About the User's Manual

The User's Manual serves for operating this instrument only. Our company shall not be responsible for any consequences and liabilities caused by using this user's manual for other purposes.

The User's Manual containing special information is under copyright protection. All rights reserved. Copy, duplication or translation of the whole or any part of the User's Manual is prohibited in case of no prior written consent from our company.

Based on the need of product technical improvement or the file updates, we reserve the right to modify the contents contained in this manual , if the change do not involve safety issues, the contents are subject to amend without notification

Due to technical upgrade or special requirements from users and with the precondition that the performance of the instrument will not be lowered, some components may vary from the description of configuration in the User's Manual.

The explain for tagging in this manual

⚠ **Warning :** You should know the information for how to avoid the patients edical staff may suffer injury.

Note: You should know the information for how to avoid possible damage to equipment.

Version 1.1 2011-05

Contents

Foreword

Thank you for choosing the digital electrocardiograph series products produced by the company. In order to ensure the safety of you, the patient and the product, please carefully read this manual before using, which can provide you with a series of safety reminders and application guidance, helping you successfully reach the expected goal during the process of usage. In this user's manual, the descriptions with the symbol ⚠ are matters needing especial attention, which may involve information about the safe usage of the product, so please pay extreme attention to those matters.

★ ALL the ECG waveform in this manual are the animal's, it is only for reference.

In order to provide assistance to users intuitively, the manual quoted some pictures as reference. As the product undergoes improvements continuously, the detailed information on parts of the pictures may be inconsistent with the actual situation, but these differences would not affect the normal operation and interpretation of the users, so can be ignored. At the mean time, the manual also described the expansion optional functions of the product, which can only be realized when you have purchased the product with those optional functions, so please identify it.

Digital electrocardiograph is used to record and display the biopotential signals generated by the activities of the heart. It mainly uses ECG electrode to extract biopotential signals from animal body, which are transmitted, filtered and amplified through the lead input network, transferred into numerical information by A/D, sent into the recorder and display after digital processing, and thus the ECG waveforms can be recorded and displayed. In view of the specialization of its applications, the product can only be used by medical personnel with professional qualifications in hospitals, clinics or medical centers, as well as first aid sites. As the complexity of the physiological structure of animal body and the diversity of the causes of diseases, the automatic diagnosis results given by the product are for reference only, which shall be complemented by professional doctors' comprehensive diagnosis according to the actual situation of the patient.

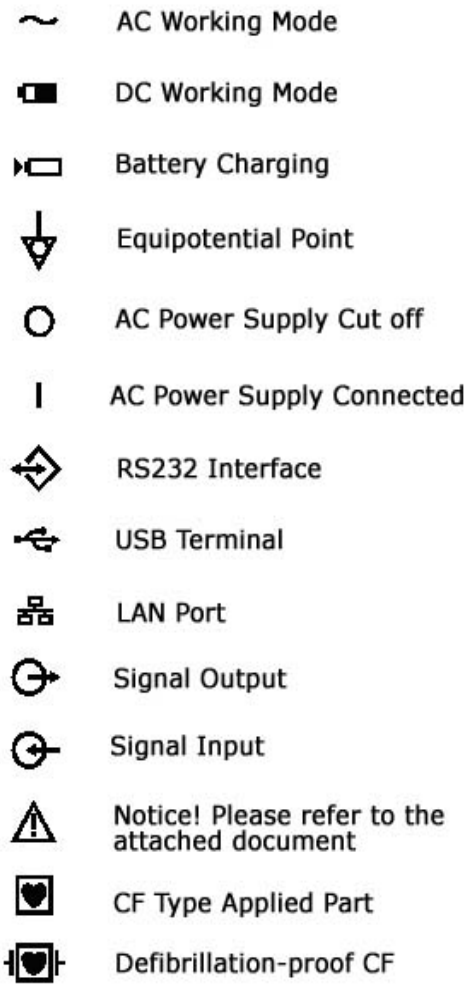
According to the classification principles of Medical Electrical Equipment Part I: General Requirements for Safety (IEC 601-1) the digital electrocardiograph is classified into the following category:

- Anti-shock category: category I, equipment with built-in power supply.
- Anti-shock level: CF type applied part
- Degree of protection against harmful inflow liquids: normal equipment (enclosed equipment with no protection against harmful inflow liquids.
- Degree of safety when used with mixed gas of flammable anesthetic gas with air, oxygen

or nitrous oxide: the equipment cannot be used with mixed gas of flammable anesthetic gas with air, oxygen or nitrous oxide.

- Duty: continuous running equipment.

Some symbols are used to represent specific information in the manual and the nameplate, sign and mark of the product, which are listed as follows for you to recognize:



Note:

Refer to the menu of status setting for Information items and interpretations on the display screen.

Chapter 1. Common Matters Needing Attention

★ **The device is for the exclusive use of licensed physicians or personnel.**

★ **Please read the following precautions thoroughly prior to using this instrument.**

★ **Applicability: It is applicable to perform the routine diagnosis via electrocardiogram for various medical therapy units, particularly in cases such as health examinations, outpatient & emergency departments and wards of hospital**.

⚠ **Warning: The following measures should be taken when installing or storing the instrument:**

- Keep the instrument away from splashing water, and do not use or install it where air pressure, humidity, temperature, ventilation, air containing dust, sulfur, salt, alkaline gas and chemicals might affect it .
- Install the instrument on a stable plane, and prevent it from vibration and mechanical shock when moving it.
- Install it in a room with complete infrastructure.
- There should be no high capacity machine such as high voltage cable , X-ray &ultrasound device as well as diathermy machine around this electrocardiograph.

⚠ **Warning:**

- The power supply should be capable of providing the proper voltage and frequency as required in the instruction manual as well as sufficient capability.
- Do not install the instrument in a chemical storage area or where gas is generated.

⚠ **Warning: Prior to operation:**

- Check that the instrument is in a complete and normal condition.
- Check that the instrument is properly installed.
- Check that all cables are connected correctly and the instrument is grounded correctly.
- It should be given particular attentions when using this instrument with other devices to avoid misdiagnosis or other problems.
- All circuits that contact the patients directly should be examined closely.
- When battery used, please check the voltage and condition of battery first.

⚠ **Warning: In operation**

- The physician should observe the patients closely without leaving during the operation. Turn off the power supply and remove the electrodes when necessary to ensure the safety of patients.

- Prevent the patients from contacting the other parts of the instrument and other conductors except the electrodes.

⚠ **Warning: After operation:**

- Turn all functional status back to the initial status , then turn off the power supply.
- Remove the electrodes gently and do not pull the lead cable emphatically when removing the electrodes.
- Clear up the instrument and all accessories for the trouble-free operation for the next use.

⚠ **Warning:**

The maintenance and servings of this instrument should be performed by the experienced technicians. When there is any functional abnormality with this instrument, it should be clearly identified to prevent the instrument from running with fault.

⚠ **Warning:**

Do not make any modification to this instrument.

⚠ **Warning:**

Maintenance and servicing

- The instrument should be subject to the maintenance and servicing regularly (Once half a year at least)
- Since the electrocardiograph is a measurement instrument, the users should have it verified by the legal unit of measurement according to the << Verification Regulation of Electrocardiograph>>, and the verification cycle should not be longer than 1 year.
- The signal input/output ports (when needed to use) are only permitted to be connected with devices of Class I which is in compliance with the standard IEC60601-1, and the total leak current should be measured by the users to determine if it conforms with the requirement and can be used after connection.
- The electrical basic circuit and the list of parts are exclusively provided to the qualified maintenance stations and personnel confirmed by our company.

⚠ **Warning:**

Products treated after scrapped: the relevant packaging materials, depleted batteries and scrapped products are treated, please remember to follow local laws, the user dispose properly of the scrapped products and materials on the basis of the requirements of local laws, and to support them recovery separation work.

The use of rechargeable batteries:

⚠ **Warning:**

Improper operation may cause the battery becomes hot, fire, explosion, destruction or attenuation of the battery capacity. The use of Rechargeable battery (hereinafter referred to as "Battery"), please read these instructions carefully and use precautions.

⚠ **Warning**:

Polarity of the batteries can not be reversed, or could cause an explosion.

⚠ **Warning**:

Do not fire near the source or the environmental temperature exceeds 60 ℃ battery, do not heat the battery or thrown it into the fire.
Taken to avoid the battery by water splashes, do not drop the battery into the water.

⚠ **Warning**:

Don’t chisel into the battery with metal chisel, hammering, or drop the battery or use the other ways to damage the battery, otherwise it will create fat cells Heat, smoke, deformation or combustion hazard.

⚠ **Warning**:

When you find the battery leakage or emit unpleasant odors, please go away immediately. If the fluid leak into the skin or clothes on, immediately wash with water. If the electrolyte leakage and enter the eyes, do not rub the eyes, immediately with a clean water and see a doctor.

⚠ **Warning**:

Only authorized installation or maintenance engineer can open the battery compartment, replace the battery; and must use the same type of rechargeable lithium batteries which our company’s division to provide.

⚠ **Warning:**

When the battery lifetime to reach, or find the battery, smell, deformation, discoloration or distortion, you should stop using the battery, And used batteries according to local regulations for processing.

⚠ **Warning:**

You must turn off lithium battery before plugging; otherwise it will appear black and white, hang and so on.

Note:

Taken to avoid the equipment being splashed with water.

NOTE:

In this manual, the subsequent amendments (not including the corrections) or revised editions of the dated reference documents are not applicable to this manual, and the latest versions of the reference documents not dated apply to this manual.

Warranty:

For product warranty issues please refer to that "warranty cards" were provides the content in accompanying document, if you have any questions, please call our customer service consulting, customer service hotline: 800-830-6643.

Maintenance Warranty

The manufacturer claims that all parts and materials as well technology of our products, except for the accompanying standard accessories for 6 months, the main unit are fully guaranteed for 18 months dating from shipment. This warranty does not apply to the products modified, disassembled, innovated, and repaired without our authorization or instructions from our company, and the products damaged due to accident, fire, thunder and lightning, flood, intentional destruction, improper installation or operation.

★ **There are such features with this instrument as follows:**

- The digital isolation technology is utilized to minimize influences such as temperature drift and time drift to ensure the high compatibility of this instrument with the environment.
- The digital signal processing is utilized which can ensure the validity and reliability in the signal processing through the processing such as drift rejection, alternating current filtering, myoelectrical filtering and heart rate testing to the ECG signals by the processor.
- It possesses the function of automatic adjustment to the baseline drift which can minimize the baseline drift caused by interferences effectively and optimize the printing position to acquire the electrocardiogram of high quality.
- It possesses the functions of automatic analysis and automatic measurement for the routine electrocardiogram parameters to relieve the burdens of physicians.
- The ECG waveform is recorded with the sophisticated method of thermal array printing , thus the waveform of tracings is clear and accurate with detailed text interpretation and complete markings for the clinic diagnosis and investigations.

- Simultaneous 12 leads acquisition in combination with the 210mm heat sensitive recording paper at high speed for tracing the electrocardiogram to make it high in efficiency ,good in effect and economic when performing the clinic examination.
- The rhythm lead is selectable to make it easy for observing the abnormal heart rate.
- With AC/DC auto-exchange function, special built-in rechargeable battery, charge circuit for battery and complete control and protection system for battery.
- It is classified as Type CF and Class I according to the standard of IEC60601-1, thus it is believed to be safe and reliable.
- The whole machine is made to be delicate, and the operating panel is straightforward and easy to use to make the operation more relaxed and accurate for the users

Chapter 2. Safety Matters Needing Attention

★ **Please read this operation manual closely to learn the correct operation manners thoroughly for sagely and effectively using this instrument.**

Note:

This instrument should be installed on a smooth and stable working bench, and be prevented from the intense vibration and shock when moving it.

Note:

The frequency and voltage of the alternating current should meet the requirement, and the current capacity should be sufficient.

Note:

When the integrity of the protective wire is unsure, please use the internal DC power supply.

Note:

The applied part of circuit works in a floating ground condition, and the design conforms with the safety standard for Type CF, thus it is able to record and display the electrical signal of body surface generated by the activity of cardiac, but can not directly act on cardiac.

Note:

For the accuracy of the electrocardiogram tracing, this instrument should be installed in a quiet and comfortable environment.

Note:

Turn off the instrument immediately if there is any abnormality occurring during the operation.

⚠ **Warning:**

The power supply cable should be 3-core cable when using this instrument with the alternating current, otherwise the hazards of electric shock may be introduced to the patients and operators. When the available 3-core cable is unusable, please use the battery for power supply.

⚠ **Warning:**

The room should be equipped with the complete power supply system and grounding system, otherwise it might be harmful to the patients.

⚠ **Warning:**

When it is used in combination with the cardiac defibrillator, the contact with patient or hospital bed should be avoided. All the electrodes which are connected or unconnected to the patients as well as the patients themselves are not necessary to be grounded .All the electrodes for use should be the Ag-Cl electrodes provided by our company . The patient cable specially provided by our company should also be used for ensuring the protection against the charging of the cardiac defibrillator. It is not recommended to use this instrument in combination with the other electric stimulators. However, if necessary, they should be used in the presence of professionals and under the appropriate directions. When the instrument is used in combination with the cardiac defibrillator or the other electric stimulators (such as HF surgical units), it is recommended to use the disposable chest electrodes in the shape of plate to prevent the adhesive metal electrodes from burning the skin of patient.

⚠ **Warning:**

Be cautious when the patient is connected with more than one instrument, because the total leak current may be harmful to the patient. Only the Class I devices in compliance with the standard of IEC60601-1 are allowed to be connected to this instrument, and the total leak current should be measured by the users to determine that if it meets the requirement and can be used after connection.

⚠ **Warning:**

When the patient is connected with a cardiac peacemaker, the accuracy of ECG testing and the analysis result might be affected. In this case, it is recommended for physicians to perform the identification and analysis in combination with the waveform. However, the potential risk will be increased in this case. Thus it should be given particular attention to the safety problem when recording the ECG in this case, and the appropriate measures should be taken to ensure the leak current at a acceptable level.

⚠ **Warning:**

Keep the high frequency electric knife away from the electrodes to prevent the patients from burning. Make the electric resistance between the high frequency electric knife and patients' body as low as possible, and be cautious particularly. If necessary, the plate electrodes can be used because of its larger contact area to limit the high frequency current density into an acceptable range.

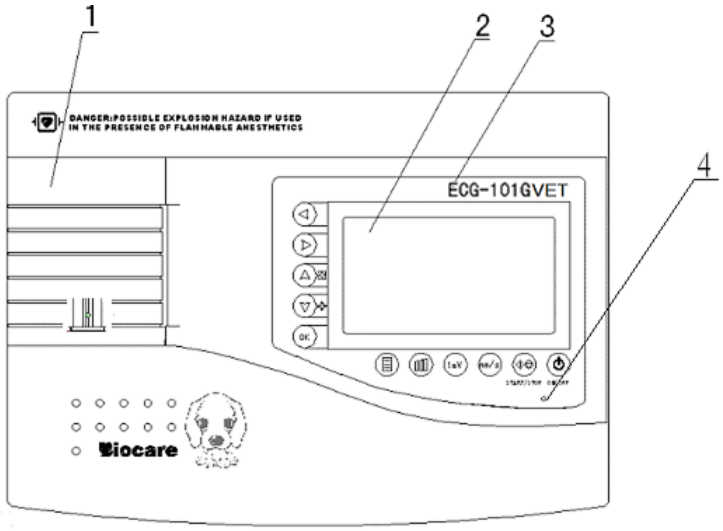
Chapter 3. Product Introduction

3.1 Composition of the Product

Composition of the product: the product is mainly composed of the main machine, leads, limb electrodes and breast electrodes.

3.2 Appearance Description of the Product

- Description of the Front Structure of the Product



1. Recorder

For loading recording paper and printing the ECG waveform and related information

2. LCD

For displaying the electrocardiogram information of the patient tested as well as the instrument status.

3. Opening Button

Press this button to open the cover of paper compartment to load or unload the recording paper.

4. indicator light

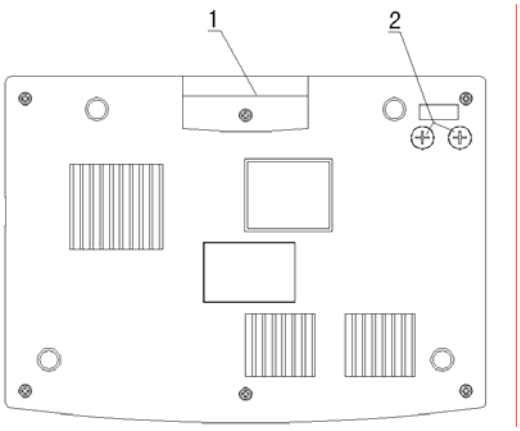
① Always light on when you power on the instrument.

② It is aglimmer when charge it.

Note:

Do not put heavy objects on the LCD display or impact it, otherwise it may be damaged.

■ Description of the Bottom Structure of the Product



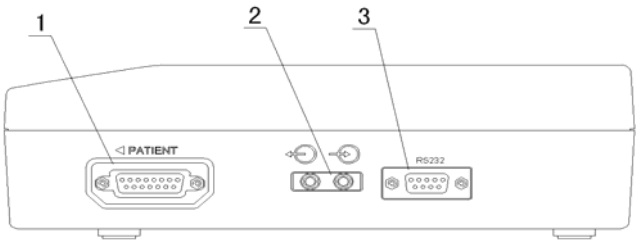
1. Handle

Used to carry the product.

2. Fuse Base

With fuse inside.

■ Description of the Right Structure of the Product



1. Lead Input & Output Interface

Connect the lead.

2. Line Input & Output Interface

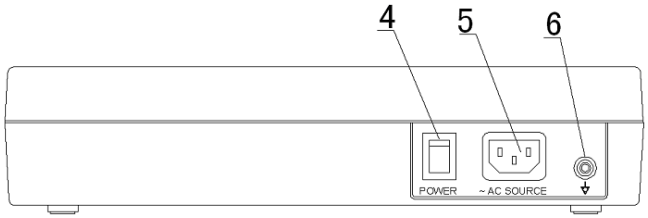
Line Output Interface: outputs the ECG analogue signals collected by the product.

Line Input Interface: receives the input ECG analogue signals and conducts printing;

3. RS-232 Interface

The data transmitting port to conduct communications with the computer.

- Description of the Rear Structure of the Product



4. AC Power Supply Switch

Used to connect and cut off AC power supply.

5. AC Power Supply Socket

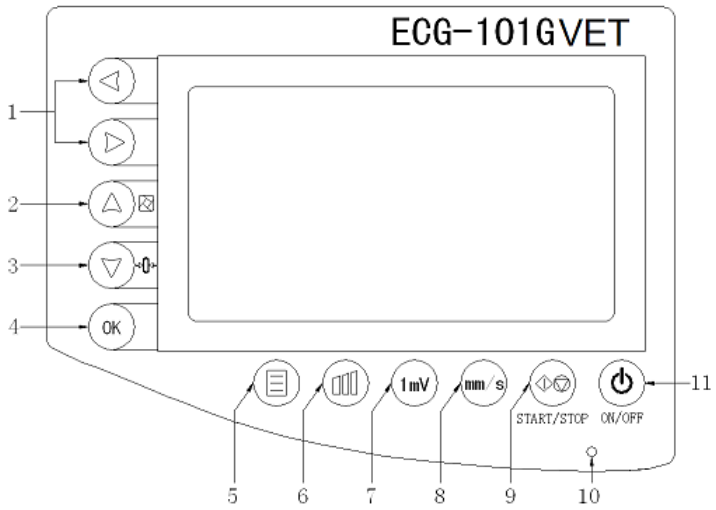
Used to connect to AC power cord.

6. Equal Potential Point (Grounding Pole)

The equal-potential point connected to another equipment can be also connected to the ground as a safe grounding point.

Chapter 4. Product Functions Description

4.1 Description of the Various Function Keys on the Control Panel



1. LEAD（◀/▶） Lead Switch

① In the recording status, used to switch the lead;

② In the menu setting status, used to select the parameters of setting.

2. MODE(▲) Mode switching button (▲)

① Used to switch among various recording modes;

② In the menu setting status, used to select options in the menu.

3. RESET（▼） Closing button (▼)

① In the standby status, used to close the lead signal;

② In the menu setting status, used to select options in the menu.

4. OK Confirm Button

Confirm the selection of the options in the menu (or enter into the next level of menu).

5. Menu setting button

Press this button in the standby status to enter the menu, and in the menu status to exit the menu.

6. (BACK) Sensitivity switch/return button

① Conduct sensitivity switch in the standby status;

② In the menu setting status, used to return to the upper level of menu.

7. 1Mv Calibration button

Press this button under the recording status to printout the calibration waveform of 1mV to check the current sensitivity status.

8. mm/s Record Speed Button

Change the recording speed of the recorder according to the requirements of the applications.

9. START/STOP Start/Stop Record Button

For starting or stopping the ECG waveform recording in the various recording modes.

10.O Power Supply Indicator Light

Indicate the status of stand- by, starting or charging of the battery.

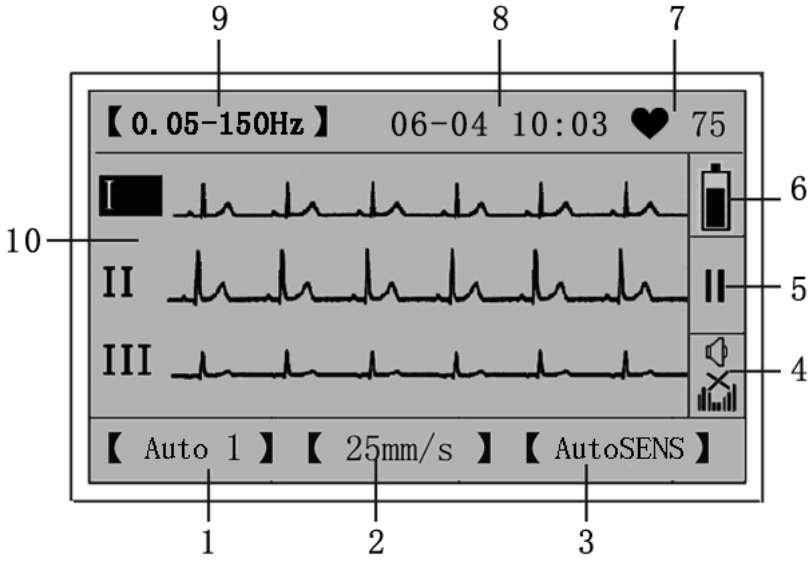
11. ON/0FF ON/OFF Button

For turning on and off this instrument. The case of system failure, press the button continuously more than three seconds, the instrument may be compelled to switch off.

Note:

Do not use sharp objects to operate the control panel in order to prevent damaging the panel, being shocked by contacting the internal circuit or damaging the product. Do not put irrelevant objects on the control panel for a long time, because that will reduce the elasticity of the control buttons on the panel and disable the panel functions.

4.2 Description of the Functions in the Product Display Interface



1. Record mode

The current mode of recording, which can be changed through the mode switching button on the control panel.

2. Record Speed

The current recording speed, which can be changed through the recording speed controlling button on the control panel.

3. Sensitivity Status

Indicate the current status of sensitivity, which can be changed through the sensitivity switching button on the control panel.

4. Sound tag

Used to indicate the current setting of the prompting sound, mainly the type of tone or the mute status.

5. Recorder status

II Indicate that the recording is stopped;
◀Indicate that the machine is recording.

6. Battery tag

Used to indicate the DC or AC power supply mode of the product: in DC power supply mode, it is also used to indicate the current capacity of the built-in battery; in AC power supply mode this tag is hidden.

7. Heart Rate Symbol and Heart Rate of Tested Patient

① Heart rate icon;

② The detected heart rate in real time.

8. System time

Display the current time.

9. Filter Status

The current status of the filter, which can be changed through the options in the menu.

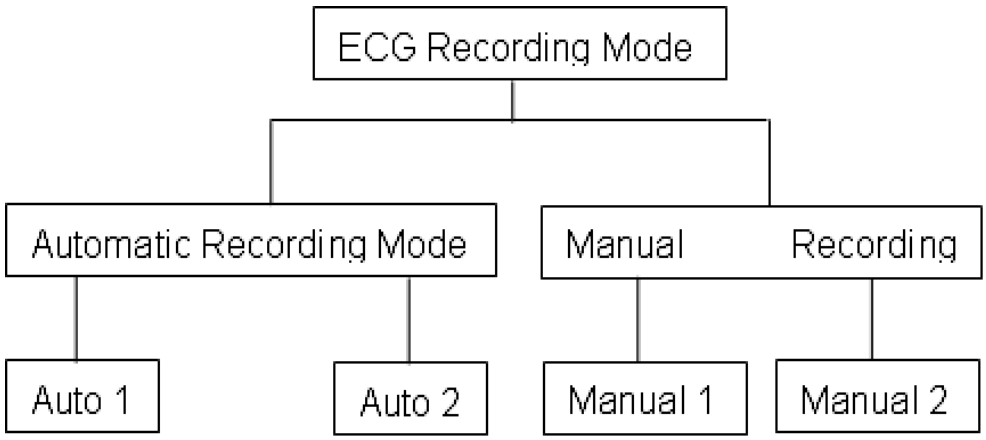
10. Lead code and waveform displaying area

① Display the real time signal waveforms of the leads;

② Display the lead code before each waveform.

4.3 Recording Mode Selection Function

The setting of recording mode must be conducted in the standby status of the product, and cannot be changed during the recording process. The recording modes of the product are divided into automatic method (including “Auto 1” and “Auto 2”), manual method (including “Manual 1” and “Manual 2”), There are two recording manners as automatic recording and manual recording with 4 recording modes as the following picture:



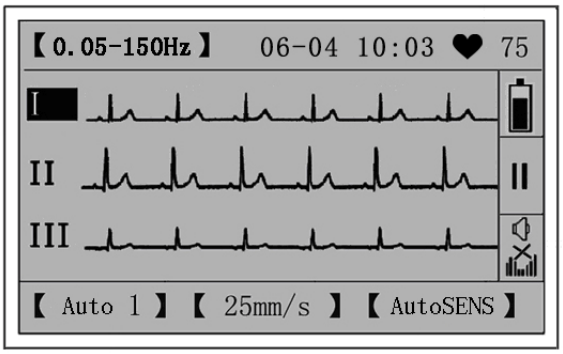
4.3.1 Functions and Features of the Product in Various Recording Modes

Recording Mode	Description of the Functions and Features
Auto 1	On the recording paper, only the signals of one lead can be recorded in each recording cycle in the longitudinal direction, and the lead can be automatically changed when each recording cycle is finished, and the waveforms of the signals of all leads are recorded in the transverse direction (for example: Ⅰ→Ⅱ→Ⅲ→aVR→aVL→aVF→ V, 7 recording cycles in all), and then the results of automatic analysis can be printed or stored according to the operator's selection.
Auto 2	On the recording paper, the signals of two leads can be recorded in each recording cycle in the longitudinal direction, and the lead can be automatically changed when each recording cycle is finished, and the waveforms of the signals of all leads are recorded in the transverse direction (for example, the recording sequence when the rhythm lead selection is II lead is as follows: Ⅰ+Ⅱ→Ⅱ+Ⅱ→Ⅲ+Ⅱ→aVR+Ⅱ→aVL+Ⅱ→aVF+Ⅱ→V+Ⅱ, 7 recording cycles in all), and then the results of automatic analysis can be printed or stored according to the operator's selection. Among them, the second lead signal in the longitudinal direction is the selectable rhythm lead signal.
Manual 1	On the recording paper, only the signals of one lead can be recorded in the longitudinal direction, the waveforms of the signals of the current lead are recorded continuously unless the lead is changed manually (for example: Ⅰ→ ……).
Manual 2	On the recording paper, the signals of two leads can be recorded in the longitudinal direction, one of them is the currently selected rhythm lead, and the waveforms of the current lead and rhythm signals are recorded continuously unless the lead is changed manually (for example, when the rhythm lead selection is II lead: Ⅰ+Ⅱ→ ……).

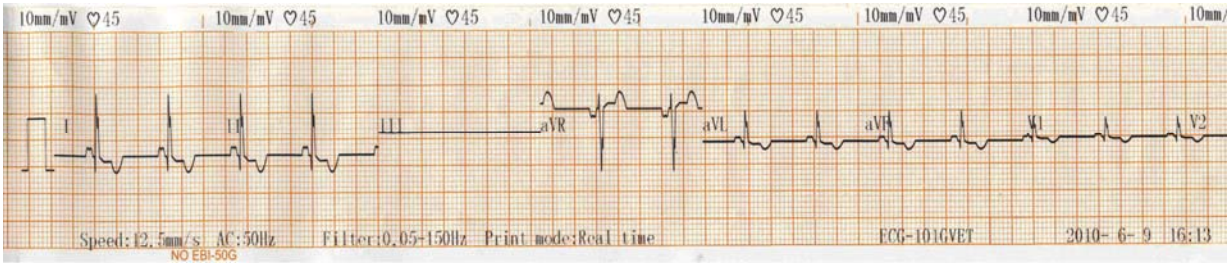
4.3.2 Description of the Relevant Information on the Display and Recording Paper in Each Recording Mode (Information shown in the following diagrams may be different in different parameter settings of various options, so is for reference only)

1）Auto 1 mode: (parameters setting: DC power supply, prompting sound closed, recording speed is 25mm/s, filter H50 d 75Hz)

a. Sample of the information displayed in the monitor

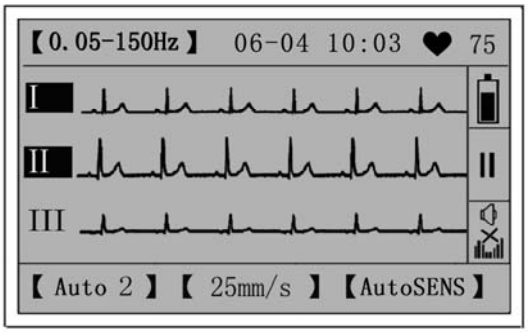


b. Sample of the information recorded by the recorder

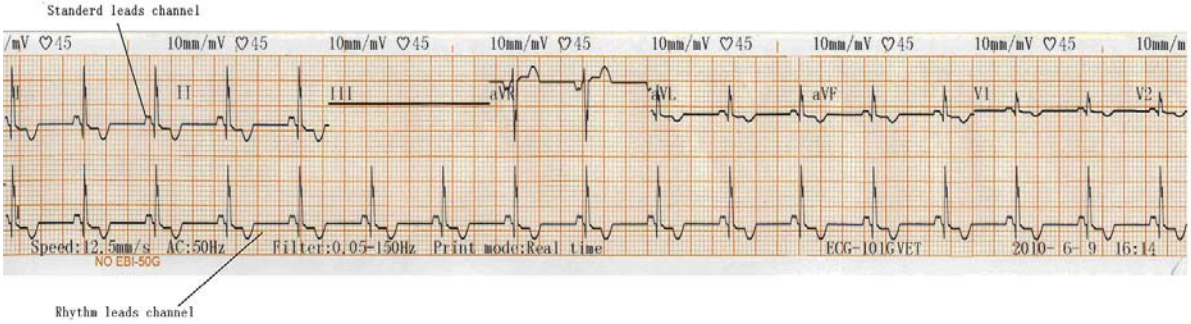


2）Auto 2 mode: (parameters setting: DC power supply, rhythm lead is II, prompting sound closed, recording speed is 25mm/s, filter H50 d 75Hz)

a. Sample of the information displayed in the monitor

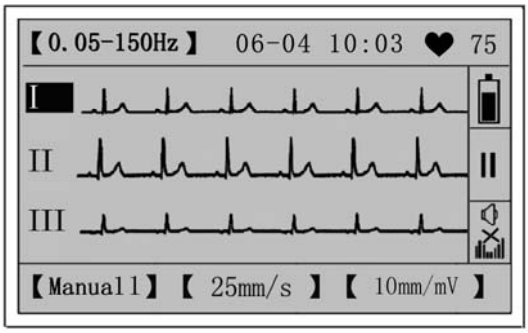


b. Sample of the information recorded by the recorder

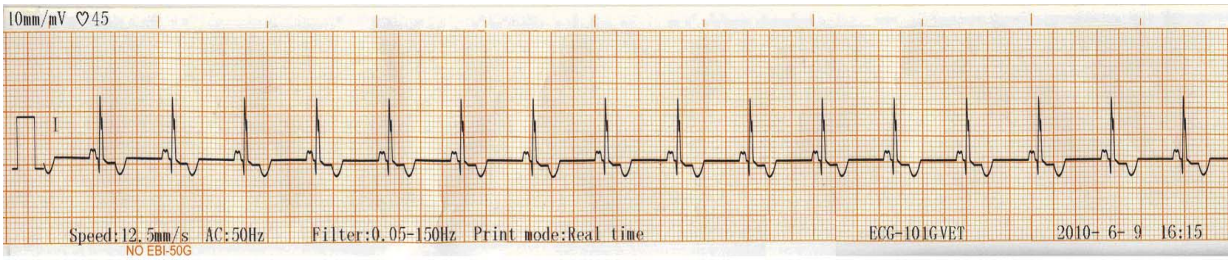


3）Manual 1 mode: (parameters setting: DC power supply, current rhythm lead selection is I, prompting sound closed, recording speed is 25mm/s, sensitivity is 10mm/mV, filter H50 d 75Hz, lead not yet been changed manually)

a. Sample of the information displayed in the monitor

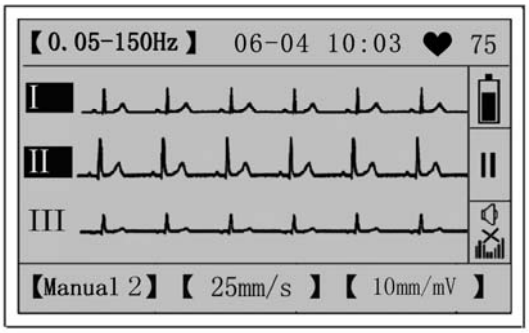


b. Sample of the information recorded by the recorder

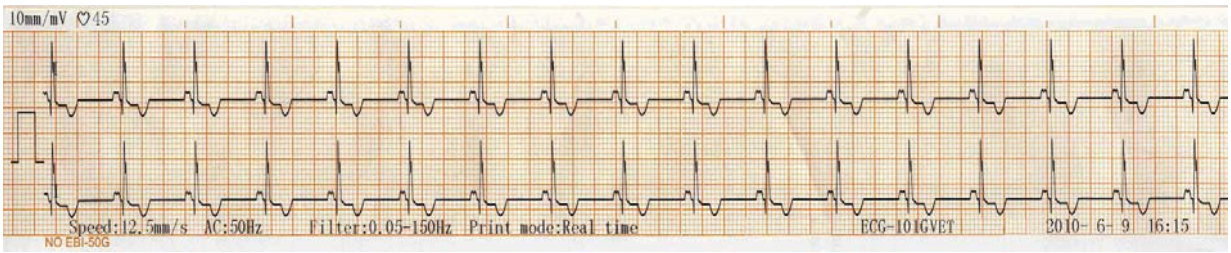


4）Manual 2 mode: (parameters setting: DC power supply, current rhythm lead selection is I, rhythm lead is II, prompting sound closed, recording speed is 25mm/s, sensitivity is 10mm/mV, filter H50 d 75Hz, lead not yet been changed manually)

a. Sample of the information displayed in the monitor



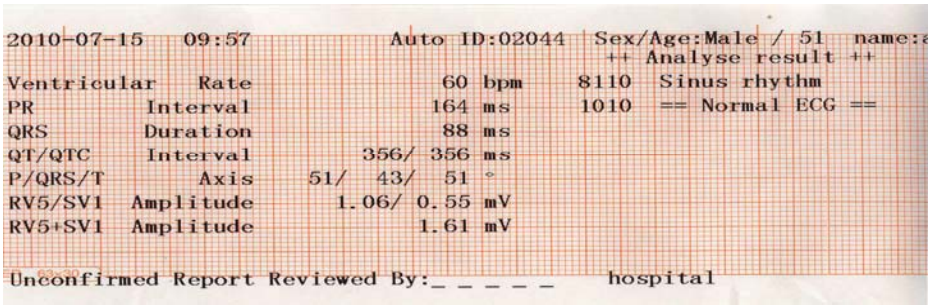
b. Sample of the information recorded by the recorder



4.4 Automatic Analysis Function

The automatic analysis function of the product can only be realized when the “Auto Mode” is selected and the signal acquisition of all the leads is finished. When the signals of the product are acquired in any Auto Mode and the waveforms of 12 leads are printed, and if the automatic analysis option in the parameter setting is activated, the signal will be analysed and processed, at the same time,the analysis result will be printed.

The recorder will print out the analysis information as shown in the following figure:

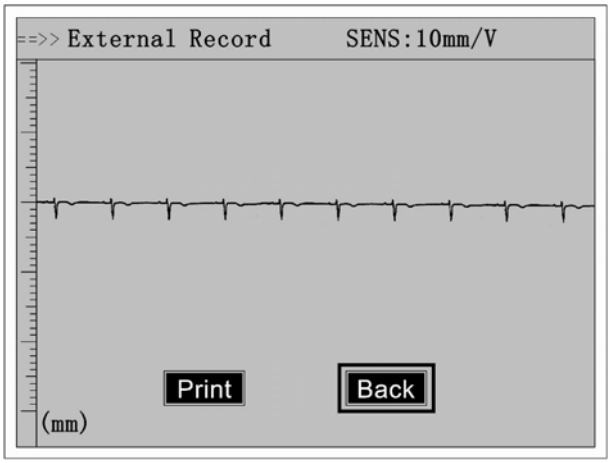


Notice:

- **The recognition of P wave and Q wave may by unreliable when the muscle electricity or power supply AC interference is too high, thus the recognition of baseline drift, ST section and T wave may be unreliable too.**
- **The end points of S wave and T wave are curved and not clear, which sometimes may cause measurement error.**
- **When R wave is omitted in case of QRS low voltage, the deviation of the measurement of heart beat may be relatively high.**
- **In case of QRS low voltage, the calculation of cardiac electric axis and the recognition of the cut off point of QRS wave may not be unreliable sometimes.**
- **When ventricular extra systole occurs frequently (continuously), it may be detected as heart beat sometimes.When many kinds of arrhythmia are combined, the recognition of P wave is difficult and the relevant parameters may not be reliable.**

4.5 External Input Recording

Connect the external signal conforming the specifications in the appendix to the external signal input interface (⊕) at the side of the product, and turn on of option of “External Input” in the system setting menu, and then the product will enter the external input mode, with the interface display as shown in the following figure:

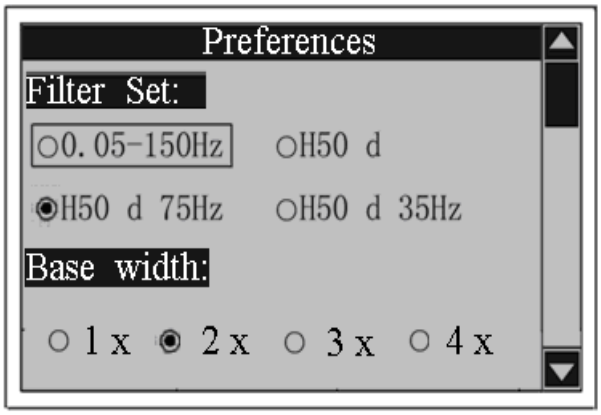


At this time, press “LEAD◄/►” button to select “Print” to record the external input signal, and select “Back” to return to the system setting menu.

Chapter 5. Menu Setting

5.1 Enter and Exit the First Level Menu

When the product is in the standby status, press the “Menu” button on the control panel to enter the first level menu user setting interface as shown in the figure below. Press the “Menu” button again button to exit menu.



5.2 Setting Menu Options

On the interface of the first level user setting menu, Press the button “▲”and/or “▼” to select menu item, and press the button "◄" or "►" to change the parameters of the item, and press the button ”OK” to confirm, then press the button “Menu” to come back the standby status.

1) The menu items list

Item	Setting Value	Defaulting Value	Comment
Filter Set	0.05-150Hz, H50 d, H50 d 75Hz, H50 d 35Hz	H50 d 75Hz	Setting filter status
Baseline width	1 X, 2 X,3 X, 4 X	2 X	Selecting the baseline width
Ext. Record	ON/OFF	OFF	Turn on or off record of externally inputted signal
LCD contrast	1～16	7	Adjust the contrast of LCD
Language set	Chinese, English, Russian	English	Selecting the language for display and print
AC frequency	50Hz / 60Hz	50Hz	Setting the AC frequency

Item	Setting Value	Defaulting Value	Comment
Printer test	Start	Start	Press Confirmation Button to print the testing triangular waveform
Restore set	Activate	Activate	Press Confirmation Button to reset to factory status
Rhythm lead	Ⅰ～ V6	Ⅱ	Selecting the rhythm lead
Record length	3～12 sec	3 sec	Selecting the record duration of lead
Power off	0～60Min	20Min	Setting the time of automatic shutdown
Auto ID	instrument is each serial number that the electrocardiogram assigns	00000-99999	----
Data Storage and Management	Press“◄/►”Key, canning choose the saving data ID gets into a data management submenu already, again according to” confirm key"	ID（XXXXX）	----
Lead(V)	ON,OFF	oFF	Setting the lead(V) ON or OFF
Display mode	1，3	3	Selecting the display mmode

2) Filter Setting

Explanation of various parameter setting items of the filter

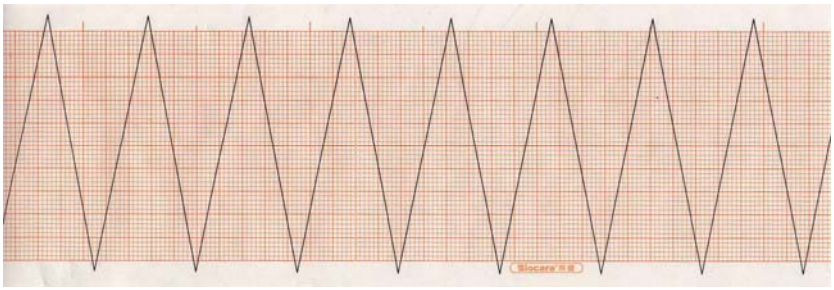
Status item or control item	Value of setting	Explanation
Filter setting	0.05-150Hz	All the filters are closed
	H50 d or H60 d	Only the AC filter and drift restraint filter are turned on
	H50 d 75Hz H60 d 75Hz	All the filters are turned on, and the frequency of muscle electricity filter is 0.5-75Hz.
	H50 d 35Hz H60 d 35Hz	All the filters are turned on, and the frequency of muscle electricity filter is 0.5-35Hz.

Note:

When the AC frequency of 50Hz is selected, the content displayed would be: H50 d, H50 d 35Hz and H50 d 75Hz; and when the AC frequency of 60Hz is selected, the content displayed would be: H60 d, H60 d 35Hz and H60 d 75Hz.

3) Printer Testing

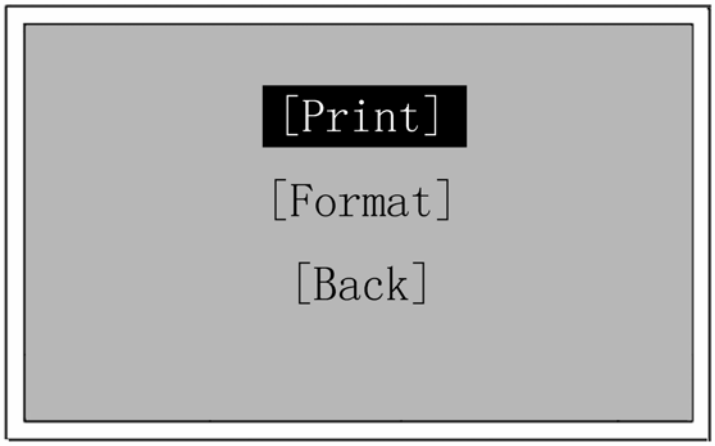
Press "▲" and/or "▼"button to select "Printer Testing" option, and press "OK" button after the recording paper is installed to initiate printer testing. The printer will print out a triangle wave, and the status of the printing head can be tested by observing whether there is any break, curve or fluctuation on the triangle wave.



5.3 Data Storage and Management

The data storage function of the product can be upgraded. With standard configuration, the product can store 8 sets of ECG data, and when you have purchased the data storage expansion functional module, the capacity of storage can be upgraded to over 10,000 copies.

Press Menu Button to enter into the menu, and use the "▲" or "▼" button to select the "Data manage" item, then use the "◄" or "►" button to select ID of the saved data. Then press Confirmation Button to enter into the sub-menu of data manage, as follow:



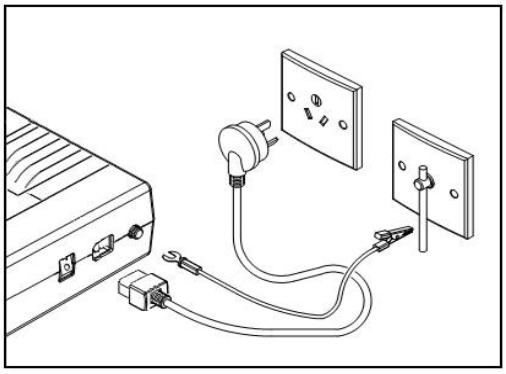
Relevant operation options are explained as follows:

Menu Options	Function Description	Remark
Print	Select this item and press Confirmation Button to rerecord data of ID selected by previous menu.	
Format	Select this item and press .Confirmation Button to format the flash memory, all saved data will be clean	Be careful to use this function! Execute this function will clear all saved data, and it can not be resumed.
Back	Select this item and press .Confirmation Button to return to the previous menu.	

Chapter 6. Operation Guidance

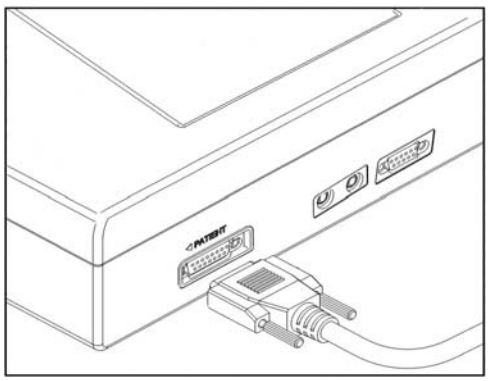
6.1 Connect the Product to AC Power Supply

When the product uses AC power supply to work, firstly turn the AC power supply switch at the back of the product to "○"position, and connect the opening end of the grounding wire to the grounding post of the product, and then connect the other end of the grounding wire with crocodile clips to the dedicated grounding point in the working environment. This kind of grounding connection must be reliable, otherwise just use the AC power supply to charge the battery of the product, and not directly use the AC power supply to run the product on patients. When the grounding line is properly connected, insert one end of the power cord provided along with the product to the AC input terminal of the product, and the other end (plug) to the network power supply socket, as shown in the figure below.



6.2 Connect the Product to the Lead

The connecting position on the product to the lead is shown in the figure below. When the plug of the lead is fully inserted into the lead socket of the product, turn the two fastening bolts on the lead plug to lock the lead onto the product and prevent loosing.

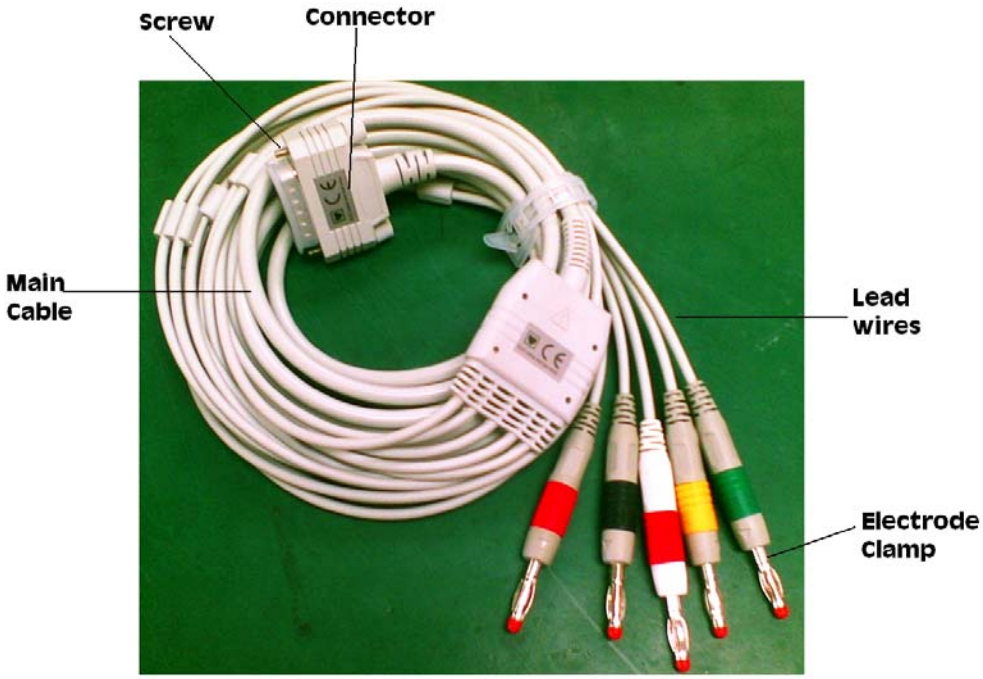


Note:

Please use the lead provided along with the product, otherwise the working efficiency of the product may be degraded and the product may be damaged.

6.3 Animal cable connection

Animal cable includes two parts, main cable and lead wires with associated electrode connectors. The electrode connectors can be distinguished from the color and identifier on them.



The identifier and color code of electrodes used comply with IEC requirements. In order to avoid incorrect connections, the electrode identifier and color code are specified in as follow table. The equivalent code of American standard is given too.

	International Standard		American Standard	
Electrode	Identifier	Color Code	Identifier	Color Code
Front Right Leg	R	Red	RA	White
Front Left Leg	L	Yellow	LA	Black
Back Right Leg	N	Black	RL	Green
Back left Leg	F	Green	LL	Red

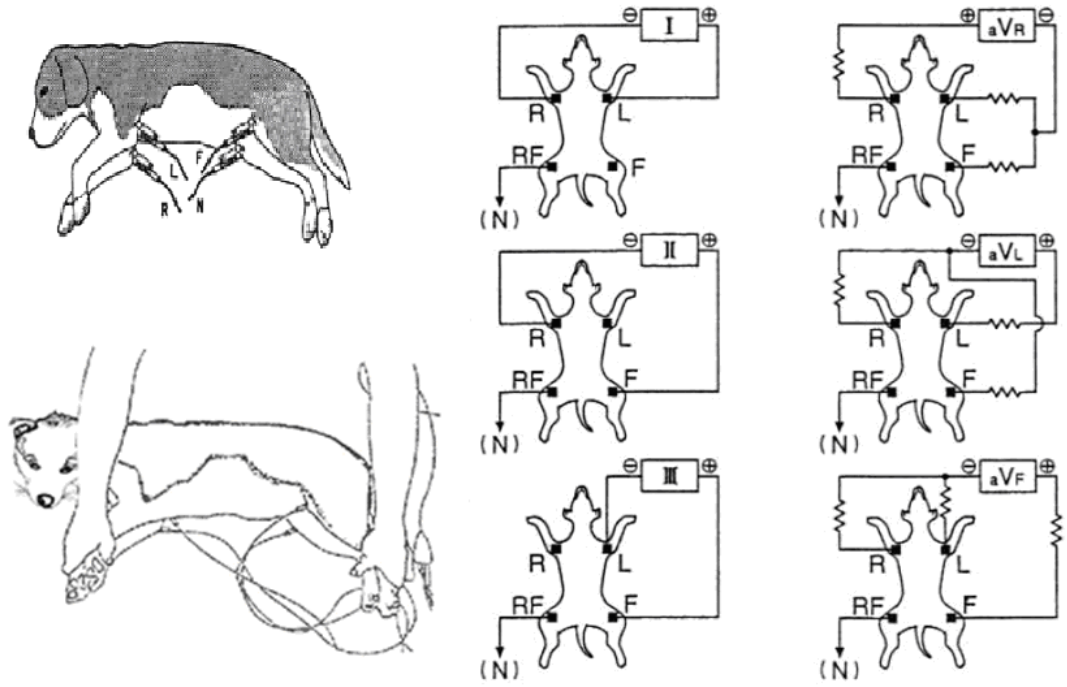
6.4 Connection between Electrode and Animal Body

Veterinary electrode adapter is required for ECG-1103 VET, the end with clip is for connection to the animal, and the end with connector is for connection to Animal cable, illustrated as below .The contacting resistance between the animal and the electrode will affect the quality of ECG waveform greatly. In order to get a high-quality ECG waveform, the skin/electrode resistance must be minimized while connecting electrodes.

1) Only use the attached electrode or the one-off electrode in good quality;
2) Do not mix the attached electrode and the one-off electrode;
3) Do not use the oxidized electrode;
4) Do not mix the new and old electrode;
5) Use medicinal alcohol to clean the contact part of the animal body and electrode, in order to reduce the contact resistance;
6) Do not stick any spacer to the contact part of the electrode and animal body;
7) Prevent a short circuit between electrodes in signal acquisition (the chest electrode is likely to be touched);
8) Make sure the electrode is reliably connected to the lead.

6.4.1 Connection between Limb Electrode and Aniaml Body

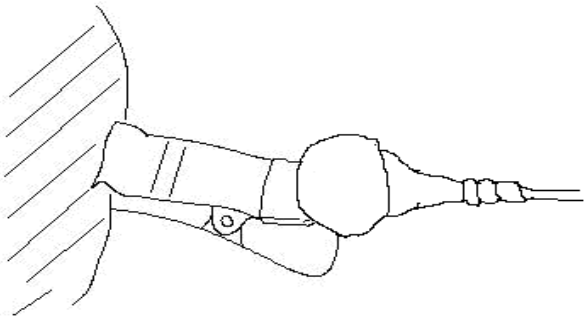
Install each electrode to the position (wrist, ankle) on the corresponding limb specified in the table below:



A B

6.4.2 Connection of electrode

Connect the electrode to front right leg(R/Red), front left leg(L/yellow), back left leg(F/green) and back right leg(N/black), illustrated as below



Note：

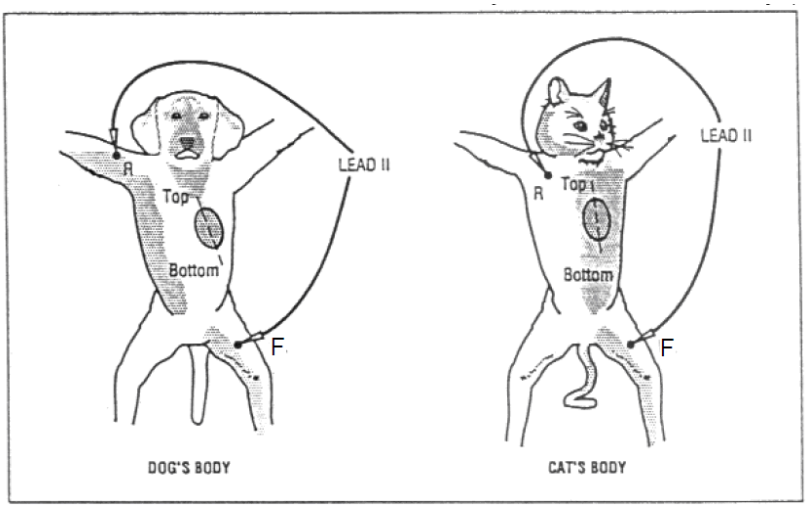
Please apply some alcohol to the clip skin for optimal connection.

PROBLEM SOLVING WITH CATS

Unlike humans and most dogs, the cardiac axis is not aligned top right to bottom left in cats. The heart has a tendency to lie more centrally with its apex more ventral than the atria, i.e., the heart points downward towards the ground when the animal stands.

This gives rise to one of the common problems with monitoring cats, finding the strongest signal to present to the R and F electrodes.

The best signal is derived top/bottom axis i.e. Lead II in humans, with R looking at the top of the heart and F at the bottom. In cats, as stated, the axis may not lie across the body.



As lead II may not align with the cat's axis, the signal is small and sometimes cancels. Therefore, by moving R more centrally onto the cat's body above the top, and F onto the cat's body below the bottom of the heart, a much larger signal will be obtained.

The plane in which the cat's heart lies within its body may also vary.

The “top” of the heart may be more dorsal and the “bottom” more ventral. In this case, we would refer to the base/apex axis (see figure as below) when the following instructions should be followed.

1. Move F to the left apex of the heart.

2. Move R to the V10 position (over the dorsal spinous process of the seventh thoracic vertebra) and F to the V4 position (sixth left intercostal space at the costochondrail junction). It will be necessary to annotate the printouts, if any, with actual configurations used to avoid later confusion.

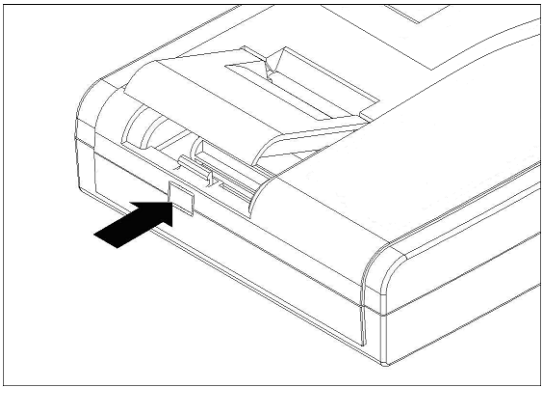
⚠ **WARNING:**

The ECG is provided for the use of qualified physicians or personnel professionally trained. The operator is supposed to be familiar with the contents of this Operation Manual before use.

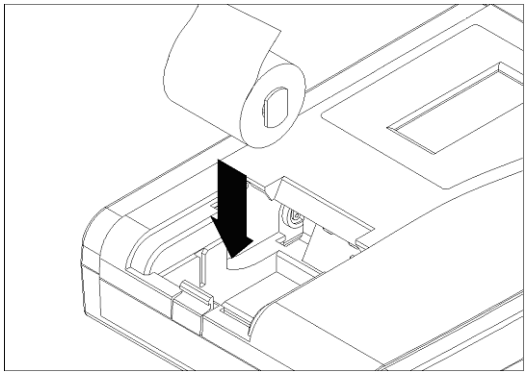
6.5 Installation of Recording Paper

The product uses thermo-sensitive paper as the recording media. In order to get clearly printed information, it is recommended to use the recording paper provided along with the product or purchase the same type of recording paper from the company. As the thermo-sensitive material is only sprayed on the front face of the recording paper, so the direction of the recording paper must be correct during installation, otherwise the printing cannot be realized. The installation sequence of the recording paper of the product is explained below:

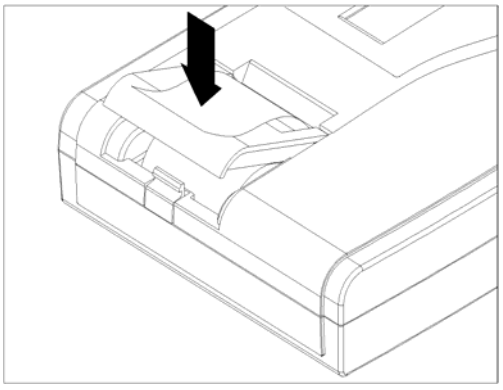
a. Press the button at the position pointed by the arrow in the figure below to make the paper cartridge cover jump up and then remove the paper cartridge cover;



b. Install the paper reel into the paper barrel in the direction indicated in the figure below, and put the paper barrel with recording paper into the paper cartridge and pull out a section of recording paper by 6cm in length. Please be aware that the end of the paper reel with a positioning pin must be installed into the corresponding clamping position in the paper cartridge.



c. Align the gear on the paper cartridge cover to the gear position on the paper cartridge, and press the end of the paper cartridge cover to lock it.



Note:

The product has a paper out warning function. When the printing paper in the paper cartridge has been used up, the display interface of the product will appear warning information (please refer to the chapter of "Warnings of the Product"). If the recording paper has not been properly installed, the product would not find the recording paper, and the paper out warning would not appear, then the installation of recording paper should be checked.

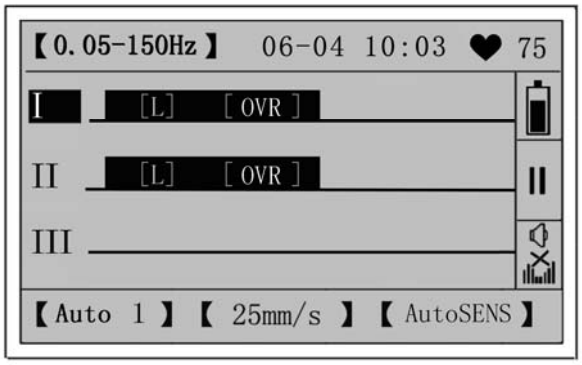
6.6 Warnings of the Product

To help users use the product properly, the product has a series of built-in warning functions to prompt the operator, which are realized in sound and light. The functions are introduced as follows.

6.6.1 Alarm for Path Overflow

If the amplitude of the input signal is out of the range of this product and causes saturation of amplifying circuit, this equipment will show overflow alarm indication (as shown in the

following image). Two cases frequently occur. One is when the lead line is just connected; the other is when the patient's body moves in the process of graph forming.



Users can process this alarm for overflow through pressing lead disconnect key (press repeatedly if necessary), and carry out other procession until the signals are stable.

6.6.2 Lead off Warning

The built-in error correction system always checks the connection status of leads. If unreliable connection of a lead is detected, the position code of the lead that falls off will be displayed in the monitor of the product to prompt the operator to correct it. The content displayed on the screen is as shown in the figure below:

When a lead falls off, the waveform of this lead will not be displayed, and "Record/Stop Control Button" will not be effective on this lead. In that event, check the electrode or lead that falls off and reconnect it.

6.6.3 When the polarizing voltage exceeds the limit value of the equipment, the warning sign referred to in Section 6.6.2 will appear to warn the user.

When the polarizing voltage of the animal body exceeds the designed limit value of polarizing voltage, the warning sign same as that in Section 6.6.2 will appear. At this time, press the "Lead Closing Button" on the control panel to conduct closing of channel and eliminate the affect of polarizing voltage on the channel circuit, thus retoring normal working status of the amplification channel.

6.6.4 Paper Off Warning

1）When the product enters standby status, the built-in error correction system will start detecting the recording paper. If it is found out that no recording paper is installed, the “Record” button will be automatically locked and the product cannot conduct recording operations, and the monitor of the product will display the words of “No Recording Paper” to prompt the user;

2）When the recording paper of the product is used up during the recording process, the product would turn to standby status from working status, and display the words of “No Recording Paper” on the monitor to prompt the user.

6.6.5 Low Battery Warning

When the product uses the built-in battery to work, and if the capacity of the built-in battery is consumed to low voltage, the monitor of the product would display the words of “Low Battery, Machine will Automatically Shut off Shortly”, and a prompting sound will be sent, and the machine will automatically shut off after 3 sec.

Chapter 7. Repair and Daily Maintenance

7.1 Matters needing attention about the repair and daily maintenance of the product

a. There is no part inside of the product that requires the user to conduct maintenance, the user's maintenance work normally involves the appearance cleaning of the product and checking of the effectiveness of controlling buttons and integrity of the outer insulating protection of the leads, thus the user should not dismantle the machine without approval;
b. When abnormal conditions of the product appear, mark the part with problem and conduct repair immediately, and do not use products with malfunctions. As there may be high voltage inside of the product that would be harmful to animal, the repair of the product must be conducted by specialists with qualification, no other person shall open the body case of the product to conduct repair. The technical materials such as electrical schematic diagram and parts list that are needed for the repair of the product can only be provided to the repairing personnel with qualification;
c. Repair of product must be conducted according to the original design, and no model alteration is allowed. After repair, the product must go through necessary safety examination and measurements before it can be used;
d. The product and all its accessories must be maintained regularly, with a time interval no longer than half a year.

7.2 Cleaning of Printing Head

The printing head of the product is the thermal dot matrix printing head. As the printing head always rubs the printing paper during long time of working, there may be dusts and paper scraps that contaminate the printing head, so the printing should be cleaned regularly. During cleaning of the printing head, do not contact the printing head with your hand, because the static electricity in animal body may cause permanent damage to the printing head. Furthermore, do not scrape the surface of printing head with hard articles to void damaging the printing head. Under normal usage, it is recommended to clean the printing head once a month according to the following cleaning steps:

a. Cut off the power supply of the product and open the paper cartridge cover of the recorder and take out the printing paper;
b. Use a piece of clean soft cloth dipped with a little alcohol to gently wipe the surface of the printing head until there is no contaminant on its surface;
c. Install the printing paper and close the paper cartridge cover when the printing head is completely dry.

7.3 Cleaning of Silicone Rubber Printing Reel

The silicone rubber printing reel must be kept level, smooth and uncontaminated, otherwise the recording effect of ECG may be affected. To clean the contamination on the silicone rubber printing reel, use a piece of clean soft cotton cloth dipped with a little alcohol to wipe it along with the longitudinal direction. During the wiping process, turn the silicone rubber printing reel along with the moving direction during normal operation until it is wiped clean.

7.4 Storage of Thermal Printing and Recording Paper

The printing paper supported by the product is the highly sensitive thermal printing and recording paper, the thermal-sensitive material sprayed on its surface will be oxidized and lose its effectiveness under the influence of light or heat source after a long time of usage, so please pay attention to the following matters concerning the recording paper:

a. Do not choose recording paper with wax smeared on its surface or with grey or black color, otherwise the information cannot be clearly recorded, and the printing head may be damaged too;
b. High temperature, humidity and exposure to sunlight may cause the recording paper to change color and lose its effectiveness, therefore the recording paper should be stored in dry and shaded places;
c. When the product will not be used for a while, take out the recording paper and separately store it;
d. The recording paper cannot be stored with materials such as PVC plastics, otherwise the color of the recording paper may be changed;
e. The recording paper with ECG information recorded on it may transfer printing to each other when overlapped and stored for a long time;
f. Only use the recording paper that meets the specifications, other recording papers may damage the thermal-sensitive printing head or silicone rubber printing reel.

7.5 Maintenance of Leads and Electrodes

a. Check the integrity of the outer protective layer of the leads regularly, and do not use the lead with breaches or gaps on its surface;
b. Use alcohol or soap water to clean the surface of leads and electrodes;
c. Deposit the leads dispersedly or in circles, do not wrap or bend the leads to small angles or store them with chemicals or sharp articles;
d. Check the connectivity of leads regularly, preferably with a millimeter;
e. The electrode must be kept dry to prevent oxidation on the surface;

7.6 Maintenance of the Machine

a. Use a piece of clean cotton cloth dipped with a little alcohol or soap water to clean the outside of the product, but do not let the liquid penetrate through gaps into the product;
b. Regularly check the functionality of the control panel;
c. Check whether there is any foreign body in the interfaces;
d. Conduct measurement inspection regularly;
e. When the product will not be used for a long time, put the product into the packing case for storage.

7.7 Replacement of Tube Fuse

When the product can work normally with the built-in battery but cannot be turned on with AC power supply, the AC fuse equipment of the product may be damaged and should be replaced according to the following steps:

a. Cut off the AC power supply of the product;
b. Turn the product up side down and insert a screwdriver into the tube fuse seat at the bottom of the product and turn the screwdriver until it is separate from the product;
c. Take out the tube fuse in the tube fuse seat to check whether the fuse is melted down, if so, replace a tube fuse with the same specifications, otherwise check the other tube fuse;
d. Install the new tube fuse into the fuse cap and align it to the position of the original tube fuse seat and use a screwdriver to fasten it clockwise;
e. If the two tube fuses are not damaged after inspection, but the product cannot work with AC power supply, then the internal circuit may have malfunction, and the product should be sent to repairing organization with qualification to be repaired;
f. When a new tube fuse is replaced and it is melted down when connecting power supply, then there may be other potential troubles in the internal circuit of the product, and the product should be sent to repairing organization with qualification to be repaired.

7.8 Maintenance and Replacement of the Built-in Battery

The built-in battery of the product is rechargeable battery which is installed inside of the product. As the service life of rechargeable battery is related to the times of charging and discharging, it is recommended to use AC power supply when the conditions permit to prolong the service life of the rechargeable battery. The electric capacity of the built-in rechargeable battery is displayed on the monitor of the product when using the battery to work, so the user can know whether the battery needs recharge through observing the electric capacity of the battery. When the battery is fully charged but the working time is less than 30 minutes, or the battery cannot be recharged, the built-in battery may have lost its effectiveness and should be replaced. As the body case of the product should be dismantled to replace the built-in battery, the replacement of the built-in battery should be conducted

by professional maintenance personnel, and the user should not replace it on himself/herself in order to avoid electric shock. Meanwhile, the rechargeable battery with the same specifications must be used to replace the built-in battery to prevent accidents from happening. The detailed steps to charge the battery, display the electric capacity and protect the battery are explained as follows:

7.8.1 Recharging the Battery

There are battery charging and protecting circuits designed inside of the product. When the AC power cord is connected, the battery can be charged. When the product is not use for a long time, at least charge and discharge the battery every three months. When charging the battery, turn the product into standby status, and open the power switch at the back the product. During charging process, the charging indicator lamp on the front face of the product will blink, and when the charging is completed the indicator lamp will illuminate constantly.

7.8.2 Capacity Display of the Battery

When using battery to supply electricity, there would be a icon that represents the capacity of the battery in the monitor after the machine is turned on, as shown in the figure below. There are four shapes of the icon which indicate different capacities which are explained below:

 : Battery capacity is full;

 : Battery capacity is sufficient;

 : Battery capacity is not sufficient, needs recharge;

 : Battery capacity is empty, needs immediate recharge;

7.8.3 Matters Needing Attention about the Usage of Battery:

a. Do not contact the positive and negative poles of the battery with conductors, otherwise there may be risk of fire;

b. Do not put the battery close to naked fire, otherwise there may be risk of explosion;

c. Do not dismantle the battery without permission;

d. The wasted battery should not be discarded randomly, instead, relevant laws and regulations should be followed for treatment.

Chapter 8. Common Malfunctions and Eliminating Methods

8.1 Phenomenon of malfunction: waveforms of some leads cannot be detected during waveform recording.

Solution:

There are several reasons for this phenomenon as follows:

1）When the product is connected to the patient, the internal baseline stabilization system needs time to adjust, just wait for a while.

2）When the phenomenon occurs when all the leads are in good status of contact, just press the lead closing button to quickly stabilize the waveforms of the channels.

3）There may be breakage of the leads, check the leads.

4）When the above reasons do not exist and this phenomenon still occurs, there may be malfunction in the signal channel of the product, please contact the after-sales personnel of the company or designated maintenance organization.

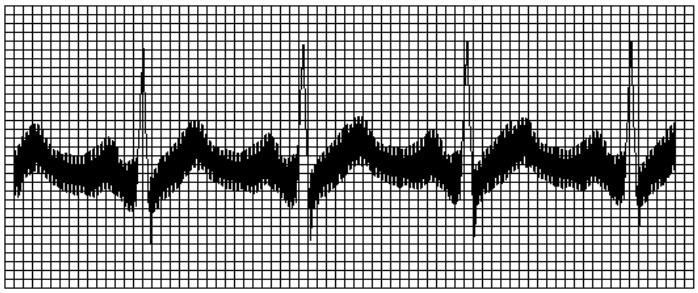
8.2 Phenomenon of malfunction: the waveform information printed has breaking points in the vertical direction

Solution: normally it is because the surface of printing head is contaminated with dusts or dirt, and it can be solved by cleaning the printing head after turning off the machine. If the phenomenon still exist when the printing head is cleaned, then part of the heating units may be damaged and need replacement. Please contact the after-sales personnel of the company or designated maintenance organization to replace the printing head.

8.3 Phenomenon of malfunction: some buttons or all the buttons on the control panel malfunction

Solution: its reason normally is that connecting parts of the control panel and the internal circuits of the product may be loose or the control panel may be damaged. In this event, ask professional maintenance personnel to open the upper cover of the product and reconnect the connection parts of the control panel and internal circuit of the product, or replace the control panel.

8.4 Phenomenon of malfunction: during recording process of the ECG, there are disturbance of certain amplitude and order in the waveform, and there are obvious shakes of the baseline (namely the AC interference) as shown in the figure below:



Possible reason:

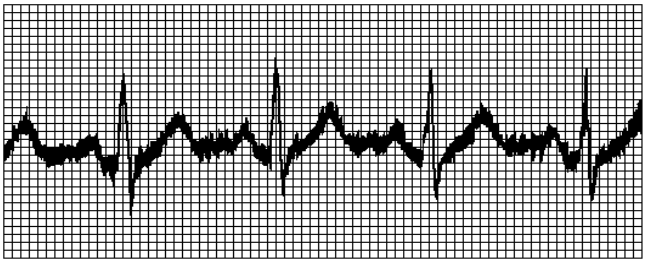
- Equipment is not properly grounded;
- Electrode or Animal cable is correctly connected;
- There is not enough cream applied;
- Animal bed is not properly grounded;
- Animal touches metal part of the animal bed;
- Somebody is touching the animal;
- There is a powerful equipment operating nearby;
- AC power frequency

Solution:

- Ground the equipment properly;
- Connect the electrode and Animal cable correctly;
- Apply enough cream;
- Ground the animal bed properly;
- Let the animal not touch the metal part of the animal bed;
- Don't touch the animal;
- Wait till the powerful equipment stops;
- Reset AC frequency accordingly to local AC frequency

If interference still exist, please apply EMG filter. The waveform will be weakened a little.

8.5 Phenomenon of malfunction: the baseline shakes abnormally on the ECG waveform (namely the muscle electricity disturbance) as shown in the figure below:



Possible reason

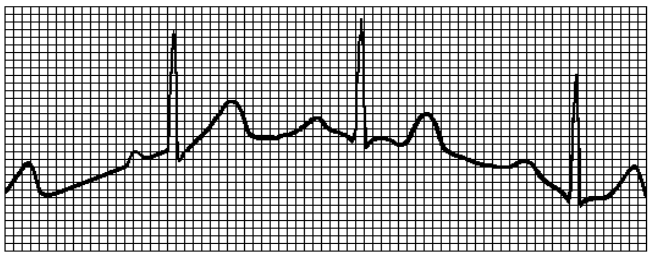
- The room is uncomfortable;
- The animal is nervous;
- The animal is not quiet;
- The electrodes are tightly attached

Solution:

- Move to a comfortable room;
- Let the animal to be relaxed;
- Don't talk with the animal during operating;
- Change the electrode if it is too tight;

If interference still exist, please apply EMG filter. The waveform will be weakened a little.

8.6 Phenomenon of malfunction: the baseline of ECG waveform moves up or down irregularly (namely the baseline is unstable) as shown in the figure below.



Possible reason

- The electrode installed not stably;
- The lead is connected to the elcctrode unreliably;
- The animal's skin contacting the electrode is not clean;
- The animal moving limbs or breathing irregularly in recording;
- Mix the new and old electrode.

Solution:

- Installed the electrode stably;
- Connect the Lead to the elcctrode reliably;
- Clean the animal's skin;
- Let animals still or quiet.
- Use the new electrode.

If the countermeasures based on the above answers fail, please enable the baseline drift filter to suppress the interference here.

Appendix A. Product Technical Specifications

1）Main Machine of the Product

Mode of Leads	Standard 12 leads	
Acquisition Method	12 leads ECG signals synchronized acquisition	
Input Method	Floating input with defibrillation protection and pacing pulse restraint functions	
Classification of Safety	Category I, CF type applied part	
Input Circuit Current	≤0.1μA	
Input Impedance	＞ 50MΩ	
Patient Leakage Current	<10μA	
Time Constant	≥3.2s	
Frequency response	0.05～150Hz	
Minimum Signal to be Detected	≤20μV（10Hz）	
Noise Level	≤15μVp-p	
Standard Sensitivity	10mm/mV	
Calibration Voltage	1mV	
Anti-polarization Voltage	±500mV	
Line Input	Single Input	
	Input Impedance	≥100kΩ
	Input Sensitivity	10mm/V
Line Output	Single Output	
	Output Impedance	≤100Ω
	Output Sensitivity	1V/mV
Filter Restraint	AC: 50 or 60Hz, ≥20dB Muscle Electricity: 35Hzor 75Hz ≥3dB	
Sensitivity	2.5 mm/mV, 5 mm/mV, 10 mm/mV, 20mm/mV	
Recording Speed	6.25mm/s, 12.5mm/s, 25mm/s, 50mm/s	
Recording Mode	Manual Mode……Single channel, two channels (with rhythm channel),	
	Automatic Mode… Single channel, two channels (with rhythm channel),	
Parameters Measured	Heart rat, PR period, QRS time limit, QT/QTC period, P/QRS/T electric axis, RV5/SV1 amplitude	

2) Recorder

Recording Method	Thermal Dot Matrix Word Printing System
Resolution	≥8dots/mm (in vertical direction) ≥16dots/mm（25mm/s）;≥8dots/mm（50mm/s） (in horizontal direction)
Specification of Recording Paper	Paper roll with the width of 50mm.

3） Monitor

Monitor	LCD, white color, with backlight Resolution: 240*128
Content Displayed	Lead waveform
	Working status information

4) Others

Leads	Standard 12 leads
Power Supply	AC: 100～240V，50/60Hz，40VA
	DC: 12V 1800mAh, Ni-MH battery
Specifications of Tube Fuse	2-Φ5×20mm AC time-lag fuse T800mA/250V

Note: Only when selecting the automatic function analysis, this parameter can print.

Appendix B Other Specifications and Environmental Requirements of the Product

B.1 External Dimensions and Weight

Dimensions of the Main Machine	310mm×230mm×70mm
Dimensions of packing	400mm×300mm×200mm
Net Weight	3.0Kg
Gross Weight	4.3Kg

B.2 Environmental Conditions

1	Transportation	
	Ambient Temperature	-20℃～+55℃
	Relative Humidity	25%～95% (No condensation)
	Atmosphere Pressure	500hPa～1060hPa
2	Storage	
	Ambient Temperature	-10℃～+40℃
	Relative Humidity	25%～80%
	Atmosphere Pressure	500hPa～1060hPa
3	Usage	
	Ambient Temperature	+5℃～+40℃
	Relative Humidity	25%～95%
	Atmosphere Pressure	700hPa～1060hPa

Appendix C. Product Packing and Accessories

C.1 Accessories Along with the Machine

The standard configuration of the product normally contains the following accessories and documents in the following table with the quantities indicated below. When there are additional accessories contained in the user's order or contract, they will be listed in the product packing list, and the content of the table below will not be adjusted, so please check and accept the delivery according to the items in the product packing list.

Instrument of ECG-101GVET	1 unit
Patient Cable	1 piece
Electrode	4 pieces
Power Cable	1 piece
Grounding Cable	1 piece
Thermal Recording Paper	1 piece
Operation Manual	1 copy
Qualified Certificate	1 copy
Packing List	1 copy

C.2 Matters Needing Attention

1) When opening the casing, check the integrity of packing case fist, and refuse to accept the product when the appearance of the packing case is damaged. When opening the packing case, please start with the top side of it;
2) After the case is opened, the user should check the accessories and documents according to the product packing list, and contact the business personnel of the company in case of unconformity;
3) Do not electrify the machine to conduct test run when the body case of the product is damage, and contact business personnel of the product immediately for treatment in that case;
4) Do not use accessories other than the originally provided accessories of the product, otherwise the performance and safety of the product may be affected;
5) The packing case must be properly kept for use in case of transportation for maintenance.