



# GIMA

PROFESSIONAL MEDICAL PRODUCTS

Gima S.p.A. - Via Marconi, 1 - 20060 Gessate (MI) Italy  
Italia: tel. 199 400 401 - fax 199 400 403  
Export: tel. +39 02 953854209/221/225 - fax +39 02 95380056  
gima@gimaitaly.com - export@gimaitaly.com  
[www.gimaitaly.com](http://www.gimaitaly.com)

## ECG HOLTER WITH SOFTWARE

### User Manual



**ATTENTION:** The operators must carefully read and completely understand the present manual before using the product



Contec Medical Systems Co., Ltd  
No. 112 Qinhuang West Street, Economic & Technical  
Development Zone, Qinhuangdao, Hebei Province, 066004  
PEOPLE'S REPUBLIC OF CHINA



Shanghai International Trading Corp. GmbH (Europe)  
Eiffestrasse 80, 20537, Hamburg, Germany

## ***Foreword***

This user manual describes features and request of this product, main structure, function, specification, correct method for transportation, installation, usage, operation, repair, maintenance and storage, as well as the safety procedure to protect both the user and equipment.

Refer to the respective chapters for details.

Please read this user manual before using the product, and operate according to this manual strictly. As for abnormality, human injury and equipment damages caused by wrong operation, which violates the rules in manual, our company without responsibility for this kind of danger and will not maintain free for this kind of malfunction.

The information contained in this document is subject to change without notice.

# CONTENTS

<b>Chapter 1</b>	<b>INTRODUCTION.....</b>	<b>5</b>
1.1	Environment Condition .....	5
1.2	Product Feature .....	5
1.3	Safety .....	5
1.4	Maintenance and Cleaning .....	6
<b>Chapter 2</b>	<b>FRAME CHARACTER OF PRODUCT .....</b>	<b>7</b>
2.1	Sketch map for every orientation.....	7
2.2	Defination of keystoke, interface and indicator light .....	8
<b>Chapter 3</b>	<b>PREPARING WORK BEFORE USING.....</b>	<b>9</b>
3.1	Electrode placement.....	9
3.2	Battery installation and notice .....	10
<b>Chapter 4</b>	<b>RECORDER OPERATION EXPLANATION.....</b>	<b>12</b>
4.1	New record .....	12
4.2	Review record .....	14
4.3	System set .....	15
4.4	Replay record.....	17
<b>Chapter 5</b>	<b>MALFUNCTION ANALYSIS AND TROUBLESHOOTING ....</b>	<b>19</b>
5.1	The problem related to the battery .....	19
5.2	The problem related to the skin and the electrode.....	20
5.3	The problem related to the cable and the input plug.....	20
5.4	Other problems.....	21
<b>Chapter 6</b>	<b>INSTRUCTIONS FOR ANALYSIS SOFTWARE .....</b>	<b>21</b>
	Pacing analysis .....	65
	Sleep breath pause syndrome analysis.....	66



# Chapter 1

## INTRODUCTION

### 1.1 Environment Condition

The environment requirement of operation, transport and storage for Dynamic ECG System

Operation Environment:

Environment Temperature:	10°C~45°C
Relative Humidity:	≤85%
Atmospheric pressure:	86 kPa~106 kPa
Power Supply:	DC 3V

Transport and Storage Environment:

Environment Temperature:	-40°C~+55°C
Relative Humidity:	≤85%
Atmospheric pressure:	86 kPa~106kPa

### 1.2 Product Feature

TLC5000 Dynamic ECG Systems contain recorder & analysis software. Recorder is an easy- to -use unit, which collects 12-lead ECG waveform synchronously and records continuously for 24 hours. In addition, it also reviews ECG waveform. It is easy for you to use analysis software which plays back ECG waveform stored in ambulatory recorder and achieves kinds of analysis functions, such as arrhythmia, HRVA,QTDA,TWA, etc.

### 1.3 Safety

The design of TLC5000 Dynamic ECG Systems accords with the international safety standard IEC60601-2-47.



#### Warning:

- Please don't use this device with the defibrillation device.
- Please don't operate this device in environment containing flammable anesthesia gas.
- Please don't use this device when scanning MRI.
- Please don't use device which has High level electromagnetic radiation in the vicinity of the recorder.
- The device is not intended for synchronous gathering.



#### Note:

- TLC5000 Dynamic ECG Systems must be operated by the personnel who has been trained and authorized. Person specially assigned for safekeeping.

Please read this user manual carefully before using the product, and operate according to this manual strictly.

The environment where the device will be used should be reasonably free from vibration, dust, corrosive or combustible matter, and shun extremes of temperature and humidity, and so on.

Doctor must tell patient monitored by recorder not to do much movement.

TLC5000 Dynamic ECG Systems is not useful for infants.

Please insert the batteries properly in the right direction for the improper insertion may damage the device and the TLC5000 Dynamic ECG Systems will be not working.

TLC5000 Dynamic ECG Systems is an independent equipment so impossible hazard caused by the summation of leakage currents because of several equipments interconnected.

For protecting environment, please deal with the batteries according to the local rule of law.



Refer to accompanying documents.



This item is compliant with Medical Device Directive 93/42/EEC of June 14, 1993, a directive of the European Economic Community



EUROPEAN REPRESENTATIVE



The protection categories against electric shock of the patient connections are: this symbol indicates that the instrument is IEC 60601-1 Type B equipment.



Reclaimable icon.



USB interface.

## **1.4 Maintenance and Cleaning**

It is recommended that you check if there is any damage on the recorder or leads wires before monitoring on the patient. If you find any damage, stop using it, and contact the biomedical engineer of the hospital or our Customer Service immediately.

In addition, the overall check of the recorder, including the safety check, should be performed only by qualified personnel once every 12 months. The recorder can be cleaned with hospital-grade ethanol and dried in air or with dry and clean cloth.

Please take out the batteries if the recorder is not in use for a long time and proper safekeeping.

## Chapter 2

### FRAME CHARACTER OF PRODUCT

#### 2.1 Sketch map for every orientation

##### 2.1.1 Front view

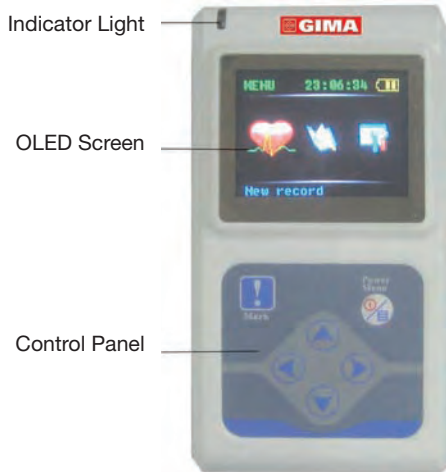


fig. 2-1  
Front view

##### 2.1.2 Leads' port



fig. 2-2  
Leads' port

Leads port



#### Note

While connecting lead wires, please refer to lead wires indicator in figure 2-4

### 2.1.3 Side view



fig. 2-3  
Side view

### 2.1.4 Bottom view

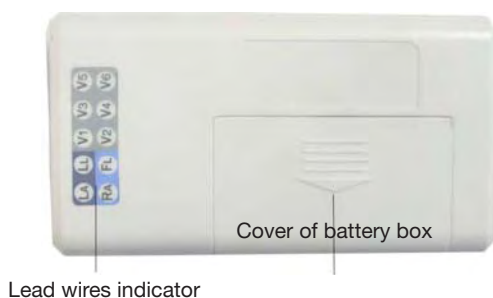


fig. 2-4  
Bottom view

## 2.2 Definition of keystroke, interface and indicator light



function key: marker / affirmance / choice



function key: menu / cancel / turn on / off



direction key: left



direction key: right



direction key: go up



direction key: go down

indicator light: (glint every 4 seconds when collecting ECG signal)  
Show date communication status when connecting with the computer.



## Chapter 3

### PREPARING WORK BEFORE USING

#### 3.1 Electrode placement

**Note**

The placement of electrode is the basic of holter recorder collecting ECG data signal. The quality and position of electrode affect the quality of ECG signal. Please read this chapter carefully before first operation.

Position of the electrode placement is shown as fig.3-1

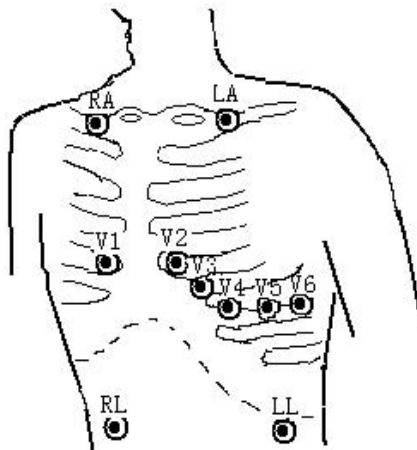


fig. 3-1

#### Deal with the skin

When attaching and placing the electrode, we need to deal with the skin at first, and be sure to clean the skin. Use 95% alcohol to scrub the skin, after the alcohol evaporates, use abrasive paper attached to the electrode to wipe the attached place to remove cuticula on the surface of the skin in order to reduce the resistance from the skin and the disturbance from the EMG. People who have much hair need to shave it to ensure the skin well connected with the electrode. The skin of old patients is dry and has many crinkles, so we have to clean the skin and make the attached place flat. If the attached place is near the bosom of the woman patient, electrode and cables should be covered by the bra and then fixed well.

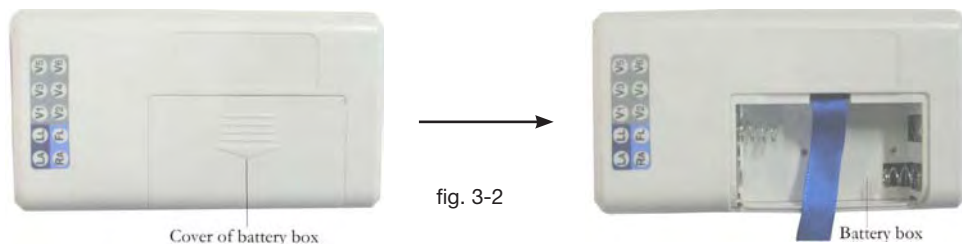
### Place the electrode

Use high-quality ECG electrode to attach the right place and connect with the correspond electrode. To prevent the electrode drop and the baseline excursion caused by pulling use the medical adhesive belt or plaster to fix every electrode and cable properly. After the cables get together, use the adhesive belt to fix in the abdomen; the rest cables can be tucked into the recorder's waistband. Don't use the common adhesive belt to attach the cables for fear of dirtying, corroding the cables and reducing the usage life span. If use the device in the environment of high temperature or easy perspiring, "EKG Medical Gel" could be wiped on the skin around the electrode beforehand

## 3.2 Battery installation and notice

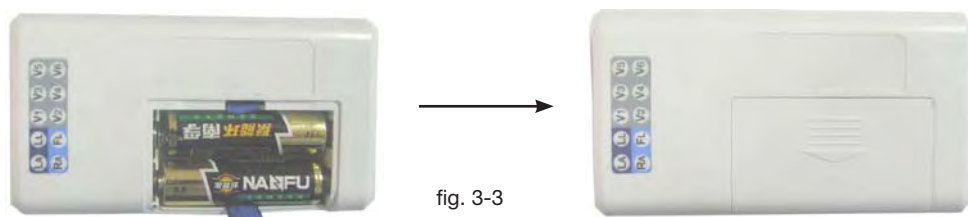
### 3.2.1 Open the battery cover according to the direction which the arrowhead on the cover indicates.

Follow as fig.3-2.



### 3.2.2 Please insert the batteries properly in the right direction, and then close the cover.

Follow as fig.3-3



### 3.2.3 The state of battery and working requirements are shown as table 3-a1



The batteries are full, the device could run in gear.



The batteries are insufficient, suggest not record.



The batteries are almost drained, please replace the battery immediately.

When the batteries are almost drained and not replaced, the recorder will show the interface as fig.3-4, and turn into protected mode.



fig. 3-4

When the energy of battery is low, the recorder turn into protected mode in order to protect the recorder from damaging. Under protected mode the device don't run until the device is electrified by USB or the batteries are full.



#### **Warning**

The batteries should be full when the device collects new information, otherwise the recording time could not last long enough.



#### **Note**

Please confirm all electrodes and lead wires are connected well to patient. Otherwise, interference in waveform at the beginning of record may lead to failure analysis.





#### **Note**

Please take off the battery after monitoring in order to protect the recorder from damaging because of battery leak.

## Chapter 4

### RECORDER OPERATION EXPLANATION

Press  for about 3 seconds to turn on the recorder (press  for about 3 seconds to turn off the recorder on the main interface), the main interface is shown in fig.4-1.

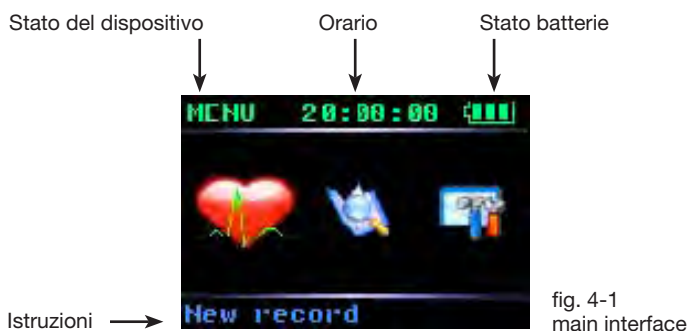


fig. 4-1  
main interface

#### 4.1 New record





Use  or  to choose  on main interface, press  to enter new record operation, display interface is as fig.4-2.



fig. 4-2

On the interface, press  or  to change the gain, press  or  to switch lead status.

After recording one time, press  if you want to continue to record,

here the interface will show the information “Last record will be covered! Are you sure?” as fig.4-3.

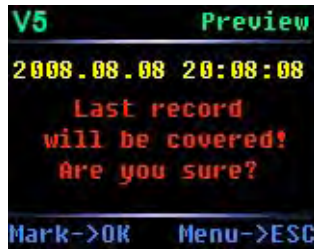




fig. 4-3

Press  to cancel recording and return to the main interface.

Press  to continue to record and the interface will show the information “Starting record” as fig.4-4.

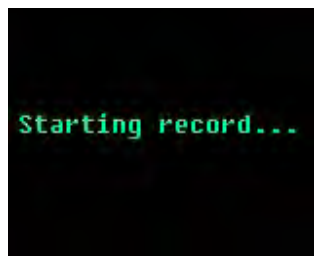



fig. 4-4

The interface as fig.4-4 will last 2 seconds, then the recorder enter stand-by mode. The blue indicator on the top left corner of recorder will glitter one time every 4 seconds to show the state in gear.

Press  for about 3 seconds to record event marker when recording, in the meanwhile, the beep from recorder indicates you have succeeded in event marker.


Press  for about 3 seconds when recording if you want to end recording manually, then the recorder will show the information as fig.4-5 to affirm whether the recording operation will be stopped.



fig. 4-5






If you confirm that you want to terminate recording, please press  for about 3 seconds according to the information showed on the interface, at the same time the screen will display the information as fig.4-6. This interface will last about 2 seconds, then return to the main interface.



fig. 4-6

## 4.2 Review record



Use  or  to choose  on main interface press  to enter review record operation interface, if the recorder has storage record, there will be a interface as fig.4-7:




indicatore cavo →



orario della registrazione →

fig. 4-7

Under this interface, use  or  to change lead marker (□, □, □, AVR, AVL, AVF, V1, V2, V3, V4, V5, V6)

press  to switch between hour, minute and second, the red one shows the option which has been chosen, use  or  to change the value.

If the recorder doesn't have storage record, there will be a "No record" information on the screen as fig.4-8, and the interface will return main interface automatically after 2 seconds.



fig. 4-8

### 4.3 System set









Use  or  to choose  on main interface press  to enter the "system set" interface as fig.4-9



fig. 4-9

Use  or  to choose the option use  or  to set the option which has been chosen or enter the inferior menu, the red one shows the option which has been chosen.

1 Auto shutdown set

The time scope of auto shutdown is 3~98 seconds (if setting 99s) the recorder will open forever.

2 Language

Under this option, you can select a language "ENG/ITA".

### 3 Demo mode

Under the item, the demonstration waveform is shown in figure 4-10



fig. 4-10

Press  to switch ECG lead waveform.

### 4 system initialization

Press  to enter the interface as shown in figure 4-11.

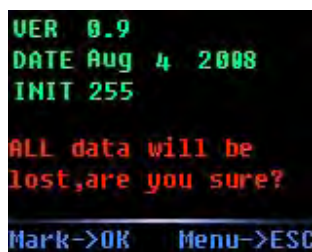


fig. 4-11



#### Note

Detailed edition information depends on recorder.

Press  to enter the initialization interface as shown in figure 4-12

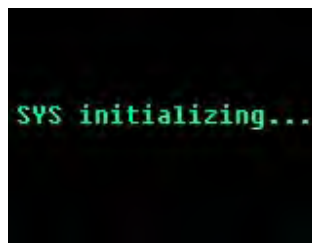



fig. 4-12



## 5 Time set

Press  to enter the time set interface as fig.4-13

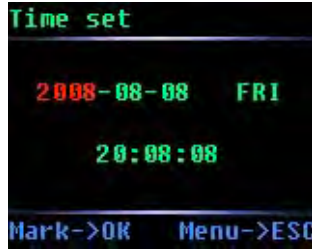







fig. 4-13

Use  or  to choose the option, use  or  to change the value,

Press  to save the setting and return superior menu.

Press  to cancel setting and returning superior menu.

## 4.4 Replay record

Please remove electrodes from patient, and then connect recorder to PC with USB cable. It is recommended that batteries should be remained in the recorder. The indicator light is on, and the interface displays the information as fig.4-14 if the connection is normal.

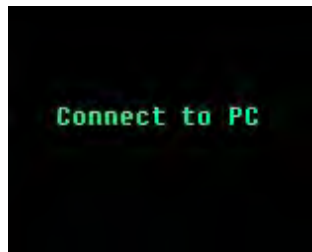


fig. 4-14

In "My computer" of PC, there is a symbol as fig.4-15

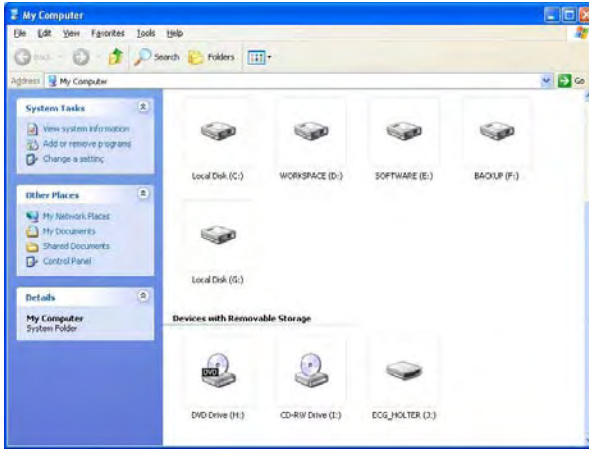


fig. 4-15

Open the disk, you can see a file named ECG\_WAVE.BIN, as fig.4-16

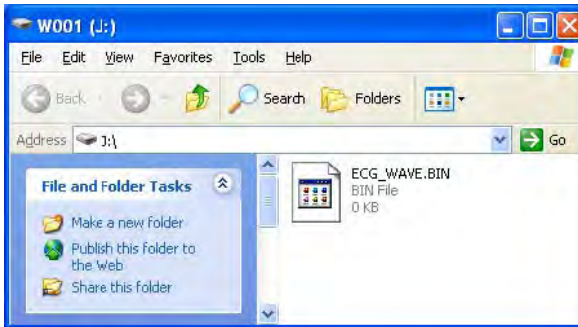


fig. 4-16

Please choose this file of analyze software to perform the replaying operation.

**Note**

Please refer to the information of chapter 6 for the detail.

After replaying, please safely remove USB Mass Storage Device as fig.4-17, then pull out USB connecting line to avoid damaging the device.

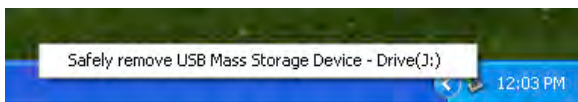


fig. 4-17

After cutting the connection with PC, this device will go back to the main interface.



**Note**

The USB interface of recorder is USB2.0, please choose the USB2.0 interface in PC to connect in order to make sure the speed of data communication.

## **Chapter 5 MALFUNCTION ANALYSIS AND TROUBLESHOOTING**

### **5.1 The problem related to the battery**

<b>Problem</b>	<b>Cause</b>	<b>Correction</b>
The recorder has no response and the indicator isn't light after the battery is put in.	1.The battery is used up.	Change another battery.
	2.The battery can't connect with the reed very well. The height of "+" of some brand of battery is too low.	Change another brand of battery. or put a thick of metal piece in the place between the "+" of battery and reed.
	3.The direction of the battery is wrong.	Install the battery correctly once again.
The record time of the recorder can't reach 24 hours.	1.The quality of the battery is poor. or the battery has been put for a long time.	Change another high-quality new battery.
	2.The battery can't be charged enough.	Recommend to use the battery whose capacity is over 1000mAh.
	3. The characteristic and brand of the battery are different.	Change another new battery.
The data can't be cleared away.	1. If the voltage above 3.5V, which beyond the working voltage, part of the electron hard disk may be broken.	Please contact our company.
	2. Some part of the recorder may be damaged because the electrolyte in the battery flows out.	Please contact our company.

## 5.2 The problem related to the skin and the electrode.

Problem	Cause	Correction
The wave is disturbed; the quality of the ECG signal is poor.	1. The skin can't be cleaned well, or the electrode isn't attached right.	Clean the skin and attach once more.
	2. The quality of the one-off electrode is poor, or the electrode has been stored for a long time.	Use new, high-quality electrode.
	3. The movement of the patient's upper limbs is too server	Ask the patient to avoid server movement when monitoring.
The amplitude of some ECG wave is small, which is difficult for analysis.	The cable is broken.	Change a new cable.

## 5.3 The problem related to the cable and the input plug

Problem	Cause	Correction
The output wave of the recorder is a straight line.	1. The recorder isn't connected well.	Please check if the needles of the plug is curved, broken or lack. If the plug is well, please connect once again.
	2. The cable is broken.	Please contact our company.
	3. The recorder is broken.	Please contact our company.
Some ECG wave is disturbed a lot, and the quality of ECG signal is poor.	1. The cable isn't connected well	Connect the cable once again according to the operation manual.
	2. Lead cable is broken.	Please change a new one.
	3. The quality of the one-off electrode is poor.	Please change new, high-quality electrode.

### 5.4 Other problems

Problem	Cause	Correction
The communication of data is failed	There is something wrong with the USB cable.	Change another USB cable.
	The USB interface of computer don't match the USB interface of the recorder.	Use 2.0 interface.

## Chapter 6 INSTRUCTIONS FOR ANALYSIS SOFTWARE

Turn on the computer and enter the WINDOWS98/2000/XP operation system. Double click the TLC5000 graph on the desktop, then enter the TLC5000 Dynamic ECG operation systems As fig.6-1.

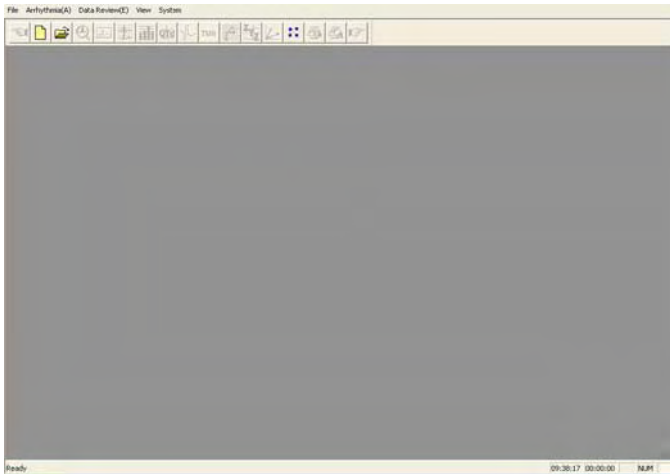



fig. 6-1

Replay HOLTER recorder

Click the “New” in the menu of “File” or click,  and input the new patient information.

If the recorder use SD memory, please choose the collection file ECG\_WAVE. BIN as fig.6-2 first. Certainly you could also copy the case history to other place, then choose. If the recorder use Flash memory please turn to fig.6-2.

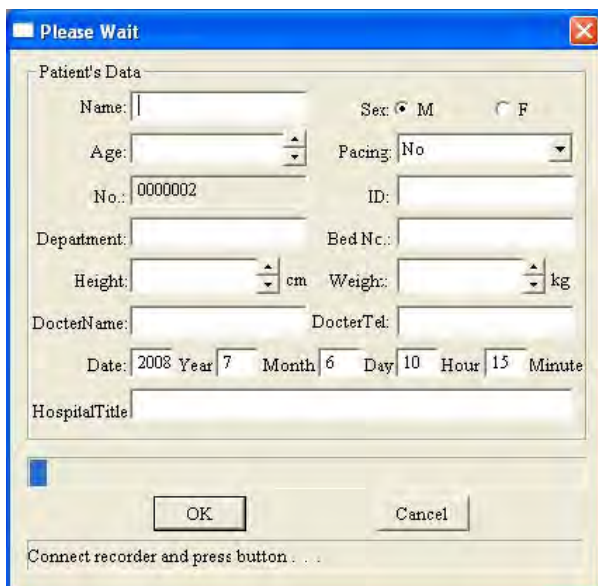
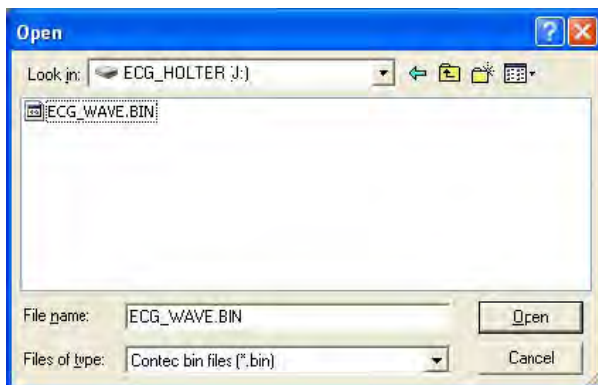
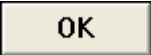


fig. 6-2

The doctor input the new information about the patient.

Attention!! If the patient takes a pacemaker, choose “Y” in the item “pacing”, then the system can add the function of pacing analysis.

Connect the HOLTER recorder with the computer, and then click the  the computer begins to read data from the recorder.

After the communication finished, enter the interface as fig.6-3.



**Note:**

Replay the same recorder, you must unplug the replaying cable and connect again, then begin to operate.

This menu is to ask whether to make the arrhythmia analysis.

Click  button as fig.6-3, and enter the analytical interface as fig.6-5.

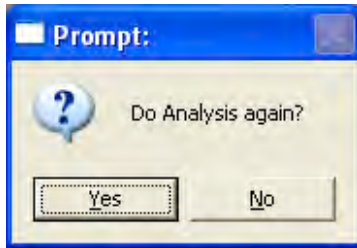


fig. 6-3



### Attention

If the patient takes a pacemaker, first enter the dialog box as fig.6-4, the doctor modify the items on the dialog box according to the parameter of pacemaker. The accuracy of pacing pulse analysis relatives to the "high" or "low" of pacing pulse, usually choose "middle", if the pulse is very low, please choose the "high".

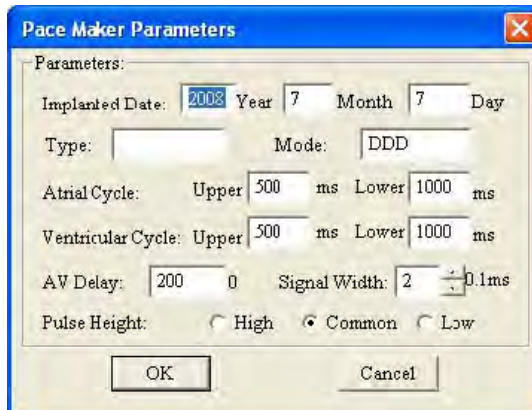


fig. 6-4

Click  button, and enter the module compilation (have analyzed) or order replaying interface (have not analyzed).

Click  to enter the interface as shown in fig.6-5.



fig. 6-5

The interface as fig.6-5 is to ask the user to choose a meaningful wave to diagnose and adjust the value of ST segment. Look at the picture. The three colored lines from left to right are baseline point, ST segment beginning point, and ST segment ending point. When clicking, the line, which is near the clicking point, will be changed.

The right side of the picture is the control view, the “manual intervention” option is designed for extending function.

If the current wave is good, please knock the **Accept** button, and then

the system enters the arrhythmia analysis as fig.6-6. If the user wants to stop arrhythmia analysis, please close direct.

If the current wave is not good, please click the **Refuse** button,

then the system will show the waves constantly until you click **Accept** to enter the arrhythmia analysis.

Click the dialog box at the right of the main analytical lead to choose main analytical lead.

RR refractory period: This parameter is general 300ms, it means the shortest time between the two heart beats, the default value is 300ms, the user can adjust it according to the concrete circumstance, if the patient’s heart rate is very quick, it should be set lower, in order to prevent losing the analysis for some heart beats.

Click the options under the “analysis leads” to decide which leads to be analyzed, the default is 8-lead

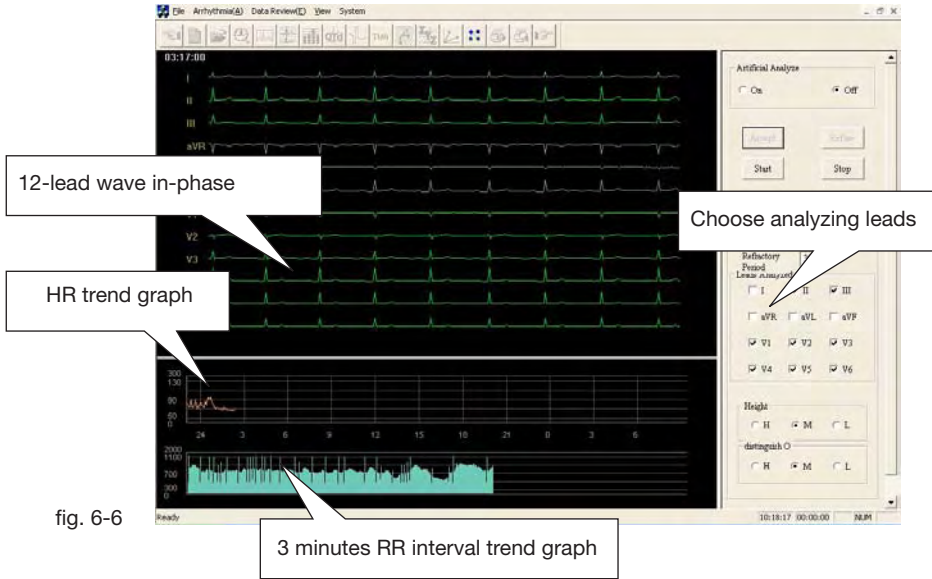
When the amplitude of the case’s wave is too low, please choose “high” in the “resolution” option

When the case meets much disturbance, please choose “high” in the “preci-



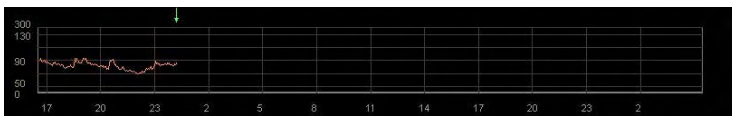
sion of judging interfering” option Analysis precision and precision of judging interfering don’t need to adjust generally. The user can choose according to the actual circumstances.

Click **Accept** and enter the picture as fig.6-6.



Click **Stop**, the system will stop temporarily. User can browse

the 12 lead ECG through “ → ↑ ← ↓ ” on the keyboard. In the heart rate trend graph, there is a green symbol line, which represents the place of the current wave. User can go back to a point, change condition (analytical leads, discernment, discernment in disturb), click the part behind the green sign will be analyzed again. (as fig.6-7).



Click **Stop** in the analytical process, the analysis will stop temporarily.

Or use “space” to switch “start/stop”.

When the analysis finished, press “ → ↑ ← ↓ ” on the keyboard to go back to certain point to analyze again if necessary.

When the analysis finished, user can enter different module by choosing different options.

Function explanation of edit module



Represent: Arrhythmia analysis module, template replay, order replay module,

HRV analysis module, QTD analysis module, HRT module, TWA module, VCG module, VLP module and TVCG module.



Go to the previous operation



go to the next operation

- scroll bar usage

Click the “ ▲▼ ” at the right side of the Window or scroll bar to change the content showed in the window.

- Change window size

Move the mouse arrowhead to the side of box, when the arrowhead turn

to “ ↔ ” or “ ↕ ”, press the left keypad of mouse and don't set free until drag to the wanted location.

- Screen interface distributing.

Click  into the replay module.(as fig.6-8)

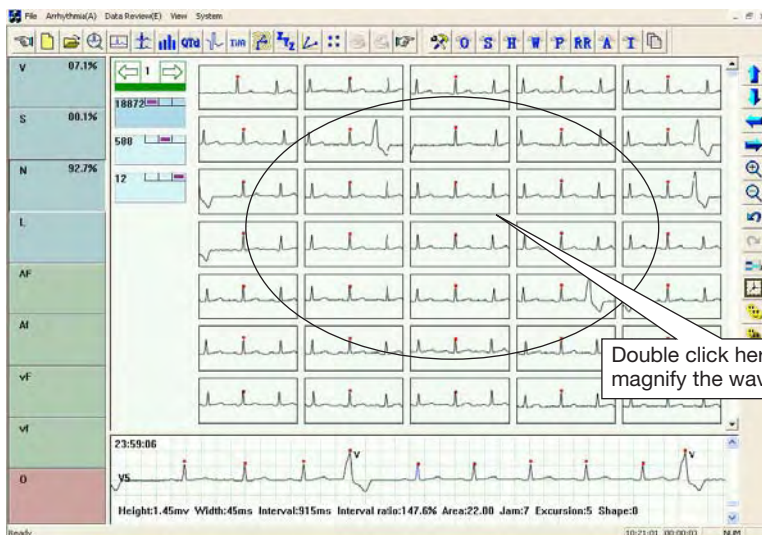


fig. 6-8

The left window is the template window. Every button is a template. The letter in the button represents the type (for example: v means ventricular premature beat, s means atrial premature beat) the percentage means what percentage this kind is in the total. The blank means no wave.

V: ventricular premature beat module  
 AF: atrial flutter module  
 S: atrial premature beat module  
 Af: atrial fibrillation module  
 N: NN heart pacing module  
 VF: ventricular flutter module  
 L: long interval module  
 Vf: ventricular fibrillation module  
 O: interfering module

If it is pacing case, then the template will increase 11 classes automatically, shown as fig.6-9.

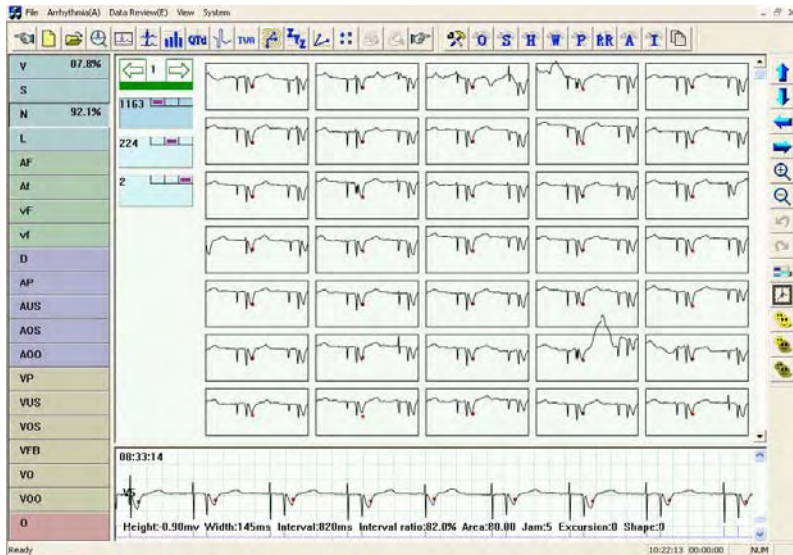


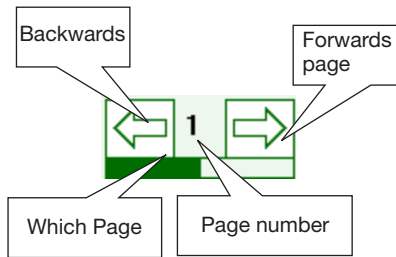
fig. 6-9


They are:

D: Dual chamber pacing  
 AP: Atrial Pacing  
 AUS: Atrial Under Sense  
 AOS: Atrial Over Sense  
 AOO: Atrial asynchronous pacing  
 VP: Ventricular pacing  
 VUS: Ventricular Under Sense

VOS: Ventricular Under Sense  
 VFB: Ventricular fusion beat  
 VO: Ventricular Pseudofusion  
 VOO: Ventricular asynchronous pacing

If it is pacing case, under the ECG showed, there will be marker with blue lines, the position on the ECG is pacing point.  
 The right window above is a display of the chosen module to display concrete wave. The right window below is the detail what the arrowhead points to at the right window above.



Press  to enter the following interface to adjust classifying parameters. As fig.6-10.

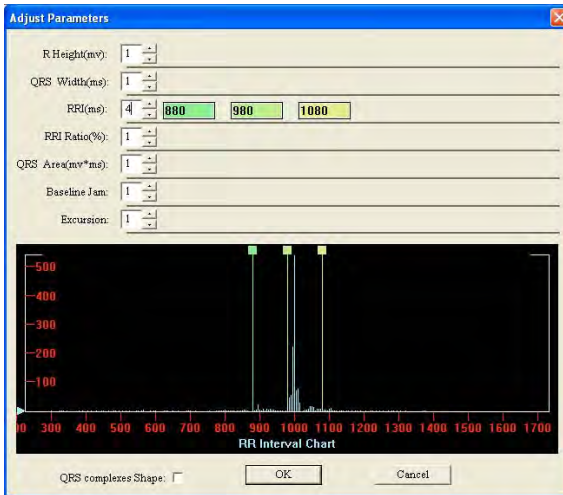


fig. 6-10

The left is the parameter name and unit. The middle is about how many kinds the parameter divided into. The right is the verge of the classification. The verge of the classification is in accordance with the lines in the distributing graph.

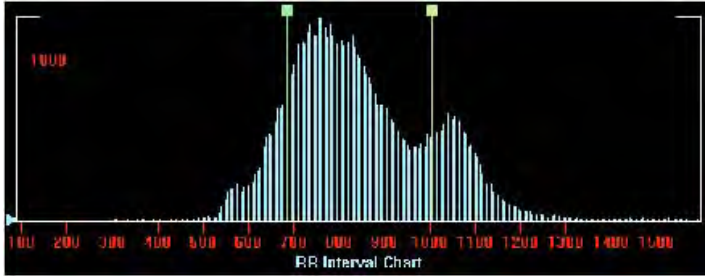


fig. 6-11

Picture 6-11 shows the distributing graph of the wave. The y-axis is the number of wave, the abscissa is attribute value of wave. The classified line corresponds to the editor box Press the square in the line to move the line to change the verge of the classification. The blue triangle on the left is the amplified staff gauge.

QRS complexes Shape:

This box decides whether to sort the waves according to shape. Wave display window. As fig.6-12

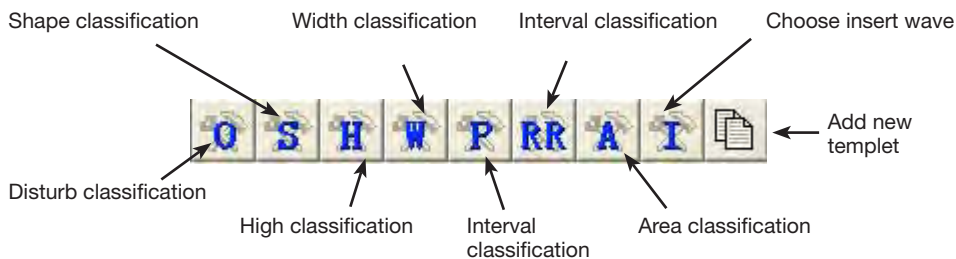


fig. 6-12



When the number of classification is large, it's used to turn the pages. The number in the middle means the current page.

The number in the square means the number of the waves. The two rectangles on the right mean there are two parameters to be classified, including height and interval. The number of diamonds in quadrate bar is the classified number according to the parameters. The purple square means the place of the wave. For example, the first kind in the above, the height of the R wave is between 0.64 and 1.22, and the RR interval is between 520 and 948. Keep the left button down, drag the wave into the classify molding board. It can change the class of these waves.



When knocking the correspond button, the system calculates the proper circumscription of the classification, and divides the parameter into some kinds automatically. For example, when knocking the “Disturb classification” button, the system calculates the proper circumscription of the classification, and divides the parameter into three kinds automatically. When knocking the “Shape classification “ button, the system will divide into four kinds automatically. When knocking the “High classification “ button, the system will divide into three kinds automatically.

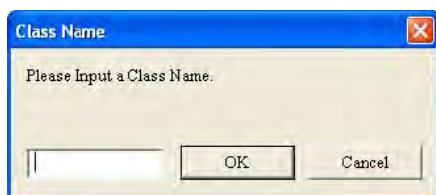


is “choose insert wave” button. When knocking this button,

the system will choose the inserting wave out to make the user easy to edit.



Open dialog box to add classify.



Click the right button open the editor menu.



Change the class module; at the same time put the waveform, which is changed into the module

### Shortcut key

“V”, “S”, “N”, “L” are the shortcut key to change the chosen wave to the corresponding sort.

“Page up”, “page down”, “home”, “end”, “↑”, “↓” mean page up, page down to the beginning of the page, to the end of the page, up and down.

### Control graph display key



Remove the ECG in the left window up



Remove the ECG in the left window down



Remove the ECG in the left window left



Remove the ECG in the left window right



Amplify the ECG in the left window



Lessen the ECG in the left window



Cancel the edit operation



Recover the edit operation



Display or hide the statistics



Display or hide the time



Choose all the ECG in the left window



Reverse choice the wave in the left window



Cancel choice in the left window



click the  button and enter order replay module.

The picture is the order replay picture of main analysis lead. And the doctor can choose the wave of other leads. As fig.6-13



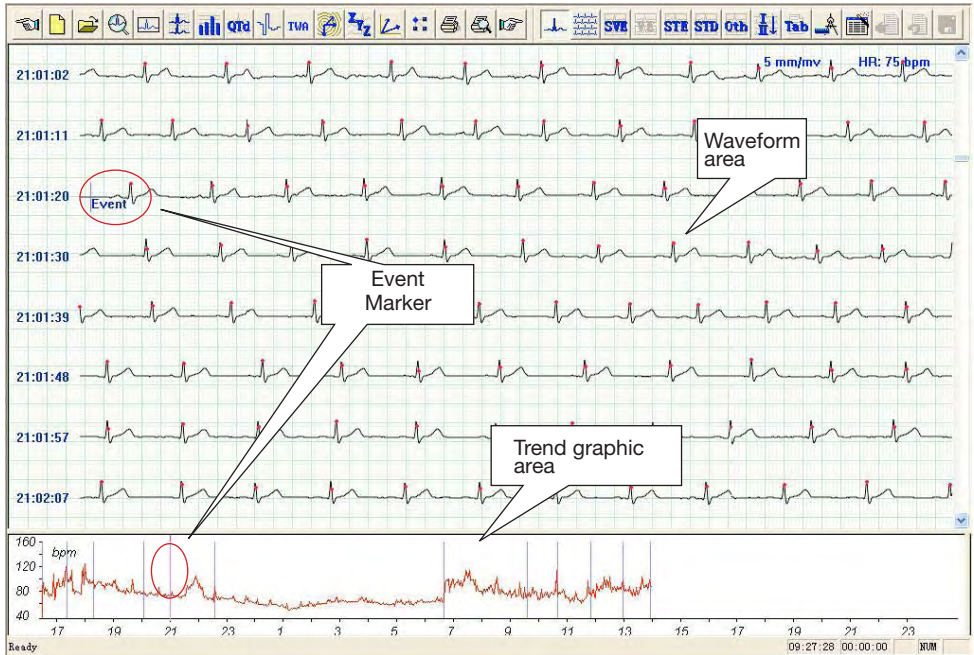


fig. 6-13



**Note:**

The calculate function of HR is as follows:

$$HR = 60000 \text{ ms} / \text{Average R-R Interval}$$

Average R-R Interval is an average of R-R interval that is from all waves in the screen.

Put the arrowhead on the ECG and knock the right key of the mouse, then appear the menu as fig.6-14. The physician can examine and analyze the ECG according to what he needs.



fig. 6-14



For example, knock “the highest heart rate”, and appear the highest heart rate ECG, which is for the main analytical lead. Of course, the physician can choose other lead according to what he needs. As fig.6-15.



fig. 6-15

In this picture, knock the right key of the mouse, appear and choose “Confirm MaxHR”, then show the highest heart rate. As fig.6-16.



fig. 6-16



Knock  button, show the multi-lead ECG. As fig.6-17.



fig. 6-17

Knock  button, show supra ventricular electrocardiogram.

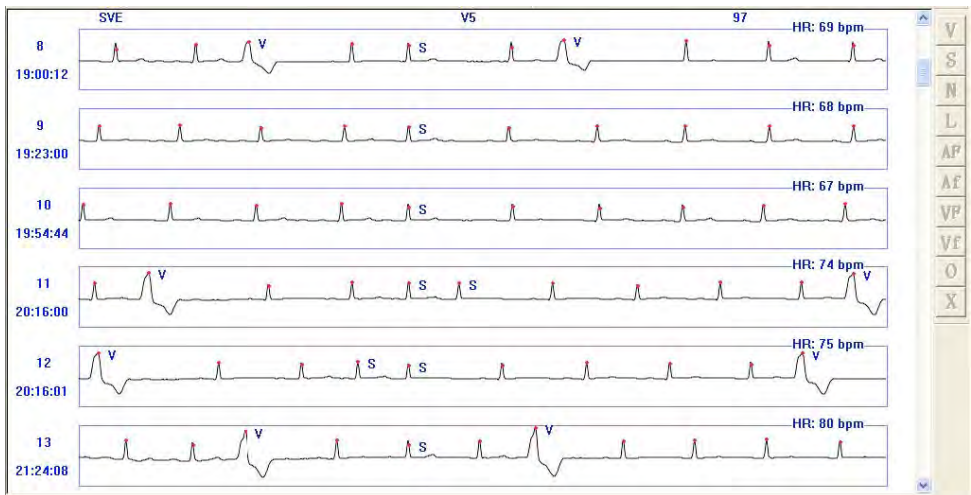



fig. 6-18

Knock  button, show ventricular electrocardiogram. As fig.6-19.

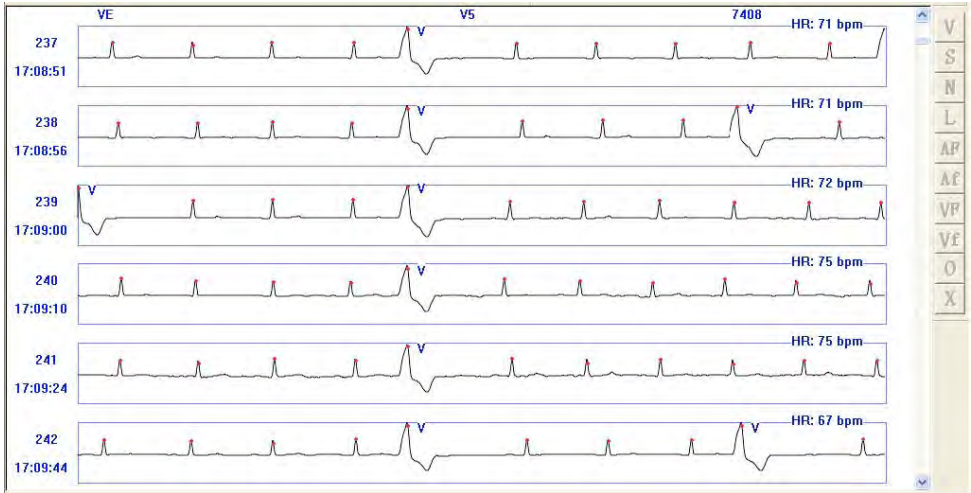


fig. 6-19

- |    |   |
|----|---|
| V  | Change type into ventricular premature beat |
| S  | Change type to atrial premature beat        |
| N  | Change type to sinus pulsation              |
| L  | Change type to long intermission            |
| AP | Change type to atrial flutter               |
| Af | Change type to atrial fibrillation          |
| vP | Change type to ventricular flutter          |
| vf | Change type to ventricular fibrillation     |
| O  | Change type to disturb                      |
| X  | Delete                                      |

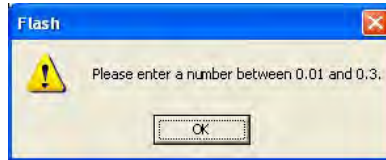
Press CTRL, and choose the bar picture by mouse at the same time,

**STE** **STD** **Oth** are just used for deleting, not others.

Knocking the **STE** button, enter ST elevation ECG.




The physician can “choose lead” according to what he needs to input the parameter. The parameter should be between 0.01 and 0.3. If the input number is out of the range, the computer will display.



Click “ok“, and input the parameter again. As fig. 6-20.

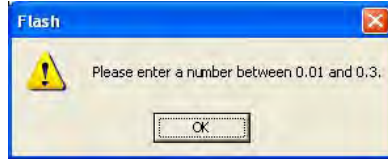


fig. 6-20

Knocking  button, display ST depression electrocardiogram.



The physician can “choose lead” according to what he needs to input the parameter. The parameter should be between 0.01 and 0.3. If the input number is out of the range, the computer will display:



Click “ok“, and input the parameter again. As fig. 6-21.

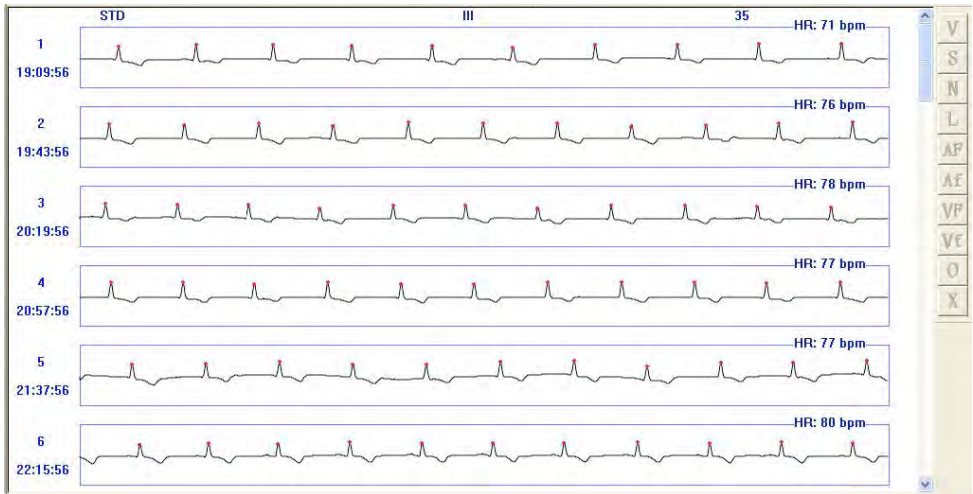



fig. 6-21


Click  button, display other classified ECG: couple S, S bigeminal

rhythm, S trigeminal rhythm, atrial tachycardia; ventricular tachycardia, couple V, V bigeminal rhythm, V trigeminal rhythm; long intermission, atrial flutter, atrial fibrillation, ventricular flutter, ventricular fibrillation; maximal heart rate, minimal heart rate.

Before do the operations, which have been introduced, if refresh button (high bright) means the data need refresh, click this button to refresh data.





Click  button to choose the number of lead to display the mono-lead ECG.

Click "STLE" item inside of "Arrhythmia" item, show fig.6-22.

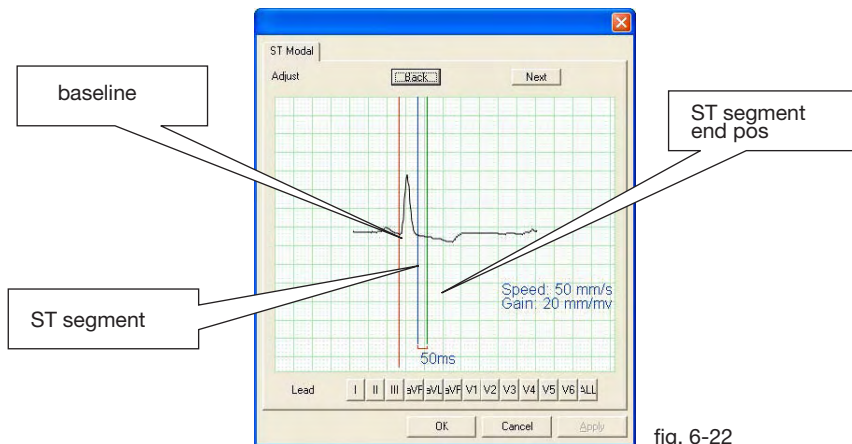


fig. 6-22

Put the cursor near the line, which needs adjust, click the left button adjust the line's position.

The doctor can choose to lead and waveform according to the demand, adjust ST segment. Click "OK" button, show as following.



Click  button, display the Arrhythmia Table.

Arrhythmia Table A as fig.6-23.

Chart

Arhythmia Table A | Arhythmia Table B | STLE Table

Hour	HR	MinHR	Max...	VE	VE Pair	VE Run	VE Big	VE Trig	SVE	SVE Pair	SVE R...	SVE Big
16:30-17:30	71	65	77	11	0	1	0	0	2	0	0	0
17:30-18:30	66	62	70	0	0	0	0	0	1	0	0	0
18:30-19:30	73	63	86	9	0	0	0	0	2	0	0	0
19:30-20:30	80	73	86	13	3	0	0	0	6	0	0	0
20:30-21:30	82	76	90	21	0	1	0	0	12	0	2	0
21:30-22:30	77	71	85	21	0	2	0	0	6	0	0	0
22:30-23:30	70	65	76	4	0	0	0	0	2	0	0	0
23:30-00:30	71	64	81	12	0	0	0	0	9	1	0	0
00:30-01:30	66	62	71	0	0	0	0	0	0	0	0	0
01:30-02:30	63	60	66	0	0	0	0	0	0	0	0	0
02:30-03:30	62	60	65	1	0	0	0	0	0	0	0	0
03:30-04:30	60	57	64	4	0	0	1	0	2	1	0	0
04:30-05:30	61	57	65	2	0	0	0	0	0	0	0	0
05:30-06:30	63	58	68	1	0	0	0	0	0	0	0	0
06:30-07:30	60	55	67	4	1	0	0	0	3	0	0	0
07:30-08:30	70	57	90	18	1	2	0	0	5	1	0	0
08:30-09:30	71	61	83	15	0	0	0	0	8	1	0	0
09:30-10:30	81	74	90	14	1	0	0	0	6	0	0	0
10:30-11:30	76	71	82	6	0	0	0	0	4	0	0	0
11:30-12:30	73	69	76	2	0	0	0	0	3	0	1	0
12:30-13:30	75	68	83	1	0	0	0	0	2	0	0	0
13:30-14:30	73	68	78	0	0	0	0	0	0	0	0	0
14:30-15:30	78	70	89	1	0	0	0	0	0	0	0	0
15:30-16:30	2	0	1	0	0	0	0	0	0	0	0	0
16:30-16:31	2	0	1	0	0	0	0	0	0	0	0	0
All	18	55	90	160	6	6	1	0	73	4	3	0

OK Cancel

fig. 6-23

Arhythmia Table B as fig.6-24.

Chart

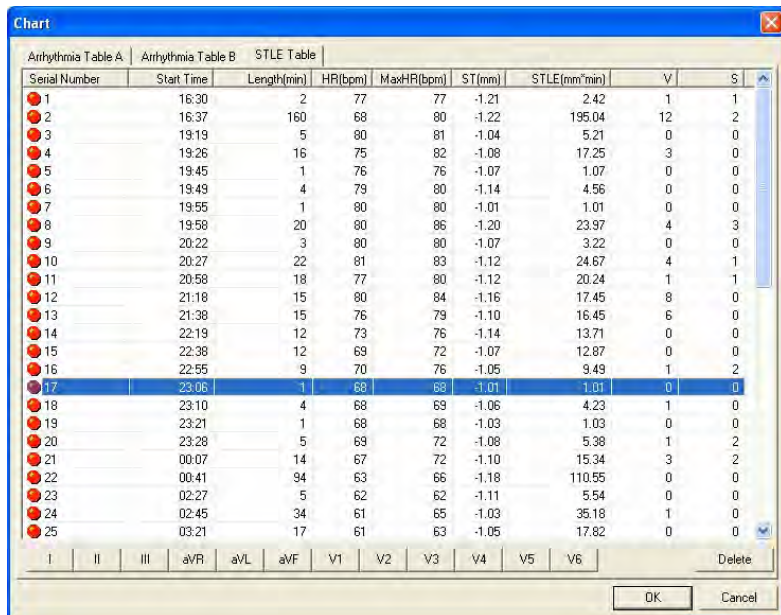
Arhythmia Table A | Arhythmia Table B | STLE Table

Hour	I_ST	II_ST	III_ST	aVR...	aVL...	aVF...	V1_ST	V2_ST	V3_ST	V4_ST	V5_ST	V6_ST
16:30-17:30	0.06	-0.05	-0.12	0.00	0.09	-0.08	-0.01	0.11	-0.00	-0.04	-0.05	-0.06
17:30-18:30	0.09	-0.04	-0.13	-0.01	0.11	-0.08	-0.02	0.11	-0.01	-0.04	-0.05	-0.06
18:30-19:30	0.07	-0.04	-0.11	-0.00	0.09	-0.08	-0.01	0.10	-0.00	-0.03	-0.05	-0.05
19:30-20:30	0.04	-0.07	-0.11	0.02	0.08	-0.09	-0.02	0.10	-0.00	-0.04	-0.05	-0.05
20:30-21:30	0.04	-0.06	-0.10	0.02	0.08	-0.08	-0.02	0.09	-0.01	-0.04	-0.05	-0.06
21:30-22:30	0.04	-0.06	-0.10	0.02	0.07	-0.08	-0.01	0.09	0.00	-0.03	-0.04	-0.05
22:30-23:30	0.07	-0.03	-0.10	-0.01	0.09	-0.06	-0.02	0.14	0.03	-0.01	-0.03	-0.04
23:30-00:30	0.04	-0.05	-0.09	0.01	0.07	-0.07	-0.01	0.12	0.02	-0.01	-0.03	-0.05
00:30-01:30	0.08	-0.03	-0.11	-0.01	0.09	-0.07	-0.02	0.14	0.03	-0.01	-0.03	-0.04
01:30-02:30	0.08	-0.03	-0.11	-0.01	0.09	-0.07	-0.03	0.14	0.03	-0.01	-0.03	-0.05
02:30-03:30	0.07	-0.03	-0.10	-0.01	0.09	-0.06	-0.02	0.14	0.02	-0.01	-0.03	-0.04
03:30-04:30	0.05	-0.04	-0.09	0.00	0.07	-0.06	-0.01	0.12	0.02	-0.01	-0.03	-0.04
04:30-05:30	0.04	-0.05	-0.09	0.01	0.06	-0.07	-0.00	0.11	0.02	-0.02	-0.03	-0.05
05:30-06:30	0.04	-0.06	-0.09	0.02	0.07	-0.08	0.00	0.10	0.02	-0.03	-0.04	-0.06
06:30-07:30	0.03	-0.06	-0.09	0.02	0.07	-0.07	0.01	0.09	0.01	-0.02	-0.04	-0.05
07:30-08:30	0.04	-0.05	-0.09	0.02	0.06	-0.07	0.00	0.10	0.01	-0.02	-0.04	-0.05
08:30-09:30	0.06	-0.04	-0.10	0.00	0.09	-0.07	-0.02	0.11	0.00	-0.03	-0.05	-0.05
09:30-10:30	0.01	-0.08	-0.09	0.04	0.06	-0.09	-0.00	0.11	0.01	-0.03	-0.05	-0.06
10:30-11:30	0.05	-0.05	-0.10	0.01	0.08	-0.08	-0.01	0.12	0.03	-0.02	-0.04	-0.05
11:30-12:30	0.07	-0.04	-0.11	-0.01	0.09	-0.07	-0.02	0.14	0.04	-0.01	-0.04	-0.04
12:30-13:30	0.07	-0.04	-0.12	-0.01	0.10	-0.08	-0.02	0.14	0.03	-0.02	-0.04	-0.05
13:30-14:30	0.06	-0.04	-0.11	0.00	0.09	-0.07	-0.01	0.14	0.03	-0.02	-0.04	-0.05
14:30-15:30	0.05	-0.03	-0.07	-0.00	0.06	-0.05	-0.02	0.07	0.01	-0.01	-0.03	-0.03
15:30-16:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16:30-16:31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All	0.05	-0.04	-0.09	0.00	0.07	-0.07	-0.01	0.11	0.01	-0.02	-0.04	-0.04
unit	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV

OK Cancel

fig. 6-24

STLE table as fig.6-25.



Serial Number	Start Time	Length(min)	HR(bpm)	MaxHR(bpm)	ST(mm)	STLE(mm*min)	V	S
1	16:30	2	77	77	-1.21	2.42	1	1
2	16:37	160	68	80	-1.22	195.04	12	2
3	19:19	5	80	81	-1.04	5.21	0	0
4	19:26	16	75	82	-1.08	17.25	3	0
5	19:45	1	76	76	-1.07	1.07	0	0
6	19:49	4	79	80	-1.14	4.56	0	0
7	19:55	1	80	80	-1.01	1.01	0	0
8	19:58	20	80	86	-1.20	23.97	4	3
9	20:22	3	80	80	-1.07	3.22	0	0
10	20:27	22	81	83	-1.12	24.67	4	1
11	20:58	18	77	80	-1.12	20.24	1	1
12	21:18	15	80	84	-1.16	17.45	8	0
13	21:38	15	76	79	-1.10	16.45	6	0
14	22:19	12	73	76	-1.14	13.71	0	0
15	22:38	12	69	72	-1.07	12.87	0	0
16	22:55	9	70	76	-1.05	9.49	1	2
17	23:06	1	68	68	-1.01	1.01	0	0
18	23:10	4	68	69	-1.06	4.23	1	0
19	23:21	1	68	68	-1.03	1.03	0	0
20	23:28	5	69	72	-1.08	5.38	1	2
21	00:07	14	67	72	-1.10	15.34	3	2
22	00:41	94	63	66	-1.18	110.55	0	0
23	02:27	5	62	62	-1.11	5.54	0	0
24	02:45	34	61	65	-1.03	35.18	1	0
25	03:21	17	61	63	-1.05	17.82	0	0

fig. 6-25



**Nota:**

HR is an average in the period of time. MaxHR is a maximum of HR per minute in the period of time.

Each row in the table stands for each period of time of ST depression of display lead. The data of table contains. beginning time, lasting time (min), HR (bpm), MaxHR (bpm),ST (mm), total burthen (mm\*min), ventricular premature beat in period of time and atrial premature beat in period of time. User could delete some periods of time in table directly, knock "ok", the changed file will be saved.

User could double click the row in the table, then the order review window will display multi-leads waveform, the beginning time of waveform is the same as "beginning time" of the row as fig.6-26.



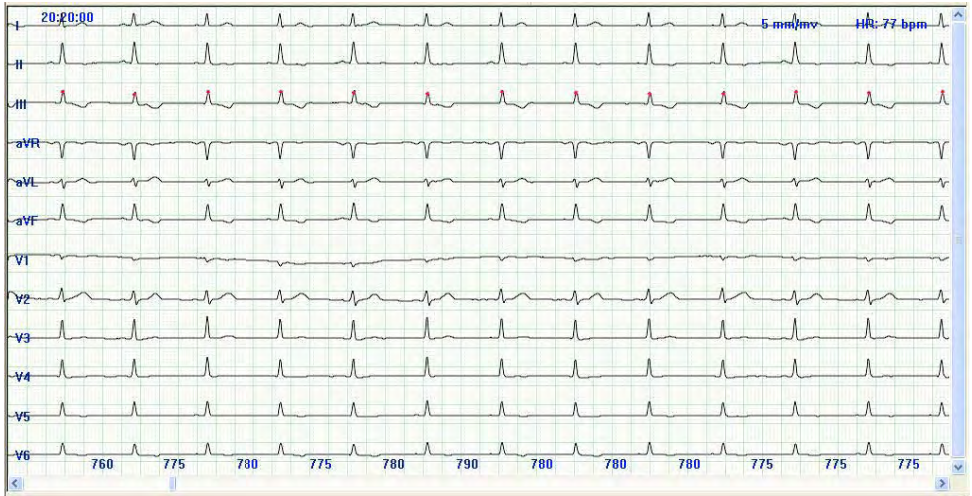
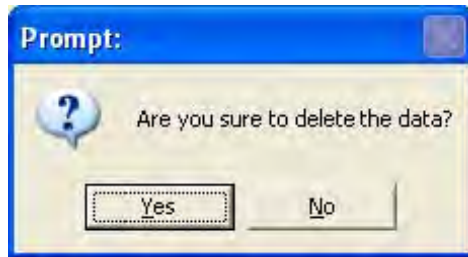


fig. 6-26

After deleting some periods of time, if user don't knock "ok" before double click the row in the table, program will remind user to save the changed file or not with the dialog box below.



Choosing  will save the changed file, choosing  will not save.

Knocking  button, enter QTD analysis system. QT dispersion main incarnate the differentia of the QT Interval between 12 leads, it is the difference between Max value and Min value which are the QT Interval between 12 leads. Its main function is reflecting Ventricle Repolarization inconsistency, and denote inconsistent degree of Ventricular excitability presumptive time, or denote difference degree of Ventricular Refractory period. QT dispersion graph is as fig.6-27. For increasing precision and reducing error, the system adopts the method that got the mean value, which was based on the each interval produced in

the 3 continuous cardiac cycle. The result will show on the right of the interface. Using three arrows betwixt the interface to mark the three continuous heart beats. You can move the heart beat which needs to be measured with the “left” or “right” key, or adjusting the start or end position of Q, S and T wave of the chosen heart beat in the left view. Click the left view, by using the up and down key to choose some lead waveform, the waveform will become green, which shows that you have pitched on the waveform of the heartbeat. Then you can adjust the position of Q, S or T by pressing the “Tab” key. If the upright line on the waveform is red, showing that you can adjust its position with the left or right key. The data in the data view on the right will change automatically. There are two buttons on the toolbar, one is limb lead, and the other is the chest lead. Each of them stands for several waveforms of leads, which show in the left view. Under the default situation, it displays the limb 6-lead. The HR trend graph can help you select the waveform of QTD, which need to be analyzed quickly.



fig. 6-27

Click  button, enter HRT analysis module.

HRT could be quantificationally expressed by two parameters, the two parameters are TO and TS. Ventricular premature beat causes artery blood pressure brief foul-up. When the adjustable function is natural, this transitory

change will be represented by the form of HRT immediately; when the adjustable function is injured, the change will weaken or disappear as fig.6-28:

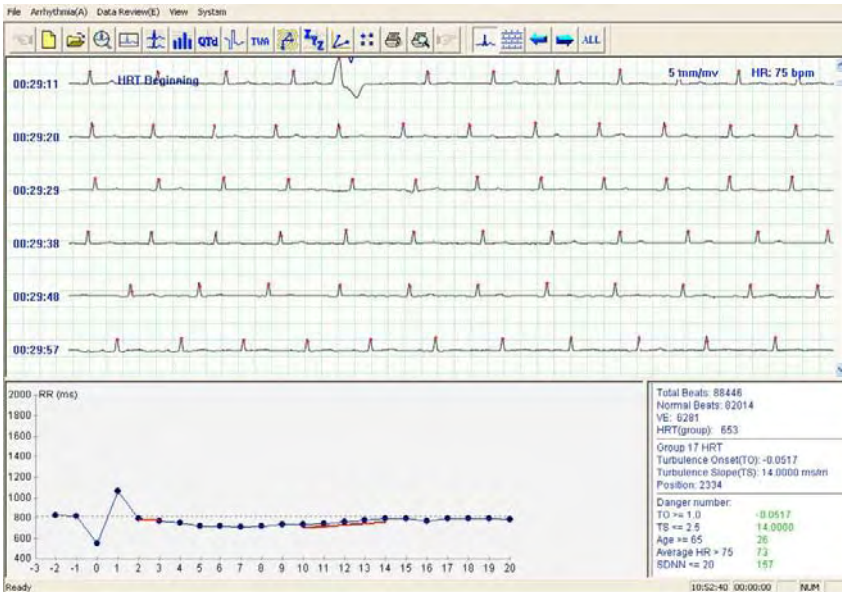










fig. 6-28

The position marked “HRT beginning” is the beginning position of wave that satisfies HRT judged condition, the third QRS wave after this position is ventricular premature beat you can see the RR interphase trend graph in the whole HRT occurring term in the left below graph, which have signed the TO,TS segment with red line to make the user more convenient to judge.

Click the  button in toolbar      will display the wave that satisfies last HRT analysis condition, Click the  button will display the wave that satisfies next HRT analysis condition, click  will display the HRT waveform after superposition on the left below window graph as fig. 6-29:

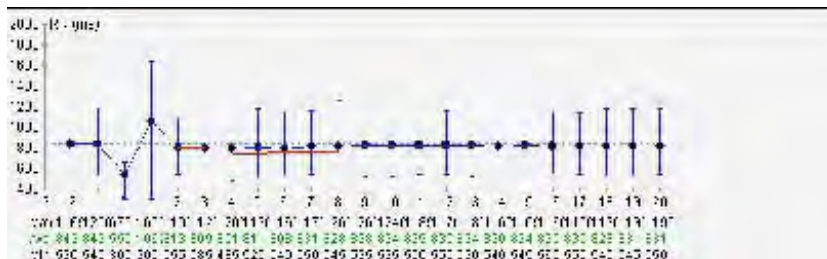


fig. 6-29

The erect line on the dot express RR interphase the maximal value and least value on different period of time.

The three row number below graph express the RR interphase the maximal value, the average and least value for the corresponding dot.

The graph on the right below window is the conclusion as fig.6-30.

Total Beats: 88446	
Normal Beats: 82014	
VE: 6281	
HRT(group): 653	
Average HRT	
Turbulence Onset(TO): -0.0380	
Turbulence Slope(TS): 7.4000 ms/rri	
Position: 68	
Danger number:	
TO >= 1.0	-0.0380
TS <= 2.5	7.4000
Age >= 65	26
Average HR > 75	73
SDNN <= 20	157

fig. 6-30

Before seeing the whole case report, the option such as “normal heart pacing” will show the word “no judging”. When the result is in the range that “the dangerous exponent” indicates, the corresponding result will turn to red to remind the user.

Click button t enters the T Wave alternation analysis module. TWA express the alternate change of amplitude, form about T wave on the ECG.TWA have consanguineous relation with Arrhythmia. The amplitude, form and periodicity of T wave of the same lead change

alternately on the ECG, the wave that amplitude difference of near waves is same or larger than 1 mm is called TWA. TWA is a important index on judging and preventing Arrhythmia.

The analysis adopts TWA measure basing on the maximum of T wave.

The general method is: choose continuous 8 (16, 32, ..... 128) waveform, number QRS waveform from the first one, such as 1, 2, 3, ....., 8, then compare the maximum of T wave; if the difference of T wave is larger than the range that has pre-established, there is TWA phenomena.

After comparing, carry out superposition of the singular number (1, 3, 5.....) wave and superposition of dual number( 2, 4, 6.....) wave respectively, then draw the result after superposition, it will be more obvious as fig.6-31:

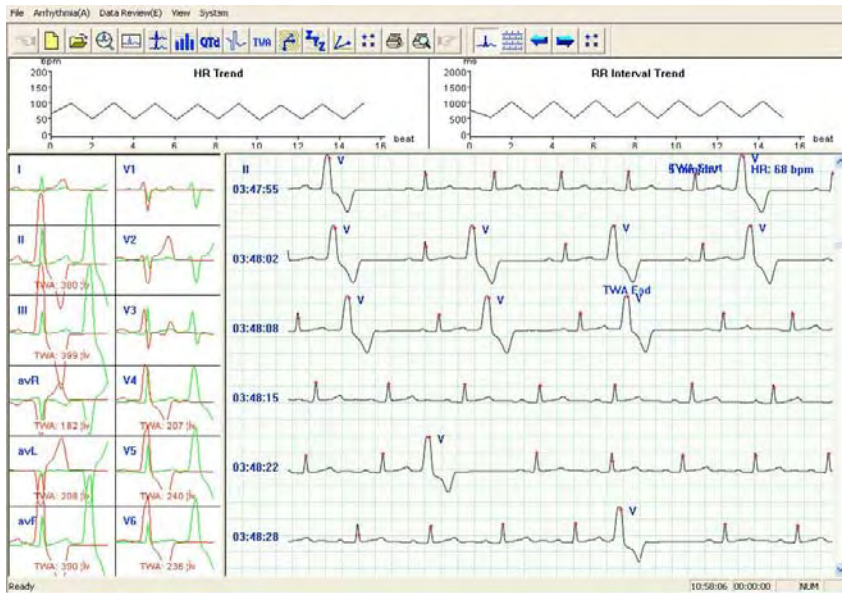


fig. 6-31

The position marked "TWA beginning", "TWA end" is the section of wave that satisfies TWA judged condition. On the left, it is the superposition graph of the singular number wave and dual number wave. The green line is the superposition wave of the singular number, the red line is the superposition wave of the dual number. If there are red words below wave, it means there is TWA phenomenon for this lead (such as V3-lead, V4-lead on above picture).


The number express the height difference after superposition of the singular number wave and superposition of dual number wave. Click the rectangle where the wave is, the right wave graph will turn to single-lead wave of the appointed lead. "heart rate trend graph", "RR interphase trend graph"






above express the heart rate of TWA segment and the mutative trend of RR interphase.

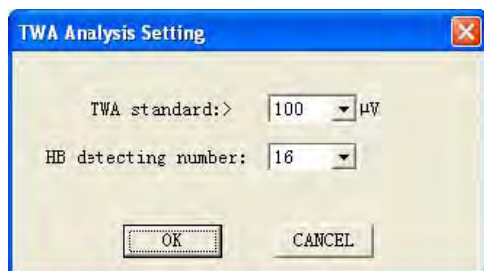
Click  button in toolbar  will display

the wave that satisfies last TWA analysis condition,


Click the  button will display the wave that satisfies next TWA analysis condition.

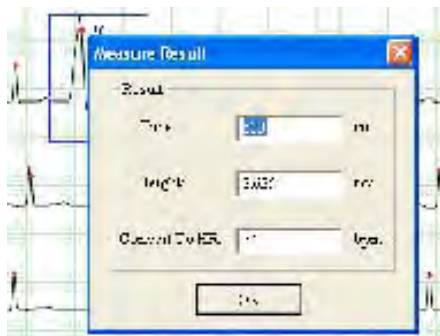
 and  express the switch between single lead and multi-lead for the current displaying waves.

 is the enactment button, click it, then the following dialog box will appear:



The user can set the TWA judging standard and the heart pacing longness for continuous measuring. The range for TWA judging standard is 40-100 mV, the heart pacing longness for continuous measuring is: 8-128. The purpose of enactment is analysis convenience and reducing mistake.

Click  button to measure RR and PR interval.



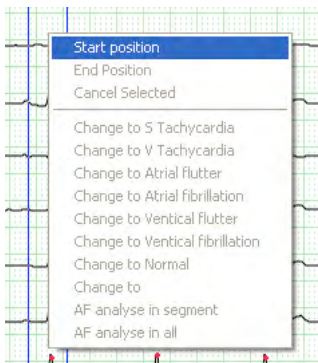
Put the red target on the ECG, pressing the left button and dragging the red target, when there appears a blue rectangle, release the mouse, then the result of measure will turn on.

Click  button to modify the type of QRS wave.

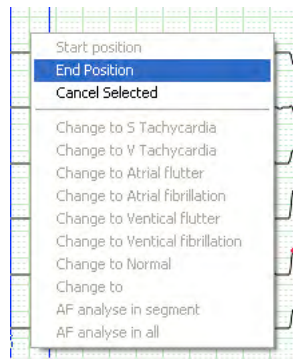


Put the mouse pointer which has the blue rectangle on the wave of QRS that need to modify, then you can click the left button to modify the wave. For example: put the blue rectangle on the S that need to modify in the left picture, click the left button and the S will change to V, then continue click the V, you will get the O.

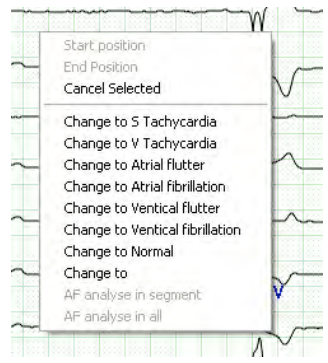
Under such situation, the waveform could be modified continuously. Move the mouse to the beginning of the waveform which needs modification, click the right button to choose the start position, then move to the end, click the right button again to make sure the end position. Now the segment can be modified.



Choose the start pos



Choose the end po



Modify the waveform in series

In the order replay interface, select the “Atrial Fibrillation” in the “Arrhythmia” menu to analyze the atrial fibrillation of the case that the arrhythmia has been construed. The atrial fibrillation analysis system will enter the interface as fig.6-32automatically.

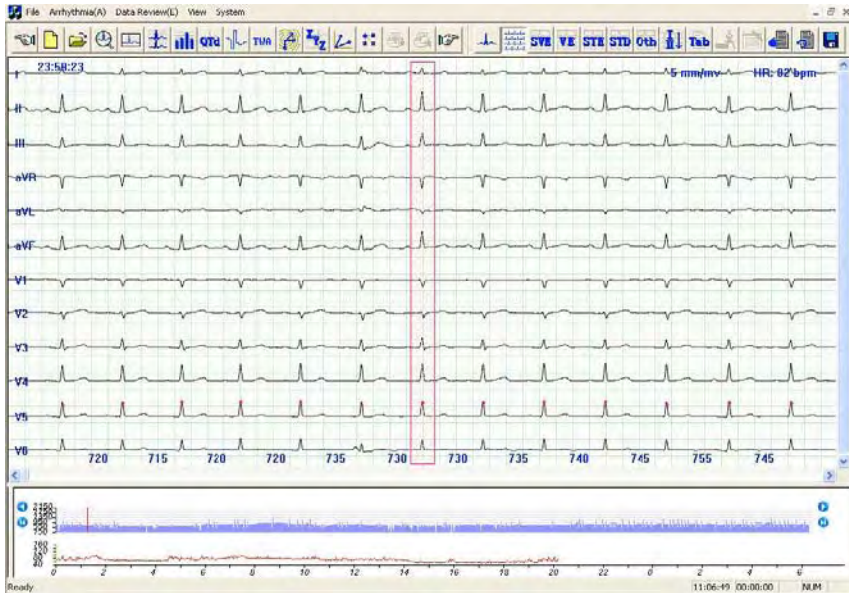


fig. 6-32

It is similar to the interface of order replay, but add the azury diagram at the top of HR trend. It is the RR interval of the current position that displayed. At the same time, there is a red rectangle appear on the multi channel graph. The waveform that the red rectangle indicates is the same as the waveform on the RR interval graph.

The user can choose any parts of RR interval to scan by using the HR trend at the bottom. User also can click directly.

Use the to roll forwards or backwards and use the

to turn over the page. During this process, the multi-channels graph and the green line on the HR trend will change at the same time.

You will see that there are azury, navy blue, gray and some white lines on the RR interval graph. Their meaning is as follows:

The azury is general waveform; The navy blue means the continuous S, V, AF, Af, VF, Vf ( the concrete meaning see the template elucidation part) etc.; Gray means the continuous artefacts; The white lines means interference segment.

System support keyboard to view RR interval trend graph. Click the view

below, passing the " → " " ← " can view the RR interval forward or backward, passing the " Page Up", "Page Down", can turn over the page backward or forward, you can also pass the " ↑ " " ↓ " to play

the RR interval automatically, and press any key to stop playing.



The user can judge the atrial fibrillation occurrence time and length assumedly by using RR interval graph. Combining the multi-channel graph, if make sure that the segment is AF; pop up the menu as follows on the RR interval by clicking the right button: Choose a segment, when the segment turn red, its attribute can be modified to S Tachycardia, V Tachycardia, Atrial flutter, Atrial fibrillation, Ventricle flutter, Ventricle fibrillation, Normal, disturb. At the same time, user also can choose automatic atrial fibrillation analysis for this segment. You also can choose the whole automatic atrial fibrillation analysis at the beginning.

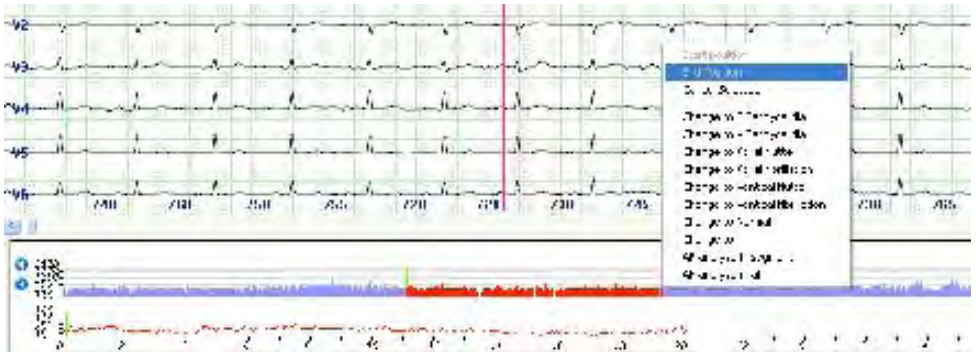
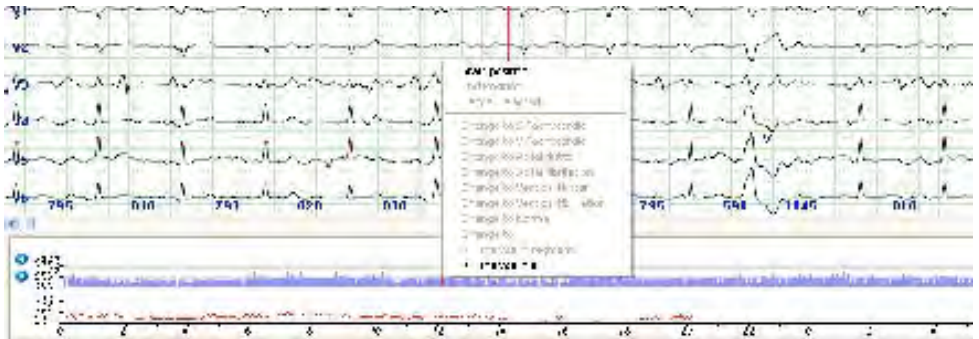










fig. 6-33

- Click  button to print multi-channel ECG.
- Click  button to cancel the print.
- Click  button to fresh data.


Click  button, enter the arrhythmia analysis module.

 **Note** Click  button, the system enters sinus mode arrhythmia analysis. Which is the default analysis.

Click  button, the system analyze all pulsation arrhythmia.

Click  button, display 5minutes arrhythmia analysis graph.

The frequency domain, time domain and the integration electrocardiogram in 5 minutes. You can print them, can change the starting time by moving the y-axis line in the below trend graph, can change page by moving the scroll bar in the top right window. As fig.6-34.

Click  button to display the all pulsation arrhythmia graph in 5 minutes. (as fig.6-35)

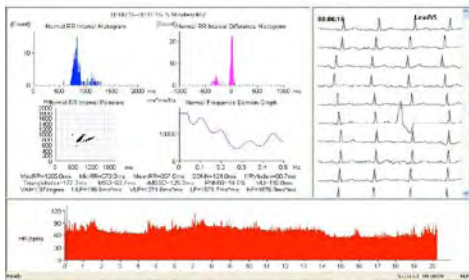


fig. 6-34

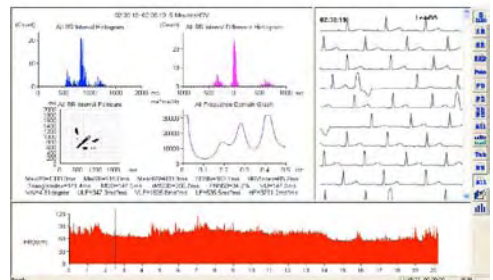



fig. 6-35

Click  button to display arrhythmia analysis graph in an hour.

The frequency domain, time domain and the integration electrocardiogram in one hour. You can print them, can change the starting time by moving the y-axis line in the below trend graph, can change page by moving the scroll bar in the top right window. As fig.6-36.

Click  button to display the whole pulsation arrhythmia graph in an hour. As fig.6-37.

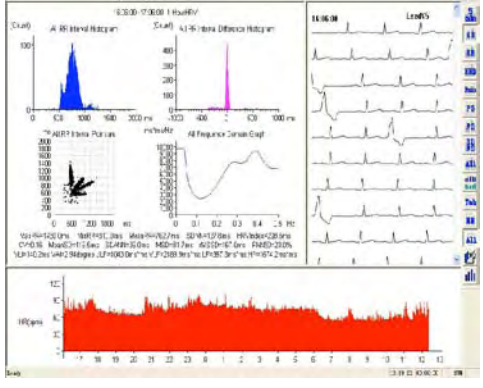
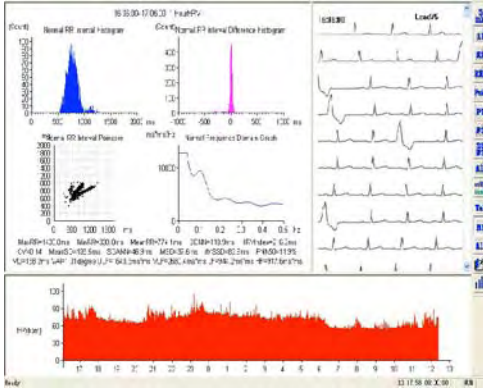
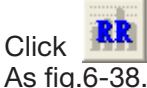


fig. 6-36

fig. 6-37



button to display the whole process RR interval histogram.

As fig.6-38.



button to display the whole pulsation RR interval histogram.

As fig.6-39.

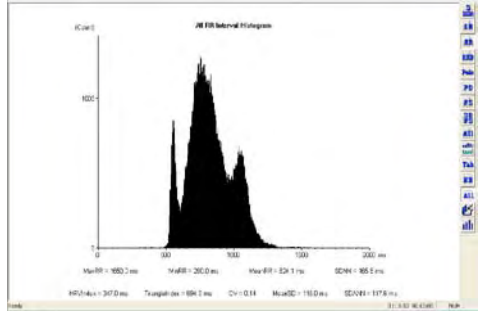
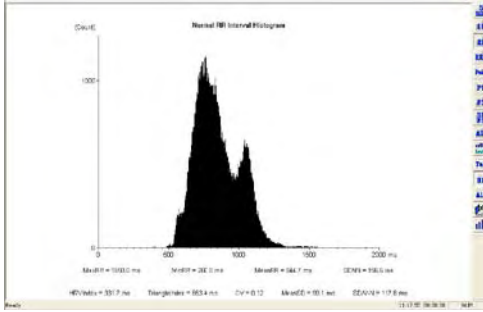


fig. 6-38

fig. 6-39



button to display the whole process RR interval dispersion histogram. (as fig.6-40)



button to display the whole pulsation RR interval dispersion histogram. (as fig.6-41)

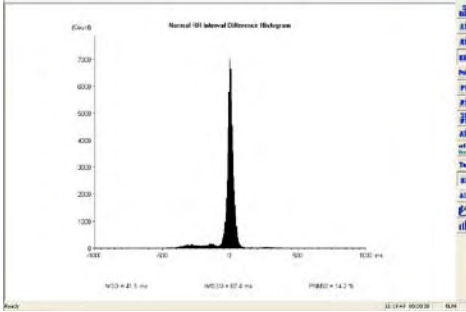


fig. 6-40

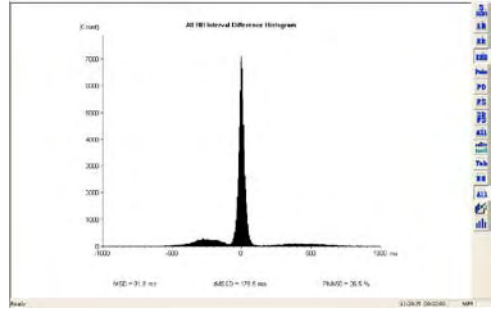


fig. 6-41



Click button to display the whole pulsation RR interval poincare. (as fig.6-42)



Click button to display all pulsation RR interval poincare. (as fig.6-43)

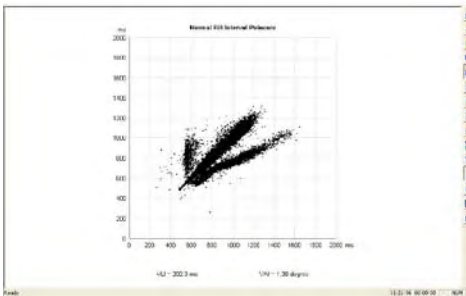


fig. 6-42

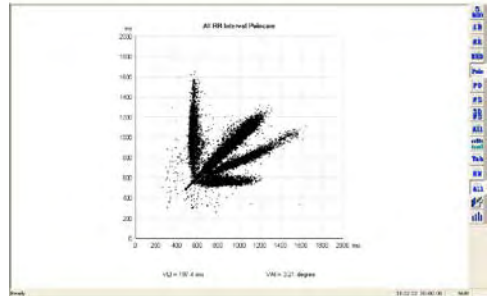


fig. 6-43



Click button to display sinus mode pulsation RR interval dispersion poincare. (fig.6-44)



Click button to display the whole pulsation RR interval dispersion poincare. (fig.6-45)

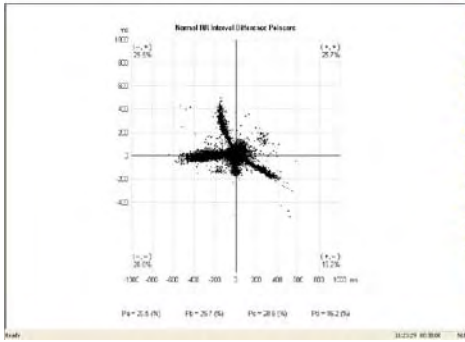


fig. 6-44

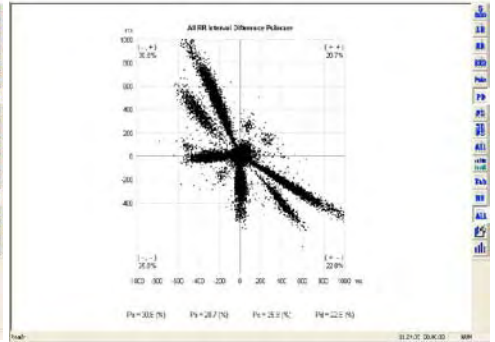




fig. 6-45

Click  button to display sinus mode pulsation spectrum graph (fig.6-46).

Click  button to display the whole pulsation spectrum graph (fig.6-47).

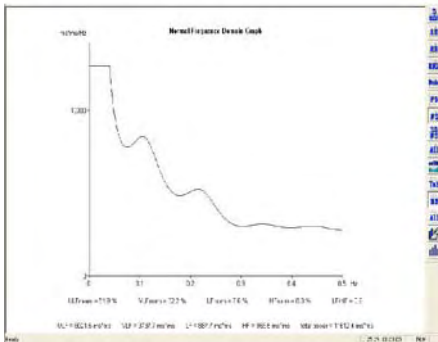


fig. 6-46

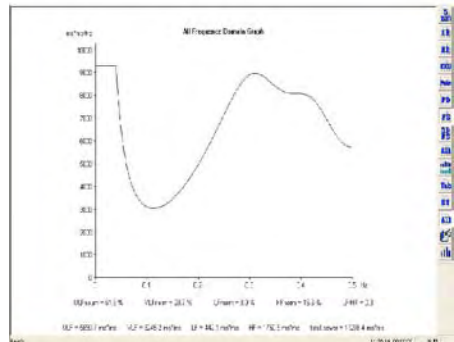




fig. 6-47

Click  button to display 3D sinus mode pulsation spectrum graph (fig.6-48).

Click  button to display the whole pulsation spectrum graph (fig.6-49).

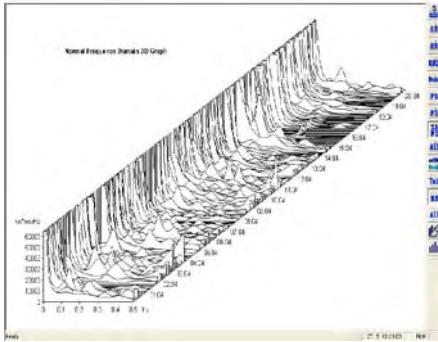


fig. 6-48

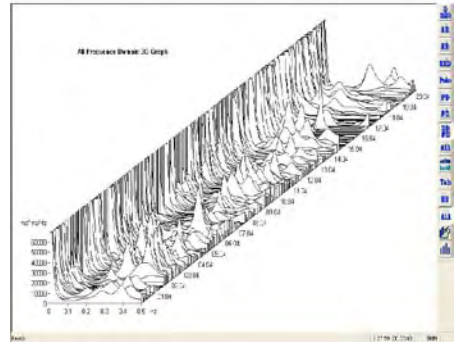


fig. 6-49



Click button to display all process analysis composite graph (fig.6-50)



Click button to display the whole pulsation analysis composite graph (fig.6-51)

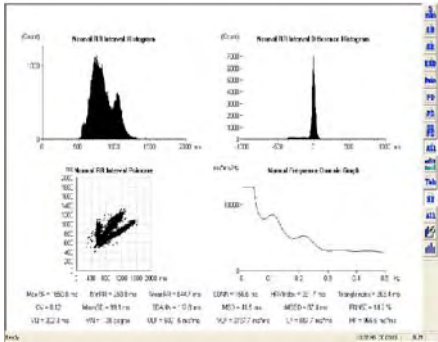


fig. 6-50

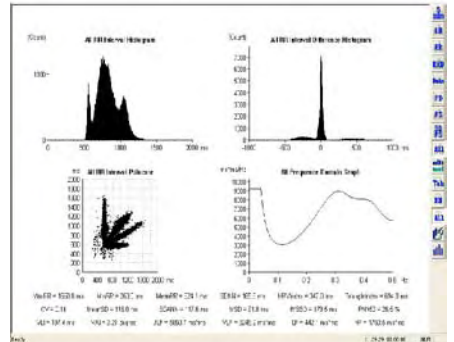


fig. 6-51



Click button to display all process heart rate aberrance trend graph (fig.6-52).



Click button to display heart rate aberrance trend graph of the whole pulsation (fig.6-53).



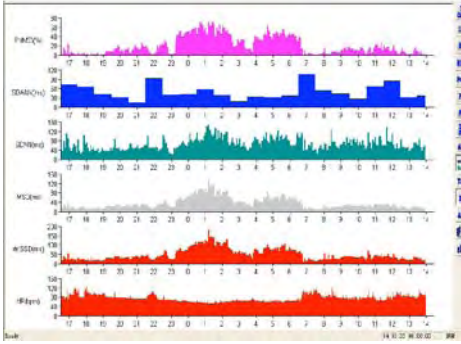


fig. 6-52

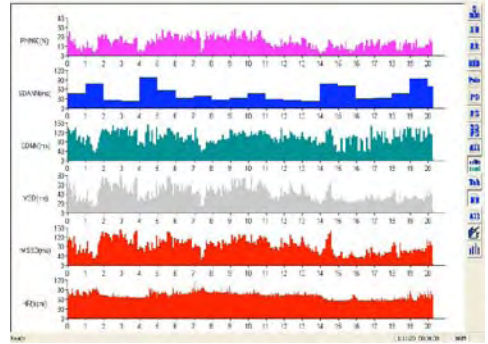


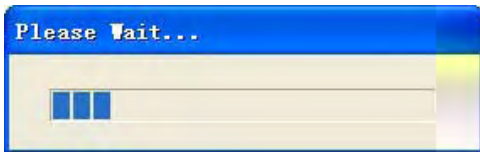
fig. 6-53

Click  button through



to display the whole heart rate variability data table (fig.6-54)

Click  button through




to display the heart rate variability data table of the whole pulsation (fig.6-55)

HRV Chart															
Heart	MaxHR	MinHR	MaxRR	MinRR	SD-RR	RMSSD	CV	VF	HRV	HRV	LF	HF	HF		
rate	rate	rate	rate	rate	rate	rate	rate	rate	rate	rate	rate	rate	rate		
00:00	140	38	74	184	21.0	3.14	30	84	2.8	129	1.2	682.5	2699.9	549.9	539.0
00:05	139	35	70	187	18.6	3.11	33	77	1.1	129	1.5	214.4	2039.3	832.2	750.2
00:10	140	36	69	182	18.1	3.18	32	125	4.6	156	1.3	308.8	1314.4	142.3	2218.8
00:15	150	31	65	133.5	13.9	3.13	33	111	4.2	123	1.3	281.7	1075.8	1107.3	416.1
00:20	150	30	61	147.7	17.9	3.32	30	6	2.1	99	1.4	408.4	204.2	623.1	630.2
00:25	139	30	70	120	15.6	3.14	37	112	2.0	114	1.4	317.3	2033.8	1860.2	721.5
00:30	126	62	70	122	16.9	3.13	33	121	20.3	76	1.3	418.8	1816.4	1832.2	211.8
00:35	110	30	47	86.5	4.27	3.11	38	38	7.1	97	1.3	752.4	1193.4	433.4	643.7
00:40	114	62	70	99.0	18.5	3.12	47	50	5.8	30	1.7	287.9	1113.1	833.8	875.5
00:45	125	42	76	17.2	14.7	3.03	62	115	22.9	180	2.0	303.5	1722.2	1480.3	522.3
00:50	135	35	70	124	18.2	3.14	36	135	9.7	128	1.3	732.3	293.4	1142.8	115.9
00:55	130	31	63	119	13.9	3.12	36	35	1.1	103	1.4	441.1	1071.9	893.3	698.8
01:00	129	30	60	105.9	15.1	3.13	35	35	1.6	109	1.0	381.8	1332.4	1073.3	136.8
01:05	140	30	64	103	15.7	3.11	30	70	1.2	122	1.3	287.3	1023.9	640.6	712.1
01:10	133	47	69	111.9	17.4	3.10	32	39	1.4	146	1.4	116.4	1162.4	1162.4	106.6

fig. 6-54

HRV Chart															
Heart	MaxHR	MinHR	MaxRR	MinRR	SD-RR	RMSSD	CV	VF	HRV	HRV	LF	HF	HF		
rate	rate	rate	rate	rate	rate	rate	rate	rate	rate	rate	rate	rate	rate		
00:00	140	38	74	184	21.0	3.14	30	84	2.8	129	1.2	682.5	2699.9	549.9	539.0
00:05	139	35	70	187	18.6	3.11	33	77	1.1	129	1.5	214.4	2039.3	832.2	750.2
00:10	140	36	69	182	18.1	3.18	32	125	4.6	156	1.3	308.8	1314.4	142.3	2218.8
00:15	150	31	65	133.5	13.9	3.13	33	111	4.2	123	1.3	281.7	1075.8	1107.3	416.1
00:20	150	30	61	147.7	17.9	3.32	30	6	2.1	99	1.4	408.4	204.2	623.1	630.2
00:25	139	30	70	120	15.6	3.14	37	112	2.0	114	1.4	317.3	2033.8	1860.2	721.5
00:30	126	62	70	122	16.9	3.13	33	121	20.3	76	1.3	418.8	1816.4	1832.2	211.8
00:35	110	30	47	86.5	4.27	3.11	38	38	7.1	97	1.3	752.4	1193.4	433.4	643.7
00:40	114	62	70	99.0	18.5	3.12	47	50	5.8	30	1.7	287.9	1113.1	833.8	875.5
00:45	125	42	76	17.2	14.7	3.03	62	115	22.9	180	2.0	303.5	1722.2	1480.3	522.3
00:50	135	35	70	124	18.2	3.14	36	135	9.7	128	1.3	732.3	293.4	1142.8	115.9
00:55	130	31	63	119	13.9	3.12	36	35	1.1	103	1.4	441.1	1071.9	893.3	698.8
01:00	129	30	60	105.9	15.1	3.13	35	35	1.6	109	1.0	381.8	1332.4	1073.3	136.8
01:05	140	30	64	103	15.7	3.11	30	70	1.2	122	1.3	287.3	1023.9	640.6	712.1
01:10	133	47	69	111.9	17.4	3.10	32	39	1.4	146	1.4	116.4	1162.4	1162.4	106.6

fig. 6-55

Click  button to display the case report, sleeping time and additional analysis. (fig.6-56)

The number of ST elevation or depression and the number of T wave inversion.

fig. 6-56



**Attention:**

If it is pacing case, the main analysis result is in the additional analysis. Attention: If the report stat. data is not match before, the reason may be that your report have not updated the latest modification result, you need click” calculation”, then click” OK”



**Attention:**

The data about sleeping time must be filled in according to fact.



Click button to display the print graph. The physician could choose what kind graph to print. (fig.6-57)

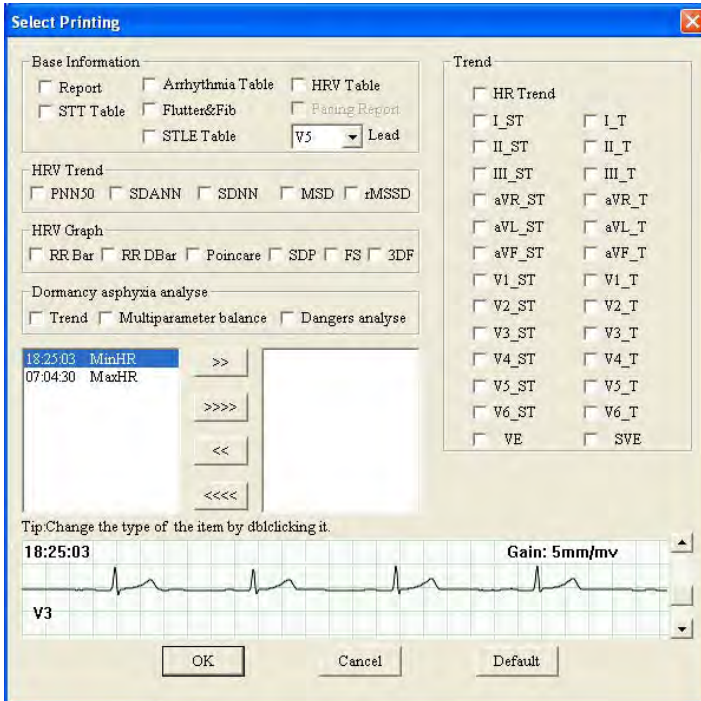


fig. 6-57


Click button to remove the single time in the left frame into the right and wait to print.

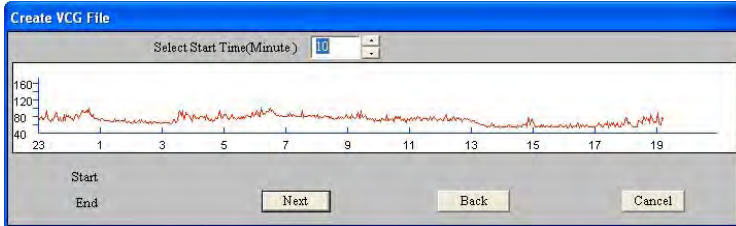
Click button to remove all the time in the left frame into the right and wait to print.

Click button to remove the single time in the right frame into the left and cancel the print.

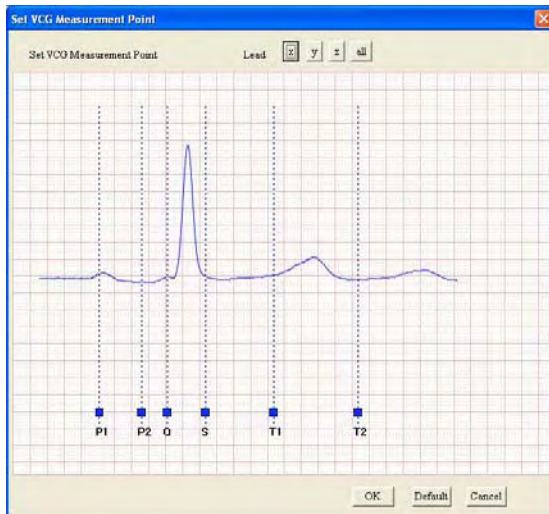
Click button to remove all the time in the right frame into the left and cancel the print.

Choosing button and enter the vector cardiogram module.

Click  button and the screen will appear t dialog box about converting file.



Press SHIFT key and knock the ECG at the same time to choose the beginning time and end time, knock “continue “button, the QRS emendation graph about beginning and end positions will appear.



Put the mouse pointer on the blue rectangle, keep the left button down, the mouse pointer will turn to yellow crisscross cursor, drag the blue rectangle left or right to setting the incept position of each wave over again.

Click "OK" button and enter three-leads VCG graph As fig.6-58.

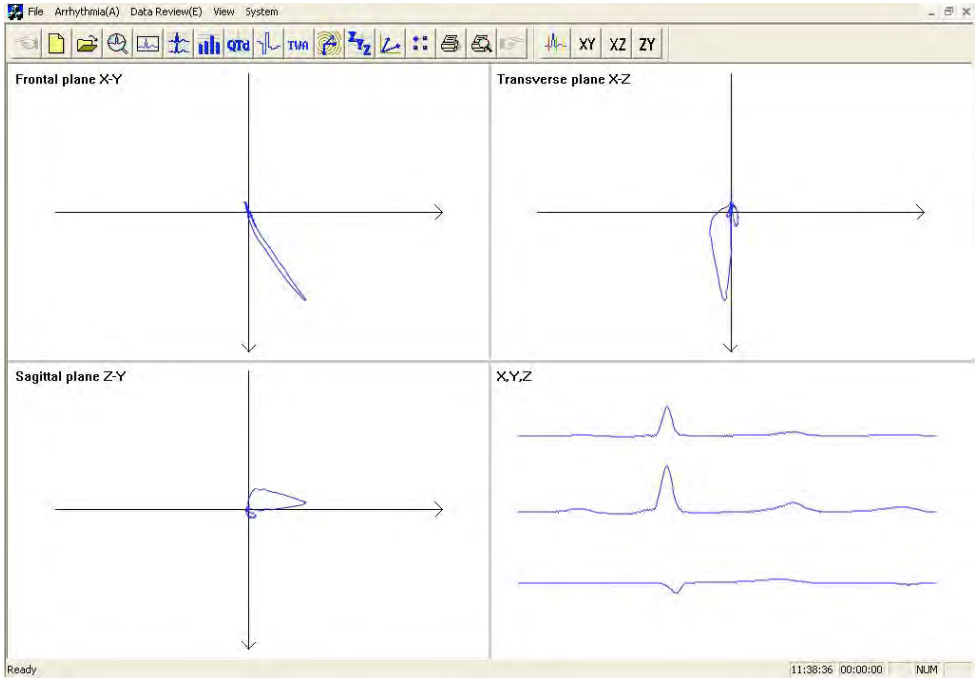
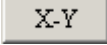
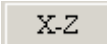


fig. 6-58

Click  button and enter X-Y amplified graph. (fig.6-59)

Click  button and enter X-Z amplified graph. (fig.6-59)

Click  button and enter Z-Y amplified graph (fig.6-59)

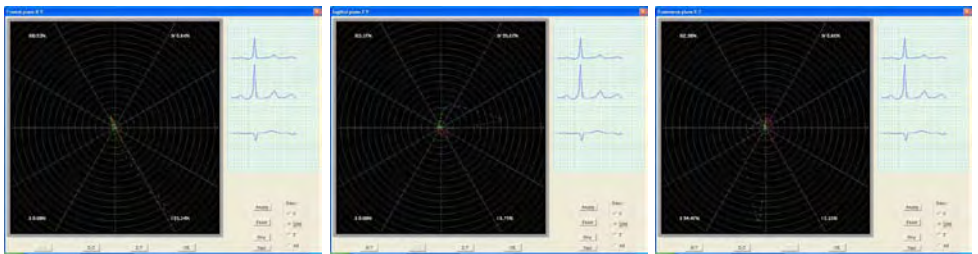


fig. 6-59

Click  button and enter VLP analytical module. (fig.6-60)

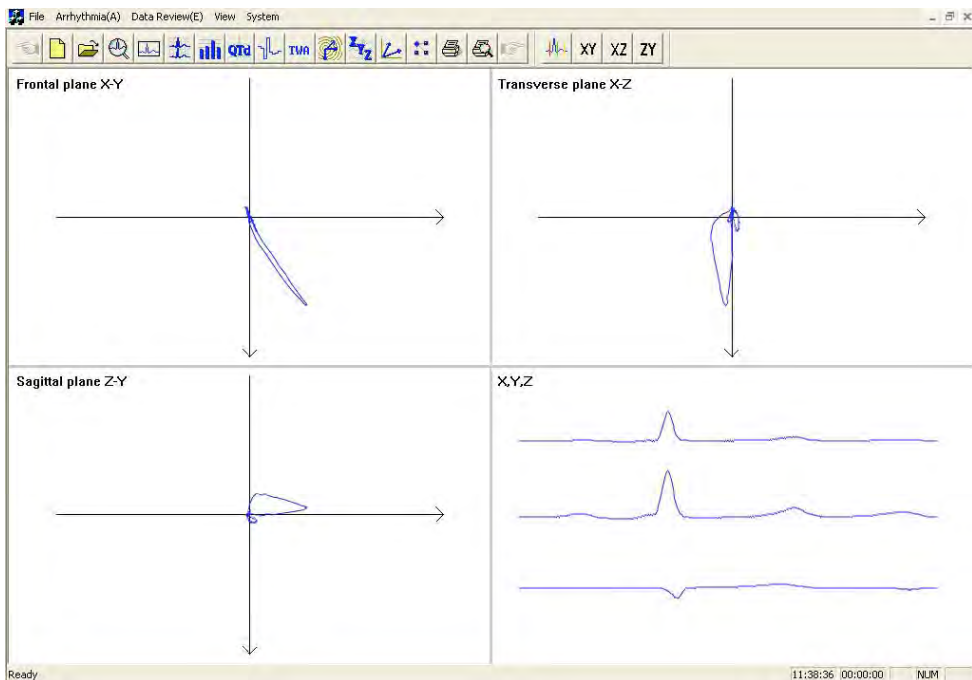

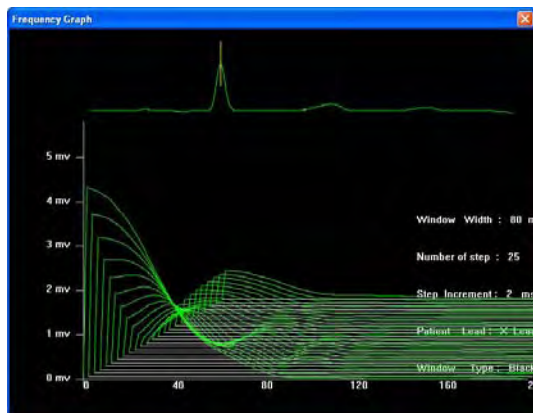




fig. 6-60


Click  button to display ST segment spectrum graph after ECG superposition.




The yellow line in the picture is the end position of the QRS wave, you can use Page Up, Page Down to adjust by hand.


Click  button means the current wave can be chosen.


Click  button means the current wave can't be chosen.

Click  button can cancel all the waves, and adjust chosen standard by hand.

Click  button means “move a waveform frontwards”, “move a waveform backwards”, “page up “,”page down”.

Click  button means the lowest and the highest waveform of heart rate.

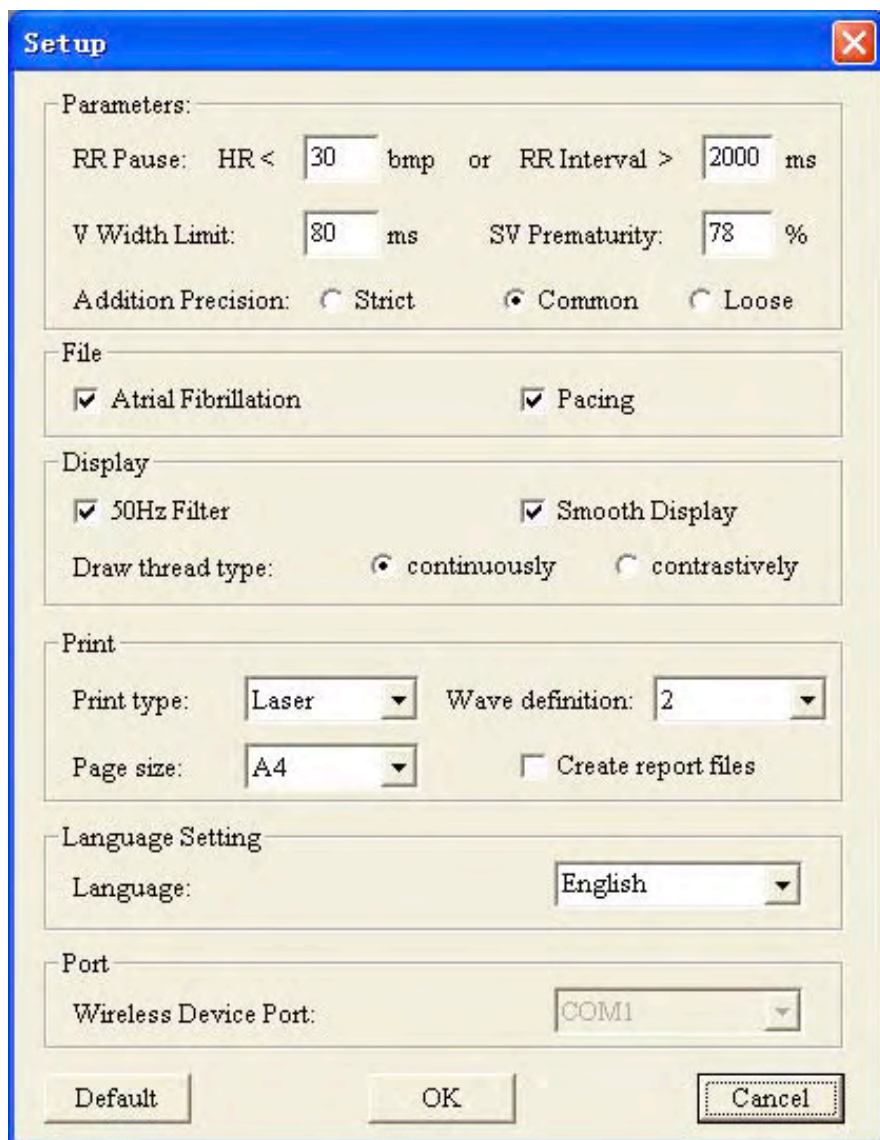
Click  button, display the statistic result.

Click  button and enter TVCG analysis module.

Click R point by mouse, VCG graph will display at the left of the screen.



Click  button and enter the parameter definition operation. As fig.6-61.



**Setup**

Parameters:

RR Pause: HR < 30 bmp or RR Interval > 2000 ms

V Width Limit: 80 ms SV Prematurity: 78 %

Addition Precision:  Strict  Common  Loose

File

Atrial Fibrillation  Pacing

Display

50Hz Filter  Smooth Display

Draw thread type:  continuously  contrastively

Print

Print type: Laser Wave definition: 2

Page size: A4  Create report files

Language Setting

Language: English

Port

Wireless Device Port: COM1

Default OK Cancel

fig. 6-61

**RR Pause:** A standard of judging long interval module;

**V Width Limit:** A standard of judging ventricular premature beat module. A wave whose QRS complex time is longer than this parameter will be judged to V. The default is 80ms;

**SV Prematurity:** A parameter of judging V or S;

**Addition Precision:** The precision of atrial fibrillation analyse;



**Atrial Fibrillation:** The report of atrial fibrillation analyse could be saved when this item has been set;

**Pacing:** The report of pacing analyse could be saved when this item has been set;

**50Hz Filter:** Using 50Hz Filter;

**Smooth Display:** Using Smooth Display;

**Draw thread type:** Select a type for drawing threads;

**Print type:** Select a type for printing ECG waves;

**Wave definition:** Select a definition for printing ECG waves;

**Page size:** Select a size for printing;

**Create report files:** Create an electronic report after print;

**Language:** Select a language for software. If the language has been changed, you should re-start the software.

**Wireless Device Port:** Select a wireless device port;

**Notice:** "Create report files" is unenabled in default of "Bullzip PDF Printer".

If the physician wants to analyze the case again, he can open the following dialog box as fig.6-62.

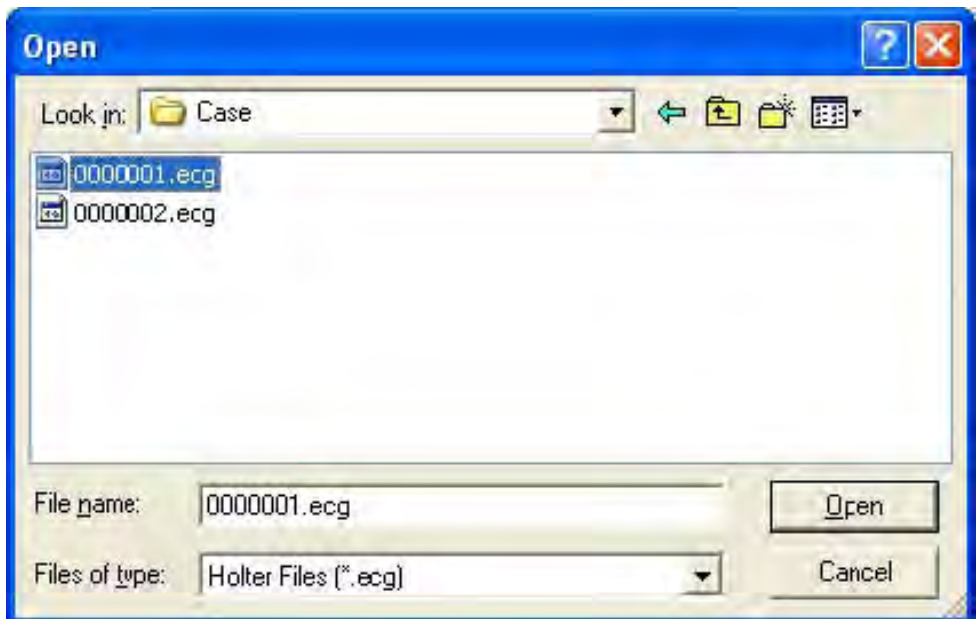


fig. 6-62





## Pacing analysis

When the data contain pacing signal, the system can identify it automatically and add the pacing analytical function. As fig.6-64.

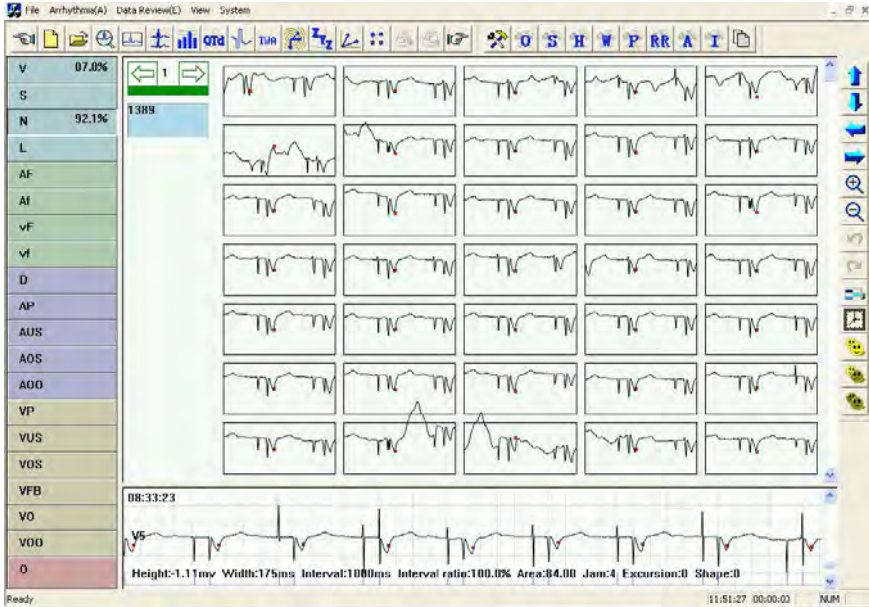


fig. 6-64

There are 11 button. Every button represents a module. The letter in the button means the name of the kind. (For example, D means dual chamber pacing). The percentage in the button means what percentage the wave is in the amount.

D: dual chamber pacing

AP: atrial pacing

AUS: atrial less sense

AOS: atrial over sense

AOO: atrial no pacing

VP: ventricle pacing

VUS: ventricle less sense


VOS: ventricle over sense

VFB: ventricular fusion beat

VO: ventricle pseudofusion

VOO: ventricle no pacing



Enter the order replay, click the  button and appear the “Data Table” dialog box which added the “Pacing Analysis Data Table” as fig.6-65. All kinds of data Start. can be gotten from it.

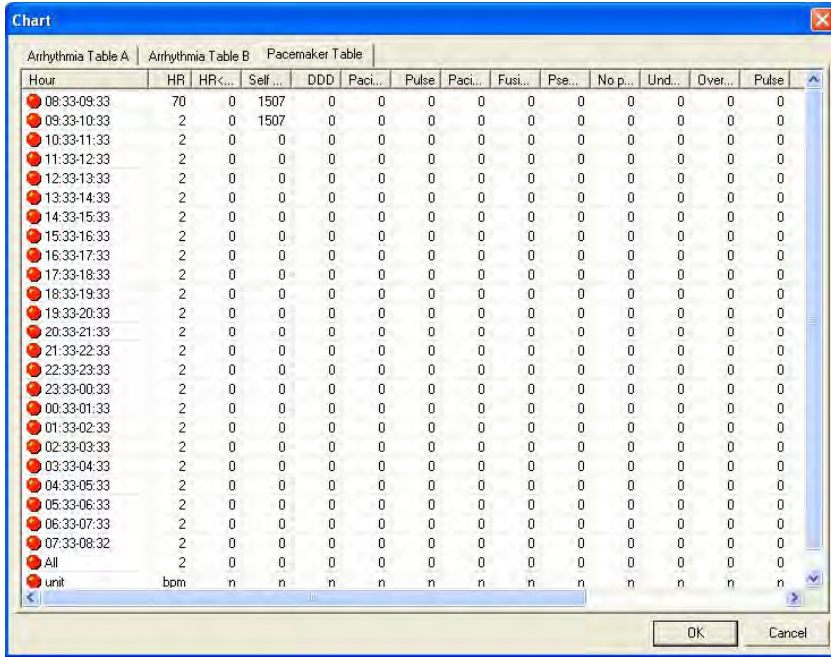


fig. 6-65

### Sleep breath pause syndrome analysis

First, make sure that the time when the patient begins to use recorder is correct, as fig.6-66.

**Please Wait**

Patient's Data

Name:  Sex:  M  F

Age:  Pacing:

No.: 0000002 ID:

Department:  Bed No.:

Height:  cm Weight:  kg

Doctor Name:  Doctor Tel:


Date: 2008 Year 7 Month 6 Day 11 Hour 52 Minute

Hospital Title:

OK Cancel

Connect recorder and press button . . .

fig. 6-66

In case report  please fill the correct sleep time and wake time about sleeping time segment as fig.6-67



Report Sleep time setting Additive Analysis

Time setting


Total time: 20h 15m 08s

Sleep: Day 22 Hour 00 Minute 00 Second

Wake up: Day 06 Hour 00 Minute 00 Second

OK Cancel Apply

fig. 6-67

Last, in printing function dialog box  please choose “trend graph”, “multi-parameter contrast”, “danger analysis” about the option of sleep apnoea analysis graph, as fig.6-68.

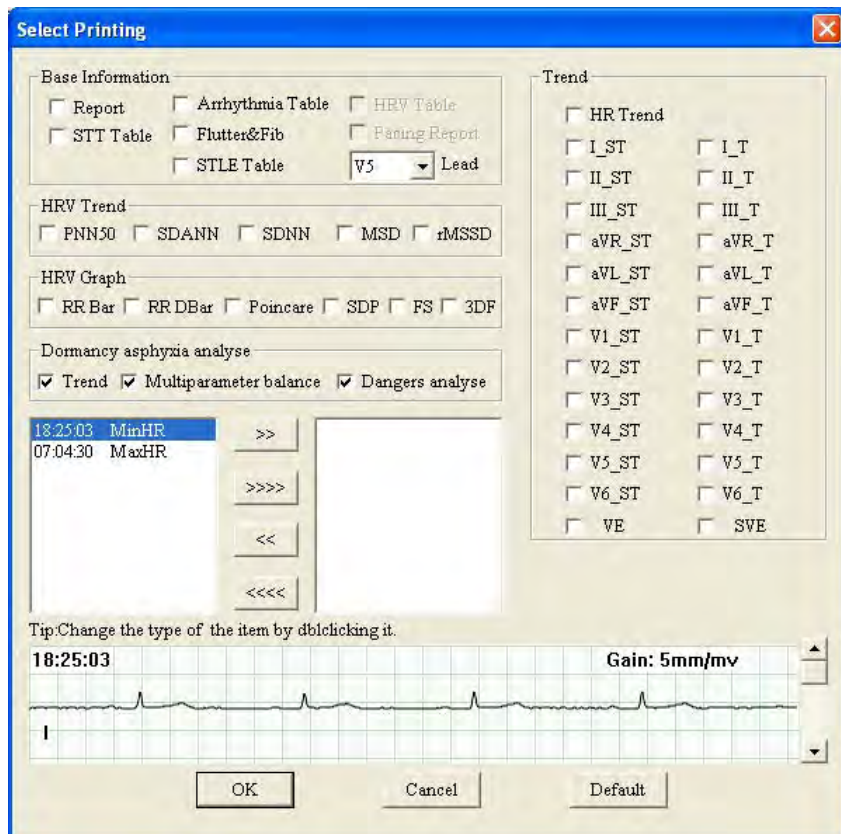


fig. 6-68

After confirming, the physician could print sleep asphyxia analysis report and diagnose.









**Disposal:** *The product must not be disposed of along with other domestic waste. The users must dispose of this equipment by bringing it to a specific recycling point for electric and electronic equipment. For further information on recycling points contact the local authorities, the local recycling center or the shop where the product was purchased. If the equipment is not disposed of correctly, fines or penalties may be applied in accordance with the national legislation and regulations.*

## **GIMA WARRANTY CONDITIONS**

Congratulations for purchasing a GIMA product. This product meets high qualitative standards both as regards the material and the production. The warranty is valid for 12 months from the date of supply of GIMA. During the period of validity of the warranty, GIMA will repair and/or replace free of charge all the defected parts due to production reasons. Labor costs and personnel traveling expenses and packaging not included. All components subject to wear are not included in the warranty. The repair or replacement performed during the warranty period shall not extend the warranty. The warranty is void in the following cases: repairs performed by unauthorized personnel or with non-original spare parts, defects caused by negligence or incorrect use. GIMA cannot be held responsible for malfunctioning on electronic devices or software due to outside agents such as: voltage changes, electro-magnetic fields, radio interferences, etc. The warranty is void if the above regulations are not observed and if the serial code (if available) has been removed, cancelled or changed. The defected products must be returned only to the dealer the product was purchased from. Products sent to GIMA will be rejected.