



User Manual

Digital Electrocardiograph

Model: iE 101 & iE 300 for vet

About The User Manual

Thank you for purchasing our product!

In order to enable you to skillfully operate our product as soon as possible, a detailed user manual is attached.


Please make sure to read all the content when installing and using the product for the first time.

To improve the performance and reliability of its parts, the product (including hardware and software) may be changed from time to time, during which, we will try to modify or add contents. Please forgive us as there may still be inconsistency with some descriptions.

We look forward to your corrections in case of any errors and omissions in this manual.

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Explanation of key words

WARNING

Indicate a potentially hazardous situation which, if not avoided, could result in death or serious injury.









CAUTION

Indicate a potentially hazardous situation which, if not avoided, may result in slight personal injury or equipment failure.

EXPLANATION

Other important information besides warning or caution.

Explanation of part symbols

| Symbol | Explanation | Symbol | Explanation |
|---|------------------------------|---|---|
| ~ | Alternating Current |  | Type CF Applied Part |
|  | Direct Current |  | Type CF applied part including defibrillation-Proof |
|  | Battery Charging |  | LAN Port |
|  | Equipotential Terminal |  | USB Port |
|  | Please refer to user manual! | | |

Conventions

| Format | Explanation |
|-------------|--|
| "***" | Used to quote the texts in the screen of the machine. |
| [***] | Used to quote the shortcut buttons or keys in the screen of the machine. |
| <i>TEXT</i> | Used to quote the referenced chapters or sections in this manual. |

Contents

| | |
|---|-----------|
| Foreword | 1 |
| Chapter 1 Introduction | 9 |
| 1.1 Equipment Overview | 10 |
| 1.1.1 Front View | 10 |
| 1.1.2 Left View | 11 |
| 1.1.3 Right View | 11 |
| 1.1.4 Operating Buttons | 12 |
| 1.2 Handle Installation | 13 |
| 1.3 Waveform Display | 14 |
| 1.3.1 Same Screen Display | 14 |
| 1.3.2 Split-screen Display | 15 |
| Chapter 2 Preparation..... | 17 |
| 2.1 Locate the ECG Machine..... | 17 |
| 2.2 Install Recording Paper..... | 17 |
| 2.3 Connect to Power Supply | 18 |
| 2.4 Connect to Animal Cable..... | 19 |
| 2.5 Power On/Off..... | 20 |
| 2.6 Connect to Network..... | 20 |
| 2.7 Apply Electrodes..... | 21 |
| 2.7.1 Electrodes Attachment..... | 22 |
| Chapter 3 Entering Animal Information..... | 23 |
| 3.1 Enter Animal Information..... | 23 |
| 3.2 Introduction of Input Method | 25 |
| 3.2.1 Standard Character Keyboard | 25 |
| 3.2.2 Digital Keyboard | 26 |
| Chapter 4 ECG Recording..... | 27 |
| 4.1 Introduction of Sensitivities, Filters, Print Speed | 28 |
| 4.2 Record ECGs | 29 |

| | |
|--|-----------|
| 4.2.1 Main Steps to Record ECG..... | 30 |
| 4.3 Introduction of Record Mode | 31 |
| 4.3.1 Auto Mode | 32 |
| 4.3.2 Manual Mode..... | 33 |
| 4.3.3 Upload Mode | 33 |
| 4.4 Advanced Mode | 34 |
| 4.4.1 Rhythm Mode | 34 |
| 4.4.2 Analysis Report Mode | 35 |
| 4.4.3 Freeze Mode | 36 |
| Chapter 5 Setting System Parameters | 37 |
| 5.1 ECG Setting | 37 |
| 5.2 Print Setting | 39 |
| 5.3 Display Setting..... | 40 |
| 5.4 Animal Information Setting | 40 |
| 5.5 System Setting | 41 |
| 5.6 Factory Maintain..... | 43 |
| Chapter 6 Data Management..... | 45 |
| 6.1 Open an ECG File..... | 46 |
| 6.2 Edit an ECG File..... | 46 |
| 6.3 Delete ECG Files | 46 |
| 6.4 Copy and Move ECG files..... | 47 |
| Chapter 7 Maintenance..... | 49 |
| 7.1 Main Unit..... | 49 |
| 7.2 Animal Cable | 49 |
| 7.3 Cleaning and Disinfection | 49 |
| 7.4 Recording Paper..... | 50 |
| 7.5 Battery | 50 |
| 7.6 Silicon Rubber Shaft for Printing | 52 |
| 7.7 Thermal Print Head..... | 52 |
| Chapter 8 Troubleshooting..... | 53 |

| | |
|--|-----------|
| 8.1 Lead Fault | 53 |
| 8.2 Printer Failure | 54 |
| 8.3 Indicator of Lead Off | 54 |
| 8.4 AC Interference..... | 55 |
| 8.5 EMG Interference | 55 |
| 8.6 Baseline Wander | 56 |
| 8.7 The ECG Machine cannot be turned on..... | 57 |
| 8.8 Paper Feeding Failure | 57 |
| 8.9 Battery is quickly Charged and Discharged..... | 58 |
| 8.10 File Uploading Failure | 58 |
| Appendix A Package and Accessories | 59 |
| A.1 Packing List | 59 |
| A.2 Dimensions and Weight | 59 |
| Appendix B Technical Specification..... | 61 |
| B.1 Specifications | 61 |
| B.1.1 Main Unit | 61 |
| B.1.2 Recorder Specification | 62 |
| B.1.3 Other Specification..... | 62 |
| B.2 Environment Requirements..... | 63 |
| Appendix C EMC-Guidance and manufacture’s declaration..... | 65 |
| C.1 Guidance and manufacturer’s declaration – electromagnetic emission | 65 |
| C.2 Guidance and manufacture’s declaration-electromagnetic immunity for all EQUIPMENT and SYSTEMS. | 66 |
| C.3 Guidance and manufacture’s declaration-electromagnetic immunity for EQUIPMENT and SYSTEMS those are not LIFE-SUPPORTING..... | 67 |
| C.4 Recommended separation distance between portable and mobile RF communications equipment and the EQUIPMENT or SYSTEM for EQUIPMENT or SYSTEM that are not LIFE-SUPPORTING..... | 69 |

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Foreword

CAUTION

- This ECG machine shall be used by qualified health professionals in the medical units.
 - In sequence to use this ECG machine correctly, safely and effectively, please read through the user manual carefully.
-

★ Safety Information

WARNING

- Avoid using and storing in the places with sulfur, salt, alkaline gas or with risk of gas leakage.
- Avoid using in the places with anesthetic gases, flammable gases such as oxygen, hydrogen or other flammable chemicals, or it may cause explosion or fire.
- Select a room with intact infrastructure (good power supply system and grounding facilities).
- Be cautious when the animal is connected with more than one instrument, because the total leak current may be harmful to the animal. Devices in compliance with the standard of IEC60601-1 are allowed to be connected to this ECG machine, and the equipotential points of all the connected devices should be connected reliability. (The equipotential point and the protection ground of this ECG machine have been connected). Total leak current should be measured by the users to determine that it meets the requirement and can be used after connection.
- All the analog and digital equipment that is connected to this ECG machine in the using environment has to be in compliance with the standard IEC60601-1; All the analog and digital equipment that is connected to this ECG machine out of using environment has to be in compliance with other national safety standards (IEC or ISO safety standards); the composition system should be in compliance with the standards of IEC 60601-1-1.
- When the equipment is used simultaneously with cardiac defibrillators, avoid contacting with animals or hospital beds. All the electrodes connected and unconnected to animals as well as animals themselves do not have to be grounded. Do not use other electrical stimulators at the same time. If needed, it should be a professional technician to carry out the operation.
- Chest and limb electrodes along with the device in the packing box could not meet the requirements of

defibrillation polarization recovery time (however, they are essential accessories of ECG), should not be used immediately for reliable measurements and diagnostics after defibrillation. To ensure proper defibrillator protection, use only the recommended disposable electrodes (Name: Skintact; Type, RT-34), lead wire and electrode adapters by our company. To ensure the protection of defibrillator discharge, use the lead wire with defibrillation-proof by our company.

- When the ECG machine is used together with a defibrillator or other electrical stimulators (like high-frequency surgical devices), we recommend using disposable chest electrodes. Otherwise the animal may get serious injury by using metal electrodes.
 - During defibrillation, the device can detect the discharge of defibrillator, and process automatically, and then quickly recover the waveform.
 - Keep the ECG machine electrodes away from the electrodes of high-frequency electrosurgical units. Ensure the resistance between the electrosurgical unit and animal body is as low as possible. If necessary, the disposable electrodes can be used because of its larger contact area on the animal body, which can keep the high-frequency current density in an acceptable range.
 - When the relevant packaging material including, depleted batteries and scrapping products are disposed, please follow the local laws; the user should properly follow requirements of local laws, and recycling laws.
-
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CAUTION

- Avoid contacting with water or other liquids, and avoid using and storing in spaces with too large barometric pressure, humidity and temperature beyond the prescribed standards, poor ventilation, or with excessive dust.
- The ECG machine should be place on the flat horizontal table and avoid strong vibration and mechanical shock while moving.
- The frequency of AC power supply and system voltage should be complied with the requirements. More importantly, the current capacity should be sufficient.
- The instrument should not be surrounded by high-voltage cables, ultrasound equipment, electrotherapy machines and other high-power equipment.
- To more accurately record the ECG, the equipment shall be placed in a quiet and comfortable environment.
- The circuit of application parts works based on floating ground and meets the safety standards in IEC60601-1 CF Type. It can be used in acquiring the body surface ECG signals, but cannot applied to the heart directly.
- Turn off the ECG machine if an accident happens.

- Please clean and disinfect reusable electrodes with medical alcohol before using.
 - The conductive parts of electrodes and connectors (including neutral electrodes) on the ECG machine should not in touch with other conductive parts.
 - Do not press the buttons with sharp or hard articles or it may cause permanent damage to the buttons.
 - Do not make any modifications to this ECG machine.
 - Perform regular maintenance and inspection for this ECG machine and all its accessories (at least once every six months).
 - The maintenance and repair of this ECG machine should be performed by experienced technicians. When there is any functional abnormality, it should be clearly identified to prevent the ECG machine from running with fault.
 - The electrical schematic diagrams and parts listed are only provided to a qualified repair station or technicians recognized by the company.
-
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★ General Operation Precautions

Before operation:

CAUTION

- Make sure the ECG machine is in good condition and the recording paper is sufficient.
- Make sure the temperature and humidity of operating environment comply with the requirements.
- Do not operate ECG machine in a place with X-ray equipment, ultrasound scanner, or other similar equipment. Those equipments may interfere with the ECG machine. If necessary, power off the mentioned equipments or move the ECG machine to an environment without interference.
- Make sure all lead wires are connected correctly and are kept away from the AC power cable.
- Make sure the equipotential cable of the ECG machine is reliable and properly connected.
- Make sure the power cable is properly connected with the ECG machine and is not twisted with other cables or wires.
- Put the lead wires in good order before connecting them to the electrodes.
- Make sure the electrodes are in good contact with skin. Please refer to *Apply Electrodes* for details.
- Please install the ECG machine near an AC power outlet. Cut off the power supply immediately when there is an emergency.
- Please keep the animal quiet and motionless.

- Use wide hospital beds and keep the animal from touching the metal parts of the hospital bed, which may cause interference in ECG waveform recording.
 - Keep the Examination room quiet and comfortable.
-
-

 **WARNING**

- All circuits that come in contacting the animal directly should be examined closely.
 - When using the battery as the power supply, please check the voltage and condition of the battery first and make sure the battery is fully charged. For new batteries, please discharge and charge it fully before using.
 - Use only 3-core power cable when using AC power, otherwise hazard of electric shock to the animal and operator cannot be completely eliminated. If the power cable is not working, only the built-in battery can safely power the ECG machine.
 - Make sure equipotential connection is complete and reliable, or else only use the built-in battery.
 - If the ECG machine is used for the first time or stored for more than three months without use, please verify that the system time is correct before use, otherwise set the system time first.
-
-

In operation:

 **WARNING**

- The physician should observe the animal closely without leaving during the operation. If necessary, turn off the ECG machine and remove the electrodes to ensure the animal's safety.
 - Prevent the animals from contacting the other parts of the ECG machine or other conductors except for the electrodes.
-
-

After operation:

 **CAUTION**

- Please return to the main interface before turning off the ECG machine.
 - Remove the electrodes gently and do not pull the lead wires emphatically.
 - Clear up the ECG machine and all the accessories for trouble-free operation of next use.
-
-

About LCD screen

CAUTION

- Do not place any heavy objects onto the LCD screen or strike it, otherwise it could damage the LCD screen.
 - When not using it, please put it away or have a cover on it. Keep it away from water.
-
-

About lithium battery

WARNING

- Only the authorized installation or service engineer can open the battery cover and replace the battery; do use the same type of rechargeable lithium battery provided by our company.
 - The positive and negative terminals of the batteries cannot be reversed, or it could cause an explosion.
 - Do not connect the two polarities of the battery with metal wires. Otherwise, there will be the hazard of fire.
 - Do not use the battery near a heat source or in and the environment with temperature up to 60 °C; do not heat the battery or throw it into the fire.
 - Keep the battery away from water; do not drop the battery into the water.
 - Do not press any metal into the battery; Do not hammer or beat the battery or use other ways to damage the battery, otherwise it will cause heat, smoke, deform or burn, which is very dangerous.
 - When you find battery leakage or its emitting unpleasant odors, please get away from it immediately. If the fluid leaks onto the skin or clothes, wash with clean water at once. If the electrolyte enters the eyes, do not rub the eyes, wash with clean water immediately, and then go to see a doctor.
 - The users need to check the battery status regularly. When the battery reaches the end of its lifetime, when it smells, deforms, discolor, contorts, the users should stop using and dispose of it according to local regulations.
-
-

★ EMC Considerations

This ECG machine conforms to the IEC60601-1-2, a safety standard for medical electronic devices or systems. However, the electromagnetic environment exceeding the limit or level defined by the standard IEC60601-1-2 will introduce the unwanted interference to the ECG machine, disable its intended functions or it will compromise its intended performance. Thus, if there is any discrepancy with this ECG machine compared to its intended

functions during operation, please do not use it for longer until the adverse affect is identified and eliminated. The appropriate preventing measures are given below by this manual for such cases:

■ Influence of radiated electromagnetic wave:

The use of a mobile phone may affect this ECG machine. Instruct all the people around to turn off their mobile phone or mini-radio devices when any medical electronic device is in use.

■ Influence of impact and conductive electromagnetic waves:

The high frequency noise produced by other devices can be introduced into this ECG machine through the alternating current socket. Please identify the noise source first, and if possible, stop the working of related devices. If they are not allowed to be stopped, measures such as application of noise abatement device should be taken to minimize the influence.

■ Influence of static electricity:

The static electricity in a dry environment (indoor) may affect this ECG machine, especially in winter. Please humidify the indoor air or pre-discharge the static electricity on the cable and the electrocardiogram recording personnel prior to using this ECG machine.

■ Influence of thunder and lightning:

A thunder and lightning strike nearby may cause voltage surge in this ECG machine. You can unplug the power supply and run the ECG machine using its internal battery in case of any danger.

Instrument classification

| Methods | Class |
|--|---|
| By Type of Protection Against Electric Shock | Class I, internal power supply |
| By Degree of Protection Against Electric Shock | Type CF applied part |
| By Degree of Liquid Proof | Ordinary equipment (enclosed device without liquid proof) |
| By Level of Protection Against Explosion | This equipment is unsuitable for use in an environment with air, oxygen or nitrous oxide mixed with flammable anesthetic gas. |
| By Mode of Operation | Continuous operation equipment |

Maintenance Warranty

Our company guarantees the new instrument on the material and technological qualification for this product within 18 months and the accessories within 6 months since purchasing day, while consumables are not covered by the guarantee in principle. This guarantee is also inapplicable to the products undergoing any modification, disassembly, refitting or self-repairing without permission of our company, as well as the products damaged by accidents, fire disaster, thunder and lightning, flood and other disaster, intentional damage, improper installation and improper usage.

CAUTION

- For all dated reference documents in this manual, its subsequent amendments (excluding corrections) or revisions do not apply to this manual; for undated reference documents, the latest version applies in this manual.
 - Due to product improvement, the content of this User Manual may differ from the product you purchased, which will not affect the usage, please operate according to the actual functions of the product.
 - This manual is subject to change without prior notice. We apologize for any inconvenience caused.
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Chapter 1 Introduction

[Main structure, performance]

The ECG machine is mainly composed of the main unit, animal cable and Animal ECG Electrode Holders.

[Scope of application]

This ECG machine is used to extract the electrocardio complex from the animal body for clinical diagnosis and research.

[Intended Use]

- Only suitable for: animals;
- Used in: animal hospitals, animal clinics;

1.1 Equipment Overview

1.1.1 Front View

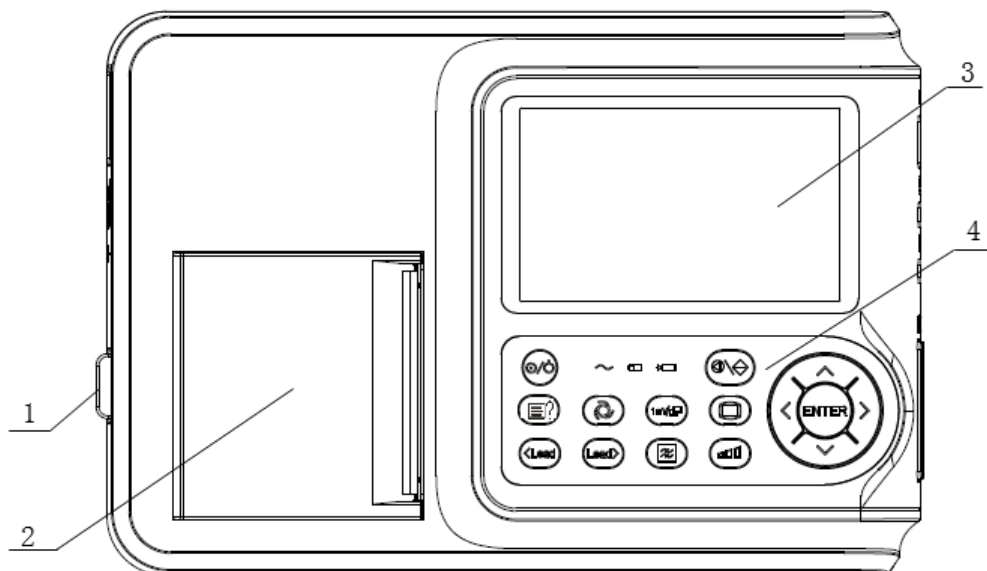


Figure 1-1 Front View

| Number | Name | Description |
|--------|-------------------|--|
| 1 | Switch Button | Push down to open the Paper Drawer. |
| 2 | Paper Drawer | Place the recording paper. |
| 3 | Display Screen | Display the waveforms, animals' information and the device status. |
| 4 | Operating Buttons | For button operations and inputting methods. Refer to <i>Operating Buttons</i> for more details. |

1.1.2 Left View

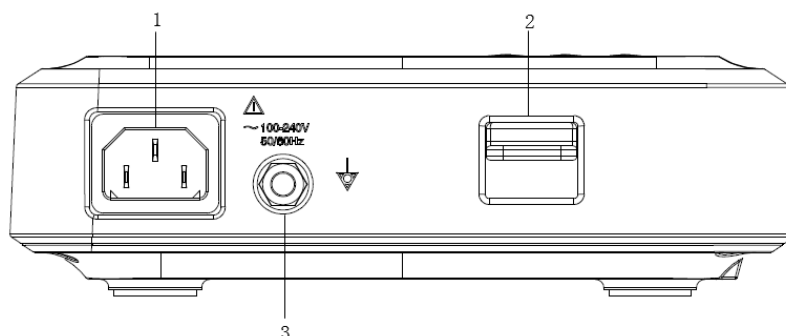


Figure 1-2 Back View

| Number | Name | Description |
|--------|------------------------|-------------------------------------|
| 1 | Power Supply Socket | Connect to the AC power adaptor. |
| 2 | Switch Button | Push down to open the Paper Drawer. |
| 2 | Equipotential Terminal | Connect to the equipotential cable. |

1.1.3 Right View

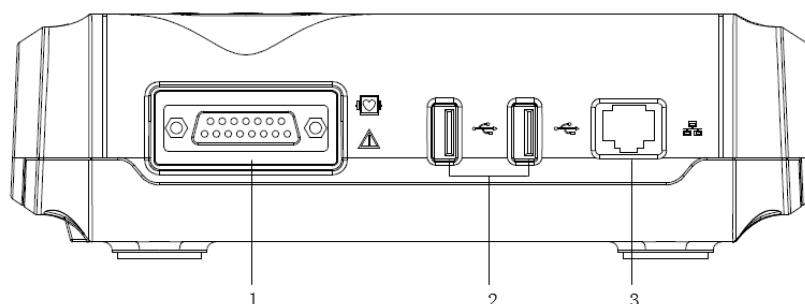


Figure 1-3 Side View

| Number | Name | Description |
|--------|----------------------------|--|
| 1 | ECG Animal Cable Connector | Connect to the Patient Cable. |
| 2 | USB Ports | Insert the USB device to save data; Insert the Bar Scanner. |
| 3 | LAN Port | Connect to net cable. |

1.1.4 Operating Buttons

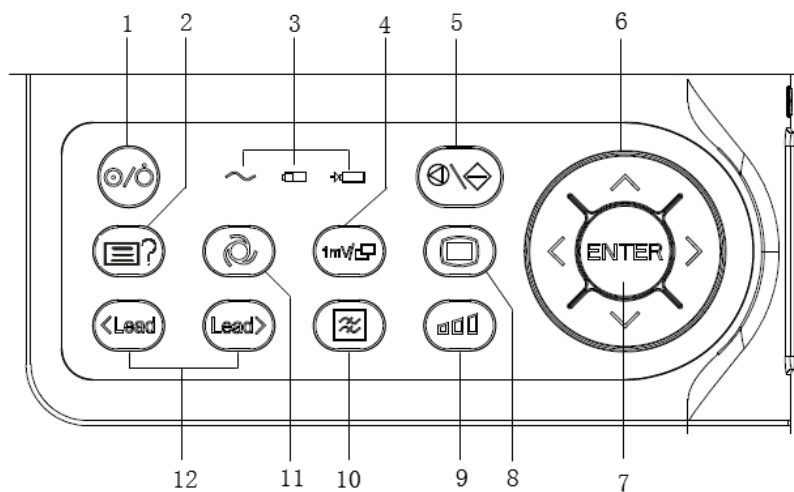





Figure 1-4 Keyboard

| Number | Name | Description |
|--------|------|---|
| 1 | | Press to power on or off the ECG machine. |
| 2 | | Press to set animal information. |
| 3 | | Indicate the power status of the ECG machine. From left to right: AC power indicator, battery indicator and charging indicator. |
| 4 | | <ol style="list-style-type: none"> In Manual Mode, press to print the calibration waveforms of 1mV to check the current sensitivity. In Auto Mode, press to copy the previous report. |
| 5 | | Press to start or stop printing the ECG waveforms and report. |
| 6 & 7 | | Press Up/Down/Right/Left button to select a menu or an option. Press [ENTER] to confirm, open a submenu, or toggle between two options in a submenu. |
| 8 | | In Main interface, press to enter configuration Menu. In other interface, press to exit. |
| 9 | | Press to select a sensitivity. |

| Number | Name | Description |
|--------|---|--|
| 10 |  | Press to set low-pass filter, baseline wander filter and AC filter. |
| 11 |  | Press to select a record mode and record format. |
| 12 |  | In manual mode, press to switch among different lead groups. In split-screen mode, press to switch among different screens. |

1.2 Handle Installation

You can install the handle as required according to the figure below. The accompanying handle set contains a handle, a screw wrench and four inner hexangular screws.

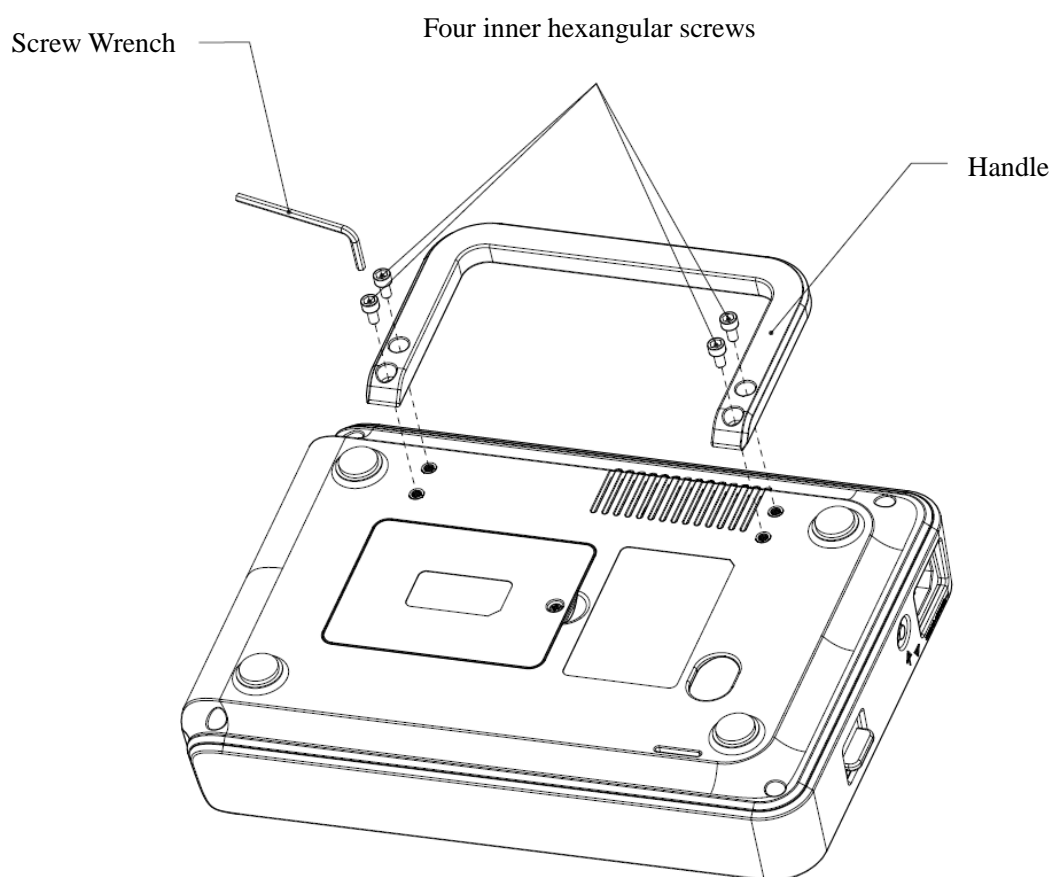


Figure 1-5 Handle Installation

1.3 Waveform Display

EXPLANATION

Screen display may slightly differ from the product you purchased, which will not affect your usage. Please operate according to the actual functions of the product.

In same screen displayed interface, 7 lead waveforms will be displayed on one interface.

In split-screen displayed interface, 7 lead waveforms will be displayed on several interfaces, which make it possible to show the waveform details more clearly.

Select [**Display**], set the display format and lead format.

1.3.1 Same Screen Display

Waveform display in same screen, 3+4 lead format:

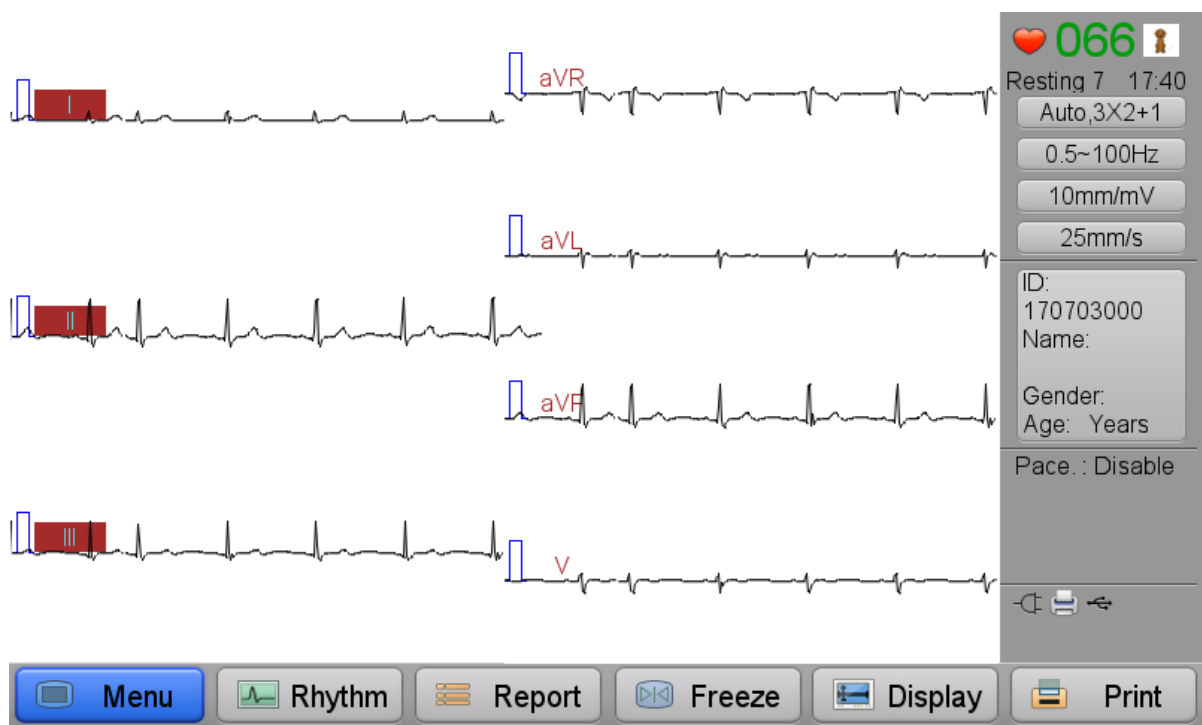


Figure 1- 6 Main Interface

Waveforms display in same screen,

7 × 1 lead format:



1.3.2 Split-screen Display

Waveform under split- screen, 3 + 4 lead format:

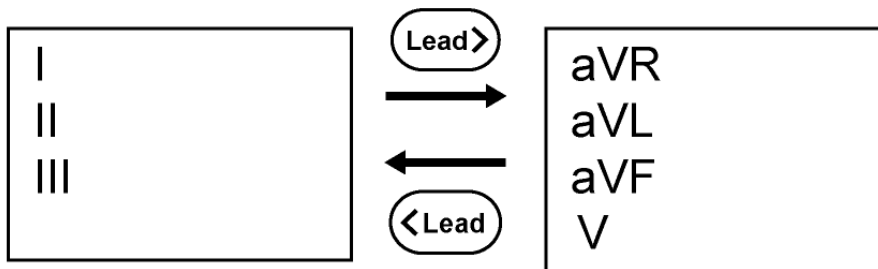




Figure 1- 7 Lead Switch

Press   to change displayed waveforms.

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Chapter 2 Preparation

2.1 Locate the ECG Machine

Please refer to *Foreword*.

2.2 Install Recording Paper

EXPLANATION

Installation of the recording paper may slightly differ from the product you purchased, which will not affect your usage, please operate according to the actual feature of the product.

See the descriptions below to install the rolling paper:

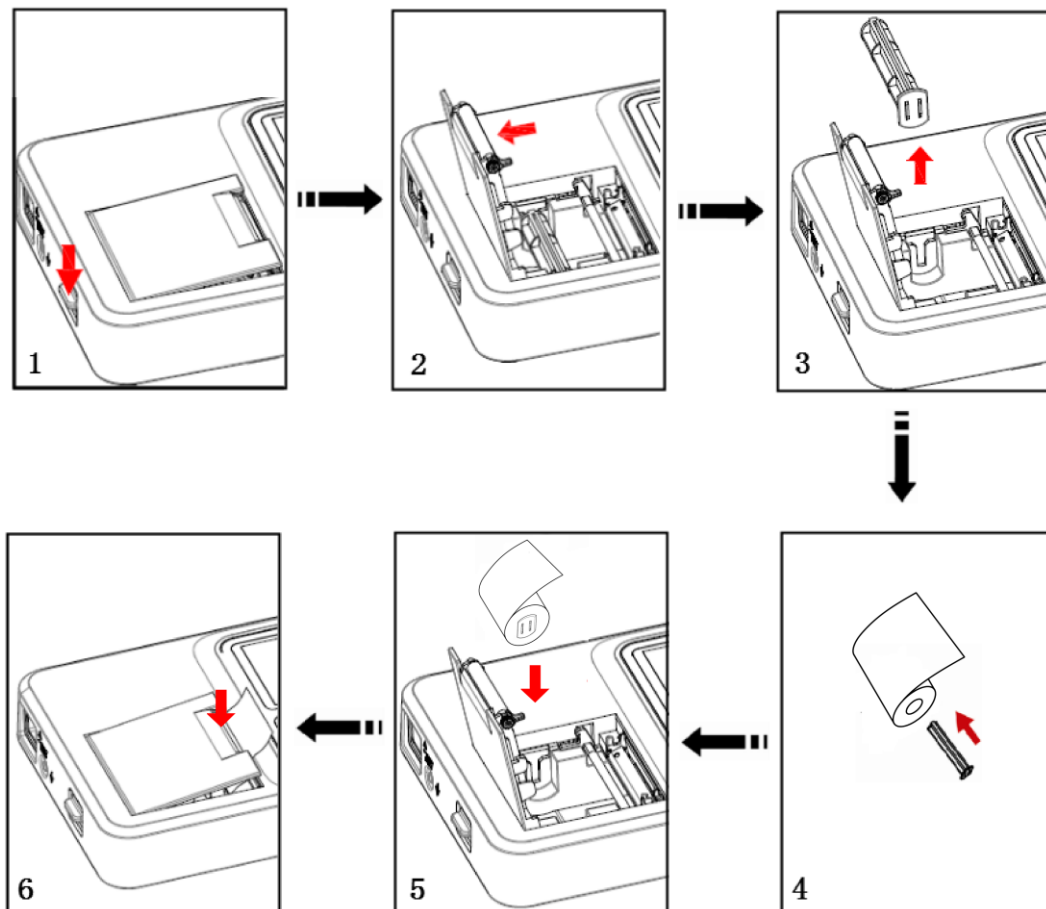


Figure 2- 1 Install the Recording Paper

1. Push the button downwards.
2. Open the Paper Drawer cover.

3. Remove the roller.
4. Insert the roller into the Rolling Paper.
5. Load the recording paper fitly into the Paper Drawer. And make sure the grid side of the paper facing downwards and towards the Thermal Print Head.
6. Pull out the paper about 2cm and press to close the Paper Drawer cover.

⚠ CAUTION

- Please make sure the recording paper is installed fitly and straightly, otherwise it may be stuck.
 - If paper is absent, or used up, or not placed well, alarm will appear on the main interface and the machine does not print.
-

2.3 Connect to Power Supply

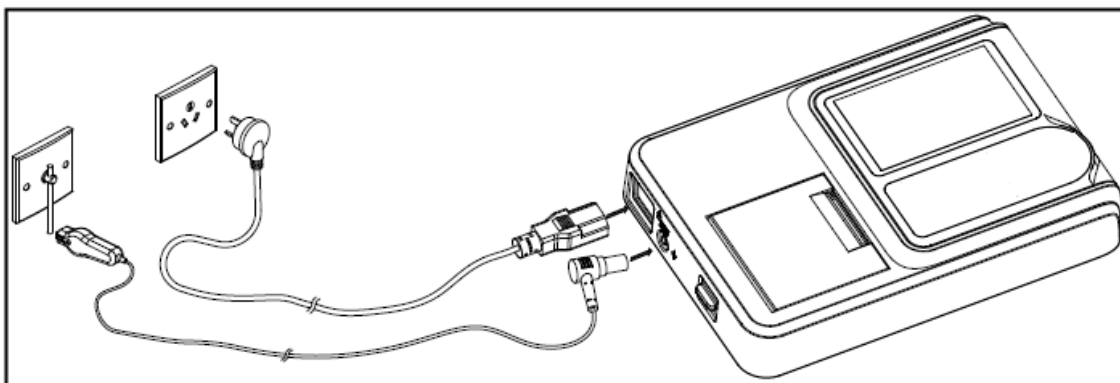


Figure 2- 2 Connect to AC Power Supply

1. Connect the AC Power Cable to the ECG machine and the Power Outlet
2. Connect Equipotential Cable to the ECG machine and the Equipotential Terminal in the room.

📖 EXPLANATION

The ECG machine is equipped with a built-in rechargeable battery and requires no extra installation. The operator needs to check the battery's capacity before usage.

⚠ CAUTION

- When the ECG machine is operated together with other medical equipment, please use the accompanying Equipotential Cable and connect the Equipotential Terminal of the ECG machine altogether with that of the other equipments so as to protect the animal from possible electric shock due to current leakage from those equipments.
 - It is forbidden to connect the Equipotential Cable to a conductive water pipe or other pipes. Otherwise, there may be hazard of electric shock to the animal.
-
-

2.4 Connect to Animal Cable

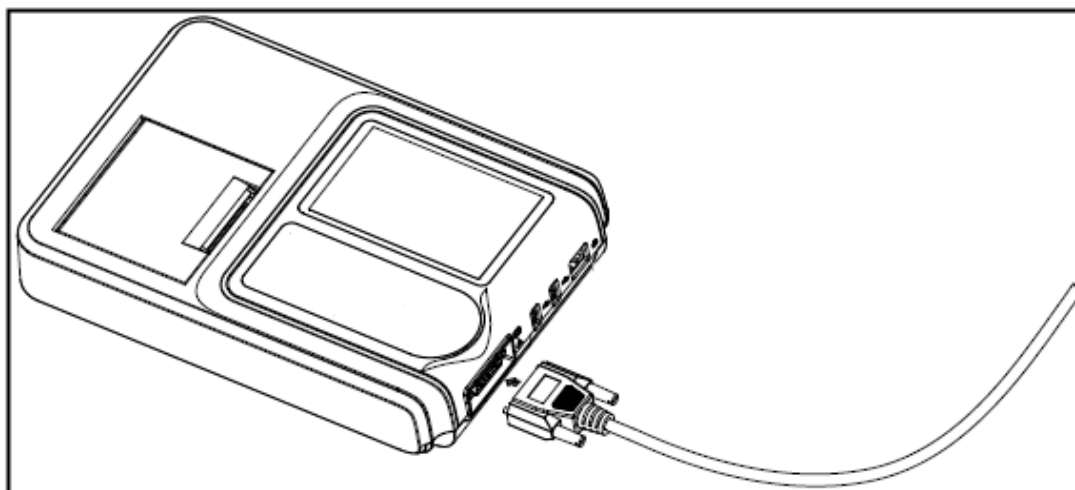



Figure 2- 3 Connect to Animal Cable

Connect the Animal Cable to the ECG machine.

⚠ CAUTION

Do not use any other Animal Cable except that supplied one. The ECG Patient Cable Connector is exclusively used for connecting the Animal Cable. Do not use it for other purposes.

2.5 Power On/Off

Press  to power on/off the ECG machine.


The ECG machine enters Standby mode if it is not in use for a setting period. Set the duration in **[System Setting] > [Standby Time]**. To exit standby mode, press any key.

The ECG machine will shut down automatically if it is not in use for a setting period. Set the duration in **[System Setting] > [Auto Power Off]**.

2.6 Connect to Network

 **CAUTION**

In the data transmission, if the ECG machine warns “Network connection failed”, please reconnect to network or reset the network configuration.

1. As shown in the following figure, the cable network system is composed of the ECG machine, the switchboard and the server.
2. Go to **[Menu] > [System Setting] > [Cable Network]** and set the **[IP address]**, **[Subnet Mask]** and **[Default Gateway]** of the ECG machine. If the IP address is in the same network segment of the server, the subnet mask and gateway shall be as the set value of the server. If the IP address is not within the same network segment of the server, subnet mask and gateway of the **[Cable Network]** shall be set according to actual situations. And make sure the specified gateway does support the data transmission between the two network segments.
3. Select **[Server Setting]** and set the correct **[IP address]** and **[Port]** number of the server.
4. When the machine is connected to network successfully, the icon  will display in the main interface.

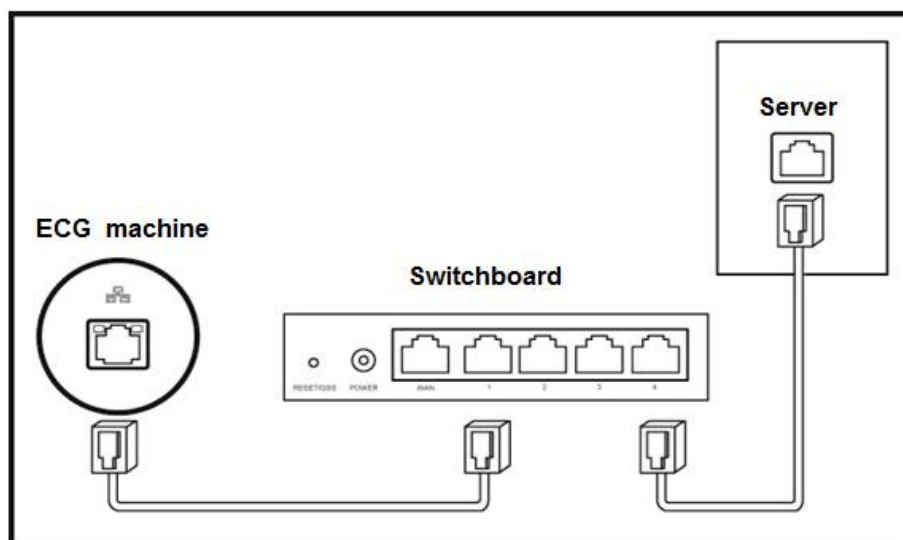


Figure 2- 4 Cable Network Connection

2.7 Apply Electrodes

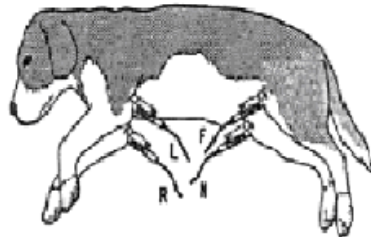
Before attaching the electrodes to animal, wipe the skin where the electrodes attached by using medical alcohol, and then apply ECG gel on the skin. After that, place electrodes to the right position.

⚠ CAUTION

- Proper electrode attachment is vital for obtaining accurate ECG waveforms; therefore, please ensure good contact between the skin and electrodes.
- Do not use the new electrodes and the used ones at the same time. Replace all electrodes together when any one of them is supposed to be replaced.
- Don't use disposable electrodes more than one time.
- Confirm the disposable electrodes are within the validity period.
- Use the disposable electrodes as soon as possible after opening the package (generally within 7 days).
- Electrodes or conducting point of lead wires shall not be in contacting with any other metal part or conductor.
- Avoid the electrodes to be dragged by the lead wires.
- Make sure animal's skin contacted with the electrodes has been well pretreated.
- Clean the stain on the electrodes with medical alcohol whenever the electrodes are contaminated.
- Make sure metal electrodes of limb electrodes touch fully with skin and tightly enough.
- Make sure adjacent electrodes and ECG gel, especially chest ones, are not contacted with each other.

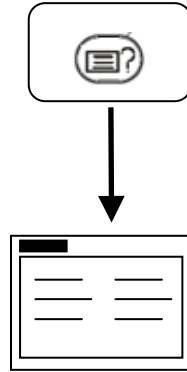
- If the examination involves a short period of time, if ECG gel is unavailable, please wipe the skin with medical alcohol to keep the skin clean and moist, rapidly attach the electrodes.
- It's not allowed to use saline water as substitute when ECG gel is not available. The saline water will cause corrosion on the electrodes.
- Electrodes shall be properly stored. When electrodes have been used for a certain period, they may become corroded and oxidized at the surface. Whenever this happens, the electrodes must be replaced.
- Do not mix electrodes of different types and manufacturers. Do not use re-useable electrodes and disposable ones together, or it will affect the recording.
- Please use our company's or authorized electrodes to make sure qualified ECG signals.

2.7.1 Electrodes Attachment

| Limb Electrodes Placement | | | | |
|----------------------------------|----------|----------|-------------|---|
| | IEC | AHA | Description | Figure |
| | R Red | RA White | Right Arm |  |
| | L Yellow | LA Black | Left Arm | |
| | N Black | RL Green | Right Leg | |
| | F Green | LL Red | Left Leg | |
| | | | | |

Chapter 3 Entering Animal Information

3.1 Enter Animal Information



Enter the animal information

You can enter ID Number, gender, and age of years. Refer to *Set Animal Information* to get more details.

Input ID number:

The screenshot shows a dialog box titled "Animal Information Input" with a close button (X) in the top right corner. The dialog contains several input fields and a button:

| | | | | | |
|------------|--|---|------------|----------------------|---------|
| ID Number | <input type="text" value="170630004"/> | > | Sub-ID No. | <input type="text"/> | > |
| First Name | <input type="text"/> | | Last Name | <input type="text"/> | |
| Gender | <input type="text"/> | > | Age | <input type="text"/> | Years > |

At the bottom of the dialog is a button labeled "Last animal info".

Figure 3- 1 Inputting Animal Information

Select the arrow button and press **ENTER**, and a menu with below three options pops up.

[Automatic Coding]: ID code is automatically generated by ECG machine when admitting a new animal and an ID code will be automatically increased each time when you press **ENTER**.

[Manual Coding]: you can code according to his own demand with numbers and letters.

[Barcode Scanner]: you can directly scan the bar code using the scanner to generate ID code.



Figure 3- 2 Barcode Scanning

EXPLANATION

When Barcode Scanner is chosen, the onscreen keyboard will be disabled. For the usage of the Barcode Scanner, please refer to the User Manual of your Barcode Scanner.


CAUTION

- Improper animal information may lead to misdiagnose. Please check the information for each new animal carefully.
 - Please avoid confusing the animals' ID numbers. Otherwise, it may cause ECG data loss or mistake.
-
-

3.2 Introduction of Input Method

3.2.1 Standard Character Keyboard

Select a text box and press **ENTER** to open the onscreen keyboard. Use Up/Down/Right/Left button to select the letters and then press **ENTER** to confirm.

Press  to exit the onscreen keyboard and return to the previous page.

Or, select **End** button on the screen and press **ENTER** to exit the onscreen keyboard.

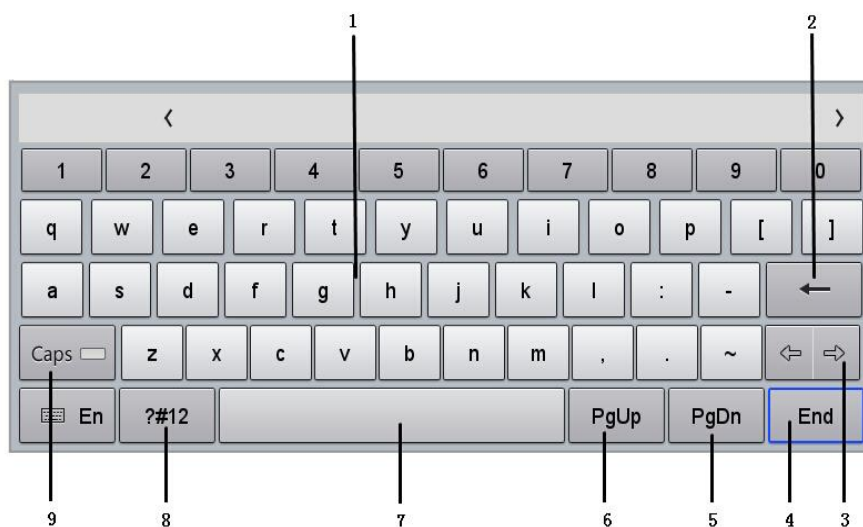



Figure 3- 3 Standard Character Keyboard

| Number | Name | Description |
|--------|-----------------|---|
| 1 | Characters Area | Input letters or punctuations. |
| 2 | Delete | Delete previous inputted character. |
| 3 | Cursor Moving | Move the position of cursor on the screen. |
| 4 | End | Exit the onscreen keyboard. |
| 5 | Page Down | / |
| 6 | Page Up | |
| 7 | Space | Input null characters. |
| 8 | Symbols | Switch to symbols pad to input kinds of symbols. |
| 9 | Caps | Switch between uppercase and lowercase letters inputting. |

3.2.2 Digital Keyboard

Select a text box and press **ENTER** to open the digital keyboard. Use Right/Left button to select the numbers and then press **ENTER** to confirm. Use Up/Down/ to exit the digital keyboard.

Or, press  to exit the digital keyboard and return to the previous page.

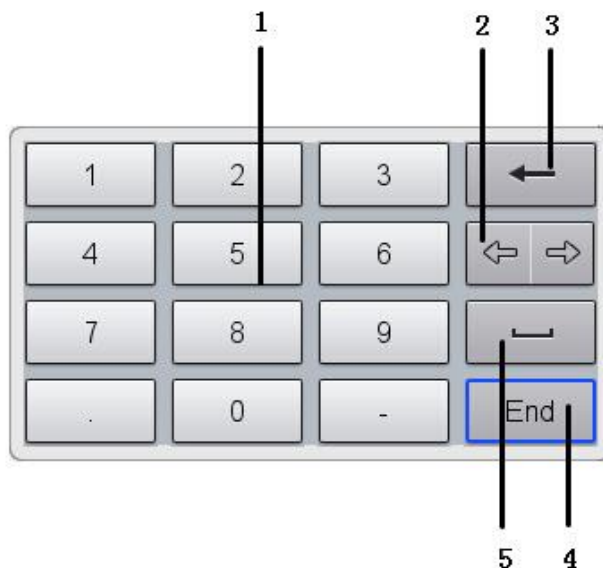


Figure 3- 4 Digital Keyboard

| Number | Name | Description |
|--------|-----------------|---|
| 1 | Characters Area | Input numbers or punctuations. |
| 2 | Cursor Moving | Move the position of cursor on the interface. |
| 3 | Delete | Delete previous inputted character. |
| 4 | End | Exit the Digital Keyboard. |
| 5 | Space | Input null characters. |

Chapter 4 ECG Recording

After the ECG machine has been powered on and all the leads are well connected, the following main interface will be displayed. And the ECG machine is ready for recording.

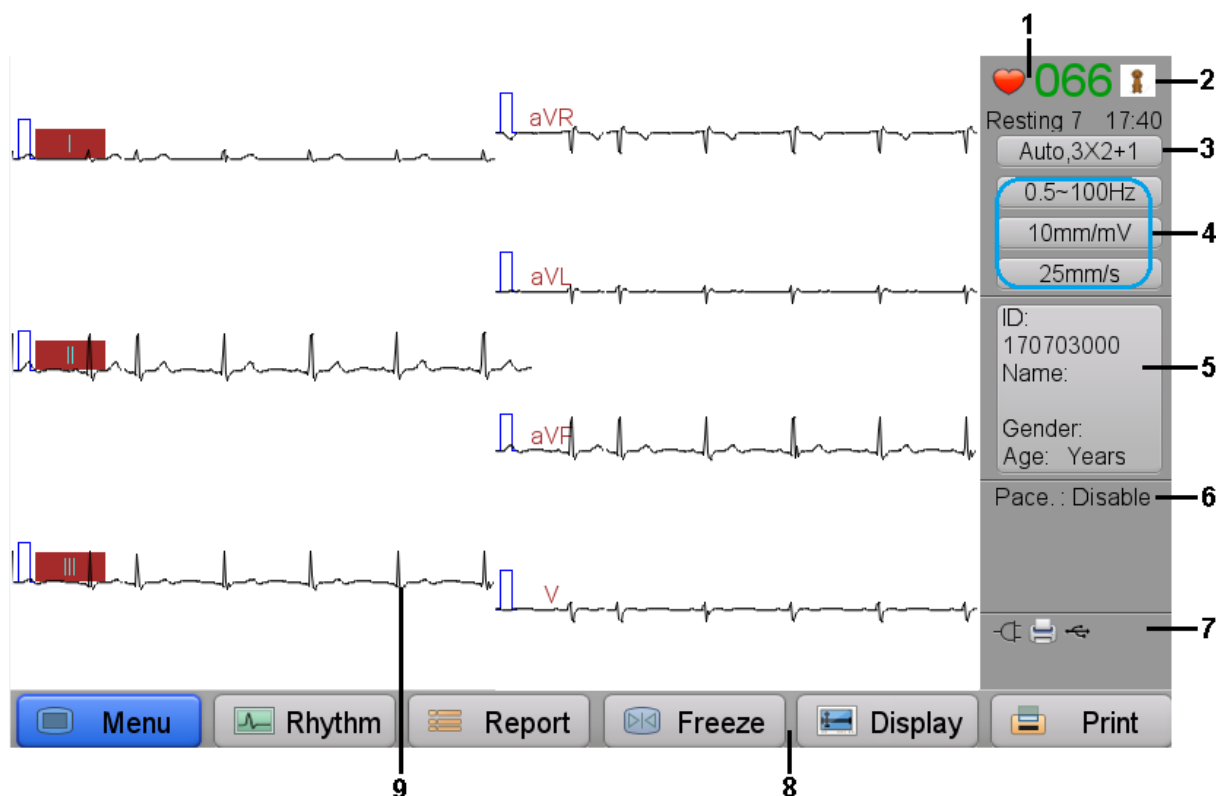





Figure 4 - 1 Main Interface


| Number | Name | Description |
|--------|-------------------------------|--|
| 1 | Heart Rate Icon | Display animal's heart rate. |
| 2 | Lead Status | Display the location and state of the electrode in the animal body. Select for a larger view. If the lead wires are not connected properly, such as electrode falls off, the corresponding electrodes on the view will flash to alarm. |
| 3 | Record Setting | Display record mode and record format;  Use  to select other record mode and format. |
| 4 | Filter, Sensitivity and Print | Display the current Filter, Sensitivity, and Print Speed. |

| | | |
|---|--------------------|--|
| | Speed Status Area | |
| 5 | Animal Information | Display animal information; |
| 6 | Alarm Area | Display text alarm information, including: system failure about Animal Cable/Print head/Paper, lead off, AC interference, EMG interference, Baseline wander, and Data overflow, etc. |
| 7 | System Status | Indicates system status, for example, mute, recording, network, USB connecting, battery, etc. |
| 8 | Shortcut Keys | Quick operation to set up parameters and execute functions. |
| 9 | Waveform Display | Display real time waveform. |

4.1 Introduction of Sensitivities, Filters, Print Speed

Before printing, set the following configuration:

Press  to select the desired sensitivities.

Press  to select the desired Low-pass Filter, Baseline Filter and AC Filter.

On the main interface, use navigation buttons to open the Print Speed Setting Menu and select the desired print speed.

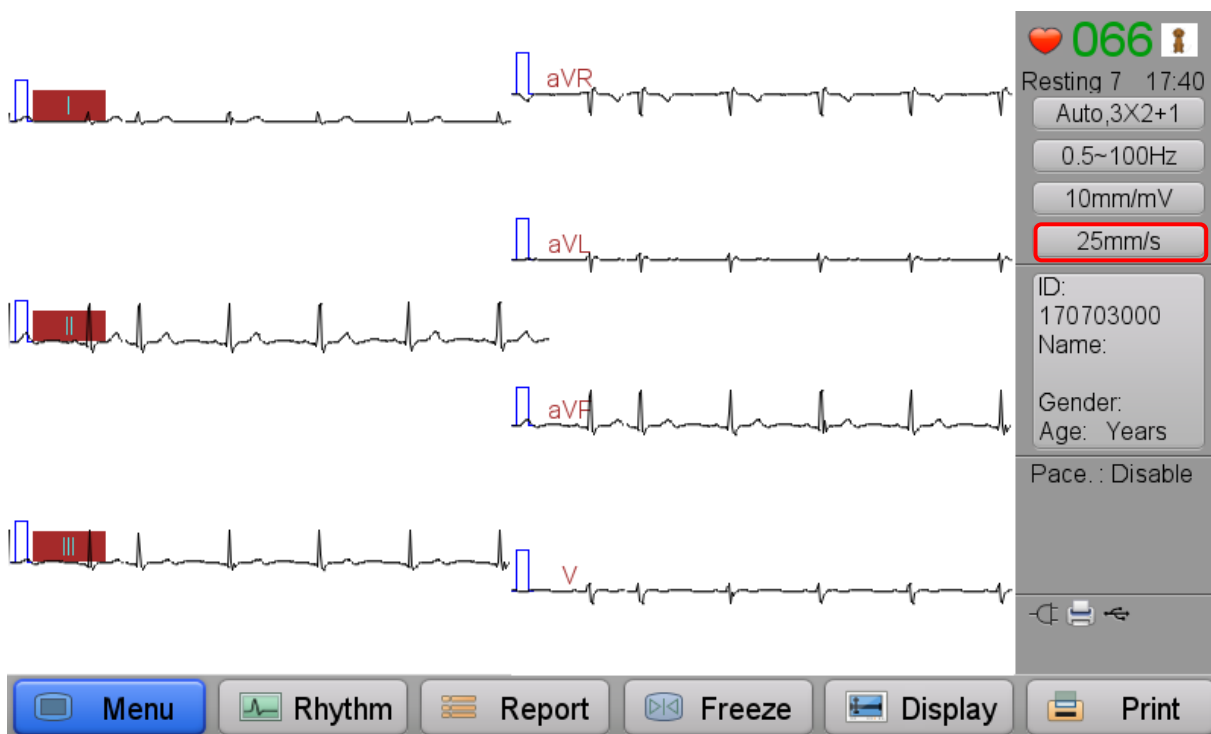



Figure 4- 2 Setup of the Sensitivities, Filters, and Print Speed

EXPLANATION

- Noise may affect the quality of the ECG signals. You can change the filter parameters to optimize the displayed or printed ECG waveforms.
 - By setting different low-pass filters, the QRS wave group's amplitude, time limit and form may change.
 - By setting different baseline wander filters, the form of ST segment may change.
 - In order to reduce baseline interference, a baseline wander filter should be employed. To make sure the ST segment is not distorted, the AAMI standards recommend that cut-off frequency of the baseline wander filter is lower than 0.67Hz.
-
-

4.2 Record ECGs

EXPLANATION

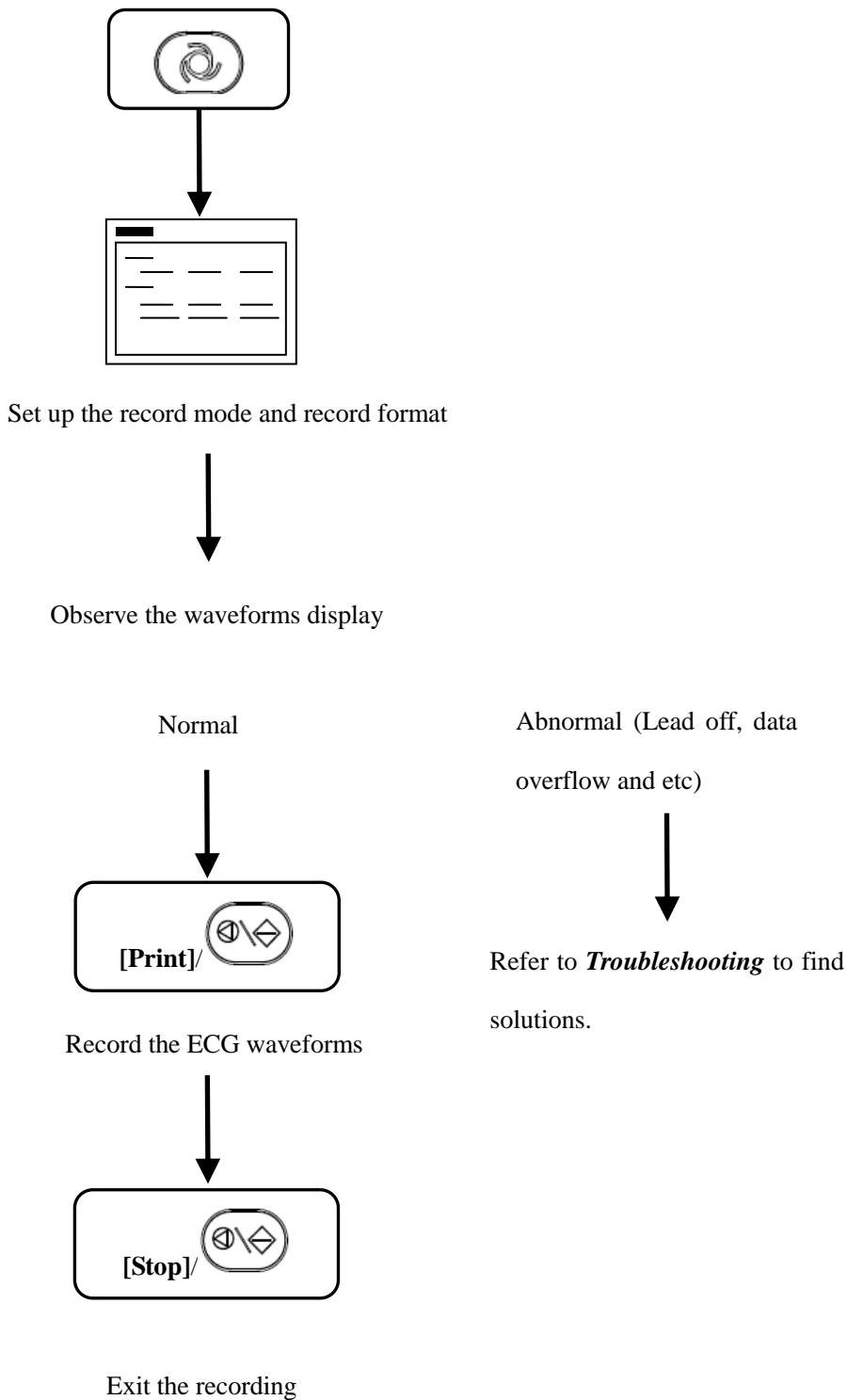
- The Pre-acquisition mode is valid only in automatic recording mode. When the Pre-acquisition mode is enabled, the ECG machine print and upload waveforms automatically; when the Pre-acquisition mode is disabled, press  to print or upload waveforms.
 - **[Record Format]** is a waveform pattern traced on the recording paper. Please see *Technical Specification* for specific recording formats.
 - **[Synchronous]** and **[Real Time]** are activated only when waveforms are printed in more than one column.

[Synchronous]: all the start point of the waveforms are the same;

[Real Time]: the start points of the waveforms in the same columns are the same; but the start points of different column are continuous to the end point of the waveforms in the previous column.

Set them in **[Print Setting] > [Print Data Type]**.
 - If you have blank paper, select **[Print Setting] > [Print Grid] > [Enable]** to print the ECG showing the grids. If you have paper with grids, suggest selecting **[Disable]** to print the ECG without showing the grids.
-
-

4.2.1 Main Steps to Record ECG



When the waveforms recording is about to finish (under any record mode except manual mode), the system will carry on the interpretation automatically. Please refer to *Auto Mode*.

⚠ CAUTION

- After the heart rate and waveforms are stable, you can print out the ECG waveforms together with the interpretation.
 - This ECG machine can detect the lead connecting status continuously, and if leadoff is detected, the corresponding lead code will flash in the Alarm Area on the main interface, accompanied by sound alarm. When “Lead off” continues, please check carefully the connections from skin to the ECG machine (including electrodes and lead wires). Alarm will disappear when connections become reliable.
-

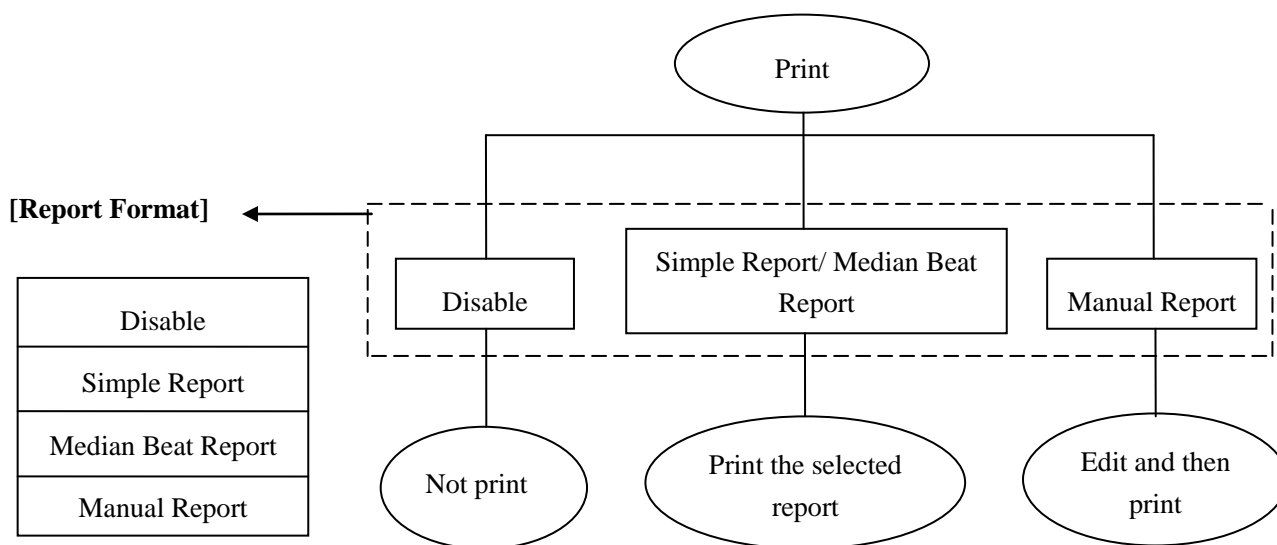
4.3 Introduction of Record Mode

📖 EXPLANATION

- Set up the Waveform length to be printed and uploaded in [Menu] > [ECG Setting] > [Wave Sample Time].
 - In [ECG Setting], if [Auto Upload] is enabled, the ECG machine will automatically upload the waveforms and the reports after printing the waveforms.
 - If [Auto-save] is enabled, the ECG machine will automatically store the waveforms and reports after printing the waveforms.
 - If the waveforms and the reports need to be stored to a specified memory, go to [System Setting] > [Default Memory] and select the desired memory: [Internal Memory] or [USB Flash Drive].
-

4.3.1 Auto Mode

In Auto Mode, the ECG machine can automatically print the waveforms and reports.



The ECG machine can analyze the resting ECG and output the measurement data, median beat, etc.

Simple Report includes animal information, simple measurement data;

Median Beat Report includes animal information, simple measurement data, Median Beat waveform and Rhythm waveforms.

In Manual Mode, the analysis reports include analysis report (1), and analysis report (2).

After printing waveforms and report, press  to print waveforms and report of the last animal.

Auto Print

In Automatic mode, select [Menu] > [Print Setting] > [Auto Print] > [Enable], the ECG machine will automatically print the waveforms and reports when the following 3 conditions are satisfied.

- Lead off does not detected for 2s (none of any electrodes);
- Five or more QRS complex detected;
- Waveform is stable, no EMG interference or Baseline drift.




EXPLANATION

- The ECG machine analyzes the latest 10 seconds waveforms.
-


* WARNING

- If there is too much AC and EMG interference, the identification of P wave and Q wave is not reliable sometimes; if there is baseline wander, the identification of ST segment and T wave is not reliable sometimes.
 - If the ending points of S wave and T wave are winding and not clear, it might cause measurement error.
 - If R wave is undetected because of low voltage for QRS complex, it might cause some deviations in heart rate measurement.
 - If QRS complex has low voltage, the electrical axis measurement and the identification of QRS dividing point can be unreliable.
 - Occasionally, the frequent (repetitive) ventricular premature beat might be detected as the median beat.
 - When several kinds of arrhythmia occur simultaneously, the identification of P wave might be difficult, and the relative parameters might be unreliable.
-
-

4.3.2 Manual Mode

In Manual Mode, press  to start or stop printing. You can switch from one column to another by pressing   at any time to control the waveform length of every leads.

4.3.3 Upload Mode

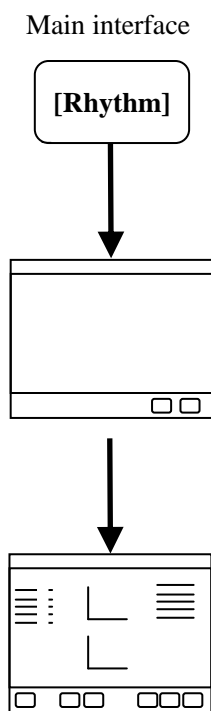
In upload Mode, select [**Upload**] or press  to analyze and then upload the ECG waveforms and reports to ECG workstation.

The Printer is disabled in this mode. You can switch to Auto mode or Manual mode to print the reports.

4.4 Advanced Mode

4.4.1 Rhythm Mode

Operate as follows to enter Rhythm Mode:



Enter Rhythm report interface

In the Rhythm interface, the ECG machine begins collecting waveforms of the Rhythm Lead. In single-rhythm pattern, only one lead is selected as rhythm lead and as long as 300s waveform will be collected and analyzed. After waveforms collecting, the ECG machine will automatically analyze the waveforms and enter report interface.

In rhythm report interface, select **[Page up]** and **[Page down]** to review more information; select **[Print]**, **[Save]**, **[Upload]** to print/save/upload the Rhythm report.

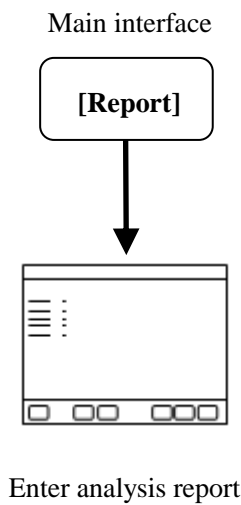
Please refer to *ECG Setting* to set **[Rhythm Lead]** and **[Rhythm Time]**.

EXPLANATION

During the waveform collection, wait for 8 seconds and then press **[R-R]** to enter report interface.

4.4.2 Analysis Report Mode

Operate as follows to enter analysis report mode:



Report (1) includes simple measurements, median beat waveforms and rhythm waveforms.

Report (2) includes waveforms of all the leads.

Analysis report interface is as follows:

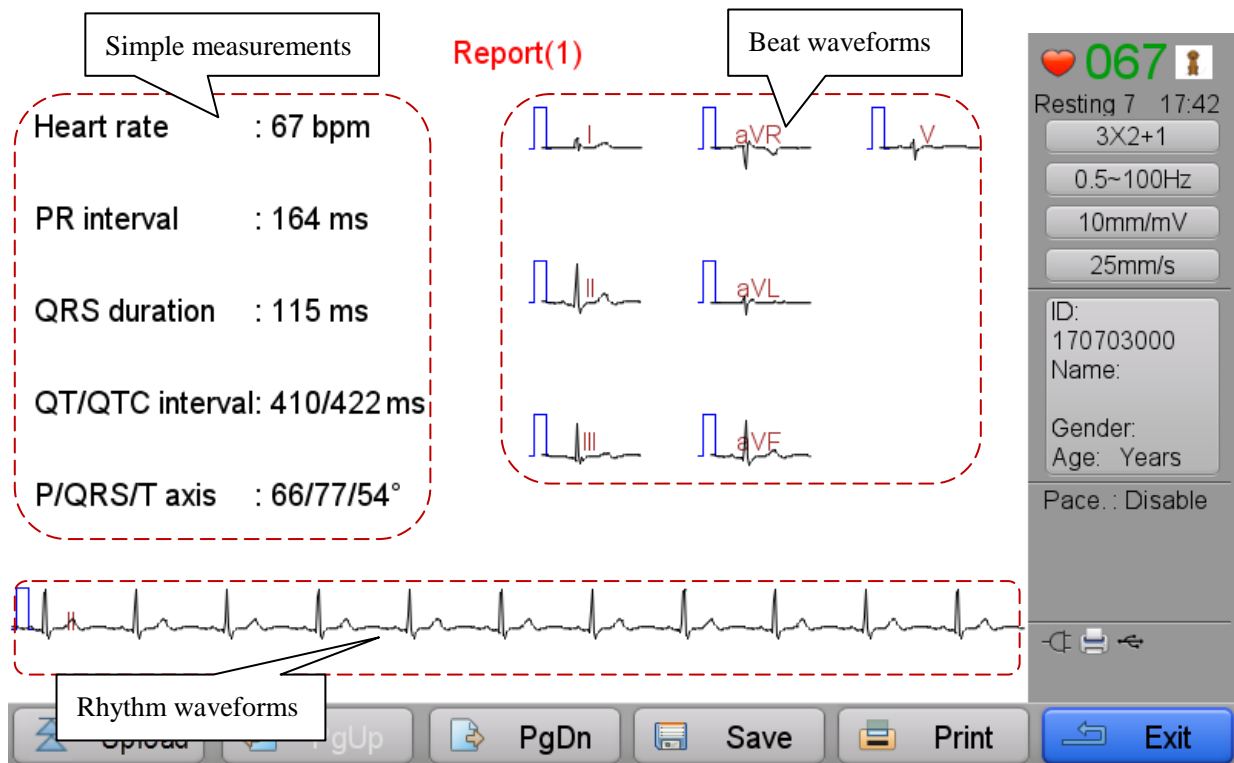


Figure 4- 3 Analysis Report 1

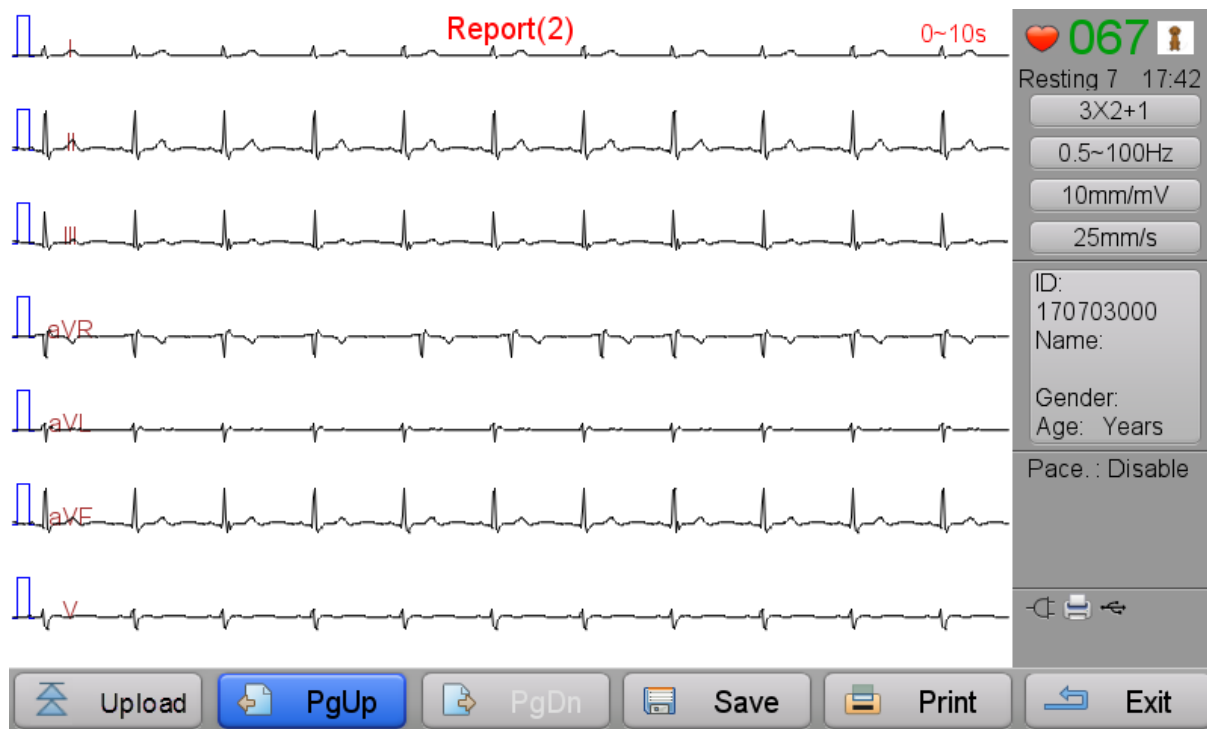
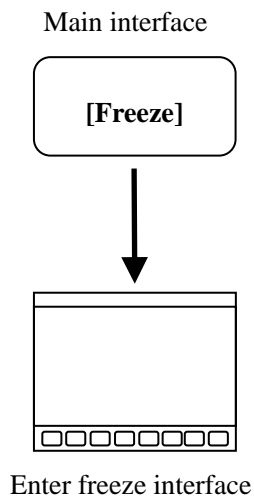


Figure 4- 4 Analysis Report 2

In above two interfaces, you can select to **Upload**, **Save**, and **Print** the report.

4.4.3 Freeze Mode

Operate as follows to enter Freeze mode:



You can freeze waveforms for 300s.

In the Freeze interface, waveforms of different pages can be by tapping **[PgUp]**/**[PgDn]** and step can be adjusted by the user.

In the Freeze interface, tap **[Print]** to print the waveforms.

Tap **[Report]**, and then choose the type of the report, you can print the selected report.

In the Freeze mode, split-screen display of lead waveforms is same as that in the main interface; please refer to **Split-screen display** for details.

Chapter 5 Setting System Parameters

In the Main interface, select [Menu] to enter the configuration menu.

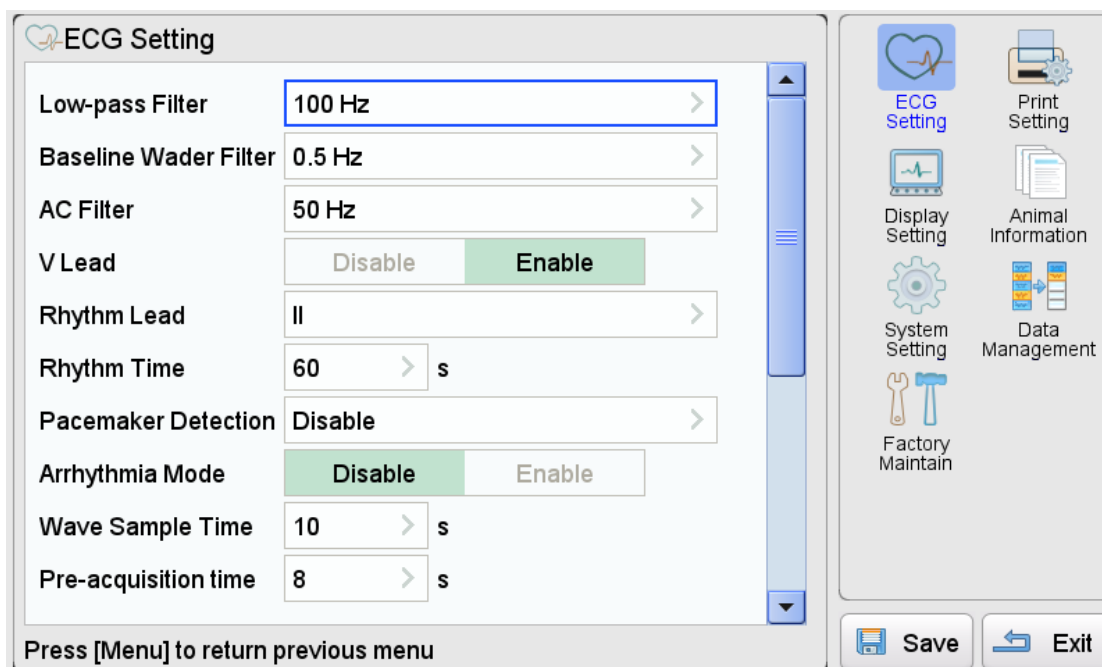


Figure 5- 1 Configuration Menu

Press  to return to the previous page; press  step by step to return to the Main interface.

Select [Save] before exiting to avoid loss of settings caused by sudden power loss.

5.1 ECG Setting

Enter [ECG Setting] to adjust parameters about Electrocardiograph. See following table:

| Name | Value | Default | Description |
|------------------------|--|---------|---|
| Low-pass Filter | 25 Hz, 35 Hz, 75 Hz, 100 Hz, 150 Hz, 250 Hz | 100 Hz | Select one option for low-pass Filter, Baseline Wander Filter and AC Filter. |
| Baseline Wander Filter | 0.01 Hz, 0.02 Hz, 0.05 Hz, 0.35 Hz, 0.5 Hz, 0.8 Hz | 0.5 Hz | |
| AC Filter | OFF, 50 Hz, 60 Hz | 50 Hz | |
| V Lead | Disable, Enable | Enable | When it is enabled, 7 waveforms will be displayed; when it is disabled, 6 waveforms |

| Name | Value | Default | Description |
|-----------------------------|---------------------------------------|---------|---|
| | | | will be displayed. |
| Rhythm Lead | I, II, III, aVR, aVL, aVF, V | II | Select a lead as rhythm lead. |
| Rhythm Time | 30 s~300 s | 60 s | Select one option for rhythm recording time. |
| Pacemaker Detection | Disable, Weak, Normal, Enhance | Disable | Select one option for the pacemaker. |
| Arrhythmia Mode | Disable, Enable | Disable | Set the arrhythmia mode. |
| Wave Sample Time | 10 s~24 s | 10s | Select one option for waveform sampling time. |
| Pre-acquisition Time | 0s~10s | 8s | Set the pre-acquisition time. |
| Printout Duration | 3~12s | 3s | Set the printout duration. Note that this option is only available for iE 101. |
| Pre-acquisition | Disable, Enable | Disable | Set the pre-acquisition mode. If enabled, it can print out previous waveforms. |
| Auto-save | Disable, Enable | Enable | Set whether to automatically save the report. |
| Data Format | ECG, JPEG, PDF | ECG | The data format for storage. |
| Auto Upload | Disable, Enable | Disable | Set to upload the waveforms and reports automatically or not after printing. |
| QTC Formula | Bazett, Fridercia, Framingham, Hodges | Hodges | Select one option for QTC formula. |
| Examination Type | Normal, Physical Examination | Normal | Select one option for examination type. |

☞ EXPLANATION

For physical examination of a large population, it is recommended to select **[Examination Type] > [Physical Examination]**.

5.2 Print Setting

Enter [Printer Setting] to adjust parameters of the Printer. See following table:

| Name | Value | Default | Description |
|-------------------|--|--------------------------|---|
| Gray Level | 1~8 | 4 (iE 101) 5 (iE 300) | Select one option for gray level. |
| Baseline Width | 1~4 | 2 | Select one option for waveform thickness. |
| Print Speed | 5 mm/s, 6.25 mm/s, 10 mm/s, 12.5 mm/s, 25 mm/s, 50 mm/s | 25 mm/s | Select one option for paper speed. |
| Report Format | Simple Report, Median Beat Report, Manual Report, Disable | Simple Report | Select one option for report format. |
| File Print Format | Current Page, Simple Report, Median Beat Report, Detail Report, Waveform | Current Page | Click to select the format to print the report. |
| Print Grid | Disable, Enable | Disable | Select whether to print the grid on the paper. |
| PDF Grid | Disable, Enable | Enable | Select whether to print the grid on the PDF file. |
| Printer | Built-in Thermal Printer, Disable | Built-in Thermal Printer | Select whether to print using built-in printer. |
| Record Mode | Refer to the <i>Appendix B Technical Specification</i> and the machine your purchased. | Auto | Select one option for report mode. |
| Record Format | Refer to the <i>Appendix B Technical Specification</i> and the machine your purchased. | | Select one option for report mode. |
| Auto Print | Disable, Enable | Disable | Auto Print is disabled in iE 101/300. |
| Print Data Type | Real Time, Synchronous | Real Time | Select one option for print data type (Only apply to iE 300). |

| Name | Value | Default | Description |
|---------------------------|-----------------|---------|--|
| Automatic Position | Disable, Enable | Disable | When it is disabled, the waveform will be equidistantly displayed. |

5.3 Display Setting

Enter [**Display Setting**] to adjust parameters about display. See following table:

| Name | Value | Default | Description |
|------------------------|--|---------------|---|
| Display Style | Classic White, Classic Black | Classic White | Set the display style of the screen. |
| Background Grid | Disable, Enable | Enable | Set to display the background grid or not. |
| Display Format | Same Screen, Split-screen | Same Screen | Select to display all the waveforms in one screen or split the waveforms and display them in different screens. |
| Lead Format | Refer to <i>Appendix B Technical Specification</i> . | 3 + 4 | Select one option for lead format. |
| Lead Standard | IEC Standard, AHA Standard | IEC Standard | Select a lead standard to display. |

5.4 Animal Information Setting

Enter [**Animal Information**] to input the patient information.

Input the following information: Sub-ID No., Gender, Age, Date of birth, Height, Weight, BPetc.

EXPLANATION

Age and Date of Birth cannot be selected at the same time.

5.5 System Setting

Enter [System Setting] to adjust the system parameters. See following table:

| Name | Value | Default | Description |
|--------------------------|--|--|---|
| Demo Mode | Normal ECG, Arrhythmia ECG, Disable | Disable | Select normal ECG to display in the interface as a demo. Or disable the Demo mode. |
| System Language | English, 中文, etc. | To be determined by the shipping country | Set the system language. |
| System Version | Version No., Compile Time, Lead Wire Version | / | Display the details of software version. |
| System Time | Current Time, Date Format, Date, Time | / | Display the details of time and date and to set the date format. |
| Network Setting | Cable Network | Cable Network | Select one option for network setting. |
| Transfer Protocol | TCP | TCP | The Default setting is TCP. FTP is disabled in iE 101/300. |
| Cable Network | IP Address, Subnet Mask, Default Gateway | / | Set the value of IP Address, Subnet Mask, and Default Gateway. |
| Server Setting | IP Address, Port | / | Input the value of IP Address, Port of server. |
| Silent Mode | Disable, Enable | Disable | Set to disable or enable the silent mode. If silent mode is enabled, all sound, including alarm tone and key tone will be mute. |
| QRS Tone | 0~10 | 6 | If all three options are zero, a mute icon will be displayed in the Main interface. |
| Alarm Tone | | | |

| Name | Value | Default | Description |
|-------------------------|--|----------------------------------|--|
| Key Tone | | | |
| Default Memory | Internal Memory, USB Flash Drive | Internal Memory | Select the default memory way for the saved file. |
| Memory Format | Internal Memory Formatting | Internal Memory Formatting | Format the specified memory. The files cannot be recovered after formatting. |
| Standby Time | None, 5 min, 10 min, 30 min, 1 h, 2 h | None | Set the standby time. |
| Auto Power-Off | None, 30 min, 1 h, 2 h, 3 h | None | Set the auto power off time. |
| System Password | Disable, Enable | Disable | Select to disable or enable to set a system password. |
| Password Setting | 0~9999 | 1234 | Set the password when the system password is enabled. |
| General Setting | 1~10 | 1 | Select one option, and then set up according to your habit, all your setup will be stored in this option to facilitate your next use. Different doctor or different check up can occupy different options. |
| Import Setting | Import from USB flash disk | / | Import files from USB flash disk. |
| Export Setting | Export to USB flash disk | / | Export files to USB flash disk. |
| Factory Default | / | / | Restore to the factory default settings. |
| Hospital | / | / | Input the name of hospital. |
| Device No. | / | / | Input the number of this ECG machine. |

 **CAUTION**

Demo mode is designed for representation only. Do not use this mode in clinical analysis, for demo waveforms may be mistaken as that of the animal and misdiagnose may happen.

5.6 Factory Maintain

Only the authorized service engineer can enter [**Factory Maintain**], please contact with our Customer Service Department if necessary.

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Chapter 6 Data Management

Select [Menu] > [Data Management] to enter the Data Management interface. Select one source of storage medium from Local (ECG machine), USB 0, or USB 1, the ECG files will be uploaded.

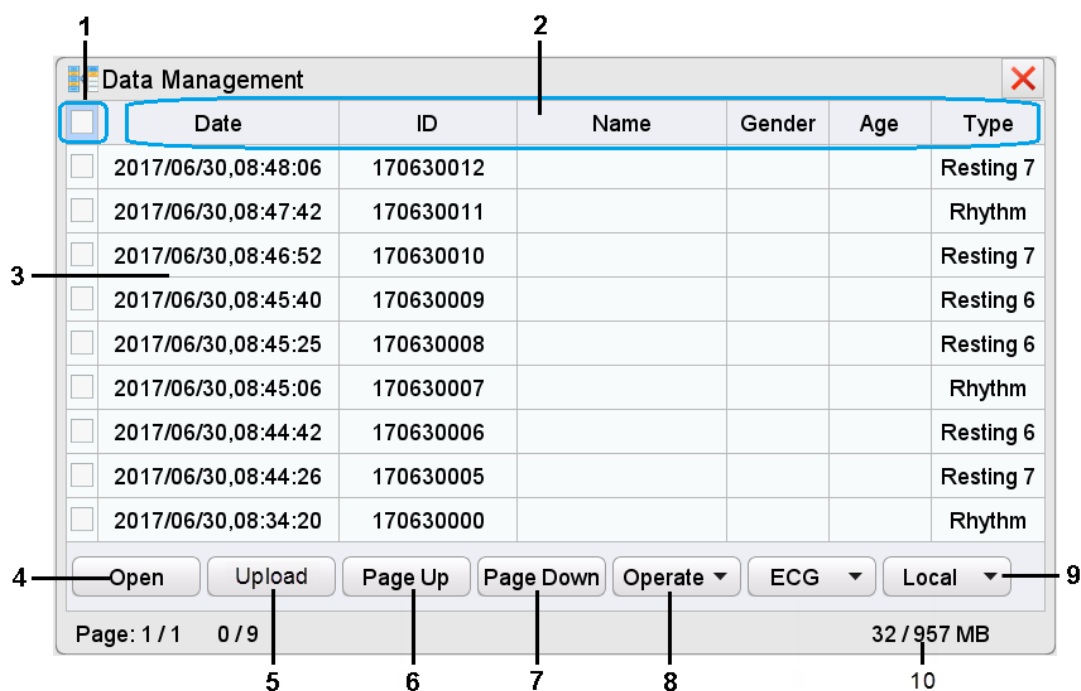


Figure 6- 1 Data Management

| No. | Name | Description |
|---------|----------------------------|--|
| 1 | Select All Shortcut Button | Press to select all the ECG files in the current page. |
| 2 | File Attributes Area | Select any file attribute, and sorting files by pressing ENTER . |
| 3 | ECG Files Display Area | Display basic animal information of all the ECG files. |
| 4 | Open | Open the animal's ECG file. |
| 5 | Upload | Upload selected ECG files to ECG workstation or server. |
| 6 and 7 | Page Up/Page Down | Browse ECG files in previous or next page. |
| 8 | Operate | Select to All , Refresh , Copy , Move , Delete , or Search the ECG files. Search ECG files according to ID number, name, age, time and symptom. |

| No. | Name | Description |
|-----|-----------------------|--|
| 9 | Select Storage Medium | Set one option for the storage medium, including local, USB 0 and USB 1. |
| 10 | Indication Area | Indicate pages of ECG files and internal memory. |

6.1 Open an ECG File

Select an ECG file, select **[Open]** and press **ENTER** to open the file.

 **EXPLANATION**

When you select more than one file to open, the default file is the first selected file.

6.2 Edit an ECG File

After opening the ECG file, you can edit the animal information, can also upload, save and print the file. You can refer to *Analysis Report Mode* to know the content and function of the ECG file.

6.3 Delete ECG Files

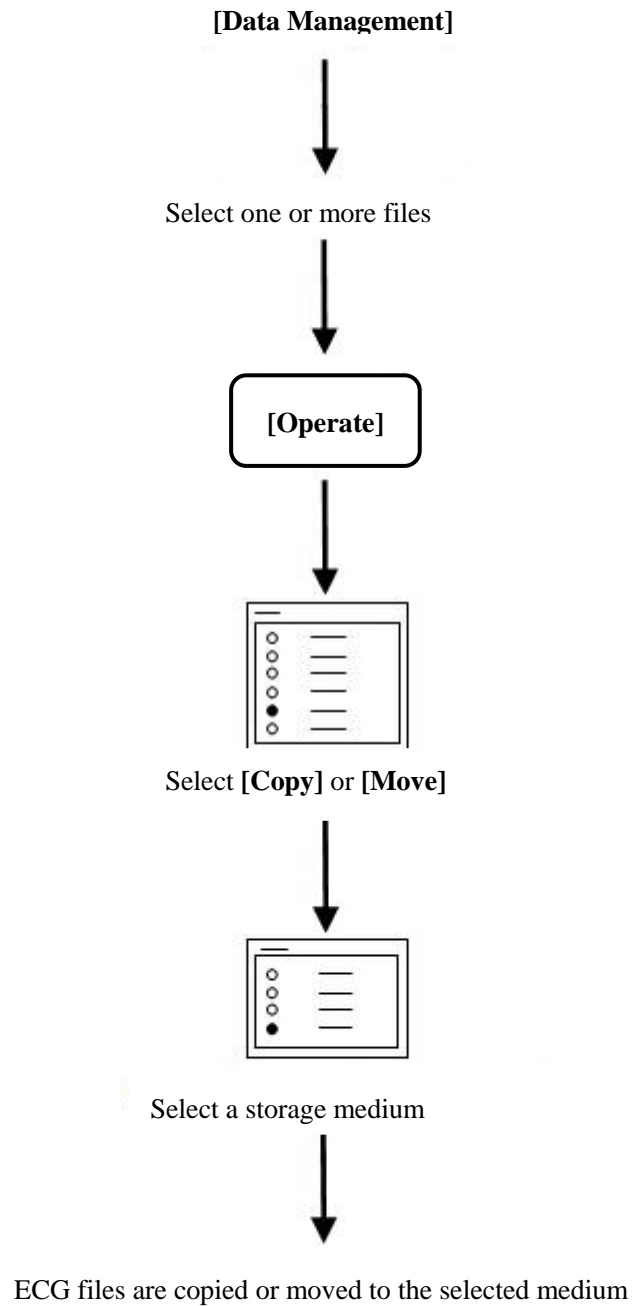
Select **[Operate]** > **[Delete]** and press **ENTER** to delete files.

 **CAUTION**

Deleted files cannot be recovered. Please confirm before deleting.

6.4 Copy and Move ECG files

Select one or more ECG files, operate as following to transfer the ECG files.



 **EXPLANATION**

- Files can be copied or moved between the local ECG machine and external storage medium. ECG files on the local machine will be deleted if the user moves them.
 - After selecting files and a path, the files will be copied to the selected path. When copy files to USB device, the system will create a new folder in the USB device to store the selected files, for example “ecg database”.
 - When there is not enough memory, the system will indicate that. You should choose new memory to make files copying or moving successfully.
 - Please regularly clear data in a storage medium or the speed of the machine will be slowed down.
-
-

 **CAUTION**

- When copying or moving the files, the continuity of power supply must be assured, or the files may be missing.
 - When copying or moving the files, it is not allowed to insert or unplug the USB device; otherwise, it may cause abnormality of the ECG machine.
-
-

Chapter 7 Maintenance

7.1 Main Unit

CAUTION

- Gently disconnect the Animal Cable and power cable without forcibly pulling the lead wires.
 - Clean the ECG machine as well as the accessories and cover the machine from dust.
 - Store the machine in a dry and cool environment and avoid excessive shocking and vibration.
-
-

7.2 Animal Cable

CAUTION

- The lead wire must be periodically checked. Damage may cause incorrect of ECG waveform at some or all leads.
 - The user should avoid twisting the Animal Cable, or the life time of the Animal Cable will be shortened.
-
-

7.3 Cleaning and Disinfection

Before cleaning, power off the ECG machine and disconnect it from the AC power.

Do cleaning first before disinfection.

The process to clean and disinfect the ECG machine, cables, lead wires and reusable electrodes are as follows:

- 1) Use a clean soft cloth absorbing an amount of cleanser or disinfectant to wipe the surface carefully and avoid touching connectors of the ECG machine and accessories.
- 2) When necessary, wipe the superfluous cleanser or disinfectant with dry cloth.
- 3) Place in the ventilated and cool environment to dry the ECG machine and accessories.

Sterilization operation for this ECG machine and accessories is not recommended, unless the manual of the accessories has requirement.

 **CAUTION**

- While cleaning and disinfection, do not splash liquid into the ECG machine and the accessories.
 - Disinfections may cause damage to the ECG machine or accessories to a certain degree. It is suggested that only when necessary, disinfect the ECG machine and accessories.
 - Neutral cleanser or disinfectant is recommended.
-
-

7.4 Recording Paper

 **CAUTION**

- To ensure good ECG recording, please use suitable thermal recording paper for the ECG machine. Incorrect recording paper can damage printer head and cause problems such as blurring trace and incorrect paper running. Pay attention to the following comments on recording paper.
 - Never use recording paper coated with wax for the ECG machine. It may cause serious problems to the printer head.
 - When exposed to high temperature, high humidity and direct sunlight, the recording paper will deteriorate. It is therefore required to store the thermal recording paper in a dry and cool environment.
 - When exposed to fluorescent light for long time, the recording paper will deteriorate.
 - When stored with polyvinyl chloride (PVC), the recording paper will deteriorate.
 - If the thermal recording paper is stored overlapping for a long time, the printing impression will leave traces in other pages, which will cause mislead readings.
 - Use suitable size recording paper for the ECG machine. Or, it may cause damage to the printer head and Silicon rubber shaft.
-
-

7.5 Battery

The ECG machine is equipped with a built-in rechargeable battery to assure continuous operation when AC power is unavailable. Charging, capacity indication and replacement of the battery are described below:

◆ Charging

The ECG machine is designed with a charger and protector for the battery.

- Please turn off the machine first before charging the battery.
- The battery-charging indicator on the operation keyboard will become green when the battery is charged completely.
- If the ECG machine is to be stored or without use for a long time, discharge and charge the battery at least once every three months (discharge the battery until the machine turns off automatically, and fully charge the battery).

◆ Capacity indicator

When the unit is powered by battery, there will be a symbol of battery capacity indication displayed on the LCD.

For example:



Full battery capacity, it can work continuously for about 3 hours.



Battery capacity is sufficient.



Insufficient battery capacity, charging is required.



Battery capacity is going to running out, immediate charging is demanded.



Battery capacity has already run out and blackout may happen at once, immediate charging is demanded.

◆ Battery replacement

The battery should be replaced by the professionals according to the following procedures.

1. Power off the ECG machine and disconnect the AC power cable.
2. Flip over the ECG machine and disassemble the battery back cover based on the instruction on the back cover.
3. Disconnect the battery plug and take out the battery.
4. Replace the existing battery with a new one. Pay attention to polarity and connection.
5. Install the battery cover.

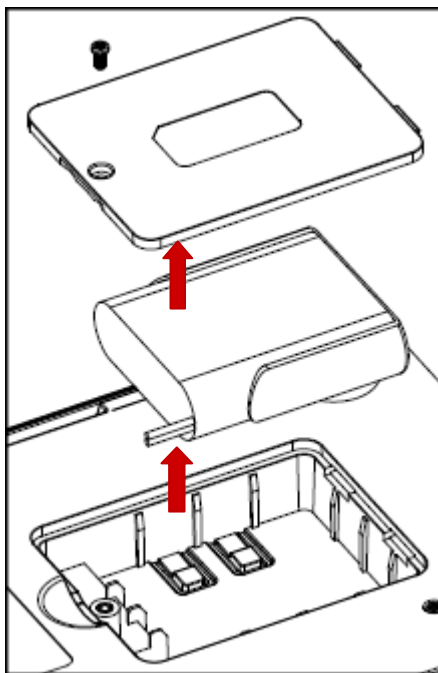


Figure 7- 1 Battery Replacement

EXPLANATION

Refer to *Foreword* for other warning information of battery.

7.6 Silicon Rubber Shaft for Printing

The silicon rubber shaft shall be kept clean, smooth and free from dirt. Otherwise, the ECG machine may print out unsatisfied ECG trace. To clean the shaft, wipe the shaft with soft cotton moistened with medical alcohol and at the same time rotate shaft until it is clear enough.

7.7 Thermal Print Head

Residue and dirt on the thermal print head could affect the clarity of recorded ECG waveform. To clean the thermal print head, open the paper cover and clean the print head with soft cotton moistened with medial alcohol. It is not permitted to clean the print head with a sharp object, which can cause permanent damage to the print head. Thermal print head maintenance should be done at least once a month.

Chapter 8 Troubleshooting

8.1 Lead Fault

1. Data saturation or overflow happens.

Solution:

Ensure that all leads are in good contact, and wait for half a minute or the waveforms on the screen are stable, and then start printing.

2. Straight line is printed in some leads.

Solution:

- 1) Check if the metal piece of electrode contacts the animal body properly; if not, adjust the position of the electrode, and adjust the tightness if necessary.
 - 2) Check if the electrodes are oxidized or faded, and clean the accessories or replace with new ones. Oxidation and aging cause conductive deterioration of the electrode sheet, resulting in poor signal transmission.
 - 3) Treat the skin of the animal with alcohol; especially in the winter of the North, dry skin causes skin resistance to become larger, which will impact the signal reception.
 - 4) Please clean the joints of lead wires and electrode holders, reinstall and tighten all joints. After long-term use, the joints will have dirt or become loose, resulting in poor signal transmission.
 - 5) Check if the appearance of the lead wires has obvious fracture; if yes, replace with new lead wire. If not, connect a proper lead wire to the device. If the waveform is stable, the lead wires have problem and have to be replaced.
 - 6) If there is no lead wire available, check if the lead wires conduct with a multimeter. First check if the inner conductors of the lead wires are conductive. Generally speaking, the acceptable resistance shall be about 10 k Ω . Then check if there is a short circuit between the outer shield and inner conductor. The resistance shall be infinity. If the lead wires have a problem, please contact our service department to replace new lead wires.
3. The other reason for lead fault can be caused by failure in signal communication. Please exclude other causes for lead fault problems first, and contact our service technicians if necessary.

8.2 Printer Failure

1. Unclear printing.

Solution:

- 1) Whenever a printer fault occurs, such as poor or incorrect ECG recording, you may try to clean the thermal printer head with soft cotton dipped with medical alcohol.
- 2) Please check if the quality of the thermal paper is poor or if the unsealing time is too long, resulting in reduced performance of thermal layers, and replace with provided or specified recording paper.
- 3) If the above methods are not applicable, guide the user to test the print head and check if the print head has breaking point; if yes, contact the company service department to replace the thermal print head.

2. Upper half or lower half is blank.

Solution:

Check if the bearing on both ends of the rubber shaft of the paper compartment cover is worn, and replace with new bearing if yes.

3. All paper or most part is blank.

Solution:

- 1) Make sure that the thermal recording paper is not installed backwards.
- 2) Check if the print head is stuck by dirt (such as adhesive tape); this often occurs when new print paper is replaced.

8.3 Indicator of Lead Off

This ECG machine can detect the lead connecting status continuously. When the leads are not well connected to the main unit, it means that the signals cannot be transferred correctly, thus there is “lead off:*” indication, accompanied by voice alarm. The symbol “*” represents the fault lead, the waveform of which will display as a straight line. Please check carefully whether the connection among the related electrodes, animal body, lead wire and the main unit remains well.

8.4 AC Interference

Apparent and regular trembling of ECG waveform in the process of recording due to AC interference is shown as below.



Causes of baseline wander are varied, please do following checks one by one:

1. Make sure the ECG machine is properly grounded according to the instructions.
2. Make sure the lead wires or electrodes are properly connected.
3. Make sure the electrodes and the animal skin have been covered with ECG gel.
4. Make sure the exam bed is properly grounded.
5. Make sure the animal is not in touch with the wall or the metal part of the bed.
6. Make sure the animal is not in touch with anybody else.
7. There shall be no large power electric equipment (such as x-ray machine, ultrasound scanner and so on) operating nearby.

⚠ CAUTION

Set AC filter to ON if AC interference still exists after the above checks are completed.

8.5 EMG Interference

Irregular trembling of ECG waveform due to EMG interference is shown as below.



Causes of baseline wander are varied; please do following checks one by one:

1. Make sure that the exam room is comfortable for examination.
2. Soothe the animal from irritation or excitement.
3. Make sure the exam bed is in suitable size.
4. Make sure the limb electrode is too tight to make the animal uncomfortable.

⚠ CAUTION

Set EMG filter to lower value if EMG interference still exists after the above checks are completed, and keep in mind that the recorded ECG waveform, particularly R wave, will be somewhat attenuated.

8.6 Baseline Wander

Irregular movement of ECG baseline due to baseline drift is shown as below:



Causes of baseline wander are varied, please do following checks one by one:

1. Make sure the electrodes are in good contact with skin.
2. Make sure the connection between the Animal Cable and electrodes is normal.
3. Make sure the electrodes are clean and animal skin contacted with the electrodes has been well pretreated.
4. Make sure the electrodes and skin are covered with ECG gel.
5. Keep the animal silent and motionless, and keep the animal from hyperventilation.
6. Used electrodes shall not be utilized with new ones in using examination.

⚠ CAUTION

If the problem still can't be cleared, please turn up the baseline wander filter, keep in mind that the recorded ECG waveforms, particularly T wave and ST segment, will be somewhat distorted.

8.7 The ECG Machine cannot be turned on

1. AC power is not working properly and the battery is exhausted.

Solution:


First check if the power outlet connects properly, if the power line and the machine connect properly, and then check if local AC voltage is normal. If everything is ok, check if the fuse is good. If everything is normal after above examination, return the machine to the manufacturer for repair, for it may be damaged.

2. After turning on, the machine turns off automatically after a few minutes.

Solution:


While working, if the screen displays the battery power, the machine is using the battery, but the battery power is insufficient, resulting in automatic shutdown. Please supply the machine with AC power, or charge the battery before working; if the user is using AC power and the machine still turns off automatically, please check according to step1.

8.8 Paper Feeding Failure

1. Press , but paper is not fed.

Solution:

Check if the keyboard has been damaged and replace damaged keyboard.

2. Press , the paper is not fed, and there is abnormal sound from recorder.

Solution:

First check if the recording paper is installed properly, and if the gear on the cover of paper magazine is in good condition.

3. Paper feeding isn't smooth, paper is stuck, or waveforms are compressed.

Solution:

First check if the thermal paper complies with the standard, then if the paper is installed properly, or replace a new roll of paper. Finally, replace the paper shaft.

8.9 Battery is quickly Charged and Discharged

If the battery is often not fully charged, the performance will be deteriorated.

Solution:

It is recommended to charge the battery continuously until the battery is fully charged and activated for the first two times. Supply the machine with AC power as far as possible.

8.10 File Uploading Failure

The most possible reason is that network settings have problems, please check the network connection and refer to *Network Connection* to re-set the network.

Appendix A Package and Accessories

A.1 Packing List

| Type | Item | Qty |
|----------|------------------------------|---------|
| Standard | ECG Machine | 1 unit |
| | Animal Cable | 1 set |
| | Animal ECG Electrode Holders | 1 set |
| | Power Cable | 1 piece |
| | Equipotential cable | 1 piece |
| | Thermal Recording Paper | 1 piece |
| | Paper Roller | 1 piece |
| | Handle Set | 1 set |
| | User Manual | 1 copy |
| | Warranty Card | 1 copy |
| | Qualified Certificate | 1 copy |
| | Packing List | 1 copy |

A.2 Dimensions and Weight

| | |
|--------------------------------|----------------------------------|
| Length × Width × Height | 281 mm × 191 mm × 59 mm (iE 101) |
| | 281 mm × 191 mm × 59 mm (iE 300) |
| Net Weight | About 1.3 kg (iE 101) |
| | About 1.3 kg (iE 300) |

 **CAUTION**

- Please open the package according to instructions on the packing box.
 - Enclosed accessories and documents shall be checked according to the packing list before starting checking on the unit.
 - Whenever there will be mismatch of the accompanying materials with the packing list, contact our Customer Service Department immediately.
 - To ensure good performance and safe operation of the ECG machine, please use the accessories supplied by the manufacturer.
 - The package box should be kept well for the regular inspection or maintenance for the machine.
-
-

Appendix B Technical Specification

B.1 Specifications

B.1.1 Main Unit

| | |
|--|---|
| Lead | 7-lead |
| Acquisition Mode | Simultaneous 7-lead Acquisition |
| Record Format | 1 × 7, 1 × 7+1R (iE 101) |
| | 3×2+1, 3×2+1+1R, 3+4 (iE 300) |
| Record Mode | Auto, Manual, Upload |
| Lead Format | 7×1, 3+4 |
| Rhythm Time | 30~300s waveforms acquisition for rhythm analysis |
| Measurement Parameters | Ventricular Rate, PR Interval, QRS Time Limit, QT/QTc Interval, P/QRS/T Axis |
| Filters | AC Filter |
| | Baseline Wander Filter |
| | Low-pass Filter |
| Input CIR Current | ≤0.1 μA |
| Input Impedance | ≥30 MΩ (10Hz) |
| Time Constant | ≥3.2 s |
| Frequency Response | 0.01 Hz~250 Hz |
| Noise Level | ≤12.5 μV _{p-p} |
| Sensitivity Threshold | ≤20 μV _{p-p} |
| Sensitivity | Auto, 0.625 mm/mV, 1.25 mm/mV, 2.5 mm/mV, 5 mm/mV, 10/5 mm/mV, 10 mm/mV, 20/10mm/mV, 20 mm/mV, and 40 mm/mV |
| Standard Sensitivity | 10 mm/mV ±2% |
| Calibration Voltage | 1 mV ±3 % |
| Accuracy of input signal reproduction | Using the method described in 4.2.7.1 of AAMI EC11 to test the overall system error, which is within ±5%; |

| | |
|---------------------------------|--|
| | Using method A and D described in 4.2.7.1 of AAMI EC11 to test frequency response. Because of sampling characteristics and the asynchronism between sample rate and signal rate of the ECG machine, digital systems may produce a noticeable modulating effect from one cycle to the next. This phenomenon, which is not physiologic, shall be clearly described in the operator's and service manuals. |
| CMRR | > 115 dB |
| Animal Leak Current | < 10 μ A |
| Sampling rate of signals | 8000Hz |

B.1.2 Recorder Specification

| | |
|------------------------|--|
| Recorder | Thermal Dot Matrix Word Printing System |
| Recording Paper | 50 mm, roll paper (iE 101) 80 mm, roll paper (iE 300) |
| Paper Speed | (5, 6.25, 10, 12.5, 25, 50)mm/s \pm 5% |

B.1.3 Other Specification

| | |
|------------------------------|--|
| Display on LCD | 5-inch TFT LCD screen (iE 101) |
| | 5-inch TFT LCD screen (iE 300) |
| Safety Classification | IEC60601-1, Class I, Type CF |
| AC Power Supply | 100 V-240V, 50 Hz /60 Hz, 80 VA (iE 101) |
| | 100 V-240V, 50 Hz /60 Hz, 80 VA (iE 300) |
| DC Power Supply | Rechargeable lithium battery, 11.1 V/ 2600mAh. In environment temperature 25 $^{\circ}$ C \pm 5 $^{\circ}$ C and with the machine turning off, the charging time is not more than 2 hours to charge the battery to 90%. |
| | In environment temperature 25 $^{\circ}$ C \pm 5 $^{\circ}$ C, the continuous working time is not less than 3 hours while the ECG device is continuously printing. |

B.2 Environment Requirements

| | | |
|---|--|-------------------------|
| 1 | Transportation | |
| | Environment Temperature | -20 °C ~ +55 °C |
| | Relative Humidity | ≤95 % (No condensation) |
| | Air Pressure | 70 kPa ~ 106 kPa |
| | Transportation: avoid direct sunshine and rain. | |
| 2 | Storage | |
| | Environment Temperature | -20 °C ~ +55 °C |
| | Relative Humidity | ≤95 % (No condensation) |
| | Air Pressure | 70 kPa ~ 106 kPa |
| | The packed ECG should be stored in the well-ventilated room without corrosive gases. | |
| 3 | Using | |
| | Environment temperature | +5 °C ~ +40 °C |
| | Relative humidity | ≤95 % (No condensation) |
| | Air pressure | 70 kPa ~ 106 kPa |

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Appendix C EMC-Guidance and manufacture's declaration

CAUTION

- The use of accessories, sensor and cable which exceed regulations can increase the electromagnetic emissions or decrease the electromagnetic immunity.
- Please don't use the equipment with tightness and pile. The equipment should be detected according to the requirements to make sure it working normally.
- Please make the equipment safety according to the EMC, and install, fix it under the situation required by EMC.
- Even though the other equipments which measure up the CISPR also may cause disturbance.
- When the amplitude of import signal narrow than regulated minimum amplitude may lead to inaccurate measure.
- Portable and mobile communications equipment will affect the performance of the equipment.

C.1 Guidance and manufacturer's declaration – electromagnetic emission

| Guidance and manufacturer's declaration – electromagnetic emission | | |
|--|------------|--|
| The Digital Electrocardiograph is intended for use in the electromagnetic environment specified below. The customer or the user of the ECG machine should assure that it is used in such an environment. | | |
| Emissions test | Compliance | Electromagnetic environment - guidance |
| RF emissions CISPR11 | Group 1 | The ECG machine uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment. |
| RF emissions CISPR11 | Class A | The ECG machine is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes. |
| Harmonic emissions EN 61000-3-2 | Class A | |
| Voltage fluctuations / flicker emissions EN 61000-3-3 | Complies | |


C.2 Guidance and manufacture’s declaration-electromagnetic immunity for all EQUIPMENT and SYSTEMS.

| Guidance and manufacture’s declaration-electromagnetic immunity | | | |
|--|--|--|---|
| The ECG machine is intended for use in the electromagnetic environment specified below. The customer of the user of the ECG machine should assure that it is used in such an environment | | | |
| Immunity test | IEC60601 test level | Compliance level | Electromagnetic environment guidance |
| Electrostatic discharge (ESD) IEC61000-4-2 | ±6KV contact ±8KV air | ±6KV contact ±8KV air | Floors should be wood, concrete or ceramic tile. If floor are covered with synthetic material, the relative humidity should be at least 30% |
| Electrical fast transient/burst IEC61000-4-4 | ±2KV for power supply lines ±1KV for input/output lines | ±1KV for power supply lines ±1KV for input/output lines | Mains power quality should be that of a typical commercial or hospital environment. |
| Surge IEC61000-4-5 | ±1KV differential mode ±2KV common mode | ±1KV differential mode ±2KV common mode | Mains power quality should be that of a typical commercial or hospital environment. |
| Voltage dips, short interruptions and voltage variation power supply input lines IEC61000-4-11 | <5% UT (>95% dip in UT) for 0.5 cycle 40% UT (60% dip in UT) for 5 cycle 70% UT (30% dip in UT) for 25 cycles <5% UT (>95% dip in UT) for 5 sec | <5% UT for 0.5 cycle 40% UT for 5 cycle 70% UT for 25 cycles <5% UT for 5 sec | Main power quality should be that of a typical commercial or hospital environment. If the user of the ECG machine requires Continued operation during power mains interruptions, it is recommended that the ECG machine be powered from an uninterruptible power supply or a battery. |

| | | | |
|---|------|------|---|
| Power frequency (50Hz) magnetic field IEC61000-4-8 | 3A/m | 3A/m | Mains power quality should be that of a typical commercial or hospital environment. |
| NOTE: UT is the A.C mains voltage prior to application of the test level. | | | |

C.3 Guidance and manufacture's declaration-electromagnetic immunity for EQUIPMENT and SYSTEMS those are not LIFE-SUPPORTING

| Guidance and manufacture's declaration-electromagnetic immunity | | | |
|---|--------------------------|------------------|--|
| The ECG machine is intended for use in the electromagnetic environment specified below. The customer of the user of the ECG machine should assure that it is used in such an environment. | | | |
| Immunity test | IEC60601 test level | Compliance level | Electromagnetic environment-guidance |
| Conducted RF IEC61000-4-6 | 3 Vrms 150kHz -80 MHz | 3 Vrms | Portable and mobile RF communications equipment should be used no closer to any part of the ECG machine, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d = \left[\frac{3.5}{V_1} \right] \sqrt{P}$ |
| Radiated RF IEC61000-4-3 | 3 V/m 80 MHz -2.5 GHz | 3 V/m | $d = \left[\frac{3.5}{E_1} \right] \sqrt{P} \text{ 80MHz-800 MHz}$ $d = \left[\frac{7}{E_1} \right] \sqrt{P} \text{ 800MHz-2.5 GHz}$ Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, range ^a should be less than the |

| | | | |
|---|--|--|---|
| | | | <p>compliance level in each frequency range.^b</p> <p>Interference may occur in the vicinity of Equipment marked with the following symbol:</p>  |
| <p>NOTE1: At 80MHz and 800MHz, the higher frequency range applies.</p> <p>NOTE2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.</p> | | | |
| <p>a. Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the ECG machine should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the ECG machine.</p> <p>b. Over the frequency range 150kHz to 80 MHz, field strengths should be less than 3V/m.</p> | | | |

C.4 Recommended separation distance between portable and mobile RF communications equipment and the EQUIPMENT or SYSTEM for EQUIPMENT or SYSTEM that are not LIFE-SUPPORTING

| Recommended separation distance between portable and mobile RF communications equipment and the ECG machine | | | |
|--|---|---|---|
| <p>The ECG machine is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the ECG machine can help prevent electromagnetic Interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the ECG machine as recommended below according to the maximum output power of the communications equipment.</p> | | | |
| Rated maximum output power of transmitter (W) | Separation distance according to frequency of transmitter (m) | | |
| | 150 kHz-80 MHz | 80 MHz-800 MHz | 800 MHz-2.5 GHz |
| | $d = \left[\frac{3.5}{V_1} \right] \sqrt{P}$ | $d = \left[\frac{3.5}{E_1} \right] \sqrt{P}$ | $d = \left[\frac{7}{E_1} \right] \sqrt{P}$ |
| 0.01 | 0.12 | 0.12 | 0.23 |
| 0.1 | 0.38 | 0.38 | 0.73 |
| 1 | 1.2 | 1.2 | 2.3 |
| 10 | 3.8 | 3.8 | 7.3 |
| 100 | 12 | 12 | 23 |
| <p>For transmitters rated at a maximum output power not listed above, the recommended separation distance in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.</p> <p>NOTE1: At 80MHz and 800MHz, the higher frequency range applies.</p> <p>NOTE2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.</p> | | | |

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