8	‘8’ font ring
0.01 (amplitude)	The amplitude at 0.01s from QRS loop
0.01 (angle)	The angle at 0.01s from QRS loop
0.02 (amplitude)	The amplitude at 0.02s from QRS loop
0.02 (angle)	The angle at 0.02s from QRS loop
0.03 (amplitude)	The amplitude at 0.03s from QRS loop
0.03 (angle)	The angle at 0.03s from QRS loop
0.04 (amplitude)	The amplitude at 0.04s from QRS loop
0.04 (angle)	The angle at 0.04s from QRS loop
Start Vector	Start point of QRS loop
End Vector	End point of QRS loop
ST Vector	The position of ST vector in vector loop
Length/Width	The ratio of length to width in T loop
T-R angle	The degree between the Max vector of T loop and the Max vector of QRS loop (degree)

F- Click on **3D** to display the 3D VCG graph.

G- Diagnosis Field

1. Enter your own opinions in the **Auto Diagnosis** textbox, and then click on the **Save** button.
2. Or, double-click on the necessary results required to be added in the **Glossary** textbox, and the selected results will be displayed in the **Auto Diagnosis** textbox, and then click on the **Save** button.

6.6.7.2 Displaying Vector ECG with Frontal Plane and QRS Loop

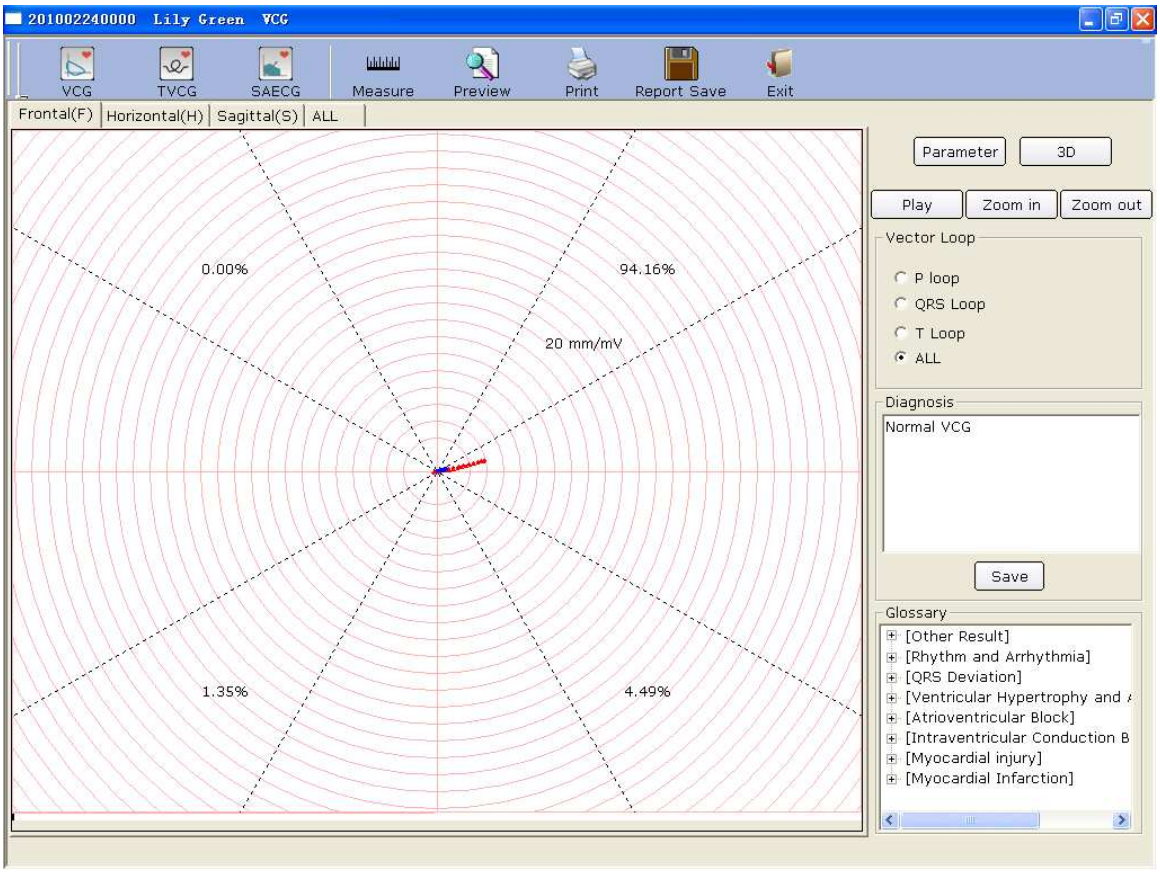


Figure 6-25 Vector ECG - Frontal & QRS loop

The percent values of **0.00%**, **94.16%**, **1.35%** and **4.49%** in the square represent the area percentages of QRS loop in every quadrant. **20 mm/mV** indicates the magnified multiple (gain). The red curve is QRS loop.

You can click on the **Zoom in** button or the **Zoom out** button to change the gain of the displayed graphics. You can click on the **Play** button to watch the forming process of the QRS loop.

6.6.7.3 Displaying 3D Vector ECG

Click on **3D** to display the 3D VCG graph.

3D (Three Dimensional Vector Loops)

This function allows you to observe the Vector ECG in three dimensions.

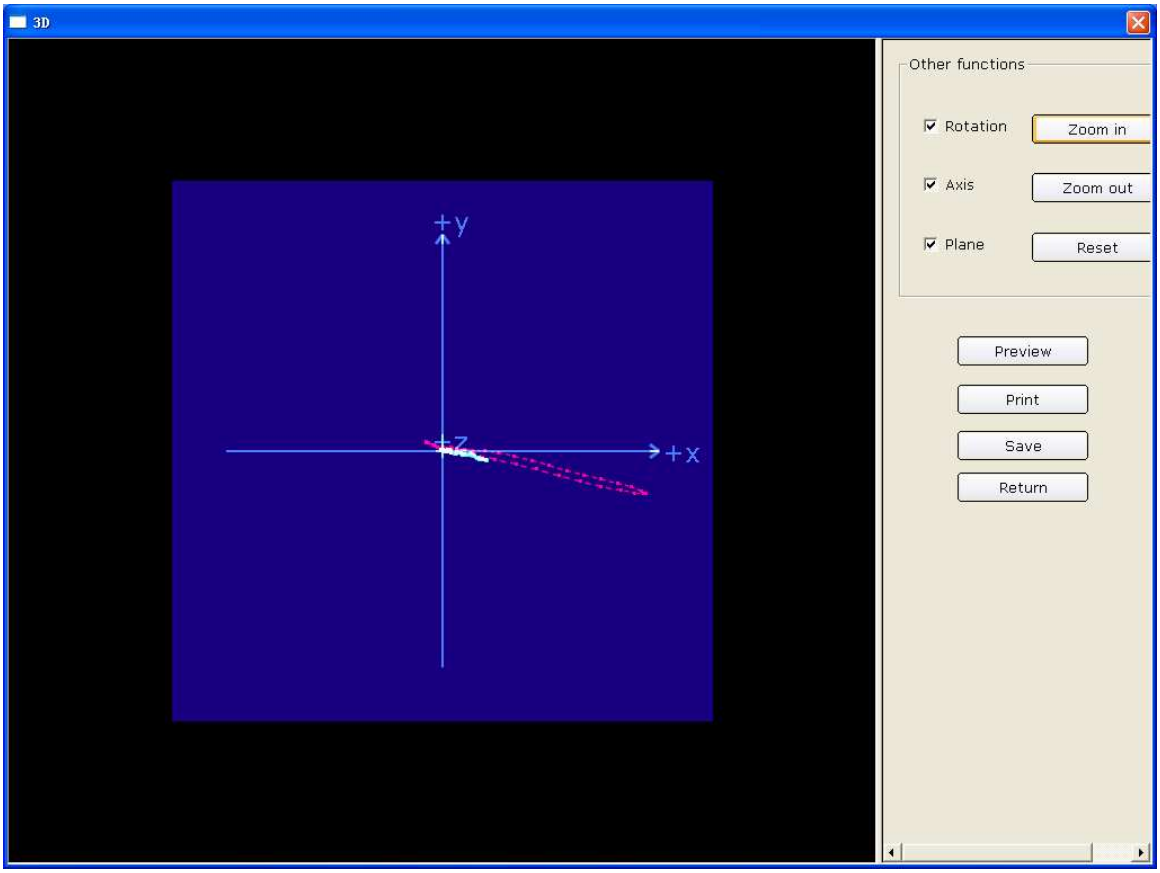
Select **Rotation**, and then you can rotate the whole picture to view all directions of the vector loops by clicking the mouse.

Select **Axis** to display the axes.

Select **Plane** to display the planes.

Click on **Zoom In**/ **Zoom Out** to magnify/minify the picture.

Click on **Reset** to restore the magnified/minified picture to original size.



Click on **Preview** to preview the 3D graph.

Click on **Print** to print the 3D graph.

Click on **Save** to save the graph on the current screen.

Click on **Return** to return to the ECG analysis screen.

6.6.7.4 Previewing Vector ECG

Click on the **Preview** button to open the VCG preview screen.

is the toolbar on the VCG preview screen.

1. Click on **Print(P)** to print the report.
2. Click on **Next Page/Prev Page** to switch to the previous/next preview page.
3. Click on **Two Page** to preview two pages on one screen simultaneously.
4. Click on **Zoom In**/ **Zoom Out** to magnify/minify the preview page.
5. Click on **Close** to close the preview screen and return to the previous screen.

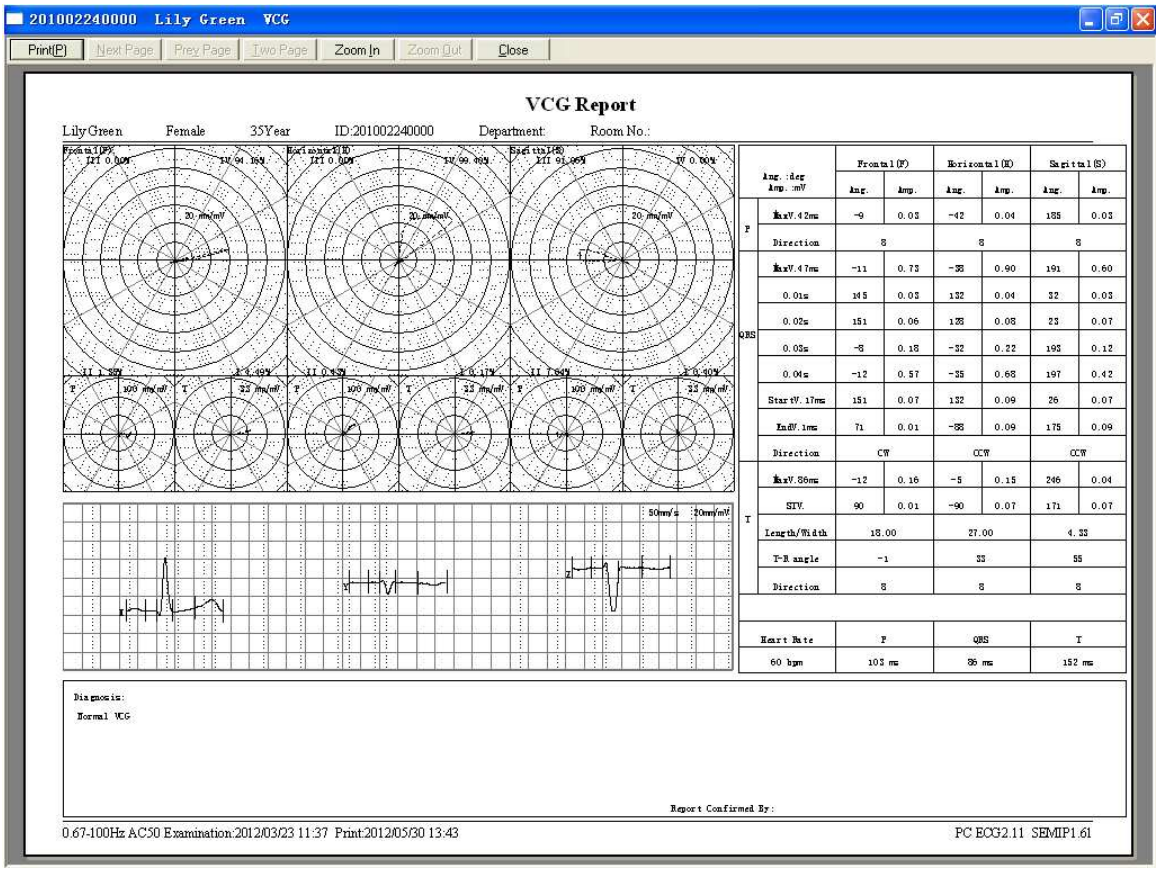
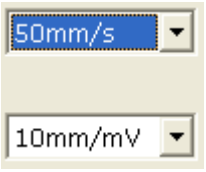


Figure 6-26 VCG Preview Screen (Plane is ALL & loop is ALL)

6.6.8 Analyzing Time Vector ECG

Click on the **TVCG** button on the ECG analysis screen to display the TVCG analysis screen. Time Vector ECG is Vector ECG including time factor.

As Figure 6-27 shows, you can observe waves of X lead, Y lead, Z lead, X-Y lead, X-Z lead and Z-Y lead.



You can choose the speed and the gain of the displayed waves.

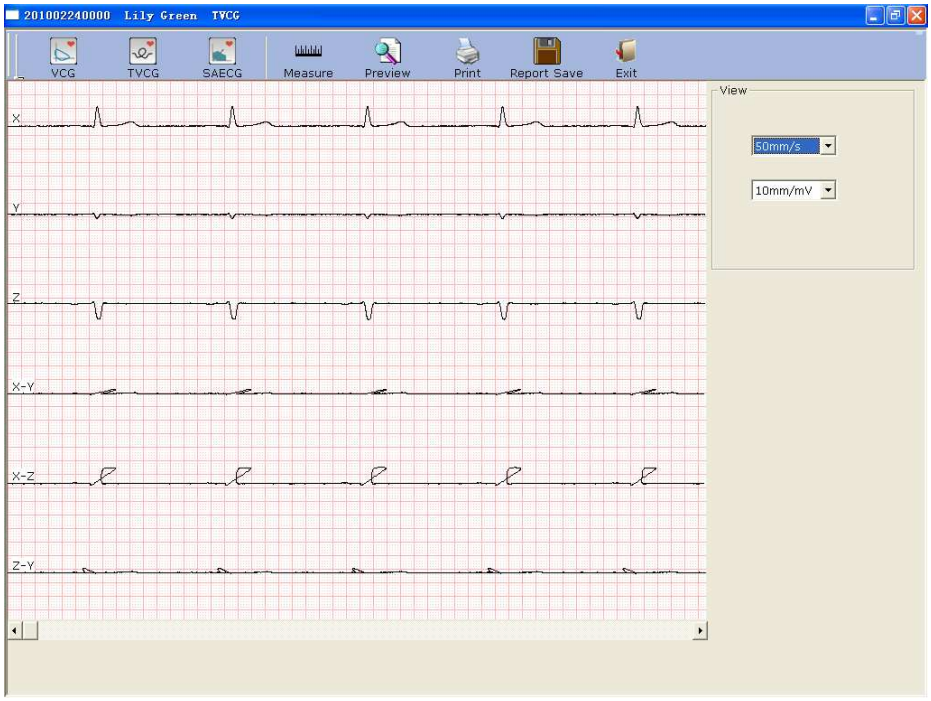


Figure 6-27 Time Vector ECG Screen

Click on the **Preview** button to display the TVCG preview screen.

is the toolbar on the TVCG preview screen.

1) Click on the **Zoom In** button on the toolbar to magnify the preview page.
2) Click on the **Zoom Out** button on the toolbar to minify the preview page.
3) Click on the **Close** button to close the TVCG preview screen and return to the previous screen.

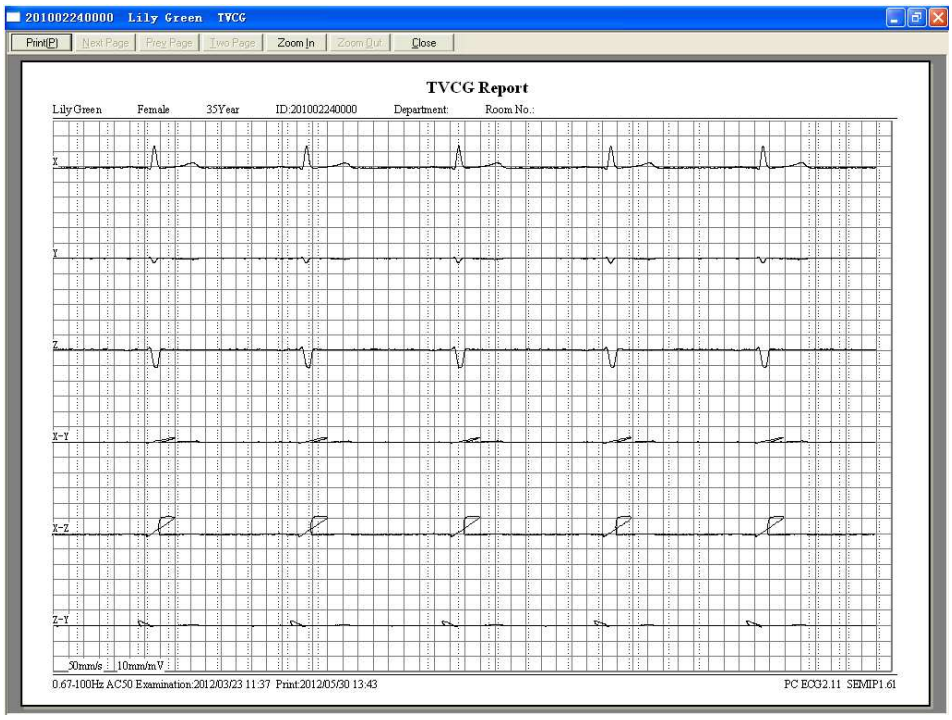


Figure 6-28 Time Vector ECG Preview Screen

6.6.9 Analyzing Signal Averaged ECG

SAECG is also called Ventricular Late Potential (VLP). Click on **SAECG** to open the SAECG analysis screen. The SAECG analysis screen includes two tabs: **Time domain** and **Frequency domain**.

6.6.9.1 About the Time Domain Window

Click on the **Time domain** tab to open the **Time domain** window.

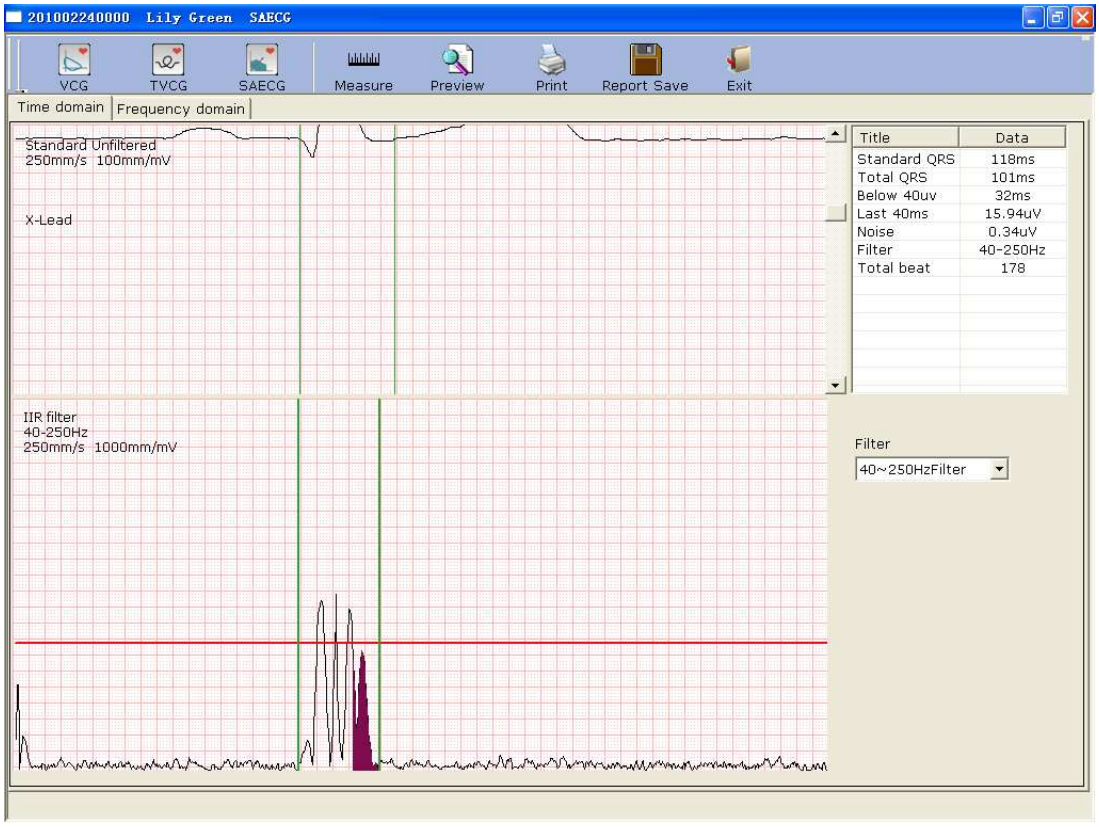
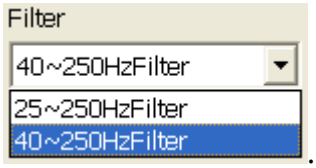


Figure 6-29 Time Domain Window

Every parameter of SAECG is shown in the following table.

Designation	**Description**
Standard QRS	QRS intervals measured on three-quadrature leads before filtering
Total QRS	The total QRS time for filtering and superimposing QRS waveform.
Below 40μV	The time of amplitude that is below 40μV for filtering and superimposing QRS waveform.
Last 40μV	The root mean square of amplitude in the last 40ms for filtering and superimposing QRS waveform.

Select a filter in the **Filter** pull-down list 

.

The top of the **Time domain** window is the window of standard superimposed QRS waveform. The left green line is the starting point of standard unfiltered QRS waveform, and the right green line is the end point. You can respectively drag the two green lines to change QRS duration.

The bottom of the **Time domain** window is the window of standard superimposed QRS waveform after filtering. The left green line is the starting point of standard filtered QRS waveform, and the right green line is the end point. You can respectively drag the two green lines to change QRS duration, and then the corresponding parameters in the right part will also change.

6.6.9.2 About the Frequency Domain Window

Click on the **Frequency domain** tab to open the **Frequency domain** window.

Figure 6-30 Frequency Domain Window

You can drag the green vertical lines on the ECG wave, and the corresponding parameters in the right part and the 3D graph in the bottom part will change.

6.6.9.3 Previewing Signal Averaged ECG

Click on the **Preview** button to display the SAECG preview screen.

is the toolbar on the SAECG preview screen.

- Click on **Print(P)** to print the report.
- Click on **Next Page/Prev Page** to switch to the previous/next preview page.
- Click on **Two Page** to preview two pages on one screen simultaneously.
- Click on **Zoom In/ Zoom Out** to magnify/minify the preview page.
- Click on **Close** to close the preview screen and return to the previous screen.

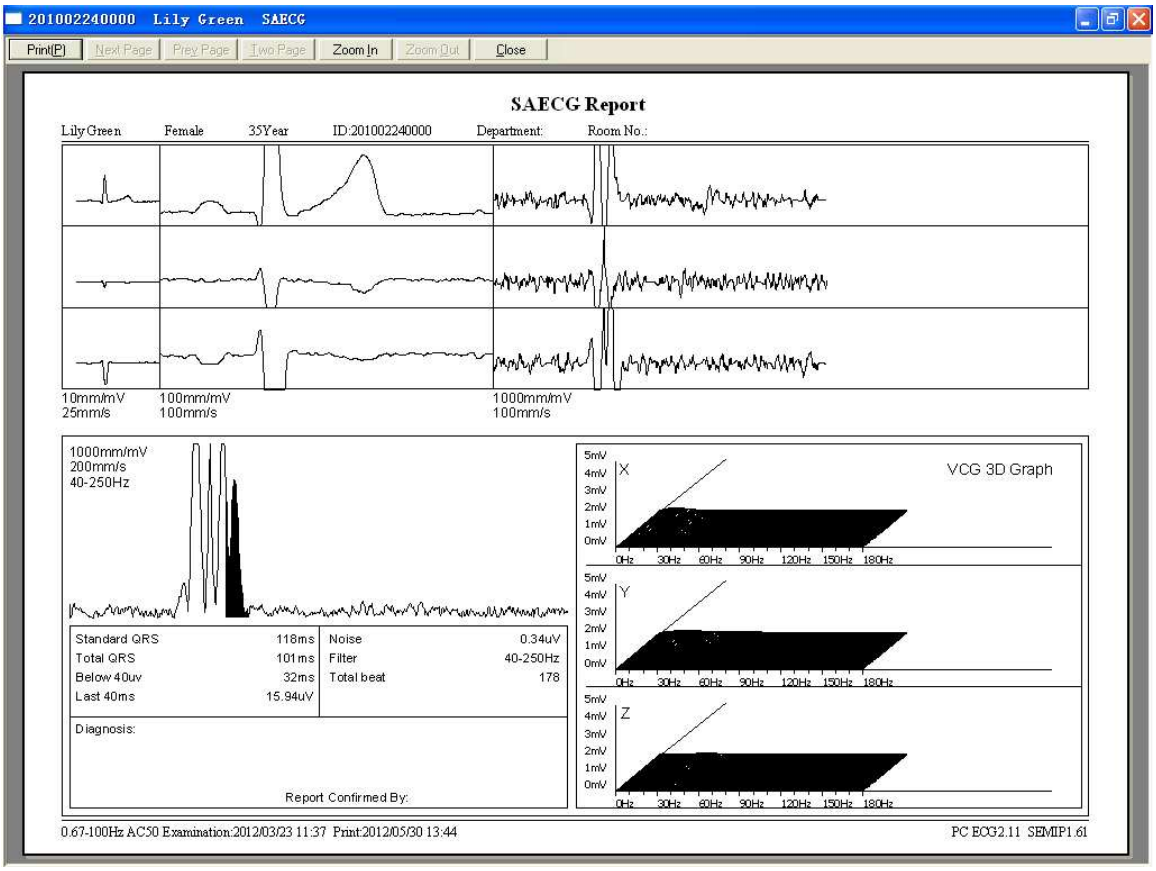
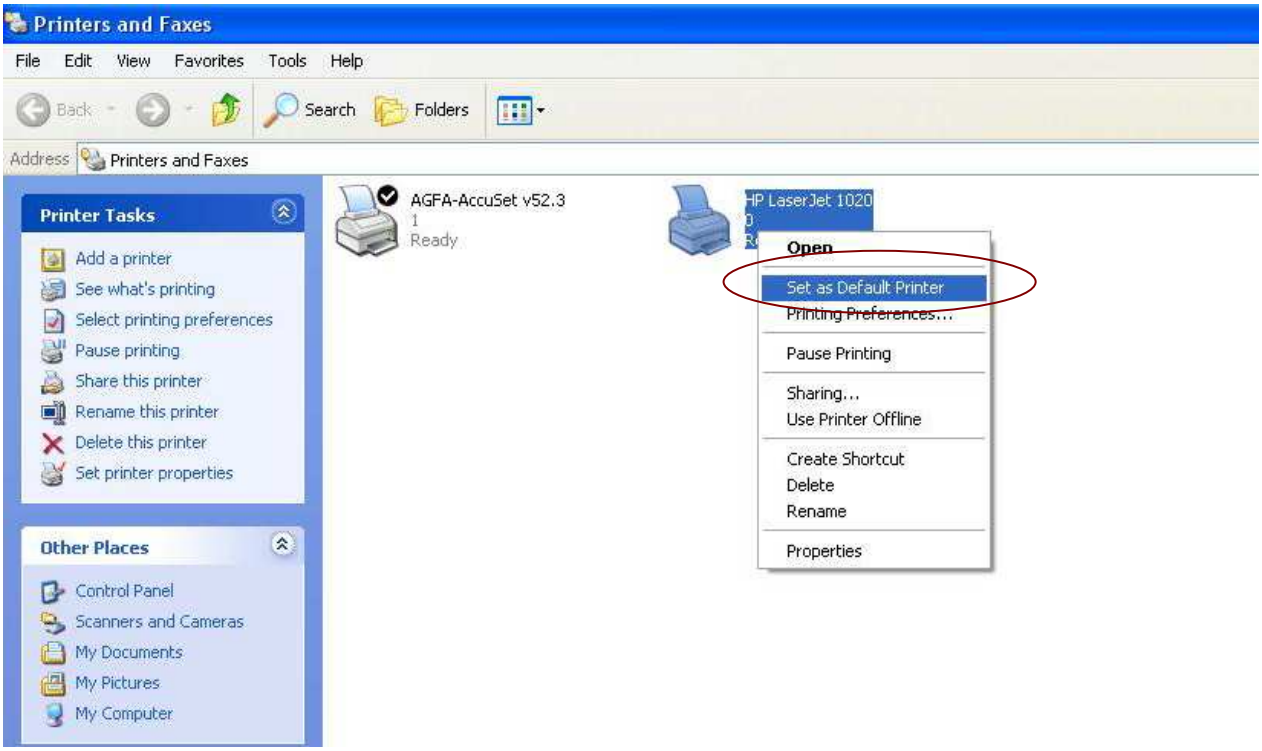


Figure 6-31 Signal Averaged ECG Report

6.6.10 Printing ECG Reports

1. Choose **Start** > **Printers and Faxes**, and then right-click on the icon of the printer used, and select **Set as Default Printer**. Then close the **Printers and Faxes** window.



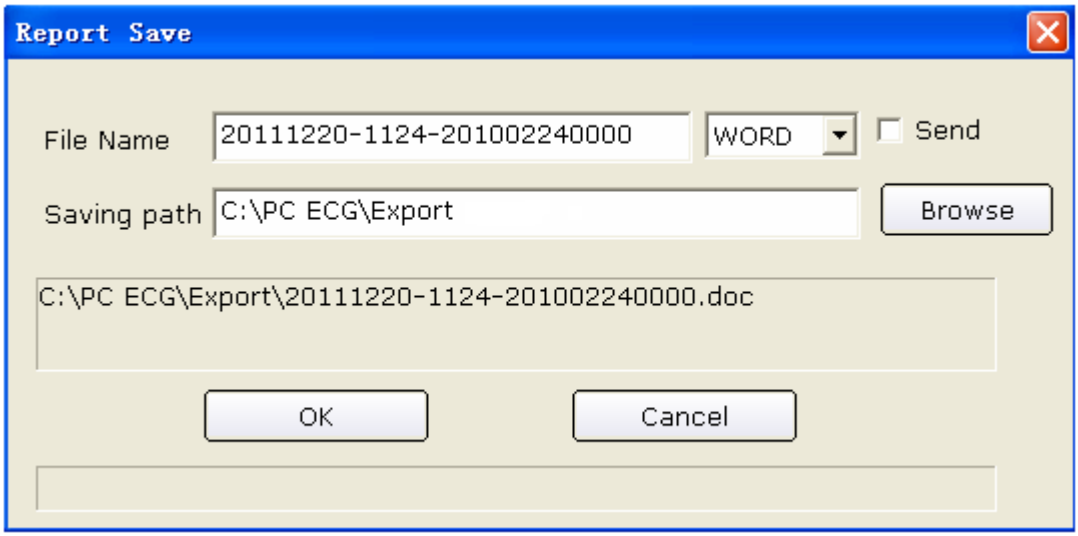
2. Click on the **Print** button on the analysis screen to print an ECG report.
3. Or, click on the **Print** button on the preview screen to print an ECG report.

6.6.11 Saving ECG Reports

You can click on the **Report Save** button 

to save ECG reports.

The report format includes **PDF**, **WORD**, **JPG** and **BMP**. Click on the **Browse** button to choose the save path and click on **OK** to save the sampled data to the designated directory. During the saving course, the system will give the hint information.



If you select **Send**, the sampled data will be sent by OUTLOOK EXPRESS (Windows XP) or Window Live Mail (Windows 7/Vista) when it is saved to the designated directory. During the saving and sending course, the system will give the hint information.

NOTE: In Windows 7/Vista, only if Window Live Mail is installed, can the report be sent by email.

6.7 Sampling STAT ECG

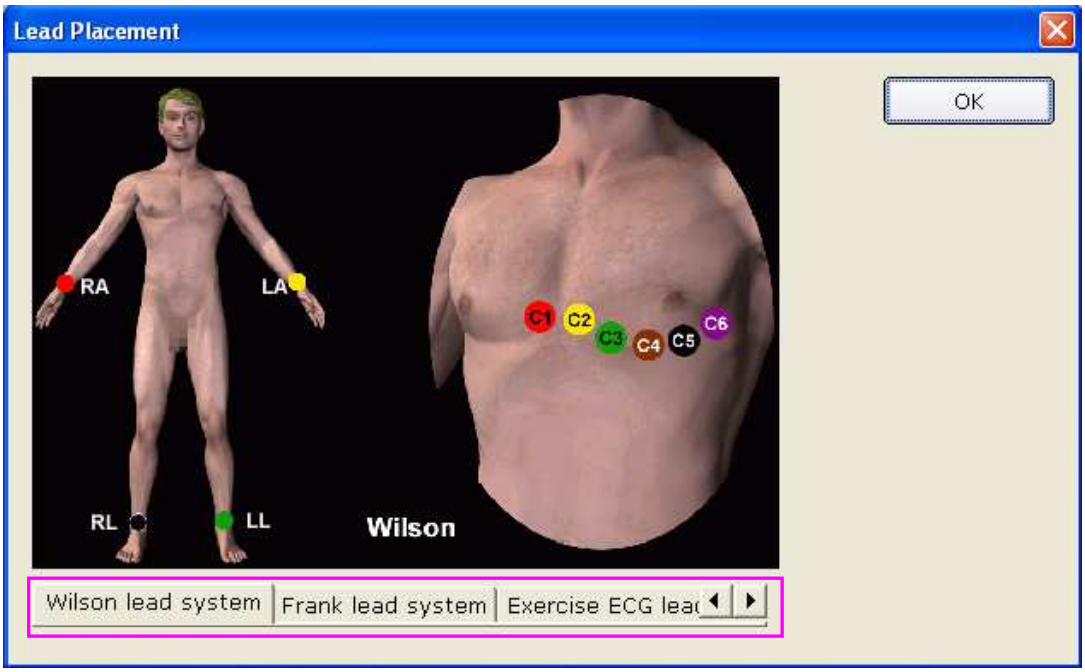
Click on the **STAT ECG** button on the main screen (Figure 6-1) to sample normal ECG directly without entering new patient information or selecting an existing patient record from the database before sampling. The system will automatically distribute a new patient ID.

Chapter 7 Operation Instructions for Exercise ECG

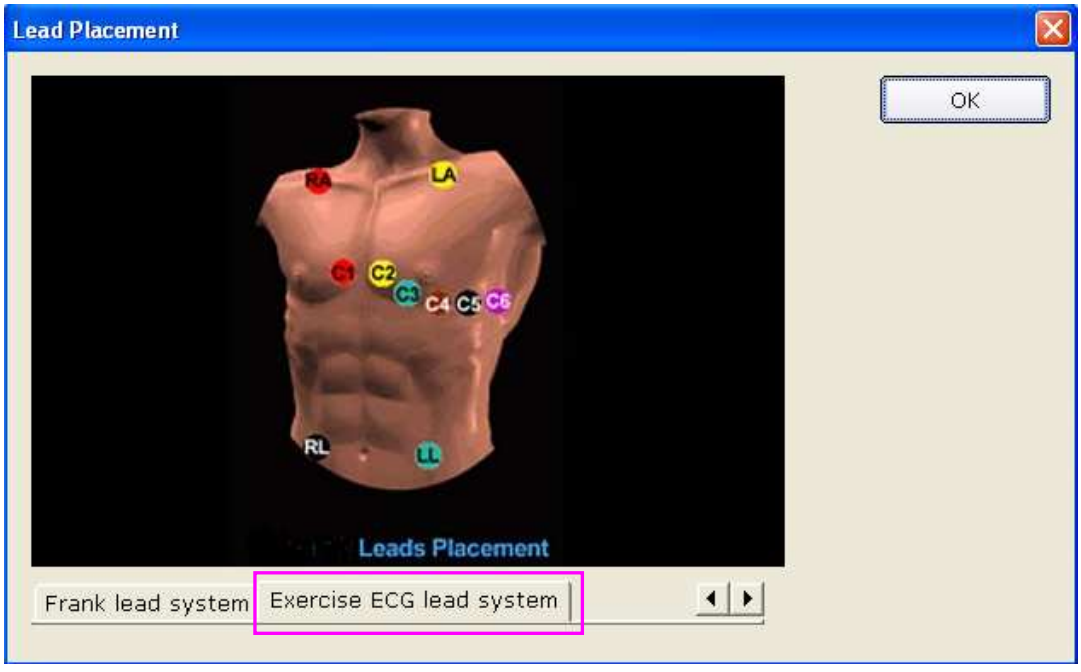
The exercise ECG function is optional. It is available only if you purchased this function.

7.1 Viewing Lead Placement Information

1. Click on the **Lead Placement** button on the main screen to display the **Lead Placement** window.

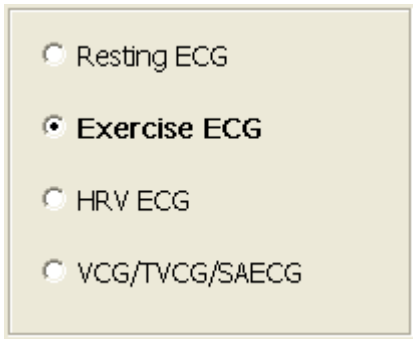


2. Click on **Exercise ECG lead system** to view the lead placement information.

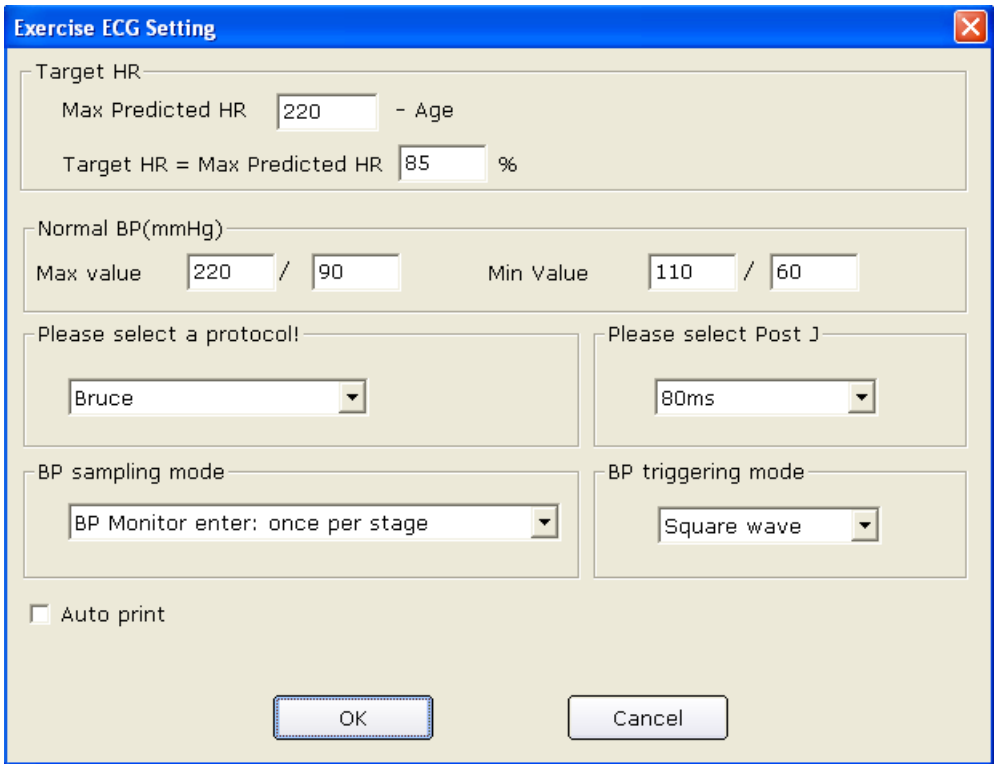


7.2 Selecting a Patient Record to Start a New Test

1. You can select a patient record from the database to start a new test. The operation steps are the same as those of resting ECG. For details, refer to Section 6.2, “Selecting a Patient Record to Start a New Test”.
2. Select **Exercise ECG** in the **Patient Information** window.

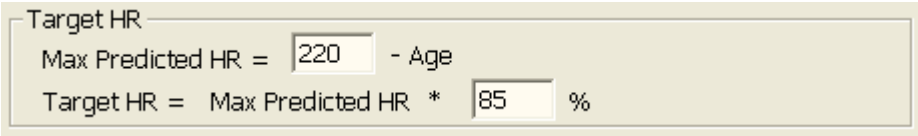


3. Click on **OK** in the **Patient Information** window to open the **Exercise ECG Setting** window. After setting the parameters, click on the **OK** button to open the pre-sampling screen.



7.2.1 Setting Target HR

The system applies the following formulas to calculate the target heart rate.

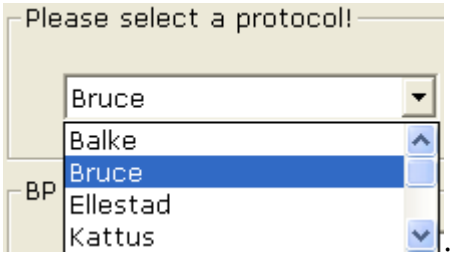


220 and **85** are default values, and you can modify them in different situations in the **Exercise ECG Setting** window.

7.2.2 Setting Normal BP

Set the normal BP range in the **Exercise ECG Setting** window. When the patient's BP exceeds the normal BP range, the system will consider it as abnormal status.

7.2.3 Setting a Protocol

Select a protocol from the pull-down list 

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7.2.4 Setting Post J

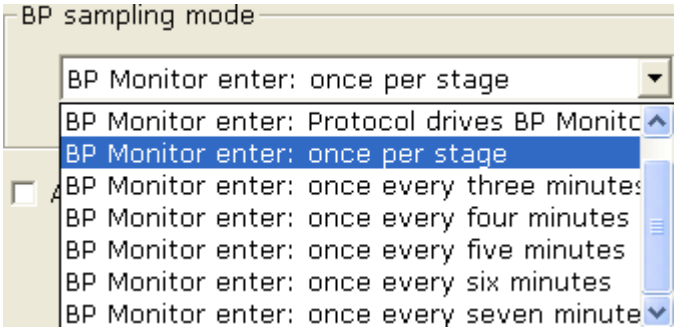
Select a Post J value from the Post J pull-down list in the **Exercise ECG Setting** window.

Post J is the length after J point of the ST segment. You can set Post J to **0ms**, **20ms**, **40ms**, **60ms** or **80ms**.

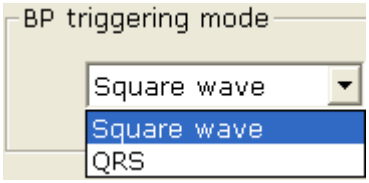
NOTE: J Point is the connection point between the end of QRS complex and the start of ST segment. It is the standard point to fix the position of ST segment in this system. Please select the proper option based on the patient's actual ECG waves.

7.2.5 Setting BP Sampling Mode

Select a BP sampling mode from the **BP sampling mode** list.



7.2.6 Setting BP Triggering Mode



You can set the BP triggering mode to **Square wave** or **QRS** in the **Exercise ECG Setting** window.

7.2.7 Setting Auto Printing

Select **Auto print** to print ECG reports automatically.

7.3 Entering New Patient Information

If the patient is a new one,

1. Click on the **New Patient** button 

on the main screen (Figure 6-1) to display the **Patient Information** window, and then enter the patient information. The operation steps are the same as those of resting ECG. For details, refer to Section 6.3, “Entering New Patient Information”.

NOTE:

1. Patient ID and age must be entered.
2. Please enter the correct patient age which has direct relationship with the calculation of the target heart rate.

2. Select **Exercise ECG** in the **Patient information** window.
3. Click on **OK** in the **Patient information** window to open the **Exercise ECG Setting** window. After setting the parameters, click on the **OK** button to open the pre-sampling screen. For details, please refer to Section 7.2, “Selecting a Patient Record to Start a New Test”.

7.4 Pre-sampling ECG

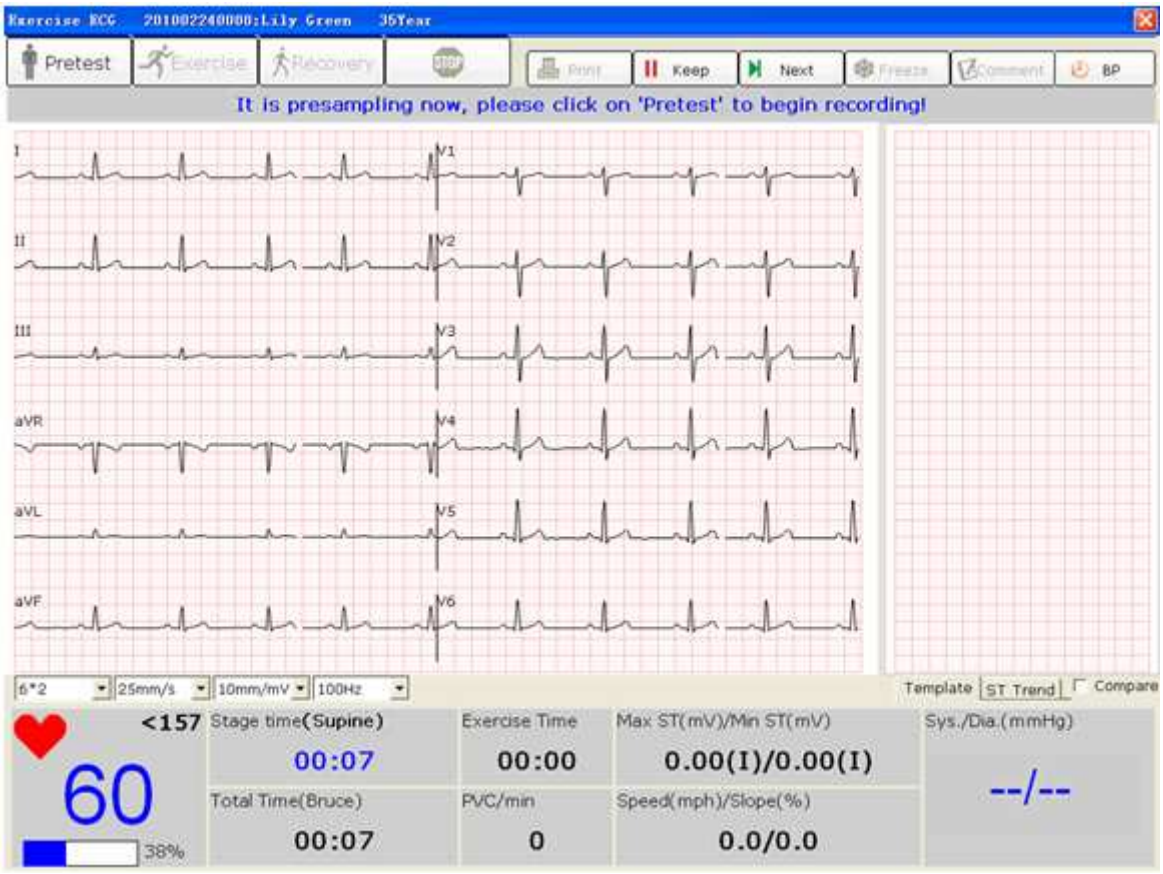
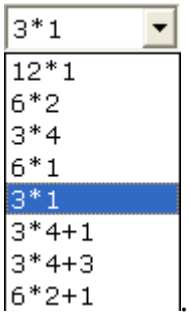


Figure 7-1 Pre-Sampling Screen

Click on **Pretest**/**Exercise**/**Recovery** to enter the relevant phase.

1. Select a display mode from the display mode pull-down list 

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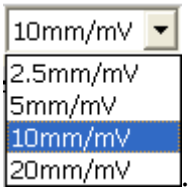
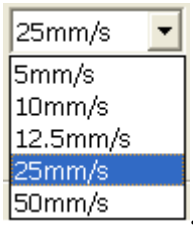
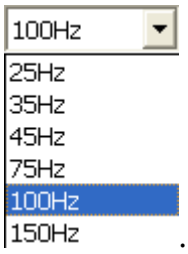
2. Select a gain from the gain pull-down list 

.

3. Select a speed from the speed pull-down list 

.

4. Select a lowpass filter from the lowpass filter pull-down list 

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7.5 Pretest Phase

Click on **Print** to print the wave of 10 seconds before you click on **Print**.

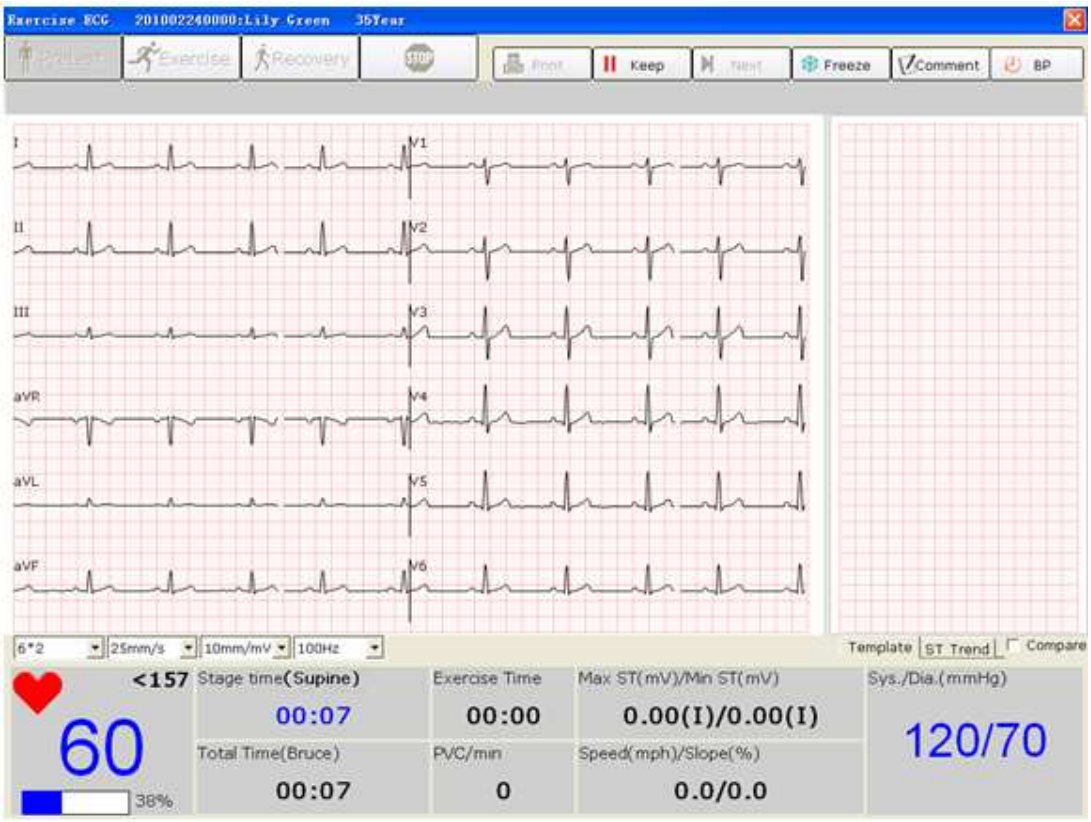
Click on **Keep,** the system will keep staying in the current phase, and the current speed and slope will also be kept until you click on **Keep** again.

Click on **Next**, the system will enter next phase/stage.

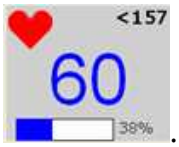
NOTE:

1. If the test time exceeds 40 minutes, the system will enter the monitoring status. Data will not be saved, analyzed or printed any more.
2. The length of the pretest phase is not fixed, but it should be no less than 15 seconds.
3. The pretest phase report will be printed at the fourteenth second.

When the tracings are satisfying and you have specified the desired settings, you can start the pretest.



7.5.1 Viewing the Heart Rate and the Blood Pressure

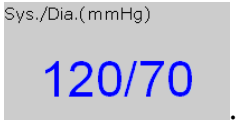
1. View the heart rate in the heart rate field 

. The middle number is the current heart rate, and the right number is the target heart rate.

   The symbol 

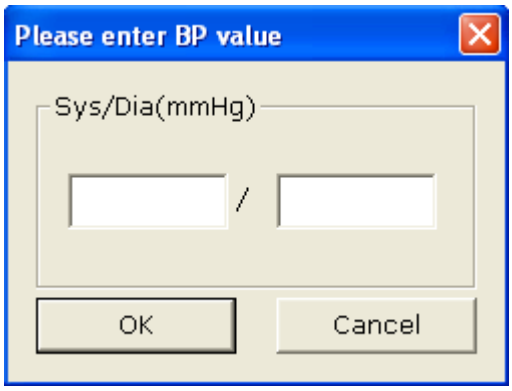
shows the percentage of the current heart rate to the target heart rate, and the blue part indicates the current heart rate.

   NOTE: If the current heart rate exceeds the target heart rate, the hint *The current HR has exceeded the target HR!* will appear on the sampling screen and the background color of the heart rate field will change from white to yellow.

2. View the blood pressure in the BP field 

. The left number is the systolic pressure, and the right number is the diastolic pressure. The displayed blood pressure will be updated every set time period. Clicking on the **BP** button can update the displayed blood pressure manually.

   Double-click on the BP field on the ECG sampling screen to open the following dialog box, and then enter the blood pressure manually. If you set the BP sampling mode to **Manually Enter BP** in the **Exercise ECG Setting** window, clicking on the **BP** button can also open the following dialog box.



NOTE: If the systolic pressure or the diastolic pressure exceeds the normal BP range, the hint *The systolic/diastolic BP has exceeded the normal range!* will appear on the sampling screen and the background color of the BP field will change from white to yellow.

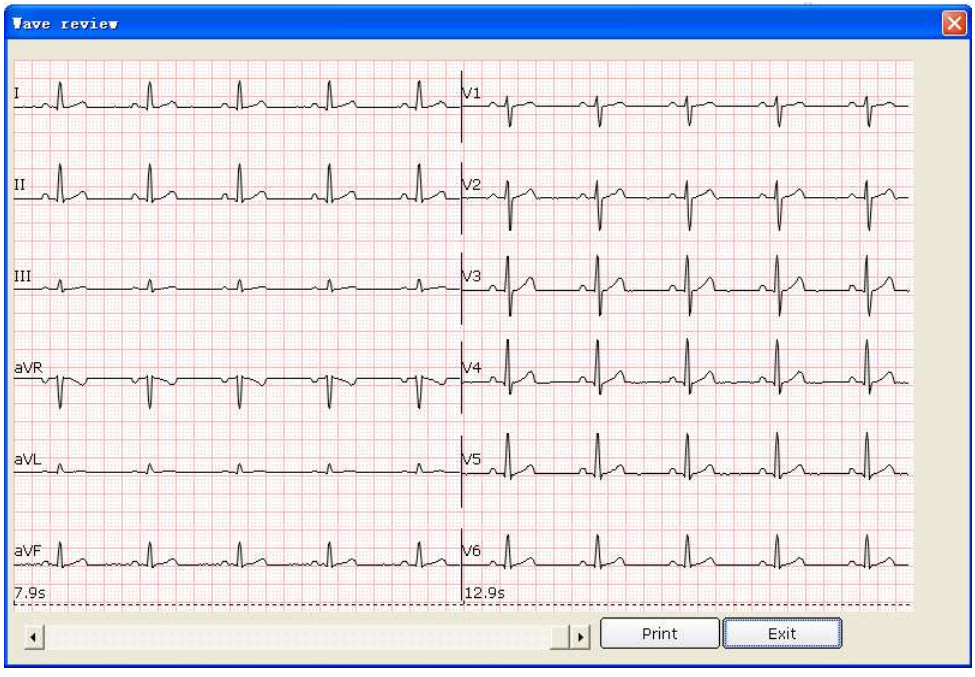
7.5.2 Viewing Other Information

1. If a treadmill is used, view other information such as the stage time, exercise time, total time, PVC/min, speed/slope, and Max ST/Min ST.
2. If an ergometer is used, view other information such as the stage time, exercise time, total time, power/RPM, and Max ST/Min ST.

NOTE: Total time is counted from the beginning of the pretest phase to the end of the exercise test.

7.5.3 Editing the Waveform

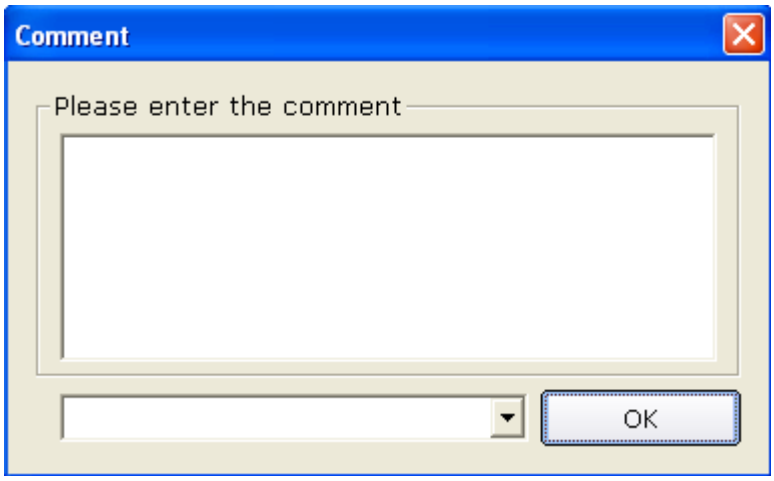
1. Click on the **Freeze** button to freeze waves on the current screen, and the **Wave review** window pops up.



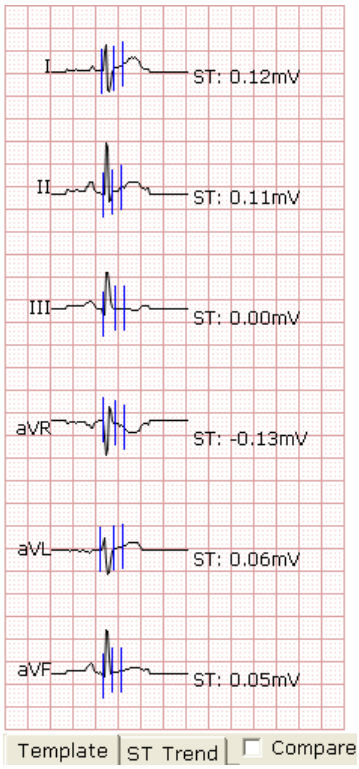
Click on the **Print** button to print the current waveform.

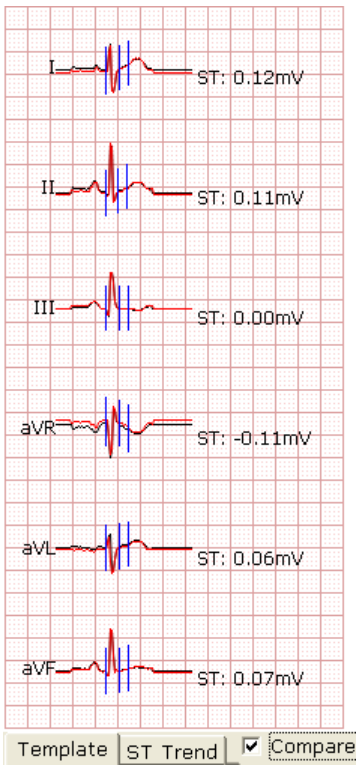
Click on **Exit** to return to the ECG sampling screen.

2. Click on the **Comment** button to display the **Comment** dialog box. Enter the comment in the **Comment** dialog box. Click on the **OK** button, and the comment will be displayed on the ECG waves on the analysis screen.

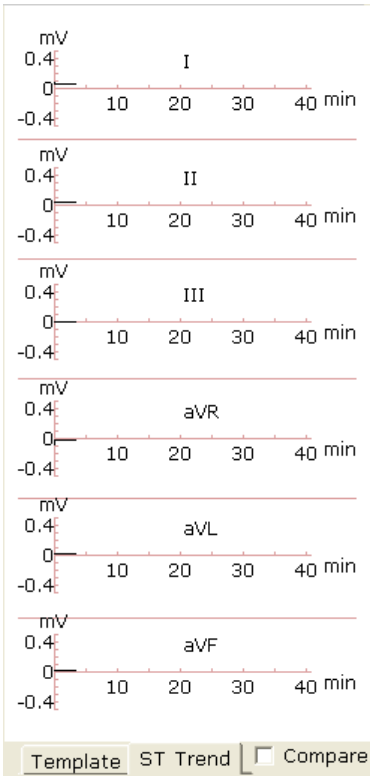


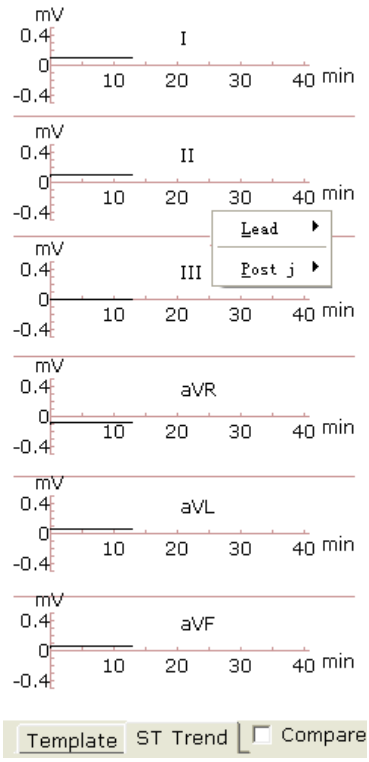
3. Click on the **Template** button, and the average waves of 12 leads and the calibration lines will be displayed. The average waves will be updated every 10 seconds. Right-click on the average wave field to display the lead group menu, and then you can select other leads. Select **Compare** to compare the current ST segments with the average beats of the sampled data in the first stage of the pretest phase. Double-click on the average wave of a lead, the amplified average wave of the lead and the calibration lines will be displayed. You can drag the calibration lines on the wave. The average wave will be updated every 10 seconds.





4. Click on the **ST Trend** button to display the ST trend. Right-click on the ST trend field to display the lead group menu, and then you can select other leads.





7.5.4 Printing the Pretest Report

1. The pretest report will be printed automatically 14 seconds after the beginning of the pretest phase.
2. Or, you can click on the **Print** button to print the pretest report.

7.6 Exercise Phase

1. Instruct the patient to use the treadmill/ergometer. Then click on the **Exercise** button to enter the exercise phase. Or, the system will enter the exercise phase automatically after reaching the set pretest time.
2. View the heart rate and BP of the patient. For details, please refer to Section 7.5.1, “Viewing the Heart Rate and the Blood Pressure”.

   NOTE: When the current heart rate exceeds the target heart rate, click on the **Recovery** button to enter the recovery phase and observe the waveforms.
3. View other information. For details, please refer to Section 7.5.2, “Viewing Other Information”.
4. Edit the waveform. For details, please refer to Section 7.5.3, “Editing the Waveform”.
5. Click on the **Print** button to print the exercise report.
6. The system will enter the next stage of the exercise phase automatically after the set time of this stage is over. Or, click on the **Exercise** or **Next** button to enter the next stage of the exercise phase manually.

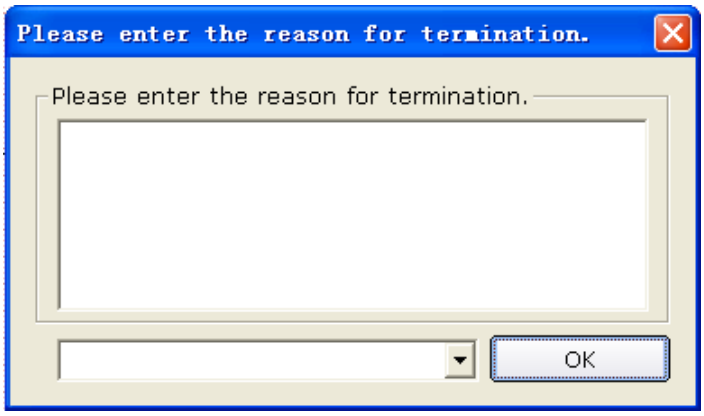
7. Click on the **Keep** button and the system enters the **Keep** state. The hint *Keep* will be displayed in the speed/power field. The **Next** button becomes unavailable. In this state, the system will not follow the previous settings to change the speed and grade of the treadmill, but keep the current speed and grade until this button is pressed again.

7.7 Recovery Phase

1. When the current heart rate exceeds the target heart rate, click on the **Recovery** button to enter the recovery phase. Or, the system will enter the recovery phase automatically after the set exercise test time is over.
2. View the heart rate and BP of the patient. For details, please refer to Section 7.5.1, “Viewing the Heart Rate and the Blood Pressure”.
3. View other information. For details, please refer to Section 7.5.2, “Viewing Other Information”.
4. Edit the waveform. For details, please refer to Section 7.5.3, “Editing the Waveform”.
5. Click on the **Print** button to print the recovery report.
6. The system will enter the next stage of the recovery phase automatically after the set time of this stage is over. Or, click on the **Recovery** button or click on the **Next** button to enter the next stage of the recovery phase manually.

7.8 Exiting the Exercise Test

During the exercise test, click on the **STOP** button to display the following dialog box. Enter the reasons for termination in the dialog box or select a reason from the pull-down list. Then click on the **OK** button to open the analysis screen. The reason for termination will be displayed in the summary report.



7.9 About Analysis Screen

7.9.1 About Summary Screen

1. Click on **Summary** to open the **Summary** screen.

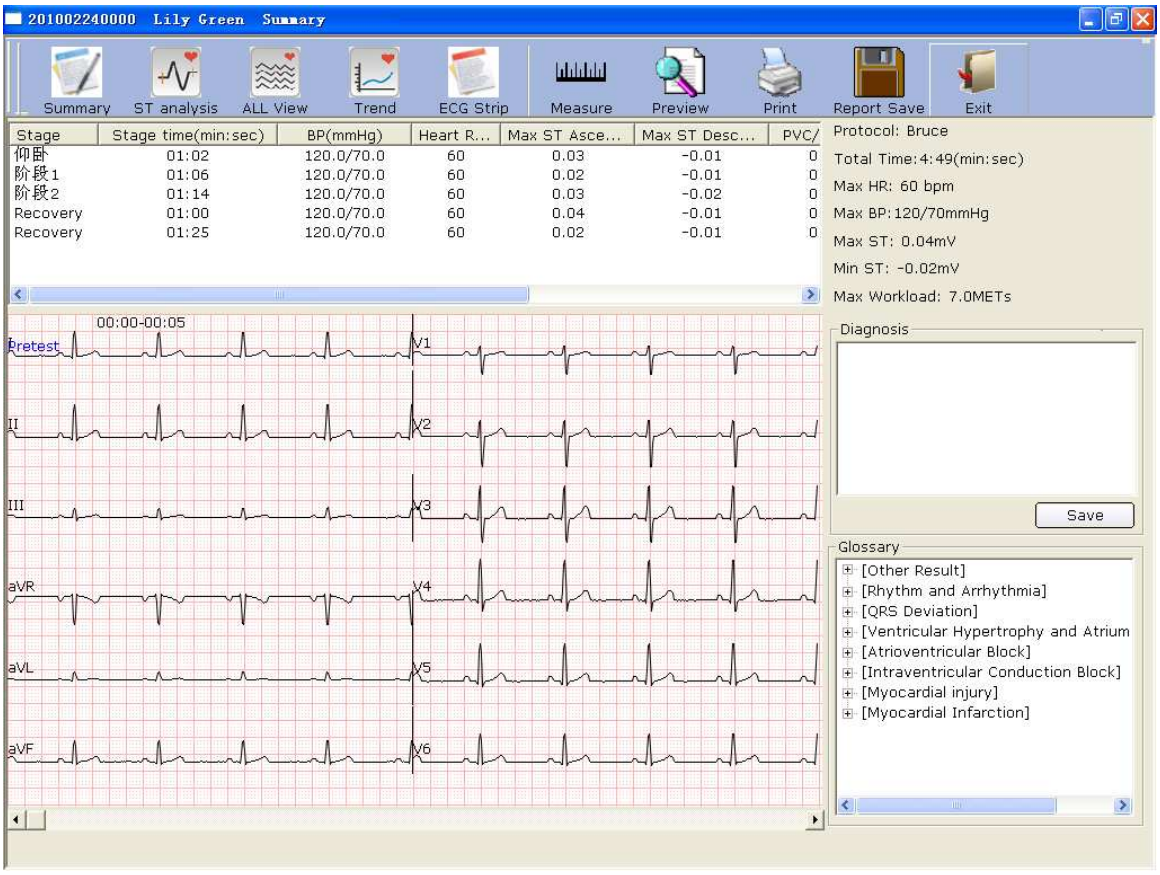


Figure 7-2 Summary Screen

Click on the **Measure** button, click on one point on the wave, and then drag the mouse to another point. The distance, amplitude difference and heart rate between the two points will be displayed.

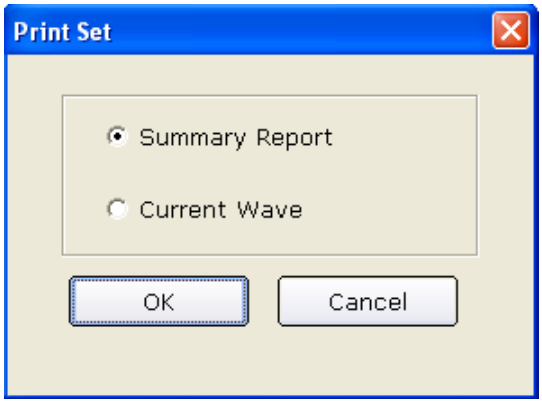
2. If a treadmill is used, view the stage, stage time, speed, slope, workload (METs), BP, HR, PVC, Max ST and Min ST in every stage of the exercise test in the list.

   If an ergometer is used, view the stage, stage time, power, BP, HR, PVC, Max ST and Min ST in every stage of the exercise test in the list.

3. Double-click on a stage, the scroll bar of the wave field will be scrolled to the ECG waves of the stage.

4. Right-click on a wave, and then click on the pop-up **Add Comment** menu. Then you can enter the comment in the **Comment** dialog box. Click on the **OK** button, and the comment will be displayed on the wave. Right-click on the comment, and then you can click on the **Delete Comment** button to delete the comment.

5. Enter diagnosis results in the **Diagnosis** textbox, and then click on **Save**.
6. Or, double-click on the necessary results required to be added in the **Glossary** textbox, the selected results will be displayed in the **Diagnosis** textbox, and then click on the **Save** button.
7. Click on the **Preview** button to display the **Print Set** window.



Select **Summary Report** or **Current Wave**. Click on the **OK** button to open the preview screen.

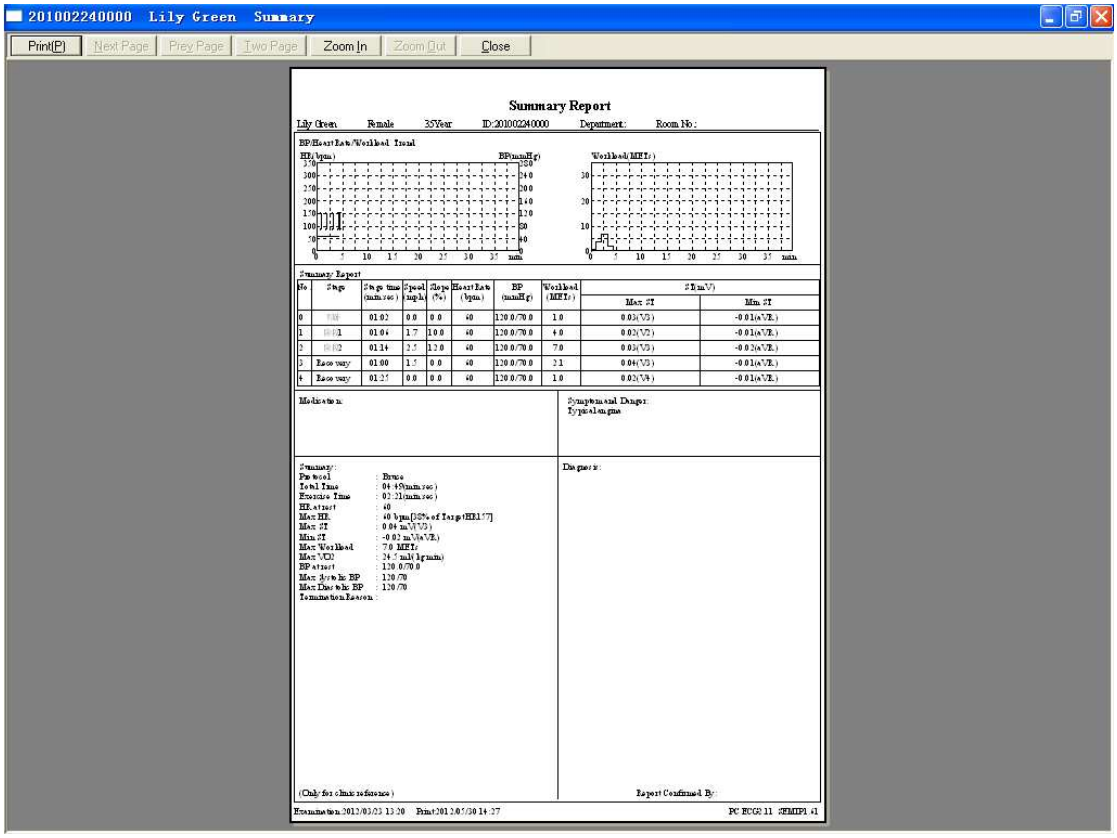


Figure 7-3 Summary Report

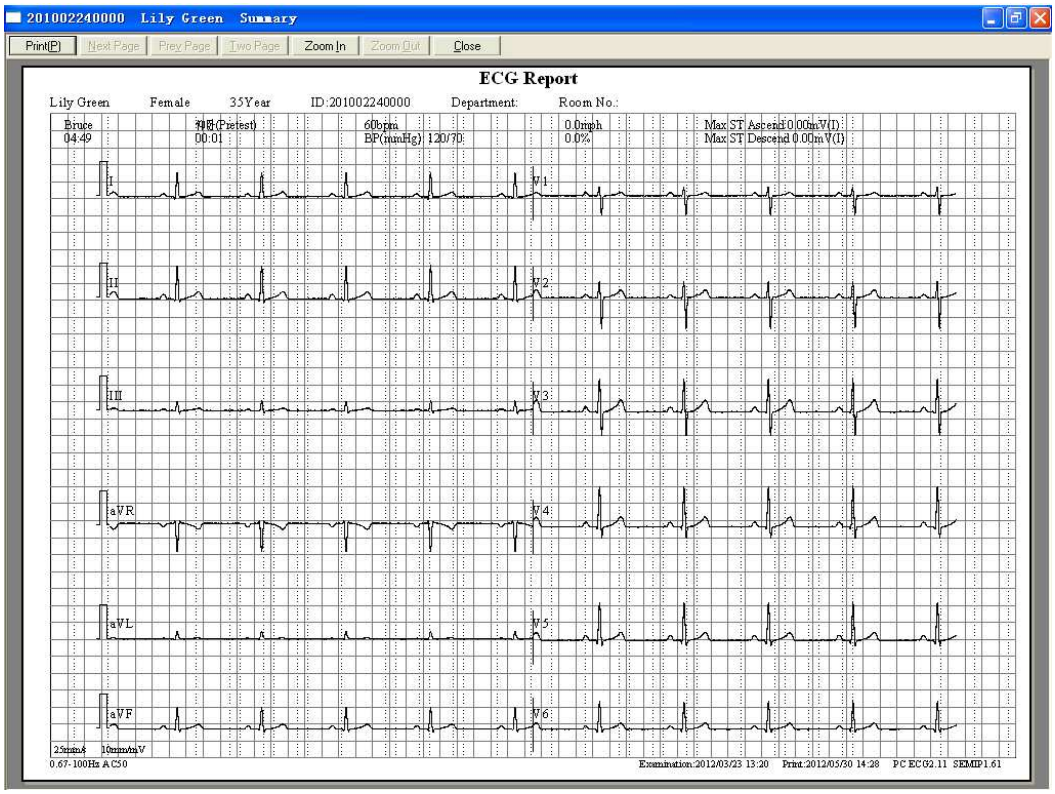


Figure 7-4 Current Wave Report

NOTE: The diagnosis result is displayed in the diagnosis field of the summary report.

7.9.2 About ST Analysis Screen

1. Click on the **ST analysis** button to display the **ST analysis** screen.

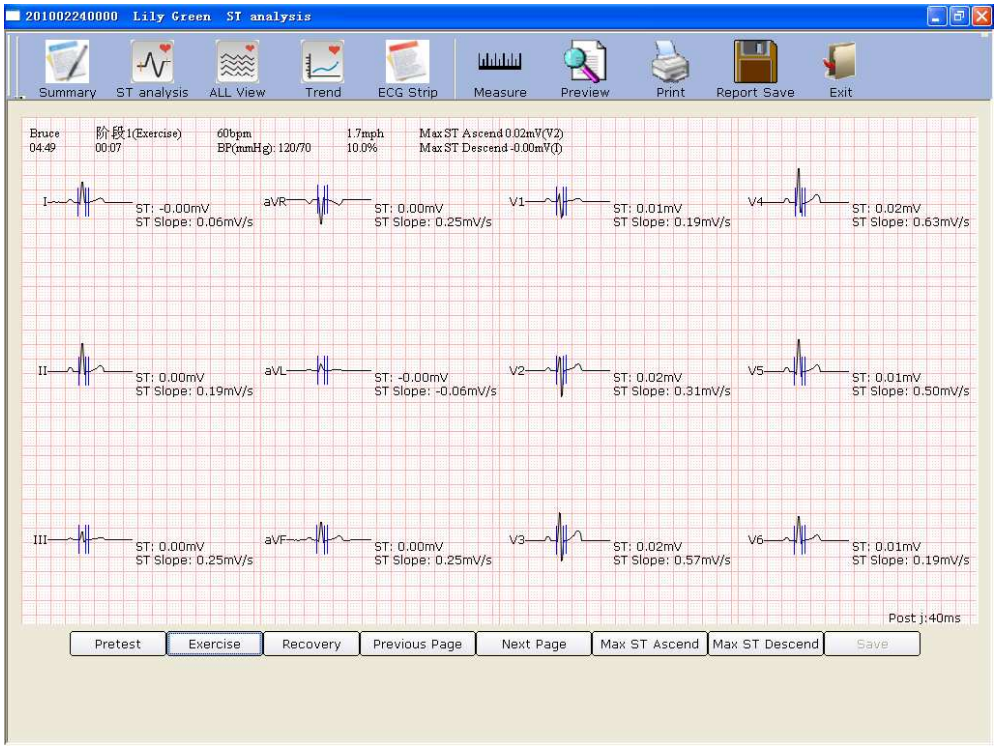
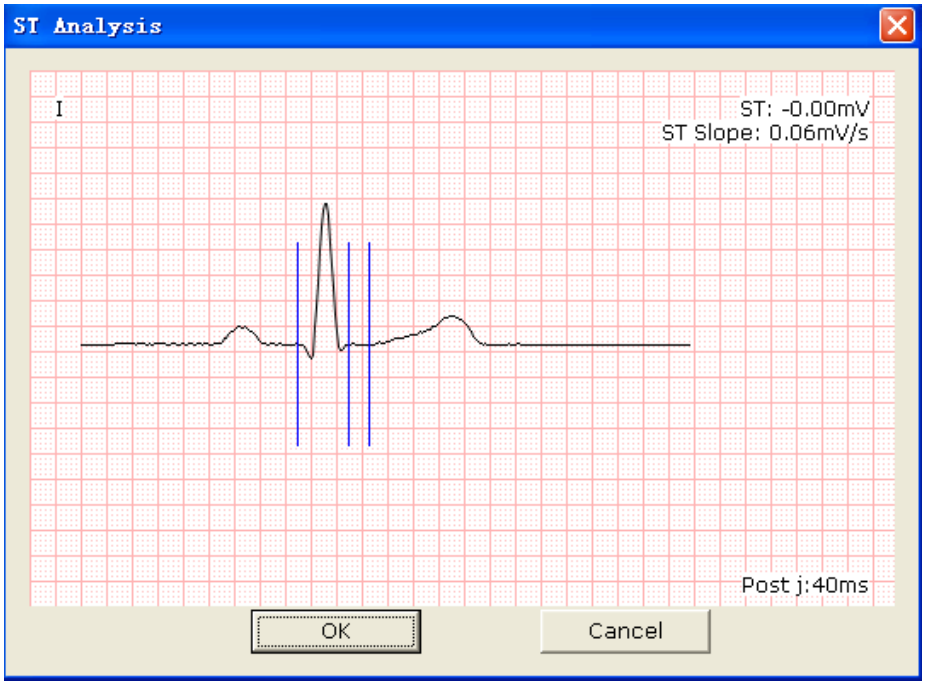


Figure 7-5 ST Analysis Screen

2. Click on **Pretest** to display 12-lead ST analysis waves of the pretest phase.
3. Click on **Exercise** to display 12-lead ST analysis waves of the exercise phase.
4. Click on **Recovery** to display 12-lead ST analysis waves of the recovery phase.
5. Click on **Previous Page**/**Next Page** to display 12-lead ST analysis waves of every 10 seconds.
6. Click on **Max ST Ascend** to display the Max ST ascending waves.
7. Click on **Max ST Descend** to display the Max ST descending waves.
8. You can double-click on the wave to select the PostJ value on the **ST analysis** screen. Double-click on the wave of a lead, the amplified wave of the lead and the calibration lines will be displayed. Drag the calibration lines on the wave, and then the ST value will change. Click on the **OK** button, and then the **Save** button becomes available. Click on **Save** to save the modifications.



7.9.3 About All View Review Screen

1. Click on the **ALL View** button to display the **ALL View** screen.

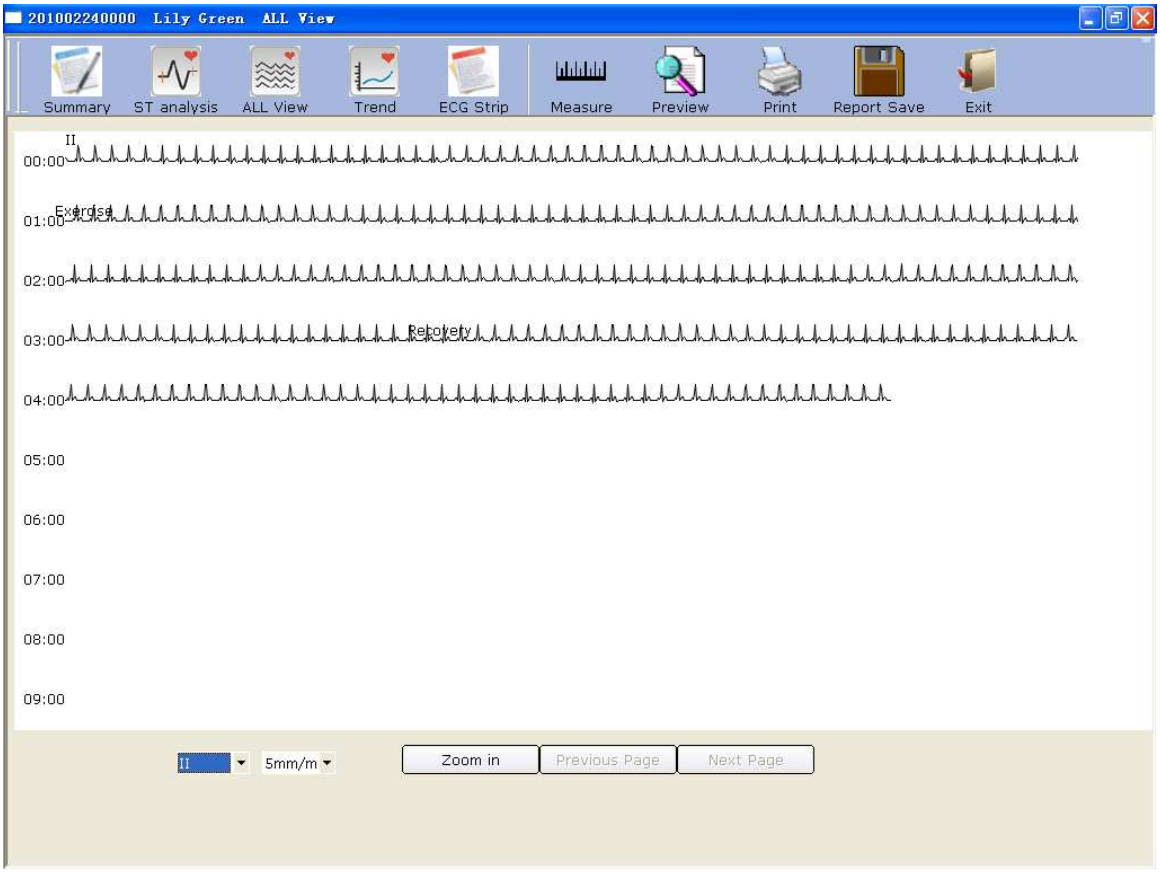
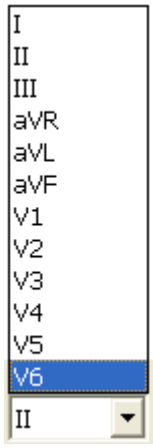
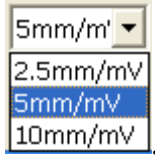


Figure 7-6 All View Screen

The **ALL View** screen displays the ECG wave of one lead throughout the whole test, and arrhythmia will be marked in red signs.

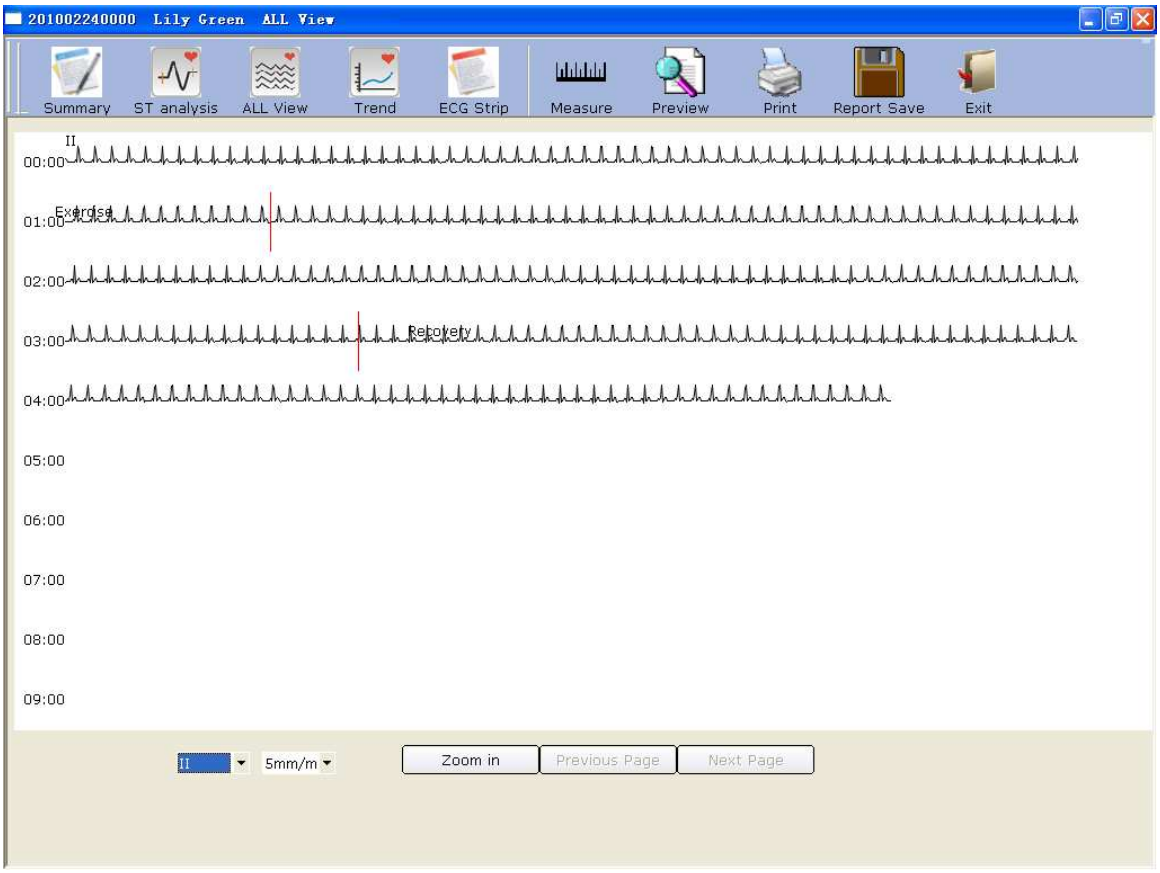
2. Select a lead from the lead pull-down list 

to view the ECG wave of the lead.

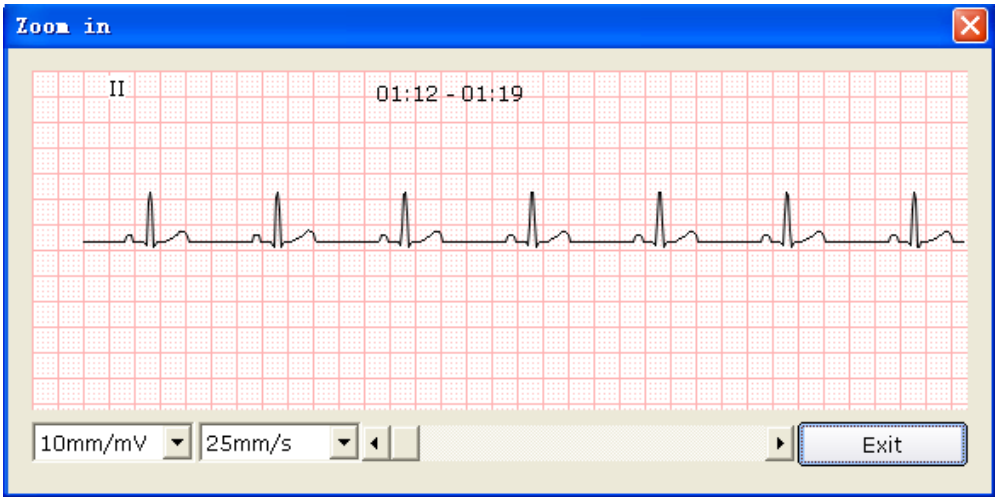
3. Select a gain from the gain pull-down list 

.

4. Click on one point on the wave and drag the mouse to another point, and then the selected range will be marked with two red lines.



Then click on the **Zoom in** button to display the amplified ECG segment.



Drag the bottom scroll bar to view the whole amplified ECG waves.

5. The **ALL View** screen displays ECG waves of 450 seconds (50 seconds in one line and at least 9 lines in one page). ECG waves exceeding 450 seconds can be reviewed by clicking on the **Previous Page/Next Page** button.

7.9.4 About Trend Screen

Click on the **Trend** button to display the **STj Trend** screen.

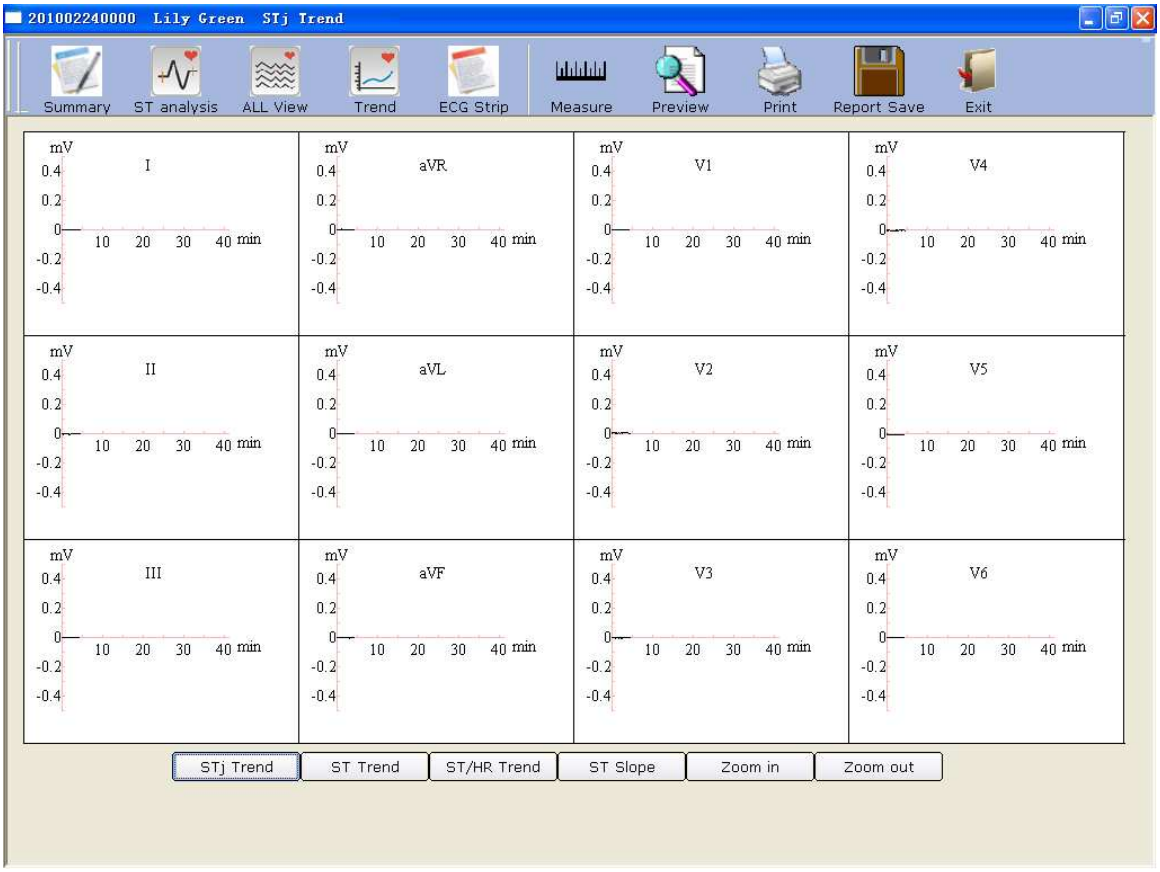


Figure 7-7 STj Trend Screen

You can observe 12-lead trend of the exercise test on the **STj Trend** screen.

The horizontal coordinate indicates test time, but the unit of the vertical coordinate is different on different trend screens.

Click on **Zoom In** or **Zoom Out** button to adjust the value on the vertical coordinate.

7.9.5 About ECG Strip Screen

Click on the **ECG Strip** button to display the **ECG Strip** screen.

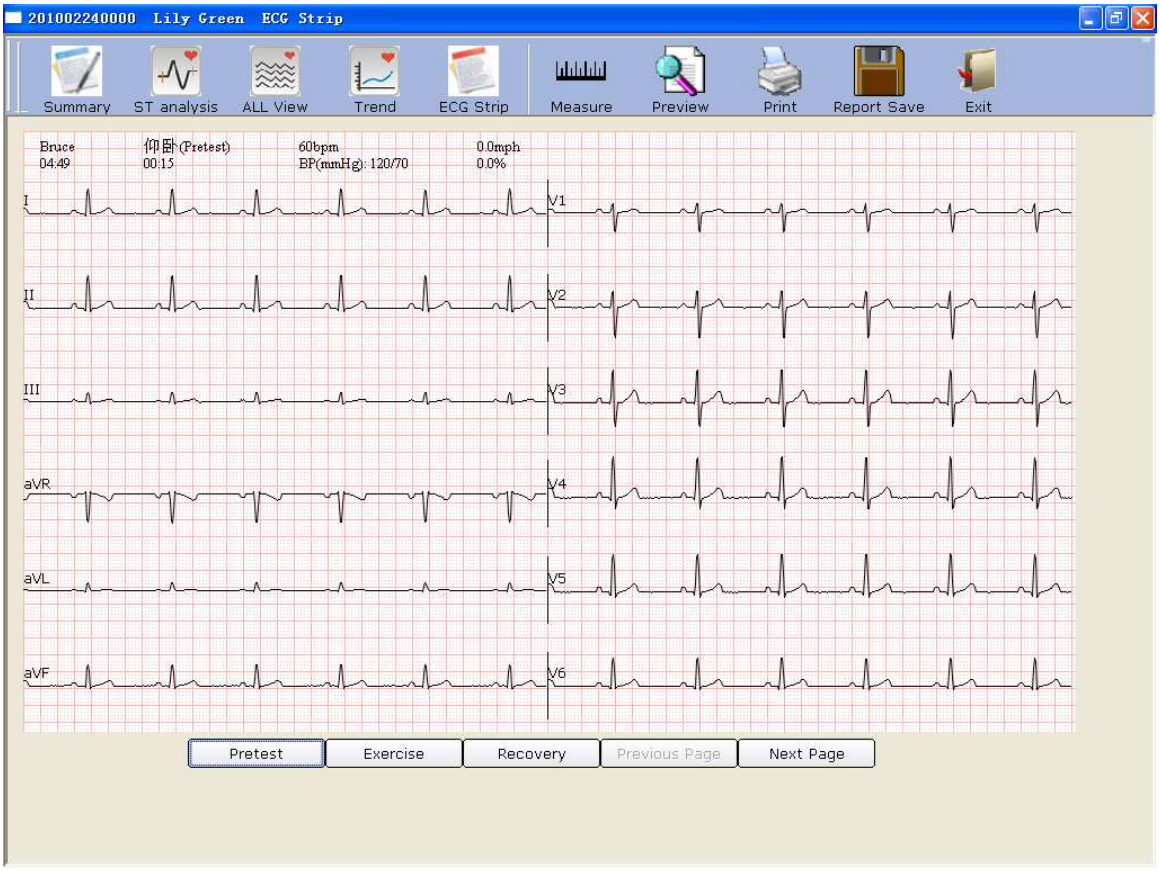


Figure 7-8 ECG Strip Screen

1. Click on **Pretest** to display 12-lead strip waves of the pretest phase.
2. Click on **Exercise** to display12-lead strip waves of the exercise phase.
3. Click on **Recovery** to display12-lead strip waves of the recovery phase.
4. Click on **Previous Page**/**Next Page** to display strip waves of every 30 seconds.

7.9.6 Previewing ECG Reports

Click on the **Preview** button to preview an ECG report.

7.9.7 Printing ECG Reports

You can print an ECG report by clicking on the **Print** button. For details, please refer to Section 6.6.10, “Printing ECG reports”.

7.9.8 Saving ECG Reports

You can save an ECG report by clicking on the **Report Save** button. For details, please refer to Section 6.6.11, “Saving ECG reports”.

7.9.9 Exiting the Analysis Screen

Click on the **Exit** button on the analysis screen to return to the previous screen.

Chapter 8 Processing Patient Records

Click on the **Data Manager** button on the main screen (Figure 6-1) to open the **Data Manager** screen (Figure 8-1).

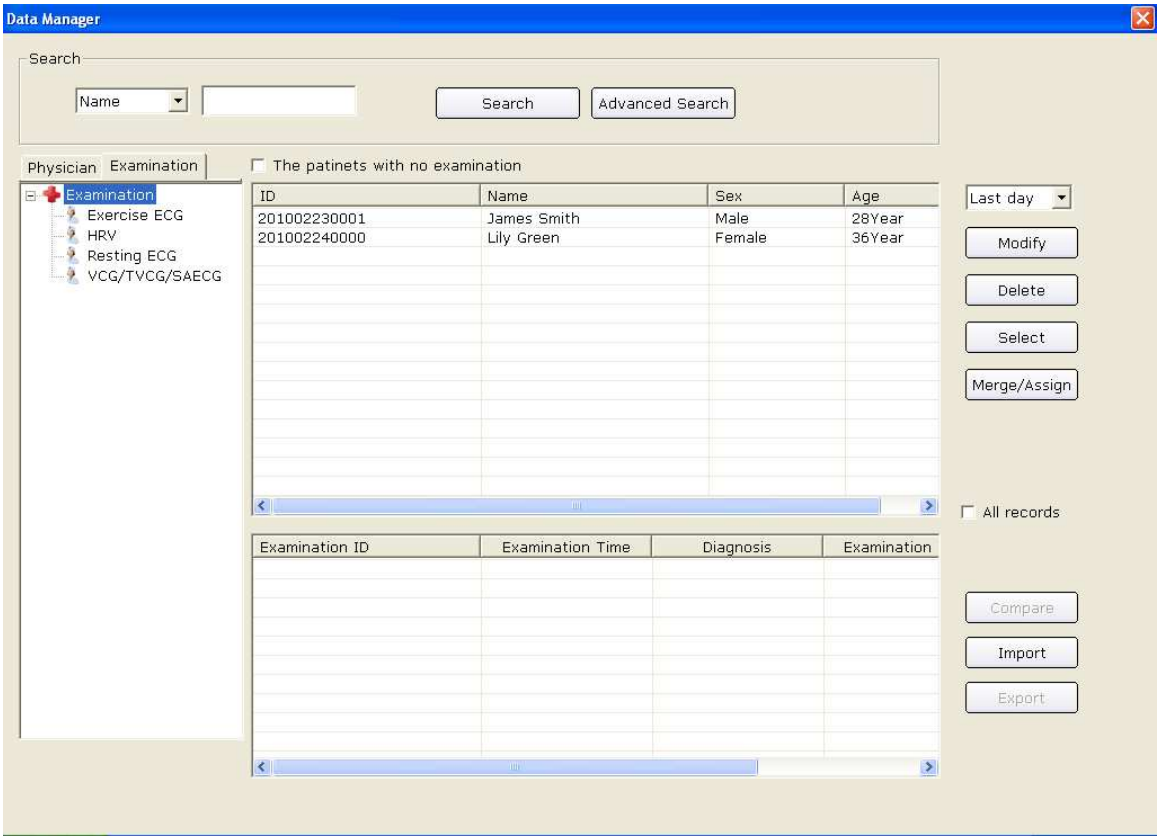
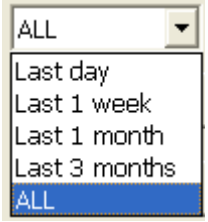


Figure 8-1 Data Manager Screen

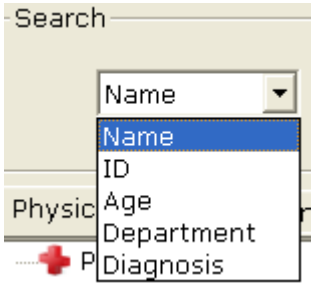
Click on a patient record in the patient information list, and then all the examination records of the patient will be displayed in the examination record list.

NOTE: Click on an option in the patient information list, such as ID, name, etc, and then all the patient records will be arranged in sequence.

8.1 Searching Patient Records

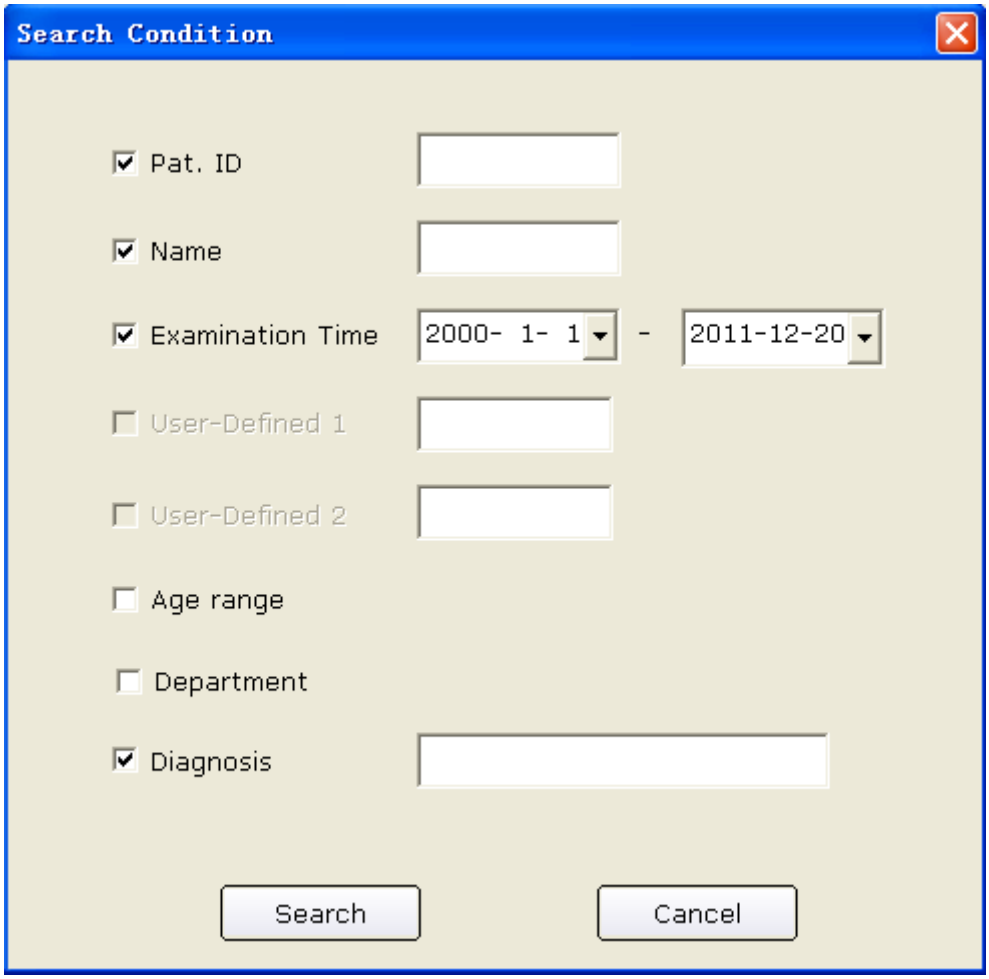
1. Select a search item in the pull-down list 

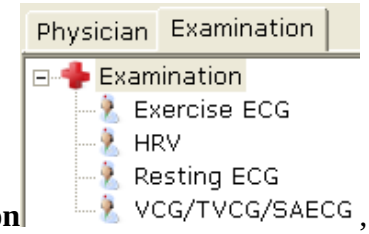
on the **Data Manager** screen. Then all the patient records which meet the search condition are listed in the patient information list.

2. Or, select a search item in the pull-down list 

, enter the corresponding information in the right textbox, and then click on the **Search** button. All the patient records which meet the conditions will be displayed in the patient information list.
3. Or, click on **Advanced Search** to display the **Search Condition** window, and then enter the search conditions. Click on the **Search** button, and all the patient records which meet the conditions will be displayed in the patient information list.

NOTE: User-defined 1 and User-defined 2 are unavailable before they are set in the **Basic Information** window (Figure 9-1).

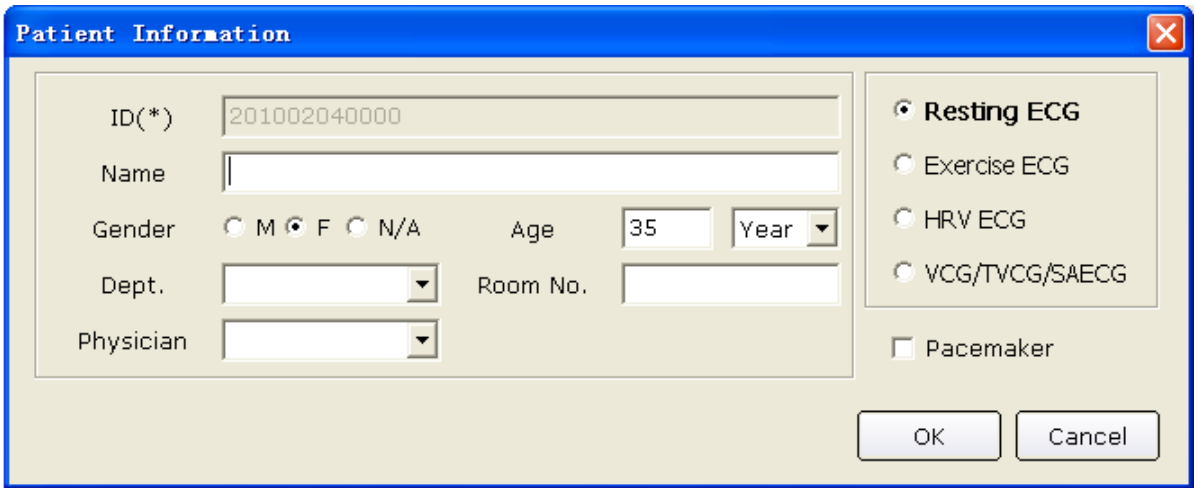


4. Or, you can click on **Physician** or **Examination** 

, and then choose the doctor name or examination types, all the patient records which meet the conditions will be displayed in the patient information list.
5. Select **The patients with no examination**, and then the patient records which are registered but not examined, will appear in the patient information list.

8.2 Modifying Patient Records

Click on a patient record in the patient information list on the **Data Manager** screen, and then click on the **Modify** button to display the **Patient Information** window. Then you can modify the information of the patient in the **Patient Information** window. If the patient has more than one record, the modification is only for the selected record. Click on the **OK** button to save these modifications.



8.3 Deleting Records

NOTE: The deletion of records is permanent, and you can't restore the records deleted. Please use this operation cautiously.

8.3.1 Deleting Patient Records

Click on a patient record in the patient information list on the **Data Manager** screen, and then click on the **Delete** button to delete the patient record from the patient information list. At the same time, all the examination records of the patient will be deleted.

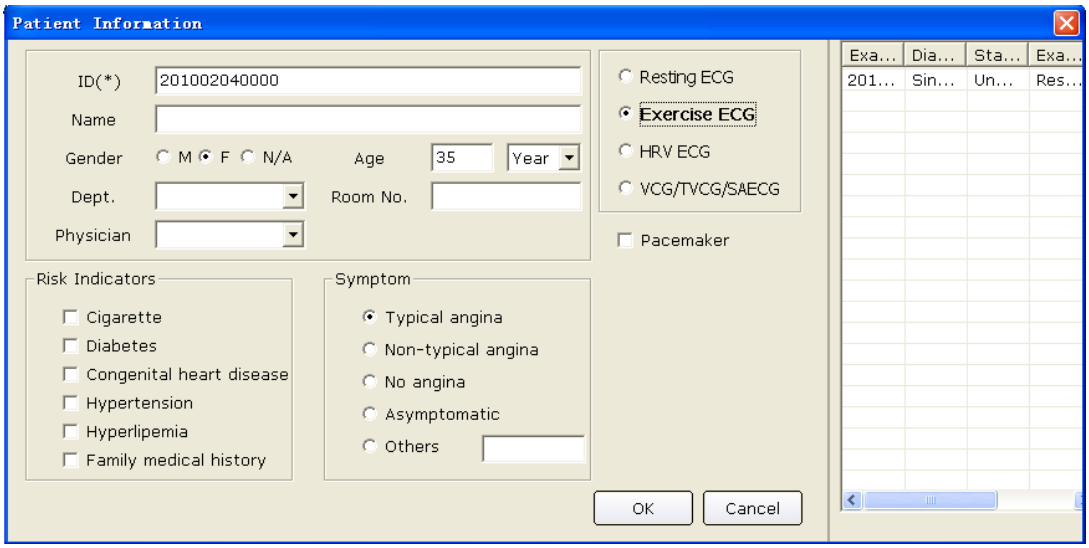
To select multiple patient records simultaneously, you can click on the first patient record to be deleted in the patient information list and press the **Shift** button on the keyboard, and then click on the last patient record to be deleted in the patient information list. You can also press the **Ctrl** button on the keyboard and then select the patient records one by one. After selecting all the patient records to be deleted, click on the **Delete** button to delete all the patient records selected from the patient information list.

8.3.2 Deleting Examination Records of a Patient

The operation methods of deleting examination records are similar to those of deleting patient records. The deletion of an examination record cannot delete the corresponding patient information.

8.4 Selecting a Patient Record

Click on a patient record in the patient information list on the **Data Manager** screen and click on the **Select** button to display the **Patient Information** window. Then click on the **OK** button, the system will sample ECG data of the patient.



8.5 Merging Examination Records

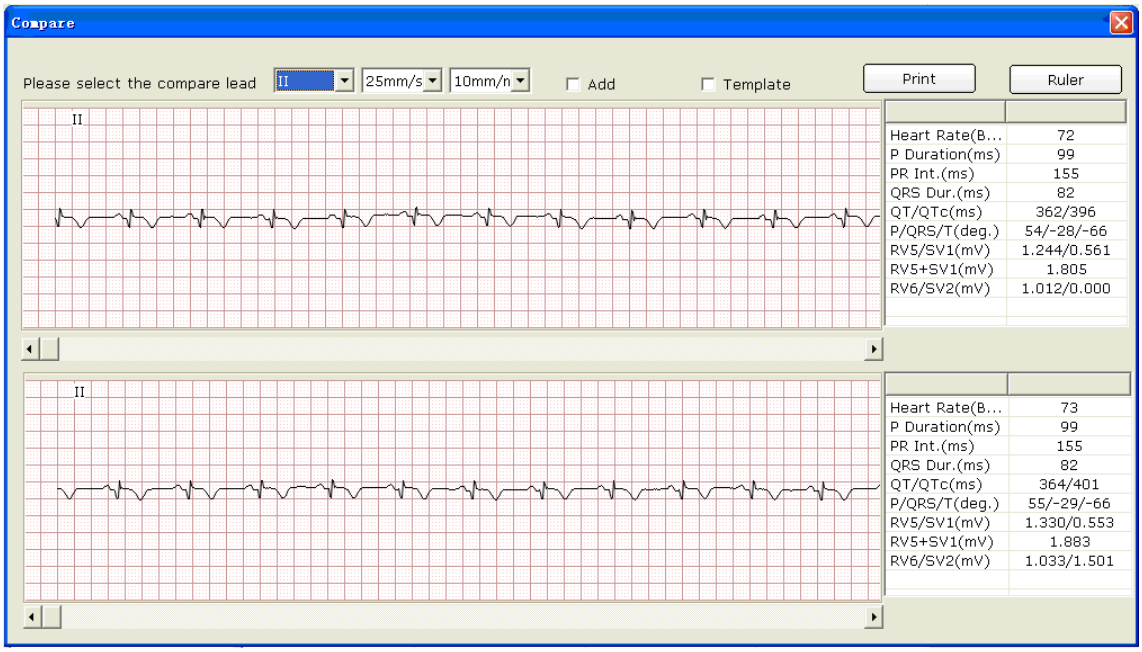
Click on one or more examination records in the examination record list on the **Data Manager** screen, and then click on the **Merge/Assign** button to display the **Patient Information** window. Input a patient ID and click on the **OK** button to assign the examination record selected to this patient.

8.6 Comparing Two Examination Records

Press the **Ctrl** button on the keyboard and select two examination records of resting ECG, and then click on the **Compare** button to display the **Compare** window.

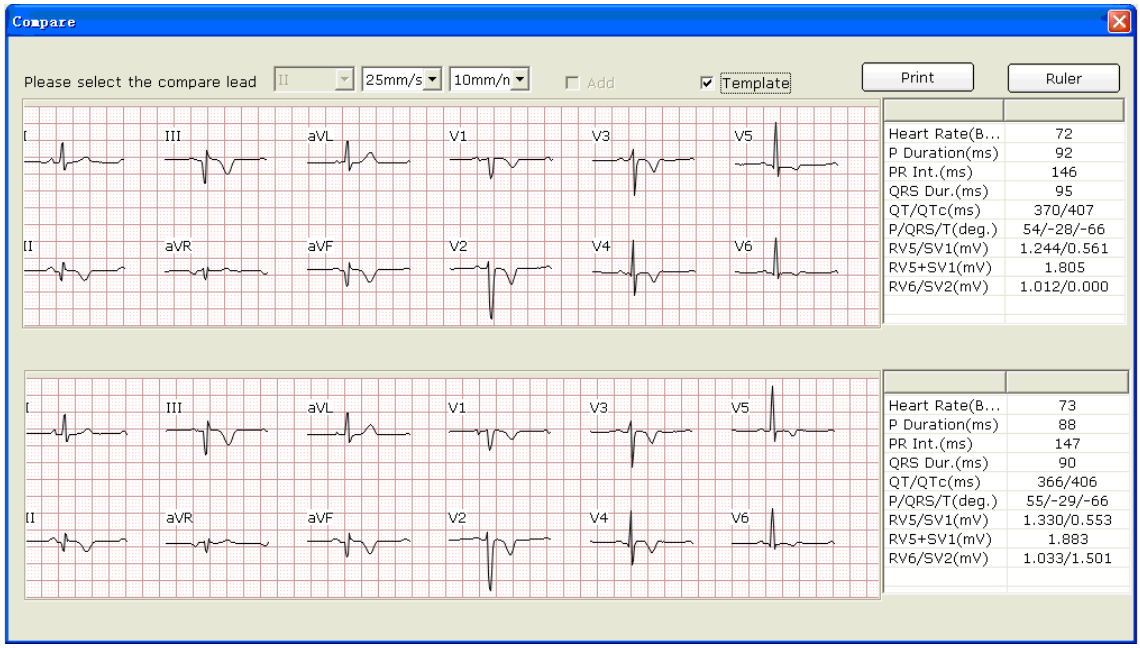
NOTE: Please select two records to compare only in Resting ECG.

You can select the lead, speed and gain to be compared from the lead pull-down list. Then the waves of the selected lead, speed and gain of the two examination records will be displayed in the window. You can drag the scroll bar on the bottom to view all the waves of the selected lead.



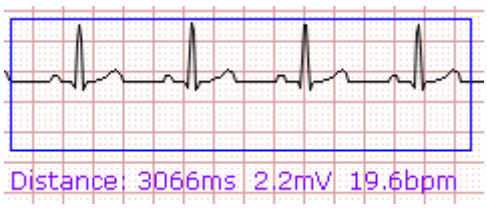
When **Add** is selected, the waves of the two examination records will be displayed in the window. The black wave is the original wave and the blue wave is the compared wave. You can drag the scroll bar on the bottom to view all the waves of the two examination records.

When **Template** is selected, the templates of the two examination records will be displayed in the window.



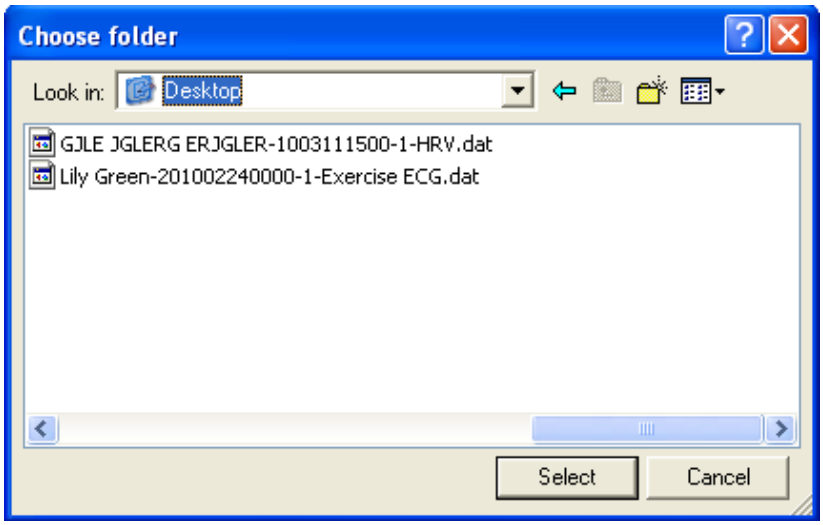
You can press **Print** button to print the current window.

Click on the **Ruler** button on the **Compare** window. Click on one point on the wave, and then drag the mouse to another point. The distance, amplitude difference and heart rate between the two points will be displayed.

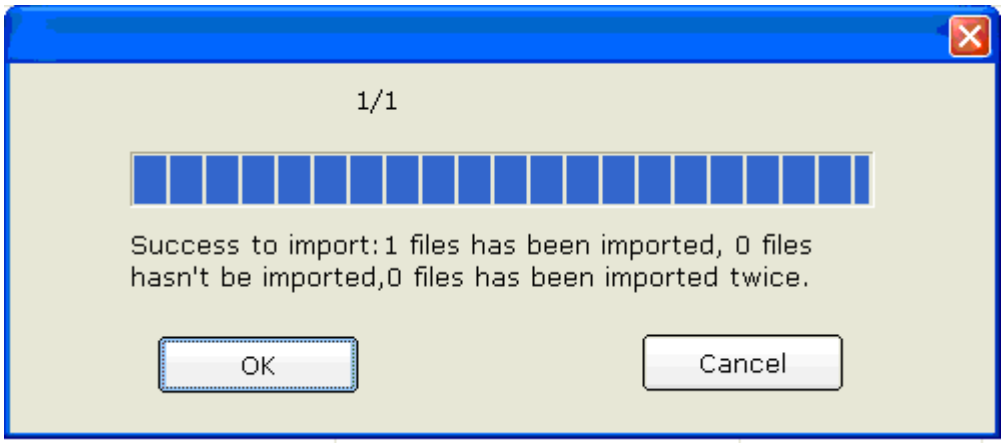


8.7 Importing ECG Data into the Data Manager Screen

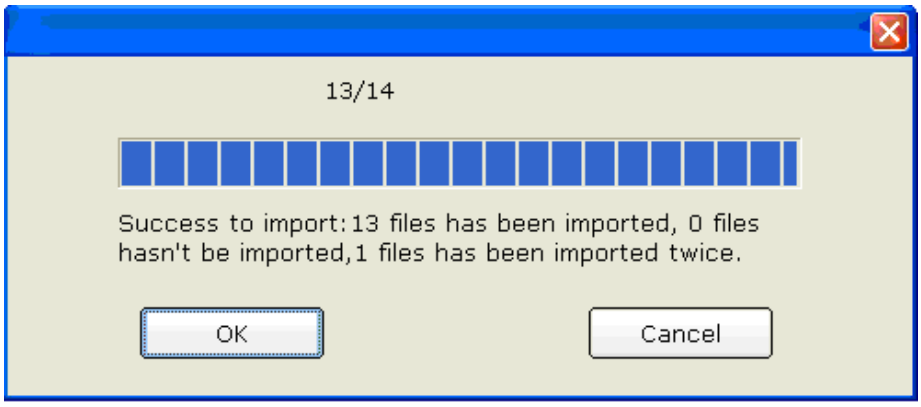
Click on the **Import** button on the **Data Manager** screen (Figure 8-1) to open the following window.



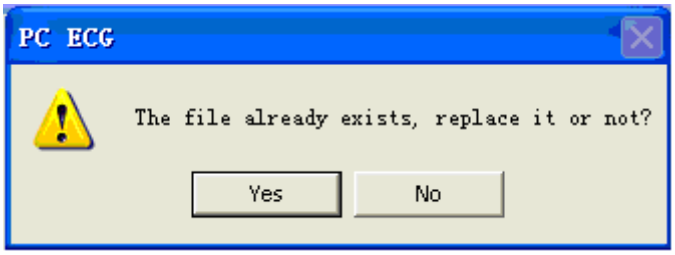
Select the data to be imported and click on the **Select** button to import the data into the **Data Manager** screen.



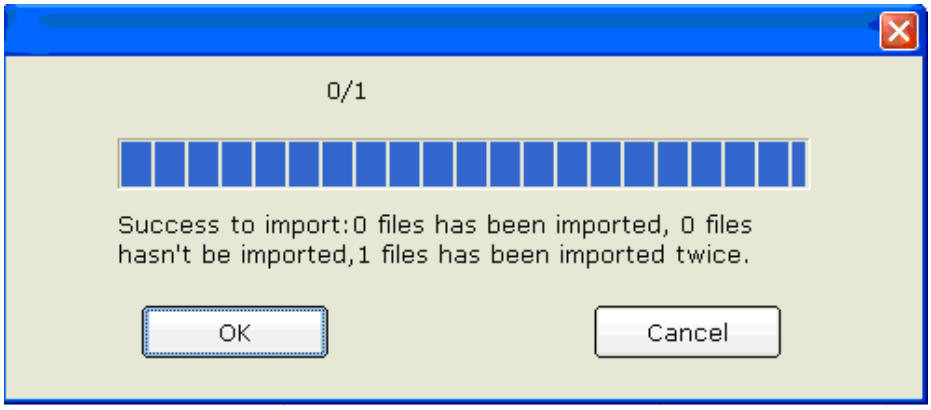
To import multiple examination records simultaneously, you can click on the first examination record to be imported and press the **Shift** button on the keyboard, and then click on the last examination record to be imported. You can also press the **Ctrl** button on the keyboard and then select the examination records one by one. After selecting all the examination records to be imported, click on the **Select** button to import all the examination records into the **Data Manager** screen. If all the data are successfully imported into the screen, the following hint will pop up.



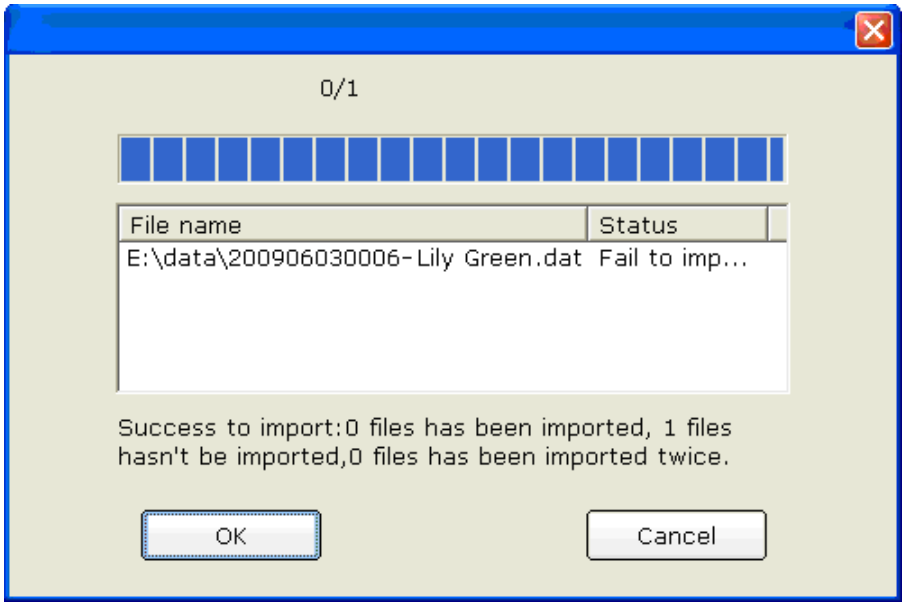
If the data to be imported exists on the **Data Manager** screen, the following hint will pop up.



If you press the **Yes** button, the imported record will replace the file with the same name.



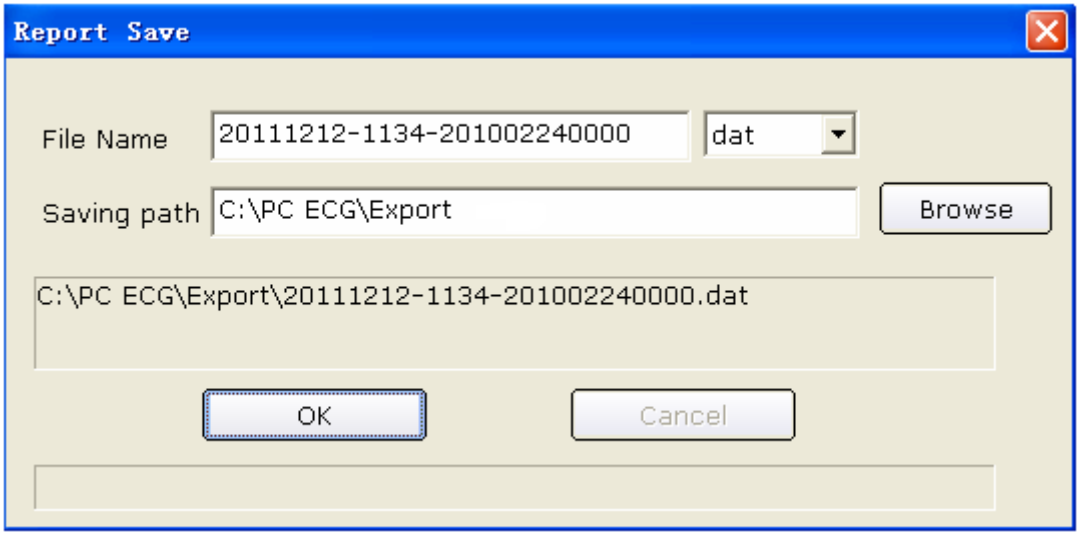
If you press the **No** button, the system will hint you a failure operation occurs.



NOTE: Only ECG data in DAT format can be imported.

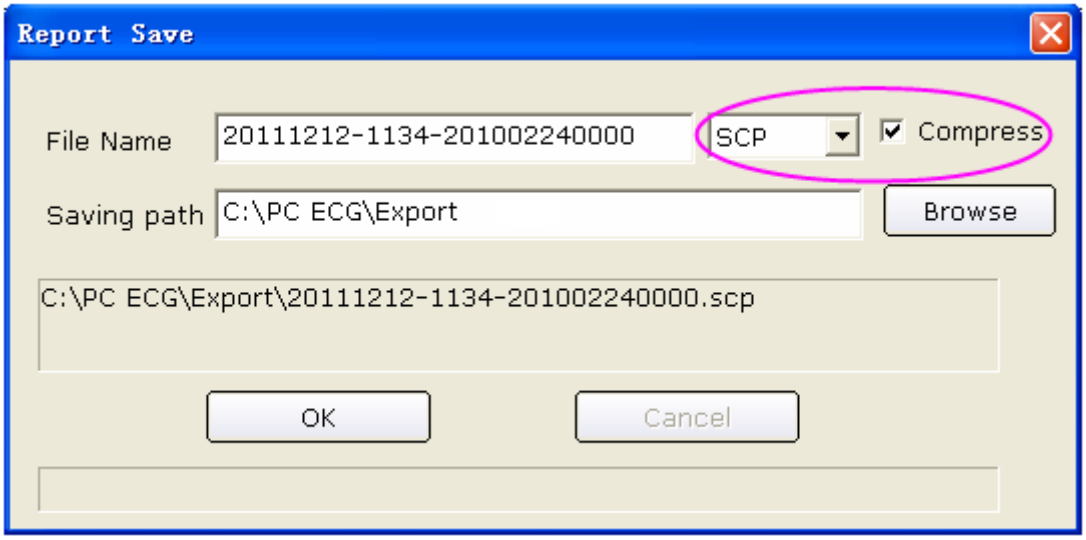
8.8 Exporting ECG Data from the Data Manager Screen

Select examination records and click on the **Export** button on the **Data Manager** screen (Figure 8-1) to open the following window. Assign the file name, saving path and export file format (SCP, FDA-XML, DICOM, dat, pdf), and then click on the **OK** button to export the data into the selected path. At the same time, the patient information of these records will be exported.



When the export is successful, the hint information will be displayed.

If you select **SCP** and **Compress**, the compressed SCP file will be exported.



NOTE: Only if the export file format is set to **SCP**, can the **Compress** check box be displayed.

If you select **pdf**, the pdf file will be exported only for Resting ECG and Exercise ECG. You need to enter the analysis screen to export pdf files for HRV ECG, VCG, TVCG and SAECG.

8.9 Viewing an Examination Record

Click on a patient record in the patient information list, and then all the records of the patient will be displayed in the examination record list.

Select **All records** and all the examination records will be displayed in the examination record list.

Double-click on an examination record in the examination record list on the **Data Manager** screen (Figure 8-1). If it is a Resting ECG record, the Resting ECG analysis screen will pop up. If it is an HRV record, the HRV analysis screen will pop up. If it is a VCG/TVCG/SAECG record, the VCG/TVCG/SAECG analysis screen will pop up. If it is an Exercise ECG record, the Exercise ECG analysis screen will pop up. Then you can do the corresponding operation to the examination record. For details, please refer to Section 6.6, “Analyzing ECG Data” and Section 7.9, “About Analysis Screen”.

Chapter 9 Configuring the System

Click on the **System Setting** button on the main screen (Figure 6-1) to open the **System Setting** window.

There are eight tabs in the **System Setting** window: **Basic Information**, **Sample Setting**, **Device**, **Print Setting**, **Output File, Data Maintenance, GDT** and **Others**.

After you modify some information in the **System Setting** window,

1. Click on the **OK** button to save these modifications and exit.
2. Or, click on the **Cancel** button to cancel these modifications and exit.

9.1 Basic Information Setup

Click on the **Basic Information** tab in the **System Setting** window to display the **Basic Information** window.

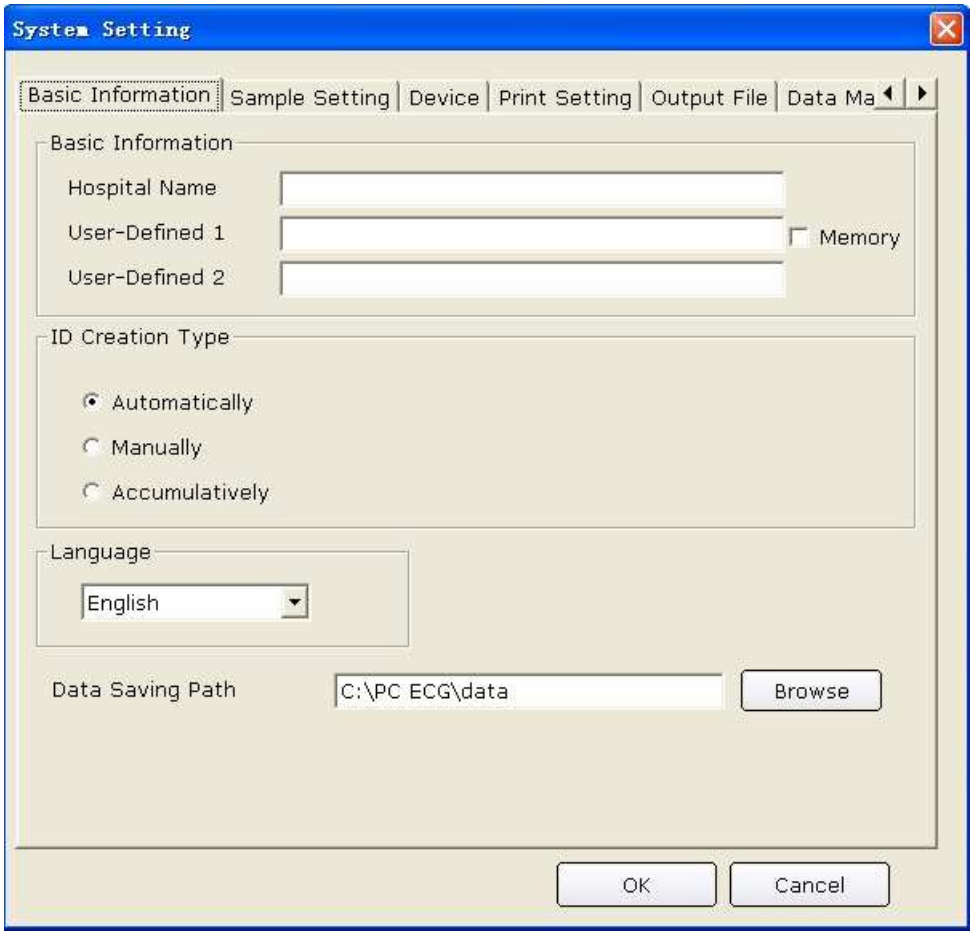


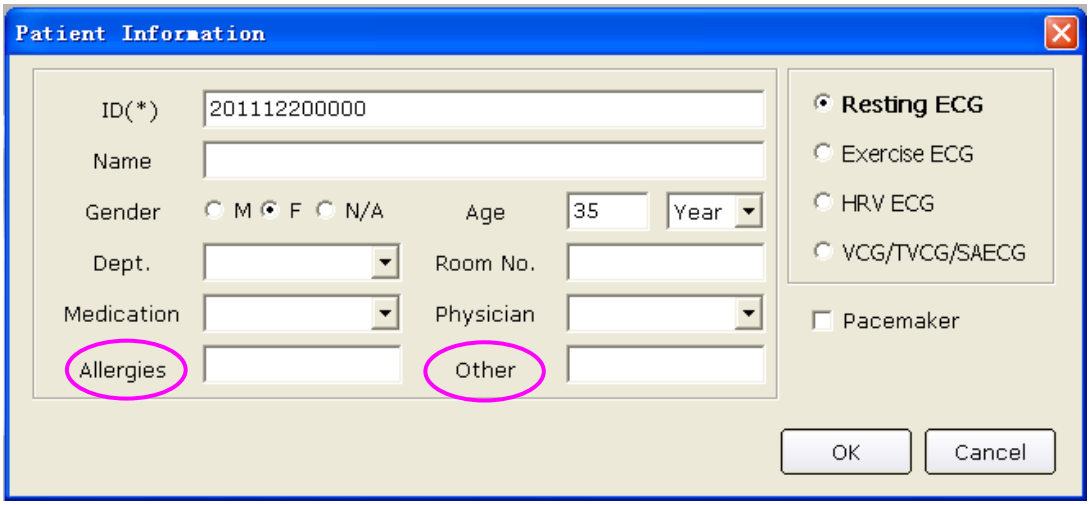
Figure 9-1 Basic Information Setup Window

9.1.1 Setting Basic Information

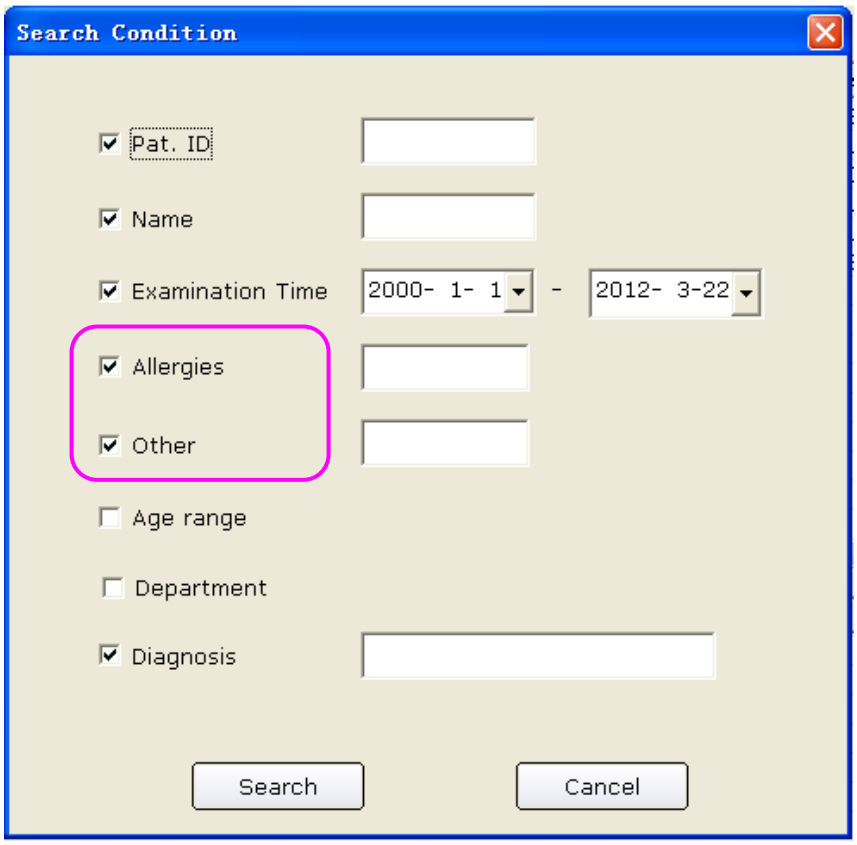
Enter information in the **Hospital Name**, **User-Defined 1** or **User-Defined 2** textbox in the **Basic Information** window (Figure 9-1).

When you fill in the **User-Defined 1/2** textbox, the corresponding items in the **Patient Information** window will change into what is filled.

For example, when you enter **Allergies** in the **User-Defined 1** textbox, and enter **Other** in the **User-Defined 2** textbox in the **Basic Information** window (Figure 9-1), the corresponding items in the **Patient Information** window will be **Allergies** and **Other** respectively.



(a)



(b)

NOTE: Click on the **New Patient** button on the main screen to open the **Patient Information** window as the above figure shows.

Select **Memory** in **Basic Information** window, the content of **User-Defined 1** in the **Patient Information** window will be saved. For example, when you enter **None** in the **Allergies** textbox of picture (a), and enter **None** in the **Other** textbox of picture (b), click **OK** and open the **Patient Information** window again, you will find that **None** is in **Allergies** textbox and the **Other** textbox is empty. If **Memory** is not selected, the **Allergies** textbox and the **Other** textbox are all empty.

9.1.2 Setting ID Mode

Set **ID Create Type** to **Automatically**, **Manually** or **Accumulatively**.

When **ID Create Type** is set to **Automatically**, the patient ID can be automatically generated according to the examination date.

When **ID Create Type** is set to **Manually**, you should enter the patient ID manually in the **Patient Information** window.

When **ID Create Type** is set to **Accumulatively**, the patient ID can be increased by one automatically. You need to set the format and the starting number for ID.

9.1.3 Setting Language

You can set the language to **Chinese** or **English**.

NOTE: To validate the language setup, after setting, you should restart the system.

9.1.4 Specifying the Storage Path of the ECG Data

Click on the **Browse** button in the **Basic Information** window (Figure 9-1) to assign the storage path.

9.2 Sample Setup

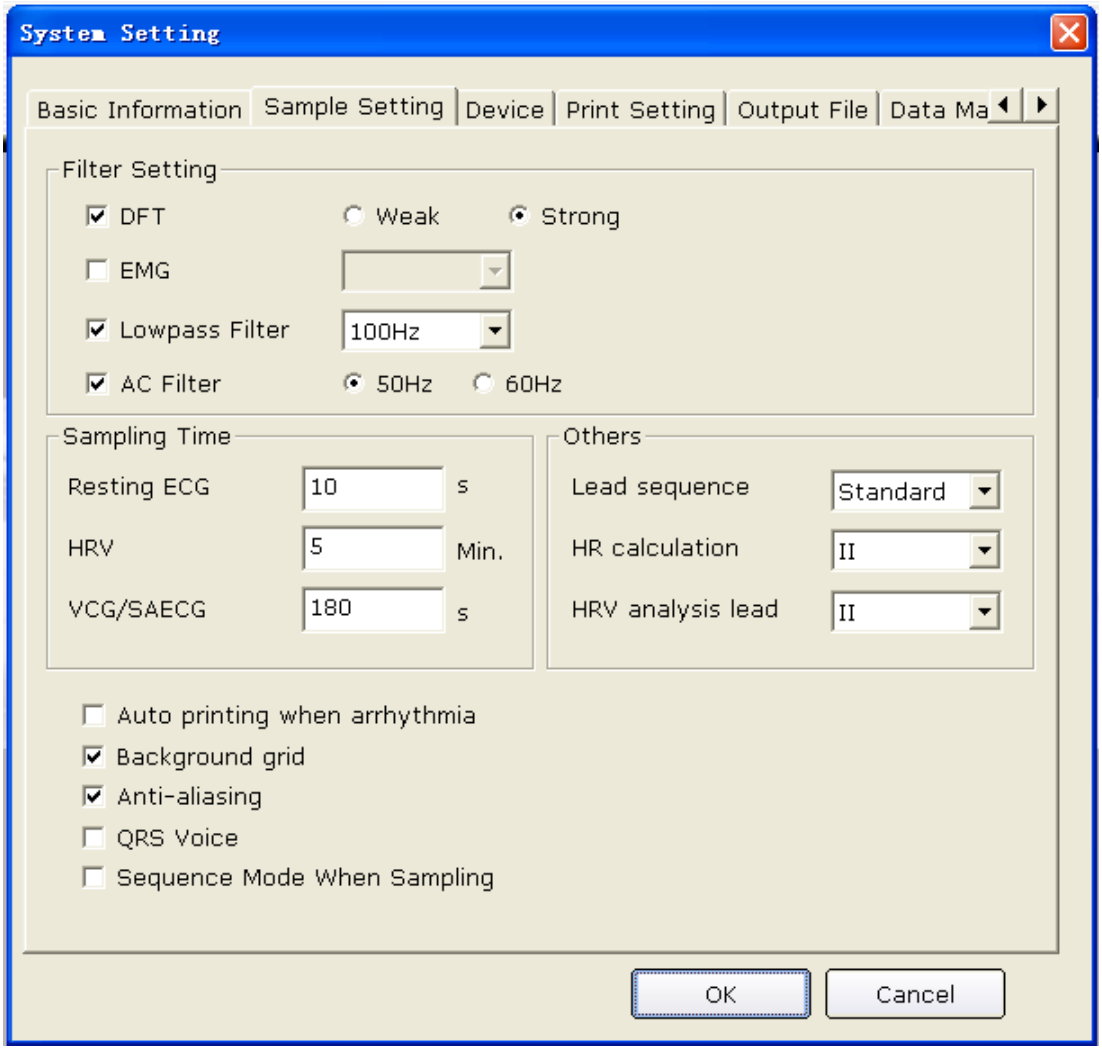
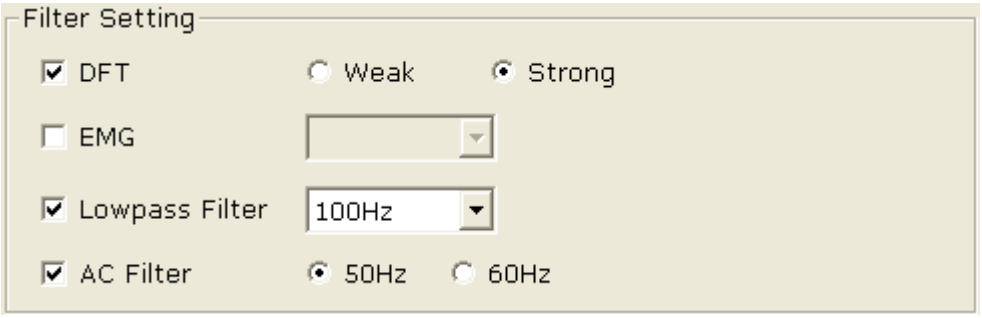


Figure 9-2 Sample Setup Window

9.2.1 Setting Filter



Set filters in the **Sample Setting** window (Figure 9-2).

DFT Filter

DFT filter greatly reduces the baseline fluctuations without affecting ECG signals. There are two options: **Weak** and **Strong**.

NOTE: If DFT filter is set to **Strong**, the ECG data displayed on the screen is 0.85 seconds later than the real-time ECG data; if DFT filter is set to **Weak**, the ECG data displayed on the screen is 1.8 seconds later than the real-time ECG data.

EMG Filter

EMG filter suppresses the disturbance caused by strong muscle tremor. The cutoff frequency can be set to **25Hz**, **35Hz**, or **45Hz**.

Lowpass Filter

Lowpass filter restricts the bandwidth of input signals. The cutoff frequency can be set to **75Hz**, **100Hz** or **150Hz**. All the input signals whose frequency is higher than the setting cutoff frequency will be attenuated.

AC Filter

AC filter suppresses AC interference without attenuating or distorting ECG signals. There are two options: **50Hz** and **60Hz**.

9.2.2 Setting Sampling Time

You can enter the normal ECG sampling time manually. The range is 10~600s.

You can enter the HRV sampling time manually. The range is 1~15min.

You can enter the sequence mode time manually. The range is 10~900s.

9.2.3 Others

1. Lead Sequence

You can set **Lead sequence** to **Standard** or **Cabrera**, and the lead groups are displayed or printed in the corresponding sequence listed in the following table.

Lead Sequence	Lead group 1	Lead group 2	Lead group 3	Lead group 4
Standard	I, II, III	aVR, aVL, aVF	V1, V2, V3	V4, V5, V6
Cabrera	aVL, I, -aVR	II, aVF, III	V1, V2, V3	V4, V5, V6

2. HR Calculation

You can set the **HR calculation** to one of the 12 standard leads: I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, or V6.

3. HR Analysis Lead

You can set the **HR Analysis Lead** to one of the 12 standard leads: I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, or V6.

9.2.4 Selecting Auto Printing When Detecting Arrhythmia

When **Auto printing when arrhythmia** is selected, if Arrhythmia ECG data, including Ventricular Tachycardia, 5>PVCS>=3, Paired PVCS, Bigeminy, Trigeminy, R ON T, single PVC and Missed Beat, is detected during the sampling course, printing will be triggered automatically.

9.2.5 Setting Background Grid

Select **Background Grid,** the grid on the background of the ECG sampling screen will be displayed.

Deselect **Background Grid**, the grid on the background of the ECG sampling screen will not be displayed.

9.2.6 Setting Anti-aliasing

Select **Anti-aliasing,** the system will automatically make the waveform smooth.

Deselect **Anti-aliasing**, the system will not make the waveform smooth.

9.2.7 Selecting QRS Voice

If you select **QRS Voice**, there will be a beep when an R wave is detected.

9.2.8 Selecting Sequence Mode When Sampling

When **Sequence Mode When Sampling** is selected, groups of waves will be displayed in succession.

9.3 Device Setup

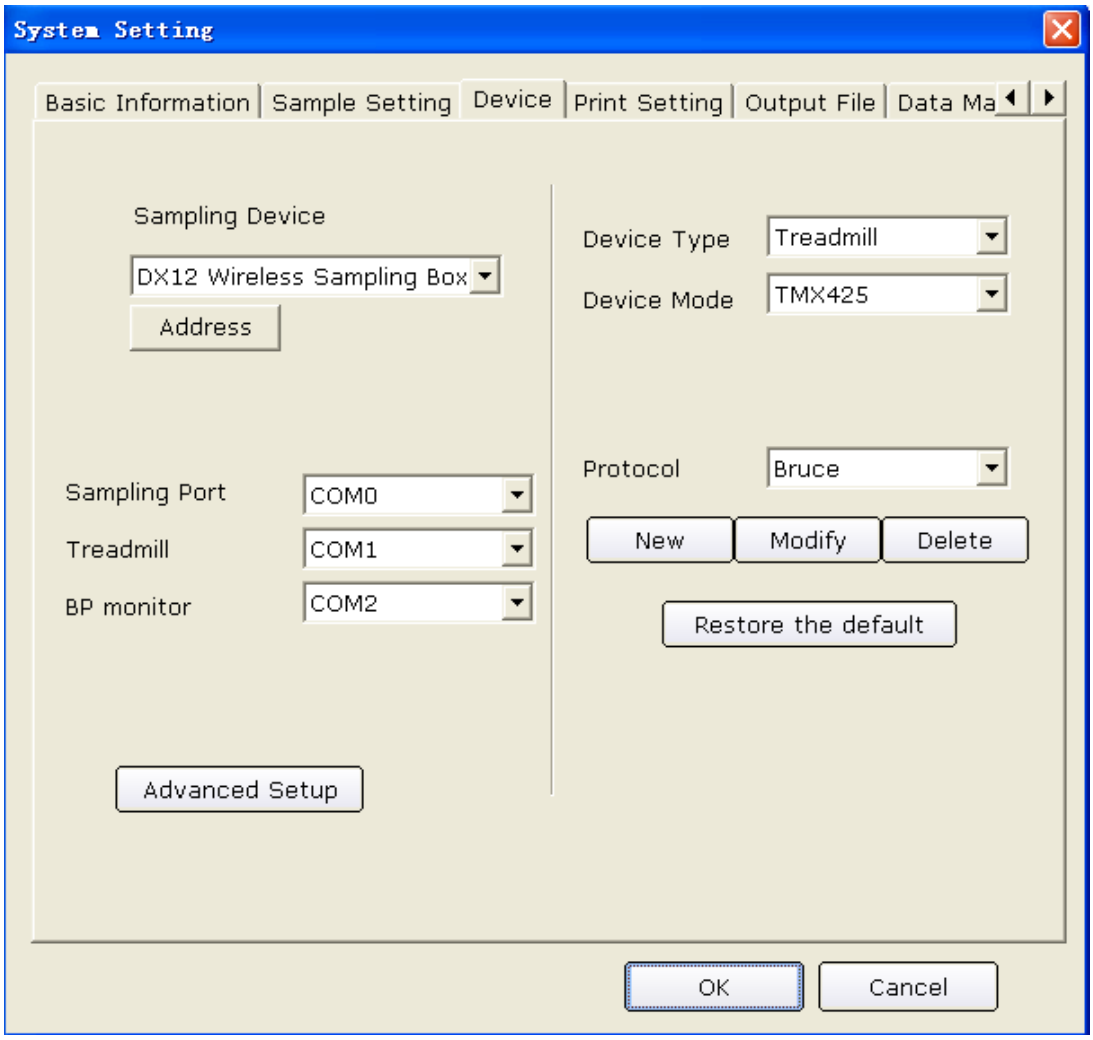
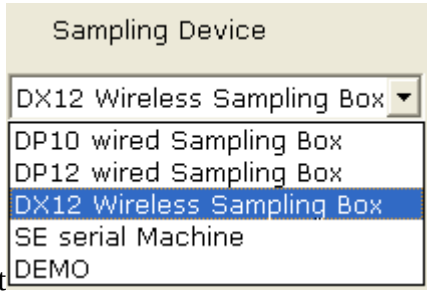


Figure 9-3 Device Setup Window

9.3.1 Setting Sampling Device



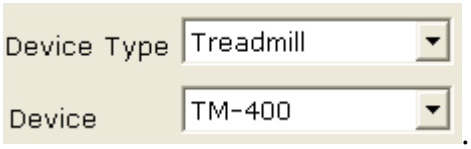
Select a sample device from the **Sampling Device** pull-down list in the **Device** window (Figure 9-3).

When **DX12 wireless sampling box** is selected, you can click on the **Address** button to view the receiver address. You can match the transmitter and receiver based on the address

from the **Sampling Device** pull-down list.

9.3.2 Setting Device Type/Mode

Select a device type/mode from the **Device Type/Device** pull-down list



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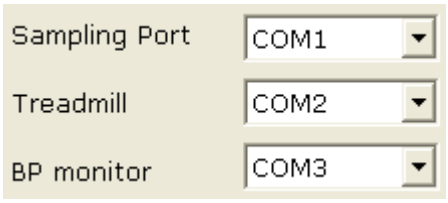
9.3.3 Setting COM Port of Sample/Treadmill/BP Monitor

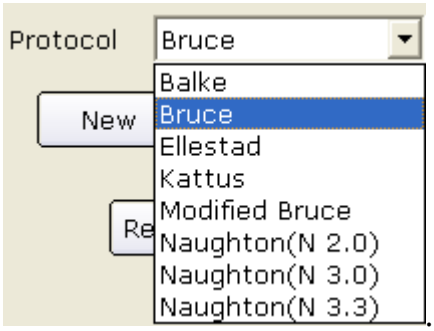
Select the COM port for sampling/treadmill/BP monitor from the corresponding pull-down lists



. To guarantee the system's proper operation, one of the preconditions is to ensure that the connection between the peripheral equipment and the PC accords with the setup in the software. For example, if you set the treadmill port to **COM2**, you should connect the treadmill to COM2 of the PC; if you set the BP monitor port to **COM3**, you should connect the BP monitor to **COM3** of the PC.

9.3.4 Setting a Protocol

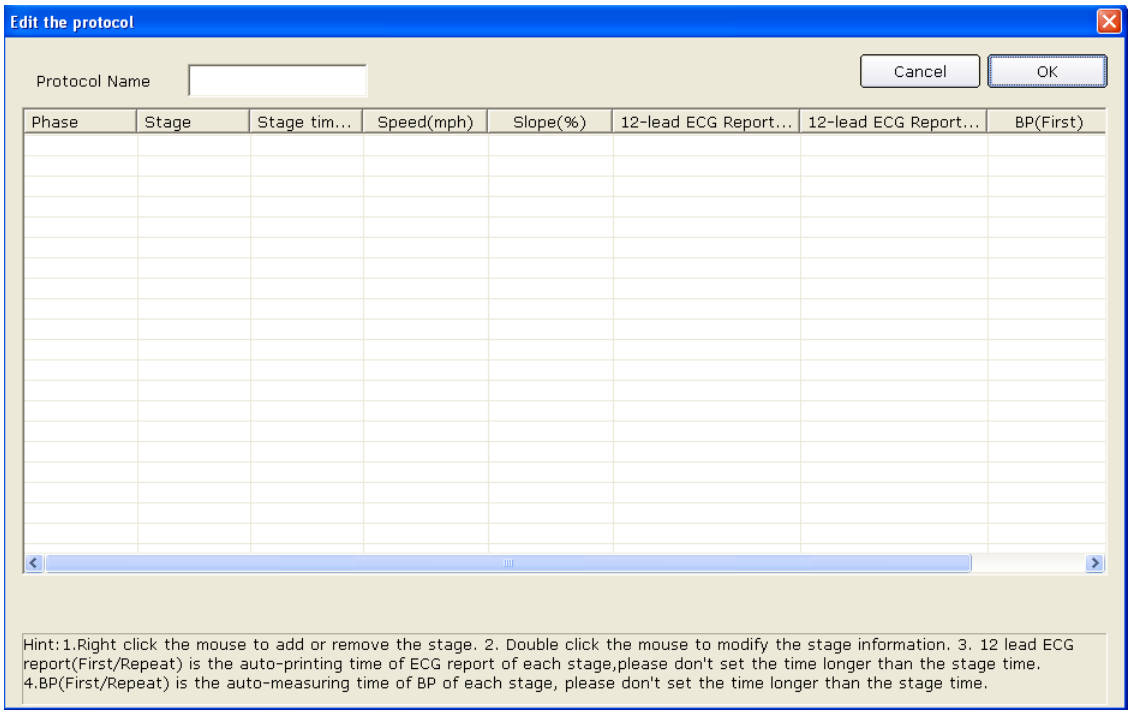
Select a protocol from the **Protocol** pull-down list

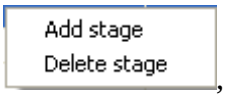


. You can also add a new protocol or modify a protocol.

9.3.4.1 Creating a New Protocol

Click on the **New** button in the **Device** window (Figure 9-3) to enter the **Edit the protocol** window.

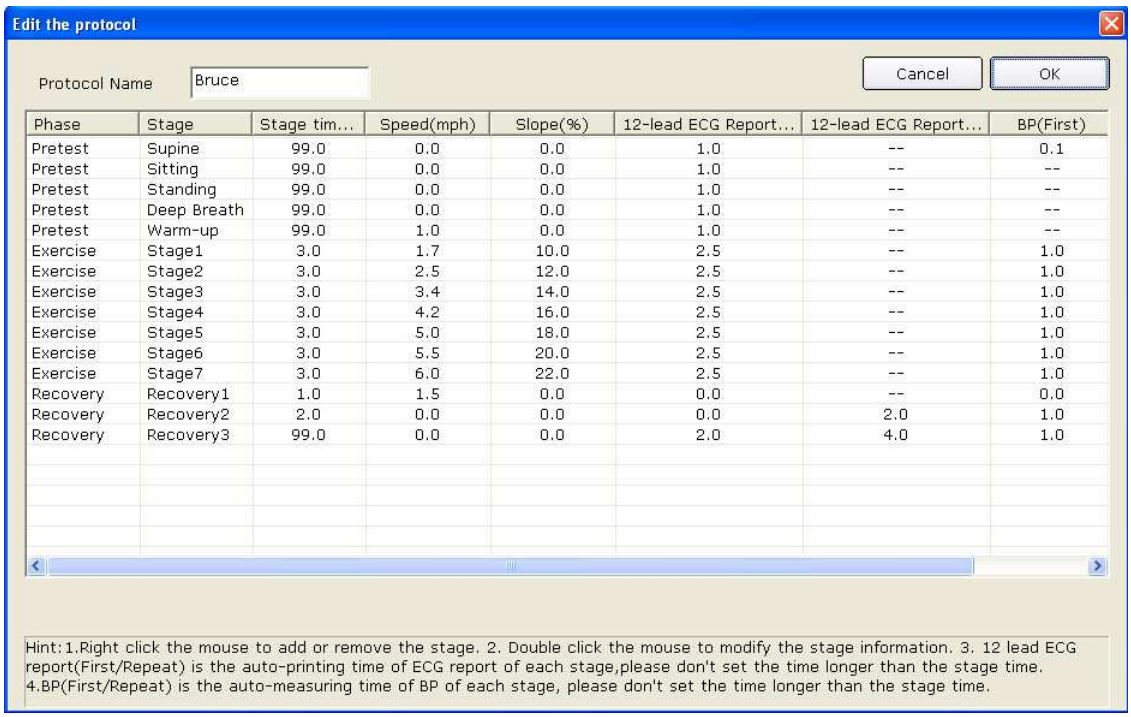


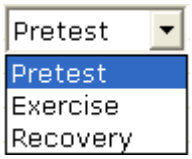
1. Enter the protocol name in the **Protocol Name** textbox.
2. Right-click on the grid to display the menu 

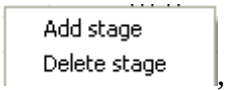
, click on **Add Stage**, and enter information in the grid.
3. Set the auto printing time of 12-lead ECG reports in the **12-lead ECG Report (First)** and **12-lead ECG Report (Repeat)** columns.
4. Set the auto BP sampling time in the **BP (First)** or **BP (Repeat)** columns.
5. After entering all the information, click on the **OK** button.

9.3.4.2 Modifying a Protocol

1. Select a protocol from the **Protocol** pull-down list, and then click on the **Modify** button to display the **Edit Protocol** window.



2. Double-click on an option of the phase row to be modified in the protocol list, and the pull-down list 

will be displayed. Select a phase and it will be displayed in the corresponding grid.
3. Double-click on the grid to be modified, input new information, and click on any other grid to save the information.
4. Right-click on the grid to display the menu 

, click on **Add Stage**, and enter information in the grid.
5. Set the auto printing time of 12-lead ECG reports in the **12-lead ECG Report (First)** and **12-lead ECG Report (Repeat)** columns.
6. Set the auto BP sampling time in the **BP (First)** or **BP (Repeat)** columns.
7. Click on the **OK** button to confirm, or click on the **Cancel** button to cancel modifications.

9.3.4.3 Deleting a Protocol

Select a protocol from the **Protocol** pull-down list, and then click on the **Delete** button to delete the protocol.

NOTE: You can't delete default protocols Bruce and IsoPower.

9.3.4.4 Restoring the default protocol

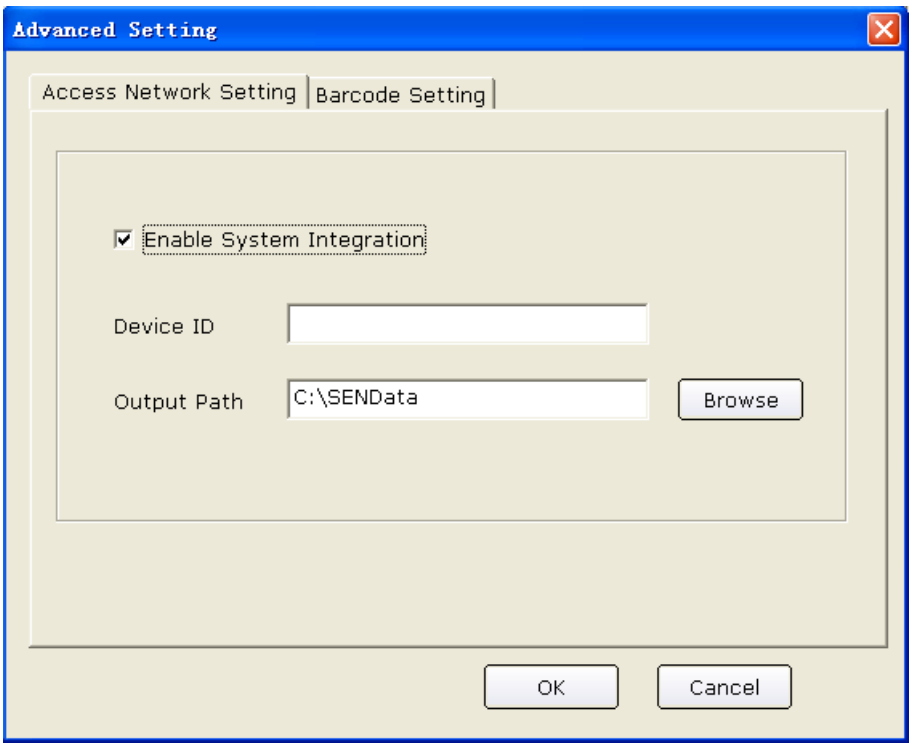
Click on the **Restore the default** button to resume the default protocol.

9.3.5 Advanced Setup

Click on **Advanced Setting**, input the correct password in the pop-up textbox, and then click on the **OK** button.

9.3.5.1 Setting Access Network

Click on the **Access Network Setting** tab to display the following window.



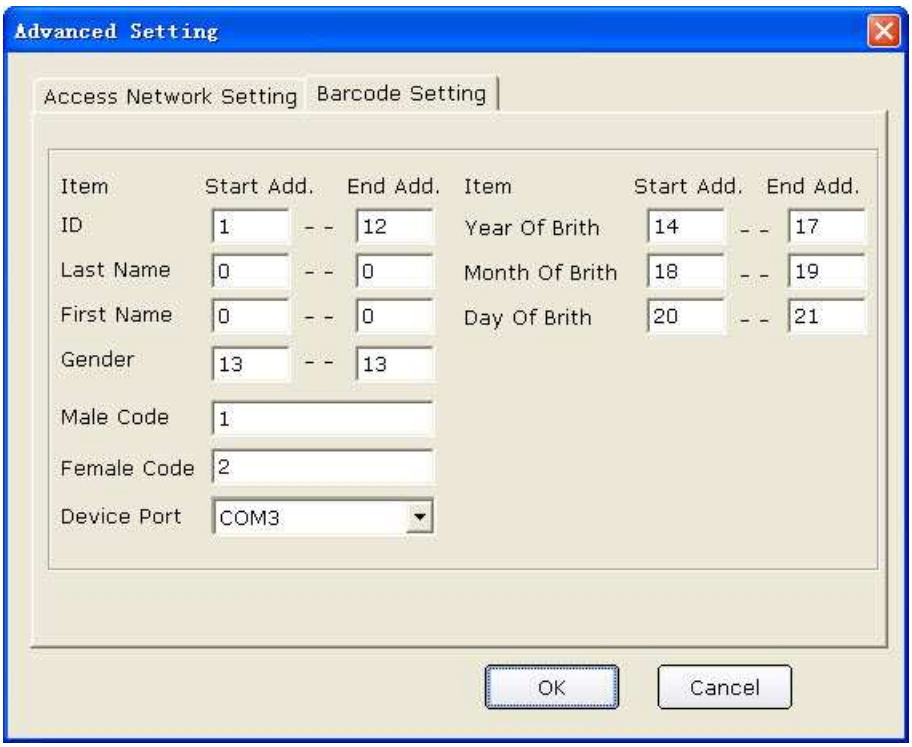
Only if **Enable System Integration** is selected, can **Device ID** and **Output Path** be set.

Device ID and **Output Path** should be set to the same values as those of Smart ECG Net. Otherwise, data of this system can not be uploaded to Smart ECG Net system normally.

If the System Integration is activated**,** the system will save two copies of data, one is saved to the data path of the system, and the other is saved to the output path, the default of which is system disk: \SENData\.

9.3.5.2 Setting Barcode

Click on the **Barcode Setting** tab to display the following window.

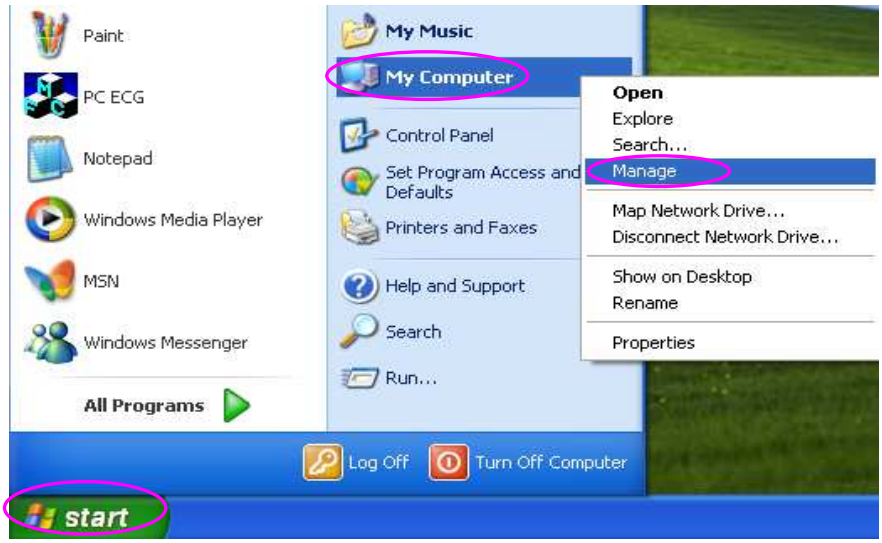


NOTE: You can make related settings only for two-dimensional bar code readers in the **Barcode Setting** window.

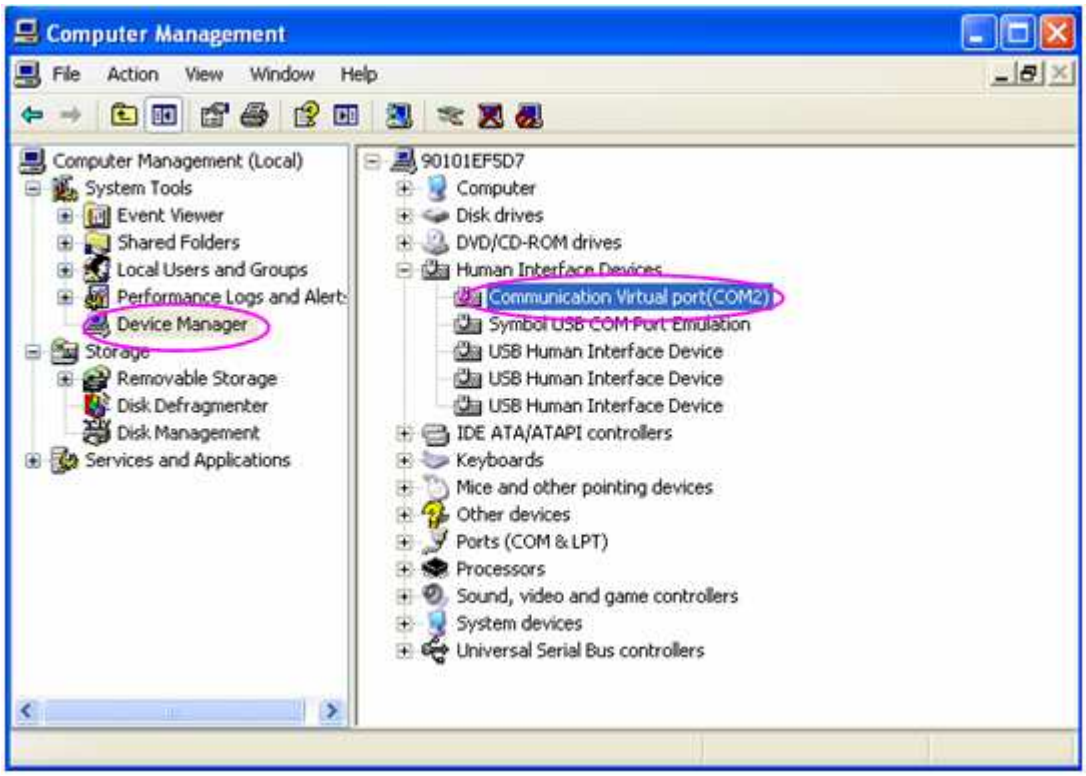
Enter the start and end addresses, the male and female codes and the device port, and then click on the **OK** button confirm.

If the bar code reader cannot be automatically detected, you can make related settings as the following procedures show:

1. Connect the bar code reader to the PC
2. Click on **start**, right-click on **My Computer**, and then select **Manage** in the pop-up menu to display the **Computer Management** screen.



3. Click on **Device Manager** on the **Computer Management** screen, and then click on **Human Interface Devices** to view port information.



4. In the **Barcode Setting** window, set **Device** to the port you view on the **Computer Management** screen, and then click on the **OK** button to confirm.
5. Restart the PC ECG software.

9.4 Print Setup

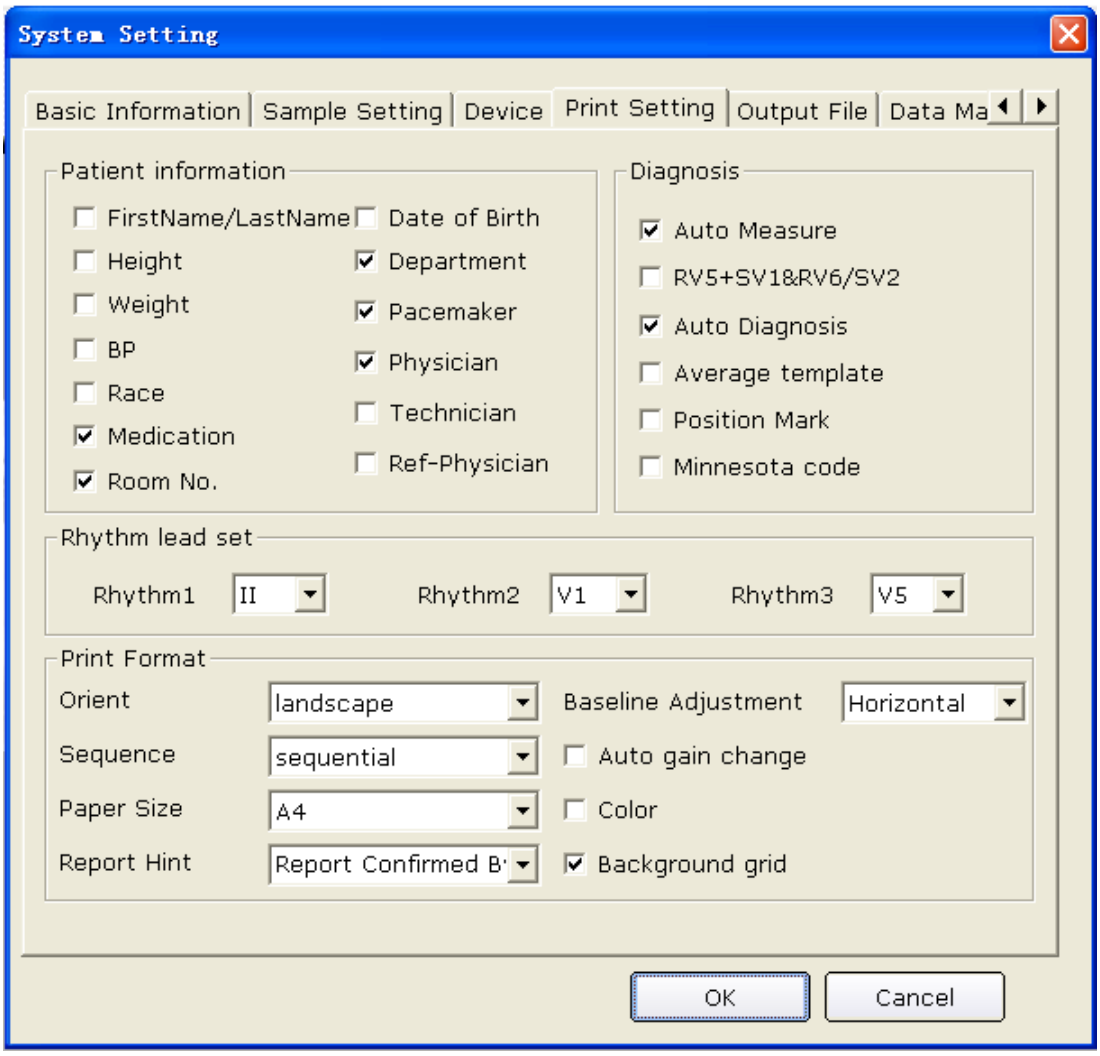
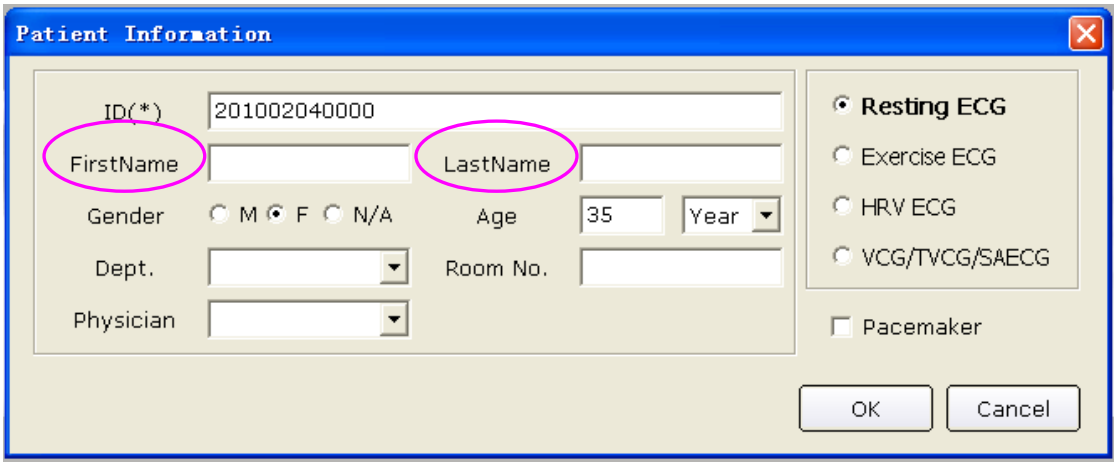


Figure 9-4 Print Setting Window

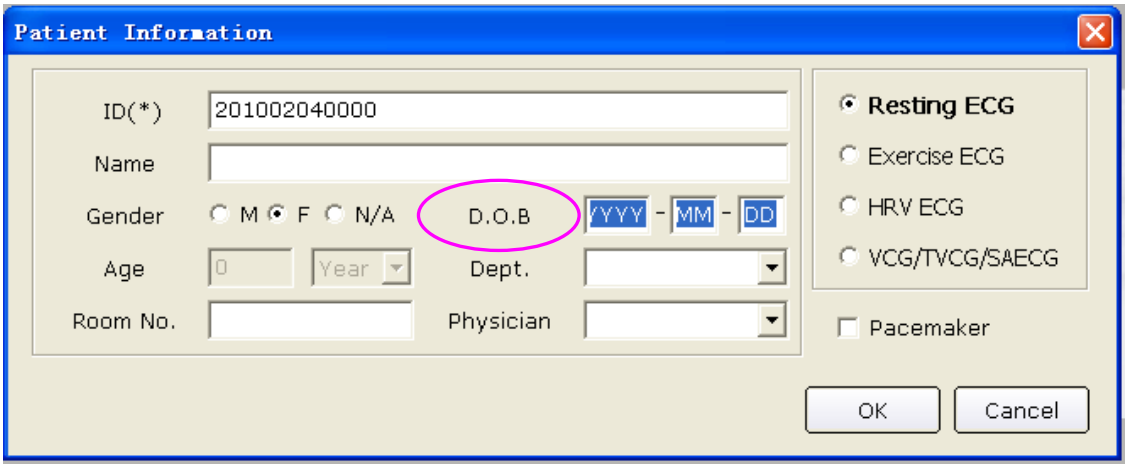
9.4.1 Choosing Patient Information to be Printed

The default items of the patient information are Department, Room No and Physician. You can also select the additional information, such as FirstName/LastName, Date of Birth, height, weight, BP, race, medication, Pacemaker, Technician and Ref-Physician. The patient information items you selected will be displayed in the **Patient Information** window and the report printed out.

If you select **First Name/Last Name**, the **Patient Name** textbox in the **Patient Information** window will change into the **First Name** and **Last Name** textboxes.



If you select **D.O.B**, the D.O.B textbox appears in the **Patient Information** window, and the **Age** textbox becomes unavailable.



9.4.2 Choosing Diagnosis Information to be Printed

The diagnosis information is displayed on the preview screen and in the report printed out.

Position Mark should be selected together with **Average template**, because the position mark is only used to mark the position of ECG waves in the average template. Select **Auto Diagnosis** to display diagnosis results on the preview screen and in the report printed out. Select **Auto Measure** to display values of parameters. Select **RV5+SV1&RV6/SV2** to display values of RV5+SV1&RV6/SV2. Select **Minnesota code** to display Minnesota code.

9.4.3 Setting Rhythm Lead

The rhythm lead can be one of 12 standard leads: I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, or V6.

When the printing mode is set to **3×4+1** or **6×2+1**, the rhythm lead selected in the **Rhythm1** list box will be printed out.

When the printing mode is set to **3×4+3**, 3 rhythm leads selected in the **Rhythm1**, **Rhythm2** and **Rhythm3** list boxes will be printed out.

9.4.4 Defining Printing Format

1. The paper form can be set to **landscape** or **portrait**.
2. Set **Sequence** to **sequential** or **synchronous**.

   When **Sequence** is set to **sequential**, the lead group is printed one by one in a certain sequence. The start time of a lead group is just the end time of the previous lead group.

   When **Sequence** is set to **synchronous**, all leads are printed simultaneously. The start time of each group is the same.
3. Set the paper size to **A4** or **Letter**.
4. Set the Report Hint to **Report confirmed by:** or **Unconfirmed Report**.
5. Set the **Baseline Adjustment** to **OFF, Horizontal** or **Auto.**
6. Select **Auto gain change**, and the gain will be changed automatically and **Auto baseline** will be changed to **Horizontal** automatically**.**
7. Select **Color** and the background grid of report will be printed in color.

   Deselect **Color,** and the background grid of report won't be printed in color.

   NOTE: If the printing color is set to color, but a black-and-white printer is used, the report printed will be illegible.
8. Select **Background grid**, and the background grid will be printed in the report.

   Deselect **Background grid**, and the background grid won't be printed in the report.

9.5 Output File Setup

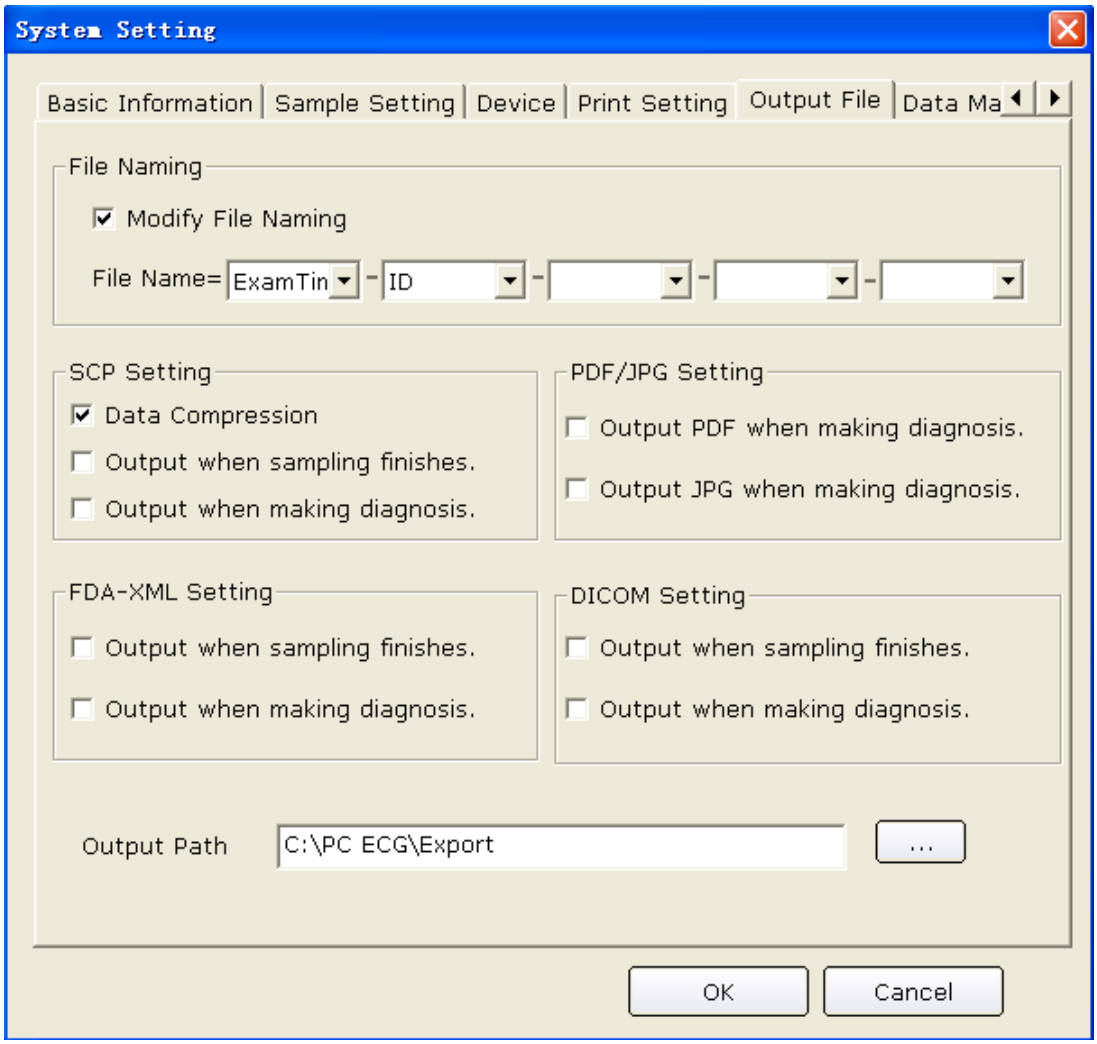


Figure 9-5 Output File Setup Window

9.5.1 File Naming

The default file name is Exam Time-ID, and a "-" exists between every two fields. You can also modify the file name manually, such as Name-ID-Exam Time. Each field includes ID, name, exam time, age and sex items, you can randomly use these items to combine a file name, but you should select at least one item as a file name.

NOTE: When you select **FirstName/LastName** in the **Print Setting** window, name will be divided into two parts.

When the file name is empty, the system will give hint information.

9.5.2 Setting PDF/JPG

Select **Output PDF when making diagnosis,** the system will automatically output files in PDF format when making diagnoses.

Select **Output JPG when making diagnosis,** the system will automatically output files in JPG format when making diagnoses.

9.5.3 Setting SCP

Select **Data Compression,** the system will automatically output files in SCP format of data compression.

Deselect **Data Compression**, the system will output files in SCP format without data compression.

Select **Output when sampling finishes,** the system will automatically output files in SCP format when sampling finishes.

Deselect **Output when sampling finishes,** the system will not output files in SCP format when sampling finishes.

Select **Output when making diagnosis,** the system will automatically output files in SCP format when making diagnoses.

Deselect **Output when making diagnosis**, the system will not output files in SCP format when making diagnoses.

9.5.4 Setting FDA-XML

Select **Output when sampling finishes,** the system will automatically output files in FDA-XML format when sampling finishes.

Deselect **Output when sampling finishes,** the system will not output files in FDA-XML format when sampling finishes.

Select **Output when making diagnosis,** the system will automatically output files in FDA-XML format when making diagnoses.

Deselect **Output when making diagnosis**, the system will not output files in FDA-XML format when making diagnoses.

9.5.5 Setting DICOM

Select **Output when sampling finishes,** the system will automatically output files in DICOM format when sampling finishes.

Deselect **Output when sampling finishes,** the system will not output files in DICOM format when sampling finishes.

Select **Output when making diagnosis,** the system will automatically output files in DICOM format when making diagnoses.

Deselect **Output when making diagnosis**, the system will not output files in DICOM format when making diagnoses.

9.5.6 Specifying the Output Path

Click on the **…** button in the **Output File** window (Figure 9-5) to assign the output path.

9.6 Data Maintenance Setup

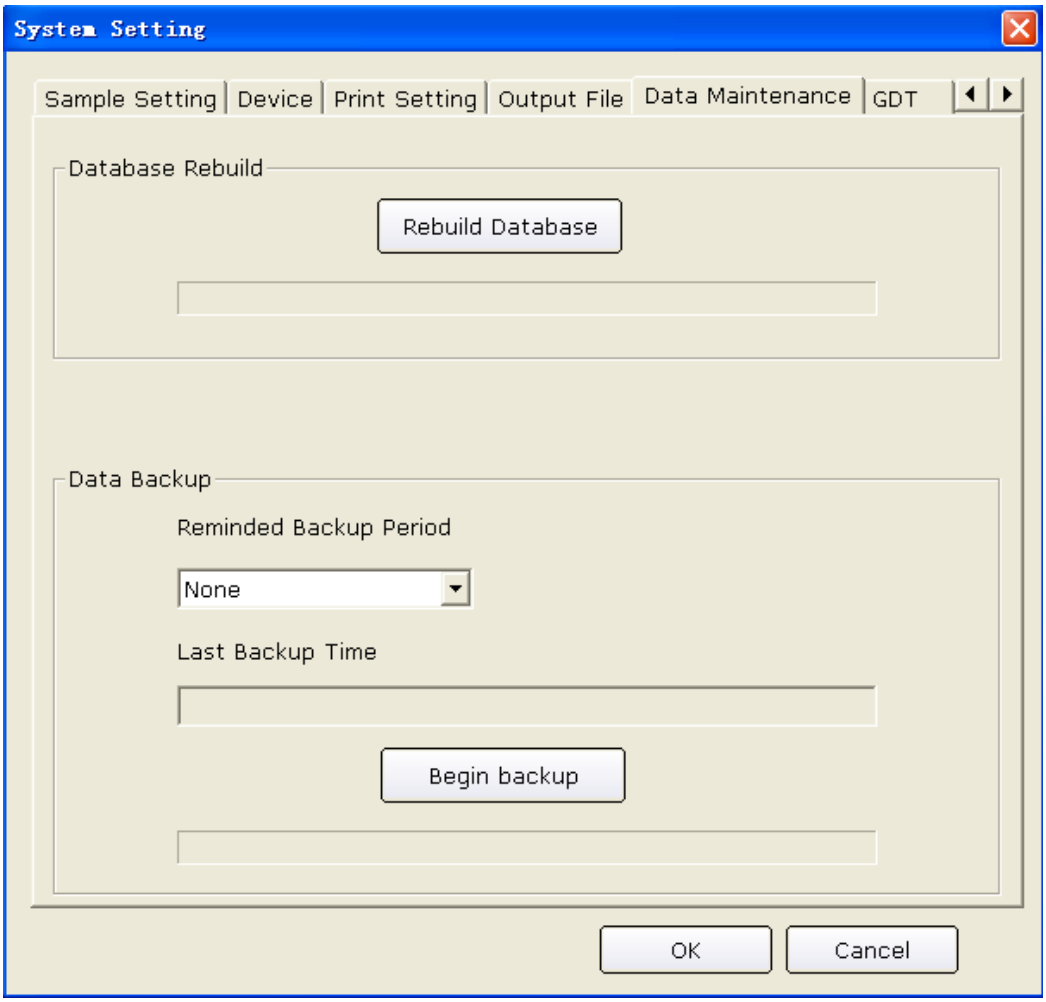
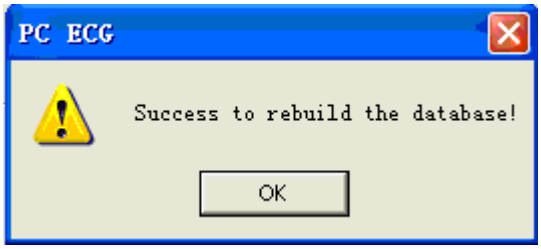


Figure 9-6 Data Maintenance Window

9.6.1 Database Rebuild

You can rebuild the database to avoid losing data because of damaged data files. Click on the **Rebuild Database** button in the **Data Maintenance** window, and then you can select the path to rebuild database. You cannot enter the path manually.

After rebuilding the path successfully, hint information will be displayed.

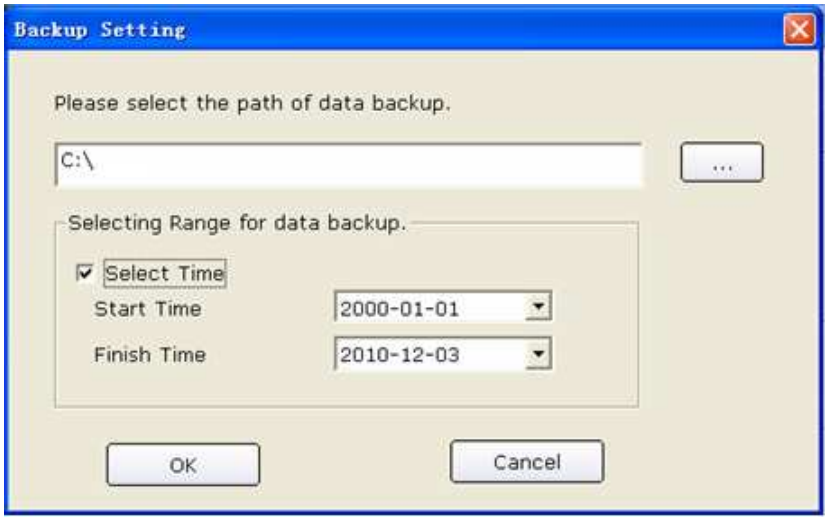


9.6.2 Database Backup

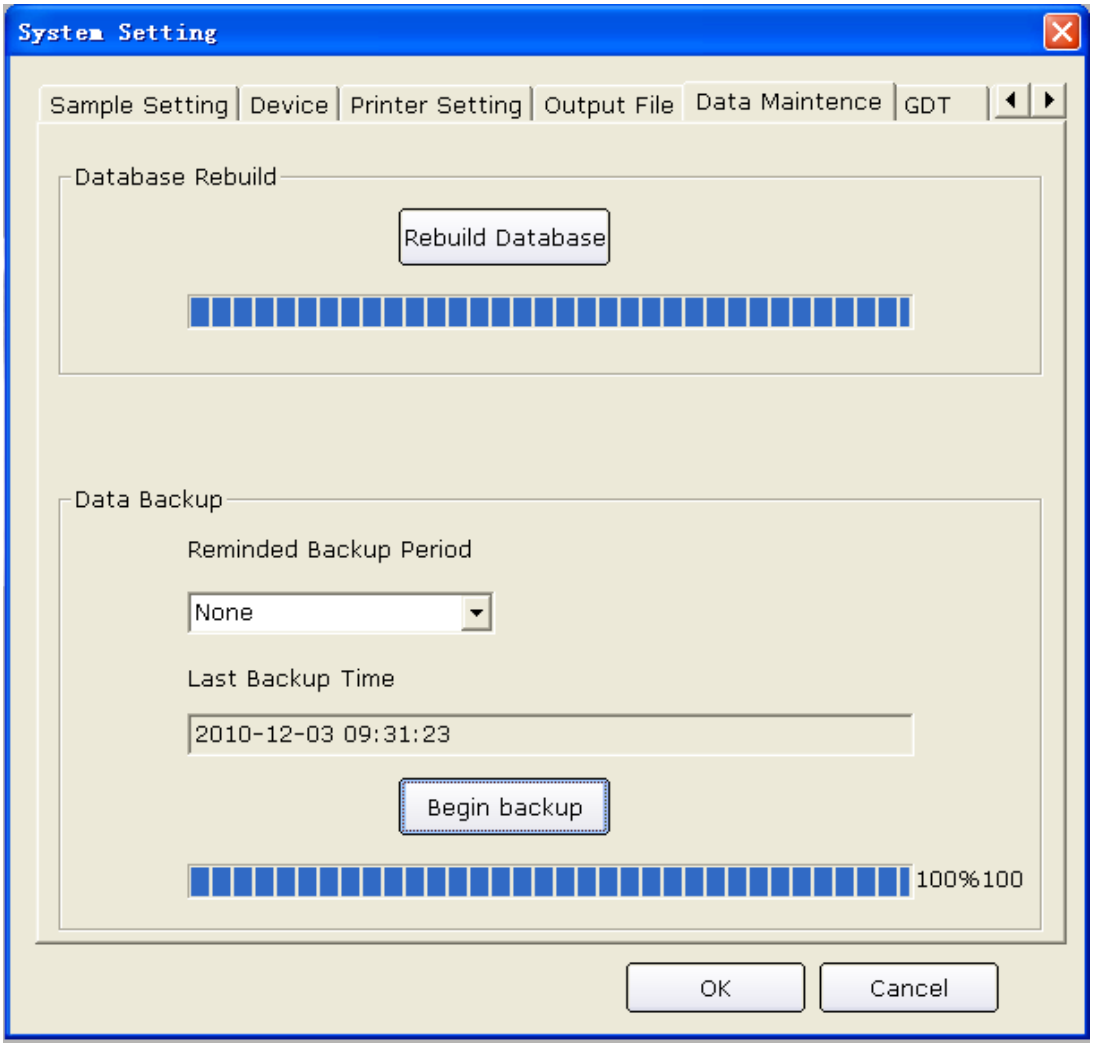
You can also make a backup for the data files to avoid your data files being damaged or missing.

Click on the **Begin backup** button in the **Data Maintenance** window, and then you can select the path of data backup. You should select the path of a disk with enough space. Otherwise, the system will prompt you to change the path.

If the **Select Time** in the **Backup Setting** window is selected, the system will back up the data files from the start time to the finish time. If the **Select Time** is not selected, the system will back up all the data files.

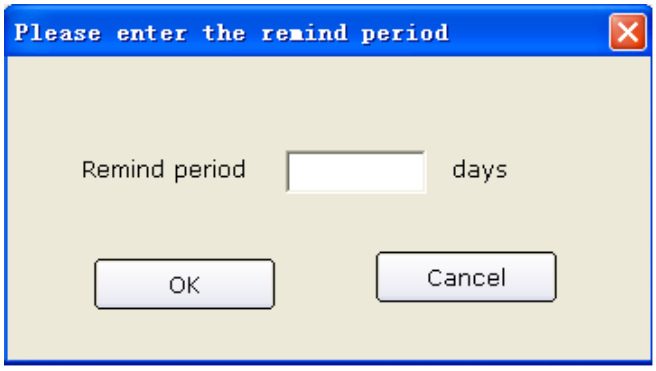


Click on the **OK** button in the **Backup Setting** window, the system will begin backup. You can check the backup status according to the progress bar or you can stop backup at any times.



The system will back up the data files for the latest time if you do not change the path.

You can also set the reminded backup period to remind you back up the data files at any time. The default system reminded period is None, you can also select 7 days, 14 days, 30 days or you can define it manually.



9.7 GDT Setup

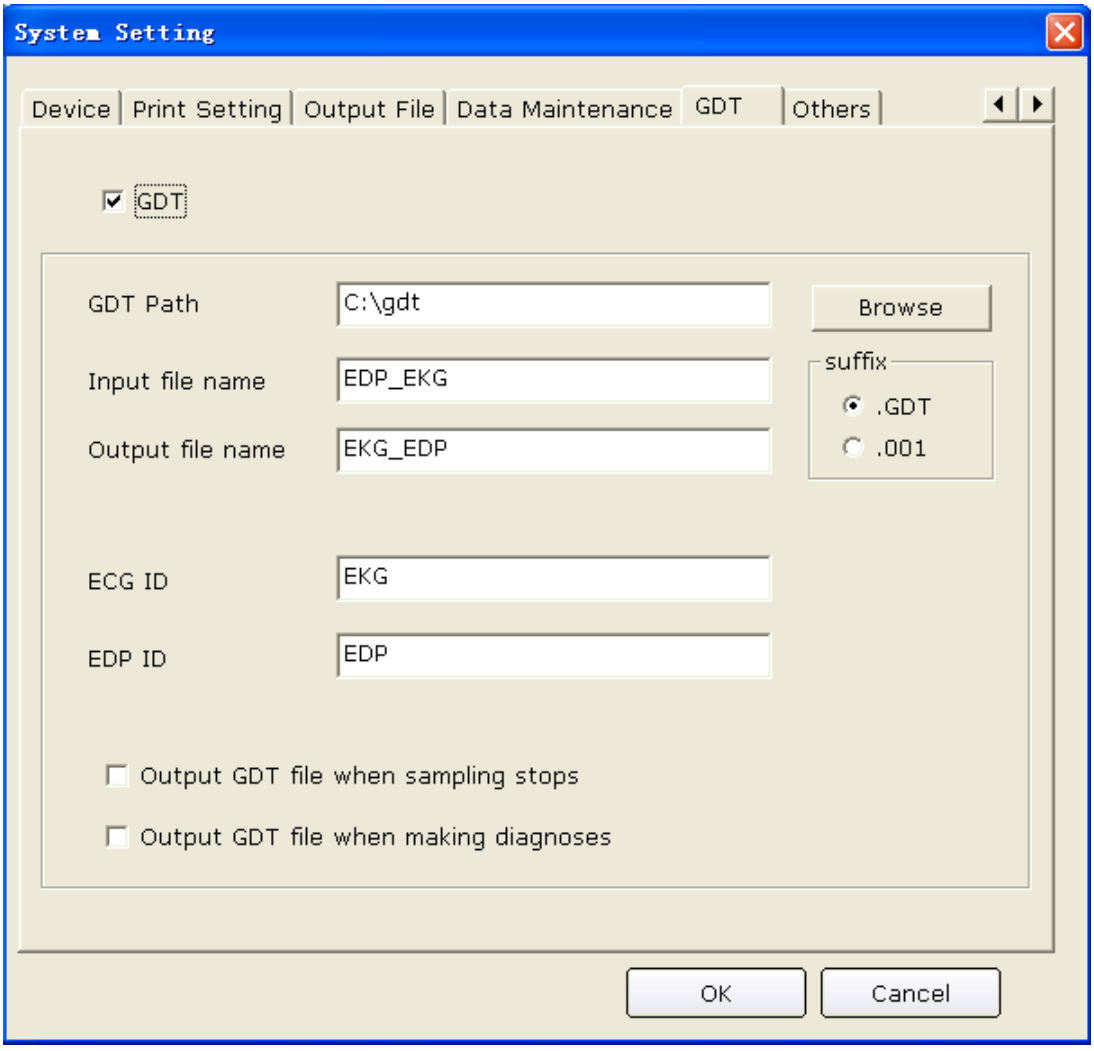


Figure 9-7 GDT Setup Window

Select **GDT** to enable GDT features.

Click on the **Browse** button, and then appoint the path to exchange files with EDP.

Fill in the **Input file name** textbox to set command file name assigned by EDP to the PC ECG system.

Fill in the **Output file name** textbox to set data file name that is used by the PC ECG system to transmit the result data to EDP.

Enter ECG ID to set GDT ID assigned to the system which will be entered in field 8315 or 8316 in the GDT protocol.

Enter EDP ID to set GDT ID of the EDP system which will be entered in field 8315 or 8316 in the GDT protocol.

Select **Output GDT file when sampling stops,** the system will automatically output GDT files when sampling stops.

Select **Output GDT file when making diagnoses**, the system will automatically output GDT files when making diagnoses.

9.8 Other Setup

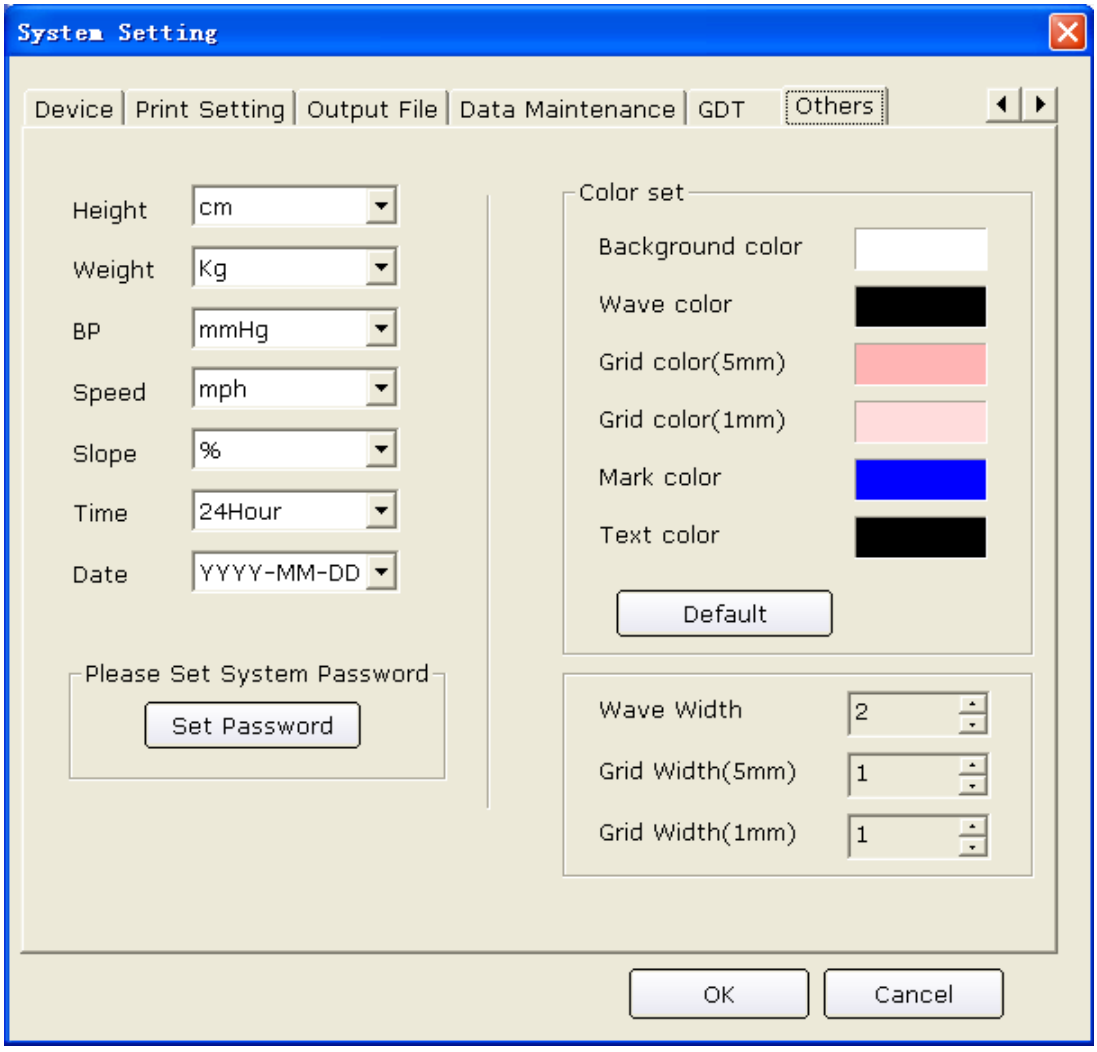


Figure 9-8 Other Setup Window

9.8.1 Setting Unit and Color

Set the height unit to **cm**, **inch** or **mm**.

Set the weight unit to **Kg, g** or **Pound**.

Set the BP unit to **kPa** or **mmHg**.

Set the speed unit to **Km/h** or **mph**.

Set the grade unit to **%** or **degree**.

Set the time mode to **24Hour** or **12Hour**.

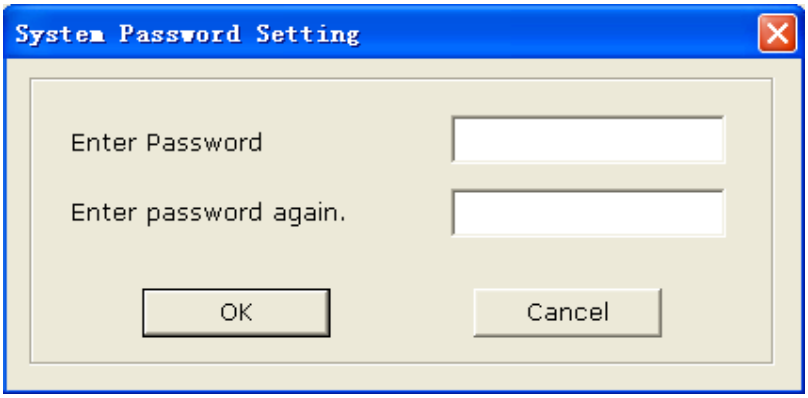
Set the date mode to **MM-DD-YYYY, DD-MM-YYYY OR YYYY-MM-DD**.

Set the color of the background, waves, grid (5mm), grid (1mm), mark and text. If you want to change a color, double-click on the color block to display the **Color** window, and then you can select your favorite color.

Click on the **Default** button to restore the default colors.

9.8.2 Setting System Password

You can set a system password to avoid the system setting being modified. Click on the **Set Password** button in the **Others** window, enter the same password for twice, and then the system password is set successfully.



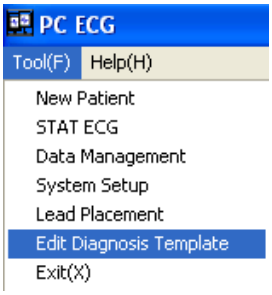
After a successful password setting, you should have a correct password to enter the **System Setting** window. Otherwise, the system will give hint information to prevent your access.

9.8.3 Setting Wave Width and Grid Width

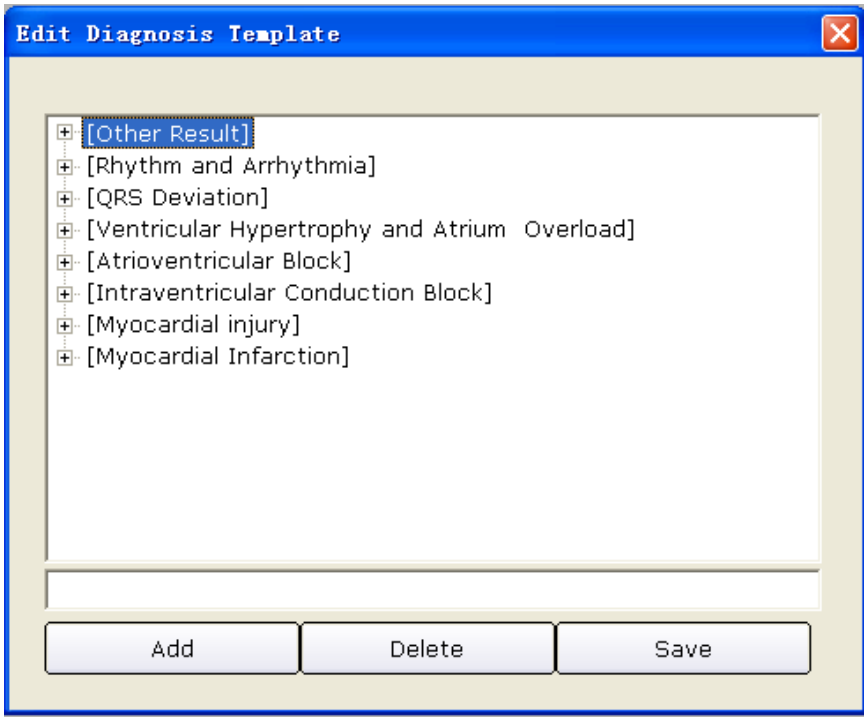
You can adjust **Wave Width, Grid Width (5mm)** and **Grid Width (1mm)** of report by using the up or down arrow. The adjustable range is: 1~5.

NOTE: The width may vary with the type of printer.

9.9 Modifying the Glossary

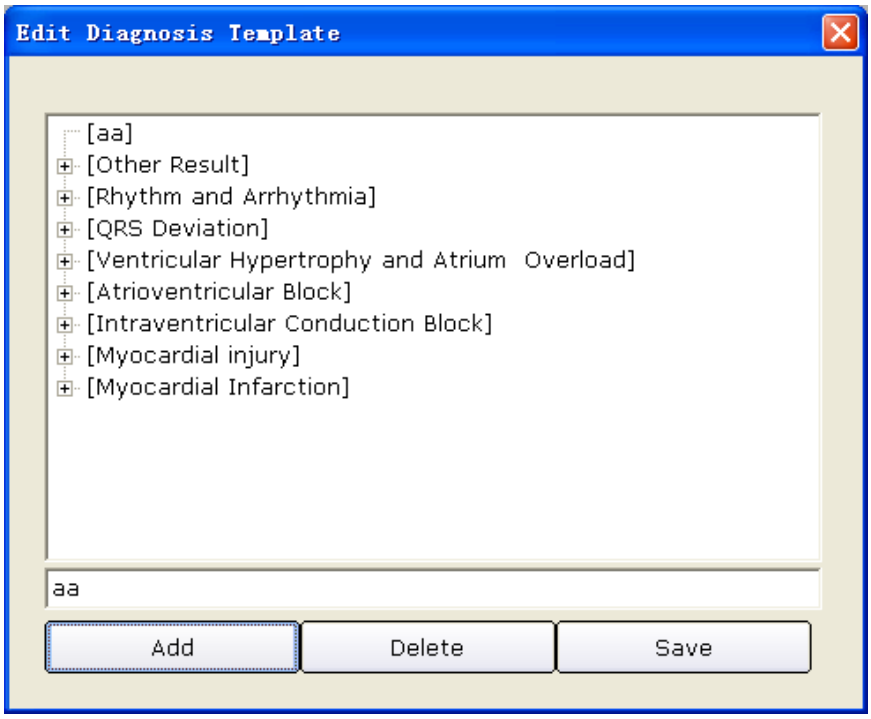


Click on **Edit Diagnosis Template** from the **Tool (F)** pull-down list on the main screen (Figure 6-1), and then the **Edit Diagnosis Template** window appears.



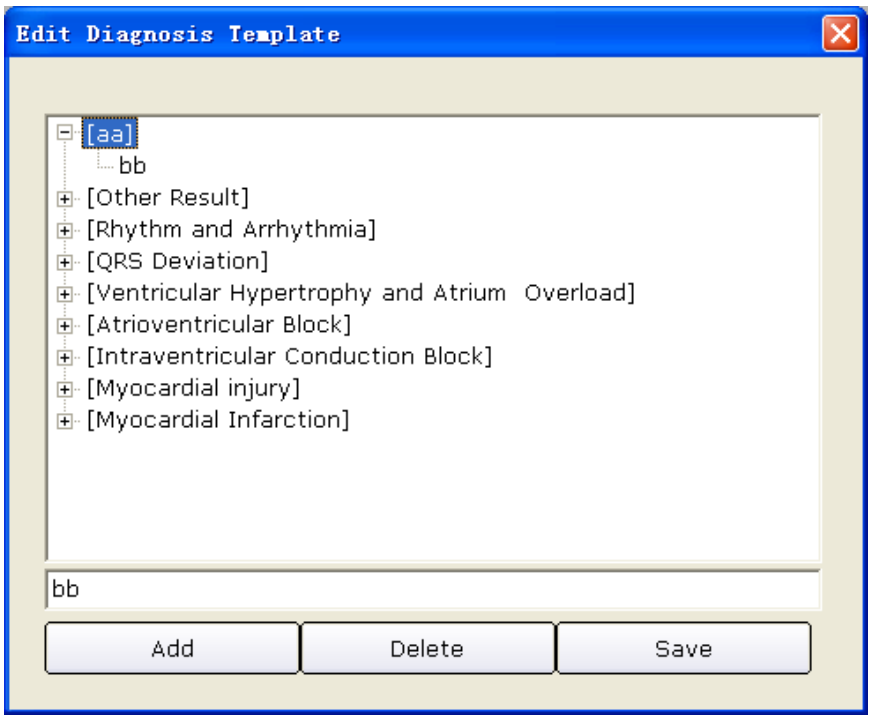
1. Adding an item

   Enter a diagnosis item, such as **aa** in the textbox, and then click on the **Add** button. The added item will be displayed in the **Edit Diagnosis Template** window.



2. Adding a subitem

Click on the item you wanted to add a subitem, enter a diagnosis subitem, such as **bb** in the textbox, and then click on the **Add** button. The added subitem will be displayed under **aa**.



3. Deleting an item

Click on the item you wanted to delete from the **Edit Diagnosis Template** window, and then click on the **Delete** button to delete this item.

4. Save the settings

Click on the **Save** button to save these modifications.

Chapter 10 Hint Information

Hint information and the corresponding causes provided by the system are listed as follows.

Table 10-1 Hint Information and Causes

Hint Information	**Causes**
Lead off: X	Electrodes fall off the patient or the patient cable falls off the ECG sampling box.
It is pre-sampling now, please click on 'Start' to begin recording.	During the pre-sampling course
Resting ECG is sampling now!	During the sampling course of Resting ECG
Can't detect the Sentinel, enter DEMO or not?	The sentinel is not inserted.
The Sentinel is not compatible, enter DEMO or not?	The sentinel is incorrect.
Hint: Please make sure the USB line has been connected. If possible, please re-connect it!	The USB cable is disconnected or the communication between the ECG sampling box and the serial port is interrupted. 1. Reconnect the ECG sampling box to the PC. 2. Click on the **Device** tab in the **System Setting** window of the PC ECG system, and check whether the sampling device is set correctly.
Communication error! Please check the USB cable!	The USB cable falls off the PC during the sampling process.
It is connecting now, please wait…	DX12 transmitter is connecting to DX12 receiver.
Can't find the corresponding Bluetooth sampling device, please make sure the device is on.	Fail to connect with DX12 receiver.
Battery of sampling device is weak, please change the battery after the test.	Battery of DX12 transmitter is low.
Battery is weak, the sampling device is closing.	Battery of DX12 transmitter is low.

Sampling Device is in sleep mode, please press “Power” to wake it up.	DX12 transmitter is in sleep mode.
Overload	The direct current offset voltage on an electrode is too high.
Sorry, Can not Connect to the Database!	MSDE 2000 or SQL Server 2005 Express is not started up.
Fail to create database!	The system fails to create database.
Fail to open the treadmill (ergometer) port! Please make sure the treadmill (ergometer) has been connected to the computer and the port setting is right	Fail to open the COM port which controls the treadmill/ergometer. Reconnect the treadmill/ergometer to the PC, and set the COM port correctly.
Fail to open the BP monitor port! Please make sure the BP monitor has been connected to the computer and the Port set is right!	Fail to open the COM port which controls the blood pressure. Reconnect the BP monitor to the PC, and set the COM port correctly.
The current HR has exceeded the target HR!	Current heart rate value exceeds the target heart rate value.
The diastolic BP has exceeded the normal range!	Diastolic blood pressure exceeds the normal BP range.
The systolic BP has exceeded the normal range!	Systolic blood pressure exceeds the normal BP range.

According to IEC/EN 60601-1-8, the characteristics of the visual alarm signals (hint information) are listed in Table 10-2.

Table 10-2 Characteristics of Visual Alarm Signals (Hint Information)

Alarm Category	Indicator Color	Flashing Frequency	Duty Cycle
LOW	Yellow	Constant (on)	100%

Chapter 11 Cleaning, Care and Maintenance

CAUTION

Turn off the system power and drag the power cable out from the socket before cleaning or disinfection.

11.1 Cleaning and Maintaining the Treadmill

Daily Cleaning and Maintenance

1. Wipe the treadmill with a clean soft cloth to remove dust, moisture and sweat stain.
2. Wipe the handrail of the treadmill with a clean soft cloth damped in non-caustic neutral detergent.
3. Do not pour or spray detergent onto the treadmill directly.

Weekly Cleaning and Maintenance

1. Clean dust around the treadmill with a dust-collector.
2. Check whether the emergency stop switch is valid.
3. Check the tightness degree of the running belt.

Semiyearly Cleaning and Maintenance

1. Lubricate the screws.
2. Valuate the state of the treadmill.

11.2 Cleaning and Maintaining the Patient Cable and Reusable Electrodes

WARNING

Failure on the part of the responsible individual hospital or institution employing this equipment to implement a satisfactory maintenance schedule may cause undue equipment failures and possible health hazards.

- Clean the patient cable with a clean soft cloth. Do not use the detergent containing alcohol to clean the patient cable.
- Integrity of the patient cable, including the main cable and lead wires, should be checked regularly. Make sure that it is conductible.

- Do not drag or twist the patient cable with excessive stress while using it. Hold the connector plugs instead of the cable when connecting or disconnecting the patient cable.
- Align the patient cable to avoid twisting, knotting or crooking at a closed angle while using it.
- Store the lead wires in a big wheel.
- Once damage or aging of the patient cable is found, replace it with a new one immediately.

Remove the remainder gel from the electrodes with a clean soft cloth first. Take suction bulbs and metal cups of chest electrodes apart, and take clamps and metal parts of limb electrodes apart. Clean them in warm water and make sure that there is no remainder gel. Dry the electrodes with a clean dry cloth or air dry naturally.

CAUTION

1. The device and accessories are to be disposed of according to local regulations after their useful lives. Alternatively, they can be returned to the dealer or the manufacturer for recycling or proper disposal.
2. The disposable electrodes can only be used for one time.

11.3 Disinfection

To avoid permanent damage to the equipment, disinfection can be performed only when it is considered as necessary according to your hospital's regulations.

Before disinfection, clean the equipment first. Then wipe the surfaces of the unit and the patient cable with hospital standard disinfectant.

CAUTION

Do not use chloric disinfectant such as chloride, sodium hypochlorite etc.

11.4 Maintenance of ECG Sampling Box

CAUTION

Besides the maintenance requirements recommended in this manual, comply with local regulations on maintenance and measurement.

The following safety checks should be performed at least every 12 months by a qualified person who has adequate training, knowledge, and practical experience to perform these tests.

a) Inspect the equipment and accessories for mechanical and functional damage.

b) Inspect the safety related labels for legibility.

c) Inspect the fuse to verify compliance with the rated current and circuit-breaking characteristics.

d) Verify that the device functions properly as described in the instructions for use.

e) Test the protection earth resistance according to IEC/EN 60601-1: Limit: 0.1 ohm.

f) Test the earth leakage current according to IEC/EN 60601-1: Limit: NC 500 μA, SFC 1000 μA

g) Test the enclosure leakage current according to IEC/EN 60601-1: Limit: NC 100 μA, SFC 500 μA.

h) Test the patient leakage current according to IEC/EN 60601-1: Limit: NC a.c. 10 μA, d.c. 10 μA; SFC a.c. 50 μA, d.c. 50 μA.

i) Test the patient auxiliary current according to IEC/EN 60601-1: Limit: NC a.c. 10 μA, d.c. 10 μA; SFC a.c. 50 μA, d.c. 50 μA.

j) Test the patient leakage current under single fault condition with mains voltage on the applied part according to IEC/EN 60601-1: Limit: 50 μA (CF).

The data should be recorded in an equipment log. If the equipment is not functioning properly or fails any of the above tests, the equipment has to be repaired.

WARNING

Failure on the part of the responsible individual hospital or institution employing this equipment to implement a satisfactory maintenance schedule may cause undue equipment failures and possible health hazards.

Chapter 12 Accessories

WARNING

Only the patient cable and other accessories supplied by the manufacturer can be used. Or else, the performance and electric shock protection can not be guaranteed.

Table 12-1 Standard Accessory List for Wired System

Accessory	Part Number
DP12 ECG Sampling Box	02.01.210039
Sentinel / USB	01.18.047225
Resting ECG External USB Cable	01.13.036134
DP12 Patient Cable / European Standard	01.57.106902
DP12 Patient Cable / American Standard	01.57.107048
Limb Electrode	01.57.040162
Chest Electrode	01.57.040163
Portable Bag	11.56.078136

Table 12-2 Standard Accessory List for Wireless System

Accessory	Part Number
PC ECG&Stress ECG (DX12) Transmitter	02.06.260163
PC ECG&Stress ECG (DX12) Receiver	02.06.260164
Exercise ECG External USB Cable	01.13.036135
Sentinel	01.18.047229
SE-1010 PC ECG software	02.01.210065
Burglar Lock	11.18.078205
DX12 Patient Cable / European Standard	01.57.471030
DX12 Patient Cable / American Standard	01.57.471055
DX12 ECG Cable / European Standard	01.57.471278
DX12 ECG Cable / American Standard	01.57.471279
Excell Alkaline AA LR6 1.5V	01.21.064086

Disposable electrodes	11.57.471046
DX12 Belt	01.57.106750
Portable Bag	11.56.078136

Table 12-3 Optional Accessory List

Accessory	**Part Number**
Sentinel / USB	01.18.047229
Patient Cable for Exercise ECG / European Standard (only for Wired ECG System)	01.57.109850
Patient Cable for Exercise ECG / American Standard (only for Wired ECG System)	01.57.109851
Resting ECG External USB Cable	01.13.036134
Disposable Frosting Film for Skin Preparation	01.57.107418
MSB1212 Disposable Electrode	01.57.040171
Exercise ECG External USB Cable	01.13.036135
Computer Lenovo, Qitian M6900	11.18.052208
Snap/Banana Socket Adapter (only for Wired ECG System)	01.13.107449
Bar Code Reader Z-3152SR（U）	01.18.052267
Bar Code Reader LAB 1000	11.23.068003

Chapter 13 Warranty & Service

13.1 Warranty

EDAN warrants that EDAN's products meet the labeled specifications of the products and will be free from defects in materials and workmanship that occur within warranty period.

The warranty is void in cases of:

1. damage caused by mishandling during shipping.
2. subsequent damage caused by improper use or maintenance.
3. damage caused by alteration or repair by anyone not authorized by EDAN.
4. damage caused by accidents.
5. replacement or removal of serial number label and manufacture label.

If a product covered by this warranty is determined to be defective because of defective materials, components, or workmanship, and the warranty claim is made within the warranty period, EDAN will, at its discretion, repair or replace the defective part(s) free of charge. EDAN will not provide a substitute product for use when the defective product is being repaired.

13.2 Contact information

If you have any question about maintenance, technical specifications or malfunctions of devices, contact your local distributor.

Alternatively, you can send an email to EDAN service department at: support@edan.com.cn.

Chapter 14 Recommended Optional Accessories

Treadmill:

Model: TM-400

Manufacturer: EDAN INSTRUMENTS, INC. China

CE marking

Model: Valiant

Manufacturer: Lode B.V. The Nettherlands

CE marking

Model: h/p/cosmos (all medical models) with coscom interface

Manufacturer: Full Vision Inc. USA

CE marking

Model: mercury med 4.0, mercury 4.0

Manufacturer: h/p/cosmos sports & medical gmbh Germany

CE marking

Ergometer:

Model: sana bike 120F, sana bike 150F, sana 250F

Manufacturer: ergosana gmbh Germany

CE marking

Model: ergoselect 100P/100K, ergoselect 200P/200K

Manufacturer: ergoline gmbh Germany

CE marking

Model: Corival

Manufacturer: Lode B.V. The Nettherlands

CE marking

STRESS BP:

Model: Tango+

Manufacturer: SunTech Medical Inc. USA

CE Certificate and FDA 510(k) clearance

Isolating Transformer:

Model: ES710

Manufacturer: BenDer Inc. Deutschland

Electrical Outlet:

Power Consumption: no less than 4500VA

Special use for medical equipment

Printer:

Model: HP2010, HP2035

Manufacturer: HP Company, USA

Model: CANON iP1980

Manufacturer: CANON Company, Japan

WARNING

1. The electrical outlet and the isolating transformer shall only be used for supplying power to the part of the system.
2. It will harm the wall outlet to connect the non-medical electrical equipment of the PC ECG system directly to the wall outlet, because the non-medical electrical equipment of the system is intended to be powered by using the electrical outlet and the isolating transformer.
3. An additional multiple portable socket-outlet or extension cord shall not be connected to the system.
4. The electrical outlet and the isolating transformer shall not be placed on the floor.

Appendix 1 Technical Specifications

A1.1 Safety Specifications

Comply with:		IEC/EN 60601-1+A1+A2, IEC/EN 60601-1-2+A1, IEC/EN60601-2-25, ANSI/AAMI EC11, IEC/EN60601-2-51
Anti-electric-shock type:		Class II
Anti-electric-shock degree:		Type CF with defibrillation-proof
Degree of protection against harmful ingress of water:		Ordinary equipment (Sealed equipment without liquid proof)
Disinfection/sterilization method:		Refer to the user manual for details
Degree of safety of application in the presence of flammable gas:		Equipment not suitable for use in the presence of flammable gas
Working mode:		Continuous operation
EMC:		Group 1, Class A
Patient Leakage Current:	NC	<10μA (AC) / <10μA (DC)
	SFC	<50μA (AC) / <50μA (DC)
Patient Auxiliary Current:	NC	<10μA (AC) / <10μA (DC)
	SFC	<50μA (AC) / <50μA (DC)

A1.2 Environment Specifications

	Transport & Storage	Working
Temperature:	DP12 ECG sampling box: -40ºC (-40ºF) ~ +55ºC (+131ºF)	+5ºC (+41ºF) ~ +40ºC (+104ºF)
	DX12 ECG sampling box: -20℃ (-4ºF)~+55℃ (+131ºF)	
Relative Humidity:	25%~93% Non-Condensing	25%~80% Non-Condensing
Atmospheric Pressure:	700hPa ~1060hPa	860hPa ~1060hPa

A1.3 Physical Specifications

Dimensions	DP12 ECG sampling box: 148 mm (L) ×100 mm (W) × 40 mm (H) (5.8in×3.9in×1.6in)
	DX12 transmitter: 63mm(L)×107mm(W) ×23mm(H) (2.5in×4.2in×0.9in)
	DX12 receiver: 155mm(L)×100mm(W)×30mm(H) (6.1in×3.9in×1.2in)
Weight	DP12 ECG sampling box: Approx. 210g
	DX12 transmitter: Approx. 113g (not including battery)
	DX12 receiver: Approx. 173g

A1.4 Power Supply Specifications

Power Supply:	PC	Operating Voltage: 110V-240V~
		Operating Frequency: 50 Hz/60 Hz
	DP12 ECG Sampling Box	DC 5V
		Input Power: 1 VA(MAX), 0.5 VA(MIN)
	DX12 transmitter	Input Power: 2x1.5V Excell Alkaline AA IEC LR6; Operation life of battery≥12 hours
	DX12 receiver	DC 5V
		Input Power: 350mW

A1.5 Performance Specifications

Display	
Display Content	System name, Patient ID, Patient name Hear rate, Display mode, Printing mode Speed, Gain, Lowpass Filter Hint information ECG waves
Recording	
Recording Paper:	A4, Letter
Paper Width:	210*295mm (A4)，216*279mm (Letter)

Paper Speed:	5 mm/s, 10 mm/s, 12.5 mm/s, 25 mm/s, 50 mm/s（±3%）
Record message:	Date, Time, Printing Speed, Filter, Symbol, Heart Rate, Patient ID, Sex, Age, Lead Mark, Lead Wave, Average Template Wave or Rhythm Lead Wave, Measurement Result and Interpretation Information Result (option) etc.
Channel:	3 / 6 / 12 channels, auto baseline adjustment
HR Recognition	
Technique:	Peak-peak detection
HR Range:	30 BPM ~300 BPM
Accuracy:	±1 BPM
Memory	
Memory:	Storage amount depends on PC machine
ECG Sampling Box Performance	
Leads Mode:	12 standard leads/ Cabrera leads
Acquisition Mode:	simultaneously 12 leads
Sample Frequency:	DP12 ECG sampling box: 1,000 /sec/channel
	DX12 transmitter: 10,000 /sec/channel (sampling) 500 /sec/channel (analysis)
A/D Resolution:	DP12 ECG sampling box: 24 bits
	DX12 transmitter: 18 bits
Time Constant:	≥3.2 s
Frequency Response:	0.05 Hz ~ 150 Hz (-3 dB)
Gain:	2.5 mm/mV, 5 mm/mV, 10 mm/mV, 20 mm/mV
Input Impedance:	DP12 ECG sampling box≥50 MΩ (10Hz)
	DX12 transmitter≥20 MΩ (10Hz)
Input Circuit Current:	≤0.05 μA
Input Voltage Range	<±5 mVpp
Calibration Voltage:	1 mV± 2%
DC Offset Voltage	DP12 ECG sampling box: ±600mV
	DX12 transmitter: ±500mV
Noise:	DP12 ECG sampling box≤12.5μVp-p
	DX12 transmitter≤15μVp-p

Filter	Work Frequency
	DFT Filter: weak/strong
	LOWPASS Filter: 25 Hz / 35 Hz / 45 Hz / 75 Hz / 100 Hz / 150 Hz
CMRR	DP12 ECG sampling box≥110 dB
	DX12 transmitter≥100 dB
Pacemaker Detection	
Amplitude	DP12 ECG sampling box: ±2 to ±700 mV
	DX12 transmitter: ±2 to ±500 mV
Width	0.1 to 2.0 ms
Sampling Frequency	10,000 /sec/channel

NOTE: Test the accuracy of input signal reproduction according to the methods described in clause 4.2.7.2 in ANSI/AAMI EC11:1991/(R) 2001/(R) 2007, and the result complies with clause 3.2.7.2 in ANSI/AAMI EC11:1991/(R) 2001/(R) 2007.

Appendix 2 EMC Information

Guidance and manufacture's declaration - electromagnetic emissions-
for all EQUIPMENT and SYSTEMS

<table>
<tr><th colspan="3">Guidance and manufacture's declaration - electromagnetic emission</th></tr>
<tr><td colspan="3">SE-1010 PC ECG is intended for use in the electromagnetic environment specified below. The customer or the user of SE-1010 PC ECG should assure that it is used in such an environment.</td></tr>
<tr><th>Emission test</th><th>Compliance</th><th>Electromagnetic environment - guidance</th></tr>
<tr><td>RF emissions
CISPR 11</td><td>Group 1</td><td>SE-1010 PC ECG uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.</td></tr>
<tr><td>RF emission
CISPR 11</td><td>Class A</td><td rowspan="3">SE-1010 PC ECG is suitable for use in all establishments, other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.</td></tr>
<tr><td>Harmonic emissions
IEC 61000-3-2</td><td>Not applicable</td></tr>
<tr><td>Voltage fluctuations/ flicker emissions
IEC 61000-3-3</td><td>Not applicable</td></tr>
</table>

Guidance and manufacture's declaration - electromagnetic immunity -
for all EQUIPMENT and SYSTEMS

Guidance and manufacture's declaration - electromagnetic immunity			
SE-1010 PC ECG is intended for use in the electromagnetic environment specified below. The customer or the user of SE-1010 PC ECG should assure that it is used in such an environment.			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete or ceramic tile. If floor are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines	Not applicable	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV line to line ±2 kV line to groud	Not applicable	Mains power quality should be that of a typical commercial or hospital environment.
Power frequency (50Hz/60Hz) magnetic field IEC 61000-4-8	3A/m	3A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles	Not applicable	Mains power quality should be that of a typical commercial or hospital environment. If the user of SE-1010 PC ECG requires continued operation during power mains interruptions, it is recommended that

	70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 sec		SE-1010 PC ECG be powered from an uninterruptible power supply or a battery.
NOTE U_T is the a.c. mains voltage prior to application of the test level.			

Guidance and manufacture's declaration - electromagnetic immunity -

for EQUIPMENT and SYSTEMS that are not LIFE-SUPPORTING

Guidance and manufacture's declaration - electromagnetic immunity			
SE-1010 PC ECG is intended for use in the electromagnetic environment specified below. The customer or the user of SE-1010 PC ECG should assure that it is used in such an environment.			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Conducted RF IEC61000-4-6 Radiated RF IEC61000-4-3	3 V_{rms} 150 kHz to 80 MHz 3 V/m 80 MHz to 2.5 GHz	$3V_{rms}$ 3 V/m	Portable and mobile RF communications equipment should be used no closer to any part of SE-1010 PC ECG, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance** $d = \left[\frac{3.5}{V_1}\right]\sqrt{P}$ $d = \left[\frac{3.5}{E_1}\right]\sqrt{P}$ 80 MHz to 800 MHz $d = \left[\frac{7}{E_1}\right]\sqrt{P}$ 800 MHz to 2.5 GHz Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the

			recommended separation distance in metres (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol: 

NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which SE-1010 PC ECG is used exceeds the applicable RF compliance level above, SE-1010 PC ECG should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating SE-1010 PC ECG.

[b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

Recommended separation distances between portable and mobile RF communications equipment and the EQUIPMENT or SYSTEM – for EQUIPMENT or SYSTEM that are not LIFE-SUPPORTING

Recommended separation distances between portable and mobile RF communications equipment and SE-1010 PC ECG

SE-1010 PC ECG is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of SE-1010 PC ECG can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and SE-1010 PC ECG as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter (W)	**Separation distance according to frequency of transmitter (m)**		
	150 kHz to 80 MHz $d = \left[\frac{3.5}{V_1}\right]\sqrt{P}$	**80 MHz to 800 MHz** $d = \left[\frac{3.5}{E_1}\right]\sqrt{P}$	**800 MHz to 2.5 GHz** $d = \left[\frac{7}{E_1}\right]\sqrt{P}$
0.01	**0.12**	**0.12**	**0.23**
0.1	**0.37**	**0.37**	**0.73**
1	**1.2**	**1.2**	**2.3**
10	**3.7**	**3.7**	**7.3**
100	**12**	**12**	**23**

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in metres (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

Appendix 3 Abbreviation

Abbreviation	Statement
ECG	Electrocardiograph/Electrocardiogram
VCG	Vector ECG
TVCG	Time Vector ECG
QTD	QT Dispersion
FCG	Frequency ECG
HRV	Heart Rate Variability
HFECG	High Frequency ECG
HRT	Heart Rate Turbulence
SAECG	Signal Averaged ECG
TO	Turbulence Onset
TS	Turbulence Slope
VLP	Ventricular Late Potential
HR	Heart Rate
P Dur	P-wave Duration
PR Dur	P-R Interval
QRS Dur	QRS Complexes Duration
QT/QTc	Q-T Interval of the Current Lead / Normalized QT Interval
P/QRS/T	Dominant Direction of the Average Integrated ECG Vectors
Maximum/Minimum	Ratio of Maximum RR Interval to Minimum RR Interval
SDNN	Standard Deviation of Normal to Normal Intervals
RMSSD	Root Mean Square Successive Difference
LF	Low Frequency
HF	High Frequency
LF (norm)	Standard LF Power

HF (norm)	Standard HF Power
aVF	Left Foot Augmented Lead
aVL	Left Arm Augmented Lead
aVR	Right Arm Augmented Lead
LA	Left Arm
R	Right
RA	Right Arm
RL	Right Leg
ID	Identification
AC	Alternating Current
USB	Universal Serial Bus

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www. edan. com. cn

EC REPRESENTATIVE
Shanghai International Holding Corp. GmbH (Europe)
Eiffestrasse 80, D-20537 Hamburg Germany
TEL: +49-40-2513175 FAX: +49-40-255726
E-mail: antonjin@yahoo.com.cn

EDAN INSTRUMENTS, INC.
3/F-B, Nanshan Medical Equipment Park, Nanhai Rd 1019#,
Shekou, Nanshan Shenzhen, 518067 P.R. CHINA
Email: info@edan.com.cn
TEL: +86-755-2689 8326 FAX: +86-755-2689 8330