , 001 , 0.5Kg , M/0.5Mon , 1ome remark about the animal , 59 , 500s , 12 , 0 , 0 , 163 , -49 , 0 , 0 , -5 , 44 , 0 , 40 , 60 , 1018 , 142 , 246 , 244 , 224 , 234 , 163 , 60

- Line 1: file title
- Line 2: names of analyzed items
- Following lines: analysis results per channel; one file exports one row

Note: If data range is current channel, use comma as separator when importing into Excel.

2. [Data range] = detailed data:

Each file occupies one block; each block has regions (Figure 6-18):

- Region 1: full path of the file
- Region 2: MD5 hash generated at export
- Region 3: animal information
- Region 4: current-beat 6-channel analysis results
- Region 5: all 9-beat analysis results for the current channel

Source File:C:\Documents and Settings\kejie.shao\桌面\tnp\03052012-001

Softron ECG Processor 2006 MD5: 98ff113cb02ce9b50fd69565451fd00a

Study infonation:

64

域2

Date : 06/11/03

Time : 05:28:19

Animal No : 001

Study No : 001

Weight : 0.5Kg

Sex/Age : M/0.5Mon

Comment : some remark about the animal

HR : 59

Sampling : 500 per sec

AXIS : 162 deg.

域3

The 6 channels ECG analysis,

Current Wave:1,

MEASUREMENT : (1/100 mV,ms)

域4

Pa

P'a

Q

R

S

R'

S'

ST

T

T'

Pd

QRS

RR

PR

QT

I

9

0

0

110

-8

0

0

0

16

0

40

60

1018

142

248

II

12

0

0

161

-48

0

0

-5

43

0

42

60

1020

142

248

III

0

0

0

58

-48

0

0

-6

28

0

42

60

1018

142

248

AVL

-11

0

-137

37

0

0

0

4

-29

0

42

62

1018

142

248

AVR

0

0

0

36

0

0

0

3

-7

0

40

60

1020

142

246

AVF

8

0

0

111

-54

0

0

-6

35

0

40

62

1018

142

248

域5

The 10 waves ECG analysis,

Current Channel:2,

MEASUREMENT : (1/100 mV,ms)

Pa

P'a

Q

R

S

R'

S'

ST

T

T'

Pd

QRS

RR

PR

QT

QTc

QTcG

QTcT1

QRSa

0

12

0

0

161

-48

0

0

-5

43

0

40

60

1018

142

248

246

226

236

161

1

12

0

0

162

-48

0

0

-5

44

0

42

60

1020

142

248

246

226

236

162

2

12

0

0

162

-49

0

0

-5

44

0

42

60

1018

142

248

246

226

236

162

3

13

0

0

162

-49

0

0

-5

44

0

42

62

1018

142

248

246

226

236

162

4

13

0

0

161

-49

0

0

-6

43

0

40

60

1020

142

246

244

224

234

161

5

12

0

0

162

-49

0

0

-5

44

0

40

62

1018

142

248

246

226

236

162

6

12

0

0

162

-47

0

0

-5

45

0

40

62

1018

140

248

246

226

236

162

7

11

0

0

163

-48

0

0

-5

45

0

38

60

1018

142

248

246

226

236

163

8

12

0

0

163

-48

0

0

-4

45

0

40

62

1020

142

248

246

226

236

163

9

12

0

0

161

-48

0

0

-5

43

0

40

60

1018

142

248

246

226

236

161

MEAN

12.00

0.00

0.00

162.00

-48.0

0.00

0.00

-5.0

44.00

0.00

40.00

61.00

1019.00

142.00

248.00

246.00

226.00

236.00

162.00

SD

1.00

0.00

0.00

1.00

1.00

0.00

0.00

0.00

1.00

0.00

1.00

1.00

1.00

1.00

1.00

1.00

1.00

1.00

1.00

1.00

Figure 6-18 Exported data regions

Notes on some results:

$$QTc(G) = \text{measured QT} + (HR - 100) \times 0.535$$

$$QTc(T1) = \text{measured QT} + (HR - 100) \times 0.287$$

where HR is heart rate.

$$QRSa = R + |Q|$$

where R is R-wave height and Q is Q-wave height.

7. Appendix: System Installation

7.1 Starting Installation

Click the executable application in the installation package to enter the installation program wizard pages.

7.2 Installation Wizard Steps

Step 1 — Prepare to install

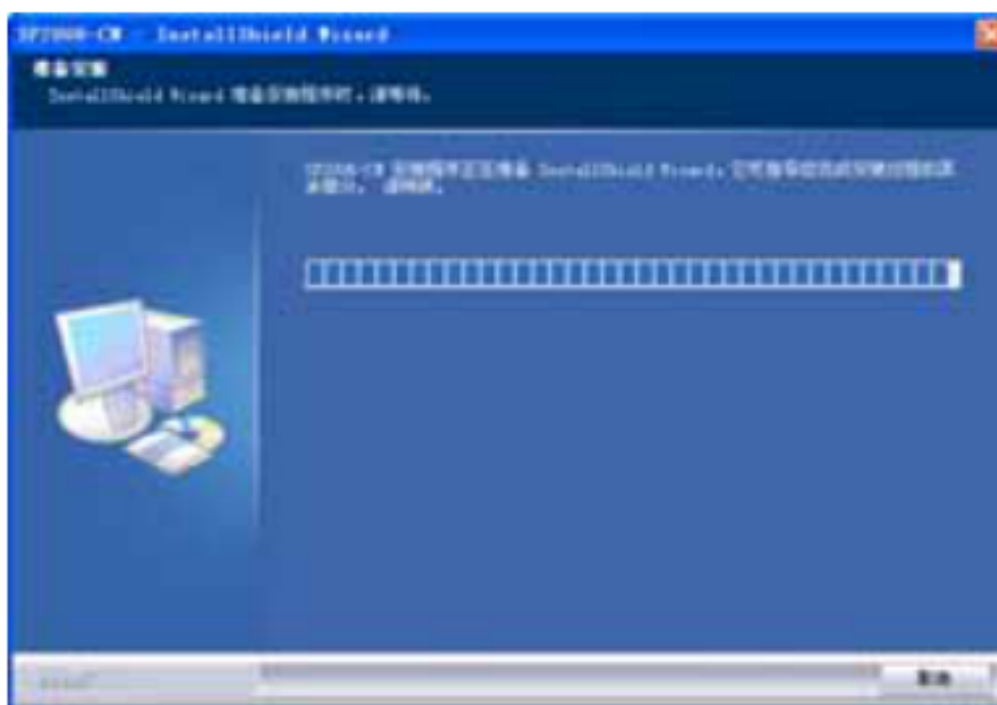


Figure 7.1 Prepare to install

Step 2 — Enter your information



Figure 7.2 User information

Step 3 — Choose installation path

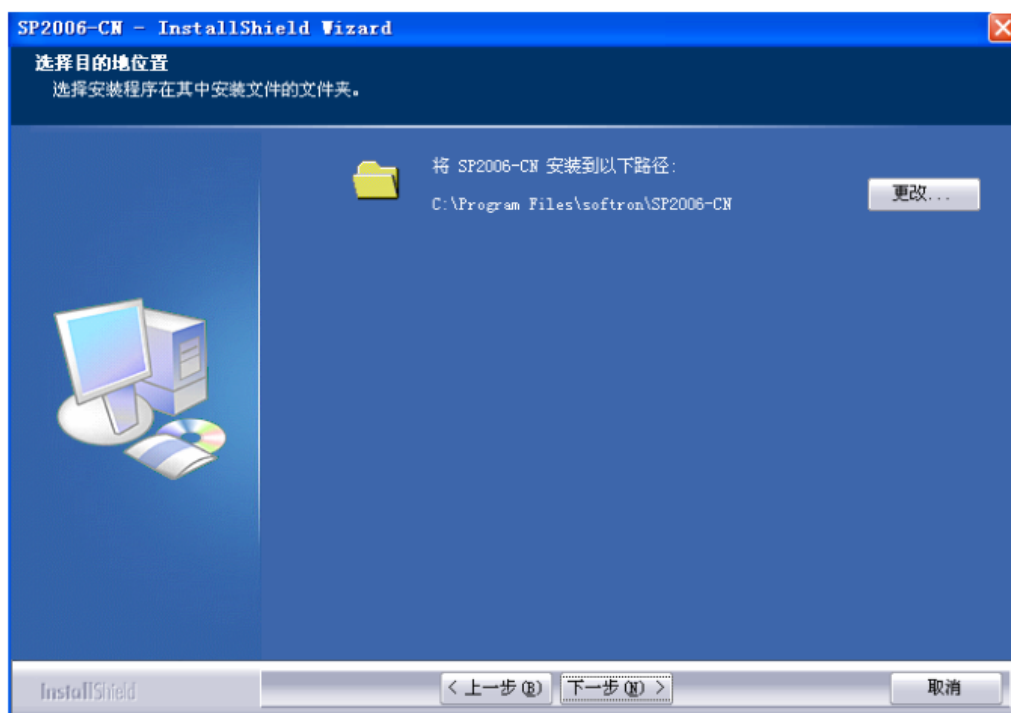


Figure 7.3 Choose installation path

Step 4 — Install

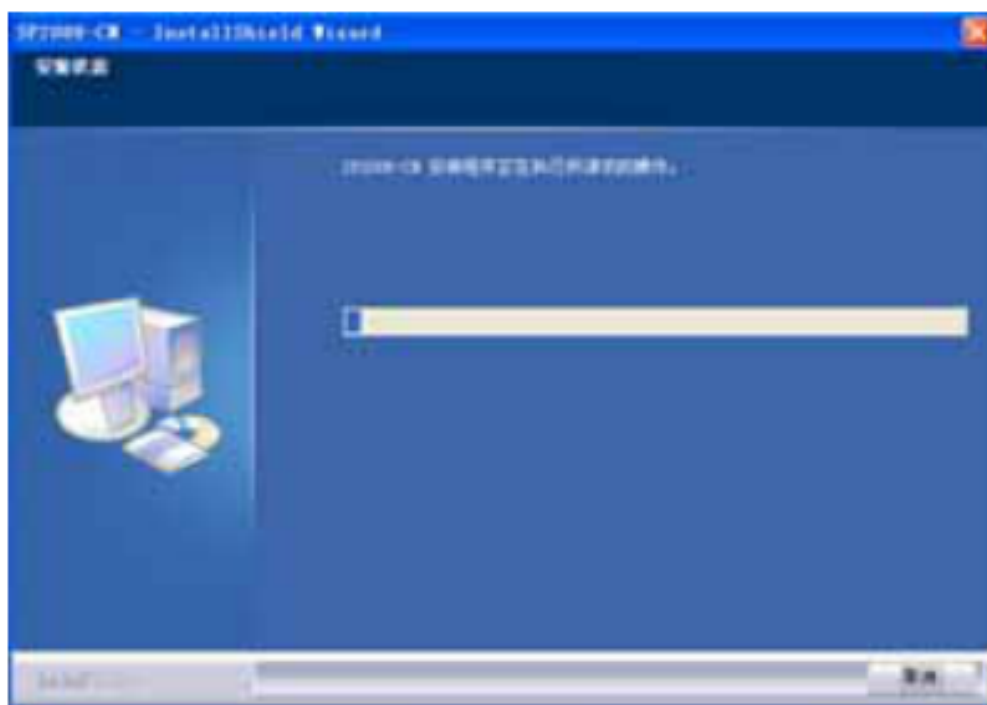


Figure 7.4 Install

Step 5 — Installation complete

After installation, the system may show the screen in Figure 7.5 or Figure 7.6.

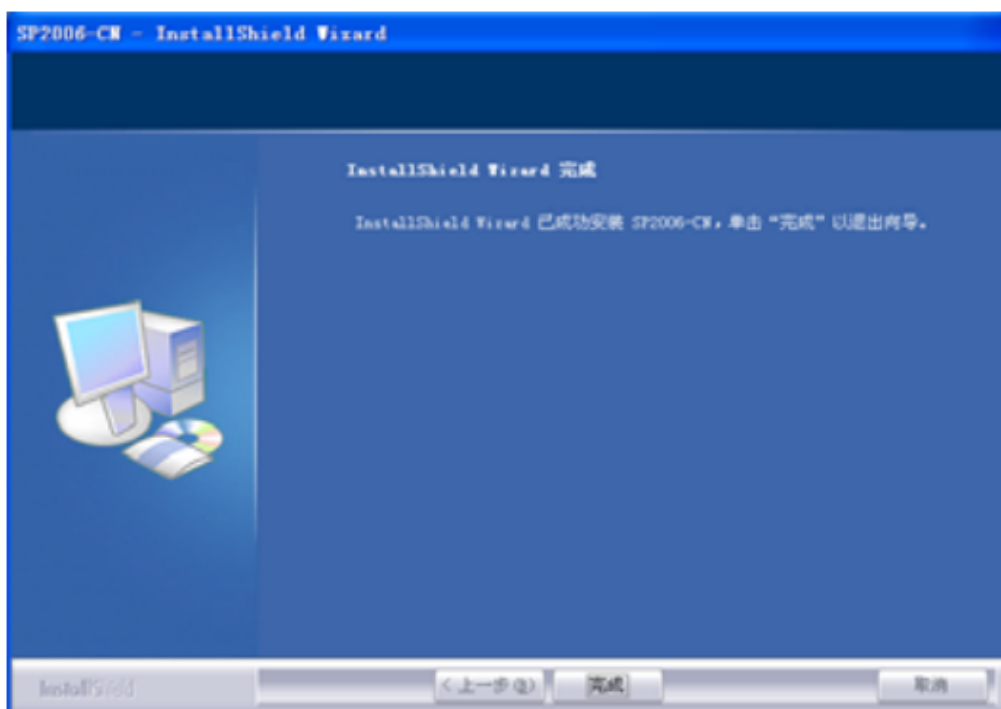


Figure 7.5 Installation complete — restart not required



Figure 7.6 Installation complete — restart required

Note: If you do not restart, the software may not start normally.