

3 CHANNEL ELECTROCARDIOGRAPH

EKG-312T

Electrocardiograph

Power: AC240/100V 50/60Hz
Safety class I. Type B



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Manufacturer's Responsibility

Our company is responsible for safety, reliability and performance of this product only in the condition that:

- All installation operations, expansions, changes, modifications and repairs of this product are conducted by our company's authorized personnel; and
- The relevant electric devices comply with the applicable national and local requirements; and
- This product should be operated under strict observance of this manual; and
- For user's demand, we can provide circuit diagram of EKG312T and the list of main components; and
- Castoff of EKG312T and accessories after service cycle shall be disposed by relevant departments or disposed according to the requirements of protecting environment and local regulations.

Contents

Chapter1 Main Technical Specifications.....	1
Chapter2 Safety Notes	3
Chapter3 Warranty Regulation.....	5
Chapter4 Product Main Characteristics	7
Chapter5 Panel Sketch Map.....	8
Chapter6 Notes Before Operation.....	11
Chapter7 Preparations Before Operation	12
Chapter8 Notes During Operation	13
Chapter9 Usage of Recording Paper.....	14
Chapter10 Electrode Placemnt.....	15
Chapter11 Grounding and Power Connection of Device.....	17
Chapter12 Battery Operation Notes.....	18
Chapter13 Control Panels and Key Instructions	19
Chapter14 Troubleshooting.....	32
Chapter15 Maintenance	34

Chapter1 Main Technical Specifications

1.1 Environment conditions

Operation

- a) Environment temperature: $+5^{\circ}\text{C}\sim+35^{\circ}\text{C}$
- b) Relative humidity: $\leq 80\%$
- c) Power supply: AC: $100\sim 240\text{V}, 50/60\text{Hz}$
DC: $7.4\text{V}, 3700\text{mAh}$ rechargeable lithium battery
- d) Atmospheric pressure: $86\text{kPa}\sim 106\text{kPa}$

Transportation and Storage

- a) Environment temperature: $-10^{\circ}\text{C}\sim 55^{\circ}\text{C}$
- b) Relative humidity: $\leq 95\%$
- c) Atmospheric pressure: $50\text{kPa}\sim 106\text{kPa}$

1.2 Input way: Floating and defibrillation protection

1.3 Lead: Standard 12 leads

1.4 Patient leak current: $<10\mu\text{A}$

1.5 Input impedance: $\geq 5\text{M}\Omega$

1.6 Frequency response: $1\text{Hz}\sim 75\text{Hz}_{-3.0\text{dB}}^{+0.4\text{dB}}$

1.7 Time constant: Time constant $>3.2\text{s}$

1.8 CMRR: $>60\text{dB}$

1.9 EMG interference filter: $25/35\text{Hz}(-3\text{dB})$

1.10 Recording way: Thermal array printing system

1.11 Specification of recording paper: $80\text{mm}(\text{W})\times 20\text{m}(\text{L})$ high-speed thermal paper

1.12 Paper speed:

Auto record: $25\text{mm/s}, 50\text{mm/s}$, error: $\pm 5\%$

Rhythm record: $25\text{mm/s}, 50\text{mm/s}$, error: $\pm 5\%$

Manual record: $5\text{mm/s}, 6.25\text{mm/s}, 10\text{mm/s}, 12.5\text{mm/s}, 25\text{mm/s}, 50\text{mm/s}$, error: $\pm 5\%$.

1.13 Sensitivity selections: $2.5, 5, 10, 20, 40\text{mm/mV}$, 5 options, error: $\pm 5\%$. Standard sensitivity is $10\text{mm/mV}\pm 0.2\text{mm/mV}$.

1.14 Auto record: Record setup according to record format and auto mode, automatically changing leads, measuring and analysing.

1.15 Manual record: Record setup according to record format, manually changing leads.

1.16 Measurement parameters: HR, P-R interval, P Duration, QRS Duration, T Duration, Q-T interval, Q-Tc, P Axis, QRS Axis, T Axis, $R(V5)$, $S(V1)$, $R(V5)+S(V1)$

1.17 Product safety type: Class I, Type CF defibrillation proof applied part.

1.18 Enduring polarization voltage: $\pm 300\text{mV}$

1.19 Noise level: $\leq 15\mu\text{Vp-p}$

1.20 Fuse specification: 2 pcs $\phi 5 \times 20\text{mm}$ AC time lag; T1.6A/250V(Power supply 220V)

1.21 Dimension: 315mm(L) \times 215mm(W) \times 77mm(H)

1.22 Net Weight: 2.25Kg

Chapter2 Safety Notes

- 2.1 The power supply should be grounded properly before operation.
- 2.2 If there is any question for the integrality of protective grounding cable, EKG312T must be run with built-in power supply.
- 2.3 Please pull out power supply plug before changing the fuse.
- 2.4 This device must be operated by medical staff trained technically and professionally, preserved by special person.
- 2.5 The operator must read this user manual carefully before operation, and operate EKG312T according to operation regulations strictly.
- 2.6 The design of this device has mature consideration of security, but operator should never neglect attention to device state and patient's observation.
- 2.7 Please turn off EKG312T and pull out power supply plug before cleaning and disinfection .
- 2.8 Please don't operate this device in the presence of flammable anaesthesia gas.
- 2.9 If this device is used with cardiac defibrillator or other electric stimulating devices at the same time, please choose Ag/AgCl chloride chest electrodes and ECG lead cables with defibrillation function. To prevent the metal electrode from burning patients' skin, the disposable chest electrode should be used if the defibrillation time is over 5 seconds. It is better not to use this device with other electric stimulating devices at the same time. If it is necessary, there must be professional technician guiding on the scene.
- 2.10 To prevent burning, radio knife contact point should keep away from electrodes and ensure the resistance between radio knife and patient's body as small as possible ,to which you should pay special attention. When necessary, you can use board electrode with larger interface, which can limit the density of high frequency current to acceptable range.
- 2.11 Notes concerning ECG waveform measurement and analysis
 - (1) P wave and Q wave identify are not always reliable with intensive EMG or AC interference. Neither are the ST segment and T wave with baseline drift.
 - (2) Winding and unclear end position of S wave and T wave may cause error in measurement.
 - (3) When R wave is uninspected caused by some leads off or QRS wave low voltage, the heart rate measurement may deviate greatly from the correct.
 - (4) In case of QRS low voltage, ECG axis calculation and border-point identify of QRS wave are not always reliable.
 - (5) Occasionally, frequent ventricular premature complexes may be identified as dominant beat.
 - (6) Merging of versatile arrhythmia may result in unreliable related parameter measurement because of the difficulty in distinguishing P wave in such situation.

- (7) This device is designed with auto analysis function, which only analyses the ECG waveforms it gathers and does not reflect all patient's states. Its analysis results may be not in accordance with doctor's diagnoses. Therefore, the final conclusion concerning each patient is up to the doctor basing on analysis results , patient symptoms, and other examinations together.

2.12 Please refer to local laws and regulations with the dispose of product castoff.

Chapter3 Warranty Regulation

3.1 In normal use, under strict observance of user manual and operation notes, in case of failure, please contact with our customer service department. Our company has the sales record and customer archives for each device. The customer has one year's warranty service from the date of purchasing according to the following conditions. To supply all-around and quick maintenance service for you, please mail the maintenance card to us in time.

3.2 Our company may adopt such ways as guidance, express to company or calling in, etc to carry out warranty promise.

3.3 Even in warranty period, the following repairs are charged in principle:

- 1) Faults or injuries caused by misuse not according to user manual and operation notes.
- 2) Faults or injuries caused by dropping accidentally when moving after purchasing.
- 3) Faults or injuries caused by repair, reconstruction, decomposition, etc not in our company.
- 4) Faults or injuries caused by natural disasters such as fire, flood, earthquake, etc.
- 5) Faults or injuries caused by improper thermal recording paper.

3.4 The warranty period for accessories and frayed parts is half a year. Power cable, recording paper, operation manual and packing material are excluded.

3.5 Our company is not responsible for the faults of other connected devices caused by the faults of this device directly or indirectly.

3.6 The warranty regulations are effective only in Chinese Mainland.

3.7 The warranty will be canceled if we find the protection label has been destroyed.

3.8 For charged maintenance beyond warranty period, our company advises to continue to use "Maintenance contract regulation". Please refer to our customer service department for details.

3.9 Take the following measures to install or store this device

- Select a room with good foundation establishments;
- EKG312T should be positioned on a horizontal workbench, avoid strong vibration and shock when moving;
- The room should be equipped with good power supply system and well grounded or it may damage the patient;
- If there is any question for the integrality of protective grounding cable, EKG312T must be run with internal AC power supply;
- AC frequency and voltage value should be in accordance with the requirements and also with enough current capacity;
- The AC power cable must be 3-line, or it may cause electric danger to patient and operator;

- Avoid contacting water, and using and storing EKG312T in places with higher air pressure, temperature and humidity beyond standard , bad aeration , excessive dust or in the presence of sulfuric acid, salt and alkali gas, or with leakage danger of gas and chemical medicine;
- EKG312T shall keep away from such high-power equipments as high voltage cable, X-ray, ultrasound device or electrotherapeutics machine,etc;
- If this device is used with cardiac defibrillator or other electric stimulating devices at the same time, please choose Ag/AgCl chloride chest electrodes and ECG lead cables with defibrillation function. To prevent the metal electrode from burning patients' skin, the disposable chest electrode should be used if the defibrillation time is over 5 seconds. It is better not to use this device with other electric stimulating devices at the same time. If it is necessary, there must be professional technician guiding on the scene;
- During operation, the doctor should be on the scene and observe the patient carefully, when necessary, turn off the power or unattach the electrodes to ensure patient's safety;
- After operation, return all device function status to initialization and then turn off the power. Unattach the electrodes lightly and avoid pulling the leads forcibly and clean EKG312T and accessories for next use;
- When EKG312T encounters voltage overload or amplifier saturation or lead off, it will prompt not to work;
- EKG312T and its accessories must be maintained and checked at regular interval(At least once half a year);
- Electrocardiograph is measure instrument, and the user should send it to legal measure units for check, and the check period should not be over 1 year.

Chapter4 Product Main Characteristics

4.1 With high resolution thermal array printing system(8 dots/mm), it needs no adjustment, and the record frequency is up to 150Hz.

4.2 Real-time and continuously record clear and exact 3 channel ECG waveforms and remarks. The remarks include lead sign, sensitivity, paper speed and filter state,etc.

4.3 In auto mode, one button operation to complete record, which will improve work efficiency.

4.4 Full touch keyboard and touch screen control make operations more convenient, LCD displays work state and EKG312T status is clear and easily read .

4.5 Safety classification:Class I, Type CF defibrillator proof applied part.

4.6 EKG312T can be powered either by AC or DC, with built-in lithium rechargeable battery.

4.7 This device can record 150 pieces of ECG and print 90 minutes continually in the best DC state.

4.8 This device can store more than 1000 cases, more convenient for data review and statistic for doctors.

4.9 The figure of whole device is elegant and gliding.

4.10 The degree of protection against entry liquids:IPX0, common equipment.




4.11 According to the degree of safety of application in the presence of a flammable anaesthetic mixture with air or oxygen or nitrous oxide: Equipment not suitable for use in the presence of the gas mentioned above.

4.12 EKG312T adopts digital signal processor, through AC, DFT and EMG filters to obtain electrocardiogram of high quality.

4.13 EKG312T has such functions as measuring, analysing and diagnosing conventional ECG parameters automatically to reduce doctor's burden and improve work efficiency.

4.14 According to the mode of operation: Noncontinuous operation.

4.15 Explanation of some symbols in this device:

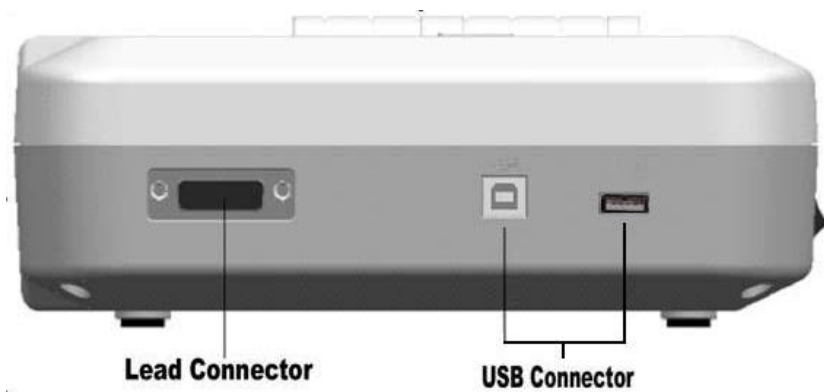
~AC	AC work mode
OFF	Power supply is disconnected
ON	Power supply is connected
	Equipotential grounding post
	The point that you should pay special attention to, please refer to user manual.
	Type CF applied part with defibrillation protection function
PATIENT	Lead connector

Chapter5 Panel Sketch Map

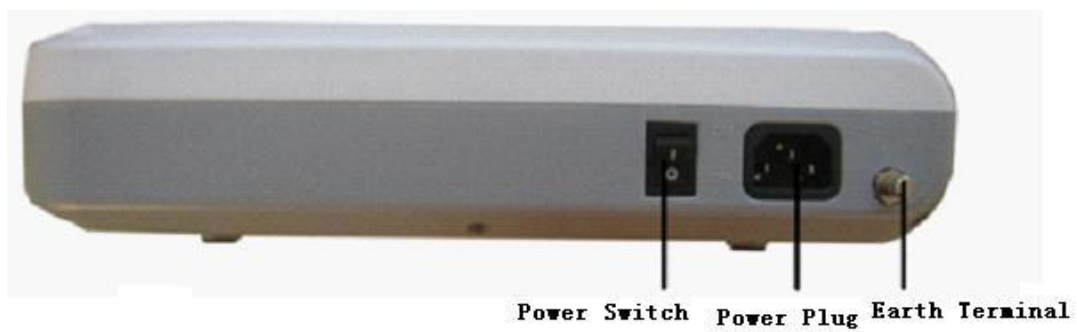
5.1 Each panel view and its components



Front view



Side view
















Rear view



Bottom view

5.2 Key Definition

	Function key: This key turns EKG312T on or off.
	Function key: This key is used to adjust gain.
	Function key: This key is used to adjust paper speed.
	Function key: This key is used to select filter function.
	Function key: Menu key.
	Function key: This key is used to switch printing modes.
	Function key: 1mV calibration.
	Function key: This key is used to print.
	Function key: System menu.
	Direction key: Up
	Direction key: Down
	Direction key: Left
	Direction key: Right

5.3 Indicator light definition



When green, the light indicates EKG312T is powered by AC supply; while red and green, it indicates the battery is charging.



Powering on indicator light.

Chapter6 Notes Before Operation

6.1 To use EKG312T safely and effectively, you should read the user manual carefully before operation.

6.2 Notes for installation and storage:

- 1) EKG312T shall be keep away from high voltage cable, X-ray equipment, ultrasound device or electrotherapeutics machine,etc.
- 2) Avoid using and storing EKG312T in the places with high air pressure, temperature and humidity beyond standard, bad ventilation, excessive dust or salt-alkali gas and chemical medicine.

6.3 EKG312T should be put on flat place and taken and put lightly when moved. Avoid too strong vibration and shock.

6.4 AC frequency and voltage value should be in accordance with the requirements to ensure enough current capacity.

6.5 Please place EKG312T indoor where it is easy to be grounded. Do not connect the patient and the cables with other conductors including ground or beds which can be conducted well with ground.

6.6 Clean the lead cables with water and soap, and sterilize with ethanol and aldehyde base.

Chapter7 Preparations Before Operation

- 7.1 Ensure EKG312T is grounded and all the cables are connected reliably.
- 7.2 Ensure the electrodes, directly connected with patient, are placed correct and reliable.
- 7.3 If you have selected to purchase UPS, check whether the output voltage is normal or not.
- 7.4 Electric gel coat should be separated and chest electrodes should not connect with each other , so as to avoid short circuit.
- 7.5 AC power cable should not enlace with ECG lead cables.

Chapter8 Notes During Operation

8.1 Pay attention to the patient and device status at any moment.

8.2 Patient and device can only be connected through ECG lead cables.

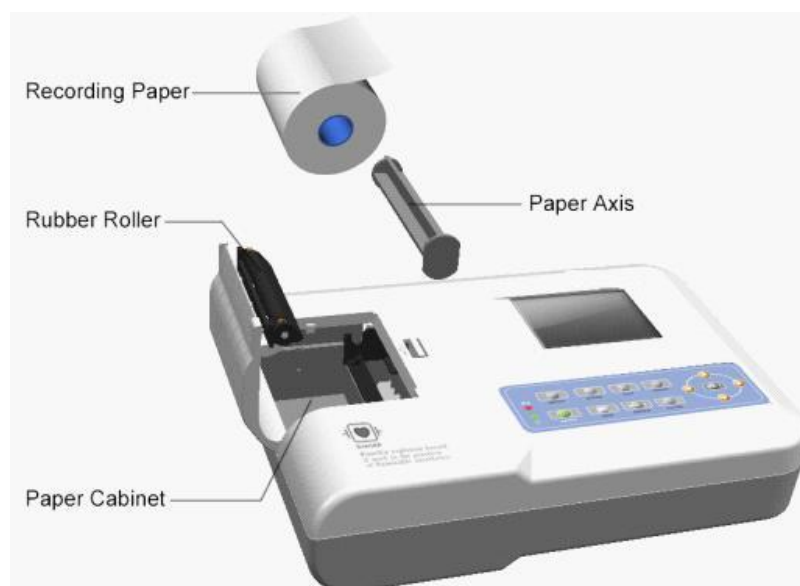
8.3 Keep close observation of the patient and device to make sure they are still during operation.

8.4 Turn off EKG312T after using.

8.5 Disconnect the power, and remove the ECG lead cables gently without strong force.

8.6 Properly keep EKG312T and its accessories for operation next time.

8.7 Recording Paper Loading

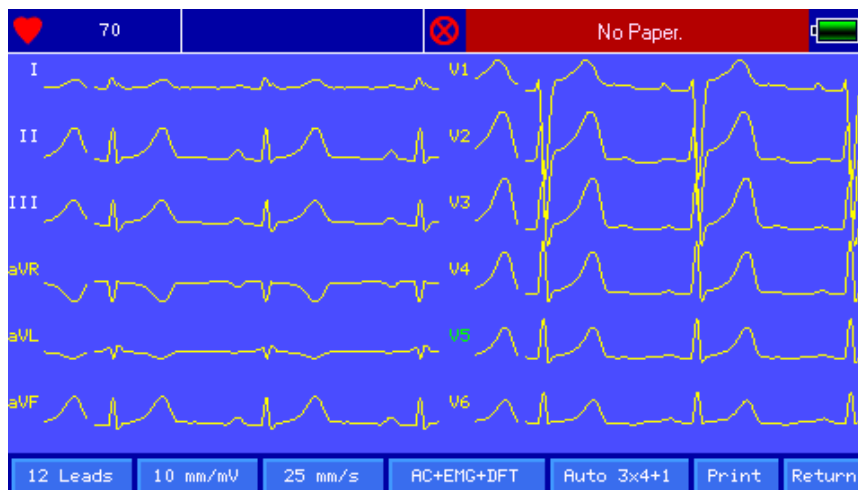


Recording paper loading sketch map

- 1) EKG312T adopts high-speed thermal recording paper with the specification of 80mm(W)×20m(L).
- 2) Open the cover of paper cabinet, take out the paper axis and install it into recording paper then load them at the proper position inside the cabinet as showed in the figure above.
- 3) Close the cover of paper carriage. It's recommended to leave 2cm paper outside.

Chapter9 Usage of Recording Paper

9.1 When recording EKG312T will stop paper trace in case of paper lack, and the LCD screen will display as the figure below to prompt paper lack.



9.2 It is recommended to use the thermal recording paper specified by our company to ensure ECG waveforms of good effect. Bad recording paper will result in unclear ECG waveforms, fading or unsmooth paper trace, etc, even pricking up the device's worn up and shortening the service cycle of such important components as printerhead. Please consult your franchiser or our company for purchasing this recording paper.

9.3 High temperature, humidity or direct sunniness may all be the causes for recording paper failure. The paper, which will not be used for long, shall be stored in place cool, dry and dark.

9.4 Substance may contaminate surface of the recording paper:

Gel, glue, and half-dry diazo compound copy paper including their organic solvent.

9.5 Substance may cause the waveforms to disappear:

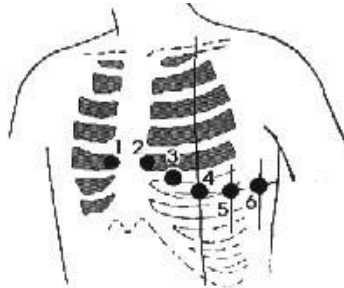
Soft PVC folders, plastic, etc; demagnetization machine and tape containing plasticizer;

some fluorescence ink pen and stamp-pad ink, etc.

Chapter10 Electrode Placement

It is better to attach chest electrodes first, then the limb electrodes.

10.1 Chest Electrode Placement(See the figure below)



Attach the chest electrodes to the locations as following:

- V1: Fourth inter-costal space at right border of sternum.
- V2: Fourth inter-costal space at left border of sternum.
- V3: Midway between V2 and V4.
- V4: Fifth inter-costal space at left mid-clavicular line.
- V5: Left anterior axillary line at the horizontal lever of V4.
- V6: Left mid-axillary line at the horizontal lever of V4.

Clean the skin where chest electrodes are to be attached with alcohol, then apply ECG cream to here around 25mm in diameter and to the edge of chest electrodes, then press and attach the electrodes to the positions from V1-V6.

Note:Keep in mind that the electrodes' coming into contact with each other or cream's overlap from one position to another is not allowed to avoid short circuit.

10.2 Limb Electrode Attachment

Electrodes should be placed on the soft skin of hands and feet. Clean all the limb electrodes and the positions where limb electrodes are to be attached with alcohol before applying ECG cream to them, then firmly attach the electrodes to the positions.



Note: Screw tightly the knob of ECG cable's plug after it is inserted to the ECG connector.

10.3 Check-List for Electrodes and ECG cables

Electrode Location	Electrode Symbol	Plug No.
Right Arm	RA/R	9
Left Arm	LA/L	10
Left Leg	LL/F	11
Right Leg	RL/N	14
Chest 1	VI/C1	12
Chest 2	V2/C2	1
Chest 3	V3/C3	2
Chest 4	V4/C4	3
Chest 5	V5/C5	4
Chest 6	V6/C6	5

Notes:

- You had better ensure to attach the lead cables in power off status.
- If there is no ECG waveforms for long, please confirm whether the electrodes are in good contact with skin or not, then press start button several times, and each time pressing start key will block for several ms.
- When attached, the electrodes must be daubed with electric gel.

Chapter11 Grounding and Power Connection of Device

Make sure power supply is off, plug the 3-line connector in the device, the other end into power receptacle which should be center grounded. It is prohibited to use water pipe or other pipeline as grounding cable. Properly grounded can ensure the safety and reduce the interference of AC and other electromagnetic wave.








Chapter12 Battery Operation Notes

12.1 EKG312T is designed with built-in full-sealed and non-maintained rechargeable lithium battery, also equipped with perfect auto-charging-discharging monitor system. When EKG312T is connected to AC power supply, the battery will be charged automatically. Battery status will be displayed on right edge of LCD screen(see 12.4) in powering on state. It needs about 4 hours to charge the battery full after absolute discharge.

12.2 EKG312T can continuously print for 90 minutes and work 4 hours in standby mode when battery is completely charged. When EKG312T is powered by battery, there will be a battery indicator in LCD screen of the front panel, showing the battery capacity in 5 modes. When the battery capacity is too low for EKG312T to operate, EKG312T will turn off automatically to avoid forever damage to the battery owing to over-discharged.

12.3 The battery should be recharged in time after discharged completely. If not used for long, the battery should be recharged every 3 months, which can extend the service life of the battery.

12.4 Seven power status displayed on LCD are showed in the table below:

No.	Indicator	Description
a		Unknown status, which is usually displayed within 1 minute after EKG312T is turned on.
b		Using AC supply
c		Using battery, full power
d		Using battery, capacity : 3/4
e		Using battery, capacity: 1/2
f		Using battery, capacity : 1/4
g		Using battery, low power, it is recommended to recharge the battery or use AC supply.

Note: When charged, the battery icon shifts from f to c.

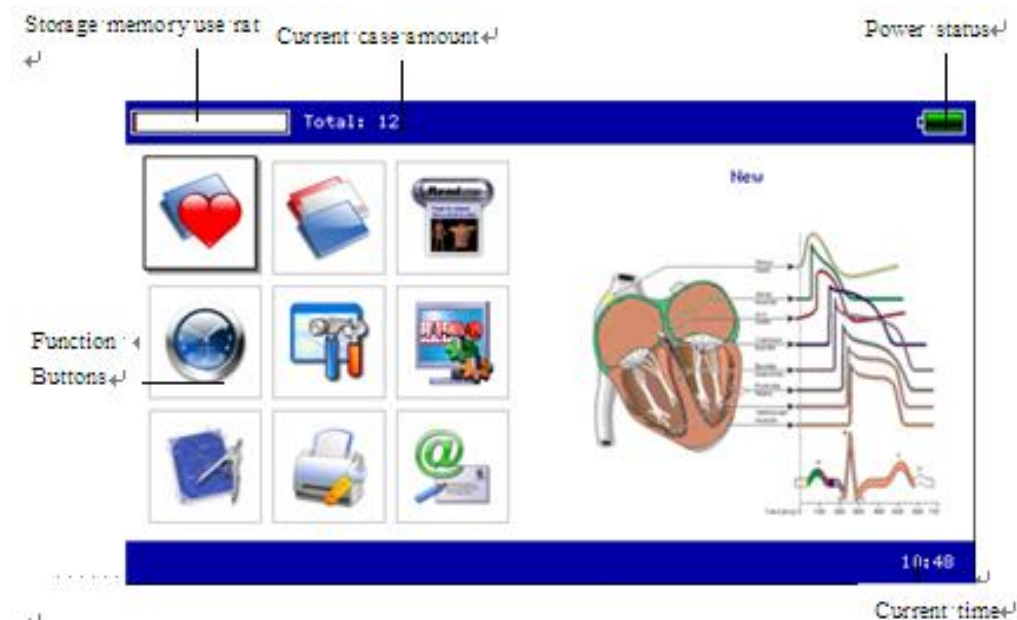
12.5 When the battery can not be recharged or works for no more than 10 minutes after fully charged, please replace the battery.

Attention

- Do not directly connect the battery polars“+” with “-” by wire, otherwise it might cause fire hazard.
- Avoid placing the battery where fire is present, or there will be explosion hazard.
- Please don't disassemble the sealed battery.

Chapter13 Control Panels and Key Instructions

13.1 Main Interface is shown below.



Power status: Please refer to 12.4

Function Buttons:



Click to enter the sampling interface, when powered on, EKG312T will automatically enter this interface.



Click to enter case management interface, where you can query , modify or delete case information



Click to see the sketch map for electrode placement



Date and time settings



System settings



Sampling settings



Analysis parameter settings, here you may set up each parameter used in auto analysis.





Printing settings, including printing mode, style and content.



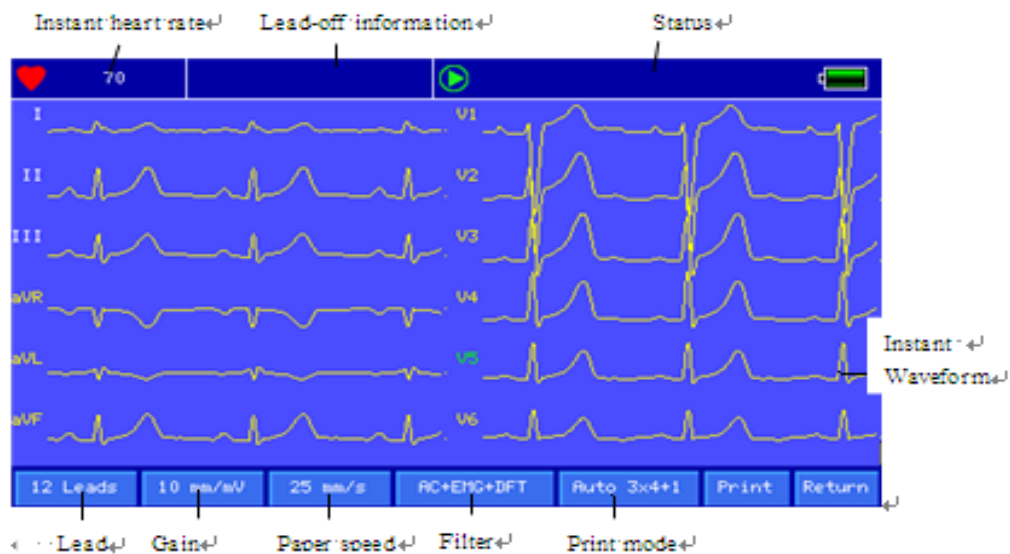
About us, displaying information about our company and software version,etc.


13.2 Sampling Interface



Select  in the main interface or use shortcut key  on the keyboard to enter sampling interface.



Note: Because of the setup about information input time in system settings, it needs to input case information before sampling (refer to 13.3 Case Information Input).

Sampling interface provides several lead display modes, including: 3 leads, 6 leads, and 12 leads, and the following interface displays 12 leads.





Stop sampling: when EKG312T is sampling, you can click the menu button  on the keyboard panel to stop and return to the main interface.


Switch lead: When non 12-lead simultaneous display in one screen, use the buttons  and  on the key panel to switch the lead waveform displayed.

Switch lead display style: With the buttons  and  on the key panel, you can switch the lead among 3-lead, 6-lead, 12-lead.

Lead-off information: In Demo mode, it displays "DEMO ECG", while in sampling mode, it displays lead-off information detected.

Switch print mode: With the button  on the key panel, you can change print mode among manual, auto 4x3, auto 3x4+1, auto 3x4, auto 2x6+1, auto 2x6, auto 3-2+1, auto 3-2, rhythm 4, rhythm 3, rhythm 2.

Adjust gain (Sensitivity): With the gain adjusting button  on the key panel, you can switch among 2.5mm/mV, 5mm/mV, 10mm/mV, 20mm/mV, 40mm/mV.


Adjust paper speed: With the speed adjusting button  on the key panel ,you can adjust paper speed among 5mm/s, 6.25mm/s, 10mm/s, 12.5mm/s, 25mm/s, 50mm/s. In auto and rhythm mode, 5mm/s, 6.25mm/s, 10mm/s, 12.5mm/s are not selectable.

Switch filter: With the filter selection button  on the key panel ,you can switch filter among no filter, .AC, EMG, DFT, AC+EMG, AC+DFT, EMG+DFT, AC+EMG+DFT.

AC: AC Filter


EMG: EMG Filter

DFT: Baseline Filter

Display calibration signal: Press  on the key panel ,1mV signal will occur on the screen once.

Print/Stop Printing: With the printing button  on the key panel, you can begin or stop the printing operation.

Auto Mode: After starting printing, automatically the system prints and stores synchronous 12-lead waveforms, of which the length is according to related setup in printing settings, and also according to this to print analysis data and conclusion, then finish printing automatically.

Manual Mode: After starting printing, the user can print different lead instant waveforms by switching the lead displayed, namely the ECG printed in manual mode is not synchronous and the data will not be saved. You need to stop printing by pressing  again.

During printing process, the printing state and display content mainly include:

Display content	Explanation
Process...	It is printing.
Waiting...	It is finishing printing.
No Paper.	Paper lack, the user should restart printing after loading paper.
Print Timeout.	Communication failure between this system and printing sub-system.
ECG Timeout	Communication failure between this system and sampling sub-system.
Low Power	Low power, it can not start printing

Note: You can not print until ECG waveforms are displayed on the screen.

Here in this interface, press  to quick enter quick setup interface showed below.



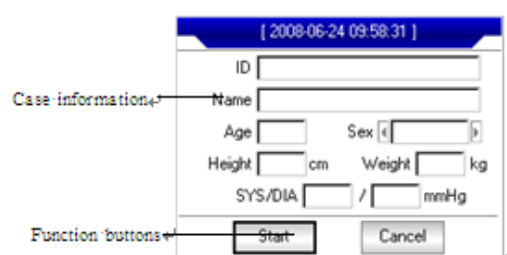
Here, click **【OK】** to apply new setup and return to sampling interface; while click **【Cancel】** not to apply and directly return to sampling interface.

Each item, its options and explanation are shown in the table below.

Item	Options	Explanation
AC Filter	[ON]/[OFF]	Set up whether to use AC Filter or not.
EMG Filter	[ON]/[OFF]	Set up whether to use EMG Filter or not.
DFT Filter	[ON]/[OFF]	Set up whether to use DFT Filter or not.
Rhythm Lead	Any one of 12 leads	Set up rhythm lead to use for printing in rhythm mode.
Show Style	[3 Leads]/[6Leads]/[12Leads]	Set up the ECG display mode in screen.
Show Gain	[2.5mm/mV]/[5mm/mV]/[10mm/mV]/[20mm/mV]/[40mm/mV]	Set up the ECG gain in screen.
Show Speed	[5mm/s]/[6.25mm/s]/[10mm/s]/[12.5mm/s]/[25mm/s]/[50mm/s]	Set up ECG sweep speed in screen, but when printing in auto and rhythm mode , it does not support 5mm/s, 10mm/s, 12.5mm/s.

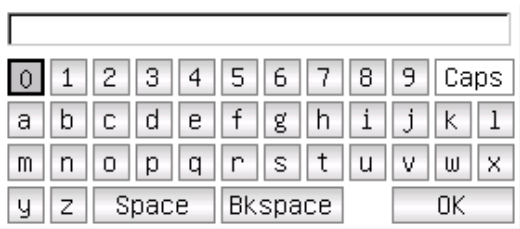
13.3 Case Information Inputting

According to different system settings(Refer to 13.8 System Settings), the operator can input case information before or after sampling or input nothing. The dialog box for inputting case information is shown below.



Choose any item, by pressing **SET** on the key panel, the screen keyboard will pop up as


follows. Here press 【Caps】 button to switch between character/capital letter and number/small letter; press 【Space】 to input a space; press 【Bkspace】 to delete the character input last; press 【OK】 will confirm input and exit this interface.

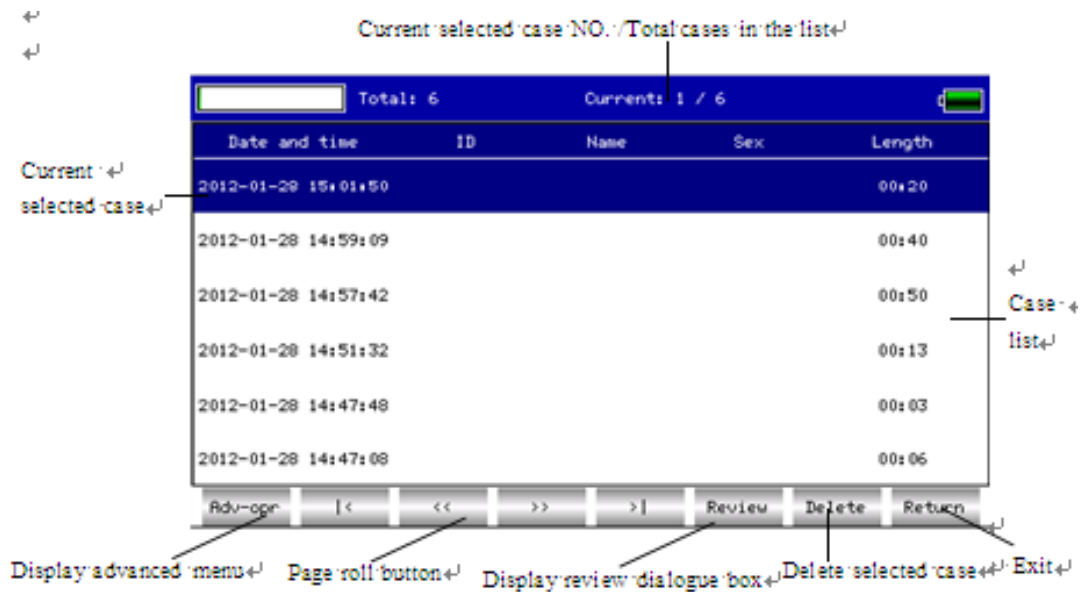


According to the limits of information, the screen keyboard has some character input limits, which will be showed in gray and are unavailable, as shown in the figure below:





13.4 Case Management


Select the button  in main interface to enter the case management interface, as shown below.




This interface displays all cases stored in the device. The user can select the case needed using the querying function(Refer to 13.5Case Querying); using editing function to edit and delete any case information; besides, you can review the case information stored(Refer to 13.6 Case Review).

: Select it , and the case list will turn to the first page .

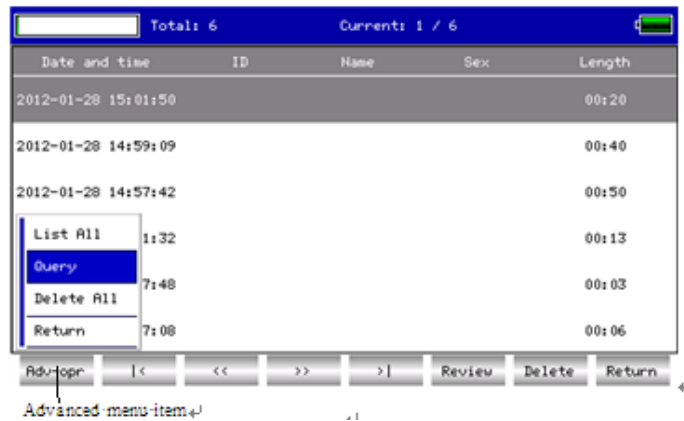
: Select it , and the case list will turn to the last page .

: Select it , and the case list will turn to the former page .

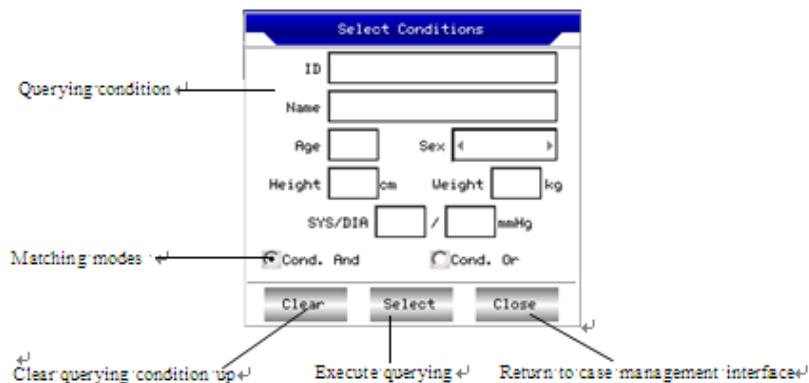
: Select it , and the case list will turn to the later page .

13.5 Case Querying

Select **【Adv-opr】** in case management interface to show the menu below.



Select **【Query】** and the case querying dialogue box shown below will pop up. Input the query condition, click **【Query】**, and the expected results will occur. Click **【Clear】**, and the system will delete all the querying conditions input.

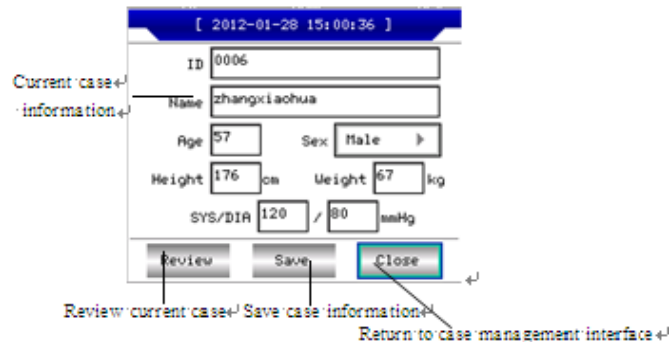


Here, **【Cond.And】** and **【Cond.Or】** are matching modes for querying condition ,and only one can be selected. If you select **【Cond.And】** ,the displayed querying results have to satisfy all the conditions input; while for **【Cond.Or】** , they only need to satisfy any condition input.

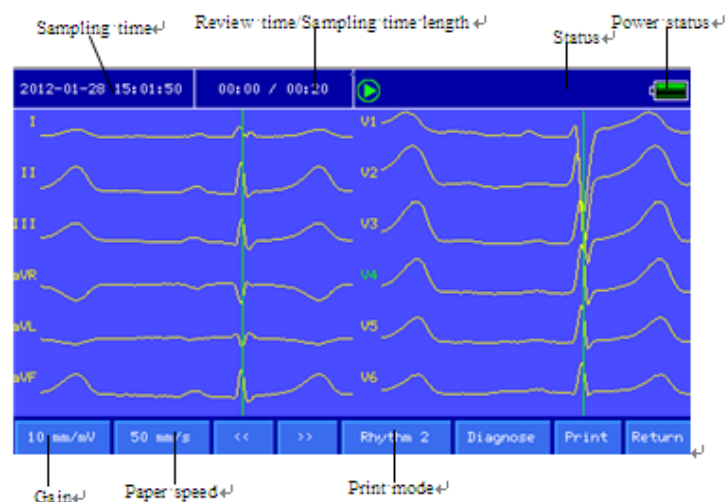
Suggestion: In case of multiply cases, it is better to input all decided querying conditions, select **【Cond.And】 to find the corresponding case quickly.**



13.6 Case review


In case management interface, select the case you want to review, click **【Review】** to pop up the dialogue box shown below ,which displays case information, here you can edit content, click **【Save】** to confirm modification and note it is not reversible.





After ensure the selection, click **【Review】** to enter the review interface shown below, which is similar to the gathering interface.



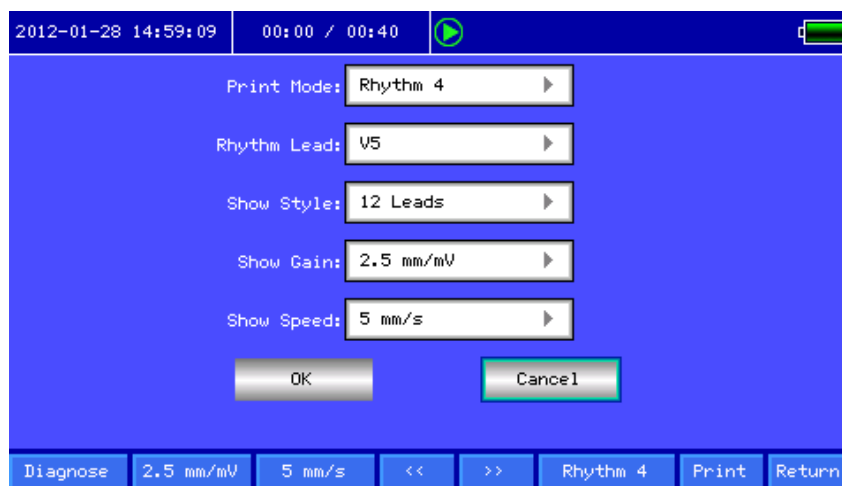
Here in this interface, you can adjust the duration of waveform display with  and . Each time pressing the button, the waveform will roll 1 second to corresponding aspect. You can also change the gain and paper speed.(Refer to 13.2 Sampling Interface)

You can enter or exit from the diagnosis interface by .

You can switch print mode by .

You can print by .

Press **SET** to access to quick setup interface shown below.




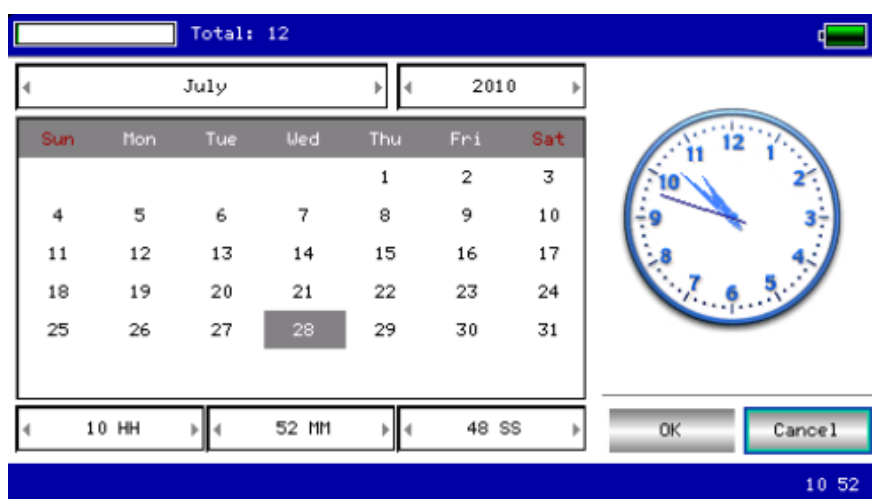
Here, click **【OK】** to apply new setup and return to sampling interface; while click **【Cancel】** not to apply and directly return to sampling interface.

Each item, its options and explanation are shown in the table below.

Item	Options	Explanation
Print mode	[Auto 4×3]/[Auto 3×4]/[Auto 2×6]/[Rhythm 2] or other print modes suited to the case	The system will choose the mode selected as print mode.
Rhythm Lead	Any one of 12 leads	Set up rhythm lead to use for printing in rhythm mode.
Show Style	[3 Leads]/[6Leads]/[12Leads]	Set up the ECG display mode in screen.
Show Gain	[2.5mm/mV]/[5mm/mV]/[10mm/mV]/[20mm/mV]/[40mm/mV]	Set up the ECG gain in screen.
Show Speed	[5mm/s]/[6.25mm/s]/[10mm/s]/[12.5mm/s]/[25mm/s]/[50mm/s]	Set up ECG sweep speed in screen, but when printing in auto and rhythm mode , it does not support 5mm/s, 10mm/s, 12.5mm/s.


13.7 Time and date settings

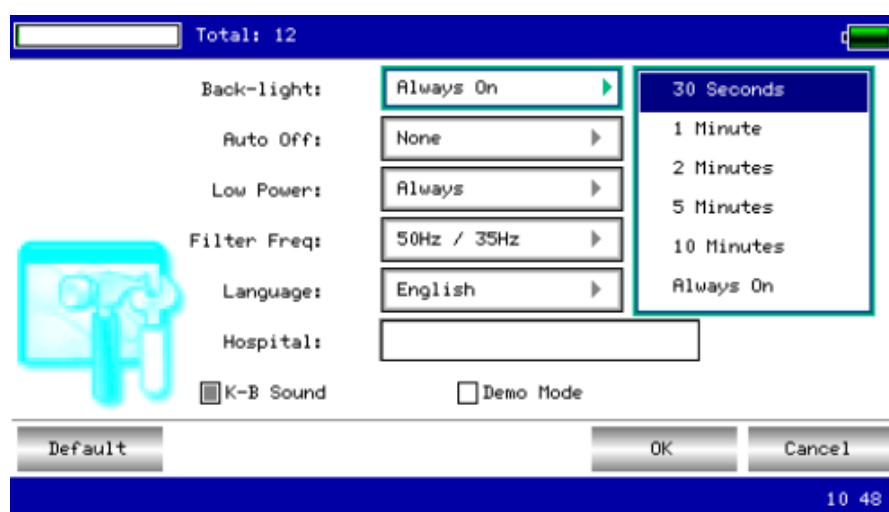
In the main interface, select  button, and date and time setting dialogue box shown below will pop up.



In this interface, you can switch options through  , and use   to edit option content.

13.8 System Settings

In the main interface, select  button, and system settings dialogue box shown below will pop up.




Here, click the button **【Default】** , and the system settings will back to default.

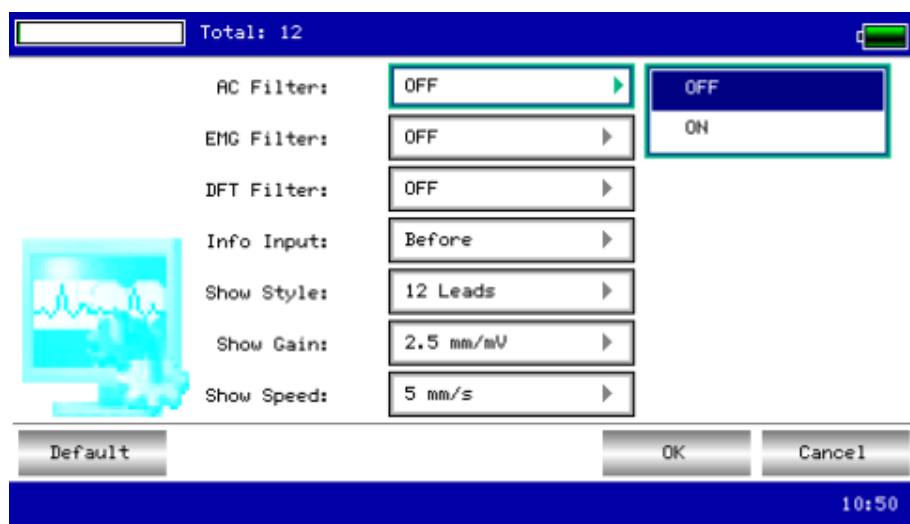
Each item, its options and explanation are shown in the table below.

Item	Options	Explanation
Back-light	30Seconds/1Minute/2Minutes/ 5Minutes/10Minutes/Always On	If there is no operation for the time selected, screen backlight will be turned off. Select "Always On" to keep screen backlight on.
Auto off	[1 minute]/[3 minutes]/[5 minutes]/ [10 minutes]/[15 minutes]/ [30 minutes]/[60 minutes]/[None]	If there is no operation for the time selected, the system will power off automatically. Select "None" and the system will not power off automatically.
Low Power	[Always]/[Only once]/[None]	When in low power, this can decide the alarm method.

Filter Freq	[50Hz/35Hz]/[50Hz/25Hz]/[60Hz/25Hz]/[60Hz/35Hz]	Set up the parameter compoundings of AC Filter and EMG Filter.
Language	[English]/[Chinese]etc	Set up the language displayed.
Hospital	Fill in it yourself.	Fill the hospital name in it.
K-B Sound	On/Off	Select to activate key-press sound, and not select to dumb it.
Demo Mode	On/Off	Select to make the system operate in demo mode, or in sampling mode.

13.9 Sampling Settings

Select  in the main interface, the sampling setting dialogue box will pop up shown below.




Here, select the button **Default** , the sampling settings will go back to the default.

Each item, its options and explanation are shown in the table below.

Item	Options	Explanation
AC Filter	[ON]/[OFF]	Set up whether to use AC Filter or not.
EMG Filter	[ON]/[OFF]	Set up whether to use EMG Filter or not.
DFT Filter	[ON]/[OFF]	Set up whether to use DFT Filter or not.
Info Input	[Before]/[After]/[None]	Set up when to input case information.
Show Style	[3 leads]/[6 leads]/[12 leads]	Set up the ECG display mode in screen.
Show Gain	[2.5mm/mV]/[5mm/mV]/[10mm/mV]/[20mm/mV]/[40mm/mV]	Set up the ECG gain in screen.
Show Speed	[5mm/s]/[6.25mm/s]/[10mm/s]/[12.5mm/s]/[25mm/s]/[50mm/s]	Set up ECG sweep speed in screen, but when printing in auto and rhythm mode , it does not support 5mm/s, 10mm/s, 12.5mm/s.

13.10 Analysis parameter settings

Select  in the main interface, the analysis parameter settings dialogue box will pop up shown

below.


The setup here will affect real-time analysis, case review and diagnosis prompt of print report when it is sampling.

Here, select the button **【Default】** , the sampling settings will go back to the default.

Each item, its options and explanation are shown in the table below.

Item	Explanation
Rhythm Lead	Set up rhythm lead to use for printing in rhythm mode.
Premature(%)	The system will use the input value as a standard of judging premature beat .
Pause Time(ms)	The system will use the input value as a standard of judging beat pause.
Tachycardia(bpm)	The system will use the input value as a standard of judging tachycardia.
Bradycardia(bpm)	The system will use the input value as a standard of judging bradycardia.

13.11 Print Settings

Select the  button in the main interface, the print settings dialogue box will pop up shown below.

Click the button **【Default】** , the print settings will go back to the default.


Each item, its options and explanation are shown in the table below.

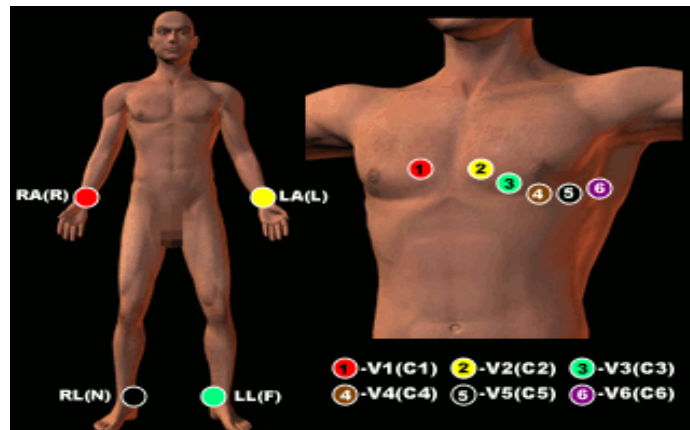
Item	Options	Explanation
Print Mode	[Auto 3×4+1]/[Auto 3×4]/ [Auto 2×6+1]/[Auto 2×6]/ [Auto 4×3]/[Auto 3-2]/ [Auto 3-2+1]/[Rhythm 4]/ [Rhythm 3]/[Rhythm 2]/[Manual]	The selection will be used as the default printing mode.
Lead Gain	Smart/Current	The option selected will be used as print gain mode. "Smart" means the system will adjust gain automatically to fit paper height; "Current" means it will use screen waveform gain as that of printing.
Auto Strip	3Sec/4Sec/5Sec /6Sec/8Sec/10Sec/ 15Sec/20Sec/25Sec	The selection will be used as the time for printing each strip.
Rhythm Strip	10Sec/15Sec/20Sec /25Sec/30Sec	In printing mode, when selecting rhythm 2, rhythm 3, or rhythm 4, the system will use the time selected as the time for printing each row waveform.
Average QRS	[4×3+Mark]/[4×3]/ [3×4+Mark]/[3×4]/ [2×6+Mark]/[2×6]/[None]	In printing mode, when selecting "Rhythm" or "Auto", the system will use the format selected to print average QRS waveform.
Auto-Diag	All/Data/Conclusion/None	Printing diagnosis includes data and conclusion, user can select as his need.
Periodic	[per1Min]/[per 2 Min] /[per3Min]/[per5Min] /[per10Min]/[per20Min] /[per30Min]/ [per 60 Min]/[Off]	When gathering ECG, the system will activate printing according to the duration selected. When printing mode is manual, it will print in "3 x 4+1" mode, or in the mode currently set.

Note: "Auto Strip", "Rhythm Strip", "Average QRS", "Auto-Diag", "Periodic" are only available in auto and rhythm print mode.

13.12 Checking Electrodes Placement




Select the  button in the main interface to view the sketch map of electrodes placement shown below.



Click any key to exit this interface.

13.13 About Us

Select the  button in the main interface, the interface shown below will pop up, which contains information related to this device.

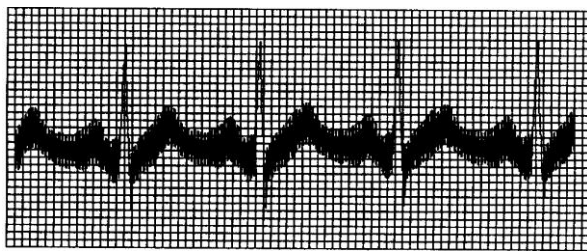
This interface shows EKG312T name, version number, company name, copyright and our contact details.

Chapter14 Troubleshooting

14.1 Powering off automatically

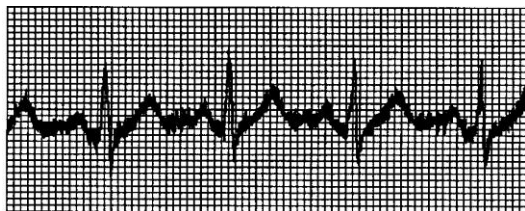
- ① Whether or not the battery capacity is nearly exhausted? Battery overdischarge protection circuit is activated.
- ② Whether or not AC supply voltage is too high? Overvoltage protection circuit is activated.
- ③ Whether or not AC interference is too large or fixed knob in lead cable socket is tightened? Overload protection circuit is activated.

14.2 AC interference



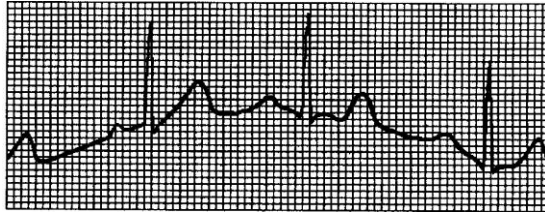
- ① Whether or not EKG312T is grounded reliably?
- ② Whether or not the electrodes or lead cables are connected correctly?
- ③ Whether or not the electrodes and skin are smeared enough electric gel?
- ④ Whether or not the metal bed is grounded reliably?
- ⑤ Whether or not the patient have touched the wall or metal parts of the bed?
- ⑥ Whether or not the patient have touched other people?
- ⑦ Whether or not there is high-power electric equipment working nearby? Such as X-ray machine or ultrasonic device,etc.

14.3 EMG interference



- ① Whether or not the room is comfortable?
- ② Whether or not the patient is nervous?
- ③ Whether or not the bed space is narrow?

14.4 Baseline drift



- ① Whether or not the electrode placement is instable?
- ② Whether or not the electrodes or lead cables are connected reliably?
- ③ Whether or not the electrodes and patient skin are cleaned and smeared enough electric gel?
- ④ Whether or not it is caused by patient's movement and breath?
- ⑤ Whether or not the electrodes or leads are in bad connection?

You can not clear the interference after having taken all the measures above, then use filter.

14.5 Troubleshooting List

Phenomenon	Cause of failure	Remedy
Too large interference, disorderly waveform	1. Grounding cable is not connected reliably. 2. Lead cables are not connected reliably. 3. There is AC interference. 4. Patient is nervous and can not keep quiet.	1. Check lead cables, grounding cable and power. 2. Do patient treatment well.
Baseline burr	1. AC interference is large. 2. Patient nervous, and EMG interference is large.	1. Amend the environment. 2. If the bed is made of steel, replace it. 3. The power cable and lead cables are not parallel or too close to each other.
Not regular waveform, large up-and-down, beeline figure	1. Bad electrode conductivity. 2. Low power. 3. Bad connection between electrodes and patient skin. 4. Loose connection between lead cables and the device's plug. 5. Bad connection between electrodes and lead cables.	1. Use alcohol of high quality. 2. Clean electrode slices and the skin below. 3. Charge the battery.
Baseline draft	1. Low power. 2. Patient movement.	1. Charge the battery. 2. Keep patient still.
Unclear waveform	1. The printerhead surface is dirty. 2. The thermal paper problem.	1. In case of power cut, clean the printerhead with alcohol, do not begin printing until it is dry. 2. Replace the thermal print paper with specified one.

Chapter15 Maintenance

15.1 Do not open the enclosure of EKG312T to avoid possible electric shock. Any maintenance and future upgrades to this device must be carried out by personnel trained and authorized by our company. The repair should be for our company's original components only.

15.2 Please pull out the power plug when it is power cut. When not used for a long period, EKG312T should be placed where it is shady , cool, and dry, powered on every 3 months.

Transportation and storage

- Transportation: Please carry out according to the regulation of contract.
- EKG312T after packed should be stored indoor where temperature is -10°C~+55°C, and relative humidity is less than 95%,without corrosive gas and drafty.